NOME STATE OFFICE BUILDING REMODEL

Volume 1

Bid Documents

(**Divisions 2 through 12**)

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Division of General Services
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SECTION 02 4100
DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Selective demolition of built site elements.

B. Selective demolition of building elements for alteration purposes.

1.02 RELATED REQUIREMENTS

A. Section 00 3100 - Available Project Information: Existing building survey conducted by Owner; information about known hazardous materials.

B. Section 01 1000 - Summary: Limitations on Contractor's use of site and premises.

C. Section 01 1000 - Summary: Sequencing and staging requirements.

D. Section 01 1000 - Summary: Description of items to be removed by Owner.

E. Section 01 1000 - Summary: Description of items to be salvaged or removed for re-use by Contractor.

F. Section 01 5000 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.

G. Section 01 6000 - Product Requirements: Handling and storage of items removed for salvage and relocation.

H. Section 01 7000 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring.

I. Section 02 6500 - Underground Storage Tank Removal.

J. Section 31 2000 - Earth Moving.

1.03 REFERENCE STANDARDS

A. 29 CFR 1926 - U.S. Occupational Safety and Health Standards; current edition.

B. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2013.

1.04 SUBMITTALS

A. See Section 01 3300 - submittal procedures.

B. Site Plan: Showing:
   1. Areas for temporary construction and field offices.
   2. Areas for temporary and permanent placement of removed materials.

C. Demolition Plan: Submit demolition plan as specified by OSHA and local authorities.
   1. Indicate extent of demolition, removal sequence, bracing and shoring, and location and construction of barricades and fences.
   2. Identify demolition firm and submit qualifications.
   3. Include a summary of safety procedures.

D. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

PART 2 PRODUCTS

2.01 MATERIALS

A. Fill Material: As specified in Section 31 2000 – General Fill

PART 3 EXECUTION

3.01 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
   1. Obtain required permits.
   2. Comply with applicable requirements of NFPA 241.
   3. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
   4. Provide, erect, and maintain temporary barriers and security devices.
   5. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
   6. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
   7. Do not close or obstruct roadways or sidewalks without permit.
   8. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
   9. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.

B. Do not begin removal until receipt of notification to proceed from Owner.

C. Protect existing structures and other elements that are not to be removed.
   1. Provide bracing and shoring.
   2. Prevent movement or settlement of adjacent structures.
   3. Stop work immediately if adjacent structures appear to be in danger.

D. Minimize production of dust due to demolition operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

E. Hazardous Materials: Comply with 29 CFR 1926 and state and local regulations.

F. Underground Storage Tanks: Remove and dispose of as specified in Section 02 6500.

3.02 EXISTING UTILITIES

A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.

E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.

F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.

G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

3.03 SELECTIVE DEMOLITION FOR ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
   1. Verify that construction and utility arrangements are as shown.
   2. Report discrepancies to Owner before disturbing existing installation.

3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.

B. Separate areas in which demolition is being conducted from other areas that are still occupied.
   1. Provide, erect, and maintain temporary dustproof partitions of construction specified in Section 01 5000 in locations indicated on drawings.
   2. Provide sound retardant partitions of construction indicated on drawings in locations indicated on drawings.

C. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and wind damage.

D. Remove existing work as indicated and as required to accomplish new work.
   1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction specified.
   2. Remove items indicated on drawings.

E. Services (Including but not limited to HVAC, Plumbing, Electrical, and Telecommunications): Remove existing systems and equipment as indicated.
   1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components.
   2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
   3. Verify that abandoned services serve only abandoned facilities before removal.
   4. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification.

F. Protect existing work to remain.
   1. Prevent movement of structure; provide shoring and bracing if necessary.
   2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
   3. Repair adjacent construction and finishes damaged during removal work.
   4. Patch as specified for patching new work.

3.04 DEBRIS AND WASTE REMOVAL

A. Remove debris, junk, and trash from site.

B. Leave site in clean condition, ready for subsequent work.

C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

SECTION 02 6500
UNDERGROUND STORAGE TANK REMOVAL

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Underground storage tank (UST) and associated piping removal and disposal.

B. Transfer of the UST contents to the new aboveground storage tank (AST).

C. Excavation and backfill of soils around the existing UST.

D. Removal, hauling, handling, transport and disposal of contaminated soils associated with UST demolition.

1.02 RELATED REQUIREMENTS

A. Section 02 4100, Demolition

B. Section 31 2000, Earth Moving

1.03 REFERENCE STANDARDS

A. ADEC 18 AAC 60, Solid Waste Management

B. ADEC 18 AAC 75, Oil and Other Hazardous Substances Pollution Control

C. ADEC 18 AAC 78, Underground Storage Tanks

D. ADEC Draft Field Sampling Guidance, May 2010

E. ADEC Underground Storage Tanks Procedures Manual, November 2002

F. OSHA 25 CFR 1910.120, Hazardous Waste Operations and Emergency Response

G. API Recommended Practice 1604, Closure of Underground Storage Tanks, 1996

1.04 TEST AND INSPECTION REPORTS REQUIRED

A. Soil compaction testing shall conform to the requirements of Section 03 3000.

1.05 SUBMITTALS

A. See Section 01 3300 - Submittal Procedures.

B. Prior to work, the Contractor shall identify and submit for approval a disposal facility that is permitted to and will accept any contaminated soil/sludge for disposal. The submitted facility must be fully operational and in full compliance with all applicable Federal, State, and local regulations.

C. Prior to work, the Contractor shall identify and submit for approval a method of containment and transport for any contaminated soil and or sludge generated on site. The submitted methods must be compliant with applicable reference standards.

D. Prior to payment, copies of all shipping manifests, bills of lading, weigh tickets, receipts, and related documentation sufficient to demonstrate tracking of any contaminated soil from the work site to the point of disposal.

E. Prior to payment, evidence satisfactory to the Owner's Representative of number of cubic yards of contaminated soil removed, transported, disposed of, and replaced with clean fill. Measurement shall be post-excavation "in place" quantities based on dimensions of excavation (not including the volume of the UST), but documentation from the disposal entity of quantity received shall also be required.

PART 2 - PRODUCTS

2.01 LINER FOR SOIL STORAGE

A. STOCKPILE LINER: A liner that will meet the minimum long-tern storage specifications set out in Table D of 18 AAC 75.370. Liner will be large enough to accommodate any contaminated soil stockpiled.

B. STOCKPILE COVER: No less than a six-mil, reinforced polyethylene liner or its equivalent (18 AAC 75.370). Cover will be large enough to accommodate any contaminated soil stockpiled.

PART 3 - EXECUTION

3.01 UST REMOVAL AND DEMOLITION

A. Follow all procedures and requirements specified in Section 02 4100 – Demolition.

B. REMOVAL OF UST CONTENTS: The contents of the 5,000 gallon UST will be transferred (including filtration) to the new AST. Prior to transfer, proper spill prevention measures will be in place including a spill catchment basin beneath the transfer point and spill response materials on hand. The contents will be verified before and after by the Owner's Representative. If residual sludge is encountered in the UST after excavation, the material will be drummed and disposed of at an approved facility (Part 1.05 A). The UST will be cleaned prior to transport in accordance with API 1604.

C. EXCAVATION AND REMOVAL OF UST AND ASSOCIATED PIPING: The Contractor shall provide a UST-Certified worker to conduct the excavation, removal, and demolition of the 5,000 gallon UST and associated piping. The Contractor will supply all equipment and labor.

D. DISPOSE OF TANK AND PIPING: The tank should be prepared for transport and disposal in accordance with API 1604. The cleaned, disassembled and inerted tank and piping will be disposed of at an approved solid waste management facility (Section 02 4100, Demolition).

3.02 SOILS EXCAVATION AND REPLACEMENT

A. ENVIRONMENTAL INVESTIGATION: Soil excavation will be directed by an Owner-provided "Qualified Person" (as defined in 18 AAC 75.990). During excavation, a photoionization detector (PID) will be used to field-screen soil surrounding the tank and associated vent and product lines. The PID screenings will be used to guide any contaminated soil excavation. The "Qualified Person" will collect confirmation samples in the excavation sidewalls and floor for submittal to an Environmental Protection Agency (EPA) and ADEC-approved laboratory. Any coordination with ADEC will be handled by the Owner's Representative.

B. EXCAVATION OF CONTAMINATED SOIL: If the "Qualified Person" determines that excavation of contaminated soil is required, the lateral extent of the excavation will be based on field screening, where structures and utilities are not the limiting factor. The vertical extent will be based on field screening, where groundwater is not the limiting factor. Excavation will continue until field screenings indicate soil is clean.

C. ON-SITE MANAGEMENT OF CONTAMINATED SOILS: Any stockpiled contaminated soils will be placed on a stockpile liner (Part 2.01 A). The stockpile liner will be lapped over a nominal 12" tall berm of clean soil. Stockpiles will also be covered with a stockpile cover (Part 2.01 B), with the edge of the cover lapped over the liner and berm to prevent water running through the soil.

D. TRANSPORTATION AND DISPOSAL OF CONTAMINATED SOILS: Any contaminated soil stockpiles generated during excavation shall be disposed of by the Contractor by transporting (in accordance with 18 AAC 60) off-site (i.e. outside Nome) to a permitted waste or thermal remediation facility. ADEC approval to transport soil (if required), will be obtained by the Owner's Representative.

E. RESTORATION OF EXCAVATED AREA: Contractor shall backfill the excavation with clean General Fill material graded to drain consistent with the local drainage pattern placed per the requirements of Section 31 2000 Earth Moving.

3.03 METHOD OF MEASUREMENT

A. Measurement of soil by the Cubic Yard to be disposed of shall be post-excavation "in place" quantities based on dimensions of any contaminated soil excavation (not including the volume of the UST), but documentation from the disposal entity of soil quantity received shall

also be required for comparison. Contractor shall perform a survey of excavation, in the presence of the Owner's Representative, to determine quantities.

3.04 METHOD OF PAYMENT

A. The Contractor shall include all costs to remove and dispose of the existing UST and associated piping, including transferring (with filtration) contents to the new AST, tank and piping excavation, removal, demolition, disposal, and excavation backfill with clean General Fill in the base bid lump sum.

B. The Contractor shall include a unit price for contaminated soil removal including contaminated soil excavation, storage, transportation and disposal at an approved facility (Part 1.05 A), and excavation backfill with clean General Fill. For bidding purposes, provide a unit price per cubic yard of contaminated soil.

C. The Contractor shall include a unit price for any UST contents (sludge or contaminated water) not transferred into the new AST including drumming, transportation and disposal at an approved facility.

END OF SECTION

SECTION 02 2600
HAZARDOUS MATERIALS ASSESSMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. The Hazardous Materials Assessment for the proposed construction is included with these Contract Documents.

1.02 USE OF INFORMATION

A. The Hazardous Materials Assessment is provided for the Contractor's information and use in the planning and performance of work in areas containing hazardous or potentially hazardous materials as outlined in Paragraph 1.03.

1. The information provided in the Hazardous Materials Assessment is based on samples collected in various locations of the building. Thus, the Owner and/or its Representative cannot guarantee or warrant that actual conditions encountered might not vary from the information presented in these reports.
2. The data reported in the Hazardous Materials Assessment is accurate to the best of the Owner's and it’s Representative's knowledge. The requirements contained in these specifications and in the relevant state and federal regulations pertaining to the performance of work in areas containing hazardous or potentially hazardous materials provide guidance for the contractor for performance of work in these areas. The Owner and its Representative disclaim all responsibility for the Contractor's erroneous conclusions regarding the information presented in these reports; the requirements contained in these specifications; and the requirements of applicable state and federal regulations pertaining to performance of work in these areas.
3. The Contractor shall be responsible for obtaining additional information if Contractor deems it necessary to carry out the work.

B. It is highly recommended that the contractor visit the site to acquaint themselves with existing conditions.

C. Attached Hazardous Materials Assessment

1.03 NOTIFICATION OF POTENTIAL HAZARDS

A. Asbestos, lead and other hazardous materials are present in the building that may impact the work of all trades. Regulated air contaminants, including asbestos and lead, are assumed to be present in settled and concealed dust in and on architectural, structural, mechanical and electrical components or systems throughout the building. All trades shall coordinate with other trades and conduct their work to prevent worker exposure or site contamination. Refer to specification Section 01 3545, Airborne Contaminant Control and Division 02 specifications for specific information concerning disturbing, removing and disposing of these materials and the installation of new materials or components. This notification is provided in accordance with EPA and OSHA requirements.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

HAZARDOUS MATERIALS SURVEY REPORT

NOME STATE OFFICE BUILDING

NOME, ALASKA

Surveyed
October 4 & 5, 2011
August 7, 2013

Report Date
December 13, 2013

EHS-ALASKA, INC.
ENGINEERING, HEALTH & SAFETY CONSULTANTS
11901 BUSINESS BLVD., SUITE 208
EAGLE RIVER, ALASKA 99577-7701

HAZARDOUS MATERIALS ASSESSMENT

NOME STATE OFFICE BUILDING

NOME, ALASKA

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Appendix B ..... Lead Analyzer Test Results

Appendix C ..... Drawings of Sample Locations

HAZARDOUS MATERIALS ASSESSMENT
NOME STATE OFFICE BUILDING CONDITION SURVEY

NOME, ALASKA

OVERVIEW

The Nome State Office Building, located in Nome, Alaska, was surveyed for the presence of asbestos-containing materials (ACM), and other potentially hazardous materials as a part of the design services for the Nome State Office Building Condition Survey Project. The survey also provided a "good faith" inspection for hazardous materials that may be disturbed during the construction. The proposed work includes the disturbance, demolition, removal and disposal of lead-containing paints and/or lead-containing materials that is incidental to the renovation and remodeling project. Mr. Scott G. Harper, P.E., of EHS-Alaska, Inc. (EHS-Alaska) conducted the inspections in October 2011, and Mr. Chris T. Ottosen conducted the inspection in August 2013.

A. GENERALIZED REQUIREMENTS FOR HAZARDOUS MATERIALS

Potentially hazardous materials have been identified in Nome State Office Building that will be affected by the proposed renovations or demolition. Those materials include asbestos, lead, polychlorinated bi-phenyls (PCBs), mercury, and radioactive materials. Other potentially hazardous materials, exterior to the building, such as contamination from underground fuel tanks may be present, but are not part of this report.

Buildings or portions of buildings that were constructed prior to 1978 which are residences, or contain day care facilities, kindergarten classes or other activities frequently visited by children under 6 years of age are classified as *child occupied facilities*. All work disturbing more than 6 square feet of lead-based painted surfaces per room for interior activities or more than 20 square feet for exterior activities in child occupied facilities must comply with the requirements of 40 CFR 745. Depending on current or future use, portions of this building may be classified as a *child occupied facility* and it is the Contractor's responsibility to insure the requirements of 40 CFR 745 are met. See lead testing results for locations of lead-based paints present in the project areas.

Only the materials that will be directly affected by this project are required to be removed. The quantities and types of materials are incorporated into the design documents for this renovation or demolition. The removal and disposal of potentially hazardous materials are highly regulated, and it is anticipated that asbestos, lead and chemical hazards will be conducted by a subcontractor to the general contractor who is qualified for such removal. It is anticipated that the general contractor and other trades will be able to conduct their work using engineering controls and work practices to control worker exposure and to keep airborne contaminants out of occupied areas of the building. Refer to Section 01 3545, Airborne Contaminant Control.

Settled and concealed dusts in areas not subject to routine cleaning are present throughout the building, including the roof, and inside and on top of architectural, mechanical, electrical, and structural elements, and those dusts are assumed to contain regulated air contaminants. This should not be read to imply that there is an existing hazard to building occupants (normal occupants of the building as opposed to construction workers working in the affected areas). However, depending on the specific work items involved and on the means and methods employed when working in the affected areas, construction workers could be exposed to regulated air contaminants from those dusts in excess of the OSHA Permissible Exposure Limits (PELs).

The settled and concealed dusts were examined by an EPA Certified Building Inspector but were not sampled. The inspector determined that the dusts are not "asbestos debris" from an asbestos-containing building material (ACBM). Based on similar sampling from similar buildings, the inspector also

determined that the dusts are unlikely to contain more than one percent (1%) asbestos by weight, and therefore are not an asbestos-containing material (ACM). Reference 40 CFR 763.83.

“Awareness training” (typically 2 hours) and possibly respiratory protection will be required for all Contractor Personnel who will be disturbing the dusts. The extent of the training and protective measures will depend upon the airborne concentrations measured during air monitoring of the contractors work force, which depends on the means and methods employed to control the dusts. The air monitoring may be discontinued following a “negative exposure assessment” showing that worker exposures are below the OSHA permissible exposure limits for the type of work and means and methods employed. Previous air monitoring from similar jobs with similar conditions may be used as historical data to establish a “negative exposure assessment”.

B. BUILDING DESCRIPTION

The Nome State Office Building was constructed in 1973 with various upgrades and repairs through the years. The two-story building with a crawl space has structural steel framing on a pile foundation with concrete slabs for flooring. Interior partitions were primarily framed and finished with painted gypsum board or a moveable gypsum board partition system. Ceilings were generally finished with either a suspended ceiling with lay-in tiles or painted gypsum board. Floors were finished with vinyl tiles, carpet over vinyl, and ceramic tiles in bathrooms. Heat was provided to the building by forced air fan-coil units supplied by a boiler with a few hydronic “fin tube” heaters that were retrofitted in colder parts of the building.

C. SAMPLING AND ANALYSIS

1. Asbestos-Containing Materials

The surveys included sampling of suspect ACM materials that had not been sampled in prior asbestos surveys, or samples of materials where previous sampling had been inconsistent.

The samples were analyzed for the presence of asbestos by polarized light microscopy (PLM), the method of analysis recommended by the U.S. Environmental Protection Agency (EPA) to determine the composition of suspected asbestos-containing materials (EPA method 600/M4-82-020). Only materials containing more than 1% total asbestos were classified as “asbestos-containing” based on EPA and the Occupational Safety and Health Administration (OSHA) criteria. Samples that were analyzed to have less than 10% asbestos were “point-counted” by the laboratory for more accuracy. Samples that are listed as having a “Trace by Point Count” had asbestos fibers found in the material, but the fibers were not present at the counting grids. Table 1 in Part D below contains a summary list of the asbestos bulk samples and the applicable results.

The Bulk Asbestos samples were analyzed for asbestos content by International Asbestos Testing Laboratories (IATL), Mt. Laurel, New Jersey a National Voluntary Laboratory Accreditation Program (NVLAP) accredited laboratory.

Field survey data sheets and laboratory reports of the bulk samples are included in Appendix A. Drawings showing sample locations are included as Appendix C.

2. Lead-Containing Materials

Nearly all surfaces in the building were coated with paint and most surfaces had been repainted. EHS-Alaska tested paint throughout the affected areas of the building using a XLi303AW X-Ray Fluorescence (XRF) lead paint analyzer (Serial # 14311 with software version 5.1CDual). Refer to the Lead Paint Screening Table in Appendix B that identifies the surfaces tested, and the results. All surfaces affected by this project may not have been tested and therefore additional sampling may be required to refute the

presence of lead-based paints in child occupied facilities regulated by 40 CFR 745. The Paint Test Locations are shown in Appendix C.

EPA and the Department of Housing and Urban Development (HUD) have defined lead-based paint as any paint or other surface coating that contains lead equal to or in excess of 1.0 milligram per square centimeter (mg/cm^2) or 0.5 percent by weight. XRF results are classified as positive (lead is present at 1.0 mg/cm^2 or greater), negative (less than 1.0 mg/cm^2 of lead was present) or inconclusive (the XRF could not make a conclusive positive or negative determination). Tests that were invalid due to operator error are shown as void tests.

A Performance Characteristic Sheet (PCS) for the NITON XLi303AW is available upon request. This PCS data provides supplemental information to be used in conjunction with Chapter 7 of the "HUD Guidelines". Performance parameters provided in the PCS are applicable when operating the instrument using the manufacturer's instructions and the procedures described in Chapter 7 of the "HUD Guidelines". The instrument was operated in accordance with manufacturer's instructions and Chapter 7 of the HUD Guidelines. No substrate correction is required for this instrument. There is no inconclusive classification for this instrument when using the 1.0 mg/cm^2 threshold.

D. SURVEY RESULTS

1. Asbestos-Containing Materials

Asbestos field survey data sheets and laboratory reports are included as Appendix A. Room numbers in the following tables may not match room numbers in the design drawings; please refer to room numbers in the Sample Location drawings in Appendix C. The following TABLE 1A lists the samples taken in August 2013, and the results of the laboratory analysis.

TABLE 1A

SAMPLE NUMBER	***MATERIAL***	***LOCATION***	***ASBESTOS CONTENT***
NSB0813-A01	**Light grey cementitious fireproofing**	**From bottom of beam in Room 104 – Photo 27**	**0.5% Actinolite ***
NSB0813-A02	Light grey cementitious fireproofing	From metal corrugated pan decking at top of elevator shaft – Photo 39	None Detected *
NSB0813-A03	Light grey cementitious fireproofing	From bottom of beam in Room 107 – Photo 58	None Detected *
NSB0813-A04	Light grey cementitious fireproofing	From top of beam in Room 107 – Photo 59	None Detected *
NSB0813-A05	Light grey cementitious fireproofing	From middle of column in Room 107 – Photo 75	None Detected *
NSB0813-A06	Light grey cementitious fireproofing	From side of column in Room 107 – Photo 76	None Detected *
NSB0813-A07	Light grey cementitious fireproofing	From bottom of beam in Hallway 126 – Photo 114	None Detected *
NSB0813-A08	Light grey cementitious fireproofing	From side of beam in Room 127 – Photo 36	None Detected *
NSB0813-A09	Light grey cementitious fireproofing	From in between top of beam and corrugated pan deck on east side of Crawlspace – Photo 164	None Detected *
NSB0813-A10	Light grey cementitious fireproofing	From top of beam on lip on east side of Crawlspace – Photo 164	None Detected *

SAMPLE NUMBER	***MATERIAL***	***LOCATION***	***ASBESTOS CONTENT***
NSB0813-A11	Light grey cementitious fireproofing	From top of beam on web on east side of Crawlspace – Photo 164	None Detected *
NSB0813-A12	White fluffy fireproofing	From bottom of beam on web on east side of Crawlspace – Photo 166	None Detected
NSB0813-A13	White fluffy fireproofing	From bottom of beam on east side of Crawlspace – Photo 167	None Detected
NSB0813-A14	Dark grey cementitious fireproofing	At base of column on west side of Crawlspace – Photo 177	None Detected *
NSB0813-A15	Light grey cementitious fireproofing	From top of column on west side of Crawlspace – Photo 180	None Detected *
NSB0813-A16	Dark grey cementitious fireproofing	On corrugated pan decking at raceway on west side of Crawlspace – Photo 181	None Detected *
NSB0813-A17	Light grey cementitious fireproofing	On corrugated pan decking west side of Crawlspace – Photo 182	None Detected *
NSB0813-A18	Dark grey cementitious fireproofing	On floor in west side of crawlspace – Photo 186	None Detected *
NSB0813-A19	Light grey cementitious fireproofing	From in between top of beam and corrugated pan deck on south exterior wall of Crawlspace – Photo 187	None Detected *
NSB0813-A20	Light grey cementitious fireproofing	From top of beam on web on south exterior wall of Crawlspace – Photo 189	None Detected *
NSB0813-A21	White fluffy fireproofing	From bottom of beam on web on south exterior wall of Crawlspace – Photo 190	None Detected
NSB0813-A22	**Dark grey cementitious fireproofing**	**On top of spray-in foam on south exterior wall of Crawlspace – Photo 191**	**Trace Actinolite ***
NSB0813-A23	Dirt with fireproofing debris	From floor at base of south exterior wall of Crawlspace – Photo 199	None Detected
NSB0813-A24	**Light grey cementitious fireproofing**	**From in between top of beam and corrugated pan deck in northwest quadrant of Crawlspace – Photo 211**	**Trace Actinolite ***
NSB0813-A25	Light grey cementitious fireproofing	From top of beam on web in northwest quadrant of Crawlspace – Photo 212	None Detected *
NSB0813-A26	White fluffy fireproofing	From bottom of beam in northwest quadrant of Crawlspace – Photo 213	None Detected *
NSB0813-A27	White plaster	Inside of metal window channel on west side of building – Photo 228	None Detected
NSOB0813-VA01	**Vermiculite & blown in cellulose insulation**	**Inside of metal window channel on southwest exterior of building – Photo 229**	**1.1% Actinolite**

SAMPLE NUMBER	***MATERIAL***	***LOCATION***	***ASBESTOS CONTENT***
NSOB0813-VA02	Rust with possible vermiculite contamination	Inside of metal window channel on north exterior of building – Photo 220	None Detected
The testing method used (polarized light microscopy [PLM]) is not consistently reliable in detecting asbestos in floor coverings and similar non-friable organically bound materials. Before this material can be considered or treated as non-asbestos containing, confirmation should be made by quantitative transmission electron microscopy (TEM).			

*These samples contained vermiculite which likely contain trace amounts of actinolite or other forms of asbestos.

The following TABLE 1B lists the samples taken in October 2011, and the results of the laboratory analysis. Asbestos field survey data sheets and laboratory reports are included in Appendix A. Room numbers in the following tables may not match room numbers in the design; please refer to room numbers in the Sample Location drawings in Appendix C.

TABLE 1B

SAMPLE NUMBER	***MATERIAL***	***LOCATION***	***ASBESTOS CONTENT***
NSOB-1011-A01	Light tan fireproofing overspray on pan deck	Center of crawl space, west of access hatch – Photo 13	None Detected Reanalyzed – None Detected**
NSOB-1011-A02	Off-white fluffy fireproofing from beam in crawl space	Northwest corner of crawl space – Photo 18	None Detected Reanalyzed – None Detected **
NSOB-1011-A03	Dark brown mastic to foam board insulation	South end of west wall in crawl space – Photo 20	None Detected
NSOB-1011-A04	White gypsum board	On south wall near west end behind sprayed-on polyurethane foam on exterior wall in crawl space – Photo 23	None Detected
NSOB-1011-A05	Off-white fluffy fireproofing from side of beam	On south wall near west end in crawl space – Photo 24	None Detected Reanalyzed – None Detected **
NSOB-1011-A06	Off-white fluffy fireproofing from bottom of beam	South center of crawl space – Photo 40	None Detected Reanalyzed – None Detected **
NSOB-1011-A07	External sheathing, tan gypsum board	Center of south wall –Photo 45	None Detected
NSOB-1011-A08	**Exterior cement board**	**Center of south wall –Photo 47**	**30% Chrysotile**
NSOB-1011-A09	Off-white fluffy fireproofing from bottom of beam	Southeast quadrant of crawl space – Photo 52	None Detected Reanalyzed – None Detected **
NSOB-1011-A10	Off-white fluffy fireproofing from bottom of beam	Southeast quadrant of crawl space – Photo 58	None Detected Reanalyzed – None Detected **
NSOB-1011-A11	Off-white fluffy fireproofing from bottom of beam	Northeast quadrant of crawl space – Photo 64	None Detected Reanalyzed – None Detected **
NSOB-1011-A12	**Gray cement board from exterior column**	**Southeast corner of building – Photo 70**	**30% Chrysotile**

SAMPLE NUMBER	***MATERIAL***	***LOCATION***	***ASBESTOS CONTENT***
NSOB-1011-A13	Dark gray sealant to gray cement board from exterior column	Southeast corner of building – Photo 71	None Detected
NSOB-1011-A14	Black and white layers of cement board sealant on exterior column	One column east of southwest corner of building – Photo 75	None Detected
NSOB-1011-A15	**Gray cement board from exterior column**	**Southwest corner of building – Photo 77**	**30% Chrysotile**
NSOB-1011-A16	**Gray-green corrugated cement board siding**	**West wall of building – Photo 82**	**30% Chrysotile**
NSOB-1011-A17	Tan screw sealant/filler on gray-green corrugated cement board siding	Center of west wall – Photo 83	None Detected
NSOB-1011-A18	**Black seam sealant to gray-green corrugated cement board siding**	**Center of west wall – Photo 83**	**1.1% Chrysotile**
NSOB-1011-A19	**Yellow and tan ¾" sandstone texture cement board**	**East side of north wall of building – Photo 90**	**35% Chrysotile**
NSOB-1011-A20	White sealant to yellow and tan ¾" sandstone texture cement board and corroded metal trim	East side of north wall of building – Photo 90	None Detected
NSOB-1011-A21	White sealant to yellow and tan ¾" sandstone texture cement board and corroded metal trim	East side of north wall of building – Photo 92	None Detected
NSOB-1011-A22	**Pink sink undercoating**	**Sink in Room 135**	**10% Chrysotile**
NSOB-1011-A23	Tan fireproofing - loose	Above lay-in ceiling tile in Room 135 _ Photo 110	None Detected Reanalyzed – None Detected**
NSOB-1011-A24	White gypsum board	From north wall above lay-in ceiling tile above sink Room 135	None Detected
NSOB-1011-A25	**Off-white joint compound**	**From north wall above lay-in ceiling tile above sink Room 135 – Photo 114**	**1.5% Chrysotile**
NSOB-1011-A26	Multiple layers of brown and off-white mastic to black 4" cove base with orange paint	Room 135 near door to Room 134 – Photo 115	None Detected
NSOB-1011-A27	Black 4" cove base	Room 135 near door to Room 134 – Photo 115	None Detected
NSOB-1011-A28	**White fire door insulation (Weyerhaeuser Composite Fire Door –1½ hour)**	**Boiler room door, Room 125 – Photo 120**	**15% Amosite**
NSOB-1011-A29	Brown mastic to original 4" yellow cove base	Southwest corner of Room 125 – Photo 121	None Detected
NSOB-1011-A30	Original 4" yellow cove base	Southwest corner of Room 125 – Photo 121	None Detected

SAMPLE NUMBER	***MATERIAL***	***LOCATION***	***ASBESTOS CONTENT***
NSOB-1011-A31	**White joint compound**	**Southwest corner of Room 125 – Photo 122**	**1.8% Chrysotile**
NSOB-1011-A32	**Tan fireproofing**	**Southeast corner of Room 125 from beam – Photo 129**	**1.1% Chrysotile Reanalyzed at 0.75% Chrysotile****
NSOB-1011-A33	Off-white air duct flex connector with brown mastic	Southeast corner of Room 125 from beam – Photo 130	None Detected in Both Layers
NSOB-1011-A34	Red gasket on	East wall Room 125 – Photo 133	None Detected
NSOB-1011-A35	Red gasket from heating pipe above boiler	Center of Room 125 – Photo 137	None Detected
NSOB-1011-A36	**Floor Tile -1 (12”x12” tan, brown, and beige ~½” x ¾” blended pattern)**	**Room 226 by door – Photo 200**	**0.25% Chrysotile**
NSOB-1011-A37	Original 4” yellow cove base	Room 226 by door – Photo 200	None Detected
NSOB-1011-A38	Brown mastic to original 4” yellow cove base	Room 226 by door – Photo 200	None Detected
NSOB-1011-A39	Tan carpet mastic	Room 227 near door to Room 226 – Photo 202	None Detected
NSOB-1011-A40	**Off-white joint compound with brown tape above lay-in ceiling tile**	**Room 228 near door to Room 227 – Photo 204**	**JC - 1.5% Chrysotile** Tape - None Detected
NSOB-1011-A41	Lay-in Ceiling Tile – 1 (White 2’x4’ textured plastic with pinholes on fiberglass)	Room 228 near door to Room 227 – Photo 204	None Detected
NSOB-1011-A42	Black 4” cove base	Northeast corner Room 228 behind door – Photo 209	None Detected
NSOB-1011-A43	Brown mastic to black 4” cove base	Northeast corner Room 228 behind door – Photo 209	None Detected
NSOB-1011-A44	White gypsum board with vinyl covering	East wall Room 229 – Photo 210	None Detected
NSOB-1011-A45	Finish to Lay-in Ceiling Tile – 1 (White 2’x4’ textured plastic with pinholes on fiberglass) with tan mastic	Room 236 at roof access hatch – Photo 219	None Detected
NSOB-1011-A46	Original 4” yellow cove base	South wall Room 236 – Photo 232	None Detected
NSOB-1011-A47	Brown mastic to original 4” yellow cove base	South wall Room 236 – Photo 232	None Detected
NSOB-1011-A48	Tan carpet mastic	Northeast corner of Room 232 – Photo 238	None Detected
NSOB-1011-A49	**White joint compound**	**From ceiling Room 238 above access hatch – Photo 241**	**1.8% Chrysotile**
NSOB-1011-A50	**White joint compound**	**North wall Room 238 above access hatch – Photo 245**	**1.2% Chrysotile**

SAMPLE NUMBER	***MATERIAL***	***LOCATION***	***ASBESTOS CONTENT***
NSOB-1011-A51	White gypsum board second layer next to wood studs	Southwest corner Room 125 on south wall – Photo 249	None Detected
NSOB-1011-A52	**Tan fireproofing overspray**	**Southwest corner Room 125 on south wall on sprayed on polyurethane foam – Photo 252**	**None Detected Reanalyzed at Trace Chrysotile****
NSOB-1011-A53	White gypsum board – exterior sheathing	Southwest corner Room 125 on south wall on exterior side of sprayed on polyurethane foam – Photo 253	None Detected
NSOB-1011-A54	Tan cementitious boiler exhaust duct sealant	South boiler in Room 125 – Photo 257	None Detected
NSOB-1011-A55	Tan cementitious boiler exhaust duct sealant	North boiler in Room 125 – Photo 259	None Detected
NSOB-1011-A56	**Off-white joint compound**	**Above lay-in ceiling tile Room 200 – Photo 281**	**1.2% Chrysotile**
NSOB-1011-A57	White gypsum board	Above lay-in ceiling tile Room 200 – Photo 281	None Detected
NSOB-1011-A58	**Floor Tile -1 (12”x12” tan, brown, and beige ~½” x ¾” blended pattern) with tan carpet mastic on top**	**Behind door in Room 224 - Photo 307**	**FT - 0.25% Chrysotile** Mastic - None Detected
NSOB-1011-A59	**Black mastic to Floor Tile - 1**	**Behind door in Room 224 - Photo 307**	**2.5% Chrysotile**
NSOB-1011-A60	Brown mastic to black cove base	Behind door in Room 224 - Photo 311	None Detected
NSOB-1011-A61	Black 4” cove base	Behind door in Room 224 - Photo 311	None Detected
NSOB-1011-A62	Original 4” yellow cove base	Room 219 by door – Photo 317	None Detected
NSOB-1011-A63	Multiple layers of tan carpet mastic	Southwest corner of Room 208 – Photo 319	None Detected
NSOB-1011-A64	Lay-in Ceiling Tile – 1 (White 2’x4’ textured plastic with pinholes on fiberglass)	Center of Room 215 – Photo 338	None Detected
NSOB-1011-A65	**Off-white joint compound**	**Above lay-in ceiling tile center of Room 215 – Photo 339**	**1.2% Chrysotile**
NSOB-1011-A66	Black sink undercoating	Under drinking fountain in Room 237 – Photo 344	None Detected
NSOB-1011-A67	White grout to beige ceramic wall tile	Northwest corner of Room 238 – Photo 346	None Detected
NSOB-1011-A68	Gray grout to red ceramic floor tile with yellow mastic and red ceramic tile	Northwest corner of Room 238 – Photo 347	None Detected in All Layers
NSOB-1011-A69	Yellow mastic to beige ceramic wall tile	Light switch near door Room 238 – Photo 349	None Detected
NSOB-1011-A70	White grout to beige ceramic tile	Light switch near door Room 238 – Photo 349	None Detected

SAMPLE NUMBER	***MATERIAL***	***LOCATION***	***ASBESTOS CONTENT***
NSOB-1011-A71	**Off-white joint compound**	**Above lay-in ceiling tile in Room 201 near doors to Rooms 202 & 203 – Photo 375**	**1.5% Chrysotile**
NSOB-1011-A72	White gypsum board	Above lay-in ceiling tile in Room 201 near doors to Rooms 202 & 203 – Photo 375	None Detected
NSOB-1011-A73	Lay-in Ceiling Tile – 1 (White 2'x4' textured plastic with pinholes on fiberglass)	Room 201 near doors to Rooms 202 & 203	None Detected
NSOB-1011-A74	Black 4" cove base with tan mastic	Room 242 by door – Photo 376	None Detected in Both Layers
NSOB-1011-A75	**Floor Tile -1 (12"x12" tan, brown, and beige ~½" x ¾" blended pattern) with brown mastic**	**Room 200 near elevator door – Photo 399**	**FT - 1.1% Chrysotile** Mastic - None Detected
NSOB-1011-A76	Red mastic to sound lining insulation on interior side of air duct	South side of crawl space access hatch Room 104 – Photo 401	None Detected
NSOB-1011-A77	Red mastic to sound lining insulation on interior side of air duct with black insulation	North side of crawl space access hatch Room 104 – Photo 402	None Detected in Both Layers
NSOB-1011-A78	Tan fireproofing on bottom of beam	Near center of Room 104 – Photo 418	None Detected Reanalyzed – None Detected**
NSOB-1011-A79	White air duct flex connector	Near center of Room 104 – Photo 421	None Detected
NSOB-1011-A80	Tan fireproofing from beam	South side of Room 104 by door – Photo 422	None Detected Reanalyzed – None Detected**
NSOB-1011-A81	**Surplus gray-green corrugated cement board siding**	**From 1 of 3 panels laying against east wall Room 104 – Photo 423**	**30% Chrysotile**
NSOB-1011-A82	**White fire door insulation (Weyerhaeuser Composite Fire Door –1½ hour)**	**From door to Room 104 – Photo 429 & 430**	**30% Amosite**
NSOB-1011-A83	**Off-white joint compound with gray-green paint**	**From roof access hatch Room 236 – Photo 431**	**1.8% Chrysotile**
NSOB-1011-A84	White gypsum board	From roof access hatch Room 236 – Photo 432	None Detected
NSOB-1011-A85	Black sealant on vent through roof	South edge of roof near center – Photo 436	None Detected
NSOB-1011-A86	Black sealant on vent through roof	East end of roof – Photo 437	None Detected
NSOB-1011-A87	Gray putty from roof drain	East side roof drain – Photo 455	None Detected
NSOB-1011-A88	Black roof membrane	East side roof drain – Photo 456	None Detected
NSOB-1011-A89	**Black tar remnant on vent cover**	**Vent cover east of access hatch – Photo 457**	**5.5% Chrysotile**

SAMPLE NUMBER	***MATERIAL***	***LOCATION***	***ASBESTOS CONTENT***
NSOB-1011-A90	Gray putty from roof drain	West side roof drain – Photo 459	None Detected
NSOB-1011-A91	Black roof membrane	West side roof drain – Photo 459	None Detected
NSOB-1011-A92	Black sealant on vent through roof	West end of roof – Photo 460	None Detected
NSOB-1011-A93	Tan fireproofing from beam	Above lay-in ceiling tile near center of Room 107 – Photo 473	None Detected Reanalyzed – None Detected**
NSOB-1011-A94	Tan carpet mastic	Southeast corner of Room 114 by door – Photo 499	None Detected
NSOB-1011-A95	Newer teal 4” cove base	Center of south wall Room 115 – Photo 500	None Detected
NSOB-1011-A96	Tan and brown layers of mastic behind newer teal cove base	Center of south wall Room 115 – Photo 500	None Detected
NSOB-1011-A97	Brown mastic to older cove base	Center of south wall Room 115 – Photo 500	None Detected
NSOB-1011-A98	Black sink undercoating	From drinking fountain in Room 107 – Photo 502	None Detected
NSOB-1011-A99	**White joint compound**	**Room 107 near door to Room 117 – Photo 506**	**1.2% Chrysotile**
NSOB-1011-A100	Black 4” cove base	Southeast corner of Room 105 – Photo 508	None Detected
NSOB-1011-A101	Brown mastic to black 4” cove base	Southeast corner of Room 105 – Photo 508	None Detected
NSOB-1011-A102	**Floor Tile -1 (12”x12” tan, brown, and beige ~½” x ¾” blended pattern)**	**Southeast corner of Room 105 – Photo 508**	**0.25% Chrysotile**
NSOB-1011-A103	**White joint compound**	**Above lay-in ceiling tile on wall corner of wall between Rooms 114 and 115 – Photo 501**	**1.3% Chrysotile**
NSOB-1011-A104	**Floor Tile -1 (12”x12” tan, brown, and beige ~½” x ¾” blended pattern)**	**Room 124 by door – Photo 519**	**0.5% Chrysotile**
NSOB-1011-A105	Original 4” yellow cove base	Room 124 by door – Photo 519	None Detected
NSOB-1011-A106	**Off-white joint compound**	**South wall Room 126 – Photo 533**	**1.2% Chrysotile**
NSOB-1011-A107	Lay-in Ceiling Tile – 2 (White 2’x4’ textured plastic on fiberglass)	South wall Room 126 – Photo 534	None Detected
NSOB-1011-A108	Gray grout to red ceramic floor tile with red ceramic tile	Room 102 by vent near north wall – Photo 536	None Detected in Both Layers
NSOB-1011-A109	White ceramic tile grout	Southeast corner of Room 102 – Photo 537	None Detected
NSOB-1011-A110	Yellow mastic to beige ceramic tile	Southwest corner of Room 102 by light switch – Photo 538	None Detected

SAMPLE NUMBER	***MATERIAL***	***LOCATION***	***ASBESTOS CONTENT***
NSOB-1011-A111	**Floor Tile -1 (12"x12" tan, brown, and beige ~½" x ¾" blended pattern) with tan carpet mastic on top**	**Room 127 by door – Photo 549**	**FT - 1.1% Chrysotile** Mastic -None Detected
NSOB-1011-A112	Brown mastic remnant probably to black cove base	Room 127 by door – Photo 549	None Detected
NSOB-1011-A113	Tan cementitious fireproofing	Room 132 above lay-in ceiling tile	None Detected Reanalyzed – None Detected**
NSOB-1011-A114	White gypsum board	Room 131 by main entrance – Photo 561	None Detected
NSOB-1011-A115	**Off-white joint compound**	**Room 131 by main entrance – Photo 562**	**1.3% Chrysotile**
NSOB-1011-A116	**White joint compound with white gypsum board and gray-green paint**	**Southwest corner Room 125 on south wall – Photo 249**	**JC - 1.2% Chrysotile** GB - None Detected
The testing method used (polarized light microscopy [PLM]) is not consistently reliable in detecting asbestos in floor coverings and similar non-friable organically bound materials. Before this material can be considered or treated as non-asbestos containing, confirmation should be made by quantitative transmission electron microscopy (TEM).			

**The lab was asked to reanalyze these samples. Reanalyzed results are a result of samples blindly reanalyzed by another analyst.

The following materials have been found to contain asbestos in this or previous surveys, or were assumed to contain asbestos.

1. Spray-on on fireproofing (some samples contained less than 1% asbestos; but to be treated as asbestos-containing).
2. "Zonolite" (vermiculite) insulation behind metal panels and metal trim on building exterior.
3. Joint compound in gypsum wallboard systems on the ceilings and walls.
4. Cement asbestos board (CAB) "Glasweld" exterior siding and column covers.
5. Seam sealants on exterior CAB siding and on porcelain coated metal panels.
6. Door, window, and penetration sealants (assumed ACM).
7. Black mastic of 12" x 12" floor tile.
8. 12" x 12" floor tile.
9. Flange gaskets on piping (Assumed ACM).
10. Boiler gaskets (Assumed ACM).
11. Fire doors.
12. Exterior tarry damp-proofing (assumed ACM).
13. Remnants of asbestos-containing patching tars at roof penetrations.
14. Pink undercoatings on stainless steel sink in Room 135.

The affects of the following asbestos-containing materials on the proposed renovation are discussed below.

Sprayed-On Fireproofing

The original construction documents of the building called for a sprayed-on fireproofing on all "I-beam" structural steel, but apparently not on the corrugated metal deck, (common practice for that time of construction). The 1976 as-built drawings for repairs following storm and flooding damage show reapplication of fireproofing in the crawlspace and repairs to the boiler room where the asbestos-containing fireproofing was found. In 1976 or at another time, a sprayed-on fireproofing was applied to

the corrugated metal deck in the crawl space and the first floor. At least one of these applications contained some asbestos. The fireproofing in the Mechanical Room 125 contained chrysotile asbestos and is considered an asbestos-containing material. Two samples of fireproofing in the crawlspace contained trace amounts of actinolite and one sample in the Fan Room 104 contained a half percent of actinolite. The most common form of fireproofing throughout the building contained vermiculite. Since actinolite is not used commercially and it is a common contaminant in vermiculite it is likely that the fireproofing throughout the building contains varying amounts of actinolite or other forms of asbestos contamination. We recommend treating all fireproofing throughout the building as asbestos-containing due to its high friability and potentially high fiber counts if it is disturbed. OSHA does regulate worker exposure even when the source is a material that contains less than 1 percent asbestos. Although there were at least 4 visibly different types of fireproofing present, we recommend that all of the fireproofing be treated as asbestos due to contamination or because they were applied over the type found to have asbestos. The fireproofing was friable, and will be removed by this project.

“Zonolite” Insulation
Approximately 80% of vermiculite insulation came from Libby, Montana and was sold under the brand name “Zonolite”. The EPA recommends to assume that the “Zonolite” is asbestos-containing. Testing has confirmed that the vermiculite is asbestos-containing. The insulation was poured into the metal trim for the porcelain coated metal panels and cement asbestos panels on the exterior of the building. As a loose fill material, the insulation may have migrated to other areas of the building. The insulation is friable, and will be removed by this project.

Floor Tile and Mastic
Vinyl floor tiles and flooring mastic throughout the building area contain asbestos. The floor tiles and mastics were mostly in good condition with a few localized areas of damage. The tile and mastic was not friable, and will be partially removed by this project.

Joint Compound
Joint compound on the original gypsum board walls, soffits and ceilings throughout the project building was asbestos-containing. No asbestos has been detected in the gypsum board. Joint compound was in good condition and is not considered friable unless damaged. The joint compound will be partially removed by this project.

Door Insulation
Hallway doors leading into the boiler and fan room were insulated with asbestos-containing insulation. The doors will be removed by this project.

Roofing Remnants
Roofing over this building is a newer roof which does not contain asbestos. However, residual mastic from the original roof may still exist beneath the newer roof on the roof deck and patching materials on flashings and other older equipment. The roofing materials will be partially removed by this project.

Cement Asbestos Board
The exterior siding and exterior column covers of the building are a cement asbestos board. The board is in good condition and is not friable. The cement asbestos board materials will be removed by this project.

Exterior Siding Seam Sealants
The sealants at seam in the exterior CAB siding had an asbestos-containing sealant. It is assumed to be located around door and window frames, as well as other penetrations. The visible sealants on the siding are not friable and are in good condition. The penetration sealants are assumed to be not friable and in good condition. The sealants will be removed by this project.

Sink Undercoating
A stainless steel sink in Room 135 was coated on the underside with a pink spray-applied material containing asbestos. This material was in good condition and is not considered friable. The sink undercoatings will be removed by this project.

Exterior Tarry Damp-proofing Sealant
The exterior concrete foundation walls may have a tarry water-proofing which is assumed to contain asbestos. The sealants are assumed to be not friable and in good condition. The tarry sealants may be disturbed or removed depending on the scope of work for this project.

Boiler Gaskets and Sealants
Due to their age, gaskets and sealants on the boilers are assumed to be asbestos-containing. These materials are difficult to sample without disassembly of equipment and consequently limited sampling was performed. These materials were in good condition but may become friable during removal for replacement. The gaskets and sealants will be removed by this project.

Flange Gaskets and Valve Packing
Due to their age, gaskets and valve packing on mechanical equipment throughout the buildings, but mostly in mechanical and fan rooms are assumed to be asbestos-containing. These materials are difficult to sample without disassembly of equipment and consequently limited sampling was performed. These materials were in good condition but may become friable during removal for replacement. The gaskets and packings will be removed by this project.

2. Asbestos in Dusts

The settled and concealed dusts were examined by an EPA Certified Building Inspector but no samples for asbestos in dusts were authorized for this project. In the crawl space and above the lay-in ceiling tiles on the first and second floor there was evidence of overspray and debris from the fireproofing on the tiles and some areas of fireproofing detaching from the metal decking and "I-beams." This material is an asbestos-containing debris unless additional sampling can prove that there is no asbestos in the fireproofing in these area.

3. Lead-Containing Materials

Lead-Testing
EHS-Alaska tested paint and other materials throughout the affected areas of the building using a NITON XLi303AW X-Ray Fluorescence (XRF) lead paint analyzer (Serial # 14311 with software version 5.1CDual). Lead in paints tested varied from a trace amount to 0.50 mg/cm^2. Lead in other materials tested varied from a trace amount to 6.20 mg/cm^2. Refer to the Lead Paint Screening Table in Appendix B that identifies the surfaces tested, and the results. The Paint Test Locations are shown in the Drawings in Appendix C.

Paints.
There were varying lead contents found in the paints, based on what surfaces they are on, with most surfaces containing little lead (but are still classified as lead-containing materials by OSHA). The highest levels of lead were found on a metal door casing and a painted, wooden bench, with lower levels on walls and other painted surfaces, and lowest levels on pre-finished materials. Lead based paints are likely to be found on structural steel.

Lead based paints (paint containing more than 1.0 mg/cm^2 of lead) were not identified in the building, but are assumed to be on structural steel. Lead was detected at very low levels in most of the painted floor, wall and ceiling surfaces. Low levels of lead found by XRF testing does not mean that the paints are free of lead, the paints may contain lead. However, these paints should not present a hazard to occupants or workers performing renovation or demolition if lead-safe work practices are followed.

Ceramic Wall Tile and Glazing.
Relatively high concentrations of lead were found in the glazing of ceramic wall and floor tiles. The glazing of decorative wall tile found on walls in restrooms contained high lead levels. The concentrations of lead in ceramic glazing compounds should not be compared to lead-based paint criteria, as the glazing is inherently unlikely to cause lead to be present in dusts or on surfaces, where it can be ingested. Lead

in ceramic tile glazing should not pose a hazard to occupants, or workers performing renovation or demolition if good work practices are followed. All ceramic tiles and fixtures in the facility should be assumed to contain lead.

Metallic Lead in Batteries, Pipe Solder and Flashing
Metallic lead items identified in the building included lead acid batteries in emergency lights and other battery backup equipment. If removed during renovation or demolition they should be recycled or disposed of as hazardous waste.

4. PCB-Containing Materials

Light Ballasts
Older fluorescent lights typically have PCB-containing ballasts. PCB-containing ballasts in fluorescent lights were banned in 1978, but manufacturers were allowed to use up existing stocks, and lights may have been reused from other facilities. The survey included examination of what were considered to be representative light fixtures, but not all fixtures were able to be accessed. All lights shall be inspected during removal or relocation. Unless ballasts were marked “No PCBs,” they must be assumed to contain PCBs and must be disposed of as a hazardous waste when removed for disposal. Only fluorescent light fixtures marked “No PCBs” were found in the building, but two ballasts are assumed to be present in the Detention Rooms. The fluorescent light fixtures will be replaced.

Older HID lights may have PCB-containing ballasts. Due to height restrictions and sealed ballast enclosures, the HID fixtures were not able to be accessed. All HID lights shall be inspected during removal or relocation. If ballasts are not marked “No PCBs,” we suggest contacting the manufacturer of the lights to determine if the ballasts contain PCB’s, or assume that they contain PCB’s and be disposed of as a hazardous waste. HID light fixtures with assumed PCB-containing ballasts may be replaced.

5. Mercury-Containing Materials

Fluorescent Lamps
Fluorescent lamps use mercury to excite the phosphor crystals that coat the inside of the lamp. These lamps contain from 15 to 48 milligrams of mercury depending on their age and manufacturer. The fluorescent light fixtures may be replaced.

Thermostats
Older thermostats or other electrical switches that may contain mercury were noted in the building.

High Intensity Discharge Lamps
High Intensity Discharge (HID) lamps use mercury and sodium vapors in the lamp, and also typically have lead-containing solders at the bases. These lamps contain varying amounts of mercury depending on their age and manufacturer. HID light fixtures may be replaced.

All mercury-containing items being removed by this project are required to be disposed of as hazardous waste or recycled.

6. Other Hazardous Materials

Smoke Detectors
Radioactive smoke detectors were found in the renovation area. If any radioactive items are removed by this project, they are required be disposed of as hazardous waste or recycled.

Soil Contamination
The scope of work for EHS-Alaska, Inc. did not include investigation of soils for petroleum or other contaminations.

Refrigerants
Refrigerators, freezers, and water coolers were identified in the building that may contain ozone depleting refrigerants. Ozone depleting substances (ODS) are regulated by the EPA and must be removed by certified technicians prior to equipment maintenance or disposal.

Glycol
The existing heating system is assumed to contain heating system glycol. Any glycol removed from the heating system shall be recovered and properly disposed of or recycled.

E. REGULATORY CONSTRAINTS

1. Asbestos-Containing Materials

The Federal Occupational Safety and Health Administration (29 CFR 1926.1101) and the State of Alaska Department of Labor (8 AAC 61) have promulgated regulations requiring testing for airborne asbestos fibers; setting allowable exposure limits for workers potentially exposed to airborne asbestos fibers; establishing contamination controls, work practices, and medical surveillance; and setting worker certification and protection requirements. These regulations apply to all workplace activities involving asbestos-containing materials.

The EPA regulations, issued as Title 40 of the Code of Federal Regulations, Part 61 (40 CFR 61) under the National Emission Standards for Hazardous Air Pollutants (NESHAP) established procedures for handling ACM during asbestos removal and waste disposal. These regulations required an owner (or the owner's contractor) to notify the EPA of asbestos removal operations and to establish responsibility for the removal, transportation, and disposal of asbestos. The Nome State Office Building will not fall under the EPA's Asbestos Hazard Emergency Response Act (AHERA) law regulating asbestos in schools, but clearance sampling will be required where asbestos-containing materials are removed.

The disposal of asbestos waste is regulated by the EPA, the Alaska Department of Environmental Conservation, and the disposal site operator. Wastes being transported to the disposal site must be sealed in leak tight containers prior to disposal and must be accompanied by disposal permits and waste manifests.

2. Dusts with Asbestos

Settled and concealed dusts above ceilings, and at other areas that are not routinely cleaned (such as inside ducts and at roofs, etc.) are assumed to have measurable concentrations of asbestos. Based on sampling of similar settled and concealed dusts at similar buildings, those dusts are assumed to contain less than 1 percent asbestos. Normal settled and concealed dusts are distinct and treated differently from debris resulting from damaged asbestos-containing materials.

Background levels of asbestos in dusts for a particular location will depend on many factors, including whether or not asbestos occurs naturally in soils in the area.

Likely sources of asbestos in dusts include natural occurrences of asbestos

The types of asbestos found in settled and concealed dusts often contain actinolite, anthophylite, and tremolite forms of asbestos which are not commonly found in bulk samples taken of materials from buildings. Those forms of asbestos may come from natural occurrences of asbestos in an outside source, such as rock or ore deposits, which appear to be common in Alaska.

Because the type of disturbance, concentration of asbestos in the dusts, cohesiveness of the dusts and room sizes will change, the airborne asbestos levels expected during the project will depend on the contractor's means and methods of conducting the work. The mere presence of asbestos in the dusts does not necessarily imply that a "hazard" exists which would require the use of specially trained workers

to “abate” the “hazard”. All dusts will likely be required to be removed from the areas where asbestos-containing materials are being removed (abatement areas) in order to achieve clearances. The dusts in the other areas are to be controlled so as to limit worker exposures and prevent contamination of occupied areas of the building.

There is no established correlation between settled or adhered dusts with measureable concentrations of asbestos and airborne concentrations. The definition in the OSHA regulations of asbestos-containing materials as those materials that contain 1 percent or more asbestos by weight, apply to cohesive materials and not to dusts. The OSHA regulations are essentially “performance based”, if workers are exposed above the permissible exposure limits, then all of the requirements in the regulations become effective.

3. Lead-Containing Materials

The EPA Standard 40 CFR 745, Lead-Base Paint Poisoning Prevention in Certain Residential Structures, defines lead–based paint hazards and regulates lead based paint activities in target housing and child-occupied facilities. The requirements of this regulation include training certification, pre-work notifications, work practice standards and record keeping. Areas typically classified as child occupied facilities may include but are not limited to: day care facilities, preschools, kindergarten classrooms, restrooms, multipurpose rooms, cafeterias, gyms, libraries and other areas routinely used by children under 6 years of age. New training requirements for Firms (Contractors) and Renovators (Workers) became effective on April 22, 2010.

The requirements apply to renovation, repair or painting activities when at least six square feet of lead-based paint is disturbed in a room or more than 20 square feet of lead-based paint is disturbed on the exterior. Lead based paint was not identified during the survey, therefore most requirements of 40 CFR 745 do not apply.

Federal OSHA (29 CFR 1926.62) and the State of Alaska (8 AAC Chapter 61) have promulgated regulations that apply to all construction work where employees may be exposed to lead. The disturbance of any surfaces painted with lead-containing paint requires lead-trained personnel, personnel protective procedures, and air monitoring until exposure levels can be determined. If initial monitoring verifies that the work practices being used are not exposing workers, monitoring and protection procedures may be relaxed. Experience has shown that some paints in most buildings will contain low concentrations of lead and disturbance of those paints are still regulated under the OSHA lead standard, 29 CFR 1926.62. Low levels of lead found by XRF testing does not mean that the paints are free of lead, the paints may contain lead, and OSHA regulations apply anytime measurable amounts of lead are present in paints.

Settled and concealed dust above ceilings, and at other areas that are not routinely cleaned are assumed to have measurable concentrations of lead. Background levels of lead in dusts for a particular location will depend on many factors, including whether or not engines utilizing leaded gasoline were run in or near a building, and upon the age of the building, and thus the age of the dusts. Because the type of disturbance, quantity of lead dusts, cohesiveness of the dusts and room sizes will change, the airborne lead levels expected during the project will depend on the contractor’s means and methods of conducting the work. The mere presence of lead in the dusts does not necessarily imply that a “hazard” exists which would require the use of specially trained workers to “abate” the “hazard”.

There is no established correlation between settled or adhered lead dust concentrations and airborne concentrations. The OSHA regulations are essentially “performance based”, if workers are exposed above the permissible exposure limits, then all of the requirements in the regulations become effective.

The EPA requires that actual construction or demolition debris that contains lead or lead-containing paint or other heavy metals be tested using the TCLP to determine if the waste must be treated as hazardous waste. All federal, state and local standards regulating lead and lead-containing wastes are required to be followed during the renovation or demolition of portions of this building.

There are no hazardous waste landfills in Alaska and the lead-containing wastes (if shown to be hazardous waste) will have to be packaged for shipping and disposal. This report assumes that disposal will take place in Seattle or elsewhere in the Pacific Northwest.

4. PCB-Containing Materials

No PCB-containing materials were found by this survey but were assumed to be present. If any PCB-containing materials are discovered and if they will be removed, the EPA has promulgated regulations (40 CFR Part 761) that cover the proper handling and disposal of PCB-containing equipment. All construction workers who are required to remove or handle PCB-containing or PCB-contaminated equipment or to transport or dispose of PCB wastes shall be trained and certified as required by the U.S. Department of Labor (29 CFR 1910.120) and the State of Alaska Department of Labor (8 AAC 61).

5. Mercury-Containing Materials

Thermostats and mercury-containing lamps are classified by the EPA as Universal Wastes. The EPA encourages that all Universal Wastes be recycled in accordance with 40 CFR 273. Mercury and mercury-containing products are considered hazardous waste if TCLP testing of the waste for mercury confirms the mercury content to be greater than the EPA criteria of 0.2 mg/l.

6. Other Hazardous Materials

Refrigerants
Refrigerators, freezers, and water coolers were present in the building that are scheduled for removal. Typically, refrigeration systems with ODS shall be maintained in order to prevent discharge of ODS. Systems that are to be removed, or dismantled shall have refrigerants containing ODS recovered and disposed of or recycled in accordance with 40 CFR 82.

Radioactive Materials
Smoke detectors were present in the project area that may contain a radioactive material. If the detectors are of the ionization type they typically contain a small amount of Americium. When removed during renovation, the detectors should be returned to the owner for reuse or returned to the manufacturer for disposal or recycling. There are no licensed disposal facilities for radioactive wastes in Alaska.

F. RECOMMENDATIONS

1. Asbestos-Containing Materials

The asbestos-containing materials identified in the building are typically in intact condition and are classified as both friable and non-friable ACM. All asbestos-containing materials that will be disturbed by the planned renovation work are required to be removed by trained asbestos workers. Refer to Section 02 8233 Removal and Disposal of Asbestos Containing Materials.

2. Dusts with Asbestos

Dusts with measurable concentrations of asbestos are assumed to be present, but are not classified as asbestos-containing materials, or as debris from asbestos-containing materials. Workers disturbing dusts are required to have hazard communication training in accordance with OSHA regulations, but are not required to receive 40 hours of training, which is required for asbestos workers. At least an initial exposure assessment or data from previous air monitoring is required to show that the contractor's chosen means and methods of controlling worker exposure to airborne contaminants below the OSHA permissible exposure limits (PELs) is required. Refer to Section 01 3545 Airborne Contaminant Control.

3. Lead-Containing Materials

Federal OSHA (29 CFR 1926.62) and the State of Alaska (8 AAC Chapter 61) have promulgated regulations that apply to all construction work where employees may be exposed to lead, including disturbance of paints with low concentrations of lead.

The EPA Standard 40 CFR 745, Lead-Base Paint Poisoning Prevention in Certain Residential Structures, defines lead–based paint hazards and regulates lead based paint activities in target housing and child-occupied facilities. Contractors disturbing lead-based paints in target housing and child occupied facilities must comply with 40 CFR 745.

Worker exposure to lead may be able to be controlled below the OSHA permissible exposure limit if proper engineering controls and procedures are used during renovation. Lead is a potentially hazardous waste and the EPA requires that all wastes that contains lead be tested to determine if they must be treated as hazardous waste. A TCLP test of the waste stream is required to be performed to determine if the waste will be hazardous or non-hazardous. Refer to Section 01 3545 Airborne Contaminant Control and Section 02 8333 Removal and Disposal of Materials Containing Lead.

4. PCB-Containing Materials

IF any PCB-containing ballasts are discovered, and they are removed or replaced, they will need to be removed, handled, packaged and disposed of in accordance with all regulations. Refer to Section 02 8418 Removal and Disposal of Chemical Hazards.

5. Mercury-Containing Materials

Mercury-containing materials scheduled for removal or replacement will need to be removed, handled, packaged and disposed of in accordance with all regulations If mercury-containing lamps are handled and disposed of in accordance with the Universal Waste Regulations, no TCLP test is required. If the Contractor chooses to perform a TCLP test of fluorescent lamps, the test shall be conducted in accordance with the requirements of TCLP testing of fluorescent lamps shall comply with ANSI/NEMA Standard Procedure for Fluorescent Lamp Sample Preparation and Toxicity Characteristic Leaching Procedure, C78.LL 1256-2003 or latest version. Refer to Section 02 8418 Removal and Disposal of Chemical Hazards.

6. Other Hazardous Materials

Radioactive materials scheduled for removal or replacement will need to be removed, handled, packaged and disposed of in accordance with all regulations. Refer to Section 02 8418 Removal and Disposal of Chemical Hazards.

Refrigeration units with ODS scheduled for removal will need to be removed, handled, packaged and disposed of in accordance with all regulations. Refer to Section 02 8418 Removal and Disposal of Chemical Hazards.

G. LIMITATIONS

The conclusions and recommendations contained in this report are based upon professional opinions with regard to the subject matter. These opinions have been arrived at in accordance with currently accepted environmental consulting and engineering standards and practices and are subject to the following inherent limitations:

1. Accuracy of Information

The laboratory reports utilized in this assessment were provided by the accredited laboratories cited in this report. Although the conclusions, opinions, and recommendations are based in part, on such

information, our services did not include the verification of accuracy or authenticity of such reports. Should such information provided be found to be inaccurate or unreliable, EHS-Alaska, Inc. reserves the right to amend or revise its conclusions, opinions, and/or recommendations.

2. Site Conditions

The intent of this survey was to identify hazardous materials that may be disturbed during routine maintenance or renovations. This survey is not intended to be utilized as the sole design document for abatement. This survey was conducted while the site was occupied. All inspections were performed with furniture, equipment and/or stored items in place. Although a concerted effort was made to identify all hazardous materials, some hazardous materials may have been hidden by furniture, equipment or stored items and may not have been identified. The survey investigated representative materials and items, such as lights and mechanical components. Variations may occur between materials and items that appear to be the same, but are actually of different construction or materials. Other asbestos-containing or potentially hazardous materials may be present in the facilities that were concealed by structural members, walls, ceilings or floor coverings.

3. Changing Regulatory Constraints

The regulations concerning hazardous materials are constantly changing, including the interpretations of the regulations by the local and national regulating agencies. Should the regulations or their interpretation be changed from our current understanding, EHS-Alaska, Inc. reserves the right to amend or revise its conclusions, opinions, and/or recommendations.

APPENDIX A

Asbestos Bulk Sample
Field Survey Data Sheets
and
Laboratory Reports

APPENDIX B

Lead Analyzer Test Results

LEAD BASED PAINT SCREENING SUMMARY

No.	SITE	INSPECTOR	ROOM	COMPONENT	SUBSTRATE	CONDITION	COLOR	DURATION	TIME	DEPTH INDEX	Results		
											LPB	mg/cm^2	+/-Error
1	NSOB	HARPER	-	-	-	-	-	118.6	10/5/2011 16:02	-	-	3.81	0.00
2	**NSOB**	**HARPER**	**-**	**CALIBRATION CK**	**-**	**-**	**-**	**20.5**	**10/5/2011 16:03**	**1.05**	**Positive**	**1.00**	**0.10**
3	**NSOB**	**HARPER**	**-**	**CALIBRATION CK**	**-**	**-**	**-**	**20.23**	**10/5/2011 16:04**	**1.07**	**Positive**	**1.00**	**0.10**
4	**NSOB**	**HARPER**	**-**	**CALIBRATION CK**	**-**	**-**	**-**	**20.43**	**10/5/2011 16:05**	**2.56**	**Positive**	**1.10**	**0.10**
5	NSOB	HARPER	104	WALL	DRYWALL	INTACT	LT GREEN	10.2	10/5/2011 16:07	1.00	Negative	0.00	0.03
6	NSOB	HARPER	104	DOOR	METAL	INTACT	ORANGE	10.23	10/5/2011 16:09	1.22	Negative	0.22	0.04
7	NSOB	HARPER	104/126	DOORCASING	METAL	INTACT	BEIGE	10.23	10/5/2011 16:11	1.51	Negative	0.50	0.10
8	NSOB	HARPER	126	DOOR	METAL	INTACT	ORANGE	10.23	10/5/2011 16:13	1.39	Negative	0.27	0.05
9	NSOB	HARPER	126	WALL	DRYWALL	INTACT	BEIGE	10.46	10/5/2011 16:14	1.00	Negative	0.00	0.03
10	NSOB	HARPER	126	WALL	DRYWALL	INTACT	BEIGE	10.22	10/5/2011 16:15	1.92	Negative	0.05	0.02
11	**NSOB**	**HARPER**	**102**	**WALL**	**CERAMIC**	**INTACT**	**BEIGE**	**5.26**	**10/5/2011 16:16**	**2.07**	**Positive**	**6.20**	**1.10**
12	NSOB	HARPER	102	DIVIDER	METAL	INTACT	TAN	6.08	10/5/2011 16:18	1.00	Negative	0.00	0.03
13	NSOB	HARPER	102	SINK	CERAMIC	INTACT	WHITE	10.22	10/5/2011 16:20	1.44	Negative	0.01	0.03
14	NSOB	HARPER	100	DOOR	METAL	INTACT	ORANGE	6.37	10/5/2011 16:24	1.76	Negative	0.30	0.08
15	NSOB	HARPER	129	WINDOW CASING	CERAMIC	INTACT	BROWN	5.24	10/5/2011 16:27	1.00	Negative	0.00	0.03
16	NSOB	HARPER	108	WINDOW CASING	METAL	INTACT	TEAL	6.07	10/5/2011 16:33	1.23	Negative	0.30	0.07
17	NSOB	HARPER	108	WINDOW TRIM	WOOD	INTACT	TEAL	5.25	10/5/2011 16:34	1.00	Negative	0.00	0.03
18	NSOB	HARPER	113	DOOR	METAL	INTACT	BROWN	6.34	10/5/2011 16:36	1.37	Negative	0.04	0.02
19	NSOB	HARPER	111	DOOR	METAL	INTACT	BLACK	6.07	10/5/2011 16:37	1.95	Negative	0.00	0.03
20	NSOB	HARPER	107	DOOR	METAL	INTACT	BEIGE	5.26	10/5/2011 16:41	1.00	Negative	0.00	0.03
21	NSOB	HARPER	119	DOOR	METAL	INTACT	ORANGE	6.08	10/5/2011 16:43	1.64	Negative	0.29	0.07
22	NSOB	HARPER	119	WALL	DRYWALL	INTACT	BEIGE	4.99	10/5/2011 16:44	1.06	Negative	0.03	0.02
23	NSOB	HARPER	206	WINDOW SILL	WOOD	INTACT	BLUE	6.35	10/5/2011 16:46	1.00	Negative	0.00	0.03
24	NSOB	HARPER	205	WINDOW TRIM	WOOD	INTACT	GREEN	5.55	10/5/2011 16:47	1.00	Negative	0.00	0.03
25	NSOB	HARPER	200	WALL	DRYWALL	INTACT	BEIGE	6.07	10/5/2011 16:49	2.83	Negative	0.10	0.06
26	NSOB	HARPER	200	BENCH	WOOD	INTACT	BEIGE	5.79	10/5/2011 16:50	2.20	Negative	0.50	0.10
27	NSOB	HARPER	214	WALL	DRYWALL	INTACT	BEIGE	5.52	10/5/2011 16:52	1.00	Negative	0.00	0.03
28	NSOB	HARPER	214	WALL	DRYWALL	INTACT	GREEN	1.93	10/5/2011 16:53	1.00	Negative	0.00	0.03
29	NSOB	HARPER	214	WALL	DRYWALL	INTACT	GREEN	5.82	10/5/2011 16:54	4.62	Negative	0.02	0.06
30	NSOB	HARPER	214	CHAIR	WOOD	INTACT	ORANGE	6.38	10/5/2011 16:55	1.32	Negative	0.00	0.03
31	NSOB	HARPER	214	WINDOW SILL	WOOD	INTACT	BEIGE	9.12	10/5/2011 16:56	1.07	Negative	0.00	0.03
32	NSOB	HARPER	223	WALL	DRYWALL	INTACT	BEIGE	5.25	10/5/2011 16:58	2.45	Negative	0.01	0.03
33	NSOB	HARPER	234	HAND RAIL	METAL	INTACT	BROWN	5.52	10/5/2011 17:02	1.37	Negative	0.40	0.10
34	NSOB	HARPER	234	WALL	METAL	INTACT	BROWN	3.32	10/5/2011 17:03	10.00	Negative	-0.06	1.39
35	**NSOB**	**HARPER**	**-**	**CALIBRATION CK**	**-**	**-**	**-**	**20.65**	**10/5/2011 17:12**	**2.68**	**Positive**	**1.10**	**0.10**
36	**NSOB**	**HARPER**	**-**	**CALIBRATION CK**	**-**	**-**	**-**	**20.68**	**10/5/2011 17:13**	**2.49**	**Positive**	**1.00**	**0.10**
37	**NSOB**	**HARPER**	**-**	**CALIBRATION CK**	**-**	**-**	**-**	**20.76**	**10/5/2011 17:14**	**1.01**	**Positive**	**1.00**	**0.10**

LEAD BASED PAINT SCREENING SUMMARY

Table Heading Descriptions:

Duration: This is the nominal time in seconds that each sample was analyzed.

Depth Index: Indicates the relative depth of the lead. A Depth Index (DI) of less than 1.5 indicates lead very near the surface layer of paint. A DI between 1.5 and 4.0 indicates moderately covered lead. A DI greater than 4.0 indicates the lead paint is deeply buried beneath multiple layers of paint.

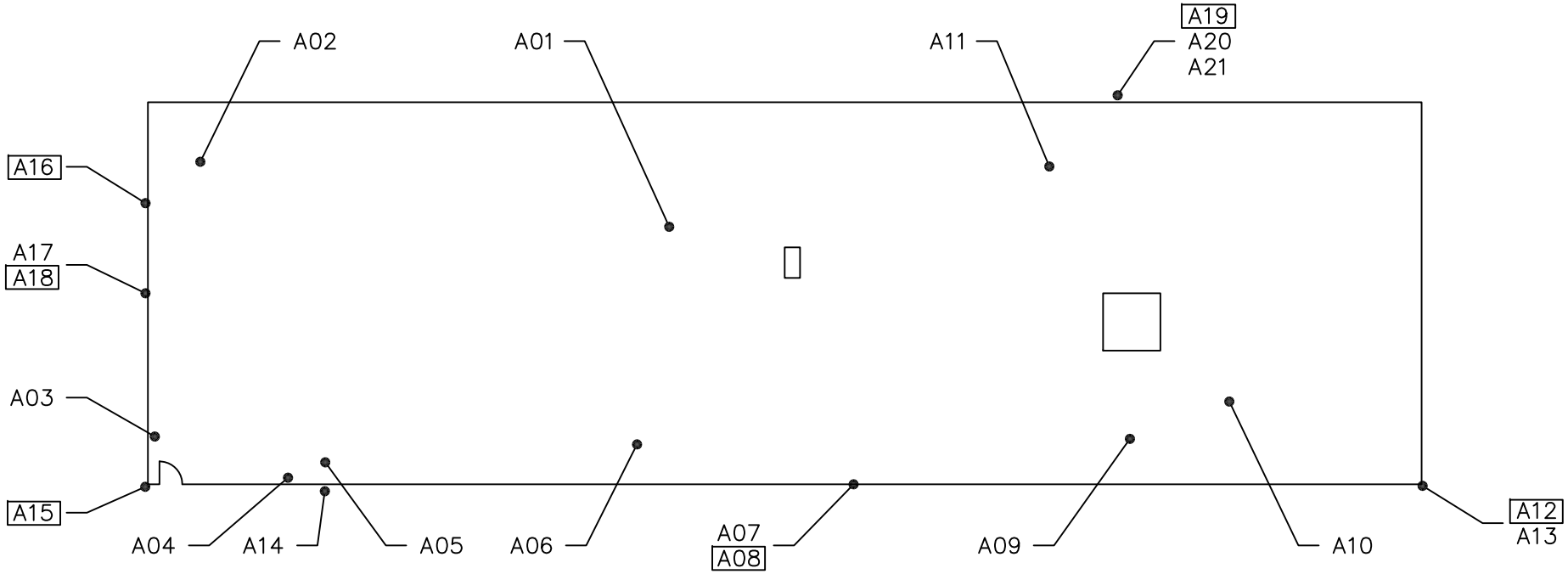
LBP: Results are shown as positive (POS $\geq$ 1.0 mg/cm^2), inconclusive (INC) or negative (NEG < 1.0 mg/cm^2). The results are based on the combined results of the K and L shell readings. L shell and K shell readings are not provided, but are available. Positive results are shown in bold print.

mg/cm2: This is the testing results produced by the NITON XLi-300 instrument in milligrams of lead per square centimeter (mg/cm^2). The EPA defines lead based paint as paint containing lead at 1.0 mg/cm^2 or greater. A negative number is a result of an internal computation made by the instrument and should be interpreted as zero. Even though paint may be termed negative (less than 1.0 mg/cm^2) by EPA definition, disturbance of the paint may still be regulated by OSHA under 29 CFR 1926.62. Where lead is present at any level, appropriate engineering controls, work practices and personal protective equipment should be used until a negative exposure assessment can be determined. <LOD indicates that the lead present was less than the limits of detection of the instrument (very little or no lead present).

VOID: This indicates that the test was intentionally terminated by the operator due to operator error (e.g. - operator moved analyzer while testing).

APPENDIX C

Drawings of Sample Locations



1
C-1

CRAWLSPACE &
EXTERIOR 1ST FLOOR
NTS

N

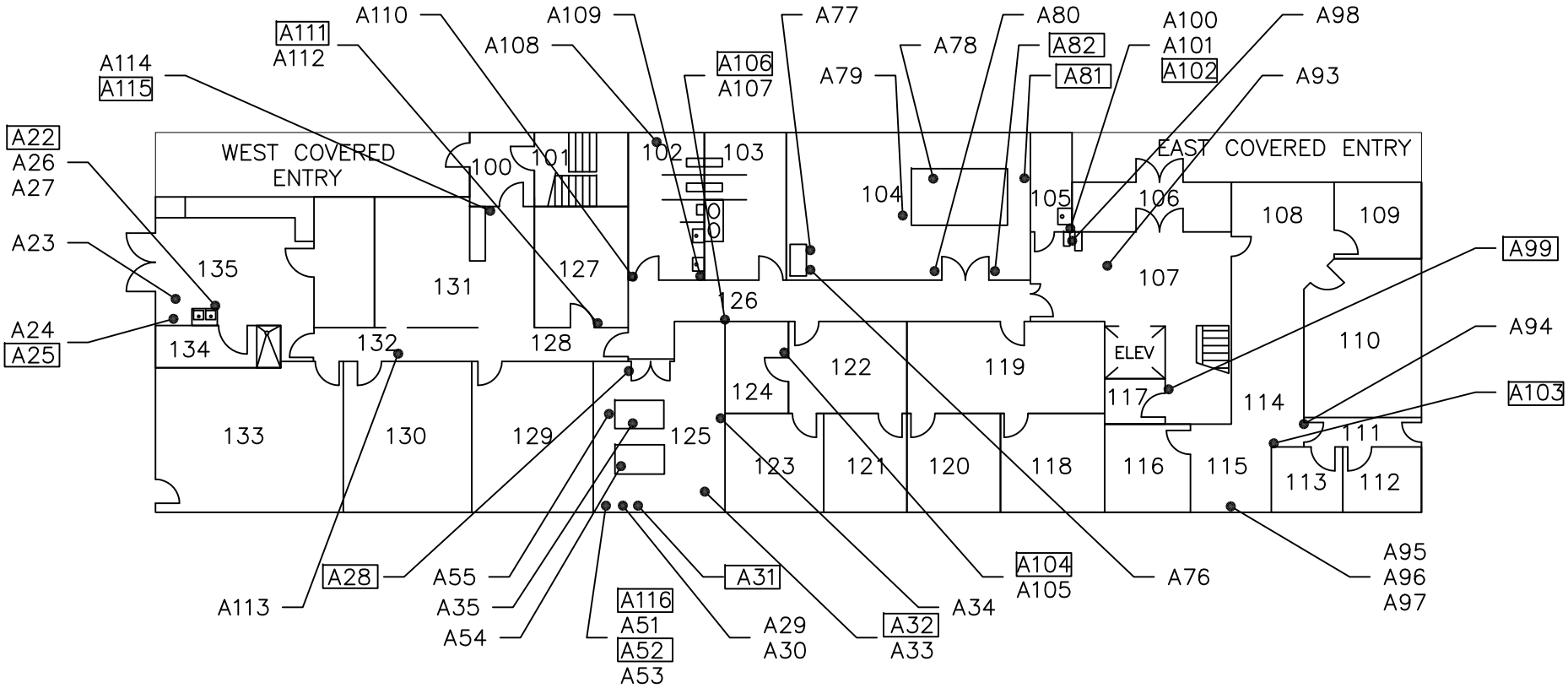
LEGEND

AXX — ASBESTOS TEST LOCATION

AXX — LAB TEST RESULTS POSITIVE FOR ASBESTOS

REFER TO TESTING SUMMARY IN REPORT FOR FULL DETAILS.
ALL SAMPLES HAVE NSOB-1011- PREFIX.

STATE OF ALASKA	STATE OFFICE BUILDING NOME, AK ASBESTOS SAMPLE LOCATION	EHS ALASKA INCORPORATED ENGINEERING, HEALTH & SAFETY CONSULTANTS	DRAWN: CTO CHECK: SGH	DATE: 10/05/11
			FILE #: 7052-SL	DWG.NO: C-4



1
C-2

1ST FLOOR
NTS

N

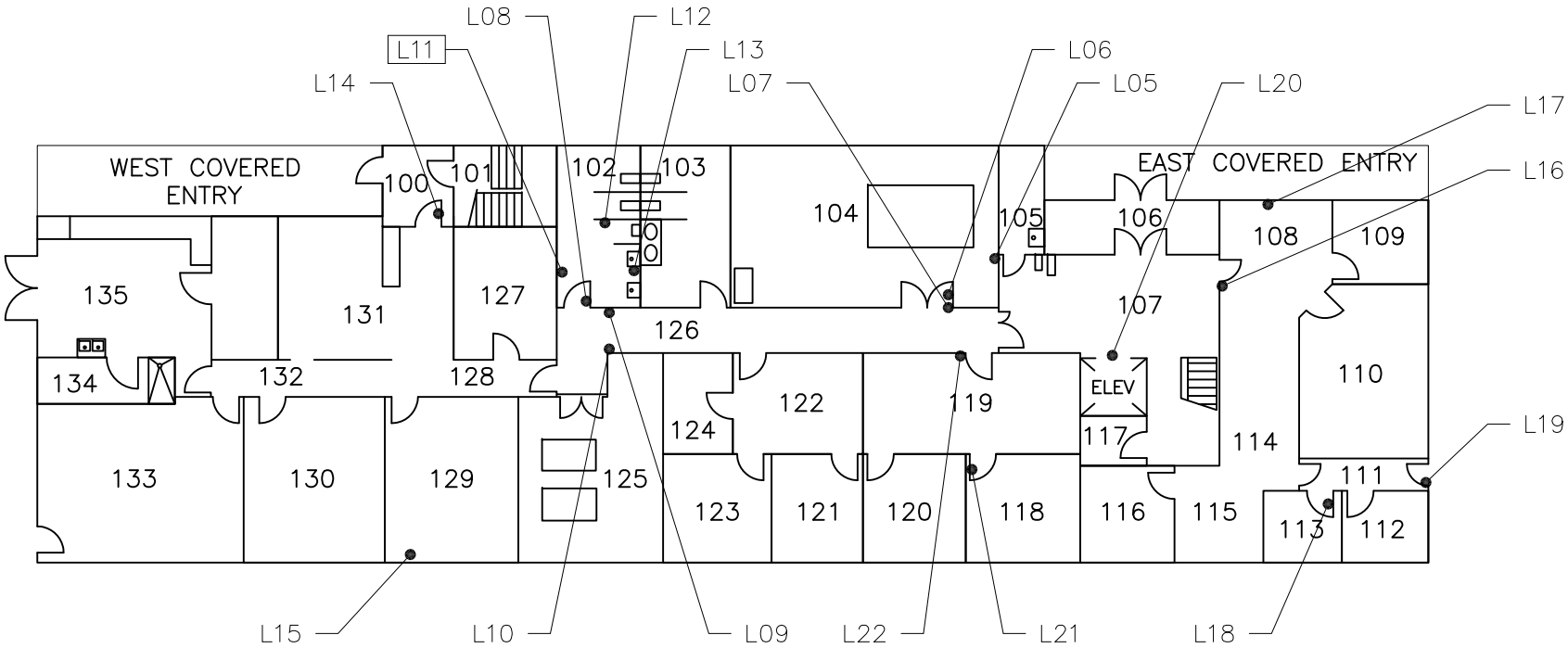
LEGEND

AXX — ASBESTOS TEST LOCATION

AXX — LAB TEST RESULTS POSITIVE FOR ASBESTOS

REFER TO TESTING SUMMARY IN REPORT FOR FULL DETAILS.
ALL SAMPLES HAVE NSOB-1011- PREFIX.

STATE OF ALASKA	STATE OFFICE BUILDING NOME, AK ASBESTOS SAMPLE LOCATION	EHS ALASKA INCORPORATED ENGINEERING, HEALTH & SAFETY CONSULTANTS	DRAWN: CTO CHECK: SGH	DATE: 10/05/11
			FILE #: 7052-SL	DWG.NO: C-5



LEGEND

LXX — LEAD TEST LOCATION

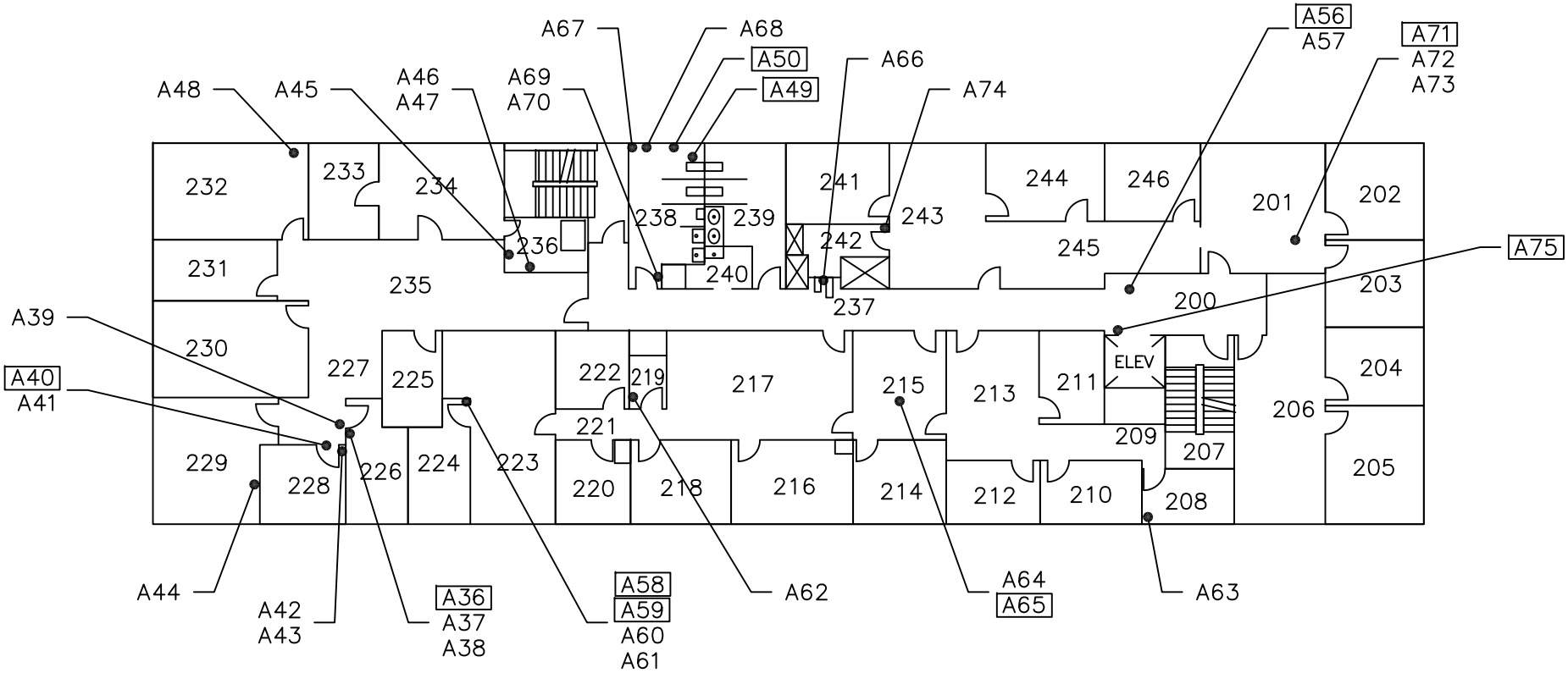
[LXX] — LEAD TEST CLASSIFIED AS LEAD-BASED PAINT

REFER TO TESTING SUMMARY IN REPORT FOR FULL DETAILS.

1 / C-3 — 1ST FLOOR
NTS

N

STATE OF ALASKA	STATE OFFICE BUILDING NOME, AK LEAD SAMPLE LOCATION	EHS ALASKA INCORPORATED ENGINEERING, HEALTH & SAFETY CONSULTANTS	DRAWN: CTO CHECK: SGH	DATE: 10/05/11
			FILE #: 7052-SL	DWG.NO: C-6



1
C-4

2ND FLOOR
NTS

N

LEGEND

AXX — ASBESTOS TEST LOCATION

AXX — LAB TEST RESULTS POSITIVE FOR ASBESTOS

REFER TO TESTING SUMMARY IN REPORT FOR FULL DETAILS.
ALL SAMPLES HAVE NSOB-1011- PREFIX.

STATE OF ALASKA	STATE OFFICE BUILDING NOME, AK ASBESTOS SAMPLE LOCATION	EHS ALASKA INCORPORATED ENGINEERING, HEALTH & SAFETY CONSULTANTS	DRAWN: CTO CHECK: SGH	DATE: 10/05/11
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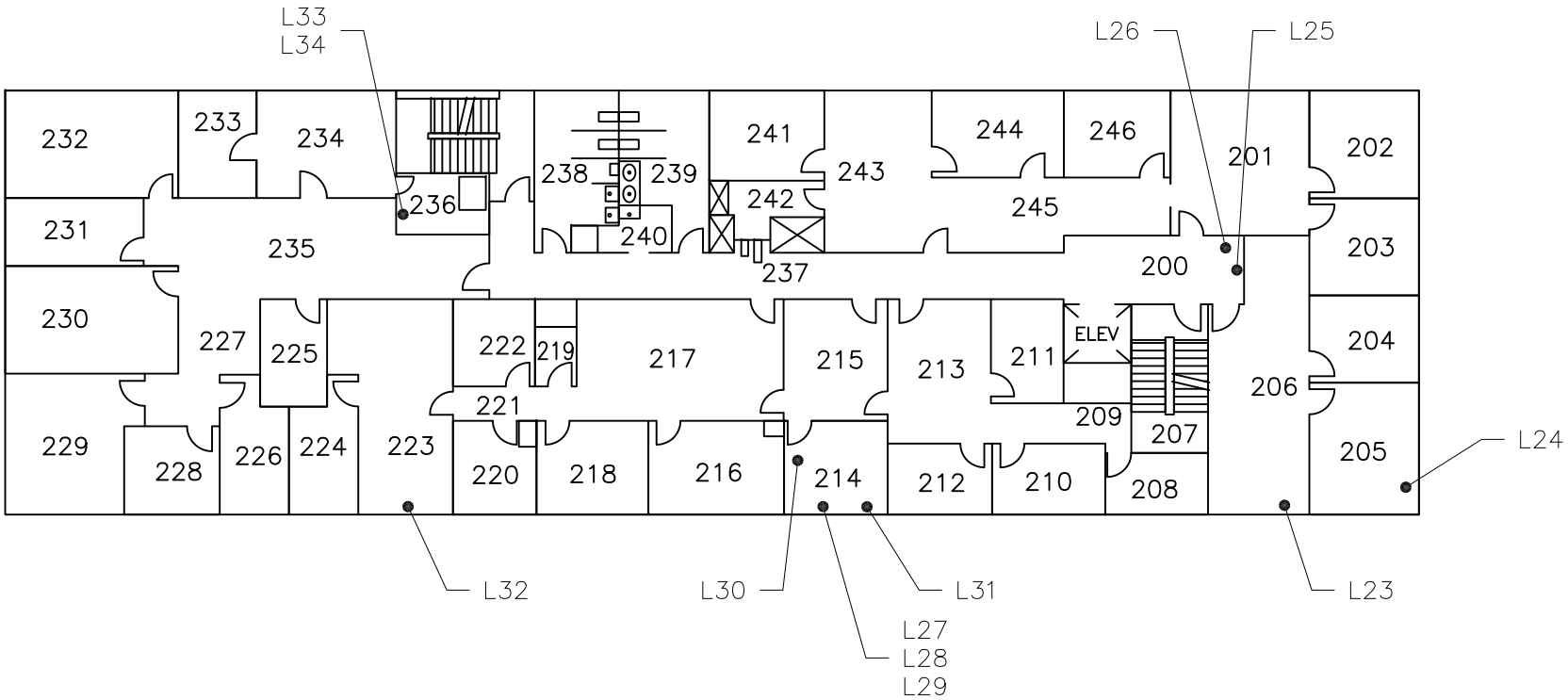

LEGEND

LXX — LEAD TEST LOCATION

LXX — LEAD TEST CLASSIFIED AS LEAD-BASED PAINT

REFER TO TESTING SUMMARY IN REPORT FOR FULL DETAILS.

1 / C-5 — 2ND FLOOR NTS

N

STATE OF ALASKA	STATE OFFICE BUILDING NOME, AK LEAD SAMPLE LOCATION	EHS ALASKA INCORPORATED ENGINEERING, HEALTH & SAFETY CONSULTANTS	DRAWN: CTO CHECK: SGH	DATE: 10/05/11
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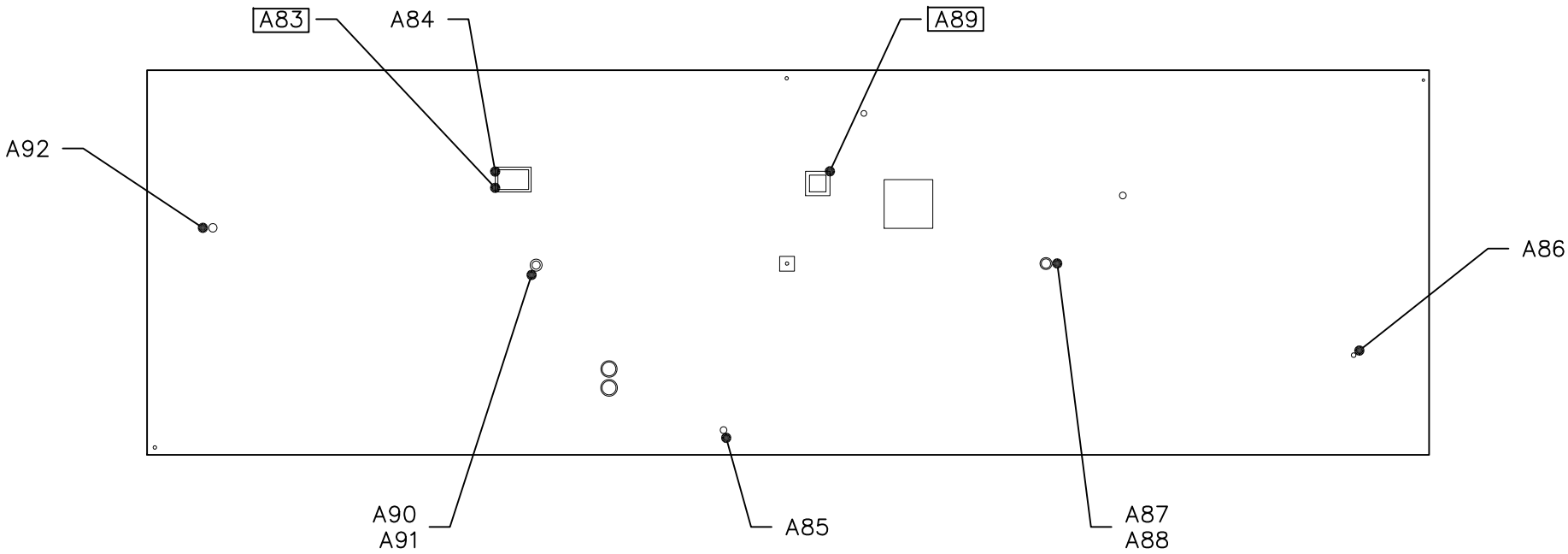


1
C-6

ROOF
NTS

N

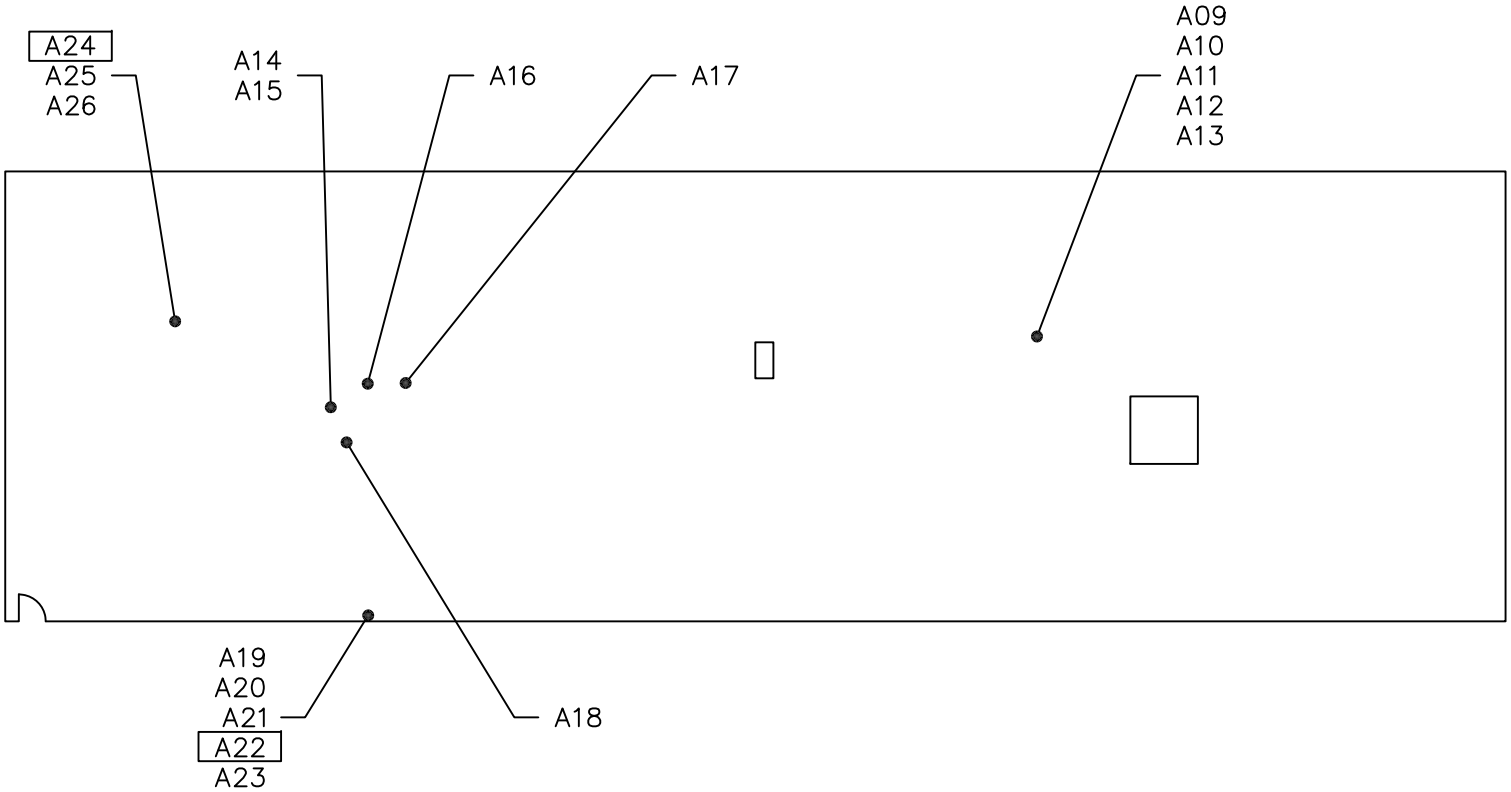
LEGEND

AXX ASBESTOS TEST LOCATION

AXX LAB TEST RESULTS POSITIVE FOR ASBESTOS

REFER TO TESTING SUMMARY IN REPORT FOR FULL DETAILS.
ALL SAMPLES HAVE NSOB-1011- PREFIX.

STATE OF ALASKA	STATE OFFICE BUILDING NOME, AK ASBESTOS SAMPLE LOCATION	EHS ALASKA INCORPORATED ENGINEERING, HEALTH & SAFETY CONSULTANTS	DRAWN: CTO CHECK: SGH	DATE: 10/05/11
			FILE #: 7052-SL	DWG.NO: C-9



1
C-1
CRAWLSPACE
NTS

N

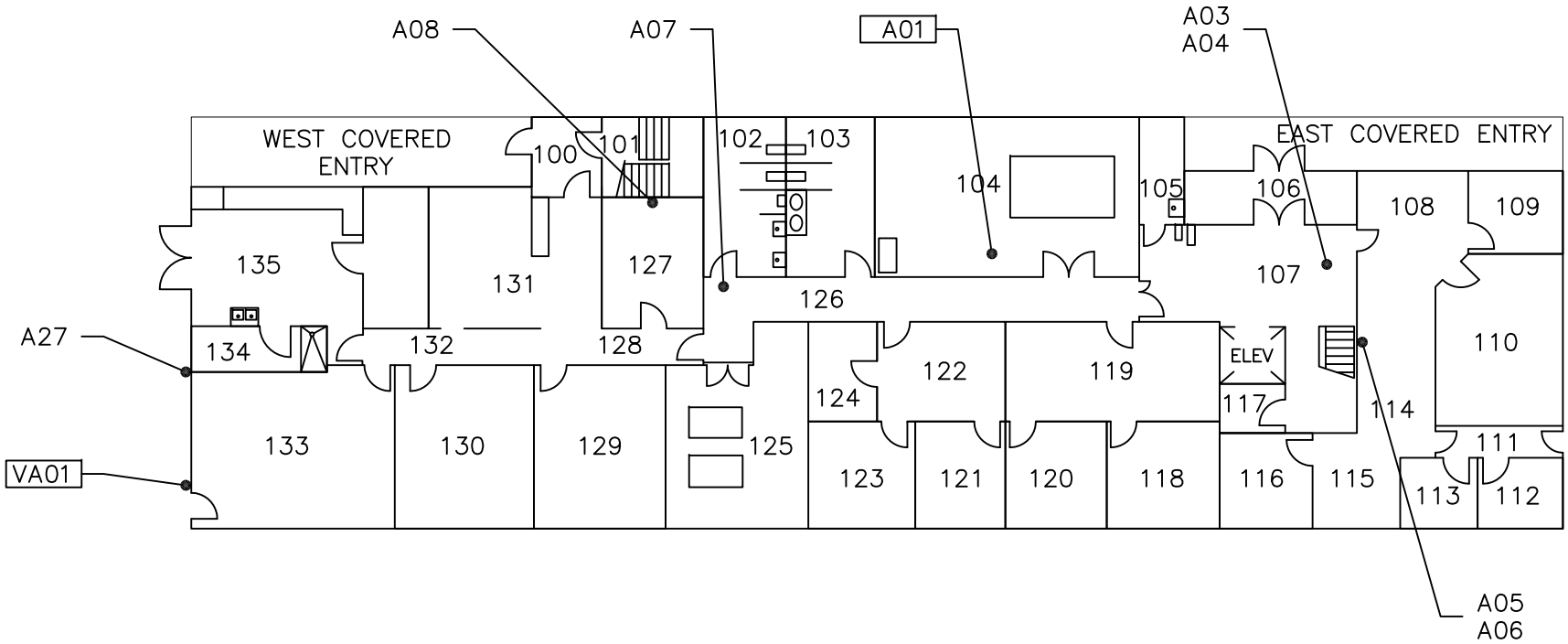
LEGEND

AXX ASBESTOS TEST LOCATION

AXX LAB TEST RESULTS POSITIVE FOR ASBESTOS

REFER TO TESTING SUMMARY IN REPORT FOR FULL DETAILS.
ALL SAMPLES HAVE NSOB-0813- PREFIX.

STATE OF ALASKA	STATE OFFICE BUILDING NOME, AK ASBESTOS SAMPLE LOCATION	EHS ALASKA INCORPORATED ENGINEERING, HEALTH & SAFETY CONSULTANTS	DRAWN: CTO CHECK: SGH	DATE: 08/07/2013
			FILE #: 7052-SL2	DWG.NO: C-1



1
C-2

1ST FLOOR
NTS

N

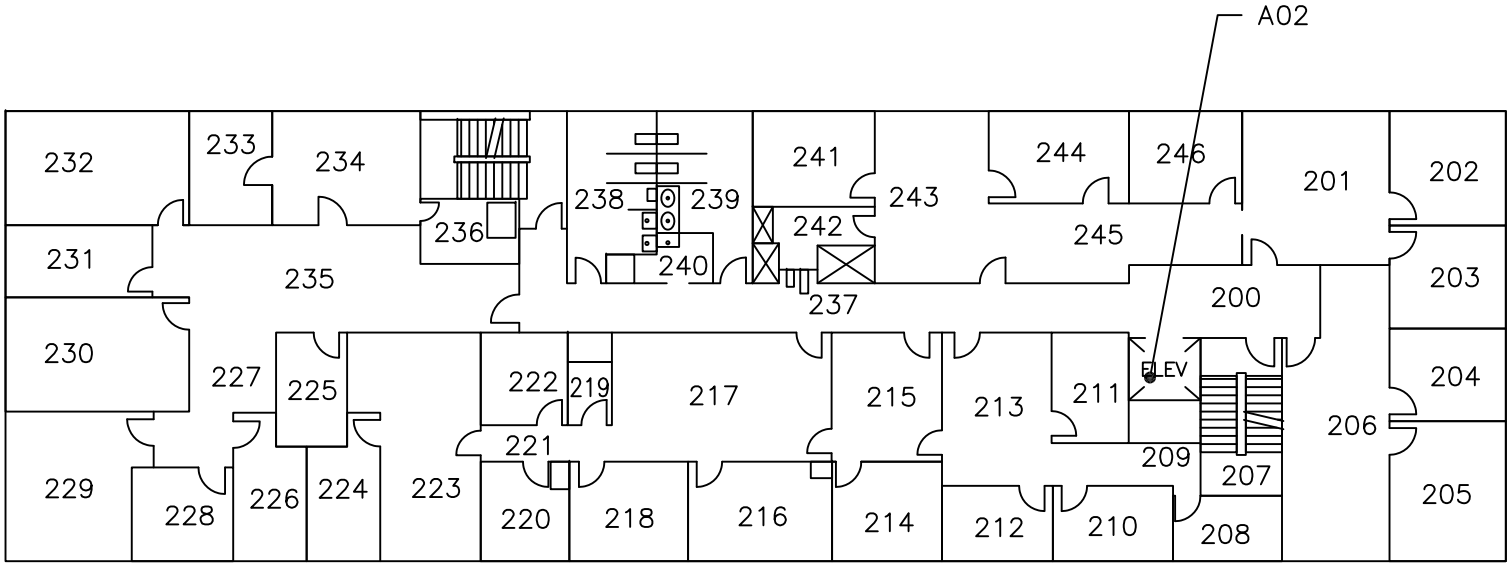
LEGEND

AXX/VAXX ASBESTOS/VERMICULITE TEST LOCATION

AXX LAB TEST RESULTS POSITIVE FOR ASBESTOS

REFER TO TESTING SUMMARY IN REPORT FOR FULL DETAILS.
ALL SAMPLES HAVE NSOB-0813- PREFIX.

STATE OF ALASKA	STATE OFFICE BUILDING NOME, AK ASBESTOS SAMPLE LOCATION	EHS ALASKA INCORPORATED ENGINEERING, HEALTH & SAFETY CONSULTANTS	DRAWN: CTO CHECK: SGH	DATE: 08/07/2013
			FILE #: 7052-SL2	DWG.NO: C-2



1
C-3

2ND FLOOR
NTS

N

LEGEND

AXX ASBESTOS TEST LOCATION

AXX LAB TEST RESULTS POSITIVE FOR ASBESTOS

REFER TO TESTING SUMMARY IN REPORT FOR FULL DETAILS.
ALL SAMPLES HAVE NSOB-0813- PREFIX.

STATE OF ALASKA	STATE OFFICE BUILDING NOME, AK ASBESTOS SAMPLE LOCATION	EHS ALASKA INCORPORATED ENGINEERING, HEALTH & SAFETY CONSULTANTS	DRAWN: CTO CHECK: SGH	DATE: 08/07/2013
			FILE #: 7052-SL2	DWG.NO: C-3

SECTION 02 2633
BIOLOGICAL ASSESSMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. The Biological Assessment for the proposed construction is included with these Contract Documents.

1.02 USE OF INFORMATION

A. The Biological Assessment is provided for the Contractor's information and use in the planning and performance of work in areas containing potential Biologicals.
   1. For the purpose of this section, Biological shall refer to the presence of suspect fungal growth on exposed or hidden surfaces.
   2. The information provided in the Biological Assessment is based on samples collected in various locations of the building. Thus, the Owner and/or its Representative cannot guarantee or warrant that actual conditions encountered might not vary from the information presented in these reports.
   3. The data reported in the Biological Assessment is accurate to the best of the Owner's and it’s Representative's knowledge. The requirements contained in these specifications and in the relevant state and federal guidelines pertaining to the performance of work in areas containing hazardous or potential Biologicals provide guidance for the contractor for performance of work in these areas. The Owner and its Representative disclaim all responsibility for the Contractor's erroneous conclusions regarding the information presented in these reports; the requirements contained in these specifications; and the requirements of applicable state and federal guidelines pertaining to performance of work in these areas.
   4. The Contractor shall be responsible for obtaining additional information if Contractor deems it necessary to carry out the work.

B. It is highly recommended that the contractor visit the site to acquaint themselves with existing conditions.

C. Attached Biological Assessment

1.03 NOTIFICATION OF POTENTIAL HAZARDS

A. Asbestos, lead and other Hazardous Materials are present in the building that may impact the work of all trades. Regulated air contaminants, including asbestos and lead, are assumed to be present in settled and concealed dust in and on architectural, structural, mechanical and electrical components or systems throughout the building. All trades shall coordinate with other trades and conduct their work to prevent worker exposure or site contamination. Refer to specification Section 01 3545, Airborne Contaminant Control and Division 02 specifications for specific information concerning disturbing, removing and disposing of these materials and the installation of new materials or components. This notification is provided in accordance with EPA and OSHA requirements.

PART 2 - PRODUCTS
Not Used

PART 3 - EXECUTION
Not Used

BIOLOGICAL ASSESSMENT

NOME STATE OFFICE BUILDING

NOME, ALASKA

Assessed
October 25 to 28, 2013

Report Date
December 13, 2013

EHS-ALASKA, INC.
ENGINEERING, HEALTH & SAFETY CONSULTANTS
11901 BUSINESS BLVD., SUITE 208
EAGLE RIVER, ALASKA 99577-7701

BIOLOGICAL ASSESSMENT
NOME STATE OFFICE BUILDING

NOME, ALASKA

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APPENDIX C ..... Sample Location Drawings
APPENDIX D ..... Asbestos Air Monitoring Laboratory Results and Chain of Custody
APPENDIX E ..... Additional Information on Fungi, Mold and Pollen

BIOLOGICAL ASSESSMENT
NOME STATE OFFICE BUILDING

NOME, ALASKA

1.0 EXECUTIVE SUMMARY

EHS-Alaska, Inc. conducted a limited mold assessment of wall cavities in select areas of the Nome State Office Building in Nome, Alaska. The purpose of the assessment was to determine if fungal amplification (growth) is present on building material surfaces to assist with the potential redesign project. The assessment consisted of a visual inspection of accessible areas of the building, along with air sampling for total fungal spores, bulk and tape lift sampling of suspect growth on building material surfaces in suspect and control areas. It is important to note that the investigation focused on areas that were likely to have signs of past water intrusion problems, as supported by relative moisture readings and a visual inspection. Areas that did not have visible signs of moisture damage or higher relative moisture readings were also investigated. Mr. Rick Friese, Field Technician and Mr. Martin Schwan, Industrial Hygienist with EHS-Alaska, Inc., conducted the assessment on October 25-28, 2013. Note: Room numbers used in this report are taken from the State of Alaska floor plans and DO NOT match the Architectural drawings.

Molds are found in virtually every environment and can be detected, indoors and outdoors, year round. Molds reproduce by means of tiny spores, which are extremely small and usually not visible to the naked eye. Mold spores spread by floating through outdoor and indoor air. Outdoors, molds play a part in nature by breaking down organic matter such as fallen leaves and dead trees. Mold may begin growing indoors when mold spores land on surfaces that remain wet for long enough for the fungal spores to germinate.

Currently, there are no federal standards or recommendations for acceptable exposures to airborne concentrations of mold or mold spores. Research on the health effects of mold exposure is ongoing. According to the Occupational Safety and Health Administration (OSHA), most typical indoor air exposures to mold do not present a risk of adverse health effects. Molds can cause adverse effects by producing allergens (substances that can cause allergic reactions). For those people who are sensitive to molds, exposure can cause symptoms such as nasal stuffiness, eye irritation, wheezing, or skin irritation. Severe reactions may occur among workers exposed to large amounts of molds in occupational settings, such as farmers working around moldy hay. Severe reactions may include fever and shortness of breath. Potential health concerns are important reasons to prevent mold growth and to remediate existing problem areas. The advice of a medical professional should always be sought if there are any emerging health issues.

Since mold spores are ever-present in the environment, it is virtually impossible to make a building “mold-free”. The goal of any remediation effort is to remove the mold “growth” after ensuring all moisture intrusion problems have been corrected.

The limited mold assessment at the Nome State Office Building indicated that water intrusion was currently occurring in three locations (Lab 135 - north wall, Office 133- left of exterior door, and Hall 111 left of door). The results of the bulk mold sampling on building material surfaces in those three locations indicate that very heavy mold growth is occurring. Mold growth will continue until the water intrusion problem is corrected. Three other areas exhibited signs of past water intrusion and mold on surfaces sampled was identified (Office 205 – east wall along floor to the left of the window, Office 129 – below right window, and Entrance 106 – along floor to the left of the exterior doors). Mold was also found on other surfaces sampled in other areas but was classified as normal mold growth associated with all buildings. However, the presence of very light or light mold growth may result in heavy mold growth should conditions change to have favorable temperatures and moisture levels for mold growth to occur.

Air sampling for total airborne mold spores was conducted before and after the investigation at each room where the wall cavities were opened. The result of the air sampling for airborne mold spores indicate that indoor levels reflect the levels found in the outdoor controls with the exception of Office 133; and the subsequent mold investigation where wall components were exposed did not release additional mold spores resulting in higher counts above outdoor controls. The high airborne spore count of *Pithomyces* in office 133 should be resolved by the redesign but occupant activities, which are assumed to be contributing to the introduction of *Pithomyces* spores in the area, may need to be evaluated if future levels are shown to be high. Results of air monitoring for mold spores indicated typical low levels that would not generally affect indoor air quality.

Visible signs of past water intrusion (painted wall bubbling, water-stained ceiling tiles and fire-proofing) were visible in some areas, but these areas were all dry. Moisture readings in building materials, especially the walls around windows, were low and did not indicate any recent leaks. One light fixture cover in office 223 had visible water stains and the area above revealed water staining on the gypsum wallboard beam and deck enclosures but the material was dry. The area above the north entrance 106 had water pooling on the foam insulation but it did not have visible mold and musty odors were not observed. Key photos are attached in Appendix A

Based on the visual assessment, bulk sampling of suspect fungal growth, and air monitoring conducted during this assessment, EHS-Alaska recommends the following:

1. The replacement of the building exterior envelop will mitigate the vast majority of the existing water intrusion problems, which were found adjacent to exterior doors at the west exterior door at Office 133 and the east exterior door and Hall 111, and the north Entrance 106. Based on existing infiltration problems at exterior doors the design and specifications for those doorways need to be robust and may need to include additional flashings and sealants at the door perimeter to rectify the avenue of water intrusion, as well as revising exterior grade, pavement or sidewalks to divert surface water away from the building.
2. Areas of damaged gypsum wall board behind cove base, and behind vinyl wall paper are to be removed and replaced, including areas where visible suspect fungal growth was found behind the cove base in Office 133 at door, Office 205 to the right of the east window, along north wall in Hall 111, and at all of the exterior door areas discussed above.
3. The design for this project includes remediating the standing water that occurs at the West Covered Entry, which appears to have caused the water intrusion occurring along the north wall of Lab 135. We recommend removing and replacing the cove base and base cabinets in Lab 135, and removing and replacing damaged wall covering and gypsum wall board behind the cabinets.
4. Install or repair insulation and vapor barriers on cold piping and ductwork penetrating the building exterior to avoid water damage from condensation.
5. Perform inspections of the areas above the ceiling to check for seasonal water intrusion and make repairs as necessary.

2.0 BACKGROUND INFORMATION

At the request of the State of Alaska Department of Administration, EHS-Alaska, Inc. conducted a Limited Mold Assessment in the Nome State Office building located on Front Street in Nome, Alaska. The purpose of the assessment was to determine if fungal amplification (growth) is present on building material surfaces inside exterior walls. The assessment consisted of a visual inspection and relative moisture measurements of accessible areas of the building, along with air sampling for total fungal spores, bulk and tape lift sampling of suspect growth on building material surfaces in “suspect” and “control” areas. Mr. Rick Friese, Field Technician and Mr. Martin Schwan, Industrial Hygienist with EHS-Alaska, Inc., conducted the assessment on October 25-28, 2013. During this assessment, Mr. Friese and Mr. Schwan met with Mr. Tyler Johnson, State of Alaska DOT, Western District Facilities, who provided access to and information on the building. The building is a two story structure that consists of typical

office space. The Alaska Department of Fish and Game occupy the majority of the first floor with the State of Alaska Legislative Affairs occupying a smaller portion on the east end. The west end of the 2nd floor is currently vacant but the remainder of the 2nd floor is occupied by the Department of Health & Social Services, Corrections, the District Attorney, and the Division of Elections. Exterior walls generally had two layers of gypsum wallboard (GWB) followed by a polyethylene vapor barrier on the interior side with a layer of spray-on foam insulation on a layer of GWB followed by cement asbestos board or porcelain enamel metal panels on the exterior side. Areas below windows generally had a single layer of GWB, polyethylene, fiberglass insulation, and plywood. Interior walls are generally GWB and some areas had a wall covering. Ceilings are generally lay-in ceiling tiles with exposed spray-on fire-proofing or foam insulation on the exterior walls above the ceiling on the first floor, and GWB on beams and columns in most areas of the second floor. Most floors in offices are carpeted and hallways had vinyl flooring. Heating is provided by forced air.

3.0 VISUAL INSPECTION

A visual inspection was conducted to assess the areas for visible signs of suspected fungal growth, water damage, and musty odors. All accessible rooms were screened to assist in selecting rooms for air monitoring. Relative moisture levels in the GWB were checked with a GE Protimeter Surveymaster nondestructive moisture meter. The relative moisture (RM) levels were generally found between 30 and 60 and those levels are not shown in the table below. Three areas were found with relative moisture level greater than 100. Most areas did not exhibit signs of moisture intrusion, suspected mold growth, or musty odors on exposed surfaces. Key results of the visual inspection for mold are summarized below in Table 3.0.

Table 3.0 Summary of Visual Inspection and Relative Moisture Readings

Location	Visible Signs of Moisture Intrusion	Musty Odor	Suspected Fungal Growth
Office 110	High relative moisture reading along floor at south wall at exterior wall	No	No
Hall 111	Side opposite of office 110. High relative moisture reading along floor on north wall near door.	Slight	Yes
Area above entrance 106	Water pooling on foam insulation at exterior wall, water-staining on GWB	No	No
Entrance 106	None	No	Yes
Elevator Pit	Water-stained GWB	No	No
Boiler Room 125	Water marks on wall, rusted metal sill & metal wall framing	No	No
Office 129	Water-staining on fire-proofing above ceiling	No	No
Office 129	Bubbling of painted GWB covering on column	No	No
Office 133	Water-staining on fire-proofing above ceiling	Slight	No
Office 133	High relative moisture reading along floor to the left of exterior door	Slight	Yes
Lab 135	Water-staining on floor at base cabinet, Moisture on floor. High relative moisture reading along floor	Slight	Yes

Location	Visible Signs of Moisture Intrusion	Musty Odor	Suspected Fungal Growth
Office 232	None	No	No
Office 229	None	No	No
Office 223	Water-staining on ceiling light fixture plastic cover, area above ceiling on GWB	No	No
Office 205	Bubbling of painted GWB near floor above cove base	No	Yes
Office 204	None	No	No
NE Office Areas	General no signs of water intrusion – low RM readings	No	No
South Office Areas	General no signs of water intrusion – low RM readings	No	No

Areas with a slight musty odor were identified and included in the air sampling plan for mold spores. Elevated spore levels were found in Office 133, spore levels in all other areas were low and did not indicate fungal amplification or additional exposure during wall cavity investigation. (See Section 6.2 of this report).

Significant amounts of settled dust were observed on some working surfaces in the office areas, and seemed to have settled over a long period of time. Settled dust can contain pollen, pet dander, spores and other potential allergens. Having large amounts of settled dust on surfaces increases the risk of the dust becoming re-suspended in the air. Periodic vacuuming with high efficiency filtered vacuums should be conducted to remove settled dust in the office areas.

4.0 SAMPLE COLLECTION METHODOLOGY

4.1 Bulk Sampling

Fourteen total locations were proposed to be investigated as outlined in the Scope of Work as follows: 4 each on south and west walls, 3 each on north and east walls. Location with signs of water damage – current or past were targeted; some areas without water damage were also investigated for comparison. The locations were selected on-site following the visual inspection, results of the relative moisture meter, and with consideration of the on-site representative who pointed out locations which may or may not have visually exhibited signs of past water intrusion. Investigative sampling by cutting holes in the wall to visually inspect wall component surfaces in this manner is considered Class II asbestos work because the joint compound in the gypsum wallboard (GWB) contains 1% or greater asbestos. Both workers involved in the mold investigation hold current State of Alaska Asbestos Abatement Certifications and are EPA certified Building Inspectors and were equipped with personal protective equipment (PPE). Additionally, personal and area air sampling for asbestos was conducted during bulk mold sampling with worker's Time Weighted Average (TWA) exposures calculated (see section 6.3).

Bulk samples and tape lift samples were collected of suspect fungal growth on wall component surfaces as approximately 5"x5" holes were cut into the wall starting from the interior and working to the exterior cement asbestos board or other exterior finish. Collected samples were sealed in plastic bags and shipped to EMLab P&K for analysis. A summary of the results of the bulk sample analysis are in section 6.1 and full laboratory results are included in Appendix B.

All air, surface, and bulk samples for total mold spores were submitted to EMLab P&K for analysis. EMLab P&K is staffed by certified microbiologists, maintains a rigorous Quality Assurance Program, is accredited by the American Industrial Hygiene Association (AIHA) Environmental Microbiology Laboratory Accreditation Program (EMLAP) and participates in the AIHA Environmental Microbiology Proficiency Analytical Testing Program (EMPAT). See Appendix B for laboratory credentials. A summary of the results of the air sampling are in section 6.2 and full laboratory results are included in Appendix B.

4.2 Air Sampling – Total Spore Count

Sampling for total fungal spores was conducted by drawing a measured amount of air at a specific flow rate (15 liters per minute) through sampling cassettes. A calibrated, high volume vacuum pump was used to draw air into the cassettes where dust and spores impacted a glass slide within the cassette housing. Air-O-Cell cassettes (Lot # 30031, Exp. 08/2014) were used for sampling total fungal spores. Sample locations were determined based on visual inspections and as suggested by owner representative. The sampling plan was designed to monitor in areas selected to be further destructively investigated to determine if fungal spores are currently present and if the destructive investigation released additional spores. On October 25, 2013, between the hours of 2:00 PM and 5:00 PM, after the visual inspection was conducted and the bulk sampling sites were selected, and prior to the destructive wall investigations, samples were collected in the following locations:

Outdoor - North Entrance: Two outdoor control samples
Outdoor West Entrance: Two outdoor control samples
Lab 135: One sample
Office 133: One sample
Office Area 131: One sample
Hall 128: One sample
Office 129: One sample
Room 122: One sample
Lobby 107: One sample
Office Area 114: One sample
Office 229: One sample
Hall 237: One sample
Office Area 243: One sample
Office Area 206: One sample
Office Area 213 at Hall 209: One sample
Break Room 223: One sample
Office 204: One sample
Office 202: One sample

On October 28, 2013, between the hours of 8:00 AM and 10:00 AM, samples were again collected at the same locations except the sample in Office area 114 was moved closer to hall 111. Samples are usually collected over 10 minutes when sampling in a clean environment. Due to potentially high dust levels, sampling times were reduced to 5 minutes to reduce the risk of overloading the cassettes. A high volume pump was adjusted to a flow rate of 15 liters per minute using a BIOS DryCal DC-1 Flow Calibrator that had been calibrated on May 28, 2013. The flow rate was checked before and after each sample using a precision rotometer attached to the pump that had been calibrated with the same BIOS DryCal DC-1 Flow Calibrator. Plastic tubing connected the pump and the sampling cassette as ambient air was drawn through the sampling train. Sample identification numbers were written on each cassette for identification. Sample cassettes were sealed with tape and placed within a “zip-lock” bag to prevent contamination during shipping.

4.3 Air Sampling – Asbestos

EHS-Alaska Inc. conducted a survey of the Nome State Office Building in October 2011 and August 2013 and found asbestos was present in some of the building materials which could be disturbed during the mold investigation of walls. Because of the likelihood that asbestos in joint compound and or fire-proofing overspray on the foam or fiberglass wall insulation may be disturbed, certified asbestos workers performed the limited mold assessment.

During this class II asbestos work, EHS-Alaska conducted personal and area airborne asbestos monitoring. Both workers were wearing personal protective equipment during the mold investigation of the wall cavities and during repair and cleaning activities. The area sampling locations included one within

the work area, one at the perimeter of the work area and one on the general floor area in which the work took place. A 30 minute excursion limit was collected on the worker performing the wall cavity investigation, and personal exposures were collected and TWA's calculated for both workers during a shift. The sampling was conducted throughout the shift and sampling cassettes were changed out several times during the work. Samples were collected on 0.8-micron mixed cellulose ester filter cassettes. Low volume battery operated air sampling pumps were used to draw a volume of air through the cassettes. A rotometer, which had been recently calibrated against a primary standard, was used to pre- and post-calibrate the sampling pump at an air flow rate of 2.0 liters per minute. The samples, including quality control field and laboratory blanks, were sent to and analyzed by International Asbestos Testing Laboratory (IATL) located in Mt. Laurel, New Jersey. The National Institute for Occupational Safety and Health analytical method 7400 was used which is the type of analysis required by OSHA. This method is used for the counting of fibers in air samples, but *does not distinguish fiber types*. A microscope of 400 times magnification is used to count any fiber at least 5 μm long with a length to width ratio of at least 3:1 (OSHA Fiber). IATL is approved by the American Industrial Hygiene Association as an Asbestos Analysts Registered laboratory. Samples were collected to compare exposures with the OSHA Permissible Exposure Limits (PEL's) for asbestos.

Analysis of air samples by Phase Contrast Microscopy (PCM) cannot distinguish between asbestos fibers and other kinds of fibers, which may be present in the air. Consequently, an analysis by PCM indicating high fiber counts does not necessarily indicate the presence of asbestos. PCM merely provides an index of the total airborne fibers present in a given size range. However, high PCM fiber concentrations can be re-analyzed for qualitative fiber identification using Transmission Electron Microscopy (TEM). In this way, PCM analysis provides a cost effective and comprehensive supplemental air-monitoring program for buildings with ACM.

5.0 DATA INTERPRETATION GUIDELINES

5.1 Fungal Data Interpretation Guidelines

There are no federal or state regulatory standards for "acceptable" levels of mold in the indoor environment. Mold is a natural part of our environment and most testing will result in identifying some levels of mold. Mold is usually not a problem indoors unless there is a moisture intrusion problem causing the mold to grow rapidly. When testing is done, it is usually to compare the levels and types of mold spores found inside the building with those found outdoors or in a non-suspect control area. In order to better understand sample results, a brief discussion of interpretation guidelines for mold sampling is provided. According to the American Conference of Governmental Industrial Hygienists (ACGIH), "Data from individual sampling episodes is often interpreted with respect to baseline data from other environments or the same environment under anticipated low exposure conditions." In the absence of established acceptable exposure limits, it is often helpful to use a comparative "control" sample, i.e. a comparison of "suspect" with "control" (non-suspect) sampling results. Sources of indoor fungal spores come from both the outdoor environment and the indoor environment. Fungal spores may enter the building through the HVAC system, open windows and doors, and can be tracked in on shoes and on clothing. Indoor sources of mold may be from previously exposed building materials and plants. When fungal spores settle on surfaces where the temperature and moisture level promotes growth, and the surface has nutrients for fungal growth, mold growth is likely. Additional Information on Fungi, Mold and Pollen can be found in Appendix E.

The following is a list of data interpretation guidelines that were used to facilitate conclusions from the fungi sampling results obtained during the sampling:

1. According to the ACGIH, "…differences that can be detected with manageable sample sizes are likely to be in 10-fold multiplicative steps." In other words, if total fungal spore or mycelial fragment concentrations are 10 times greater in the sample from a "suspect" location than in a "control" sample collected from a non-suspect location, then that sample location may be a fungal amplification site.

2. Certain fungal genera, such as *Aspergillus, Penicillium, Chaetomium, Fusarium, Stachybotrys*, and others may be potentially toxigenic. The presence of a few spores or low relative concentrations of potentially toxic fungi should not be considered abnormal.

3. Certain fungal genera, such as *Acremonium, Alternaria, Aspergillus, Penicillium, Chaetomium, Fusarium, Trichoderma, Stachybotrys*, and others may be indicative of high water activity. The presence of a few spores or low relative concentrations of potential water indicator fungi should not be considered abnormal.

4. Dominance (greater than 50 %) of a particular fungal genus or classification in a sample may indicate active fungal growth at or near the sampling location.

5. When "suspect" levels significantly and consistently exceed "control" levels and/or "suspect" levels contain significant levels of fungal genera that were not detected from a "control" area, fungal amplification and contamination may be suspected.

6. Bulk and surface samples can be used to confirm the nature of suspected microbial growth and identify the types of organisms present. The concentrations of microorganisms present depend on a number of factors such as the nature of the material, its moisture history, and the air velocities in the area of the surface sampled. Surface sample results can be an indication of the relative degree of contamination but cannot be related to airborne levels.

6.0 SAMPLING RESULTS AND DISCUSSIONS

6.1 Bulk Sampling

A summary of the bulk and tape lift sample qualitative microscopic exam is included below in Table 6.1. A copy of the laboratory results are included in Appendix B. The location and a description of the wall components (layers) are included along with observations, and the major mold species present if any. Wall layers start at the inside surface and reference to front or back simply refer to the first surface encountered. Observations are suspect fungal growth or no suspect growth as determined with the naked eye or through the use of a magnifying glass. Nine of the fourteen sites investigated exhibited some degree of mold growth. Three of the nine sites which had suspect mold growth (Office 133, Lab 135, & Hall 111) had a slight musty, mildew odor and had visible moisture and signs of water intrusion. Two of the three sites exhibiting water intrusion are adjacent to an exterior door (Hall 111 & Office 133).

Different categories of molds have different water requirements. Some molds such as *Stachybotrys*, *Ulocladium*, *Chaetomium*, and *Acremonium* thrive on wet building materials. The presence of these type of mold is an indication of serious water intrusion. The growth rating is indicated below the major species found and ranges from <1+ (very light) to 4+ (very heavy growth). Results of areas with identified heavy or very mold growth are summarized below. Heavy or very heavy mold growth refers to the density of the mold growth of the sample submitted and does not constitute that there is heavy or very heavy mold growth found throughout the area were the sample was taken.

- The results of the bulk mold sampling in the east wall in Office 205, below and to the left of the window near the floor, indicate very heavy *Stachybotrys* growth behind the cove base and behind the first two layers of the gypsum wallboard (GWB). Heavy growth of *Ulocladium* was also observed on the back side of the first GWB layer.

- The result of bulk mold sampling in the north wall of Lab 135, near the access hatch under the base cabinet, indicate very heavy *Chaetomium* growth behind the cove base at the base of the base cabinet. Heavy growth of *Chaetomium* was also found on the front side of the GWB behind the fiberboard in the wall below the metal access hatch.

- The result of the bulk mold sampling in the west wall in Office 133, to the left of the door near the floor, indicate very heavy *Stachybotrys* growth behind the cove base and behind the first two

layers of the GWB. Light growth of *Penicillium/Aspergillus* was also found on the back surface of the GWB between the spray-on foam insulation and the CAB.

- The result of the bulk mold sampling in the south wall of Office 129, below the right window, indicate heavy growth of *Penicillium/Aspergillus* on the front side of the GWB behind the fiberglass insulation.

- The result of the bulk mold sampling in the north wall of Entrance 106, along the floor to the west of the doors, indicate very heavy growth of *Chaetomium*, *Stachybotrys*, and another unknown growth behind the cove base.

- The result of the bulk mold sampling in Hall 111, at the north interior wall next to the exterior door, indicate very heavy growth of *Stachybotrys* behind the cove base and heavy growth of *Stachybotrys* was found behind the wall covering. Moderate growth of *Penicillium/Aspergillus* was found on the front side of the GWB and heavy growth of *Ulocladium* was found on the back side of the GWB.

Table 6.1 Sample Locations and Layer Identification

LOCATION	***SAMPLE ID***	***DESCRIPTION***	***OBSERVATION***	***LAB RESULT***	***GROWTH RATING OF MOLD SPECIES PRESENT***					
					Cladosporium	Stachybotrys	Penicillium/ Aspergillus	Ulocladium	Chaetomium	*Other (see lab report)*
205 South Wall Below Window	-	L1 Gypsum Wallboard	No Suspect Growth	NA	-	-	-	-	-	-
	-	L2 Polyethylene	No Suspect Growth	NA	-	-	-	-	-	-
	-	L3 Fiberglass Insulation	No Suspect Growth	NA	-	-	-	-	-	-
	MBO1	L4 Plywood	Suspect Fungal Growth	Mold Growth	2+	None Identified	None Identified	None Identified	None Identified	None Identified
205 East Wall, Left of Heater, Above Cove Base	MBO2	Behind Cove Base	Suspect Fungal Growth	Mold Growth	None Identified	4+	None Identified	None Identified	None Identified	None Identified
	MBO3	L1 Gypsum Wallboard – Front Side	Suspect Fungal Growth	Mold Growth	None Identified	None Identified	1+	4+	None Identified	None Identified
	MBO4	L1 Gypsum Wallboard – Back Side	Suspect Fungal Growth	Mold Growth	None Identified	4+	None Identified	<1+	None Identified	None Identified
	MBO5	L2 Gypsum Wallboard – Back Side	Suspect Fungal Growth	Mold Growth	None	4+	None	<1+	None Identified	2+
	-	L3 Polyethylene	No Suspect Growth	NA	-	-	-	-	-	-
	MBO6	L4 Spray-on Foam Insulation	Suspect Fungal Growth	Normal Trapping	None Identified	None Identified	None Identified	None Identified	None Identified	None Identified
	MBO7	L5 Gypsum Wallboard – Back Side	No Suspect Growth	Minimal Mold Growth	-	Few	-	-	-	<1+
	-	L6 Cement Asbestos Board	No Suspect Growth	NA	-	-	-	-	-	-
204 East Wall, Left of Center	-	L1 Gypsum Wallboard	No Suspect Growth	NA	-	-	-	-	-	-
	MBO8	L2 Gypsum Wallboard – Back Side	No Suspect Growth	Normal Trapping	None Identified	None Identified	None Identified	None Identified	None Identified	None Identified
	-	L3 Polyethylene	No Suspect Growth	NA	-	-	-	-	-	-
	-	L4 Spray-on Foam Insulation: 2-3 Layers	No Suspect Growth	NA	-	-	-	-	-	-
	MB09	L5 Gypsum Wallboard – Front Side	Suspect Fungal Growth	Normal Trapping	None Identified	None Identified	None Identified	None Identified	None Identified	None Identified
	-	L6 Porcelain Enamel Panel	No Suspect Growth	NA	-	-	-	-	-	-
234 North Wall, Column between Windows	-	L1 Gypsum Wallboard	No Suspect Growth	NA	-	-	-	-	-	-
	-	L2 Gypsum Wallboard	No Suspect Growth	NA	-	-	-	-	-	-
	-	L3 Polyethylene	No Suspect Growth	NA	-	-	-	-	-	-
	-	L4-L6 Foam Insulation Sheet: 2 Layers with Mastic between	No Suspect Growth	NA	-	-	-	-	-	-
	MB10	L7 Metal	Suspect Fungal Growth	Normal Trapping	None Identified	None Identified	None Identified	None Identified	None Identified	None Identified

LOCATION	SAMPLE ID	DESCRIPTION	OBSERVATION	LAB RESULT	GROWTH RATING OF MOLD SPECIES PRESENT					
					Cladosporium	Stachybotrys	Penicillium/ Aspergillus	Ulocladium	Chaetomium	*Other (see lab report)*
232 North Wall, Center along Floor	-	L1 Gypsum Wallboard	No Suspect Growth	NA	-	-	-	-	-	-
	-	L2 Gypsum Wallboard	No Suspect Growth	NA	-	-	-	-	-	-
	-	L3 Polyethylene	No Suspect Growth	NA	-	-	-	-	-	-
	-	L4 Spray-on Foam Insulation	No Suspect Growth	NA	-	-	-	-	-	-
	MB11	L5 Gypsum Wallboard – Back Side	No Suspect Growth	Mold Growth in Vicinity?	None Identified	<1+	None Identified	None Identified	None Identified	None Identified
	-	L6 Cement Asbestos Board	No Suspect Growth	NA	-	-	-	-	-	-
230 West Wall, Right of Column	-	L1 Gypsum Wallboard	L1 & L2 are bonded together No Suspect Growth	NA	-	-	-	-	-	-
	-	L2 Gypsum Wallboard	No Suspect Growth	NA	-	-	-	-	-	-
	-	L3 Polyethylene	No Suspect Growth	NA	-	-	-	-	-	-
	-	L4 Spray-on Foam Insulation: 2-3 Layers	No Suspect Growth	NA	-	-	-	-	-	-
	MB12	L5 Gypsum Wallboard – Front Side	Suspect Fungal Growth	Normal Trapping	None Identified	None Identified	None Identified	None Identified	None Identified	None Identified
	MB13	L5 Gypsum Wallboard – Back Side	Suspect Fungal Growth	Normal Trapping	None Identified	None Identified	None Identified	None Identified	None Identified	None Identified
	-	L6 Porcelain Enamel Panel	No Suspect Growth	NA	-	-	-	-	-	-
229 West Wall, Below Window	-	L1 Gypsum Wallboard	No Suspect Growth	NA	-	-	-	-	-	-
	-	L2 Polyethylene	No Suspect Growth	NA	-	-	-	-	-	-
	-	L3 Fiberglass Insulation	No Suspect Growth	NA	-	-	-	-	-	-
	-	L4 Plywood	No Suspect Growth	NA	-	-	-	-	-	-
228 South Wall, Right of Windows	MB14	L1 Gypsum Wallboard – Front Side	L1 & L2 are bonded together No Suspect Growth	Mold Growth	None Identified	None Identified	1+	None Identified	None Identified	None Identified
	MB15	L2 Gypsum Wallboard – Front Side	No Suspect Growth	Normal Trapping	None Identified	None Identified	None Identified	None Identified	None Identified	None Identified
	-	L3 Polyethylene	No Suspect Growth	NA	-	-	-	-	-	-
	-	L4 Spray-on Foam Insulation: 2-3 Layers	No Suspect Growth	NA	-	-	-	-	-	-
	MB16	L5 Gypsum Wallboard – Front Side	No Suspect Growth	Normal Trapping	None Identified	None Identified	None Identified	None Identified	None Identified	None Identified
	MB17	L5 Gypsum Wallboard – Back Side	No Suspect Growth	Mold Growth	None Identified	None Identified	1+	None Identified	None Identified	None Identified
	-	L6 Porcelain Enamel Panel or CAB	Did not expose	NA	-	-	-	-	-	-

LOCATION	SAMPLE ID	DESCRIPTION	OBSERVATION	LAB RESULT	GROWTH RATING OF MOLD SPECIES PRESENT					
					Cladosporium	Stachybotrys	Penicillium/ Aspergillus	Ulocladium	Chaetomium	*Other (see lab report)*
135 North Wall, Below Bench	MB18	Behind Cove Base along Base Cabinet	Suspect Fungal Growth	Mold Growth	None Identified	None Identified	1+	None Identified	4+	None Identified
	MB19	L1 Fiberboard – Front Side, below Hatch Door	Suspect Fungal Growth	Mold Growth	None Identified	<1+	None Identified	None Identified	1+	1+
	MB20	L2 Gypsum Wallboard – Front Side	Suspect Fungal Growth	Mold Growth	None Identified	1+	None Identified	None Identified	3+	None Identified
	-	L3 Polyethylene	No Suspect Growth	NA	-	-	-	-	-	-
	-	L4 Spray-on Foam Insulation	No Suspect Growth	NA	-	-	-	-	-	-
	MB21	L5 Gypsum Wallboard – Front Side	Suspect Fungal Growth	Mold Growth	None Identified	None Identified	1+	None Identified	None Identified	None Identified
	MB22	L5 Gypsum Wallboard – Back Side	Suspect Fungal Growth	Mold Growth	None Identified	None Identified	1+	None Identified	Few	None Identified
	-	L6 Cement Asbestos Board	No Suspect Growth	NA	-	-	-	-	-	-
133 West Wall, Left of Door	MB23	West wall, left of Door, behind Cove Base	Suspect Fungal Growth	Mold Growth	None Identified	4+	1+	None Identified	None Identified	None Identified
	MB24	L1 Gypsum Wallboard – Back Side	Suspect Fungal Growth	Mold Growth	None Identified	4+	None Identified	None Identified	None Identified	None Identified
	MB25	L2 Gypsum Wallboard – Back Side	Suspect Fungal Growth	Mold Growth	None Identified	4+	None Identified	None Identified	None Identified	None Identified
	-	L3 Polyethylene	No Suspect Growth	NA	-	-	-	-	-	-
	-	L4 Spray-on Foam Insulation	No Suspect Growth	NA	-	-	-	-	-	-
	MB26	L5 Gypsum Wallboard – Back Side	Suspect Fungal Growth	Mold Growth	<1+	<1+	1+	None Identified	None Identified	None Identified
	-	L6 Cement Asbestos Board or Metal?	No Suspect Growth	NA	-	-	-	-	-	-
129 Below Window	-	L1 Gypsum Wallboard	No Suspect Growth	NA	-	-	-	-	-	-
	MB27	L2 Gypsum Wallboard – Back Side	No Suspect Growth	Mold Growth	1+	None Identified	<1+	None Identified	None Identified	1+-
	-	L3 Polyethylene	No Suspect Growth	NA	-	-	-	-	-	-
	-	L4 Fiberglass Insulation	No Suspect Growth	NA	-	-	-	-	-	-
	MB28	L5 Gypsum Wallboard – Front Side	Suspect Fungal Growth	Mold Growth	<1+	<1+	3+	None Identified	None Identified	<1+
	-	L6 Plywood	Did Not Expose	NA	-	-	-	-	-	-

LOCATION	SAMPLE ID	DESCRIPTION	OBSERVATION	LAB RESULT	GROWTH RATING OF MOLD SPECIES PRESENT					
					Cladosporium	Stachybotrys	Penicillium/ Aspergillus	Ulocladium	Chaetomium	*Other (see lab report)*
121 Below Window	-	L1 Gypsum Wallboard	No Suspect Growth	NA	NA	NA	NA	NA	NA	NA
	-	L2 Gypsum Wallboard	No Suspect Growth	NA	NA	NA	NA	NA	NA	NA
	-	L3 Polyethylene	No Suspect Growth	NA	NA	NA	NA	NA	NA	NA
	-	L4 Fiberglass Insulation	No Suspect Growth	NA	NA	NA	NA	NA	NA	NA
	-	L5 Gypsum Wallboard	No Suspect Growth	NA	NA	NA	NA	NA	NA	NA
	-	L6 Plywood?	No Suspect Growth	NA	NA	NA	NA	NA	NA	NA
Lobby 106, North Wall left of Exterior Doors	MB29	Wall behind Cove Base	Suspect Fungal Growth	Mold Growth	None Identified	1+	<1+	None Identified	4+	4+
	MB30	Wall behind Cove Base	Suspect Fungal Growth	Mold Growth	None Identified	4+	None Identified	None Identified	None Identified	None Identified
	-	L1 Gypsum Wallboard – Back Side	No Suspect Growth	NA	NA	NA	NA	NA	NA	NA
	-	L2 Gypsum Wallboard – Back Side	No Suspect Growth	NA	NA	NA	NA	NA	NA	NA
	-	L3 Polyethylene	No Suspect Growth	NA	NA	NA	NA	NA	NA	NA
	-	L4 Spray-on Foam Insulation	No Suspect Growth	NA	NA	NA	NA	NA	NA	NA
	-	L5 Gypsum Wallboard – Back Side	No Suspect Growth	NA	NA	NA	NA	NA	NA	NA
	-	L6 Cement Asbestos Board or Metal?	No Suspect Growth	NA	NA	NA	NA	NA	NA	NA
Hall 111, left of Door along Interior Wall at Exterior Wall	MB31	Back side of Cove Base	Suspect Fungal Growth	Mold Growth	None Identified	4+	1+	None Identified	None Identified	None Identified
	MB32	L1, Wall Covering – Behind Cove Base	Suspect Fungal Growth	Mold Growth	None Identified	3+	None Identified	None Identified	None Identified	None Identified
	MB33	L2 Gypsum Wallboard – Front Side	Suspect Fungal Growth	Mold Growth	None Identified	1+	<1+	None Identified	None Identified	1+
	MB34	L2 Gypsum Wallboard – Back Side	Suspect Fungal Growth	Mold Growth	None Identified	None Identified	2+	3+	None Identified	None Identified

6.2 Air Sampling Results – Total Spores

The results of air sampling on October 25, 2013 and October 28, 2013 are summarized in Table 6.2. The outdoor grounds were wet as there had been rain and snow for the past two days. Since there was precipitation, there was some potential for ambient mold spore suppression that would cause the appearance of false indoor amplification. However, that did not seem to be the case as all levels were actually low except for office 133. The sampling on October 25 was conducted between 2:00 PM and 5:00 PM with the outdoor temperatures around 40° F and the outdoor relative humidity near 60%. The indoor temperature was near 72° F and the relative humidity was near 25%. The sampling on October 28 was conducted between 8:00 AM and 10:00 AM with the outdoor temperatures around 40° F and the outdoor relative humidity near 29%. The indoor temperature was near 68° F and the relative humidity was near 33%. The total spore count results on both days were low compared to controls and historical data for Alaska in the month of October. The results also indicate that additional spores were not released during the wall cavity investigation.

The lab reported that several samples had arrived with broken slides and could not be analyzed. EHS-Alaska attempted to damage slides which are held in place inside the Air-O-Cell cassette by running the pump flow rate at double the standard flow rate (30 liters per minute) and covering the cassette to see if the vacuum pulled by the pump could break the slide and it could not. EHS also dropped and threw several Air-O-Cell cassettes onto a hard surface and no damage was observed. The analyst stated that they do receive broken slides and that it is not unusual. In the future EHS will modify the sample shipping to the lab by adding bubble wrap to the box. EHS will also bubble wrap the sampling cassettes to and from the sampling site to prevent damage during transport.

The total spores found in the outdoor control samples on 10/25/13 ranged from <13 to 390 Spores per cubic meter (Spores/m^3). The outdoor control samples on 10/28/13 were damaged during transport but levels indoors are comparable to the levels recorded indoors on 10/25/13. The types of spores found in the outdoor samples were typical for outdoor environments and included *Ascospores* and *Basidiospores*. Other spores typically found include *Aspergillus/Penicillium*, *Cladosporium*, *Ganoderma*, and *Myxomycetes*.

Ascospores are a common classification of fungi where spores are produced in a sack-like structure called an ascus. *Basidiospores* (Buh-sid-ee-oh-spores) are a general classification of fungi that are commonly found in gardens, forests and woodlands and are commonly seen indoors in lower numbers. *Aspergillus* and *Penicillium* spores are indistinguishable under the direct microscopic examination used in this analysis (total spore count). Both types of spores can be found in the environment in soils and forests. *Cladosporium* (Clad-oh-spore'-ee-um) is widely distributed in air and rotten organic material. *Ganoderma* grows on conifers and hardwoods worldwide, causing white rot, root rot, and stem rot. It is also known as a "shelf fungus" because the fruiting body forms a stalk-less shelf on the sides of trees and logs. *Myxomycetes* can be found worldwide on decaying logs, leaves, and mulched flower beds. Its spores are transported by the wind and by insects. One of the identified spores was *Pithomyces* (pith-oh-my-sees) found in office 133. *Pithomyces* is found on decaying plants, especially leaves and grasses. Rarely found indoors, but it can grow on paper products such as that found on GWB. Pithomyces has no reports of allergies or infections in humans. *Pithomyces* was not identified on any of the bulk samples but the analyst suggested that competing species like the *Stachybotrys* (very heavy growth in Office 133) may be growing directly over *Pithomyces* making it hard to identify in the bulk sample.

Generally, if there are no fungal amplification (growth) problems indoors, the types and concentration of spores found in suspect areas would be similar in type and number as those found in control areas. If fungal amplification is occurring indoors, airborne levels are typically more than ten times higher than control areas and frequently dominated (greater than 50 percent of the spores in a sample) by types of spores known to grow in wet environments such as *Aspergillus*, *Penicillium*, or *Stachybotrys*. None of the air samples contained *Stachybotrys* spores but *Stachybotrys* was found on some of the surfaces of bulk samples taken of wall components. *Stachybotrys*, however does not aerosolize into the air as well as other fungal spores.

Table 6.2 Airborne Spore Sample Results for October 25 and 28, 2013

Location	Date	Total Spores (Spores /M^3)	Ascospores (Spores /M^3)	Aspergillus/ Penicillium (Spores /M^3)	Basidio-spores (Spores /M^3)	Stachybotrys (Spores /M^3)	Pithomyces (Spores /M^3)
North Outdoor Control Samples		<13	-	-	-	-	-
	10/25/13	110	40	-	67	-	-
		Slide Broken In Transit					
	10/28/13	Slide Broken In Transit					
West Outdoor Control Samples		13	-	-	13	-	-
	10/25/13	390	130	-	250	-	-
		Slide Broken In Transit					
	10/28/13	Slide Broken In Transit					
Lab 135	10/25/13	<13	-	-	-	-	-
	10/28/13	Slide broken in Transit					
Office 133	10/25/13	2,800	40	190	110	-	2,400
	10/28/13	Slide Broken In Transit					
Office Area 131	10/25/13	40	-	-	40	-	-
	10/28/13	Slide Broken In Transit					
Hall 128	10/25/13	<13	-	-	-	-	-
	10/28/13	53	-	27	27	-	-
Office 129	10/25/13	27	-	-	27	-	-
	10/28/13	67	27	40	-	-	-
Room 122	10/25/13	<13	-	-	-	-	-
	10/28/13	Slide Broken In Transit					
Lobby 107	10/25/13	80	-	-	80	-	-
	10/28/13	80	13	-	67	-	-
Office Area 114	10/25/13	40	-	-	40	-	-
Hall 111	10/28/13	Slide Broken In Transit					
Office 229	10/25/13	110	-	-	80		-
	10/28/13	80	13	13	53	-	-
Hall 237	10/25/13	67	-	-	67	-	-
	10/28/13	120	27	40	53	-	-
Office Area 243	10/25/13	120	-	-	110	-	-
	10/28/13	80	27	40	13	-	-
Office Area 206	10/25/13	150	-	-	130	-	-
	10/28/13	190	13	67	93	-	-
Office Area 213	10/25/13	53	-	-	53	-	-
	10/28/13	130	13	27	67	-	-
Break Room 223	10/25/13	67	-	-	67	-	-
	10/28/13	93	27	40	27	-	-
Office 204	10/25/13	130	-	-	130	-	-
	10/28/13	110	40	13	53	-	-
Office 202	10/25/13	320	-	-	310	-	-
	10/28/13	130	13	53	53	-	-

The total airborne spore counts found throughout the building reflect the levels found in the outdoor control samples and do not indicate that spores in the indoor environment originate from indoor sources. The types of spores were similar to the typical outdoor spore types found in the control samples and included *Ascospores*, *Aspergillus*/*Penicillium*, and *Basidiospores*. The low number and types of spores in these samples did not indicate active fungal growth is occurring in the building with the possible exception of one area, located in office 133.

Results for the air sample taken on 10/25/13 in office 133 indicate high spore counts of *Pithomyces* that were not found at any significant level in the outdoor controls or on any other indoor sample. *Pithomyces* is commonly found in soils and in decaying wood and other plant materials. Elevated spore counts of *Pithomyces* indicate the spores are originating from an indoor source and fungal amplification is occurring. *Pithomyces* is rarely found growing indoors, but can grow on paper under the right conditions and has been reported on carpet and ceiling tiles. Colonies of *Pithomyces* are fast growing. Since this area is occupied by wildlife biologists who spend time in the field, the source of the *Pithomyces* spores is most likely from occupant field visits or stored items.

Hyphal (mycelial) fragments are fuzzy filamentous portions of mold, like the stem of a flower, which break off during mold growth. The presence of high levels of mycelial fragments in the air may indicate active fungal growth. During this assessment, very low levels of hyphal fragments were present in outdoor samples and in indoor samples indicating that active fungal growth was not present during this assessment.

Pollen concentrations were virtually undetected in the samples. This was probably due to the time of year and weather.

The nature of the sampling method allows non-microbial particulates to be collected on the glass slides along with the fungal spores. These particulates are capable of masking the presence of fungal spores. The laboratory categorizes each cassette with a “Background” rating dependent upon the amount of non-microbial particulate on the cassette’s slide. Particulates may serve as “carriers” for mold spores and may provide nutrient for mold growth. The laboratory’s background rating scale is included in the sample results in Appendix B and ranges from 1 to 4+ with 4+ being high. Spore counts from areas with 4+ background debris can be regarded as the minimal count and actual spore counts may be higher than reported. Sample times were all run at for 5 minutes 15 liters, which is the recommended sampling time for indoor office areas.

6.3 Air Monitoring Results – Asbestos

Asbestos air monitoring results for work performed on October 26 & 27, 2013 are summarized below in Table 6.3A and the calculated TWA’s are shown in Table 6.3B. The Excursion Limits calculated on both 10/26 & 10/27 for worker Schwan were below the Occupational Safety and Health Administration (OSHA) Excursion Limit of 1.0 f/cc. The PCM results were at or below the OSHA 8-hour time weighted average (TWA) permissible exposure limit (PEL) of 0.1-fibers/cubic centimeter (f/cc) for both workers Schwan and Friese.

Table 6.3A Asbestos Air Monitoring Results for October 26 and 27, 2013

Sample	Date - Shift	Description	Concentration (f/cc)
NSB1310-A01	10/26/13 - AM	Excursion – Schwan	<0.0370
NSB1310-A02	10/26/13 - AM	Personal – Friese	<0.0085
NSB1310-A03	10/26/13 - AM	Inside Work Area	0.0280
NSB1310-A04	10/26/13 - AM	Outside Work Area	0.0150
NSB1310-A05	10/26/13 - AM	2nd Floor - Hall	<0.0054
NSB1310-A06	10/26/13 - AM	Personal – Schwan	0.130
NSB1310-A09	10/26/13 - PM	Personal – Schwan	0.0720

Sample	Date - Shift	Description	Concentration (f/cc)
NSB1310-A10	10/26/13 - PM	Personal – Friese	0.0210
NSB1310-A11	10/26/13 - PM	Inside Work Area	<0.0067
NSB1310-A12	10/26/13 - PM	Outside Work Area	<0.0066
NSB1310-A13	10/27/13 AM	Excursion – Schwan	<0.0370
NSB1310-A14	10/27/13 AM	Personal – Friese	0.0300
NSB1310-A15	10/27/13 AM	Inside Work Area	0.0360
NSB1310-A16	10/27/13 AM	Outside Work Area	<0.0052
NSB1310-A17	10/27/13 AM	1st Floor - Hall	<0.0051
NSB1310-A20	10/27/13 AM	Personal – Schwan	0.200

Table 6.3B below summarizes the calculated TWA for workers Schwan and Friese. Using the method prescribed by OSHA, the 8-hour TWA is calculated by TWA = $[C_1T_1 + C_2T_2 + C_nT_n]/8$hrs.

Table 6.3B Worker TWA for October 26 and 27, 2013

Worker	Date	Calculation	TWA (f/cc)
R. Friese	10/26/13	[(.0085*2.76) + (.021*3.46)]/8	.012
M. Schwan	10/26/13	[(.037*.5) + (.13*2.56) + (.072*3.46)]/8	.075
R. Friese	10/27/13	[(.030*4.43)]/8	.017
M. Schwan	10/27/13	[(.037*.5) + (.20*3.93)]/8	.100

7.0 CONCLUSIONS AND RECOMMENDATIONS

A limited mold assessment was made of the Nome State Office Building, located in Nome, Alaska, to determine if fungal amplification (growth) is present on building material surfaces to assist with the potential redesign project. The results of the visual inspection and bulk mold sampling of building material surfaces indicate that there are three areas with active water intrusion and associated mold growth (Lab 135 - north wall, Office 133- left of exterior door, and Hall 111 left of door). Mold growth will continue until the water intrusion problem is corrected. Three other areas exhibited signs of past water intrusion and mold on surfaces was confirmed (Office 205 – east wall along floor to the left of the window, Office 129 – below right window, and Entrance 106 – along floor to the left of the exterior doors). Mold was also found on other surfaces sampled in other areas but is considered normal mold growth associated with all buildings. However, the presence of very light or light mold growth may result in the heavy mold growth under favorable temperatures and moisture levels. The result of the air sampling for airborne mold spores indicate that indoor levels reflect the levels found in the outdoor controls with the exception of Office 133; and the subsequent mold investigation where wall components were exposed did not release additional mold spores resulting in higher counts above outdoor controls. The high airborne spore count of *Pithomyces* in office 133 should be resolved by the redesign but occupant activities, which are assumed to be contributing to the introduction of *Pithomyces* spores in the area, may need to be evaluated if future levels are shown to be high. Results of air monitoring for mold spores indicated typical low levels that would not generally affect indoor air quality.

Based on the visual assessment, bulk sampling of suspect fungal growth, and air monitoring conducted during this assessment, EHS-Alaska recommends the following:

1. The replacement of the building exterior envelop will mitigate the vast majority of the existing water intrusion problems, which were found adjacent to exterior doors at the west exterior door at Office 133 and the east exterior door and Hall 111, and the north Entrance 106. Based on existing infiltration problems at exterior doors the design and specifications for those doorways need to be robust and may need to include additional flashings and sealants at the door perimeter to rectify the avenue of water intrusion, as well as revising exterior grade, pavement or sidewalks to divert surface water away from the building.

2. Areas of damaged gypsum wall board behind cove base, and behind vinyl wall paper are to be removed and replaced, including areas where visible suspect fungal growth was found behind the cove base in Office 133 at door, Office 205 to the right of the east window, along north wall in Hall 111, and at all of the exterior door areas discussed above.
3. The design for this project includes remediating the standing water that occurs at the West Covered Entry, which appears to have caused the water intrusion occurring along the north wall of Lab 135. We recommend removing and replacing the cove base and base cabinets in Lab 135, and removing and replacing damaged wall covering and gypsum wall board behind the cabinets.
4. Install or repair insulation and vapor barriers on cold piping and ductwork penetrating the building exterior to avoid water damage from condensation.
5. Perform inspections of the areas above the ceiling to check for seasonal water intrusion and make repairs as necessary.

8.0 LIMITATIONS / STANDARD OF CARE

This survey was conducted by EHS-Alaska, Inc. in accordance with the previously defined Scope of Work and Proposal, dated October 3, 2013, and revised on October 9, 2013. It is understood that this survey was limited to bulk mold sampling of wall system components in 14 locations, along with supporting airborne spore counts. During the course of mold remediation, or other construction work, additional water damaged/mold contaminated materials may be found.

The findings we have presented within this report were based on limited research and on the sampling that we conducted at this site. They should not be construed as a definite conclusion regarding the environmental conditions at this site. The data presented in this report should be considered representative of the time of our site sampling. Changes in site conditions can occur with time, because of natural variations in airborne concentrations, seasonal variations, differing airflow patterns through the building, and human activity. Actual conditions in areas not sampled may differ from those in this report.

Interpretation of mold results is seldom clear-cut, since there are no universally accepted numeric guidelines or standards. Different people have highly variable reactions to microbial agents. None of the information contained herein should be construed as medical advice or a call to action for evacuation. Any decision relative to medical significance should be made by a qualified physician. The results given throughout this study are valid only for the locations and dates indicated. EHS-Alaska, Inc. is not responsible for any action, legal or otherwise, or lack of action resulting from the interpretation of data during this study.

EHS-Alaska, Inc. followed currently accepted industrial hygiene practices, including professional opinions based on observations and laboratory data obtained. The recommendations in this report are based upon industry-accepted general practices, guidance documents published by the US Environmental Protection Agency ("Mold Remediation in Schools and Commercial Buildings"), the "Assessment, Remediation, and Post-Remediation Verification of Mold in Buildings," published in 2004 by the American Industrial Hygiene Association (AIHA), the New York City Department of Health “Guidelines on Assessment and Remediation of Fungi in Indoor Environments” updated in 2008, “Bioaerosols: Assessment and Control”, by the American Conference of Governmental Industrial Hygienists (ACGIH), published in 1999, AND THE Standard and reference guide for professional mold Remediation (IICRC S520). These guidelines are generally accepted as “industry standard” for microbial remediation protocols. Other than this, no warranty is implied or intended.

APPENDIX A

Key Photos

Figure 1A – East wall left of window in office 205 was selected because there appeared to have been past water damage even though the relative moisture readings were low.

Figure 1B – Office 205: Suspect fungal growth was identified behind cove base.

Figure 1C – Office 205: Close-up of suspect fungal growth which the lab later identified as Stachybotrys.

Figure 1D – Office 205: Stachybotrys growth was also found behind painted surface on first layer of GWB.

Figure 1E – Office 205: Fungal growth was also found between the first two layers of GWB.

Figure 1F – Office 205: Suspect fungal growth was not observed on the foam insulation or on the outer GWB.

Figure 2A – Lab 135 has a slight mildew odor (also masked by "dead animal odors") with visible moisture behind cove base on north wall.

Figure 2B – Lab 135 has Chaetomium growth all along the cove base attached to the base cabinet.

Figure 2C – Lab 135 did not appear to have suspect fungal growth inside the wall cavity at the access hatch but it was obvious that water intrusion was occurring somewhere along the north wall.

Figure 3A – Office 133: Water staining above the ceiling.at the SW corner.

Figure 3B – Office 133: Confirmed mold growth was found behind the cove base. West wall, left of exterior door.

Figure 3C – Office 133: Very heavy mold growth was also found between the first 2 layers of GWB. West wall, left of exterior door.

Figure 3D – Office 133: Rusted metal sill plates were frequently encountered in the building's exterior wall.

Figure 3E – Office 133: Light mold growth was also found on the inside face of the GWB on the exterior side of the black vapor barrier. West wall, left of exterior door, below water staining above ceiling.

Figure 3F – Office 133: Suspect fungal growth was not identified on the GWB between the foam insulation and the CAB. West wall, left of exterior door, below water staining above ceiling.

Figure 4A – Ceiling above entrance 106: Note water pooling on insulation and past water staining.

Figure 4B – Entrance 106: Area above the entrance (Fig 4A) had visible amounts of water and this wall to the left of the doors was investigated.

Figure 4C – Entrance 106: Light mold growth on the GWB paper behind the cove base.

Figure 4D – Entrance 106: Heavy mold growth on the GWB paper behind the cove base.

Figure 4E – Entrance 106: Suspect fungal growth was not identified inside wall cavity.

Figure 5A – Hall 111 at door: Water intrusion at threshold has resulted in mold growth in left wall. The other side of the wall (Office 110) indicated high relative moisture readings.

Figure 5B – Hall 111: North wall to the left of the door was moist to the touch.

Figure 5C – Hall 111: Very heavy mold growth was found on the wall covering behind the cove base.

Figure 5D – Hall 111: Heavy mold growth was also found on the GWB behind the cove base.

Figure 5E – Hall 111: Water intrusion has resulted in corrosion of the metal framing

Figure 6 – Office 129: Water staining above the ceiling. Area was dry and no suspect fungal growth was identified in the wall.

Figure 7A – Office 223: Water staining on light fixture cover.

Figure 7B – Office 223: Water staining on GWB above suspended ceiling was totally dry.

Figure 7C – Office 223: Water staining on GWB on steel beam above suspended ceiling was totally dry.

Figure 8 – Corrosion of the exterior mullions may be contributing to water intrusion into the building interior.

APPENDIX B

Laboratory Results, Chain of Custody, and Certifications

CHAIN OF CUSTODY

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Phoenix, AZ: 1501 West Knudsen drive, Phoenix, AZ 85027 * (800) 651-4802
San Bruno, CA: 1150 Bayhill Drive, #100, San Bruno, CA 94066 * (866) 888-6653

Weather	Fog	Rain	Snow	Wind	Clear
None	☐	☑	☑	☑	
Light	☑	☐	☐	☐	
Moderate	☐	☐	☐	☐	
Heavy	☐	☐	☐	☐	

001134112

CONTACT INFORMATION

Company:	EHS-Alaska	Address:	11901 Business Blvd., Ste. 208, Eagle River AK 99577
Contact:	Martin Schwan	Special Instructions:	PREFIX FOR ALL SAMPLES = NSB1310-
Phone:	907-694-1383		

PROJECT INFORMATION

Project ID:	7052-08-Nome Mold Sampling		
Project Description:	Mold investigation - Bulk & Tape sampling		
Project Zip Code:	99762	Sampling Date & Time:	10/26/13 Day
PO Number:	7052-08	Sampled By:	M. Schwan

TURN AROUND TIME CODES (TAT)

STD – Standard (DEFAULT)
ND – Next Business Day
SD – Same Business Day Rush
WH – Weekend / Holiday

Rushes received after 5 pm or on Saturdays, will be processed on the next business day. Please contact in advance of sending samples.

REQUESTED (Use check

Non-Culturable: Spore Trap; Tape Swab Bulk
Cultur: BioCassette™, And Water, Bulk, Dust, Soil, Contact Plates

Sample ID	Description	Sample Type (SAMPLE TYPE CODES)	TAT (TAT Codes)	Total Volume / Area (specifications)	Notes (Sampling Loc, Info, etc)	Fungi – Spore Trap Analysis	Spore Trap Analysis – Other particles	Direct Microscopic Exam (Qualitative)	Quantitative Spore Count Direct Exam	1-Media Surface Fungi (Genus ID + Asp. spp.)	2-Media Surface Fungi (Genus ID + Asp. spp.)	3-Media Surface Fungi (Genus ID + Asp. spp.)	Culturable Air Fungi (Genus ID + Asp. spp.)	Gram Stain & Counts (Culturable Air & Surface Bacteria)	Legionella culture	Total Coliform, E. coli (Presence/Absence)	Membrane Filtration (specify organism):	MPN Bacteria (specify organism):	QuantiTray – Sewage Screen	Asbestos Analysis – PCM Airborne Fibre Count (NIOSH 7400)	Asbestos Analysis – PLM (EPA method 600/R-93-116)	PCR (specify test):	Specify Service
MB01	R205 South wall @ L4	T	STD	-	AM	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
MB02	R205 East wall above Cove Base	T	STD	-	AM	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
MB03	R205 East wall, 1st surface of L1	T	STD	-	AM	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
MB04	R205 East wall, 2nd surface of L1	B	STD	-	AM	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
MB05	R205 East wall, 2nd surface of L2	B	STD	-	AM	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
MB06	R205 East wall, 1st surface of foam ins	B	STD	-	AM	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
MB07	R205 East wall, 2nd surface of L5	T	STD	-	AM	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
MB08	R204 East wall, 2nd surface of L2	T	STD	-	AM	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
MB09	R204 East wall, 1st surface of L5	B	STD	-	AM	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
MB10	R234 North wall, @ L7	T	STD		PM	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
MB11	R232 North wall, 2nd surface of L5	B	STD	-	PM	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

SAMPLE TYPE CODES

BC – BioCassette ™	ST – Spore Trap: Zefon, Allergenco, Burkard ...	T – Tape	D – Dust
AIS – Anderson		SW – Swab	SO – Soil
SAS – Surface Air Sampler	P – Potable Water	B – Bulk	
CP – Contact Plate	NP – Non-Potable Water	O – Other:	

RELINQUISHED BY	DATE / TIME	RECEIVED BY	DATE / TIME
[signature]	10-29-13 2:00pm	Fedex 7970 3225 1780	10-30-13 11:30am
FedEx	10-31-13	[signature]	9:45 Am

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Phoenix, AZ: 1501 West Knudsen drive, Phoenix, AZ 85027 * (800) 651-4802
San Bruno, CA: 1150 Bayhill Drive, #100, San Bruno, CA 94066 * (866) 888-5653

Weather	Fog	Rain	Snow	Wind	Clear
None	☐	☐	☑	☐	
Light	☑	☐	☐	☐	
Moderate	☐	☑	☐	☑	
Heavy	☐	☐	☐	☐	

001134112

CONTACT INFORMATION

Company:	EHS-Alaska	Address:	11901 Business Blvd., Ste. 208, Eagle River AK 99577
Contact:	Martin Schwan	Special Instructions:	PREFIX FOR ALL SAMPLES = NSB1310-
Phone:	907-694-1383		

PROJECT INFORMATION

Project ID:	7052-08-Nome Mold Sampling		
Project Description:	Mold investigation - Bulk & Tape sampling		
Project Zip Code:	99762	Sampling Date & Time:	10/26/13 Day
PO Number:	7052-08	Sampled By:	M. Schwan

TURN AROUND TIME CODES (TAT)

STD – Standard (DEFAULT)
ND – Next Business Day
SD – Same Business Day Rush
WH – Weekend / Holiday

Rushes received after 2 pm or on weekends will be considered received the next business day. Please call in advance of weekend samples needs.

	Sample ID	Description	Sample Type (Bulk)	TAT (Rush)	Total Volume / Area (Required)	Analysis (Lab ID, Test Method)
12	MB12	R229 West wall, 1st surface of L5	B	STD	-	PM
13	MB13	R229 West wall, 2nd surface of L5	B	STD	-	PM
14	MB14	R228 South wall, 1st surface of L1	B	STD	-	PM
15	MB15	R228 South wall, 1st surface of L2	B	STD	-	PM
16	MB16	R228 South wall, 1st surface of L5	B	STD	-	PM
17	MB17	R228 South wall, 2nd surface of L5	B	STD	-	PM
	END	END 10/26/13		STD		
				STD		
				STD		
				STD		
				STD		

Fungi – Spore Trap Analysis	Spore Trap Analysis – Other particles	Direct Microscopic Exam (Qualitative)	Quantitative Spore Count Direct Exam	1-Media Surface Fungi (Genus ID + Asp. spp.)	2-Media Surface Fungi (Genus ID + Asp. spp.)	3-Media Surface Fungi (Genus ID + Asp. spp.)	Culturable Air Fungi (Genus ID + Asp. spp.)	Gram Stain & Counts (Culturable Air & Surface Bacteria)	*Legionella* culture	Total Coliform, *E. coli* (Presence/Absence)	Membrane Filtration (specify organism):	MPN Bacteria (specify organism):	QuantiTray – Sewage Screen	Asbestos Analysis – PCM Airborne Fiber Count (NIOSH 7400)	Asbestos Analysis – PLM (EPA method 600/R-93-116)	PCR (specify test):	Specify Service
☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
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☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

BC – BioCassette ™	ST – Spore Trap: Zefon, Allergenco, Burkard ...	T – Tape	D – Dust
AIS – Anderson		SW – Swab	SO – Soil
SAS – Surface Air Sampler	P – Potable Water	B – Bulk	
CP – Contact Plate	NP – Non-Potable Water	O – Other:	

Relinquished by	Date & Time	Received by	Date & Time
Martin Schwan	10-24-13 2:00pm	FedEx 7970 3225 1780	10-30-13 11:30am

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Weather	Fog	Rain	Snow	Wind	Clear
None	☑	☐	☑	☐	
Light	☐	☐	☐	☐	
Moderate	☐	☑	☐	☐	
Heavy	☐	☐	☐	☑	

001134107

CONTACT INFORMATION

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Contact:	Martin Schwan	Special Instructions:	PREFIX FOR ALL SAMPLES = NSB1310-
Phone:	907-694-1383		

PROJECT INFORMATION

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Project Description:	Mold investigation - Bulk & Tape sampling		
Project Zip Code:	99762	Sampling Date & Time:	10/27/13 Day
PO Number:	7052-08	Sampled By:	M. Schwan

TURN AROUND TIME CODES (TAT)

STD – Standard (DEFAULT)
ND – Next Business Day
SD – Same Business Day Rush
WH – Weekend / Holiday

Rushes cannot start 2 hours or more before closing, nor be completed before the next business day. Please allow for beginning of weekend analysis delays

	Sample Id	Description	Sample Type Below	TAT Above	Total Volume Area (cm²/ml/g)	Notes (Priority, Emp. Relevant)
1	MB18	R135 North wall, behind CB below hatch	B	STD	-	AM
2	MB19	R135 North wall, fiberboard below hatch	B	STD	-	AM
3	MB20	R228 North wall, 1st surface of L2	B	STD	-	AM
4	MB21	R228 North wall, 2nd surface of L2	B	STD	-	AM
5	MB22	R228 North wall, 2nd surface of L5	B	STD	-	AM
6	MB23	R133 West wall, behind CB	T	STD	-	AM
7	MB24	R133 West wall, 2nd surface of L1	B	STD	-	AM
8	MB25	R133 West wall, 2nd surface of L2	B	STD	-	AM
9	MB26	R133 West wall, 2nd surface of L5	B	STD	-	AM
10	MB27	R129 South wall, 2nd surface of L2	T	STD		AM
11	MB28	R129 South wall, 1st surface of L5	T	STD	-	AM

REQUES (Use ch

Sample Id	Non-Culturable: Spore Trap: Fungi – Spore Trap Analysis	Spore Trap Analysis – Other particles	Tape Swab Bulk: Direct Microscopic Exam (Qualitative)	Quantitative Spore Count Direct Exam	BioCassette™, Andersen, SAS, Swab, Water, Bulk, Dust, Soil, Contact Plates: 1-Media Surface Fungi (Genus ID + Asp. spp.)	2-Media Surface Fungi (Genus ID + Asp. spp.)	3-Media Surface Fungi (Genus ID + Asp. spp.)	Culturable Air Fungi (Genus ID + Asp. spp.)	Gram Stain & Counts (Culturable Air & Surface Bacteria)	Legionella culture	Total Coliform, E. coli /Pseudomonas/Arsenic	Membrane Filtration (specify organism):	MPN Bacteria (specify organism):	QuantiTray – Sewage Screen	Other Requests: Asbestos Analysis – PCM Airborne Fiber Count (NIOSH 7400)	Asbestos Analysis – PLM (EPA method 600/R-93-116)	PCR (specify test):	Specify Service
MB18	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
MB19	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
MB20	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
MB21	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
MB22	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
MB23	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
MB24	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
MB25	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
MB26	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
MB27	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
MB28	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

SAMPLE TYPE CODES

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A1S – Anderson		SW – Swab	SO – Soil
SAS – Surface Air Sampler	P – Potable Water	B – Bulk	
CP – Contact Plate	NP – Non-Potable Water	O – Other:	

Relinquished by	Date/Time	Received by	Date/Time
Martin Schwan	10/29/13 2:00pm	Fedex 7970 3225 1780	10/30/13 11:30am
[illegible]	10-31-13	[illegible]	9:45am

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Weather	Fog	Rain	Snow	Wind	Clear
None	☑	☐	☑	☐	
Light	☐	☐	☐	☐	
Moderate	☐	☑	☐	☐	
Heavy	☐	☐	☐	☑	

001134107

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WH – Weekend / Holiday

Results posted after 2 pm or not available until the next business day. Please contact in advance of weekend analysis needs.

	Sample ID	Description	Sample Type (Bulk)	TAT (Rush)	Test Volume / Area (Tape, Swab)	Notes (Include Lab ID #, etc)
12	MB29	Entrance 106, North, behind cove base	T	STD	-	PM
13	MB30	Entrance 106, North, behind cove base	T	STD	-	PM
14	MB31	Hall 111 wall, North, behind cove base	T	STD	-	PM
15	MB32	Hall 111 wall, North, back of wall cover	T	STD	-	PM
16	MB33	Hall 111 wall, North, 1st surface GWB	T	STD	-	PM
17	MB34	Hall 111 wall, North, 2nd surface GWB	T	STD	-	PM
	END	END		STD		
				STD		
				STD		
				STD		
				STD		

Sample ID	Fungi – Spore Trap Analysis	Spore Trap Analysis – Other particles	Direct Microscopic Exam (Qualitative)	Quantitative Spore Count Direct Exam	1-Media Surface Fungi (Genus ID + Asp. spp.)	2-Media Surface Fungi (Genus ID + Asp. spp.)	3-Media Surface Fungi (Genus ID + Asp. spp.)	Culturable Air Fungi (Genus ID + Asp. spp.)	Gram Stain & Counts (Culturable Air & Surface Bacteria)	Legionella culture	Total Coliform, E. coli (Presence/Absence)	Membrane Filtration (specify organism):	MPN Bacteria (specify organism):	QuantiTray – Sewage Screen	Asbestos Analysis – PCM Airborne Fiber Count (NIOSH 7400)	Asbestos Analysis – PLM (EPA method 600/R-93-116)	PCR (specify test):	Specify Service
MB29	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
MB30	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
MB31	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
MB32	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
MB33	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
MB34	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
END	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
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	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

SAMPLE TYPE CODES			
BC – BioCassette ™	ST – Spore Trap: Zefon, Allergenco, Burkard ...	T – Tape	D – Dust
A1S – Anderson		SW – Swab	SO – Soil
SAS – Surface Air Sampler	P – Potable Water	B – Bulk	
CP – Contact Plate	NP – Non-Potable Water	O – Other:	

Relinquished by	Date / Time	Received by	Date / Time
Martin Schwan	10/29/13 2:00pm	Fedex 7970 3325 1780	10/30/13 11:30am
FedEx	10-31-13	[illegible]	9:45

By submitting this Chain of Custody, you agree to be bound by the terms and conditions set forth at http://www.emlab.com/s/main/servicetermsl.html

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Report for:

Mr. Martin Schwan
EHS-Alaska, Inc.
11901 Business Blvd, Suite 208
Eagle River, AK 99577

Regarding: Project: 7052-08-Nome Mold Sampling; Mold Investigation-Bulk & Tape Sampling
EML ID: 1134112

Approved by:

Technical Manager
Fernando Fernandez

Dates of Analysis:
Direct microscopic exam (Qualitative): 11-01-2013

Service SOPs: Direct microscopic exam (Qualitative) (1039)
AIHA-LAP, LLC accredited service, Lab ID #102297

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EMLab P&K ("the Company") shall have no liability to the client or the client's customer with respect to decisions or recommendations made, actions taken or courses of conduct implemented by either the client or the client's customer as a result of or based upon the Test Results. In no event shall the Company be liable to the client with respect to the Test Results except for the Company's own willful misconduct or gross negligence nor shall the Company be liable for incidental or consequential damages or lost profits or revenues to the fullest extent such liability may be disclaimed by law, even if the Company has been advised of the possibility of such damages, lost profits or lost revenues. In no event shall the Company's liability with respect to the Test Results exceed the amount paid to the Company by the client therefor.

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Client: EHS-Alaska, Inc.
C/O: Mr. Martin Schwan
Re: 7052-08-Nome Mold Sampling; Mold Investigation-Bulk & Tape Sampling

Date of Sampling: 10-26-2013
Date of Receipt: 10-31-2013
Date of Report: 11-01-2013

DIRECT MICROSCOPIC EXAMINATION REPORT

Background Debris and/or Description	Miscellaneous Spores Present*	MOLD GROWTH: Molds seen with underlying mycelial and/or sporulating structures†	Other Comments††	General Impression
Lab ID-Version‡: 5123363-1, Analysis Date: 11/01/2013: Bulk sample 4: MB04 R205 East Wall, 2nd Surface Of L1				
Wall	Few	4+ *Stachybotrys* species < 1+ *Ulocladium* species	A few *Chaetomium* spores detected.	Mold growth
Lab ID-Version: 5123364-1, Analysis Date: 11/01/2013: Bulk sample 5: MB05 R205 East Wall, 2nd Surface Of L2				
Wall	Very few	4+ *Stachybotrys* species 2+ Colorless spore type, ID unknown < 1+ *Ulocladium* species	None	Mold growth
Lab ID-Version: 5123365-1, Analysis Date: 11/01/2013: Bulk sample 6: MB06 R205 East Wall, 1st Surface Of Foam Ins				
Insulation	Few	None	None	Normal trapping
Lab ID-Version: 5123366-1, Analysis Date: 11/01/2013: Bulk sample 9: MB09 R204 East Wall, 1st Surface Of L5				
Wall	Very few	None	None	Normal trapping
Lab ID-Version: 5123367-1, Analysis Date: 11/01/2013: Bulk sample 11: MB11 R232 North Wall, 2nd Surface Of L5				
Wall	Very few	< 1+ *Stachybotrys* species	None	Mold growth in vicinity?
Lab ID-Version: 5123368-1, Analysis Date: 11/01/2013: Bulk sample 12: MB12 R230 West Wall, 1st Surface Of L5				
Wall	Very few	None	None	Normal trapping
Lab ID-Version: 5123369-1, Analysis Date: 11/01/2013: Bulk sample 13: MB13 R230 West Wall, 2nd Surface Of L5				
Wall	Very few	None	None	Normal trapping
Lab ID-Version: 5123370-1, Analysis Date: 11/01/2013: Bulk sample 14: MB14 R228 South Wall, 1st Surface Of L1				
Wall	Very few	1+ *Penicillium* species	None	Mold growth
Lab ID-Version: 5123371-1, Analysis Date: 11/01/2013: Bulk sample 15: MB15 R228 South Wall, 1st Surface Of L2				
Wall	Very few	None	None	Normal trapping
Lab ID-Version: 5123372-1, Analysis Date: 11/01/2013: Bulk sample 16: MB16 R228 South Wall, 1st Surface Of L5				
Wall	Very few	None	None	Normal trapping
Lab ID-Version: 5123373-1, Analysis Date: 11/01/2013: Bulk sample 17: MB17 R228 South Wall, 2nd Surface Of L5				
Wall	Very few	1+ *Penicillium* species	None	Mold growth

Background Debris and/or Description	Miscellaneous Spores Present*	MOLD GROWTH: Molds seen with underlying mycelial and/or sporulating structures†	Other Comments††	General Impression
Lab ID-Version‡: 5123374-1, Analysis Date: 11/01/2013: Tape sample 1: MB01 R205 South Wall @ L4				
Moderate	Very few	2+ *Cladosporium* species	None	Mold growth
Lab ID-Version: 5123375-1, Analysis Date: 11/01/2013: Tape sample 2: MB02 R205 East Wall Above Cove Base				
Heavy	Very few	4+ *Stachybotrys* species	None	Mold growth
Lab ID-Version: 5123376-1, Analysis Date: 11/01/2013: Tape sample 3: MB03 R205 East Wall, 1st Surface Of L1				
Heavy	Few	4+ *Ulocladium* species 1+ *Penicillium/Aspergillus* group	None	Mold growth
Lab ID-Version: 5123377-1, Analysis Date: 11/01/2013: Tape sample 7: MB07 R205 East Wall, 2nd Surface Of L5				
Heavy	Very few	< 1+ Brown hyphae with no associated spores, ID unknown.	A few *Stachybotrys* spores detected.	Minimal mold growth
Lab ID-Version: 5123378-1, Analysis Date: 11/01/2013: Tape sample 8: MB08 R204 East Wall, 2nd Surface Of L2				
Heavy	Very few	None	None	Normal trapping
Lab ID-Version: 5123379-1, Analysis Date: 11/01/2013: Tape sample 10: MB10 R234 North Wall @ L7				
Moderate	Very few	None	None	Normal trapping

* Indicative of normal conditions, i.e. seen on surfaces everywhere. Includes basidiospores (mushroom spores), myxomycetes, plant pathogens such as ascospores, rusts and smuts, and a mix of saprophytic genera with no particular spore type predominating. Distribution of spore types seen mirrors that usually seen outdoors.

† Quantities of molds seen growing are listed in the MOLD GROWTH column and are graded 1+ to 4+, with 4+ denoting the highest numbers.

†† Some comments may refer to the following: Most surfaces collect a mix of spores which are normally present in the outdoor environment. At times it is possible to note a skewing of the distribution of spore types, and also to note "marker" genera which may indicate indoor mold growth. Marker genera are those spore types which are present normally in very small numbers, but which multiply indoors when conditions are favorable for growth.

‡ A "Version" indicated by -"x" after the Lab ID# with a value greater than 1 indicates a sample with amended data. The revision number is reflected by the value of "x".

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Client: EHS-Alaska, Inc.
C/O: Mr. Martin Schwan
Re: 7052-08-Nome Mold Sampling; Mold Investigation-Bulk & Tape Sampling

Date of Sampling: 10-26-2013
Date of Receipt: 10-31-2013
Date of Report: 11-01-2013

Mold/Fungal Growth Rating Details

Growth Rating	Quantities of molds indicating growth are listed in the MOLD/FUNGAL GROWTH section. Judgement is used in determining the amount of growth present in the sample. For example, if only one portion of the sample has evidence of heavy growth, then it will receive a rating of heavy growth even though, strictly speaking, on a percentage basis of the entire sample, the amount of growth is low.	
	Swab/Tape/Dust/Wipe sample	Bulk Sample
< 1+ (Very Light Growth)	Evidence of very light growth observed on the sample as indicated by spores of one type seen with underlying mycelial and/or with their sporulating structures found in less than 10% of the microscopic fields examined.	Areas of very light growth detected by the presence of spores of one type seen with underlying mycelial and/ or with their sporulating structures in the bulk sample.
1+ (Light Growth)	Evidence of light growth observed on the sample as indicated by spores of one type seen with underlying mycelial and/or with their sporulating structures found in 10 to 25% of the microscopic fields examined.	Areas of light growth detected by the presence of spores of one type seen with underlying mycelial and/ or with their sporulating structures in the bulk sample.
2+ (Moderate Growth)	Evidence of moderate growth observed on the sample as indicated by spores of one type seen with underlying mycelial and/or with their sporulating structures found in 26 to 50% of the microscopic fields examined.	Areas of moderate growth detected by the presence of spores of one type seen with underlying mycelial and/ or with their sporulating structures in the bulk sample.
3+ (Heavy Growth)	Evidence of heavy growth observed on the sample as indicated by spores of one type seen with underlying mycelial and/or with their sporulating structures found in 51 to 75% of the microscopic fields examined.	Areas of heavy growth detected by the presence of spores of one type seen with underlying mycelial and/ or with their sporulating structures in the bulk sample.
4+ (Very Heavy Growth)	Evidence of very heavy growth observed on the sample as indicated by spores of one type seen with underlying mycelial and/or with their sporulating structures found to be nearly confluent in the majority of the microscopic fields examined.	Areas of very heavy growth detected by the presence of spores of one type seen with underlying mycelial and/ or with their sporulating structures in the bulk sample.

Miscellaneous Spores

Slides/specimens are examined for the presence of mold spores and pollen, noting the quantities and distribution of spore types found. A designation of 'normal trapping' is made when a mix of spore types is present with the same general distribution as is usually found outdoors. In other words, the biological component of the sample surface is like that found everywhere. Types of spores present would include basidiospores (mushroom spores), myxomycetes (slime molds), plant pathogens such as ascospores, rusts and smuts, and a mix of saprophytic genera with no particular spore type predominating. Many of these spore types would not be found growing indoors on building materials since many plant pathogens require living plants for growth, and mushrooms require compost, leaf duff of various types, or associations with roots of certain trees, etc. Due to these factors, when a mix of spores seen include these types as well as pollen, the rational source is the outside air, rather than indoor mold growth. The numbers of miscellaneous spores seen are graded and described as shown below as none, very few, few, variety, and wide variety.

None	Very Few	Few	Variety	Wide Variety
No spores detected	Very few spores detected	A few spores detected	Many spores containing a variety of different genera detected	Many spores containing a wide variety of different genera detected

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Report for:

Mr. Martin Schwan
EHS-Alaska, Inc.
11901 Business Blvd, Suite 208
Eagle River, AK 99577

Regarding: Project: 7052-08-Nome Mold Sampling; Mold Investigation-Bulk & Tape Sampling
EML ID: 1134107

Approved by:

Technical Manager
Fernando Fernandez

Dates of Analysis:
Direct microscopic exam (Qualitative): 11-01-2013

Service SOPs: Direct microscopic exam (Qualitative) (1039)
AIHA-LAP, LLC accredited service, Lab ID #102297

All samples were received in acceptable condition unless noted in the Report Comments portion in the body of the report. Due to the nature of the analyses performed, field blank correction of results is not applied. The results relate only to the items tested.

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Client: EHS-Alaska, Inc.
C/O: Mr. Martin Schwan
Re: 7052-08-Nome Mold Sampling; Mold Investigation-Bulk & Tape Sampling

Date of Sampling: 10-27-2013
Date of Receipt: 10-31-2013
Date of Report: 11-01-2013

DIRECT MICROSCOPIC EXAMINATION REPORT

Background Debris and/or Description	Miscellaneous Spores Present*	MOLD GROWTH: Molds seen with underlying mycelial and/or sporulating structures†	Other Comments††	General Impression
Lab ID-Version‡: 5123475-1, Analysis Date: 11/01/2013: Bulk sample 1: NSB1310-MB18 R135 North Wall, Behind CB Below Hatch				
R135 North Wall, Behind CB Below Hatch	Very few	4+ *Chaetomium* species 1+ *Penicillium/Aspergillus* group	None	Mold growth
Lab ID-Version: 5123476-1, Analysis Date: 11/01/2013: Bulk sample 2: NSB1310-MB19 R135 North Wall, Fiberboard Below Hatch				
R135 North Wall, Fiberboard Below Hatch	Very few	1+ *Chaetomium* species 1+ Unknown species < 1+ *Stachybotrys* species	None	Mold growth
Lab ID-Version: 5123477-1, Analysis Date: 11/01/2013: Bulk sample 3: NSB1310-MB20 R135 North Wall, 1st Surface Of L2				
R228 North wall, 1st surface Of L2	Very few	3+ *Chaetomium* species 1+ *Stachybotrys* species	A few *Penicillium/ Aspergillus* group spores detected.	Mold growth
Lab ID-Version: 5123478-1, Analysis Date: 11/01/2013: Bulk sample 4: NSB1310-MB21 R135 North Wall, 1st Surface Of L5				
R228 North Wall, 2nd Surfade Of L2	Very few	1+ *Penicillium/Aspergillus* group	A few *Chaetomium* spores detected.	Mold growth
Lab ID-Version: 5123479-1, Analysis Date: 11/01/2013: Bulk sample 5: NSB1310-MB22 R135 North Wall, 2nd Surface Of L5				
R228 North Wall, 2nd Surface of L5	Very few	1+ *Penicillium/Aspergillus* group	A few *Chaetomium* spores detected.	Mold growth
Lab ID-Version: 5123480-1, Analysis Date: 11/01/2013: Bulk sample 7: NSB1310-MB24 R133 West Wall, 2nd Surface Of L1				
R133 West Wall, 2nd Surface Of L1	Very few	4+ *Stachybotrys* species	None	Mold growth
Lab ID-Version: 5123481-1, Analysis Date: 11/01/2013: Bulk sample 8: NSB1310-MB25 R133 West Wall, 2nd Surface Of L2				
R133 West Wall, 2nd Surface Of L2	Very few	4+ *Stachybotrys* species	None	Mold growth
Lab ID-Version: 5123482-1, Analysis Date: 11/01/2013: Bulk sample 9: NSB1310-MB26 R133 West Wall, 2nd Surface Of L5				
R133 West Wall, 2nd Surface of L5	Very few	1+ *Penicillium/Aspergillus* group < 1+ *Cladosporium* species < 1+ *Stachybotrys* species	None	Mold growth

Background Debris and/or Description	Miscellaneous Spores Present*	MOLD GROWTH: Molds seen with underlying mycelial and/or sporulating structures†	Other Comments††	General Impression
Lab ID-Version‡: 5123483-1, Analysis Date: 11/01/2013: Tape sample 6: NSB1310-MB23 R133 West Wall, Behind CB				
Scant	None	4+ *Stachybotrys* species 1+ *Penicillium/Aspergillus* group	None	Mold growth
Lab ID-Version: 5123484-1, Analysis Date: 11/01/2013: Tape sample 10: NSB1310-MB27 R129 South Wall, 2nd Surface Of L2				
Moderate	Very few	1+ *Acremonium* species 1+ *Cladosporium* species < 1+ *Penicillium/Aspergillus* group	None	Mold growth
Lab ID-Version: 5123485-1, Analysis Date: 11/01/2013: Tape sample 11: NSB1310-MB28 R129 South Wall, 1st Surface Of L5				
Moderate	Very few	3+ *Penicillium/Aspergillus* group < 1+ *Acremonium* species < 1+ *Cladosporium* species < 1+ *Stachybotrys* species	None	Mold growth
Lab ID-Version: 5123486-1, Analysis Date: 11/01/2013: Tape sample 12: NSB1310-MB29 Entrance 106, North, Behind Cove Base				
Heavy	Very few	4+ *Chaetomium* species 4+ Unknown species 1+ *Stachybotrys* species < 1+ *Penicillium/Aspergillus* group	None	Mold growth
Lab ID-Version: 5123487-1, Analysis Date: 11/01/2013: Tape sample 13: NSB1310-MB30 Entrance 106, North, Behind Cove Base				
Heavy	Very few	4+ *Stachybotrys* species	None	Mold growth
Lab ID-Version: 5123488-1, Analysis Date: 11/01/2013: Tape sample 14: NSB1310-MB31 Hall 111 Wall, North, Behind Cove Base				
Moderate	Very few	4+ *Stachybotrys* species 1+ *Penicillium/Aspergillus* group	None	Mold growth
Lab ID-Version: 5123489-1, Analysis Date: 11/01/2013: Tape sample 15: NSB1310-MB32 Hall 111 Wall, North, Back Of Wall Cover				
Very Heavy	Very few	3+ *Stachybotrys* species	None	Mold growth
Lab ID-Version: 5123490-1, Analysis Date: 11/01/2013: Tape sample 16: NSB1310-MB33 Hall 111 Wall, North, 1st Surface GWB				
Moderate	Very few	1+ *Paecilomyces* species 1+ *Stachybotrys* species < 1+ *Penicillium/Aspergillus* group	None	Mold growth
Lab ID-Version: 5123491-1, Analysis Date: 11/01/2013: Tape sample 17: NSB1310-MB34 Hall 111 Wall, North, 2nd Surface GWB				
Moderate	Very few	3+ *Ulocladium* species 2+ *Penicillium/Aspergillus* group	None	Mold growth

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Client: EHS-Alaska, Inc.
C/O: Mr. Martin Schwan
Re: 7052-08-Nome Mold Sampling; Mold Investigation-Bulk & Tape Sampling

Date of Sampling: 10-27-2013
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2+ (Moderate Growth)	Evidence of moderate growth observed on the sample as indicated by spores of one type seen with underlying mycelial and/or with their sporulating structures found in 26 to 50% of the microscopic fields examined.	Areas of moderate growth detected by the presence of spores of one type seen with underlying mycelial and/ or with their sporulating structures in the bulk sample.
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Miscellaneous Spores

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None	Very Few	Few	Variety	Wide Variety
No spores detected	Very few spores detected	A few spores detected	Many spores containing a variety of different genera detected	Many spores containing a wide variety of different genera detected

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Phoenix, AZ: 1501 West Knudsen drive, Phoenix, AZ 85027 * (800) 651-4802
San Bruno, CA: 1150 Bayhill Drive, #100, San Bruno, CA 94066 * (866) 888-6653

Weather	Fog	Rain	Snow	Wind	Clear
None	☐	☐	☑	☐	
Light	☑	☐	☐	☐	
Moderate	☐	☑	☐	☐	
Heavy	☐	☐	☐	☑	

001133741

CONTACT INFORMATION

Company:	EHS-Alaska	Address:	11901 Business Blvd., Ste. 206, Eagle River AK 99577
Contact:	Martin Schwan	Special Instructions:	PREFIX FOR ALL SAMPLES = NSB1310-
Phone:	907-694-1383		

PROJECT INFORMATION

Project ID:	7052-08-Nome Mold Sampling		
Project Description:	Mold Investigation within walls.		
Project Zip Code:	99762	Sampling Date & Time:	10/25/13 / PM
PO Number:	7052-08	Sampled By:	M. Schwan

TURN AROUND TIME CODES (TAT)

STD – Standard (DEFAULT)
ND – Next Business Day
SD – Same Business Day Rush
WH – Weekend / Holiday

Results received after 2:00 or weekends will be considered received the next business day. Please allow us in advance of sending analysis results.

	Sample ID	Description	Sample Type Code	TAT Code	Total Volume / Area (if applicable)	Notes (Time of day, Lab Filters)	Fungi – Spore Trap Analysis	Spore Trap Analysis – Other particles	Direct Microscopic Exam (Qualitative)	Quantitative Spore Count Direct Exam	1-Media Surface Fungi (Genus ID + Asp. spp.)	2-Media Surface Fungi (Genus ID + Asp. spp.)	3-Media Surface Fungi (Genus ID + Asp. spp.)	Culturable Air Fungi (Genus ID + Asp. spp.)	Gram Stain & Counts (Culturable Air & Surface Bacteria)	Legionella culture	Total Coliform, E. coli (Presence/Absence)	Membrane Filtration (specify organism):	MPN Bacteria (specify organism):	Quanti Tray – Sewage Screen	Asbestos Analysis – PCM Airborne Fiber Count (NIOSH 7400)	Asbestos Analysis – PLM (EPA method 600/R-93-116)	PCR (specify test):	Specify Service
1	M01	Outdoor - North Entrance	ST	STD	75	2:30 PM 60% 44 F	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
2	M02	Outdoor - West Entrance	ST	STD	75	2:45 PM 60% 44 F	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
3	M03	Lab 135	ST	STD	75	Afternoon 25% 72 F	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
4	M04	Office Area 131	ST	STD	75	Afternoon 25% 72 F	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
5	M05	Hall 128	ST	STD	75	Afternoon 25% 72 F	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
6	M06	Office 129	ST	STD	75	Afternoon 25% 72 F	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
7	M07	Room 122	ST	STD	75	Afternoon 25% 72 F	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
8	M08	Lobby 107	ST	STD	75	Afternoon 25% 72 F	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
9	M09	Office area 114	ST	STD	75	Afternoon 25% 72 F	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
10	M10	Office 229	ST	STD	75	Afternoon 25% 72 F	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
11	M11	FIELD BLANK (Office Area 235)	ST	STD	-	Afternoon 25% 72 F	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

SAMPLE TYPE CODES

BC – BioCassette ™	ST – Spore Trap: Zefon, Allergenco, Burkard ...	T – Tape	D – Dust
AIS – Anderson		SW – Swab	SO – Soil
SAS – Surface Air Sampler	P – Potable Water	B – Bulk	
CP – Contact Plate	NP – Non-Potable Water	O – Other:	

Relinquished by	Date / Time	Received by	Date / Time
Martin Schwan	10/29/13 11:00 am	Fedex 7770 2907 2891	10-29-13 12:50pm
	10/30/13		

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Phoenix, AZ: 1501 West Knudsen drive, Phoenix, AZ 85027 * (800)651-4802
San Bruno, CA: 1150 Bayhill Drive, #100, San Bruno, CA 94066 * (866) 888-6653

Weather	Fog	Rain	Snow	Wind	Clear
None	☐	☐	☑	☐	
Light	☑	☐	☐	☐	
Moderate	☐	☑	☐	☐	
Heavy	☐	☐	☐	☑	

Lab Use

001133741

CONTACT INFORMATION

Company:	EHS-Alaska	Address:	11901 Business Blvd., Ste. 208, Eagle River AK 99577
Contact:	Martin Schwan	Special Instructions:	PREFIX FOR ALL SAMPLES = NSB1310-
Phone:	907-694-1383		

PROJECT INFORMATION

Project ID:	7052-08-Nome Mold Sampling		
Project Description:	Mold investigation within walls.		
Project Zip Code:	99762	Sampling Date & Time:	10/25/13 / PM
PO Number:	7052-08	Sampled By:	M. Schwan

TURN AROUND TIME CODES (TAT)

STD – Standard (DEFAULT)
ND – Next Business Day
SD – Same Business Day Rush
WH – Weekend / Holiday

Rushes received after 2 pm or on weekends or holidays will be considered received the next business day. Please allow 1 business day for received analysis results.

	Sample ID	Description	Sample Type Code	TAT Code	Total Volume / Area (specify units)	Notes (Weather, Temp, RH, etc.)
12	M12	Hall 237 - Center	ST	STD	75	2:30 PM 60% 44 F
13	M13	Office Area 243	ST	STD	75	2:45 PM 60% 44 F
14	M14	Office Area 206	ST	STD	75	Afternoon 25% 72 F
15	M15	Office Area 213 at hall 209	ST	STD	75	Afternoon 25% 72 F
16	M16	Break Room 223	ST	STD	75	Afternoon 25% 72 F
17	M17	Office 204	ST	STD	75	Afternoon 25% 72 F
18	M18	Office 202	ST	STD	75	Afternoon 25% 72 F
19	M19	Outdoor - North Entrance	ST	STD	75	Afternoon 25% 72 F
20	M20	Outdoor - West Entrance	ST	STD	75	Afternoon 25% 72 F
21	M21	Office 133	ST	STD	75	Afternoon 25% 72 F
	END	END	ST	STD	-	

Lab Use Only

Sample ID	Non-Culturable: Spore Trap: Fungi – Spore Trap Analysis	Spore Trap: Other particles	Tape Swab Bulk: Direct Microscopic Exam (Qualitative)	Quantitative Spore Count Direct Exam	BioCassette™, Andersen, SAS, Swab, Water, Bulk, Dust, Soil, Contact Plates: 1-Media Surface Fungi (Genus ID + Asp. spp.)	2-Media Surface Fungi (Genus ID + Asp. spp.)	3-Media Surface Fungi (Genus ID + Asp. spp.)	Culturable Air Fungi (Genus ID + Asp. spp.)	Gram Stain & Counts (Culturable Air & Surface Bacteria)	Legionella culture	Total Coliform, E. coli (Presence/Absence)	Membrane Filtration (specify organism):	MPN Bacteria (specify organism):	QuantiTray – Sewage Screen	Other Requests: Asbestos Analysis – PCM Airborne Fiber Count (NIOSH 7400)	Asbestos Analysis – PLM (EPA method 600/R-93-116)	PCR (specify test):	Specify Service
M12	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
M13	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
M14	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
M15	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
M16	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
M17	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
M18	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
M19	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
M20	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
M21	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

SAMPLE TYPE CODES

BC – BioCassette™	ST – Spore Trap: Zefon, Allergenco, Burkard ...	T – Tape	D – Dust
A1S – Anderson		SW – Swab	SO – Soil
SAS – Surface Air Sampler	P – Potable Water	B – Bulk	
CP – Contact Plate	NP – Non-Potable Water	O – Other:	

RELINQUISHED BY	DATE & TIME	RECEIVED BY	DATE & TIME
Martin Schwan	10/29/13 1:00pm	fedex 7970 2927 7391	10-29-13 12:50pm
	10/30/13		

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San Bruno, CA: 1150 Bayhill Drive, #100, San Bruno, CA 94066 * (866) 888-6653

Weather	Fog	Rain	Snow	Wind	Clear
None	☐	☑	☑	☑	
Light	☑	☐	☐	☐	
Moderate	☐	☐	☐	☐	
Heavy	☐	☐	☐	☐	

001133745

CONTACT INFORMATION

Company:	EHS-Alaska	Address:	11901 Business Blvd., Ste. 208, Eagle River AK 99577
Contact:	Martin Schwan	Special Instructions:	PREFIX FOR ALL SAMPLES = NSB1310-
Phone:	907-694-1383		

PROJECT INFORMATION

Project ID:	7052-08-Nome Mold Sampling		
Project Description:	Mold investigation		
Project Zip Code:	99762	Sampling Date & Time:	10/28/13 / AM
PO Number:	7052-08	Sampled By:	M. Schwan

TURN AROUND TIME CODES (TAT)

STD – Standard (DEFAULT)
ND – Next Business Day
SD – Same Business Day Rush
WH – Weekend / Holiday

Rushes received after 2 pm or on weekends and holidays will be considered received the next business day. Please contact lab ahead of delivery to schedule rushes.

	Sample ID	Description	Sample type (code)	TAT (code)	Total Volume / Area (cubic meters)	Notes (Temperature, Humidity, etc.)	Fungi – Spore Trap Analysis	Spore Trap Analysis – Other particles	Direct Microscopic Exam (Qualitative)	Quantitative Spore Count Direct Exam	1-Media Surface Fungi (Genus ID + Asp. spp.)	2-Media Surface Fungi (Genus ID + Asp. spp.)	3-Media Surface Fungi (Genus ID + Asp. spp.)	Culturable Air Fungi (Genus ID + Asp. spp.)	Gram Stain & Counts (Culturable Air & Surface Bacteria)	Legionella cultura	Total Coliform, E. coli (Presence/Absence)	Membrane Filtration (specify organism):	MPN Bacteria (specify organism):	QuantiTray – Sewage Screen.	Asbestos Analysis – PCM Airborne Fiber Count (NIOSH 7400)	Asbestos Analysis – PLM (EPA method 600/R-93-116)	PCR (specify test):	Specify Service
1	M22	Outdoor - North Entrance	ST	STD	75	8:30 AM 29% 50 F	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
2	M23	Outdoor - West Entrance	ST	STD	75	8:30 AM 29% 50 F	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
3	M24	Lab 135	ST	STD	75	Morning 33% 68 F	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
4	M25	Office Area 131	ST	STD	75	Morning 33% 68 F	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
5	M26	Hall 128	ST	STD	75	Morning 33% 68 F	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
6	M27	Office 129	ST	STD	75	Morning 33% 68 F	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
7	M28	Room 122	ST	STD	75	Morning 33% 68 F	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
8	M29	Lobby 107	ST	STD	75	Morning 33% 68 F	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
9	M30	Office area 114 at Hall 111	ST	STD	75	Morning 33% 68 F	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
10	M31	Office 229	ST	STD	75	Morning 33% 68 F	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
11	FB M32	FIELD BLANK (Office Area 235)	ST	STD	-	Morning 33% 68 F	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

SAMPLE TYPE CODES

BC – BioCassette ™	ST – Spore Trap: Zefon, Allergenco, Burkard ...	T – Tape	D – Dust
A1S – Anderson		SW – Swab	SO – Soil
SAS – Surface Air Sampler	P – Potable Water	B – Bulk	
CP – Contact Plate	NP – Non-Potable Water	O – Other:	

RECEIVED BY	DATE & TIME	RECEIVED BY	DATE & TIME
Martin Schwan	12:00pm 10-29-13	Fedex 7970 2927 4291	10/29/13 1:00pm
	10/30/13		

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San Bruno, CA: 1150 Bayhill Drive, #100, San Bruno, CA 94066 * (866) 888-6653

Weather		Fog	Rain	Snow	Wind	Clear
Liquid	None	☐	☑	☑	☑	
	Light	☑	☐	☐	☐	
	Moderate	☐	☐	☐	☐	
	Heavy	☐	☐	☐	☐	

001133745

CONTACT INFORMATION

Company:	EHS-Alaska	Address:	11901 Business Blvd., Ste. 208, Eagle River AK 99577
Contact:	Martin Schwan	Special Instructions:	PREFIX FOR ALL SAMPLES = NSB1310-
Phone:	907-694-1383		

PROJECT INFORMATION

Project ID:	7052-08-Nome Mold Sampling		
Project Description:	Mold investigation		
Project Zip Code:	99762	Sampling Date & Time:	10/28/13 - AM
PO Number:	7052-08	Sampled By:	M. Schwan

TURN AROUND TIME CODES (TAT)

STD – Standard (DEFAULT)
ND – Next Business Day
SD – Same Business Day Rush
WH – Weekend / Holiday

Rushes received after 2 pm or on weekends will be considered received the next business day. Please contact in advance of sending samples if possible.

	Sample ID	Description	Sample Type (Code)	TAT (Code)	Total Volume/ Area (Liters/cm²)	Notes (Time of day, Temp, Rh, etc)	Fungi – Spore Trap Analysis	Spore Trap Analysis – Other particles	Direct Microscopic Exam (Qualitative)	Quantitative Spore Count Direct Exam	1-Media Surface Fungi (Genus ID + Asp. spp.)	2-Media Surface Fungi (Genus ID + Asp. spp.)	3-Media Surface Fungi (Genus ID + Asp. spp.)	Culturable Air Fungi (Genus ID + Asp. spp.)	Gram Stain & Counts (Culturable Air & Surface Bacteria)	Legionella culture	Total Coliform, E. coli (Presence/Absence)	Membrane Filtration (specify organism):	MPN Bacteria (specify organism):	Quanti Tray – Sewage Screen	Asbestos Analysis – PCM Airborne Fiber Count (NIOSH 7400)	Asbestos Analysis – PLM (EPA method 600/R-93-116)	PCR (specify test):	Specify Service
12	M33	Hall 237 - Center	ST	STD	75	8:30 AM 29% 50 F	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
13	M34	Office Area 243	ST	STD	75	8:30 AM 29% 50 F	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
14	M35	Office Area 206	ST	STD	75	Morning 33% 68 F	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
15	M36	Office Area 213 at hall 209	ST	STD	75	Morning 33% 68 F	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
16	M37	Break Room 223	ST	STD	75	Morning 33% 68 F	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
17	M38	Office 204	ST	STD	75	Morning 33% 68 F	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
18	M39	Office 202	ST	STD	75	Morning 33% 68 F	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
19	M40	Office 133	ST	STD	75	Morning 33% 68 F	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
20	M41	Outdoor - North Entrance	ST	STD	75	Morning 33% 68 F	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
21	M42	Outdoor - West Entrance	ST	STD	75	Morning 33% 68 F	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	END	END	ST	STD	-		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Non-Culturable: Spore Trap; Tape Swab Bulk
Culturable: BioCassette™, Air Water, Bulk, Dust, Surface Plates

SAMPLE TYPE CODES

BC – BioCassette ™	ST – Spore Trap: Zefon, Allergenco, Burkard ...	T – Tape	D – Dust
AIS – Anderson		SW – Swab	SO – Soil
SAS – Surface Air Sampler	P – Potable Water	B – Bulk	
CP – Contact Plate	NP – Non-Potable Water	O – Other:	

RELINQUISHED BY	DATE & TIME	RECEIVED BY	DATE & TIME
Martin Schwan	10-29-13 12:00pm	Fedex 7978 2927 7291	10/29/13 1:00pm
	10/30/13		

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Report for:

Mr. Martin Schwan
EHS-Alaska, Inc.
11901 Business Blvd, Suite 208
Eagle River, AK 99577

Regarding: Project: 7052-08-Nom,e Mold Sampling; Mold Investigation Within Walls
EML ID: 1133741

Approved by:

Technical Manager
Fernando Fernandez

Dates of Analysis:
Spore trap analysis: 10-31-2013

Service SOPs: Spore trap analysis (1038)
AIHA-LAP, LLC accredited service, Lab ID #102297

All samples were received in acceptable condition unless noted in the Report Comments portion in the body of the report. Due to the nature of the analyses performed, field blank correction of results is not applied. The results relate only to the items tested.

EMLab P&K ("the Company") shall have no liability to the client or the client's customer with respect to decisions or recommendations made, actions taken or courses of conduct implemented by either the client or the client's customer as a result of or based upon the Test Results. In no event shall the Company be liable to the client with respect to the Test Results except for the Company's own willful misconduct or gross negligence nor shall the Company be liable for incidental or consequential damages or lost profits or revenues to the fullest extent such liability may be disclaimed by law, even if the Company has been advised of the possibility of such damages, lost profits or lost revenues. In no event shall the Company's liability with respect to the Test Results exceed the amount paid to the Company by the client therefor.

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(800) 651-4802 Fax (623) 780-7695 www.emlab.com

Client: EHS-Alaska, Inc.
C/O: Mr. Martin Schwan
Re: 7052-08-Nom,e Mold Sampling; Mold Investigation Within Walls

Date of Sampling: 10-25-2013
Date of Receipt: 10-30-2013
Date of Report: 10-31-2013

SPORE TRAP REPORT: NON-VIABLE METHODOLOGY

Location:	1: M01 Outdoor-North Entrance		2: M02 Outdoor-West Entrance		3: M03 Lab 135		4: M04 Office Area 131		5: M05 Hall 128	
Comments (see below)	A		None		A		None		B	
Lab ID-Version‡:	5121590-1		5121591-1		5121592-1		5121593-1		5121594-1	
Analysis Date:	10/31/2013		10/31/2013		10/31/2013		10/31/2013		10/31/2013	
	raw ct.	spores/m3	raw ct.	spores/m3	raw ct.	spores/m3	raw ct.	spores/m3	raw ct.	spores/m3
Ascospores										
Basidiospores			1	13			3	40		
Chaetomium										
Cladosporium										
Epicoccum										
Fusarium										
Myrothecium										
Nigrospora										
Other brown										
Other colorless										
Penicillium/Aspergillus types†										
Pithomyces										
Rusts										
Smuts, Periconia, Myxomycetes										
Stachybotrys										
Stemphylium										
Torula										
Ulocladium										
Zygomycetes										
Background debris (1-4+)††	None		< 1+		None		< 1+		< 1+	
Hyphal fragments/m3	< 13		< 13		< 13		< 13		< 13	
Pollen/m3	< 13		< 13		< 13		< 13		< 13	
Skin cells (1-4+)	None		< 1+		None		< 1+		< 1+	
Sample volume (liters)	75		75		75		75		75	
§ TOTAL SPORES/m3		< 13		13		< 13		40		< 13

Comments: A) No trace present. B) No spores detected.

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample.
† The spores of *Aspergillus* and *Penicillium* (and others such as *Acremonium, Paecilomyces*) are small and round with very few distinguishing characteristics. They cannot be differentiated by non-viable sampling methods. Also, some species with very small spores are easily missed, and may be undercounted.
††Background debris indicates the amount of non-biological particulate matter present on the trace (dust in the air) and the resulting visibility for the analyst. It is rated from 1+ (low) to 4+ (high). Counts from areas with 4+ background debris should be regarded as minimal counts and may be higher then reported. It is important to account for samples volumes when evaluating dust levels.

The analytical sensitivity is the spores/m3 divided by the raw count. The limit of detection is the analytical sensitivity multiplied by the sample volume divided by 1000.

For more information regarding analytical sensitivity, please contact QA by calling the laboratory.
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§ Total Spores/m3 has been rounded to two significant figures to reflect analytical precision.

EMLab P&K
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Client: EHS-Alaska, Inc.
C/O: Mr. Martin Schwan
Re: 7052-08-Nom,e Mold Sampling; Mold Investigation Within Walls

Date of Sampling: 10-25-2013
Date of Receipt: 10-30-2013
Date of Report: 10-31-2013

SPORE TRAP REPORT: NON-VIABLE METHODOLOGY

Location:	6: M06 Office 129		7: M07 Room 122		8: M08 Lobby 107		9: M09 Office Area 114	
Comments (see below)	None		B		None		C	
Lab ID-Version‡:	5121595-1		5121596-1		5121597-1		5121598-1	
Analysis Date:	10/31/2013		10/31/2013		10/31/2013		10/31/2013	
	raw ct.	spores/m3	raw ct.	spores/m3	raw ct.	spores/m3	raw ct.	spores/m3
Ascospores								
Basidiospores	2	27			6	80	3	40
Chaetomium								
Cladosporium								
Epicoccum								
Fusarium								
Myrothecium								
Nigrospora								
Other brown								
Other colorless								
Penicillium/Aspergillus types†								
Pithomyces								
Rusts								
Smuts, Periconia, Myxomycetes								
Stachybotrys								
Stemphylium								
Torula								
Ulocladium								
Zygomycetes								
Background debris (1-4+)††	1+		1+		1+		3+	
Hyphal fragments/m3	< 13		< 13		< 13		13	
Pollen/m3	< 13		< 13		< 13		< 13	
Skin cells (1-4+)	< 1+		< 1+		< 1+		1+	
Sample volume (liters)	75		75		75		75	
§ TOTAL SPORES/m3		27		< 13		80		40

Comments: B) No spores detected. C) The slide was received broken. 35% of trace available for analysis.

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample.
† The spores of *Aspergillus* and *Penicillium* (and others such as *Acremonium, Paecilomyces*) are small and round with very few distinguishing characteristics. They cannot be differentiated by non-viable sampling methods. Also, some species with very small spores are easily missed, and may be undercounted.
††Background debris indicates the amount of non-biological particulate matter present on the trace (dust in the air) and the resulting visibility for the analyst. It is rated from 1+ (low) to 4+ (high). Counts from areas with 4+ background debris should be regarded as minimal counts and may be higher then reported. It is important to account for samples volumes when evaluating dust levels.

The analytical sensitivity is the spores/m3 divided by the raw count. The limit of detection is the analytical sensitivity multiplied by the sample volume divided by 1000.

For more information regarding analytical sensitivity, please contact QA by calling the laboratory.
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C/O: Mr. Martin Schwan
Re: 7052-08-Nom,e Mold Sampling; Mold Investigation Within Walls

Date of Sampling: 10-25-2013
Date of Receipt: 10-30-2013
Date of Report: 10-31-2013

SPORE TRAP REPORT: NON-VIABLE METHODOLOGY

Location:	10: M10 Office 229		11: M11 Field Blank (Office Area 235)		12: M12 Hall 237-Center		13: M13 Office Area 243	
Comments (see below)	None		None		D		None	
Lab ID-Version‡:	5121599-1		5121600-1		5121601-1		5121602-1	
Analysis Date:	10/31/2013		10/31/2013		10/31/2013		10/31/2013	
	raw ct.	spores/m3	raw ct.	spores/m3	raw ct.	spores/m3	raw ct.	spores/m3
Ascospores								
Basidiospores	6	80			5	67	8	110
Chaetomium								
Cladosporium	2	27						
Epicoccum								
Fusarium								
Myrothecium								
Nigrospora								
Other brown							1	13
Other colorless								
Penicillium/Aspergillus types†								
Pithomyces								
Rusts								
Smuts, Periconia, Myxomycetes								
Stachybotrys								
Stemphylium								
Torula								
Ulocladium								
Zygomycetes								
Background debris (1-4+)††	2+		None		2+		2+	
Hyphal fragments/m3	< 13		N/A		< 13		27	
Pollen/m3	< 13		N/A		< 13		< 13	
Skin cells (1-4+)	< 1+		None		< 1+		1+	
Sample volume (liters)	75		0		75		75	
§ TOTAL SPORES/m3		110		N/A		67		120

Comments: D) The slide was received broken. 50% of trace available for analysis.

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample.
† The spores of *Aspergillus* and *Penicillium* (and others such as *Acremonium, Paecilomyces*) are small and round with very few distinguishing characteristics. They cannot be differentiated by non-viable sampling methods. Also, some species with very small spores are easily missed, and may be undercounted.
††Background debris indicates the amount of non-biological particulate matter present on the trace (dust in the air) and the resulting visibility for the analyst. It is rated from 1+ (low) to 4+ (high). Counts from areas with 4+ background debris should be regarded as minimal counts and may be higher then reported. It is important to account for samples volumes when evaluating dust levels.

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For more information regarding analytical sensitivity, please contact QA by calling the laboratory.
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Client: EHS-Alaska, Inc.
C/O: Mr. Martin Schwan
Re: 7052-08-Nom,e Mold Sampling; Mold Investigation Within Walls

Date of Sampling: 10-25-2013
Date of Receipt: 10-30-2013
Date of Report: 10-31-2013

SPORE TRAP REPORT: NON-VIABLE METHODOLOGY

Location:	14: M14 Office Area 206		15: M15 Office Area 213 At Hall 209		16: M16 Break Room 223		17: M17 Office 204	
Comments (see below)	None		D		D		None	
Lab ID-Version‡:	5121603-1		5121604-1		5121605-1		5121606-1	
Analysis Date:	10/31/2013		10/31/2013		10/31/2013		10/31/2013	
	raw ct.	spores/m3	raw ct.	spores/m3	raw ct.	spores/m3	raw ct.	spores/m3
Ascospores								
Basidiospores	10	130	4	53	5	67	10	130
Chaetomium								
Cladosporium								
Epicoccum								
Fusarium								
Myrothecium								
Nigrospora								
Other brown								
Other colorless								
Penicillium/Aspergillus types†								
Pithomyces								
Rusts								
Smuts, Periconia, Myxomycetes	1	13						
Stachybotrys								
Stemphylium								
Torula								
Ulocladium								
Zygomycetes								
Background debris (1-4+)††	3+		3+		2+		2+	
Hyphal fragments/m3	13		< 13		< 13		< 13	
Pollen/m3	< 13		< 13		< 13		< 13	
Skin cells (1-4+)	1+		< 1+		< 1+		1+	
Sample volume (liters)	75		75		75		75	
§ TOTAL SPORES/m3		150		53		67		130

Comments: D) The slide was received broken. 50% of trace available for analysis.

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample.
† The spores of *Aspergillus* and *Penicillium* (and others such as *Acremonium, Paecilomyces*) are small and round with very few distinguishing characteristics. They cannot be differentiated by non-viable sampling methods. Also, some species with very small spores are easily missed, and may be undercounted.
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Client: EHS-Alaska, Inc.
C/O: Mr. Martin Schwan
Re: 7052-08-Nom,e Mold Sampling; Mold Investigation Within Walls

Date of Sampling: 10-25-2013
Date of Receipt: 10-30-2013
Date of Report: 10-31-2013

SPORE TRAP REPORT: NON-VIABLE METHODOLOGY

Location:	18: M18 Office 202		19: M19 Outdoor-North Entrance		20: M20 Outdoor-West Entrance		21: M21 Office 133	
Comments (see below)	None		None		E		None	
Lab ID-Version‡:	5121607-1		5121608-1		5121609-1		5121610-1	
Analysis Date:	10/31/2013		10/31/2013		10/31/2013		10/31/2013	
	raw ct.	spores/m3	raw ct.	spores/m3	raw ct.	spores/m3	raw ct.	spores/m3
Ascospores			3	40	10	130	3	40
Basidiospores	23	310	5	67	19	250	8	110
Chaetomium								
Cladosporium								
Fusarium								
Myrothecium								
Nigrospora								
Other brown	1	13					5	67
Other colorless								
Penicillium/Aspergillus types†							14	190
Pithomyces							178	2,400
Rusts								
Smuts, Periconia, Myxomycetes								
Stachybotrys								
Stemphylium								
Torula								
Ulocladium								
Zygomycetes								
Background debris (1-4+)††	2+		2+		2+		1+	
Hyphal fragments/m3	< 13		< 13		< 13		120	
Pollen/m3	< 13		< 13		< 13		< 13	
Skin cells (1-4+)	1+		< 1+		< 1+		< 1+	
Sample volume (liters)	75		75		75		75	
§ TOTAL SPORES/m3		320		110		390		2,800

Comments: E) The slide was received broken. 40% of trace available for analysis.

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample.
† The spores of *Aspergillus* and *Penicillium* (and others such as *Acremonium, Paecilomyces*) are small and round with very few distinguishing characteristics. They cannot be differentiated by non-viable sampling methods. Also, some species with very small spores are easily missed, and may be undercounted.
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For more information regarding analytical sensitivity, please contact QA by calling the laboratory.
‡ A "Version" indicated by -"x" after the Lab ID# with a value greater than 1 indicates a sample with amended data. The revision number is reflected by the value of "x".
§ Total Spores/m3 has been rounded to two significant figures to reflect analytical precision.

Report for:

Mr. Martin Schwan
EHS-Alaska, Inc.
11901 Business Blvd, Suite 208
Eagle River, AK 99577

Regarding: Project: 7052-08-Nome Mold Sampling; Mold Investigation
EML ID: 1133745

Approved by:

Technical Manager
Fernando Fernandez

Dates of Analysis:
Spore trap analysis: 10-31-2013

Service SOPs: Spore trap analysis (1038)
AIHA-LAP, LLC accredited service, Lab ID #102297

All samples were received in acceptable condition unless noted in the Report Comments portion in the body of the report. Due to the nature of the analyses performed, field blank correction of results is not applied. The results relate only to the items tested.

EMLab P&K ("the Company") shall have no liability to the client or the client's customer with respect to decisions or recommendations made, actions taken or courses of conduct implemented by either the client or the client's customer as a result of or based upon the Test Results. In no event shall the Company be liable to the client with respect to the Test Results except for the Company's own willful misconduct or gross negligence nor shall the Company be liable for incidental or consequential damages or lost profits or revenues to the fullest extent such liability may be disclaimed by law, even if the Company has been advised of the possibility of such damages, lost profits or lost revenues. In no event shall the Company's liability with respect to the Test Results exceed the amount paid to the Company by the client therefor.

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Client: EHS-Alaska, Inc.
C/O: Mr. Martin Schwan
Re: 7052-08-Nome Mold Sampling; Mold Investigation

Date of Sampling: 10-28-2013
Date of Receipt: 10-30-2013
Date of Report: 10-31-2013

SPORE TRAP REPORT: NON-VIABLE METHODOLOGY

Location:	1: M22 Outdoor-North Entrance		2: M23 Outdoor-West Entrance		3: M24 Lab 135		4: M25 Office Area 131		5: M26 Hall 128	
Comments (see below)	A		A		A		A		None	
Lab ID-Version‡:	5121503-1		5121504-1		5121505-1		5121506-1		5121507-1	
Analysis Date:	10/31/2013		10/31/2013		10/31/2013		10/31/2013		10/31/2013	
	raw ct.	spores/m3	raw ct.	spores/m3	raw ct.	spores/m3	raw ct.	spores/m3	raw ct.	spores/m3
Ascospores										
Basidiospores									2	27
Chaetomium										
Cladosporium										
Epicoccum										
Fusarium										
Myrothecium										
Nigrospora										
Other brown										
Other colorless										
Penicillium/Aspergillus types†									2	27
Pithomyces										
Rusts										
Smuts, Periconia, Myxomycetes										
Stachybotrys										
Stemphylium										
Torula										
Ulocladium										
Zygomycetes										
Background debris (1-4+)††	None		None		None		None		3+	
Hyphal fragments/m3	< 13		< 13		< 13		< 13		< 13	
Pollen/m3	< 13		< 13		< 13		< 13		< 13	
Skin cells (1-4+)	None		None		None		None		1+	
Sample volume (liters)	75		75		75		75		75	
§ TOTAL SPORES/m3		< 13		< 13		< 13		< 13		53

Comments: A) The slide was received broken. Analysis was not possible.

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample.
† The spores of *Aspergillus* and *Penicillium* (and others such as *Acremonium, Paecilomyces*) are small and round with very few distinguishing characteristics. They cannot be differentiated by non-viable sampling methods. Also, some species with very small spores are easily missed, and may be undercounted.
††Background debris indicates the amount of non-biological particulate matter present on the trace (dust in the air) and the resulting visibility for the analyst. It is rated from 1+ (low) to 4+ (high). Counts from areas with 4+ background debris should be regarded as minimal counts and may be higher then reported. It is important to account for samples volumes when evaluating dust levels.

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Client: EHS-Alaska, Inc.
C/O: Mr. Martin Schwan
Re: 7052-08-Nome Mold Sampling; Mold Investigation

Date of Sampling: 10-28-2013
Date of Receipt: 10-30-2013
Date of Report: 10-31-2013

SPORE TRAP REPORT: NON-VIABLE METHODOLOGY

Location:	6: M27 Office 129		7: M28 Room 122		8: M29 Lobby 107		9: M30 Office Area 114 At Hall 111	
Comments (see below)	None		A		None		A	
Lab ID-Version‡:	5121508-1		5121509-1		5121510-1		5121511-1	
Analysis Date:	10/31/2013		10/31/2013		10/31/2013		10/31/2013	
	raw ct.	spores/m3	raw ct.	spores/m3	raw ct.	spores/m3	raw ct.	spores/m3
Ascospores	2	27			1	13		
Basidiospores					5	67		
Chaetomium								
Cladosporium								
Epicoccum								
Fusarium								
Myrothecium								
Nigrospora								
Other brown								
Other colorless								
Penicillium/Aspergillus types†	3	40						
Pithomyces								
Rusts								
Smuts, Periconia, Myxomycetes								
Stachybotrys								
Stemphylium								
Torula								
Ulocladium								
Zygomycetes								
Background debris (1-4+)††	3+		None		4+		None	
Hyphal fragments/m3	< 13		< 13		< 13		< 13	
Pollen/m3	< 13		< 13		< 13		< 13	
Skin cells (1-4+)	2+		None		1+		None	
Sample volume (liters)	75		75		75		75	
§ TOTAL SPORES/m3		67		< 13		80		< 13

Comments: A) The slide was received broken. Analysis was not possible.

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample.
† The spores of *Aspergillus* and *Penicillium* (and others such as *Acremonium*, *Paecilomyces*) are small and round with very few distinguishing characteristics. They cannot be differentiated by non-viable sampling methods. Also, some species with very small spores are easily missed, and may be undercounted.
††Background debris indicates the amount of non-biological particulate matter present on the trace (dust in the air) and the resulting visibility for the analyst. It is rated from 1+ (low) to 4+ (high). Counts from areas with 4+ background debris should be regarded as minimal counts and may be higher then reported. It is important to account for samples volumes when evaluating dust levels.

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Client: EHS-Alaska, Inc.
C/O: Mr. Martin Schwan
Re: 7052-08-Nome Mold Sampling; Mold Investigation

Date of Sampling: 10-28-2013
Date of Receipt: 10-30-2013
Date of Report: 10-31-2013

SPORE TRAP REPORT: NON-VIABLE METHODOLOGY

Location:	10: M31 Office 229		11: M32 Field Blank (Office Area 235)		12: M33 Hall 237-Center		13: M34 Office Area 243	
Comments (see below)	None		None		None		None	
Lab ID-Version‡:	5121512-1		5121513-1		5121514-1		5121515-1	
Analysis Date:	10/31/2013		10/31/2013		10/31/2013		10/31/2013	
	raw ct.	spores/m3	raw ct.	spores/m3	raw ct.	spores/m3	raw ct.	spores/m3
Ascospores	1	13			2	27	2	27
Basidiospores	4	53			4	53	1	13
Chaetomium								
Cladosporium								
Epicoccum								
Fusarium								
Myrothecium								
Nigrospora								
Other brown								
Other colorless								
Penicillium/Aspergillus types†	1	13			3	40	3	40
Pithomyces								
Rusts								
Smuts, Periconia, Myxomycetes								
Stachybotrys								
Stemphylium								
Torula								
Ulocladium								
Zygomycetes								
Background debris (1-4+)††	4+		< 1+		3+		4+	
Hyphal fragments/m3	< 13		N/A		< 13		53	
Pollen/m3	< 13		N/A		< 13		< 13	
Skin cells (1-4+)	1+		< 1+		1+		2+	
Sample volume (liters)	75		0		75		75	
§ TOTAL SPORES/m3		80		N/A		120		80

Comments:

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample.
† The spores of *Aspergillus* and *Penicillium* (and others such as *Acremonium*, *Paecilomyces*) are small and round with very few distinguishing characteristics. They cannot be differentiated by non-viable sampling methods. Also, some species with very small spores are easily missed, and may be undercounted.
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C/O: Mr. Martin Schwan
Re: 7052-08-Nome Mold Sampling; Mold Investigation

Date of Sampling: 10-28-2013
Date of Receipt: 10-30-2013
Date of Report: 10-31-2013

SPORE TRAP REPORT: NON-VIABLE METHODOLOGY

Location:	14: M35 Office Area 206		15: M36 Office Area 213 And Hall 209		16: M37 Break Room 223		17: M38 Office 204	
Comments (see below)	None		None		None		None	
Lab ID-Version‡:	5121516-1		5121517-1		5121518-1		5121519-1	
Analysis Date:	10/31/2013		10/31/2013		10/31/2013		10/31/2013	
	raw ct.	spores/m3	raw ct.	spores/m3	raw ct.	spores/m3	raw ct.	spores/m3
Ascospores	1	13	1	13	2	27	3	40
Basidiospores	7	93	5	67	2	27	4	53
Chaetomium								
Cladosporium			2	27				
Epicoccum								
Fusarium								
Myrothecium								
Nigrospora								
Other brown	1	13						
Other colorless								
Penicillium/Aspergillus types†	5	67	2	27	3	40	1	13
Pithomyces								
Rusts								
Smuts, Periconia, Myxomycetes								
Stachybotrys								
Stemphylium								
Torula								
Ulocladium								
Zygomycetes								
Background debris (1-4+)††	4+		4+		3+		3+	
Hyphal fragments/m3	< 13		13		< 13		< 13	
Pollen/m3	< 13		< 13		< 13		< 13	
Skin cells (1-4+)	1+		1+		1+		1+	
Sample volume (liters)	75		75		75		75	
§ TOTAL SPORES/m3		190		130		93		110

Comments:

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample.
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Date of Sampling: 10-28-2013
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Date of Report: 10-31-2013

SPORE TRAP REPORT: NON-VIABLE METHODOLOGY

Location:	18: M39 Office 202		19: M40 Office 133		20: M41 Outdoor-North Entrance		21: M42 Outdoor-West Entrance	
Comments (see below)	None		A		A		A	
Lab ID-Version‡:	5121520-1		5121521-1		5121522-1		5121523-1	
Analysis Date:	10/31/2013		10/31/2013		10/31/2013		10/31/2013	
	raw ct.	spores/m3	raw ct.	spores/m3	raw ct.	spores/m3	raw ct.	spores/m3
Ascospores	1	13						
Basidiospores	4	53						
Chaetomium								
Cladosporium								
Fusarium								
Myrothecium								
Nigrospora								
Other brown								
Other colorless								
Penicillium/Aspergillus types†	4	53						
Pithomyces								
Rusts								
Smuts, Periconia, Myxomycetes	1	13						
Stachybotrys								
Stemphylium								
Torula								
Ulocladium								
Zygomycetes								
Background debris (1-4+)††	3+		None		None		None	
Hyphal fragments/m3	< 13		< 13		< 13		< 13	
Pollen/m3	< 13		< 13		< 13		< 13	
Skin cells (1-4+)	1+		None		None		None	
Sample volume (liters)	75		75		75		75	
§ TOTAL SPORES/m3		130		< 13		< 13		< 13

Comments: A) The slide was received broken. Analysis was not possible.

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample.
† The spores of *Aspergillus* and *Penicillium* (and others such as *Acremonium*, *Paecilomyces*) are small and round with very few distinguishing characteristics. They cannot be differentiated by non-viable sampling methods. Also, some species with very small spores are easily missed, and may be undercounted.
††Background debris indicates the amount of non-biological particulate matter present on the trace (dust in the air) and the resulting visibility for the analyst. It is rated from 1+ (low) to 4+ (high). Counts from areas with 4+ background debris should be regarded as minimal counts and may be higher then reported. It is important to account for samples volumes when evaluating dust levels.

The analytical sensitivity is the spores/m3 divided by the raw count. The limit of detection is the analytical sensitivity multiplied by the sample volume divided by 1000.

For more information regarding analytical sensitivity, please contact QA by calling the laboratory.
‡ A "Version" indicated by -"x" after the Lab ID# with a value greater than 1 indicates a sample with amended data. The revision number is reflected by the value of "x".
§ Total Spores/m3 has been rounded to two significant figures to reflect analytical precision.

AIHA Laboratory Accreditation Programs, LLC

acknowledges that

Aerotech Laboratories, Inc

1501 West Knudsen Drive, Phoenix, AZ 85027

Laboratory ID: 102297

along with all premises from which key activities are performed, as listed above, has fulfilled the requirements of the AIHA Laboratory Accreditation Programs (AIHA-LAP), LLC accreditation to the ISO/IEC 17025:2005 international standard, *General Requirements for the Competence of Testing and Calibration Laboratories in* the following:

LABORATORY ACCREDITATION PROGRAMS

☐	**INDUSTRIAL HYGIENE**	Accreditation Expires:
☐	**ENVIRONMENTAL LEAD**	Accreditation Expires:
✓	**ENVIRONMENTAL MICROBIOLOGY**	Accreditation Expires: 03/01/2014
☐	**FOOD**	Accreditation Expires:

Specific Field(s) of Testing (FoT)/Method(s) within each Accreditation Program for which the above named laboratory maintains accreditation is outlined on the attached **Scope of Accreditation**. Continued accreditation is contingent upon successful on-going compliance with ISO/IEC 17025:2005 and AIHA-LAP, LLC requirements. This certificate is not valid without the attached **Scope of Accreditation**. Please review the AIHA-LAP, LLC website (www.aihaaccreditedlabs.org) for the most current Scope.

S. D. Allen Iske, PhD, CIH, CSP
Chairperson, Analytical Accreditation Board

Cheryl O. Morton
Managing Director, AIHA Laboratory Accreditation Programs, LLC

Revision 12: 03/29/2012

Date Issued: 07/31/2012

AIHA Laboratory Accreditation Programs, LLC

SCOPE OF ACCREDITATION

Aerotech Laboratories, Inc
1501 West Knudsen Drive, Phoenix, AZ 85027

Laboratory ID: **102297**
Issue Date: 07/31/2012

The laboratory is approved for those specific field(s) of testing/methods listed in the table below. Clients are urged to verify the laboratory's current accreditation status for the particular field(s) of testing/Methods, since these can change due to proficiency status, suspension and/or revocation. A complete listing of currently accredited Environmental Microbiology laboratories is available on the AIHA-LAP, LLC website at: http://www.aihaaccreditedlabs.org

Environmental Microbiology Laboratory Accreditation Program (EMLAP)

Initial Accreditation Date: 12/01/2001

EMLAP Category	Field of Testing (FoT)	Method	Method Description (*for internal methods only*)
Fungal	Air - Culturable	SOP 1042	Preparation of Via-cell samples for nonviable and viable fungal analysis
		SOP 1043	Preparation and Analysis of Air Samples for Culturable Fungi
	Bulk - Culturable	SOP 1040	Preparation of Bulk, Dust/Soil, Swab/Wipe and Water/Liquid Samples for Quantitative Fungal and/or Bacterial Analysis
		SOP 2584	Analysis of Dust, Swab, Water and Bulk Samples for Culturable Fungi
	Surface - Culturable	SOP 1040	Preparation of Bulk, Dust/Soil, Swab/Wipe and Water/Liquid Samples for Quantitative Fungal and/or Bacterial Analysis
		SOP 2584	Analysis of Dust, Swab, Water and Bulk Samples for Culturable Fungi
	Air - Direct Examination	SOP 1038	Preparation and Analysis of Spore Trap (Air) Samples for Fungal Spores, Other Biological and Non-Biological Particles
		SOP 1042	Preparation of Via-cell samples for nonviable and viable fungal analysis
	Bulk - Direct Examination	SOP 1039	Preparation and Analysis of Tape, Swab, Wipe, Bulk and Dust-Soil Samples for Qualitative Direct Microscopic Exam
		SOP 1041	Preparation and Analysis of Tape, Swab, Wipe, Bulk and Dust-Soil Samples for Quantitative Direct Microscopic Exam
	Surface - Direct Examination	SOP 1039	Preparation and Analysis of Tape, Swab, Wipe, Bulk and Dust-Soil Samples for Qualitative Direct Microscopic Exam

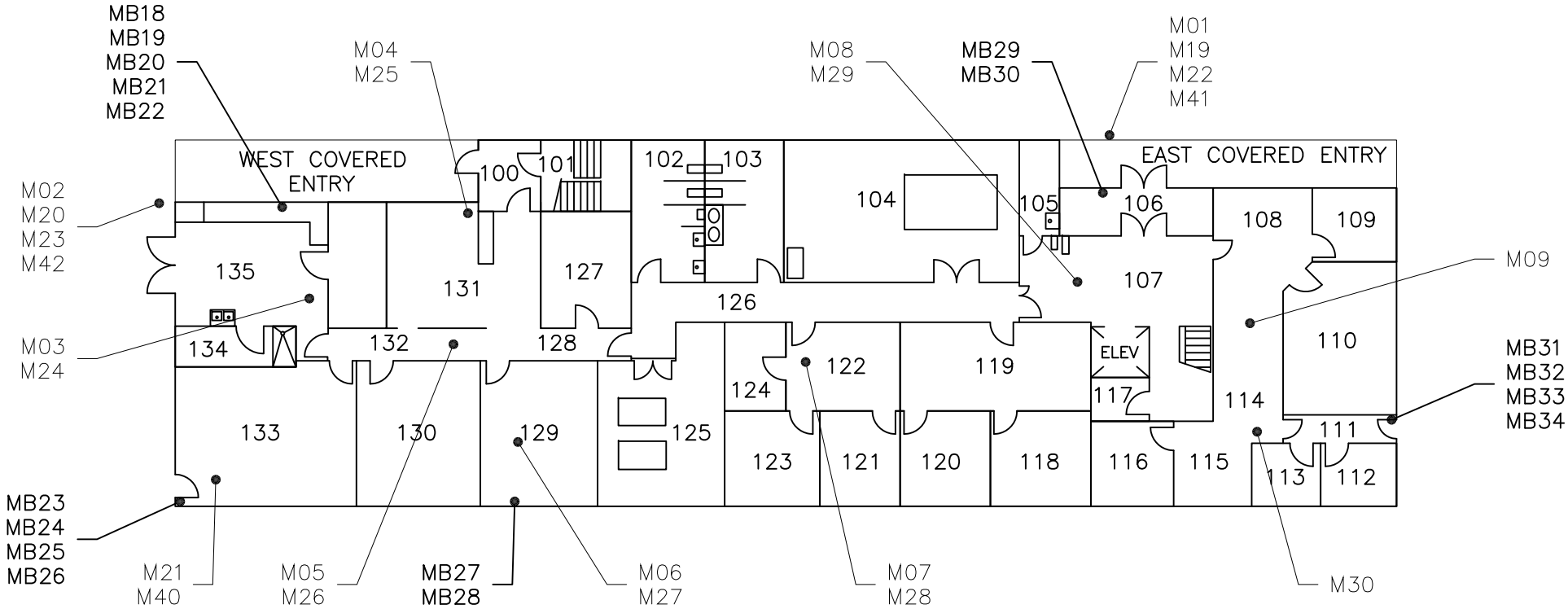
EMLAP Category	Field of Testing (FoT)	Method	Method Description (*for internal methods only*)
Fungal	Surface - Direct Examination	SOP 1041	Preparation and Analysis of Tape, Swab, Wipe, Bulk and Dust-Soil Samples for Quantitative Direct Microscopic Exam
Bacterial	Air - Culturable	SOP 1047	Bacteria, Air-Total Counts, Grain negative counts and paragraph
		SOP 1051	Enumeration and Gram Stain Identification of Aerobic Bacteria in Air
		SOP 2463	Enumeration of Thermophilic Actinomycetes in Air
	Bulk - Culturable	SOP 1040	Preparation of Bulk, Dust/Soil, Swab/Wipe and Water/Liquid Samples for Quantitative Fungal and/or Bacterial Analysis
		SOP 1050	Enumeration and Gram Stain Identification of Aerobic Bacteria and Thermophilic Actinomycetes in Contact Plates, Swab, Bulk, CarpetChek and Water Samples
	Surface - Culturable	SOP 1040	Preparation of Bulk, Dust/Soil, Swab/Wipe and Water/Liquid Samples for Quantitative Fungal and/or Bacterial Analysis
		SOP 1050	Enumeration and Gram Stain Identification of Aerobic Bacteria and Thermophilic Actinomycetes in Contact Plates, Swab, Bulk, CarpetChek and Water Samples
	Legionella	SOP 1687	Detection and Enumeration of Legionella bacteria

The laboratory participates in the following AIHA-LAP, LLC-approved proficiency testing programs**:**

- ✓ Fungal Culturable
- ✓ Bacterial Culturable
- ✓ Fungal Direct Examination

APPENDIX C

Sample and Test Location Sketches



1 / C-1 1ST FLOOR
NTS

N

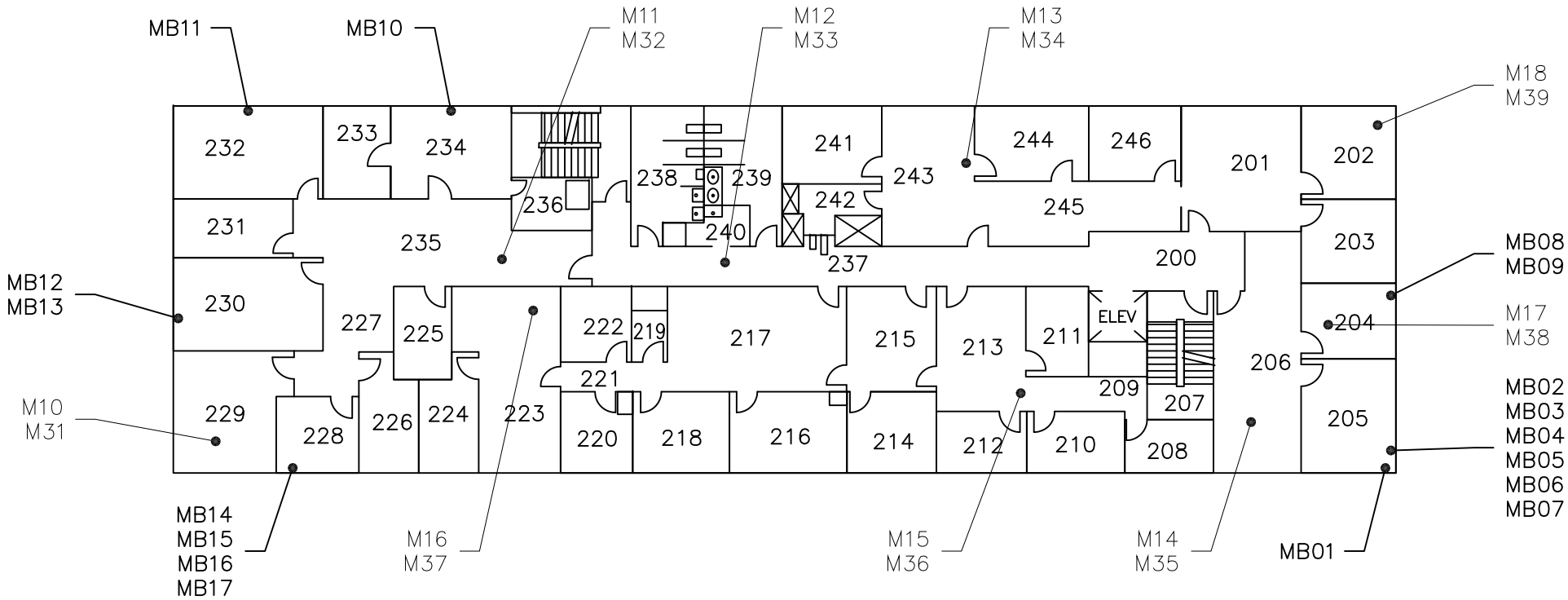
LEGEND

MXX MOLD AIR TEST LOCATION

MBXX MOLD BULK TEST LOCATION

REFER TO TESTING SUMMARY IN REPORT FOR FULL DETAILS. ALL SAMPLES HAVE NSB1310– PREFIX.

STATE OF ALASKA	STATE OFFICE BUILDING NOME, AK MOLD SAMPLE LOCATION	EHS ALASKA INCORPORATED ENGINEERING, HEALTH & SAFETY CONSULTANTS	DRAWN: CTO CHECK: RAF	DATE: 10/26/2013
			FILE #: 7052-SL3	DWG.NO: C-1



1
C-2

2ND FLOOR
NTS

N

LEGEND

MXX MOLD AIR TEST LOCATION

MBXX MOLD BULK TEST LOCATION

REFER TO TESTING SUMMARY IN REPORT FOR FULL DETAILS. ALL SAMPLES HAVE NSB1310– PREFIX.

STATE OF ALASKA	STATE OFFICE BUILDING NOME, AK MOLD SAMPLE LOCATION	EHS ALASKA INCORPORATED ENGINEERING, HEALTH & SAFETY CONSULTANTS	DRAWN: CTO CHECK: RAF	DATE: 10/26/2013
			FILE #: 7052-SL3	DWG.NO: C-2

APPENDIX D

Asbestos Air Monitoring Laboratory Results, Chain of Custody

RECEIVED
NOV 08 2013
EHS-ALASKA, INC.

EHS ALASKA INCORPORATED

EHS-Alaska, Inc.
11901 Business Blvd., Suite 208, Eagle River, AK 99577-7701
Ph (907) 694-1383 • Fax (907) 694-1382
E-mail • ehsak@ehs-alaska.com

CHAIN OF CUSTODY RECORD/AIR MONITORING FIELD SURVEY DATA Page 1 of 1

FIELD COLLECTION DATE: 10/26/13 | JOB#: 7052-08 | ANALYSIS REQUESTED: ☑ PCM ☐ TEM ☐ LEAD ☐ OTHER

PROJECT NAME: Nome State Building Mold investigat | QUANTITIES: 20

FACILITY: Nome State Building | DISPOSAL: Normal | TURNAROUND: ~~5 days~~ 24 hr

SPECIAL INSTRUCTIONS: Hold for Potential TEM Analysis | WORK AREA LOCATION: See Attached

TYPE: PCM=MCE, TEM=25 OR 37mm

LOT # 30030

COLLECTED BY (signature): Martin Schwan

PRINTED NAME: MARTIN Schwan

CERT# TBI24-11-47/20110842 AHERA#

ROTOMETER# 011

SHIPPING METHOD: Fed-Ex

Fedex 8808 8896 0

COURIER (signature) 10/30/13 DATE/TIME 11:30 am

RECEIVED OCT 31 2013

SELECTED LABORATORY

SAMPLES ACCEPTED BY: IAL - By

DATE/TIME

ANALYST'S SIGNATURE

DATE/TIME 10/31/13

COMMENTS:
Worker A = Martin Schwan
Worker B = Rick Frase

E-MAILED 11-1

11-1-13

10/31/13

SAMPLE ID	SAMPLE DESCRIPTION	PUMP#	START TIME / FLOW	STOP TIME / FLOW	AVERAGE FLOW (L/m)	VOLUME Liters	RESULT (units) f/cc
1. NSB1310 5158549 - A01	Exclusion-worker A	22	9:13 / 2.5	9:43 / 2.5	2.5	75	<0.037
2. 5158550 - A02	Personal - worker B	21	9:21 / 2.0	12:07 / 2.0	2.0	332	<.0085
3. 5158551 - A03	Inside work Area Rm	04	9:13 / 2.0	12:17 / 2.0	2.0	368	.0280
4. 5158552 - A04	outside Work Area	25	9:15 / 2.0	12:37 / 2.0	2.0	404	.0150
5. 5158553 - A05	2nd Floor - center of Hall 237	05	08:53 / 2.0	5:32 / 2.0	2.0	519	<.0054
6. 5158554 - A06	Personal - Worker A	22	9:44 / 2.0	12:17 / 2.0	2.0	308	.130
5158555 - X07	field blank						
8. 5158556 - X08	field blank						
9. 5158557 - A09	Personal - Worker A	22	2:00 / 2.0	5:28 / 2.0	2.0	416	.0720
10. 5158558 - A10	Personal - Worker B	21	2:03 / 2.0	5:31 / 2.0	2.0	416	.0210
11. 5158559 - A11	Inside work area	04	1:58 / 2.0	5:29 / 2.0	2.0	422	<.0066
12. 5158560 - A12	Outside work area	25	1:56 / 2.0	5:30 / 2.0	2.0	428	

A: AREA B: BACKGROUND E: ENVIRONMENTAL P: PERSONAL C or T: CLEARANCE(T for TEM) X: BLANK OWA: OUTSIDE WORK AREA IWA: INSIDE WORK AREA

RETURN A SIGNED COPY OF THIS FORM WITH THE FINAL REPORT TO EHS-ALASKA

RECEIVED
NOV 08 2013
EHS-ALASKA, INC.

EHS ALASKA INCORPORATED
EHS-Alaska, Inc.
11901 Business Blvd., Suite 208, Eagle River, AK 99577-7701
Ph (907) 694-1383 • Fax (907) 694-1382
E-mail • ehsak@ehs-alaska.com

CHAIN OF CUSTODY RECORD/AIR MONITORING FIELD SURVEY DATA Page 2 of 2

FIELD COLLECTION DATE: 10/27/13 | JOB#: 7052-08 | ANALYSIS REQUESTED: ☑ PCM ☐ TEM ☐ LEAD ☐ OTHER

PROJECT NAME: Nome State Building Mold Investigation | QUANTITIES: 20

FACILITY: Nome State Building | DISPOSAL: Normal | TURNAROUND: ~~5 days~~ 24 hr

SPECIAL INSTRUCTIONS: Hold for Potential TEM Analysis | WORK AREA LOCATION:

TYPE: PCM=MCE, TEM=25 OR 37mm

LOT #: 30030

COLLECTED BY (signature):

PRINTED NAME: Rick Friese

CERT#: 10084-01-05 / AHERA#: 23740-24742

ROTOMETER#: 011

SHIPPING METHOD: Fed-Ex

COURIER (signature): Fedex 7970 3308 1876 | DATE/TIME: 10/30/13 11:30 am

SELECTED LABORATORY: IATL

SAMPLES ACCEPTED BY:

DATE/TIME:

ANALYST'S SIGNATURE:

DATE/TIME:

COMMENTS: Worker A = Martin Schoten
Worker B = Rick Friese

SAMPLE ID	SAMPLE DESCRIPTION	PUMP#	START TIME / FLOW	STOP TIME / FLOW	AVERAGE FLOW (L/m)	VOLUME Liters	RESULT (units) f/cc
1. 5158561 NS8010-A013	Excursion - Worker A	22	9:32 / 2.5	10:02 / 2.5	2.5	75	<.037
2. 5158562 A14	Personal - Worker B	21	9:34 / 2.0	2:00 / 2.0	2.0	532	.030
3. 5158563 A15	1st floor Inside work area	04	9:29 / 2.0	1:57 / 2.0	2.0	536	.036
4. 5158564 A16	1st floor outside work area	25	9:28 / 2.0	1:57 / 2.0	2.0	538	<.0052
5. 5158565 A17	1st floor - center of Hall 126	05	9:27 / 2.0	2:01 / 2.0	2.0	548	<.0051
6. 5158566 X18	Field blank						
7. 5158567 X19	Field blank						
8. 5158568 X20	Personal - Worker A	22	10:03 / 2.0	1:59 / 2.0	2.0	472	0.20
9.	END						
10.							
11.							
12.							

A: AREA B: BACKGROUND E: ENVIRONMENTAL P: PERSONAL C or T: CLEARANCE(T for TEM) X: BLANK OWA: OUTSIDE WORK AREA IWA: INSIDE WORK AREA

RETURN A SIGNED COPY OF THIS FORM WITH THE FINAL REPORT TO EHS-ALASKA

03/05

IATL International Asbestos Testing Laboratories

9000 Commerce Parkway Suite B Mt. Laurel, NJ 08054
Telephone: 856-231-9449 Fax: 856-231-9818

CERTIFICATE OF ANALYSIS

RECEIVED
NOV 08 2013
EHS-ALASKA, INC.

Client: EHS Alaska Incorporated
11901 Business Blvd., Ste 208
Eagle River AK 99577-7701

Report Date: 10/31/2013
Report Number: 318087
Project: NomeStateBuilding 10-26-13
Project No.: 7052-08

PCM AIR SAMPLE ANALYSIS SUMMARY

Lab No.	Client No.	Description / Location	Volume (Liters)	Density (Fibers/mm²)	Concentration (Fibers/cc)
5158549	NSB1310-A01	Excursion-Martin Schwan,Worker A Pump #22	75	3.98	<0.0370
5158550	NSB1310-A02	Personal-Rick Friese,Worker B Pump #21	332	5.31	<0.0085
5158551	NSB1310-A03	Inside Work Area Rm Pump #04	368	27.2	0.0280
5158552	NSB1310-A04	Outside Work Area Pump #25	404	15.9	0.0150
5158553	NSB1310-A05	2nd Floor Center Of Hall 237,Pump #05	519	2.65	<0.0054
5158554	NSB1310-A06	Personal-Martin Schwan,Worker A Pump #22	308	102	0.1300
5158555	NSB1310-X07	Field Blank	0	1.33	NA
5158556	NSB1310-X08	Field Blank	0	1.33	NA
5158557	NSB1310-A09	Personal-Martin Schwan,Worker A Pump #22	416	77.6	0.0720

Accreditation: **AIHA Registry Program, LLC** **AIHA-LAP, LLC No. 100188**

This confidential report relates only to those item(s) tested and does not represent an endorsement by NIST-NVLAP, AIHA or any agency of the U.S. government

This report shall not be reproduced except in full, without written approval of the laboratory.

Analytical Method: Phase Contrast Microscopy - NIOSH 7400 Method Revision #4, Issue 2, August 15, 1994

Comments: A VOID concentration means that the sample has been overloaded with particulate matter and could not be reliably analyzed.
Method requires submittal of blanks. Reporting Limit based upon 7 f/mm². These results are not blank corrected.
IATL assumes that appropriate sampling methods were used and that the data upon which these results are based, has been accurately supplied by the client.
This confidential report relates only to those item(s) tested and does not represent an endorsement by NIST-NVLAP, AIHA or any agency of the U.S. government. Current annual Coefficient of Variation (CV) values from low to high fiber ranges are 0.30, 0.22, & 0.26 as required by NIOSH 7400.

Date Received: 10/31/2013
Date Analyzed: 10/31/2013
Analyst: B. Reich

Approved By: Frank Ehrenfeld
Frank E. Ehrenfeld, III
Laboratory Director

IATL International Asbestos Testing Laboratories

9000 Commerce Parkway Suite B Mt. Laurel, NJ 08054
Telephone: 856-231-9449 Fax: 856-231-9818

CERTIFICATE OF ANALYSIS

Client: EHS Alaska Incorporated
11901 Business Blvd., Ste 208
Eagle River AK 99577-7701

RECEIVED
NOV 08 2013
EHS-ALASKA, INC.

Report Date: 10/31/2013
Report Number: 318087
Project: NomeStateBuilding 10-26-13
Project No.: 7052-08

PCM AIR SAMPLE ANALYSIS SUMMARY

Lab No.	Client No.	Description / Location	Volume (Liters)	Density (Fibers/mm²)	Concentration (Fibers/cc)
5158558	NSB1310-A10	Personal-Rick Friese,Worker B Pump #21	416	22.5	0.0210
5158559	NSB1310-A11	Inside Work Area Pump #04	422	5.31	<0.0067
5158560	NSB1310-A12	Outside Work Area Pump #25	428	3.98	<0.0066
5158561	NSB1310-A13	Excursion-Martin Schwan,Worker A Pump #22	75	2.65	<0.0370
5158562	NSB1310-A14	Personal-Rick Friese,Worker B Pump #21	532	41.1	0.0300
5158563	NSB1310-A15	1st Floor Inside Work Area,Pump #04	536	50.4	0.0360
5158564	NSB1310-A16	1st Floor Outside Work Area,Pump #25	538	2.65	<0.0052
5158565	NSB1310-A17	1st Floor Center Of Hall 126,Pump #05	548	2.65	<0.0051
5158566	NSB1310-X18	Field Blank	0	1.33	NA

Accreditation: **AIHA Registry Program, LLC** **AIHA-LAP, LLC No. 100188**

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Comments: A VOID concentration means that the sample has been overloaded with particulate matter and could not be reliably analyzed.
Method requires submittal of blanks. Reporting Limit based upon 7 f/mm². These results are not blank corrected.
IATL assumes that appropriate sampling methods were used and that the data upon which these results are based, has been accurately supplied by the client.
This confidential report relates only to those item(s) tested and does not represent an endorsement by NIST-NVLAP, AIHA or any agency of the U.S. government. Current annual Coefficient of Variation (CV) values from low to high fiber ranges are 0.30, 0.22, & 0.26 as required by NIOSH 7400.

Date Received: 10/31/2013
Date Analyzed: 10/31/2013
Analyst: B. Reich

IATL International Asbestos Testing Laboratories

9000 Commerce Parkway Suite B Mt. Laurel, NJ 08054
Telephone: 856-231-9449 Fax: 856-231-9818

CERTIFICATE OF ANALYSIS

Client: EHS Alaska Incorporated
11901 Business Blvd., Ste 208
Eagle River AK 99577-7701

Report Date: 10/31/2013
Report Number: 318087
Project: NomeStateBuilding 10-26-13
Project No.: 7052-08

PCM AIR SAMPLE ANALYSIS SUMMARY

Lab No.	Client No.	Description / Location	Volume (Liters)	Density (Fibers/mm²)	Concentration (Fibers/cc)
5158567	NSB1310-X19	Field Blank	0	1.33	NA
5158568	NSB1310-X20	Personal-Martin Schwan,Worker A Pump #22	472	240	0.2000

Accreditation: **AIHA Registry Program, LLC** **AIHA-LAP, LLC No. 100188**

This confidential report relates only to those item(s) tested and does not represent an endorsement by NIST-NVLAP, AIHA or any agency of the U.S. government

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Analytical Method: Phase Contrast Microscopy - NIOSH 7400 Method Revision #4, Issue 2, August 15, 1994

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Method requires submittal of blanks. Reporting Limit based upon 7 f/mm². These results are not blank corrected.
IATL assumes that appropriate sampling methods were used and that the data upon which these results are based, has been accurately supplied by the client.
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Date Received: 10/31/2013
Date Analyzed: 10/31/2013
Analyst: B. Reich

APPENDIX E

Additional Information on Fungi, Mold and Pollen

ADDITIONAL INFORMATION ON FUNGI, MOLD, AND POLLENS

Fungi

Fungi include yeasts, molds, and fleshy fungi. Yeasts are unicellular organisms. Molds are multi-cellular filamentous organisms, such as mildews, rusts, and smuts. Fleshy fungi are multi-cellular, filamentous organisms that produce a thick (fleshy) reproductive body. The fleshy fungi include mushrooms, puffballs, and coral fungi. All fungi require organic compounds for energy and carbon. They obtain their nutrients from dead organic matter in soil and water.

Mold

Mold normally refers to fungi with a filamentous growth form, often giving rise to “fuzzy”, cottony, woolly, or powdery textured colonies. Molds produce spores that are poorly visible or not visible at all to the naked eye and that in many species are specialized to become airborne. According to the EPA, all molds have the potential to cause health effects. Molds produce allergens, irritants, and in some cases toxins that may cause reactions in humans. The types and severity of symptoms depend on the types of mold present, the extent of an individual's exposure, the ages of the individuals, and their existing sensitivities or allergies. Specific reactions to mold growth can include:

Allergic Reactions: Inhaling or touching mold may cause allergic reactions in sensitive individuals. Allergic reactions to mold are common and can be immediate or delayed. Symptoms include sneezing, runny nose, red eyes and skin rash.

Asthma: Molds can trigger asthma attacks in persons who are allergic (sensitized) to molds. The irritants produced by molds may also worsen asthma in non-allergic people.

Hypersensitivity Pneumonitis: This condition may develop following a short term or long term exposure to mold. The disease resembles bacterial pneumonia and is uncommon.

Irritant Effects: Mold exposure can cause irritation of the eyes, skin, nose, throat and lungs.

Opportunistic Infections: People with weakened immune systems may be more vulnerable to infections from mold.

Reproduction in mold occurs by the formation of spores. After a mold forms a spore, the spore detaches from the parent and, if viable, may germinate into a new mold. Whether culturable (spores that can colonize and are capable of active growth under adequate conditions), or non-culturable (sterile spores that are incapable of active growth), all spores are capable of producing ill effects.

Some individuals are more susceptible to fungal concentrations and types of fungi than others. On the other hand, some individuals demonstrate no adverse response to similar fungal concentrations.

In light of individual differences, there has been great reluctance by governmental, or health and safety organizations to set numerical standards or guideline values.

Pollens

Pollens are particles released from plants as they blossom. Pollens can cause similar symptoms to mold organisms, and are common allergens. They are lightweight, so a gentle breeze can carry them as far as 200 miles. Seasonal pollens permeate the air. During spring and summer, various trees and plants flower, sending millions of pollen particles into the air that cause seasonal allergies and asthma. Ragweed season occurs from late summer until the first frost. Ragweed is one of the biggest causes of hay fever, a form of allergic rhinitis. Studies indicate that an individual's sensitivity to these inhaled particles wanes with age.

SECTION 02 8233
REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING MATERIALS

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. The work requires the disturbance, demolition, removal, and disposal of the following asbestos-containing materials (ACM) from the Nome State Office Building Remodel Project as shown on the drawings and as specified herein. Bulk samples have been taken of suspect materials in this facility and the results are documented in Section 02 2600, Hazardous Materials Assessment:

1. Spray-on on fireproofing (some samples contained less than 1% asbestos; but to be treated as asbestos).
2. “Zonolite” (vermiculite) insulation behind metal panels and metal trim on building exterior.
3. Joint compound in gypsum wallboard systems on the ceilings and walls.
4. Cement asbestos board (CAB) “Glasweld” exterior siding and column covers.
5. Seam sealants on exterior CAB siding and on porcelain coated metal panels.
6. Door, window, and penetration sealants (assumed ACM).
7. Black mastic of 12” x 12” floor tile.
8. 12” x 12” floor tile.
9. Flange gaskets on piping (Assumed ACM).
10. Boiler gaskets (Assumed ACM).
11. Fire doors.
12. Exterior tarry damp-proofing (assumed ACM).
13. Remnants of asbestos-containing patching tars at roof penetrations.
14. Pink undercoatings on stainless steel sink in Room 135.

B. Quantities of ACM and hazardous materials shown on drawings are based on a comprehensive survey of the building and take-offs from scale drawings. The hazardous material survey report and quantities provided are considered a baseline for bid purposes. It is the contractor’s responsibility to remove and dispose of all ACMs affected by the project from the site in accordance with applicable regulations. The contractor shall immediately notify the owner if other ACM or additional quantities are discovered. Quantities of materials removed shall be documented on a daily basis and shall include all materials removed and locations, in the units used on the drawings. Unit pricing shall be provided in the bid for all identified hazardous material in case additional quantities are discovered.

C. Asbestos, lead and other hazardous materials are present in the building that may impact the work of all trades. Regulated air contaminates, including asbestos and lead, are assumed to be also present in settled and concealed dust in and on architectural, structural, mechanical and electrical components or systems throughout the building. All trades shall coordinate with other trades and conduct their work to prevent worker exposure or site contamination. Refer to Specification Section 02 2600, Hazardous Materials Assessment, Section 01 3545, Airborne Contaminant Control; and Division 02 specifications for specific information concerning disturbing, removing and disposing of these materials and the installation of new materials or components. This notification is provided in accordance with EPA and OSHA requirements.

D. Asbestos-containing materials may have come loose and fallen onto or into, floors, ceilings, walls, chases, wall cavities or mechanical, electrical and structural system components. The Contractor shall immediately notify the Owner if and when they

encounter worn, damaged, or deteriorated ACM as evidenced by dust or debris adjacent to ACM materials.

E. Work may be required while employees are occupying the building. Work during occupied periods involving disturbance of asbestos-containing materials inside the building shall be performed using critical barriers and negative air pressure enclosures. Access to work area from within the building shall be blocked to prevent unauthorized or inadvertent entry by employees. Access to work area shall be secured by lock when work is not ongoing.

F. All work shall comply with Environmental Protection Agency (EPA) AHERA standard, 40 CFR 763. Clearance sampling is required if the necessary disturbance of asbestos-containing material is not classified as “Small-Scale, Short-Duration” work as defined in 40 CFR 763, and is not required for work that only involves the disturbance of dusts with asbestos. Visual inspections are required for all work disturbing asbestos. Final Visual Inspections and Clearance sampling will be conducted by the Contractor’s Independent Testing Laboratory. Clearance air samples shall include a minimum of five (5) Transmission Electron Microscopy (TEM) samples from each affected space, taken using aggressive methods as outlined in Appendix A to 40 CFR 763 and analyzed in accordance with 40 CFR 763.90.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A.	Section 01 3545	Airborne Contaminant Control
B.	Section 02 2600	Hazardous Materials Assessment
C.	Section 02 2633	Biological Assessment
D.	Section 02 8333	Removal and Disposal of Materials Containing Lead
E.	Section 02 8418	Removal and Disposal of Chemical Hazards
F.	Section 02 8533	Mold Remediation

1.03 DEFINITIONS AND ABBREVIATIONS: Definitions and abbreviations are provided in the applicable publications listed in Paragraph 1.04 of this section.

1.04 APPLICABLE PUBLICATIONS: The publications listed below form a part of this specification to the extent referenced.

A. General Requirements: All work shall be performed in compliance with the International Building, Fire, Fuel Gas, Mechanical, Residential, Energy Conservation and Administrative Code; Uniform Plumbing Code; the National Electrical Code; and the publications listed in this section that are in effect at the time of the bidding of this contract.

B. Title 29 Codes of Federal Regulations (CFR), Department of Labor (USDOL)

Part 1910	General Occupational Safety and Health Standards
Part 1926	Safety and Health Regulations for Construction

C. Title 40 CFR, Environmental Protection Agency (EPA)

Part 61	National Emission Standards for Hazardous Air Pollutants
Part 311	Worker Protection
Part 763	Asbestos

D. Title 49 CFR, Department of Transportation (DOT)

Part 171	General Information, Regulations and Definitions
Part 172	Hazardous Materials Communication and Regulations
Part 173	General Requirements for Shipments and Packaging
Part 177	Carriage by Public Highway
Part 178	Specifications for Packaging
Part 382	Requirements for Drug Testing
Part 383	Commercial Driver's License Standards

E. State of Alaska Administrative Codes (AAC)

8 AAC 61	Occupational Safety and Health Standards
18 AAC 60	Solid Waste Management

F. State of Alaska Statutes

AS 18.31	Health and Safety - Asbestos
AS 45.50.477	Titles Relating to Industrial Hygiene

G. Public Law 101-637
Asbestos School Hazard Abatement Reauthorization Act

H. Federal Standards

313D	Material Safety Data Sheets

I. American National Standard Institute (ANSI)

Z9.2	Local Exhaust Systems
Z87.1	Eye and Face Protection
Z88.2	Practices for Respiratory Protection

J. American Society for Testing and Materials (ASTM)

D-4397	Polyethylene Sheeting

K. International Code Institute
International Building (IBC), Fire, Fuel Gas, Mechanical, Residential, Energy Conservation and Administrative Codes Current Standards

L. National Fire Protection Association (NFPA)

NFPA 701	Fire Tests for Flame Resistant Textiles and Films

M. National Institute of Occupational Safety and Health (NIOSH)
Manual of Analytical Methods, Current Edition

N. Underwriters Laboratories (UL)

UL 586	High-Efficiency, Particulate, Air (HEPA) Filter Units

1.05 QUALITY ASSURANCE

A. On-site Observation:

1. The safety and protection of the Contractor's employees, sub-contractor's employees, Owner's employees, the facility, and the public is the sole responsibility of the Contractor.
2. The Owner, the Owner's Representative or representatives of State or Federal agencies may make unannounced visits to the site during the work. The contractor shall make available two complete sets of clean, protective clothing for such visitor use. If the work requires the use of PAPR or Supplied Air Respirators, the contractor shall provide respirators to the visitor to ensure

compatibility with fresh batteries or supplied air system. It is the visitor's responsibility to ensure medical qualification, training, and current "fit test" prior to using any respirator provided by the Contractor.

3. If the Owner or agency visitor determines that practices are in violation of applicable regulations, they will immediately notify the Contractor that operations must cease until corrective action is taken. Such notification will be followed by formal confirmation.
4. The Contractor shall stop work after receiving such notification. The work may not be restarted until the Contractor receives written authorization from the Owner.
5. All costs resulting from such a stop work order shall be borne by the Contractor and shall not be a basis for an increase in the contract amount or an extension of time.

B. Air Monitoring: Air monitoring during the work shall be performed as follows:

1. The Contractor shall hire Independent Testing Laboratories to collect and evaluate all air samples that are the responsibility of the Contractor. The Contractor shall direct its laboratories, in writing, to release air monitoring data, and all other pertinent data and records, to the Owner. A copy of this written direction shall be submitted to the Owner along with the information required by Paragraph 1.13 of this Specification.
2. The Contractor shall be responsible for monitoring its employees for potential exposure to airborne asbestos fibers as required by this specification and all applicable regulations.
3. The Contractor shall be responsible for work area monitoring and environmental monitoring outside the work area as required by this specification.
4. The Owner may perform air monitoring inside the building, inside the work areas, and on the Contractor's employees while asbestos work is underway and at any time during the work.
5. Final inspection and clearance air monitoring shall be conducted by the Contractor's Independent Testing Laboratory. The Independent Testing Laboratory may not be hired by the Abatement Subcontractor to perform final visual inspections and clearance air monitoring.
6. The Contractor shall have its Independent Testing Laboratories archive all air samples until the successful completion of the project.

C. Additional Sampling of Suspect Materials:

1. The Contractor and all Subcontractors shall be vigilant during demolition and construction in the event additional suspect asbestos or hazardous materials are encountered. If suspect asbestos or hazardous materials not previously identified are encountered, the contractor shall stop work that may be affected by this material and immediately notify the Owner. The Owner or the Owner's Representative will provide recommendations and additional testing if necessary.
2. The Contractor and all Subcontractors shall notify the Owner prior to any bulk sampling of suspect asbestos-containing material or other hazardous materials to allow the Owner or Owner's Representative to be present during such sampling.

1.06 PROTECTION OF EXISTING WORK TO REMAIN: Perform asbestos removal in the project work areas without contamination of adjacent work or the facility.

1.07 MEDICAL REQUIREMENTS

A. Institute and maintain a medical surveillance program for employees in accordance with 29 CFR 1926.1101 and 29 CFR 1910.134.

B. Institute and maintain a random drug testing program, as required by 49 CFR 382, for all drivers of vehicles transporting asbestos or hazardous materials.

1.08 TRAINING: Employ only workers who are trained and certified as required by 29 CFR 1910, 29 CFR 1926, 40 CFR 763, and 49 CFR 383 to remove, encapsulate, barricade, transport, or dispose of asbestos.

1.09 PERMITS AND NOTIFICATIONS: Secure necessary permits for asbestos removal, hauling, and disposal and provide timely notification as required by federal, state, and local authorities.

1.10 SAFETY AND ENVIRONMENTAL COMPLIANCE: Comply with laws, ordinances, rules, and regulations of federal, state, and local authorities regarding handling, storing, transporting, and disposing of hazardous materials and all other construction activities.

1.11 RESPIRATOR PROGRAM: Establish a respirator program as required by ANSI Z88.2 and 29 CFR 1910.134.

1.12 HAZARD COMMUNICATION PROGRAM: Implement a hazard communication program in accordance with 29 CFR 1910.1200.

1.13 SUBMITTALS

A. The Contractor shall submit the following documentation to the Owner for review, approval or rejection. Work shall not begin until submittals are approved.
1. Shop drawings.
2. Work plan.
3. Liability insurance policy and performance bond.
4. Schedule.
5. Testing laboratory and laboratory personnel.
6. Disposal site designations and disposal authorizations.
7. Waste transporter designation.
8. Notifications and certifications.
9. “Competent Person” designation and experience.
10. Request for substitutions.

B. Shop drawings shall show:
1. Boundaries of each regulated work area.
2. Location and construction of decontamination areas.
3. Location of temporary site storage facilities.
4. Location of air monitoring stations, both in and outside of the work area.
5. Emergency egress route(s).
6. Location of negative pressure exhaust systems, if required.
7. Preliminary design of permanent barriers to enclose inaccessible asbestos-containing fireproofing.

C. The work plan shall include procedures for:
1. Work area setup and protection.
2. Worker protection and decontamination.
3. Initial exposure assessment procedures.
4. Asbestos removal procedures.
5. Waste load-out, transport, and disposal procedures.
6. Air monitoring procedures.
   a. Air monitoring procedures shall include the number of daily samples and the target volumes of each type of sample.
   b. Clearance air monitoring procedures and protocols for each work area.

7. Determination by the Certified Project Designer of the estimated quantities of ACM and PACM to be removed, and determination of clearance requirements for each different type or phase of work.
8. Emergency procedures.
9. The Work Plan shall be prepared, signed and dated by an Environmental Protection Agency (EPA) Certified Project Designer.
10. Submit proposed methods to install a sealed physical barrier to cover remaining remnants of fireproofing that are in inaccessible locations and cannot be removed.

D. Insurance Policy and Bond: Submit copies of the Contractor's or Subcontractor's insurance policy and performance bond. Submittal requirement is only to ensure that the insurance certificate(s) show specific coverage for the potentially hazardous materials being handled by this project. The insurance and bond amounts and certificate holder requirements are addressed in other portions of the contract documents and are not covered as part of this submittal requirement.

E. Schedule: Submit construction schedule by work area.

F. Independent Testing Laboratories and Laboratory Personnel: Submit the name, location, and phone number of proposed independent testing laboratories, and the names and certifications of the industrial hygiene technicians. Include the laboratory's accreditation. Not all laboratories will require all accreditations.
1. The Independent Testing Laboratories shall be acceptable to Owner.
2. The laboratories shall be proficient in the National Institute of Occupational Safety and Health (NIOSH) Proficiency in Analytical Testing (PAT) program and shall be accredited by the National Institute of Science and Technology (NIST) under their National Voluntary Laboratory Accreditation Program (NVLAP) for bulk asbestos analysis and airborne asbestos fibers as appropriate. NVLAP accreditation for bulk asbestos analysis may be waived if the microscopists are listed in the American Industrial Hygiene Association (AIHA) Asbestos Analyst Registry (AAR).
3. Provide a current list of their microscopists who have participated in the latest PAT and NVLAP programs and provide the names of microscopists and evidence that they have completed the NIOSH 582 course or equivalent. Provide latest AAR report of performance for microscopists.
4. Provide name(s) and resume(s) of proposed on-site industrial hygiene technician(s) showing academic degrees and Alaska Abatement Certificate(s).

G. Disposal Site: Submit the name and location of the proposed Alaska Department of Environmental Conservation/ U.S. Environmental Protection Agency (DEC/EPA) permitted disposal site. Submit authorization to dispose of asbestos waste by the proposed disposal site operator.

H. Waste Transporter: Submit the name and address of the proposed waste transporter.

I. Representations: Submit a signed statement by the Contractor that records of employees' work assignments, certifications, respirator fit tests, and medical records are accurate, up-to-date, and available for inspection.

J. Notifications and Certificates:
1. Submit a copy of the written "Notification of Demolition and Renovation" to the Environmental Protection Agency. (If required by NESHAP).
2. Submit a State of Alaska Department of Labor (ADOL) approved copy of the written ADOL notification of proposed workers.
3. Submit a copy of Project Designer's current certification.

K. Competent Person: Submit the name and certifications of the Contractor's proposed Competent Person and a list of his/her previous projects. Certify by signed statement that the Competent Person has the knowledge and training to supervise the work in compliance with the publications listed in Paragraph 1.04 above.

L. Substitutions: Submit requests for substitutions of materials, equipment and methods.

M. Updated Project Information: Submit changes to the submitted project information at least 24 hours prior to the effective time of change for the following:
1. Updated schedules.
2. Change in Competent Person.
3. ADOL approval for additional workers.
4. Changes to work plan.
5. Revisions to the EPA notification.
6. Final proposed design of permanent barriers to enclose inaccessible asbestos-containing fireproofing.

1.14 TEST REPORTS: Contractor shall submit periodic test reports, daily logs, monitoring results as specified herein Submit two (2) copies of the following information within twenty-four (24) hours after the end of a shift:

A. Initial Exposure Assessment(s): Submit the results of the Contractor's initial exposure assessment(s).

B. Daily Air Monitoring: Submit daily, all results of Contractor's air monitoring (submit no later than 24 hours after the end of the shift). Submittal shall consist of negative air pressure recordings, visual inspection report, field data sheets, and the analytical laboratory's results.

C. Project Daily Logs: Submit the previous day's Daily Logs. Logs shall include regulated area sign-in sheets and list of asbestos-containing materials removed including quantities and locations of those materials, in the units used on the drawings. Claims for additional quantities will not be addressed unless daily quantities are submitted.

D. Clearance Air Monitoring: Submit draft results of Contractor's clearance air monitoring for each work area for Owner's review and approval prior to releasing the work area to unprotected workers. FAX or electronic submittals are acceptable. Submittal shall include the following:
1. A signed and dated copy of the final visual inspection report (completed prior to clearance air monitoring) certifying that all dust and debris have been removed from the work area and that all ACM to be removed as required by the contract, were removed.
2. Documentation that clearance air sample collection complied with 40 CFR 763, contract specifications and the approved work plan.
3. Drawings of the work area with sampling locations clearly marked. Work area drawings shall be clearly identified as to their location within the facility.
4. Field data sheets for sampling including: sample locations, calibration device serial number, initial and final pump calibration readings, pump time on and off, initial and final sampling flow rate, pump type and serial number, and sample cassette identification.
5. Laboratory results, signed and dated by the analyst.
6. Data sheets and visual inspection sheets shall be signed and dated by the Industrial Hygiene Technician performing the work.

1.15 PROJECT COMPLIANCE DOCUMENTS: Prepare and submit the following records of compliance with hazardous materials regulations following each work area clearance. Submittals

may contain segregated submittals for more than one (1) work area. Submittal shall be received by Owner within four (4) weeks following work area clearance. Compliance documents shall be signed and dated and shall include as a minimum:

A. Waste transport records (40 CFR 61, Figure 4).

B. Disposal site receipts.

C. Contractor's "Start" and Finish" dates for the work area(s).

D. Daily logs, including regulated area sign in sheets, materials summary, etc (if not previously submitted).

E. Final work area inspection report(s) and inspector certifications (if not previously submitted).

F. Final, signed, clean copies of all air sampling field data sheets, location drawings, and air monitoring log, including all clearance data.

G. Final, signed, clear, legible copies of all analytical laboratory air monitoring test results, including all clearance data, and current laboratory certifications (if changed from previously submitted).

H. Copies of Asbestos Worker Training certificates for workers performing work on this project and all approved Alaska DOL notifications for those workers, and any revisions to the EPA notification(s).

1.16 SANITARY FACILITIES: Provide adequate toilet and hygiene facilities.

1.17 MATERIAL STORAGE: Store all materials subject to damage off the ground and secure from damage, weather, or vandalism.

1.18 ON-SITE DOCUMENTATION: The Contractor shall maintain on the job site, at a location approved by the owner, copies of the following data for safety procedures, equipment, and supplies used for the work.

A. Equipment: Show the model, style, capacity and the operation and maintenance procedures for the following, as applicable:
   1. High-Efficiency, Particulate, Air (HEPA) Filtration units.
   2. HEPA Vacuum cleaners.
   3. Pressure differential recording equipment.
   4. Heat stress monitoring equipment.

B. Material Safety Data Sheets (MSDS): Maintain on site, Material Safety Data Sheets for each chemical and other material proposed to be used.

C. Respiratory Protection Plan: The Contractor's and/or Subcontractor's written respirator program.

PART 2 - PRODUCTS

2.01 PERSONAL PROTECTIVE EQUIPMENT: Provide personal protective clothing as approved and selected by the IH.

A. Respirators: Provide personally issued and marked respirators approved by the National Institute of Occupational Safety and Health (NIOSH). Provide sufficient replacements for respirators with disposable canisters. Use respirators equipped with dual cartridges whenever both asbestos hazards and other respiratory hazards exist in the work area.

B. Provide filter cartridges approved for each airborne contaminant which may be present. NIOSH approved filter cartridges may be used. At no time shall the permissible exposure limit (PEL) for the contaminant exceed the PEL listed in 8 AAC 61.1100.

C. Whole Body Protection: Provide approved disposable fire retardant, full body coveralls and hoods fabricated from nonwoven fabric, gloves, eye protection, and hard-hats, and other protective clothing as required to meet applicable safety regulations to personnel potentially exposed to asbestos above the permissible exposure limits (PELs). Wear this protection properly. Full facepiece respirators shall meet the requirements of ANSI Z87.1.

D. Provide protective personal equipment and clothing at no cost to the workers.

2.02 DECONTAMINATION UNIT

A. Provide a temporary three-stage decontamination unit, attached in a leak-tight manner to each negative pressure work area. Decontamination units shall consist of a clean room equipped with separate lockers for each worker, a shower room, and an equipment locker room equipped with separate lockers for each worker.

B. Shower specifications: Locate flow and temperature controls within the shower where adjustable by the user. Hot water service may be secured from the building hot water system if available, but only with back-flow protection installed by the Contractor at the point of connection, and with prior notification and approval by the Owner. Should sufficient hot water be unavailable, the Contractor shall provide a minimum 40-gallon electric hot water heater with a minimum recovery rate of 20 gallons per minute. Water from the shower room shall not be allowed to wet the floor in the clean room.

2.03 WASTE WATER FILTERS: Provide Water Filtration Units with filters of adequate capacity to treat decontamination water and shower flows. Water filtration unit effluent shall contain less than 7,000,000 asbestos fibers per liter prior to discharge to sanitary sewer or storm drains.

2.04 DANGER SIGNS AND TAPE: Post danger signs and tape signs to demarcate areas where asbestos waste is temporarily stored, and, in areas not accessible to the public, where asbestos-containing materials are left in place. Signs and labels shall be in accordance with applicable regulations and codes. The signs posted at work area entrances, exits, decontamination areas, emergency egress, and waste disposal areas shall comply with 29 CFR 1926.1101 and the International Fire Code.

2.05 WARNING LABELS: Affix warning labels to all components or containers containing asbestos wastes. Conform labeling to 29 CFR 1926.1101 and 49 CFR 172.

2.06 HEPA FILTRATION UNITS: (if required) shall conform to ANSI Z9.2, and HEPA filters shall be UL-586 labeled.

2.07 PRESSURE DIFFERENTIAL MONITORING EQUIPMENT: Provide continuous monitoring of the pressure differential with an automatic recording instrument for each negative pressure enclosure. Locate the instrument in a clean area where personnel have access to it without respiratory protection. The instrument shall be fitted with an alarm should the negative pressure drop below -0.02 inches of water column relative to the air outside containment.

2.08 CHEMICALS

A. Adhesives: Adhesives shall be capable of sealing joints of adjacent sheets of polyethylene to finished or unfinished surfaces and of adhering under both dry and wet conditions.

B. Mastic Removal Solvents: Mastic removal solvents shall not contain halogenated compounds or compounds with flashpoints less than 60° C (140° F). Solvents shall be compatible with replacement materials.

C. Sealants and Encapsulants: Penetrating and bridging encapsulants for asbestos applications. Tint “Lock-Down” encapsulants used in non-finished areas for identification in a color that will not obscure residual asbestos. Encapsulants shall be compatible with replacement materials.

D. Surfactant: Use a surfactant specifically designed to effectively wet asbestos. Mix and apply the surfactant as recommended by the manufacturer.

2.09 MATERIALS

A. Disposal Containers: Use disposal containers to receive, retain, and dispose of asbestos-containing or contaminated materials. Label leak tight containers in accordance with the applicable regulations. Non-leak tight containers are not acceptable. Plastic bags shall be a minimum 6-mil polyethylene, pre-printed with approved warning labels. Plastic wrap shall be 6-mil polyethylene sheets, securely wrapped and taped. Disposal containers shall be labeled with “ASBESTOS NA 2212,” Contractor’s name and location, and a Class 9 label.

B. Glove Bags: The glove bags shall be a minimum of 6-mil polyethylene or polyvinylchloride plastic, and specially designed for removal of asbestos-containing materials, with two inward projecting long sleeves and rubber gloves, one inward projecting water wand sleeve, an internal tool pouch, and an attached, labeled receptacle for asbestos waste.

C. Plastic Sheet: A minimum 6-mil thick flame resistant polyethylene (in accordance with NFPA 701) shall be used unless otherwise specified.

D. Tape: Tape shall be capable of sealing joints of adjacent sheets of polyethylene, for attachment of polyethylene sheets to finished or unfinished surfaces and of adhering under both dry and wet conditions.

2.10 OTHER MATERIALS: The Contractor shall provide standard commercial quality of all other materials as required to prepare and complete the work.

2.11 TOOLS AND EQUIPMENT

A. The Contractor shall provide tools and equipment as required to prepare and complete the work. Tools and equipment shall meet all applicable safety regulations.

B. Transportation equipment shall be suitable for loading, temporary storage, transit, and unloading of contaminated waste without exposure to persons or property. All trucks or vans used to transport asbestos shall be enclosed and all containers sealed leaktight. Truck drivers shall have a commercial driver's license with hazardous material endorsement.

PART 3 - EXECUTION

3.01 WORK AREAS

A. Regulated Work Areas: Establish regulated work areas in compliance with 29 CFR 1926.1101.

B. Decontamination Area: Install decontamination areas in compliance with 29 CFR 1926.1101. Decontamination area shall meet fire-exiting requirements of the International Fire Code. Showers shall be provided with hot water and water filtration units.

C. Negative Pressure Enclosure System: Construct Negative Pressure Enclosure Systems as required by 29 CFR 1926.1101, these specifications, and approved work plan. Signage shall conform to the International Fire Code and 29 CFR 1926.1101. Exhausts from HEPA Filtration Units shall terminate outside of the building.

D. Notify applicable Fire Marshal as required by the International Fire Code.

3.02 PERSONNEL PROTECTION PROCEDURES

A. Contractor's Competent Person shall strictly enforce personal protection procedures as required by the approved work plan and all applicable regulations.

B. Post the decontamination, safety, and work procedures to be followed by workers.

C. Provide continuous on-site supervision by the approved Competent Person.

D. Maintain a daily log of all workers and visitors entering regulated work areas. Log shall contain the name of each individual, his or her organization, accurate time of entering and leaving, and purpose of visit.

3.03 ASBESTOS REMOVAL PROCEDURES: Remove asbestos in accordance with the Contractor's Approved Work Plan, applicable regulations and this specification. The Owner shall be notified 24-hours in advance of any asbestos disturbance taking place outside of a Negative Pressure Enclosure System.

3.04 AIR MONITORING

A. Perform personal, work area, and environmental monitoring for airborne asbestos fibers by industrial hygiene technicians who are employees of (one of) the Contractor's Independent Testing Laboratories.

B. Conduct air monitoring in accordance with 29 CFR 1926.1101, current EPA guidance, and as specified herein. Calibrate all sampling pumps on-site with a calibrated transfer standard before and after each sample. Built-in rotameters on pumps are not acceptable for calibration. Additional samples beyond the minimum numbers shown below may be necessary if samples are overloaded or require shorter sampling periods to achieve

readable samples, due to size of the work force, or due to more than one 8-hour work shifts.

C. Conduct daily work area and environmental air monitoring per shift as follows:
1. Three (3) air samples within the work area.
2. One (1) air sample located outside the entrance to the work area.
3. One (1) air sample located at the exhaust(s) of the HEPA filtration unit(s) (if more than one unit is used, the sampling may be rotated between units, however, each unit must be sampled at least once every three days).
4. Three (3) air samples located in adjacent occupied areas.
5. Two (2) waste load-out samples for the full duration of the operation, one taken inside the wash-down station and one taken on the clean side of the wash-down station, in addition to the daily work area and environmental samples. (No samples are necessary if no load-out operation is performed.).

D. Clearance air monitoring shall be conducted by the Contractor's Independent Testing Laboratory subcontractor. The Independent Testing Laboratory may not be hired by the Abatement Subcontractor to perform visual inspections and clearance air monitoring. Owner approval is required before a work area is released to unprotected workers. The Contractor is responsible for all costs associated with clearance and scheduling of visual inspection and clearance air monitoring. The maximum acceptable level of airborne asbestos fibers for work area clearance is as published in 40 CFR 763 for TEM analysis. A minimum of five aggressive clearance samples are required for each work area, regardless of the type of analysis. TEM analysis shall be used unless PCM analysis is approved. PCM analysis (NIOSH Method 7400) may be performed if allowed by 40 CFR 763 and with prior approval by the Owner or Owner's representative. The Contractor has the option, at its expense and at no cost to the Owner, of re-cleaning the work area and repeating the clearance air monitoring procedures or of having failed phase contrast microscopy (PCM) sample media sent to his/her NVLAP accredited laboratory for TEM analysis by NIOSH Method 7402.

E. Conduct personal air monitoring in accordance with 29 CFR 1926.1101 and as specified herein.
1. Take personnel samples (excluding excursion samples) at least twice per eight-hour work shift at the rate of one sample for every six people performing that task in the same work area. Persons performing separate tasks or in separate work areas shall be sampled separately.
2. Collect and analyze excursion samples as required by 29 CFR 1926.1101.
3. Continuously monitor all workers disturbing asbestos outside of a Negative-Pressure Enclosure System if that work is conducted indoors.

F. Daily personnel monitoring may be discontinued only after the Contractor's Independent Testing Laboratory certifies in writing that a Negative Exposure Assessment has been obtained and the Owner has reviewed and approved the negative exposure assessment data.

G. Submit air monitoring results to the Owner as specified in Paragraphs 1.14 and 1.15.

3.05 DISPOSAL

A. Dispose of asbestos wastes in an EPA/DEC permitted asbestos landfill.

B. Comply with current waste disposal, handling, labeling, storage, and transportation requirements of the waste disposal facility, U.S. Department of Transportation, and EPA regulations.

C. Workers handling waste shall wear protective clothing and canister type respirators.

D. Drivers of the waste transport vehicles need not wear respirators while enroute.

E. Workers shall wear respirators when handling asbestos material at the disposal site.

3.06 CLEANING OF WORK AREA

A. Remove all asbestos material and debris upon completion of asbestos repair or removal within a work area. Wet clean or HEPA vacuum all surfaces within the work area.

B. Notify the Owner and the Independent Testing Laboratory that asbestos work has been completed and the work area is ready for visual inspection. Include in the visual inspection report a statement that all asbestos in the work area has been removed, repaired and/or encapsulated as required by the contract, and that all debris has been removed.

C. All required demolition (ACM and non-ACM) shall be completed in each work area prior to clearance air monitoring. Exceptions may be made with prior approval of the Owner.

D. A lockdown encapsulant shall be applied to all surfaces within the abatement areas prior to performing clearance air monitoring.

3.07 CLEARANCE AIR MONITORING

A. The Contractor and its Independent Testing Laboratory shall conduct and document a visual inspection to verify that all asbestos in the work area has been removed, repaired and/or encapsulated as required by the contract, and that all debris has been removed.

B. Final clearance air monitoring tests shall not be performed until all areas and materials within the work area are fully clean and dry.

C. Final clearance air monitoring shall be conducted by the Contractor's Independent Testing Laboratory in accordance with all applicable regulations and the Contractor's approved work plan after passing the visual inspection. The clearance criteria shall include a minimum of five clearance samples using "aggressive methods" collected and analyzed in accordance with 40 CFR 763. TEM analysis is required, unless PCM analysis is specifically pre-approved by the Owner as part of the work plan submittal.

D. If the final clearance air monitoring results show that the work area has failed to meet the clearance criteria, the Independent Testing Laboratory shall notify the Owner and the Contractor. The Contractor shall reclean the work area and request the Independent Testing Laboratory to conduct a follow-up inspection to be followed by another set of clearance air monitoring samples. All work specified in this paragraph shall be done at no additional expense to the Owner.

E. If the clearance air monitoring results meet the clearance criteria of 40 CFR 763 and the specifications for the work and the Owner has reviewed and accepted the clearance results as required by 1.14 D, then the HEPA filtration units may be deactivated (if applicable) and all seals, barriers, barricades, and decontamination areas shall be dismantled and removed and the work area released to unprotected workers.

F. Submit the final work area inspection report, clearance air monitoring field data sheets and the laboratory air monitoring report to the Owner as specified in Paragraph 1.15.

3.08 SUBSTANTIAL COMPLETION

A. After the work area barriers and temporary construction and equipment have been removed, the Contractor shall inspect the work area to verify that no asbestos debris, contaminated water, or other residue remains. Any remaining residue shall be cleaned up using HEPA vacuum cleaners and wet wiping methods.

B. The Contractor shall certify that the work area has been cleaned of all asbestos in compliance with the contract, and that there is no unrepaired damage to walls, ceilings, doors, surfaces, equipment or finishes other than that called for by the scope of work.

C. Costs of restoration of damaged finishes shall be borne by the Contractor.

END OF SECTION

SECTION 02 8333
REMOVAL AND DISPOSAL OF MATERIALS CONTAINING LEAD

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. The work may require the disturbance (including cleanup of existing loose paint), demolition, or removal, and disposal of lead painted and/or lead-containing materials related to the Nome State Office Building Remodel Project as shown on the drawings and as specified herein. Items to be disturbed may include, but are not limited to:
1. Painted interior and exterior surfaces.
2. Painted windows, doors and frames.
3. Painted mechanical and electrical equipment.
4. Lead-containing dust in and on architectural, structural, mechanical, and electrical components.
5. Lead-acid batteries for exit and emergency lights, and other equipment.
6. Lead caulking in bell and spigot pipe joints.
7. Lead in pipe solder at copper pipe fittings.
8. Painted structural and miscellaneous steel.

B. In addition to the above materials, the following materials are located in other areas of the building, and may require disturbance for auxiliary support, such as electrical and mechanical equipment and installation of equipment. Not all lead-containing materials are to be removed from these areas, only that required to complete the project work need be removed:
1. Lead in glazing of ceramic plumbing fixtures.

C. This building was constructed prior to 1978 but is not regulated by 40 CFR 745.

D. The work includes all air monitoring, dust sampling, waste testing and disposal as specified herein. Materials listed are not necessarily hazardous waste or hazardous to handle. Lead-containing paints or materials identified for demolition and disposal shall be tested by the Toxicity Characteristics Leaching Procedure (TCLP) to determine if they are hazardous waste prior to disposal. Metal waste shall be recycled where practical.

E. Asbestos, lead and other hazardous materials are present in the building that may impact the work of all trades. Regulated air contaminates, including asbestos and lead, are assumed to be also present in settled and concealed dust in and on architectural, structural, mechanical and electrical components or systems throughout the building. All trades shall coordinate with other trades and conduct their work to prevent worker exposure or site contamination. Refer to Specification Section 02 2600, Hazardous Materials Assessment, Section 01 3545, Airborne Contaminant Control; and Division 02 specifications for specific information concerning disturbing, removing and disposing of these materials and the installation of new materials or components. This notification is provided in accordance with EPA and OSHA requirements.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 3545 Airborne Contaminant Control

B. Section 02 2600 Hazardous Materials Assessment

C. Section 02 2633 Biological Assessment

D. Section 02 8233 Removal and Disposal of Asbestos Containing Materials

E. Section 02 8418 Removal and Disposal of Chemical Hazards

F. Section 02 8533 Mold Remediation

1.03 DEFINITIONS AND ABBREVIATIONS: Definitions and abbreviations are provided in the applicable publications listed in Paragraph 1.04 of this section.

1.04 APPLICABLE PUBLICATIONS: The publications listed below form a part of this specification to the extent referenced.

A. General Requirements: All work shall be performed in compliance with the International Building (IBC), Fire, Fuel Gas, Mechanical, Residential, Energy Conservation and Administrative Code; Uniform Plumbing Code; the National Electrical Code; and the publications listed in this section that are in effect at the time of the bidding of this contract.

B. Title 29 Code of Federal Regulations (CFR), Department of Labor (USDOL)
Part 1910 General Occupational Safety and Health Standards
Part 1926 Safety and Health Regulations for Construction

C. Title 40 CFR, Environmental Protection Agency (EPA)
Part 260 Hazardous Waste Management System: General
Part 261 Identification and Listing of Hazardous Wastes
Part 262 Standards Applicable to Generators of Hazardous Waste
Part 263 Standards Applicable to Transporters of Hazardous Waste
Part 270 Hazardous Waste Permit Program
Part 273 Standards for Universal Waste Management
Part 311 Worker Protection
Part 745 Lead Based Paint Poisoning Prevention in Certain Residential Structures

D. Title 49 CFR, Department of Transportation (DOT)
Part 171 General Information, Regulations and Definitions
Part 172 Hazardous Materials Communication and Regulations
Part 173 General Requirements for Shipments and Packaging
Part 176 Carriage by Vessel
Part 177 Carriage by Public Highway
Part 178 Specifications for Packaging
Part 382 Requirements for Drug Testing
Part 383 Commercial Driver's License Standards

E. Alaska Administrative Codes (AAC)
8 AAC 61 Occupational Safety and Health Standards
18 AAC 60 Solid Waste Management
18 AAC 62 Hazardous Waste Management
18 AAC 70 Water Quality Standards
18 AAC 75 Oil and Hazardous Substances Pollution Control

F. Alaska Statues (AS)
AS 45.50.477 Titles Relating to Industrial Hygiene

G. Municipality of Anchorage
AMC 26.50.060 Specific Discharge Limitations

H. Federal Standards
313D Material Safety Data Sheets

I. American National Standards Institute (ANSI)
Z9.2 Local Exhaust Systems
Z87.1 Eye and Face Protection
Z88.2 Practices for Respiratory Protection

J. American Society For Testing and Materials (ASTM)
D 4397 Polyethylene Sheeting
E 1728 Standard Practice for Collection of Settled Dust Samples Using Wipe Sampling Methods for Subsequent Lead Determination
E 1792 Specification for Wipe Sampling Materials for Lead in Surface Dust

K. International Code Institute
International Building (IBC), Fire, Fuel Gas, Mechanical, Residential, Energy Conservation and Administrative Code Current Standards

L. National Fire Protection Association (NFPA)
NFPA 701 Fire Tests for Flame Resistant Textiles and Films

M. National Institute of Occupational Safety and Health (NIOSH)
Manual of Analytical Methods, Current Edition

N. Underwriters Laboratories (UL)
UL 586 High-Efficiency, Particulate, Air (HEPA) Filter Units

1.05 QUALITY ASSURANCE

A. On-site Observation:
1. The safety and protection of the Contractor's employees, Subcontractor's employees, Owner's employees, the facility, and the public is the sole responsibility of the Contractor.
2. The Owner, the Owner's Representative, or representatives of State or Federal agencies may make unannounced visits to the site during the work. The Contractor shall make available two complete sets of clean, protective clothing for such visitor use. If the work requires the use of PAPR or Supplied Air Respirators, the contractor shall provide respirators to the visitor to ensure compatibility with fresh batteries or supplied air system. It is the visitor's responsibility to ensure medical qualification, training, and current "fit test" prior to using any respirator provided by the Contractor.
3. If the Owner or agency visitor determines that practices are in violation of applicable regulations, they will immediately notify the Contractor that operations must cease until corrective action is taken. Such notification will be followed by formal confirmation.
4. The Contractor shall stop work after receiving such notification. The work may not be restarted until the Contractor receives written authorization from the Owner.
5. All costs resulting from such a stop work order shall be borne by the Contractor and shall not be a basis for an increase in the contract amount or an extension of time.

B. Monitoring and Testing: Monitoring and testing during the work shall be performed as follows:
   1. The Contractor shall hire Independent Testing Laboratories to collect and evaluate all air, dust, bulk, and toxicity characteristic leaching procedure (TCLP) samples that are the responsibility of the Contractor. The Contractor shall direct its laboratories, in writing, to release monitoring and testing data, and all other pertinent data and records, to the Owner.
   2. The Contractor shall be responsible for monitoring its employees for potential exposure to airborne contaminants as required by this specification and all applicable regulations.
   3. The Contractor shall be responsible for work area monitoring and environmental monitoring outside the work area as required by this specification.
   4. The Owner may perform monitoring and testing inside the building, inside the work areas, and on the Contractor's employees while work is underway and at any time during the work.
   5. Final inspection and clearance testing shall be conducted by the Contractor.
   6. The Contractor shall have its Independent Testing Laboratories archive all samples until the successful completion of the project.

C. Additional Sampling of Suspect Materials:
   1. The Contractor and all Subcontractors shall be vigilant during demolition and construction in the event additional suspect lead or hazardous materials are encountered. If suspect lead or hazardous materials not previously identified are encountered, the contractor shall stop work that may be affected by this material and immediately notify the Owner. The Owner or the Owner's Representative will provide recommendations and additional testing if necessary.
   2. The Contractor and all Subcontractors shall notify the Owner prior to any bulk sampling of suspect lead-containing material or other hazardous materials to allow the Owner or Owner's Representative to be present during such sampling.

1.06 PROTECTION OF EXISTING WORK TO REMAIN: Perform lead removal in the project work areas without damage or contamination of adjacent work or the facility.

1.07 MEDICAL REQUIREMENTS

A. Institute and maintain a surveillance program in accordance with 29 CFR 1926.62 and 29 CFR 1910.134.

B. Institute and maintain a random drug testing program, as required by 49 CFR 382, for all drivers of vehicles transporting hazardous materials.

1.08 TRAINING: Employ only workers who are trained and certified as required by 29 CFR 1910, 29 CFR 1926, 40 CFR 311, 40 CFR 745 and 49 CFR 383 to remove, encapsulate, barricade, transport, or dispose of lead-containing materials.

1.09 PERMITS, IDENTIFICATION NUMBERS AND NOTIFICATIONS: Secure necessary permits for hazardous material removal, storage, transport and disposal and provide timely notification as required by federal, state, and local authorities.

1.10 SAFETY AND ENVIRONMENTAL COMPLIANCE: Comply with laws, ordinances, rules, and regulations of federal, state, and local authorities regarding handling, storing, transporting, and disposing of hazardous materials and all other construction activities.

1.11 RESPIRATOR PROGRAM: Establish a respirator program as required by ANSI Z88.2 and 29 CFR 1910.134.

1.12 HAZARD COMMUNICATION PROGRAM: Implement a hazard communication program in accordance with 29 CFR 1910.1200.

1.13 SUBMITTALS

A. Submit the following documentation to the Owner for review, approval or rejection. Work shall not begin until submittals are approved.
1. Shop drawings.
2. Work plan.
3. Liability insurance policy and performance bond.
4. Schedule.
5. Independent testing laboratory and laboratory personnel.
6. Disposal site designations.
7. Waste transporter designations.
8. Representations.
9. "Competent Person" designation and experience.
10. Request for substitutions.

B. Shop drawings shall show:
1. Boundaries of each lead work area, if required.
2. Location and construction of decontamination stations, if required.
3. Location of temporary site storage facilities.
4. Location of air monitoring stations, both in and outside of the work area.
5. Emergency egress route(s).
6. Location of negative pressure exhaust systems, if required.

C. The work plan shall include procedures for:
1. Work area set-up and protection.
2. Worker protection and decontamination.
3. Initial exposure determination(s).
4. Lead removal procedures.
5. Waste testing, transport, and disposal procedures.
6. Monitoring and testing procedures (Sampling and Analysis Plan).
7. Spill clean-up emergency procedures.

D. Insurance Policy and Bond: Submit copies of the Contractor's or Subcontractor's insurance policy and performance bond. Submittal requirement is only to ensure that the insurance certificate(s) show specific coverage for the potentially hazardous materials being handled by this project. The insurance and bond amounts and certificate holder requirements are addressed in other portions of the contract documents and are not covered as part of this submittal requirement.

E. Schedule: Submit construction schedule by work area.

F. Independent Testing Laboratories and Laboratory Personnel: Submit the name, location, and phone number of proposed independent testing laboratories, and the names and certifications of the industrial hygiene technicians. Include the laboratory's accreditation. Not all laboratories will require all accreditations.
1. The Independent Testing Laboratories shall be acceptable to Owner.
2. Submit evidence that the laboratory is currently judged proficient in lead analysis, as determined by the Environmental Lead Proficiency Analytical Testing (ELPAT) Program, of the American Industrial Hygiene Association (AIHA) Environmental Lead Laboratory Accreditation Program (ELLAP) for lead in paint chip, soil, and dust wipe samples.
3. Submit evidence that the laboratory is currently certified by OSHA to perform blood lead analysis.

4. Submit evidence that the laboratory has demonstrated proficiency as determined by ELPAT or ELLAP performance for NIOSH Method 7082 and/or NIOSH Method 7105 analytical method for the determination of lead in air.
5. Submit evidence that the laboratory has demonstrated proficiency in performing analyses according to Method 1311 TCLP, corresponding to the current version of Test Methods for Evaluating Solid Wastes (Chemical Physical Methods), SW-846. Evidence may include successful participation in a recognized inter-laboratory quality control program such as a laboratory certified by the California Health and Welfare Agency, Department of Health Services, or a more informal inter-laboratory quality control program.
6. Submit evidence that the laboratory is currently accredited by the American Industrial Hygiene Association (AIHA).
7. Submit the name, address, telephone number, and résumé of the Contractor's Industrial Hygienist (IH) who prepared the Sampling and Analysis Plan and will oversee the on-site monitoring. Submit the names, addresses, and résumés of industrial hygiene technicians who may assist the IH for on-site tasks. Submit documentation that the IH has all the qualifications for the assigned duties as required by the Contractor's liability insurance policy.
8. Submit copies of the Contractor's letter to each of the independent testing laboratories, directing each to release all the results for this project to the Owner, as these results become available and as specified herein.

G. Disposal Site: Submit the name and location of the proposed Environmental Protection Agency (EPA) permitted disposal site.

H. Waste Transporter: Submit the name and address of the proposed waste transporter.

I. Representations: Submit statement by the Contractor that records of employees' work assignments, certifications, respirator fit tests, and medical records are accurate, up-to-date, and available for inspection.

J. Competent Person: Submit the name and certifications of the Contractor's proposed Competent Person and a list of his/her previous projects. Certify that the Competent Person has the knowledge and training to supervise the work in compliance with the publications listed in Paragraph 1.04 above.

K. Substitutions: Submit requests for substitutions of materials, equipment and methods.

L. Updated Project Information: Submit changes to the submitted project information at least 24 hours prior to the effective time of change for the following:
1. Updated schedules for lead removal.
2. Change in Competent Person.
3. Changes to work plan.

1.14 TEST REPORTS: Submit the following documentation produced during the work as soon as received:

A. Project Daily Logs: Submit the previous day's Daily Logs. Logs shall include regulated area sign-in sheets and list of lead-containing materials removed, including quantities and locations of those materials, in the units used on the drawings. Claims for additional quantities will not be addressed unless daily quantities are submitted.

B. Monitoring and testing data sheets and laboratory reports.

1.15 PROJECT COMPLIANCE DOCUMENTS: Submit the following documents to the Owner with application for final payment:

A. Contractor's actual project "Start and Finish" dates.

B. Waste testing results per Paragraph 3.05 (A).

C. Waste Shipment Records (Manifest EPA form 8700-22) if required.

D. Clearance sampling and soil sampling data sheets (if required) and laboratory reports.

E. Disposal site receipts.

F. Final clearance submittals as outlined in 3.07 (if required).

G. Evidence that each employee who was engaged in lead disturbance/removal work or who was exposed to lead completed training on lead covering the requirements of 29 CFR 1926.62.

1.16 SANITARY FACILITIES: Provide adequate toilet and hygiene facilities.

1.17 MATERIAL STORAGE: Store all materials subject to damage off the ground and secure from damage, weather, or vandalism.

1.18 ON-SITE DOCUMENTATION: The Contractor shall maintain on the job site, at a location approved by the owner, copies of the following data for safety procedures, equipment, and supplies used for the work.

A. Equipment: Show the model, style, capacity and the operation and maintenance procedures for the following, as applicable:
1. High-Efficiency, Particulate, Air (HEPA) Filtration units.
2. HEPA Vacuum cleaners.
3. Pressure differential recording equipment.
4. Heat stress monitoring equipment.

B. Material Safety Data Sheets (MSDSs): Maintain on site, Material Safety Data Sheets for each chemical and other material proposed to be used.

C. Respiratory Protection Plan: The Contractor's written respirator program.

PART 2 - PRODUCTS

2.01 PERSONAL PROTECTIVE EQUIPMENT: Provide personal protective clothing as approved and selected by the IH.

A. Respirators: Provide personally issued and marked respirators approved by the National Institute of Occupational Safety and Health (NIOSH). Provide sufficient replacements for respirators with disposable canisters. Use respirators equipped with dual cartridges whenever both lead hazards and other respiratory hazards exist in the work area.

B. Provide filter cartridges approved for each airborne contaminant which may be present. NIOSH approved filter cartridges may be used. At no time shall the permissible exposure limit (PEL) for the contaminant exceed the PEL listed in 8 AAC 61.1100.

C. Whole Body Protection: Provide approved aprons, gloves, eye protection, and hard-hats, and other protective clothing as required to meet applicable safety regulations to personnel potentially exposed to lead dust or fumes above the permissible exposure limit (PEL). Wear this protection properly. Full facepiece respirators shall meet the requirements of ANSI Z87.1.

D. Provide protective personal equipment and clothing at no cost to the workers.

2.02 DECONTAMINATION UNIT

A. Provide a temporary three-stage decontamination unit, attached in a leak-tight manner to each Contained Work Area. Decontamination units shall consist of a clean room equipped with separate lockers for each worker, a shower room, and an equipment locker room equipped with separate lockers for each worker.

B. Shower specifications: Locate flow and temperature controls within the shower and be adjustable by the user. Hot water service may be secured from the building hot water system if available, but only with back-flow protection installed by the Contractor at the point of connection, and with prior notification and approval by the Owner. Should sufficient hot water be unavailable, the Contractor shall provide a minimum 40 gallon electric hot water heater with a minimum recovery rate of 20 gallons per hour. Water from the shower room shall not be allowed to wet the floor in the clean room.

2.03 WASTE WATER FILTERS: Install the waste water filters in a series of stages with the final filtration stage sufficient to meet discharge standard of 18 AAC 70 and/or any local sewage system discharge limit for lead. Size the waste water pump for 1.25 times the shower head flow-rate. Dispose all filters as lead contaminated waste.

2.04 WARNING SIGNS AND TAPE: Post warning signs and tape at the boundaries and entrances to lead disturbance and removal work areas. Signs required by other statutes, regulations, or ordinances may be posted in addition to, or in combination with, this warning sign. Conform warning signs and tape to the requirements of 29 CFR 1926.62.

2.05 WARNING LABELS: Affix warning labels to all hazardous waste disposal containers as described in the Contractor's approved Solid Waste Disposal Plan. Conform labeling to 29 CFR 1926.62 and 49 CFR 100-199.

2.06 NEGATIVE PRESSURE EXHAUST SYSTEM: Use the negative pressure exhaust systems to exhaust each contained work area where the PEL will or is expected to be exceeded. Operate the negative pressure exhaust system continuously (24 hours a day) during lead work. Select the negative pressure exhaust system equipment to provide a minimum of 4 air changes per hour under load within the work area. The negative pressure exhaust system shall have a minimum of two stages of pre-filtration ahead of the HEPA filter: The HEPA filter shall bear the UL-586 label. In no case shall the building ventilation system be used as the local exhaust for the contained work area. Terminate the exhaust outside of the building. The exhaust ventilation system equipment shall be equipped with lock-out protection to prevent operation without a HEPA filter properly installed. The exhaust system equipment shall be equipped with the following instrumentation: a static pressure gauge with low flow alarm, an elapsed time indicator, automatic shutdown capability in the event of a major rupture in the HEPA filter or blocked air discharge and an automatic re-start when power is restored after a power failure.

2.07 PRESSURE DIFFERENTIAL MONITORING EQUIPMENT: Provide continuous monitoring of the pressure differential with an automatic recording instrument for each contained work area. Locate the instrument in a clean area where personnel have access to it without respiratory protection. The instrument shall be fitted with an alarm should the negative pressure drop below -0.02 inches of water column relative to the air outside containment.

2.08 TOOLS: Vacuum cleaners shall be equipped with HEPA filters. Use only approved power tools to remove lead-containing material. Do not use open-flame and electric element heat-gun type tools with temperatures in excess of 700° F to remove lead-containing material. Remove all residual lead contamination from reusable tools being removed from lead disturbance or removal work areas. Electrical tools and equipment shall be UL listed.

2.09 AIR MONITORING EQUIPMENT: The Contractor's IH shall select the air monitoring equipment to be used for the evaluation of airborne lead.

2.10 EXPENDABLE SUPPLIES: Provide flame resistant 6-mil thick polyethylene sheet plastic shall be provided in widths necessary to minimize seams.

2.11 MATERIAL SAFETY DATA SHEETS (MSDSs): Provide MSDSs for all chemical materials brought onto the work-site.

2.12 OTHER ITEMS: Provide other items, such as consumable materials, disposable and/or reusable cleaning equipment and hand tools, or miscellaneous construction equipment and materials, in sufficient quantity as necessary to fulfill and complete the requirements of the contract. Electrical equipment and supplies shall be UL listed.

2.13 ENCAPSULANTS: Encapsulants shall contain no toxic or hazardous substances. Encapsulants shall be compatible with the products to which they are applied and be compatible with replacement products.

PART 3 - EXECUTION

3.01 WORK AREAS

A. Lead Control Areas: A control area, structure or containment where lead-containing or contaminated materials are being disturbed. Critical barriers and/or physical boundaries shall be employed to isolate the lead control area and to prevent migration of lead contamination and unauthorized entry of personnel.

B. Contained Lead Work Area Requirements: Construct contained lead work areas as described in the Contractor's approved work plan. A contained lead work area is required whenever airborne lead levels cannot be maintained below the OSHA action level at the boundary of a lead work area.

C. Building Ventilation System: Shut down and isolate by air-tight seals all building ventilation systems supplying air into or returning air from a lead control area or contained lead work area.

D. Building Electrical Systems: Verify that the electrical service is deactivated, disconnected and locked out where necessary for wet washing and/or removal. Provide temporary electrical service, equipped with ground fault protection, where needed.

3.02 PERSONNEL PROTECTION PROCEDURES

A. Initial Determination: An initial determination is required in the absence of acceptable prior exposure data in accordance with 29 CFR 1926.62. Establish an initial lead work area for each material to be disturbed and each disturbance procedure if required. Isolate these lead work areas from the rest of the building. Personnel working in these areas shall wear respiratory protection and personal protective equipment as directed by the IH. Perform personal and work area air monitoring as directed by the IH. Operational

decontamination facilities shall be available. Work performed shall be representative of the work to be done during the remainder of the project.

B. Respirator Evaluation: Upgrading, downgrading, or not requiring respirators shall be recommended by the Contractor's IH based on the measured airborne lead-containing dust concentrations. Immediately implement recommendations to upgrade the respiratory protection shall be implemented immediately, followed by notification to the Owner. NOTE: Submit recommendations in writing to downgrade respirator type or not require respirators to the Owner for review and written approval prior to implementation.

C. Decontamination Procedures: Worker and material decontamination procedures shall be as described in the Contractor’s approved work plan. Worker decontamination shall be as directed by the Contractor’s competent person.

D. Work Stoppage: Stop work if the IH, the Owner, or a representative of a regulatory agency determines that the work is not in compliance with the Contractor's approved work plan, these specifications, or applicable laws and regulations. The Contractor shall stop work and notify the Owner whenever the measured concentrations of lead outside the lead control area equal or exceed 30 $\mu g/m^3$ for airborne lead or 200 $\mu g/ft^2$ for lead dust on surfaces that would normally be accessible by building occupants. When such work stoppage occurs, the cause of the contamination shall be corrected and the damaged or contaminated area shall be restored to its original decontaminated condition by the Contractor at no expense to the Owner. The Contractor is responsible for removing dusts and debris that were generated as a result of his work.

E. The Contractor shall adhere to all applicable regulations regarding entry into confined spaces.

3.03 LEAD DISTURBANCE AND REMOVAL PROCEDURES:

A. General: Perform lead disturbance or removal work in accordance with the Contractors approved work plan, applicable regulations and this specification.

B. Pre-Cleaning: Removal of existing loose paint chips is included in the scope of work. Pre-clean surfaces by HEPA vacuum and wet washing/wiping prior to the establishment of a work area.

C. Perform waste battery storage and disposal in accordance with 40 CFR 261, 40 CFR 264, 40 CFR 265, 40 CFR 273 and 8 AAC.

3.04 MONITORING AND TESTING: Conduct daily sampling in accordance with the Contractor's accepted Sampling and Analysis Plan and this specification. The Owner may conduct air monitoring in the Contractor’s work areas and on the Contractor’s employees.

A. Perform environmental air monitoring outside the lead work area for each lead work area without a negative initial determination. Include at least one sample immediately outside the entrance to the lead work area.

B. Perform dust wipe sampling for each lead work area without a negative initial determination. Include at least one sample immediately outside the entrance to the work area daily.

C. Take personnel samples in accordance with 29 CFR 1926.62. Personal samples for an employee will include a minimum of two samples per 8 hour shift. Employees will be monitored at the rate of at least one employee for every eight people performing each

task in each work area. Persons performing separate tasks or in separate lead work areas shall be sampled separately.

D. Reduction of monitoring: For each operation for which the Negative Initial Determination established workers' exposure will be below the action level, the Contractor's IH may petition the Owner's Representative to recommend that the monitoring as required above be reduced for the specific task or operation.

3.05 DISPOSAL

A. Sampling of Waste Materials: The Contractor shall test waste materials according to 40 CFR 261 and the disposal site's permit to determine if they are hazardous waste and to dispose of them accordingly. Collect, package and transport to an EPA approved Hazardous Waste Disposal Site all bulk debris, loose paint chips, fines, dust from HEPA filters and vacuum bags, unfiltered waste water, water filter cartridges, disposable personal protective equipment (including respirator filters, poly, and tape) which do not have TCLP test results that classify the material as non-hazardous for lead. Lead-acid batteries and other batteries are classified by the EPA as Universal Wastes. The EPA encourages that all Universal Wastes be recycled in accordance with 40 CFR 273, or in the case of lead-acid batteries, in accordance with 40 CFR 266, subpart G.

B. Hazardous Waste Disposal: Dispose of hazardous project wastes as required by 40 CFR 260 and the Contractor's approved work plan.

C. Construction (Non-Hazardous) Waste Disposal: Dispose of solid (non-hazardous) waste in a permitted waste facility, in accordance with applicable federal, state, and local laws and regulations. Burning of waste is prohibited.

D. Salvageable Materials: The Contractor may salvage metallic lead, lead-acid batteries and other materials to keep such materials from entering the project waste stream. Sell or transfer salvage with a document of exempt status as provided by 40 CFR 261.

E. Waste Storage: Temporarily store solid wastes as described in the approved work plan.

3.06 FINAL CLEANING AND VISUAL INSPECTION: Perform a final cleaning and visual inspection of each lead control area prior to release to unprotected workers in accordance with the Contractor's approved work plan. Clean the lead control area by vacuuming with a HEPA filtered vacuum cleaner, wet mopping or wet wiping. Do not dry sweep or use pressurized air to clean up the area. A final visual inspection report shall be provided verifying that all lead disturbance required by the contract has been completed and that all visible dust and debris subject to disturbance by the planned work under this contract have been removed and the area HEPA vacuumed, wet mopped or wet wiped.

3.07 WORK AREA CLEARANCE TESTING: Work area clearance testing by the Contractor is required for each lead control area where the lead action level has been exceeded. Clearance testing shall be performed only after a visual inspection report by the IH Technician has documented that the work area is clean and that all lead disturbance required by the contract has been completed. Clearance testing shall include the following:

A. A visual inspection report by the Contractor's IH Technician verifying that all lead disturbance required by the contract has been completed and that all visible dust and debris subject to disturbance by the planned work under this contract have been removed and the area HEPA vacuumed, wet mopped or wet wiped.

B. Three (3) lead wipe and/or lead soil sample results from within the lead control area per the Contractor's approved work plan and in accordance with NIOSH method 9100. Clearance levels shall be 200 µg/ft^2 for wipes or 500 ppm in soil.

C. The Owner may conduct concurrent clearance testing.

D. Work area barriers or containments shall not be removed until clearance testing results are reviewed and approved by the Owner.

3.08 SUBSTANTIAL COMPLETION

A. After the work area barriers and temporary construction and equipment have been removed, the Contractor shall inspect the work area to verify that no lead debris, contaminated water, or other residue remains. Any remaining residue shall be cleaned up using HEPA vacuum cleaners and wet wiping methods.

B. The Contractor shall certify that the work area has been cleaned of all lead in compliance with the contract, and that there is no unrepaired damage to walls, ceilings, doors or surfaces or finishes other than that called for by the scope of work.

C. Costs of restoration of damaged finishes shall be borne by the Contractor.

END OF SECTION

SECTION 02 8418
REMOVAL AND DISPOSAL OF CHEMICAL HAZARDS

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK: The work includes proper removal and disposal of electrical equipment and chemical hazards related to the Nome State Office Building Remodel Project as shown on the drawings and as specified herein. Items to be removed or disturbed may include, but are not limited to:

A. Mercury and mercury compounds in electrical equipment and light fixtures, switches, etc.

B. PCB containing ballasts and light fixture components contaminated with PCB-containing oil.

C. Heating system components with glycol.

D. Ozone Depleting Substances (ODS) in refrigeration equipment.

E. Lead-acid batteries for exit and emergency lights, and other equipment.

F. Asbestos, lead and other hazardous materials are present in the building that may impact the work of all trades. Regulated air contaminants, including asbestos and lead, are assumed to be also present in settled and concealed dust in and on architectural, structural, mechanical and electrical components or systems throughout the building. All trades shall coordinate with other trades and conduct their work to prevent worker exposure or site contamination. Refer to Specification Section 02 2600, Hazardous Materials Assessment; Section 01 3545, Airborne Contaminant Control; and Division 02 specifications for specific information concerning disturbing, removing and disposing of these materials and the installation of new materials or components. This notification is provided in accordance with EPA and OSHA requirements.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 3545 Airborne Contaminant Control

B. Section 02 2600 Hazardous Materials Assessment

C. Section 02 2633 Biological Assessment

D. Section 02 8233 Removal and Disposal of Asbestos Containing Materials

E. Section 02 8333 Removal and Disposal of Materials Containing Lead

F. Section 02 8533 Mold Remediation

1.03 DEFINITIONS AND ABBREVIATIONS: Definitions and abbreviations are provided in the applicable publications listed in Paragraph 1.04 of this Section.

1.04 APPLICABLE PUBLICATIONS: The publications listed below form a part of this specification to the extent referenced.

A. General Requirements: All work shall be performed in compliance with the International Building (IBC), Fire, Fuel Gas, Mechanical, Residential, Energy Conservation and

Administrative Code; Uniform Plumbing Code; the National Electrical Code; and the publications listed in this section that are in effect at the time of the bidding of this contract.

B. Title 10 Code of Federal Regulations (CFR), Nuclear Regulatory Commission

Part 20	Standard for Protection Against Radiation

C. Title 29 CFR, Department of Labor (USDOL)

Part 1910	General Occupational Safety and Health Standards
Part 1926	Safety and Health Regulations for Construction

D. Title 40 CFR, Environmental Protection Agency (EPA)

Part 61	National Emission Standards for Hazardous Air Pollutants
Part 260	Hazardous Waste Management System: General
Part 261	Identification and Listing of Hazardous Waste
Part 262	Standards Applicable to Generators of Hazardous Waste
Part 263	Standards Applicable to Transporters of Hazardous Waste
Part 270	The Hazardous Waste Permit Program
Part 273	Standards for Universal Waste Management
Part 311	Worker Protection
Part 761	Polychlorinated Biphenyls (PCBs)

E. Title 49 CFR, Department of Transportation (DOT)

Part 171	General Information, Regulations and Definitions
Part 172	Hazardous Materials Communication and Regulations
Part 173	General Requirements for Shipments and Packaging
Part 177	Carriage by Public Highway
Part 178	Specifications for Packagings
Part 382	Requirements for Drug Testing
Part 383	Commercial Driver's License Standards

F. State of Alaska Administrative Codes (AAC)

8 AAC 61	Occupational Safety and Health Standards
18 AAC 60	Solid Waste Management
18 AAC 62	Hazardous Wastes
18 AAC 75	Oil and Hazardous Substances Pollution Control

G. State of Alaska Statutes (AS)

AS 45.50.477	Titles Relating to Industrial Hygiene

H. Federal Standards

313D	Material Safety Data Sheets

I. American National Standard Institute (ANSI)

Z9.2	Local Exhaust Systems
Z87.1	Eye and Face Protection
Z88.2	Practices for Respiratory Protection
C78.LL 1256	Procedures for Fluorescent Lamp Sample Preparation and Toxicity Characteristic Leaching Procedure.

J. American Society for Testing and Materials (ASTM)

D-4397	Polyethylene Sheeting

K. International Code Institute

International Building (IBC), Fire, Fuel Gas, Mechanical, Residential, Energy Conservation and Administrative Code Current IC Standards

L. National Fire Protection Association (NFPA)
NFPA 701 Fire Tests for Flame Resistant Textiles and Films

M. National Institute of Occupational Safety and Health (NIOSH)
Manual of Analytical Methods, Current Edition

1.05 QUALITY ASSURANCE

A. On-site Observation:
1. The safety and protection of the Contractor's employees, sub-contractor's employees, Owner's employees, the facility, and the public is the sole responsibility of the Contractor.
2. The Owner, the Owner's Representative, or representatives of State or Federal agencies may make unannounced visits to the site during the work. The contractor shall make available two complete sets of clean protective clothing for such visitor use. If the work requires the use of PAPR or Supplied Air Respirators, the contractor shall provide respirators to the visitor to ensure compatibility with fresh batteries or supplied air system. It is the visitor's responsibility to ensure medical qualification, training, and current "fit test" prior to using any respirator provided by the Contractor.
3. If the Owner or agency visitor determines that practices are in violation of applicable regulations, they will immediately notify the Contractor that operations must cease until corrective action is taken. Such notification will be followed by formal confirmation.
4. The Contractor shall stop work after receiving such notification. The work may not be restarted until the Contractor receives written authorization from the Owner.
5. All costs resulting from such a stop work order shall be borne by the Contractor and shall not be a basis for an increase in the contract amount or an extension of time.

B. Monitoring and Testing: Monitoring and testing during the work shall be performed as follows:
1. The Contractor shall hire Independent Testing Laboratories to collect and evaluate all air, bulk, and toxicity characteristic leaching procedure (TCLP) samples, which are the responsibility of the Contractor. The Contractor shall direct its laboratories, in writing, to release monitoring and testing data, and all other pertinent data and records, to the Owner.
2. The Contractor shall be responsible for monitoring its employees for potential exposure to airborne contaminants as required by specification 01 3545 and all applicable regulations.
3. The Contractor shall be responsible for work area monitoring and environmental monitoring outside the work area as required by this specification.
4. The Owner may perform monitoring and testing inside the building, inside the work areas, and on the Contractor's employees while work is underway and at any time during the work.
5. The Contractor shall have its Independent Testing Laboratories archive all samples until the successful completion of the project.
6. Final inspection and clearance testing shall be conducted by the Contractor.

1.06 PROTECTION OF EXISTING WORK TO REMAIN: Perform hazardous material removal work without damage or contamination of adjacent work or the site.

1.07 MEDICAL REQUIREMENTS

A. Institute and maintain a medical surveillance program in accordance with 29 CFR 1910.134.

B. Institute and maintain a random drug testing program, as required by 49 CFR 382, for all drivers of vehicles transporting hazardous materials.

1.08 TRAINING: Employ only workers who are trained and certified as required by 29 CFR 1910, 29 CFR 1926, 40 CFR 311, and 49 CFR 383 to remove, encapsulate, barricade, transport, or dispose of hazardous materials.

1.09 PERMITS AND NOTIFICATIONS: Secure necessary permits for hazardous material removal, storage, transport and disposal and provide timely notification as required by federal, state, and local authorities.

1.10 SAFETY AND ENVIRONMENTAL COMPLIANCE: Comply with laws, ordinances, rules, and regulations of federal, state, and local authorities regarding handling, storing, transporting, and disposing of hazardous materials and all other construction activities.

1.11 RESPIRATOR PROGRAM: Establish a respirator program as required by ANSI Z88.2 and 29 CFR 1910.134.

1.12 HAZARD COMMUNICATION PROGRAM: Implement a hazard communication program in accordance with 29 CFR 1910.1200.

1.13 SUBMITTALS

A. Approval: Submit the following documentation to the Owner for review, approval, or rejection. Work shall not begin until submittals are approved.
1. Shop drawings.
2. Hazardous material removal work plan.
3. Liability insurance policy and performance bond.
4. Schedule.
5. Independent testing laboratories.
6. Disposal site designations.
7. Waste Transporter Designations.
8. Notifications and certifications.
9. Competent Person Designation Notifications and Certifications.
10. Request for Substitutions.

B. Shop drawings shall show:
1. Boundaries of all hazardous material removal areas.
2. Location and construction of decontamination stations, if required.
3. Location of temporary site storage facilities.
4. Location of air monitoring stations, if required.
5. Emergency egress route(s).

C. The work plan shall include procedures for:
1. Work area set-up and protection.
2. Worker protection and decontamination.
3. Ballast removal procedures.
4. Mercury-containing lamp removal and packaging procedures.
5. Mercury-containing material removal procedures.
6. Monitoring and testing procedures (Sampling and Analysis Plan).

7. Radioactive materials removal and tracking procedures.
8. Waste handling, packaging, labeling, and manifesting procedures.

D. Insurance Policy and Performance Bond: Submit copies of the Contractor's or Subcontractor's insurance policy and performance bond. Submittal requirement is only to ensure that the insurance certificate(s) show specific coverage for the potentially hazardous materials being handled by this project. The insurance and bond amounts and certificate holder requirements are addressed in other portions of the contract documents and are not covered as part of this submittal requirement.

E. Schedule: Submit construction schedule by work area.

F. Independent Testing Laboratories and Laboratory Personnel: Submit the name, location, and phone number of proposed independent testing laboratories, and the names and certifications of industrial hygiene technicians. Include the laboratory's accreditation. Not all laboratories will require all accreditations.
1. The Independent Testing Laboratories shall be acceptable to the Owner.
2. Evidence that a laboratory has demonstrated proficiency in performing analyses according to Method 1311 TCLP, corresponding to the current version of Test Methods for Evaluating Solid Wastes (Chemical Physical Methods), SW-846. Evidence may include successful participation in a recognized inter-laboratory quality control program such as a laboratory certified by the California Health and Welfare Agency, Department of Health Services, or a more informal inter-laboratory quality control program.
3. Submit the name, address, telephone number, and résumé of the Industrial Hygienist (IH) who prepared the Sampling and Analysis Plan and will oversee the on-site monitoring. Submit the names, addresses, and résumés of industrial hygiene technicians who may assist the IH for on-site tasks. The Contractor shall submit documentation that the IH has all the qualifications for the assigned duties as required by the Contractor's liability insurance policy.
4. Submit copies of the Contractor's letters to the independent testing laboratories, directing each to release all the results for this project to the Owner, as these results become available and as specified herein.

G. Disposal Site: Submit the name and location of the proposed Alaska Department of Environmental Conservation (DEC) or U.S. Environmental Protection Agency (EPA) permitted disposal sites.

H. Waste Transporter: Submit the name, address and EPA Hazardous Waste Transporter identification number for the proposed waste transporters.

I. Certifications, Permits, and Notifications: Obtain and submit copies of EPA Hazardous Waste Generator identification number for the purpose of accumulating hazardous waste in accordance with 40 CFR 262. Submit copies of refrigerant recovery technician's EPA certification and company name when refrigeration systems are being demolished or deactivated. If the site does not have an EPA ID number for hazardous wastes, the contractor will need to assist the Owner in obtaining the EPA ID number, but the Owner will be available to sign the application documents and shipment records prepared by the contractor.

J. Representations: Submit statement by the Contractor that records of employees' work assignments, certifications, respirator fit tests, and medical records are accurate, up-to-date, and available for inspection.

K. Competent Person: Submit the name and certifications of the Contractor's proposed Competent Person and a list of his/her previous projects. Certify that the Competent

Person has the knowledge and training to supervise the work in compliance with the publications listed in Paragraph 1.04 above.

L. Substitutions: Submit requests for substitutions of materials, equipment and methods.

M. Updated Project Information: Submit changes to the submitted project information at least 24 hours prior to the effective time of change for the following:
1. Updated schedules for hazardous material removal.
2. Change in competent person.
3. Changes to work plan.

1.14 TEST REPORTS: Submit the following documentation produced during the work as received:

A. Project Daily Logs: Submit the previous day's Daily Logs. Logs shall include regulated area sign-in sheets and list of chemical hazards removed including quantities and locations of those materials, in the units used on the drawings. Claims for additional quantities will not be addressed unless daily quantities are submitted.

B. Monitoring and testing data sheets and laboratory reports.

1.15 PROJECT COMPLIANCE DOCUMENTS: Submit the following documents with the application for final payment.

A. Daily sign-in sheets.

B. Contractor's actual "start and finish" project dates.

C. All hazardous waste shipping manifests.

D. Disposal site receipts, including manufacturer name and serial numbers from each radioactive exit sign (if removed).

E. All final laboratory results.

F. Submit legible copies of the each Worker’s Hazardous Waste Operations and Emergency Response (HAZWOPR) cards and/or a copy of the refresher training certificate to show that all workers have received their initial training or an eight-hour refresher course within the past year.

1.16 SANITARY FACILITIES: Provide adequate toilet and hygiene facilities.

1.17 MATERIAL STORAGE: Store all materials subject to damage off the ground and secure from damage, weather, or vandalism.

1.18 ON-SITE DOCUMENTATION: The Contractor shall maintain on the job site, at a location approved by the owner, copies of the following data for safety procedures, equipment, and supplies used for the work.

A. Equipment: Show the model, style, operations, and maintenance for the following, as applicable:
1. Respirators, PAPR and canister types.
2. Decontamination facilities.
3. Specialized hazards handling equipment.

B. Expendable supplies: Maintain the manufacturer's safety data, and use the data for the following supplies:
   1. Coveralls and headgear.
   2. Boots, aprons, and gloves.
   3. Disposal containers.
   4. Solvents and degreasers.

C. Material Safety Data Sheets (MSDS): Maintain Material Safety Data Sheets for each chemical and other material proposed to be used, on-site at a location approved by the owner.

D. Respirator Program: The Contractor's written respirator program.

PART 2 - PRODUCTS

2.01 PERSONAL PROTECTIVE EQUIPMENT: Provide personal protective clothing as approved and selected by the IH.

A. Respirators: Provide personally issued and marked respirators approved by the National Institute of Occupational Safety and Health (NIOSH). Provide sufficient replacements for respirators with disposable canisters.

B. Provide filter cartridges approved for each airborne contaminant which may be present. NIOSH approved filter cartridges may be used. At no time shall the permissible exposure limit (PEL) for the contaminant exceed the PEL listed in 8 AAC 61.1100.

C. Whole Body Protection: Provide approved aprons, gloves, goggles, face shields, and hard-hats, and other protective clothing as required to meet applicable safety regulations to <u>all</u> workers engaged in hazardous materials removal. Full facepiece respirators shall meet the requirements of ANSI Z87.1.

D. Provide protective personal equipment and clothing at no cost to the workers.

2.02 DECONTAMINATION UNIT: Provide a decontamination station in accordance with the Contractor's accepted work plan and applicable regulations.

2.03 WARNING SIGNS AND TAPE: Post warning signs and tape at the boundaries and entrances to chemical hazards removal areas. Signs required by other statutes, regulations, or ordinances may be posted in addition to, or in combination with, this warning sign.

2.04 WARNING LABELS: Affix warning labels to all hazardous waste disposal containers as described in the Contractor's approved Solid Waste Disposal Plan. Conform labeling to 49 CFR 100-199.

2.05 SPECIALIZED EQUIPMENT: Lamp crushers and other specialized equipment to consolidate, reduce or treat hazardous materials are classified as RCRA treatment and the EPA specifically prohibits the use of Drum Top Crushers for management of fluorescent lamps as universal waste unless an equivalency determination is made by the state.

2.06 EXPENDABLE SUPPLIES: Provide flame resistant 6-mil thick polyethylene sheet plastic in widths necessary to minimize seams.

2.07 MATERIAL SAFETY DATA SHEETS (MSDSs): Provide MSDSs for all chemical materials brought onto the work-site.

2.08 OTHER ITEMS: Provide other items, such as consumable materials, disposable and/or reusable cleaning equipment and hand tools, or miscellaneous construction equipment and materials, in sufficient quantity as necessary to fulfill and complete the requirements of the contract. Electrical equipment and supplies shall be UL listed.

2.09 ENCAPSULANTS: Encapsulants shall contain no toxic or hazardous substances. Encapsulants shall be compatible with the products to which they are applied and be compatible with any replacement products.

PART 3 - EXECUTION

3.01 WORK AREAS

A. Electrical Power: Verify that the electrical power to the equipment being removed is deactivated, disconnected, and locked-out.

B. Loaded Disposal Drums: The Contractor shall provide handling equipment to move disposal drums loaded with hazardous wastes.

3.02 PERSONNEL PROTECTION PROCEDURES

A. All personnel entering the work area shall sign the daily log and put on clean protective clothing.

B. Basic protective clothing shall consist of aprons, gloves, goggles, face shields, and hard hats--with the addition of approved full body coveralls, bib-type aprons, and respirators as conditions warrant.

C. Make available a contaminated material disposal drum, 6-mil. plastic wrapping and tape, or appropriate bagging materials for leaking ballasts and/or oil-contaminated components.

D. Decontamination Procedures: All personnel handling or removing hazardous materials will comply with the decontamination procedures as described in the approved work plan.

3.03 HAZARDOUS MATERIAL REMOVAL PROCEDURES: Remove hazardous materials in accordance with the Contractor's approved work plan, applicable regulations, and this specification.

A. Perform PCB related work in accordance with 40 CFR 761, 8 AAC 61, 18 AAC 60 and 18 AAC 62.

B. Perform mercury-containing lamps storage and transport in accordance with 40 CFR 261, 40 CFR 264, 40 CFR 265, 40 CFR 273 and 8 AAC.

C. Perform waste battery storage and disposal in accordance with 40 CFR 261, 40 CFR 264, 40 CFR 265, 40 CFR 273 and 8 AAC.

D. Perform removal of ozone depleting substances in accordance with 40 CFR 82, 8 AAC 61, 18 AAC 60, and 18 AAC 62.

3.04 MONITORING AND TESTING: Conduct daily sampling in accordance with the Contractor's accepted Sampling and Analysis Plan and this Specification. The Owner may conduct air monitoring in the Contractor's work areas and on the Contractor's employees.

A. Personal, work area, and environmental monitoring for airborne contaminants shall be performed by industrial hygiene technicians who are employees of (one of) the Contractor's Independent Testing Laboratories.

B. Perform air monitoring in accordance with 29 CFR 1926, current EPA guidance, and as specified herein. Calibrate all sampling pumps on-site with a calibrated transfer standard before and after each sample. Built-in rotameters on pumps are not acceptable for calibration.

C. Monitor for all airborne contaminants listed in 29 CFR 1926.55 and 8 AAC 61.1100, which are produced by the Contractor's operations.

D. Contractor shall test waste materials as required by 40 CFR 261, the disposal site's permit, and it's approved work plan. If performed, TCLP testing of fluorescent lamps shall comply with ANSI/NEMA Standard Procedure for Fluorescent Lamp Sample Preparation and Toxicity Characteristic Leaching Procedure, C78.LL 1256-2003 or latest version.

3.05 DISPOSAL

A. Dispose of hazardous wastes in an EPA permitted hazardous waste disposal site as required by 40 CFR 260 and 40 CFR 761, the Contractor's approved plan, and the disposal site operator.

B. Comply with current waste disposal, handling, labeling, storage, and transportation requirements of the waste disposal facility, U.S. Department of Transportation, and EPA regulations.

C. Fluorescent, mercury vapor, metal halide and high pressure sodium lamps are classified by the EPA as hazardous mercury waste under the Universal Waste Rule under 40 CFR 273. Mercury and mercury-containing products are considered hazardous waste unless TCLP testing of the waste for mercury confirms the mercury content to be less than the EPA criteria of 0.2 mg/l. If mercury-containing lamps and thermostats are handled and disposed of in accordance with the Universal Waste Regulations, no TCLP test is required. If the Contractor chooses to perform a TCLP test of fluorescent lamps, the test shall be conducted in accordance with the requirements of ANSI/NEMA Standard Procedure for Fluorescent Lamp Sample Preparation and Toxicity Characteristic Leaching Procedure, C78.LL 1256-2003 or latest version.

D. Dispose of radioactive materials and equipment in accordance with the manufacturer's recommendations, the disposal site's requirements and 10 CFR 20, Subpart K. Provide list of manufacturer name and serial numbers for all removed radioactive exit signs to owner.

E. Refrigerants in refrigeration and cooling systems in the building contain ODS components that must be recovered and recycled or disposed of in accordance with 40 CFR 82. Personnel decommissioning or removing ODS refrigerants shall hold appropriate EPA training and certificate for handling and recovering these materials.

F. Heating systems containing glycol shall be drained and all glycol collected in appropriate waste containers for recycling or disposal. Glycol shall be tested for heavy metals using the Toxicity Characteristics Leaching Procedure (TCLP). Glycol that failed the TCLP shall be packaged for disposal as hazardous waste.

3.06 CLEANING OF WORK AREA

A. Remove all hazardous materials and debris within a work area. Wet clean all work area surfaces.

B. Notify the Owner that hazardous materials removal has been completed and the work area is ready for visual inspection. Include a statement that all hazardous materials and debris in the work area have been removed as required by the contract.

END OF SECTION

SECTION 02 8533
MOLD REMEDIATION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK:

A. This is not a mold abatement project. Biological materials, herein referred to as “mold”, have been identified on building materials that are required to be disturbed as part of the scope of work for the project. The scope related to mold is generally as follows:

B. Removing materials with mold that are affected by the scope of work for the project, including at hidden surfaces within the building.

C. Cleaning and decontamination of the non-porous and semi-porous surfaces that are scheduled to remain including HEPA vacuuming all surfaces and damp wiping of all non-porous and semi-porous surfaces including wood, laminate, concrete flooring, furniture and area contents.

D. Asbestos-containing joint compound in gypsum wallboard systems is present, along with other potentially hazardous materials. Because the majority of the biologically affected materials also have asbestos present, the demolition work is generally governed by the asbestos removal requirements. Refer to section 02 2600 for additional information on other hazardous materials.

E. Asbestos, lead and other hazardous materials are present in the building that may impact the work of all trades. Regulated air contaminates, including asbestos and lead, are assumed to be also present in settled and concealed dust in and on architectural, structural, mechanical and electrical components or systems throughout the building. All trades shall coordinate with other trades and conduct their work to prevent worker exposure or site contamination. Refer to Specification Section 02 2600, Hazardous Materials Assessment, Section 01 3545, Airborne Contaminant Control; and Division 02 specifications for specific information concerning disturbing, removing and disposing of these materials and the installation of new materials or components. This notification is provided in accordance with EPA and OSHA requirements.

1.02 RELATED WORK SPECIFIED ELSEWHERE:

A. Section 01 3545 Airborne Contaminant Control

B. Section 02 2600 Hazardous Materials Assessment

C. Section 02 2633 Biological Assessment

D. Section 02 8333 Removal and Disposal of Materials Containing Lead

E. Section 02 8418 Removal and Disposal of Chemical Hazards

1.03 DEFINITIONS AND ABBREVIATIONS: Definitions and abbreviations are provided below and in the applicable publications listed in Paragraph 1.04 of this section.

A. Abatement - Removal of contaminated building materials from a structure.

B. Cleanable Surface - Non-porous or structurally sound semi-porous materials (i.e. concrete, hard plastics, wood farming).

C. Contaminated Material - Contents in the proximity of gross mold contamination, and including grossly contaminated materials, are assumed contaminated.

D. Grossly Contaminated Material - Past or current mold growth as evidenced by staining, discoloration, material degradation, musty smells, or obvious mold growth.

E. HEPA Filter - High Efficiency Particulate Air filter capable of trapping and retaining at least 99.97% of all mono-dispersed particles of 0.3 micron or larger.

F. Non-Porous Material - Those materials incapable of water absorption such as metals, glass, and hard plastics.

G. Porous Material - Those materials capable of water absorption such as ceiling tiles, insulation, fabrics, and wallboard.

H. Semi-Porous Material - Those materials capable of limited water absorption such as wood and concrete.

1.04 APPLICABLE PUBLICATIONS: The publications listed below form a part of this specification to the extent referenced.

A. General Requirements: All work shall be performed in compliance with the International Building, Fire, Fuel Gas, Mechanical, Residential, Energy Conservation and Administrative Code; Uniform Plumbing Code; the National Electrical Code; and the publications listed in this section that are in effect at the time of the bidding of this contract.

B. Institute of Inspection, Cleaning and Restoration Certification:
IICRC S 520 - Standard and Reference Guide for Professional Mold Remediation

C. Environmental Protection Agency (EPA) Guidelines:
Mold Remediation in Schools and Commercial Buildings

D. American Conference of Governmental Industrial Hygienists (ACGIH):
Bioaerosols: Assessment and Control

E. American Industrial Hygiene Association (AIHA):
Assessment, Remediation, and Post-Remediation Verification of Mold in Buildings

F. New York City Department of Health:
Guidelines on Assessment and Remediation of Fungi in Indoor Environments

1.05 GENERAL REQUIREMENTS:

A. This protocol pertains to removal and disposal of contaminated building materials, and cleaning and decontamination of remaining materials.

B. The requirements contained in this Section pertain to CONTAMINATED MATERIALS ABATEMENT WORK and are for the purpose of protecting employees and occupants against exposure to hazardous substances.

1.06 QUALITY ASSURANCE:

A. On-site Observation:

B. The safety and protection of the Contractor's employees and all other occupants of the facility is the sole responsibility of the Contractor.

1.07 RESPIRATOR PROGRAM: Establish a respirator program as required by ANSI Z88.2 and 29 CFR 1910.134.

1.08 HAZARD COMMUNICATION PROGRAM: Implement a hazard communication program in accordance with 29 CFR 1910.1200.

1.09 SUBMITTALS

A. The Contractor shall submit the following documentation to the Owner for review, approval or rejection. Work shall not begin until submittals are approved.
   1. The Work Plan shall be prepared in the form of checklists and shall include specific procedures for:
      a. Work area preparation and protection procedures;
      b. Worker protection and decontamination procedures, including
      c. normal removal and “spill” response; and
      d. Waste handling, packaging, and disposal procedures.
   2. The Work Plan shall contain sufficient detail so that a skilled worker, by following the Plan, can perform acceptable work in a safe manner to remove and dispose of the contaminated building materials, and to clean and decontaminate remaining salvageable materials.

1.10 PROTECTION OF EXISTING WORK TO REMAIN:

A. Perform contaminated materials removal in the project work areas without damage or contamination of adjacent building materials/furnishings. Where existing building materials/furnishings are damaged or contaminated, it shall be restored to its original condition.

1.11 SANITARY FACILITIES: Provide adequate toilet and hygiene facilities.

1.12 MATERIAL STORAGE: Store all materials subject to damage off the ground and secure from damage, weather, or vandalism.

1.13 ON-SITE DOCUMENTATION: The Contractor shall maintain on the job site, at a location approved by the owner, copies of the following data for safety procedures, equipment, and supplies used for the work.

A. Equipment: Show the model, style, capacity and the operation and maintenance procedures for the following, as applicable:
   1. High-Efficiency, Particulate, Air (HEPA) Filtration units.
   2. HEPA Vacuum cleaners.
   3. Pressure differential recording equipment.
   4. Heat stress monitoring equipment.

B. Material Safety Data Sheets (MSDS): Maintain on site, Material Safety Data Sheets for each chemical and other material proposed to be used.

C. Respiratory Protection Plan: The Contractor's and/or Subcontractor's written respirator program.

PART 2 - PRODUCTS

2.01 PERSONAL PROTECTIVE EQUIPMENT: Provide personal protective clothing as approved and selected by the IH.

A. Respirators: Provide personally issued and marked respirators approved by the National Institute of Occupational Safety and Health (NIOSH). Provide sufficient replacements for respirators with disposable canisters. Use respirators equipped with dual cartridges whenever both asbestos hazards and other respiratory hazards exist in the work area.

B. Provide approved cartridge-type half-face respirators with HEPA (P 100) filter cartridges for workers. The entire cartridge shall be replaceable; units with replaceable filter media are not acceptable. Stacked cartridges (HEPA/organic vapor & acid gas) capable of filtering mold spores, bacteria and chemical vapors will be required for disinfecting remaining materials if chemicals are used.

C. Whole Body Protection: Provide approved disposable fire retardant, full body coveralls and hoods fabricated from nonwoven fabric, gloves, eye protection, and hard-hats, and other protective clothing as required to meet applicable safety regulations to personnel potentially exposed to asbestos above the permissible exposure limits (PELs). Wear this protection properly. Full facepiece respirators shall meet the requirements of ANSI Z87.1.

D. Provide protective personal equipment and clothing at no cost to the workers.

2.02 MSDS:

A. Provide MSDS's (Material Safety Data Sheets) for all hazardous chemicals used on-site.

2.03 POLYETHYLENE SHEETING:

A. All polyethylene sheeting used on-site shall be 6 mil and meet or exceed NFPA 701 standards for fire resistance.

PART 3 - EXECUTION

3.01 PREPARATION:

A. Electrical Power: The Contractor shall verify that the electrical power to the affected components is deactivated, disconnected, and locked-out.

B. Decontamination Procedures: All personnel involved with removal and/or handling of contaminated materials will comply with the following decontamination procedures:
1. Establish a change area where personnel will don or remove personal protection equipment (PPE);
2. Utilize assembly-line decontamination stations where used equipment/gear will be disposed into approved waste containers;
3. HEPA vacuum outside of work coveralls before leaving work area.
4. Remove disposable PPE materials and place in approved disposal bags for disposal with removed contaminated materials; and,
5. Proceed through decontamination stations and thoroughly clean hands and exposed surfaces with soap, then rinse with clean water.

C. Prior to commencement of removal/cleaning, if applicable, all salvageable contents shall be removed by the Contractor from the premises to a temporary location for cleaning and disinfecting. For non-porous surfaces (e.g., plastic, glass, metal), and semi-porous surfaces (e.g. wood), the surfaces shall be cleaned with a mild detergent. For porous surfaces that show no visible mold contamination or water damage, the surfaces shall be cleaned with a vacuum equipped with High Efficiency Particulate (HEPA) filtration.

3.02 WORKER PROTECTION – Approved Work Plan procedures:

A. All personnel entering the work area shall sign the daily log and put on clean protective clothing.

B. Basic protective clothing shall consist of coveralls, head and boot covers, gloves, hard hats, safety glasses or goggles, and respirators.

C. Contaminated material disposal: Six (6) mil. Plastic wrapping and tape, or comparable bagging materials shall be used for disposal of contaminated components.

3.03 REMOVAL OF CONTAMINATED SURFACES TO INCLUDE: WALL COVERING, GYPSUM WALLBOARD, COVE BASE, WOOD FRAMING, AND ASSOCIATED MATERIALS

A. Work involving asbestos-containing materials shall be conducted as asbestos abatement work in accordance with Section 02 8233.

B. The contractor shall ensure that all workers are provided appropriate PPE to include: coveralls (tyvek), head and boot covers, gloves, and respirators and hard hats where required.

C. Pre-demolition preparations:
1. Isolate the work area: Seal the area using 6 mil fire-resistant plastic sheeting and duct tape.
2. Establish a negative pressure enclosure in accordance with the Contractor's approved work plan utilizing a negative air machine with HEPA filtration.
3. Remove and bag or wrap all grossly contaminated materials and store in work area in preparation for disposal.
4. Remove contaminated construction materials from the site and dispose at approved solid waste disposal facility.

D. Removal of Contaminated Materials scheduled for removal:
1. Remove and dispose of materials with visible mold
2. Inspect adjacent floor and wall surfaces for mold growth. If mold is discovered, HEPA vacuum all surfaces, clean surfaces with a mild detergent, HEPA vacuum all surfaces, allow surfaces to completely dry. Follow same procedure for wood surfaces and add light sanding or wire brushing after cleaning surfaces with a mild detergent until no mold is visible.
3. Wet wipe all adjacent surfaces with a mild detergent and allow to dry.
4. HEPA vacuum all surfaces.

E. Cleaning of Contaminated Materials scheduled to remain:
1. If during the course of the renovation suspect mold growth is found, the following procedure is recommended:
2. Document location of suspect mold growth. Include photos, type of surface, and quantity.
3. For materials that cannot be cleaned, remove and dispose that portion of the material with suspect mold growth along with an additional 8"-12" past visible mold.

4. HEPA vacuum all floor surfaces followed by cleaning with a mild detergent, followed by HEPA vacuum, allow to dry.
5. Inspect adjacent surfaces for suspect mold growth. If mold is discovered, HEPA vacuum all surfaces, clean surfaces with a mild detergent, HEPA vacuum all surfaces, allow surfaces to completely dry. Follow same procedure for wood surfaces and add light sanding or wire brushing after cleaning surfaces with a mild detergent until no mold is visible.
6. Wet wipe all adjacent surfaces with a mild detergent and allow to dry.

3.04 CLEARANCE AIR MONITORING

A. The Contractor shall conduct a visual inspection to verify the completion of removal and clean up.

B. Final clearance air monitoring tests and surface sampling will not be performed until all areas and materials within the work area are fully cleaned (no visibly detectable debris or dust on any surface within abatement area), and dry. Final clearance monitoring will be accomplished by EHS-Alaska, Inc., utilizing non-viable mold air monitoring and surface sampling protocols, and will be analyzed by an accredited Laboratory for evidence of any remaining contamination.

C. If the final clearance monitoring results show that the work area has failed to meet the clearance criteria, EHS-Alaska, Inc. shall notify the Contractor. If failed, the Contractor shall re-clean the work area, prior to collection of another set of final clearance samples.

D. Once the final clearance monitoring results meet the clearance criteria then all seals, barriers, barricades, and decontamination areas shall be dismantled and removed.

E. Work area containment's and/or critical barriers shall not be removed until final clearance results are reviewed and accepted by EHS-Alaska, Inc..

3.05 RESTORATION OF WORK AREA

A. Upon completion, remove and dispose of all plastic sheeting as contaminated materials.

END OF SECTION

SECTION 03 3000
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:

1. Footings.
2. Foundation walls.
3. Building walls.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1. Indicate amounts of mixing water to be withheld for later addition at Project site.

C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, bent bar diagrams, bar arrangement, splices and laps, and supports for concrete reinforcement.

D. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork.

E. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.

1. Location of construction joints is subject to approval of the Architect.

1.5 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.
2. Admixtures.
3. Form materials and form-release agents.
4. Steel reinforcement and accessories.
5. Curing compounds.
6. Bonding agents.
7. Adhesives.
8. Repair materials.

C. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:

1. Aggregates.

D. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

C. Testing Agency Qualifications: An independent agency, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.

D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M, "Structural Welding Code - Reinforcing Steel."

E. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301, "Specifications for Structural Concrete," Sections 1 through 5.
2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

1. Plywood, metal, or other approved panel materials.
2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:

   a. High-density overlay, Class 1 or better.
   b. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
   c. Structural 1, B-B or better; mill oiled and edge sealed.
   d. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch (19 by 19 mm), minimum.

D. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.

E. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

F. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that will leave no corrodible metal closer than 1 inch (25 mm) to the plane of exposed concrete surface.
2. Furnish ties that, when removed, will leave holes no larger than 1 inch (25 mm) in diameter in concrete surface.

2.2 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

B. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.

C. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from as-drawn steel wire into flat sheets.

2.3 REINFORCEMENT ACCESSORIES

A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete.

2.4 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:

1. Portland Cement: ASTM C 150.

B. Normal-Weight Aggregates: ASTM C 33, coarse aggregate or better, graded. Provide aggregates from a single source.

1. Maximum Coarse-Aggregate Size: 3/4 inch (19 mm) nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Water: ASTM C 94/C 94M.

2.5 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260.

B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

C. Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete and complying with ASTM C 494/C 494M, Type C.

D. Non-Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, non-set-accelerating, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete.

2.6 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

2.7 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: [ASTM D 1751, asphalt-saturated cellulosic fiber] [or] [ASTM D 1752, cork or self-expanding cork].

B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, [epoxy resin with a Type A shore durometer hardness of 80] [aromatic polyurea with a Type A shore durometer hardness range of 90 to 95] per ASTM D 2240.

C. Bonding Agent: ASTM C 1059/C 1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

D. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:

1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

E. Reglets: Fabricate reglets of not less than 0.022-inch- (0.55-mm-) thick, galvanized-steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.

F. Dovetail Anchor Slots: Hot-dip galvanized-steel sheet, not less than 0.034 inch (0.85 mm) thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.8 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.

1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

B. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

C. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

3. Use water-reducing admixture in pumped concrete and concrete with a water-cementitious materials ratio below 0.50.
4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.

D. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

2.9 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 4000 psi (27.6 MPa) at 28 days.
2. Maximum Water-Cementitious Materials Ratio: 0.45.
3. Slump Limit: 4 inches (100 mm) for concrete with verified slump of 2 to 4 inches (50 to 100 mm) before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch (25 mm).
4. Air Content: 6.0 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch (19-mm) nominal maximum aggregate size.

2.10 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.11 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For mixer capacity of 1 cu. yd. (0.76 cu. m) or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
2. For mixer capacity larger than 1 cu. yd. (0.76 cu. m), increase mixing time by 15 seconds for each additional 1 cu. yd. (0.76 cu. m).
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:

1. Class A, 1/8 inch (3.2 mm) for smooth-formed finished surfaces.
2. Class B, 1/4 inch (6 mm) for rough-formed finished surfaces.

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.

1. Install keyways, reglets, recesses, and the like, for easy removal.
2. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer exterior corners and edges of permanently exposed concrete.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
3. Install dovetail anchor slots in concrete structures as indicated.

3.3 REMOVING AND REUSING FORMS

A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained.

1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

1. Weld reinforcing bars according to AWS D1.4/D 1.4M, where indicated.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.5 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.

3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
7. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

3.6 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

C. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

D. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
2. Maintain reinforcement in position on chairs during concrete placement.
3. Screed slab surfaces with a straightedge and strike off to correct elevations.
4. Slope surfaces uniformly to drains where required.
5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

E. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When average high and low temperature is expected to fall below 40 deg F (4.4 deg C) for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

F. Hot-Weather Placement: Comply with ACI 301 and as follows:

1. Maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.7 FINISHING FORMED SURFACES

A. Rough-Formed Surfaces: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces not exposed to view.

B. Smooth-Formed Surfaces: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces exposed to view.

C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.8 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel finish concrete surfaces.

3.9 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.

D. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

   a. Water.
   b. Continuous water-fog spray.
   c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

   a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
   b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
   c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.

3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

   a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer.

3.10 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 (1.18-mm) sieve, using only enough water for handling and placing.

C. Repairing Rough Formed Surfaces: Surface defects include, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface.

1. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

D. Repairing Smooth Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch (13 mm) in any dimension to solid concrete. Limit cut depth to 3/4 inch (19 mm). Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.11 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Inspections:

1. Steel reinforcement placement.
2. Steel reinforcement welding.
3. Headed bolts and studs.
4. Verification of use of required design mixture.
5. Concrete placement, including conveying and depositing.
6. Curing procedures and maintenance of curing temperature.
7. Verification of concrete strength before removal of shores and forms from beams and slabs.

C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture for the first 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m) or fraction thereof.

2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample.
4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C 31/C 31M.
   a. Cast and field cure two sets of two standard cylinder specimens for each composite sample.

6. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
   a. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from the same composite sample and tested at age indicated.
7. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).
8. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
9. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
10. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
11. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
12. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

END OF SECTION 033000

SECTION 03 3053
EXTERIOR CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Prepare sub-grade to receive base course.

B. Place stabilizing base courses, work and compact.

C. Place Portland Cement Concrete (PCC) sidewalk.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 Cast-in-Place Concrete

B. Section 31 2000 Earth Moving

1.03 TESTING

A. Testing Agency Qualifications: An independent agency, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

B. The Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.

1.04 TEST AND INSPECTION REPORTS REQUIRED

A. Shall conform to the requirements of Section 03 3000.

1.05 ENVIRONMENTAL REQUIREMENTS

A. Place no concrete when outside temperature is, or is expected to be, below 40 degrees F, or when the subgrade has standing water or snow.

B. Do not place on frozen materials.

PART 2 - PRODUCTS

2.01 PORTLAND CEMENT CONCRETE

A. As specified in Section 03 3000 Cast-in-Place Concrete.

B. Mix design shall show proposed admixtures, amounts, usage instructions, and justification for proposed exterior use.

PART 3 - EXECUTION

3.01 INSPECTION OF SITE

A. Examine site surfaces and elevations, subsurface soils report, existing site survey and details of Drawings for defects that will adversely affect the work.

B. Start of work shall mean acceptance of existing grades as capable of producing an acceptable job.

3.02 TOLERANCES

A. 1/8 inch in ten feet (non-cumulative) smooth surface alignment to elevations indicated on Drawings, without any local depressions.

3.03 FIELD QUALITY CONTROL

A. As specified in Section 03 3000 Cast-in-Place Concrete.

END OF SECTION 03 3053

SECTION 05 1200
STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Structural steel.
2. Grout.

B. Related Requirements:

1. Section 053100 "Steel Decking" for field installation of shear connectors through deck.
2. Section 055000 "Metal Fabrications" for steel lintels and shelf angles not attached to structural-steel frame miscellaneous steel fabrications and other steel items not defined as structural steel.

1.3 DEFINITIONS

A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

1.4 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. LEED Submittals:

1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
2. Laboratory Test Reports for Credit IEQ 4.2: For primers, documentation indicating that products comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

C. Shop Drawings: Show fabrication of structural-steel components.

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
2. Include embedment Drawings.
3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts.

1.7 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

C. Field quality-control and special inspection reports.

1.8 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.9 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.

1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

A. W-Shapes: ASTM A 992/A 992M or ASTM A 572/A 572M, Grade 50 (345).

B. Channels, Angles, Plate and Bar: ASTM A 36/A 36M.

C. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

A. High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, (ASTM A 563M, Class 8S) heavy-hex carbon-steel nuts; and ASTM F 436 (ASTM F 436M), Type 1, hardened carbon-steel washers; all with plain finish.

B. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.

2.3 PRIMER

A. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.

B. Galvanizing Repair Paint: ASTM A 780/A 780M.

2.4 GROUT

A. Metallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, metallic aggregate grout, mixed with water to consistency suitable for application and a 30-minute working time.

B. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.5 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," and to AISC 360.
   1. Mark and match-mark materials for field assembly.
   2. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

   1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.

C. Bolt Holes: Cut, drill, mechanically thermal cut, or punch standard bolt holes perpendicular to metal surfaces.

D. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 3, "Power Tool Cleaning."

E. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

2.6 SHOP CONNECTIONS

A. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

2.7 SHOP PRIMING

A. Shop prime steel surfaces except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches (50 mm).
2. Surfaces to be field welded.
3. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
4. Galvanized surfaces.

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
1. SSPC-SP 3, "Power Tool Cleaning."

C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils (0.038 mm). Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

2.8 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/A 123M.

1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.

3.3 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

3.4 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:

1. Verify structural-steel materials and inspect steel frame joint details.
2. Verify weld materials and inspect welds.
3. Verify connection materials and inspect high-strength bolted connections.

B. Bolted Connections: Inspect bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

C. Welded Connections: Visually inspect field welds according to AWS D1.1/D1.1M.

D. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:

1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
2. Conduct tests according to requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors already tested.

3.5 REPAIRS AND PROTECTION

A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780/A 780M.

B. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

C. Touchup Painting: Cleaning and touchup painting are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

END OF SECTION 051200

SECTION 05 4000
COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Exterior non-load-bearing wall framing.

B. Related Requirements:
   1. Section 092116.23 "Gypsum Board Shaft Wall Assemblies" for interior non-load-bearing, metal-stud-framed, shaft-wall assemblies.
   2. Section 092216 "Non-Structural Metal Framing" for interior non-load-bearing, metal-stud framing and ceiling-suspension assemblies.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of cold-formed steel framing product and accessory.

B. LEED Submittals:

   1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

C. Shop Drawings:

   1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
   2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

D. Delegated-Design Submittal: For cold-formed steel framing.

1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Product Test Reports: For each listed product, for tests performed by a qualified testing agency.
   1. Expansion anchors.
   2. Power-actuated anchors.
   3. Mechanical fasteners.
   4. Vertical deflection clips.

5. Horizontal drift deflection clips
6. Miscellaneous structural clips and accessories.

C. Research Reports: For non-standard cold-formed steel framing, from ICC-ES.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

B. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed steel framing from corrosion, moisture staining, deformation, and other damage during delivery, storage, and handling.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering cold-formed steel framing that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide cold-formed steel framing by one of the following:

1. Allied Studco.
2. AllSteel Products, Inc.
3. California Expanded Metal Products Company.
4. Clark Metal Framing.
5. Consolidated Fabricators Corp.; Building Products Division.
6. Craco Metals Manufacturing, LLC.
7. Custom Stud, Inc.
8. Dale/Incor.
9. Design Shapes in Steel.
10. Dietrich Metal Framing; a Worthington Industries Company.
11. Formetal Co. Inc. (The).
12. Innovative Steel Systems.
13. MarinoWare; a division of Ware Industries.
14. Quail Run Building Materials, Inc.
15. SCAFCO Corporation.
16. Southeastern Stud & Components, Inc.
17. Steel Construction Systems.
18. Steeler, Inc.
19. Super Stud Building Products, Inc.
20. United Metal Products, Inc.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design cold-formed steel framing.

B. Structural Performance: Provide cold-formed steel framing capable of withstanding design loads within limits and under conditions indicated.

1. Design Loads: As indicated.
2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
   a. Exterior Non-Load-Bearing Framing: Horizontal deflection of 1/240 of the wall height.

3. Design framing systems to provide for movement of framing members located outside the insulated building envelope without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 100 deg F (67 deg C).
4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:

   a. Upward and downward movement of 1 inch (25 mm).

5. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

C. Cold-Formed Steel Framing Design Standards:
1. Wall Studs: AISI S211.
2. Headers: AISI S212.

D. AISI Specifications and Standards: Unless more stringent requirements are indicated, comply with AISI S100 and AISI S200.

E. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.3 COLD-FORMED STEEL FRAMING, GENERAL

A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:

1. Grade: As required by structural performance.
2. Coating: G60 (Z180), A60 (ZF180), AZ50 (AZ150), or GF30 (ZGF90).

B. Steel Sheet for Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:

1. Grade: As required by structural performance.
2. Coating: G60 (Z180).

2.4 EXTERIOR NON-LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.054 inch (1.72 mm).

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.043 inch (1.09 mm).

C. Vertical Deflection Clips: Manufacturer's standard bypass clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.

D. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure through positive mechanical attachment to stud web and structure.

2.5 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:

1. Supplementary framing.
2. Bracing, bridging, and solid blocking.
3. Web stiffeners.
4. Anchor clips.
5. End clips.
6. Foundation clips.
7. Gusset plates.
8. Stud kickers and knee braces.
9. Joist hangers and end closures.
10. Hole reinforcing plates.
11. Backer plates.

2.6 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.

B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel hex-headed bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.

C. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing per ASTM E 488 conducted by a qualified testing agency.

D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.

E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.

1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

F. Welding Electrodes: Comply with AWS standards.

2.7 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: SSPC-Paint 20 or MIL-P-21035B.

B. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

C. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107/C 1107M, with fluid consistency and 30-minute working time.

D. Shims: Load bearing, high-density multimonomer plastic, and nonleaching; or of cold-formed steel of same grade and coating as framing members supported by shims.

E. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch (6.4 mm) thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

2.8 FABRICATION

A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.

1. Fabricate framing assemblies using jigs or templates.
2. Cut framing members by sawing or shearing; do not torch cut.
3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.

   a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
   b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by no fewer than three exposed screw threads.

4. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.

C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch (3 mm).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Install load bearing shims or grout between the underside of load-bearing wall bottom track and the top of foundation wall or slab at locations with a gap larger than 1/4 inch (6 mm) to ensure a uniform bearing surface on supporting concrete or masonry construction.

B. Install sealer gaskets at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

3.3 INSTALLATION, GENERAL

A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed steel framing according to AISI S200 and to manufacturer's written instructions unless more stringent requirements are indicated.

C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.

1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch (1.6 mm).

D. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.

1. Cut framing members by sawing or shearing; do not torch cut.
2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.

a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.

b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.

E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

G. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.

H. Install insulation, specified in Section 072100 "Thermal Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.

J. Erection Tolerances: Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:

1. Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.

B. Fasten both flanges of studs to top and bottom track unless otherwise indicated. Space studs as follows:

1. Stud Spacing: As indicated.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.

1. Install single deep-leg deflection tracks and anchor to building structure.
2. Install double deep-leg deflection tracks and anchor outer track to building structure.
3. Connect vertical deflection clips to bypassing studs and anchor to building structure.
4. Connect drift clips to cold-formed metal framing and anchor to building structure.

E. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 48 inches (1220 mm) apart. Fasten at each stud intersection.

1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches (305 mm) of single deflection track. Install a combination of bridging and stud or

stud-track solid blocking of width and thickness matching studs, secured to stud webs or flanges.

2. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
3. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
4. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.5 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Field and shop welds will be subject to testing and inspecting.

C. Testing agency will report test results promptly and in writing to Contractor and Architect.

D. Remove and replace work where test results indicate that it does not comply with specified requirements.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.6 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 05 5000
METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Shop fabricated steel and aluminum items.

1.02 RELATED REQUIREMENTS

A. Section 05 5213 - Pipe and Tube Railings.

B. Section 09 9123 - Painting and Coating: Paint finish.

1.03 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; American Architectural Manufacturers Association; 2012.

B. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels; 2002.

C. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels; 2010.

D. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels; 2011.

E. ANSI A14.3 - American National Standard for Ladders -- Fixed -- Safety Requirements; 2008.

F. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2008.

G. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.

H. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2012.

I. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.

J. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2012.

K. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength; 2010.

L. ASTM A325M - Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Tensile Strength (Metric); 2009.

M. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2010a.

N. ASTM B85/85M - Standard Specification for Aluminum-Alloy Die Castings; 2010.

O. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2010.

P. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric]; 2010.

Q. ASTM B210 - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes; 2012.

R. ASTM B210M - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes (Metric); 2012.

S. ASTM B211 - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire; 2012e1.

T. ASTM B211M - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold-Finished Bar, Rod, and Wire (Metric); 2012e1.

U. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2012.

V. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric]; 2012.

W. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; American Welding Society; 2012.

X. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society; 2010.

Y. AWS D1.2/D1.2M - Structural Welding Code - Aluminum; American Welding Society; 2008.

Z. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel; International Accreditation Service, Inc.; 2011.

AA. SSPC-Paint 15 - Steel Joist Shop Primer; Society for Protective Coatings; 1999 (Ed. 2004).

AB. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society for Protective Coatings; 2002 (Ed. 2004).

AC. SSPC-SP 2 - Hand Tool Cleaning; Society for Protective Coatings; 1982 (Ed. 2004).

1.04 SUBMITTALS

A. See Section 01 3300 - submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.

1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

C. Welders' Certificates: Submit certification for welders employed on the project, verifying AWS qualification within the previous 12 months.

1.05 QUALITY ASSURANCE

A. Design under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State in which the Project is located.

B. Fabricator Qualifications: A qualified steel fabricator that is accredited by the International Accreditation Service (IAS) Fabricator Inspection Program for Structural Steel (AC172).

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

A. Steel Sections: ASTM A36/A36M.

B. Steel Tubing: ASTM A500, Grade B cold-formed structural tubing.

C. Plates: ASTM A283.

D. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.

E. Slotted Channel Framing: ASTM A653, Grade 33.

F. Slotted Channel Fittings: ASTM A1011/A1011M.

G. Bolts, Nuts, and Washers: ASTM A325 (ASTM A325M), Type 1, galvanized to ASTM A153/A153M where connecting galvanized components.

H. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

I. Wire Mesh 3”: Galvanized Steel .08 Wire Thickness, Square Welded (Non-woven)

J. Handrail Brackets: Heavy Cast plain steel; 2.5 inch centerline to wall, BASIS OF DESIGN McNichols # WMHCMB251U.

K. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

J. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.02 MATERIALS - ALUMINUM

A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.

B. Sheet Aluminum: ASTM B209 (ASTM B209M), 5052 alloy, H32 or H22 temper.

C. Aluminum-Alloy Drawn Seamless Tubes: ASTM B210 (ASTM B210M), 6063 alloy, T6 temper.

D. Aluminum-Alloy Bars: ASTM B211 (ASTM B211M), 6061 alloy, T6 temper.

E. Aluminum-Alloy Die Castings: ASTM B85.

F. Bolts, Nuts, and Washers: Stainless steel.

G. Welding Materials: AWS D1.2/D1.2M; type required for materials being welded.

2.03 FABRICATION

A. Fit and shop assemble items in largest practical sections, for delivery to site.

B. Fabricate items with joints tightly fitted and secured.

C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

D. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.04 FABRICATED ITEMS

A. Ladders: Steel; in compliance with ANSI A14.3; with mounting brackets and attachments; galvanized finish.

1. Side Rails: 3/8 x 2 inches members spaced at 20 inches.
2. Rungs: one inch diameter solid round bar spaced 12 inches on center.
3. Space rungs 7 inches from wall surface.

B. Bumper Posts and Guard Rails: As detailed; galvanized finish.

C. Bollards: Steel pipe, concrete filled, crowned cap, as detailed; galvanized finish.

D. Ledge Angles, Shelf Angles, Channels, and Plates Not Attached to Structural Framing: For support of metal decking; galvanized finish.

E. Lintels: As detailed; galvanized finish.

F. Door Frames for Wall Openings. Channel sections; prime paint finish.

G. Slotted Channel Framing: Fabricate channels and fittings from structural steel complying with the referenced standards; factory-applied, rust-inhibiting thermoset acrylic enamel finish.

2.05 FINISHES - STEEL

A. Prepare surfaces to be primed in accordance with SSPC-SP2.

B. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

C. Prime Painting: One coat.

D. Galvanizing of Structural Steel Members: Galvanize after fabrication to ASTM A123/A123M requirements.

E. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.

2.06 FINISHES - ALUMINUM

A. Interior Aluminum Surfaces: Class I natural anodized.

B. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.

2.07 FABRICATION TOLERANCES

A. Squareness: 1/8 inch maximum difference in diagonal measurements.

B. Maximum Offset Between Faces: 1/16 inch.

C. Maximum Misalignment of Adjacent Members: 1/16 inch.

D. Maximum Bow: 1/8 inch in 48 inches.

E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

3.03 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Perform field welding in accordance with AWS D1.1/D1.1M.

D. Obtain approval prior to site cutting or making adjustments not scheduled.

E. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

SECTION 05 5213
PIPE AND TUBE RAILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall mounted handrails.

B. Stair railings and guardrails.

C. Free-standing railings at steps.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Placement of anchors in concrete.

B. Section 09 2116 - Gypsum Board Assemblies: Placement of backing plates in stud wall construction.

C. Section 09 9000 - Painting and Coating: Paint finish.

1.03 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; American Architectural Manufacturers Association; 2012.

B. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels; 2002.

C. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels; 2010.

D. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.

E. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2012.

F. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2010a.

G. ASTM B241/B241M - Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube; 2010.

H. ASTM B429/B429M - Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube; 2010.

I. ASTM B483/B483M - Standard Specification for Aluminum and Aluminum-Alloy Drawn Tubes and Pipe for General Purpose Applications; 2003.

J. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings; 2000 (Reapproved 2006).

K. ASTM E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings; 2000 (Reapproved 2006).

L. SSPC-Paint 15 - Steel Joist Shop Paint; The Society for Protective Coatings; 1999 (Ed. 2004).

M. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); The Society for Protective Coatings; 2002 (Ed. 2004).

1.04 SUBMITTALS

A. See Section 01 3300 - for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.

PART 2 PRODUCTS

2.01 RAILINGS - GENERAL REQUIREMENTS

A. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of ASTM E985 and applicable local code.

B. Distributed Loads: Design railing assembly, wall rails, and attachments to resist distributed force of 75 pounds per linear foot applied to the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E 935.

C. Concentrated Loads: Design railing assembly, wall rails, and attachments to resist a concentrated force of 200 pounds applied at any point on the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E 935.

D. Allow for expansion and contraction of members and building movement without damage to connections or members.

E. Dimensions: See drawings for configurations and heights.

1. Top Rails and Wall Rails: 1-1/2 inches diameter, round.
2. Intermediate Rails: 1-1/4 inches diameter, round.
3. Posts: 1-1/2 inches diameter, round.

F. Provide anchors and other components as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.

1. For anchorage to concrete, provide inserts to be cast into concrete, for bolting anchors.
2. For anchorage to stud walls, provide backing plates, for bolting anchors.

G. Provide slip-on non-weld mechanical fittings to join lengths, seal open ends, and conceal exposed mounting bolts and nuts, including but not limited to elbows, T-shapes, splice connectors, flanges, escutcheons, and wall brackets.

2.02 ALUMINUM MATERIALS

A. Aluminum Pipe: Schedule 40; ASTM B429/B 429M, ASTM B241/B 241M, or ASTM B483/B 483M.

B. Aluminum Tube: Minimum wall thickness of 0.127 inch; ASTM B429/B 429M, ASTM B241/B 241M, or ASTM B483/B 483M.

C. Non-Weld Mechanical Fittings: Slip-on cast aluminum, for Schedule 40 pipe, with flush setscrews for tightening by standard hex wrench, no bolts or screw fasteners.

D. Exposed Fasteners: No exposed bolts or screws.

2.03 STEEL RAILING SYSTEM

A. Steel Tube: ASTM A 500, Grade B cold-formed structural tubing.

B. Steel Pipe: ASTM A 53/A 53M, Grade B Schedule 40, black finish.

C. Non-Weld Mechanical Fittings: Slip-on, galvanized malleable iron castings, for Schedule 40 pipe, with flush setscrews for tightening by standard hex wrench, no bolts or screw fasteners.

D. Welding Fittings: Factory- or shop-welded from matching pipe or tube; seams continuously welded; joints and seams ground smooth.

E. Exposed Fasteners: No exposed bolts or screws.

F. Straight Splice Connectors: Steel concealed spigots.

G. Galvanizing: In accordance with requirements of ASTM A123/A123M.

1. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic.

H. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

2.04 FABRICATION

A. Accurately form components to suit specific project conditions and for proper connection to building structure.

B. Fit and shop assemble components in largest practical sizes for delivery to site.

C. Fabricate components with joints tightly fitted and secured. Provide spigots and sleeves to accommodate site assembly and installation.

D. Welded Joints:

1. Exterior Components: Continuously seal joined pieces by intermittent welds and plastic filler. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.

2. Interior Components: Continuously seal joined pieces by intermittent welds and plastic filler.
3. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply items required to be cast into concrete with setting templates, for installation as work of other sections.

C. Apply one coat of bituminous paint to concealed aluminum surfaces that will be in contact with cementitious or dissimilar materials.

3.03 INSTALLATION

A. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.

B. Anchor railings securely to structure.

C. Conceal anchor bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per floor level, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

SECTION 05 5305
METAL GRATINGS AND FLOOR PLATES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Formed metal floor, mezzanine, and stair tread gratings.

B. Flat surface floor and stair tread plating.

C. Perimeter closure.

1.02 RELATED REQUIREMENTS

A. Section 09 9000 - Painting and Coating: Field paint finish.

1.03 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2008.

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2012.

C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.

D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2011.

E. ASTM A786/A786M - Standard Specification for Hot-Rolled Carbon, Low-Alloy, High-Strength Low-Alloy, and Alloy Steel Floor Plates; 2005 (Reapproved 2009).

F. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2012a

G. ASTM B211 - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire; 2012e1.

H. ASTM B211M - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold-Finished Bar, Rod, and Wire (Metric); 2012e1.

I. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society; 2010.

J. NAAMM MBG 532 - Heavy Duty Metal Bar Grating Manual; The National Association of Architectural Metal Manufacturers; 2009 (ANSI/NAAMM MBG 532).

K. SSPC-Paint 15 - Steel Joist Shop Primer; Society for Protective Coatings; 1999 (Ed. 2004).

L. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society for Protective Coatings; 2002 (Ed. 2004).

1.04 PERFORMANCE REQUIREMENTS

A. Design Live (Pedestrian) Load: Uniform load of 100 lb/sq ft minimum; concentrated load of 300 lbs.

B. Design Live (Light Vehicle) Load: Uniform load of 500 lb/sq ft minimum; concentrated load of 2000 lbs.

C. Maximum Allowable Deflection Under Live Load: 1/240 of span; size components by single support design.

1.05 SUBMITTALS

A. See Section 01 3300 - submittal procedures.

B. Product Data: Provide span and deflection tables.

C. Shop Drawings: Indicate details of component supports, openings, perimeter construction details, and tolerances.

D. Welders' Certificates: Submit certification for welders employed on the project, verifying AWS qualification within the previous 12 months.

1.06 QUALITY ASSURANCE

A. Designer Qualifications: Design gratings and plates under direct supervision of a Professional Structural Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

PART 2 PRODUCTS

2.01 MATERIALS

A. Steel Floor Plate: ASTM A786/A786M; pattern as indicated.

B. Steel For Welding or Riveting: ASTM A36/A36M, unfinished, of shapes indicated.

C. Steel Sheet for Lock Forming: Hot-dipped galvanized, ASTM A653/A653M, FS Type B, with G90/Z275 coating.

D. Steel Framing: ASTM A36/A36M shapes, unfinished.

E. Cross Bars: ASTM B211 (ASTM B211M) solid bars.

F. Welding Materials: AWS D1.1; type required for materials being welded.

G. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

H. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.02 ACCESSORIES

A. Fasteners and Saddle Clips: Galvanized steel:

B. Perimeter Closure: Of same material as grating.

2.03 FABRICATION

A. Grating Type: NAAMM MBG 532, Pressure Locked Type.

B. Top Surface: Serrated.

2.04 FINISHES

A. Galvanizing for Steel Shapes: ASTM A123/A123M.

B. Galvanizing for Steel Hardware: ASTM A153/A153M.

C. Non-Slip Surfacing: Aluminum oxide.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that opening sizes and dimensional tolerances are acceptable.

B. Verify that supports are correctly positioned.

3.02 INSTALLATION

A. Install components in accordance with manufacturer's instructions.

B. Place frames in correct position, plumb and level.

C. Mechanically cut galvanized finish surfaces. Do not flame cut.

D. Set perimeter closure flush with top of grating and surrounding construction.

E. Secure to prevent movement.

3.03 TOLERANCES

A. Conform to NAAMM MBG 532.

3.04 SCHEDULES

END OF SECTION

SECTION 055316
PLANK GRATINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes formed-metal plank gratings.

B. Related Requirements:

1. Section 051200 "Structural Steel Framing" for structural-steel framing system components.

1.3 COORDINATION

A. Coordinate installation of anchorages for gratings, grating frames, and supports. Furnish setting drawings, directions for installing anchorages. Deliver such items to Project site in time for installation.

1.4 ACTION SUBMITTALS

A. Product Data: For formed-metal plank gratings.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code – Steel”

1.6 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with gratings by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 FORMED-METAL PLANK GRATINGS

A. C-shaped channels rolled from heavy sheet metal of thickness indicated, and punched in serrated diamond shape to produce raised slip-resistant surface and drainage holes. Hot dip galvanize after fabrication.

1. Channel Width: As indicated.
2. Channel Depth: As indicated.
3. Material Gauge: As indicated.

2.2 FASTENERS

A. General: Unless otherwise indicated, provide zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and flat washers.

2.3 FABRICATION

A. Cut, drill, and punch material cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

B. Fit exposed connections accurately together to form hairline joints.

C. Welding: Comply with AWS recommendations and the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.

D. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space the anchoring devices to secure gratings, frames, and supports rigidly in place and to support indicated loads.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing gratings to in-place construction.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing gratings. Set units accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

C. Field Welding: Comply with AWS recommendations and the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.

3.2 INSTALLING METAL PLANK GRATINGS

A. General: Comply with manufacturer's written instructions for installing gratings. Use manufacturer's standard anchor clips and hold-down devices for bolted connections.

B. Attach units to supporting members by bolting or welding at every point of contact.

3.3 ADJUSTING AND CLEANING

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas, and repair galvanizing to comply with ASTM A 780/A 780M.

END OF SECTION

SECTION 06 1000
ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Rough opening framing for doors, windows, and roof openings.

B. Roof-mounted curbs.

C. Roofing nailers.

D. Roofing cant strips.

E. Preservative treated wood materials.

F. Fire retardant treated wood materials.

G. Miscellaneous framing and sheathing.

H. Concealed wood blocking, nailers, and supports –including backing for exterior sheet metal and siding.

I. Miscellaneous wood nailers, furring, and grounds.

1.02 REFERENCE STANDARDS

A. ANSI A208.1 - American National Standard for Particleboard; 2009.

B. APA PRP-108 - Performance Standards and Qualification Policy for Structural-Use Panels (Form E445); 2001.

C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.

D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2011

E. ASTM D2898 - Standard Test Methods for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing; 2010.

F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2012.

G. AWPA U1 - Use Category System: User Specification for Treated Wood; American Wood Protection Association; 2012.

H. PS 20 - American Softwood Lumber Standard; National Institute of Standards and Technology (Department of Commerce); 2010.

I. WWPA G-5 - Western Lumber Grading Rules; Western Wood Products Association; 2011.

1.03 SUBMITTALS

A. See Section 01 3300 - submittal procedures.

B. Product Data: Provide technical data on wood preservative materials.

1.04 DELIVERY, STORAGE, AND HANDLING

A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, or installation.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.

1. If no species is specified, provide any species graded by the agency specified; if no grading agency is specified, provide lumber graded by any grading agency meeting the specified requirements.
2. Grading Agency: Any grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee (www.alsc.org) and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.

B. Lumber fabricated from old growth timber is not permitted.

2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

A. Grading Agency: Western Wood Products Association (WWPA).

B. Sizes: Nominal sizes as indicated on drawings, S4S.

C. Moisture Content: S-dry or MC19.

D. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:

1. Lumber: S4S, No. 2 or Standard Grade.
2. Boards: Standard or No. 3.

2.03 ACCESSORIES

A. Fasteners and Anchors:

1. Metal and Finish: Hot-dipped galvanized steel per ASTM A 153/A 153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.

2. Drywall Screws: Bugle head, hardened steel, power driven type, length three times thickness of sheathing.

2.04 FACTORY WOOD TREATMENT

A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.

1. Fire-Retardant Treated Wood: Mark each piece of wood with producer's stamp indicating compliance with specified requirements.
2. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.

B. Fire Retardant Treatment:

1. Exterior Type: AWPA U1, Category UCFB, Commodity Specification H, chemically treated and pressure impregnated; capable of providing a maximum flame spread rating of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes both before and after accelerated weathering test performed in accordance with ASTM D2898.
   a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
   b. Treat all exterior rough carpentry items.
   c. Do not use treated wood in direct contact with the ground.

C. Preservative Treatment:

1. Exterior Type: Lumber above grade: AWPA U1, Category UC3B, Commodity Specification A, using waterborne preservative to 0.25lb/cu.ft. retention. Plywood above grade: AWPA UC2 and UC3B, Commodity Specification F,
   a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
   b. Treat all exterior rough carpentry items and all door and window and exterior mechanical penetration jamb, head and sill framing.
   c. Do not use treated wood in direct contact with the ground.

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

A. Select material sizes to minimize waste.

B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.02 BLOCKING, NAILERS, AND SUPPORTS

A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim. Modify exterior blocking and nailers as required to match exterior metal siding rib depth.

B. In metal stud walls, provide continuous blocking around door and window and mechancial openings for anchorage of frames, securely attached to stud framing.

C. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.

D. Specifically, provide the following non-structural framing and blocking:

1. Cabinets and shelf supports.
2. Wall brackets.
3. Handrails.
4. Grab bars.
5. Towel and bath accessories.
6. Wall-mounted door stops.
7. Chalkboards and marker boards.
8. Wall paneling and trim.
9. Joints of rigid wall coverings that occur between studs.
10. Wall Mounted audio video equipment.

3.03 ROOF-RELATED CARPENTRY

A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.

B. Provide wood curb at all roof openings except where specifically indicated otherwise. Form corners by alternating lapping side members.

3.04 TOLERANCES

A. Framing Members: 1/4 inch from true position, maximum.

B. Variation from Plane (Other than Floors): 1/4 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

3.05 CLEANING

A. Waste Disposal: Comply with the requirements of Section 01 7419.

1. Comply with applicable regulations.
2. Do not burn scrap on project site.
3. Do not burn scraps that have been pressure treated.

B. Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill.

C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

SECTION 06 2000
FINISH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Finish carpentry items.

B. Hardware and attachment accessories.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Support framing, grounds, and concealed blocking.

B. Section 08 1416 - Flush Wood Doors.

C. Section 08 8000 - Glazing: Glass and glazing of partitions.

D. Section 09 9123 - Painting and Coating: Painting and finishing of finish carpentry items.

1.03 REFERENCE STANDARDS

A. ANSI A135.4 - American National Standard for Basic Hardboard; 2004.

B. ANSI A208.1 - American National Standard for Particleboard; 2009.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2012.

D. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2009.

E. BHMA A156.9 - American National Standard for Cabinet Hardware; Builders Hardware Manufacturers Association; 2010 (ANSI/BHMA A156.9).

F. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood; Hardwood Plywood & Veneer Association; 2009.

G. PS 1 - Structural Plywood; 2009.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with plumbing rough-in, electrical rough-in, and installation of associated and adjacent components.

1.05 SUBMITTALS

A. See Section 01 3300 - submittal procedures.

B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.

1. Provide the information required by AWI/AWMAC/WI Architectural Woodwork Standards.

1.06 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect work from moisture damage.

PART 2 PRODUCTS

2.01 FINISH CARPENTRY ITEMS

A. Quality Grade: Unless otherwise indicated provide products of quality specified by AWI/AWMAC/WI Architectural Woodwork Standards for Custom Grade.

B. Interior Woodwork Items:

1. Moldings, Bases, Casings, and Miscellaneous Trim: Clear white pine; prepare for paint finish.
2. Window Sills: Maple; prepare for transparent finish.
3. Loose Shelving: Birch plywood; prepare for paint finish.

2.02 WOOD-BASED COMPONENTS

A. Wood fabricated from old growth timber is not permitted.

2.03 LUMBER MATERIALS

A. Softwood Lumber: Fir species, quarter sawn, maximum moisture content of 6 percent; with vertical grain, of quality suitable for transparent finish.

B. Hardwood Lumber: Maple species, quarter sawn, maximum moisture content of 6 percent; with vertical grain, of quality suitable for transparent finish.

2.04 SHEET MATERIALS

A. Softwood Plywood Not Exposed to View: Any face species, veneer core; PS 1 Grade A-B; glue type as recommended for application.

B. Softwood Plywood Exposed to View: Face species as indicated, plain sawn, medium density fiberboard core; PS 1 Grade A-B; glue type as recommended for application.

C. Hardwood Plywood: Face species as indicated, plain sawn, book matched, medium density fiberboard core; HPVA HP-1, Front Face Grade AA, Back Face Grade 1; glue type as recommended for application.

2.05 FASTENINGS

A. Adhesive for Purposes Other Than Laminate Installation: Suitable for the purpose; not containing formaldehyde or other volatile organic compounds.

B. Concealed Joint Fasteners: Threaded steel.

2.06 ACCESSORIES

A. Primer: Alkyd primer sealer.

B. Wood Filler: Solvent base, tinted to match surface finish color.

2.07 HARDWARE

A. Hardware: Comply with BHMA A156.9.

2.08 FABRICATION

A. Shop assemble work for delivery to site, permitting passage through building openings.

B. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

2.09 SHOP FINISHING

A. Sand work smooth and set exposed nails and screws.

B. Apply wood filler in exposed nail and screw indentations.

C. On items to receive transparent finishes, use wood filler that matches surrounding surfaces and is of type recommended for the applicable finish.

D. Finish work in accordance with AWI/AWMAC/WI Architectural Woodwork Standards, Section 5 - Finishing for Grade specified and as follows:

PART 3 EXECUTION

3.01 INSTALLATION

A. Install work in accordance with AWI/AWMAC/WI Architectural Woodwork Standards requirements for grade indicated.

B. Set and secure materials and components in place, plumb and level.

C. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.

3.02 PREPARATION FOR SITE FINISHING

A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.

B. Site Finishing: See Section 09 9123.

3.03 TOLERANCES

A. Maximum Variation from True Position: 1/16 inch.

B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

END OF SECTION

SECTION 06 4116
PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:

1. Plastic-laminate-faced architectural cabinets.
2. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-faced architectural cabinets unless concealed within other construction before cabinet installation.

B. Related Requirements:

1. Section 06 10 00 "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing cabinets and concealed within other construction before cabinet installation.
2. Section 12 36 23.13 "Plastic-Laminate-Clad Countertops."

1.03 PREINSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site**.**

1.04 SUBMITTALS

A. See Section 01 3300 – submittal procedures.

1.05 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

B. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

C. Fire-Test-Response Characteristics: Provide decorative plastic laminate with the following subsurface burning characters as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 450 or less.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver cabinets until painting and similar operations that could damage woodwork have been completed in installation areas. If cabinets must be stored in other than installation areas,

store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.07 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F (16 and 32 deg C) and relative humidity between 25 and 55 percent during the remainder of the construction period.

B. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed, and indicate measurements on Shop Drawings.

C. Established Dimensions: Where cabinets are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.08 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that cabinets can be supported and installed as indicated.

B. Hardware Coordination: Distribute copies of approved hardware schedule specified in Section 08 71 00 "Door Hardware (Descriptive Specification)" to fabricator of architectural woodwork; coordinate Shop Drawings and fabrication with hardware requirements.

PART 2 - PRODUCTS

2.01 ARCHITECTURAL CABINET FABRICATORS

A. Fabricators: Coordinate with State of Alaska representative for list of approved fabricators.

2.02 PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of architectural plastic-laminate cabinets indicated for construction, finishes, installation, and other requirements.

1. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.

B. Grade: Custom.

C. Cabinet, Door, and Drawer Front Interface Style: Flush overlay.

D. Reveal Dimension: As indicated

E. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by woodwork quality standard.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Formica Corporation.

b. Wilsonart International.

c. Abet Laminati

F. Laminate Cladding for Exposed Surfaces:

1. Horizontal Surfaces: Grade HGS.
2. Postformed Surfaces: Grade HGP.
3. Vertical Surfaces: Grade VGS
4. Edges: PVC edge banding, 0.12 inch (3 mm) thick, matching laminate in color, pattern, and finish.
5. Pattern Direction: Vertically for drawer fronts, doors, and fixed panels.

G. Materials for Semiexposed Surfaces:

1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate.
   a. Edges of Plastic-Laminate Shelves: PVC tape, 0.018-inch (0.460-mm) minimum thickness, matching laminate in color, pattern, and finish.
   b. Edges of Thermoset Decorative Panel Shelves: PVC or polyester edge banding.
   c. Retain first subparagraph below if required to provide balanced construction.
2. Drawer Sides and Backs: Thermoset decorative panels with PVC or polyester edge banding.
3. Drawer Bottoms: Thermoset decorative panels.

H. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.

1. Join subfronts, backs, and sides with glued rabbeted joints supplemented by mechanical fasteners.

I. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

1. As selected by Designer from laminate manufacturer's full range in the following categories:
   a. Solid colors, matte finish.
   b. Patterns, matte finish.

2.03 FIRE-RETARDANT-TREATED MATERIALS

A. Fire-Retardant-Treated Materials, General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

1. Use treated materials that comply with requirements of referenced woodworking standard. Do not use materials that are warped, discolored, or otherwise defective.
2. Use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.
3. Identify fire-retardant-treated materials with appropriate classification marking of qualified testing agency in the form of removable paper label or imprint on surfaces that will be concealed from view after installation.

B. Fire-Retardant-Treated Lumber and Plywood: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, with no evidence of significant progressive combustion

when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet (3.2 m) beyond the centerline of the burners at any time during the test.

1. Kiln dry lumber and plywood after treatment to a maximum moisture content of 19 and 15 percent, respectively.
2. For items indicated to receive a stained or natural finish, use organic resin chemical formulation.
3. Mill lumber after treatment within limits set for wood removal that do not affect listed fire-test-response characteristics, using a woodworking shop certified by testing and inspecting agency.
4. Mill lumber before treatment and implement special procedures during treatment and drying processes that prevent lumber from warping and developing discolorations from drying sticks or other causes, marring, and other defects affecting appearance of treated woodwork.

C. Fire-Retardant Particleboard: Panels complying with the following requirements, made from softwood particles and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 25 or less per ASTM E 84.

1. For panels 3/4 inch (19 mm) thick and less, comply with ANSI A208.1 for Grade M-2 except for the following minimum properties: modulus of rupture, 1600 psi (11 MPa); modulus of elasticity, 300,000 psi (2070 MPa); internal bond, 80 psi (550 kPa); and screw-holding capacity on face and edge, 250 and 225 lbf (1100 and 1000 N), respectively.
2. Products: Subject to compliance with requirements, provide:
   a. Flakeboard Company Limited; Duraflake FR.

D. Fire-Retardant Fiberboard: Medium-density fiberboard panels complying with ANSI A208.2, made from softwood fibers, synthetic resins, and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 200 or less per ASTM E 84.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Panel Source International, Inc.; Pyroblock Platinum.

2.04 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets except for items specified in Section 08 71 00 "Door Hardware (Descriptive Specification)."

B. Butt Hinges: 2-3/4-inch (70-mm), five-knuckle steel hinges made from 0.095-inch- (2.4-mm-) thick metal, and as follows:

1. Semiconcealed Hinges for Flush Doors: BHMA A156.9, B01361.
2. Semiconcealed Hinges for Overlay Doors: BHMA A156.9, B01521.

C. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 170 degrees of opening.

D. Back-Mounted Pulls: BHMA A156.9, B02011.

E. Wire Pulls: Back mounted, solid metal 4 inches (100 mm) long, 5/16 inch (8 mm) in diameter.

F. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081

G. Shelf Rests: BHMA A156.9, B04013; metal, two-pin type with shelf hold-down clip.

H. Drawer Slides: BHMA A156.9.

1. Grade 1 and Grade 2: Side mounted full-extension type; zinc-plated steel with polymer rollers.
2. Grade 1HD-100 and Grade 1HD-200: Side mounted; full extension type; zinc-plated-steel ball-bearing slides.
3. For drawers more than 3 inches (75 mm) high but not more than 6 inches (150 mm) high and not more than 24 inches (600 mm) wide, provide Grade 1HD-100.
4. For drawers more than 6 inches (150 mm) high or more than 24 inches (600 mm) wide, provide Grade 1HD-200.
5. For trash bins not more than 20 inches (500 mm) high and 16 inches (400 mm) wide, provide Grade 1HD-200

I. Door Locks: BHMA A156.11, E07121.

J. Drawer Locks: BHMA A156.11, E07041.

K. Door and Drawer Silencers: BHMA A156.16, L03011.

A. Grommets for Cable Passage through Countertops: 2-inch (51-mm) OD, gray, molded-plastic grommets and matching plastic caps with slot for wire passage.
   1. Product: Subject to compliance with requirements, provide "TG series" by Doug Mockett & Company, Inc.

B. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
   1. Satin Stainless Steel: BHMA 630.

C. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.05 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: hardwood lumber, kiln dried to less than 15 percent moisture content.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

C. Adhesives: Do not use adhesives that contain urea formaldehyde.

D. Adhesive for Bonding Plastic Laminate: Unpigmented contact cement.

2.06 FABRICATION

A. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.

B. Fabricate cabinets to dimensions, profiles, and details indicated.

C. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
   1. Notify Architect seven days in advance of the dates and times woodwork fabrication will be complete.
   2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check

measurements of assemblies against field measurements before disassembling for shipment.

D. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

PART 3 - EXECUTION

3.01 PREPARATION

A. Before installation, condition cabinets to average prevailing humidity conditions in installation areas.

B. Before installing cabinets, examine shop-fabricated work for completion and complete work as required.

C. Verify mechanical, electrical and building items affecting work are placed and ready to receive work.

3.02 INSTALLATION

A. Grade: Install cabinets to comply with same grade as item to be installed.

B. Assemble cabinets and complete fabrication at Project site to the extent that it was not completed in the shop.

C. Install cabinet's level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm).

D. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

E. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use finishing screws for exposed fastening, countersunk and filled flush with woodwork.

1. Use filler matching finish of items being installed.

F. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.

1. Install cabinets with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.

2. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches (400 mm) o.c. with No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish.

3.03 ADJUSTING AND CLEANING

A. Adjust for maximum offset of true alignment with different adjacent materials to 1/32 inch (0.80 mm).

B. Adjust for true alignment of same materials to flush.

C. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

D. Clean, lubricate, and adjust hardware.

E. Clean cabinets on exposed and semiexposed surfaces.

F. Do not allow construction near unprotected surfaces.

END OF SECTION 06 41 16

SECTION 07 1300
SHEET WATERPROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sheet membrane waterproofing.

B. Protection boards.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete substrate.

B. Section 07 2100 - Thermal Insulation: Insulation used for protective cover.

C. Section 07 6200 - Sheet Metal Flashing and Trim: Metal parapet, coping, and counterflashing.

D. Section 07 9005 - Joint Sealers: Sealant for joints in substrates.

E. Section 22 1006 - Plumbing Piping Specialties: Roof drain and plumbing vent flashing flanges.

1.03 REFERENCE STANDARDS

A. ASTM C836/C836M - Standard Specification for High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course; 2012.

B. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension; 2006a.

C. ASTM D570 - Standard Test Method for Water Absorption of Plastics; 1998 (Reapproved 2010).

D. ASTM D624 - Standard Test Method For Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers; 2000 (Reapproved 2012).

E. ASTM D746 - Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact; 2007.

F. ASTM D882 - Standard Test Method for Tensile Properties of Thin Plastic Sheeting; 2012.

G. ASTM D903 - Standard Test Method for Peel or Stripping Strength of Adhesive Bonds; 1998 (Reapproved 2010).

H. ASTM D1876 - Standard Test Method for Peel Resistance of Adhesives (T-Peel Test); 2008,

I. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2011.

J. ASTM D2240 - Standard Test Method For Rubber Property--Durometer Hardness; 2005 (Reapproved 2010).

K. ASTM D5295 - Standard Guide for Preparation of Concrete Surfaces for Adhered (Bonded) Membrane Waterproofing Systems; 2000 (Reapproved 2006).

L. ASTM D5385 - Standard Test Method for Hydrostatic Pressure Resistance of Waterproofing Membranes; 1993 (Reapproved 2006).

M. ASTM D5602 - Standard Test Method for Static Puncture Resistance of Roofing Membrane Specimens; 2011.

N. ASTM D6506 - Standard Specification for Asphalt Based Protection for Below-Grade Waterproofing; 2001 (Reapproved 2009).

O. ASTM E96/E96M - Standard Test Methods For Water Vapor Transmission of Materials; 2012.

P. ASTM E154 - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover; 2008a.

Q. NRCA ML104 - The NRCA Roofing and Waterproofing Manual; National Roofing Contractors Association; Fifth Edition, with interim updates.

1.04 SUBMITTALS

A. See Section 01 3300 - submittal procedures.

B. Product Data: Provide data for membrane.

C. Shop Drawings: Indicate special joint or termination conditions and conditions of interface with other materials.

D. Manufacturer's Installation Instructions: Indicate special procedures.

E. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with NRCA Roofing and Waterproofing Manual for membrane systems.

B. Membrane Manufacturer Qualifications: Company specializing in waterproofing sheet membranes with three years experience.

1.06 FIELD CONDITIONS

A. Maintain ambient temperatures above 40 degrees F for 24 hours before and during application and until liquid or mastic accessories have cured.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Contractor shall correct defective Work within a five year period after Date of Substantial Completion; remove and replace materials concealing waterproofing at no extra cost to Owner.

PART 2 PRODUCTS

2.01 WATERPROOFING APPLICATIONS

A. Self-Adhered Modified Bituminous Sheet Waterproofing: Use at all exterior concealed vertical substrates

1. Cover below grade and applications within 8 inches of finished grade with protection board.

2.02 MEMBRANE MATERIALS

A. Self-Adhered Modified Bituminous Membrane:

1. Thickness: 60 mil (0.060 inch).
2. Sheet Width: 36 inches.
3. Tensile Strength:
   a. Film: 5000 pounds per square inch, minimum, measured according to ASTM D882 and at grip-separation rate of 2 inches per minute.
   b. Membrane: 325 pounds per square inch, minimum, measured according to ASTM D412 Method A, using die C and at spindle-separation rate of 2 inches per minute.
4. Elongation at Break: 300 percent, minimum, measured according to ASTM D412.
5. Water Vapor Permeance: 0.05 perm, maximum, measured in accordance with ASTM E96/E96M.
6. Low Temperature Flexibility: Unaffected when tested according to ASTM D1970 at minus 20 degrees F, 180 degree bend on 1 inch mandrel.
7. Peel Strength: 7 pounds per inch, minimum, when tested according to ASTM D903.
8. Lap Adhesion Strength: 5 pounds per inch, minimum, when tested according to ASTM D1876.
9. Puncture Resistance: 50 pounds, minimum, measured in accordance with ASTM E154.
10. Water Absorption: 0.1 percent increase in weight, maximum, measured in accordance with ASTM D570, 24 hour immersion.
11. Hydrostatic Resistance: Resists the weight of 200 feet when tested according to ASTM D5385.
12. Adhesives, Sealants, Tapes, and Accessories: As recommended by membrane manufacturer.
13. Manufacturers:
    a. Carlisle Coatings & Waterproofing Incorporated; MiraDRI 860/861: www.carlisle-ccw.com.
    b. Grace Construction Products; Bituthene www.na.graceconstruction.com.
    c. W.R. Meadows, Inc; MEL-ROL: www.wrmeadows.com.
    d. Substitutions: See Section 01 6000 - Product Requirements.

2.03 ACCESSORIES

A. Sealant for Substrate Surfaces: as specified in Section 07 9005.

B. Protection Board: Rigid insulation specified in Section 07 2100.

C. Protection Board: Type capable of preventing damage to waterproofing due to backfilling and construction traffic.

1. Use one of the following:
   a. Asphalt impregnated wood fiberboard, 1/4 inch thick.
   b. Polystyrene foam board, 1 inch thick.
   c. Semi-rigid glass fiber board; unaffected by water, freeze-thaw, fungus, or soil bacteria; containing no formaldehyde, phenol, acrylic, or artificial color; 3/4 inch thick, nominal.
2. Products:
   a. Mar-flex Waterproofing & Building Products; Drain & Dry: www.mar-flex.com.
   b. Mar-flex Waterproofing & Building Products; Shockwave: www.mar-flex.com.
   c. W.R. Meadows, Inc; Protection Course: www.wrmeadows.com.
   d. Substitutions: See Section 01 6000 - Product Requirements.

D. Flexible Flashings: Type recommended by membrane manufacturer.

E. Counterflashings: Galvanized steel sheet, 0.08 inch thick.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify substrate surfaces are durable; free of matter detrimental to adhesion or application of waterproofing system.

C. Verify that items that penetrate surfaces to receive waterproofing are securely installed.

3.02 PREPARATION

A. Protect adjacent surfaces not designated to receive waterproofing.

B. Clean and prepare surfaces to receive waterproofing in accordance with manufacturer's instructions. Vacuum substrate clean.

C. Seal cracks and joints with sealant using depth to width ratio as recommended by sealant manufacturer.

D. Surfaces for Adhesive Bonding: Apply surface conditioner at a rate recommended by manufacturer. Protect conditioner from rain or frost until dry.

E. Concrete Surfaces for Adhesive Bonding: Prepare concrete substrate according to ASTM D5295.

1. Remove substances that inhibit adhesion including form release agents, curing compounds admixtures, laitance, moisture, dust, dirt, grease and oil.
2. Repair surface defects including honeycombs, fins, tie holes, bug holes, sharp offsets, rutted cracks, ragged corners, deviations in surface plane, spalling and delaminations, as described in the reference standard.
3. Remove and replace areas of defective concrete as specified in Section 03 3000.
4. Prepare concrete for adhesive bonded waterproofing using mechanical or chemical methods described in the referenced standard.
5. Test concrete surfaces as described in the referenced standards. Verify surfaces are ready to receive adhesive bonded waterproofing membrane system.

3.03 INSTALLATION - MEMBRANE

A. Install membrane waterproofing in accordance with manufacturer's instructions.

B. Roll out membrane. Minimize wrinkles and bubbles.

C. Self-Adhering Membrane: Remove release paper layer. Roll out on substrate with a mechanical roller to encourage full contact bond.

D. Overlap edges and ends and seal by method recommended by manufacturer, minimum 3 inches. Seal permanently waterproof. Apply uniform bead of sealant to joint edge.

E. Reinforce membrane with multiple thickness of membrane material over joints, whether joints are static or dynamic.

F. Weather lap joints on sloped substrate in direction of drainage. Seal joints and seams.

H. Install flexible flashings. Seal items penetrating through membrane with flexible flashings. Seal watertight to membrane.

I. Seal membrane and flashings to adjoining surfaces. Install termination bar at all edges. Install counterflashing over all exposed edges.

3.04 FIELD QUALITY CONTROL

A. On completion of horizontal membrane installation, dam installation area in preparation for flood testing.

B. Flood to minimum depth of 1 inch with clean water. After 48 hours, inspect for leaks.

C. If leaking is found, remove water, repair leaking areas with new waterproofing materials as directed by Architect; repeat flood test. Repair damage to building.

D. When area is proven watertight, drain water and remove dam.

3.05 PROTECTION

A. Do not permit traffic over unprotected or uncovered membrane.

3.06 SCHEDULE

A. Foundation Wall: One ply of self adhereing membrane waterproofing from 6 inches above grade to top of footing.

END OF SECTION

SECTION 07 2100
THERMAL INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Board insulation at perimeter foundation wall, underside of floor slabs, and exterior wall behind cast-in-place concrete wall.

B. Batt insulation and vapor retarder sheet membranes in exterior wall, ceiling, and roof construction.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Supporting construction for batt insulation.

B. Section 07 2119 - Foamed-In-Place Insulation: Plastic foam insulation other than boards.

D. Section 07 2500 - Weather Barriers: Separate air barrier and water barrier materials.

E. Section 07 5323 - Elastomeric Membrane Roofing: Insulation specified as part of roofing system.

F. Section 07 8400 - Firestopping: Insulation as part of fire-rated through-penetration assemblies.

G. Section 09 2116 - Gypsum Board Assemblies: Acoustic insulation inside walls and partitions.

1.03 REFERENCE STANDARDS

A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2010.

B. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2012.

C. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2010.

D. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2012.

E. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2012.

F. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics; 2012.

G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2012.

H. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2012.

I. ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace At 750 Degrees C; 2012.

J. ASTM E2357 - Standard Test Method for Determining Air Leakage of Air Barrier Assemblies; 2011.

1.04 SUBMITTALS

A. See Section 01 3300 - submittal procedures.

B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

C. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.

1.05 FIELD CONDITIONS

A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

B. All insulation and vapor retarder installations shall be inspected by an Owner’s representative prior to concealment in construction assemblies. Make any indicated repairs.

PART 2 PRODUCTS

2.01 APPLICATIONS

A. Insulation Under Concrete Slabs: Extruded polystyrene board.

B. Insulation at Perimeter of Foundation: Expanded polystyrene board.

C. Insulation Over Metal Stud Framed Walls, Continuous: Extruded polystyrene board.

D. Insulation in Metal Framed Walls: Batt insulation with separate vapor retarder.

E. Insulation in Wood Framed Walls: Batt insulation with separate vapor retarder.

F. Insulation Above Lay-In Acoustical Ceilings: Batt insulation with no vapor retarder.

2.02 FOAM BOARD INSULATION MATERIALS

A. Expanded Polystyrene Board Insulation: ASTM C578; with the following characteristics:

1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
3. Board Thickness: 1-1/2 inches.
4. Board Edges: Square.
5. Water Absorption: 4 percent by volume, maximum, when tested In accordance with ASTM D2842.
6. Board Density: 0.9 lb/cu ft.

7. Compressive Resistance: 10 psi.
8. Thermal Conductivity (k factor) at 25 degrees F: 0.23.

B. Extruded Polystyrene Board Insulation: ASTM C578, Type X; Extruded polystyrene board with either natural skin or cut cell surfaces; with the following characteristics:

1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
3. Board Thickness: 1-1/2 inches.
4. Board Edges: Square.
5. Thermal Conductivity (k factor) at 25 degrees F: 0.18.
6. Compressive Resistance: 15 psi.
7. Board Density: 1.3 lb/cu ft.
8. Water Absorption, maximum: 0.3 percent, volume.

C. Polyisocyanurate Board Insulation: Rigid cellular foam, complying with ASTM C1289; Type II, Class 2, polymer bonded glass fiber mat both faces.

1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
3. Board Thickness: 1 inch.
4. Board Edges: Square.

2.03 BATT INSULATION MATERIALS

A. Where batt insulation is indicated, either glass fiber or mineral fiber batt insulation may be used, at Contractor's option.

B. Glass Fiber Batt Insulation: Flexible preformed batt or blanket, complying with ASTM C665; friction fit.

1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
3. Combustibility: Non-combustible, when tested in accordance with ASTM E136.
4. Thermal Resistance: R=3.16 per inch
5. Thickness: As indicated in drawings.
6. Facing: Unfaced.

C. Mineral Fiber Batt Insulation: Flexible preformed batt or blanket, complying with ASTM C665; friction fit; unfaced flame spread index of 0 (zero) when tested in accordance with ASTM E84.

1. Smoke Developed Index: 0 (zero), when tested in accordance with ASTM E84.
2. Thickness: As indicated on drawings.

2.04 ACCESSORIES

A. Sheet Vapor Retarder: Translucent polyethylene film for above grade application, 10 mil thick.

B. Tape: Polyethylene self-adhering type, mesh reinforced, 2 inch wide.

C. Protection Board for Below Grade Insulation: Cementitious, 1/4 inch thick.

D. Adhesive: Type recommended by insulation manufacturer for application to continuously seal vapor retarder laps.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation and adhesive.

B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

3.02 BOARD INSTALLATION AT FOUNDATION PERIMETER

A. Adhere a 6 inch wide strip of polyethylene sheet over construction, control, and expansion joints with double beads of adhesive each side of joint.

1. Tape seal joints.
2. Extend sheet full height of joint.

B. Apply adhesive to back of boards:

1. Full bed 1/8 inch thick.

C. Install boards horizontally on foundation perimeter.

1. Install in running bond pattern.
2. Butt edges and ends tightly to adjacent boards and to protrusions.

D. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

E. Immediately following application of board insulation, place protective boards over exposed insulation surfaces.

3.03 BOARD INSTALLATION AT EXTERIOR WALLS

A. Adhere a 6 inch wide strip of polyethylene sheet over expansion joints with double beads of adhesive each side of joint.

1. Tape seal joints between sheets.

B. Install rigid insulation directly to steel studs or exterior grade sheathing at 16 inches on center with manufacturer recommended mechanical fasteners. Tape all joints with manufacturer's minimum 4 inch wide sealant tape; comply with ASTM E2357.

C. Install boards horizontally on walls.

1. Place boards to maximize adhesive contact.
2. Install in running bond pattern.
3. Butt edges and ends tightly to adjacent boards and to protrusions.

D. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.04 BOARD INSTALLATION UNDER CONCRETE SLABS

A. Place insulation under slabs on grade after base for slab has been compacted.

B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

C. Prevent insulation from being displaced or damaged while placing vapor retarder and placing slab.

3.05 BATT INSTALLATION

A. Install insulation and vapor retarder (on warm side of wall) in accordance with manufacturer's instructions.

B. Install in exterior wall and roof spaces without gaps or voids. Do not compress insulation.

C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

E. Install with factory applied vapor retarder membrane facing warm side of building spaces. Lap and continuously seal ends and side flanges of membrane over framing members.

F. Retain insulation batts in place with wire mesh secured to framing members. All vapor retarder laps are to be located in accessible locations for inspection.

G. Tape seal butt ends, lapped flanges, and tears or cuts in membrane.

H. At wood framing, place vapor retarder on warm side of insulation by stapling at 6 inches on center. Lap and seal sheet retarder joints over member face.

I. At metal framing, place vapor retarder on warm side of insulation; lap and seal sheet retarder joints over member face.

J. Tape seal tears or cuts in vapor retarder.

K. Extend vapor retarder tightly to full perimeter of adjacent window and door frames and other items interrupting the plane of the membrane. Tape seal in place.

L. Coordinate work of this section with construction of air barrier seal specified in Section 07 2500.

M. Request inspection of vapor retarder installation by Owner’s representative not less than 24 hours prior to concealment.

3.06 PROTECTION

A. Do not permit installed insulation or vapor retarder membrane to be damaged prior to its concealment. Repair any damage with new batt insulation and carefully adhesive seal damaged vapor retarder.

END OF SECTION

SECTION 07 2119
FOAMED-IN-PLACE INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Foamed-in-place insulation.

1. In exterior framed walls.
2. In exterior wall, soffit and roof crevices.
3. At junctions of dissimilar wall and roof materials.
4. Protecting structural components that penetrate the building thermal envelope where indicated in the drawings.

B. Protective intumescent coating.

C. Fluid Applied Vapor Retarder.

1.02 REFERENCE STANDARDS

A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2010.

B. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics; 2012.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2012.

D. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2012.

E. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004 (Reapproved 2012).

F. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials; 2011.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week prior to commencing work of this section.

1.04 SUBMITTALS

A. See Section 01 3300 - submittal procedures.

B. Product Data: Provide product description, insulation properties, overcoat properties, and preparation requirements.

C. Manufacturer's Installation Instructions: Indicate special procedures, and perimeter conditions requiring special attention.

D. Certificates: Certify that products of this section meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with not less than three years of documented experience.

1.06 REGULATORY REQUIREMENTS

A. Conform to applicable code for flame and smoke limitations.

1.07 FIELD CONDITIONS

A. Do not apply foam when temperature is below that specified by the manufacturer for ambient air and substrate.

B. Do not apply foam when temperature is within 5 deg F of dew point.

PART 2 PRODUCTS

2.01 MATERIALS

A. Foamed-In-Place Polyurethane Insulation: ASTM C 1029 Type II, Medium-density, rigid or semi-rigid, closed cell polyurethane foam; foamed on-site, using blowing agent of water or non-ozone-depleting gas.

1. Aged Thermal Resistance (R-value): 6.2 (deg F hr sq ft)/Btu, minimum, when tested at 1 inch thickness in accordance with ASTM C518 after aging for 180 days at 41 degrees F.
2. Water Vapor Permeance: Vapor retarder; 1 perm, maximum, when tested at intended thickness in accordance with ASTM E96/E96M, desiccant method.
3. Water Absorption: Less than 2 percent by volume, maximum, when tested in accordance with ASTM D2842.
4. Air Permeance: 0.004 cfm/sq ft, maximum, when tested at intended thickness in accordance with ASTM E2178 at 1.5 psf.
5. Closed Cell Content: At least 90 percent. Minimum Density of 1.5 lbs/cu.ft.
6. Surface Burning Characteristics: Flame spread/Smoke developed index of 75/450, maximum, when tested in accordance with ASTM E84.
7.

2.02 ACCESSORIES

A. Primer: As required by insulation manufacturer.

B. Overcoat: Intumescent coating of type recommended by insulation manufacturer and as required to comply with applicable codes for all interior locations not directly clad with gypsum wall board or heavy gauge sheet metal.

C. Vapor Retarder: Spray, roll or brush applied paint style vapor retarder paint providing a perm rating of not more than 0.5 perm. Vapor retarder material is to be compatible with the sprayed polyurethane foam insulation and the sprayed on fire barrier coating. ASTM C 755.

1. “Latex Vapor Barrier Primer Sealer 260”, Benjamin Moore & Co., Inc., (201) 573-9600. or Approved Substitution..

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify work within construction spaces or crevices is complete prior to insulation application.

B. Verify that surfaces are clean, dry, and free of matter that may inhibit insulation or overcoat adhesion.

3.02 PREPARATION

A. Mask and protect adjacent surfaces from over spray or dusting.

B. Apply primer in accordance with manufacturer's instructions.

3.03 APPLICATION

A. Apply insulation in accordance with manufacturer's instructions.

B. Apply insulation by spray method, to a uniform monolithic density without voids.

C. Apply to achieve a thermal resistance R value of +30.

D. Apply overcoat monolithically, without voids to fully cover foam insulation, to achieve fire rating required.

E. Patch damaged areas.

F. Where applied to voids and gaps assure space for expansion to avoid pressure on adjacent materials that may bind operable parts.

G. Trim excess away for applied trim or remove as required for continuous sealant bead.

3.04 FIELD QUALITY CONTROL

A. Field inspections and tests will be performed by an independent testing agency under provisions of Section 01 4000.

B. Inspection will include verification of insulation and overcoat thickness and density.

3.05 PROTECTION

A. Do not permit subsequent construction work to disturb applied insulation.

END OF SECTION

SECTION 07 2500
WEATHER BARRIERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Water Barrier: Self Adhered Bituminous Membrane under exterior wall cladding, over sheathing or other substrate; water and air tight and vapor retardant.

B. Air Barriers: Materials that form a system to stop passage of air through exterior walls, joints between exterior walls and roof, and joints around frames of openings in exterior walls.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-In-Place Concrete: Vapor retarder under concrete slabs on grade.

B. Section 05 4000 - Cold-Formed Metal Framing: Water-resistive barrier under exterior cladding.

C. Section 07 2100 - Thermal Insulation: Vapor retarder installed in conjunction with batt insulation.

D. Section 07 5300 - Elastomeric Membrane Roofing: Vapor retarder installed as part of roofing system.

E. Section 07 9005 - Joint Sealers: Sealant materials and installation techniques.

F. Section 09 2116 - Gypsum Board Assemblies: Water-resistive barrier under exterior cladding.

1.03 DEFINITIONS

A. Water Barrier: Assemblies that form water-resistive barriers, air barriers,and vapor retarders.

B. Air Barrier: Air tight barrier made of material that is relatively air impermeable but water vapor permeable, both to the degree specified, with sealed seams and with sealed joints to adjacent surfaces. Note: For the purposes of this specification, vapor impermeable air barriers are classified as vapor retarders.

1.04 REFERENCE STANDARDS

A. AATCC Test Method 127 - Water Resistance: Hydrostatic Pressure Test; 2008.

B. ASTM C836/C836M - Standard Specification for High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course; 2012.

C. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2011.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2012.

E. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2012.

F. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials; 2011.

G. ICC-ES AC38 - Acceptance Criteria for Water-Resistive Barriers; ICC Evaluation Service, Inc.; 2011.

H. ICC-ES AC212 - Acceptance Criteria for Water-Resistive Coatings Used as Water-Resistive Barriers over Exterior Sheathing; ICC Evaluation Service, Inc.; 2011.

1.05 SUBMITTALS

A. See Section 01 3300 - submittal procedures.

B. Product Data: Provide data on material characteristics.

C. Shop Drawings: Provide drawings of special joint conditions.

D. Manufacturer's Installation Instructions: Indicate preparation.

1.06 FIELD CONDITIONS

A. Maintain temperature and humidity recommended by the materials manufacturers before, during and after installation.

PART 2 PRODUCTS

2.01 WEATHER BARRIER ASSEMBLIES

A. Water-Resistive Barrier: Provide mebrane on exterior walls below grade from footing line to termination height shown in drawings.

B. Air Barrier Material:

1. On outside surface of sheathing of exterior walls and soffits use air barrier membrane sheet, self adhering with flashed wall penetrations.

2.02 SELF ADHERED MEMBRANCE (SAM) WATER-RESISTIVE BARRIER MATERIALS

A. Basis of Design: WR Grace Bituthene composite self adhering membrane suitable for above and below grade concealed exterior vertical surface covering with self sealing overlap joints and penetrations. Provide Bituthene 4000 or similar product intended for water protection of exterior substrates indicated in this project. Product substitutions of similar products by other manufacturers maybe submitted per Section 01 3300 for consideration .

2.03 AIR BARRIER MATERIAL (ABM) (WATER VAPOR PERMEABLE AND WATER-RESISTIVE)

A. Air Barrier Sheet, Mechanically and Self-Adhesive Fastened:

1. Air Permeance: 0.004 cubic feet per minute per square foot, maximum, when tested in accordance with ASTM E2178.

2. Water Vapor Permeance: 5 perms, minimum, when tested in accordance with ASTM E96/E96M Procedure A (desiccant method).
3. Water Penetration Resistance: Withstand a water head of 21 inches, minimum, for minimum of 5 hours, when tested in accordance with AATCC 127.
4. Ultraviolet and Weathering Resistance: Approved in writing by manufacturer for minimum of 6 months weather exposure.
5. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 50 or less, when tested in accordance with ASTM E84.
6. Water Resistance: Comply with applicable water-resistive requirements of ICC-ES Acceptance Criteria AC38.
7. Products:
   A. Vapro Sheild Wrap Sheild SA
   B. Grace Construction Products: Vycor V40
   C. Polyguard Products, Polygaurd JT-30
   D. Product Substitution: See Section 01 2513/01 2516

2.04 SEALANTS

A. Butyl Sealant: Type as specified in Section 07 9005.

B. Polyurethane Sealant: Type as specified in Section 07 9005.

C. Silicone Sealant: Type as specified in Section 07 9005.

E. Sealant Backers: As specified in Section 07 9005.

F. Primers, Cleaners, and Other Sealant Materials: As recommended by membrane and sealant manufacturers, appropriate to application, and compatible with adjacent materials.

2.05 ADHESIVES

A. Mastic Adhesive: Compatible with sheet seal and substrate, thick mastic of uniform knife grade consistency.

B. Non-Curing Adhesive: Compatible with sheet seal and substrate, permanently non-curing.

2.06 ACCESSORIES

A. ABM Flexible Flashing: Self-adhesive sheet flashing complying with ASTM D1970, manufactured to flash exterior wall window, door and mechanical system openings.

   1. Products:
      a. Products approved for this use by the manufacturer of the ABM product

B. Thinners and Cleaners: As recommended by material manufacturer.

C. Attachment Battens: Stainless steel or aluminum bars with anchors of same material.

D. Fasteners and surface primers: as recommended by membrane manufacturer for use in Coastal Marine environment.

PART 3 EXECUTION

3.01 PREPARATION

A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.

B. Clean and prime substrate surfaces to receive adhesives in accordance with manufacturer's instructions.

3.02 INSTALLATION

A. Install materials in accordance with manufacturer's instructions.

B. Water-Resistive Barriers: Install continuous barrier over surfaces indicated, with sheets lapped to shed water but with seams not sealed.

C. Air Barriers: Install continuous air tight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.

D. Apply sealants and adhesives within recommended application temperature ranges. Consult manufacturer if temperature is out of this range.

E. Mechanically Fastened Sheets - On Exterior:

1. Install sheets shingle-fashion to shed water, with seams generally horizontal.
2. Overlap seams as recommended by manufacturer but at least 6 inches.
3. Overlap at outside and inside corners as recommended by manufacturer but at least 12 inches.
4. For applications specified to be air tight, seal seams, laps, penetrations, tears, and cuts with self-adhesive tape; use only large-headed, gasketed fasteners recommended by the manufacturer.
5. Install water-resistive barrier over jamb flashings.
6. Install air barrier and vapor retarder UNDER jamb flashings.
7. Install head flashings under weather barrier.
8. At openings to be filled with frames having nailing flanges, wrap excess sheet into opening; at head, seal sheet over flange and flashing.

F. Self-Adhesive Sheets:

1. Prepare substrate in manner recommended by sheet manufacturer; fill and tape joints in substrate and between dissimilar materials.
2. Lap sheets shingle-fashion to shed water and seal laps air tight.
3. Once sheets are in place, press firmly into substrate with resilient hand roller; ensure that all laps are firmly adhered with no gaps or fishmouths.
4. Use same material, or other material approved by sheet manufacturer for the purpose, to seal to adjacent construction and as flashing.
5. At wide joints, provide extra flexible membrane allowing joint movement.

G. Openings and Penetrations in Exterior Weather Barriers:

1. Install flashing over sills, covering entire sill frame member, extending at least 5 inches onto weather barrier and at least 6 inches up jambs; mechanically fasten stretched edges.

2. At openings to be filled with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with at least 4 inches wide; do not seal sill flange.
3. At openings to be filled with non-flanged frames, seal weather barrier to all sides of opening framing, using flashing at least 9 inches wide, covering entire depth of framing.
4. At head of openings, install flashing under weather barrier extending at least 2 inches beyond face of jambs; seal weather barrier to flashing.
5. At interior face of openings, seal gap between window/door frame and rough framing, using joint sealant over backer rod.
6. Service and Other Penetrations: Form flashing around penetrating item and seal to weather barrier surface.

3.03 FIELD QUALITY CONTROL

A. Do not cover installed weather barriers until required inspections have been completed.

B. Obtain approval of installation procedures by the weather barrier manufacturer based on a mock-up installed in place, prior to proceeding with remainder of installation.

C. Take digital photographs of each portion of the installation prior to covering up.

3.04 PROTECTION

A. Do not leave materials exposed to weather longer than recommended by manufacturer.

B. Do not leave paper- or felt-based barriers exposed to weather for longer than one week.

END OF SECTION

SECTION 07 4213
METAL WALL PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manufactured coated aluminum sheet panels for exterior vertical walls and mechanical penthouse module mechanically field seamed ribbed cladding with related matching flashings and accessory components suitable for an exposed coastal condition. Panel fasteners shall be concealed.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Wall panel substrate blocking and trim blocking.

B. Section 07 2100 - Thermal Insulation.

C. Section 07 2500 - Weather Barriers: Weather barrier under wall panels.

D. Section 07 9005 - Joint Sealers.

E. Section 09 2116 - Gypsum Board Assemblies: Wall panel substrate.

F. Section 09 2116 - Gypsum Board Assemblies: Water-resistive barrier under wall panels.

1.03 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2011.

B. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process; 2010.

C. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2010.

D. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric]; 2010.

E. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2012.

F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2012.

1.04 SUBMITTALS

A. See Section 01 3300 - submittal procedures.

B. Shop Drawings: Indicate dimensions, layout, joints, construction details, methods of anchorage, and panel retention clip spacing.

C. Engineering calculations for spacing and anchorage of panel retention clips prepared and stamped by an Alaska registered structural engineer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.

B. Store prefinished material off ground and protected from weather. Prevent twisting, bending, or abrasion, and provide ventilation to stored materials. Slope metal sheets to ensure drainage.

C. Prevent contact with materials that may cause discoloration or staining of products.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective work within a five year period after Substantial Completion for degradation of panel finish, including color fading caused by exposure to weather.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. BASIS OF DESIGN: AEP Span SpanSeam .04 thick factory coated Aluminum with 2 inch ribs @12” OC field striated panels.

B Product Substitutions must match panel profile, materials, attachment method and metal gauge Ribs must not exceed 2 inches deep. : Comply with Section 01 2513

2.02 MANUFACTURED METAL PANELS

A. Wall Panel System: Factory fabricated prefinished metal panel system, site assembled.

1. Provide prefinished exterior panels and corrosion resistant subgirt framing assembly and all required anchors.
2. Design and size components to withstand dead and live loads caused by positive and negative wind pressure acting normal to plane of wall.
3. Design Pressure: In accordance with applicable codes and exposure condition.
4. Maximum Allowable Deflection of Panel: 1/180 of span.
5. Movement: Accommodate movement within system without damage to components or deterioration of seals, movement within system; movement between system and perimeter components when subject to seasonal temperature cycling; dynamic loading and release of loads; and deflection of structural support framing.

6. Drainage: Provide positive drainage to exterior for moisture entering or condensation occurring within panel system.
7. Fabrication: Formed true to shape, accurate in size, square, and free from distortion or defects; pieces of longest practical lengths.
8. Corners: Factory-fabricated in one continuous piece with minimum 18 inch returns.
9. Exterior Finish: Panel manufacturer's standard polyvinylidene fluoride (PVDF) coating, top coat over epoxy primer, 20 year warranty on finish.
10. Exterior Panel Back Coating: Panel manufacturer's standard fluoropolymer wash coat.

B. Exterior Panels:

1. Profile: Vertical; style as indicated on drawings. Panels to be continuous full height with no horizontal joints.
2. Side Seams: Continuous-interlocked, tight-fitting, sealed with continuous gasket or sealer
3. Material: Precoated aluminum sheet, minimum 0.04 gage thick .with matching flashings
4. Panel Width:12 inches nominal.
5. Panel Length: continuous from roof parapet to base as indicated on drawings.
6. Panel surface to Herr-Voss corrective leveled with striations.
7. Color: As selected by Architect from manufacturer's standard line.
8. Panel elevation layout to be sized and installed to provide equal panel sizing from building plane corner to building plane corner without variation exceeding 1 inch in 8 feet horizontally.
9. Panel and flashing color: To be selected by Architect from Manufacturers full non-metallic color range.

C. Performance Requirements:

1. Thermal Movement: Provide for free and noiseless vertical and horizontal thermal movement due to expansion and contraction under material temperature range of minus 30 degrees F to 120 degrees F without buckling, opening of joints, undue stress on fasteners, or other detrimental effects; allow for ambient temperature at time of fabrication, assembly, and erection procedures.
2. Attached to substrate with corrosion resistant fasteners and clip system to secure panels for winds loads specified in the IBC 2009 for this coastal locality and building exterior configuration.
3. 20 year finish warranty for fading, chalking and physical deterioration due to weathering of panels system components.

D. Subgirts:

1. Profile as needed; to attach panel system to building. All substrate components shall be galvanized steel or extruded aluminum. Fastener shall be stainless steel

E. Internal and External Corners: Same material, thickness, and finish as exterior sheets; shop cut and factory mitered to required angles. Mitered internal corners to be back braced with Matching gage precoated sheet stock to maintain continuity of profile.

F. Expansion Joints: Same material, thickness and finish as exterior sheets manufacturer's standard brake formed type, of profile to suit system.

G. Trim: Same material, thickness and finish as exterior sheets; brake formed to required profiles indicated in architectural drawings.

H. Anchors: Stainless steel.

2.04 ACCESSORIES

A. Gaskets: Manufacturer's standard type suitable for use with system, permanently resilient; ultraviolet and ozone resistant.

B. Sealants: As specified in Section 07 9005.

C. Sealants: Manufacturer's standard type suitable for use with installation of system; non-staining.

1. Color: To be selected by Architect.

D. Fasteners: Manufacturer's standard type to suit application; with soft neoprene washers, stainless steel. Fastener cap same color as exterior panel.

E. Field Touch-up Paint: As recommended by panel manufacturer.

F. Bituminous Paint: Asphalt base.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that building framing members are ready to receive panels.

B. Verify that water-resistive barrier has been installed over substrate completely and correctly.

3.02 PREPARATION

A. Install subgirts perpendicular to panel length, securely fastened to substrates and shimmed and leveled to uniform plane. Space at intervals indicated. Panel retaining clips shall be installed a minimum 24” oc vertically.

3.03 INSTALLATION

A. Install panels on walls and soffits in accordance with manufacturer's instructions and approved layout shop drawings. Panels to be installed to provide symmetrical rib layout on each building plane.

B. Protect surfaces in contact with cementitious materials and dissimilar metals with bituminous paint. Allow to dry prior to installation.

C. Fasten panels to structural supports; aligned, level, and plumb.

D. Locate joints over supports. Lap panel ends minimum 2 inches.

E. Provide expansion joints where indicated.

F. Use concealed fasteners unless otherwise approved by Architect.

G. Seal and place gaskets to prevent weather penetration. Maintain neat appearance.

H. Coordinate profile and installation of trim substrate blocking to provide full backing of trim as indicated in drawings.

3.04 TOLERANCES

A. Maximum Offset From True Alignment Between Adjacent Members Butting or In Line: 1/16 inch.

B. Maximum Variation from Plane or Location Indicated on Drawings: 1/4 inch.

3.05 CLEANING

A. Remove site cuttings from finish surfaces.

B. Clean and wash prefinished surfaces with mild soap and water; rinse with clean water.

END OF SECTION

SECTION 07 4264
PHENOLIC WALL PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Exposed fastener attached solid phenolic exterior cladding panels and related fasteners metal trims and mounting tracks.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-In-Place Concrete: Vapor retarder under concrete slabs on grade.

B. Section 06 1000 - Exterior Plywood sheathing

C. Section 07 2500 – Exterior Weather Barrier beneath exterior cladding system.

1.03 DEFINITIONS

A. Phenolic Panels designed for exterior exposed architectural cladding with UV and high moisture resistance.

1.04 REFERENCE STANDARDS

A. ASTM D638 -10 Standard Test Method for Tensile Properties of Plastics.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2012.

C. ASTM D790 -10 Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials

D. NEMA Standards Publication LD3-2005. High pressure decorative laminates

E. 2009 IBC Chapter 14 Exterior Walls.

1.05 SUBMITTALS

A. See Section 01 3300 - submittal procedures.

B. Product Data: Provide data on material characteristics.

C. Shop Drawings: Provide drawings of layout of subtracted support framing, fasteners spacing, panel dimension layout, and returns and special joint conditions.

D. Manufacturer's Installation Instructions: Indicate preparation.

E. Engineering calculations for spacing and anchorage of panel retention clips prepared and stamped by an Alaska registered structural engineer.

1.06 FIELD CONDITIONS

A. Maintain temperature recommended by the materials manufacturers during installation.

B. Verify substrates are flat and straight and penetrations are properly aligned. Correct alignment defects prior to installing paneling system.

PART 2 PRODUCTS

2.01 WALL PANEL SYSTEM

A. Wall Panel System: 5/16” thick, 4ft x 8 ft size solid Phenolic exterior wall panels of thermally fused multiple sheet kraft paper with acrylic surface layer corrosion resistant fasteners, corrosion resistant anchors supported by extruded aluminum sub framing; provide installed panel system capable of maintaining specified performance without defects, damage or failure.

1. Provide structural design by or under direct supervision of a Structural Engineer licensed in the State in which the Project is located.
2. Provide open panel jointing as indicated on the drawings for exterior vertical walls, column enclosures and horizontal soffits rainscreen cladding system .
3. Anchor panels substrate framing without exposed fasteners. Attach panels with exposed fasteners.

B. Performance Requirements:

1. Thermal Movement: Provide for free and noiseless vertical and horizontal thermal movement due to expansion and contraction under material temperature range of minus 30 degrees F to 120 degrees F without buckling, opening of joints, undue stress on fasteners, or other detrimental effects; allow for ambient temperature at time of fabrication, assembly, and erection procedures.
2. Attached to substrate with corrosion resistant fasteners and track system to secure panels for winds loads specified in the IBC 2009 for this locality and building exterior configuration.
3. 20 year warranty for fading, chalking and physical deterioration due to weathering of panels system components.

4. All recessed components visible at joints shall be flat black.

2.02 MANUFACTURERS

A. Phenolic Panels: Solid flat panels with integral black edge reveal. Acrylic protected color or pattern surface both faces matching as selected by Architect.

BASIS OF DESIGN: Stonewood Panels (Fiberresin Industries, Inc;, Parklex or approved substitution per section 01 2513.

1. Overall Sheet Thickness: 5/16 inch for vertical surfaces. 5/16 inch for horizontal soffits.

2. Face Sheets: UV resistant factory applied acrylic.

3. Manufacturer's standard, selected for best appearance and finish durability.
4. Bond and Peel Strength: No adhesive failure of the bond between the core and the skin nor cohesive failure of the core itself below 22.4 inch-pound/inch with no degradation in bond performance, when tested in accordance with ASTM D1781, simulating resistance to panel delamination, after 8 hours of submersion in boiling water and after 21 days of immersion in water at 70 degrees F.
5. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.

B. Metal Sub- Framing Members: Panel manufacturer shall provide all sub-girts, zee-clips, base and sill angles and channels, hat-shaped and rigid channels, and furring channels required for complete installation.

1. Provide material strength, dimensions, configuration as required to meet the applied loads applied and in compliance with applicable building code.
2. Sheet Steel Components: ASTM A653/A653M galvanized to G90/Z275 or zinc-iron alloy-coated to A60/ZF180; or ASTM A792/A792M aluminum-zinc coated to AZ60/AZM180.
3. Stainless Steel Sheet Components: ASTM A480/A480M.

C. Anchors, Clips and Accessories: Use one of the following:

1. Stainless steel complying with ASTM A480/A480M, ASTM A276 or ASTM A666.

D. Fasteners:

1. Exposed fasteners: Stainless steel; permitted only where indicated on shop drawings and subject to prior approval of the Architect.
2. Screws: Self-drilling or self-tapping Type 410 stainless steel. Pre-drill holes as recommended by manufacturer to avoid panel alignment problems and thread stripping.

E. Provide panel system manufacturer's and installer’s standard corrosion resistant accessories, including fasteners, clips, anchorage devices and attachments.

PART 3 EXECUTION

3.01 PREPARATION

A. Examine substrate and clean and repair as required to eliminate conditions that would be detrimental to proper installation.

B. Verify that weather barrier has been installed over substrate completely and correctly.

C. Do not begin until unacceptable conditions have been corrected.

D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Install sheet metal flashing:

1. Above door and window trim and casings.

2. Above any horizontal trim in field of siding.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions and recommendations.

1. Read warranty and comply with all terms necessary to maintain warranty coverage.
2. Install in accordance with conditions stated in model code evaluation report applicable to location of project.
3. Use trim details indicated on drawings.
4. Touch up all field cut edges before installing.
5. Pre-drill fastener holes if necessary to prevent breakage and thread damage.

B. Over Wood and Wood-Composite Sheathing: Fasten siding through sheathing into studs.

C. Over Foam Sheathing: Read and comply with sheathing manufacturer's recommendations.

1. For sheathing of 1 inch (25 mm) thickness or less, nail through sheathing into studs using correspondingly longer nails.
2. For sheathing over 1 inch (25 mm) thickness, install furring strips over studs and fasten siding through furring and into studs.

D. Over Steel Studs: Use hot-dipped galvanized self-tapping screws, with the points of at least 3 screws penetrating each stud the panel crosses and at panel ends.

E. Allow space between both ends of siding panels that butt against trim for thermal movement; .

G. Do not install siding less than 6 inches from surface of ground and other surfaces where water may collect.

3.04 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 07 5323
ETHYLENE-PROPYLENE-DIENE-MONOMER ROOFING (EPDM)

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Ballasted EPDM membrane roofing system, including all components specified to modify existing roof system for patching vacated roof penetrations and installing new roof penetrations.

B. Disposal of demolition debris and construction waste is the responsibility of Contractor. Perform disposal in manner complying with all applicable federal, state, and local regulations.

C. Comply with the published recommendations and instructions of the roofing membrane manufacturer, at http://manual.fsbp.com.

D. Roofing Installers Warranty (see end of this Section).. No modification of the Contract Sum will be made for failure to adequately examine the Contract Documents or the project conditions.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Wood nailers associated with roofing and roof insulation.

B. Section 07 6200 - Sheet Metal Flashing and Trim: Formed metal flashing and trim items associated with roofing.

C. Section 07 7200 - Roof Accessories: Roof hatches, vents, and manufactured curbs.

1.03 DEFINITIONS

A. Roofing Terminology: Refer to ASTM D1079 for definition of terms related to roofing work not otherwise defined in the section.

1.04 REFERENCE STANDARDS

A. ASTM C140 - Standard Test Methods of Sampling and Testing Concrete Masonry Units and Related Units; 2012.

B. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2012.

C. ASTM D1079 - Standard Terminology Relating to Roofing, Waterproofing, and Bituminous Materials; 2010.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2012.

E. FM DS 1-28 - Wind Design; Factory Mutual System; 2007.

F. FM DS 1-29 - Roof Deck Securement and Above-Deck Roof Components; Factory Mutual System; 2006.

G. PS 1 - Structural Plywood; 2009.

H. SPRI ES-1 - Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems; 2003. (ANSI/SPRI ES-1)

1.05 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conference in Nome: Before start of roofing work, Contractor shall hold a meeting to discuss the proper installation of materials and requirements to achieve the warranty.

1. Require attendance with all parties directly influencing the quality of roofing work or affected by the performance of roofing work.
2. Notify Architect well in advance of meeting.

1.06 SUBMITTALS

A. See Section 01 3300 - submittal procedures.

B. Product Data:

1. Provide membrane manufacturer's printed data sufficient to show that all components of roofing system, including insulation and fasteners, comply with the specified requirements and with the membrane manufacturer's requirements and recommendations for the system type specified; include data for each product used in conjunction with roofing membrane.
2. Installation Instructions: Provide manufacturer's instructions to installer, marked up to show exactly how all components will be installed; where instructions allow installation options, clearly indicate which option will be used.

C. Samples: Submit samples of EPDM Membrane.

D. Shop Drawings: Provide:

1. The roof membrane manufacturer's standard details customized for this project for all relevant conditions, including flashings, base tie-ins, roof edges, terminations, expansion joints, penetrations, and drains.

E. Installer Qualifications: Letter from manufacturer attesting that the roofing installer meets the specified qualifications.

H. Executed Roofing Installer’s Warranty.

1.07 QUALITY ASSURANCE

A. Installer Qualifications: Roofing installer shall have the following:

1. Current approval, license, or authorization as applicator by the manufacturer- Carlisle or Firestone – no substitutions allowed.
2. At least five years experience in installing specified system.

1.08 DELIVERY, STORAGE AND HANDLING

A. Deliver products in manufacturer's original containers, dry and undamaged, with seals and labels intact and legible.

B. Store materials clear of ground and moisture with weather protective covering.

C. Keep combustible materials away from ignition sources.

1.09 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Comply with all Roofing Installer’s Warranty procedures required by Installer, including notifications, scheduling, and inspections.

PART 2 PRODUCTS

2.01 ROOFING SYSTEM DESCRIPTION

A. Roofing System: Ethylene-propylene-diene-monomer (EPDM) single-ply membrane.

1. See Drawings for existing and new roofing system components
2. Existing full coverage Paver System is Westile brand with retaining clips and parapet perimeter retention flashing. Reuse and or match existing components.

B. Roofing System Components:

1. Ballast Paver System.
2. Membrane: Thickness as specified.
3. Insulation:
   a. Maximum Board Thickness: 2 inches; use as many layers as necessary; stagger joints in adjacent layers.
4. Deck Cover Board: Gypsum-based board, 5/8 inch thick; cold adhesive attached.

2.02 EPDM MEMBRANE MATERIALS

A. Roofing and Flashing Membrane: Black, cured synthetic single-ply membrane composed of Ethylene-propylene-diene-monomer (EPDM) with the following properties:

1. Reinforcement: Polyester weft inserted scrim; membrane complying with ASTM D4637 Type II.
2. Thickness: 0.060 inch.
3. Nominal Thickness Tolerance: Plus/minus 10 percent.
4. Sheet Width: Provide the widest available sheets to minimize field seaming.

2.03 ROOF INSULATION

A. Extruded Polystyrene Board Insulation: Closed cell foam, complying with ASTM C1289 Type II Class 1, See Drawings:

PART 3 INSTALLATION

3.01 GENERAL

A. Install roofing, insulation, flashings, and accessories in accordance with roofing manufacturer's published instructions and recommendations for the specified roofing system. Where manufacturer provides no instructions or recommendations, follow good roofing practices and industry standards. Comply with federal, state, and local regulations.

B. Obtain all relevant instructions and maintain copies at project site for duration of installation period.

C. Do not start work until Pre-Installation Notice has been submitted to manufacturer as notification that this project requires a manufacturer's warranty.

D. Perform work using competent and properly equipped personnel.

E. Temporary closures, which ensure that moisture does not damage any completed section of the new roofing system, are the responsibility of the applicator. Completion of flashings, terminations, and temporary closures shall be completed as required to provide a watertight condition.

F. Install roofing membrane only when surfaces are clean, dry, smooth and free of snow or ice; do not apply roofing membrane during inclement weather or when ambient conditions will not allow proper application; consult manufacturer for recommended procedures during cold weather. Do not work with sealants and adhesives when material temperature is outside the range of 45-80 degrees F.

G. Protect adjacent construction, property, vehicles, and persons from damage related to roofing work; repair or restore damage caused by roofing work.

   1. Protect from spills and overspray from adhesives, sealants and coatings.
   2. Particularly protect metal, glass, plastic, and painted surfaces from bitumen, adhesives, and sealants within the range of wind-borne overspray.
   3. Protect finished areas of the roofing system from roofing related work traffic and traffic by other trades.

H. Until ready for use, keep materials in their original containers as labeled by the manufacturer.

I. Consult membrane manufacturer's instructions, container labels, and Material Safety Data Sheets (MSDS) for specific safety instructions. Keep all adhesives, sealants, primers and cleaning materials away from all sources of ignition.

3.02 EXAMINATION

A. Examine roof deck to determine that it is sufficiently rigid to support installers and their mechanical equipment and that deflection will not strain or rupture roof components or deform deck.

B. Verify that surfaces and site conditions are ready to receive work. Correct defects in the substrate before commencing with roofing work.

C. Examine roof substrate to verify that it is properly sloped to drains.

D. Verify that the specifications and drawing details are workable and not in conflict with the roofing manufacturer's recommendations and instructions; start of work constitutes acceptable of project conditions and requirements.

3.03 PREPARATION

A. Take appropriate measures to ensure that fumes from adhesive solvents are not drawn into the building through air intakes.

B. Prior to proceeding, prepare roof surface so that it is clean, dry, and smooth, and free of sharp edges, fins, roughened surfaces, loose or foreign materials, oil, grease and other materials that may damage the membrane.

3.04 INSULATION INSTALLATION

A. Install ballasted insulation in configuration and with attachment method(s) to match existing.

B. Neatly and tightly fit insulation to all penetrations, projections, and nailers, with gaps not greater than 1/4 inch. Fill gaps greater than 1/4 inch with acceptable insulation. Do not leave the roofing membrane unsupported over a space greater than 1/4 inch.

C. Loose Laid Installation: Install insulation by laying loose over substrate without mechanical securement of any kind.

3.05 SINGLE-PLY MEMBRANE INSTALLATION

A. Beginning at low point of roof, place membrane without stretching over substrate and allow to relax at least 30 minutes before attachment or splicing; in colder weather allow for longer relax time.

B. Lay out the membrane pieces so that field and flashing splices are installed to shed water.

C. Install membrane without wrinkles and without gaps or fishmouths in seams; bond and test seams and laps in accordance with membrane manufacturer's instructions and details.

D. Install membrane loose laid, with edge securement as specified.

1. Exceptions: Round pipe penetrations less than 18 inches in diameter and square penetrations less than 4 inches square.
2. Metal edging is not merely decorative; ensure anchorage of membrane as intended by roofing manufacturer.

3.06 FLASHING AND ACCESSORIES INSTALLATION

A. Install flashings, including laps, splices, joints, bonding, adhesion, and attachment, as required by membrane manufacturer's recommendations and details.

3.07 FINISHING

A. Ballast: Install over completed assembly each work day.

B. Pavers: Install butted tightly, not more than 3/8 inch apart.

3.08 FIELD QUALITY CONTROL

A. Provide final inspection of the roofing system by Owner's Representative and Roofing Installer.

B. Perform all corrections necessary for issuance of warranty.

3.09 CLEANING

A. Clean all contaminants generated by roofing work from building and surrounding areas, including bitumen, adhesives, sealants, and coatings.

B. Repair or replace building components and finished surfaces damaged or defaced due to the work of this section; comply with recommendations of manufacturers of components and surfaces.

C. Remove leftover materials, trash, debris, equipment from project site and surrounding areas.

3.10 ROOFING INSTALLER'S WARRANTY

A. WHEREAS <NAME> of <ADDRESS>, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:

1. Owner: <**Insert**>
2. Address: <**Insert**>
3. Building Name: <**Insert**>
4. Address: <**Insert**>
5. Area of Work: <**Insert**>
6. Acceptance Date: <**Insert**>
7. Warranty Period: 2 years.
8. Expiration Date: <**Insert**>

B. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,

C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period he will, at his own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.

D. This Warranty is made subject to the following terms and conditions:

1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:

   a. lightning;
   b. fire;
   c. failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;

d. faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work, unless constructed by roofing installer;
e. vapor condensation on bottom of roofing; and
f. activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.

2. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof has been paid by Owner or by another responsible party so designated.
3. The Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents, resulting from leaks or faults or defects of work.
4. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of said alterations, but only to the extent said alterations affect work covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not become null and void, unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.
5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.
6. The Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.
7. This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

E. IN WITNESS THEREOF, this instrument has been duly executed this ____day of November, 20__.

1. Authorized Signature:
2. Name:
3. Title:

END OF SECTION

SECTION 07 6200
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fabricated sheet metal items, including flashings, counterflashings, sheet metal roofing, and scuppers.

B. Reglets and accessories.

C. Foundation insulation and waterproofing protection panels

1.02 RELATED REQUIREMENTS

A. Section 07 7410 - Metal Wall Panels

B. Section 07 9005 - Joint Sealers.

1.03 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; American Architectural Manufacturers Association; 2012.

B. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels; 2011.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2011.

D. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2010.

E. ASTM D2178 - Standard Specification for Asphalt Glass Felt Used in Roofing and Waterproofing; 2004.

F. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 2007 (Reapproved 2012)e1.

G. SMACNA (ASMM) - Architectural Sheet Metal Manual; Sheet Metal and Air Conditioning Contractors' National Association; 2012.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.

1.05 SUBMITTALS

A. See Section 01 3000 - submittal procedures.

B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

1.06 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA Architectural Sheet Metal Manual requirements and standard details, except as otherwise indicated.

B. Fabricator and Installer Qualifications: Company specializing in sheet metal work with 5 years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

B. Prevent contact with materials that could cause discoloration or staining.

PART 2 PRODUCTS

2.01 SHEET MATERIALS

A. Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 0.02 inch thick base metal.

B. Pre-Finished Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 0.02 inch thick base metal, shop pre-coated with PVDF coating.

1. PVDF (Polyvinylidene Fluoride) Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system.
2. Color: As selected by Architect from manufacturer's standard colors.

C. Stainless Steel: ASTM A666 Type 304, soft temper, 0.015 inch thick; smooth No. 4 finish.

D. Pre-Finished Aluminum, Fluoropolymer coated 0.04 inch thick, Match metal wall panel colors and profiles in drawings.

E. Pre-Finished Aluminum Plate for foundation insulation and waterproofing protection panels: Fluoropolymer coated 0.25 inch thick

2.02 ACCESSORIES

A. Fasteners: Stainless steel, with soft neoprene washers.

B. Underlayment: ASTM D2178, glass fiber roofing felt.

C. Slip Sheet: Rosin sized building paper.

D. Primer: Zinc chromate type.

E. Protective Backing Paint: Zinc molybdate alkyd.

F. Sealant: specified in Section 07 9005.

G. Plastic Cement: ASTM D4586, Type I.

H. Reglets: Surface mounted type, stainless steel; face and ends covered with plastic tape.

2.03 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Fabricate cleats of same material as sheet, minimum 8 inches wide, interlocking with sheet.

C. Form pieces in longest possible lengths.

D. Hem exposed edges on underside 1/2 inch; miter and seam corners.

E. Form material with flat lock seams, except where otherwise indicated. At moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.

F. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.

G. Fabricate flashings to allow toe to extend 2 inches over roofing gravel. Return and brake edges.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.

B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.02 PREPARATION

A. Install starter and edge strips, and cleats before starting installation.

B. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil.

3.03 INSTALLATION

A. Conform to drawing details.

B. Insert flashings into reglets to form tight fit. Secure in place with lead wedges. Pack remaining spaces with lead wool. Seal flashings into reglets with sealant.

C. Secure flashings in place using concealed fasteners. Use exposed fasteners only where permitted.

D. Apply plastic cement compound between metal flashings and felt flashings.

E. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.

F. Seal metal joints watertight.

3.04 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Control, for field inspection requirements.

B. Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.

END OF SECTION

SECTION 07 7200
ROOF ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manufactured curbs, equipment rails, and pedestals.

1.02 RELATED REQUIREMENTS

A. Section 07 6200 - Sheet Metal Flashing and Trim: Roof accessory items fabricated from sheet metal.

1.03 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2012.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2011.

D. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process; 2010.

E. FM P7825 - Approval Guide; Factory Mutual Research Corporation; current edition.

F. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2009.

G. UL (BMD) - Building Materials Directory; current edition.

1.04 SUBMITTALS

A. See Section 01 3300 - submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used.

1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.
4. Maintenance requirements.

C. Shop Drawings: For non-penetrating rooftop supports, submit detailed layout developed for this project, with design calculations for loadings and spacings.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store products under cover and elevated above grade.

PART 2 PRODUCTS

2.01 MANUFACTURED CURBS

A. Manufactured Curbs, Equipment Rails, and Other Roof Mounting Assemblies: Factory-assembled hollow sheet metal construction with fully mitered and welded corners, integral counterflashing, internal reinforcing, and top side and edges formed to shed water.

1. Sheet Metal: Hot-dip aluminum zinc alloy coated steel sheet (Galvalume) complying with ASTM A792/A792M; AZ55 coating designation; 18 gage, 0.048 inch thick.
2. Roofing Cants: Provide integral sheet metal roofing cants dimensioned to begin slope at top of roofing insulation; 1:1 slope; minimum cant height 4 inches.
3. Manufacture curb bottom and mounting flanges for installation directly on roof deck, not on insulation; match slope and configuration of roof deck.
4. Provide the layouts and configurations shown on the drawings.

B. Curbs Adjacent to Roof Openings: Provide curb on all sides of opening, with top of curb horizontal for equipment mounting.

1. Provide preservative treated wood nailers along top of curb.
2. Insulate inside curbs with 1-1/2 inch thick fiberglass insulation.
3. Height Above Finished Roof Surface: 8 inches, minimum.

C. Equipment Rails: Two-sided curbs in straight lengths, with top horizontal for equipment mounting.

1. Provide preservative treated wood nailers along top of rails.
2. Height Above Finished Roof Surface: 12 inches, minimum.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions, in manner that maintains roofing weather integrity.

3.04 CLEANING

A. Clean installed work to like-new condition.

3.05 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 07 8400
FIRESTOPPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Firestopping systems.

B. Firestopping of all joints and penetrations in fire-resistance rated and smoke-resistant assemblies, whether indicated on drawings or not, and other openings indicated.

1.02 RELATED REQUIREMENTS

A. Section 01 7329 – Cutting and Patching.

B. Section 09 2116 - Gypsum Board Assemblies: Gypsum wallboard fireproofing.

1.03 REFERENCE STANDARDS

A. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2012.

B. ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops; 2011a.

C. ASTM E1966 - Standard Test Method for Fire Resistive Joint Systems; 2007 (Reapproved 2011).

D. ASTM E2307 - Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-story Test Apparatus; 2010.

E. ASTM E2837 - Standard Test Method for Determining Fire Resistance of Continuity Head-of-Wall Joint Systems Installed Between Rated Wall Assemblies and Nonrated Horizontal Assemblies; 2011.

F. ITS (DIR) - Directory of Listed Products; Intertek Testing Services NA, Inc.; current edition.

G. FM P7825 - Approval Guide; Factory Mutual Research Corporation; current edition.

H. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168; current edition; www.aqmd.gov.

I. UL 2079 - Standard for Tests for Fire Resistance of Building Joint Systems; Underwriters Laboratories Inc.; 2004.

J. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc.; current edition.

1.04 SUBMITTALS

A. See Section 01 3300 - submittal procedures.

B. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number. Submit proposed code required firestop permanent labeling.

C. Product Data: Provide data on product characteristics, performance ratings, and limitations.

D. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Qualification statements for installing mechanics.

1.05 QUALITY ASSURANCE

A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.

1. Listing in the current-year classification or certification books of UL, FM, or ITS (Warnock Hersey) will be considered as constituting an acceptable test report.
2. Valid evaluation report published by ICC Evaluation Service, Inc. (ICC-ES) at www.icc-es.org will be considered as constituting an acceptable test report.
3. Submission of actual test reports is required for assemblies for which none of the above substantiation exists.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

C. Installer Qualifications: Company specializing in performing the work of this section and:

1. Trained by the manufacturer.
2. With minimum 3 years documented experience installing work of this type.
3. Able to show at least 5 satisfactorily completed projects of comparable size and type.

1.06 MOCK-UP

A. Install one firestopping assembly representative of each fire rating design required on project.

1. Where one design may be used for different penetrating items or in different wall constructions, install one assembly for each different combination.

B. If accepted, mock-up will represent minimum standard for the Work.

C. If accepted, mock-up may remain as part of the Work. Remove and replace mock-ups not accepted.

1.07 FIELD CONDITIONS

A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation. Maintain minimum temperature before, during, and for 3 days after installation of materials.

B. Provide ventilation in areas where solvent-cured materials are being installed.

PART 2 PRODUCTS

2.01 FIRESTOPPING - GENERAL REQUIREMENTS

A. Firestopping: Any material meeting requirements.

B. Firestopping Materials with Volatile Content: Provide only products having lower volatile organic compound (VOC) content than required by South Coast Air Quality Management District Rule No.1168.

C. Mold Resistance: Provide firestopping materials with mold and mildew resistance rating of 0 as determined by ASTM G21.

D. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Type required for tested assembly design.

2.02 FIRESTOPPING ASSEMBLY REQUIREMENTS

A. Perimeter Fire Containment Firestopping: Use any system that has been tested according to ASTM E2307 to have fire resistance F Rating equal to required fire rating of the floor assembly.

1. Movement: In addition, provide systems that have been tested to show movement capability as indicated.
2. Temperature Rise: In addition, provide systems that have been tested to show T Rating as indicated.
3. Air Leakage: In addition, provide systems that have been tested to show L Rating as indicated.
4. Where floor assembly is not required to have a fire rating, provide systems that have been tested to show L Rating as indicated.

B. Floor-to-Floor, Wall-to-Wall, and Wall-to-Floor Joints, Except Perimeter, Where Both Are Fire-Rated: Use any system that has been tested according to ASTM E1966 or UL 2079 to have fire resistance F Rating equal to required fire rating of the assembly in which the joint occurs.

1. Air Leakage: In addition, provide systems that have been tested to show L Rating as indicated.
2. Listing by UL, FM, or Intertek in their certification directory will be considered evidence of successful testing.

C. Through Penetration Firestopping: Use any system that has been tested according to ASTM E814 to have fire resistance F Rating equal to required fire rating of penetrated assembly.

1. Temperature Rise: In addition, provide systems that have been tested to show T Rating as indicated.
2. Air Leakage: In addition, provide systems that have been tested to show L Rating as indicated.
3. Listing by UL, FM, or Intertek in their certification directory will be considered evidence of successful testing.

2.03 FIRESTOPPING SYSTEMS

A. Firestopping: Any material meeting requirements.

1. Fire Ratings: Use any system listed by UL or tested in accordance with ASTM E814 that has F Rating equal to fire rating of penetrated assembly and T Rating Equal to F Rating and that meets all other specified requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify openings are ready to receive the work of this section.

3.02 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter that could adversely affect bond of firestopping material.

B. Remove incompatible materials that could adversely affect bond.

C. Install backing materials to arrest liquid material leakage.

3.03 INSTALLATION

A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.

B. Do not cover installed firestopping until inspected by authority having jurisdiction.

C. Install labeling required by code.

3.04 CLEANING

A. Clean adjacent surfaces of firestopping materials.

3.05 PROTECTION

A. Protect adjacent surfaces from damage by material installation.

END OF SECTION

SECTION 07 9005
JOINT SEALERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sealants and joint backing.

B. Precompressed foam sealers.

C. Hollow gaskets.

1.02 RELATED REQUIREMENTS

A. Section 07 2500 - Weather Barriers: Sealants required in conjunction with air barriers and vapor retarders:

B. Section 07 8400 - Firestopping: Firestopping sealants.

C. Section 08 8000 - Glazing: Glazing sealants and accessories.

D. Section 09 2116 - Gypsum Board Assemblies: Acoustic sealant.

1.03 REFERENCE STANDARDS

A. ASTM C834 - Standard Specification for Latex Sealants; 2010.

B. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications; 2012.

C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2011.

D. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2011a.

E. ASTM D1056 - Standard Specification for Flexible Cellular Materials--Sponge or Expanded Rubber; 2007.

F. ASTM D1667 - Standard Specification for Flexible Cellular Materials--Poly(Vinyl Chloride) Foam (Closed-Cell); 2005 (Reapproved 2011).

G. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness; 2005 (Reapproved 2010).

H. ASTM D2628 - Standard Specification for Preformed Polychloroprene Elastomeric Joint Seals for concrete Pavements; 1991 (Reapproved 2011).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with other sections referencing this section.

1.05 SUBMITTALS

A. See Section 01 3300 - submittal procedures.

B. Product Data: Provide data indicating sealant chemical characteristics.

C. Manufacturer's Installation Instructions: Indicate special procedures.

1.06 QUALITY ASSURANCE

A. Maintain one copy of each referenced document covering installation requirements on site.

B. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

1.07 MOCK-UP

A. Provide mock-up of sealant joints in conjunction with window under provisions of Section 01 4000.

B. Construct mock-up with specified sealant types and with other components noted.

C. Locate where directed.

D. Mock-up may remain as part of the Work.

1.08 FIELD CONDITIONS

A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

1.09 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective work within a five year period after Date of Substantial Completion.

C. Warranty: Include coverage for installed sealants and accessories which fail to achieve airtight seal, exhibit loss of adhesion or cohesion, or do not cure.

PART 2 PRODUCTS

2.01 SEALANTS

A. Type 1- General Purpose Exterior Sealant: Polyurethane; ASTM C920, Grade NS, Class 25, Uses M, G, and A; single component.

1. Color: To be selected by Architect from manufacturer's standard range.
2. Applications: Use for:
   a. Control, expansion, and soft joints in masonry.

b. Joints between concrete and other materials.
c. Joints between metal frames and other materials.
d. Other exterior joints for which no other sealant is indicated.

B. Type 2 - Exterior Metal Lap Joint Sealant: Butyl or polyisobutylene, nondrying, nonskinning, noncuring.

1. Applications: Use for:
   a. Concealed sealant bead in sheet metal work.
   b. Concealed sealant bead in siding overlaps.

C. Type 3 - General Purpose Interior Sealant: Acrylic emulsion latex; ASTM C834, Type OP, Grade NF single component, paintable.

1. Color: To be selected by Architect from manufacturer's standard range.
2. Applications: Use for:
   a. Interior wall and ceiling control joints.
   b. Joints between door and window frames and wall surfaces.
   c. Other interior joints for which no other type of sealant is indicated.

D. Type 4 - Nonsag Tamper-Resistant Sealant: ASTM C920, Grade NS, Class 12-1/2, Uses M, G, and A; single or multi- component.

1. Type: Polyurethane.
2. Color: To be selected by Architect from manufacturer's standard range.
3. Applications: Use for the following joints in secure areas.
   a. Interior wall and ceiling control joints.
   b. Joints between door and window frames and wall surfaces.
   c. Other interior joints for which no other type of sealant is indicated.

E. Type 5- Bathtub/Tile Sealant: White silicone; ASTM C920, Uses I, M and A; single component, mildew resistant.

1. Applications: Use for:
   a. Joints between plumbing fixtures and floor and wall surfaces.
   b. Joints between kitchen and bath countertops and wall surfaces.

F. Type 6 - Acoustical Sealant for Concealed Locations:

1. Composition: Permanently tacky non-hardening butyl sealant.
2. Applications: Use for concealed locations only:
   a. Sealant bead between top stud runner and structure and between bottom stud track and floor.

G. Type 7 - Concrete Floor Joint Filler: Self-leveling, pourable, semi-rigid sealant intended for filling cracks and control joints not subject to significant movement; rigid enough to support concrete edges under traffic.

1. Composition: Polyurea or epoxy, single or multi-part,100 percent solids by weight.
2. Hardness: 75 to 80 after 7 days, when tested in accordance with ASTM D2240 Shore A.
3. Joint Width: 1/8 to 1/4 inch.
4. Applications: Use for:
   a. Control joints in concrete slabs and floors not filled with filler placed in form.

b. joints in concrete slabs and floors.

H. Type 8 - Interior Floor Joint Sealant: Polyurethane, self-leveling; ASTM C920, Grade P, Class 25, Uses T, M and A; single component.

1. Approved by manufacturer for wide joints up to 1-1/2 inches.
2. Color: To be selected by Architect from manufacturer's standard range.
3. Applications: Use for:
   a. Expansion joints in floors.

I. Type 9 - Concrete Paving Joint Sealant: Polyurethane, self-leveling; ASTM C920, Class 25, Uses T, I, M and A; single component.

1. Color: Gray.
2. Applications: Use for:
   a. Joints in sidewalks and vehicular paving.

J. Type 10 - Acrylic Sealant: ASTM C920, Grade NS, Class 12-1/2, Uses NT, M, A, O; single component, solvent curing, non-staining, non-bleeding, non-sagging.

1. Color: To be selected by Architect from manufacturer's standard range.
2. Movement Capability: Plus and minus 12-1/2 percent.
3. Service Temperature Range: -13 to 180 degrees F.
4. Shore A Hardness Range: 25 to 50.

K. Type 11 - Butyl Sealant: ASTM C920, Grade NS, Class 12-1/2, Uses NT, M, A, G, O; single component, solvent release, non-skinning, non-sagging.

1. Color: To be selected by Architect from manufacturer's standard range.
2. Movement Capability: Plus and minus 12-1/2 percent.
3. Service Temperature Range: -13 to 180 degrees F.
4. Shore A Hardness Range: 10 to 30.

L. Type 12 - Nonsag Polysulfide Sealant: ASTM C920, Grade NS, Class 25, Uses NT, I, M, A, G, O; two component, chemical curing, non-staining, non-bleeding, capable of continuous water immersion, non-sagging type.

1. Color: To be selected by Architect from manufacturer's standard range.
2. Movement Capability: Plus and minus 25 percent.
3. Service Temperature Range: -40 to 180 degrees F.
4. Shore A Hardness Range: 20 to 35.

M. Type 13 - Nonsag Polyurethane Sealant: ASTM C920, Grade NS, Class 25, Uses NT, I, M, A, G, O; single component, chemical curing, non-staining, non bleeding, capable of continuous water immersion, non-sagging type.

1. Color: To be selected by Architect from manufacturer's standard range.
2. Movement Capability: Plus and minus 25 percent.
3. Service Temperature Range: -40 to 180 degrees F.
4. Shore A Hardness Range: 20 to 35.

N. Type 14 - Silicone Sealant: ASTM C920, Grade NS, Class 25, Uses NT, A, G, M, O; single component, solvent curing, non-sagging, non-staining, fungus resistant, non-bleeding.

1. Color: To be selected by Architect from manufacturer's standard range.
2. Movement Capability: Plus and minus 25 percent.
3. Service Temperature Range: -65 to 180 degrees F.
4. Shore A Hardness Range: 15 to 35.

2.02 ACCESSORIES

A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.

B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.

C. Joint Backing: Round foam rod compatible with sealant; ASTM D 1667, closed cell PVC; oversized 30 to 50 percent larger than joint width.

D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

B. Verify that joint backing and release tapes are compatible with sealant.

3.02 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean and prime joints in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

D. Protect elements surrounding the work of this section from damage or disfigurement.

3.03 INSTALLATION

A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Perform installation in accordance with ASTM C1193.

C. Perform acoustical sealant application work in accordance with ASTM C919.

D. Measure joint dimensions and size joint backers to achieve the following, unless otherwise indicated:

1. Width/depth ratio of 2:1.
2. Neck dimension no greater than 1/3 of the joint width.
3. Surface bond area on each side not less than 75 percent of joint width.

E. Install bond breaker where joint backing is not used.

F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.

G. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

H. Tool joints concave.

I. Precompressed Foam Sealant: Do not stretch; avoid joints except at corners, ends, and intersections; install with face 1/8 to 1/4 inch below adjoining surface.

3.04 CLEANING

A. Clean adjacent soiled surfaces.

3.05 PROTECTION

A. Protect sealants until cured.

3.06 SCHEDULE

A. Exterior Joints for Which No Other Sealant Type is Indicated: Type 13;

B. Control and Expansion Joints in Paving: Type 9.

C. Joints Between Concrete Panels and Between Panels and Adjacent Work: Type13

D. Lap Joints in Exterior Sheet Metal Work: Type 2

E. Butt Joints in Exterior Metal Work and Siding: Type 1.

F. Joints Between Exterior Metal Frames and Adjacent Work (except masonry): Type 1.

G. Under Exterior Door Thresholds: Type 1.

H. Interior Joints for Which No Other Sealant is Indicated: Type 3

I. Control and Expansion Joints in Interior Concrete Slabs and Floors: Type 8.

J. Joints Between Plumbing Fixtures and Walls and Floors, and Between Countertops and Walls: Type 5.

K. In STC-Rated Walls, Between Metal Stud Track/Runner and Adjacent Construction: Type 1.

END OF SECTION

SECTION 08 1113
HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Non-fire-rated steel doors and frames.

B. Steel frames for wood doors.

C. Fire-rated steel doors and frames.

D. Thermally insulated steel doors.

E. Sound-rated steel doors and frames.

F. Steel glazing frames.

1.02 RELATED REQUIREMENTS

A. Section 08 7100 - Door Hardware.

B. Section 08 8000 - Glazing: Glass for doors and borrowed lites.

C. Section 09 9123 - Painting and Coating: Field painting.

1.03 REFERENCE STANDARDS

A. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 2009.

B. ANSI A250.8 - SDI-100 Recommended Specifications for Standard Steel Doors and Frames; 2003.

C. ANSI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 1998 (R2011).

D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2011.

E. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009.

F. ASTM E413 - Classification for Rating Sound Insulation; 2010.

G. BHMA A156.115 - Hardware Preparation in Steel Doors and Steel Frames; 2006.

H. NAAMM HMMA 840 - Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames; The National Association of Architectural Metal Manufacturers; 2007.

I. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames; The National Association of Architectural Metal Manufacturers; 2006.

J. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2013.

K. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association; 2012.

L. UL (BMD) - Building Materials Directory; Underwriters Laboratories Inc.; current edition.

M. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

N. UL 1784 - Standard for Air Leakage Tests of Door Assemblies; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3300 - Administrative Requirements for submittal procedures.

B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced grade standard.

C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and identifying location of different finishes, if any.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store in accordance with NAAMM HMMA 840.

B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Steel Doors and Frames:

1. Assa Abloy Ceco, Curries, or Fleming: www.assaabloydss.com.
2. De La Fontaine Inc; : www.delafontaine.com.
3. Republic Doors; Product www.republicdoor.com.
4. Steelcraft, an Ingersoll Rand brand; Product www.steelcraft.com.
5. Substitutions: See Section 01 2513 - Product Requirements.

2.02 DOORS AND FRAMES

A. Requirements for All Doors and Frames:

1. Accessibility: Comply with ANSI/ICC A117.1.
2. Door Top Closures: Flush with top of faces and edges.

3. Door Edge Profile: Beveled on both edges.
4. Door Texture: Smooth faces.
5. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.
6. Hardware Preparation: In accordance with BHMA A156.115, with reinforcement welded in place, in addition to other requirements specified in door grade standard.
7. Galvanizing for Units in Wet Areas: All components hot-dipped zinc-iron alloy-coated (galvannealed), manufacturer's standard coating thickness.
8. Finish: Factory primed, for field finishing.

B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with all the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.03 STEEL DOORS

A. Exterior Doors

1. Grade: ANSI A250.8 Level 4, physical performance Level A, Model 2, seamless.
2. Core: Polystyrene foam.
3. Top Closures for Outswinging Doors: Flush with top of faces and edges.
4. Galvanizing: All components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness.

B. Interior Doors, Non-Fire-Rated:

1. Grade: ANSI A250.8 Level 2, physical performance Level B, Model 1, full flush.
2. Thickness: 1-3/4 inches.

C. Interior Doors, Fire-Rated:

1. Grade: ANSI A250.8 Level 2, physical performance Level B, Model 1, full flush.
2. Fire Rating: As indicated on Door and Frame Schedule, tested in accordance with UL 10C ("positive pressure").
   a. Rate of Temperature Rise Across Door Thickness for _____ Doors: 250 F degrees.
   b. Provide units listed and labeled by UL.
   c. Attach fire rating label to each fire rated unit.

D. Interior Smoke and Draft Control Doors (Indicated as "S" on Drawings): Same construction as fire-rated doors with indicated fire rating, plus:

1. Maximum Air Leakage: 3.0 cfm per sq ft of door opening at 0.10 inch w.g. pressure, when tested in accordance with UL 1784 at both ambient and elevated temperatures.
2. Gasketing: No added gasketing or seals allowed.
3. Label: UL "S" label.

E. Interior Doors, Sound-Rated:

1. Grade: ANSI A250.8 Level 2, physical performance Level B, Model 2, seamless.
2. STC Rating of Assembled Door, Frame, and Seals: 35, calculated in accordance with ASTM E413, tested in accordance with ASTM E90.

3. Sound Seals: Integral, concealed in door or frame.

2.04 STEEL FRAMES

A. General:

1. Comply with the requirements of grade specified for corresponding door.
   a. Frames for Wood Doors: Comply with frame requirements specified in ANSI A250.8 for Level 1, 16 gage
   b. Frames for Sound-Rated Wood Doors: Comply with frame requirements specified in ANSI A250.8 for Level 1, 16 gage
   c. Frames for Bullet Resistant Door: Comply with frame requirements specified in NAAMM HMMA 862; 14 ga, 0.07 inch.
2. Finish: Same as for door.
3. Frames Wider than 48 Inches: Reinforce with steel channel fitted tightly into frame head, flush with top.

B. Exterior Door Frames: Face welded, seamless with joints filled.

1. Galvanizing: All components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness.
2. Finish: Factory primed, for field finishing.
3. Weatherstripping: Separate, see Section 08 7100.

C. Interior Door Frames, Non-Fire-Rated: Drywall slip-on type.

1. Finish: Factory primed, for field finishing.

D. Interior Door Frames, Fire-Rated: Knock-down type.

1. Fire Rating: Same as door, labeled.

E. Sound-Rated Door Frames: Drywall slip-on type.

1. Finish: Factory primed, for field finishing.

F. Mullions for Pairs of Doors: Removable type, of profile similar to jambs.

G. Frames for Interior Glazing or Borrowed Lights: Construction and face dimensions to match door frames, and as indicated on drawings.

H. Transom Bars: Fixed, of profile same as jamb and head.

2.05 ACCESSORY MATERIALS

A. Glazing: As specified in Section 08 8000.

B. Removable Stops: Formed sheet steel, shape as indicated on drawings, mitered or butted corners; prepared for countersink style tamper proof screws.

C. Astragals for Double Doors: Specified in Section 08 7100.

1. Fire-Rated Doors: Steel, shape as required to accomplish fire rating.

D. Mechanical Fasteners for Concealed Metal-to-Metal Connections: Self-drilling, self-tapping, steel with electroplated zinc finish.

E. Silencers: Resilient rubber, fitted into drilled hole; 3 on strike side of single door, 3 on center mullion of pairs, and 2 on head of pairs without center mullions.

F. Temporary Frame Spreaders: Provide for all factory- or shop-assembled frames.

2.06 FINISH MATERIALS

A. Primer: Rust-inhibiting, complying with ANSI A250.10, door manufacturer's standard.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

3.02 INSTALLATION

A. Install in accordance with the requirements of the specified door grade standard and NAAMM HMMA 840.

B. In addition, install fire rated units in accordance with NFPA 80.

C. Coordinate frame anchor placement with wall construction.

D. Coordinate installation of hardware.

E. Coordinate installation of glazing.

3.03 TOLERANCES

A. Maximum Diagonal Distortion: 1/16 in measured with straight edge, corner to corner.

3.04 ADJUSTING

A. Adjust for smooth and balanced door movement.

B. Adjust sound control doors so that seals are fully engaged when door is closed.

END OF SECTION

SECTION 08 1416
FLUSH WOOD DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Flush wood doors; flush configuration; fire rated, non-rated, and acoustical.

1.02 RELATED REQUIREMENTS

A. Section 06 2000 - Finish Carpentry.

B. Section 08 1113 - Hollow Metal Doors and Frames.

C. Section 08 7100 - Door Hardware.

D. Section 08 8000 - Glazing.

1.03 REFERENCE STANDARDS

A. ANSI A135.4 - American National Standard for Basic Hardboard; 2004.

B. AWI (QCP) - Quality Certification Program, www.awiqcp.org; current edition at www.awiqcp.org.

C. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2009.

D. AWMAC (GIS) - Guarantee and Inspection Services Program; current edition at www.awmac.com/gis.php.

E. ICC (IBC) - International Building Code; 2012.

F. ITS (DIR) - Directory of Listed Products; Intertek Testing Services NA, Inc.; current edition.

G. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2013.

H. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association; 2012.

I. UBC Std 7-2, Part II - Test Standard for Smoke- and Draft-control Assemblies; International Conference of Building Officials; 1997.

J. UL (BMD) - Building Materials Directory; Underwriters Laboratories Inc.; current edition.

K. UL 10B - Standard for Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

L. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

M. UL 1784 - Standard for Air Leakage Tests of Door Assemblies; Current Edition, Including All Revisions.

N. WDMA I.S.1-A - Architectural Wood Flush Doors; Window and Door Manufacturers Association; 2011.

1.04 SUBMITTALS

A. See Section 01 3300 - submittal procedures.

B. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.

C. Shop Drawings: Show doors and frames, elevations, sizes, types, swings, undercuts, beveling, blocking for hardware, factory machining, factory finishing, cutouts for glazing and other details.

1. Provide the information required by AWI/AWMAC/WI Architectural Woodwork Standards.
2. Include certification program label.

D. Specimen warranty.

E. Test Reports: Show compliance with specified requirements for the following:

G. Warranty, executed in Owner's name.

1.05 QUALITY ASSURANCE

A. Maintain one copy of the specified door quality standard on site for review during installation and finishing.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1. Company with at least one project in the past 5 years with value of woodwork within 20 percent of cost of woodwork for this Project.

C. Installed Fire Rated Door and Transom Panel Assembly: Conform to NFPA 80 for fire rated class as indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Package, deliver and store doors in accordance with specified quality standard.

B. Accept doors on site in manufacturer's packaging. Inspect for damage.

C. Protect doors with resilient packaging sealed with heat shrunk plastic. Do not store in damp or wet areas; or in areas where sunlight might bleach veneer. Seal top and bottom edges with tinted sealer if stored more than one week. Break seal on site to permit ventilation.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Interior Doors: Provide manufacturer's warranty for 2 years.

C. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 PRODUCTS

2.01 DOORS AND PANELS

A. All Doors: See drawings for locations and additional requirements.

1. Quality Level: Custom Grade, Extra Heavy Duty performance, in accordance with WDMA I.S.1-A.
2. Wood Veneer Faced Doors: 5-ply unless otherwise indicated.

B. Interior Doors: 1-3/4 inches thick unless otherwise indicated; flush construction.

1. Provide solid core doors at all locations.
2. Fire Rated Doors: Tested to ratings indicated on drawings in accordance with International Building Code ("positive pressure"); UL or WH (ITS) labeled without any visible seals when door is open.
3. Smoke and Draft Control Doors (Indicated as "S" on Drawings): In addition to required fire rating, provide door assemblies tested in accordance with UL 1784 with maximum air leakage of 3.0 cfm per sq ft of door opening at 0.10 inch w.g. pressure at both ambient and elevated temperatures; with "S" label; if necessary, provide additional gasketing or edge sealing.
4. Wood veneer facing with factory transparent finish where indicated on drawings.

2.02 DOOR AND PANEL CORES

A. Non-Rated Solid Core and 20 Minute Rated Doors: Type particleboard core (PC), plies and faces as indicated above.

B. Fire Rated Doors: Mineral core, Type FD, plies and faces as indicated above; with core blocking as required to provide adequate anchorage of hardware without through-bolting.

C. Sound Retardant Doors: Equivalent to Type PC construction with core as required to achieve rating specified; plies and faces as indicated above.

2.03 DOOR FACINGS

A. Wood Veneer Facing for Transparent Finish: Species as specified above, veneer grade as specified by quality standard, plain sliced, book veneer match, running assembly match; unless otherwise indicated.

1. Vertical Edges: Any option allowed by quality standard for grade.
2. Pairs: Pair match each pair; set match pairs within 10 feet of each other when doors are closed.

2.04 ACCESSORIES

A. Glazing Stops: Wood, of same species as door facing, butted corners; prepared for countersink style tamper proof screws.

2.05 DOOR CONSTRUCTION

A. Fabricate doors in accordance with door quality standard specified.

B. Cores Constructed with stiles and rails:

1. Provide solid blocks at lock edge for hardware reinforcement.
2. Provide solid blocking for other through-bolted hardware.

C. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.

D. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.

1. Exception: Doors to be field finished.

E. Provide edge clearances in accordance with the quality standard specified.

2.06 FACTORY FINISHING - WOOD VENEER DOORS

A. Finish work in accordance with AWI/AWMAC/WI Architectural Woodwork Standards, Section 5 - Finishing for Grade specified and as follows:

1. Transparent:
   a. System - 1, Lacquer, Nitrocellulose.
   b. Sheen: Flat.

B. Factory finish doors in accordance with approved sample.

C. Seal door top edge with color sealer to match door facing.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.02 INSTALLATION

A. Install doors in accordance with manufacturer's instructions and specified quality standard.

1. Install fire-rated doors in accordance with NFPA 80 requirements.

B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.

C. Use machine tools to cut or drill for hardware.

D. Coordinate installation of doors with installation of frames and hardware.

E. Coordinate installation of glazing.

3.03 TOLERANCES

A. Conform to specified quality standard for fit and clearance tolerances.

B. Conform to specified quality standard for telegraphing, warp, and squareness.

3.04 ADJUSTING

A. Adjust doors for smooth and balanced door movement.

B. Adjust closers for full closure.

3.05 SCHEDULE - SEE DRAWINGS

END OF SECTION

SECTION 08 3100
ACCESS DOORS AND PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall access door and frame units.

B. Ceiling access door and frame units.

1.02 REFERENCE STANDARDS

A. ITS (DIR) - Directory of Listed Products; Intertek Testing Services NA, Inc.; current edition.

B. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc.; current edition.

1.03 SUBMITTALS

A. See Section 01 3300 - submittal procedures.

B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.

C. Shop Drawings: Indicate exact position of all access door units.

D. Project Record Documents: Record actual locations of all access units.

PART 2 PRODUCTS

2.01 ACCESS DOOR AND PANEL APPLICATIONS

A. Walls, Unless Otherwise Indicated:

1. Size: 16 x 16 inches, unless otherwise indicated.
2. Standard duty, hinged door.
3. Tool-operated spring or cam lock; no handle.
4. In All Wall Types: Surface mounted face frame and door surface flush with frame surface.

B. Walls in Wet Areas and Exterior Locations:

1. Material: Stainless steel.
2. Size:16’x16’ inches, unless otherwise indicated.
3. Standard duty, hinged door.
4. Tool-operated spring or cam lock; no handle.
5. In All Wall Types: Surface mounted face frame and door surface flush with frame surface.

C. Fire Rated Walls: See drawings for wall fire ratings.

1. Material: Steel, hot-dipped zinc or zinc-aluminum-alloy coated.
2. Size: 16 x 16 inches, unless otherwise indicated.
3. Insulated, double skin door panel.
4. Tool-operated spring or cam lock; no handle.

D. Ceilings, Unless Otherwise Indicated: Same type as for walls.

1. Size in Lay-in Grid Ceilings: To match grid module.
2. Size in Other Ceilings: 12 x 12 inches, unless otherwise indicated.
3. Tool-operated spring or cam lock; no handle.

E. Fire Rated Ceilings: See drawings for ceiling fire ratings.

1. Size: 12 x 12 inches, unless otherwise indicated.
2. Tool-operated spring or cam lock; no handle.

F. Security Doors in Walls: Where indicated on drawings.

1. Size: 12 x 12 inches, unless otherwise indicated.
2. Heavy duty door and frame.
3. Lock type as indicated.

2.02 WALL AND CEILING UNITS

A. Access Doors: Factory fabricated door and frame units, fully assembled units with corner joints welded, filled, and ground flush; square and without rack or warp; coordinate requirements with assemblies units are to be installed in.

1. Door Style: Single thickness with rolled or turned in edges.
2. Heavy Duty Single Thickness Steel Door Panels: 14 gage, 0.0747 inch, minimum.
3. Double-Skinned Hollow Steel Door Panels: 16 gage, 0.059 inch, minimum, on both sides and all edges.
4. Units in Fire Rated Assemblies: Fire rating as required by applicable code for the fire rated assembly in which they are to be installed.
5. Steel Finish: Primed.
6. Stainless Steel Finish: No. 4 brushed finish.
7. Hardware:

a. Hardware for Fire Rated Units: As required for listing.
b. Hinges for Non-Fire-Rated Units: Concealed, constant force closure spring type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that rough openings are correctly sized and located.

3.02 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Install frames plumb and level in openings. Secure rigidly in place.

C. Position units to provide convenient access to the concealed work requiring access.

END OF SECTION

SECTION 08 4313
ALUMINUM-FRAMED STOREFRONTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum-framed storefront, with vision and opaque coated spandrel glass.

B. Infill spandrel panels of rigid insulation and glass.

C. Aluminum doors and frames.

D. Weatherstripping.

E. Perimeter sealant.

1.02 RELATED REQUIREMENTS

A. Section 05 1200 - Structural Steel Framing: Steel attachment members.

B. Section 05 5000 - Metal Fabrications: Steel attachment devices.

C. Section 07 2500 - Weather Barriers: Perimeter air and vapor seal between glazing system and adjacent construction.

D. Section 07 9005 - Joint Sealers: Perimeter sealant and back-up materials.

E. Section 08 7100 - Door Hardware: Hardware items other than specified in this section.

F. Section 08 8000 - Glazing: Glass and glazing accessories.

1.03 REFERENCE STANDARDS

A. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site; American Architectural Manufacturers Association; 2012.

B. AAMA 501.2 - Field Check of Metal Storefronts, Curtain Walls, and Sloped Glazing Systems for Water Leakage; American Architectural Manufacturers Association; 2009 (part of AAMA 501).

C. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; American Architectural Manufacturers Association; 2012.

D. AAMA 612 - Voluntary Specification, Performance Requirements and Test Procedures for Combined Coatings of Anodic Oxide and Transparent Organic Coatings on Architectural Aluminum; 2002.

E. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections; American Architectural Manufacturers Association; 2009.

F. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; American Society of Civil Engineers; 2011.

G. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2008.

H. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2012.

I. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2010.

J. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric]; 2010.

K. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2012.

L. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric]; 2012.

M. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004 (Reapproved 2012).

N. ASTM E330 - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2002 (Reapproved 2010).

O. ASTM E547 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Cyclic Static Air Pressure Differential; 2000 (Reapproved 2009).

P. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2009).

Q. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference; 2000 (Reapproved 2008)

R. ASTM E1996 - Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes; 2012.

S. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society for Protective Coatings; 2002 (Ed. 2004).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with installation of other components that comprise the exterior enclosure.

B. Preinstallation Meeting: Conduct a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

A. See Section 01 3300 - submittal procedures.

B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, door hardware, internal drainage details and powered opener wiring chases.

C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related Work, expansion and contraction joint location and details, and field welding required.

D. Design Data: Provide framing member structural and physical characteristics, engineering calculations, dimensional limitations.

E. Hardware Schedule: Complete itemization of each item of hardware to be provided for each door, cross-referenced to door identification numbers in Contract Documents.

F. Report of field testing for water leakage.

1.06 QUALITY ASSURANCE

A. Designer Qualifications: Design structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed at the State in which the Project is located.

B. Manufacturer and Installer Qualifications: Company specializing in manufacturing aluminum glazing systems with minimum three years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Handle products of this section in accordance with AAMA CW-10.

B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.08 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

1.09 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.01 BASIS OF DESIGN -- FRAMING FOR INSULATING GLAZING

A. Wind-Borne-Debris Resistance Tested, Center-Set Style:

1. Basis of Design: C.R. Laurence Co., Inc; U.S. Aluminum Series IT600 Storm Front (thermal).
2. Vertical Mullion Dimensions: 2-1/2 inches wide by 5 inches deep.

B. Center-Set Style, Thermally-Broken:

1. Basis of Design: C.R. Laurence Co., Inc; U.S. Aluminum Series IT451/451-S.
2. Vertical Mullion Dimensions: 2 inches wide by 4-1/2 inches deep.

C. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed below:

1. C.R. Laurence Co., Inc; U.S. Aluminum: www.crl-arch.com.
2. EFCO, a Pella Company: www.efcocorp.com.
3. Kawneer type 7550
4. Bucher Glass Hi-Therm System, www.bucher.com

2.02 BASIS OF DESIGN -- SWINGING DOORS

A. Wide Stile, Insulating Glazing, Thermally-Broken:

1. Basis of Design: Kawneer 350 Medium Stile Thermal Door.
2. Thickness: 2-1/4 inch.

C. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed below:

2.03 STOREFRONT

A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.

1. Finish: Class I natural anodized.
   a. Factory finish all surfaces that will be exposed in completed assemblies.
   b. Touch-up surfaces cut during fabrication so that no natural aluminum is visible in completed assemblies, including joint edges.
   c. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.
2. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors and hardware; fasteners and attachments concealed from view; reinforced as required for imposed loads.
3. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
4. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.

5. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.
6. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
7. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
8. Air and Vapor Seal: Maintain continuous air barrier and vapor retarder throughout assembly, primarily in line with inside pane of glazing and inner sheet of infill panel and heel bead of glazing compound.

B. Performance Requirements:

1. Wind Loads: Design and size components to withstand the specified load requirements without damage or permanent set, when tested in accordance with ASTM E330, using loads 2 times the design wind loads and 15 Seconds duration of maximum load.
   a. Design Wind Loads: Comply with requirements of 2009 IBC code.
   b. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.
2. Wind-Borne-Debris Resistance: Identical full-size glazed assembly without auxiliary protection, tested by independent agency in accordance with ASTM E1996 for Wind Zone 4, Basic Protection, for Large and Small Missile impact and pressure cycling at design wind pressure.
3. Water Penetration Resistance: No uncontrolled water on interior face, when tested in accordance with ASTM E331 at pressure differential of 15 lbf/sq ft.
4. Air Leakage: Maximum of 0.06 cu ft/min/sq ft of wall area, when tested in accordance with ASTM E283 at 6.27 pounds per square foot pressure differential across assembly.
5. Condensation Resistance Factor of Exterior Framing: 70, minimum, measured in accordance with AAMA 1503.

2.04 COMPONENTS

A. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system.

1. Framing members for interior applications need not be thermally broken.
2. Glazing stops: Flush.

B. Infill Panels: Insulated Tempered Laminate with white side 2 coating and attached rigid insulation – See Section 08 8000

C. Swing Doors: Glazed aluminum.

1. Thickness: 2 inches.
2. Top Rail: 4 inches wide.
3. Vertical Stiles: 4-1/2 inches wide.
4. Bottom Rail: 8 inches wide.
5. Glazing Stops: Square.
6. Finish: Same as storefront.

2.05 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

B. Sheet Aluminum: ASTM B209 (ASTM B209M).

C. Structural Steel Sections: ASTM A36/A36M; galvanized in accordance with requirements of ASTM A123/A123M.

D. Structural Supporting Anchors Attached to Structural Steel: Design for bolted attachment.

E. Structural Supporting Anchors Attached to Reinforced Concrete Members: Design for welded attachment to weld plates embedded in concrete.

F. Fasteners: Stainless steel.

G. Exposed Flashings: 0.032 inch thick aluminum sheet; finish to match framing members.

H. Concealed Flashings: 0.018 inch thick stainless steel.

I. Perimeter Sealant: specified in Section 07 9005.

J. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

K. Touch-Up Primer for Galvanized Steel Surfaces: SSPC-Paint 20, zinc rich.

2.06 FINISHES

A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating or AAMA 612 clear anodic coating with electrolytically deposited organic seal; not less than 0.7 mils thick.

B. Touch-Up Materials: As recommended by coating manufacturer for field application.

2.07 HARDWARE

A. For each door, include weatherstripping and sill sweep strip.

B. Other Door Hardware: As specified in Section 08 7100 - Door Hardware.

C. Weatherstripping: Wool pile, continuous and replaceable; provide on all doors.

D. Sill Sweep Strips: Resilient seal type, retracting, of neoprene; provide on all doors.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other work.

B. Verify that wall openings and adjoining air and vapor seal materials are ready to receive work of this section.

3.02 INSTALLATION

A. Install wall system in accordance with manufacturer's instructions.

B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Provide alignment attachments and shims to permanently fasten system to building structure.

D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

E. Provide thermal isolation where components penetrate or disrupt building insulation.

F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.

G. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.

H. Coordinate attachment and seal of perimeter air and vapor barrier materials.

I. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

J. Set thresholds in bed of mastic and secure.

K. Install glass and infill panels in accordance with Section 08 8000, using glazing method required to achieve performance criteria.

L. Install perimeter sealant in accordance with Section 07 9005.

M. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.03 TOLERANCES

A. Maximum Variation from Plumb: 0.06 inches every 3 ft non-cumulative or 1/16 inches per 10 ft, whichever is less.

B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

3.04 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for independent testing and inspection requirements. Inspection will monitor quality of installation and glazing.

B. Test installed storefront for water leakage in accordance with AAMA 501.2.

3.05 ADJUSTING

A. Adjust operating hardware and sash for smooth operation.

3.06 CLEANING

A. Remove protective material from pre-finished aluminum surfaces.

B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.

C. Remove excess sealant by method acceptable to sealant manufacturer.

3.07 PROTECTION

A. Protect installed products from damage during subsequent construction.

END OF SECTION

SECTION 08 5113
ALUMINUM WINDOWS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Extruded thermally broke aluminum windows with fixed sash.

B. Factory glazing.

1.02 RELATED REQUIREMENTS

A. Section 05 5000 - Metal Fabrications: Steel lintels.

B. Section 06 1000 - Rough Carpentry: Rough opening framing.

C. Section 07 2500 - Weather Barriers: Perimeter air and vapor seal between window frame and adjacent construction.

D. Section 07 9005 - Joint Sealers: Perimeter sealant and back-up materials.

E. Section 08 8000 - Glazing.

1.03 REFERENCE STANDARDS

A. AAMA/WDMA/CSA 101/I.S.2/A440 - AAMA/WDMA/CSA 101/I.S.2/A440, NAFS — North American Fenestration Standard/Specification for windows, doors, and skylights.; American Architectural Manufacturers Association; 2011.

B. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; American Architectural Manufacturers Association; 2012.

C. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections; American Architectural Manufacturers Association; 2009.

D. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site; American Architectural Manufacturers Association; 2012.

E. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; American Society of Civil Engineers; 2011.

F. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2012.

G. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2010.

H. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric]; 2010.

I. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2012.

J. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric]; 2012.

K. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004 (Reapproved 2012).

L. ASTM E330 - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2002 (Reapproved 2010).

M. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2009).

N. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference; 2000 (Reapproved 2008)

O. ASTM E1996 - Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes; 2012.

P. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society for Protective Coatings; 2002 (Ed. 2004).

Q. SSPC-Paint 25 - Zinc Oxide, Alkyd, Linseed Oil Primer for Use Over Hand Cleaned Steel, Type I and Type II; Society for Protective Coatings; 1997 (Ed. 2004).

R. SSPC-Paint 25BCS - Zinc Oxide, Alkyd, Linseed Oil Primer for Use Over Blast Cleaned Steel; Society for Protective Coatings; 1997 (Ed. 2004).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.

1.05 SUBMITTALS

A. See Section 01 3300 - submittal procedures.

B. Product Data: Provide component dimensions.

C. Grade Substantiation: Provide specified Grade Substantiation before submitting shop drawings or starting fabrication.

D. Shop Drawings: Indicate opening dimensions, elevations of different types, framed opening tolerances, method for achieving air and vapor barrier seal to adjacent construction, anchorage locations, and installation requirements.

E. Samples: Submit two samples, 8 x 12 inch in size illustrating typical corner construction, accessories, and finishes.

F. Manufacturer's Installation Instructions: Include complete preparation, installation, and cleaning requirements.

1.06 QUALITY ASSURANCE

A. Manufacturer and Installer Qualifications: Company specializing in fabrication of commercial aluminum windows of types required, with not fewer than three years of experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of AAMA CW-10.

B. Protect finished surfaces with wrapping paper or strippable coating during installation. Do not use adhesive papers or sprayed coatings that bond to substrate when exposed to sunlight or weather.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.01 BASIS OF DESIGN - ARCHITECTURAL CLASS WINDOWS

A. Provide products tested for compliance with AAMA/NWWDA101/I.S.2-97 Class F-HC100/F-AW100.

B. Very High Wind Speed, Wind-Borne-Debris Resistance Tested:

1. KAWNEER 7550 with Type IG-1/S-5 glazing (Section 08 8000)
2. Basis of Design: BUCHER GLASS HI-THERM SYSTEM with Type IG-1 /S-5 glazing (Section 08 8000)
3. OLD CASTLE Reliance HTC with Type IG-1/S-5 glazing (Section 08 8000)

D. Substitution Procedures: See Section 01 2513 - Product Requirements.

1. For any product not identified as "Basis of Design", submit information as specified for substitutions.

2.02 WINDOWS

A. Aluminum Windows: Extruded aluminum frame and sash, factory fabricated, factory finished, with related flashings, and anchorage and attachment devices.

1. Provide units factory glazed.

2. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors; fasteners and attachments concealed from view; reinforced as required for operating hardware and imposed loads.
3. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
4. Movement: Accommodate movement between window and perimeter framing and deflection of lintel, without damage to components or deterioration of seals.
5. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
6. Thermal Movement: Design to resist thermal movement caused by 180 degrees F surface temperature without buckling stress on glass, joint seal failure, damaging loads on structural elements, damaging loads on fasteners, reduction in performance or other detrimental effects.

B. Performance Requirements: Provide products that comply with the following:

1. Grade Substantiation: Either AAMA Certification Label or independent test report itemizing compliance will constitute acceptable evidence of compliance.
2. Positive Design Wind Load: 100 lbf/sq ft.
3. Negative Design Wind Load: 100 lbf/sq ft.
4. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.
5. Wind-Borne-Debris Resistance: Identical full-size glazed assembly without auxiliary protection, tested by independent agency in accordance with ASTM E1996 for Wind Zone 4, Basic Protection, for Large and Small Missile impact and pressure cycling at design wind pressure.
6. Water Leakage: No uncontrolled leakage on interior face when tested in accordance with ASTM E331 at differential pressure of 15 pounds per square foot.
7. Air Leakage: Maximum of 0.3 cu ft/min/sq ft at 6.24 pounds per square foot differential pressure, when tested in accordance with ASTM E283.
8. Condensation Resistance Factor of Frame: minimum 65 measured in accordance with AAMA 1503.
9. Window assembly overall U-value =.19

C. Fixed, Non-Operable Type:

1. Construction: Thermally broken.
2. Exterior Finish: Class I natural anodized.
3. Interior Finish: Class I natural anodized.

2.03 COMPONENTS

A. Frames: 1-7/8 inch wide x 4 inch deep profile, of 0.07 inch thick section; thermally broken with interior portion of frame insulated from exterior portion; flush glass stops of snap-on type.

B. Glazing: As specified in Section 08 8000.

C. Sills: 0.07 inch thick minimum, extruded aluminum; sloped for positive wash; fit under sash leg to 1/2 inch beyond wall face; one piece full width of opening jamb angles to terminate sill end.

D. Fasteners: Stainless steel.

E. Glazing Materials: As specified in Section 08 8000.

F. Sealant and Backing Materials: As specified in Section 07 9005.

2.04 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.

B. Sheet Aluminum: ASTM B209 (ASTM B209M), 5005 alloy, H12 or H14 temper.

C. Concealed Steel Items: Profiled to suit mullion sections; galvanized in accordance with ASTM A123/A123M.

2.05 FINISHES

A. Class I Natural Finish or Anodized Plus Natural Anodized 2-step Finish:

B. Touch-Up Primer for Galvanized Steel Surfaces: SSPC-Paint 20, zinc rich.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that wall openings and adjoining air and vapor seal materials are ready to receive aluminum windows.

3.02 INSTALLATION

A. Install windows in accordance with manufacturer's instructions.

B. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.

C. Align window plumb and level, free of warp or twist. Maintain dimensional tolerances and alignment with adjacent work.

D. Install sill and sill end angles.

E. Provide thermal isolation where components penetrate or disrupt building insulation. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

F. Coordinate attachment and seal of perimeter air barrier and vapor retarder materials.

G. Install glass and infill panels in accordance with requirements specified in Section 08 8000.

H. Install perimeter sealant in accordance with requirements specified in Section 07 9005.

3.03 TOLERANCES

A. Maximum Variation from Level or Plumb: 1/16 inches every 3 ft non-cumulative or 1/8 inches per 10 ft, whichever is less.

3.04 ADJUSTING

A. Adjust hardware for smooth operation and secure weather tight closure.

3.05 CLEANING

A. Remove protective material from factory finished aluminum surfaces.

B. Wash surfaces by method recommended and acceptable to sealant and window manufacturer; rinse and wipe surfaces clean.

C. Remove excess sealant by moderate use of mineral spirits or other solvent acceptable to sealant and window manufacturer. Remove all window labels and adhesives.

END OF SECTION

SECTION 08 7100
DOOR HARDWARE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Hardware for wood, hollow steel, and aluminum doors.

B. Hardware for fire-rated doors.

C. Electrically operated and controlled hardware.

D. Lock cylinders for doors for which hardware is specified in other sections.

E. Thresholds.

F. Weatherstripping, seals and door gaskets.

1.02 RELATED REQUIREMENTS

A. Section 08 1113 - Hollow Metal Doors and Frames.

B. Section 08 1416 - Flush Wood Doors.

C. Section 08 4313 - Aluminum-Framed Storefronts: Hardware for doors in storefront, including:

1. Integral weatherstripping.
2. Installation of lock cylinders provided under this section.

1.03 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities; Final Rule; current edition; (ADA Standards for Accessible Design).

B. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 2009.

C. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2012.

D. BHMA A156.1 - American National Standard for Butts and Hinges; Builders Hardware Manufacturers Association, Inc.; 2006 (ANSI/BHMA A156.1).

E. BHMA A156.2 - American National Standard for Bored and Preassembled Locks & Latches; Builders Hardware Manufacturers Association; 2011 (ANSI/BHMA A156.2).

F. BHMA A156.3 - American National Standard for Exit Devices; Builders Hardware Manufacturers Association; 2008 (ANSI/BHMA A156.3).

G. BHMA A156.4 - American National Standard for Door Controls - Closers; Builders Hardware Manufacturers Association, Inc.; 2008 (ANSI/BHMA A156.4).

H. BHMA A156.5 - Cylinders and Input Devices for Locks; Builders Hardware Manufacturers Association; 2010 (ANSI/BHMA A156.5).

I. BHMA A156.6 - American National Standard for Architectural Door Trim; Builders Hardware Manufacturers Association; 2010 (ANSI/BHMA A156.6).

J. BHMA A156.7 - American National Standard for Template Hinge Dimensions; Builders Hardware Manufacturers Association; 2003 (ANSI/BHMA A156.7).

K. BHMA A156.8 - American National Standard for Door Controls - Overhead Stops and Holders; Builders Hardware Manufacturers Association, Inc.; 2010 (ANSI/BHMA A156.8).

L. BHMA A156.13 - American National Standard for Mortise Locks & Latches Series 1000; Builders Hardware Manufacturers Association; 2012 (ANSI/BHMA A156.13).

M. BHMA A156.15 - American National Standard for Release Devices - Closer Holder, Electromagnetic and Electromechanical; Builders Hardware Manufacturers Association; 2011 (ANSI/BHMA A156.15).

N. BHMA A156.18 - American National Standard for Materials and Finishes; Builders Hardware Manufacturers Association, Inc.; 2012 (ANSI/BHMA A156.18).

O. BHMA A156.21 - American National Standard for Thresholds; Builders Hardware Manufacturers Association; 2009 (ANSI/BHMA A156.21).

P. BHMA A156.22 - American National Standard for Door Gasketing and Edge Seal Systems, Builders Hardware Manufacturers Association; 2012 (ANSI/BHMA A156.22).

Q. BHMA A156.23 - American National Standard for Electromagnetic Locks; Builders Hardware Manufacturers Association, Inc.; 2010 (ANSI/BHMA A156.23).

R. BHMA A156.31 - Electric Strikes and Frame Mounted Actuators; 2007 (ANSI/BHMA A156.31).

S. BHMA A156.115 - Hardware Preparation in Steel Doors and Steel Frames; 2006.

T. BHMA A156.115W - Hardware Preparation in Wood Doors with Wood or Steel Frames; 2006.

U. DHI (LOCS) - Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames; Door and Hardware Institute; 2004.

V. DHI WDHS.3 - Recommended Locations for Architectural Hardware for Flush Wood Doors; Door and Hardware Institute; 1993; also in WDHS-1/WDHS-5 Series, 1996.

W. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2013.

X. NFPA 101 - Life Safety Code; National Fire Protection Association; 2012.

Y. UL (BMD) - Building Materials Directory; Underwriters Laboratories Inc.; current edition.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the manufacture, fabrication, and installation of products onto which door hardware will be installed.

B. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.

C. Preinstallation Meeting: Convene a preinstallation meeting one week prior to commencing work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

A. See Section 01 3300 - submittal procedures.

B. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project.

C. Hardware Schedule: Detailed listing of each item of hardware to be installed on each door. Use door numbering scheme as included in the Contract Documents. Identify electrically operated items and include power requirements.

D. Keying Schedule: Submit for approval of Owner.

E. Project Record Documents: Record actual locations of concealed equipment, services, and conduit.

F. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.

G. Keys: Deliver with identifying tags to Owner by security shipment direct from hardware supplier.

H. Warranty: Submit manufacturer's warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

I. Maintenance Materials and Tools: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 6000 - Product Requirements, for additional provisions.
2. Tools: One set of all special wrenches or tools applicable to each different or special hardware component, whether supplied by the hardware component manufacturer or not.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

B. Hardware Supplier Qualifications: Company specializing in supplying commercial door hardware with 3 years of experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Package hardware items individually; label and identify each package with door opening code to match hardware schedule.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 DOOR HARDWARE - GENERAL

A. Provide all hardware specified or required to make doors fully functional, compliant with applicable codes, and secure to the extent indicated.

B. Provide all items of a single type of the same model by the same manufacturer.

C. Provide products that comply with the following:

1. Applicable provisions of federal, state, and local codes.
2. ADA Standards for Accessible Design.
3. ANSI/ICC A117.1, American National Standard for Accessible and Usable Buildings and Facilities.
4. Fire-Rated Doors: NFPA 80.
5. All Hardware on Fire-Rated Doors: Listed and classified by UL as suitable for the purpose specified and indicated.
6. Hardware for Smoke and Draft Control Doors (Indicated as "S" on Drawings): Provide hardware that enables door assembly to comply with air leakage requirements of the applicable code.
7. Products Requiring Electrical Connection: Listed and classified by UL as suitable for the purpose specified and indicated.

D. Electrically Operated and/or Controlled Hardware: Provide all power supplies, power transfer hinges, relays, and interfaces required for proper operation; provide wiring between hardware and control components and to building power connection.

E. Finishes: All door hardware the same finish unless otherwise indicated.

1. Primary Finish: Satin chrome plated over nickel on brass or bronze, 626 (approx US26D).
2. Secondary Finish: Satin chrome plated over nickel on brass or bronze, 626 (approx US26D).
   a. Use secondary finish in kitchens, bathrooms, and other spaces containing chrome or stainless steel finished appliances, fittings, and equipment; provide primary finish on one side of door and secondary finish on other side if necessary.
3. Finish Definitions: BHMA A156.18.
4. Exceptions:
   a. Where base metal is specified to be different, provide finish that is an appearance equivalent according to BHMA A156.18.
   b. Hinges for Fire-Rated Doors: Steel base metal with plated finish.

F. Fasteners:

1. Mineral Core Wood Doors: Sex bolts.
2. Concrete and Masonry Substrates: Stainless steel machine screws and lead expansion shields.

2.02 HINGES

A. Hinges: Provide hinges on every swinging door.

1. Provide five-knuckle full mortise butt hinges unless otherwise indicated.
2. Provide ball-bearing hinges at all doors.
3. Provide hinges in the quantities indicated.
4. Provide non-removable pins on exterior outswinging doors.
5. Provide non-removable pins on outswinging interior doors at suite entrances and all storage and file rooms.
6. Where electrified hardware is mounted in door leaf, provide power transfer hinges.

B. Butt Hinges: Comply with BHMA A156.1 and A156.7; heavy weight, unless otherwise indicated.

1. Provide hinge width required to clear surrounding trim.

C. Quantity of Hinges Per Door:

1. Doors up to 60 inches High: Two hinges.
2. Doors From 60 inches High up to 90 inches High: Three hinges.
3. Doors 90 inches High up to 120 inches High: Four hinges.
4. Doors over 120 inches High: One additional hinge per each additional 30 inches in height.
5. Dutch Doors: Two hinges each leaf.

D. Manufacturers - Hinges:

1. Assa Abloy McKinney: www.assaabloydss.com.
2. Bommer Industries, Inc: www.bommer.com.
3. C. R. Laurence Co., Inc: www.crl-arch.com.
4. Hager Companies: www.hagerco.com.
5. Stanley Black & Decker: .stanleyblackanddecker. .
6. Ives Ingersoll Rand: www.ingersollrand.com
7. Substitutions: See Section 01 2513 - Product Requirements.

2.03 PUSH/PULLS

A. Push/Pulls: Comply with BHMA A156.6.

1. Provide push and pull on doors not specified to have lockset, latchset, exit device, or auxiliary lock.
2. On solid doors, provide matching push plate and pull plate on opposite faces.
3. On glazed storefront doors, provide matching push/pull bars on both faces.

B. Manufacturers - Push/Pulls:

1. Assa Abloy McKinney: www.assaabloydss.com.
2. C. R. Laurence Co., Inc; www.crl-arch.com.
3. Hager Companies: www.hagerco.com.
4. Hiawatha, Inc: www.hiawathainc.com.

5. Triangle Brass Manufacturing Co., Inc: .trimcobbw. .
6. Ives Ingersoll Rand: www.ingersollrand.com
7. Substitutions: See Section 01 2513 - Product Requirements.

2.04 LOCKS AND LATCHES

A. Locks: Provide a lock for every door, unless specifically indicated as not requiring locking.

1. Hardware Sets indicate locking functions required for each door.
2. If no hardware set is indicated for a swinging door provide an office lockset.
3. Trim: Provide lever handle or pull trim on outside of all locks unless specifically stated to have no outside trim.
4. Lock Cylinders: Provide key access on outside of all locks unless specifically stated to have no locking or no outside trim.
5. In door sections, where a lock cylinder referenced to Section 08 7100 is specified, furnish and install a mortise lock cylinder keyed to the building keying system.

B. Lock Cylinders: BEST - no substitutions, seven-pin standard core.

1. Provide cams and/or tailpieces as required for locking devices required.

C. Keying: Grand master keyed

1. Include construction keying.
2. Key to existing keying system.
3. Supply keys in the following quantities:
   a. _6___ master keys.
   b. _3___ grand master keys.
   c. _6___ construction keys.
   d. _3___ change keys for each lock.
4. When providing keying information, comply with DHI Handbook "Keying systems and nomenclature".

D. Latches: Provide a latch for every door that is not required to lock, unless specifically indicated "push/pull" or "not required to latch".

2.05 CYLINDRICAL LOCKSETS

A. Cylindrical Locksets: All interior doors Except entrance vestibule interior doors, secure storage, file rooms, communications rooms

B. Locking Functions: As defined in BHMA A156.2, and as follows:

1. Passage: No locking, always free entry and exit.
2. Privacy: F76, emergency tool unlocks.
3. Office: F82 Grade 1, key not required to lock, unlocks upon exit.
4. Classroom: F84, key required to lock.
5. Intruder Classroom: F110, keyed both sides.
6. Communicating: F80 or F113.
7. Always-Locked: F86, key required to lock, may not be left unlocked.
8. Two-Key Entry: F88, outside locked by key from both sides, free egress
9. Store Door: F91, locked by key from both sides, not an emergency exit (must be unlocked during occupied hours).

10. Exit Only: F89, may not be left unlocked.

C. Manufacturers - Cylindrical Locksets:

1. Assa Abloy Corbin Russwin, Sargent, or Yale: www.assaabloydss.com.
2. Best Access Systems, division of Stanley Security Solutions: www.bestlock.com.
3. Hager Companies: www.hagerco.com.
4. Schlage: www.schlage.com.
5. Substitutions: See Section 01 2513 - Product Requirements.

2.06 MORTISE LOCKSETS

A. Mortise Locksets: All Exterior doors, entrance vestibule interior doors, secure storage, file rooms communications rooms.

B. Locking Functions: As defined in BHMA A156.13, and as follows:

1. Passage: F01.
2. Privacy: F19, or F02 with retraction of deadbolt by use of inside lever/knob.
3. Office: F04, key not required to lock, remains locked upon exit.
4. Classroom: F05, key required to lock.
5. Entry, Deadbolt: F20, may be locked without key, free egress.
6. Always-Locked: F07, may not be left unlocked.
7. Two-Key Entry: F09, outside locked by key from both sides, free egress.
8. Exit Only: F07 or F31, may have outside trim, may not be left unlocked.

C. Manufacturers - Mortise Locksets:

1. Assa Abloy Corbin Russwin, Sargent, or Yale: www.assaabloydss.com.
2. Best Access Systems, division of Stanley Security Solutions: www.bestlock.com.
3. Hager Companies: www.hagerco.com.
4. Schlage: www.schlage.com.
5. Substitutions: See Section 01 2513 - Product Requirements.

2.07 AUXILIARY LOCKS

A. Locking Functions: As defined in BHMA A156.5, and as follows:

1. Public Entry/Exit ("nightlatch"): E023, D012
2. Deadbolt, Unoccupied: E015 or F17, deadbolt by key outside and turn inside.

B. Manufacturers - Auxiliary Locks: Same as other locks.

2.08 FLUSHBOLTS

A. Flushbolts: Lever extension bolts in leading edge of door, one bolt into floor, one bolt into top of frame.

1. Pairs of Swing Doors: At inactive leaves, provide flush bolts of type as required to comply with code.
2. Floor Bolts: Provide dustproof strike except at metal thresholds.

B. Manual Flushbolts: Provide lever extensions for top bolt at over-size doors.

C. Self-Latching Flushbolts: Automatically latch upon closing of door; manually retracted.

D. Automatic Flushbolts: Automatically latch upon closing of door; automatic retraction of bolts when active leaf is opened.

2.09 EXIT DEVICES

A. Exit Devices:

B. Locking Functions: Functions as defined in BHMA A156.3, and as follows:

1. Entry/Exit, Always-Unlocked: Outside lever unlocked, no outside key access, no latch holdback.
2. Entry/Exit, Free Swing: Key outside retracts latch, latch holdback (dogging) for free swing during occupied hours, not fire-rated; outside trim must be specified as lever or pull.
3. Entry/Exit, Always-Latched: Key outside locks and unlocks lever, no latch holdback (dogging).
4. Entry/Exit, Always-Locked: Key outside retracts latchbolt but does not unlock lever, no latch holdback.
5. Exit Only, Secure: No outside trim, no key entry, no latch holdback, deadlocking latchbolt.

C. Manufacturers:

1. Assa Abloy Corbin Russwin, Sargent, or Yale: www.assaabloydss.com.
2. Von Duprin: www.vonduprin.com.
3. Substitutions: See Section 01 2513 - Product Requirements.

2.10 CLOSERS

A. Closers: Complying with BHMA A156.4.

1. Provide surface-mounted, door-mounted closers unless otherwise indicated.
2. Provide a door closer on every exterior door.
3. Provide a door closer on every fire- and smoke-rated door. Spring hinges are not an acceptable self-closing device unless specifically so indicated.
4. On pairs of swinging doors, if an overlapping astragal is present, provide coordinator to ensure the leaves close in proper order.
5. At corridors, locate door-mounted closer on room side of door.
6. At outswinging exterior doors, mount closer in inside of door.
7. Product components to be engineered for minus 30F operation.

B. Manufacturer - Closers:

1. LCN: www.lcnclosers.com. No Substitutions

2.11 STOPS AND HOLDERS

A. Stops: Complying with BHMA A156.8; provide a stop for every swinging door, unless otherwise indicated.

1. Provide wall stops, unless otherwise indicated.
2. If wall stops are not practical, due to configuration of room or furnishings, provide overhead stop.

3. Stop is not required if positive stop feature is specified for door closer; positive stop feature of door closer is not an acceptable substitute for a stop unless specifically so stated.

B. Wall Stops:

2.12 GASKETING AND THRESHOLDS

A. Gaskets: Complying with BHMA A156.22.

1. On each door in smoke partition, provide smoke gaskets; top, sides, and meeting stile of pairs. If fire/smoke partitions are not indicated on drawings, provide smoke gaskets on each door identified as a "smoke door" and 20-minute rated fire doors.
2. On each exterior door, provide weatherstripping gaskets, unless otherwise indicated; top, sides, and meeting stiles of pairs.
   a. Where exterior door is also required to have fire or smoke rating, provide gaskets functioning as both smoke and weather seals.
3. On each exterior door, provide door bottom sweep, unless otherwise indicated.
4. On doors indicated as "sound-rated", "acoustical", or with an STC rating, provide sound-rated gaskets and automatic door bottom; make gaskets completely continuous, do not cut or notch gaskets for installation.

B. Thresholds:

1. At each exterior door, provide a threshold unless otherwise indicated.
2. Field cut threshold to frame for tight fit.

C. Fasteners At Exterior Locations: Non-corroding, marine environment.

D. Manufacturers - Gasketing and Thresholds:

1. Assa Abloy McKinney: www.assaabloydss.com.
2. Hager Companies: www.hagerco.com.
3. National Guard Products, Inc: www.ngpinc.com.
4. Pemko Manufacturing Co: www.pemko.com.
5. Zero International, Inc: www.zerointernational.com.
6. Substitutions: See Section 01 2513 - Product Requirements.

2.13 PROTECTION PLATES AND ARCHITECTURAL TRIM

A. Protection Plates:

1. Kickplate: Provide on push side of every door with closer, except storefront and all-glass doors.

B. Drip Guard: Provide projecting drip guard over all exterior doors unless they are under a projecting roof or canopy.

C. Manufacturers - Protection Plates and Architectural Trim:

1. Assa Abloy McKinney: www.assaabloydss.com.
2. C. R. Laurence Co., Inc;www.crl-arch.com.
3. Hager Companies: www.hagerco.com.

4. Hiawatha, Inc: www.hiawathainc.com.
5. Triangle Brass Manufacturing Co., Inc: .trimcobbw. .
6. Ives Ingersoll Rand: www.ingersollrand.com
7. Substitutions: See Section 01 2513 - Product Requirements.

2.14 KEY CONTROLS

A. Facility Manager's Key Cabinet: Sheet steel construction, piano hinged door with key lock.

1. Mounting: Wall-mounted.
2. Capacity: Actual quantity of keys, plus 25 percent additional capacity.
3. Size key hooks to hold 6 keys each.
4. Finish: Baked enamel, manufacturer's standard color.
5. Key cabinet lock to building keying system.

B. Fire Department Lock Box: Heavy-duty, surface mounted, solid stainless-steel box with hinged door and interior gasket seal; single drill resistant lock with dust covers with exterior reflective stripe.

1. Capacity: Holds 10 keys.
2. Finish: Manufacturer's standard silver.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that doors and frames are ready to receive work; labeled, fire-rated doors and frames are present and properly installed, and dimensions are as indicated on shop drawings.

B. Verify that electric power is available to power operated devices and of the correct characteristics.

3.02 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions and applicable codes.

B. Use templates provided by hardware item manufacturer.

C. Install hardware on fire-rated doors and frames in accordance with code and NFPA 80.

D. Mounting heights for hardware from finished floor to center line of hardware item: As listed in Schedule, unless otherwise noted:

3.03 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 01 4000.

3.04 ADJUSTING

A. Adjust work under provisions of Section 01 7900.

B. Adjust hardware for smooth operation.

C. Adjust gasketing for complete, continuous seal; replace if unable to make complete seal.

3.05 CLEANING

A. Clean adjacent surfaces soiled by hardware installation. Clean finished hardware per manufacturer's instructions after final adjustments has been made. Replace items that cannot be cleaned to manufacturer's level of finish quality at no additional cost.

3.06 PROTECTION

A. Protect finished Work under provisions of Section 01 7000.

B. Do not permit adjacent work to damage hardware or finish.

HARDWARE SETS

4.01 GENERAL

HW 01

6	EA	HW HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
2	EA	POWER TRANSFER	EPT10	689	VON
1	EA	ELEC PANIC HARDWARE	EL-3549A-EO	626	VON
1	EA	ELEC PANIC HARDWARE	EL-3549A-NL-OP-388	626	VON
1	EA	RIM CYLINDER	1E72	626	BES
1	EA	MORTISE CYLINDER	1E74 (for Key Switch)	626	BES
2	EA	90 DEG OFFSET PULL	8190 10" O	630	IVE
2	EA	OH STOP	100S	630	GLY
1	EA	SURF. AUTO OPERATOR	9553 REG/STD MS	ANCLR	LCN
2	EA	ACTUATOR, WALL MOUNT	8310-853T	630	LCN
2	EA	DOOR SWEEP	C607A	CL	NGP
1	EA	THRESHOLD	8426 MS/LA	AL	NGP
1	EA	KEYSWITCH	653-04	630	SCE
1	EA	POWER SUPPLY	PS914 900-4RL	LGR	VON
1	EA		WEATHERSTRIP BY DOOR/FRAME MANUFACTURER		

Operational Description
When doors to be unlocked, key switch will retract and hold latch bolts of exit devices and activate outside actuator. Pushing either actuator will auto open door.
When doors to be locked, key switch will release latch bolts and deactivate outside actuator. Entry by key. Free exit. Pushing interior actuator will release latch bolts momentarily and auto open doors.

HW

3	EA	HW HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	PANIC HARDWARE	98-NL-OP-110MD	626	VON
1	EA	RIM CYLINDER	1E72	626	BES
1	EA	90 DEG OFFSET PULL	8190 10" O	630	IVE
1	EA	OH STOP	100S	630	GLY
1	EA	SURFACE CLOSER	4111 EDA	689	LCN
1	EA	HEAD SEAL	706A	AL	NGP
1	SET	SEALS	9706E Jambs	AL	NGP
1	EA	DOOR SWEEP	C607A	CL	NGP
1	EA	THRESHOLD	8426 MS/LA	AL	NGP

HW 03

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	ND80BDCD RHO	626	SCH
1	EA	PERMANENT CORE	AS REQUIRED	626	BES
1	EA	SURFACE CLOSER	4011	689	LCN
1	EA	KICK PLATE	8400 12" X 1" LDW B4E	630	IVE
1	EA	WALL STOP	WS401CCV	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW 04

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	L9080L 06A	626	SCH
1	EA	MORTISE CYLINDER	1E74	626	BES
1	EA	SURFACE CLOSER	4011	689	LCN
1	EA	KICK PLATE	8400 12" X 2" LDW B4E	630	IVE
1	EA	WALL STOP	WS401CCV	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW 05

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	ENTRANCE LOCK	ND53BDCD RHO	626	SCH
1	EA	PERMANENT CORE	AS REQUIRED	626	BES
1	EA	WALL STOP	WS401CCV	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW 06

6	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	SET	AUTO FLUSH BOLT	FB41P	630	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	CLASSROOM LOCK	ND70BDCD RHO	626	SCH
1	EA	PERMANENT CORE	AS REQUIRED	626	BES
1	EA	COORDINATOR	COR X FL	628	IVE
1	EA	OH STOP	100S	630	GLY

1	EA	SURFACE CLOSER	4011	689	LCN
1	EA	SURFACE CLOSER	4011	689	LCN
			x ST1544 x 4020-18		
2	EA	KICK PLATE	8400 12" X 1" LDW B4E	630	IVE
1	EA	WALL STOP	WS401CCV	626	IVE
1	SET	SEALS	5050B	BRN	NGP
1	SET	ASTRAGAL	9115A	CL	NGP

HW 07

HARDWARE BY DOOR / FRAME
MANUFACTURER

HW 08

6	EA	HW HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	SET	AUTO FLUSH BOLT	FB31P	630	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	STOREROOM LOCK	L9080L 06A EXT AS REQ	626	SCH
1	EA	MORTISE CYLINDER	1E74	626	BES
1	EA	COORDINATOR	COR X FL	628	IVE
2	EA	MOUNTING BRACKET	MB	689	IVE
2	EA	OH STOP	100S	630	GLY
2	EA	SURFACE CLOSER	4111 EDA	689	LCN
2	EA	ARMOR PLATE	8400 36" X 1" LDW B4E	630	IVE
1	EA	HEAD SEAL	706A	AL	NGP
1	SET	SEALS	9706E	AL	NGP
			at Jambs		
1	SET	ASTRAGAL	9115A	CL	NGP
2	EA	DOOR SWEEP	C627A	CL	NGP
1	EA	THRESHOLD	8426 MS/LA	AL	NGP

HW 09

3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	CLASSROOM LOCK	ND70BDCD RHO	626	SCH
1	EA	PERMANENT CORE	AS REQUIRED	626	BES
1	EA	SURFACE CLOSER	4111 EDA	689	LCN
1	EA	KICK PLATE	8400 12" X 2" LDW B4E	630	IVE
1	EA	WALL STOP	WS401CCV	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW 10

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	ND80BDCD RHO	626	SCH
1	EA	OH STOP	100S	630	GLY
1	EA	SURFACE CLOSER	4011	689	LCN
			x ST1544 x 4020-18		
1	EA	KICK PLATE	8400 12" X 2" LDW B4E	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW 11

6	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	SET	CONST LATCHING BOLT	FB51P	630	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	STOREROOM LOCK	ND80BDCD RHO	626	SCH
1	EA	PERMANENT CORE	AS REQUIRED	626	BES
1	EA	COORDINATOR	COR X FL	628	IVE
2	EA	OH STOP	100S	630	GLY
2	EA	SURFACE CLOSER	4011 x ST1544 x 4020-18	689	LCN
2	EA	KICK PLATE	8400 12" X 1" LDW B4E	630	IVE
1	SET	SEALS	5050B	BRN	NGP
1	SET	ASTRAGAL	9115A	CL	NGP

HW 12

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	ND80BDCD RHO	626	SCH
1	EA	PERMANENT CORE	AS REQUIRED	626	BES
1	EA	SURFACE CLOSER	4011	689	LCN
1	EA	KICK PLATE	8400 12" X 2" LDW B4E	630	IVE
1	EA	WALL STOP	WS401CCV	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW 13

1	EA	TRACK	1500		JOH
	SET	DOOR PULL, 3/4" RND	PR 8102 6" J	630	IVE

HW 14

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	CLASSROOM LOCK	ND70BDCD RHO	626	SCH
1	EA	PERMANENT CORE	AS REQUIRED	626	BES
1	EA	SURFACE CLOSER	4011	689	LCN
1	EA	KICK PLATE	8400 12" X 2" LDW B4E	630	IVE
1	EA	WALL STOP	WS401CCV	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW 15

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PRIVACY W/DB & IND	L9496L OCCUPIED/VACANT 06A EE L583-363	626	SCH
1	EA	MORTISE CYLINDER	1E74	626	BES
1	EA	SURFACE CLOSER	4011	689	LCN
1	EA	KICK PLATE	8400 12" X 2" LDW B4E	630	IVE

1	EA	MOP PLATE	8400 4" X 1" LDW B4E	630	IVE
1	EA	WALL STOP	WS401CCV	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW 16

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	L9080L 06A	626	SCH
1	EA	MORTISE CYLINDER	1E74	626	BES
1	EA	SURFACE CLOSER	4011	689	LCN
1	EA	KICK PLATE	8400 12" X 2" LDW B4E	630	IVE
1	EA	WALL STOP	WS401CCV	626	IVE
1	EA	HEAD SEAL	706A	AL	NGP
1	SET	SEALS	9706E at Jambs	AL	NGP
1	EA	DOOR SWEEP	C627A	CL	NGP
1	EA	THRESHOLD	8426 MS/LA	AL	NGP

HW 17

3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	CLASSROOM LOCK	ND70BDCD RHO	626	SCH
1	EA	PERMANENT CORE	AS REQUIRED	626	BES
1	EA	OH STOP	100S	630	GLY
1	EA	SURFACE CLOSER	4011 x ST1544 x 4020-18	689	LCN
1	EA	KICK PLATE	8400 12" X 2" LDW B4E	630	IVE
1	SET	SEALS	5050B	BRN	NGP

END OF SECTION

SECTION 08 8000
GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Glass.

B. Glazing compounds and accessories.

1.02 RELATED REQUIREMENTS

A. Section 06 2000 - Finish Carpentry Wood Door components with requirement for glass.

B. Section 07 2500 - Weather Barriers.

C. Section 07 9005 - Joint Sealers: Sealant and back-up material.

D. Section 08 1113 - Hollow Metal Doors and Frames: Glazed doors and borrowed lites.

E. Section 08 1416 - Flush Wood Doors: Glazed lites in doors.

F. Section 08 4313 - Aluminum-Framed Storefronts: Glazing furnished by storefront manufacturer.

G. Section 08 5113 - Aluminum Windows: Glazing furnished by window manufacturer.

HI. Section 08 8300 - Mirrors.

I. Section 10 2800 - Toilet, Bath, and Laundry Accessories: Mirrors.

1.03 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; current edition.

B. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2011).

C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2011.

D. ASTM C1036 - Standard Specification for Flat Glass; 2011e1.

E. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.

F. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass; 2009e1.

G. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2013.

H. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2012a.

I. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2010.

J. GANA (GM) - GANA Glazing Manual; Glass Association of North America; 2009.

K. GANA (SM) - GANA Sealant Manual; Glass Association of North America; 2008.

L. GANA (LGDG) - Laminated Glazing Reference Manual; Glass Association of North America; 2009.

M. ICC (IBC) - International Building Code; 2012.

N. SIGMA TM-3000 - Glazing Guidelines for Sealed Insulating Glass Units; Sealed Insulating Glass Manufacturers Association; 2004.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a pre-installation meeting one week before starting work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

A. See Section 01 3300 - submittal procedures.

B. Product Data on Glass Types and Spandrel components: Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements.

C. Product Data on Glazing Compounds: Provide chemical, functional, and environmental characteristics, limitations, special application requirements. Identify available colors.

D. Manufacturer's Certificate: Certify that tempered and safety glass meets or exceeds specified requirements.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 6000 - Product Requirements, for additional provisions.
2. Extra Insulating Glass Units: One of each glass size and each glass type.

1.06 QUALITY ASSURANCE

A. Perform Work in accordance with GANA Glazing Manual and GANA Sealant Manual for glazing installation methods.

1.07 FIELD CONDITIONS

A. Do not install glazing when ambient temperature is less than 40 degrees F.

B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Sealed Insulating Glass Units: Provide a five (5) year warranty to include coverage for seal failure, interpane dusting or misting, including replacement of failed units.

C. Laminated Glass: Provide a five (5) year warranty to include coverage for delamination, including replacement of failed units.

D. Polycarbonate Sheet Glazing: Provide a fifteen (15) year warranty to include coverage for breakage, coating failure, abrasion resistance, including replacement of failed units.

PART 2 PRODUCTS

2.01 GLAZING TYPES

A. Type IG-1 - Sealed Insulating Impact resistant Glass Units: Vision glazing.

1. Application(s): All exterior window glazing unless otherwise indicated.
2. Outboard Lite: laminated float glass, 1/4 inch thick, minimum.
   a. Tint: Gray.
   b. Coating: Low-E type, on #2 surface.
3. Middle Lite: Annealed float glass, 1/4 inch thick.
   a. Tint: Clear.
4. Inboard Lite: Fully tempered float glass, 1/4 inch thick, minimum.
   a. Tint: Clear.
5. Total Thickness: 1-1/2 inch.
6. Thermal Resistance (U-Value): [5.2], nominal.
7. Glazing Method: Gasket glazing.

B. Type IG -2 Sealed Insulating Glass Units: Vision glazing, low-E.

1. Application(s): Exterior Aluminum Doors.
2. Outboard Lite: Fully tempered float glass, 1/4 inch thick, minimum.
   a. Tint: Clear.
   b. Coating: Low-E type, on #2 surface.
3. Inboard Lite: Fully tempered float glass, 1/4 inch thick, minimum.
   a. Tint: Clear.
5. Between-lite space filled with air.
6. Thermal Resistance (U-Value): 4, nominal.
7. Total Thickness: 1 inch.

C. Type S-3 - Single Safety Glazing: Non-fire-rated.

1. Applications: Provide this type of glazing in the following locations:
   a. Glazed lites in interior doors, except fire doors.
   b. Glazed sidelights to interior doors, except in fire-rated walls and partitions.
   c. Other locations required by applicable federal, state, and local codes and regulations.
   d. Other locations indicated on the drawings.
2. Type: Fully tempered float glass as specified.
3. Tint: Clear.

4. Thickness: 1/4 inch.

D. Type S-4 - Security Glazing: Laminated glass/plastic glazing.

1. Application: Locations indicated on the drawings.
2. Performance:
   a. Forced Entry:
3. Glazing Method: Gasket glazing.

C. Type S-5 - Single Safety Glazing: Opaque back-coated for exterior spandrel panels.

1. Applications: Provide this type of glazing in the following locations:
   a. Glazed Spandrel Panel –See exterior elevations and details.
2. Type: Fully tempered laminated float glass as specified.
3. Tint: Clear with factory opaque white coatings on face 2 suitable for exterior exposure in a storefront aluminum exterior frame system with marine weather exposure and adhesive for attached rigid insulation to face of coated surface.
4. Thickness: 1/4 inch.
5. Spandrel Insulation Backing provide rigid closed cell insulation and moisture resistant high density hardboard or heavy gauge corrosion resistant metal to provide spandrel with bite thickness for glazing stops equal to triple pane window and an additional 2 inches of attached closed cell high density rigid insulation profiled to fill window frame opening as indicated in architectural drawings.
6. Project includes outside corner butted spandrel panels as indicated drawings.

2.02 EXTERIOR GLAZING ASSEMBLIES

A. Structural Design Criteria: Select type and thickness to withstand dead loads and wind loads acting normal to plane of glass at design pressures calculated in accordance with ASCE 7.

1. Use the procedure specified in ASTM E1300 to determine glass type and thickness.
2. Limit glass deflection to 1/200 or flexure limit of glass, whichever is less, with full recovery of glazing materials.
3. Thicknesses listed are minimum.

B. Air and Vapor Seals: Provide completed assemblies that maintain continuity of building enclosure vapor retarder and air barrier:

1. In conjunction with vapor retarder and joint sealer materials described in other sections.
2. To maintain a continuous air barrier and vapor retarder throughout the glazed assembly from glass pane to heel bead of glazing sealant.

2.03 GLASS MATERIALS

A. Float Glass: All glazing is to be float glass unless otherwise indicated.

1. Annealed Type: ASTM C1036, Type I, transparent flat, Class 1 clear, Quality Q3 (glazing select).
2. Heat-Strengthened and Fully Tempered Types: ASTM C1048.
3. Tinted Types: Color and performance characteristics as indicated.
4. Thicknesses: As indicated; for exterior glazing comply with specified requirements for wind load design regardless of specified thickness.

2.04 SEALED INSULATING GLASS UNITS

A. Sealed Insulating Glass Units: Types as indicated.

1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
2. Edge Spacers: Aluminum, bent and soldered corners.
3. Edge Seal: Glass to elastomer with supplementary silicone sealant.
4. Purge interpane space with dry hermetic air.

2.05 GLAZING COMPOUNDS

2.06 GLAZING ACCESSORIES

A. Setting Blocks: Neoprene, 80 to 90 Shore A durometer hardness, ASTM C864 Option I. Length of 0.1 inch for each square foot of glazing or minimum 4 inch x width of glazing rabbet space minus 1/16 inch x height to suit glazing method and pane weight and area.

B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness, ASTM C 864 Option I. Minimum 3 inch long x one half the height of the glazing stop x thickness to suit application, self adhesive on one face.

C. Glazing Tape: Preformed butyl compound with integral resilient tube spacing device; 10 to 15 Shore A durometer hardness; coiled on release paper; black color.

D. Glazing Gaskets: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option I; Dark Grey color.

PART 3 EXECUTION

3.01 INSTALLERS

A. Acceptable Installers:

3.02 EXAMINATION

A. Verify that openings for glazing are correctly sized and within tolerance.

B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and ready to receive glazing.

3.03 PREPARATION

3.04 INSTALLATION - EXTERIOR/INTERIOR DRY METHOD (GASKET GLAZING)

A. Place setting blocks at 1/4 points with edge block no more than 6 inches from corners.

B. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.

C. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

3.05 CLEANING

A. Remove glazing materials from finish surfaces.

B. Remove labels after Work is complete.

C. Clean glass and adjacent surfaces.

3.06 PROTECTION

A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.

3.07 SCHEDULE

A. Aluminum Windows: Type S-1, exterior wet/dry method

B. Metal-Framed Storefronts and Curtain Wall: Type S-2, thicknesses required to comply with performance requirements, exterior dry method.

C. Aluminum Entrances: Type S-2, exterior dry method .

D. Hollow Steel Frames – Interior Type S-3

E. Steel Doors:

1. Interior: Type S-3 , interior wet method.
2. Exterior: Type S-2 dry method,

END OF SECTION

SECTION 08 8717
SAFETY AND SECURITY GLAZING FILMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Glazing film applied to new glazing assemblies.

B. New Glazing: Factory or shop install film to glazing before installation in frames.

C. Glazing assemblies to receive film are indicated on Drawings.

1.02 RELATED REQUIREMENTS

A. Section 08 1113 - Hollow Metal Doors and Frames: New exterior doors and lites with glazing to receive film.

B Section 08 5113 - Aluminum Windows: New exterior windows to receive film.

C. Section 08 8000 - Glazing: New exterior glazing to receive film.

1.03 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Consumer Products Safety Commission; current edition.

B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings, Safety Performance Specifications and Methods of Test; 2010.

C. ASTM C1184 - Standard Specification for Structural Silicone Sealants; 2005.

D. ASTM D882 - Standard Test Method for Tensile Properties of Thin Plastic Sheeting; 2012.

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2012.

1.04 SUBMITTALS

A. See Section 01 3300 - submittal procedures.

B. Supplemental Anchors: Where supplemental anchors are necessary to achieve specified performance submit detailed information in accordance with substitution procedures; include two samples, minimum length 2 inches.

C. Test Reports: Detailed reports of full-scale chamber tests to specified criteria, using assemblies identical to those required for this project.

D. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Record of product certification for safety requirements.
2. Preparation instructions and recommendations.
3. Storage and handling requirements and recommendations.
4. Installation methods.

E. Shop Drawings: Detailing installation of film, anchoring accessories, and sealant.

F. Specimen warranty.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Glazing film manufacturer specializing in manufacture of safety glazing films with minimum 10 years successful experience.

B. Installer Qualifications: Certified by glazing film manufacturer.

1.06 FIELD CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.07 WARRANTY

A. Provide 10 year manufacturer's replacement warranty to cover film against peeling, cracking, discoloration, and deterioration.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. 3M Window Film: www.3m.com/us/arch_construct/scpd/windowfilm.

B. Flexvue Films: www.flexvuefilms.com.

C. Madico, Inc: www.madico.com.

D. Substitutions: See Section 01 2513 - Product Requirements.

2.02 SAFETY AND SECURITY GLAZING FILM

A. Blast Resistant Glazing for All Glazing Indicated: Provide new glazing assemblies to provide Level 2 blast resistance when tested in accordance with GSA TS01 at a peak pressure of ___ psi, and impact resistance complying with ANSI Z97.1 and CPSC 16 CFR 1201 Category II, as specified.

1. 1/4 inch thick clear annealed glass.
2. Surface applied film.
3. Requiring no supplemental anchoring devices.

2.03 MATERIALS

A. Glazing Film: Transparent polyester film for permanent bonding to glass.

1. Color: Clear.
2. Construction: Multi-ply laminate.
3. Adhesive Type: Pressure sensitive acrylic.
4. Tensile Strength: ____ psi minimum when tested in accordance with ASTM D882.
5. Breaking Strength: ____ psi when tested in accordance with ASTM D882.
6. Surface Burning Characteristics: Flame spread index of 25, maximum, and smoke developed index of 450, maximum, when tested in accordance with ASTM E84 (Class A).
7. Environmental Performance.
   a. Exterior Ambient Temperature range of -40F to + 100F
   b. Coastal Marine Storm exposure.
8. Light Transmission of Film Applied on 1/4 inch Thick Clear Annealed Glass:

B. Accessory Materials: As recommended or required by film manufacturer.

C. Supplementary Anchors: As required by performance criteria and acceptable to Architect.

D. Structural Silicone Sealant: Self-priming, elastomeric adhesive complying with ASTM C1184.

E. Glass Cleaner: As recommended by glazing film manufacturer.

PART 3 EXECUTION

3.01 PREPARATION

A. Clean glass of dust, dirt, paint, oil, grease, mildew, mold, and other contaminants that would inhibit adhesion.

B. Immediately prior to applying film, thoroughly wash glass with neutral cleaning solution.

C. Protect adjacent surfaces.

D. Do not begin installation until substrates have been properly prepared.

3.02 INSTALLATION

A. Do not apply glazing film when surface temperature is less that 40 degrees F or if precipitation is imminent.

B. Install in accordance with manufacturer's instructions, without air bubbles, wrinkles, streaks, bands, thin spots, pinholes, or gaps, as required to achieve specified performance.

C. Accurately cut film with straight edges to required sizes allowing 1/16 inch to 1/8 inch gap at perimeter of glazed panel unless otherwise required by anchorage method.

D. Seams: Seam film only as required to accommodate material sizes; form seams vertically without overlaps and gaps; do not install with horizontal seams.

E. Clean glass and anchoring accessories following installation. Remove excess sealants and other glazing materials from adjacent finished surfaces.

F. Remove labels and protective covers.

3.03 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 09 2116
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Performance criteria for gypsum board assemblies.

B. Gypsum sheathing.

C. Cementitious backing board.

D. Gypsum wallboard.

E. Joint treatment and accessories.

1.02 RELATED REQUIREMENTS

A. Section 05 4000 - Cold-Formed Metal Framing: Exterior wind-load-bearing metal stud framing.

B. Section 06 1000 - Rough Carpentry: Wood blocking product and execution requirements.

C. Section 07 2100 - Thermal Insulation: Acoustic insulation.

D. Section 07 2500 - Weather Barriers: Water-resistive barrier over sheathing.

E. Section 07 8400 - Firestopping: Top-of-wall assemblies at fire rated walls.

F. Section 07 9005 - Joint Sealers: Acoustic sealant.

G. Section 09 2216 - Non-Structural Metal Framing.

1.03 REFERENCE STANDARDS

A. ANSI A108.11 - American National Standard for Interior Installation of Cementitious Backer Units; 2012.1.

B. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units; 2012.1.

C. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2012.

D. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2002 (Reapproved 2007).

E. ASTM C557 - Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing; 2003 (Reapproved 2009)e1.

F. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2012.

G. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2011.

H. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness; 2011.

I. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2007.

J. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2008.

K. ASTM C1280 - Standard Specification for Application of Gypsum Sheathing; 2012.

L. ASTM C1325 - Standard Specification for Non-Asbestos Fiber-Mat Reinforced Cement Substrate Sheets; 2008b.

M. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2011.

N. ASTM C1658/C1658M - Standard Specification for Glass Mat Gypsum Panels; 2012.

O. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2012.

P. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009.

Q. ASTM E413 - Classification for Rating Sound Insulation; 2010.

R. GA-216 - Application and Finishing of Gypsum Board; Gypsum Association; 2010.

S. GA-600 - Fire Resistance Design Manual; Gypsum Association; 2012.

T. ICC (IBC) - International Building Code; 2012.

U. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc.; current edition.

1.04 SUBMITTALS

A. See Section 01 3300 - submittal procedures.

B. Shop Drawings: Indicate special details associated with fireproofing and acoustic seals.

C. Product Data: Provide data on metal framing, gypsum board, accessories, and joint finishing system.

D. Test Reports: For all stud framing products that do not comply with ASTM C645 or C 754, provide independent laboratory reports showing maximum stud heights at required spacings and deflections.

E. Samples: Submit two samples of gypsum board finished with proposed texture application, 12 by 12 inches in size, illustrating finish color and texture.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

A. Provide completed assemblies complying with ASTM C840 and GA-216.

1. See PART 3 for finishing requirements.

B. Interior Partitions Indicated as Acoustic: Provide completed assemblies with the following characteristics:

1. Acoustic Attenuation: STC of 45-49 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

C. Shaft Walls at HVAC Shafts: Provide completed assemblies with the following characteristics:

1. Air Pressure Within Shaft: Sustained loads of 5 lbf/sq ft with maximum mid-span deflection of L/240.
2. Acoustic Attenuation: STC of 35-39 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

D. Shaft Walls at Elevator Shafts: Provide completed assemblies with the following characteristics:

1. Air Pressure Within Shaft: Intermittent loads of 5 lbf/sq ft with maximum mid-span deflection of L/240.
2. Acoustic Attenuation: STC of 35-39 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

E. Fire Rated Assemblies: Provide completed assemblies with the following characteristics:

1. ICC IBC Item Numbers: Comply with applicable requirements of ICC IBC for the particular assembly.
2. Gypsum Association File Numbers: Comply with requirements of GA-600 for the particular assembly.
3. UL Assembly Numbers: Provide construction equivalent to that listed for the particular assembly in the current UL Fire Resistance Directory.

2.02 BOARD MATERIALS

A. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.

1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
2. Glass-mat-faced gypsum panels as defined in ASTM C1658/C1658M, suitable for paint finish, of the same core type and thickness may be substituted for paper-faced board.
3. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.

a. Mold-resistant board is required at all locations.
4. Thickness:
a. Vertical Surfaces: 5/8 inch.

B. Backing Board For Wet Areas: One of the following products:

1. Application: Surfaces behind tile in wet areas including areas below and above the lab steam capture hood.
2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
3. ANSI Cement-Based Board: Non-gypsum-based; aggregated Portland cement panels with glass fiber mesh embedded in front and back surfaces complying with ANSI A118.9 or ASTM C1325.
a. Thickness: 1/2 inch.

C. Backing Board For Non-Wet Areas: Water-resistant gypsum backing board as defined in ASTM C1396/C1396M; sizes to minimum joints in place; ends square cut.

1. Application: Vertical surfaces behind thinset tile, except in wet areas.
2. Edges: Tapered.

D. Ceiling Board: Special sag-resistant gypsum ceiling board as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.

1. Application: Ceilings, unless otherwise indicated.
2. Thickness: 1/2 inch.
3. Edges: Tapered.

E. Exterior Sheathing Board: Sizes to minimize joints in place; ends square cut.

1. Application: Exterior sheathing, unless otherwise indicated.
2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
3. Glass-Mat-Faced Sheathing: Glass mat faced gypsum substrate as defined in ASTM C1177/C1177M.
4. Core Type: Regular and Type X, as indicated.
5. Type X Thickness: 5/8 inch.
6. Regular Board Thickness: 1/2 inch.
7. Edges: Square, for vertical application.

F. Exterior Soffit Board: Exterior gypsum soffit board as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.

1. Application: Ceilings and soffits in protected exterior areas, unless otherwise indicated.
2. Edges: Tapered.

G. Shaftwall and Coreboard: Type X; 1 inch thick by 24 inches wide, beveled long edges, ends square cut.

1. Paper Faced Type: Gypsum shaftliner board or gypsum coreboard as defined ASTM C1396/C1396M; water-resistant faces.
2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.

2.03 ACCESSORIES

A. Acoustic Insulation: ASTM C665; preformed glass fiber, friction fit type, unfaced. Thickness: 4 inch.

B. Water-Resistive Barrier: As specified in Section 07 2500.

C. Joint Materials: ASTM C475 and as recommended by gypsum board manufacturer for project conditions.

1. Tape: 2 inch wide, coated glass fiber tape for joints and corners, except as otherwise indicated.

D. High Build Drywall Surfacer: Vinyl acrylic latex-based coating for spray application, designed to take the place of skim coating and separate paint primer in achieving Level 5 finish.

E. Screws for Attachment to Steel Members Less Than 0.03 inch In Thickness, to Wood Members, and to Gypsum Board: ASTM C1002; self-piercing tapping type; cadmium-plated for exterior locations.

F. Screws for Attachment to Steel Members From 0.033 to 0.112 inch in Thickness: ASTM C954; steel drill screws for application of gypsum board to loadbearing steel studs.

G. Adhesive for Attachment to Wood: ASTM C557.

H. Exterior Soffit Vents: One piece, perforated, ASTM B 221 6063 T5 alloy aluminum, with edge suitable for direct application to gypsum board and manufactured especially for soffit application. Provide continuous vent.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

3.02 SHAFT WALL INSTALLATION

A. Shaft Wall Framing: Install in accordance with manufacturer's installation instructions.

1. Fasten runners to structure with short leg to finished side, using appropriate power-driven fasteners at not more than 24 inches on center.
2. Install studs at spacing required to meet performance requirements.

B. Shaft Wall Liner: Cut panels to accurate dimension and install sequentially between special friction studs.

1. On walls over sixteen feet high, screw-attach studs to runners top and bottom.
2. Seal perimeter of shaft wall and penetrations with acoustical sealant.

3.03 ACOUSTIC ACCESSORIES INSTALLATION

A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.

B. Acoustic Sealant: Install in accordance with manufacturer's instructions.

1. Place one bead continuously on substrate before installation of perimeter framing members.

3.04 BOARD INSTALLATION

A. Comply with ASTM C 840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

B. Fire-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.

C. Exterior Sheathing: Comply with ASTM C1280. Install sheathing vertically, with edges butted tight and ends occurring over firm bearing.

1. Paper-Faced Sheathing: Immediately after installation, protect from weather by application of water-resistive barrier.

D. Exterior Soffit Board: Install perpendicular to framing, with staggered end joints over framing members or other solid backing.

E. Cementitious Backing Board: Install over steel framing members and plywood substrate where indicated, in accordance with ANSI A108.11 and manufacturer's instructions.

3.05 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints: Place control joints consistent with lines of building spaces and as follows:

1. Not more than 30 feet apart on walls and ceilings over 50 feet long.
2. At exterior soffits, not more than 30 feet apart in both directions.

B. Corner Beads: Install at external corners, using longest practical lengths.

C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials and as indicated.

3.06 JOINT TREATMENT

A. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:

1. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
2. Level 5: Walls and ceilings to receive semi-gloss or gloss paint finish and other areas specifically indicated.
3. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
4. Level 1: Fire rated wall areas above finished ceilings, whether or not accessible in the completed construction.

5. Level 0: Temporary partitions and surfaces indicated to be finished in later stage of project.

B. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.

1. Feather coats of joint compound so that camber is maximum 1/32 inch.

C. Where Level 5 finish is indicated, spray apply high build drywall surfacer over entire surface after joints have been properly treated; achieve a flat and tool mark-free finish.

D. Fill and finish joints and corners of cementitious backing board as recommended by manufacturer.

3.07 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

END OF SECTION

SECTION 09 2216
NON-STRUCTURAL METAL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal partition, ceiling, and soffit framing.

B. Framing accessories.

1.02 RELATED REQUIREMENTS

A. Section 05 4000 - Cold-Formed Metal Framing: Structural load bearing metal stud framing and Exterior wall stud framing.

B. Section 05 4000 - Cold Formed Metal Framing: Execution requirements for anchors for attaching work of this section.

C. Section 05 5000 - Metal Fabrications: Metal fabrications attached to stud framing.

D. Section 05 5000 - Metal Fabrications: Execution requirements for anchors for attaching work of this section.

E. Section 06 1000 - Rough Carpentry: Wood blocking within stud framing.

F. Section 07 2500 - Weather Barriers.

G. Section 07 2100 - Thermal Insulation: Acoustic Insulation.

H. Section 07 6200 - Sheet Metal Flashing and Trim: Head and sill flashings.

I. Section 08 3100 - Access Doors and Panels.

J. Section 09 2116 - Gypsum Board Assemblies: Metal studs for gypsum board partition framing.

K. Section 09 2116 - Gypsum Board Assemblies: Execution requirements for anchors for attaching work of this section.

1.03 REFERENCE STANDARDS

A. AISI SG02-1 - North American Specification for the Design of Cold-Formed Steel Structural Members; American Iron and Steel Institute; 2001 with 2004 supplement. (replaced SG-971)

B. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members; 2011a.

C. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2011.

D. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2007.

E. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009.

F. ASTM E413 - Classification for Rating Sound Insulation; 2010.

G. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society for Protective Coatings; 2002 (Ed. 2004).

1.04 SUBMITTALS

A. See Section 01 3300 - submittal procedures.

B. Shop Drawings:

1. Indicate prefabricated work, component details, stud layout, framed openings, anchorage to structure, acoustic details, type and location of fasteners, accessories, and items of other related work.
2. Describe method for securing studs to tracks, splicing, and for blocking and reinforcement of framing connections.

C. Product Data: Provide data describing framing member materials and finish, product criteria, load charts, and limitations.

D. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

PART 2 PRODUCTS

2.01 FRAMING MATERIALS

A. Fire Rated Assemblies: Comply with applicable code and as indicated on drawings.

B. Non-Loadbearing Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/240 at 5 psf.

1. Studs: C shaped with flat or formed webs with knurled faces.
2. Runners: U shaped, sized to match studs.
3. Furring: Hat-shaped sections, minimum depth of 7/8 inch.

C. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.

D. Partition Head to Structure Connections: Provide mechanical anchorage devices that accommodate deflection using slotted holes, screws and anti-friction bushings, preventing rotation of studs while maintaining structural performance of partition.

1. Structural Performance: Maintain lateral load resistance and vertical movement capacity required by applicable code, when evaluated in accordance with AISI North American Specification for the Design of Cold-Formed Steel Structural Members.
2. Material: ASTM A653/A653M steel sheet, SS Grade 50, with G60/Z180 hot dipped galvanized coating.

E. Furring and Bracing Members: Of same material as studs; thickness to suit purpose; complying with applicable requirements of ASTM C754.

F. Fasteners: ASTM C1002 self-piercing tapping screws.

G. Sheet Metal Backing: 0.036 inch thick, galvanized.

H. Anchorage Devices: Powder actuated.

I. Acoustic Insulation: As specified in Section 07 2100.

J. Acoustic Sealant: As specified in Section 09 2116.

K. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic.

2.02 FABRICATION

A. Fabricate assemblies of framed sections to sizes and profiles required.

B. Fit, reinforce, and brace framing members to suit design requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that rough-in utilities are in proper location.

3.02 INSTALLATION OF STUD FRAMING

A. Comply with requirements of ASTM C754.

B. Extend partition framing to structure where indicated and to ceiling in other locations.

C. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.

D. Partitions Terminating at Structure: Attach top runner to structure, maintain clearance between top of studs and structure, and connect studs to track using specified mechanical devices in accordance with manufacturer's instructions; verify free movement of top of stud connections; do not leave studs unattached to track.

E. Align and secure top and bottom runners at 24 inches on center.

F. At partitions indicated with an acoustic rating:

1. Provide components and install as required to produce STC ratings as indicated, based on published tests by manufacturer conducted in accordance with ASTM E90 with STC rating calculated in accordance with ASTM E413.
2. Place one bead of acoustic sealant between runners and substrate, studs and adjacent construction.
3. Place one bead of acoustic sealant between studs and adjacent vertical surfaces.

G. Fit runners under and above openings; secure intermediate studs to same spacing as wall studs.

H. Install studs vertically at spacing indicated on drawings.

I. Align stud web openings horizontally.

J. Secure studs to tracks using crimping method. Do not weld.

K. Stud splicing is not permissible.

L. Fabricate corners using a minimum of three studs.

M. Double stud at wall openings, door and window jambs, not more than 2 inches from each side of openings.

N. Brace stud framing system rigid.

O. Coordinate erection of studs with requirements of door frames; install supports and attachments.

P. Coordinate installation of bucks, anchors, and blocking with electrical, mechanical, and other work to be placed within or behind stud framing.

3.03 CEILING AND SOFFIT FRAMING

A. Comply with requirements of ASTM C754.

B. Install furring after work above ceiling or soffit is complete. Coordinate the location of hangers with other work.

C. Install furring independent of walls, columns, and above-ceiling work.

D. Securely anchor hangers to structural members or embed in structural slab. Space hangers as required to limit deflection to criteria indicated. Use rigid hangers at exterior soffits.

E. Space main carrying channels at maximum 72 inch on center, and not more than 6 inches from wall surfaces. Lap splice securely.

F. Securely fix carrying channels to hangers to prevent turning or twisting and to transmit full load to hangers.

G. Place furring channels perpendicular to carrying channels, not more than 2 inches from perimeter walls, and rigidly secure. Lap splices securely.

3.04 TOLERANCES

A. Maximum Variation From True Position: 1/8 inch in 10 feet.

B. Maximum Variation From Plumb: 1/8 inch in 10 feet.

END OF SECTION

SECTION 09 5100
ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Suspended metal grid ceiling system.

B. Acoustical units.

1.02 RELATED REQUIREMENTS

A. Section 07 2100 - Thermal Insulation: Acoustical insulation.

B. Section 07 9005 - Joint Sealers: Acoustical sealant.

C. Section 08 3100 - Access Doors and Panels: Access panels.

D. Section 28 3100 - Fire Detection and Alarm: Fire alarm components in ceiling system.

E. Section 23 3700 - Air Outlets and Inlets: Air diffusion devices in ceiling.

F. Section 26 5100 - Interior Lighting: Light fixtures in ceiling system.

G. Section 27 3100 - Public Address Systems: Speakers in ceiling system.

1.03 REFERENCE STANDARDS

A. ASTM C635 - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2007.

B. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels; 2008.

C. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2012.

D. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions; 2011.

E. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2008e1.

F. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc.; current edition.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.

B. Do not install acoustical units until after interior wet work is dry.

1.05 SUBMITTALS

A. See Section 01 3300 - submittal procedures.

B. Shop Drawings: Indicate grid layout and related dimensioning.

C. Product Data: Provide data on suspension system components.

D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 7800 - Product Requirements, for additional provisions.
2. Extra Acoustical Units: Quantity full size new tiles in original packaging, equal to 5 percent of total installed .

1.06 QUALITY ASSURANCE

A. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Acoustical Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.07 FIELD CONDITIONS

A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

PART 2 PRODUCTS

2.01 ACOUSTICAL UNITS

A. Acoustical Units - General: ASTM E1264, Class A.

B. Acoustical Panels Type 1: Painted mineral fiber, ASTM E1264 Type III, with the following characteristics:

1. Size: 24 x 48 inches.
2. Thickness: 3/4 inches.
3. Composition: Wet felted.
4. Light Reflectance: 0.87percent, determined as specified in ASTM E1264.
5. NRC Range: 0.80 determined as specified in ASTM E1264.
6. Edge: Square.
7. Surface Color: White.
8. Product: Ultima High NRC -1940 by Armstrong (BASIS OF DESIGN). Product Substitution –see Section 01 2513.
9. Suspension System: Exposed grid 15/16” face

2.02 SUSPENSION SYSTEM(S)

A. Suspension Systems - General: ASTM C635; die cut and interlocking components, with stabilizer bars, clips, splices, perimeter moldings, and hold down clips as required.

B. Exposed Steel Suspension System: Formed steel, heavy duty commercial quality cold rolled; heavy-duty.

1. Profile: Tee; 15/16 inch wide face.
2. Construction: Double web.
3. Finish: White painted.

2.03 ACCESSORIES

A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.

B. Perimeter Moldings: Same material and finish as grid.

1. At Exposed Grid: Provide L-shaped molding for mounting at same elevation as face of grid.

C. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that layout of hangers will not interfere with other work.

3.02 INSTALLATION - SUSPENSION SYSTEM

A. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, and manufacturer's instructions and as supplemented in this section. Seismic brace ceiling system per Building Code requirements.

B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

C. Install after major above-ceiling work is complete. Coordinate the location of hangers with other work.

D. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

E. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

F. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

G. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.

H. Do not eccentrically load system or induce rotation of runners.

I. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.

1. Use longest practical lengths.
2. Overlap and rivet corners.

3.03 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Fit border trim neatly against abutting surfaces.

D. Install units after above-ceiling work is complete.

E. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.

F. Cutting Acoustical Units:

1. Cut to fit irregular grid and perimeter edge trim.
2. Make field cut edges of same profile as factory edges.
3. Double cut and field paint exposed reveal edges.

G. Where round obstructions occur, provide preformed closures to match perimeter molding.

H. Lay acoustical insulation for a distance of 48 inches either side of acoustical partitions as indicated.

3.04 TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

END OF SECTION

SECTION 09 6513
RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:

1. Resilient base.
2. Resilient stair accessories.

1.03 SUBMITTALS

A. See Section 01 3300 – submittal procedures.

1.04 QUALITY ASSURANCE

A. Source Limitations: Obtain each type and color of product specified from one source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C).

1.06 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 65 deg F (18 deg C) or more than 85 deg F (29 deg C), in spaces to receive resilient products during the following time periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 65 deg F (18 deg C) or more than [85 deg F (29 deg C).

C. Install resilient products after other finishing operations, including painting, have been completed.

1.07 WARRANTY

A. Manufacturer's Materials Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner many have under Contract Documents.
   1. Warranty Period: 1 year limited warranty commencing on Date of Substantial Completion. Notice of any defect must be made in writing to manufacturer within thirty (30) days after buyer learns of the defect.
   2. Limited Wear Warranty: 3 year limited wear warranty.

PART 2 - PRODUCTS

2.01 **PERFORMANCE REQUIREMENTS**

A. FloorScore Compliance: Resilient base shall comply with requirements of FloorScore certification.

2.02 VINYL BASE – VB-1

A. Manufacturers: Subject to compliance with requirements, provide products by the following: provide::
   1. Roppe Corporation, USA.

B. Product Standard: ASTM F 1861, Type TV (vinyl, thermoplastic).
   1. Group: I (solid, homogeneous)
   2. Style and Location:
      a. Cove: As scheduled in drawings

C. Minimum Thickness: 0.125 inch (3.2 mm).

D. Height: 2-1/2 inches (64 mm)

E. Lengths: Cut lengths 48 inches (1219 mm) long

F. Outside Corners: Job formed

G. Inside Corners: Job formed

H. Colors and Patterns: TV 8P114, #194 Burnt Umber.

2.03 RUBBER STAIR ACCESSORIES – RF-7

A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
   1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

B. Manufacturers: Subject to compliance with requirements, provide products by:
   1. Roppe Corporation, USA.

C. Stair Treads: ASTM F 2169.
   1. Type: synthetic rubber compound
   2. Class: 1 (smooth, flat).
   3. Group: 1 (embedded abrasive strips)
   4. Nosing Style: Square
   5. Nosing Height: As scheduled in drawings.
   6. Thickness: 1/4 inch (6 mm) and tapered to back edge
   7. Size: Lengths and depths to fit each stair tread in one piece

8. Integral Risers: Smooth, flat; in height that fully covers substrate.

D. Landing Tile: Matching treads; produced by same manufacturer as treads and recommended by manufacturer for installation with treads

E. Locations: Provide rubber stair accessories in areas indicated, as scheduled in dawings.

Colors and Patterns: #41 Heavy Duty, #194 Burnt Umber, with matching risers and black abrasive strip at edge of tread.

2.04 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.

1. Adhesives shall have a VOC content of 50 g/L or less

C. Stair-Tread Nose Filler: Two-part epoxy compound recommended by resilient stair-tread manufacturer to fill nosing substrates that do not conform to tread contours.

D. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edges of flooring, and in maximum available lengths to minimize running joints.

E. Floor Polish: Provide protective, liquid floor-polish products recommended by resilient stair-tread manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.02 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates for Resilient Stair Accessories: Prepare horizontal surfaces according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.

2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.

3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9.

4. with installation only after substrates pass testing according to manufacturer's written recommendations, but not less stringent than the following:

a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.

b. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have maximum 60 percent relative humidity level.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install resilient products until they are the same temperature as the space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.03 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Job-Formed Corners:

1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches (76 mm) in length.

a. Form without producing discoloration (whitening) at bends. Shave back of base vertically at fold point and at two diagonal additional stress relief gouges on the vertical surface, approximately 1/2-inch (12mm) long, 1-inch (25mm) from the center gouge.

2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches (76 mm) in length.

a. Miter or cope corners to minimize open joints.

3.04 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

B. Resilient Stair Accessories:

1. Use stair-tread-nose filler to fill nosing substrates that do not conform to tread contours.

2. Tightly adhere to substrates throughout length of each piece.

3. For treads installed as separate, equal-length units, install to produce a flush joint between units.

3.05 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.

B. Perform the following operations immediately after completing resilient-product installation:

1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum horizontal surfaces thoroughly.
3. Damp-mop horizontal surfaces to remove marks and soil.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Floor Polish: Remove soil, visible adhesive, and surface blemishes from resilient stair treads before applying liquid floor polish.

1. Apply one to two coat(s).

E. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION 09 65 13

SECTION 09 6516
RESILIENT SHEET FLOORING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes rubber sheet flooring.

1.03 SUBMITTALS

A. See Section 01 3300 – submittal procedures.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for resilient sheet flooring installation and seaming method indicated.

1. Engage an installer who employs workers for this Project who are trained or certified by resilient sheet flooring manufacturer for installation techniques required.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store resilient sheet flooring and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C). Store rolls upright.

1.06 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 68 deg F (20 deg C), ± 5 deg F (3 deg C) and 50% RH ± 10% or more than 85 deg F (29 deg C , in spaces to receive resilient sheet flooring during the following time periods:

1. 48 hours before installation.
2. During installation.
3. 72 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C)

C. Close spaces to traffic during resilient sheet flooring installation.

D. Close spaces to traffic for 48 hours after resilient sheet flooring installation.

E. Install resilient sheet flooring after other finishing operations, including painting, have been completed.

1.07 WARRANTY

A. Provide current, detailed manufacturer's warranty for each flooring product as applicable, including limited wear, defect and conductivity.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For resilient sheet flooring, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

B. FloorScore Compliance: Resilient sheet flooring shall comply with requirements of FloorScore certification.

2.02 UNBACKED RUBBER SHEET FLOORING – RF-6

A. Products: Subject to compliance with requirements, provide the following:

1. Nora Systems, Inc; Noraplan Envirocare

B. Product Standard: ASTM F 1859.

1. Type: Type I (homogeneous rubber sheet)
2. Thickness: 3MM.
3. Hardness: Manufacturer's standard hardness, measured using Shore, Type A durometer per ASTM D 2240

C. Wearing Surface: Smooth.

D. Sheet Width: 4.0 feet (1.2 m)

E. Seamless-Installation Method: Heat welded

F. Colors and Patterns: Environcare 2930, Windflower.

2.03 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by resilient sheet flooring manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by flooring and adhesive manufacturers to suit resilient sheet flooring and substrate conditions indicated.

1. Adhesives shall have a VOC content of 50 g/L or less.

C. Seamless-Installation Accessories:

1. Heat-Welding Bead: Manufacturer's solid-strand product for heat welding seams.
   a. Color: Match flooring.

D. Integral-Flash-Cove-Base Accessories:

1. Cove Strip: 1-inch (25-mm) radius provided or approved by resilient sheet flooring manufacturer.
2. Cap Strip: Square metal, vinyl, or rubber cap provided or approved by resilient sheet flooring manufacturer.
3. Corners: Metal inside and outside corners and end stops provided or approved by resilient sheet flooring manufacturer.

E. Floor Polish: Provide protective, liquid floor-polish products recommended by resilient sheet flooring manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient sheet flooring.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Prepare substrates according to resilient sheet flooring manufacturer's written instructions to ensure adhesion of resilient sheet flooring.

B. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by resilient sheet flooring manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by resilient sheet flooring manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
4. Moisture Testing: Proceed with installation only after substrates pass testing according to resilient sheet flooring manufacturer's written recommendations, but not less stringent than the following:
   a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
   b. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have a maximum 60 percent relative humidity level.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install resilient sheet flooring until it is the same temperature as the space where it is to be installed.

1. At least 48 hours in advance of installation, move flooring and installation materials into spaces where they will be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient sheet flooring.

3.03 RESILIENT SHEET FLOORING INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient sheet flooring.

B. Unroll resilient sheet flooring and allow it to stabilize before cutting and fitting.

C. Lay out resilient sheet flooring as follows:

1. Maintain uniformity of flooring direction.
2. Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least 6 inches (152 mm) away from parallel joints in flooring substrates.
3. Double cut seams.
4. Match edges of flooring for color shading at seams.
5. Avoid cross seams.
6. Layout seams to avoid less than 1/3 of full roll width.

D. Scribe and cut resilient sheet flooring to butt neatly and tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, and door frames.

E. At movable and demountable partitions, install flooring under partitions without interruption in flooring or pattern.

F. Center seams and transitions under doors.

G. Extend resilient sheet flooring into toe spaces, door reveals, closets, and similar openings.

H. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on resilient sheet flooring as marked on substrates. Use chalk or other nonpermanent marking device.

I. Install resilient sheet flooring on covers for telephone and electrical ducts and similar items in installation areas. Maintain overall continuity of color and pattern between pieces of flooring installed on covers and adjoining flooring. Tightly adhere flooring edges to substrates that abut covers and to cover perimeters.

J. Adhere resilient sheet flooring to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

K. Seamless Installation:

1. Heat-Welded Seams: Comply with ASTM F 1516. Rout joints and heat weld with welding bead to permanently fuse sections into a seamless flooring. Prepare, weld, and finish seams to produce surfaces flush with adjoining flooring surfaces.

L. Integral-Flash-Cove Base: Cove resilient sheet flooring 6 inches (152 mm) up vertical surfaces. Support flooring at horizontal and vertical junction with cove strip. Butt at top against cap strip.

1. Install metal corners at inside and outside corners.

3.04 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting resilient sheet flooring.

B. Perform the following operations immediately after completing resilient sheet flooring installation:

1. Remove adhesive and other blemishes from surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

C. Protect resilient sheet flooring from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Floor Polish: Remove soil, adhesive, and blemishes from flooring surfaces before applying liquid floor polish.

E. Cover resilient sheet flooring until Substantial Completion.

END OF SECTION 09 65 16

SECTION 09 6519
RESILIENT TILE FLOORING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:

1. Vinyl composition floor tile.
2. Linoleum tile

1.03 SUBMITTALS

A. See Section 01 3300 – submittal procedures.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for floor tile installation and seaming method indicated.

1. Engage an installer who employs workers for this Project who are trained or certified by floor tile manufacturer for installation techniques required.

B. Source Limitations: Obtain each type, color, and pattern of product specified from one source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to Project site in manufacturer's original, unopened cartons and containers, each bearing names of product and manufacturer, Project identification, and shipping and handling instructions.

B. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C). Store floor tiles on flat surfaces.

1.06 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 68 deg F (21 deg C)] or more than 90 deg F (35 deg C) in spaces to receive floor tile during the following time periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).

C. Close spaces to traffic during floor tile installation.

D. Close spaces to traffic for 48 hours after floor tile installation.

E. Install floor tile after other finishing operations, including painting, have been completed.

1.07 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace resilient flooring that do not comply with requirements or that fail in materials within specified warranty period.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For resilient tile flooring, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

B. FloorScore Compliance: Resilient tile flooring shall comply with requirements of FloorScore certification.

2.02 LINOLEUM TILE RF-1, RF-2

A. Products: Subject to compliance with requirements, provide the following:

1. Forbo

B. Tile Standard: EN-ISO 2436, EN-ISO 10874

C. Wearing Surface: Smooth.

D. Thickness: 2.5 mm

E. Size: 13 by 13 inches

F. Colors and Patterns: As selected by Architect from full range of industry colors, t707 Barley, t3048 Graphite.

2.03 VINYL COMPOSITION FLOOR TILE RF-5

A. Products: Subject to compliance with requirements, provide the following:

1. Armstrong World Industries, Inc;

a. Standard Excelon

B. Tile Standard: ASTM F 1066, Class 1

C. Wearing Surface: Smooth

D. Thickness: 0.125 inch (3.2 mm)

E. Size: 12 by 12 inches (305 by 305 mm).

F. Colors and Patterns: RF-5 - 51877 Earth Green; 1/4 turn installation

2.04 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.

1. Adhesives shall comply with the following limits for VOC content:

a. Vinyl Composition Tile Adhesives: 50 g/L or less.

C. Floor Polish: Provide protective, liquid floor-polish products recommended by floor tile manufacturer.

2.05 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

2.06 PREPARATION

A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.

2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.

3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.

4. Moisture Testing: Proceed with installation only after substrates pass testing according to floor tile manufacturer's written recommendations, but not less stringent than the following:

a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.

b. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have a maximum 60 percent relative humidity level.

C. Access Flooring Panels: Remove protective film of oil or other coating using method recommended by access flooring manufacturer.

D. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

E. Do not install floor tiles until they are the same temperature as the space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.

F. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

2.07 FLOOR TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing floor tile.

B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.

1. Lay tiles square with room axis in pattern indicated per drawings.

C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.

1. Lay tiles in pattern of colors and sizes indicated per drawings.

D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.

F. Center transitions under doors.

G. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.

H. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.

I. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

2.08 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.

B. Perform the following operations immediately after completing floor tile installation:

1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

C. Protect floor tile from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Floor Polish: Remove soil, adhesive, and blemishes from floor tile surfaces before applying liquid floor polish.

1. Apply coat(s) as recommended by manufacturer.

E. Cover floor tile until Substantial Completion.

END OF SECTION 09 65 19

SECTION 09 6536
STATIC-CONTROL RESILIENT FLOORING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:

1. Static-dissipative, vinyl composition floor tile

B. Related Requirements:

1. Section 096513 "Resilient Base and Accessories" for resilient base, reducer strips, and other accessories installed with static-control resilient flooring.

1.03 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Nome State Office Building in Nome, Alaska.

1. Review methods and procedures related to static-control resilient flooring including, but not limited to, the following:

a. Examination and preparation of substrates to receive static-control resilient flooring.

b. Installation including seamless installation techniques.

1.04 SUBMITTALS

A. See Section 01 3300 – submittal procedures.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for static-control resilient flooring.

1. Engage an installer who employs workers for this Project who are trained or certified by manufacturer for installation techniques required.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store static-control resilient flooring and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer but not less than 65 deg F (18 deg C) or more than 85 deg F (29 deg C).

1. Floor Tile: Store on flat surfaces.

1.07 PROJECT CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 65 deg F (18 deg C) or more than 85 deg F (29 deg C), in spaces to receive static-control resilient flooring during the following time periods:

1. 48 hours before installation.

2. During installation.
3. 48 hours after installation.

B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C).

C. Close spaces to traffic during static-control resilient flooring installation.

D. Close spaces to traffic for 48 hours after static-control resilient flooring installation.

E. Install static-control resilient flooring after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Static-Dissipative Properties: Provide static-control resilient flooring with static-control properties indicated as determined by testing identical products per test method indicated by an independent testing and inspecting agency.

1. Electrical Resistance: Test per ASTM F 150 with 100-V applied voltage and ESD-STM-7.1.
   a. Average greater than 1 megohm and less than or equal to 1000 megohms when test specimens are tested surface to ground.
   b. Average greater than 1 megohm and less than or equal to 1000 megohms when installed floor coverings are tested surface to ground.
2. Static Generation: Less than 10 V when tested per ESD STM 97.2 at 40 percent relative humidity and less than 100 V at 12 percent relative humidity in combination with conductive footwear and a person.
3. Static Decay: 5000 to zero V in less than .5 seconds when tested per FED-STD-101C/4046.1.

B. FloorScore Compliance: Static-control resilient flooring shall comply with requirements of FloorScore certification.

C. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 and ASTM E 662 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

2.02 STATIC-DISSIPATIVE RESILIENT FLOOR COVERINGS

A. Static-Dissipative, Vinyl Composition Floor Tile RF-4: ASTM F 1066 (vinyl composition floor tile, non-asbestos formulated), Class 2 (through-pattern tile).

1. Products: Subject to compliance with requirements, provide the following:
   a. Armstrong World Industries, Inc; Static Dissipative SDT.
2. Thickness: 0.125 inch (3.2 mm).
3. Size: 12 by 12 inches (305 by 305 mm).
4. Colors and Patterns: 51951 Armor Gray, 1/4 turn installation

2.03 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified portland cement or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

B. Static-Control Adhesive: Provided or approved by manufacturer; type that maintains electrical continuity of floor-covering system to ground connection.

1. Adhesives shall comply with the following limits for VOC content:
   a. VCT and Asphalt Tile Adhesives: Not more than 50 g/L.
   b. Rubber Floor Adhesives: Not more than 60 g/L.

C. Grounding Strips: Provided or approved by manufacturer; type and size that maintains electrical continuity of floor-covering system to ground connection.

D. Maintenance Floor Tiles: Special floor tiles inscribed "Conductive floor. Do not wax."

E. Floor Polish: Provide protective, static-control liquid floor polish products as recommended by floor-covering manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, with Installer and manufacturer's representative present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion or static-control characteristics of floor coverings.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Prepare substrates according to manufacturer's written instructions and with oversight by manufacturer's representative to ensure adhesion of static-control resilient flooring and electrical continuity of floor-covering systems.

B. Concrete Substrates: Prepare according to ASTM F 710.
   1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
   2. Remove substrate coatings and other substances that are incompatible with floor-covering adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
   3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
   4. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after substrates pass testing.
      a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
      b. Perform relative-humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have maximum 75 percent relative-humidity level measurement.

C. Access Flooring Panels: Remove protective film of oil or other coating using method recommended by access flooring manufacturer.

D. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

E. Do not install static-control resilient flooring until it is same temperature as space where it is to be installed.
   1. Move static-control resilient flooring and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

F. Sweep and vacuum substrates to be covered by static-control resilient flooring immediately before installation.

3.03 INSTALLATION, GENERAL

A. Install static-control resilient flooring according to manufacturer's written instructions.

B. Embed grounding strips in static-control adhesive. Extend grounding strips beyond perimeter of static-control resilient floor-covering surfaces to ground connections.

C. Scribe, cut, and fit static-control resilient flooring to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

D. Extend static-control resilient flooring into toe spaces, door reveals, closets, and similar openings. Extend static-control resilient flooring to center of door openings.

E. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on static-control resilient flooring as marked on substrates. Use chalk or other nonpermanent, non-staining marking device.

F. Install static-control resilient flooring on covers for telephone and electrical ducts, and similar items in installation areas. Maintain overall continuity of color and pattern with pieces of static-control resilient flooring installed on covers. Tightly adhere static-control resilient flooring edges to substrates that abut covers and to cover perimeters.

G. Adhere static-control resilient flooring to substrates using a full spread of static-control adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.04 FLOOR-TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing floor tile.

B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so floor tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half floor tile at perimeter.

1. Lay floor tiles square with room axis in pattern indicated per drawing set.

C. Match floor tiles for color and pattern by selecting floor tiles from cartons in same sequence as manufactured and packaged if so numbered. Discard broken, cracked, chipped, or deformed floor tiles.

3.05 FIELD QUALITY CONTROL

A. Testing: Engage a qualified testing agency to test electrical resistance of static-control resilient flooring for compliance with requirements.

1. Arrange for testing after static-control adhesives have fully cured and static-control resilient flooring has stabilized to ambient conditions and after ground connections are completed.

2. Arrange for testing of static-control resilient flooring before and after performing floor polish procedures.

B. Static-control resilient flooring will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.06 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of static-control resilient flooring.

B. Perform the following operations immediately after completing static-control resilient flooring:

1. Remove static-control adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

C. Protect static-control resilient flooring from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

1. Do not wax static-control resilient flooring.
2. If recommended in writing by manufacturer, apply protective static-control floor polish formulated to maintain or enhance floor covering's electrical properties; ensure static-control resilient flooring surfaces are free from soil, static-control adhesive, and surface blemishes.
   a. Verify that both floor polish and its application method are approved by manufacturer and that floor polish will not leave an insulating film that reduces static-control resilient flooring's effectiveness for static control.

D. Cover static-control resilient flooring until Substantial Completion.

END OF SECTION 096536

SECTION 09 6543
LINOLEUM FLOORING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes linoleum floor tile

1.03 SUBMITTALS

A. See Section 01 3300 – submittal procedures.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for flooring installation.

1. Engage an installer who employs workers for this Project who are trained or certified by flooring manufacturer for installation techniques required.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store flooring and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 65 deg F (18 deg C) or more than 90 deg F (32 deg C).

1. Floor Tile: Store on flat surfaces.

1.06 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than [70 deg F (21 deg C) or more than 95 deg F (35 deg C) in spaces to receive flooring during the following time periods:

1. Seven days prior to installation.
2. During installation.
3. Seven days after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).

C. Close spaces to traffic during flooring installation.

D. Close spaces to traffic for 72 hours after flooring installation.

E. Install flooring after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For linoleum flooring, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

B. FloorScore Compliance: Flooring shall comply with requirements of FloorScore certification.

2.02 LINOLEUM FLOOR TILE RF-1 and RF-2

A. Product: Subject to compliance with requirements, provide product indicated on Drawings by the following:

1. Forbo Industries, Inc.

B. Linoleum Floor Tile: ASTM F 2195, Type I, linoleum floor tile with fibrous backing.

1. Nominal Floor Tile Size: 13 by 13 inches (330 by 330 mm).

C. Thickness: 0.08 inch (2.0 mm)

D. Colors and Patterns:
1. RF-1 – MCT, 707 Barley, Installation pattern per plans
2. RF-2 – MCT, 3048 Graphite, Installation pattern per plans

2.03 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by linoleum flooring manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by flooring and adhesive manufacturers to suit products and substrate conditions indicated.

1. Adhesives shall have a VOC content of 50 g/L or less.

C. Floor Polish: Provide protective, liquid floor-polish products recommended by linoleum flooring manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of flooring.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Prepare substrates according to linoleum flooring manufacturer's written instructions to ensure adhesion of flooring.

B. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.

2. Remove substrate coatings and other substances that are incompatible with flooring adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by linoleum flooring manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by linoleum flooring manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
4. Moisture Testing: Perform tests recommended by linoleum flooring manufacturer, but not less stringent than the following:
   a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
   b. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have maximum 75 percent relative humidity level.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install flooring until it is the same temperature as space where it is to be installed.
   1. At least 72 hours in advance of installation, move flooring and installation materials into spaces where they will be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by flooring.

3.03 INSTALLATION, GENERAL

A. Comply with manufacturer's written instructions for installing flooring.

B. Scribe and cut flooring to butt neatly and tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings.

C. Extend flooring into toe spaces, door reveals, closets, and similar openings.

D. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on flooring as marked on substrates. Use chalk or other nonpermanent marking device.

E. Install flooring on covers for telephone and electrical ducts and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of flooring installed on covers and adjoining flooring. Tightly adhere flooring edges to substrates that abut covers and to cover perimeters.

F. Adhere flooring to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

G. Heat-Welded Seams: For seamless installation, comply with ASTM F 1516. Rout joints and heat weld with welding bead to permanently fuse sections into a seamless flooring. Prepare, weld, and finish seams to produce surfaces flush with adjoining flooring surfaces.

3.04 LINOLEUM FLOOR TILE INSTALLATION

A. Lay out linoleum floor tiles from center marks established with principal walls, discounting minor offsets, so floor tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
   1. Lay floor tiles square with room axis in pattern indicated in Drawings.

3.05 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting linoleum flooring.

B. Perform the following operations immediately after completing linoleum flooring installation:

1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

C. Protect linoleum flooring from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Floor Polish: Remove soil, visible adhesive, and surface blemishes from linoleum flooring before applying liquid floor polish.

1. Apply two to three coat(s) or as recommended by manufacturer.

E. After allowing drying room film (yellow film caused by linseed oil oxidation) to disappear, cover linoleum flooring until Substantial Completion.

END OF SECTION 096543

SECTION 09 6813
TILE CARPETING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes modular, tufted carpet tile.

B. Related Requirements:

1. Section 02 41 00 "Demolition" for removing existing floor coverings.
2. Section 09 65 13 "Resilient Base and Accessories" and Section 09 65 19 "Resilient Tile Flooring" for resilient wall base and accessories installed with carpet tile.

1.03 DEFINITIONS

A. Pile Thickness: Yarn Tuft heights above top surface of backing.

1.04 PREINSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Nome State Office Building in Nome, Alaska.

1. Review methods and procedures related to carpet tile installation including, but not limited to, the following:
   a. Review delivery, storage, and handling procedures.
   b. Review ambient conditions and ventilation procedures.
   c. Review subfloor preparation procedures.

1.05 SUBMITTALS

See Section 01 3300 – submittal procedures.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association at the Commercial II certification level.

B. Fire-Test-Response Ratings: Where indicated, provide carpet tile identical to those of assemblies tested for fire response according to NFPA 253 by a qualified testing agency.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI 104.

1.08 FIELD CONDITIONS

A. Comply with CRI 104 for temperature, humidity, and ventilation limitations.

B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at occupancy levels during the remainder of the construction period.

C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.

D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.09 WARRANTY

A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.

1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
2. Failures include, but are not limited to, more than 10 percent edge raveling, snags, runs, dimensional stability, excess static discharge, loss of tuft bind strength, loss of face fiber, and delamination.
3. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 CARPET TILE CPT-1 and CPT-2

A. Products: Subject to compliance with requirements, provide the following:

1. Mohawk Group, The
   a. CPT-1: First One Up, BT286
   b. CPT-2: First Step Modular, L8513

B. Color:

1. CPT-1: 7728 Physical
2. CPT-2: 524 Stepping Stone

C. Pattern:

1. CPT-1: Monolitic
2. CPT-2: Quarter Turn

D. Fiber Content:

1. CPT-1: Solution Dyed
2. CPT-2: Yarn Dyed

E. Fiber Type:

1. CPT-1: Colorstrand® SD Nylon
2. CPT-2: Fortis™ Nylon

F. Pile Characteristic:

1. CPT-1: Textured Patterned Loop
2. CPT-2:Performance Loop Pile

G. Yarn Twist:

1. CPT-1: Per manufacturer specifications
2. CPT-2: Per manufacturer specifications

H. Yarn Count:
   1. CPT-1: Per manufacturer specifications
   2. CPT-2: Per manufacturer specifications
I. Density:
   1. CPT-1: 7,266
   2. CPT-2: 5,494
J. Finished Pile Thickness:
   1. CPT-1: 0.109” (2.77 mm)
   2. CPT-2: 0.249” (6.3 mm)
K. Stitches:
   1. CPT-1: 9.0 per inch (35.43/10cm)
   2. CPT-2: 8.5 per inch (33.46/10cm)
L. Gage:
   1. CPT-1: 1/12 (47.00 rows per 10 cm)
   2. CPT-2: 5/32 (25.2 rows per 10 cm)
M. Surface Pile Weight:
   1. CPT-1: 22.0 oz. per sq. yd. (746.02 g/m2)
   2. CPT-2: 38.0 oz. per sq. yd. (1288 g/m2)
N. Total Weight:
   1. CPT-1: Per manufacturer specifications
   2. CPT2: Per manufacturer specifications
O. Primary Backing/Backcoating:
   1. CPT-1: Manufacturer’s standard material
   2. CPT-2: Manufacturer’s standard material
P. Secondary Backing:
   1. CPT-1: Manufacturer’s standard material
   2. CPT-2 Manufacturer’s standard material
Q. Backing System:
   1. CPT-1: EcoFlex ICT
   2. CPT-2: EcoFlex ICT
R. Size:
   1. CPT-1: 24 by 24 inches (610 by 610 mm)
   2. CPT-2: 24 by 24 inches (610 by 610 mm)
S. Applied Soil-Resistance Treatment:
   1. CPT-1: Manufacturer's standard material (Sentry Plus)
   2. CPT-2: Manufacturer’s standard material
T. Antimicrobial Treatment:
   1. CPT-1: Manufacturer's standard material
   2. CPT-2: Manufacturer’s standard material

2.02 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.

1. Adhesives shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance. Examine carpet tile for type, color, pattern, and potential defects.

B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:

1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet tile manufacturer.

2. Subfloor finishes comply with requirements specified in Section 03 30 00 "Cast-in-Place Concrete" for slabs receiving carpet tile.

3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.

C. For wood subfloors, verify the following:

1. Underlayment over subfloor complies with requirements specified in Section 06 10 00 "Rough Carpentry."

2. Underlayment surface is free of irregularities and substances that may interfere with adhesive bond or show through surface.

D. For metal subfloors, verify the following:

1. Underlayment surface is free of irregularities and substances that may interfere with adhesive bond or show through surface.

E. For painted subfloors, verify the following:

1. Perform bond test recommended in writing by adhesive manufacturer.

F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. General: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile installation.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch (3 mm) wide or wider and protrusions more than 1/32 inch (0.8 mm) unless more stringent requirements are required by manufacturer's written instructions.

C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet tile manufacturer.

D. Clean metal substrates of grease, oil, soil and rust, and prime if directed by adhesive manufacturer. Rough sand painted metal surfaces and remove loose paint. Sand aluminum surfaces, to remove metal oxides, immediately before applying adhesive.

E. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.03 INSTALLATION

A. General: Comply with CRI 104, Section 14, "Carpet Modules," and with carpet tile manufacturer's written installation instructions.

B. Installation Method: [As recommended in writing by carpet tile manufacturer] [Glue down; install every tile with full-spread, releasable, pressure-sensitive adhesive] [Partial glue down; install periodic tiles with releasable, pressure-sensitive adhesive] [Free lay; install carpet tiles without adhesive].

C. Maintain dye lot integrity. Do not mix dye lots in same area.

D. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.

E. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.

G. Install pattern parallel to walls and borders.

H. Stagger joints of carpet tiles so carpet tile grid is offset from access flooring panel grid. Do not fill seams of access flooring panels with carpet adhesive; keep seams free of adhesive.

3.04 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing carpet tile:

1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet tile manufacturer.
2. Remove yarns that protrude from carpet tile surface.
3. Vacuum carpet tile using commercial machine with face-beater element.

B. Protect installed carpet tile to comply with CRI 104, Section 16, "Protecting Indoor Installations."

C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 09 68 13

SECTION 09 9123
INTERIOR PAINTING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes surface preparation and the application of paint systems on the following interior substrates:

1. Concrete.
2. Concrete masonry units (CMU).
3. Steel.
4. Aluminum (not anodized or otherwise coated).
5. Gypsum board.

B. Related Requirements:

1. Section 051200 "Structural Steel Framing" for shop priming of metal substrates with primers specified in this Section.

1.03 DEFINITIONS

A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.

B. Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

C. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

D. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.

E. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.

F. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.

G. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.04 SUBMITTALS

A. See Section 01 3300 – submittal procedures.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C) per manufacturer instructions.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

3. Dispose of solvent-based materials, and materials used with solvent-based materials; in accordance with requirements of local authorities having jurisdiction.

1.06 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C), within limits recommended by manufacturer for optimum results. Do not apply coatings under environmental conditions outside manufacturer's absolute limits.

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Sherwin-Williams Company (The).

B. Products: Subject to compliance with requirements, provide product listed in other Part 2 articles for the paint category indicated.

2.02 PAINT, GENERAL

A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."

B. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.

2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

C. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction and, for interior paints and coatings applied at Project site, must meet the limitations and restrictions on chemical components set by the following standards.

1. Topcoat Paints: Green Sea Standards GS-11, Paints, First Edition, May 20 1993

2. All other Architectural Coatings, Primers and Undercoats: South Coast Air Quality Management District (SCAQMD) Rule #113, Architectural Coatings, Rules in Effect on January 1, 2004

D. Colors: As selected by Designer from manufacturer's full range:

1. SW 7042; Shoji White; R-230, G-224, B-211

2. SW 7074; Software; R-127, G-132, B-134

3. SW 2851; Sage Green Light; R-112, G-112, B-92

4. SW 6661; Papaya; R-239, G-190, B-112

2.03 PRIMERS/SEALERS

A. Primer Sealer, Latex, Interior

1. Sherwin Williams; ProMar 200 Zero VOC Interior Latex Primer; BW28W02600

2.04 WATER-BASED PAINTS

A. Latex, Interior, Flat, (Gloss Level 1)

1. Sherwin Williams; ProMar 200 Zero VOC Interior Latex Paint

B. Latex, Interior, Egg-Shel, (Gloss Level 2)

1. Sherwin Williams; ProMar 200 Zero VOC Interior Latex Paint

C. Latex, Interior, Semi-Gloss, (Gloss Level 5):

1. Sherwin Williams; ProMar 200 Zero VOC Interior Latex Paint

2.05 WATER-BASED WOOD STAINS

A. Acrylic, Interior, Semi-Gloss (Gloss Level 5)
Sherwin Williams Minwax Water Based Wood Stain

2.06 WATER-BASED PROTECTIVE SEALERS

A. Acrylic, Interior, Semi-Gloss (Gloss Level 5)

1. Sherwin Wiliams Minwax Polycrylic Protective Finish Semi-Gloss

2.07 SOURCE QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:

1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
2. Testing agency will perform tests for compliance with product requirements.
3. Owner may direct Contractor to stop applying coatings if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.
2. Masonry (Clay and CMU): 12 percent.
3. Wood: 15 percent.
4. Gypsum Board: 12 percent.

C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

D. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

E. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.02 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

E. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer.

F. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

G. Aluminum Substrates: Remove loose surface oxidation.

H. Wood Substrates:

1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
2. Sand surfaces that will be exposed to view, and dust off.
3. Prime edges, ends, faces, undersides, and backsides of wood.
4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

3.03 APPLICATION

A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:

1. Paint the following work where exposed in occupied spaces. Reference drawings for paint finish:

a. Equipment, including panelboards.

b. Uninsulated metal piping.

c. Uninsulated plastic piping.

d. Pipe hangers and supports.

e. Metal conduit.

f. Plastic conduit.

g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.

h. Other items as directed by Architect.

2. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.04 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.

1. Contractor shall touch up and restore painted surfaces damaged by testing.

2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.05 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.06 INTERIOR PAINTING SCHEDULE

A. Steel Substrates:

1. Latex over Alkyd Primer System:

a. Prime Coat: Primer, alkyd, anti-corrosive, for metal.
b. Prime Coat: Primer, alkyd, quick dry, for metal.
c. Prime Coat: Primer, alkyd, anti-corrosive, for metal or primer, alkyd, quick dry, for metal.
d. Prime Coat: Shop primer specified in Section where substrate is specified.
e. Intermediate Coat: Latex, interior, matching topcoat.
f. Topcoat: Latex, interior, flat, (Gloss Level 1).
g. Topcoat: Latex, interior, (Gloss Level 2).
h. Topcoat: Latex, interior, (Gloss Level 3).
i. Topcoat: Latex, interior, (Gloss Level 4).
j. Topcoat: Latex, interior, semi-gloss, (Gloss Level 5).
k. Topcoat: Latex, interior, gloss, (Gloss Level 6, except minimum gloss of 65 units at 60 degrees).

2. Institutional Low-Odor/VOC Latex System:

a. Prime Coat: Primer, rust-inhibitive, water based.
b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
c. Topcoat: Latex, interior, institutional low odor/VOC, flat (Gloss Level 1).
d. Topcoat: Latex, interior, institutional low odor/VOC, (Gloss Level 2).
e. Topcoat: Latex, interior, institutional low odor/VOC, (Gloss Level 3).
f. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (Gloss Level 5).

B. Aluminum (Not Anodized or Otherwise Coated) Substrates:

1. Latex System:

a. Prime Coat: Primer, quick dry, for aluminum
b. Intermediate Coat: Latex, interior, matching topcoat.
c. Topcoat: Latex, interior, flat, (Gloss Level 1)
d. Topcoat: Latex, interior, (Gloss Level 2)
e. Topcoat: Latex, interior, (Gloss Level 3)
f. Topcoat: Latex, interior, (Gloss Level 4)
g. Topcoat: Latex, interior, semi-gloss, (Gloss Level 5)
h. Topcoat: Latex, interior, gloss, (Gloss Level 6, except minimum gloss of 65 units at 60 degrees)

C. Gypsum Board Substrates:

1. Latex System:

a. Prime Coat: Primer sealer, latex, interior.
b. Prime Coat: Latex, interior, matching topcoat.
c. Intermediate Coat: Latex, interior, matching topcoat.
d. Topcoat: Latex, interior, flat, (Gloss Level 1).
e. Topcoat: Latex, interior, (Gloss Level 2).
f. Topcoat: Latex, interior, (Gloss Level 3).
g. Topcoat: Latex, interior, (Gloss Level 4).
h. Topcoat: Latex, interior, semi-gloss, (Gloss Level 5).
i. Topcoat: Latex, interior, gloss, (Gloss Level 6, except minimum gloss of 65 units at 60 degrees).

D. Wood Substrates: Including wood trim, architectural woodwork, doors, windows, wood-based panel products, glued-laminated construction, "Latex System" Subparagraph below corresponds to MPI INT 6.1M, MPI INT 6.2D, MPI INT 6.3T, and MPI INT 6.4R.

1. Acrylic System:

a. Prime Coat: Stain, Acrylic for interior wood
b. Intermediate Coat: Acrylic, interior, matching topcoat.
c. Topcoat: Acrylic, interior, semi-gloss

END OF SECTION 099123

SECTION 09 9600
HIGH-PERFORMANCE COATINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. High performance coating for new exterior vertical concrete walls and wainscots.

B. Special preparation of surfaces.

1.02 RELATED REQUIREMENTS

A. Section 09 9123 - Painting and Coating.

1.03 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2012.

B. SSPC-SP 2 - Hand Tool Cleaning; Society for Protective Coatings; 1982 (Ed. 2004).

C. SSPC-SP 3 - Power Tool Cleaning; Society for Protective Coatings; 1982 (Ed. 2004).

D. SSPC-SP 6 - Commercial Blast Cleaning; Society for Protective Coatings; 2007.

E. SSPC-SP 7 - Brush-Off Blast Cleaning; Society for Protective Coatings; 2007.

F. SSPC-SP 10 - Near-White Blast Cleaning; Society for Protective Coatings; 2000 (Ed. 2007).

1.04 SUBMITTALS

A. See Section 01 3300 - submittal procedures.

B. Product Data: Provide data indicating coating materials.

C. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

D. Maintenance Data: Include cleaning procedures and repair and patching techniques.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. Extra Coating Materials: 1 gallon of each type and color.
2. Label each container with manufacturer's name, product number, color number, and room names and numbers where used.

1.05 QUALITY ASSURANCE

A. Maintain one copy of each referenced document that applies to application on site.

B. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

C. Applicator Qualifications: Company specializing in performing the work of this section with minimum 3 years documented experience.

1.06 FIELD CONDITIONS

A. Do not install materials when temperature is below 55 degrees F or above 90 degrees F.

B. Maintain this temperature range, 24 hours before, during, and 72 hours after installation of coating.

C. Restrict traffic from area where coating is being applied or is curing.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

C. Warranty: Include coverage for bond to substrate.

PART 2 PRODUCTS

2.01 HIGH-PERFORMANCE COATINGS

A. Provide concrete coating systems that meet the following minimum performance criteria, unless more stringent criteria are specified:

1. Surface Burning Characteristics: Flame spread/Smoke developed index of 0/0, maximum, when tested in accordance with ASTM E84.

B. Severe Exposure: All minimum criteria, plus:

1. Salt Spray Resistance

2.02 MATERIALS

A. Coatings - General: Provide complete modified waterborne acrylate multi-coat systems formulated and recommended by manufacturer for the applications indicated, in the thicknesses indicated; number of coats specified does not include primer or filler coat.

B. Basis of Design: Tnemec Enviro-crete Series 156 Product substitution: See procedures in Section 01 2513..

1. Product characteristics:

a. Percentage of solids by volume: 50.9 minimum.
b. Dry film thickness, per coat: 6.0 mils, minimum.
c. Comply with the performance requirements specified above for marine weather exposure.

2. Primer for concrete as recommended by coating manufacturer
3. Primer for ferrous metal: as recommended by coating manufacturer
4. Primer for non-ferrous metal:as recommended by coating manufacturer

C. Primers and crack sealing: As recommended by coating manufacturer for specific substrate, unless otherwise specified.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that substrate surfaces are ready to receive work as instructed by the coating manufacturer. Obtain and follow manufacturer's instructions for examination and testing of substrates.

C. Cementitious Substrates: Do not begin application until substrate has cured 28 days minimum and measured moisture content is not greater than 16 percent.

D. Wood: Do not begin application if substrate has moisture content over 12 percent.

3.02 PREPARATION

A. Clean surfaces of loose foreign matter.

B. Remove substances that would bleed through finished coatings. If unremovable, seal surface with shellac.

C. Remove finish hardware, fixture covers, and accessories and store.

D. Existing Painted and Sealed Surfaces:

1. Strip existing paint and coatings from surface.
2. Clean with mixture of trisodium phosphate and water to remove surface grease and foreign matter.

E. Galvanized Surfaces: Remove surface contamination and oils and wash with solvent.

F. Ferrous Metal:

1. Solvent clean.
2. Remove loose rust, loose mill scale, and other foreign substances using power tools according to SSPC-SP 3.

G. Protect adjacent surfaces and materials not receiving coating from spatter and overspray; mask if necessary to provide adequate protection. Repair damage.

3.03 PRIMING

A. Apply primer to all exposed vertical concrete surfaces, unless specifically not required by coating manufacturer. Apply in accordance with coating manufacturer's instructions.

B. Wood: Prior to priming patch with filler to produce smooth, even surface.

C. Concrete: Prior to priming, patch with masonry filler recommended by coating manufacturer to produce smooth surface.

3.04 COATING APPLICATION

A. Apply coatings to all exposed vertical concrete surfaces in accordance with manufacturer's instructions, to thicknesses specified.

B. Apply in uniform thickness coats, without runs, drips, pinholes, brush marks, or variations in color, texture, or finish. Finish edges, crevices, corners, and other changes in dimension with full coating thickness.

3.05 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

B. Clean surfaces immediately of overspray, splatter, and excess material.

C. After coating has cured, clean and replace finish hardware, fixtures, and fittings previously removed.

3.06 PROTECTION

A. Protect finished work from damage.

3.07 SCHEDULE

A. Colors: As selected from manufacturer’s standard light and grey tones.

END OF SECTION

SECTION 09 9713.23

EXTERIOR COATING SYSTEMS FOR STRUCTURAL STEEL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. This specification defines the requirements for materials, surface preparation, application, and touch up of coatings for structural steel columns on the Nome State Office Building (SOB). Where a conflict exists between this specification and the referenced standards or manufacturers' product data sheets, this specification applies.
No revisions and or addendum's shall be made to this specification without the review and approval of the project Corrosion Engineer.

1.02 RELATED SECTIONS

A. Section 01 3300 – Submittals.

B. Section 01 3319 – Shop Drawings, Product Data and Samples.

1.03 REFERENCES

A. Alaska Statute (AS):

1. 18.63 Hazardous Painting Certification

B. American Society for Testing and Materials (ASTM):

1. ASTM D2697 Standard Test Method for Volume Nonvolatile Matter in Clear or Pigmented Coatings

2. ASTM D1640 Standard Test Method for Drying, Curing, or Film Formation of Organic Coatings at Room Temperature

3. ASTM D4285 Standard Test Method for Indicating Oil or Water in Compressed Air

4. ASTM E337 Standard Test Method for Measuring Humidity with a Psychrometer (the Measurement of Wet-and Dry-Bulb Temperatures

C. Environmental Protection Agency (EPA):

1. EPA 24 Determination of Volatile Matter Content, Water Content, Density, Volume Solids, and Weight Solids of Surface Coatings

D. National Association of Corrosion Engineers (NACE):

1. SP0188-2006 Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates.

2. RP0287-2002 Field Measurement of Surface Profile of Abrasive Blast-Cleaned Steel Surfaces Using a Replica Tape

D. Steel Structures Painting Council (SSPC) Specifications:

1. SSPC-PA 1 Shop, Field, and Maintenance Painting

2. SSPC-PA 2 Measurement of Dry Paint Thickness with Magnetic Gauges

3. SSPC-SP 1 Solvent Cleaning

4. SSPC-SP 10 Near White Blast Cleaning

5. SSPC-VIS 1 Guide and Reference Photographs for Steel Surfaces Prepared by Dry Abrasive Blast Cleaning (Revised 2002).

1.04 SUBMITTALS

A. Refer to Section 01 3300 – Submittal Procedures and Section 01 3323 – Shop Drawings, Product Data and Samples, for submittal requirements and procedures.

B. Contractor shall submit for approval the following items twenty-one (21) days prior to the start of coatings application:

1. Applicators: Provide information on the qualifications, experience, and certification(s) of all coating applicators to be utilized on the Project.

2. Inspectors: Provide information on the qualifications, experience, and certification(s) of coating inspectors to be utilized on the Project.

3. Material Data Sheets: Provide Manufacturers Technical Data Sheets for all paints, coatings, solvents, detergents and degreasers planned for use.

4. Application Instructions & Recommendations: Provide manufacturers application instructions and recommendations for each product.

Instruction and recommendation information should include surface prep, ambient temperature and humidity requirements, thinning information, recoat windows, curing times and other relevant application information.

5. MSDS Information: Provide Material Safety Data Sheets (MSDS) for all coatings and coating related products used.

6. Quality Control and Inspection Program: Provide a written plan and procedures that documents the Contractor's proposed Quality Control and Inspection program. Information should include safe operating procedures, planned inspection points, quality assurance measures, etc.

7. Alternate Coating System: If different manufacturers and/or coating materials are proposed provide Manufacturer name, certification and documented experience information; technical and performance information to demonstrate product capability, fitness for service in belowground arctic applications, corrosion and dielectric resistance information, and chemical properties. Approval of alternate material is required prior to proceeding.

C. The Contractor shall submit the following items on a daily basis during coating application activities:

1. Temperature, humidity, and dew point readings during coating applications.

2. Abrasive blast profile information.

3. Magnetic dry film thickness readings for each coating applied.

1.05 QUALIFICATIONS

A. Coating Manufacturer: The coating Manufacturer must be a company specializing in the manufacture of coating systems as specified in this Specification with a minimum of 5 years of documented experience.

B. Contractor: The Contractor must be a company specializing in performing shop and field applied coatings for structural steel systems with a minimum 5 years of documented experience.

C. Painter: The painter must be an individual specializing in performing work of this Specification with a minimum of 2 years documented experience and must be certified in the State of Alaska in accordance with AS 18.63.

D. Coating Inspector: Coating inspectors must be trained in the inspection, application, and testing of coatings with the following minimum requirements:

1. Must have passed Session One of the NACE International Coating Inspector Program (CIP) with a current and active certificate.

2. Must have a minimum of 2 years of industrial coating experience.

1.06 QUALITY CONTROL

A. Contractor shall provide and maintain an effective quality control program to assure conformance to the Specifications and plans with respect to materials, workmanship, finish, and functional performance. The Contractor's quality control program shall provide an independent NACE Certified Coating Inspector to inspect and perform testing for all surface preparation and coating application relevant to this Specification.

B. Unless specified herein, the coating manufacturer's printed recommendations and instructions for shelf life, surface preparation, mixing, thinning, handling, applying, curing, and protecting coating and for all other procedures relative to coating shall be strictly observed.

C. All coating materials shall be fully examined and inspected prior to use to verify that they have been stored properly, have not exceeded the manufacturer's shelf life, and that they meet the requirements of this Specification. Materials that are found to be improperly stored or are otherwise out of compliance are subject to rejection and replacement at Contractor expense.

D. It is the applicator's responsibility to perform Work to the requirements of this Specification and to conduct inspections and tests necessary to ensure compliance. The Owner may conduct any inspection deemed necessary to verify compliance.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver all coating materials to the project site in the original, unopened containers. The packaging shall be plainly marked with the name of the manufacturer, product, date of manufacture, shelf-life, batch number, and destination.

B. Protect the coating materials from freezing or overheating. Transport and store the coating materials in areas between 45° F and 100° F. If the coating materials freeze or overheat (exceed 100° F), reject the coating materials and notify the Project Representative.

PART 2 MATERIALS

2.01 COATING SYSTEM

A. The following materials can be used for the subject coating applications. Coating system # 1 materials are for use on the structural columns in areas to be encapsulated

in concrete. Coating System # 2 is intended for use on structural columns in areas not encapsulated in concrete and to be directly exposed to sunlight. Do not tint, shade, or modify the coating formulation at the job site.

Coating System # 1

Manufacturer No. 1

Coating Material	**Coating Thickness (DFT)**		
	Minimum (mils)	**Maximum (mils)**	**Average (mils)**
Primer Coat: Bar Rust 236	6.0	8.0	7.0
Finish Coat: Bar Rust 236	6.0	8.0	7.0
Total	12.0	16.0	14.0

Note:

1. Bar Rust 236 is a Devoe High Performance Coatings product, ICI Paints North America, 15885 W. Sprague Rd., Strongsville, OH 44136 (www.devoecoatings.com).
2. The primer coat shall contrast in color from the top coat.
3. Recommended thinner, Devoe T-10.

Manufacturer No. 2

Coating Material	**Coating Thickness (DFT)**		
	Minimum (mils)	**Maximum (mils)**	**Average (mils)**
Primer Coat: Interseal 670HS	6.0	8.0	7.0
Finish Coat: Interseal 670HS	6.0	8.0	7.0
Total	12.0	16.0	14.0

Note:

1. Interseal is an International Protective Coatings product, 6001 Antoine Drive, Houston, TX 77901 (www.international-pc.com).
2. The primer coat shall contrast in color from the top coat.
3. Recommended thinner: International GTA220.

Coating System # 2

Manufacturer No. 1

Coating Material	**Coating Thickness (DFT)**		
	Minimum (mils)	**Maximum (mils)**	**Average (mils)**
Primer Coat: Bar Rust 236	6.0	8.0	7.0
Intermediate Coat: Bar Rust 236	6.0	8.0	7.0
Finish Coat: Devthane 359	4.0	6.0	5.0
Total	16.0	22.0	19.0

Note:

1. Bar Rust 236 is a Devoe High Performance Coatings product, ICI Paints North America, 15885 W. Sprague Rd., Strongsville, OH 44136 (www.devoecoatings.com).
2. The primer coat shall contrast in color from the top coat.
3. Recommended thinner, Devoe T-10.

Manufacturer No. 2

Coating Material	**Coating Thickness (DFT)**		
	Minimum (mils)	**Maximum (mils)**	**Average (mils)**
Primer Coat: Interseal 670HS	6.0	8.0	7.0
Intermediate Coat: Interseal 670HS	6.0	8.0	7.0
Finish Coat: Interthane 870 HS	3.0	5.0	4.0
Total	15.0	21.0	18.0

Note:

1. Interseal is an International Protective Coatings product, 6001 Antoine Drive, Houston, TX 77901 (www.international-pc.com).
2. The primer coat shall contrast in color from the top coat.
3. Recommended thinner for Interseal-International GTA220, For Interthane GTA013

2.02 ABRASIVE BLAST MATERIALS

A. Abrasive blast materials shall use dry, neutral pH, hard abrasives of angular configuration that are free of oil, dust, clay or other foreign particles. The following lists acceptable abrasive materials and manufacturers:

1. Green Diamond 20/50 nickel slag: Green Diamond Nickel Company, 5093 Riddle By-Pass Rd., Riddle, OR 97469.

2. GMA 30/60 or 30/40 garnet: Barton Mines Corporation, 1658 Cole Blvd., Suite 190, Golden, CO 80401

3. Meyers Idaho 30/40 garnet: Emerald Creek Garnet Milling Co., Route 4, Fernwood, ID 83830

4. Ruby Red 30/40 garnet: Ruby Garnet Products, Alder, Montana

2.03 CLEANER

A. The following additives shall be used for power washing surfaces in preparation for coating application:

1. Cleaner: Devprep 88 Heavy Duty Cleaner.

2. Chlor*RID or Chlor*RID DTS (Chlor*RID International, Inc. P.O. Box 908, Chandler, AZ 85244)

PART 3 EXECUTION

3.01 SAFETY

A. It is the responsibility of the Contractor and any subcontractors to perform all work in a safe manner. Also, it is the responsibility of the Contractor to assure that all applicable health and safety standards and all local, state, and federal safety regulations are met. The omission in this Specification of any applicable safety regulation does not relieve the Contractor of responsibility to comply.

B. The Contractor shall keep on hand and/or post copies of all local, state, and federal safety regulations governing the work procedures at the work site. This shall also include copies of the Material Safety Data Sheets (MSDS) for all chemicals used on the Project. The Contractor shall brief all workers at the job site of the location of the regulations and MSDS.

C. Provide safe access to the work areas. The work areas shall be kept free of debris.

D. Any ignition source, such as internal combustion engines, welding operations, smoking areas, shall be kept at a safe distance from surfaces during coating preparation, application and curing.

E. Blast nozzles shall be equipped with a “deadman” type shut-off device. Blasting hoses, spray equipment, air movers, and other type equipment shall be grounded.

F. Inspect protective clothing and personal protective equipment before use to ensure they are in proper, functioning condition.

G. It is the Contractor's responsibility to dispose of all materials, both hazardous and non-hazardous. All unused mixed materials shall be disposed of immediately. All cans containing coating materials or thinners, containers that were used for mixing materials, and rags or other items contaminated with coating materials or thinners shall be disposed of according to applicable safety and waste disposal regulations.

H. The Contractor shall address all safety issues regarding surface preparation and coating of in-service and/or out-of-service petroleum piping. This shall include, but is not limited to, grounding of equipment and sealing of vents and other openings during blasting, spraying, or other activities that may produce static charges. Coordinate with the Fuels Manager while performing surface preparations or painting.

3.02 PRE-JOB CONFERENCE

A. A meeting shall be held, prior to any work being performed, to review this and other Project Specifications. The Engineer, Contractor, Inspector, and Manufacturer's Representative should be invited to attend.

B. The Contractor shall be responsible for scheduling the pre-job conference meeting.

C. Any proposed deviations from this Specification must be brought to the attention of the Engineer at or before the pre-job conference.

3.03 SURFACE PREPARATION

A. Remove any factory or field testing marks made with paint or "magic markers" using thinner or a cleaner that does not leave a residue.

B. Clean steel surfaces prior to blast cleaning per SSPC SP 1 using Devprep 88. Rinse with fresh water (less than 100 ppm chlorides) to obtain a clean wetted metal surface with a pH between 6.5 and 7.5. For pitted steel, use a pressurized fresh water rinse with a minimum water pressure of 200 psi to obtain a pH between 6.5 and 7.5.

C. For surfaces subject to chloride contamination (such as the steel on the seaward side of the building), perform a second wash using Chlor*RID or Chlor*RID DTS per manufacturer's recommendations. Rinse with fresh water (less than 100 ppm of chlorides) to obtain a wetted, metal surface with a pH between 6.5 and 7.5.

D. Inspect all steel surfaces for existing damage or imperfections that may subject the pending coating application to potential failure. Damage and imperfections may

include dents, gouges, scrapes, pits, anomalous weld issues, etc. Bring any imperfections to the attention of the Project Representative for evaluation and repair directions.

E. Remove all sharp edges, protuberances, or weld spatter via soft pack grinding or sanding.

Note:	*All grinding and sanding activities shall take the repairs down to the original steel surface level only. Repairs that require grinding and sanding into the steel surface (i.e. that result in wall loss) shall require the notification and approval of the Project Representative.*

F. Blast clean the external surfaces of all applicable piping per SSPC SP 10. At least 95% of each square inch of surface area must be free of all visible residues, and the remainder is limited to the light discoloration allowed by SSPC SP 10. Abrasive blasting shall require the following:

1. Do not use wet, contaminated or used abrasive material.

2. Examine the abrasive for cleanliness and proper grade size. Remove a handful of abrasive at the start of each shift, place in clean water, and evaluate for clay, oil, or other contaminants. Abrasive blast material containing clay, oil, or other contaminants shall be rejected.

3. Determine the cleanliness of blasting air and pressure developed at the nozzle in accordance with ASTM D4285 at the start of each shift. DO NOT use contaminated air for abrasive blasting activities.

4. Ensure that the surface temperature of the substrate to be blasted and coated is a minimum of 40° F and 5° F above the dew point, as measured per ASTM E337, at all times between blast and primer coat application.

5. Achieve a surface anchor-pattern profile of not less than 1.5 mils or greater than 3.5 mils. Determine surface anchor-pattern profile with extra coarse Testex Press-O-Film in accordance with NACE RP0287-2002.

6. Comparatively define the degree of surface preparation using SSPC VIS 1.

G. Remove dust and spent abrasive from the surface by using oil-free pressurized air, brushing, or vacuum cleaning.

H. Prevent rusting and contamination of prepared surfaces. If rusting or contamination occurs, restore the surface to meet the requirements of SSPC SP 10.

I. Prepared steel must receive primer within 8 hours of blast cleaning.

3.04 APPLICATION

A. Verify that the surface is free of rust and contamination, and that the substrate surface temperature has been maintained at the minimum 40° F and 5° F above the dew point (measured per ASTM E337) requirements for the entire period since blast cleaning, prior to commencing coating application.

B. Prime the prepared surfaces within 8 hours of abrasive blast cleaning and within the time recommended by the manufacturer for the climatic conditions. Never coat after corrosion or recontamination has occurred. In the event that coating application does not occur within the prescribed time window, repeat the abrasive blast for the entire area to be coated.

C. Mix coating in accordance with manufacturer's instructions.

D. Thin the coating materials a maximum of 10% using the manufacturer's recommended thinner (Devoe T-10 thinner for Bar-Rust 236 applications).

E. Mixed coating materials have a usable pot life of 4 hours at 77° F (for Bar-Rust 236 applications). Useable pot life starts when parts A and B are mixed together.

F. Prior to spraying, verify that the compressed air source is clean (free of oil and moisture) using a blotter test. Perform a blotter test at least once per shift. Air cleanliness shall be in accordance with ASTM D4285. DO NOT use contaminated air for coating application.

F. Apply coating in accordance with the applicable sections of SSPC PA 1, this Specification, and the manufacturer's current instructions. Use airless or conventional spray equipment for all coating unless specific stripe coating or coating repair conditions (see Section 3.05 of this Specification) warrant other methods.

G. Apply coating materials in uniform layers of 50% overlapping strokes. Continuously check WFT to ensure correct application. Use contrasting colors for each coat (primer vs. finish) for verification of complete coverage.

H. Stripe coat irregular surfaces such as welds, joints, corrosion areas, bolts, exposed threads, interstices, or any other surface where coating has a tendency to break down prior to commencing primer coat applications. Stripe coating may use brush applications where conditions prohibit the effective application of sprayed coatings. Stripe coating shall use primer coat material and may be thinned up to 25% using the manufacturer's specified thinner material.

I. Primer Coat: If the primer coat fails to meet the minimum specified DFT, apply the WFT required to obtain the minimum specified DFT. Blast clean and recoat any area where the second application does not met the DFT required.

J. Intermediate Coat (System #2): If the intermediate coat fails to meet the minimum specified DFT, apply the WFT required to obtain the minimum specified DFT. Apply the intermediate coat within 72 hours after application of

the primer coat. If more than 72 hours has elapsed before the intermediate coat can be applied, either brush-off blast clean or lightly hand sand the primer coat surface to kill the gloss and establish an anchor pattern for the finish coat

K. Finish Coat: Finish coat application may commence after an adequate cure time (per manufacturer's specifications) has been met and the Inspector has verified that the primer coat meets the requirements of this Specification. The finish coat must be applied a within 72 hours of the primer coat application. If more than 72 hours has elapsed, the primer coat surface must be brush blasted or hand sanded to establish an anchor profile for the finish coat. Additionally, if the finish coat fails to meet the minimum specified DFT, an additional coating thickness may be applied to meet the DFT requirement.

L. Blast clean and recoat any excessive coating thickness that results in mud cracking, fisheyes, pores, or blistering of the cured coating.

M. Brush out all coating runs and sags immediately.

N. Where structural column extends above the concrete cap, apply coating to a minimum of 12 inches above top of the cap.

3.05 FORCE CURING

A. After coating, hold the piping area to the existing temperature for 90 minutes before adding heat.

B. After the 90 minute period, heat may be applied to the area; however, the ambient temperature around the column must not exceed 110° F.

C. Do not force cure coatings under conditions which may lead to cracking, wrinkling, blistering, formation of pores, or other may otherwise detrimentally affect surface quality.

3.06 INSPECTION

A. Measure the DFT after each coat and the total DFT for the entire coating system in accordance with SSPC-PA 2. Calibrate gages using NIST, Certified Coating Thickness Standards for Nonmagnetic Coating on Steel.

B. After surface preparation work, inspect surfaces to receive coatings and repair all defects prior to applying coatings.

C. Surface preparation and coating application are subject to inspection by the NACE Inspector. Remove any materials that have been determined by the Inspector to be improperly applied or excessively damaged and replace to the satisfaction of the Project Representative. This also applies to materials that have been excessively damaged by cleaning procedures.

D. After the finish coat has fully cured completely, inspect the coating visually and perform a holiday inspection using holiday detector set to 1400 volts DC. Holiday testing shall cover 100% of the coated area and shall be performed in accordance with NACE SP 0188-2006. Use a suitable surfactant in accordance with manufacturer's instructions. Mark all holidays during the inspection with a chloride-free marker and repair per Section 3.07 of this Specification.

E. Before commencing surface prep and coating activities, the coatings Contractor and the NACE Inspector shall agree on mutually acceptable "hold points". The Contractor shall not continue work past each hold point until the NACE Inspector has approved the previous work. Hold points shall include, but are not limited to the following:

1. Verification of proper materials and shelf-life.

2. Verification of pre-blast surface cleanliness and environmental conditions (substrate temperatures, dew point spreads, etc.)

3. Verification and evaluation of post-blast surface cleanliness and anchor profiles.

4. Verification and evaluation of pre-primer coat surface cleanliness and environmental conditions.

5. Verification and evaluation of primer coat application and DFTs

6. Verification and evaluation of pre-finish coat surface cleanliness and environmental conditions.

7. Verification and evaluation of finish coat application and DFTs

8. Verification of holiday testing and coating repairs.

F. The responsibility of the Inspector is to approve or disapprove Work according to these Specifications. The inspector shall immediately bring any deviations from this specification to the attention of the Project Representative. The inspector does not have authority to direct work.

3.07 COATING REPAIRS

A. Repair pinholes and small area holidays (i.e. one square inch or smaller) by daubing the holiday with the specified finish coat material mixed without thinner or solvent.

B. Allow the repair coating to dry a minimum of 3 hours and until the holiday detector conductor does not imprint or damage the coating.

C. For medium sized repairs (i.e. between 1 and 6 square inches), prep the exposed metal surface in accordance with Sections 3.03, abrading the surrounding coating

via hand sanding or brush blasting application to feather repair coatings onto. Apply multiple coats, as required, to achieve the specified DFTs noted in Section 2.01 (B) of this Specification. Feather repair coating onto the abraded existing coatings using a minimum of 3-inches of overlap and allow adequate cure time per manufacturer's instructions.

D. For repairs of larger areas such as field welds or areas greater than 6 square inches, treat the repair as if it were a new coating application requiring surface prep, primer coat and finish coat. Feather the repair coating onto the surrounding coating (with a minimum of 3-inches of overlap) after first hand sanding or brush blasting the surrounding finish coat to ensure proper adhesion of the repair coating.

E. When testing the repairs with the holiday detector, test only the locations that were repaired. If holidays persist, repeat steps A and B, above.

END OF SECTION

SECTION 09 9723

EXTERIOR COATING SYSTEMS FOR CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. This Specification defines the requirements for cleaning, repairs, evaluation, surface preparation, materials, application of protective coating systems, and inspections for concrete surfaces on the Nome State Office Building (SOB). Where a conflict exists between this specification and the referenced standards or manufacturers' product data sheets, this specification applies.
No revisions and or addendum's shall be made to this specification without the review and approval of the project Corrosion Engineer.

1.02 RELATED SECTIONS

A. Section 01 3300 – Submittals.

B. Section 01 3319 – Shop Drawings, Product Data and Samples.

1.03 REFERENCES

A. Alaska Statute (AS):

1. 18.63 Hazardous Painting Certification

B. American Society for Testing and Materials (ASTM):

1. ASTM D2697 Standard Test Method for Volume Nonvolatile Matter in Clear or Pigmented Coatings

2. ASTM D1640 Standard Test Method for Drying, Curing, or Film Formation of Organic Coatings at Room Temperature

3. ASTM D4258 Standard Practice for Surface Cleaning Concrete for Coating

4. ASTM D4259 Standard Practice for Abrading Concrete

5. ASTM D4285 Standard Test Method for Indicating Oil or Water in Compressed Air

6. ASTM E337 Standard Test Method for Measuring Humidity with a Psychrometer (the Measurement of Wet-and Dry-Bulb Temperatures

C. Environmental Protection Agency (EPA):

1. EPA 24 Determination of Volatile Matter Content, Water Content, Density, Volume Solids, and Weight Solids of Surface Coatings

D. National Association of Corrosion Engineers (NACE):

1. RP0288-94 Standard Recommended Practice for Inspection of Linings on Steel and Concrete.

D. Steel Structures Painting Council (SSPC) Specifications:

1. SSPC-PA 1 Shop, Field, and Maintenance Painting

2. SSPC-SP 1 Solvent Cleaning

3. SSPC-SP 13 Surface Preparation for Concrete

1.04 SUBMITTALS

A. Refer to Section 01 3300 – Submittal Procedures and Section 01 3323 – Shop Drawings, Product Data and Samples, for submittal requirements and procedures.

B. Contractor shall submit for approval the following items twenty-one (21) days prior to the start of coatings application:

1. Applicators: Provide information on the qualifications, experience, and certification(s) of all coating applicators to be utilized on the Project.

2. Inspectors: Provide information on the qualifications, experience, and certification(s) of coating inspectors to be utilized on the Project.

3. Material Data Sheets: Provide Manufacturers Technical Data Sheets for all paints, coatings, solvents, detergents and degreasers planned for use.

4. Application Instructions & Recommendations: Provide manufacturers application instructions and recommendations for each product. Instruction and recommendation information should include surface prep, ambient temperature and humidity requirements, thinning information, recoat windows, curing times and other relevant application information.

5. MSDS Information: Provide Material Safety Data Sheets (MSDS) for all coatings and coating related products used.

6. Quality Control and Inspection Program: Provide a written plan and procedures that documents the Contractor's proposed Quality Control and Inspection program. Information should include safe operating procedures, planned inspection points, quality assurance measures, etc.

7. Alternate Coating System: If different manufacturers and/or coating materials are proposed provide Manufacturer name, certification and documented experience information; technical and performance information to demonstrate product capability, fitness for service in belowground arctic applications, corrosion and dielectric resistance information, and chemical properties.

C. The Contractor shall submit the following items on a daily basis during coating application activities:

1. Temperature, humidity, and dew point readings during coating applications.

2. Abrasive blast profile information.

3. Wet film thickness readings for each coating applied.

1.05 QUALIFICATIONS

A. Coating Manufacturer: The coating Manufacturer must be a company specializing in the manufacture of coating systems as specified in this Specification with a minimum of 5 years of documented experience.

B. Contractor: The Contractor must be a company specializing in performing shop and field applied coatings with a minimum 5 years of documented experience.

C. Painter: The painter must be an individual specializing in performing work of this Specification with a minimum of 2 years documented experience and must be certified in the State of Alaska in accordance with AS 18.63.

D. Coating Inspector: Coating inspectors must be trained in the inspection, application, and testing of coatings with the following minimum requirements:

1. Must have passed Session One of the NACE International Coating Inspector Program (CIP) with a current and active certificate.

2. Must have a minimum of 2 years of industrial coating experience.

1.06 QUALITY CONTROL

A. Contractor shall provide and maintain an effective quality control program to assure conformance to the Specifications and plans with respect to materials, workmanship, finish, and functional performance. The Contractor's quality control program shall provide an independent NACE Certified Coating Inspector to inspect and perform testing for all surface preparation and coating application relevant to this Specification.

B. Unless specified herein, the coating manufacturer's printed recommendations and instructions for shelf life, surface preparation, mixing, thinning, handling, applying, curing, and protecting coating and for all other procedures relative to coating shall be strictly observed.

C. All coating materials shall be fully examined and inspected prior to use to verify that they have been stored properly, have not exceeded the manufacturer's shelf life, and that they meet the requirements of this Specification. Materials that are found to be improperly stored or are otherwise out of compliance are subject to rejection and replacement at Contractor expense.

D. It is the applicator's responsibility to perform Work to the requirements of this Specification and to conduct inspections and tests necessary to ensure compliance. The Owner may conduct any inspection deemed necessary to verify compliance.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver all coating materials to the project site in the original, unopened containers. The packaging shall be plainly marked with the name of the manufacturer, product, date of manufacture, shelf-life, batch number, and destination.

B. Protect the coating materials from freezing or overheating. Transport and store the coating materials in areas between 45° F and 100° F. If the coating materials freeze or overheat (exceed 100° F), reject the coating materials and notify the Project Representative.

PART 2 MATERIALS

2.01 COATING SYSTEM

A. The following coating systems are acceptable systems for the application to the new and existing concrete surfaces for the Nome SOB. Do not tint, shade, or modify the coating formulation at the job site.

i. **Coating System # 1**

Manufacturer No. 1

Coating Material	**Coating Thickness (DFT)**		
	Minimum (mils)	**Maximum (mils)**	**Average (mils)**
Pre-Prime Coat: Pre-Prime 167	1.0	1.5	1.5
Prime CoatCoat: Bar Rust 236	6.0	8.0	7.0
Finish Coat: Devthane 359	4.0	6.0	5.0
Total	11.0	15.5	13.5

Note:

1. Bar Rust 236 is a Devoe High Performance Coatings product, ICI Paints North America, 15885 W. Sprague Rd., Strongsville, OH 44136 (www.devoecoatings.com).
2. The primer coat shall contrast in color from the top coat.
3. Recommended thinner, Devoe T-10.

2.02 ABRASIVE BLAST MATERIALS

A. Abrasive blast materials shall use dry, neutral pH, hard abrasives of angular configuration that are free of oil, dust, clay or other foreign particles. The following lists acceptable abrasive materials and manufacturers:

1. Green Diamond 20/50 nickel slag: Green Diamond Nickel Company, 5093 Riddle By-Pass Rd., Riddle, OR 97469.

2. GMA 30/60 or 30/40 garnet: Barton Mines Corporation, 1658 Cole Blvd., Suite 190, Golden, CO 80401

3. Meyers Idaho 30/40 garnet: Emerald Creek Garnet Milling Co., Route 4, Fernwood, ID 83830

4. Ruby Red 30/40 garnet: Ruby Garnet Products, Alder, Montana

2.03 CLEANER

A. The following additives shall be used for power washing surfaces in preparation for coating application:

1. Cleaner: Devprep 88 Heavy Duty Cleaner.

2. Chlor*RID or Chlor*RID DTS (Chlor*RID International, Inc. P.O. Box 908, Chandler, AZ 85244)

PART 3 EXECUTION

3.01 SAFETY

A. It is the responsibility of the Contractor and any subcontractors to perform all work in a safe manner. Also, it is the responsibility of the Contractor to assure that all applicable health and safety standards and all local, state, and federal safety regulations are met. The omission in this Specification of any applicable safety regulation does not relieve the Contractor of responsibility to comply.

B. The Contractor shall keep on hand and/or post copies of all local, state, and federal safety regulations governing the work procedures at the work site. This shall also include copies of the Material Safety Data Sheets (MSDS) for all chemicals used on the Project. The Contractor shall brief all workers at the job site of the location of the regulations and MSDS.

C. Provide safe access to the work areas. The work areas shall be kept free of debris.

D. Any ignition source, such as internal combustion engines, welding operations, smoking areas, shall be kept at a safe distance from surfaces during coating preparation, application and curing.

E. Blast nozzles shall be equipped with a “deadman” type shut-off device. Blasting hoses, spray equipment, air movers, and other type equipment shall be grounded.

F. Inspect protective clothing and personal protective equipment before use to ensure they are in proper, functioning condition.

G. It is the Contractor’s responsibility to dispose of <u>all</u> materials, both hazardous and non-hazardous. All unused mixed materials shall be disposed of immediately. All cans containing coating materials or thinners, containers that were used for mixing materials, and rags or other items contaminated with coating materials or thinners shall be disposed of according to applicable safety and waste disposal regulations.

H. The Contractor shall address all safety issues regarding surface preparation and coating of in-service and/or out-of-service petroleum piping. This shall include, but is not limited to, grounding of equipment and sealing of vents and other openings during blasting, spraying, or other activities that may produce static charges. Coordinate with the Fuels Manager while performing surface preparations or painting.

3.02 PRE-JOB CONFERENCE

A. A meeting shall be held, prior to any work being performed, to review this and other Project Specifications. The Engineer, Contractor, Inspector, and Manufacturer's Representative should be invited to attend.

B. The Contractor shall be responsible for scheduling the pre-job conference meeting.

C. Any proposed deviations from this Specification must be brought to the attention of the Engineer at or before the pre-job conference.

3.03 SURFACE PREPARATION

A. Surface preparation will be completed for all exposed concrete both new and existing.

B. Use detergent cleaning or steam cleaning to remove surface contaminants such as oil, grease and dirt prior to abrasive blasting areas to be coated. Use the manufacturer's recommended cleaner or an approved equivalent cleaner which does not leave a residue. Solvents must not be used for cleaning. Steam cleaning may be required for areas with extensive contamination. Refer to ASTM D 4258 for standard cleaning practices.

C. Clean the surfaces of the areas to be coated to the extent necessary to ensure that the entire surface area is free of all contaminates and laitance. Ensure that all remaining concrete is intact and tightly adherent. Refer to SSPC-SP 13 for concrete surface preparation instructions.

D. Remove any unsound concrete within area of voids identified by the Engineer. Flush out cracks or voids with fresh water to remove laitance and dirt.

E. Sweep blast all surfaces prepared using equipment and abrasives outlined above. Sweep blast surfaces according to ASTM D 4259.

1. Do not use wet, contaminated or used abrasive material.

2. Examine the abrasive for cleanliness and proper grade size. Remove a handful of abrasive at the start of each shift, place in clean water, and evaluate for clay, oil, or other contaminants. Abrasive blast material containing clay, oil, or other contaminants shall be rejected.

3. Determine the cleanliness of blasting air and pressure developed at the nozzle in accordance with ASTM D4285 at the start of each shift. DO NOT use contaminated air for abrasive blasting activities.

F. After abrasive blasting, remove residual abrasive and/or debris from the surfaces by vacuum cleaning.

G. Rinse entire surface with clear, fresh water (less than 100 ppm of chlorides) to obtain a wetted surface with a pH between 6.5 and 8.0.For surfaces subject to chloride contamination (such as the concrete on the seaward side of the building), perform a second wash using Chlor*RID or Chlor*RID DTS per manufacturer's recommendations. Rinse with fresh water (less than 100 ppm of chlorides) to obtain a wetted surface with a pH between 6.5 and 7.5.

3.04 APPLICATION

A. Verify that the surface temperature of the area to be coated is a minimum of 50 deg F and 5 deg F above the dew point in accordance with ASTM E 337. These environmental conditions are to be maintained until the coating application is completed.

B. Apply Pre-Prime coat to specified DFT range noted in Table 1 to all exposed surfaces.

C. Back roll pre-prime coat. Allow Pre-prime coat to cure according to manufacturer's instructions.

D. Mix coating materials in accordance with manufacturer's instructions. Do not exceed the manufacturer's recommended pot life. Usable pot life begins when parts A and B are mixed together.

E. Use a power roller or power sprayer as appropriate for all coating material applications unless specific site and equipment conditions warrant use of other coating application methods. Other coating methods are subject to client approval prior to use. Comply with the instructions and recommendations of the coating manufacturer for methods of application and equipment used.

F. Ensure that the surfaces to be coated are clean, dry and free of dirt, debris, grease, oil, salt deposits, laitance and other foreign matter prior to all coating applications.

G. Apply all coating materials in accordance with the application techniques described in this specification and the manufacturer's current instructions. If a conflict exists, this specification shall govern.

H. Apply coating materials in uniform layers of approximately 50 percent overlapping strokes.

I. Blast clean and recoat excessive coating thickness that results in mud cracking, fisheyes, pores or blistering of the cured coating.

J. Work out all coating runs and sags immediately. If runs or sags still exist, allow to dry and remove by hand sanding.

K. Do not force dry coatings under conditions that would cause cracking, wrinkling, blistering, formation of pores, or otherwise detrimentally affect surface quality.

L. Implementation contractor shall submit coating coverage calculations, thinning levels and WFT measurements to the Project Engineer (PE) for verification of adequate resulting DFT for each section coated.

3.05 INSPECTION

A. The implementation contractor shall provided WFT measurements of each applied coating layer of the specified coating system. The frequency of testing the WFT of each coating layer shall be as follows:

1. One WFT test for each 50 ft^2 coated.

B. After surface preparation work, inspect surfaces to receive coatings and repair all defects prior to applying coatings.

C. Surface preparation and coating application are subject to inspection by the NACE Inspector. Remove any materials that have been determined by the Inspector to be improperly applied or excessively damaged and replace to the satisfaction of the Project Representative. This also applies to materials that have been excessively damaged by cleaning procedures.

D. Before commencing surface prep and coating activities, the coatings Contractor and the NACE Inspector shall agree on mutually acceptable “hold points”. The Contractor shall not continue work past each hold point until the NACE Inspector has approved the previous work. Hold points shall include, but are not limited to the following:

1. Verification of proper materials and shelf-life.

2. Verification of pre-blast surface cleanliness and environmental conditions (substrate temperatures, dew point spreads, etc.)

3. Verification and evaluation of post-blast surface cleanliness and anchor profiles.

4. Verification and evaluation of pre-primer coat surface cleanliness and environmental conditions.

5. Verification and evaluation of primer coat application

6. Verification and evaluation of pre-finish coat surface cleanliness and environmental conditions.

7. Verification and evaluation of finish coat application

8. Verification of coating repairs.

E. The responsibility of the Inspector is to approve or disapprove Work according to these Specifications. The inspector shall immediately bring any deviations from this specification to the attention of the Project Representative. The inspector does not have authority to direct work.

3.07 COATING REPAIRS

A. Repair pinholes and small area holidays (i.e. one square inch or smaller) by daubing the holiday with the specified finish coat material mixed without thinner or solvent.

B. Allow the repair coating to dry a minimum of 3 hours and until the holiday detector conductor does not imprint or damage the coating.

END OF SECTION

SECTION 10 2600
WALL AND DOOR PROTECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Corner guards.
   2. Impact-resistant wall coverings.
   3. Door protection systems.

B. Related Sections:
   1. Section 055000 "Metal Fabrications" for angle corner guards.
   2. Section 087100 "Door Hardware" for metal armor, kick, mop, and push plates.

1.03 SUBMITTALS

A. See Section 01 3300 – submittal procedures.

1.04 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Wall-Guard Covers: Full-size plastic covers of maximum length equal to 2 percent of each type, color, and texture of units installed, but no fewer than two, 8-foot- (2.4-m-) long units.

B. Include mounting and accessory components. Replacement materials shall be from same production run as installed units.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

B. Source Limitations: Obtain impact-resistant wall protection units from single source from single manufacturer.

C. Product Options: Drawings indicate size, profiles, and dimensional requirements of impact-resistant wall protection units and are based on the specific system indicated. Refer to Section 014000 "Quality Requirements."
   1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

D. Surface-Burning Characteristics: Provide impact-resistant, plastic wall protection units with surface-burning characteristics as determined by testing identical products per ASTM E 84, NFPA 255, or UL 723 by UL or another qualified testing agency.

E. Regulatory Requirements: Comply with applicable provisions in [the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines] [and] [ICC/ANSI A117.1].

F. Pre-installation Conference: Conduct conference at Nome State Office Building in Nome, Alaska.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store impact-resistant wall protection units in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

1. Maintain room temperature within storage area at temperature range per manufacturer guidelines not less than 70 deg F (21 deg C) during the period plastic materials are stored.
2. Keep plastic sheet material out of direct sunlight.
3. Store plastic wall protection components for a minimum of 72 hours, or until plastic material attains a minimum room temperature of per manufacturer guidelines at 68 deg F (21 deg C).
   a. Store corner-guard covers in a vertical position.
   b. Store wall-guard covers in a horizontal position.
4. Storage of Materials: Store rigid panels flat and elevated of floors in a dry place at the project site.
5. Handling: Remove foreign matter from face of panels by use of a soft bristle brush, avoiding abrasive action.

1.07 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install impact-resistant wall protection units until building is enclosed and weatherproof, wet work is complete and dry, and HVAC system is operating and maintaining temperature per manufacturer guidelines at 68 deg F (21 deg C) for not less than 72 hours before beginning installation and for the remainder of the construction period.

1.08 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of impact-resistant wall protection units that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Structural failures.
   b. Deterioration of plastic and other materials beyond normal use.

PART 2 - PRODUCTS

2.01 MATERIALS

A. PVC Plastic: ASTM D 1784, Class 1, textured, chemical- and stain-resistant, high-impact-resistant PVC or acrylic-modified vinyl plastic with integral color throughout; thickness as indicated.

1. Impact Resistance: Minimum 30.4 ft-lbf/in. of notch when tested according to ASTM D 256-90b, Impact Resistance of Plastics

2. Self-extinguishing when tested according to ASTM D 635-74
3. Flame-Spread Index: 25 or less.
4. Smoke-Developed Index: 450 or less.

B. Stainless-Steel Sheet: ASTM A 240/A 240M.

C. Fasteners: Aluminum, nonmagnetic stainless-steel, or other noncorrosive metal screws, bolts, and other fasteners compatible with items being fastened. Use security-type fasteners where exposed to view.

D. Adhesive: As recommended by impact-resistant plastic wall protection manufacturer and with a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.02 CORNER GUARDS

A. Surface-Mounted, Stainless Steel Corner Guards, fabricated with 90- or 135-degree turn to match wall condition;

1. Basis-of-Design Product: Subject to compliance with requirements, provide product by the following:
   a. WallGuard.com.
2. Fabrication: Corner guars shall be factory formed from stainless steel sheet.
   a. Lengthwise perimeter edges to include nominal 10 degree return bend
   b. Edge burrs shall be removed
   c. Satin finish grain oriented parallel with length
   d. Single piece fabrication to 144” length.
3. Mechanical fasteners
   a. For optional pre-drilled holes: stainless steel #6 c 1-1/2” Philips oval head sheet metal screw with stainless steel cup washer
   b. For optional pre-frilled and countersunk holes: stainless steel #6 x 1-1/2” Philips oval head sheet metal screw.
   c. Tamper resistant fasteners available.

2.03 IMPACT-RESISTANT WALL COVERINGS

A. Impact-Resistant Sheet Wall Covering: Fabricated from plastic sheet wall-covering material.

1. Basis-of-Design Product: Subject to compliance with requirements, provide product by the following:
   a. IPC Door and Wall Protection Systems; Division of InPro Corporation.
2. Size: 48 by 120 inches for sheet.
3. Sheet Thickness: 0.040 inch (1.0 mm).
4. Color and Texture: As selected by Architect from manufacturer's full range, #0350 Sharkskin.
5. Height: Wainscot to 4’-0” A.F.F.
6. Trim and Joint Moldings: Extruded rigid plastic that matches sheet wall covering color.
7. Mounting: Adhesive.

2.04 DOOR PROTECTION SYSTEMS

A. General: Comply with BHMA A156.6.

1. For fire-rated doors, provide door protection systems that are UL listed and labeled.

B. Protection Plates: Fabricated from stainless steel, .05 inches thick.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:
      a. Rockwood Manufacturing

C. Armor Plates: Minimum .05 inches thick, beveled four sides.
   1. Size: 36 inches (914 mm) high by door width, with allowance for frame stops.
   2. Color and Texture: As selected by Architect from manufacturer's full range, satin stainless steel.
   3. Mounting: Countersunk screws through factory-drilled mounting holes

D. Kick/Mop Plates: Minimum .05 inches thick, beveled four sides.
   1. Size: 8 inches (203 mm) high by door width, with allowance for frame stops.
   2. Color and Texture: As selected by Architect from manufacturer's full range, satin stainless steel.
   3. Mounting: Countersunk screws through factory-drilled mounting holes

2.05 ACCESSORIES

A. Division Bars, Corner Trim: Panel manufacturer's standard length, non staining, extruded vinyl pieces; longest length possible to eliminate end joints.

B. Caulks and Adhesives: Clear silicone sealant and construction adhesive as recommended by the panel manufacturer.

2.06 FABRICATION

A. Fabricate impact-resistant wall protection units to comply with requirements indicated for design, dimensions, and member sizes, including thicknesses of components.

B. Preform curved semirigid, impact-resistant sheet wall covering in factory for radius and sheet thickness as follows:
   1. Sheet Thickness of 0.040 Inch (1.0 mm): 24-inch (610-mm) radius.

C. Assemble components in factory to greatest extent possible to minimize field assembly. Disassemble only as necessary for shipping and handling.

D. Fabricate components with tight seams and joints with exposed edges rolled. Provide surfaces free of wrinkles, chips, dents, uneven coloration, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.

2.07 METAL FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
   1. Remove tool and die marks and stretch lines, or blend into finish.
   2. Grind and polish surfaces to produce uniform finish, free of cross scratches.
   3. Run grain of directional finishes with long dimension of each piece.
   4. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

B. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances, fire rating, and other conditions affecting performance of work.

B. Examine walls to which impact-resistant wall protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.

1. Examine backup surfaces to determine that corners are plumb and straight, surfaces are smooth, uniform, clean and free from foreign matter, nails countersunk, joints and cracks filled flush and smooth with the adjoining surface.

2. For impact-resistant wall protection units attached with adhesive or foam tape, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Complete finishing operations, including painting, before installing impact-resistant wall protection system components.

B. Before installation, clean substrate to remove dust, debris, and loose particles.

3.03 INSTALLATION

A. General: Install impact-resistant wall protection units level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.

1. Install impact-resistant wall protection units in locations and at mounting heights indicated on Drawings.

2. Provide splices, mounting hardware, anchors, and other accessories required for a complete installation.

a. Provide anchoring devices to withstand imposed loads.

b. Where splices occur in horizontal runs of more than 20 feet (6.1 m), splice aluminum retainers and plastic covers at different locations along the run, but no closer than 12 inches (305 mm).

c. Adjust end and top caps as required to ensure tight seams.

3.04 CLEANING

A. Immediately after completion of installation, clean plastic covers and accessories using a standard, ammonia-based, household cleaning agent.

B. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

C. Wash the panel faces with warm soapy water.

D. Provide final protection and maintain conditions in a manner acceptable to Installer that ensures panel assemblies are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 10 26 00

SECTION 10 2800
TOILET ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Accessories for toilet rooms.

B. Grab bars.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 – Wood Blocking for accessory substrate anchorage.

1.03 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities; Final Rule; current edition; (ADA Standards for Accessible Design).

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2012.

C. ASTM A269 - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2010.

D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2011.

E. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2010.

F. ASTM C1036 - Standard Specification for Flat Glass; 2011e1.

G. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror; 2008.

H. ASTM F2285 - Standard Consumer Safety Performance Specification for Diaper Changing Tables for Commercial Use; 2004 (Reapproved 2010).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with the placement of internal wall reinforcement, concealed ceiling supports, and reinforcement of toilet partitions to receive anchor attachments.

1.05 SUBMITTALS

A. See Section 01 3300 - submittal procedures.

B. Product Data: Provide data on accessories describing size, finish, details of function, attachment methods.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Toilet Accessories:

1. A & J Washroom Accessories Inc: www.ajwashroom.com.
2. American Specialties, Inc: www.americanspecialties.com.
3. Bradley Corporation: www.bradleycorp.com.
4. Bobrick
5. Substitutions: Section 01 2513 - Product Requirements.

2.02 MATERIALS

A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.

1. Grind welded joints smooth.
2. Fabricate units made of metal sheet of seamless sheets, with flat surfaces.

B. Keys: Provide three keys for each accessory to Owner; master key all lockable accessories.

C. Stainless Steel Sheet: ASTM A666, Type 304.

D. Stainless Steel Tubing: ASTM A269, Type 304 or 316.

E. Galvanized Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G90/Z275 coating.

F. Mirror Glass: Float glass, ASTM C1036 Type I, Class 1, Quality Q2, with silvering, protective and physical characteristics complying with ASTM C1503.

G. Adhesive: Two component epoxy type, waterproof.

H. Fasteners, Screws, and Bolts: Hot dip galvanized, tamper-proof, security type.

I. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

2.03 FINISHES

A. Stainless Steel: No. 4 satin brushed finish, unless otherwise noted.

B. Baked Enamel: Pretreat to clean condition, apply one coat primer and minimum two coats epoxy baked enamel.

2.04 TOILET ROOM ACCESSORIES

A. Toilet Paper Dispenser: Double roll, surface mounted bracket type, chrome-plated zinc alloy brackets, spindleless type for tension spring delivery designed to prevent theft of tissue roll.

1. Attached Purse Shelf: 0.03 inch satin finished stainless steel, with rolled or formed edge at front.

B. Semi Recessed Paper Towel Dispenser/ Trash Receptacle: Folded paper type, brushed stainless steel, semi-recessed, with viewing slots on sides as refill indicator and tumbler lock.

1. Capacity: 300 C-fold minimum.

C. Seat Cover Dispenser: Stainless steel, surface-mounted, reloading by concealed opening at base, tumbler lock.

1. Minimum capacity: 250 seat covers, each side.

D. Grab Bars: Stainless steel, nonslip grasping surface finish.

1. Standard Duty Grab Bars:

a. Push/Pull Point Load: 250 pound-force, minimum.
b. Dimensions: 1-1/4 inch outside diameter, minimum 0.05 inch wall thickness, exposed flange mounting, 1-1/2 inch clearance between wall and inside of grab bar.
c. Length and Configuration: As indicated on drawings.

E. Sanitary Napkin Disposal Unit: Stainless steel, surface-mounted, self-closing door, locking bottom panel with full-length stainless steel piano-type hinge, removable receptacle.

F. Diaper Changing Station: Wall-mounted folding diaper changing station for use in commercial toilet facilities, meeting or exceeding ASTM F2285.

1. Style: Horizontal.
2. Material: Polyethylene.
3. Mounting: Surface.
4. Color: Gray.
5. Minimum Rated Load: 300 lbs

G. Wall mounted mirror with stainless steel frame. See Drawings for size and location.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify exact location of accessories for installation.

C. Verify that field measurements are as indicated on drawings.

3.02 PREPARATION

A. Deliver inserts and rough-in frames to site for timely installation.

B. Provide templates and rough-in measurements as required.

3.03 INSTALLATION

A. Install accessories in accordance with manufacturers' instructions.

B. Install plumb and level, securely and rigidly anchored to substrate.

C. Mounting Heights and Locations: As required by accessibility regulations and as indicated on drawings

END OF SECTION

SECTION 10 4400

FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire extinguishers.

B. Fire extinguisher cabinets.

C. Building Entrance Knox Box

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Wood blocking product and execution requirements.

1.03 REFERENCE STANDARDS

A. NFPA 10 - Standard for Portable Fire Extinguishers; 2013.

B. UL (FPED) - Fire Protection Equipment Directory; Underwriters Laboratories Inc.; current edition.

1.04 SUBMITTALS

A. See Section 01 3300 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate cabinet physical dimensions.

C. Product Data: Provide extinguisher operational features.

D. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.

E. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

1.05 FIELD CONDITIONS

A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 PRODUCTS

2.01 FIRE EXTINGUISHERS

A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.

1. Provide extinguishers labeled by UL for the purpose specified and indicated.

B. Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gage.

1. Class: A:B:C.
2. Size: 5 pound.
3. Finish: Baked polyester powder coat, color as selected.
4. Temperature range: -40 degrees F to 120 degrees F.

2.02 FIRE EXTINGUISHER CABINETS

A. Metal: Formed primed steel sheet; 0.036 inch thick base metal.

B. Cabinet Configuration: Semi-recessed type.

1. Sized to accommodate accessories.
2. Trimless type.
3. Trim: Returned to wall surface, with 2 inch projection, 1-1/2 inch wide face.

C. Door: 0.036 inch thick, reinforced for flatness and rigidity; latch. Hinge doors for 180 degree opening with two butt hinge. Provide nylon catch.

D. Door Glazing: Plastic, clear, 1/8 inch thick acrylic. Set in resilient channel gasket glazing.

E. Cabinet Mounting Hardware: Appropriate to cabinet. Pre-drill for anchors.

F. Weld, fill, and grind components smooth.

G. Finish of Cabinet Exterior Trim and Door: Baked enamel, color as selected.

H. Finish of Cabinet Interior: White enamel.

2.03 ACCESSORIES

A. Extinguisher Brackets: Formed steel, chrome-plated.

B. Exterior Building Knox Box: Model 2300 recessed with tamper switch hinged door. Lock: OFOI Mortis Cylinder Best 7 pin lock core: Obtain keyway information from Nome Fire Chief or designated fire official.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install cabinets plumb and level, 48 inches from finished floor to inside top of cabinet.

C. Secure rigidly in place.

D. Place extinguishers and accessories in cabinets.

E. Install Knox box where indicated on drawings. Coordinate installation and keys with Owner and Local Fire Chief.

3.03 SCHEDULES

END OF SECTION

SECTION 10 7500
FLAGPOLES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum Flagpoles.

1.02 REFERENCE STANDARDS

A. AASHTO M 36 - Standard Specification for Corrugated Steel Pipe, Metallic-Coated, for Sewers and Drains; American Association of State Highway and Transportation Officials; 2003.

B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless; 2012.

C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2012.

D. ASTM A312/A312M - Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes; 2012.

E. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2012.

F. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric]; 2012.

G. ASTM B241/B241M - Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube; 2010.

1.03 SUBMITTALS

A. See Section 01 3300 - submittal procedures.

B. Product Data: Provide data on pole, accessories, and configurations.

C. Shop Drawings: Indicate detailed dimensions, base details, anchor requirements, and imposed loads.

D. Maintenance Data: Provide lubrication and periodic maintenance requirement schedules and parts diagrams and lists.

1.04 QUALITY ASSURANCE

A. Designer Qualifications: Design flagpole foundation under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed the State in which the Project is located.

PART 2 PRODUCTS

2.01 FLAGPOLES

A. Flagpoles: Aluminum.

1. Design: Straight shaft.
2. Mounting: Ground mounted type.
3. Outside Butt Diameter: 10 inches.
4. Outside Tip Diameter: 4 inches.
5. Nominal Wall Thickness: 3/16 inches minimum.
6. Nominal Height: 30 ft; measured from nominal ground elevation.
7. Halyard: Interior type.

B. Performance Requirements:

1. Flagpole With Flag Flying: Resistant without permanent deformation to 120 miles/hr wind velocity; non-resonant, safety design factor of 2.5.
2. Flagpole Without Flag: Resistant without permanent deformation to 105 miles/hr wind velocity; non-resonant, safety design factor of 2.5.

2.02 POLE MATERIALS

A. Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.

2.03 ACCESSORIES

A. Truck Assembly: Cast aluminum; revolving, stainless steel ball bearings, non-fouling.

B. Cleats: 9 inch size, aluminum with galvanized steel fastenings, two per halyard.

C. Cleat Box: Aluminum, with built-in hinge and hasp assembly, attached to pole with tamper proof screws inside box.

D. Halyard: 5/16 inch diameter stainless steel aircraft cable.

E. Primer: Zinc chromate type.

2.04 OPERATORS

A. Hand Crank: Removable crank type.

2.05 MOUNTING COMPONENTS

A. Foundation Tube Sleeve: AASHTO M 36M, corrugated 16 gage stainless steel, , depth of 60 inches minimum.

B. Pole Base Attachment: Flush; steel base with base cover.

C. Lighting Ground Rod: 96 inch long copper rod, 3/4 inch diameter.

D. Lightning Ground Cable: Copper No. 6 AWG, soft drawn.

2.06 FINISHING

A. Metal Surfaces in Contact With Concrete: Asphaltic paint.

B. Concealed Steel Surfaces: Galvanized to ASTM A123/A123M requirements.

C. Exposed to View Steel Surfaces: Galvanized to ASTM A123/A123M requirements.

D. Aluminum: Anodized to natural aluminum color.

E. Finial: Spun finish.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that concrete foundation is ready to receive work and dimensions are as indicated on shop drawings.

3.02 PREPARATION

A. Coat metal sleeve surfaces below grade and surfaces in contact with dissimilar materials with asphaltic paint.

3.03 INSTALLATION

A. Install flagpole, base assembly, and fittings in accordance with manufacturer's instructions.

B. Electrically ground flagpole installation.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1 inch.

3.05 ADJUSTING

A. Adjust operating devices so that halyard and flag function smoothly.

3.06 SCHEDULES

A. Poles: Qty: Two, Height: 30 Ft above grade,

END OF SECTION

SECTION 11 3100
RESIDENTIAL APPLIANCES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Kitchen appliances.

1.02 RELATED REQUIREMENTS

A. Section 06 4116 – Casework openings for residential appliances.

B. Section 22 2116 - Plumbing Piping: Plumbing connections for appliances.

C. Section 26 0503 - Equipment Wiring: Electrical connections for appliances.

1.03 REFERENCE STANDARDS

A. UL (EAUED) - Electrical Appliance and Utilization Equipment Directory; Underwriters Laboratories Inc.; current edition.

1.04 SUBMITTALS

A. See Section 01 3300 - submittal procedures.

B. Product Data: Manufacturer's data indicating dimensions, capacity, and operating features of each piece of residential equipment specified.

C. Copies of Warranties: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Electric Appliances: Listed and labeled by UL and complying with NEMA standards.

PART 2 PRODUCTS

2.01 KITCHEN APPLIANCES

A. All Equipment Eligible for Energy Star Rating: Energy Star Rated. All equipment shall have controls and operating hardware that complies with ADA and ADAG requirements and guidelines.

B. Refrigerator: Free-standing, 29.1 cu.ft Side-by-Side.

1. Capacity: Total minimum storage of 29.1 cu. ft. ; minimum 15 percent freezer capacity.
2. Energy Usage: Minimum 20 percent more energy efficient than energy efficiency standards set by DOE. Electronic controls
3. Features:
   a. automatic icemaker -10lbs bin capacity
   b. recessed in door water dispenser

c. finnish contured stainless steel doors
d. glass shelves in refrigerator
e. LED lighting in freezer and refrigerator compartments
f. doo ajar alarm
h. gallon jug door bins
i. freezer sliding drawers

4. BASIS of DESIGN: GE PROFILE 29.1 Model # PSHS9PGZSS or approved equal..
5. Quantity: 1

C. Microwave: Countertop.

1. Capacity: 1.6 cubic ft.
2. Power: 1150 watts, 110v 60 cycle.
3. Features: Include turntable.
4. Finish: Stainless Steel
5. BASIS OF DESIGN: GE 1.6 cu.ft. Model # JES1651SRSS or approved equal
6. Quantity: 2

D. Dishwasher: Undercounter ADA Compliant low profile

1. Controls: Solid state electronic.
2. Features: Include rinse aid dispenser, optional no-heat dry, optional water temperature boost, adjustable upper rack, and adjustable lower rack and hard food disposer
3. Finish: Stainless Steel Tub and exterior door panels.
4. Provide all water supply, drain and electrical connection components for fully functional dishwasher complying with codes.
5. BASIS OF DESIGN: GE 24” Undercounter Model # GLDT696DSS or approved equal
6. Quantity: 1

E. Coffee Maker – Single Serve

1. Controls: Solid state electronic.
2. Features: Single Serve coffee cartridge, Adjustable temperature, 60 oz. Water reservoir (no plumbing connection required) 5 cup fill sizes
3. Finish: Black.
4. Quantity: 2
5. BASIS OF DESIGN: Keurig Black Programmable Single Serve Model # 108678 or approved equal

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify utility rough-ins are present and correctly located.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Anchor built-in equipment in place.

3.03 ADJUSTING

A. Adjust operating equipment to efficient operation.

3.04 CLEANING

A. Remove packing materials from equipment.

B. Wash and clean equipment.

END OF SECTION

SECTION 11 5300
LABORATORY EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Laboratory equipment.

B. Connection to utilities including ductwork and exterior wall exhaust with stainless steel hood.

C. Service fittings and outlets and controls.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Large Components: Ensure that large components can be moved into final position without damage to other construction.

B. Preinstallation Meeting: Convene one week before starting work of this section.

1.03 SUBMITTALS

A. See Section 01 3300 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide equipment dimensions and construction, equipment capacities, physical dimensions, utility and service requirements and locations, point loads and attachment details

C. Shop Drawings: Indicate equipment locations, large scale plans, elevations, cross sections, rough-in and anchor placement dimensions and tolerances, and clearances required.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Operation Data: Include description of equipment operation and required adjusting and testing.

F. Maintenance Data: Identify system maintenance requirements, servicing cycles, lubrication types required and local spare part sources.

G. Project Record Documents: Record actual locations of concealed utility lines and connection points

H. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing the types of products specified in this section, with minimum three years of documented experience.

1.05 REGULATORY REQUIREMENTS

A. Conform to UL requirements for fabrication and installation of equipment.

B. Equipment controls, levers, and sash operation shall comply with 2009 IBC / ADA requirements for location and function

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Laboratory Equipment:

1. Kewaunee Scientific Corp; www.kewaunee.com.
2. Labconco Corporation; www.labconco.com.
3. Bedford;
4. Fisher Scientific
5. Substitutions: See Section 01 2513 - Product Requirements.

2.02 COMPONENTS

A. Equipment: Scheduled at end of this section.

B. All electrical components shall be UL listed for intended use.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that rough-in frames, anchors and supports are accurately placed.

3.02 PREPARATION

A. Provide rough-in frame and anchors for placement by Division 6 or 9 subcontractors

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with standards required by authority having jurisdiction.

C. Anchor equipment securely in place.

D. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

E. Touch-up minor damaged surfaces caused during installation. Replace damaged components as directed by Architect.

3.04 ADJUSTING

A. Adjust operating equipment to efficient operation.

3.05 CLOSEOUT ACTIVITIES

A. Demonstrate equipment operation and periodic maintenance.

3.06 SCHEDULES

A. Small countertop Fume Hood: Basis of Design: Labconco Fiberglass 30 Fume Hood #3030003 standard model with bypass airflow. 110V, with remote blower and internal LED lighting with basic airflow monitor kit. Install where indicated on the plans. Provide remote blower and all required controls, stainless steel ductwork, exhaust stack and blower disconnect.

END OF SECTION

SECTION 12 2113
HORIZONTAL LOUVER BLINDS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:

1. Horizontal louver blinds with aluminum slats.

B. Related Requirements:

1. Section 061000 "Miscellaneous Rough Carpentry" for wood blocking and grounds for mounting horizontal louver blinds and accessories.

1.03 ALLOWANCES

A. Horizontal louver blinds are part of construction budget.

1.04 SUBMITTALS

A. See Section 01 3300 – submittal procedures.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver horizontal louver blinds in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.06 FIELD CONDITIONS

A. Environmental Limitations: Do not install horizontal louver blinds until construction and wet and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Where horizontal louver blinds are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Source Limitations: Obtain horizontal louver blinds from single source from single manufacturer.

2.02 HORIZONTAL LOUVER BLINDS, ALUMINUM SLATS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Bali Blinds

B. Slats: Aluminum; alloy and temper recommended by producer for type of use and finish indicated; with crowned profile and radius corners.
   1. Width: 1 inch (25 mm)
   2. Thickness: Manufacturer's standard
   3. Spacing: Manufacturer's standard
   4. Finish: Brushed Aluminum 121

C. Headrail: Formed steel or extruded aluminum; long edges returned or rolled. Headrails fully enclose operating mechanisms on three sides.
   1. Capacity: Two blinds per headrail unless otherwise indicated.
   2. Ends: Capped or plugged
   3. Manual Lift Mechanism:
      a. Lift-Cord Lock: Variable; stops lift cord at user-selected position within blind full operating range
      b. Operator: Extension of lift cord(s) through lift-cord lock mechanism to form cord pull.
   4. Manual Tilt Mechanism: Enclosed worm-gear mechanism and linkage rod that adjusts ladders.
      a. Tilt: Full.
      b. Operator: Corrosion-resistant steel rod
   5. Manual Lift-Operator and Tilt-Operator Locations: Right side and left side of headrail, respectively unless otherwise indicated.
   6. Integrated Headrail/Valance:

D. Bottom Rail: Formed-steel or extruded-aluminum tube that secures and protects ends of ladders and lift cords and has plastic- or metal-capped ends.

E. Lift Cords: Manufacturer's standard braided cord.

F. Ladders: Evenly spaced across headrail at spacing that prevents long-term slat sag.

G. Valance: Manufacturer's standard

H. Mounting Brackets: With spacers and shims required for blind placement and alignment indicated.
   1. Type: Wall
   2. Intermediate Support: Provide intermediate support brackets to produce support spacing recommended by blind manufacturer for weight and size of blind.

I. Hold-Down Brackets and Hooks or Pins: Manufacturer's standard.

J. Side Channels and Perimeter Light Gap Seals: Manufacturer's standard.

K. Colors, Textures, Patterns, and Gloss:
   1. Slats: Brushed Aluminum 121
   2. Components: Provide rails, cords, ladders, and materials exposed to view matching or coordinating with slat color unless otherwise indicated

L. Colors, Finishes, and Gloss:
   1. Slats: As indicated on Drawings
   2. Components: Provide rails, cords, ladders, and materials exposed to view matching or coordinating with slat color unless otherwise indicated

2.03 HORIZONTAL LOUVER BLIND FABRICATION

A. Product Safety Standard: Fabricate horizontal louver blinds to comply with WCMA A 100.1 including requirements for corded, flexible, looped devices; lead content of components; and warning labels.

B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows:

1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which blind is installed less 1/4 inch (6 mm) per side or 1/2 inch (13 mm) total, plus or minus 1/8 inch (3.1 mm). Length equal to head-to-sill dimension of opening in which blind is installed less 1/4 inch (6 mm), plus or minus 1/8 inch (3.1 mm).

C. Concealed Components: Noncorrodible or corrosion-resistant-coated materials.

1. Lift-and-Tilt Mechanisms: With permanently lubricated moving parts.

D. Mounting and Intermediate Brackets: Designed for removal and reinstallation of blind without damaging blind and adjacent surfaces, for supporting blind components, and for bracket positions and blind placement indicated.

E. Installation Fasteners: No fewer than two fasteners per bracket, fabricated from metal noncorrosive to brackets and adjoining construction; type designed for securing to supporting substrate; and supporting blinds and accessories under conditions of normal use.

F. Color-Coated Finish:

1. Metal: For components exposed to view, apply manufacturer's standard baked finish complying with manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install horizontal louver blinds level and plumb, aligned and centered on openings, and aligned with adjacent units according to manufacturer's written instructions.

1. Locate so exterior slat edges are not closer than 1 inch (25 mm) from interior faces of glass and not closer than 1/2 inch (13 mm)]from interior faces of glazing frames through full operating ranges of blinds.

2. Install mounting and intermediate brackets to prevent deflection of headrails.

3. Install with clearances that prevent interference with adjacent blinds, adjacent construction, and operating hardware of glazed openings, other window treatments, and similar building components and furnishings.

3.03 ADJUSTING

A. Adjust horizontal louver blinds to operate free of binding or malfunction through full operating ranges.

3.04 CLEANING AND PROTECTION

A. Clean horizontal louver blind surfaces after installation according to manufacturer's written instructions.

B. Provide final protection and maintain conditions in a manner acceptable to manufacturer and Installer and that ensures that horizontal louver blinds are without damage or deterioration at time of Substantial Completion.

C. Replace damaged horizontal louver blinds that cannot be repaired in a manner approved by Architect before time of Substantial Completion.

3.05 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain systems.

END OF SECTION 122113

SECTION 12 3553
METAL LABORATORY CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal cabinets and cabinet hardware.

B. Solvent storage cabinets.

C. Casework Metal Countertops.

1.02 RELATED REQUIREMENTS

A. Section 07 9005 - Joint Sealers.

1.03 REFERENCE STANDARDS

A. ANSI Z97.1 - Safety Glazing Materials Used in Buildings, Safety Performance Specifications and Methods of Test; 2010.

B. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2010.

C. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength, Low Alloy, and High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2012

D. ASTM C1036 - Standard Specification for Flat Glass; 2011e1.

E. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.

F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2012.

G. NFPA 30 - Flammable and Combustible Liquids Code; 2012.

H. SEFA 2.3 - Installation of Scientific Laboratory Furniture and Equipment; 2010.

I. SEFA 3 - Work Surfaces; 2010.

J. SEFA 7 - Laboratory and Hospital Fixtures; 2010.

K. SEFA 8M - Laboratory Grade Metal Casework; 2010.

L. IBC – ADA Accessibility Requirements.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Large Components: Ensure that large components can be moved into final position without damage to other construction.

1.05 SUBMITTALS

A. See Section 01 3300 - submittal procedures.

B. Product Data: Details of materials, component dimensions and configurations, construction details, joint details, attachments; manufacturer's catalog literature on hardware, accessories, and service fittings, if any.

C. Shop Drawings: Casework locations, large scale plans, elevations, cross sections, rough-in and anchor placement dimensions and tolerances, clearances required, and utility locations, if any.

D. Test Reports: Independent laboratory reports showing compliance with chemical resistance requirements for cabinet finish.

E. Maintenance Data: Manufacturer's recommendations for care and cleaning.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Laboratory Casework:

1. Thermo Fisher Scientific; www.thermoscientific.com.
2. Kewaunee Scientific Corp; www.kewaunee.com.
3. Bretford;
4. Mott Manufacturing
5. Substitutions: Not permitted.

2.02 METAL LABORATORY CASEWORK

A. Casework: Die-formed metal sheet; each unit self-contained and not dependent on adjacent units or building structure for rigidity; factory-fabricated, -assembled, and -finished.

1. Style: Flush overlay.
2. Sheet Metal: Steel.
   a. Gables, Front and Back Panels, Gusset Plates and Rails: 18 gage thick.
   b. Door Fronts, Drawers, Cabinet Floors, Shelves, Filler Panels and Drawer Dividers: 20 gage thick.
   c. Backing Sheet to Door and Door Fronts: 22 gage thick.

3. Structural Performance: In addition to the requirements of SEFA 3, 7 and 8, provide components that safely support the following minimum loads, without deformation or damage:
    a. Base Units: 500 pounds per linear foot (744 kg per m) across the cabinet ends.
    b. Suspended Units: Minimum 300 pounds (136 kg) static load.
    c. Drawers: 125 pounds (57 kg).
    d. Hanging Wall Cases: 300 pounds (136 kg).
    e. Shelves: 100 pounds (45 kg).
4. Corners and Joints: Without gaps or inaccessible spaces or areas where dirt or moisture could accumulate.
5. Edges and Seams: Smooth. Form counter tops, shelves, and drain boards from continuous sheets.
6. Shelf Edges: Turn down 1 inch on each side and return 5/8 inch front and back.
7. Ends: Close open ends with matching construction.
8. Welding: Electric spot weld; grind joints smooth and flush.
9. Drawers and Doors: Fabricate drawer and door fronts of sandwiched sheets of sheet steel welded together and reinforced for hardware. Fill with sound deadening core.
10. Glazing: With gasket and removable stops; minimize rattling and vibration.
11. Fixture Locations: Cut and drill counter tops, backs, and other components for service outlets and fixtures.
12. Filler Panels: Where cabinets do not fit tight to adjacent construction, provide filler panels of matching construction and finish.
13. Finish on Steel (Except Stainless Steel): Provide a finish on all surfaces having chemical resistance equal to Level 0 (no change) or Level 1 (slight change of gloss or slight discoloration) according to SEFA 8.1.
    a. Coating Type: Baked on epoxy; minimum two coats.
    b. Color: As selected from manufacturer's standard selection.
    c. Preparation: Degrease and phosphate etch, and prime.
14. Stainless Steel Finish: No. 4, brushed finish.
15. Separation: Use bituminous paint or non-conductive tape to coat metal surfaces in contact with cementitious materials and to separate dissimilar metals.

B. Solvent Storage Cabinets: Construction identical to other cabinets, with following exceptions:

1. Construct to NFPA 30 and applicable OSHA requirements.
2. Fire Resistance: Maximum internal temperature of 325 degrees F when subjected to a ten minute fire test and using a standard time-temperature curve in accordance with NFPA 30.
3. Minimum 18 gauge steel, double panel construction with 1-1/2 inch space between panels and electrical grounding connection.
4. Shelves: Full depth, adjustable.
5. Bottom Pan: 2 inches deep liquid tight pan covering entire bottom of cabinet.
6. Cabinet Hardware: UL-listed, self-closing, latching doors synchronized so that both doors always fully close; three point latching system in right hand leaf of every pair of doors and equip latching system with lock; fusible-link hold-open device that releases the door to close when ambient temperature exceeds 165 degrees F.
7. Vents: Provide venting capable of achieving at least ten air changes per hour.
    a. Tie into building hazardous exhaust system.
    b. Vent Connections: 1-1/2 inch minimum diameter, corrosion resistant piping having flame spread rating of 25 or less, when tested in accordance with ASTM E84.
    c. Provide minimum of two vents with fire baffle for each cabinet.
8. Signage: Provide manufacturer's standard, signage reading "FLAMMABLE - KEEP FIRE AWAY" or similar message in bright red color.

C. Stainless Steel Countertops: ASTM A666 Type 304 stainless steel sheet; 16 gage, 0.06 inch nominal sheet thickness.

1. Finish: 4B satin brushed finish.
2. Exposed Edge Shape: Straight turndown with return; 1-1/2 inch high face, 1/2 inch return to face of case; reinforced with hardwood or steel.
3. Back and End Splashes: Same material; welded 1/4 inch radius coved joint to countertop; square top edge with 1 inch wide top surface and minimum 1/2 inch turndown;

2.03 MATERIALS

A. Sheet Steel: Mild, cold rolled and leveled unfinished steel sheet, ASTM A1008/A1008M, Class 1 (matte) finish.

B. Stainless Steel Sheet: ASTM A666 Type 304.

C. Glass: Fully tempered float; ASTM C1036, Type 1, Quality Q3; ASTM C1048, tempered using horizontal tempering and complying with ANSI Z97.1; 4 mm thick minimum; exposed edges ground, and cut or drilled to receive hardware; clear.

F. Cabinet Hardware: Manufacturer's standard styles, exposed components stainless steel.

1. Finish of Exposed Components: No. 4 finish.
2. Locks: Lock with 4 pin cylinder and 1 keys per lock. All Drawers and cabinets to have locks. All Locks to be keyed the same.
3. Shelves:
   a. Shelf Standards and Rests: Vertical chrome steel standards with rubber button fitted steel rests.
   b. Shelf Brackets: Vertical chrome steel standards with chrome steel arms.
4. Swinging Doors:
   a. Hinges: Offset pin.
   b. Catches: Magnetic.
   c. Pulls: Chrome wire pulls, 4 inches wide.
5. Drawers:
   a. Pulls: Chrome wire pulls, 4 inches wide.
   b. Slides: Steel, full extension arms, ball bearings; capacity as recommended by manufacturer for drawer height and width.

G. Service Fittings and Fixtures:

1. Escutcheons: Stainless steel.

H. Sound Deadening Material: Inorganic, for sandwich panel fabrication.

I. Sealant: Sanitary type, specified in Section 07 9005.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify capacity of support framing and anchors.

B. Verify that service connections are correctly located and of proper characteristics.

3.02 INSTALLATION

A. Perform installation in accordance with manufacturer's instructions and with SEFA 2.3.

B. Use anchoring devices to suit conditions and substrate materials encountered.

C. Set casework items plumb and square, securely anchored to building structure.

D. Align cabinets to adjoining components, install filler panels where necessary to close gaps; seal joints between cabinets and countertops and adjacent construction.

E. Separate dissimilar metals to prevent galvanic action.

F. Vented Cabinets: Install in strict compliance with manufacturer's written installation instructions.

1. Install vent kits and connect to exhaust system.
2. Use only rigid materials for venting. No flexible materials permitted.

G. Replace units that are damaged, including those that have damaged finishes.

3.03 ADJUSTING

A. Adjust operating parts, including doors, drawers, hardware, and fixtures, to function smoothly.

3.04 CLEANING

A. Clean all components.

3.05 PROTECTION

A. Do not permit finished casework and countertops to be exposed to continued construction activity.

B. Repair damage that occurs prior to Substantial Completion, including finishes, using methods prescribed by manufacturer; replace units that cannot be repaired to like-new condition.

END OF SECTION

SECTION 12 3616
METAL COUNTERTOPS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes stainless-steel countertops and integral sinks.

1.03 SUBMITTALS

A. See Section 01 3300 – submittal procedures.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver metal countertops & sinks only after casework has been completed in installation areas.

B. Keep finished surfaces covered with polyethylene film or other protective covering during handling and installation.

1.05 FIELD CONDITIONS

A. Field Measurements: Verify actual dimensions of construction to receive metal countertops by field measurements before fabrication.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 316L.

B. Sealant for Countertops: Manufacturer's standard sealant of characteristics indicated below that complies with applicable requirements in Section 079200 "Joint Sealants."

1. Mildew-Resistant Joint Sealant: Mildew resistant, single component, nonsag, neutral curing, silicone
2. Color: Clear.
3. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.02 STAINLESS-STEEL COUNTERTOPS & SINKS

A. Countertops: Fabricate from 0.062-inch- (1.59-mm-) thick, stainless-steel sheet. Provide smooth, clean exposed tops and edges in uniform plane, free of defects. Provide front and end overhang of 1 inch (25 mm) over the base cabinets.

1. Joints: Fabricate countertops in sections for joining in field, with joints at locations indicated.
2. Sound deaden the undersurface with heavy-build mastic coating.
3. Extend the top down to provide a 1-inch- (25-mm-) thick edge with a 1/2-inch (12.7-mm) return flange.

4. Form the backsplash coved to and integral with top surface, with a 1/2-inch- (12.7-mm) thick top edge and 1/2-inch (12.7-mm) return flange.
5. Provide raised (marine) edge around perimeter of tops containing sinks; pitch tops containing sinks two ways to provide drainage without channeling or grooving.
6. Where stainless-steel sinks occur in stainless-steel tops, factory weld into one integral unit.

B. Stainless-Steel Sinks: Fabricate from stainless-steel sheet, not less than 0.050-inch (1.27-mm) nominal thickness. Fabricate with corners rounded and coved to at least 5/8-inch (16-mm) radius. Slope the sink bottoms to outlet without channeling or grooving. Provide continuous butt-welded joints.

1. Provide sizes indicated or manufacturer's closest standard size of equal or greater volume, as approved by Architect.
2. Provide double-wall construction for sink partitions with top edge rounded to at least 1/2-inch (13-mm) diameter.
3. Factory punch holes for fittings.
4. Provide sinks with stainless-steel strainers and tailpieces.
5. Provide sinks with integral rims except where located in stainless-steel countertops.
6. Apply 1/8-inch- (3-mm-) thick coating of heat-resistant, sound-deadening mastic to undersink surfaces.

2.03 STAINLESS-STEEL FINISH

A. Grind and polish surfaces to produce uniform, directional satin finish matching No. 4 finish, with no evidence of welds and free of cross scratches. Run grain with long dimension of each piece. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces clean.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of metal countertops.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install metal countertops level, plumb, and true; shim as required, using concealed shims.

B. Field Jointing: Where possible, make field jointing in the same manner as shop jointing; use fasteners recommended by manufacturer. Prepare edges to be joined in shop so Project-site processing of top and edge surfaces is not required. Locate field joints where shown on Shop Drawings.

C. Secure tops to cabinets with Z- or L-type fasteners or equivalent; use two or more fasteners at each front, end, and back.

D. Abut top and edge surfaces in one true plane, with internal supports placed to prevent deflection.

E. Seal junctures of tops, splashes, and walls with mildew-resistant silicone sealant or another permanently elastic sealing compound recommended by countertop material manufacturer.

3.03 CLEANING AND PROTECTION

A. Repair or remove and replace defective work as directed on completion of installation.

B. Clean finished surfaces, touch up as required, and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.

C. Protection: Provide 6-mil (0.15-mm) plastic or other suitable water-resistant covering over the countertop surfaces. Tape to underside of countertop at a minimum of 48 inches (1220 mm) o.c. Remove protection at Substantial Completion.

END OF SECTION 12 36 16

SECTION 12 3661
SIMULATED STONE COUNTERTOPS AND TRIM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Solid-surface-material countertops, backsplashes and trim.

1.03 SUBMITTALS

A. See Section 01 3300 – submittal procedures.

1.04 QUALITY ASSURANCE

A. Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this project and whose products have a record of successful in-service performance

B. Fabricator/Installer Qualifications:
   1. Work of this section shall be by a certified fabricator/installer, certified in writing by the manufacturer

C. Applicable Standards:
   1. American National Standards Institute (ANSI)
      a. American Society for Testing Materials (ASTM)
      b. National Electrical Manufacturers Association (NEMA)
      c. NSF International
   2. Fire test response characteristics:
      a. Provide with the following Class A (Class I) surface burning characteristics as determined by testing identical products per UL 723 (ASTM E84) or another testing and inspecting agency acceptable to authorities having jurisdiction:
         1) Flame Spread Index: 25 or less
         2) Smoke Developed Index: 450 or less

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver no components to project site until areas are ready for installation.

B. Store components indoors prior to installation.

C. Handle materials to prevent damage to finished surfaces.
   1. Provide protective coverings to prevent physical damage or staining following installation for duration of project

1.06 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions of exterior windows and countertops by field measurements after base cabinets are installed but before countertop fabrication is complete.

1.07 COORDINATION

A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

B. Coordination drawings:

1. Shall be prepared indicating:
   a. Plumbing work
   b. Electrical work
   c. Miscellaneous steel for general work
   d. Indicated location of all walls (rated and non-rated), blocking locations and recessed wall items, etc.)
2. Content:
   a. Project-specific information, drawing accurately to scale
   b. Do not base coordination drawings on reproductions of the contract documents or standard printed data.
   c. Indicate dimensions shown on the contract drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements.
   d. Provide alternate sketches to designer for resolution of such conflicts.

1.08 WARRANTY

A. Provide manufacturer’s warranty against defects in materials

1. Warranty shall provide material and labor to repair or replace defective materials
2. Damage caused by physical or chemical abuse or damage from excessive heat will not be warranted.

B. Manufacturer’s Warranty period:

1. Per specified manufacturer, from date of substantial completion

PART 2 - PRODUCTS

2.01 SOLID-SURFACE-MATERIAL COUNTERTOPS

A. Configuration: Provide countertops with the following front and backsplash style:

1. Front: Straight, slightly eased at top
2. Backsplash: Straight, slightly eased at corner
3. Endsplash: Matching backsplash

B. Countertops**:** 1/2-inch- (12.7-mm-) thick, solid surface material with front eased edge in same material.

C. Backsplashes: 1/2-inch- (12.7-mm-)

D. Fabrication: Fabricate tops in one piece with shop-applied edges and backsplashes unless otherwise indicated. Comply with solid-surface-material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.

1. Fabricate with loose backsplashes for field assembly.
2. Install integral sink bowls in countertops in the shop.

2.02 SOLID-SURFACE-MATERIAL TRIM

A. Configuration: Provide trim at inside of exterior windows with the following style:
   1. Edges: Straight

B. Trim**:** 1-1/2-inch thick x 1-1/2-inch thick, solid surface material trim with straight edge in same material at inside of exterior windows. See Architectural Details and Opening Schedule for additional information.

C. Fabrication: Fabricate trim in one piece unless otherwise indicated. Comply with solid-surface-material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.

2.03 COUNTERTOP AND TRIM MATERIALS

A. Particleboard: ANSI A208.1, made with binder containing no urea formaldehyde.

B. Plywood: Marine Plywood in wet locations.

C. Adhesives: Adhesives shall not contain urea formaldehyde.

D. Adhesives: Adhesives shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

E. Solid Surface Material: Homogeneous solid sheets of filled plastic resin complying with ANSI SS1.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. LG Hausys Hi Macs
   2. Type: Provide Standard Type unless Special Purpose Type is indicated.
   3. Integral Sink Bowls: Comply with ISSFA-2 and ANSI Z124.3, Type 5 or Type 6, without a precoated finish.
   4. Colors and Patterns: As selected by Architect from manufacturer's full range and as follows:
      a. LG Hi-Macs Classic, Armadillo GT909, Polished
      b. LG Hi-Macs Classic, Umber Granite G605, Polished
      c. LG Hi-Macs Classic, Ivory White S29, Polished
   5. Ledgers and Blocking: Dimension lumber conforming to DOC PS 20.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions, with fabricator present for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install components plumb, level and rigid, scribed to adjacent finishes, in accordance with approved shop drawings and product data
   1. Provide product in largest pieces available

2. Form field joints using manufacturer's recommended adhesive, with joints inconspicuous in finished work.
3. Exposed joints/seams shall not be allowed.
4. Reinforce field joints with solid surface strips extending a minimum of 1 inch on either side of the seam with the strip being the same thickness as the top.
5. Cut and finish component edges with clean, sharp returns.
6. Rout radii and contours to template
7. Anchor securely to base cabinets or other supports
8. Align adjacent countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop.
9. Align adjacent trim and form seams to comply with manufacturer's written recommendations using adhesive in color to match trim.
10. Carefully dress joints smooth, remove surface scratches and clean entire surface.

B. Install countertops and trim level to a tolerance of 1/8 inch in 8 feet (3 mm in 2.4 m).

C. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Pre-drill holes for screws as recommended by manufacturer. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

1. Install backsplashes and endsplashes to comply with manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.
2. Seal edges of cutouts in particleboard subtops by saturating with varnish.

D. See architectural detail for trim fastening and additional attachment information. Use adhesive in color to match trim, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

3.03 CLEANING AND PROTECTION

A. Keep components clean during installation

B. Remove adhesives, sealants and other stains

END OF SECTION 12 36 61

SECTION 12 3623.13
PLASTIC-LAMINATE-CLAD COUNTERTOPS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes plastic-laminate countertops.

1.03 SUBMITTALS

A. See Section 01 3300 – submittal procedures.

1.04 INFORMATIONAL SUBMITTALS

A. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates

B. Evaluation Reports: For fire-retardant-treated materials, from ICC-ES.

1.05 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

B. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver countertops until painting and similar operations that could damage countertops have been completed in installation areas. If countertops must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.07 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install countertops until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Environmental Limitations: Do not deliver or install countertops until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F (16 and 32 deg C) and relative humidity between 25 and 55 percent during the remainder of the construction period.

C. Field Measurements: Where countertops are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate

measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

D. Established Dimensions: Where countertops are indicated to fit to other construction, establish dimensions for areas where countertops are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.01 PLASTIC-LAMINATE COUNTERTOPS

A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades indicated for construction, installation, and other requirements.

1. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.

B. Grade: Custom

C. High-Pressure Decorative Laminate: NEMA LD 3, Grade HGL

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Formica Corporation.

D. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

1. As indicated by manufacturer's designations.
2. Match Architect's sample.
3. As selected by Designer from manufacturer's full range in the following categories:

a. Solid colors, matte finish.
b. Wood grains, matte finish.
c. Patterns, matte finish.

4. Grain Direction: Parallel to cabinet fronts.

E. Edge Treatment: 3-mm PVC edging

F. Core Material: Particleboard or medium-density fiberboard

G. Core Material at Sinks: exterior-grade plywood

H. Core Thickness: 3/4 inch (19 mm)

1. Build up countertop thickness to 1-1/2 inches (38 mm) at front, back, and ends with additional layers of core material laminated to top.

I. Backer Sheet: Provide plastic-laminate backer sheet, NEMA LD 3, Grade BKL, on underside of countertop substrate.

J. Paper Backing: Provide paper backing on underside of countertop substrate.

2.02 WOOD MATERIALS

A. Wood Products: Provide materials that comply with requirements of referenced quality standard unless otherwise indicated.

B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.

1. Medium-Density Fiberboard: ANSI A208.2, made with binder containing no urea formaldehyde
2. Particleboard: ANSI A208.1, Grade M-2, made with binder containing no urea formaldehyde
3. Softwood Plywood: DOC PS 1.

2.03 FIRE-RETARDANT-TREATED MATERIALS

A. Fire-Retardant-Treated Materials, General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

1. Use treated materials that comply with requirements of referenced woodworking standard. Do not use materials that are warped, discolored, or otherwise defective.
2. Use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.
3. Identify fire-retardant-treated materials with appropriate classification marking of qualified testing agency in the form of removable paper label or imprint on surfaces that will be concealed from view after installation.

B. Fire-Retardant-Treated Lumber and Plywood: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet (3.2 m) beyond the centerline of the burners at any time during the test.

1. Kiln dry lumber and plywood after treatment to a maximum moisture content of 19 and 15 percent, respectively.
2. For items indicated to receive a stained or natural finish, use organic resin chemical formulation.
3. Mill lumber after treatment within limits set for wood removal that do not affect listed fire-test-response characteristics, using a woodworking shop certified by testing and inspecting agency.
4. Mill lumber before treatment and implement special procedures during treatment and drying processes that prevent lumber from warping and developing discolorations from drying sticks or other causes, marring, and other defects affecting appearance of treated woodwork.

C. Fire-Retardant Particleboard: Panels complying with the following requirements, made from softwood particles and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 25 or less per ASTM E 84.

1. For panels 3/4 inch (19 mm) thick and less, comply with ANSI A208.1 for Grade M-2 except for the following minimum properties: modulus of rupture, 1600 psi (11 MPa); modulus of elasticity, 300,000 psi (2070 MPa); internal bond, 80 psi (550 kPa); and screw-holding capacity on face and edge, 250 and 225 lbf (1100 and 1000 N), respectively.
2. For panels 13/16 to 1-1/4 inches (20 to 32 mm) thick, comply with ANSI A208.1 for Grade M-1 except for the following minimum properties: modulus of rupture, 1300 psi (9 MPa); modulus of elasticity, 250,000 psi (1720 MPa); linear expansion, 0.50 percent; and screw-holding capacity on face and edge, 250 and 175 lbf (1100 and 780 N), respectively.

2.04 ACCESSORIES

A. Grommets for Cable Passage through Countertops: 1-1/4-inch (32-mm) OD, gray molded-plastic grommets and matching plastic caps with slot for wire passage.

1. Product: Subject to compliance with requirements, by Doug Mockett & Company, Inc.

2.05 MISCELLANEOUS MATERIALS

A. Adhesives: Do not use adhesives that contain urea formaldehyde.

B. Adhesive for Bonding Plastic Laminate: Unpigmented contact cement.

C. VOC Limits for Installation Adhesives and Sealants: Use products that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Wood Glues: 30 g/L.
2. Multipurpose Construction Adhesives: 70 g/L.
3. Structural Wood Member Adhesive: 140 g/L.
4. Architectural Sealants: 250 g/L.

2.06 FABRICATION

A. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.

B. Fabricate countertops to dimensions, profiles, and details indicated. Provide front and end overhang of 1 inch (25 mm) over base cabinets. Ease edges to radius indicated for the following:

C. Complete fabrication, including assembly, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

1. Notify Architect seven days in advance of the dates and times woodwork fabrication will be complete.
2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.

D. Shop cut openings to maximum extent possible to receive appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

1. Seal edges of openings in countertops with a coat of varnish.

PART 3 - EXECUTION

3.01 PREPARATION

A. Before installation, condition countertops to average prevailing humidity conditions in installation areas.

B. Before installing countertops, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.02 INSTALLATION

A. Grade: Install countertops to comply with same grade as item to be installed.

B. Assemble countertops and complete fabrication at Project site to the extent that it was not completed in the shop.

1. Provide cutouts for appliances, plumbing fixtures, electrical work, and similar items.
2. Seal edges of cutouts by saturating with varnish.

C. Field Jointing: Where possible, make in the same manner as shop jointing, using dowels, splines, adhesives, and fasteners recommended by manufacturer. Prepare edges to be joined in shop so Project-site processing of top and edge surfaces is not required. Locate field joints where shown on Shop Drawings.

D. Install countertops level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm).

E. Scribe and cut countertops to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

F. Fire-Retardant-Treated Wood: Handle, store, and install fire-retardant-treated wood to comply with chemical treatment manufacturer's written instructions, including those for adhesives used to install woodwork.

G. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.

1. Install countertops with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
2. Seal junctures of tops, splashes, and walls with mildew-resistant silicone sealant or another permanently elastic sealing compound recommended by countertop material manufacturer.

3.03 ADJUSTING AND CLEANING

A. Repair damaged and defective countertops, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean countertops on exposed and semi-exposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 12 36 23.13

NOME STATE OFFICE BUILDING REMODEL

Volume 2

Bid Documents

(Divisions 13 through 33)

ITB # 2014-0222-2289
DOA Project No.: AK# NSOB 001
Date: December 13, 2013

Department of Administration
Division of General Services
Robert B. Atwood Building
550 W. Seventh Ave., Suite 1970
Anchorage, AK, 99501
907.269.0300

BDS

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26 2716 CABINETS AND ENCLOSURES
26 2726 WIRING DEVICES

26 2819 ENCLOSED SWITCHES
26 4213 SACRIFICIAL ANODE CATHODIC PROTECTION SYSTEM
26 5100 INTERIOR LIGHTING
26 5200 EMERGENCY LIGHTING

DIVISION 27 - COMMUNICATIONS

27 1000 STRUCTURED CABLING

DIVISION 28 - ELECTRONIC SAFETY AND SECURITY

28 3100 ADDRESSABLE FIRE ALARM AND SMOKE DETECTION SYSTEMS

DIVISION 31 – EARTHWORK

31 2000 EARTH MOVING

DIVISION 32 – EXTERIOR IMPROVEMENTS

32 1216 ASPHALT PAVING
32 1723 PAVEMENT MARKINGS
32 3101 CHAIN LINK FENCE

DIVISION 33 – UTILITIES

33 7173 ELECTRICAL UTILITY SERVICES

APPENDIX

02 2600 APPENDICES WITHOUT LAB RESULTS
02 2633 APPENDICES

SECTION 13 2126
COLD STORAGE ROOMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Prefabricated insulated cold storage rooms with wall, floor, and ceiling panels.

B. Door, frame, and hardware.

C. Self contained refrigeration unit.

D. Controls and lighting.

E. Shelving and supports.

F. Maintenance of refrigeration unit.

1.02 RELATED REQUIREMENTS

A. Section 07 9005 - Joint Sealers.

B. Section 22 0513 - Common Motor Requirements for Plumbing Equipment.

C. Section 26 2717 - Equipment Wiring: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2011.

B. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2010.

C. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process; 2010.

D. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2010.

E. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2010.

F. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004 (Reapproved 2012).

G. ASTM E774 - Standard Specification for the Classification of the Durability of Sealed Insulating Glass Units; 1997.

H. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2010.

I. NSF 7 - Commercial Refrigerators and Freezers; NSF International; 2009.

J. NEMA MG 1 - Motors and Generators; National Electrical Manufacturers Association; 2011.

K. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

L. UL (EAUED) - Electrical Appliance and Utilization Equipment Directory; Underwriters Laboratories Inc.; current edition.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination with Electrical: Coordinate location and characteristics of electrical service.

B. Preinstallation Meeting: Convene one week before starting work of this section.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate layout, room dimensions, materials, components, fasteners, doors, hardware, equipment, finishes, method of installation and assembly, panel placement, supplementary support or bracing, controls, and service rough-in.

C. Product Data: Provide data on hardware and fixtures, joint details.

D. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention and all service connections

E. Certificates: Certify that products of this section meet or exceed specified requirements.

F. Maintenance Contract.

G. Operation Data: Include operating equipment, service and lubrication schedules, and parts list.

H. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Designer Qualifications: Design cold storage room roof under direct supervision of a Professional Mechanical Engineer experienced in design of this work and licensed in the State in which the Project is located.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than Five years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Wrap and crate finished components and assemblies at factory to prevent damage or marring of surfaces during shipping and handling.

B. Do not deliver materials or assemblies to site until installation spaces are ready to receive units.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

C. Provide five year manufacturer warranty for remote refrigeration compressor unit.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Walk-in Freezer:

1. Kolpak
2. Nor-Lake
3. Thermo-Kool
4. Substitutions: See Section 01 2513 - Product Requirements.

2.02 COLD STORAGE ROOMS

A. Cold Storage Rooms: Factory-fabricated packaged units, comprised of modular panels, equipment, and fittings.

1. All exposed components non-combustible.
2. Comply with NSF 7.
3. Electrical Equipment: Listed and classified by UL as suitable for the purpose specified and indicated.
4. Cold Storage Room Size: See Drawings. This unit is a matching size replacement for an existing 40 year old unit.

B. Performance Requirements:

1. Ceiling Panels: Withstand their own weight, dead loads, and live loads of 50 psf with maximum deflection of 1:180.
2. Floor Panels: Withstand 600 psf uniform load without physical damage or indentation of panel or insulation and a point load of 300 psf without indentation.
3. Temperature Maintain set temperature: 0-20+ degrees F; plus or minus 2 F degrees of set temperature.
4. Air Tightness of Assembled Unit: Limit air infiltration through assembly to 0.06 cu ft/min/sq ft of wall area, measured at a reference differential pressure across assembly of 1.57 psf as measured in accordance with ASTM E283.
5. Vapor Seal: Interior room atmospheric pressure of 1 inch sp, 72 degrees F, 40 percent RH: No failure.
6. Vapor Tightness: Sufficient to eliminate frost accumulation.

2.03 COMPONENTS

A. Wall Panels: Comprising the following:

1. Exterior Sheet: 0.042 inch aluminum stucco embossed.
2. Interior Sheet: 0.042 inch aluminum stucco embossed.
3. Core: Insulation bonded to exterior and interior sheets 97% closed cell urethane foam with compressive strength of 28psi. Panel U factor of <0.029 (R=34 for 4 inch thick walls with UL flame test spread of >25..
4. Panel Width: 48 inches, one piece floor to ceiling.
5. Panel Assembly: Tongue and groove edges, integral cam action locking clamps spaced not over 40 inches on center and interior and exterior flexible vinyl gaskets.

B. Ceiling Panels: Same construction as walls except exterior sheets of 0.030 inch aluminum.

C. Floor Panels: Comprising the following:

1. Top Sheet: 14 gauge stainless steel.
2. Bottom Sheet: 14 gauge galvanized steel sheet.
3. Core: 3/4 inch thick plywood laminated between top sheet and insulation; all bonded.
4. Panel Width: 48 inches, one piece wall to wall.
5. Panel Assembly: Tongue and groove edges, integral cam action locking clamps spaced not over 40 inches on center.
6. Provide slip resistant interior floor finish

D. Insulation Thickness: 4 inches floors, walls and ceiling.

E. Doors: Overlap type for 48 x98 inch opening, construction as for walls but with edges closed; Provide thermal performance equal to 90% of wall panels; flexible gasket containing magnetic strip on four edges; heated gasket thermostatic control with two way air relief valve. Provide key cylinder lock on exterior and interior latch release without need of key or tools. Hardware to be polished aluminum cam action type; self closing; 4 adjustable hinges; interior and exterior 36inch high full width kick plates mechanically attached. Provide interior emergency panic button and exterior high decibel audio and flashing alarm.

F. View Windows: Sealed insulating glass units in doors, triple glass at freezers.

G. Crane Rail Opening: Provide double brush gasketed portal for existing crane rail penetration above door opening - See Drawings.

H. Provide permanent mounted slip resistant surfaced metal ramp from door threshold to adjacent room finished floor for carts to enter.

I. Provide matching material and finish for perimeter closing panels to adjacent wall and ceiling finishes. Provide exterior removable panel access to all above unit components.

2.04 MATERIALS

A. Aluminum: ASTM B209 (ASTM B209M) sheet.

B. Steel Sheet: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G90/Z275 coating;

C. Stainless Steel Sheet: ASTM A666 Type 304; No. 4 finish, .

E. Accessories: Thresholds, closure plates, ramps, hanger rods, tie down plates, bolts, screws, and washers; non-corrosive.

F. Insulating Glass: Hermetically sealed double pane units, 1/4 inch thick lights, clear float glass panes, 5/8 inch unit thickness; certified by independent testing agency to comply with ASTM E2190.

G. Sealant type as specified in Section 07 9005. Properly seal all room penetrations on interior and exterior of penetration.

H. Door Gaskets: Resilient hollow neoprene; electric heated at freezer doors; organic grease and oil resistant, replaceable and adjustable, concealed magnetic strip to maintain air tight seal.

2.05 COMPONENTS

A. Hardware: Cast brass, nylon bearing self closing hinges, roller catch latch and keeper; cylinder lock and inside safety release mechanism.

B. Shelving and Supports: Stainless steel type 304 construction, open rod construction, wall mounted heavy duty supports extending from 24” to 84” AFF. . Size: Shelf depth of 24 inches with vertical maximum spacing of 42 inches with two tiers of shelfs running full length of east wall.

C. Light Fixtures: Vapor tight, LED with luminance equal to incandescent 150 watt lamp, operating toggle switch on exterior wall of room with pilot light, wired in rigid conduit.

2.06 EQUIPMENT

A. Cooling System: Direct expansion refrigerant, air cooled; remote located condensing unit for all rooms, evaporator, unit cooler, self contained with valves, controls, switches, timers, refrigerant piping, insulated suction lines, and wiring. Size and capacity to maintain environment specified; hot gas defrost; electrically heated trace condensate drain. Automatic defrost system with hot gas bypass defrost with timer and fan delay switch. Piping shall be ACR type hard drawn, cleaned and capped type L copper tubing soldered with silver solder. Hot gas piping shall be silver brazed. All piping to be installed to allow linear expansion of copper after startup. Suction piping is to be sized for velocity of 500-700fpm on horizontal runs. Size all liquid piping for maximum 2 psig pressure drop. Provide appropriate hangars and tubing clamps to support each of the lines individually with maximum clamp spacing of 8 feet. Provide 7/8 inch or greater type L copper tubing from evaporator drain pan to the building waste system, pitch the line to drain away from evaporator to a floor drain or house side of sink trap

1. Cooling Unit: Locate remote from cold storage rooms in location indicated on the drawings. Pipe coolant to cold rooms. Evaporator Coil: Copper Tube; copper fin with aluminum housing. Air velocity less than 500 fpm blower motor permanently lubricated, ball bearing design rubber mounted and thermally protected. Provide insulated stainless steel condensate drain pan large enough to collect all condensate during normal operating and defrost cycles.
2. Compressor: Air cooled; semi-hermetic; serviceable untie sized to maintain temperature. All components shall be designed for 125 psig working pressure or 150 percent of maximum operating pressure; whichever is greater. Unit shall have minimum of a high/low pressure safety control, receiver with fusible plug, liquid line drier with sight glass, crankcase pressure regulator, accumulator, vibration absorbers and thermal protection. Unit shall be designed for continuous operation for maximum compressor life and to eliminate on and off cycling. Evaporator shall have matching capacity of compressor.

B. Electrical Characteristics:

1. 208 volts, three phase, 60 Hz.
2. Refer to Section 26 0503 - Equipment Wiring: Electrical connections.

C. Motor: NEMA MG 1.

D. Control Panel: Provide with recording dial thermometers, alarms, and controls at door

E. Controls: microprocessor PID controller for continuous monitoring of room condition versus set point

F. Thermometer: digital type.

G. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70.

H. Disconnect Switch: Factory mount disconnect switch in control panel.

2.07 FINISHES

A. Exterior Aluminum Cladding: White color. Baked acrylic enamel.

B. Interior Aluminum Cladding: White color. Baked acrylic enamel.

C. Stainless Steel: No. 4 finish.

D. Hardware: Polished chrome.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces, prepared openings, and roughed-in utilities are ready to receive work and opening dimensions are as indicated on shop drawings.

3.02 INSTALLATION

A. Assemble and install components in accordance with manufacturer's instructions.

B. Set floor panels in place and align. Connect to floor drains. Seal joints continuously and lock panels tightly together.

C. Set wall attachments on floor and anchor securely. Align over insulated break of recessed insulated floor slab.

D. Cut holes, install anchors, and seal room panels for plumbing, power, and lighting. Provide reinforcing or anchorage in walls for shelving equipment as specified.

E. Assemble wall panels; lock in place with cam locks. Brace securely until ceiling panels are installed.

F. Install ceiling panels; lock into wall panels. Provide and install supplementary ceiling hanger supports to building structure above.

G. Install heated thresholds and ramps.

H. Hang doors. Adjust to operate smoothly.

I. Locate condensing unit on top of roof if feasible based on clearances, hot air disapation and access for servicing.. Support coil on room interior and make connections as required. Wire-in alarm unit and door and threshold heaters. Run condensate line to nearest drain.

J. Install ceiling trim and ceiling fascia, cover plates between top of room and finished ceiling and end closure plates between room and adjacent wall.

K. Seal joints and services through walls with sealant to provide moisture and vapor seal.

3.03 FIELD QUALITY CONTROL

A. Test and adjust control equipment to ensure performance conforms to specified requirements.

B. Operate room and test full range of functions over a continuous 48 hour period, recording physical data on operating equipment. Continuously record temperature and humidity.

C. Test each room for air tightness.

D. Adjust and re-test any room not meeting requirements.

E. Provide three copies of a written quality control test report.

F. Shut off equipment and controls and lock doors to prevent operation or access by unauthorized persons.

3.04 CLEANING

A. Remove temporary protection from prefinished surfaces.

B. Wash and clean floor, walls, and ceiling inside room and exposed surfaces on the outside. Clean glass, fixtures, and fittings.

3.05 CLOSEOUT ACTIVITIES

A. Demonstrate, in the presence of Owner, the operation, function, and maintenance of each room and its associated equipment.

B. Manufacturer's Demonstration Representative: Fully knowledgeable of operating and servicing the work.

3.06 MAINTENANCE

A. See Section 01 7900 - Execution Requirements, for additional requirements relating to maintenance service.

B. Provide a separate maintenance contract for specified maintenance service.

C. Provide service and maintenance of refrigeration unit for two years from Date of Substantial Completion, at no extra cost to Owner.

END OF SECTION

SECTION 22 0500
COMMON WORK RESULTS FOR PLUMBING

PART 1 GENERAL

1.01 SCOPE

A. All provisions of the Contract including the General and Supplementary Conditions and the General Requirements apply to this work.

1.02 WORK INCLUDED

A. The work to be included in these and all other mechanical subsections shall consist of providing, installing, adjusting and setting into proper operation complete and workable systems for all items shown on the drawings, described in the specifications or reasonably implied. This shall include the planning and supervision to coordinate the work with other crafts and to maintain a proper time schedule for delivery of materials and installation of the work.

B. Division 01 of the specifications is to be specifically included as well as all related drawings.

1.03 RELATED WORK

A. See Section 01 3300 – submittal procedures.

B. Related Work Specified Elsewhere:
   1. Electrical Specifications: Division 26
   2. Motors and Connections: Division 26
   3. Starters and Disconnects: Division 26

C. Unless otherwise indicated on the electrical drawings or the electrical schedules, provide all mechanical equipment motors, motor starters, thermal overload switches, control relays, time clocks, thermostats, motor operated valves, float controls, damper motors, electric switches, electrical components, wiring and any other miscellaneous Division 22 controls. Disconnect switches are included in the electrical work, unless specifically called out on mechanical plans.

D. Carefully coordinate all work with the electrical work shown and specified elsewhere.

1.04 REFERENCED CODES - LATEST ADOPTED EDITION

A. NFPA 13 Installation of Sprinkler Systems

B. NFPA 70 National Electrical Code (NEC)

C. IMC International Mechanical Code

D. UPC Uniform Plumbing Code

E. IFC International Fire Code

F. IFGC International Fuel Gas Code

G. IBC International Building Code

1.05 SUBMITTALS

A. See General Conditions and the General Requirements in Section 01 3300 regarding submittals.

B. Submit by specification section complete and all at one time; partial submittals will not be considered.

C. Catalog sheets shall be complete and the item or model to be used shall be *clearly marked*, and identified as to which item in the specifications or on the drawings is being submitted and with drawing fixture number where applicable.

D. *Only submit* on items specifically required by each specification section. If a submittal has not been requested, it will not be reviewed.

1.06 PROJECT RECORD DRAWINGS

A. In addition to other requirements of Division 01, mark up a clean set of drawings as the work progresses to show the dimensioned location and routing of all mechanical work which will

become permanently concealed. Show routing of work in concealed blind spaces within the building.

B. Show the location of all valves and their appropriate tag identification.

C. At completion of project, deliver these drawings to the owner and obtain a written receipt.

1.07 HANDLING

A. See General Conditions and the General Requirements in Division 01 regarding material handling.

B. Deliver packaged materials to job site in unbroken packages with manufacturer's label, and store to facilitate inspection and installation sequence. All items must be labeled and identified as to make, size and quality.

1.08 SUBSTITUTIONS

A. In accordance with the General Conditions and the General Requirements in Division 01, Substitution and Product Options, all substitute items must fit in the available space, and be of equal or better quality including efficiency performance, size, and weight, and must be compatible with existing equipment. The owner shall be the final authority regarding acceptability of substitutes.

1.09 DIMENSIONS

A. Before ordering any material or doing any work, the Contractor shall verify all dimensions, including elevations, and shall be responsible for the correctness of the same. No extra charge or compensation will be allowed on account of differences between actual dimensions and measurements indicated on the drawings.

B. Any differences, which may be found, shall be submitted to the Engineer for consideration before proceeding with the work.

1.10 MANUFACTURER’S DIRECTIONS

A. All manufactured articles shall be applied, installed and handled as recommended by the manufacturer, unless specifically called out otherwise in the plans. Advise the owner of any such conflicts before installation.

1.11 PERMITS, FEES, ETC

A. The Contractor under each section of these specifications shall arrange for a permit from the local authority. The Contractor shall pay for any inspection fees or other fees and charges required by ordinance, law, codes and these specifications.

1.12 TESTING

A. The Contractor under each section shall, at his own expenses, perform the various tests as specified and required by the owner and as required by applicable code, the State, and local authorities. The Contractor shall furnish all fuel and materials necessary for making tests

1.13 TERMINOLOGY

A. Whenever the words "furnish", "provide", "furnish and install", "provide and install", and/or similar phrases occur, it is the intent that the materials and equipment described be furnished, installed and connected under this Division of the Specifications, complete for operation unless specifically noted to the contrary.

B. Where a material is described in detail, listed by catalog number or otherwise called for, it shall be the Contractor's responsibility to furnish and install the material.

C. The use of the word "shall" conveys a mandatory condition to the contract.

D. "This section" refers to the section in which the statement occurs.

E. "The project" includes all work in progress during the construction period.

F. In describing the various items of equipment, in general, each item will be described singularly, even though there may be a multiplicity of identical or similar items.

1.14 SCHEDULE OF WORK

A. The work must be expedited and close coordination will be required in executing the work. The various trades shall perform their portion of the work at such times as directed so as to meeting scheduled completion dates, and to avoid delaying any other trade. The owner will set up completion dates. Each contractor shall cooperate in establishing these times and locations and shall process his work so as to ensure the proper execution of it.

1.15 COOPERATION AND CLEANING UP

A. The contractor for the work under each section of the specifications shall coordinate his work with the work described in all other sections of the specifications to the end that, as a whole, the job shall be a finished one of its kind, and shall carry on his work in such a manner that none of the work under any section of these specifications shall be handicapped, hindered or delayed at any time.

B. At all times during the progress of the work, the Contractor shall keep the premises clean and free of unnecessary materials and debris. The Contractor shall, on direction at any time from the owner, clear any designated areas or area of materials and debris. On completion of any portion of the work, the Contractor shall remove from the premises all tools and machinery and all debris occasioned by the work, leaving the premises free of all obstructions and hindrances.

1.16 GUARANTEE

A. Unless a longer guarantee is hereinafter called for, all work, materials and equipment items shall be guaranteed for a period of one year after acceptance by the Owner. All defects in labor and materials occurring during this period, as determined by the Architect, shall be repaired and/or replaced to the complete satisfaction of the Architect. Guarantee shall be in accordance with Division 01.

1.17 COMPLETION REQUIREMENTS

A. In accordance with Division 01, Project Closeout; before acceptance and final payment, the Contractor shall furnish:
   1. Accurate project record drawings, shown in red ink on prints, showing all changes from the original plans made during installation of the work.
   2. All manufacturers' guarantees.
   3. Warranties.
   4. Operation and maintenance manuals.

PART 2 PRODUCTS

2.01 MATERIALS

A. All equipment shall be regularly cataloged items of the manufacturer and shall be supplied as a complete unit in accordance with the manufacturer's standard specifications along with any optional items required for proper installation unless otherwise noted. Maintain manufacturer's identification, model number, etc. on all equipment at all times.

B. Where more than one of an item is to be provided, all of the items shall be identical manufacture, make, model, color, etc.

2.02 RESTRICTED MATERIALS

A. No materials containing asbestos in any form shall be allowed. Where materials or equipment provided by this Contractor are found to contain asbestos, such items shall be removed and replaced with non-asbestos items. Entire cost of asbestos removal and disposal and cost of installing new items shall be the responsibility of the Contractor for those asbestos containing items installed by the Contractor.

B. No solder or flux containing lead shall be used on this project.

PART 3 EXECUTION

3.01 DRAWINGS

A. The mechanical drawings are generally diagrammatic. Complete details of the building, which affect the mechanical installation, may not be shown. For additional details, see Architectural, Structural, Civil and Electrical Drawings. Coordinate work under this section with that of all related trades.

3.02 INSTALLATION

A. All work shall comply with the latest adopted applicable codes and ordinances including, but not limited to, the NFPA, IMC, IFC, UPC, IFGC and IBC Standards; all local and state amendments to all codes and standards.

B. Obtain and pay for all inspection fees, connection charges and permits as a part of the Contract.

C. Compliance with codes and ordinances shall be at the Contractor's expense.

3.03 MEASUREMENTS

A. Verify all measurements on the job site.

B. Locate all equipment and fixtures on the centers of walls, openings, spaces, etc., unless specified otherwise.

C. Check all piping, ducts, etc. to clear openings.

D. Rough-in dimensions shall be per manufacturer's recommendations and in compliance with ADA Guidelines.

3.04 OPERATING INSTRUCTIONS

A. Before the facility is turned over to the Owner, instruct the Owner or Owner's personnel in the operation, care and maintenance of all systems and equipment under the jurisdiction of the Mechanical Division. These instructions shall also be included in a written summary in the Operating Maintenance Manuals.

B. The Operation and Maintenance Manuals shall be utilized for the basis of the instruction. Provide a minimum of four hours of onsite instruction to the owner designated personnel.

3.05 OPERATION AND MAINTENANCE MANUALS

A. Submit maintenance manuals to the Engineer covering all equipment, fixtures, devices, etc. installed by the Contractor. Submit prior to substantial completion.

B. The operation and maintenance manuals shall be bound in a loose leaf three ring binder with reinforced holes in the sheets so as to prevent lost pages. The manual shall contain, but not limited to, the following types of information:

1. Cover sheet with name, address, telephone number of Contractor, General Contractor and major equipment suppliers.
2. Catalog cuts of all equipment, fixtures, etc. installed (Marked to identify the specific items used).
3. Manufacturer's maintenance and overhaul instruction booklets including exploded views.
4. Identification numbers of all parts and nearest sources for obtaining parts and services.
5. A copy of valve schedule and reduced scale drawings showing valve locations.
6. Written summary of instructions to Owner.

C. A periodic maintenance form that includes all of the equipment shall be provided with the maintenance manual. The form shall list each piece of equipment and how often maintenance is required (daily, weekly, monthly, annually). Opposite each task shall be squares for check-off for a full year (initials) to verify that the tasks are being done.

3.06 CUTTING, FITTING, PATCHING AND FINISH

A. Arrange and pay for all cutting, fitting, repairing, patching and finishing of work by other trades where it is necessary to disturb such work to permit installation of mechanical work. Perform work only with craftsmen skilled in their respective trades.

B. Avoid cutting, insofar as possible, by setting sleeves, frames, etc. and by requesting openings in advance. Assist other trades in securing correct location and placement of rough-frames, sleeves, openings, etc. for piping.

C. Cut all holes neatly and as small as possible to admit work. Include cutting where sleeves or openings have been omitted. Perform cutting in a manner so as not to weaken walls, partitions or floors. Drill holes required to be cut in floors without breaking out around holes.

3.07 PAINTING

A. Perform all of the following painting in accordance with provisions of Division 9 with colors as selected by the Architect. Provide the following items as a part of mechanical work:
   1. Factory applied prime and finish coats on mechanical equipment.
   2. Factory applied prime coat on access doors.
   3. Pipe identification where specified.

B. If factory finish on any equipment furnished is damaged in shipment or during construction, refinish to equal original factory finish.

3.08 INSTALLATION OF EQUIPMENT

A. Unless otherwise indicated, mount all equipment and install in accordance with manufacturer's recommendations and approved submittals.

B. Maintain manufacturer’s recommended minimum clearances for access and maintenance.

C. Where equipment is to be anchored to structure, furnish and locate necessary anchoring and vibration isolation devices.

D. Furnish all structural steel, such as angles, channels, beams, etc. required to support all piping, equipment and accessories installed under this Division. Use structural supports suitable for equipment specified or as indicated. In all cases, support design will be based upon data contained in manufacturer's catalog.

E. Openings: Arrange for necessary openings in buildings to allow for admittance and reasonable maintenance or replacement of all apparatus furnished under this Contract.

F. Access Doors: Provide as necessary for reasonable maintenance of all equipment valves, water hammer arrestors, trap primers, and controls, etc.

END OF SECTION

SECTION 22 0503
PIPES AND TUBES FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Pipe and pipe fittings for the following systems:
   1. Domestic water piping within 5 feet of building.
   2. Sanitary sewer piping buried within 5 feet of building.
   3. Sanitary sewer piping above grade.
   4. Storm water piping within 5 feet of building.
   5. Equipment drains and over flows.
   6. Unions and flanges.

1.02 RELATED SECTIONS

A. Section 07 9005 - Firestopping: Product requirements for firestopping for placement by this section.

B. Section 08 3100 - Access Doors and Frames: Product requirements for access doors for placement by this section.

C. Division 09 - Painting and Coating: Product and execution requirements for painting specified by this section.

D. Section 22 0523 - General-Duty Valves for Plumbing Piping: Product requirements for valves for placement by this section.

E. Section 22 0529 - Hangers and Supports for Plumbing Piping and Equipment: Product requirements for pipe hangers and supports and firestopping for placement by this section.

F. Section 22 0548 - Vibration and Seismic Controls for Plumbing Piping and Equipment: Product requirements for vibration isolation for placement by this section.

G. Section 22 0700 - Plumbing Insulation: Product requirements for piping insulation for placement by this section.

1.03 REFERENCES

A. See Section 01 3300 – submittal procedures.

B. American Society of Mechanical Engineers:
   1. ASME B16.3 - Malleable Iron Threaded Fittings.
   2. ASME B16.4 - Gray Iron Threaded Fittings.
   3. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.
   4. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
   5. ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings (DWV).
   6. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV.
   7. ASME B31.9 - Building Services Piping.
   8. ASME Section IX - Boiler and Pressure Vessel Code - Welding and Brazing Qualifications.

C. ASTM International:
   1. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
   2. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings.
   3. ASTM B32 - Standard Specification for Solder Metal.
   4. ASTM B88 - Standard Specification for Seamless Copper Water Tube.
   5. ASTM B306 - Standard Specification for Copper Drainage Tube (DWV).
   6. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.

7. ASTM D1785 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
8. ASTM D2235 - Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.
9. ASTM D2241 - Standard Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter.
10. ASTM D2464 - Standard Specification for Threaded Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
11. ASTM D2466 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
12. ASTM D2564 - Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.
13. ASTM D2661 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe and Fittings.
14. ASTM D2729 - Standard Specification for Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
15. ASTM D2665 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings.
16. ASTM D2680 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) and Poly (Vinyl Chloride) (PVC) Composite Sewer Piping.
17. ASTM D2751 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings.
18. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
19. ASTM D3034 - Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

D. American Welding Society:
1. AWS A5.8 - Specification for Filler Metals for Brazing and Braze Welding.

E. American Water Works Association:
1. AWWA C110 - American National Standard for Ductile-Iron and Grey-Iron Fittings, 3 in. through 48 in. (75 mm through 1200 mm), for Water and Other Liquids.
2. AWWA C111 - American National Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
3. AWWA C151 - American National Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water.

F. Cast Iron Soil Pipe Institute:
1. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications.
2. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications.

1.04 SUBMITTALS

A. Section 01 3300 - Submittal Procedures.

B. Product Data: Submit data on pipe materials and fittings. Submit manufacturers catalog information.

C. Welders' Certificate: Include welders' certification of compliance with ASME Section IX.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with ASME B31.9 code for installation of piping systems and ASME Section IX for welding materials and procedures.

1.06 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years experience.

B. Installer: Company specializing in performing work of this section with minimum three years experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Division 01 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Furnish temporary end caps and closures on piping and fittings. Maintain in place until installation.

C. Protect piping from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Section 01 5719 - Temporary Environmental Controls: Environmental conditions affecting products on site.

1.09 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.10 COORDINATION

A. Division 01 - Administrative Requirements: Requirements for coordination.

B. Coordinate installation of buried piping with trenching.

PART 2 PRODUCTS

2.01 DOMESTIC WATER PIPING

A. Copper Tubing: ASTM B88, Type L, hard drawn. Fittings: ASME B16.18, cast copper alloy, or ASME B16.22, wrought copper. Joints: ANSI/ASTM B32, solder, Grade 95TA; Flux: ASTM B813 or Viega Pro-Press or Equal.

B. CPVC ½" To 2": FlowGuard Gold CPVC or equal, ASTM D2846, NSF listed, SDR 11, Schedule 40, Fittings: Solvent welded socket type.

C. CPVC Larger than 2": Corzan CPVC or equal, ASTM F441, NSF listed, Schedule 80, Fittings: ASTM F439 Solvent welded socket type.

2.02 SANITARY SEWER PIPING

A. Cast Iron Pipe: CISPI 301, hub-less, service weight.
   1. Fittings: Cast iron, CISPI 301.
   2. Joints: ASTM C1540, ASTM C564, Neoprene gaskets and stainless steel clamp-and-shield assemblies. Minimum 4 clamps, Husky SD 4000 or approved equal.

B. Copper Tube: ASTM B306, DWV
   1. Fittings: ASME B16.23, cast bronze, or ASME B16.29, wrought copper.
   2. Joints: ASTM B32, Alloy Grade Sb5 tin-antimony, or Alloy Grade Sn95 tin-silver, lead free solder.

2.03 EQUIPMENT DRAINS AND OVERFLOWS

A. Steel Pipe: ASTM A53/A53M Schedule 40, galvanized.
   1. Fittings: ASME B16.3, malleable iron or ASME B16.4, cast iron.
   2. Joints: Threaded for pipe 2 inch and smaller; flanged for pipe 2-1/2 inches and larger.

B. Copper Tubing: ASTM B88, Type L drawn.
   1. Fittings: ASME B16.18, cast brass, or ASME B16.22 solder wrought copper.
   2. Joints: ASTM B32, Alloy Grade Sb5 tin-antimony, or Alloy Grade Sn95 tin-silver, lead free solder.

2.04 UNIONS AND FLANGES

A. Unions for Pipe 2 inches and Smaller:
   1. Ferrous Piping: Class 150, malleable iron, threaded.

B. Flanges for Pipe 2-1/2 inches and Larger:

1. Ferrous Piping: Class 150, forged steel, slip-on flanges.
2. PVC Piping: PVC flanges.
3. CPVC Piping: CPVC flanges.
4. Gaskets: 1/16 inch thick preformed neoprene gaskets.

C. CPVC Pipe Materials: For connections to equipment and valves with threaded connections, furnish solvent-weld socket to screwed joint adapters and unions, or ASTM D2864, Schedule 80, threaded, CPVC pipe.

PART 3 EXECUTION

3.01 EXAMINATION

A. Division 01- Administrative Requirements: Verification of existing conditions before starting work.

3.02 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare piping connections to equipment with flanges or unions.

D. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

3.03 INSTALLATION

A. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

B. Install piping to maintain headroom without interfering with use of space or taking more space than necessary.

C. Group piping whenever practical at common elevations.

D. Sleeve pipe passing through partitions, walls and floors. Refer to Section 22 0529.

E. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

F. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting. Refer to Division 09.

G. Install firestopping at fire rated construction perimeters and openings containing penetrating sleeves and piping. Refer to Division 07.

H. Support cast iron drainage piping at every joint.

I. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment..

J. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 22 0700.

K. Provide access where valves and fittings are not accessible. Coordinate size and location of access doors with Division 08.

L. Install non-conducting dielectric connections wherever jointing dissimilar metals.

M. Establish invert elevations, slopes for drainage to 1/4 inch per foot minimum, and 1/8 inch per foot if 4” or over, minimum. Maintain gradients.

N. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Provide clearances at cleanout for snaking drainage system.

O. Encase exterior cleanouts in concrete flush with grade.

P. Install floor cleanouts at elevation to accommodate finished floor.

Q. Slope piping and arrange systems to drain at low points.

R. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

S. Install piping penetrating roofed areas to maintain integrity of roof assembly.

T. Install valves in accordance with Section 22 0523.

U. Install piping specialties in accordance with Section 23 2116.

V. Insulate piping. Refer to Section 22 0700.

W. Install pipe identification in accordance with Section 22 0553.

X. Install domestic water piping system in accordance with ASME B31.9.

Y. Install sanitary waste and vent piping systems in accordance with ASME B31.9.

Z. Support cast iron drainage piping at every joint.

3.04 FIELD QUALITY CONTROL

A. Section 01 4000- Quality Control (Testing) Requirements and Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.

B. Test domestic water piping system in accordance with applicable code.

C. Test storm drainage piping system in accordance with applicable code.

3.05 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Prior to starting work, verify system is complete, flushed and clean.

B. Disinfect all portions of the domestic water system as per Section 609.9 of the 2009 UPC. Submit written statement indicating test procedure and results.

END OF SECTION

SECTION 22 0523
GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Ball valves.
   2. Butterfly valves.
   3. Check valves.

1.02 RELATED WORK

A. Section 22 0503 - Pipes and Tubes for Plumbing Piping and Equipment: Product and installation requirements for piping materials applying to various system types.

B. Section 22 0529 - Hangers and Supports for Plumbing Piping and Equipment: Product and installation requirements for pipe hangers and supports.

C. Section 22 0700 - Plumbing Insulation: Product and installation requirements for insulation for valves.

1.03 REFERENCES

A. See Section 01 3300 – submittal procedures.

B. Manufacturers Standardization Society of the Valve and Fittings Industry:
   1. MSS SP 67 - Butterfly Valves.
   2. MSS SP 71 - Cast Iron Swing Check Valves, Flanged and Threaded Ends.
   3. MSS SP 80 - Bronze Gate, Globe, Angle and Check Valves.
   4. MSS SP 110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

1.04 SUBMITTALS

A. Section 01 3300 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit manufacturers catalog information with valve data and ratings for each service.

C. Manufacturer's Installation Instructions: Submit hanging and support methods, joining procedures.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.05 CLOSEOUT SUBMITTALS

A. Section 01 7800 - Project Closeout Requirements: Requirements for submittals.

B. Operation and Maintenance Data: Submit installation instructions, spare parts lists, exploded assembly views.

1.06 QUALITY ASSURANCE

A. For drinking water service, provide valves complying with NSF 61.

1.07 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years documented experience.

B. Installer: Company specializing in performing work of this section with minimum three years documented experience approved by manufacturer.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Section 01 1413 – Site Access and Storage: Requirements for transporting, handling, storing, and protecting products.

B. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

C. Provide temporary protective coating on cast iron and steel valves.

1.09 ENVIRONMENTAL REQUIREMENTS

A. Section 01 5719 - Temporary Environmental Controls: Environmental conditions affecting products on site.

1.10 WARRANTY

A. Section 01 7800 - Project Closeout Requirements: Requirements for warranties.

PART 2 PRODUCTS

2.01 BALL VALVES

A. Manufacturers:
   1. Crane Valve, North America.
   2. Hammond Valve.
   3. Milwaukee Valve Company.
   4. NIBCO, Inc.
   5. Stockham Valves & Fittings.
   6. Substitutions: Division 01 - Product Requirements.

B. 2 inches and Smaller: MSS SP 110, bronze, two piece body, chrome plated ball, full port, teflon seats, blow-out proof stem, solder or threaded ends with union, and lever handle.

C. Over 2 Inches: Cast steel, two piece body, full port chrome plated steel ball, Teflon seat and stuffing box seals, lever handle, flanged. Seat material to be compatible with liquid handled.

2.02 CHECK VALVES

A. Horizontal Swing Check Valves:
   1. Manufacturers:
      a. Crane Valve, North America.
      b. Hammond Valve.
      c. Milwaukee Valve Company.
      d. NIBCO, Inc.
      e. Stockham Valves & Fittings.
      f. Substitutions: Section 01 2513 - Product Substitutions.

B. Up to 2 Inches: Bronze swing disc, solder or screwed ends.

C. Over 2 Inches: Iron body, bronze trim, swing disc, renewable disc and seat, flanged ends.

2.03 SPRING LOADED CHECK VALVES

A. Iron body, bronze trim, spring loaded, renewable composition disc, screwed, wafer, or flanged ends.

2.04 BUTTERFLY VALVES

A. Manufacturers:
   1. Crane Valve, North America.
   2. Hammond Valve.
   3. Milwaukee Valve Company.
   4. NIBCO, Inc.
   5. Stockham Valves & Fittings.
   6. Substitutions: Section 01 2513 - Product Substitutions.

B. 2-1/2 inches and Larger: MSS SP 67
   1. Body: Cast or ductile iron, wafer or lug ends, stainless steel stem, extended neck.
   2. Disc: Aluminum bronze
   3. Seat: Resilient replaceable seat suitable for service.
   4. Handle and Operator: 10 position lever handle. Furnish gear operators for valves 8 inches and larger, and chain-wheel operators for valves mounted over 8 feet above floor.

2.05 GATE VALVES

A. Not permitted. Use ball or butterfly valves for isolation service.

2.06 GLOBE VALVES

A. Not permitted. Use ball or butterfly valves for throttling service.

PART 3 EXECUTION

3.01 EXAMINATION

A. Division 01 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify piping system is ready for valve installation.

3.02 INSTALLATION

A. Install valves with stems upright or horizontal, not inverted.

B. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.

C. Install 3/4 inch ball valves with cap for drains at main shut-off valves, low points of piping, bases of vertical risers, and at equipment.

D. Install valves with clearance for installation of insulation and allowing access.

E. Provide access where valves and fittings are not accessible. Coordinate size and location of access doors.

3.03 VALVE APPLICATIONS

A. Install shutoff and drain valves at locations indicated on Drawings in accordance with this Section.

B. Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.

C. Install ball valves for throttling, bypass, or manual flow control services.

D. Install spring loaded check valves on discharge of water pumps.

E. Install lug end butterfly valves adjacent to equipment when functioning to isolate equipment.

F. Install ball and butterfly valves in domestic water systems for shut-off service.

END OF SECTION

SECTION 22 0529

HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Pipe hangers and supports.
   2. Hanger rods.
   3. Sleeves.
   4. Formed steel channel.

1.02 RELATED WORK

A. Section 07 8400 - Firestopping: Product requirements for firestopping for placement by this section.

B. Section 07 9005 - Joint Sealers: Product requirements for sealant materials for placement by this section.

C. Section 22 0503 - Pipes and Tubes for Plumbing Piping and Equipment: Execution requirements for placement of hangers and supports specified by this section.

D. Section 22 1300 - Pipes and Tubes for Sanitary Sewer Piping and Equipment: Execution requirements for placement of hangers and supports specified by this section.

1.03 REFERENCES

A. See Section 01 3300 – submittal procedures.

B. American Society of Mechanical Engineers:
   1. ASME B31.9 - Building Services Piping.

C. ASTM International:
   1. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
   2. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
   3. ASTM E814 - Standard Test Method for Fire Tests of Through Penetration Fire Stops.
   4. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers.
   5. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems.

D. American Welding Society:
   1. AWS D1.1 - Structural Welding Code - Steel.

E. Manufacturers Standardization Society of the Valve and Fittings Industry:
   1. MSS SP 58 - Pipe Hangers and Supports - Materials, Design and Manufacturer.
   2. MSS SP 69 - Pipe Hangers and Supports - Selection and Application.
   3. MSS SP 89 - Pipe Hangers and Supports - Fabrication and Installation Practices.

F. Underwriters Laboratories Inc.:
   1. UL 263 - Fire Tests of Building Construction and Materials.
   2. UL 723 - Tests for Surface Burning Characteristics of Building Materials.
   3. UL 1479 - Fire Tests of Through-Penetration Firestops.
   4. UL 2079 - Tests for Fire Resistance of Building Joint Systems.
   5. UL - Fire Resistance Directory.

1.04 DEFINITIONS

A. Firestopping (Through-Penetration Protection System): Sealing or stuffing material or assembly placed in spaces between and penetrations through building materials to arrest movement of fire, smoke, heat, and hot gases through fire rated construction.

1.05 SYSTEM DESCRIPTION

A. Firestopping Materials: Comply with requirements of Division 07.

1.06 PERFORMANCE REQUIREMENTS

A. Firestopping Materials: Comply with requirements of Section 07 8400.

B. Conform to applicable code for support of plumbing piping.

1.07 SUBMITTALS

A. Section 01 3300 - Submittal Procedures.

B. Product Data:
   1. Hangers and Supports: Submit manufacturers catalog data including load capacity.

C. Manufacturer's Installation Instructions:
   1. Hangers and Supports: Submit special procedures and assembly of components.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.08 QUALITY ASSURANCE

A. Perform Work in accordance with applicable authority for welding hanger and support attachments to building structure.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Division 01 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Accept materials on site in original factory packaging, labeled with manufacturer's identification.

C. Protect from weather and construction traffic, dirt, water, chemical, and damage, by storing in original packaging.

1.10 ENVIRONMENTAL REQUIREMENTS

A. Section 01 5719 - Temporary Environmental Controls: Environmental conditions affecting products on site.

1.11 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.12 WARRANTY

A. Division 01 - Execution and Closeout Requirements: Product warranties and product bonds.

PART 2 PRODUCTS

2.01 PIPE HANGERS AND SUPPORTS

A. Manufacturers:
   1. Carpenter & Paterson Inc.
   2. Creative Systems Inc.
   3. Flex-Weld, Inc.
   4. Glope Pipe Hanger Products Inc.
   5. Michigan Hanger Co.
   6. Superior Valve Co.
   7. Anvil.
   8. Substitutions: Section 01 2513 – Product Substitutions.

B. Plumbing Piping - DWV:
   1. Conform to MSS SP58.
   2. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron or Carbon steel, adjustable swivel, split ring.
   3. Hangers for Pipe Sizes 2 inches and Larger: Carbon steel, adjustable, clevis.
   4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
   5. Wall Support for Pipe Sizes 3 inches and Smaller: Cast iron hook.

6. Wall Support for Pipe Sizes 4 inches and Larger: Welded steel bracket and wrought steel clamp.
7. Vertical Support: Steel riser clamp.
8. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
9. Copper Pipe Support: Copper-plated, carbon-steel adjustable, ring.

C. Plumbing Piping - Water:
1. Conform to MSS SP58.
2. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron or Carbon steel, adjustable swivel, split ring.
3. Hangers for Cold Pipe Sizes 2 inches and Larger: Carbon steel, adjustable, clevis.
4. Hangers for Hot Pipe Sizes 2 to 4 inches: Carbon steel, adjustable, clevis.
5. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
6. Wall Support for Pipe Sizes 3 inches and Smaller: Cast iron hook.
7. Vertical Support: Steel riser clamp.
8. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
9. Floor Support for Hot Pipe Sizes 4 inches and Smaller: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
10. Copper Pipe Support: Copper-plated, Carbon-steel ring.

2.02 ACCESSORIES

A. Hanger Rods: Mild steel threaded both ends, threaded on one end, or continuous threaded.

2.03 SLEEVES

A. Sleeves for Pipes Through Non-fire Rated Floors: 18 gage thick galvanized steel.

B. Sleeves for Pipes Through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Steel pipe or 18 gage thick galvanized steel.

C. Sealant: Refer to Division 07.

2.04 FORMED STEEL CHANNEL

A. Manufacturers:
1. Allied Tube & Conduit Corp.
2. B-Line Systems Midland Ross Corporation, Electrical Products Division
3. Unistrut Corp.
4. Substitutions: Section 01 2513 - Product Substitutions.

B. Product Description: Galvanized 12 gage thick steel. With holes 1-1/2 inches on center.

PART 3 EXECUTION

3.01 EXAMINATION

A. Division 01 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify openings are ready to receive sleeves.

C. Verify openings are ready to receive firestopping.

3.02 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter affecting bond of firestopping material.

B. Remove incompatible materials affecting bond.

C. Do not drill or cut structural members.

3.03 INSTALLATION - PIPE HANGERS AND SUPPORTS

A. Install in accordance with MSS SP 69.

B. Install in accordance with manufacturer's instructions.

C. Support horizontal piping as scheduled.

D. Install hangers with minimum 1/2 inch space between finished covering and adjacent work.

E. Place hangers within 12 inches of each horizontal elbow.

F. Use hangers with 1-1/2 inch minimum vertical adjustment.

G. Support horizontal cast iron pipe adjacent to each hub, with 5 feet maximum spacing between hangers.

H. Support vertical piping at every floor. Support vertical cast iron pipe at each floor at hub.

I. Where piping is installed in parallel and at same elevation, provide multiple pipe or trapeze hangers.

J. Support riser piping independently of connected horizontal piping.

K. Provide transverse seismic support for all piping systems.

L. Provide copper plated hangers and supports for copper piping.

M. Design hangers for pipe movement without disengagement of supported pipe.

N. Prime coat exposed steel hangers and supports. Refer to Division 09. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

O. Provide clearance in hangers and from structure and other equipment for installation of insulation. Refer to Section 22 0700.

3.04 INSTALLATION - SLEEVES

A. Set sleeves in position in forms. Provide reinforcing around sleeves.

B. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

C. Where piping penetrates floor, ceiling, or wall, close off space between pipe and adjacent work with firestopping insulation and caulk airtight. Provide close fitting metal collar or escutcheon covers at both sides of penetration.

D. Extend sleeves through floors one inch above finished floor level. Pack and caulk sleeves full depth and provide floor plate.

E. Install chrome plated steel escutcheons at finished surfaces.

3.05 FIELD QUALITY CONTROL

A. Section 01 4000 - Quality Control Requirements: Requirements for inspecting, testing.

B. Section 01 7800 - Project Closeout Requirements: Requirements for testing, adjusting, and balancing.

C. Inspect installed firestopping for compliance with specifications and submitted schedule.

3.06 CLEANING

A. Section 01 7800 - Project Closeout Requirements: Requirements for cleaning.

B. Clean adjacent surfaces of firestopping materials.

3.07 PROTECTION OF FINISHED WORK

A. Section 01 7800 - Project Closeout Requirements: Requirements for protecting finished Work.

B. Protect adjacent surfaces from damage by material installation.

3.08 SCHEDULES

PIPE MATERIAL	MAXIMUM HANGER SPACING Feet	HANGER ROD DIAMETER Inches
ABS (All sizes)	4	3/8

Cast Iron (All Sizes)	5	5/8
Cast Iron (All Sizes) with 10 foot length of pipe	10	5/8
Copper Tube, 1-1/4 inches and smaller	6	1/2
Copper Tube, 1-1/2 inches and larger	10	1/2
CPVC, PVC (All Sizes)	4	3/8
Steel, 3 inches and smaller	12	1/2
Steel, 4 inches and larger	12	5/8

END OF SECTION

SECTION 22 0548

VIBRATION AND SEISMIC CONTROLS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 WORK INCLUDED

A. Vibration Isolation.

B. Seismic Restraint.

1.02 GENERAL

A. The requirements for seismic protection measures to be applied to plumbing equipment and systems specified herein are in addition to any other items called for in other sections of these specifications.

B. Seismic calculations shall be based upon Seismic Structural Category D. Seismic calculations shall utilize and Component Importance Factor, IP, of 1.0. Refer to Structural drawings and specifications for additional requirements.

1.03 PLUMBING EQUIPMENT

A. See Section 01 3300 – submittal procedures.

B. Plumbing equipment shall include the following items to the extent required on plans or in other sections of these specifications.
   1. Hot Water Generators.
   2. Expansion/Compression Tanks.
   3. Domestic Water Piping.
   4. DWV Piping.

1.04 REFERENCE STANDARDS

A. ASCE 7 – Minimum Design Loads for Buildings and Other Structures, Latest adopted Edition.

B. SMACNA - Seismic Restraint Manual, Guidelines for Mechanical Systems.

C. IBC – International Building Code, Latest Adopted Edition.

D. UPC – Uniform Plumbing Code.

1.05 SUBMITTALS

A. Submit shop drawings and manufacturer's data in accordance with Section 01 3300.

B. Provide structural and seismic calculations with fastening details in accordance with the IBC. Provide Calculations shall be certified by a licensed engineer. Submit shop drawings and seismic calculations for review. Submit plan review approved set to Engineer when available. The submittals must include a licensed engineer’s stamp and signature and shall be provided as deferred submittal.

C. Shop drawings shall include catalog cuts, templates and erection and installation details, as appropriate. Submittals shall be complete in detail; shall indicate thickness, type, grade, class of metal; and dimensions; and shall show construction details, reinforcement, anchorage, and installation with relation to the building construction.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Vibration isolators shall be manufactured by:
   1. Vibro-Accoustics.
   2. Amber Booth.
   3. International Seismic Application Technology.
   4. Mason Industries.
   5. Substitutions: Under provisions of Section 01 2513.

2.02 LIMITS OF VIBRATION

A. Statically and dynamically balance all rotating machinery, pumps, etc. Do dynamic balancing at the operating speed of the motor.

B. Select isolated equipment in accordance with the weight distribution, to produce uniform deflection on the vibration mounts. Deflection of vibration mounts shall be required to produce 95% vibration isolation efficiency, based on the equipment hp, rpm, location in regard to critical spaces and stiffness of the building supporting structural members, supporting the equipment.

C. For fan-motor units in which the impeller is supported by the motor shaft, the motor and impeller shall be dynamically balanced as an integral unit.

2.03 EARTHQUAKE BUMPERS AND SNUBBERS

A. Bumpers:
   1. Fabricate the bumper cradle of 6 X 4 X 3/8" angle iron minimum and provide with at least two holes for bolting to the floor.
   2. Attach one or more Elastomeric mountings to pad the 6" leg of the angle iron.
   3. Design the mounting to deflect not more than ¾" under the shock loading of 1 g in any direction in the horizontal plane.
   4. Manufacturer: Vibration Mounting Series "SR" seismic restraints, or similar.

B. Snubbers:
   1. Interlocking steel members restrained by shock absorbent rubber materials.
   2. Elastomeric materials shall be replaceable and a minimum of ¾” thickness.
   3. Maintain 1/8” air gap in all directions in design of snubber.
   4. Acceleration of 4 g’s in any direction.
   5. All-directional restraint.
   6. Manufacturer: Mason Industries Z-1011 Seismic Snubber.

2.04 MATERIALS AND EQUIPMENT

A. Materials and equipment shall conform to the respective specifications and other requirements specified below.

B. Bolts and Nuts: Square head bolts and heavy hexagon nuts, ANSI B18.2.1 and B18.2.2, and ASTM A 307 or A 576.

C. Bolts, underground, ASTM 325.

D. Sway Brace: Material used for members listed in Tables I through III of this specification, except for pipes, shall be structural steel conforming with ASTM A 36. Steel pipes shall conform to ASTM A 501.

E. Flexible Couplings: Flexible couplings shall have same pressure ratings as adjoining pipe.

F. Flexible ball joints conforming to the following requirements may be employed on above ground piping. Joints shall have cast or wrought steel casing and ball parts capable of 360º rotation plus not less than 15º angular movement. Joints shall be certified to be suitable for the service intended by the manufacturer, based on not less than 2 years satisfactory operation in a similar application.

G. Sleeve type couplings shall be used for joining plain-end pipe section. The couplings shall consist of one steel middle ring, two steel followers, two gaskets, and necessary steel bolts and nuts to compress the gaskets.

H. Seismic Cable Restraint: High strength galvanized steel aircraft cable manufactured to meet or exceed minimum materials and standard requirements pre AISI Manual for structural applications of steel cables and ASTM A630. Break strengths must be per ASTM E-8 procedures. UL certified break strength, color coded.

PART 3 EXECUTION

3.01 SCOPE OF WORK

A. All vibrating equipment and the interconnecting pipe shall be isolated to eliminate the transmission of objectionable noise and vibration from the structure.

B. Plumbing equipment shall be carefully checked upon delivery for proper performance which shall include proper noise and vibration operation.

C. Where additional attenuation is required for ventilation equipment, the increased pressure drop must not cause an increase in power requirements form those specified.

D. All installed rotating equipment with excessive noise and/or vibration which cannot be corrected in place shall be replaced at no cost to Owner.

3.02 GENERAL PROCEDURES

A. Select isolators in accordance with the manufacturer's recommendations and the equipment weight distribution to allow for proper static deflection of the isolators in relation to the span of the building structure supporting the equipment, considering the allowable deflection and weight of the structure.

B. Install isolators so they can be easily removed for replacement.

C. Mount all equipment absolutely level.

D. Install all isolators per manufacturer's instructions.

E. Install vibration isolators for mechanical motor driven equipment.

F. Secure seismic restraint cable to structure and to braced component through bracket or stake eye specifically designed by the cable manufacturer to exceed cable restraint rated capacity.

3.03 PIPING

A. Provide the first two piping supports away from an isolated piece of equipment to which piping is connected with spring hangers having deflections equal to that of the equipment isolation. Size supports for all horizontal piping 2-½" and larger which is spring isolated for a minimum starting deflection of 3/4" with the pipe filled.

B. Where piping 2" and smaller is to be isolated, use either Stoneman #S100, S500, S200 or S600 isolators or support the piping on its insulation with a sheetmetal shield, using a section of 9# density insulation under the hanger.

C. Size vertical piping supports with deflection capability equal to four times the anticipated expansion or contraction. Install temporary anchors as required to permit readjustment of springs in the risers, to fix direction of pipe movement and final operating deflection of the springs.

D. Piping vibration isolation flexible connections shall make a 90º change of direction unless otherwise noted.

3.04 **RUST PROOFING**

A. Treat all vibration isolation hardware for resistance to corrosion.

B. Provide zinc electro-plated nuts, bolts and washers.

C. Provide steel components PVC coated or primed with zinc chromate primer and painted with two coats of industrial grade enamel. Completely remove all welding slag and thoroughly clean all surfaces before painting.

3.05 SWAY BRACES

A. Sway braces shall be installed on piping and ductwork to preclude damage during seismic activity. All bracing shall conform to the requirements of the IBC. Provisions on this paragraph apply to all piping within a 5 foot line around outside of building unless buried in the ground. Piping grouped for support on trapeze type hangers shall be braced at the same intervals as determined by the smallest diameter pipe of the group. The trapeze type hanger shall be secured with less than two 1/2 inch bolts. Bracing rigidly attached to pipe flanges, or similar, shall not be used where it would interfere with thermal expansion of piping.

3.06 SPREADERS

A. Spreaders shall be provided between racked or adjacent piping runs to prevent contact during seismic activity. All spreaders shall conform to the requirements of the IBC.

3.07 FLEXIBLE COUPLINGS OR JOINTS

A. Building Piping: Flexible couplings or joints in building pipe shall be provided at bottom of all pipe risers 3-1/2 inch size and larger. Cast iron waste and vent piping need only comply with these provisions when caulked joints are used.

3.08 ANCHOR BOLTS

A. All floor or pad mounted equipment required by any section of these specifications shall use cast in place anchor bolts. Two nuts shall be provided on each bolt. Anchor bolts must conform to ASTM A 307.

3.09 VIBRATION ISOLATED DEVICES

A. Resilient and Spring Type Vibration Devices: Vibration isolation devices shall be selected so that the maximum movement of equipment from the static deflection point shall be 0.5 inches.

B. Multidirectional Seismic Snubbers: A minimum of four multidirectional seismic snubbers shall be installed on all floor or slab mounted equipment.

3.10 EQUIPMENT SWAY BRACING

A. Equipment sway bracing shall be provided for all items supported from overhead floor or roof structures to conform to the requirements of the IBC.

END OF SECTION

SECTION 22 0553

IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Nameplates.
   2. Tags.
   3. Stencils.
   4. Pipe markers.
   5. Ceiling tacks.
   6. Labels.
   7. Lockout devices.

B. Related Sections:
   1. Division 09 - Painting and Coating: Execution requirements for painting specified by this section.

1.02 REFERENCES

A. American Society of Mechanical Engineers:
   1. ASME A13.1 - Scheme for the Identification of Piping Systems.

B. National Fire Protection Association:
   1. NFPA 99 - Standard for Health Care Facilities.

1.03 SUBMITTALS

A. See Section 01 3300 - submittal procedures.

B. Product Data: Submit manufacturers catalog literature for each product required.

C. Manufacturer's Installation Instructions: Indicate installation instructions, special procedures, and installation.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.04 CLOSEOUT SUBMITTALS

A. Division 01 - Execution and Closeout Requirements: Closeout procedures.

B. Project Record Documents: Record actual locations of tagged valves; include valve tag numbers.

1.05 QUALITY ASSURANCE

A. Conform to ASME A13.1 for color scheme for identification of piping systems and accessories.

1.06 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

B. Installer: Company specializing in performing Work of this section with minimum three years experience.

1.07 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.01 NAMEPLATES

A. Manufacturers:
   1. Craftmark Identification Systems.
   2. Safety Sign Co.
   3. Seton Identification Products.
   4. Substitutions: Section 01 2513 - Product Substitutions.

B. Product Description: Laminated three-layer plastic with engraved black letters on light contrasting background color.

2.02 TAGS

A. Plastic Tags:
1. Manufacturers:
   a. Craftmark Identification Systems.
   b. Safety Sign Co.
   c. Seton Identification Products.
   d. Substitutions: Section 01 2513 - Product Requirements.
2. Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inches diameter.

B. Metal Tags:
1. Manufacturers:
   a. Craftmark Identification Systems.
   b. Safety Sign Co.
   c. Seton Identification Products.
   d. Substitutions: Section 01 2513 - Product Substitutions.
2. Brass with stamped letters; tag size minimum 1-1/2 inches diameter with finished edges.

C. Information Tags:
1. Manufacturers:
   a. Craftmark Identification Systems.
   b. Safety Sign Co.
   c. Seton Identification Products.
   d. Substitutions: Section 01 2513 - Product Substitutions.
2. Clear plastic with printed "Danger," "Caution," or "Warning" and message; size 3-1/4 x 5-5/8 inches with grommet and self-locking nylon ties.

D. Tag Chart: Typewritten letter size list of applied tags and location in anodized aluminum frame.

2.03 STENCILS

A. Stencils: With clean cut symbols and letters of following size:
1. Up to 2 inches Outside Diameter of Insulation or Pipe: 1/2 inch high letters.
2. 2-1/2 to 6 inches Outside Diameter of Insulation or Pipe: 1-inch high letters.
3. Over 6 inches Outside Diameter of Insulation or Pipe: 1-3/4 inches high letters.

B. Stencil Paint: As specified in Division 09, semi-gloss enamel, colors and lettering size are conforming to ASME A13.1.

2.04 PIPE MARKERS

A. Color and Lettering: Conform to ASME A13.1.

B. Plastic Pipe Markers:
1. Manufacturers:
   a. Craftmark Identification Systems.
   b. Safety Sign Co.
   c. Seton Identification Products.
   d. Substitutions: Section 01 2513 - Product Substitutions.
2. Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering. Larger sizes may have maximum sheet size with spring fastener.

C. Plastic Tape Pipe Markers:
1. Manufacturers:
   a. Craftmark Identification Systems.
   b. Safety Sign Co.
   c. Seton Identification Products.
   d. Substitutions: Section 01 2513 - Product Substitutions.

2. Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.
3. Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

2.05 CEILING LABELS

A. Manufacturers:
1. DuraLabel
2. Brady Worldwide, Inc.
3. Brimar Industries, Inc.
4. Craftmark Identification Systems.
5. Substitutions: Section 01 2513 - Product Substitutions.

B. Description: Description: 3/4" x 3" vinyl label, 3.0 Mil self adhesive vinyl similar to DuraLabel Pro. Label color shall be black text on a white background.

PART 3 EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

B. Prepare surfaces in accordance with Division 09 for stencil painting.

3.02 INSTALLATION

A. Apply stencil painting in accordance with Division 09.

B. Install identifying devices after completion of coverings and painting.

C. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive.

D. Install tags using corrosion resistant chain. Number tags consecutively by location.

E. Identify water heaters and pumps with plastic nameplates. Identify in-line pumps and other small devices with tags.

F. Identify control panels and major control components outside panels with plastic nameplates.

G. Identify valves in main and branch piping with tags.

H. Identify piping, concealed or exposed, with plastic pipe markers or stenciled painting. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and tee, at each side of penetration of structure or enclosure, and at each obstruction.

I. Label ceiling grid for mechanical equipment, valves and control components located above ceiling. The label shall contain the equipment tag, valve tag or identification tag for control component.

END OF SECTION

SECTION 22 0700
PLUMBING INSULATION

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Plumbing piping insulation, jackets and accessories.
   2. Plumbing equipment insulation, jackets and accessories.

B. Related Sections:
   1. Division 07: Product requirements for firestopping for placement by this section.
   2. Division 09 - Painting and Coating: Execution requirements for painting insulation jackets and covering specified by this section.

1.02 REFERENCES

A. ASTM International:
   1. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
   2. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
   3. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
   4. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement.
   5. ASTM C449/C449M - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement.
   6. ASTM C450 - Standard Practice for Fabrication of Thermal Insulating Fitting Covers for NPS Piping, and Vessel Lagging.
   7. ASTM C534 - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.
   8. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation.
   9. ASTM C585 - Standard Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System).
   10. ASTM C591 - Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation.
   11. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
   12. ASTM C921 - Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.
   13. ASTM C1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.
   14. ASTM D1785 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedule 40, 80, and 120.
   15. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
   16. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials.

1.03 SUBMITTALS

A. See Section 01 3300 - submittal procedures.

B. Product Data: Submit product description, thermal characteristics and list of materials and thickness for each service, and location.

C. Manufacturer's Installation Instructions: Submit manufacturers published literature indicating proper installation procedures.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.04 QUALITY ASSURANCE

A. Test pipe insulation for maximum flame spread index of 25 and maximum smoke developed index of not exceeding 50 in accordance with ASTM E84.

B. Pipe insulation manufactured in accordance with ASTM C585 for inner and outer diameters.

C. Factory fabricated fitting covers manufactured in accordance with ASTM C450.

1.05 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

B. Applicator: Company specializing in performing work of this section with minimum three years experience and approved by manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Division 01 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.

C. Protect insulation from weather and construction traffic, dirt, water, chemical, and damage, by storing in original wrapping.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Division 01 - Product Requirements: Environmental conditions affecting products on site.

B. Install insulation only when ambient temperature and humidity conditions are within range recommended by manufacturer.

C. Maintain temperature before, during, and after installation for minimum period of 24 hours.

1.08 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.09 WARRANTY

A. Division 01 - Execution and Closeout Requirements: Product warranties and product bonds.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Manufacturers for Glass Fiber and Mineral Fiber Insulation Products:
   1. CertainTeed.
   2. Knauf.
   3. Johns Manville.
   4. Owens-Corning.
   5. Substitutions: Section 01 2513 - Product Substitutions.

B. Manufacturers for Closed Cell Elastomeric Insulation Products:
   1. Aeroflex. Aerocell.
   2. Armacell, LLC. Armaflex.
   3. Nomaco. K-flex.
   4. Substitutions: Section 01 2513 - Product Substitutions.

C. Manufacturers for Polyisocyanurate Foam Insulation Products:
   1. Dow Chemical Company.
   2. Substitutions: Section 01 2513 - Product Substitutions.

D. Manufacturers for Extruded Polystyrene Insulation Products:
   1. Dow Chemical Company.
   2. Substitutions: Section 01 2513 - Product Substitutions.

2.02 PIPE INSULATION

A. TYPE P-1: ASTM C547, molded glass fiber pipe insulation.
   1. Thermal Conductivity: 0.23 at 75 degrees F.
   2. Operating Temperature Range: 0 to 850 degrees F.
   3. Vapor Barrier Jacket: ASTM C1136, Type I, factory applied reinforced foil kraft with self-sealing adhesive joints.
   4. Jacket Temperature Limit: minus 20 to 150 degrees F.

B. TYPE P-2: ASTM C534, Type I, flexible, closed cell elastomeric insulation, tubular.
   1. Thermal Conductivity: 0.27 at 75 degrees F.
   2. Operating Temperature Range: Range: Minus 70 to 180 degrees F.

2.03 PIPE INSULATION JACKETS

A. Vapor Retarder Jacket:
   1. White Kraft paper with glass fiber yarn, bonded to aluminized film.
   2. Water Vapor Permeance: ASTM E96/E96M; 0.02 perms.

B. PVC Plastic Pipe Jacket:
   1. Product Description: One piece molded type fitting covers and sheet material, off-white color.

C. Aluminum Pipe Jacket:
   1. ASTM B209.
   2. Thickness: 0.020 inch thick sheet.
   3. Finish: Corrugated or textured.
   4. Joining: Longitudinal slip joints and 2 inch laps.

D. Stainless Steel Pipe Jacket:
   1. ASTM A240/A240M OR ASTM 666 Type 304 stainless steel.
   2. Thickness: 0.010 inch thick.
   3. Finish: Corrugated.

2.04 PIPE INSULATION ACCESSORIES

A. Vapor Retarder Lap Adhesive: Compatible with insulation.

B. Covering Adhesive Mastic: Compatible with insulation.

C. Piping 1-1/2 inches diameter and smaller: Galvanized steel insulation protection shield. MSS SP-69, Type 40. Length: Based on pipe size and insulation thickness.

D. Piping 2 inches diameter and larger: Wood insulation saddle, hard maple. Inserts length: not less than 6 inches long, matching thickness and contour of adjoining insulation.

E. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

F. Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement: ASTM C449/C449M.

G. Insulating Cement: ASTM C195; hydraulic setting on mineral wool.

H. Adhesives: Compatible with insulation.

2.05 EQUIPMENT INSULATION

A. TYPE E-1: ASTM C612; glass fiber, rigid board, noncombustible with factory applied reinforced aluminum foil jacket.
   1. Thermal Conductivity: 0.023 at 75 degrees F.
   2. Operating Temperature Range: 0 to 450 degrees F.
   3. Density: 3.0 pound per cubic foot.
   4. Jacket Temperature Limit: minus 20 to 150 degrees F.

2.06 EQUIPMENT INSULATION JACKETS

A. PVC Plastic Equipment Jacket:
   1. Product Description: ASTM D1785, sheet material, off-white color.
   2. Minimum Service Temperature: -40 degrees F.

3. Maximum Service Temperature: 150 degrees F.
4. Water Vapor Permeance: ASTM E96/E96M; 0.02 perms.

B. Aluminum Equipment Jacket:
1. ASTM B209.
2. Thickness: 0.020 inch thick sheet.
3. Finish: Corrugated or textured.
4. Joining: Longitudinal slip joints and 2 inch laps.

C. Stainless Steel Equipment Jacket:
1. ASTM ASTM A240/A240M OR ASTM 666 Type 304 stainless steel.
2. Thickness: 0.010 inch thick.
3. Finish: Corrugated.

D. Vapor Retarder Jacket:
1. ASTM C921, white Kraft paper with glass fiber yarn, bonded to aluminized film.
2. Water Vapor Permeance: ASTM E96/E96M; 0.02 perms.
3. Indoor Vapor Retarder Finish:
a. Cloth: Untreated; 9 oz/sq yd weight.
b. Vinyl emulsion type acrylic, compatible with insulation.

2.07 EQUIPMENT INSULATION ACCESSORIES

A. Vapor Retarder Lap Adhesive: Compatible with insulation.

B. Covering Adhesive Mastic: Compatible with insulation.

C. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

D. Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement: ASTM C449/C449M.

E. Adhesives: Compatible with insulation.

PART 3 EXECUTION

3.01 EXAMINATION

A. Division 01 - Administrative Requirements: Coordination and project conditions.

B. Verify piping and equipment has been tested before applying insulation materials.

C. Verify surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION - PIPING SYSTEMS

A. Piping Exposed to View in Finished Spaces: Locate insulation and cover seams in least visible locations.

B. Continue insulation through penetrations of building assemblies or portions of assemblies having fire resistance rating of one hour or less. Provide intumescent firestopping when continuing insulation through assembly. Finish at supports, protrusions, and interruptions. Refer to Division 07 for penetrations of assemblies with fire resistance rating greater than one hour.

C. Piping Systems Conveying Fluids Below Ambient Temperature:
1. Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
2. Furnish factory-applied or field-applied vapor retarder jackets. Secure factory-applied jackets with pressure sensitive adhesive self-sealing longitudinal laps and butt strips. Secure field-applied jackets with outward clinch expanding staples and seal staple penetrations with vapor retarder mastic.
3. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor retarder adhesive or PVC fitting covers.

D. Glass Fiber Board Insulation:
1. Apply insulation close to equipment by grooving, scoring, and beveling insulation. Fasten insulation to equipment with studs, pins, clips, adhesive, wires, or bands.

2. Fill joints, cracks, seams, and depressions with bedding compound to form smooth surface. On cold equipment, use vapor retarder cement.
3. Cover wire mesh or bands with cement to a thickness to remove surface irregularities.

E. Hot Piping Systems less than 140 degrees F:
1. Furnish factory-applied or field-applied standard jackets. Secure with outward clinch expanding staples or pressure sensitive adhesive system on standard factory-applied jacket and butt strips or both.
2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
3. Do not insulate unions and flanges at equipment, but bevel and seal ends of insulation at such locations.

F. Inserts and Shields:
1. Piping 1-1/2 inches Diameter and Smaller: Install galvanized steel shield between pipe hanger and insulation.
2. Piping 2 inches Diameter and Larger: Install insert between support shield and piping and under finish jacket.
   a. Insert Configuration: Minimum 6 inches long, of thickness and contour matching adjoining insulation; may be factory fabricated.
   b. Insert Material: Compression resistant insulating material suitable for planned temperature range and service.
3. Piping Supported by Roller Type Pipe Hangers: Install galvanized steel shield between roller and inserts.

G. Insulation Terminating Points:
1. Coil Branch Piping 1 inch and Smaller: Terminate hot water piping at union upstream of the coil control valve.
2. Condensate Piping: Insulate entire piping system and components to prevent condensation.

H. Closed Cell Elastomeric Insulation:
1. Push insulation on to piping.
2. Miter joints at elbows.
3. Seal seams and butt joints with manufacturer’s recommended adhesive.
4. When application requires multiple layers, apply with joints staggered.
5. Insulate fittings and valves with insulation of like material and thickness as adjacent pipe.

I. High Temperature Pipe Insulation:
1. Install in multiple layers to meet thickness scheduled.
2. Attach each layer with bands. Secure first layer with bands before installing next layer.
3. Stagger joints between layers.
4. Finish with canvas jacket.
5. Cover with aluminum jacket or with seams located on bottom side of horizontal piping.

J. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet above finished floor): Finish with PVC jacket and fitting covers or aluminum jacket.

K. Buried Piping: Insulate only where insulation manufacturer recommends insulation product may be installed in trench, tunnel or direct buried. Install factory fabricated assembly with inner all-purpose service jacket with self-sealing lap, and asphalt impregnated open mesh glass fabric, with 1 mil thick aluminum foil sandwiched between three layers of bituminous compound; outer surface faced with polyester film.

L. Heat Traced Piping Interior to Building: Insulate fittings, joints, and valves with insulation of like material, thickness, and finish as adjoining pipe. Size large enough to enclose pipe and heat tracer.

M. Prepare pipe insulation for finish painting. Refer to Division 09.

3.03 INSTALLATION - EQUIPMENT

A. Factory Insulated Equipment: Do not insulate.

B. Exposed Equipment: Locate insulation and cover seams in least visible locations.

C. Fill joints, cracks, seams, and depressions with bedding compound to form smooth surface. On cold equipment, use vapor retarder cement.

D. Equipment Containing Fluids Below Ambient Temperature:
   1. Insulate entire equipment surfaces.
   2. Apply insulation close to equipment by grooving, scoring, and beveling insulation. Fasten insulation to equipment with studs, pins, clips, adhesive, wires, or bands.
   3. Furnish factory-applied or field-applied vapor retarder jackets. Secure factory-applied jackets with pressure sensitive adhesive self-sealing longitudinal laps and butt strips. Secure field-applied jackets with outward clinch expanding staples and seal staple penetrations with vapor retarder mastic.
   4. Finish insulation at supports, protrusions, and interruptions.

E. Equipment Containing Fluids 140 degrees F Or Less:
   1. Do not insulate flanges and unions, but bevel and seal ends of insulation.
   2. Install insulation with factory-applied or field applied jackets, with or without vapor barrier. Finish with glass cloth and adhesive.
   3. Finish insulation at supports, protrusions, and interruptions.

F. Equipment in Mechanical Equipment Rooms or Finished Spaces: Finish with PVC jacket and fitting covers or aluminum jacket.

G. Nameplates and ASME Stamps: Bevel and seal insulation around; do not cover with insulation.

H. Equipment Requiring Access for Maintenance, Repair, or Cleaning: Install insulation for easy removal and replacement without damage.

I. Prepare equipment insulation for finish painting. Refer to Division 09.

3.04 SCHEDULES

A. Water Supply Services Piping Insulation Schedule:

Domestic Hot Water Supply and Recirculation	P-1	3/4 inches and smaller 1-1/2 inches and larger	0.5 1.0
Domestic Cold Water	P-1 or P-2	3/4 inches and smaller 1 inches and larger	0.5 1.0

END OF SECTION

SECTION 22 2116
PLUMBING SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Back Water Valve.
B. Floor Drains.
C. Cleanouts.
D. Backflow Preventers.
E. Water Hammer Arrestors.
F. Hose Bibbs Hydrants.
G. Trap Primers.
H. Master Tempering Valve.

1.02 RELATED WORK

A. Section 01 3300 – Submittal Procedures.
B. Section 01 7900 – Demonstration and Training.
C. Section 07 5323 – Ethylene-Propylene-Diene-Monomer Roofing (EPDM).
D. Section 22 0529 – Hangers and Supports for Plumbing Piping and Equipment.
E. Section 22 0503 – Pipes and Tubes for Plumbing Piping and Equipment.
F. Section 22 3000 – Plumbing Equipment.
G. Section 22 4000 – Plumbing Fixtures.

1.03 REFERENCES

A. See Section 01 3300 – submittal procedures.
B. American National Standards Institute:
   1. ANSI Z21.22 - Relief Valves for Hot Water Supply Systems.
C. American Society of Sanitary Engineering:
   1. ASSE 1010 - Performance Requirements for Water Hammer Arresters.
   2. ASSE 1011 - Performance Requirements for Hose Connection Vacuum Breakers.
   3. ASSE 1012 - Performance Requirements for Backflow Preventer with Intermediate Atmospheric Vent.
   4. ASSE 1013 - Performance Requirements for Reduced Pressure Principle Backflow Preventers and Reduced Pressure Fire Protection Principle Backflow Preventers.
   5. ASSE 1019 - Performance Requirements for Vacuum Breaker Wall Hydrants, Freeze Resistant, Automatic Draining Type.
D. Plumbing and Drainage Institute:
   1. PDI WH201 - Water Hammer Arrester Standard.

1.04 QUALITY ASSURANCE

A. Manufacturer: For each product specified, provide components by same manufacturer throughout.
B. Backflow Prevention: Installation and testing by a certified backflow assembly tester, in accordance with the Uniform Plumbing Code (UPC).

1.05 SUBMITTALS

A. Submit product data under provisions of Section 01 3300.
B. Submit on all items covered by this section.

C. Submit backflow assembly tester UPC certificate. Submit letter of certification for installation signed by tester.

1.06 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Section 01 3300.

B. Provide Manufacturer's parts list and maintenance information on specialties.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS – BACKWATER VALVES

A. Mifab.

B. J.R. Smith.

C. Zurn.

D. Substitutions: Section 01 2513 - Product Substitutions.

2.02 BACKWATER VALVES

A. Cast iron body with backwater valve and bolted cover

B. Provide with alarm system with wall mount alarm box, 15 feet ¼ Polyethlyene Tubing, UL Listed.

2.03 ACCEPTABLE MANUFACTURERS - FLOOR DRAINS

A. Mifab.

B. J.R. Smith.

C. Zurn.

D. Substitutions: Section 01 2513 - Product Substitutions.

2.04 FLOOR DRAINS

A. FD-1: ANSI A112.21.1; lacquered cast iron two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable chrome plated nickel-bronze strainer and trap primer connection.

2.05 ACCEPTABLE MANUFACTURERS - CLEANOUTS

A. J.R. Smith.

B. Zurn.

C. Josam.

D. Mifab.

E. Substitutions: Section 01 2513 - Product Substitutions.

2.06 CLEANOUTS

A. Exterior Surfaced Areas: Round cast iron access frame and non-skid cover, bronze plug, vandal resistant screws; Model 4251 manufactured by J.R. Smith.

B. Exterior Unsurfaced Areas: Round cast iron access frame and non-skid cover, bronze plug, vandal resistant screws, set in minimum 18" X 18" concrete pad; Model 4251 manufactured by J.R. Smith.

C. Interior Finished Floor Areas: Enamel paint coated cast iron, two piece body with double drainage flange, weep holes, reversible clamping collar, bronze plug, and adjustable round nickel bronze scoriated cover in service areas and round with depressed cover to accept floor finish in finished floor areas; Model 4021 manufactured by J.R. Smith.

D. Interior Finished Wall Areas: Line type with lacquered cast iron body and round epoxy coated gasketed cover, bronze plug, and round stainless steel access cover secured with machine screw; Model 4422 manufactured by J.R. Smith.

E. Interior Unfinished Accessible Areas: Caulked or threaded type. Provide bolted stack cleanouts on vertical rainwater leaders.

2.07 ACCEPTABLE MANUFACTURERS - BACKFLOW PREVENTERS

A. Watts Regulator.

B. FEBCO.

C. Zurn.

D. Substitutions: Section 01 2513 - Product Substitutions.

2.08 BACKFLOW PREVENTERS

A. General: Backflow Preventer shall conform to the applicable requirements of AWWA C510. Furnish a certificate of Full Approval or a current Certificate of Approval for each design, size, and make of backflow preventer being provided for the project. The certificate shall be from the Foundation for Cross- Connection Control and Hydraulic Research, University of Southern California, and shall attest that this design, size, and make of backflow preventer has satisfactorily passed the complete sequence of performance testing and evaluation for the respective level of approval. A Certificate of Provisional Approval is not acceptable in lieu of the above. IAPMO (UPC) approved.

B. Reduced Pressure Backflow Preventers: ANSI/ASSE 1013; FDA approved epoxy coated cast iron (4" or larger) or bronze body (3" or smaller) with bronze and stainless steel internal parts and stainless steel springs; two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; third check valve which opens under back pressure in case of diaphragm failure; non-threaded vent outlet; assembled with two gate valves, strainer, and four test cocks; Series 909 manufactured by Watts.

C. Double Check Valve Assemblies: ANSI/ASSE 1012; Bronze body (3" and smaller) or FDA approved epoxy coated cast iron body (4" and larger) with bronze or stainless steel internal parts and stainless steel springs; two independently operating check valves with intermediate atmospheric vent with two gate valves and strainer; Series 709 manufactured by Watts.

2.09 ACCEPTABLE MANUFACTURERS - WATER HAMMER ARRESTORS

A. J.R. Smith.

B. Precision plumbing Products, PPP.

C. Zurn.

D. Substitutions: Section 01 2513 - Product Substitutions.

2.10 WATER HAMMER ARRESTORS

A. ANSI A112.26.1; sized in accordance with PDI WH-201, pre-charged suitable for operation in temperature range -100 to 300º F and maximum 250 psig working pressure; Series 5000 manufactured by J.R. Smith.

2.11 ACCEPTABLE MANUFACTURERS – HOSE BIBBS

A. Woodford.

B. Acorn.

C. Zurn.

D. Substitutions: Section 01 2513 - Product Substitutions.

2.12 HOSE BIBBS

A. HB-1: Exterior Hose Bibb; ANSI/ASSE 1019; non-freeze, self-draining type with polished chrome, lockable recessed box hose thread spout, removable key, and vacuum breaker in conformance with ANSI/ASSE 1011.

2.13 ACCEPTABLE MANUFACTURERS –TRAP PRIMER VALVES

A. Precision Plumbing Products, Inc.

B. Substitutions: Section 01 2513 - Product Substitutions.

2.14 TRAP PRIMER VALVE

A. Valve: Machined of brass, containing no springs or diaphragms. "O" rings acceptable for -40 to +450 F operation.

B. Distribution Unit: Brass fitting with copper water reservoir. Clear plastic cover. Tappings for up to four drain taps.

C. Prime-Rite Trap Primer as manufactured by Precision Plumbing Products or equal.

2.15 ACEPTABLE MANUFACTURER –TEMPERING VALVES

A. Symons.

B. Powers.

C. Lawler.

D. Substitutions: Section 01 2513 - Product Substitutions.

2.16 TEMPERING VALVE

A. Provide thermostatic mixing valve with swivel action check stops, removable cartridge with strainer, stainless steel piston and liquid fill thermal motor with bellow element mounted out of water, inlet manifold piping, ball valves, bi-metal dial thermometer, connecting piping and fittings. Provide with wall mounting bracket.

PART 3 EXECUTION

3.01 PREPARATION

A. Thoroughly coordinate layout of all plumbing specialties with all other trades prior to installation.

B. Coordinate cutting and forming of roof and floor construction to receive drains to required invert elevations.

C. Coordinate location of all concealed plumbing specialties that require access doors.

3.02 INSTALLATION AND APPLICATION

A. Install specialties in accordance with manufacturer's instructions to permit intended performance.

B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with Teflon based thread compound. Ensure clearance at cleanout for rodding of drainage system.

C. Encase exterior cleanouts in concrete flush with grade.

D. Pipe and install water hammer arrestors as per manufacturer’s instructions.

E. Pipe and install electronic trap primers as per manufacturer’s instructions.

3.03 THERMOSTATIC MIXING VALVE INSTALLATION

A. Install in accordance with manufacturer's instructions. Adjust valve to operating temperature indicated on plans.

END OF SECTION

SECTION 22 3000
PLUMBING EQUIPMENT

PART 1 GENERAL

1.01 WORK INCLUDED

A. Hot Water Generators.

B. Expansion Tanks.

1.02 RELATED WORK

A. Section 22 0500 – Common Work Results for Plumbing.

B. Section 22 0548 – Vibration and Seismic Controls for Plumbing Piping and Equipment.

1.03 QUALITY ASSURANCE

A. See Section 01 3300 – submittal procedures.

B. Provide pumps with manufacturer's name, model number, and rating/capacity identified.

C. Ensure products and installation of specified products are in conformance with recommendations and requirements of the following organizations:
   1. National Sanitation Foundation (NSF).
   2. American Society of Mechanical Engineers (ASME).
   3. Underwriters Laboratories (UL).

1.04 REGULATORY REQUIREMENTS

A. Conform to NSF, UL and ANSI requirements for water heaters.

1.05 SUBMITTALS

A. Submit product data under provisions of Section 23 0500 and Section 01 3300 Submittal Procedures.

B. Include dimension drawings of water heaters indicating components and connections to other equipment and piping.

C. Submit manufacturer's installation instructions under provisions of Section 01 3300 Submittal Procedures.

1.06 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Section 23 0500 and Division 01 General Requirements.

B. Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Division 01 General Requirements.

B. Store and protect products under provisions of Division 01 General Requirements.

C. Provide temporary inlet and outlet caps. Maintain caps in Place until installation.

1.08 WARRANTY

A. Provide manufacturer's warranty under provisions of Division 01 General Requirements.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS - HOT WATER GENERATORS

A. Amtrol.

B. Superstor.

C. Substitutions: Under provisions of 01 2513 – Product Substitutions.

2.02 HOT WATER GENERATORS

A. Pressure Shell: Type 316L stainless steel, for working pressure of minimum 125 psig, steel support, tappings for accessories, threaded connections, 2" rigid polyurethane insulation.

B. Heat Exchanger: Replaceable, high output cupronickel heat exchanger, double wall vented to atmosphere.

C. Outer Jacket: Polyethylene.

D. Temperature Control: Electro-mechanical Aquastat.

E. Accessories: Tank drain, ASME pressure relief valve with extended probe suitable for maximum working pressure.

2.03 EXPANSION TANKS

A. Construction: Welded steel, rated for working pressure of 150 psig, 200 degree F maximum working temperature, flexible butyl rubber diaphragm, polypropylene liner sealed into tank, and steel legs or saddles.

B. Accessories: Air-charging fitting, tank drain; pre-charge to incoming water pressure.

C. Amtrol or approved equal.

PART 3 EXECUTION

3.01 WATER HEATER INSTALLATION

A. Install water heaters in accordance with manufacturer's instructions and to NSF and UL requirements.

B. Coordinate with plumbing piping and related electrical work to achieve operating system.

END OF SECTION

SECTION 22 4000
PLUMBING FIXTURES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Water closets.
   2. Lavatories.
   3. Faucets.
   4. Sinks.
   5. Service sinks.
   6. Refrigerator Boxes.
   7. Hose Bibbs.

1.02 SUBMITTALS

A. Product Data: Required.
   1. Include fixtures, sizes, utility sizes, trim, and finishes

B. Manufacturer's Installation Instructions: Required.

C. Manufacturer's Certificate: Required.

1.03 CLOSEOUT SUBMITTALS

A. See Section 01 3300 – submittal procedures.

B. Operation and Maintenance Data: Required
   1. Include fixture trim exploded view and replacement parts lists.

1.04 WARRANTY

A. Furnish one manufacturer warranty for plumbing fixtures.

1.05 EXTRA MATERIALS

A. Division 01 – Execution and Closeout Requirements: Spare parts and maintenance parts.

PART 2 PRODUCTS

2.01 PLUMBING FIXTURES

A. Manufacturers for Plumbing Fixtures Throughout Section:
   1. Kohler
   2. American Standard Plumbing.
   3. Sloan.
   4. Delta Faucet Co., Commercial Div.
   5. Haws Drinking Faucet Co.
   6. Just Manufacturing, Inc
   7. Fiat.
   8. Elkay.
   9. Substitutions: Permitted

B. Provide plumbing fixture fittings in accordance with ASME A112.18.1 that prevent backflow from fixture into water distribution system.

C. Refer to plumbing schedules on mechanical drawings for basis of design fixture model numbers.

PART 3 EXECUTION

3.01 INSPECTION

A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

B. Verify adjacent construction is ready to receive rough-in work of this Section.

3.02 INSTALLATION

A. Provide chrome plated rigid or flexible supplies to fixtures with angle stops, reducers, and escutcheons.

B. Seal fixtures to wall and floor surfaces with sealant as specified in Division 07, color to match fixture.

C. For ADA accessible water closets, install flush valve with handle to wide side of stall.

D. Install components level and plumb.

E. Install and secure fixtures in place with wall or floor carriers, supports as per the manufacturer's instructions.

F. Solidly attach floor mounted water closets to toilet flange with non-corroding t-bolts, washers and acorn nuts.

G. Install each fixture with removable p-trap for servicing and cleaning

3.03 SCHEDULES

A. Fixture Mounting Heights:
   1. Water Closet:
      a. Standard: 15 inches to top of bowl rim.
      b. Accessible: 18 inches to top of seat.
   2. Lavatory:
      a. Standard: 31 inches to top of basin rim.
      b. Accessible: 34 inches to top of basin rim.

3.04 ADJUSTING AND CLEANING

A. Adjust stops, valves or flow control valves for intended water flow rate to fixtures without splashing, noise, or overflow.

B. At completion clean plumbing fixtures and equipment.

END OF SECTION

SECTION 23 0500
COMMON WORK RESULTS FOR HVAC

PART 1 GENERAL

1.01 SCOPE

A. All provisions of the Contract including the General and Supplementary Conditions and the General Requirements apply to this work.

1.02 WORK INCLUDED

A. The work to be included in these and all other mechanical subsections shall consist of providing, installing, adjusting and setting into proper operation complete and workable systems for all items shown on the drawings, described in the specifications or reasonably implied. This shall include the planning and supervision to coordinate the work with other crafts and to maintain a proper time schedule for delivery of materials and installation of the work.

B. Division 01 of the specifications is to be specifically included as well as all related drawings.

1.03 RELATED WORK

A. See Section 01 3300 – submittal procedures.

B. Related Work Specified Elsewhere:
   1. Electrical Specifications: Division 26
   2. Motors and Connections: Division 26
   3. Starters and Disconnects: Division 26

C. Unless otherwise indicated on the electrical drawings or the electrical schedules, provide all mechanical equipment motors, motor starters, thermal overload switches, control relays, time clocks, thermostats, motor operated valves, float controls, damper motors, electric switches, electrical components, wiring and any other miscellaneous Division 23 controls. Disconnect switches are included in the electrical work, unless specifically called out on mechanical plans.

D. Carefully coordinate all work with the electrical work shown and specified elsewhere.

1.04 REFERENCED CODES - LATEST ADOPTED EDITION

A. NFPA 70 - National Electrical Code (NEC)

B. IMC - International Mechanical Code

C. UPC - Uniform Plumbing Code

D. IFC - International Fire Code

E. IFGC - International Fuel Gas Code

F. IBC - International Building Code

1.05 SUBMITTALS

A. See Submittal Procedures 01 3300.

B. Submit by specification section complete and all at one time; partial submittals will not be considered. Submittals shall be in booklet form. The data shall be arranged and indexed under basic categories. A typewritten index shall be included with dividers and identifying tabs between sections and references to sections of specifications.

C. Catalog sheets shall be complete and the item or model to be used shall be clearly marked, and identified as to which item in the specifications or on the drawings is being submitted and with drawing fixture number where applicable.

D. Only submit on items specifically required by each specification section. If a submittal has not been requested, it will not be reviewed.

1.06 PROJECT RECORD DRAWINGS

A. In addition to other requirements of Division 01, mark up a clean set of drawings as the work progresses to show the dimensioned location and routing of all mechanical work which will

become permanently concealed. Show routing of work in concealed blind spaces within the building.

B. Show the location of all valves and their appropriate tag identification.

C. At completion of project, deliver these drawings to the owner and obtain a written receipt.

1.07 HANDLING

A. See Division 01 Materials and Equipment regarding material handling.

B. Deliver packaged materials to job site in unbroken packages with manufacturer's label, and store to facilitate inspection and installation sequence. All items must be labeled and identified as to make, size and quality.

1.08 SUBSTITUTIONS

A. In accordance with the General Conditions and Division 01, Product Substitutions, all substitute items must fit in the available space, and be of equal or better quality including efficiency performance, size, and weight, and must be compatible with existing equipment. The owner shall be the final authority regarding acceptability of substitutes.

1.09 DIMENSIONS

A. Before ordering any material or doing any work, the Contractor shall verify all dimensions, including elevations, and shall be responsible for the correctness of the same. No extra charge or compensation will be allowed on account of differences between actual dimensions and measurements indicated on the drawings.

B. Any differences, which may be found, shall be submitted to the Engineer for consideration before proceeding with the work.

1.10 MANUFACTURER’S DIRECTIONS

A. All manufactured articles shall be applied, installed and handled as recommended by the manufacturer, unless specifically called out otherwise in the plans. Advise the owner of any such conflicts before installation.

1.11 PERMITS, FEES, ETC

A. The Contractor under each section of these specifications shall arrange for a permit from the local authority. The Contractor shall pay for any inspection fees or other fees and charges required by ordinance, law, codes and these specifications.

1.12 TESTING

A. The Contractor under each section shall, at his own expenses, perform the various tests as specified and required by the owner and as required by applicable code, the State, and local authorities. The Contractor shall furnish all fuel and materials necessary for making tests

1.13 TERMINOLOGY

A. Whenever the words "furnish", "provide", "furnish and install", "provide and install", and/or similar phrases occur, it is the intent that the materials and equipment described be furnished, installed and connected under this Division of the Specifications, complete for operation unless specifically noted to the contrary.

B. Where a material is described in detail, listed by catalog number or otherwise called for, it shall be the Contractor's responsibility to furnish and install the material.

C. The use of the word "shall" conveys a mandatory condition to the contract.

D. "This section" refers to the section in which the statement occurs.

E. "The project" includes all work in progress during the construction period.

F. In describing the various items of equipment, in general, each item will be described singularly, even though there may be a multiplicity of identical or similar items.

1.14 SCHEDULE OF WORK

A. The work must be expedited and close coordination will be required in executing the work. The various trades shall perform their portion of the work at such times as directed so as to meeting scheduled completion dates, and to avoid delaying any other trade. The owner will set up completion dates. Each contractor shall cooperate in establishing these times and locations and shall process his work so as to ensure the proper execution of it.

1.15 COOPERATION AND CLEANING UP

A. The contractor for the work under each section of the specifications shall coordinate his work with the work described in all other sections of the specifications to the end that, as a whole, the job shall be a finished one of its kind, and shall carry on his work in such a manner that none of the work under any section of these specifications shall be handicapped, hindered or delayed at any time.

B. At all times during the progress of the work, the Contractor shall keep the premises clean and free of unnecessary materials and debris. The Contractor shall, on direction at any time from the owner, clear any designated areas or area of materials and debris. On completion of any portion of the work, the Contractor shall remove from the premises all tools and machinery and all debris occasioned by the work, leaving the premises free of all obstructions and hindrances.

1.16 GUARANTEE

A. Unless a longer guarantee is hereinafter called for, all work, materials and equipment items shall be guaranteed for a period of one year after acceptance by the Owner. All defects in labor and materials occurring during this period, as determined by the Architect, shall be repaired and/or replaced to the complete satisfaction of the Architect. Guarantee shall be in accordance with Division 01.

1.17 COMPLETION REQUIREMENTS

A. In accordance with the General Conditions and the General Requirements in Division 01, Project Closeout; before acceptance and final payment, the Contractor shall furnish:
   1. Accurate project record drawings, shown in red ink on blueline prints, showing all changes from the original plans made during installation of the work.
   2. All manufacturers' guarantees.
   3. Warranties.
   4. Test and balance reports.
   5. Operation and maintenance manuals.

PART 2 PRODUCTS

2.01 MATERIALS

A. All equipment shall be regularly cataloged items of the manufacturer and shall be supplied as a complete unit in accordance with the manufacturer's standard specifications along with any optional items required for proper installation unless otherwise noted. Maintain manufacturer's identification, model number, etc. on all equipment at all times.

B. Where more than one of an item is to be provided, all of the items shall be identical manufacture, make, model, color, etc.

2.02 RESTRICTED MATERIALS

A. No materials containing asbestos in any form shall be allowed. Where materials or equipment provided by this Contractor are found to contain asbestos, such items shall be removed and replaced with non-asbestos items. Entire cost of asbestos removal and disposal and cost of installing new items shall be the responsibility of the Contractor for those asbestos containing items installed by the Contractor.

B. No solder or flux containing lead shall be used on this project.

2.03 ELECTRICAL MOTORS

A. Motors: Furnish electric motors designed for the specific application and duty applied, and to deliver rated horsepower without exceeding temperature ratings when operated on power

systems with a combined variation in voltage and frequency not more than + 10% of rated voltage. Motors for pumps and fans shall be selected to be non-overloading.

B. Verify from the drawings and specifications the available electrical supply characteristics and furnish equipment that will perform satisfactorily under the conditions shown and specified.

C. Size motors for 1.15 service factor and not to exceed 40º C temperature rise above ambient.

D. Fractional horsepower motors to have self-resetting thermal overload switch.

E. Provide Premium Efficiency, motors for all three phase motors one horsepower and larger. Standard efficiency motors will not be acceptable.

PART 3 EXECUTION

3.01 DRAWINGS

A. The mechanical drawings are generally diagrammatic. Complete details of the building, which affect the mechanical installation, may not be shown. For additional details, see Architectural, Structural, Civil and Electrical Drawings. Coordinate work under this section with that of all related trades.

3.02 INSTALLATION

A. All work shall comply with the latest adopted applicable codes and ordinances including, but not limited to, the NFPA, IMC, IFC, UPC, IFGC and IBC Standards; all local and state amendments to all codes and standards.

B. Obtain and pay for all inspection fees, connection charges and permits as a part of the Contract.

C. Compliance with codes and ordinances shall be at the Contractor's expense.

3.03 MEASUREMENTS

A. Verify all measurements on the job site.

B. Locate all equipment and fixtures on the centers of walls, openings, spaces, etc., unless specified otherwise.

C. Check all piping, ducts, etc. to clear openings.

D. Rough-in dimensions shall be per manufacturer's recommendations and in compliance with ADA Guidelines.

3.04 OPERATING INSTRUCTIONS

A. Before the facility is turned over to the Owner, instruct the Owner or Owner's personnel in the operation, care and maintenance of all systems and equipment under the jurisdiction of the Mechanical Division. These instructions shall also be included in a written summary in the Operating Maintenance Manuals.

B. The Operation and Maintenance Manuals shall be utilized for the basis of the instruction. Provide a minimum of eight hours of onsite instruction to the owner designated personnel.

3.05 OPERATING AND MAINTENANCE MANUALS

A. Submit maintenance manuals to the Engineer covering all equipment, fixtures, devices, etc. installed by the Contractor. Submit prior to substantial completion.

B. The operation and maintenance manuals shall be bound in a loose leaf three ring binder with reinforced holes in the sheets so as to prevent lost pages. The manual shall contain, but not limited to, the following types of information:

1. Cover sheet with name, address, telephone number of Contractor, General Contractor and major equipment suppliers.
2. Catalog cuts of all equipment, fixtures, etc. installed (Marked to identify the specific items used).
3. Manufacturer's maintenance and overhaul instruction booklets including exploded views.
4. Identification numbers of all parts and nearest sources for obtaining parts and services.

5. Reduced scale drawings of the control system and a verbal description of how these controls operate.
6. A copy of the final test and balance report.
7. A copy of valve schedule and reduced scale drawings showing valve locations.
8. Written summary of instructions to Owner.

C. A periodic maintenance form that includes all of the equipment shall be provided with the maintenance manual. The form shall list each piece of equipment and how often maintenance is required (daily, weekly, monthly, annually). Opposite each task shall be squares for check-off for a full year (initials) to verify that the tasks are being done.

3.06 SYSTEM ADJUSTING

A. In accordance with Section 23 05 93 Testing, Adjusting and Balancing.

B. Each part of each system shall be adjusted and readjusted as necessary to ensure proper functioning of all controls, proper air distribution, and elimination of drafts, noise and vibration.

C. Balance air and water systems for volume quantities shown and as required to ensure even temperature and the elimination of drafts. Balancing shall be done by a qualified firm acceptable to the Engineer. Provide balancing log to the Engineer before substantial completion.

3.07 CUTTING, FITTING, PATCHING AND FINISH

A. Arrange and pay for all cutting, fitting, repairing, patching and finishing of work by other trades where it is necessary to disturb such work to permit installation of mechanical work. Perform work only with craftsmen skilled in their respective trades.

B. Avoid cutting, insofar as possible, by setting sleeves, frames, etc. and by requesting openings in advance. Assist other trades in securing correct location and placement of rough-frames, sleeves, openings, etc. for ducts and piping.

C. Cut all holes neatly and as small as possible to admit work. Include cutting where sleeves or openings have been omitted. Perform cutting in a manner so as not to weaken walls, partitions or floors. Drill holes required to be cut in floors without breaking out around holes.

3.08 PAINTING

A. Perform all of the following painting in accordance with provisions of Division 09 with colors as selected by the Architect. Provide the following items as a part of mechanical work:
   1. Factory applied prime and finish coats on mechanical equipment.
   2. Factory applied prime and finish coat on all air registers, grilles and diffusers, unless otherwise specified.
   3. Factory applied prime coat on access doors.
   4. Pipe identification where specified.

B. If factory finish on any equipment furnished is damaged in shipment or during construction, refinish to equal original factory finish.

3.09 INSTALLATION OF EQUIPMENT

A. Unless otherwise indicated, mount all equipment and install in accordance with manufacturer's recommendations and approved submittals.

B. Maintain manufacture recommended minimum clearances for access and maintenance.

C. Where equipment is to be anchored to structure, furnish and locate necessary anchoring and vibration isolation devices.

D. Furnish all structural steel, such as angles, channels, beams, etc. required to support all piping, ductwork, equipment and accessories installed under this Division. Use structural supports suitable for equipment specified or as indicated. In all cases, support design will be based upon data contained in manufacturer's catalog.

E. Openings: Arrange for necessary openings in buildings to allow for admittance and reasonable maintenance or replacement of all apparatus furnished under this Contract.

F. Access Doors: Provide as necessary for reasonable maintenance of all equipment valves, controls, etc.

END OF SECTION

SECTION 23 0503

PIPES AND TUBES FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 WORK INCLUDED

A. Section Includes: Pipe and pipe fittings for the following systems:
   1. Heating water piping.
   2. Glycol piping.
   3. Equipment drains and over flows.
   4. Unions and flanges.

1.02 RELATED WORK

A. Section 23 0523 - General-Duty Valves for HVAC Piping: Product requirements for valves for placement by this section.

B. Section 23 0529 - Hangers and Supports for HVAC Piping and Equipment: Product requirements for pipe hangers and supports and firestopping for placement by this section.

C. Section 23 0548 - Vibration and Seismic Controls for HVAC Piping and Equipment: Product requirements for vibration isolation for placement by this section.

D. Section 23 0700 - HVAC Insulation: Product requirements for piping insulation for placement by this section.

E. Section 23 2116 - Hydronic Piping Specialties: Product requirements for hydronic piping specialties for placement by this section.

1.03 REFERENCES

A. See Section 01 3300 – submittal procedures.

B. American Society of Mechanical Engineers:
   1. ASME B16.3 - Malleable Iron Threaded Fittings.
   2. ASME B16.4 - Gray Iron Threaded Fittings.
   3. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.
   4. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
   5. ASME B31.1 - Power Piping.
   6. ASME B31.9 - Building Services Piping.
   7. ASME B36.10M - Welded and Seamless Wrought Steel Pipe.
   8. ASME Section IX -Boiler and Pressure Vessel Code - Welding and Brazing Qualifications.

C. ASTM International:
   1. ASTM B32 - Standard Specification for Solder Metal.
   2. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
   3. ASTM B88 - Standard Specification for Seamless Copper Water Tube.
   4. ASTM F876 - Standard Specification for Crosslinked Polyethylene (PEX) Tubing.
   5. ASTM F877 - Standard Specification for Crosslinked Polyethylene (PEX) Plastic Hot-and Cold-Water Distribution Systems.
   6. ASTM F1476 - Standard Specification for Performance of Gasketed Mechanical Couplings for Use in Piping Applications.

D. American Welding Society:
   1. AWS A5.8 - Specification for Filler Metals for Brazing and Braze Welding.
   2. AWS D1.1 - Structural Welding Code - Steel.

E. National Fire Protection Association:
   1. NFPA 54 - National Fuel Gas Code.

1.04 SUBMITTALS

A. Submittal Procedures 01 3300.

B. Include data on pipe materials and pipe fittings.

C. Include welders' certification of compliance with ASME Section IX.

1.05 QUALITY ASSURANCE

A. Welding Materials and Procedures: Conform to ASME Section IX, and applicable state labor regulations.

1.06 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years documented experience.

B. Installer: Company specializing in performing work of this section with minimum three years documented experience approved by manufacturer.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Section 01 6000 Materials and Equipment.

B. Store and protect products under provisions of Section 01 6000 Materials and Equipment.

C. Deliver and store valves in shipping containers with labeling in place.

D. Furnish temporary end caps and closures on piping and fittings. Maintain in place until installation.

E. Protect piping from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

1.08 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.09 COORDINATION

A. Division 01 - Administrative Requirements: Requirements for coordination.

B. Coordinate installation of buried piping with trenching.

PART 2 PRODUCTS

2.01 HEATING WATER AND GLYCOL PIPING, ABOVE GROUND

A. Copper Tubing: ASTM B88, Type L drawn.
   1. Fittings: ASME B16.18, cast brass, or ASME B16.22 solder wrought copper.
   2. Joints: ASTM B32, Alloy Grade Sb5 tin-antimony, or Alloy Grade Sn95 tin-silver, lead free solder, AWS A5.8 Classification BCuP-3 or BCuP-4 silver braze.
   3. Flux: ASTM B813.
   4. Press Fittings: Viega ProPress Fittings are allowed. Sealing elements for press fittings shall be EPDM.Sealing elements shall be factory installed or an alternative supplied by fitting manufacturer. Press end shall have Smart Connect feature design leakage path. Smart Connect™ (SC Feature) In ProPress ½" to 4" dimensions the Smart Connect Feature assures leakage of liquids and/or gases from inside the system past the sealing element of an un-pressed connection. The function of this feature is to provide the installer quick and easy identification of connections which have not been pressed prior to putting the system into operation.

2.02 EQUIPMENT DRAINS AND OVERFLOWS

A. Steel Pipe: ASTM A53/A53M Schedule 40, galvanized.
   1. Fittings: ASME B16.3, malleable iron or ASME B16.4, cast iron.
   2. Joints: Threaded for pipe 2 inch and smaller; flanged for pipe 2-1/2 inches and larger.

B. Copper Tubing: ASTM B88, Type L drawn.
   1. Fittings: ASME B16.18, cast brass, or ASME B16.22 solder wrought copper.
   2. Joints: ASTM B32, Alloy Grade Sb5 tin-antimony, or Alloy Grade Sn95 tin-silver, lead free solder.

2.03 UNIONS AND FLANGES

A. Unions for Pipe 2 inches and Smaller:
   1. Ferrous Piping: Class 150, malleable iron, threaded.
   2. Copper Piping: Class 150, bronze unions with soldered.
   3. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

B. Flanges for Pipe 2-1/2 inches and Larger:
   1. Ferrous Piping: Class 150, forged steel, slip-on flanges.
   2. Copper Piping: Class 150, slip-on bronze flanges.
   3. Gaskets: 1/16 inch thick preformed neoprene gaskets.

2.04 HEATING GLYCOL SYSTEM CLEANER

A. Physical Properties: Water soluble, 1.12 specific gravity, 212°F boiling point.

B. Appearance/color/odor: Yellow color liquid. Slight ammine odor.

C. Acceptable Manufacturers: CH_2O Inc and Hercules.

PART 3 EXECUTION

3.01 EXAMINATION

A. Division 01 - Administrative Requirements: Verification of existing conditions before starting work.

3.02 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare piping connections to equipment with flanges or unions.

D. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

3.03 INSTALLATION

A. Install in accordance with manufacturer's written installation instructions.

B. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

C. Install piping to maintain headroom without interfering with use of space or taking more space than necessary.

D. Group piping whenever practical at common elevations.

E. Sleeve pipe passing through partitions, walls and floors. Refer to Section 23 0529.

F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Refer to Section 23 0516.

G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 23 0700.

H. Provide access where valves and fittings are not accessible.

I. Install non-conducting dielectric connections wherever jointing dissimilar metals.

J. Slope piping and arrange systems to drain at low points.

K. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

L. Install piping penetrating roofed areas to maintain integrity of roof assembly.

M. Install valves in accordance with Section 23 0523.

N. Install hydronic piping specialties in accordance with Section 23 2116.

O. Insulate piping. Refer to Section 23 0700.

3.04 INSTALLATION - HEATING PIPING SYSTEMS

A. Install glycol piping in accordance with ASME B31.9.

3.05 FIELD QUALITY CONTROL

A. Section 01 4000 – Quality Control (Testing) Requirements and Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.

B. Pressure test natural gas piping in accordance with NFPA 54.

3.06 CLEANING THE HEATING GLYCOL PIPING SYSTEM

A. Division 01 - Execution and Closeout Requirements: Requirements for cleaning.

B. Prior to starting work, verify that the heating glycol piping systems are complete.

C. Fill the heating glycol piping systems system with the system cleaner, one (1) quart hydronic system cleaner for every twenty (20) gallons of water in the hydronic system.

D. Circulate heating glycol piping systems system cleaning solution for a minimum of six (6) hours. Let system cool completely.

E. Upon completion of boil out, completely flush system and drain all low points.

F. Fill system with appropriate glycol solution. See Specification Section 23 2116 for procedures.

G. Submit a written and signed statement to the Owner that the above referenced cleaning procedures have been completed.

END OF SECTION

SECTION 23 0516
EXPANSION FITTINGS AND LOOPS FOR HVAC PIPING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Flexible pipe connectors.

B. Related Sections:
   1. Section 23 0503 - Hydronic Piping: Product and installation requirements for piping used in hydronic heating and cooling systems.
   2. Section 23 0529 - Hangers and Supports for HVAC Piping and Equipment: Product and installation requirements for piping hangers and supports.
   3. Section 23 0548 - Vibration and Seismic Controls for HVAC Piping and Equipment: Product and installation requirements for vibration isolators used in piping systems.

1.02 REFERENCES

A. American Society of Mechanical Engineers:
   1. ASME B31.1 - Power Piping.
   2. ASME B31.5 - Refrigeration Piping.
   3. ASME B31.9 - Building Services Piping.
   4. ASME Section IX - Boiler and Pressure Vessel Code - Welding and Brazing Qualifications.

1.03 SUBMITTALS

A. Section 01 3300 - Submittal Procedures: Requirements for submittals.

B. Product Data:
   1. Flexible Pipe Connectors: Indicate maximum temperature and pressure rating, face-to-face length, live length, hose wall thickness, hose convolutions per foot and per assembly, fundamental frequency of assembly, braid structure, and total number of wires in braid.

C. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

D. Manufacturer’s Field Reports: Indicate results of inspection by manufacturer’s representative.

1.04 CLOSEOUT SUBMITTALS

A. Section 01 3300 Submittal Procedures - Execution and Closeout Requirements: Closeout procedures.

B. Operation and Maintenance Data: Submit adjustment instructions.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with ASME B31.9 code for installation of piping systems.

1.06 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

B. Installer: Company specializing in performing work of this section with minimum three years experience approved by manufacturer.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Section 01 6000 Materials and Equipment - Product Requirements: Product storage and handling requirements.

B. Accept expansion joints on site in factory packing with shipping bars and positioning devices intact. Inspect for damage.

C. Protect equipment from exposure by leaving factory coverings, pipe end protection, and packaging in place until installation.

1.08 WARRANTY

A. Division 01 - Execution and Closeout Requirements: Product warranties and product bonds.

B. Furnish five year manufacturer warranty for leak free performance of packed expansion joints.

1.09 EXTRA MATERIALS

A. Division 01 - Execution and Closeout Requirements: Spare parts and maintenance products.

PART 2 PRODUCTS

2.01 FLEXIBLE PIPE CONNECTORS

A. Manufacturers:
   1. Mason Industries.
   2. Hyspan.
   3. Mercer Rubber Co.
   4. Substitutions: Section 01 2513 - Product Substitutions Requirements.

B. Copper Piping:
   1. Inner Hose: Bronze.
   2. Exterior Sleeve: Braided bronze.
   3. Pressure Rating: 125 psig WSP and 450 degrees F, 200 psig WOG and 250 degrees F.
   4. Joint: As specified for pipe joints.
   5. Size: Use pipe sized units.
   6. Maximum offset: 3/4 inch on each side of installed center line.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install Work in accordance with ASME B31.9.

B. Install flexible pipe connectors on pipes connected to equipment supported by vibration isolation. Refer to Section 21 0548. Provide line size flexible connectors.

C. Install flexible connectors at right angles to displacement. Install one end immediately adjacent to isolated equipment and anchor other end. Install in horizontal plane unless indicated otherwise.

D. Rigidly anchor pipe to building structure. Provide pipe guides to direct movement only along axis of pipe. Erect piping so strain and weight is not on cast connections or apparatus.

END OF SECTION

SECTION 23 0523
GENERAL-DUTY VALVES FOR HVAC PIPING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Ball valves.
   2. Butterfly valves.
   3. Check valves.

1.02 RELATED WORK

A. Section 23 0503 - Pipes and Tubes for HVAC Piping and Equipment: Product and installation requirements for piping materials applying to various system types.

B. Section 23 0529 - Hangers and Supports for HVAC Piping and Equipment: Product and installation requirements for pipe hangers and supports.

C. Section 23 0700 - HVAC Insulation: Product and installation requirements for insulation for valves.

D. Section 23 2116 - Hydronic Piping Specialties: Product and installation requirements for piping specialties used in hydronic piping systems.

1.03 REFERENCES

A. See Section 01 3300 – submittal procedures.

B. ASTM International:
   1. ASTM A216/A216M - Standard Specification for Steel Castings, Carbon, Suitable for Fusion Welding, for High-Temperature Service.
   2. ASTM D1785 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
   3. ASTM D4101 - Standard Specification for Propylene Injection and Extrusion Materials.

C. Manufacturers Standardization Society of the Valve and Fittings Industry:
   1. MSS SP 67 - Butterfly Valves.
   2. MSS SP 71 - Cast Iron Swing Check Valves, Flanged and Threaded Ends.
   3. MSS SP 80 - Bronze Gate, Globe, Angle and Check Valves.
   4. MSS SP 110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

D. Underwriters Laboratories Inc.:
   1. UL 842 - Valves for Flammable Fluids.

1.04 SUBMITTALS

A. Section 01 3300 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit manufacturers catalog information with valve data and ratings for each service.

C. Manufacturer's Installation Instructions: Submit hanging and support methods, joining procedures.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.05 CLOSEOUT SUBMITTALS

A. Division 01 - Execution and Closeout Requirements: Requirements for submittals.

B. Project Record Documents: Record actual locations of valves.

C. Operation and Maintenance Data: Submit installation instructions, spare parts lists, exploded assembly views.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Section 01 6000 – Materials and Equipment: Requirements for transporting, handling, storing, and protecting products.

B. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

C. Provide temporary protective coating on cast iron and steel valves.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Section 01 5719 Temporary Environmental Controls: Environmental conditions affecting products on site.

1.08 WARRANTY

A. Division 01 - Execution and Closeout Requirements: Requirements for warranties.

PART 2 PRODUCTS

2.01 BALL VALVES

A. Manufacturers:
   1. Crane Valve, North America.
   2. Hammond Valve.
   3. Milwaukee Valve Company.
   4. NIBCO, Inc.
   5. Stockham Valves & Fittings.
   6. Substitutions: Section 01 2513 - Product Substitutions Requirements.

B. Up to 2 Inches: Class 150, bronze two piece body, full port, forged brass, chrome plated ball, Teflon seats and stuffing box ring, blow-out proof stem, lever handle solder or threaded ends with union. Seat material to be compatible with fluid handled.

C. Over 2 Inches: Class 150, cast steel, two piece body, full port chrome plated steel ball, Teflon seat and stuffing box seals, lever handle flanged. Seat material to be compatible with liquid handled.

2.02 BUTTERFLY VALVES

A. Manufacturers:
   1. Crane Valve, North America.
   2. Hammond Valve.
   3. Milwaukee Valve Company.
   4. NIBCO, Inc.
   5. Stockham Valves & Fittings.
   6. Substitutions: Section 01 2513 - Product Substitutions Requirements.

B. 2-1/2 inches and Larger: MSS SP 67, Class 150.
   1. Body: Cast or ductile iron, wafer or lug ends, stainless steel stem, extended neck.
   2. Disc: Aluminum bronze
   3. Seat: Resilient replaceable for service to 180°F .
   4. Handle and Operator: 10 position lever handle.
   5. All materials to be compatible and approved for fluid handled.

2.03 CHECK VALVES

A. Manufacturers:
   1. Crane Valve, North America.
   2. Hammond Valve.
   3. Milwaukee Valve Company.
   4. NIBCO, Inc.
   5. Stockham Valves & Fittings.
   6. Substitutions: Section 01 2513 - Product Substitutions Requirements.

B. Horizontal Swing Check Valves:
   1. Up to 2 Inches: Class 125, bronze swing disc, solder or screwed ends.

2. Over 2 Inches: Class 125, iron body, bronze trim, swing disc, renewable disc and seat, flanged ends.

PART 3 EXECUTION

3.01 EXAMINATION

A. Division 01 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify piping system is ready for valve installation.

3.02 INSTALLATION

A. Install valves with stems upright or horizontal, not inverted.

B. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.

C. Install 3/4 inch ball valves with cap for drains at main shut-off valves, low points of piping, bases of vertical risers, and at equipment.

D. Install valves with clearance for installation of insulation and allowing access.

3.03 VALVE APPLICATIONS

A. Install shutoff and drain valves at locations indicated on contract drawings in accordance with this Section.

B. Install ball or butterfly valves for shut-off and to isolate equipment, part of systems, or vertical risers.

C. Install ball or butterfly valves for throttling, bypass, or manual flow control services.

END OF SECTION

SECTION 23 0529

HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
1. Pipe hangers and supports.
2. Hanger rods.
3. Inserts.
4. Flashing.
5. Equipment curbs.
6. Sleeves.
7. Mechanical sleeve seals.
8. Formed steel channel.
9. Equipment bases and supports.

B. Related Sections:
1. Division 03 - Concrete Forming and Accessories: Execution requirements for placement of inserts and sleeves in concrete forms specified by this section.
2. Division 03 - Cast-In-Place Concrete: Execution requirements for placement of concrete housekeeping pads specified by this section.
3. Division 07 - Firestopping: Product requirements for firestopping for placement by this section.
4. Division 07 - Joint Protection: Product requirements for sealant materials for placement by this section.
5. Division 09 - Painting and Coating: Product and execution requirements for painting specified by this section.
6. Section 23 0503 - Pipes and Tubes for HVAC Piping and Equipment: Execution requirements for placement of hangers and supports specified by this section.
7. Section 23 0548 - Vibration and Seismic Controls for HVAC Piping and Equipment: Product and execution requirements for vibration isolators.
8. Section 23 2113 - Hydronic Piping: Execution requirements for placement of hangers and supports specified by this section.

1.02 REFERENCES

A. American Society of Mechanical Engineers:
1. ASME B31.1 - Power Piping.
2. ASME B31.9 - Building Services Piping.

B. ASTM International:
1. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
2. ASTM E814 - Standard Test Method for Fire Tests of Through Penetration Fire Stops.
3. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers.
4. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems.

C. American Welding Society:
1. AWS D1.1 - Structural Welding Code - Steel.

D. FM Global:
1. FM - Approval Guide, A Guide to Equipment, Materials & Services Approved By Factory Mutual Research For Property Conservation.

E. Manufacturers Standardization Society of the Valve and Fittings Industry:
1. MSS SP 58 - Pipe Hangers and Supports - Materials, Design and Manufacturer.
2. MSS SP 69 - Pipe Hangers and Supports - Selection and Application.
3. MSS SP 89 - Pipe Hangers and Supports - Fabrication and Installation Practices.

F. Underwriters Laboratories Inc.:
   1. UL 263 - Fire Tests of Building Construction and Materials.
   2. UL 723 - Tests for Surface Burning Characteristics of Building Materials.
   3. UL 1479 - Fire Tests of Through-Penetration Firestops.
   4. UL 2079 - Tests for Fire Resistance of Building Joint Systems.
   5. UL - Fire Resistance Directory.

G. Intertek Testing Services (Warnock Hersey Listed):
   1. WH - Certification Listings.

1.03 DEFINITIONS

A. See Section 01 3300 – submittal procedures.

B. Firestopping (Through-Penetration Protection System): Sealing or stuffing material or assembly placed in spaces between and penetrations through building materials to arrest movement of fire, smoke, heat, and hot gases through fire rated construction.

1.04 SYSTEM DESCRIPTION

A. Firestopping Materials: Comply with requirements of Division 07.

1.05 PERFORMANCE REQUIREMENTS

A. Firestopping Materials: Comply with requirements of Division 07.

1.06 SUBMITTALS

A. Section 01 3300 - Submittal Procedures: Submittal procedures.

B. Shop Drawings: Indicate system layout with location including critical dimensions, sizes, and pipe hanger and support locations and detail of trapeze hangers.

C. Product Data:
   1. Hangers and Supports: Submit manufacturers catalog data including load capacity.

D. Design Data: Indicate load carrying capacity of trapeze, multiple pipe, and riser support hangers. Indicate calculations used to determine load carrying capacity of trapeze, multiple pipe, and riser support hangers.

E. Manufacturer's Installation Instructions:
   1. Hangers and Supports: Submit special procedures and assembly of components.

F. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.07 QUALITY ASSURANCE

A. Perform Work in accordance with AWS D1.1 for welding hanger and support attachments to building structure.

1.08 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years experience.

B. Installer: Company specializing in performing Work of this section approved by manufacturer.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Section 01 6000 - Materials and Equipment: Requirements for transporting, handling, storing, and protecting products.

B. Accept materials on site in original factory packaging, labeled with manufacturer's identification.

C. Protect from weather and construction traffic, dirt, water, chemical, and damage, by storing in original packaging.

1.10 ENVIRONMENTAL REQUIREMENTS

A. Section 01 5719 - Temporary Environmental Requirements: Environmental conditions affecting products on site.

B. Provide ventilation in areas to receive solvent cured materials.

1.11 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.12 WARRANTY

A. Division 01 - Execution and Closeout Requirements: Product warranties and product bonds.

PART 2 PRODUCTS

2.01 PIPE HANGERS AND SUPPORTS

A. Manufacturers:
   1. Carpenter & Paterson Inc.
   2. Creative Systems Inc.
   3. Flex-Weld, Inc.
   4. Glope Pipe Hanger Products Inc.
   5. Michigan Hanger Co.
   6. Superior Valve Co.
   7. Substitutions: Section 01 2513 - Product Substitutions Requirements.

B. Hydronic Piping:
   1. Conform to MSS SP58.
   2. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron or Carbon steel, adjustable swivel, split ring.
   3. Hangers for Cold Pipe Sizes 2 inches and Larger: Carbon steel, adjustable, clevis.
   4. Hangers for Hot Pipe Sizes 2 to 4 inches: Carbon steel, adjustable, clevis.
   5. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
   6. Multiple or Trapeze Hangers for Hot Pipe Sizes 6 inches and Larger: Steel channels with welded spacers and hanger rods, cast iron roll.
   7. Wall Support for Pipe Sizes 3 inches and Smaller: Cast iron hooks.
   8. Wall Support for Pipe Sizes 4 inches and Larger: Welded steel bracket and wrought steel clamp.
   9. Vertical Support: Steel riser clamp.

2.02 ACCESSORIES

A. Hanger Rods: Mild steel threaded both ends, threaded on one end, or continuous threaded.

2.03 INSERTS

A. Manufacturers:
   1. Hilti Corp.
   2. ITW Buildex and Illinois Tool Works, Inc.
   3. National Pipe Hanger Corporation.
   4. Unistrut, Tyco International, Ltd.
   5. US Strut, Unitron Products, Inc.
   6. Substitutions: Section 01 2513 - Product Substitutions Requirements.

B. Inserts: Malleable iron case of steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.04 FLASHING

A. Metal Flashing: 26 gage thick galvanized steel.

B. Metal Counterflashing: 22 gage thick galvanized steel.

C. Flexible Flashing: 47 mil thick sheet butyl; compatible with roofing.

D. Caps: Steel, 22 gage minimum; 16 gage at fire resistant elements.

2.05 EQUIPMENT CURBS

A. Manufacturers:
   1. AES Industries.

2. Commercial Products Group; Hart & Cooley Inc.
3. Custom Solution Roof and Metal Products.
4. EZCurbAdapter.com.
5. Lloyd Industries, Inc.
6. Metalform Manufacturing, Inc.
7. R & S Manufacturing and Sales Company, Inc.
8. Roof Products, Inc.
9. The Pate Company.
10. Thybar Corporation.
11. Substitutions: Section 01 2513 - Product Substitutions Requirements.

B. Fabrication: Welded 18 gage galvanized steel shell and base, mitered 3 inch cant, variable step to match root insulation, 1-1/2 inch thick insulation, factory installed wood nailer.

2.06 SLEEVES

A. Sleeves for Pipes Through Non-fire Rated Floors: 18 gage thick galvanized steel.

B. Sleeves for Pipes Through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Steel pipe or 18 gage thick galvanized steel.

C. Sleeves for Round Ductwork: Galvanized steel.

D. Sleeves for Rectangular Ductwork: Galvanized steel or wood.

E. Sealant: Refer to Division 07.

2.07 MECHANICAL SLEEVE SEALS

A. Manufacturers:
1. Thunderline Link-Seal, Inc.
2. NMP Corporation.
3. Substitutions: Section 01 2513 - Product Substitutions Requirements.

B. Product Description: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between object and sleeve, connected with bolts and pressure plates causing rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

2.08 FORMED STEEL CHANNEL

A. Manufacturers:
1. Allied Tube & Conduit Corp.
2. B-Line Systems.
3. Midland Ross Corporation, Electrical Products Division.
4. Unistrut Corp.
5. Substitutions: Section 01 2513 - Product Substitutions Requirements.

B. Product Description: Galvanized 12 gage thick steel. With holes 1-1/2 inches on center.

2.09 FIRESTOPPING

A. Firestopping Materials: Comply with requirements of Division 07.

2.10 FIRESTOPPING ACCESSORIES

A. Installation Accessories: Comply with requirements of Division 07.

PART 3 EXECUTION

3.01 EXAMINATION

A. Division 01 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify openings are ready to receive sleeves.

3.02 PREPARATION

A. Obtain permission from Architect/Engineer before using powder-actuated anchors.

B. Obtain permission from Architect/Engineer before drilling or cutting structural members.

3.03 INSTALLATION - INSERTS

A. Install inserts for placement in concrete forms.

B. Install inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

C. Provide hooked rod to concrete reinforcement section for inserts carrying pipe 4 inches and larger.

D. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

E. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut flush with top of slab.

3.04 INSTALLATION - PIPE HANGERS AND SUPPORTS

A. Install in accordance with MSS SP 69.

B. Support horizontal piping as scheduled.

C. Install hangers with minimum 1/2 inch space between finished covering and adjacent work.

D. Place hangers within 12 inches of each horizontal elbow.

E. Use hangers with 1-1/2 inch minimum vertical adjustment.

F. Support vertical piping at every floor.

G. Where piping is installed in parallel and at same elevation, provide multiple pipe or trapeze hangers.

H. Support riser piping independently of connected horizontal piping.

I. Provide copper plated hangers and supports for copper piping.

J. Design hangers for pipe movement without disengagement of supported pipe.

K. Prime coat exposed steel hangers and supports. Refer to Division 09. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

L. Provide clearance in hangers and from structure and other equipment for installation of insulation. Refer to Section 22 0700.

3.05 INSTALLATION - EQUIPMENT BASES AND SUPPORTS

A. Provide housekeeping pads of concrete, minimum 3-1/2 inches thick and extending 6 inches beyond supported equipment. Refer to Division 03.

B. Using templates furnished with equipment, install anchor bolts, and accessories for mounting and anchoring equipment.

C. Construct supports of formed steel channel. Brace and fasten with flanges bolted to structure.

D. Provide rigid anchors for pipes after vibration isolation components are installed. Refer to Section 21 0548.

3.06 INSTALLATION - FLASHING

A. Provide flexible flashing and metal Counterflashing where piping and ductwork penetrate weather or waterproofed walls, floors, and roofs.

B. Provide curbs for roof installations 24 inches minimum high above roofing surface. Flash and counter-flash with sheet metal; seal watertight. Attach Counterflashing to equipment and lap base flashing on roof curbs. Flatten and solder joints.

C. Adjust storm collars tight to pipe with bolts; caulk around top edge. Use storm collars above roof jacks. Screw vertical flange section to face of curb.

3.07 INSTALLATION - SLEEVES

A. Exterior watertight entries: Seal with mechanical sleeve seals.

B. Set sleeves in position in forms. Provide reinforcing around sleeves.

C. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

D. Extend sleeves through floors 1 inch above finished floor level. Caulk sleeves.

E. Where piping or ductwork penetrates floor, ceiling, or wall, close off space between pipe or duct and adjacent work with firestopping insulation and caulk airtight. Provide close fitting metal collar or escutcheon covers at both sides of penetration.

F. Install chrome plated steel escutcheons at finished surfaces.

3.08 INSTALLATION - FIRESTOPPING

A. Firestopping Materials: Comply with requirements of Division 07.

3.09 FIELD QUALITY CONTROL

A. Section 01 4000 – Quality Control (Testing): Requirements for inspecting, testing.

B. Division 01 - Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.

C. Inspect installed firestopping for compliance with specifications and submitted schedule.

3.10 CLEANING

A. Division 01 - Execution and Closeout Requirements: Requirements for cleaning.

3.11 PROTECTION OF FINISHED WORK

A. Division 01 - Execution and Closeout Requirements: Requirements for protecting finished Work.

B. Protect adjacent surfaces from damage by material installation.

3.12 SCHEDULES

A. Copper and Steel Pipe Hanger Spacing:

PIPE SIZE Inches	COPPER TUBING MAXIMUM HANGER SPACING Feet	STEEL PIPE MAXIMUM HANGER SPACING Feet	COPPER TUBING HANGER ROD DIAMETER Inches	STEEL PIPE HANGER ROD DIAMETER Inches
1/2	5	7	3/8	3/8
3/4	5	7	3/8	3/8
1	6	7	3/8	3/8
1-1/4	7	7	3/8	3/8
1-1/2	8	9	3/8	3/8
2	8	10	3/8	3/8
2-1/2 (Note 2)	9	11	1/2	1/2
3	10	12	1/2	1/2
4	12	14	1/2	5/8
5	13	16	1/2	5/8
6	14	17	5/8	3/4

END OF SECTION

SECTION 23 0548

VIBRATION AND SEISMIC CONTROLS FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 WORK INCLUDED

A. Vibration Isolation.

B. Seismic Restraint.

1.02 GENERAL

A. The requirements for seismic protection measures to be applied to mechanical equipment and systems specified herein are in addition to any other items called for in other sections of these specifications.

B. Seismic calculations shall be based upon Seismic Category D. Seismic calculations shall utilize and Component Importance Factor, IP, of 1.5. Refer to Structural Drawings and specifications for additional requirements.

1.03 MECHANICAL EQUIPMENT

A. See Section 01 3300 – submittal procedures.

B. Mechanical equipment shall include the following items to the extent required on plans or in other sections of these specifications.

1. Boilers.
2. Pumps with Motors.
3. Air Separators
4. Expansion and Compression Tanks.
5. Glycol Tanks.
6. Unit Heaters.
7. Cabinet Unit Heaters.
8. Fuel Oil Tanks.
9. Fuel Oil Day Tanks.
10. Control Panels.
11. Air Handling Units.
12. Fans.
13. VAV Boxes.
14. Air Conditioning Units.
15. Roof Hoods.
16. Heating Piping.
17. Fuel Piping.
18. Ducts.

1.04 REFERENCE STANDARDS

A. ASCE 7 – Minimum Design Loads for Buildings and Other Structures, Latest adopted Edition.

B. SMACNA - Seismic Restraint Manual, Guidelines for Mechanical Systems.

C. IBC – International Building Code, Latest Adopted Edition.

D. IMC – International Mechanical Code.

E. Provide and install mechanical equipment so that Average Noise Criteria Curves, as outlined in ASHRAE Guide, are not exceeded.

1.05 SUBMITTALS

A. Submit shop drawings and manufacturer's data in accordance with Section 01 3300.

B. Provide structural and seismic calculations with fastening details in accordance with the IBC. Provide Calculations shall be certified by a licensed engineer. Submit shop drawings and seismic calculations for review. Submit plan review approved set to Engineer when available.

The submittals must include a licensed engineer's stamp and signature and shall be provided as deferred submittal.

C. Shop drawings shall include catalog cuts, templates and erection and installation details, as appropriate. Submittals shall be complete in detail; shall indicate thickness, type, grade, class of metal; and dimensions; and shall show construction details, reinforcement, anchorage, and installation with relation to the building construction.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Vibration isolators shall be manufactured by:
   1. Vibro-Accoustics.
   2. Amber Booth.
   3. International Seismic Application Technology.
   4. Mason Industries.

B. Ventilating equipment flexible connections and duct flexible connections shall be:
   1. DuroDyne Duroprene or equal.
   2. Ventfabrics, Chicago, Illinois.
   3. Elgen Manufacturing Co., Garfield, New Jersey.

C. Substitutions: Section 01 2513 - Product Substitutions Requirements.

2.02 VIBRATION ISOLATORS (ROTATING EQUIPMENT EXCEPT FANS)

A. Floor Mount: Closed spring mount with iso-stiff springs and limit stop for seismic restraint.

B. Hangers: Closed spring hanger with 1" thick acoustic isolator.

C. Provide pairs of neoprene side snubbers or restraining springs where side torque or thrust may develop.

D. Color code spring mounts, spring selected to operate at no greater than 2/3 solid deflection and have ¼" ribbed neoprene pads.

2.03 VENTILATING SYSTEMS FLEXIBLE CONNECTIONS

A. Fabricate of neoprene coated flameproof fabric a minimum of 2" wide (3" wide for fan connectors) tightly crimped into metal edging strip and attach to ducting and equipment by screws or bolts at 6" intervals. DuroDyne Duroprene treated duct material, or equal. Durolon or equal for outdoor or high pressure applications.

2.04 LIMITS OF VIBRATION

A. Statically and dynamically balance all rotating machinery, fans and pumps, etc. Do dynamic balancing at the operating speed of the motor.

B. Select isolated equipment in accordance with the weight distribution, to produce uniform deflection on the vibration mounts. Deflection of vibration mounts shall be required to produce 95% vibration isolation efficiency, based on the equipment hp, rpm, location in regard to critical spaces and stiffness of the building supporting structural members, supporting the equipment.

C. For fan-motor units in which the impeller is supported by the motor shaft, the motor and impeller shall be dynamically balanced as an integral unit.

2.05 EQUIPMENT BASES

A. Structural Steel - General:
   1. For each piece of equipment, provide a fabricated base to include equipment and motor without overhang of equipment or motor.
   2. Use structural WF members to form perimeter framing, with minimum beam depth equal to 1/12 the longest span, except that for maximum spans less than seven feet, use six inch deep beams; and for spans greater than eight feet, do not exceed eight inches. Use diagonal WF braces equal to 1/2 the depth of the perimeter beam whenever the longest beam exceeds six feet.

3. Mount isolated motor driven equipment with its motor on a common base of sufficient rigidity to maintain permanent alignment.
4. Attach all equipment which does not have sufficient strength to permit its mounting on independent isolators to a suitable structural steel frame base or concrete pad.
5. Provide snubbers to prevent excess motion on starting and stopping, and for earthquake bracing.
6. Design snubbers so that they not be engaged during steady running conditions.

B. Structural Steel Fan Base: Provide rectangular steel fan and motor bases with motor slide rails and holes drilled to receive fan and motor. Use height saving brackets for side mounting of isolators.

2.06 EARTHQUAKE BUMPERS AND SNUBBERS

A. Bumpers:
1. Fabricate the bumper cradle of 6 X 4 X 3/8" angle iron minimum and provide with at least two holes for bolting to the floor.
2. Attach one or more Elastomeric mountings to pad the 6" leg of the angle iron.
3. Design the mounting to deflect not more than ¾" under the shock loading of 1 g in any direction in the horizontal plane.
4. Manufacturer: Vibration Mounting Series "SR" seismic restraints, or similar.

B. Snubbers:
1. Interlocking steel members restrained by shock absorbent rubber materials.
2. Elastomeric materials shall be replaceable and a minimum of ¾” thickness.
3. Maintain 1/8” air gap in all directions in design of snubber.
4. Acceleration of 4 g’s in any direction.
5. All-directional restraint.
6. Manufacturer: Mason Industries Z-1011 Seismic Snubber.

2.07 MATERIALS AND EQUIPMENT

A. Materials and equipment shall conform to the respective specifications and other requirements specified below.

B. Bolts and Nuts: Square head bolts and heavy hexagon nuts, ANSI B18.2.1 and B18.2.2, and ASTM A 307 or A 576.

C. Bolts, underground, ASTM 325.

D. Sway Brace: Material used for members listed in Tables I through III of this specification, except for pipes, shall be structural steel conforming with ASTM A 36. Steel pipes shall conform to ASTM A 501.

E. Flexible Couplings: Flexible couplings shall have same pressure ratings as adjoining pipe.

F. Flexible ball joints conforming to the following requirements may be employed on above ground piping. Joints shall have cast or wrought steel casing and ball parts capable of 360º rotation plus not less than 15º angular movement. Joints shall be certified to be suitable for the service intended by the manufacturer, based on not less than 2 years satisfactory operation in a similar application.

G. Sleeve type couplings shall be used for joining plain-end pipe section. The couplings shall consist of one steel middle ring, two steel followers, two gaskets, and necessary steel bolts and nuts to compress the gaskets.

H. Seismic Cable Restraint: High strength galvanized steel aircraft cable manufactured to meet or exceed minimum materials and standard requirements pre AISI Manual for structural applications of steel cables and ASTM A630. Break strengths must be per ASTM E-8 procedures. UL certified break strength, color coded.

PART 3 EXECUTION

3.01 SCOPE OF WORK

A. All vibrating equipment and the interconnecting pipe and ductwork shall be isolated to eliminate the transmission of objectionable noise and vibration from the structure.

B. Mechanical equipment shall be carefully checked upon delivery for proper mechanical performance which shall include proper noise and vibration operation.

C. Where additional attenuation is required for ventilation equipment, the increased pressure drop must not cause an increase in power requirements from those specified.

D. All rotating equipment, fans, pumps, compressors, etc., shall be statically and dynamically balanced.

E. All installed rotating equipment with excessive noise and/or vibration which cannot be corrected in place shall be replaced at no cost to Owner.

3.02 GENERAL PROCEDURES

A. Select isolators in accordance with the manufacturer's recommendations and the equipment weight distribution to allow for proper static deflection of the isolators in relation to the span of the building structure supporting the equipment, considering the allowable deflection and weight of the structure.

B. Install isolators so they can be easily removed for replacement.

C. Mount all equipment absolutely level.

D. Install all isolators per manufacturer's instructions.

E. Install vibration isolators for mechanical motor driven equipment.

F. Secure seismic restraint cable to structure and to braced component through bracket or stake eye specifically designed by the cable manufacturer to exceed cable restraint rated capacity.

3.03 PIPING

A. Provide the first two piping supports away from an isolated piece of equipment to which piping is connected with spring hangers having deflections equal to that of the equipment isolation. Size supports for all horizontal piping 2-1/2" and larger which is spring isolated for a minimum starting deflection of 3/4" with the pipe filled.

B. Where piping 2" and smaller is to be isolated, use either Stoneman #S100, S500, S200 or S600 isolators or support the piping on its insulation with a sheetmetal shield, using a section of 9# density insulation under the hanger.

C. Size vertical piping supports with deflection capability equal to four times the anticipated expansion or contraction. Install temporary anchors as required to permit readjustment of springs in the risers, to fix direction of pipe movement and final operating deflection of the springs.

D. Piping vibration isolation flexible connections shall make a 90º change of direction unless otherwise noted.

3.04 RUST PROOFING

A. Treat all vibration isolation hardware for resistance to corrosion.

B. Provide zinc electro-plated nuts, bolts and washers.

C. Provide steel components PVC coated or primed with zinc chromate primer and painted with two coats of industrial grade enamel. Completely remove all welding slag and thoroughly clean all surfaces before painting.

3.05 SWAY BRACES

A. Sway braces shall be installed on piping and ductwork to preclude damage during seismic activity. All bracing shall conform to the requirements of the IBC. Provisions on this paragraph apply to all piping within a 5 foot line around outside of building unless buried in the ground. Piping grouped for support on trapeze type hangers shall be braced at the same intervals as determined by the smallest diameter pipe of the group. The trapeze type hanger shall be

secured with less than two 1/2 inch bolts. Bracing rigidly attached to pipe flanges, or similar, shall not be used where it would interfere with thermal expansion of piping.

3.06 SPREADERS

A. Spreaders shall be provided between racked or adjacent piping runs to prevent contact during seismic activity. All spreaders shall conform to the requirements of the IBC.

3.07 FLEXIBLE COUPLINGS OR JOINTS

A. Building Piping: Flexible couplings or joints in building pipe shall be provided at bottom of all pipe risers 3-1/2 inch size and larger.

3.08 ANCHOR BOLTS

A. All floor or pad mounted equipment required by any section of these specifications shall use cast in place anchor bolts. Two nuts shall be provided on each bolt. Anchor bolts must conform to ASTM A 307.

3.09 VIBRATION ISOLATED DEVICES

A. Resilient and Spring Type Vibration Devices: Vibration isolation devices shall be selected so that the maximum movement of equipment from the static deflection point shall be 0.5 inches.

B. Multidirectional Seismic Snubbers: A minimum of four multidirectional seismic Snubbers shall be installed on all floor or slab mounted equipment.

3.10 EQUIPMENT SWAY BRACING

A. Equipment sway bracing shall be provided for all items supported from overhead floor or roof structures to conform to the requirements of the IBC.

END OF SECTION

SECTION 23 0553
IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Nameplates.
   2. Tags.
   3. Stencils.
   4. Pipe markers.
   5. Ceiling tacks.

B. Related Sections:
   1. Division 09 - Painting and Coating: Execution requirements for painting specified by this section.

1.02 REFERENCES

A. American Society of Mechanical Engineers:
   1. ASME A13.1 - Scheme for the Identification of Piping Systems.

1.03 SUBMITTALS

A. See Section 01 3300 – submittal procedures.

B. Substitutions: Section 01 2513 - Product Substitutions Requirements.

C. Product Data: Submit manufacturers catalog literature for each product required.

D. Shop Drawings: Submit list of wording, symbols, letter size, and color coding for mechanical identification and valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

E. Manufacturer's Installation Instructions: Indicate installation instructions, special procedures, and installation.

F. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.04 CLOSEOUT SUBMITTALS

A. Division 01 - Execution and Closeout Requirements: Closeout procedures.

B. Project Record Documents: Record actual locations of tagged valves; include valve tag numbers.

1.05 QUALITY ASSURANCE

A. Conform to ASME A13.1 for color scheme for identification of piping systems and accessories.

1.06 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

B. Installer: Company specializing in performing Work of this section with minimum three years experience approved by manufacturer.

1.07 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.01 NAMEPLATES

A. Manufacturers:
   1. Brady Worldwide, Inc.
   2. Brimar Industries, Inc.
   3. Craftmark Identification Systems.
   4. Safety Sign Co.

5. Seton Identification Products.
6. Substitutions: Section 01 2513 - Product Substitutions Requirements.

B. Product Description: Laminated three-layer plastic with engraved black letters on light contrasting background color.

2.02 TAGS

A. Plastic Tags:
1. Manufacturers:
a. Brady Worldwide, Inc.
b. Brimar Industries, Inc.
c. Craftmark Identification Systems.
d. Seton Identification Products.
e. Substitutions: Section 01 2513 - Product Substitutions Requirements.
2. Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inches diameter.

B. Metal Tags:
1. Manufacturers:
a. Brady Worldwide, Inc.
b. Brimar Industries, Inc.
c. Craftmark Identification Systems.
d. Seton Identification Products.
e. Substitutions: Section 01 2513 - Product Substitutions Requirements.
2. Brass with stamped letters; tag size minimum 1-1/2 inches diameter with finished edges.

C. Information Tags:
1. Manufacturers:
a. Brady Worldwide, Inc.
b. Brimar Industries, Inc.
c. Craftmark Identification Systems.
d. Safety Sign Co.
e. Seton Identification Products.
f. Substitutions: Section 01 2513 - Product Substitutions Requirements.
2. Clear plastic with printed "Danger," "Caution," or "Warning" and message; size 3-1/4 x 5-5/8 inches with grommet and self-locking nylon ties.

D. Tag Chart: Typewritten letter size list of applied tags and location in anodized aluminum frame.

2.03 STENCILS

A. Manufacturers:
1. Brady Worldwide, Inc.
2. Brimar Industries, Inc.
3. Craftmark Identification Systems.
4. Safety Sign Co.
5. Seton Identification Products.
6. Substitutions: Section 01 2513 - Product Substitutions Requirements.

B. Stencils: With clean cut symbols and letters of following size:
1. Up to 2 inches Outside Diameter of Insulation or Pipe: 1/2 inch high letters.
2. 2-1/2 to 6 inches Outside Diameter of Insulation or Pipe: 1-inch high letters.
3. Over 6 inches Outside Diameter of Insulation or Pipe: 1-3/4 inches high letters.
4. Ductwork and Equipment: 1-3/4 inches high letters.

C. Stencil Paint: As specified in Division 09, semi-gloss enamel, colors and lettering size conforming to ASME A13.1.

2.04 PIPE MARKERS

A. Color and Lettering: Conform to ASME A13.1.

B. Plastic Pipe Markers:
   1. Manufacturers:
      a. Brady Worldwide, Inc.
      b. Brimar Industries, Inc.
      c. Craftmark Identification Systems.
      d. Safety Sign Co.
      e. Seton Identification Products.
      f. Substitutions: Section 01 2513 - Product Substitutions Requirements.
   2. Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering. Larger sizes may have maximum sheet size with spring fastener.

C. Plastic Tape Pipe Markers:
   1. Manufacturers:
      a. Brady Worldwide, Inc.
      b. Brimar Industries, Inc.
      c. Craftmark Identification Systems.
      d. Safety Sign Co.
      e. Seton Identification Products.
      f. Substitutions: Section 01 2513 - Product Substitutions Requirements.
   2. Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

2.05 CEILING LABELS

A. Manufacturers:
   1. DuraLabel
   2. Brady Worldwide, Inc.
   3. Brimar Industries, Inc.
   4. Craftmark Identification Systems.
   5. Substitutions: Section 01 2513 - Product Substitutions Requirements

B. Description: Description: 3/4" x 3" vinyl label, 3.0 Mil self adhesive vinyl similar to DuraLabel Pro. Label color shall be black text on a white background.

2.06 UNDERGROUND WARNING TAPE

A. Manufacturers:
   1. Craftmark Identification Systems.
   2. Kolbi Pipe Markers Co.
   3. Seton Identification Products.
   4. Substitutions: Section 01 2513 - Product Substitutions Requirements. Description: Polyethylene tape with metallic core for detection and location of piping with metal detector resistant to acids, alkalis and other soil components.
   5. Size: 0.004 inch 6 inches Printed text as selected by Architect/Engineer in black color and repeated at maximum 40 inches intervals.

PART 3 EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

B. Prepare surfaces in accordance with Division 09 for stencil painting.

3.02 INSTALLATION

A. Apply stencil painting in accordance with Division 09.

B. Install identifying devices after completion of coverings and painting.

C. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive.

D. Install tags using corrosion resistant chain. Number tags consecutively by location.

E. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.

F. Identify air handling units, pumps, heat transfer equipment, tanks, and water treatment devices with plastic nameplates. Identify in-line pumps and other small devices with tags.

G. Identify control panels and major control components outside panels with plastic nameplates.

H. Identify valves in main and branch piping with tags.

I. Identify air terminal units and radiator valves with numbered tags.

J. Tag automatic controls, instruments, and relays. Key to control schematic.

K. Identify piping, concealed or exposed, with plastic pipe markers or stenciled painting. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and tee, at each side of penetration of structure or enclosure, and at each obstruction.

L. For exposed natural gas lines other than steel pipe, attach yellow pipe labels with "GAS" in black lettering, at maximum 5 foot spacing.

M. Label ceiling grid for mechanical equipment, valves and control components located above ceiling. The label shall contain the equipment tag, valve tag or identification tag for control component.

END OF SECTION

SECTION 23 0593
TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Testing adjusting and balancing of air systems.
   2. Testing adjusting and balancing of hydronic systems.
   3. Measurement of final operating condition of HVAC systems.
   4. Sound measurement of equipment operating conditions.
   5. Vibration measurement of equipment operating conditions.

B. Related Sections:
   1. Section 23 0923 - Direct-Digital Control System for HVAC: Requirements for coordination between DDC system and testing, adjusting, and balancing work.
   2. Section 23 0993 - Sequence of Operations for HVAC Controls: Sequences of operation for HVAC equipment.

1.02 REFERENCES

A. Associated Air Balance Council:
   1. AABC MN-1 - National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems.

B. American Society of Heating, Refrigerating and Air-Conditioning Engineers:
   1. ASHRAE 111 - Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning and Refrigeration Systems.

C. Natural Environmental Balancing Bureau:
   1. NEBB - Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems.

D. Testing Adjusting and Balancing Bureau:
   1. TABB - International Standards for Environmental Systems Balance.

1.03 SUBMITTALS

A. See Section 01 3300 - submittal procedures.

B. Prior to commencing Work, submit proof of latest calibration date of each instrument.

C. Test Reports: Indicate data on TABB Report Forms.

D. Field Reports: Indicate deficiencies preventing proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.

E. Prior to commencing Work, submit report forms or outlines indicating adjusting, balancing, and equipment data required. Include detailed procedures, agenda, and sample report forms.

F. Submit draft copies of report for review prior to final acceptance of Project.

G. Furnish reports in binder manuals, complete with table of contents page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.

1.04 CLOSEOUT SUBMITTALS

A. Division 01 - Execution and Closeout Requirements: Closeout procedures.

B. Project Record Documents: Record actual locations of flow measuring stations balancing valves and rough setting.

C. Operation and Maintenance Data: Furnish final copy of testing, adjusting, and balancing report inclusion in operating and maintenance manuals.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with NEBB Procedural Standards for Testing, Balancing and Adjusting of Environmental Systems.

B. Prior to commencing Work, calibrate each instrument to be used.

1.06 QUALIFICATIONS

A. Agency: Company specializing in testing, adjusting, and balancing of systems specified in this section with minimum three years documented experience Certified by NEBB.

1.07 SEQUENCING

A. Division 01 - Summary: Work sequence.

B. Sequence balancing between completion of systems tested and Date of Substantial Completion.

1.08 SCHEDULING

A. Division 01 - Administrative Requirements: Coordination and project conditions.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.01 EXAMINATION

A. Division 01 - Administrative Requirements: Coordination and project conditions.

B. Verify systems are complete and operable before commencing work. Verify the following:
   1. Systems are started and operating in safe and normal condition.
   2. HVAC control systems are installed complete and operable.
   3. Proper thermal overload protection is in place for electrical equipment.
   4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
   5. Duct systems are clean of debris.
   6. Fans are rotating correctly.
   7. Fire and volume dampers are in place and open.
   8. Air coil fins are cleaned and combed.
   9. Access doors are closed and duct end caps are in place.
   10. Air outlets are installed and connected.
   11. Duct system leakage is minimized.
   12. Hydronic systems are flushed, filled, and vented.
   13. Pumps are rotating correctly.
   14. Proper strainer baskets are clean and in place or in normal position.
   15. Service and balancing valves are open.

3.02 PREPARATION

A. Furnish instruments required for testing, adjusting, and balancing operations.

B. Make instruments available to Architect/Engineer to facilitate spot checks during testing.

3.03 INSTALLATION TOLERANCES

A. Air Handling Systems: Adjust to within plus or minus 10 percent of design.

B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 10 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

C. Hydronic Systems: Adjust to within plus or minus 10 percent of design.

3.04 ADJUSTING

A. Division 01 - Execution and Closeout Requirements: Testing, adjusting, and balancing.

B. Verify recorded data represents actual measured or observed conditions.

C. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

D. After adjustment, take measurements to verify balance has not been disrupted. If disrupted, verify correcting adjustments have been made.

E. Report defects and deficiencies noted during performance of services, preventing system balance.

F. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

G. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by Owner.

3.05 AIR SYSTEM PROCEDURE

A. Adjust air handling and distribution systems to obtain required or design supply, return, and exhaust air quantities.

B. Make air flow rate measurements in main ducts by Pitot tube traverse of entire cross sectional area of duct.

C. Measure air quantities at air inlets and outlets.

D. Adjust distribution system to obtain:
   1. Space temperatures within 5 degrees F.
   2. Minimal objectionable drafts.

E. Use volume control devices to regulate air quantities only to extent adjustments do not create objectionable air motion or sound levels. Effect volume control by using volume dampers located in ducts.

F. Vary total system air quantities by adjustment of fan speeds. Provide sheave drive changes to vary fan speed. Vary branch air quantities by damper regulation.

G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.

H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across fan. Make allowances for 50 percent loading of filters.

I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.

J. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.

K. At modulating damper locations, take measurements and balance at extreme conditions. Balance variable volume systems at maximum airflow rate, full cooling, and at minimum airflow rate, full heating.

L. Measure building static pressure and adjust supply, return, and exhaust air systems to obtain required relationship between each to maintain approximately 0.05 inches differential static pressure near building entries.

M. Check multi-zone units for motorized damper leakage. Adjust air quantities with mixing dampers set first for cooling, then heating, then modulating.

N. For variable air volume system powered units set volume controller to airflow setting indicated. Confirm connections properly made and confirm proper operation for automatic variable-air-volume temperature control.

3.06 WATER SYSTEM PROCEDURE

A. Adjust water systems, after air balancing, to obtain design quantities.

B. Use calibrated fittings and pressure gauges to determine flow rates for system balance. Where flow-metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in system.

C. Confirm air bleeds indicate system is full of water.

D. Adjust systems to obtain specified pressure drops and flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.

E. Perform system balance with automatic control valves fully open triple duty valves fully open, and pump VFDs at 100 percent speed.

F. Confirm pump rotation and differential pressure at full flow.

G. Perform adjustment of water distribution systems by the following measures:
   1. Reduce total system flow rate first by reducing speed of VFD.
   2. Use balancing cocks, valves, and fittings.

H. Do not use service or shut-off valves for balancing unless designed for balancing and shut-off functions. Where available pump capacity is less than total flow requirements or individual system parts, simulate full flow in one part by temporary restriction of flow to other parts.

3.07 SCHEDULES

A. Partial list of Equipment Requiring Testing, Adjusting, and Balancing:
   1. Plumbing Pumps and Recirculation System Balance Valves.
   2. HVAC Pumps Systems.
   3. Computer Room Air Conditioning Units.
   4. Air Coils.
   5. Terminal Heat Transfer Units.
   6. Air Handling Units.
   7. Fans.
   8. Air Filters.
   9. Air Terminal Units.
   10. Air Inlets and Outlets.

B. Report Forms
   1. Title Page:
      a. Name of Testing, Adjusting, and Balancing Agency
      b. Address of Testing, Adjusting, and Balancing Agency
      c. Telephone and facsimile numbers of Testing, Adjusting, and Balancing Agency
      d. Project name
      e. Project location
      f. Project Architect
      g. Project Engineer
      h. Project Contractor
      i. Project altitude
      j. Report date
   2. Summary Comments:
      a. Design versus final performance
      b. Notable characteristics of system
      c. Description of systems operation sequence
      d. Summary of outdoor and exhaust flows to indicate building pressurization
      e. Nomenclature used throughout report
      f. Test conditions
   3. Instrument List:
      a. Instrument
      b. Manufacturer
      c. Model number
      d. Serial number
      e. Range
      f. Calibration date

4. Electric Motors:
    a. Manufacturer
    b. Model/Frame
    c. HP/BHP and kW
    d. Phase, voltage, amperage; nameplate, actual, no load
    e. RPM
    f. Service factor
    g. Starter size, rating, heater elements
    h. Sheave Make/Size/Bore
5. V-Belt Drive:
    a. Identification/location
    b. Required driven RPM
    c. Driven sheave, diameter and RPM
    d. Belt, size and quantity
    e. Motor sheave diameter and RPM
    f. Center to center distance, maximum, minimum, and actual
6. Pump Data:
    a. Identification/number
    b. Manufacturer
    c. Size/model
    d. Impeller
    e. Service
    f. Design flow rate, pressure drop, BHP and kW
    g. Actual flow rate, pressure drop, BHP and kW
    h. Discharge pressure
    i. Suction pressure
    j. Total operating head pressure
    k. Shut off, discharge and suction pressures
    l. Shut off, total head pressure
7. Heat Exchanger:
    a. Identification/number
    b. Location
    c. Service
    d. Manufacturer
    e. Model number
    f. Serial number
    g. Steam pressure, design and actual
    h. Primary water entering temperature, design and actual
    i. Primary water leaving temperature, design and actual
    j. Primary water flow, design and actual
    k. Primary water pressure drop, design and actual
    l. Secondary water leaving temperature, design and actual
    m. Secondary water leaving temperature, design and actual
    n. Secondary water flow, design and actual
    o. Secondary water pressure drop, design and actual
8. Heating Coil Data:
    a. Identification/number
    b. Location
    c. Service
    d. Manufacturer
    e. Air flow, design and actual
    f. Water flow, design and actual
    g. Water pressure drop, design and actual

h. Entering water temperature, design and actual
i. Leaving water temperature, design and actual
j. Entering air temperature, design and actual
k. Leaving air temperature, design and actual
l. Air pressure drop, design and actual

9. Air Moving Equipment:
   a. Location
   b. Manufacturer
   c. Model number
   d. Serial number
   e. Arrangement/Class/Discharge
   f. Air flow, specified and actual
   g. Return air flow, specified and actual
   h. Outside air flow, specified and actual
   i. Total static pressure (total external), specified and actual
   j. Inlet pressure
   k. Discharge pressure
   l. Sheave Make/Size/Bore
   m. Number of Belts/Make/Size
   n. Fan RPM
10. Return Air/Outside Air Data:
   a. Identification/location
   b. Design air flow
   c. Actual air flow
   d. Design return air flow
   e. Actual return air flow
   f. Design outside air flow
   g. Actual outside air flow
   h. Return air temperature
   i. Outside air temperature
   j. Required mixed air temperature
   k. Actual mixed air temperature
   l. Design outside/return air ratio
   m. Actual outside/return air ratio
11. Exhaust Fan Data:
   a. Location
   b. Manufacturer
   c. Model number
   d. Serial number
   e. Air flow, specified and actual
   f. Total static pressure (total external), specified and actual
   g. Inlet pressure
   h. Discharge pressure
   i. Sheave Make/Size/Bore
   j. Number of Belts/Make/Size
   k. Fan RPM
12. Duct Traverse:
   a. System zone/branch
   b. Duct size
   c. Area
   d. Design velocity
   e. Design air flow
   f. Test velocity

g. Test air flow
h. Duct static pressure
i. Air temperature
j. Air correction factor

13. Air Monitoring Station Data:
    a. Identification/location
    b. System
    c. Size
    d. Area
    e. Design velocity
    f. Design air flow
    g. Test velocity
    h. Test air flow
14. Flow Measuring Station:
    a. Identification/number
    b. Location
    c. Size
    d. Manufacturer
    e. Model number
    f. Serial number
    g. Design Flow rate
    h. Design pressure drop
    i. Actual/final pressure drop
    j. Actual/final flow rate
    k. Station calibrated setting
15. Terminal Unit Data:
    a. Manufacturer
    b. Type, constant, variable, single, dual duct
    c. Identification/number
    d. Location
    e. Model number
    f. Size
    g. Minimum static pressure
    h. Minimum design air flow
    i. Maximum design air flow
    j. Maximum actual air flow
    k. Inlet static pressure
16. Air Distribution Test Sheet:
    a. Air terminal number
    b. Room number/location
    c. Terminal type
    d. Terminal size
    e. Area factor
    f. Design velocity
    g. Design air flow
    h. Test (final) velocity
    i. Test (final) air flow
    j. Percent of design air flow
17. Vibration Test:
    a. Location of points:
        1) Fan bearing, drive end
        2) Fan bearing, opposite end
        3) Motor bearing, center (when applicable)

4) Motor bearing, drive end
5) Motor bearing, opposite end
6) Casing (bottom or top)
7) Casing (side)
8) Duct after flexible connection (discharge)
9) Duct after flexible connection (suction)

b. Test readings:
1) Horizontal, velocity and displacement
2) Vertical, velocity and displacement
3) Axial, velocity and displacement

c. Normally acceptable readings, velocity and acceleration
d. Unusual conditions at time of test
e. Vibration source (when non-complying)

END OF SECTION

SECTION 23 0700
HVAC INSULATION

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. HVAC piping insulation, jackets and accessories.
   2. HVAC equipment insulation, jackets and accessories.
   3. HVAC ductwork insulation, jackets, and accessories.

B. Related Sections:
   1. Division 07 - Firestopping: Product requirements for firestopping for placement by this section.
   2. Division 09 - Painting and Coating: Execution requirements for painting insulation jackets and covering specified by this section.

1.02 REFERENCES

A. ASTM International:
   1. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
   2. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
   3. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
   4. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement.
   5. ASTM C449/C449M - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement.
   6. ASTM C450 - Standard Practice for Fabrication of Thermal Insulating Fitting Covers for NPS Piping, and Vessel Lagging.
   7. ASTM C533 - Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation.
   8. ASTM C534 - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.
   9. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation.
   10. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
   11. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
   12. ASTM C585 - Standard Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System).
   13. ASTM C591 - Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation.
   14. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
   15. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.
   16. ASTM C921 - Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.
   17. ASTM C1071 - Standard Specification for Thermal and Acoustical Insulation (Glass Fiber, Duct Lining Material).
   18. ASTM C1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.
   19. ASTM C1290 - Standard Specification for Flexible Fibrous Glass Blanket Insulation Used to Externally Insulate HVAC Ducts.
   20. ASTM D1785 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.

21. ASTM D4637 - Standard Specification for EPDM Sheet Used in Single-Ply Roof Membrane.
22. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
23. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials.
24. ASTM E162 - Standard Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source.

B. Sheet Metal and Air Conditioning Contractors:
1. SMACNA - HVAC Duct Construction Standard - Metal and Flexible.

C. Underwriters Laboratories Inc.:
1. UL 1978 - Standard for Safety for Grease Ducts.

1.03 SUBMITTALS

A. See Section 01 3300 - submittal procedures.

B. Product Data: Submit product description, thermal characteristics and list of materials and thickness for each service, and location.

C. Manufacturer's Installation Instructions: Submit manufacturers published literature indicating proper installation procedures.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.04 QUALITY ASSURANCE

A. Test pipe insulation for maximum flame spread index of 25 and maximum smoke developed index of not exceeding 50 in accordance with ASTM E84.

B. Pipe insulation manufactured in accordance with ASTM C585 for inner and outer diameters.

C. Factory fabricated fitting covers manufactured in accordance with ASTM C450.

D. Duct insulation, Coverings, and Linings: Maximum 25/50 flame spread/smoke developed index, when tested in accordance with ASTM E84, using specimen procedures and mounting procedures of ASTM E 2231.

1.05 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

B. Applicator: Company specializing in performing Work of this section with minimum three years experience approved by manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Division 01 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.

C. Protect insulation from weather and construction traffic, dirt, water, chemical, and damage, by storing in original wrapping.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Section 01 5719 - Temporary Environmental Controls: Environmental conditions affecting products on site.

B. Install insulation only when ambient temperature and humidity conditions are within range recommended by manufacturer.

C. Maintain temperature before, during, and after installation for minimum period of 24 hours.

1.08 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.09 WARRANTY

A. Division 01 - Execution and Closeout Requirements: Product warranties and product bonds.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Manufacturers for Glass Fiber and Mineral Fiber Insulation Products:
   1. CertainTeed.
   2. Knauf.
   3. Johns Manville.
   4. Owens-Corning.
   5. Substitutions: Section 01 2513 - Product Substitutions Requirements.

B. Manufacturers for Closed Cell Elastomeric Insulation Products:
   1. Aeroflex. Aerocell.
   2. Armacell, LLC. Armaflex.
   3. Nomaco. K-flex.
   4. Substitutions: Section 01 2513 - Product Substitutions Requirements.

C. Manufacturers for Polyisocyanurate Foam Insulation Products:
   1. Dow Chemical Company.
   2. Substitutions: Section 01 2513 - Product Substitutions Requirements.

D. Manufacturers for Extruded Polystyrene Insulation Products:
   1. Dow Chemical Company.
   2. Substitutions: Section 01 2513 - Product Substitutions Requirements.

2.02 PIPE INSULATION

A. TYPE P-1: ASTM C547, molded glass fiber pipe insulation.
   1. Thermal Conductivity: 0.23 at 75 degrees F.
   2. Operating Temperature Range: 0 to 850 degrees F.
   3. Vapor Barrier Jacket: ASTM C1136, Type I, factory applied reinforced foil kraft with self-sealing adhesive joints.
   4. Jacket Temperature Limit: minus 20 to 150 degrees F.

2.03 PIPE INSULATION JACKETS

A. Vapor Retarder Jacket:
   1. White Kraft paper with glass fiber yarn, bonded to aluminized film.
   2. Water Vapor Permeance: ASTM E96/E96M; 0.02 perms.

B. PVC Plastic Pipe Jacket:
   1. Product Description: One piece molded type fitting covers and sheet material, off-white color.
   2. Thickness: 10 mil.

C. Aluminum Pipe Jacket:
   1. ASTM B209.
   2. Thickness: 0.020 inch thick sheet.
   3. Finish: Corrugated or textured.
   4. Joining: Longitudinal slip joints and 2 inch laps.
   5. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.

2.04 PIPE INSULATION ACCESSORIES

A. Vapor Retarder Lap Adhesive: Compatible with insulation.

B. Covering Adhesive Mastic: Compatible with insulation.

C. Piping 1-1/2 inches diameter and smaller: Galvanized steel insulation protection shield. MSS SP-69, Type 40. Length: Based on pipe size and insulation thickness.

D. Piping 2 inches diameter and larger: Wood insulation saddle, hard maple. Inserts length: not less than 6 inches long, matching thickness and contour of adjoining insulation.

E. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

F. Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement: ASTM C449/C449M.

G. Insulating Cement: ASTM C195; hydraulic setting on mineral wool.

H. Adhesives: Compatible with insulation.

2.05 EQUIPMENT INSULATION

A. TYPE E-1: ASTM C612; glass fiber, rigid board, noncombustible with factory applied reinforced aluminum foil jacket.
   1. Thermal Conductivity: 0.023 at 75 degrees F.
   2. Operating Temperature Range: 0 to 450 degrees F.
   3. Density: 3.0 pound per cubic foot.
   4. Jacket Temperature Limit: minus 20 to 150 degrees F.

B. TYPE E-2: Reusable Thermal Insulation Covers: thermal insulating wool, 2.4 lb./cu. Ft. density, maximum temperature rating of 1000 Deg F; Interior/Exterior Fabric: 17 oz./sq. yd. fiberglass cloth, maximum temperature rating of -80 to 500 Deg F; Securement: Fourteen gauge stainless steel buckle and strap assembly; Sewing Thread: Kevlar/Stainless Steel S-110 Natural with Stainless Steel Core, six to nine stitches per inch; Drawcord: 0.125" diameter #4 ultra strength polyester drawcord. Thermal Energy Products "Energy-Wrap" or equal.

C. TYPE E-3: Exterior FSK Duct Wrap: Flexible glass fiber; ANSI/ASTM C553; commercial grade; 'k' value of 0.27 at 75º F.

2.06 EQUIPMENT INSULATION JACKETS

A. PVC Plastic Equipment Jacket:
   1. Product Description: ASTM D1785, sheet material, off-white color.
   2. Minimum Service Temperature: -40 degrees F.
   3. Maximum Service Temperature: 150 degrees F.
   4. Water Vapor Permeance: ASTM E96/E96M; 0.02 perms.
   5. Thickness: 10 mil.

B. Aluminum Equipment Jacket:
   1. ASTM B209.
   2. Thickness: 0.016 inch thick sheet.
   3. Finish: Corrugated or textured.
   4. Joining: Longitudinal slip joints and 2 inch laps.
   5. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.

C. Vapor Retarder Jacket:
   1. ASTM C921, white Kraft paper with glass fiber yarn, bonded to aluminized film.
   2. Water Vapor Permeance: ASTM E96/E96M; 0.02 perms. Indoor Vapor Retarder Finish:
      a. Cloth: Untreated; 9 oz/sq yd weight.
      b. Vinyl emulsion type acrylic, compatible with insulation.

2.07 EQUIPMENT INSULATION ACCESSORIES

A. Vapor Retarder Lap Adhesive: Compatible with insulation.

B. Covering Adhesive Mastic: Compatible with insulation.

C. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

D. Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement: ASTM C449/C449M.

E. Adhesives: Compatible with insulation.

2.08 DUCTWORK INSULATION

A. TYPE D-1: ASTM C1290, Type III, flexible glass fiber, commercial grade with factory applied reinforced aluminum foil jacket meeting ASTM C1136, Type II.

1. Thermal Conductivity: 0.27 at 75 degrees F.
2. Maximum Operating Temperature: 250 degrees F.
3. Density: 1.5 pound per cubic foot.

B. TYPE D-2: ASTM C612, Type IA or IB, rigid glass fiber, with factory applied all service facing meeting ASTM C1136, Type II.
1. Thermal Conductivity: 0.23 at 75 degrees F.
2. Density: 3.0 pound per cubic foot.

C. TYPE D-4: ASTM C1071, Type I, flexible, glass fiber duct liner with coated air side.
1. Thermal Conductivity: 0.24 at 75 degrees F.
2. Density: 3.0 pound per cubic foot.
3. Maximum Operating Temperature: 250 degrees F.
4. Maximum Air Velocity: 6,000 feet per minute.

D. TYPE D-5: ASTM C1071, Type II, rigid, glass fiber duct liner with coated air side.
1. Thermal Conductivity: 0.23 at 75 degrees F.
2. Density: 3.0 pound per cubic foot.
3. Maximum Operating Temperature: 250 degrees F.
4. Maximum Air Velocity: 4,000 feet per minute.

2.09 DUCTWORK INSULATION JACKETS

A. Aluminum Duct Jacket:
1. ASTM B209.
2. Thickness: 0.016 inch thick sheet.
3. Finish: Corrugated or textured.
4. Joining: Longitudinal slip joints and 2 inch laps.
5. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.

B. Vapor Retarder Jacket:
1. Kraft paper with glass fiber yarn and bonded to aluminized film 0.0032 inch vinyl.
2. Water Vapor Permeance: ASTM E96/E96M; 0.02 perms.
3. Secure with pressure sensitive tape.

C. Canvas Duct Jacket: UL listed, 6 oz/sq yd, plain weave cotton fabric with fire retardant lagging adhesive compatible with insulation.

D. Outdoor Duct Jacket: Asphalt impregnated and coated sheet, 50 lb/square.

E. Membrane Duct Jacket: ASTM D4637; Type I, EPDM; non-reinforced, 0.060 inch thick, 48 inch wide roll; color as selected.

2.10 DUCTWORK INSULATION ACCESSORIES

A. Vapor Retarder Tape:
1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

B. Vapor Retarder Lap Adhesive: Compatible with insulation.

C. Adhesive: Waterproof, ASTM E162 fire-retardant type.

D. Liner Fasteners: Galvanized steel, impact applied welded with integral head.

E. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

F. Lagging Adhesive: Fire retardant type with maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

G. Impale Anchors: Galvanized steel, 12 gage self-adhesive pad.

H. Adhesives: Compatible with insulation.

I. Membrane Adhesives: As recommended by membrane manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Division 01 - Administrative Requirements: Coordination and project conditions.

B. Verify piping, equipment and ductwork has been tested before applying insulation materials.

C. Verify surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION - PIPING SYSTEMS

A. Piping Exposed to View in Finished Spaces: Locate insulation and cover seams in least visible locations.

B. Continue insulation through penetrations of building assemblies or portions of assemblies having fire resistance rating of one hour or less. Provide intumescent firestopping when continuing insulation through assembly. Finish at supports, protrusions, and interruptions. Refer to Section 07 84 00 for penetrations of assemblies with fire resistance rating greater than one hour.

C. Piping Systems Conveying Fluids Below Ambient Temperature:
   1. Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
   2. Furnish factory-applied or field-applied vapor retarder jackets. Secure factory-applied jackets with pressure sensitive adhesive self-sealing longitudinal laps and butt strips. Secure field-applied jackets with outward clinch expanding staples and seal staple penetrations with vapor retarder mastic.
   3. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor retarder adhesive or PVC fitting covers.

D. Hot Piping Systems less than 140 degrees F:
   1. Furnish factory-applied or field-applied standard jackets. Secure with outward clinch expanding staples or pressure sensitive adhesive system on standard factory-applied jacket and butt strips or both.
   2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
   3. Do not insulate unions and flanges at equipment, but bevel and seal ends of insulation at such locations.

E. Inserts and Shields:
   1. Piping 1-1/2 inches Diameter and Smaller: Install galvanized steel shield between pipe hanger and insulation.
   2. Piping 2 inches Diameter and Larger: Install insert between support shield and piping and under finish jacket.
      a. Insert Configuration: Minimum 6 inches long, of thickness and contour matching adjoining insulation; may be factory fabricated.
      b. Insert Material: Compression resistant insulating material suitable for planned temperature range and service.
   3. Piping Supported by Roller Type Pipe Hangers: Install galvanized steel shield between roller and inserts.

F. Insulation Terminating Points:
   1. Coil Branch Piping 1 inch and Smaller: Terminate hot water piping at union upstream of the coil control valve.
   2. Chilled Water Coil Branch Piping: Insulate chilled water piping and associated components up to coil connection.
   3. Condensate Piping: Insulate entire piping system and components to prevent condensation.

G. Closed Cell Elastomeric Insulation:
   1. Push insulation on to piping.
   2. Miter joints at elbows.

3. Seal seams and butt joints with manufacturer's recommended adhesive.
4. When application requires multiple layers, apply with joints staggered.
5. Insulate fittings and valves with insulation of like material and thickness as adjacent pipe.

H. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet above finished floor): Finish with PVC jacket and fitting covers or aluminum jacket.

I. Buried Piping: Insulate only where insulation manufacturer recommends insulation product may be installed in trench, tunnel or direct buried. Install factory fabricated assembly with inner all-purpose service jacket with self-sealing lap, and asphalt impregnated open mesh glass fabric, with 1 mil thick aluminum foil sandwiched between three layers of bituminous compound; outer surface faced with polyester film.

J. Heat Traced Piping Interior to Building: Insulate fittings, joints, and valves with insulation of like material, thickness, and finish as adjoining pipe. Size large enough to enclose pipe and heat tracer.

K. Prepare pipe insulation for finish painting. Refer to Division 09.

3.03 INSTALLATION - EQUIPMENT

A. Factory Insulated Equipment: Do not insulate.

B. Exposed Equipment: Locate insulation and cover seams in least visible locations.

C. Fill joints, cracks, seams, and depressions with bedding compound to form smooth surface. On cold equipment, use vapor retarder cement.

D. Equipment Containing Fluids 140 degrees F or less:
1. Do not insulate flanges and unions, but bevel and seal ends of insulation.
2. Install insulation with factory-applied or field applied jackets, with or without vapor barrier. Finish with glass cloth and adhesive.
3. Finish insulation at supports, protrusions, and interruptions.

E. Equipment in Mechanical Equipment Rooms or Finished Spaces: Finish with PVC jacket and fitting covers, aluminum jacket, or stainless steel jacket.

F. Cover insulation with aluminum jacket.

G. Nameplates and ASME Stamps: Bevel and seal insulation around; do not cover with insulation.

H. Equipment Requiring Access for Maintenance, Repair, or Cleaning: Install insulation for easy removal and replacement without damage.

I. Prepare equipment insulation for finish painting. Refer to Division 09.

3.04 INSTALLATION – RADIANT PANELS

A. Insulate the entire top of the radiant ceiling panel with minimum 2" flexible fiberglass insulation complete with FSK facing. Tuck and continuously adhere the insulation between ceiling grid runner and radiant panel, use FSK tape. No exposed fiberglass shall be allowed.

3.05 INSTALLATION - DUCTWORK SYSTEMS

A. Duct dimensions indicated on Drawings are finished inside dimensions.

B. Insulated ductwork conveying air above ambient temperature:
1. Provide with or without standard vapor retarder jacket.
2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.

C. Ductwork Exposed in Boiler Room, Fan Rooms, Mechanical Equipment Rooms or Finished Spaces: Finish with Canvas jacket.

D. External Glass Fiber Duct Insulation:
1. Secure insulation with vapor retarder with wires and seal jacket joints with vapor retarder adhesive or tape to match jacket.
2. Secure insulation without vapor retarder with staples, tape, or wires.

3. Install without sag on underside of ductwork. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift ductwork off trapeze hangers and insert spacers.
4. Seal vapor retarder penetrations by mechanical fasteners with vapor retarder adhesive.
5. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.

E. External Elastomeric Duct Insulation:
1. Adhere to clean oil-free surfaces with full coverage of adhesive.
2. Seal seams and butt joints with manufacturer's recommended adhesive.
3. When application requires multiple layers, apply with joints staggered.
4. Insulate standing metal duct seams with insulation of like material and thickness as adjacent duct surface. Apply adhesive at joints with flat duct surfaces.
5. Lift ductwork off trapeze hangers and insert spacers.

F. Duct Liner:
1. Adhere insulation with adhesive for 100 percent coverage.
2. Secure insulation with mechanical liner fasteners. Comply with SMACNA Standards for spacing.
3. Seal and smooth joints. Seal and coat transverse joints.
4. Seal liner surface penetrations with adhesive.
5. Cut insulation for tight overlapped corner joints. Support top pieces of liner at edges with side pieces.

G. Prepare duct insulation for finish painting. Refer to Division 09.

3.06 SCHEDULES

A. Heating Services Piping Insulation Schedule:

Heating Water Supply and Return	P-1	1-1/2 inches and smaller 2 inches and larger	1 2

B. Equipment Insulation Schedule:

Valves and flanges for pipe sizes 2" and larger	E-2	2
Air Separators and Hydraulic Separators	E-2	2
Radiant Panels	E-3	2

C. Ductwork Insulation Schedule:

DUCTWORK SYSTEM	INSULATION TYPE	INSULATION THICKNESS inches
Combustion Air	D-2	2
Outside Air Intake	D-2	2
Exhaust Ducts Within 5 feet of Exterior Openings	D-1 or D-2	1.5
Exhaust Ducts Exposed to Outdoor Air	D-2	2.0
Transfer Air Ducts (internally insulated)	D-4 or D-5	1.0

END OF SECTION

SECTION 23 0800
COMMISSIONING OF HVAC

PART 1 GENERAL

1.01 COMMISSIONING DESCRIPTION

A. HVAC commissioning process includes the following tasks:
   1. Testing and startup of HVAC equipment and systems.
   2. Equipment and system pre-functional verification checks.
   3. Assistance in functional performance testing to verify testing and balancing, and equipment and system performance.
   4. Provide qualified personnel to assist in commissioning tests.
   5. Ensure all equipment and systems are fully operational and ready for functional performance testing.
   6. Provide equipment, materials, and labor necessary to correct deficiencies found during commissioning process to fulfill contract and warranty requirements.
   7. Provide operation and maintenance information to Commissioning Authority for review.

B. Equipment and Systems to Be Commissioned:
   1. Air Handler.
   2. Hot Water Generators.
   3. Tempering Valve.
   4. Boilers.
   5. Pumps.
   6. Glycol Tanks.
   7. Unit Heaters.
   8. Cabinet Unit Heaters.
   9. Radiant Panels.
   10. Day Tanks.
   11. Fuel Tanks.
   12. Relief Fans.
   13. Boiler Room Vent Fans.
   14. Exhaust Fans.
   15. VAV Boxes.
   16. Computer Room Air Conditioning Units.
   17. Exhaust Hoods.
   18. Building Automation System

1.02 COMMISSIONING SUBMITTALS

A. Section 01 9100 - Commissioning: Requirements for commissioning submittals.

B. Draft Forms: Submit draft of start-up plan, pre-functional verification checklists.

C. Test Reports: Indicate data on pre-functional verification checklists for each piece of equipment and system as specified.

D. Field Reports: Indicate deficiencies preventing completion of equipment or pre-functional verification checklists or system to achieve specified performance.

1.03 CLOSEOUT SUBMITTALS

A. See Section 01 3300 – submittal procedures.

B. Operation and Maintenance Data.

1.04 QUALITY ASSURANCE

A. Perform Work in accordance with ASHRAE Guideline 1.

1.05 COMMISSIONING RESPONSIBILITIES

A. Contractor or System Installer Commissioning Responsibilities:

1. Attend commissioning meetings.
2. Assist the Commissioning Authority in developing a commissioning schedule for completion of the commissioning work.
3. Review draft commissioning plan prepared by the Commissioning Authority.
4. Review the Functional Performance Test procedures that describe the step-by-step process to functionally test the system.
5. Develop startup and initial checkout plan.
6. Develop pre-functional verification checklists.
7. Prior to startup, inspect, check, and verify correct and complete installation of equipment and system components for pre-functional verification checks.
8. Perform and document completed startup and pre-functional verification checklists.
9. Provide manufacturer's representatives to execute starting of equipment where specified.
10. Provide personnel to assist commissioning authority during functional performance testing.
11. Assist commissioning authority in performing functional performance tests on equipment and systems.
12. Provide the Commissioning Authority with completed equipment start-up forms, pre-functional verification checklists, point-to-point checklists, balancing logs, pre-test acquisition forms and other information appropriate to the commissioning process.

B. Temperature Controls Installer Commissioning Responsibilities:
1. Attend commissioning meetings.
2. Review design for ability of systems to be controlled.
3. Inspect, check, and confirm proper operation and performance of control hardware and software.
4. Submittal of pre-functional verification checklists for performing automatic temperature control system point-to-point checks.
5. Inspect check and confirm correct installation and operation of automatic temperature control system input and output device operation through point-to-point check.
6. Demonstrate system performance and operation to commissioning authority during functional performance tests including each mode of operation.
7. Provide control system technician to assist during commissioning authority functional performance testing.
8. Provide control system technician to assist testing, adjusting, and balancing agency.

C. Testing, Adjusting, and Balancing Agency Commissioning Responsibilities:
1. Attend commissioning meetings.
2. Participate in verification of testing, adjusting, and balancing report for verification or diagnostic purposes.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install additional balancing dampers, balancing valves, access doors, test ports, and pressure and temperature taps required by Commissioning Authority.

B. Place mechanical systems and equipment into full operation and continue operation during each working day of commissioning.

C. Install replacement sheaves and belts to obtain system performance, as requested by Commissioning Authority.

D. Install test holes in ductwork and plenums as required for balancing and as requested by Commissioning Authority for taking air measurements.

F. Prior to start of functional performance test, install replacement filters in equipment.

END OF SECTION

SECTION 23 0900
INSTRUMENTATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pressure gauges and pressure gauge taps.

B. Thermometers and thermometer wells.

1.02 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

A. Section 23 2113 – Plumbing and Hydronic Piping: Installation of thermometer wells, pressure gauge tappings.

1.03 RELATED SECTIONS

A. See Section 01 3300 – submittal procedures.

B. Section 23 0923 – Building Automation System.

C. Section 23 0993 - Sequence of Operation.

1.04 REFERENCES

A. ASTM E1 - Specification for ASTM Thermometers.

B. ASTM E77 - Verification and Calibration of Liquid-in-Glass Thermometers.

1.05 SUBMITTALS

A. Submit under provisions of Section 01 3300.

B. Product Data: Include list which indicates use, operating range, total range and location for manufactured components.

C. Submit manufacturer's installation instructions under provisions of Section 01 3300 Submittal Procedures.

1.06 PROJECT RECORD DOCUMENTS

A. Submit documents under provisions of Division 01 General Requirements.

B. Accurately record actual locations of instrumentation.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Do not install instrumentation when areas are under construction, except for required rough-in, taps, supports and test plugs.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Dwyer.

B. Trerice.

C. Marshaltown.

D. Ashcroft.

E. Enerpac.

F. Sisco.

G. Petersen.

H. Substitutions: Section 01 2513 - Product Substitutions Requirements.

2.02 PRESSURE GAUGES

A. 4-1/2 inch diameter cast aluminum case, phosphor bronze bourbon tube, rotary bronze movement, brass socket, with silicone fluid dampening black figures on white background, one percent mid-scale accuracy, scale calibrated in psi. Model 600C as manufactured by Trerice.

2.03 PRESSURE GAUGE TAPS

A. Gauge Isolation Valve: Lever handle ball valve, forged brass body, chrome plated brass ball, viton o-rings for maximum 150 psig. Model Mini T-82-M as manufactured by Jomar.

B. Needle Valve: Brass for maximum 150 psig. Model 735 as manufactured by Trerice.

C. Pulsation Damper: Pressure snubber, brass with 1/4 inch connections. Series 870 as manufactured by Trerice.

D. Coil Siphon: Brass, ¼", male pipe thread each end. 885 series.

2.04 STEM TYPE THERMOMETERS

A. 9 inch scale, universal adjustable angle, red appearing mercury, lens front tube, cast aluminum case with blueblack metallic finish and clear Lexan window, extended brass stem, cast aluminum adjustable joint with positive locking device, 2 percent of scale accuracy to ASTM E77, scale calibrated in both degrees F and degrees C. BX9 series as manufactured by Trerice.

2.05 DIAL THERMOMETERS

A. Direct mounted, solid liquid filled, 3-1/2 inch diameter dial in stainless steel case, adjustable angle, brass movement with silicone fluid dampening, white with black markings and black pointer, sealed glass lens silicone dampening of case and bearing points; brass bulb, brass removable union connection, 1% of full scale accuracy, calibrated in both degrees F and degrees C. Model L80030 as manufactured by Trerice.

B. Remote mounted, vapor actuated, 4-1/2 inch diameter dial in cast aluminum case with stainless steel ring, with copper bulb, copper capillary with bronze braided armor, white with black markings and black pointer, glass lens, 1% mid-scale accuracy, calibrated in both degrees F and degrees C. Model V80341 as manufactured by Trerice.

2.06 THERMOMETER SUPPORTS

A. Socket: Brass separable sockets for thermometer stems with or without extensions as required, and with cap and chain.

B. Flange: 3 inch outside diameter reversible flange, designed to fasten to sheet metal air ducts, with brass perforated stem.

2.07 TEST PLUGS

A. Test Plug: 1/4 inch or 1/2 inch brass fitting and cap for receiving 1/8 inch outside diameter pressure or temperature probe with Nordel or Viton core for temperatures up to 350 degrees F.

B. Test Kit: Carrying case, internally padded and fitted containing one 2-1/2 inch diameter pressure gauge, two gauge adapters with 1/8 inch probes, two 1-1/2 inch dial thermometers.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide two pressure gauges per pump, installing taps before strainers and on suction and discharge of pump. Pipe to gauge with isolation valve to each tapping.

C. Install pressure gauges with pulsation dampers. Provide needle valve or gauge isolation valve to isolate each gauge. Provide coil siphon for all pressure gauges installed on steam and condensate systems.

D. Install thermometers in piping systems in sockets in short couplings Enlarge pipes smaller than 2-1/2 inch for installation of thermometer sockets. Select bulb length to reach centerline of pipe.

E. Install thermometer sockets adjacent to controls system thermostat, transmitter, or sensor sockets. Refer to Section 23 0923.

F. Provide instruments with scale ranges selected according to service with largest appropriate scale.

G. Install gauges and thermometers in locations where they are easily read from normal operating level.

3.02 PRESSURE GAUGE SCHEDULE

LOCATION	SCALE RANGE
Pumps less than 40' TDH	0 - 30 PSIG
Pumps more than 40' TDH	0 - 60 PSIG
Heating water system	0 - 30 PSIG
Others	As applicable

3.03 STEM TYPE THERMOMETER SCHEDULE

LOCATION	SCALE RANGE
Heating water system	0 - 200° F
Domestic hot water.	0 - 200° F
Others	As applicable

END OF SECTION

SECTION 23 0923
BUILDING AUTOMATION SYSTEM

PART 1 GENERAL

1.01 SUMMARY

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 General Requirements Specification Sections, apply to this Section.

B. This section specifies the requirements for the Building Automation System (BAS) to be installed in conjunction with this project.

C. The BAS contractor shall furnish and install a fully integrated building automation system, incorporating direct digital control (DDC) and electric control for energy management, equipment monitoring and control, and subsystems as specified herein.

D. The BAS contractor shall be responsible for all BAS and temperature control wiring for a complete and operable system. All wiring shall be done in accordance with Division 26 of this specification and all local and national codes.

E. The BAS contractor shall furnish one PC-based graphical operator's workstation for local control and monitoring of the BAS system. The workstation shall consist of a Windows-based CPU, keyboard and monitor and shall be equipped with the appropriate graphical software for control and monitoring of the system. The existing workstation shall be updated at the completion of this project to reflect any additions and changes made during this project.

F. The BAS system shall be provide remote monitoring and provide remote notification to the owner for critical alarms.

1.02 SYSTEM DESCRIPTION

A. Building controllers shall include complete energy management software, including scheduling building control strategies with optimum start and logging routines. All energy management software and firmware shall be resident in field hardware and shall not be dependent on the operator's terminal. Operator's terminal software is to be used for access to field-based energy management functions only. Provide zone-by-zone direct digital logic control of space temperature, scheduling, runtime accumulation, equipment alarm reporting, and override timers for after-hours usage. All application controllers all equipment and any other piece of controlled equipment shall be fully programmable.

B. Room sensors shall allow room setpoint adjustment within preset limits. Initial settings 68-74 Degree F.

C. Provide all alarms, manual control, and status indication functions as indicated under the sequence of operation, Specification Section 23 0993.

D. The system shall be Web Enabled and shall be accessible through any computer connected to the internet using a standard web browser and appropriate password protection. Contractor shall include costs for all network wiring and coordination with the owner for IP Address connection.

E. The system shall include remote notification services to allow messaging of critical alarms to owners' designated personnel.

1.03 RELATED SECTIONS

A. See Section 01 3300 – submittal procedures.

B. Section 23 0500 – Basic Mechanical Materials and Methods.

C. Section 23 0593 – Balancing and Testing.

D. Section 23 0993 - Sequence of Operation.

E. Section 23 2113 – Plumbing and Hydronic Piping.

F. Section 23 2116 – Hydronic Specialties.

G. Section 23 3300 – Ductwork Accessories.

H. Section 23 3600 – Air Terminal Units.

I. Section 23 0800 – Commissioning of HVAC.

J. Division 26 – Electrical Specifications.

1.04 REFERENCES

A. ASHRAE 85 - Automatic Control Terminology for Heating, Ventilating, Air Conditioning

B. ANSI/ASHRAE 135-2004 Data Communication Protocol for Building Automation and Control Systems (BACnet)

C. ASME MC8S.1 - Terminology for Automatic Control

D. NEMA EMCI - Energy Management Systems Definitions

1.05 QUALITY ASSURANCE

A. The direct digital control system provided shall be designed, furnished, installed, tested, certified and placed into service by a Control Contractor who is regularly engaged in the installation of direct digital control systems in Alaska. The Control Contractor shall maintain an office in Alaska with parts and maintenance personnel to ensure prompt response (24 hour maximum) to an emergency call during the one year correction period.

B. The Control Contractor shall be able to demonstrate that he has had experience designing and installing direct digital control systems of comparable type and size to that called for in these Specifications.

C. The Control Contractor, if other than the manufacturer, shall hold a manufacturer's franchise or license to design and install control systems for that manufacturer.

D. Within two weeks after award of contract submit to the Project Manager the following items for Contractor qualification:

1. Name of manufacturer and proof that the Control Contractor holds a manufacturer's franchise or license to design and install the proposed control system.
2. Proof of Alaskan Office, with full time service representative.
3. List of Alaskan buildings with names, addresses, and phone numbers of Owners which are representative of direct digital control systems that have been installed by the Control Contractor. Include a brief description and approximate control system construction cost of each system submitted.

1.06 EQUIPMENT AND SHOP DRAWING REVIEW SUBMITTALS

A. Provide electronic submittals in accordance with Section 23 0500 and Division 01 General Requirements.

B. Prior to programming, ordering of equipment, or installation of any portion of the system submit the following in a single tabbed and indexed PDF package for review by the Project Manager.

1. System architecture diagram showing power supply to each component; interconnection of direct digital controllers, building management station, and peripherals; and indication of proposed location of direct digital controllers.
2. Sequence of operations. Print sequence of operations on the schematic control diagrams so that the relevant sequence is on the same diagram with the control schematic it describes. The Sequence of Operations provided in the Contract Documents is written in directive language. Rewrite the sequence of operations to be submitted to the Owner in language that explains the sequences of operation. Remove all directives to the Contractor.
3. Schematic control diagrams 11 inches by 17 inches minimum paper size with upper case lettering, minimum 1/16 inch high plotted from digitized files in AutoCAD format. Clearly indicate wire and terminal labels, set points, reset schedules, switch over points, signal ranges, and other points required to completely describe the system. Show interface with any existing control systems. Depict circuitry on schematic control diagrams to allow circuits to be traced from connection to connection using one of the following methods:

a. Diagram each wire or tube depicting full length of circuit from connection to connection.
b. Reference each wire to a uniquely labeled terminal. Depict terminals on a sequentially labeled terminal strip showing attached wires and the device labels of the components attached at the other end. If the wiring label used is different than the terminal label indicate the wire label. In addition provide ladder diagrams indicating current or air flow through circuitry components.
c. Construct digitized schematic control diagrams using a symbol library so that symbols for similar equipment are common. Use separate layers or line type designations for the following items:
   1) Device Symbols
   2) Equipment Symbols
   3) Ductwork
   4) Piping
   5) Wiring

4. Valve schedules
5. Subpanel and panel face layouts.
6. Control components data sheets, installation, operation, and adjustment instructions. Further index and tab this section of the submittal by item number.
   a. Each control component shall be identified with a separate item number. Separate each item with a divider sheet with plastic index tabs.
   b. Provide two alphabetical listings of all items included in the binder in an index at the front of the binder. One index shall list items by functional name. The other index shall list items by symbol used in the control diagrams.
   c. Each sheet or page shall indicate the specific item(s) proposed for this project. Delete or cross out all other items.
7. Orientation and training instruction schedule and course outlines.
8. Printed copies of graphic screens and tabular screens.

1.07 OPERATION AND MAINTENANCE MANUALS

A. Provide electronic operations and maintenance manuals in accordance with Section 23 0500 and Division 01 General Requirements.

B. Operation and Maintenance Manuals must be submitted for review, reviewed by the Project Manager, corrected in accordance with review comments, and accepted by the Project Manager before a request for final or substantial completion inspection will be considered by the Project Manager.

C. The Operation and Maintenance Manual shall include the information required for the equipment review submittal, updated as required to reflect current as-built conditions, plus the following:
   1. Maintenance information and parts lists for control components.
   2. Complete system as-built wiring diagrams indicating the following:
      a. Wiring for all control and power circuits indicating the voltage and breaker location for each circuit.
      b. Wiring for direct digital controllers and interface panels.
      c. Terminal number or code name for terminals in direct digital controllers and interface panels with unused terminals marked "spare".
      d. Assigned name, address, and engineering units for direct digital controller input and output terminals.
      e. Location, identification tag, type, function, and wiring for sensors, switches, relays, damper and valve operators, and other control system components.
   3. List of software with current revision numbers, vendor name and support telephone numbers.

4. Indicate on the Record Drawings the location of control devices and panels that are not physically attached to mechanical equipment and that are not already indicated on the construction documents.
5. Include copies of programming and variable printouts for the direct digital control computers created to fulfill the sequence of operation requirements. Include the following information:
   a. Print date and time on each page with the sequence of operation corresponding to the program listing on that page.
   b. List and describe variables used. Where applicable, variable names referring to system components shall also be referenced to names used on system Shop Drawings.
   c. Block Programming diagrams if block programming is used.
6. Provide reloadable backup copy of programming and variable printouts for the direct digital control computers created to fulfill the sequence of operation requirements. Provide on CD-ROM disk.
7. Provide digitized copies of as built schematic control diagrams, wiring diagrams, and graphic screens recorded on CD-ROM disk in AutoCad or PDF drawing format.
8. Provide a print out of the configuration files for each controller. Place controller specific print out in specific controller cabinet.
9. Provide other information required for the Owner to properly troubleshoot and maintain the control system.

D. Submit index table of histories to be provided as part of final inspection for review concurrently with Operation and Maintenance Manual.

E. Published and bound building management system software or hardware manuals are not required to be included in the three ring “Operation and Maintenance Manual”. Provide one copy of each published and bound building management system software or hardware manual required for the maintenance and operation of building management system to the Project Manager one week prior to request for substantial completion. Provide a separate index sheet describing each separately provided bound manual as part of the “Operation and Maintenance Manual”.

F. After the final inspection and subsequent punch list inspections update each copy of the Operation and Maintenance Manual to reflect final as-built conditions.

1.08 SYSTEMS DEMONSTRATION

A. The Contractor will completely check out, calibrate and test all connected hardware and software to insure that the system performs in accordance with the approved specifications and sequences of operation.

B. Provide complete demonstration of system operation to the owners representative at the project substantial completion inspection. The Contactor will demonstrate to the Owner's satisfaction that all equipment and systems operate in accordance with the sequence of operation as outlined under Section 23 09 93. Demonstration will include all equipment controlled by the Direct Digital Control System.

C. Building management station demonstration will consist of:
   1. Running sample point log and system configuration reports as requested.
   2. Display and demonstrate each data entry to show site specific customizing capability. Demonstrate parameter changes.
   3. Step through penetration tree, display all graphics, demonstrate dynamic update and direct access to graphics.
   4. Execute system commands in graphic mode including operation of control system set points, schedules, valves, dampers and control relays. Commands shall be executed as necessary to demonstrate the system is controlling in accordance with the sequence of operations.
   5. Demonstrate update, and alarm responsiveness.

6. Demonstrate digital system configuration graphics with interactive upload and download, and demonstrate specified diagnostics.
7. Demonstrate programming with point options of beep duration, beep rate, alarm archiving and color banding.

1.09 WARRANTY

A. Under provisions of Division 01 General Requirements.

B. All components, system software, parts and assemblies will be guaranteed against defects in materials and workmanship for one year from acceptance date.

C. Labor to troubleshoot, repair, reprogram, or replace system components will be furnished by the Contractor at no charge to the owner during the warranty period.

D. All corrective software modifications made during warranty service periods will be updated on all user documentation and on user and manufacturer archived software disks.

1.10 SUBSTANTIAL INSPECTION SUPPLEMENTAL DATA

A. Substantial inspection supplemental data must be submitted for review, reviewed by the Project Manager, corrected in accordance with review comments, and accepted by the Project Manager before a request for substantial completion inspection will be considered by the Project Manager.

PART 2 - PRODUCTS

2.01 APPROVED BUILDING AUTOMATION SYSTEMS

A. Siemens Industry Inc.

B. No Substitutions Allowed.

2.02 NETWORKING COMMUNICATIONS

A. The design of the BAS shall network one new operator workstation and stand alone DDC Controllers. The network architecture shall consist of three levels; a campus-wide Management Level Network (MLN) Ethernet network based on TCP/IP protocol, a high performance peer to peer building level network (BLN) and DDC Controller floor level local area networks (FLN). Access to the system shall be totally transparent to the user when accessing data or developing control programs.

B. The design of the BAS shall allow the co-existence of new DDC Controllers with existing DDC Controllers on the same network without the use of gateways, protocol converters, or third-party interface devices.

C. Management Level Network
1. All PCs shall simultaneously direct connect to the Ethernet and Management Level Network without the use of an interposing device.
2. The Management Level Network shall not impose a maximum constraint on the number of operator workstations.
3. Simultaneous user access to network limited to number of sight licenses issued to user.
4. When appropriate, any DDC controller residing on the peer-to-peer building level network shall connect to Ethernet network without the use of a PC.
5. Any PC on the Ethernet Management Level Network shall have transparent communication with controllers on the building level networks connected via Ethernet as well as directly connected building level networks. Any PC shall be able to interrogate any controller on the building level network in addition to being able to download program changes to individual controllers.
6. The Management Level Network shall reside on industry standard Ethernet utilizing standard TCP/IP, IEEE 802.3. The Ethernet system will be provided and maintained by UAF.
7. Access to the system database shall be available from any client workstation on the Management Level Network.

D. Peer-to-Peer Building Level Network (BLN)

1. The system shall have the ability to support integration of third party systems (fire alarm, security, lighting, Variable Frequency Drives, PLCs, chillers, boilers) via a panel mounted open protocol processor. This processor shall exchange data between the two systems for inter-process control. All exchange points shall have full system functionality as specified herein.
2. Data transfer via RS485.

E. Floor Level Network (FLN)
1. This level communication shall support a family of application specific controllers and shall communicate with the peer to peer network through DDC Controllers for transmission of global data.

2.03 PERSONAL COMPUTER OPERATOR WORKSTATION

A. A standard PC workstation shall be provided in the location(s) indicated on the contract documents for command entry, information management, network alarm management and database management functions. All real-time control functions shall be resident in the DDC Controllers to facilitate greater fault tolerance and reliability.

B. A new PC workstation is not required if there is an existing workstation already installed on site. The existing workstation shall be updated at the completion of this project to reflect any additions and changes made during this project.

2.04 HVAC CONTROLLERS

A. Digital HVAC controllers shall be the PXC-Modular or PXC-Compact series manufactured by Siemens. Controllers shall be a 12-bit stand-alone, multi tasking, multi user, real time digital control processors consisting of modular hardware with plug in enclosed processors.

B. Each HVAC Controller shall have sufficient memory to support its own operating system and databases, including:
1. Control processes
2. Energy management applications
3. Alarm management applications including custom alarm messages for each level alarm for each point in the system.
4. Historical/trend data for points specified
5. Maintenance support applications
6. Custom processes
7. Operator I/O
8. Remote communications

C. HVAC Controllers shall provide a RS 232C serial data communication port for operation of operator I/O devices such as industry standard printers, operator terminals, modems and portable laptop operator's terminals

D. HVAC Equipment Controllers shall provide local LED status indication for each digital input and output for constant, up to date verification of all point conditions without the need for an operator I/O device.

E. Each HVAC Equipment Controller shall continuously perform self diagnostics, communication diagnosis and diagnosis of all components. The HVAC Equipment Controller shall provide both local and remote annunciation of any detected component failures, low battery conditions or repeated failure to establish communication

F. All controllers will be mounted in enclosed control panels with screwed, removable covers.

G. All control devices located in exposed areas subject to outside weather conditions shall be mounted inside weatherproof enclosures. Location of each panel shall be convenient for adjustment service.

H. Nameplates shall be provided beneath each panel face mounted control device describing the function of each device. Nameplates shall have white letters engraved on blue Lamicoid, or approved equal.

I. All control panels shall bear a UL label compatible with the application.

J. All electrical devices within the panel shall pre-wired to terminal strips with all inter-device wiring within the panel completed prior to installation of the system.

2.05 TERMINAL EQUIPMENT CONTROLLERS (TEC)

A. Control of terminal units such as VAV boxes, fan-coli units and reheat coils shall be accomplished by a microprocessor based stand-alone controller utilizing direct digital control. The Terminal Equipment Controller (TEC) shall interface to the building control system in a multi-drop communications network originating at the DDC field panel. An individual controller shall be provided for each terminal unit. The terminal controller must be listed by Underwriters Laboratory under UL 916 PAZX and UL 864 UDTZ.

B. For VAV boxes, the controls contractor shall furnish the terminal controller (controller and damper motor) to the terminal unit manufacturer for factory mounting. Costs associated with factory mounting of terminal controller shall be the responsibility of the terminal unit manufacturer. The terminal box manufacturer shall provide a duct probe air velocity sensor suitable for interfacing with the TEC's differential pressure transducer.

C. TEC valve and damper actuators shall be of the 24 VAC floating point type. Upon power loss, the actuator will maintain its current damper position. Position status is shown in percentage open notation.

D. TEC room temperature sensors shall come complete with a terminal jack and programmable override switch integral to the sensor assembly. The terminal jack shall be used to connect a portable operator's terminal to control and monitor all hardware and software points associated with the terminal unit. An override switch shall initiate override of the night setback or unoccupied mode to normal operation when activated. A thumbwheel-type temperature setpoint dial shall also be provided with 1 Deg F temperature increments. Override switch and temperature setpoint functions may be locked out, canceled or limited as to time or temperature via software.

2.06 AUTOMATIC CONTROL VALVES

A. All automatic control valves shall be fully proportioning with modulating plugs for equal percentage or linear flow characteristics. The valves shall be sized by the BAS contractor and be provided with actuators of sufficient power for the duty intended. Valve body and actuator selection shall be sufficient to handle system pressure and shall close against the differential pressures expected to be encountered on the project. Butterfly valves are not acceptable.

B. Two-way valves: All 2-Way valves shall be provided as specified in section 23 21 16. The contractor is responsible to coordinate actuators signal and power requirements for all valves will the valve supplier. Provide field testing and wiring connections to all control valve to perform in accordance with the sequence of operations.

C. 3-Way Valves - 1/2 in. through 1 in. diameter: Valves shall be constructed with cast iron, brass or stainless bodies. Trim shall consist of a removable cage providing valve plug guiding throughout the entire travel range. A stainless steel stem shall be provided. Bonnet, cage and the stem and plug assembly shall be removable for servicing. Actuator shall be cast aluminum with spring-return piston operated by synthetic rubber diaphragm. Body rating shall be 400-PSI at 150 degrees F.

D. 3-Way Valves - 1-1/2 in. through 2 in. diameter: Valves shall be constructed with cast iron, brass or stainless bodies. For special duty, valves may be selected by the BAS contractor to have either bronze or cast iron bodies with screwed or flanged ends. Valves shall have either piston or diaphragm actuators as required.

E. 3-Way Valves - 2-1/2 in. diameter and above: Valves shall be constructed with cast iron, brass or stainless bodies and have flanged connections.

F. Valves shall be selected for maximum 3.0-PSI pressure drop through valve at design flow.

G. Unless otherwise noted in the sequence of operation, heating valves shall fail normally open, cooling valves normally closed.

2.07 SENSORS

A. All electronic temperature sensors shall be standard resistance type for all temperature ranges. All electronic temperature sensors shall be factory calibrated and of tamper proof construction requiring no field calibration. Temperature sensor accuracy shall be a minimum of +/- 1%. To insure system accuracy, a common sensor shall be used for each control loop to provide control, indication (local and central), alarm indication (local and central) and where multi-control functions, such as discharge temperature control with compensation and positive high and low limits are used.

B. Where the sensor is used for sensing of mixed air temperature or air handler coil discharge temperatures, and/or the duct area cross-section is in excess of 14 square feet, the instrument shall incorporate an averaging element. Outside air sensing shall be accomplished using a sensing element and transmitter shielded from the effects of sunlight.

C. Sensors shall be furnished in scale ranges compatible with system operating range.

D. Where sensors are used for sensing liquid temperatures, they shall be furnished with separable wells or appropriate material.

E. Fluid Pressure:
   1. Semi-conductor strain gauge pressure transducer with range 150 percent of operating pressure and over pressure tolerance of 200 percent of range pressure, plus or minus 2 percent accuracy over full range, and maximum drift of 1 percent full range per year. Kele PTX1E or equal.
   2. Watertight enclosure.
   3. Provide with brass or stainless steel snubber and pigtail on steam applications.
   4. Provide with gate or ball valve isolation.

F. Duct Static or Air Differential Pressure:
   1. Semi-conductor strain gauge pressure transducer with range 150 percent of operating pressure and over pressure tolerance of 200 percent of range pressure, plus or minus 2 percent accuracy over full range, and maximum drift of 1 percent full range per year. Dwyer Series 600 or equal.
   2. Provide static pressure tips with integral compression fittings for reference tubing at duct penetrations.

G. Current Sensor:
   1. Current transformer and conditioning circuitry to convert 0-20 amps AC line current to 0-5 VDC input directly, and 20 to 5,000 amps AC using an auxiliary current transformer. Veris Hawkeye or equal.

H. Carbon Dioxide Sensors:
   1. Provide carbon dioxide sensors for sensing indoor air quality in rooms or air ducts. Unit shall consist of a microprocessor-based selective photo-acoustic CO2 sensor and a VOC (Volatile Organic Compound) sensor with a heated stannic dioxide semiconductor. Sensor shall have a LED indicating the intensity of the CO2 level on the sensor itself.
   2. Power Supply: 24VAC, 50-60Hz, max 6VA.
   3. Range of Use: 0-2000ppm.
   4. Tolerance: +/- 100ppm.
   5. Voltage Output: 0-10Vdc.
   6. Operating Temperature: 14-113 deg F.
   7. Humidity: 0-95% RH.

2.08 THERMOSTATS AND SENSORS

A. Electronic Room Temperature Sensors: Shall be thermistor type with 55 degree F to 95 degree F range. Provide with: LED display, slider bar and night setback button. Covers shall be robust, of institutional quality, suitably finished.

B. Line-voltage Thermostats: Shall have bi-metal switches with a rating of at least 1.2 times the load they are handling. Covers will be sensing only.

C. Provide locking covers where indicate on mechanical drawings.

2.09 PRESSURE GAUGES AND THERMOMETERS

A. To be provided and installed by the mechanical contractor as specified elsewhere.

2.10 RELAYS AND SIGNAL TRANSMITTERS

A. All necessary relays and signal boosters shall be furnished to make the system a full and operable system as required by the Sequence of Operations.

2.11 AIR AND WATER FLOW PROOF DEVICES

A. Provide current operated relays as standard proof devices. Pressure differential switches may be used as directed. Paddle type flow switches are not acceptable.

B. Provide solid-state, adjustable, current operated relay. Provide a relay that changes switch contact state in response to an adjustable set point value of current in the monitored A/C circuit.

C. Adjust the relay switch point so that the relay responds to motor operation under load as an ON state and so that the relay responds to an unloaded running motor as an OFF state. A motor with a broken belt is considered an unloaded motor.

D. Provide status device for any fans, motors and pumps as reference in the Sequence of Operations.

2.12 VARIABLE FREQUENCY DRIVES

A. Scope: Furnish Variable Speed Drives as specified on the drawings and schedules. Standard and optional features shall be included within the VFD enclosure as specified.

B. General: The VFD shall convert three-phase, 60 Hz utility power to adjustable voltage and frequency, three-phase, AC power for stepless motor speed control from 10% to 100% of the motor's 60 Hz speed. Input voltage shall be as specified on the drawing schedule. The VFD shall include a converter and an inverter section. The converter section shall convert fixed frequency and voltage AC utility power to variable DC voltage. VFD's that use silicon controlled rectifiers in the converter bridge shall also include an input power isolation transformer. The isolation transformer shall be housed in a separate NEMA 1 enclosure and shall include a copper electrostatic shield. The VFD shall utilize IGBT, PWM or 6-step waveform technology. The VFD maximum output current rating shall be 110% of the motor nameplate full load current. The VFD and options shall be listed by a nationally recognized testing agency such as UL or ETL. The VFD and options shall comply with the applicable requirements of the latest standards of ANSI, IEEE, and the National Electric Code. Power line noise shall be limited to a voltage distortion factor and line notch depth as defined in IEEE Standard 519-1981, Guide for Harmonic Control and Reactive Compensation of Static Power Converters. The VFD shall not emit either conducted or radiated RFI in excess of the limitations set forth in the FCC Rules and Regulations, Part 15, Subpart J.

C. Construction: The VFD shall include the following basic features:

1. The VFD shall be housed in a NEMA 1 enclosure.
2. The following operator controls shall be located on the front of the enclosure:
   a. Run/stop selector switch to start and stop the motor
   b. Auto/manual selector switch
   c. Manual speed potentiometer
   d. Power on pilot light to indicate that the VFD is being supplied by the power line.
   e. Fault pilot light to indicate that the VFD has tripped on a fault condition
   f. Digital meter with selector switch to indicate percent speed and percent load.
   g. Volt meter and amp meter.
3. Two sets of Form C, dry contacts to indicate when the VFD is in the run mode.
4. Two sets of Form C, dry contacts to indicate when the VFD is in the fault mode.

5. When input power returns to normal following a fault trip for undervoltage, overvoltage, or phase loss, the VFD shall automatically restart. The VFD shall not automatically restart following fault trips due to overload or overcurrent.
6. Factory minimum-level spare fuse kit.
7. Relay for RED signal from motor.
8. Input circuit breaker.

D. Protective Requirements: The VFD shall include the following protective features:
1. Current limiting semiconductor fused for the power input.
2. Separate overload relay for each motor controlled.
3. Protection against input power undervoltage, overvoltage and phase loss.
4. Protection against output current overload and overcurrent.
5. Protection against overtemperature within the VFD.
6. Protection against overvoltage on the DC bus.
7. Any disconnect switches between VFD and the motor shall include an auxiliary contact interlocked to the VFD fault trip circuit.
8. DC bus discharge circuit for protection of service personnel.

E. Adjustments: The VFD shall include the following adjustments available via potentiometers inside the enclosure:
1. Maximum speed, adjustable 50-100% base speed.
2. Minimum speed, adjustable 0-50% base speed.
3. Acceleration time, adjustable 2-60 seconds.
4. Deceleration time, adjustable 2-60 seconds with override circuit to prevent nuisance trips if deceleration time is set too short.
5. Current limit, adjustable 1-110%.

F. Special Requirements: The following special features shall be included in the VFD enclosure.
1. Manual bypass shall provide all the circuitry necessary to transfer the motor from the VFD to the power line, or from the line to the controller while the motor is at zero speed. The bypass circuitry shall be mounted in a separate section of the VFD enclosure. Two motor contactors, electrically interlocked, shall be utilized. One contactor is to be between the controller and the motor. The other contactor is to be between the bypass power one and the motor providing across-the-line starting. Motor protection is to be provided in both the controller mode and the bypass mode. The bypass section door shall include a "drive/line" switch, "on/off-reset" and a "load transferred to line" pilot line. The bypass circuitry shall include a fused disconnect switch or circuit breaker to provide a means of disconnecting all power to both the bypass circuitry and the controller. The disconnect switch or circuit breaker shall be door interlocked and lockable. The fused or circuit breaker shall be sized to provide short circuit protection for the motor when in the bypass mode per NEC.

G. Start-up Service: The manufacturer shall provide start-up service in the form of a factory trained service technician. The service technician shall verify correct installation, start-up the drive and check for proper operation

H. VFD Warranty: The VFD shall be warranted by the manufacturer for a period of 24 months from the date of shipment. The warranty shall include parts, labor, travel costs, and living expenses incurred by the manufacturer to provide factory-authorized service

I. Approved Manufacturer: ABB, Model ACH-550.

2.13 AIRFLOW SENSOR MEASUREMENT DEVICES

A. Airflow Sensor Measurement Devices
1. Acceptable Manufacturers
   a. EBTRON, Inc. Model GTx116-P
   b. No Substitutions.

2. Provide airflow sensor measurement devices as indicated in the sequence of operations. Fan inlet measurement devices shall not be substituted for duct or plenum measurement devices indicated on the plans.
3. Each measurement device shall consist of one or more sensor probe assemblies and a single microprocessor-based transmitter. Each sensor probe assembly will contain one or more independently wired sensor housings. Multiple sensor housings shall be equally weighted and averaged by the transmitter prior to output. Pitot tubes and arrays are not acceptable. Vortex shedding flow meters are not acceptable.
4. All Sensor Probe Assemblies
   a. Each sensor housing shall be manufactured of a U.L. listed engineered thermoplastic.
   b. Each sensor housing shall utilize two hermetically sealed, bead-in-glass thermistor probes to determine airflow rate and ambient temperature. Devices that use “chip” type thermistors are unacceptable. Devices that do not have 2 thermistors in each sensor housing are not acceptable.
   c. Each sensor housing shall be calibrated at a minimum of 16 airflow rates and have an accuracy of +/-2% of reading over the entire operating airflow range. Each sensor assembly shall be calibrated to standards that are traceable to the National Institute of Standards and Technology (NIST).
   d. Devices whose accuracy is the combined accuracy of the transmitter and sensor probes must demonstrate that the total accuracy meets the performance requirements of this specification throughout the measurement range.
   e. Each sensor probe assembly shall have an integral, U.L. listed, plenum rated cable and terminal plug for connection to a remotely mounted transmitter. All terminal plug interconnecting pins shall be gold plated.
   f. Each sensor assembly shall not require matching to the transmitter in the field.
   g. A single manufacturer shall provide both the airflow measuring probe(s) and transmitter at a given measurement location.
5. Duct and Plenum Sensor Probe Assemblies
   a. Sensor housings shall be mounted in an extruded, gold anodized, 6063 aluminum tube probe assembly.
   b. The number of sensor housings provided for each location shall be as follows:
      1)

Area (sq. ft.)	Sensors
<=1	2
>1 to <4	4
4 to <8	6
8 to <12	8
12 to <16	12
>=12	16

   c. Probe assembly mounting brackets shall be constructed of 304 stainless steel. Probe assemblies shall be mounted using one of the following options:
      1) Insertion mounted through the side or top of the duct
      2) Internally mounted inside the duct or plenum
      3) Standoff mounted inside the plenum
   d. The operating airflow range shall be 0 to 5,000 CFM unless otherwise indicated on the plans.
6. Fan Inlet Sensor Probe Assemblies (Allowed only at roof mounted relief fans upon written permission from the ASD field representative).
   a. Sensor housings shall be mounted on 304 stainless steel blocks.
   b. Mounting rods shall be field adjustable to fit the fan inlet and constructed of nickel plated steel.
   c. Mounting feet shall be constructed of 304 stainless steel.
   d. The operating airflow range shall be 0 to 10,000 CFM unless otherwise indicated on the plans.
7. Transmitters

a. The transmitter shall have an LCD display capable of displaying airflow and temperature. Airflow shall be field configurable to be displayed as a velocity or a volumetric rate.
b. The transmitter shall be capable of displaying the individual airflow and temperature readings of each sensor on the LCD display.
c. The transmitter shall operate on 24 VAC. The transmitter shall not require an isolated power source.
d. The transmitter shall be protected from weather and water.
e. The transmitter shall be capable of communicating with the host controls using one of the following interface options:
   1) Linear analog output signal: Field selectable, fuse protected and isolated, 0-10VDC and 4-20mA (4-wire)
   2) RS-485: Field selectable BACnet-MS/TP, ModBus-RTU and Johnson Controls N2 Bus
   3) 10 Base-T Ethernet: Field selectable BACnet Ethernet, BACnet-IP, ModBus-TCP and TCP/IP

8. The measuring device shall be UL listed as an entire assembly.
9. The manufacturer's authorized representative shall review and approve placement and operating airflow rates for each measurement location indicated on the plans. A written report shall be submitted to the mechanical engineer if any measurement locations do not meet the manufacturer's placement requirements.
10. Install in accordance with manufacturer's instructions at the locations indicated on the contract drawings. Duct and plenum devices shall not be adjusted without approval from the mechanical engineer.

2.14 CONTROL RELAYS

A. General: Provide relays rated for current and voltage requirements of controlled equipment.

B. Panel Mounted Relays:
1. Plug in type, with DIN rail mountable plug in sockets. IDEC RH series or equal.
2. UL listed.

C. Field Mounted Relays:
1. Solid state packaged relay including relay, LED indicator, provisions for mounting, transient protection and housing. Functional Devices RIB T series or equal.
2. Provide with a Hand-Off-Auto switch.
3. Provide internal separation between class 1 and class 2 wiring including separate wire ways or nipples.
4. UL listed.

2.15 DAMPER AND VALVE ACTUATORS

A. General:
1. Where exposed to outdoor air or air temperatures lower than 50 deg F provide completely weatherproof actuators with internal heaters to allow normal operation at minus 50 deg F.
2. Provide spring return to normal position type actuators except at fin tube radiation valves and variable air volume terminal units where fail to last position actuators are acceptable.
3. Provide actuators of the following signal types:
   a. Modulating Electronic Actuators. Actuator to convert electronic 1-10VDC or 4-20mA analog signal to a linear, positive positioning stroke. Provide actuators that utilize less than 8VDC or 14ma signal range with linear potentiometer feedback to controller, incorporated into control loop programming. Provide modulating electronic actuators for modulating control except as indicated. Belimo or equal.
   b. Tri-State Reversing Electric Actuators. Actuator to reverse or hold position depending on contact closure state. Provide with linear potentiometer feedback to controller, incorporated in control loop programming. Tri-state reversing electric actuators may be used for terminal unit and fin tube radiation control. Belimo or equal.

c. Two Position Electric Actuator. Direct mounting actuator to open or close depending on contact closure state. Belimo or equal.

2.16 EMERGENCY BOILER SHUT OFF

A. Momentary contact pushbutton with 60 mm diameter red mushroom head, mounted on stainless steel 1-gang plate in recessed box. Mount a red engraved nameplate with white letters that reads "Boiler Emergency Stop" on faceplate or wall above button. Provide NO or NC contact blocks as required to perform the specified sequence of operation.

2.17 WIRING AND RACEWAYS

A. Provide wiring and raceway complying with the National Electrical Code, Division 16, and State and Local Codes and Ordinances.

B. Provide wiring and raceway complying with the National Electrical Code, and State and Local Codes and Ordinances.

C. Raceways:
1. EMT, metal duct, IMC, surface metal raceways, or totally enclosed metal trough with flexible metal tubing unless otherwise noted.
2. Provide rigid steel conduit raceways when raceway is buried or embedded in concrete.
3. Provide 18 inches minimum to 36 inches maximum flexible metal conduit of galvanized steel construction for final connection to control devices. For connections to pipe mounted devices, and to devices in damp, wet, or exterior locations, or in mechanical rooms containing boilers or steam converters, provide oil-resistant liquid-tight flexible metal conduit.
4. Provide EMT connectors with rain tight compression fittings and insulated throats.
5. Wire mould is generally not allowed except as approved on a case-by-case basis with the owner’s representative.

D. Wiring:
1. Provide wire with copper stranded conductors. Provide color or number coded jackets.
2. Low voltage wiring from control components to input/output modules: 20 gauge minimum foil-shielded cable rated 100 VDC at 80 deg C.
3. Provide plenum rated cable whenever wire is run without conduit.
4. Provide communications network wiring meeting the gauge, impedance, capacitance, resistance and shielding requirements specified by the manufacturer of the connected devices.
5. Identify wires and cables with permanent self-laminating machine print labeling system. Provide labels capable of receiving 8 characters of type written text, with minimum print on area of 1 inch by 1/2 inch, and protected by a clear sheath. Thomas & Betts E-Z Code or equal.
6. Support or bundle wire with self locking, UL listed cable ties. Provide 40 lb rated cable ties incorporating a stainless steel locking insert. Provide UL 94V-0 flammability rated, halar cable ties when installed without panel enclosure. Thomas & Betts Ty-Rap or equal.
7. Provide cable tie anchors designed for mechanical anchoring, allowing removal of cable tie without removal of anchor, capable of accepting at a minimum a number 8 screw. Adhesive cable tie anchors are allowed only on the interior surface of panel doors. Panduit TM series or equal.

2.18 PANELS

A. General:
1. UL listed, not over 24 inches wide by 42 inches high, constructed of 14 U.S.S gauge steel except that enclosures less than 20 inches in both dimensions may be 16 gauge. Provide multi-section or multiple individual panels as required. Hoffman or equal.
2. Equipped with subpanels.
3. Punched or stamped to receive front mounted switches, gauges, indicating lights and alarms.

4. Secure to the front of every control panel that has more than one source of power the following warning label: The word "WARNING" shall be in 1 inch high letters. Other letters shall be 1/4 inch high.
   a. WARNING Complete de-energization of this control panel requires that circuit breakers supplying all equipment controlled by this panel be opened.
5. Provide track mounted terminals with integral permanent labeling system. Integral screws for securing connected wires. Voltage and amperage ratings to match terminated wire ratings. Marathon or equal.
6. Provide nylon insulated crimp connectors with voltage and amperage rating matching connected wire ratings unless terminal strip is designed to connect to connected wire type without using a crimp connector. Thomas & Betts STA-KON connectors or equal.
7. Indicating lamps on panel shall be long life type, rated for a minimum life of 10,000 hours.

B. Interior Enclosures:
   1. Piano hinged front with latch and lock.
   2. Baked enamel finish
   3. Concealed enclosures may be standard electrical boxes.

2.19 FIRESTOPPING

A. Capable of maintaining an effective barrier against flame, heat, and smoke. Metalines, Dow, 3M, or equal.

B. Provide installations classified in Underwriter's Laboratories (UL) Building Materials Directory or listed in the Warnock Hersey International Directory.

C. Paintable where exposed to view.

D. Waterproof in plumbing chases.

E. Provide the product of more than one manufacturer if required to provide listed installations throughout.

PART 3 – EXECUTION

3.01 GENERAL

A. Modify existing control system devices as indicated. Extend and modify the existing wiring and control system power source to accommodate indicated direct digital control system devices.

B. Before beginning installation of new system components, test the existing system devices that are being reused in modified control systems for proper operation and report any devices in need of replacement or repair to the Project Manager. At the option of the Project Manager, he will issue a contract amendment to replace or repair the defective devices or he will have Owner maintenance personnel replace or repair the defective devices. The Contractor shall be responsible for providing new devices to replace existing devices that are not brought to the Project Manager’s attention before beginning installation of new system components.

C. Work must comply with industry standards except when more restrictive tolerances or specified requirements indicate more rigid standards. Perform work by persons qualified to produce workmanship of specified quality. If required by the State of Alaska workers shall be licensed. If requested provide copy of license.

D. Do not install control devices in locations where they are subject to damage or malfunction due to normally encountered ambient temperatures.

E. Mount damper operators and other control devices secured to insulated ductwork on brackets such that the device is external of the insulation.

F. Schematics and diagrams, when indicated on the Drawings, show approximate functional relationships and sequences only. All required devices are not shown. Contractor is responsible for providing all components required for a complete functioning system selected to meet the specific functional requirements of each application.

G. Hard wire control devices. Do not use power line carriers.

H. Ensure that the direct digital controller network, N2, and power wiring will support both a 10 percent increase in network length, and a 10 percent increase in controllers similar to those installed without having to add additional network repeaters, increase power wire size or circuit breaker capacity.

I. Unless indicated otherwise, connect the primary sensing input and the associated output for each control loop to the same controller. A secondary or resetting input may be attached to any controller and communicated over the network.

J. After the final inspection and subsequent punch list inspections provide wiring schematic and Control Drawings with written sequence of operations, 11 inches by 17 inches in size, reduced from the as-built Control Drawings. Provide one copy in each Operation and Maintenance Manual, and one copy laminated in heavy clear plastic, at its applicable control panel. Provide one set of backup tapes and disks necessary to restart and reload all programmable devices used in the control system.

K. Tune control loops to respond quickly to control fluctuations without hunting.

L. Label control devices mounted in the field and within control cabinets with 1/4 inch high white embossed letters and black tape background. Dymo or equal. Symbol to match symbol used on Control Drawings.

M. Additional work under this contract may be required due to oversights by the owner's specification. This additional work may be requested and authorized by the project manager based on informal estimates in writing, email or otherwise. The contractor shall be requested to breakout hourly rates on the bid schedule for this work by craft and/or discipline.

N. Provide digital (.txt, .csv) file of complete tag/block name dictionary of all physical and virtual points used under the physical point list and control logic referenced in Sequence of Operation. This will be used for owner developed graphics.

3.02 WIRING AND RACEWAYS

A. Permanently label electrical or electronic wiring at each end indicating location and the device at opposite end. At the direct digital controller end use either the I/O address, if it describes the connected device, or the unique control device tag used on the control schematics. At the device end indicate both the terminal number and the controller connected at the other end. For color coded multi-conductor cable, label cable sheath not individual conductors.

B. At field devices where conductors are not wired to terminal strips wire using a unique color for each conductor connected to that device.

C. Install wiring in a neat and orderly manner generally running along building lines.

D. Support low voltage wiring run without conduit at a maximum of 4 feet between anchors.

E. Seal conduit penetrations at floor and wall penetrations with firestopping installed as indicated. Note that this applies to all floor and wall penetrations, not just fire barrier penetrations. At all mechanical rooms or other rooms containing floor drains, except those with slab on grade floors, make penetration watertight and extend sleeve 3 inches above the floor.

F. Wire all electrical controls and switches furnished under this Section of the Specifications.

G. Make wire connections using factory fabricated jack assemblies, terminal strips, or solder connections. Use crimp connectors on stranded wire unless connecting to terminal strips approved for direct stranded wire connection. Insulate solder connections with heat shrink tubing. Field connections in control power wiring circuits may be made using wire nuts.

H. Avoid splices in signal wire, where unavoidable connect with solder connections and label on each side of splice. Use identical wire type and color on each side of splice.

I. Connect each direct digital controller diagnostic port to an RJ-11 jack on the room sensors. If there are more than one room sensor per controller, connect to one and indicate that sensor on As-builts Drawings.

J. Conceal wiring in finished areas. Unless otherwise noted, install wiring inside conduit or fully enclosed metallic raceway.

K. Low voltage wiring installed in concealed accessible locations may be run without conduit. Sleeve wiring at wall penetrations.

L. Metal raceways crossing expansion joints make provision for 3 way movement. For conduits 1 & 1/2 inch and larger use O-Z type DX fittings, or equal.

M. At raceway penetrations of the vapor barrier provide a double splice patch (one on each side of vapor barrier) by cutting a square piece of vapor barrier 12 inches larger on all sides than the pipe. Cut a round hole in the center of the square splice patch, smaller than the pipe, to form a stretched fit. Force the pipe through the splice patch and tape all sides to the vapor barrier and seal the vapor barrier to the pipe at the penetration with an adhesive compatible with the vapor barrier material.

N. Securely seal at the warm end, raceways running from a warm area to a cold area. Seal with a silicone not harmful to wire insulation. Ductseal or equal.

O. Install all wiring in accordance with National Electrical Code, and State and Local Codes and Ordinances.

3.03 PANELS

A. Provide UL listed panel assemblies.

B. Mount control devices other than sensors and operators in panels on the panel face and the subpanel surface. Removal of devices shall not require removal of subpanel. Do not mount devices on panel sides.

C. Wire control devices mounted in control panels through permanently and sequentially labeled terminal strips.

D. Arrange panels and junction boxes in a clear, logical manner, installed to allow easy servicing and labeling.

E. Arrange control devices such that inadvertent operation of push-buttons, switches, etc. will not result in a jammed or inoperable system caused by component or device failure.

F. Label panels, control switches, and panel mounted gauges with minimum 1/2 inch high by 1/16 inch thick, black, laminated plastic with white core. "Setonply" by Seton Nameplate Corp. or equal. Engrave with 1/4 inch high characters identifying the switch or gauge by the description indicated on the Control Drawings. Attach labels to panels with mechanical fasteners with a maximum head size of 3/16 inch. Adhesive backing is not sufficient to provide secure mounting.

3.04 SENSORS AND SWITCHES

A. Mount room sensors and fan control switches in offices 48 inches above finished floor, with any operable portion no higher than 48 inches, unless otherwise indicated. Where adjacent to light switches mount at same height as switches to provide a clean horizontally aligned installation unless doing so requires the operable portion to be above 48 inches. For sensors with tamper proof guards, sensors may be mounted between 48 inches and 60 inches above finished floors.

B. Liquid or air flow across pumps, and fans, etc. shall be sensed using current sensor unless indicated otherwise.

C. Differential pressure transducers shall be used to sense differential pressure unless indicated otherwise. Unless indicated otherwise mount differential pressure transducers in panel adjacent to associated direct digital controller. At each differential pressure transducer provide with a differential pressure gauge piped in parallel with the transducer, mounted on panel face.

D. Connect low temperature limit switches directly to the controlled equipment's motor starter control coil or, for equipment with no motor starter, to contacts of a relay in the equipment's power circuit.

E. Fill immersion fluid temperature sensor wells with heat conducting compound. At 1-1/2 inches and smaller piping install wells in pipe tees one size larger than line size.

F. Provide sensors and thermostats installed on exterior surfaces with insulated bases such that actual room temperature not wall surface temperature is sensed.

G. Provide cast aluminum ventilating, nonbreakable shields and mounting brackets for sensors which are indicated to have protective covers.

H. Provide averaging sensors in air handling unit casings or in areas where stratification is likely to occur. Provide averaging element of sufficient length to accurately indicate the average duct temperature.

I. Protect averaging or capillary tubes where they penetrate duct with rubber grommet and seal with clear silicon. Support averaging or capillary tubes with copper capillary clips which maintain a minimum tubing bend radius of 1 inch.

3.05 CONTROL POWER SUPPLY

A. Provide uniterruptible power supply (UPS) on power supply to all control panels and control transformers.

B. Provide electric power to control devices from control system power circuit or from device or equipment being controlled.

C. Carry a dedicated ground wire to controllers from the associated breaker panel. Do not use the conduit system for grounding purposes.

3.06 PRE-FUNCTIONAL TESTING AND ADJUSTING

A. Upon completion of the installation, the contractor shall initiate operation of the control system and perform all necessary testing and diagnostics to ensure proper operation. A formal commissioning procedure shall be utilized to insure complete system integrity and conformance to these specifications. This procedure shall consist of two separate steps incorporating point verification and program verification. Commissioning forms shall address all field devices, field controllers, software statements, and software points. Submit for approval a written testing procedure indicating how each of these steps will be accomplished in accordance with Section 23 0800.

B. Verify correct installation and wiring of all points.

C. Confirm that all devices are installed correctly. Verify that terminations are tight and of correct polarity. Document and signoff the results on Point Verification form.

D. Coordinate the final adjustments and "fine tuning" of control functions and devices so that the building, the mechanical systems, and the control systems operate and respond as an integrated comfortable and energy efficient component of this facility.

E. Upon completion of start up test existing smoke detectors to ensure fan shutdown. Note that test of circuitry is sufficient.

F. Verify that all points are wired to the correct termination block at the control panel by verifying continuity between the device and the panel termination. Document and signoff results on Pre-Functional test forms. Verify that each sequence performs as specified in contract documents. Tune each loop as required for proper operation.

G. Document and signoff the results on Program Pre-Functional Test forms.

H. Command all digital output points on and off and confirm proper operation of the associated output device. Command all analog output points to various levels within their range and confirm proper operation of the associated output device. Activate all digital input sensors and confirm proper point status at the panel. Measure conditions at all analog input sensors with an independent reference device, calibrate as required, and confirm proper point status at the panel. Document and signoff the results on Pre=Functional Test forms.

I. Deficiencies revealed by failed test(s) shall be repaired and corrected and the test(s) repeated until successful.

J. Verify interface to Boiler control system, including control and monitoring of all points in Sequence of Operation.

K. Provide completed pre-functional testing forms to commissioning agent prior to functional testing.

3.07 FUNCTIONAL TESTING

A. Perform funcational testing of all systems in accordance with Section 01 9100, Section 23 0800 and Section 26 0800.

3.08 SPECIAL TOOLS AND SPARE PARTS

A. Provide three sets of special tools required to adjust control devices. This includes allen wrenches and other special tools. This does not include common tools such as pliers, adjustable wrenches, flat blade or Phillips screwdrivers. This set shall be provided during Owner instruction period and proper use shall be demonstrated to Owner personnel during said period.

3.09 DATABASE ARCHIVAL AND UPGRADE

A. Provide a complete database backup CD for the building management system and each direct digital controller to the Owner at final inspection. If software modifications are required during the warranty period update CD.

3.10 ORIENTATION AND TRAINING

A. Provide 40 hours of on-site orientation and training to Owner personnel designated by the Project Manager. Orientation and training sessions shall be conducted by a factory trained manufacturers representative familiar with the systems software, hardware, and accessories. Limit training time per day to 6 hours. Complete training and orientation according to the following schedule:
   1. 24 hours (3 days) of instruction after acceptable performance of the system hardware and software has been established and prior to final inspection.
   2. 16 hours (2 days) of instruction six months after final inspection.

B. Submit proposed training dates and instruction session course outlines for acceptance by Project Manager.

C. Provide instructions on all the operations listed in the initial course outline during the first training session. On subsequent sessions communicate in advance with facility supervisor to determine which operations require additional instruction.

D. Initial course outline:
   1. Determine the control strategies that have been defined for a specific piece of equipment.
   2. Utilize X-Y graphing and histories as an aid for control loop tuning.
   3. Enable or disable control strategies.
   4. Assign sensors and/or actuators to a control strategy.
   5. Simulate control strategies with substituted inputs or outputs.
   6. Define appropriate control loop algorithms and choose optimum loop parameters for loop control.
   7. Add/delete control loops to the system.
   8. Add/delete points to the system.
   9. Label parameters and variables with names or acronyms of a minimum of eight letters.
   10. Select points to be alarmable and define the alarm state(s).
   11. Download programming to the system after all direct digital controllers and building management station program memory has been lost.
   12. Process stored historical data and display and printout data in tabular and graphical formats.
   13. Diagnose system malfunctions.
   14. Change system operating sequences

3.11 SUBSTANTIAL INSPECTION REQUIREMENTS

A. Substantial inspection data must be submitted for review, reviewed by the Project Manager, corrected in accordance with review comments, and accepted by the Project Manager before a request for final or substantial completion inspection will be considered by the Project Manager.

B. Prior to the substantial inspection, review and test entire installation for conformance with contract documents. Test shall include thorough field check of sequence of operations for each

system and piece of equipment including simulation of all possible modes of operation. With the call for inspection, verify in writing that this system review and test has been performed and anything not conforming to contract documents shall be so noted.

C. During the Substantial inspection Contractor personnel shall provide on-site assistance to inspection personnel required for a complete and thorough inspection.

D. During the Substantial inspection Contractor personnel shall demonstrate that the control system performs in accordance with the contract documents. Provide material and personnel required to perform the demonstration.

END OF SECTION

SECTION 23 0993
SEQUENCE OF OPERATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sequence of operations for mechanical systems and equipment.

1.02 RELATED SECTIONS

A. Section 23 0923 – Building Automation System.

B. Section 23 0924 – Variable Frequency Drives.

C. Section 23 5200 – Boilers.

D. Section 23 0593 – Balancing and Testing.

1.03 SYSTEM DESCRIPTION

A. See Section 01 3300 – submittal procedures.

B. This Section defines the manner and method by which controls function. Requirements for each type of control system operation are specified. Equipment, devices, and system components required for control systems are specified in other Sections.

1.04 SUBMITTALS

A. Submit under provisions of Section 01 3300 Submittal Procedures.

B. Submit diagrams indicating mechanical system controlled and control system components. Label with settings, adjustable range of control and limits. Include written description of control sequence.

C. Include flow diagrams for each control system, graphically depicting control logic.

D. Include draft copies of graphic displays indicating mechanical system components, control system components, and controlled function status and value.

1.05 PROJECT RECORD DOCUMENTS

A. Submit documents under provisions of Division 01 General Requirements.

B. Accurately record actual setpoints and settings of controls, including changes to sequences made after submission of shop drawings.

PART 2 PRODUCTS

PART 3 EXECUTION

3.01 DOMESTIC WATER HEATING SYSTEM (HWG-1, CP-2)

A. Alarms:
   1. Low Supply Temperature.
   2. High Supply Temperature.
   3. No Flow CP-2.

B. Digital Control and Indication:
   1. Domestic Hot Water Supply Temperature Indication.
   2. CP-2 On-Off Control.
   3. CP-3 On-Off Status.

C. Automated Control:
   1. HWG will operate to maintain discharge water setpoint as controlled by an integral aquastat initially set at 140 F. Tempering valve shall be adjusted to supply 120 degree F hot water. Aquastat on HWG shall open valve during call for heat. When HWG temperature rises above setpoint, the control valve shall close.
   2. The hot water circulation pump, CP-2 shall operate based upon building scheduling initially set at 5:00 A. M. to 9:00 P.M. Monday through Friday.

3.02 BOILER WATER CONTROL (B-1, B-2. BP-1, BP-2, CP-1, CP-1A)

A. Alarms:
   1. Boiler Alarm, B-1, B-2.
   2. Main hydronic loop low HGS temperature.
   3. Main hydronic loop low HGR temperature.
   4. Low System Pressure.
   5. Pump Failure, BP-1, BP-2, CP-1, CP-1A.
   6. Critical Pump Failure, CP-1 and CP-1A Failure.
   7. Critical Boiler Alarm, B-1 and B-2 Alarm.

B. Digital Control and Indication:
   1. Boiler Status, B-1, B-2.
   2. Boiler Firing Rate, B-1, B-2.
   3. Boiler System Setpoint.
   4. Main hydronic loop HGR temperature indication.
   5. Main hydronic loop HGS temperature indication.
   6. Outdoor air temperature indication.
   7. Outdoor temperature reset adjustment.
   8. B-1 thru B-3 HGS temperature indication.
   9. Pump BP-1, BP-2, CP-1 and CP-1A Status.
   10. Pump CP-1, CP-1A speed indication.
   11. Pump CP-1, CP-1A on/off control.
   12. Boiler System Pressure.
   13. Hydronic system differential pressure.
   14. Hydronic system differential pressure setpoint.
   15. Lead Pump Selector.
   16. Alternator Setting (hours of use).
   17. Alarm setpoints.

C. Automated Control:
   1. Provide on/off and modulating firing rate control of boilers, B-1 and B-2 with Direct Digital Control (DDC) System. Provide on/off control of the associated boiler circulation pumps, CP-1 and CP-2 with Direct Digital Control System. Provide DDC programming to alternate boilers lead/lag, enable/disabled the boilers, modulate firing rate and operate associated circulation pumps to maintain supply temperature setpoint. Programming shall incorporate rate of rise calculation to prevent boiler operation when system temperature is not decreasing. Programming shall include minimum run times for boilers, minimum time delay between cycling boilers on/off and minimum run time for boiler circulation pumps after boiler has completed firing. Adjust minimum timing as required to optimize boiler performance and in accordance with boiler manufacturers' recommendations.
   2. DDC System shall operate the boilers to maintain boiler supply set point based on an adjustable outside air temperature reset schedule. Initial settings as follows:

Outside Temperature	Loop HWS Temperature
0º F	180º F
60º F	150º F

   3. The BAS shall monitor the boiler system and provide alarms to the owner's workstation and remote alarm point.
   4. The secondary pumps shall operate to maintain the heating system pressure differential setpoint at 8 PSI (initial setting, coordinate with balancer for final setting). The lead pump shall modulate its speed to maintain the setpoint. Upon failure of the lead pump, the lag pump shall operate. Lead/lag operation shall alternate every 200 hours of use (adjustable)

5. Emergency Boiler Shutdown: Provide resettable red pushbutton for emergency shutdown of boilers. Hardwire interlock pushbutton to disable all boilers when button is pressed. Provide red placard above pushbutton to read "Emergency Boiler Shutdown".

3.03 UNIT HEATERS

A. Alarms:
   1. None.

B. Manual Control and Indication:
   1. Temperature set point.
   2. Temperature indication.

C. Automated Control:
   1. Local electric thermostat shall fan on/off and valve open/closed to maintain set point.

3.04 CABINET UNIT HEATERS

A. Alarms:
   1. None.

B. Manual Control and Indication:
   1. Temperature set point.
   2. Temperature indication.

C. Automated Control:
   1. Local electric thermostat shall fan on/off and valve open/closed to maintain set point.

3.05 RADIANT PANELS AND FINTUBE RADIATION

A. Alarms:
   1. High Space Temperature.
   2. Low Space Temperature.

B. Digital Control and Indication:
   1. Space temperature setpoint.
   2. Space temperature indication.
   3. Operation mode schedule adjustment.
   4. Operation mode indication.
   5. Control Valve Position.
   6. Alarm Setpoints.

C. Automated Control:
   1. Operation Mode: Day and night mode of operation will be controlled by a seven (7) day programmable time schedule.
   2. Day Mode: Control valve shall open/close or modulate to maintain daytime set-point.
   3. Night Mode: Control valve shall open/close or modulate to maintain night time setpoint. Upon drop in room temperature below night set back temperature, initially set at 60ºF (adjustable), signal low temperature alarm and start associated AHU and modulate zone VAV control valve to maintain space temperature.
   4. Space sensor will open/close or modulate control valve to maintain setpoint.

3.06 DAY TANK (DT-1)

A. Alarms:
   1. Low Level.
   2. High Level.

B. Digital Control and Indication:
   1. Fuel Oil Usage (Gallons).
   2. Alarm setpoints.

C. Automated Control:
   1. Packaged controls to operate day tank to maintain tank level.
   2. Provide fuel oil meter on fuel oil supply to each day tank to monitor fuel usage.

3. Provide high and low level alarms.

3.07 GLYCOL TANK (GT-1)

A. Alarms:
   1. Low Level.

B. Digital Control and Indication:
   1. Tank Low Level Alarm.
   2. Alarm setpoints.

C. Automated Control:
   1. System shall normally be off. Utilize supervised fill procedure only. Package controls shall cycle pump on as required to obtain system operating pressure.

3.08 VARIABLE VOLUME AIR HANDLING UNIT (AHU-1)

A. Alarms:
   1. Low supply air temperature (40° F, adjustable).
   2. Filter high differential pressure.
   3. High Static Pressure Alarm.
   4. Freeze Alarm.
   5. VFD Fault.
   6. No airflow

B. Digital Control and Indication.
   1. On-off control.
   2. On-off indication.
   3. Outside temperature reset adjustment.
   4. S/A temperature setpoint.
   5. S/A temperature indication.
   6. M/A temperature setpoint.
   7. M/A temperature indication.
   8. O/A minimum position adjustment.
   9. Return airflow delivery to building by flow sensor.
   10. Supply airflow delivery to building by flow sensor.
   11. Filter differential pressure indication.
   12. Morning warm-up S/A setpoint.
   13. Morning warm-up R/A setpoint.
   14. R/A temperature indication.
   15. R/A CO2 concentration.
   16. Control valve position.
   17. Duct static pressure setpoint.
   18. Duct static pressure indication.
   19. VFD signal indication.
   20. Alarm setpoints.

C. Automated Control:
   1. Operation Mode: Day and night mode of operation will be controlled by DDC system. Start air handling units and relief fans independently from each other after time delay to minimize electrical demand loads. Variable frequency drives shall be limited to a minimum ten minute ramp up time to full speed operation.
   2. Night Mode Operation: During night mode of operation the fan shall be off, O/A damper shall be fully closed, R/A damper fully open. Heating coil will modulate to maintain M/A sensor setpoint except under freeze alarm as defined below.
   3. Morning Warm-up: At the beginning of day mode, fan starts on 100% R/A. Heating coil modulates to maintain 80° F (adjustable) S/A setpoint. When R/A temperature rises to 65° F (adjustable) the system will switch to day mode operation. Optimum start/stop programming with historical multiplier shall be utilized to determine exact start up time to meet daytime setpoint in the building per the owners' schedule.

4. Day Mode Operation:
   a. During operation airflow sensors shall be used to accurately control and record the volume of outside air delivered to the building. The supply airflow and return airflow rates shall be measured by airflow sensors located in the main ductwork to determine the outside airflow rate to the building. The minimum outside airflow rate during occupied hours shall 1000 CFM. The outside airflow rate shall be recorded and used to control the volume of air discharged to the exterior by the respective relief air fan.
   b. The outside air minimum position shall be further offset based upon CO2 concentration in the primary return air duct exceed 1100 ppm (initial setting, adjustable). In the event of a failure of the CO2 outside air dampers shall failsafe to minimum position.
   c. The S/A desired temperature shall be reset based on sensing all the room sensors and VAV box positions and adjusting the calculated S/A setpoint up or down as required to maintain the setpoint in the hottest room with the VAV box wide open. Minimum supply temperature shall be 55 Degrees F, Maximum Temperature shall be 70 Degrees F.
   d. The O/A dampers, R/A dampers shall modulate to maintain the desired S/A temperature setpoint. M/A temperature shall not be allowed to drop below 45 Deg F under any of the operating conditions described above.
   e. During cooling season outside air damper shall modulate open to provide economizer cooling until outside air temperature exceeds return air temperature. If outside air temperature exceeds return air temperature, then unit shall operate at minimum outside air setting.
5. Variable Speed Drive: Duct static pressure sensor will modulate VFD to maintain setpoint of 0.80" initially (adjustable). Static pressure sensor shall be located approximately 2/3 of the distance between the supply fan and the most remote terminal unit. In systems with more than one main duct provide a sensor in each main duct and control the static pressure based upon the most restrictive case. Coordinate final setpoint with balancer during test and balance.
6. On S/A freeze alarm set initially at 35° F (adjustable), the fan shall stop, O/A dampers will fully close, R/A dampers will fully open. Provide automatic reset.
7. Air handling unit smoke detector shall be wired directly to the addressable fire alarm system. Air handling unit fan motor starter shall be connected to the fire alarm system to stop fan motor on alarm. DDC system shall verify fan shut down and shall close the outside air damper and shut down respective relief fans and close the motorized dampers. Coordinate with Division 26. Detection of smoke at the air handling unit smoke detector shall shut down the AHU.

3.09 RELIEF AIR FANS (RF-1)

A. Alarms:
   1. Fan Failure.
   2. VFD Fault

B. Digital Control and Indication:
   1. On-off control.
   2. On-off indication.
   3. Outside air intake airflow from respective air handling unit.
   4. Calculated relief air airflow required for relief fan.
   5. Actual relief air airflow measure by airflow sensor at relief fan.
   6. VFD Signal indication
   7. VFD Setpoint
   8. Differential Pressure Sensor Monitoring Indication for each respective zone (interior to exterior reference and interior to interior reference).
   9. Fan Room Temperature Indication.
   10. Fan Room Temperature Setpoint.
   11. Relief Fan Damper Position.

12. Alarm setpoints.

C. Automated Control:
1. Relief fan shall be interlocked to operate in sequence with the air handling unit (RF-1, AHU-1). Relief fan shall only operate when the respective air handling unit operates beyond minimum outside air setpoint.
2. DDC System shall modulate individual relief fan VFD's to exhaust the same amount of outside air that is brought into the building by the respective air handling unit as measured by airflow sensors. Relief Airflow shall lag outside airflow by 10% (adjustable) to provide slight building pressurization.
3. The building shall include static pressure reference monitoring to ensure proper operation of the intake/relief air system and to allow adjustment of lag setpoint for individual relief fans. Differential static pressure monitoring shall be maintained between the interior of the building and the exterior of the building. Locate indoor reference in first floor main corridor.
4. Night Mode: Exhaust air dampers shall be closed and the fan shall be off.
5. Morning Warm-up: Exhaust air control dampers will be closed and the fan shall be off.

3.10 BOILER ROOM VENTILATION FAN

A. Alarms:
1. Low S/A air temperature (35º F adjustable).
2. High Filter Differential Pressure.
3. Fan Failure.
4. Space high temperature (85 Deg F, adjustable).

B. Control and Indication:
1. On-off control.
2. On-off indication.
3. Room temperature setpoint.
4. Room temperature indication.
5. S/A temperature setpoint.
6. S/A temperature indication.
7. Filter differential pressure.
8. Mixing Damper position.
9. Alarm setpoints.

C. Automated Control:
1. When the room temperature exceeds 78 degrees F (initial setting, adjustable) the mixing box dampers shall open 20% and the fan shall start.
2. Upon fan start-up the damper shall modulate proportionately to maintain the space temperature setpoint.
3. The discharge air temperature shall be controlled between 50 degrees F and 70 degrees F (adjustable) to maintain the space temperature setpoint.
4. When the space temperature drops below 74 degrees F (initial setting, adjustable), the fan shall stop; the outside/return air damper assembly shall close.
5. On low temperature S/A discharge alarm (initially set at 35 degrees F) the fan shall stop and outside air/return air dampers shall close.

3.11 EXHAUST FANS (EF-1,2,3)

A. Alarms:
1. None.

B. Digital Control and Indication:
1. None.

C. Automated Control:
1. Exhaust fans shall be interlocked to operate with lighting circuit.

3.12 STEAM KETTLE HOOD EXHAUST FAN

A. Alarms:
   1. Fan Failure.

B. Control and Indication:
   1. Hood Control Switch (On/Off) Position Indication.
   2. Fan On-Off Indication.
   3. Alarm setpoints.

C. Automated Control:
   1. Operation Mode: Fan shall be controlled on/off by local switch mounted adjacent to hood. When fan switch is on, fan shall start, when switch is off, fan shall stop. Monitor fan status and provide alarm if a fan fails to operate when the switch is turned on.
   2. VAV-101 Serving Lab 107 shall operate at 250 CFM when hood switch is off. When hood switch is on, VAV-101 shall operate to provide 900 CFM.

3.13 FUME HOOD EXHAUST FAN

A. Alarms:
   1. Fan Failure.

B. Control and Indication:
   1. Fume Hood Control Switch (On/Off) Position Indication.
   2. Fan On-Off Indication.
   3. Alarm setpoints.

C. Automated Control:
   1. Operation Mode: Fan shall operate continuously to maintain fume hood and Lab 107 negative with respect to adjacent spaces. When fan switch is on, fan shall start, when switch is off, fan shall stop. Monitor fan status and provide alarm if fan fails to operate when switch is turned on.

3.14 VARIABLE AIR VOLUME TERMINAL UNITS

A. Alarms:
   1. High Space Temperature.
   2. Low Space Temperature.

B. Digital Control and Indication:
   1. Space temperature setpoint.
   2. Space temperature indication.
   3. Operation mode schedule adjustment.
   4. Operation mode indication.
   5. Actual cfm indication.
   6. Minimum airflow setpoint.
   7. Maximum airflow setpoint.
   8. Damper Position.
   9. Control Valve Position.
   10. Alarm Setpoints.

C. Automated Control:
   1. Space sensor will modulate air valve to maintain setpoint.
   2. Where associated with a tempering coil or space radiation heat, upon continued drop in area temperature after airflow is at minimum position, modulate the control valve on the radiant panel in series with the reheat coil control valve to maintain the space temperature setpoint.
   3. Minimum airflow setpoint for boxes shall be 30% (Initial Setting, Adjustable) unless noted otherwise in plans and specifications.

3.15 IDF ROOM AIR CONDITIONING UNITS (AC-1, AC-2)

A. Alarms:

1. High Room Temperature.
2. Air Conditioning Unit Alarm.
3. Digital Control and Indication:
4. Space temperature indication.
5. Air Conditioning Unit Status.

B. Automated Control:
1. Operation Mode: Packaged terminal air conditioning unit to operate on local control thermostat to provide cooling to room. DDC system shall monitor room temperature and provide alarm when temperature exceeds 80 Deg F.

3.16 ELECTRIC HEAT TRACE (RAINLEADER MAIN, IN CRAWLSPACE)

A. Alarms:
1. Heat Trace Failure.

B. Digital Control and Indication:
1. Heat Trace Enable/Disable.
2. Heat Trace Status (By Current Sensor)

C. Automated Control
1. The existing rain leader Heat Trace circuit in the crawlspace shall be activated between September and May. Heat Trace circuit shall be disabled June through August.
2. Monitor current on heat trace circuit, provide an alarm if heat trace fails to operate.

3.17 AFTER HOURS OPERATION

A. Individual thermostats in classrooms include an override button to switch from night mode to day mode. Provide programming to allow for a 2-hour (adjustable) override to start the respective ventilation system in day mode. Include programming to allow this function to be disabled by the owner.

3.18 LIGHTING CONTROL

A. Alarms:
1. None.

B. Digital Control and Indication:
1. Level 1 – Occupied/Unoccupied Mode
2. Level 2 – Occupied/Unoccupied Mode
3. Exterior Lighting

C. Automatic Control:
1. Provide connection to lighting control panels to switch lighting on/off for each floor. Provide connection for exterior lighting control. Operate all lights on/off based on occupancy schedule. Provide one schedule per floor and one schedule for exterior lighting. Coordinate lighting schedule with owner.

3.19 BACKWATER VALVE

A. Alarms:
1. Backwater Alarm.

B. Digital Control and Indication:
1. Backwater Alarm.

C. Automated Control:
1. Monitor alarm contacts on the backwater valve monitoring system.

3.20 FIRE ALARM MONITORING

A. Alarms:
1. Fire Alarm.
2. Fire System Trouble Alarm.

3.21 REMOTE NOTIFICATION

A. Provide remote notification service with BAS to send critical alarms by text message to up to 3 phone numbers. Provide programming for up to twelve critical alarms. 4 alarms to be selected by the owner during training and 8 critical alarms listed below. The system shall be programmed to initiate the call out for any of the critical alarms indicated. Critical Alarms:

1. Boiler Failure, B-1 & B-2 in Alarm
2. Critical Pump Failure, CP-1 & 1A in Alarm.
3. Critical Pump Failure, BP-1 & BP-2 in Alarm.
4. Low Glycol Level.
5. Low Boiler System Pressure.
6. Low Building Temperature (Below 55 Deg F).
7. Backwater Valve Alarm.
8. Day Tank Alarm (High or Low Level).

END OF SECTION

SECTION 23 1113
FACILITY FUEL-OIL PIPING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Section Includes:
   1. Fuel Oil Piping - Buried.
   2. Fuel Oil Piping - Above Ground.
   3. Fuel Oil Underground Containment System.
   4. Unions and Flanges.
   5. Valves.
   6. Pipe Hangers and Supports.
   7. Relief Valves.
   8. Strainers.
   9. Flexible Connectors.
   10. Underground Pipe Markers.

B. Related Sections:
   1. Section 23 0503 - Pipes and Tubes for HVAC Piping and Equipment: Piping materials for fuel oil piping systems.
   2. Section 23 0529 - Hangers and Supports for HVAC Piping and Equipment: Product requirements for pipe hangers and supports.
   3. Section 23 0553 - Identification for HVAC Piping and Equipment: Product requirements for valve and pipe identification for placement by this section.

1.02 REFERENCES

A. American Society of Mechanical Engineers:
   1. ASME B16.3 - Malleable Iron Threaded Fittings.
   2. ASME B31.1 - Power Piping.
   3. ASME B31.9 - Building Services Piping.
   4. ASME B36.10M - Welded and Seamless Wrought Steel Pipe.
   5. ASME Section IX - Boiler and Pressure Vessel Code - Welding and Brazing Qualifications.

B. ASTM International:
   1. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
   2. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers.

C. American Welding Society:
   1. AWS A5.8 - Specification for Filler Metals for Brazing and Braze Welding.
   2. AWS D1.1 - Structural Welding Code - Steel.

D. National Fire Protection Association:
   1. NFPA 30 - Flammable and Combustible Liquids Code.
   2. NFPA 31 - Standard for the Installation of Oil-Burning Equipment.

E. Underwriters Laboratories Inc.:
   1. UL 567 - Pipe Connectors for Flammable Liquids and Combustible Liquids and LP-Gas.
   2. UL 842 - Valves for Flammable Fluids.
   3. UL 913 - Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, and III, Division 1, Hazardous Locations.

1.03 SUBMITTALS

A. See Section 01 3300 - submittal procedures.

B. Product Data:

1. Piping: Submit data on pipe materials, fittings, and accessories. Submit manufacturers catalog information.
2. Valves: Submit manufacturer’s catalog information with valve data and ratings for each service.
3. Hangers and Supports: Submit manufacturer’s catalog information including load capacity.
4. Fuel Piping Specialties: Submit manufacturer’s catalog information including capacity, rough-in requirements, and service sizes.

C. Test Reports: Submit written test results for piping system pressure test.

D. Manufacturer's Installation Instructions: Submit piping system and, piping accessories.

1.04 CLOSEOUT SUBMITTALS

A. Execution and Closeout Requirements: Closeout procedures under provisions of Division 01.

B. Project Record Documents: Record actual locations of valves, piping system, and system components.

C. Project Record Documents: Record actual locations of piping mains with invert elevations, valves and manholes.

D. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

E. Operation and Maintenance Data under provisions of Division 01. Submit spare parts lists, exploded assembly views.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with NFPA 31.

B. Perform Work in accordance with authority having jurisdiction.

C. Valves: Manufacturer's name and pressure rating marked on valve body.

D. Welding Materials and Procedures: Conform to ASME Code and applicable state labor regulations.

E. Welders Certification: In accordance with ANSI/ASME Sec 9.

1.06 QUALIFICATIONS

A. Installer: Company specializing in performing work of this section with minimum three years documented experience or approved by manufacturer. And must be installed by a State of Alaska certified underground storage tank worker.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Division 01 - Product Requirements: Product storage and handling requirements.

B. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

C. Protect piping and fittings from soil and debris with temporary end caps and closures. Maintain in place until installation.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Section 01 5719 - Temporary Environmental Controls.

B. Do not install underground piping when bedding is wet or frozen.

1.09 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.10 COORDINATION

A. Division 01 - Administrative Requirements: Requirements for coordination.

B. Coordinate trenching, excavating, bedding, backfilling of buried piping systems with requirements of Division 31.

1.11 WARRANTY

A. Division 01 - Execution and Closeout Requirements: Product warranties and product bonds.

B. Furnish manufacturer warranty for leak detection and location system.

PART 2 PRODUCTS

2.01 FUEL OIL PIPING - INSIDE BUILDING

A. Steel Pipe: ASTM A53/A53M or ASME B36.10M Schedule 40 black.
   1. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M wrought carbon steel and alloy steel welding type.
   2. Joints: Threaded for pipe 2 inch and smaller; welded for pipe 2-1/2 inches and larger.

2.02 FUEL OIL PIPING - OUTSIDE BUILDING

A. Steel Pipe: ASTM A53/A53M or ASME B36.10M Schedule 40 black.
   1. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M wrought carbon steel and alloy steel welding type.
   2. Joints: ANSI/AWS D1.1, welded.

2.03 UNIONS AND FLANGES

A. Unions for Pipe 2 inches and Smaller:
   1. Ferrous Piping: Class 150, malleable iron, threaded.
   2. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.04 GATE VALVES

A. No allowed.

2.05 GLOBE VALVES

A. Not Allowed.

2.06 BALL VALVES

A. UL 842 (YRBX) Listed, ANSI B16.34, Conforming to API 598, two piece carbon steel body, Type 316 stainless steel ball and stem, blow out proof stem, TFM 1600 seats and stem packing, 1000 WOG / 150 WSP. Jomar Model T-CS-1001N-SS or approved equal.

2.07 CHECK VALVES

A. Swing Check Valves
   1. 2 inches and Smaller: MSS SP 80, Class 150, bronze body and cap, bronze seat, Buna-N disc, threaded ends.

B. Spring Loaded Check Valves:
   1. 2 inches and Smaller: MSS SP 80, Class 150 bronze body, in-line spring lift check, silent closing, Buna-N disc, integral seat, threaded ends.

2.08 HANGERS AND SUPPORTS

A. Conform to NFPA 31.

B. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron or Carbon steel, adjustable swivel, split ring.

2.09 FLEXIBLE CONNECTORS

A. Manufacturers:
   1. Flex-Hose Co., Inc.
   2. Flex-Weld, Inc.
   3. The Metraflex Company.
   4. Substitutions: Section 01 2513 - Product Substitutions.

B. Corrugated Type 304 stainless steel inner hose with single layer of Type 304 stainless steel exterior braiding. Maximum working pressure 200 psig.

2.10 RELIEF VALVES

A. ASME certified and labeled. Maximum working temperature: 450 degrees F. Body: Bronze. Seat: Viton or Monel. Stem and Springs: Stainless steel. Threaded ends. Automatic type, direct pressure actuated at maximum 60psi.

2.11 STRAINERS

A. Manufacturers:
   1. Mueller Steam Specialty.
   2. O.C. Keckley Company.
   3. Spirax Sarco, Inc.
   4. Substitutions: Section 01 2513 - Product Substitutions.

B. 2 inch and Smaller: Y pattern, bronze body, threaded ends, Class 150, 1/32 inch stainless steel perforated screen.

2.12 FUEL FILTERS

A. Support: Steel bracket suitable for wall mounted application to support entire packaged unit.

B. Unit: A complete packaged oil filter. Including: filters and separator.

C. Model 1000 MA, as manufactured by Racor.

2.13 FUEL OIL DE-AERATOR

A. UL listed fuel oil de-aerator, converts single pipe supply to two-pipe system complete with fusible valve and integral fuel filter, Tigerholm Tigerloop Combi or equal.

PART 3 EXECUTION

3.01 EXAMINATION

A. Division 01 - Administrative Requirements: Coordination and project conditions.

B. Verify excavations are to required grade, dry, and not over-excavated.

3.02 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.03 INSTALLATION - PIPE HANGERS AND SUPPORTS

A. Install hangers and supports in accordance with ASTM F708 and MSS SP 89.

B. Support horizontal piping hangers as scheduled.

C. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.

D. Place hangers within 12 inches of each horizontal elbow.

E. Install hangers to allow 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.

F. Where installing several pipes in parallel and at same elevation, provide multiple pipe hangers or trapeze hangers.

G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

3.04 INSTALLATION –PIPING

A. Install fuel oil piping in accordance with NFPA 31.

B. Provide non-conducting dielectric connections wherever jointing dissimilar metals. Install in accordance with NACE RP-01-69.

C. Route piping in orderly manner and maintain gradient.

D. Install piping to conserve building space and not interfere with use of space.

E. Group piping whenever practical at common elevations.

F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

G. Sleeve pipe passing through partitions, walls and floors. Refer to Section 23 0529.

H. Install fire stopping at fire rated construction perimeters and openings containing penetrating sleeves and piping. Refer to Division 07.

I. Provide clearance for installation of insulation and access to valves and fittings.

J. Provide access where valves and fittings are not exposed.

K. Where pipe support members are welded to structural building framing, scrape, brush clean, weld, and apply one coat of zinc rich primer. Refer to Division 09.

L. Prepare pipe, fittings, supports, and accessories not pre-finished, ready for finish painting. Refer to Division 09.

M. Install identification on piping systems including underground piping. Refer to Section 23 0553.

N. Install valves with stems upright or horizontal, not inverted.

O. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

END OF SECTION

SECTION 23 1300
FACILITY FUEL-STORAGE TANKS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Aboveground fuel storage tanks.
   2. Fuel Oil Day Tanks.
   3. Fuel system specialties.
   4. Fuel system equipment.

1.02 REFERENCES

A. American Petroleum Institute:
   1. API 650 - Welded Steel Tanks for Oil Storage.
   2. API 2000 - Venting Atmospheric and Low-Pressure Storage Tanks: Nonrefrigerated and Refrigerated.

B. National Fire Protection Association:
   1. NFPA 30 - Flammable and Combustible Liquids Code.
   2. NFPA 30A – Code for Motor Fuel Dispensing Facilities and Repair Garages

C. Underwriters Laboratories Inc.:
   1. UL 142 - Steel Aboveground Tanks for Flammable and Combustible Liquids.
   2. UL 567 - Pipe Connectors for Flammable Liquids and Combustible Liquids and LP-Gas.
   3. UL 913 - Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, and III, Division 1, Hazardous Locations.
   4. UL 2085 - Standard for Safety for Insulated Aboveground Tanks Flammable and Combustible Liquids.

1.03 TERMINOLOGY

A. See Section 01 3300 – submittal procedures.

B. Whenever the words "furnish", "provide", "furnish and install", "provide and install", and/or similar phrases occur, it is the intent that the materials and equipment described be furnished, installed and connected under this Division of the Specifications, complete for operation unless specifically noted to the contrary.

C. Where a material is described in detail, listed by catalog number or otherwise called for, it shall be the Contractor's responsibility to furnish and install the material.

D. The use of the word "shall" conveys a mandatory condition to the contract.

E. "This section" refers to the section in which the statement occurs.

F. "The project" includes all work in progress during the construction period.

G. In describing the various items of equipment, in general, each item will be described singularly, even though there may be a multiplicity of identical or similar items.

1.04 SYSTEM DESCRIPTION

A. Provide one aboveground UL 142 listed Double-wall-tank for Fuel oil, complete with accessories.
   1. Provide tank with tank gage, appurtenances, and spare ports.
   2. Ladders and platform for maintenance and service.
   3. Provide tank with remote fill unit mounted on side of the tank.
   4. Tank Capacity:
      a. Volume: 3,000 gallons.

1.05 SUBMITTALS

A. Submittal Procedures: Under provision Section 01 3300.

B. Shop Drawings:
   1. Tanks: Indicate tank dimensions; number, size, and location of tappings; number, size, and location of manholes; anchors, lifting points, containment boxes, and accessories.

C. Product Data:
   1. Tanks: Submit manufacturer's catalog information including capacity.
   2. All gauges, valves, pumps, venting, remote fill accessories, furnished specialties and all associated appurtenances.
   3. Day Tank: Include wiring diagram for control and power connections.

D. Test Reports: Submit written test results for tank pressure test.

E. Manufacturer's Installation Instructions: Submit tanks data.

F. Manufacturer's Certificate:
   1. Certify Products meet or exceed specified requirements.

1.06 CLOSEOUT SUBMITTALS

A. Execution and Closeout Requirements: Under provision of Division 01.

B. Operation and Maintenance Data: Submit spare parts lists, exploded assembly views, and manufacturer's installation and maintenance instructions for tanks, and fill. Provide catalog cuts for all equipment provided.

C. Day Tank manual shall include the following as a minimum:
   1. Registration certificate
   2. Glossary
   3. Equipment list
   4. Detailed description of operation
   5. Pump specifications
   6. Installation instructions
   7. Troubleshooting instructions
   8. Maintenance instructions
   9. Piping diagram
   10. Electrical drawing
   11. Exploded view parts drawing/parts list
   12. Dimensional drawing
   13. Warranty card

1.07 QUALITY ASSURANCE

A. Perform Work in accordance with NFPA 30 and NFPA 30A.

B. Ensure pumps operate at specified system fluid temperatures without vapor binding.

C. Ensure specified products are in conformance with recommendations and requirements of the following organizations:
   1. National Electrical Manufacturers' Association (NEMA).
   2. Underwriters Laboratories (UL).

D. Welding Materials and Procedures: Conform to ASME Code and applicable state labor regulations.

E. Welders Certification: In accordance with ANSI/ASME Sec 9.

1.08 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

B. Above Ground Fuel Storage Dispensing Tanks: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

C. The day tank system, shall be designed and manufactured by a single supplier and be a standard product in serial production. The manufacturer shall have at least 10 years experience in the design and manufacture of these products.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Product Requirements: Product storage and handling requirements under provision of Division 01.

1.10 COORDINATION

A. Administrative Requirements: Requirements for coordination under provision of Division 01.

1.11 WARRANTY

A. Execution and Closeout Requirements: Product warranties and product bonds under provision Division 01.

B. Furnish 30 year manufacturer warranty for tanks.

C. Day Tanks: Supply a manufacturer's 2-year field service warranty which covers all parts and all labor for guarantee of parts and workmanship as specified herein.

PART 2 PRODUCTS

2.01 ABOVEGROUND FUEL OIL STORAGE TANK

A. Manufacturers:
   1. Anchorage Tank & Welding, Inc.
   2. Ace Tank.
   3. Greer Tank.
   4. Substitutions: Section 01 2513 - Product Substitutions.

B. Product Description: Provide a 3,000 gallon UL Listed above ground double-wall secondary containment tank. The tank shall consist of an inner and outer steel tank; the tank shall be a UL 142 listed and meet the standards of NFPA 30 and 30A. The entire tank system, including the skid and secondary containment, shall be listed by Underwriters Laboratories under UL® 142 Standard for Safety as a complete, indivisible unit. The skid mounted tank assembly shall bear the UL® listing mark.

C. Tank Configuration: Cylindrical.

D. Primary Tank: Single wall steel tank constructed in accordance with UL 142 not less than 3/16 inch thick.

E. Outer Tank: Single wall steel tank constructed in accordance with UL 142 not less than 3/16 inch thick.

F. Lifting Lugs: shall be attached at the top of the tank ends. Each eye shall be capable of supporting the empty weight of tank and skids without permanent distortion.

G. Tank skids: Tank skids shall be constructed according to UL standards. Skids shall be constructed to allow lifting of empty tank end or skidding of tank without distortion. The skid rails shall be constructed of structural steel beam and shall be listed as an integral part of the tank. Skid supports shall be constructed of plate steel, equal in thickness to the inner tank, with a 90 degree bent edge 1" wide on each side for structural support. Supports shall be placed directly under the inner tank heads and thereafter, evenly spaced along the tank, provided however, that such spacing shall not exceed 69". The skid supports shall be attached to a 12" wide saddle pad attached to the outer tank shell which is of sufficient length to encompass its bottom 120 degrees. A capped length of Schedule 80 pipe shall be attached to each end of the skid to function as a towbar when the tank is empty. The full 360 degrees of the towbar shall be encircled by the beam members.

H. Weld Joints: All joints on the inner and outer shell and the tank heads shall be that required by UL 142 listing. In addition, all non-structural external seams shall be seal welded before painting. All weld spatter shall be removed and all sharp edges shall be rounded and smoothed by grinding. Flat unflanged heads are not permitted on either the inner or outer tank

I. Tank Attachments and Penetrations: Piping penetrations shall be made through the top of the tank only. The secondary containment shall allow for the full recovery of a release into the annular space. An additional fitting shall be incorporated into the tank (typically located on the

top of the opposite end of the tank from the monitor port) to allow for flushing of any product which may accumulate as the result of a release or accidental fill of the annular space. Each tank shall be equipped with lifting lugs adequate for the safe handling of the tank during installation. Each lifting lug must be designed to support the total weight of the dual wall tank. A minimum of two lifting lugs shall be provided on tanks having a rated capacity of more than 1100 gallons.

J. Finish: Factory painted with marine grade epoxy. A two coat system shall be applied according to the manufacturer's recommendations. The first coat shall be a minimum 2 mil dry film thickness primer coat. A second coat shall be applied to a given total of 6 mils minimum dry film thickness. All exterior surfaces shall be cleaned and prepared by sandblasting in accordance with Steel Structures Painting SSPC-3 and thereafter, coated per the coating manufacturer's recommendations.

K. Material for all steel construction shall conform to ASTM-36. All pipe and fittings shall conform to schedule 40, seamless iron pipe. All pipe connections shall be screwed or welded except for the final connection to the tank which shall be an approved welded fitting.

L. Bottom Fill Package: The tank shall include a bottom filling connection and a spill containment vessel designed specifically for aboveground stationary storage tanks. The vessel shall employ a full diameter hinged and gasketed lid with a strong back and lockable latch. The bottom shall have both a 2" nipple to accommodate the specified overfill valve, and a 1" threaded opening for a drainback valve. Furnish fill containment assembly with capacity of not less than 20 gallons spill containment. Include quick disconnect hose coupling with dust plug, check valve, shut-off valve, ground stud, 1 gpm hand pump for spill containment with shut-off and check valve. Positive fill limiting valve set to activate at 90-95% tank capacity, liquid level clock gauge, flexible hose connection. Factory assembled piping and fittings.

M. Normal Vent: Furnish each compartment of primary tank with 2 inch updraft venting device exhausting upward at elevation of at least 12 feet aboveground. Size vent in accordance with NFPA 30.

N. Vent Cap: Upward "V" design, steel cap and body, removable 30 mesh brass screen. Slip on style with set screw. Grooved drain lip extended beyond base.

O. Emergency Vents: Furnish each compartment of primary tank with emergency vents sized in accordance with NFPA 30. Do not use access openings for emergency venting purposes. OPW 301 or equal.

P. Monitor Port: Minimum 2 inch steel pipe with locking cap to be used for detecting leaks between primary and outer tanks.

Q. Provide two spare 4" tappings on tank and 24" access manhole.

R. Drop Tube
   1. Lightweight aluminum tube, buna gasket and adaptors as necessary for fill box or sufficient length to extend to six inches above tank bottom

S. Accessories:
   1. Level Gage: Mechanical float activated level gage capable of indicating approximate fluid level in tank reading in feet and inches. Gauge to be readable up to 20 feet away within 1/8". Gauge to be able to be rotated 360 deg after mounting. Standard float to pass through a 2" opening. Body to be aluminum with stainless steel float and cable. Morrison Bros. Co. Fig 818 or equal.
   2. Tank Decals: Furnish warning and tank identification signs located prominently on tank following fire code requirements.
   3. Fill Alarm: Whistles type alarm to whistle while tank is filled. Stops whistling when fuel has reached capacity level. Cast iron with corrosion resistant finish. King fill alarm model 4516 or equal.
   4. Overfill prevention valve complete with tank adapter valve terminates flow of product when the liquid level reaches a preset warning level (90-95%). Valves to have built in bleed hole

to provide anti-syphoning protection. Valve to be rated for a maximum pressure of 100 psi. OPW 61fSTOP or equal.

5. Access Steps: Furnish galvanized access platform with working surface of minimum of 24 inches in width, 20 inches in length, and 36 inches below top of tank.

2.02 FUEL OIL DAY TANK

A. Manufacturers:
   1. Simplex.
   2. Pryco.
   3. Tramont.
   4. Substitutions: Section 01 2513 - Product Substitutions.

B. General: Provide a packaged design UL-142 double-wall secondary containment construction day tank with on-board supply duplex pumps drawing from a remote main source tank. Day tank shall be complete in all respects in order to provide a reliable source of fuel. Day tank shall provide an automatic, self-refilling fuel supply system.

C. The day tank shall be designed and supplied as an engineered system by the manufacturer. Each tank shall be of packaged design to include all inlet flow control devices, other valves, level controls, pump control, indicators, alarms and all other devices as required to form an integrated, functional system such that field installation is restricted largely to external piping, wiring and such intermediate devices that are required by code and/or good engineering practice to interconnect the bulk source of supply to the day tank, the day tank to the prime mover and to provide for external vents as per local codes and UL142, NFPA31 and NFPA37.

D. The system shall be for use with fuel oil as described by NFPA321, “Basic Classification of Flammable and Combustible Liquids”. As defined by this standard, the fuel supply system shall be for use with “combustible liquids”, those having a flash point at or above 100°F and further defined as class II or class III liquids. In no case shall a liquid defined as “flammable”, or as “class I” or as having a flash point less than 100°F be used. In every case, the system shall not be used or applied at a temperature in excess of the flash point of the contents. Electrical equipment used in the system shall be in accordance with NFPA30, section 5-7, wherein it states “For areas where class II or class III liquids only are stored or handled at a temperature below their flash points, the electrical equipment may be installed in accordance with provisions of NFPA70, National Electric Code, for ordinary locations...”

E. The system shall be designed and installed in accordance with applicable sections of NFPA30, NFPA31, NFPA37, UL80 and UL142. The day tank shall bear the label of Underwriters Laboratories standard 142 and UL508.

F. Day tank construction:
   1. All welded steel atmospheric tank of rectangular, double-wall secondary containment, welded construction built in accordance with codes and standards noted above for indoor use with fuel oil
   2. Pipe thread connections shall be provided for fuel oil supply from remote pump set, supply to prime mover, return from prime mover, overflow to main tank, vents, and drain with fire rated ball valve. A weatherproof, screened vent cap shall be provided as a loose item for field installation at the outdoor vent termination. A weighted type emergency vent cap shall be supplied installed on the primary tank and secondary containment emergency vent ports (100 gallon and larger).
   3. The tank shall be equipped with a welded steel channel base suitable for bolt attachment to a concrete pad
   4. The tank shall have interior corrosion inhibitor to deter corrosion prior to installation and use
   5. The exterior of the day tank shall receive a heavy-duty industrial anti-corrosion coating and be finish painted
   6. All day tank system components shall be protected by a removable or hinged steel equipment cover.
   7. Day tank shall be factory leak tested at 2.5 PSI.

8. The tank shall be steel double-wall secondary containment construction bearing the UL 142 label. The containment shall be equipped with a leak detector that shall activate the “leak” alarm described below. A drain with fire rated ball valve is to be supplied. The containment shall be equipped with a separate e-vent as required by UL 142.

G. Supply fire rated ball valves as follows:
   1. Day tank drain
   2. Secondary containment drain

H. Fuel delivery system: Provide installed upon the day tank, a duplex fuel oil pump and duplex pump controller with automatic alternator for supply of fuel from the main tank to the day tank.

I. Duplex pumps: 2.0 GPM at 1725 rpm, when operating with fuel oil having a viscosity of 32SSU.
   1. Direct drive, motor driven pumps coupled via flexible coupling.
   2. Motors to be TEFC construction, HP as required for pump at 50 PSI NEMA type B, continuous duty at 40°C, 1725 RPM, 120V AC, 60 hertz, 1.15 service factor
   3. Pumps to be directly driven, positive displacement, internal gear type with mechanical shaft seal and cast iron body, machined steel gears.
   4. Fire rated shutoff ball valves on pump inlets
   5. Pump check valve, spring-type, cast iron construction
   6. Flowswitch each pump
   7. Suction strainer, cast iron wye type fuel oil strainer on each pump suction
   8. Provide a piston type, 0.1 gallon per stroke hand pump installed and piped and equipped with fire-rated shutoff valves.
   9. Inlet flow control solenoid valve each pump. Stainless steel construction, with fire-rated bypass valve.
   10. Supply an overflow return pump at 150% minimum capacity, of supply pump and of identical construction. Add overflow return pump controller to paragraph 1.5 below.

J. Day tank level controller. A UL Listed, integrated design, digital level controller shall be supplied which provides differential level control for activation of pumps, duplex pump alternator, tank level indication, system alarms and manual operating controls. Level controller shall be self-contained as a unit within a NEMA4 enclosure integral with the day tank assembly.
   1. PLC based with 6-inch, color, touch-panel operator interface
   2. Dual level sensor input:
      a. 4-20mA continuous sensor, analog-to-digital input
      b. Point sensing float switches: low, refill start, refill stop, high, checkpoint for automatic cross check of sensors
   3. Leak sensor
   4. Spare I/O for options and design-build features
   5. MODBUS and Ethernet network compatible
   6. 4-20mA loop output for tank level
   7. Operator touch-panel interface functions:
      a. HOA switch
      b. Test
      c. Reset
      d. Alarm silence
      e. Numeric display of tank level in gallons (liters)
      f. Graphic condition display of tank level and pump/status/alarm condition
      g. Message indicators for status and alarm, including:
      h. Normal operation
      i. Pump running (fill, return, single or multiple pumps)
      j. Tank filling
      k. Loss of flow
      l. Low
      m. Critical low
      n. High

o. Critical high
p. Leak
q. Not in auto
r. Controller failure with specific message
s. Other messages as determined by design-build option configuration

8. Relay dry contact outputs for the following (5A, SPDT):
   a. Low alarms
   b. High alarms
   c. Leak
   d. Not in auto

K. Day tank testing:
   1. The day tank shall be supplied with manufacturers test certificates as below Tank test: pressure test, leak proof test and structural integrity/appearance test
   2. Level controller: operational test of level sensors, level indicator, level control, alarms, backup devices
   3. Pump: vacuum test, flow test, pressure test, leak proof test, ampere/voltage test, load test, overload test.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's recommendations.

B. Provide interties from daytank controls to remote pumping unit.

C. Extend vent from tank to exterior of building and end a minimum of twelve feet above grade.

END OF SECTION

SECTION 23 2116
HYDRONIC SPECIALTIES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Expansion Tanks.

B. Air vents.

C. Air Separators.

D. Strainers.

E. Flow Control valves.

F. Relief Valves.

G. Glycol System.

1.02 RELATED WORK

A. Section 23 0500 – Basic Mechanical Materials and Methods.

B. Section 23 0700 – Mechanical Insulation.

C. Section 23 2113 – Plumbing and Hydronic Piping.

1.03 REFERENCES

A. See Section 01 3300 – submittal procedures.

B. ANSI/ASME - Boilers and Pressure Vessels Code.

1.04 QUALITY ASSURANCE

A. Manufacturer: For each product specified, provide components by same manufacturer throughout.

1.05 SUBMITTALS

A. Submit product data under provisions of Section 23 0500 and Section 01 3300 Submittal Procedures.

B. Provide valve schedule for flow control valves and combination actuated ball valves/flow control valves.

1.06 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Division 01 General Requirements.

B. Include installation instruction, assembly views, lubrication instructions, and replacement parts list.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Section 01 6000 Materials and Equipment.

B. Store and protect products under provisions of Section 01 6000 Materials and Equipment.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS EXPANSION TANKS

A. Amtrol.

B. Taco.

C. Bell & Gossett.

D. Substitutions: Section 01 2513 - Product Substitutions.

2.02 EXPANSION TANKS

A. Construction: Welded steel, tested and stamped in accordance with Section 8D of ANSI/ASME Code; supplied with National Board Form U-1, rated for working pressure of 125 psig, with flexible EPDM diaphragm sealed into tank, and steel legs or saddles.

B. Accessories: Pressure gauge and air-charging fitting, tank drain; precharge to 12 psig.

2.03 ACCEPTABLE MANUFACTURERS - AIR SEPARATORS

A. Spirotherm.

B. Substitutions: Section 01 2513 - Product Substitutions.

2.04 AIR SEPARATORS

A. Fabricated of steel, rated for 150 psig design pressure and be selected for less than 1 foot of water pressure drop and velocity not to exceed 4 feet per second through the unit at specified GPM. Units to include internal copper coalescing medium to facilitate maximum air and dirt separation and suppress turbulence. Provide integral high capacity float actuated air vent a top of the tank. Units shall include a valved side tap to flush floating dirt or liquids and for quick bleeding of large amounts of air during system fill or refill. Units shall incorporate a removable lower head to facilitate removal of copper coalescing medium for inspection or cleaning. Units shall incorporate bottom blow-down with a valved and capped hose thread connection. Line connections shall be flanged. Dip Tube Fitting: For 125 psig operating pressure; to prevent free air collected in boiler from rising into system.

2.05 ACCEPTABLE MANUFACTURERS - AIR VENTS

A. Spirotherm.

B. Taco.

C. Amtrol.

D. Bell & Gossett.

E. Substitutions: Section 01 2513 - Product Substitutions.

2.06 AIR VENTS

A. Manual Type: Disk type vent with built-in check valve for manual or automatic operation, discs replaceable without draining system, 1/8 inch shank, rated at 50 psi; Hoffman No. 500 or equal.

B. Float Type: Brass or semi-steel body, copper float, stainless steel valve and valve seat; 1/8 inch NPT connection to atmosphere with drain piping suitable for system operating temperature and pressure; with isolating valve. Hoffman No. 79 or equal.

C. High Capacity Automatic Air Vent: Cast iron body, stainless steel and brass trim, EPDM diaphragm, rated for 250°F, 2 PSIG through 150 PSIG, ¾ inch system connection, 3/8 inch NPT connection to atmosphere with drain piping. Provide with isolation valve and strainer upstream of vent. Armstrong AAE-750 or equal.

2.07 ACCEPTABLE MANUFACTURERS - STRAINERS

A. Bell & Gossett.

B. Taco.

C. Armstrong.

D. Substitutions: Section 01 2513 - Product Substitutions.

2.08 STRAINERS

A. Size 2 inch and Under: See Paragraph 2.8 and 2.9.

B. Size 2-½ inch to 4 inch: Flanged iron body for 175 psig working pressure, Y pattern with 3/64 inch stainless steel perforated screen.

C. Size 5 inch and Larger: Flanged iron body for 175 psig working pressure, basket pattern with 1/8 inch stainless steel perforated screen.

2.09 ACCEPTABLE MANUFACTURERS - RELIEF VALVES

A. Watts.

B. Taco.

C. Bell & Gossett.

D. Substitutions: Section 01 2513 - Product Substitutions.

2.10 RELIEF VALVES

A. Bronze body, Teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, capacities ASME certified and labeled.

2.11 BALANCE VALVES

A. Not permitted, use flow control valves for balancing service.

2.12 ACCEPTABLE MANUFACTURERS – FLOW CONTROL VALVES, COMBINATION STRAINER/ISOLATION VALVES, COMINATION ACTUATED BALL VALVES AND FLOW CONTROL VALVES

A. Griswold.

B. FlowCon.

C. Hydronic Components, Inc., HCI

D. Substitutions: Section 01 2513 - Product Substitutions.

2.13 FLOW CONTROL VALVES, COMBINATION STRAINER/ISOLATION VALVES, COMINATION ACTUATED BALL VALVES AND FLOW CONTROL VALVES

A. Flow Control Valves

1. General Specifications
   a. Automatic flow control valve cartridges shall automatically control flow rates with ?5% accuracy over an operating pressure differential range of at least 14 times the minimum required for control. Four operating pressure ranges shall be available with the minimum range requiring less than 2 PSID to actuate the mechanism.
   b. Valve internal control mechanism shall consist of a stainless steel one-piece cartridge with segmented port design and full travel linear coil spring.
   c. All flow control valve cartridges shall be warranted by the manufacturer for five years from date of sale.
2. Flow Control Combination Valves Up to 2"
   a. Combo Valve, size 1/2" and 3/4", shall be brass alloy body (ASTM B584) rated at no less than 300 PSI/250 Deg F; shall include two union ends with interchangeable end pieces for either inlet or outlet of valve body.
   b. Combo Valve, size 1" shall be brass alloy body (ASTM B584) rated at no less than 300 PSI/250 Deg F; shall include two union ends with interchangeable end pieces for either inlet or outlet of valve body.
   c. Combo Valve, size 1-1/4" and 1-1/2", shall be brass alloy body (ASTM B584)rated at no less than 300 PSI/250 Deg F; shall include two union ends with interchangeable end pieces for either inlet or outlet of valve body.
   d. Combo Valves, sizes 1-1/2 through 2" shall be gray iron (ASTM A 126-61T Class 30) rated at no less than 300 PSI/275 Deg F. These sizes shall include removable threaded flange end connections and handle ball valve as standard equipment.
   e. Dual pressure or pressure/temperature test valves for verifying accuracy of flow performance shall be provided for all valve sizes.
3. Flow Control Valves Over 2"
   a. Class 150 Flange End Valves shall consist of steel pipe with flange ends, and stainless steel flow control cartridge assembly; 230 PSIG / 300º F shall be supplied with dual pressure or pressure/temperature test valves for verifying accuracy of flow performance for all sizes; shall have flange ends compatible with ANSI B 16.5-1968 150 lb. Steel flanges; shall be permanently marked to show direction of flow, shall have body tag to indicate model number and flow rate.
   b. Class 300 Flange End Valves shall consist of steel pipe with flange ends, and stainless steel flow control cartridge assembly; 655 PSIG / 300º F shall be supplied with dual pressure or pressure/temperature test valves for verifying accuracy of flow performance for all sizes; shall have flange ends compatible with ANSI B 16.5-1968

300 lb. Steel flanges; shall be permanently marked to show direction of flow, shall have body tag to indicate model number and flow rate.

B. Combination Strainer/Isolation Valves
   1. 1/2" through 2" strainer shall be Y-type configuration made of bronze with a brass cap. 2-1/2", 3", 4", and 6" Y-strainer shall be made of iron (ASTM A126-61T, Class 30) Maximum pressure rating of 300 PSI.
   2. Strainer screen shall be stainless steel and rated for 20 mesh, easily accessible for cleaning.
   3. Y-Strainer shall be offered with blow down and pressure/temperature test valve options.
   4. Strainer shall include a 600 WOG manual isolation ball valve.

C. Combination Actuated Ball Valves and Flow Limiting Cartridge (Automizer)
   1. Combination valve shall include a Flow Limiting Cartridge, Actuated Ball Valve, and Manual Isolation Ball in a single valve housing.
   2. Valve housing shall consist of forged brass, rated at no less than 360 psi at 250 Deg F.
   3. Valve shall have a union end connection that includes a factory installed manual air vent to allow for venting of the coil or heat pump.
   4. Automatic Flow Limiting Cartridge (FLC)
      a. FLC shall automatically control flow rates with ±5% accuracy over an operating pressure differential range of at least 14 times the minimum required for control. Three operating pressure ranges shall be available with the minimum range requiring less than 3 PSID to actuate the mechanism.
      b. Valve internal control mechanism shall consist of a stainless steel one-piece cartridge with segmented port design and full travel linear coil spring.
      c. Dual pressure/temperature test valves for verifying the pressure differential across the cartridge and system shall be standard.
      d. Manufacturer shall be able to provide certified independent laboratory tests verifying accuracy of performance
   5. Actuated Ball Valve
      a. Valve ball shall consist of chemically plated nickel brass.
      b. Actuator stem shall be removable/replaceable without removing valve from line.
      c. Manufacturer shall be able to provide ball insert to make flow control equal percentage.
      d. Valve shall have EPDM O-Rings behind ball seals to allow for a minimum close-off pressure of 100 psi with 35 in-lbs of torque for 1/2" to 1-1/2" sizes.
      e. Actuator shall provide minimum torque required for full valve shutoff position.
      f. Provide valve actuator, coordinate signal and voltage requirements with supplier of Building Automation System, Section 23 09 23. Verify compatible signal and voltage of actuator prior to submittal.
   6. Isolation Ball Valve
      a. Valve shall include a 600 WOG manual isolation ball valve.

D. Accessories
   1. Identification tags shall be available for all valves; tags shall be indelibly marked with flow rate, model number, zone identification: tags shall be 3" x 3" aluminum.
   2. Pressure/temperature test valves or pressure only test valves shall be available at 1/4" NPT for measuring pressure or temperature in fluid systems.

2.14 GLYCOL SYSTEM

A. 55 US gallon HDPE storage/mixing tank with cover; pump suction hose with inlet strainer; pressure pump with thermal cut-out; integral pressure switch; integral check valve; cord and plug; pre-charged accumulator tank with EPDM diaphragm; manual diverter valve for purging air and agitating contents of storage tank; 10 to 25 psi pressure adjustable regulating valve complete with pressure gauge; integral replaceable strainer; built-in check valve; union connection; 36" long flexible connection hose with check valve; low level pump cut-out. Pressure pump shall be capable of running dry without damage. Provide unit with RIA10-1-

SAA, Low pressure alarm panel with Remote monitoring dry contracts. Unit shall be completely pre-assembled and certified by a recognized testing.

B. Glycol Solution: Inhibited propylene glycol and water solution factory pre-mixed 50-50, suitable for operating temperatures of -23º F. The glycol shall be delivered to site in sealed containers, provide with color dye in bright red. DOWFROST HD as manufactured by DOW Chemical Company or approved equal. Provide new glycol solution, re-use of the existing glycol in the school is not acceptable.

PART 3 EXECUTION

3.01 INSTALLATION AND APPLICATION

A. Install specialties in accordance with manufacturer's instructions to permit intended performance.

B. Support tanks inside building from building structure, in accordance with the IBC and manufacturer's instructions.

C. Provide manual air vents at system high points and as indicated.

D. For automatic air vents, provide vent tubing to nearest drain. Where a drain is not available run discharge to a 12"x12"x6" high galvanized, water tight pan located in an accessible location.

E. Provide valved drain and hose connection on strainer blow down connection.

F. Provide relief valves on pressure tanks, low pressure side of reducing valves, and heat exchangers.

G. Select system relief valve capacity so that it is greater than make-up pressure reducing valve capacity. Select equipment relief valve capacity to exceed rating of connected equipment.

H. Pipe relief valve outlet to nearest floor drain or glycol tank for glycol systems.

I. Where one line vents several relief valves, make cross sectional area equal to sum of individual vent areas.

J. Clean and flush glycol system before adding glycol solution.

K. Provide new glycol solution, re-use of the existing glycol is not acceptable.

L. Feed glycol solution to system through make-up line with pressure regulator, venting system high points. Set to fill at 12 psig. Pressure system cold at 5 psig, adjust when hot to 12 psig.

M. Perform tests determining strength of glycol and water solution and submit written test results.

3.02 AIR VENT APPLICATION SCHEDULE

Location	Type
Terminal heating units, mains below	Manual
Terminal heating units, mains above	None
Heating mains, at high points in system	Automatic
Combination air separator/strainers	High capacity

Note: For terminal heating units, mains above unit, install branch piping connections at bottom of mains or 45° from bottom to allow air migration to mains.

END OF SECTION

SECTION 23 2123
HYDRONIC PUMPS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Variable speed in-line system circulators.
   2. In-line system circulators.
   3. In-line circulators.

B. Related Sections:
   1. Section 23 0503 - Hydronic Piping: Execution requirements for connection to pumps specified by this section.
   2. Section 23 0513 - Common Motor Requirements for HVAC Equipment: Product requirements for motors for placement by this section.
   3. Section 23 0523 - General-Duty Valves for HVAC Piping: Product requirements for valves used in hydronic piping systems.
   4. Section 23 0548 - Vibration and Seismic Controls for HVAC Piping and Equipment: Product requirements for vibrations isolators installed with pumps.
   5. Section 23 2116 - Hydronic Piping Specialties: Product and execution requirements for piping specialties installed in hydronic systems adjacent to pumps.
   6. Division 26 - Equipment Wiring Connections: Execution requirements for electrical connections to pumps specified by this section.

1.02 REFERENCES

A. National Electrical Manufacturers Association:
   1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

B. Underwriters Laboratories Inc.:
   1. UL 778 - Motor Operated Water Pumps.

1.03 PERFORMANCE REQUIREMENTS

A. See Section 01 3300 – submittal procedures.

B. Provide pumps to operate at system fluid temperatures indicated on Drawings without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

1.04 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacture, assembly, and field performance of pumps with minimum three years experience.

B. Provide pumps with UL listing.

1.05 SUBMITTALS

A. Section 01 3300 - Submittal Procedures.

B. Product Data: Submit certified pump curves showing performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable. Include electrical characteristics and connection requirements. Submit also, manufacturer model number, dimensions, service sizes, and finishes.

C. Manufacturer's Installation Instructions: Submit application, selection, and hookup configuration with pipe and accessory elevations. Submit hanging and support requirements and recommendations.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.06 CLOSEOUT SUBMITTALS

A. Division 01 - Execution and Closeout Requirements: Closeout procedures.

B. Operation and Maintenance Data: Submit installation instructions, servicing requirements, assembly views, lubrication instructions, and replacement parts list.

1.07 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

B. Installer: Company specializing in performing Work of this section with minimum three years experience and approved by manufacturer.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Section 01 6000 Materials and Equipment: Product storage and handling requirements.

B. Protect systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.09 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.10 WARRANTY

A. Division 01 - Execution and Closeout Requirements: Product warranties and product bonds.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Grundfos.

2.02 VARIABLE SPEED IN-LINE SYSTEM CIRCULATORS

A. The pumps shall be of the single stage, in-line design with suction and discharge port flanges of identical diameter.

B. The head-capacity curve shall have a steady rise in head from maximum to minimum flow within the preferred operating region.

C. The pumps shall have the following features:
   1. The pump housing shall have a stainless steel/teflon neck ring to minimize recirculation and increase pump efficiency.
   2. The impellers shall be laser welded stainless to obtain maximum efficiency. Cast impellers and composite material shall not be acceptable. The impellers shall be secured to the shaft with a split cone and a nut.
   3. The suction and discharge flanges shall be tapped and drilled (1/4” NPT) to allow gauge installation on the pump.
   4. The pump shall have unbalanced mechanical seal. The mechanical seal shall be manufactured by the same manufacturer. The seal faces shall be tungsten carbide/carbon with EPDM rubber bellows. (For glycol applications reduced face o-ring seal with tungsten carbide vs. tungsten carbide faces shall be used)
   5. Pump Construction: Pump housing and motor stool - Cast iron EN-JL-1040; Impellers, rotor can, rotor cladding - 304 Stainless Steel; Shaft - 431 Stainless Steel; Coupling - Cast iron, 2 piece rigid coupling; Coupling guard - 304 stainless steel; Vent screw –Brass.

D. For open loop applications pump housing and motor adapter shall be bronze.

E. All pumps shall be tested per ISO 9906 Annex A.

F. Pump housing and pump adapter shall be electro coated high corrosion resistance and paint shall be cured at minimum 375 Deg F.

G. Motor: Each motor shall be of the asynchronous squirrel cage design and tested with the pump as one unit by the same manufacturer. The motor enclosure shall be TEFC. The motor insulation shall be Class F with temperature rise of Class B.

H. Integrated Variable Speed Drive: The VSD shall be designed and manufactured by the same manufacturer as the pump. The VSD shall be factory installed on the motor. The VSD enclosure class shall be IP44. The VSD shall have the human interface options of:
   1. Control panel on the VSD face
   2. Building Automation Systems Interface
   3. The VSD shall be able controlled by the signals from a single sensor. The acceptable sensors signal is 4 to 20 mA. or 10-10 Vdc signals.
   4. VSD shall allow one digital input and one set point input

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F. Pump housing and pump adapter shall be electro coated high corrosion resistance and paint shall be cured at minimum 375 Deg F.

G. Motor: Each motor shall be of the asynchronous squirrel cage design and tested with the pump as one unit by the same manufacturer. The motor enclosure shall be TEFC. The motor insulation shall be Class F with temperature rise of Class B.

2.04 IN-LINE CIRCULATORS

A. Type: Maintenance free, self-lubricated, 3 speed industrial/commercial single stage, direct drive circulator.

B. Casing: Cast iron.

C. Impeller: Type 304 stainless steel.

D. Bearings: Upper and lower radial bearings to be aluminum oxide ceramic, tungsten carbide shaft bearing surfaces.

E. Shaft: Stainless steel with type 430F.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install pumps in accordance with manufacturer's instructions.

B. Provide access space around pumps for service. Provide no less than minimum as recommended by manufacturer.

C. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

D. Decrease from line size with long radius reducing elbows or reducers.

E. Support piping adjacent to pump such that no weight is carried on pump casings. In-line pumps are supported by adjacent piping.

F. Lubricate pumps before start-up.

G. Adjust pump control settings at peak flow, coordinate with balancer and control contractor, enable automatic control of pump speed and head.

3.02 VARIABLE SPEED DRIVE PUMP START-UP

A. Configure variable speed pump to automatically adjust pump speed based on system demand. Coordinate with balancer maximum pump curve settings, adjust pump programming to provide maximum flow as determined during system balance. Adjust pump control settings at peak flow, coordinate with balancer and control contractor, enable automatic control of pump speed and head.

3.03 FIELD QUALITY CONTROL

A. Section 01 4000 Quality Control (Testing) Requirements: Field inspecting, testing, adjusting, and balancing.

END OF SECTION

SECTION 23 3100
HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Low pressure ducts.
   2. Medium and high pressure ductwork.
   3. Casings.
   4. Acoustical ductwork.
   5. Duct cleaning.

1.02 RELATED SECTIONS

A. Division 09 - Painting and Coating: Execution requirements for Weld priming, weather resistant, paint or coating specified by this section.

B. Section 23 0529 - Hangers and Supports for HVAC Piping and Equipment: Product requirements for hangers, supports and sleeves for placement by this section.

C. Section 23 3300 - Air Duct Accessories: Product requirements for duct accessories for placement by this section.

D. Section 23 3500 – Dust Collection Systems: Ductwork for Dust Collection Systems.

1.03 REFERENCES

A. See Section 01 3300 – submittal procedures.

B. ASTM International:
   1. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
   2. ASTM A90/A90M - Standard Test Method for Weight Mass of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings.
   3. ASTM A167 - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
   4. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
   5. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
   6. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

C. National Fire Protection Association:
   1. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilating Systems.
   2. NFPA 90B - Standard for the Installation of Warm Air Heating and Air Conditioning Systems.

D. Sheet Metal and Air Conditioning Contractors:
   1. SMACNA - HVAC Air Duct Leakage Test Manual.
   2. SMACNA - HVAC Duct Construction Standard - Metal and Flexible.

E. Underwriters Laboratories Inc.:
   1. UL 181 - Factory-Made Air Ducts and Connectors.

1.04 DEFINITIONS

A. Duct Sizes: Inside clear dimensions. For lined ducts, maintain sizes inside lining.

B. Low Pressure: Three pressure classifications: ½ inch WG positive or negative static pressure and velocities less than 2,000 fpm; 1 inch WG positive or negative static pressure and velocities less than 2,500 fpm and 2 inch WG positive or negative static pressure and velocities less than 2,500 fpm.

C. Medium Pressure: Three pressure classifications: 3 inch WG positive or negative static pressure and velocities less than 4,000 fpm, 4 inch WG positive static pressure and velocities

greater than 2,000 fpm, 6 inch WG positive static pressure and velocities greater than 2,000 fpm.

D. High Pressure: 10 inch WG positive static pressure and velocities greater than 2,000 fpm.

1.05 PERFORMANCE REQUIREMENTS

A. Variation of duct configuration or sizes other than those of equivalent or lower loss coefficient is not permitted except by written permission. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts.

1.06 SUBMITTALS

A. Section 01 3300 - Submittal Procedures.

B. Shop Drawings: Submit duct fabrication drawings, drawn to scale not smaller than 1/8” inch equals 1 foot, on drawing sheets same size as Contract Documents, indicating:
   1. Fabrication, assembly, and installation details, including plans, elevations, sections, details of components, and attachments to other work.
   2. Duct layout, indicating pressure classifications and sizes in plan view. For exhaust duct systems, indicate classification of materials handled as defined in this section.
   3. Fittings.
   4. Reinforcing details and spacing.
   5. Seam and joint construction details.
   6. Penetrations through fire rated and other walls.
   7. Terminal unit and coil installations.
   8. Hangers and supports, including methods for building attachment, vibration isolation, and duct attachment.

C. Product Data: Submit data for duct materials.

D. Test Reports: Indicate pressure tests performed. Include date, section tested, test pressure, and leakage rate, following SMACNA HVAC Air Duct Leakage Test Manual.

E. Manufacturer's Installation Instructions: Submit special procedures for glass fiber ducts.

1.07 CLOSEOUT SUBMITTALS

A. Division 01 - Execution and Closeout Requirements: Closeout procedures.

B. Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

1.08 QUALITY ASSURANCE

A. Perform Work in accordance with SMACNA - HVAC Duct Construction Standards - Metal and flexible.

B. Construct ductwork to NFPA 90A and NFPA 90B standards.

1.09 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

B. Installer: Company specializing in performing Work of this section with minimum three years experience approved by manufacturer.

1.10 ENVIRONMENTAL REQUIREMENTS

A. Section 01 5719 - Temporary Environmental Controls - Product Requirements.

B. Do not install duct sealant when temperatures are less than those recommended by sealant manufacturers.

C. Maintain temperatures during and after installation of duct sealant.

1.11 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.12 WARRANTY

A. Division 01 - Execution and Closeout Requirements: Product warranties and product bonds.

PART 2 - PRODUCTS

2.01 DUCT MATERIALS

A. General: Non-combustible or conforming to requirements for Class 1 air duct materials, or UL 181.

B. Steel Ducts: ASTM A527 galvanized steel sheet, lock-forming quality, having zinc coating of 1.25 oz. per sq. ft. for each side in conformance with ASTM A90.

C. Stainless Steel Ducts: ASTM A167, Type 304.

D. Spiral Ductwork: All spiral duct and fittings shall be manufactured from G-60 galvanized steel meeting ASTM-A924 and A653 requirements.

E. Fasteners: Rivets, bolts, or sheet metal screws.

F. Sealant: Non-hardening, water resistant, fire resistive, compatible with mating materials; liquid used alone or with tape, or heavy mastic.

G. Hanger Rod: Steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

2.02 LOW PRESSURE DUCTWORK

A. Fabricate and support in accordance with SMACNA HVAC Duct Construction Standards and ASHRAE handbooks, except as indicated. Provide duct material, gauges, reinforcing, and sealing for operating pressures indicated.

B. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts. No variation of duct configuration or sizes permitted except by written permission.

C. Construct T's, bends, and elbows with radius of not less than 1-½ times width of duct on centerline. Where not possible and where rectangular elbows are used, provide [air foil] turning vanes. Where acoustical lining is indicated, provide turning vanes of perforated metal with glass fiber insulation.

D. Increase duct sizes gradually, not exceeding 15º divergence wherever possible. Divergence upstream of equipment shall not exceed 30º; convergence downstream shall not exceed 45º.

E. Provide easements where low pressure ductwork conflicts with piping and structure. Where easements exceed 10 percent duct area, split into two ducts maintaining original duct area.

F. Connect flexible ducts to metal ducts with draw bands.

G. Use crimp joints with or without bead for joining round duct sizes 12 inch and smaller with crimp in direction of air flow.

H. Use double nuts and lock washers on threaded rod supports.

2.03 MEDIUM AND HIGH PRESSURE DUCTWORK

A. Fabricate and support in accordance with SMACNA HVAC Duct Construction Standards and ASHRAE handbooks, except as indicated. Provide duct material, gauges, reinforcing, and sealing for operating pressures indicated.

B. Construct T's, bends, and elbows with radius of not less than 1-½ times width of duct on centerline. Where not possible and where rectangular elbows are used, provide air foil turning vanes. Where acoustical lining is required, provide turning vanes of perforated metal with glass fiber insulation. Weld in place.

C. Transform duct sizes gradually, not exceeding 15º divergence and 30º convergence.

D. Fabricate continuously welded medium and high pressure round and oval duct fittings two gauges heavier than duct gauges indicated in SMACNA Standard. Joints shall be minimum 4 inch cemented slip joint, brazed or electric welded. Prime coat welded joints.

E. Provide standard 45 degree lateral wye takeoffs unless otherwise indicated where 90 degree conical tee connections may be used.

2.04 CASINGS

A. Fabricate casings in accordance with SMACNA HVAC Duct Construction Standards and construct for operating pressures indicated.

B. Mount floor mounted casings on 4 inch high concrete curbs. At floor, rivet panels on 8 inch centers to angles. Where floors are acoustically insulated, provide liner of 18 gauge galvanized expanded metal mesh supported at 12 inch centers, turned up 12 inches at sides with sheet metal shields.

C. Reinforce door frames with steel angles tied to horizontal and vertical plenum supporting angles. Install hinged access doors where indicated or required for access to equipment for cleaning and inspection.

D. Fabricate acoustic casings with reinforcing turned inward. Provide 16 gauge back facing and 22 gauge perforated front facing with 3/32 inch diameter holes on 5/32 inch centers. Construct panels 3 inches thick packed with 4.5 lb./cu. ft. minimum glass fiber media, on inverted channels of 16 gauge. .

2.05 EXHAUST HOOD DUCTWORK

A. Construct duct in accordance with medium pressure standards listed above. Fume hood duct shall be Type 316L stainless steel. Provide duct material, gauges, reinforcing, and sealing for operating pressures indicated. All duct shall be welded liquidtight.

2.06 FLEXIBLE DUCTS

A. Product Description: UL 181, Class 0, interlocking spiral of aluminum foil.
   1. Pressure Rating: 2 inches wg positive or 1.5 negative for low pressure ducts and 15 inches wg positive or negative for medium high pressure ducts.
   2. Maximum Velocity: 5000 fpm.
   3. Temperature Range: -100 degrees F to 432 degrees F.

2.07 INSULATED FLEXIBLE DUCTS

A. Product Description: UL 181, Class 0, interlocking spiral of aluminum foil; fiberglass insulation; aluminized vapor barrier film.
   1. Pressure Rating: Same as 2.2A.
   2. Maximum Velocity: 5000 fpm.
   3. Temperature Range: -20 degrees F to 250 degrees F.
   4. Thermal Conductivity: Maximum 0.23 at 75 degrees F.

2.08 ACCOUSTICAL DUCTWORK

A. Construct outer duct in accordance with medium pressure listed above. Provide 22 gauge perforated interior facing with 3/32 inch holes on 5/32 inch centers. Construct ductwork 1 inch thick packed with duct liner in accordance with Section 23 07 00. Duct liner shall support inner facing with no voids.

B. Joints shall allow for continuous interior facing and liner.

C. All dimensions are inside clear dimensions.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Division 01 - Administrative Requirements: Coordination and project conditions.

B. Verify sizes of equipment connections before fabricating transitions.

3.02 INSTALLATION

A. Install and seal ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.

B. During construction, install temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

C. Use crimp joints with or without bead or beaded sleeve couplings for joining round duct sizes 8 inch and smaller.

D. Install duct hangers and supports in accordance with Section 23 0529.

E. Use double nuts and lock washers on threaded rod supports.

F. Connect flexible ducts to metal ducts with draw bands.

3.03 INTERFACE WITH OTHER PRODUCTS

A. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

B. Install openings in ductwork where required to accommodate thermometers and controllers. Install pitot tube openings for testing of systems. Install pitot tube complete with metal can with spring device or screw to prevent air leakage. Where openings are provided in insulated ductwork, install insulation material inside metal ring.

C. Connect diffusers or light troffer boots to low pressure ducts with 5 feet maximum length of flexible duct held in place with strap or clamp.

D. Connect air outlets and inlets to supply ducts with five foot maximum length of flexible duct. Do not use flexible duct to change direction.

3.04 CLEANING

A. Division 01 - Execution and Closeout Requirements: Final cleaning.

B. Clean duct system and force air at high velocity through duct to remove accumulated dust. To obtain sufficient air flow, clean one half of system completely before proceeding to other half. Protect equipment with potential to be harmed by excessive dirt with temporary filters, or bypass during cleaning.

3.05 SCHEDULES

A. Ductwork Material Schedule:

AIR SYSTEM	MATERIAL
Supply	Steel
Supply, Explosed	Spiral, Steel
Return and Relief	Steel
General Exhaust	Steel
Outside Air Intake	Steel
Combustion Air	Steel
Fume Hood Exhaust	Stainless Steel

END OF SECTION

SECTION 23 3300
AIR DUCT ACCESSORIES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Volume control dampers.
   2. Backdraft dampers.
   3. Air turning devices.
   4. Flexible duct connections.
   5. Duct access doors.
   6. Duct test holes.
   7. Turning vanes.
   8. Sound Attenuators.

1.02 RELATED SECTIONS

A. Section 23 0923 - Direct-Digital Control System for HVAC: Execution and Product requirements for connection and control of Combination Smoke and Fire Dampers for placement by this section.

B. Section 23 3100 - HVAC Ducts and Casings: Requirements for duct construction and pressure classifications.

C. Division 26 - Equipment Wiring Connections: Execution requirements for connection of electrical Combination Smoke and Fire Dampers specified by this section.

1.03 REFERENCES

A. See Section 01 3300 – submittal procedures.

B. Air Movement and Control Association International, Inc.:
   1. AMCA 500 - Test Methods for Louvers, Dampers, and Shutters.

C. ASTM International:
   1. ASTM E1 - Standard Specification for ASTM Thermometers.

D. National Fire Protection Association:
   1. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilating Systems.

E. Sheet Metal and Air Conditioning Contractors:
   1. SMACNA - HVAC Duct Construction Standard - Metal and Flexible.

1.04 SUBMITTALS

A. Section 01 3300 - Submittal Procedures.

B. Shop Drawings: Indicate for shop fabricated assemblies including volume control dampers and duct access doors.

C. Product Data: Submit data for shop fabricated assemblies and hardware used.

D. Product Data: Submit for the following. Include where applicable electrical characteristics and connection requirements.
   1. Backdraft dampers.
   2. Flexible duct connections.
   3. Volume control dampers.
   4. Duct access doors.
   5. Duct test holes.

E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.05 CLOSEOUT SUBMITTALS

A. Division 01 - Execution and Closeout Requirements: Closeout procedures.

B. Project Record Documents: Record actual locations of access doors.

1.06 QUALITY ASSURANCE

A. Dampers tested, rated and labeled in accordance with the latest UL requirements.

B. Damper pressure drop ratings based on tests and procedures performed in accordance with AMCA 500.

1.07 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Section 01 6000 - Materials and Equipment: Product storage and handling requirements.

B. Protect dampers from damage to operating linkages and blades.

C. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly indicating manufacturer and material.

D. Storage: Store materials in a dry area indoor, protected from damage.

E. Handling: Handle and lift dampers in accordance with manufacturer's instructions. Protect materials and finishes during handling and installation to prevent damage.

1.09 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.10 COORDINATION

A. Division 01 - Administrative Requirements: Coordination and project conditions.

B. Coordinate work where appropriate with building control work.

1.11 WARRANTY

A. Division 01 - Execution and Closeout Requirements: Product warranties and product bonds.

1.12 EXTRA MATERIALS

A. Division 01 - Execution and Closeout Requirements: Spare parts and maintenance products.

PART 2 PRODUCTS

2.01 BACK-DRAFT DAMPERS

A. Manufacturers:
   1. Penn.
   2. Ruskin.
   3. Tuttle & Bailey.
   4. Substitutions: Section 01 2513 - Product Substitutions.

B. Product Description: Multi-Blade, back-draft dampers: Parallel-action, gravity-balanced, Galvanized 16 gage thick steel, or extruded aluminum. Blades, maximum 6 inch width, center pivoted, with felt or flexible vinyl sealed edges. Blades linked together in rattle-free manner with 90-degree stop, steel ball bearings, and plated steel pivot pin. Furnish dampers with adjustment device to permit setting for varying differential static pressure.

2.02 DUCT ACCESS DOORS

A. Manufacturers:
   1. Duro-Dyne.
   2. Ruskin.
   3. Hart & Cooley.
   4. Substitutions: Section 01 2513 - Product Substitutions.

B. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated on Drawings.

C. Fabrication: Rigid and close fitting of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ductwork, furnish minimum 1 inch thick insulation with sheet metal cover.
   1. Less than 12 inches square, secure with sash locks.
   2. Up to 18 inches Square: Furnish two hinges and two sash locks.
   3. Up to 24 x 48 inches: Three hinges and two compression latches with outside and inside handles.
   4. Larger Sizes: Furnish additional hinge.
   5. Access panels with sheet metal screw fasteners are not acceptable.

2.03 VOLUME CONTROL DAMPERS

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated on Drawings.

B. Splitter Dampers:
   1. Material: Same gage as duct to 24 inches size in both dimensions, and two gages heavier for sizes over 24 inches.
   2. Blade: Fabricate of single thickness sheet metal to streamline shape, secured with continuous hinge or rod.
   3. Operator: Minimum 1/4 inch diameter rod in self aligning, universal joint action, flanged bushing with set screw.
   4. Single Blade Dampers: Fabricate for duct sizes up to 6 x 30 inch.

C. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 x 72 inch. Assemble center and edge crimped blades in prime coated or galvanized frame channel with suitable hardware.

D. End Bearings: Except in round ductwork 12 inches and smaller, furnish end bearings. On multiple blade dampers, furnish oil-impregnated nylon or sintered bronze bearings. Furnish closed end bearings on ducts having pressure classification over 2 inches wg.

E. Quadrants:
   1. Furnish locking, indicating quadrant regulators on single and multi-blade dampers.
   2. On insulated ducts mount quadrant regulators on standoff mounting brackets, bases, or adapters.
   3. Where rod lengths exceed 30 inches furnish regulator at both ends.

2.04 FLEXIBLE DUCT CONNECTIONS

A. Manufacturers:
   1. Duro-Dyne.
   2. Substitutions: Section 01 2513 - Product Substitutions Requirements.

B. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated on Drawings.

C. Connector: Fabric crimped into metal edging strip.
   1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric conforming to NFPA 90A, minimum density 20 oz per sq yd.
   2. Net Fabric Width: Approximately 3 inches wide.

2.05 DUCT TEST HOLES

A. Permanent Test Holes: Factory fabricated, air tight flanged fittings with screw cap. Furnish extended neck fittings to clear insulation.

2.06 CONTROL DAMPERS

A. Manufacturers:
   1. Ruskin.
   2. Tamco
   3. Substitutions: Section 01 2513 - Product Substitutions.

B. Extruded aluminum damper frame shall not be less than .080" in thickness. Damper frame shall be insulated with polystyrofoam on three sides if "Installed in Duct" type and on four sides if "Flanged to Duct" type.

C. Blades to be extruded aluminum profiles, internally insulated with expanded polyurethane foam and shall be thermally broken. Complete blade shall have an insulating factor of R-2.29 and a temperature index of 55.

D. Blade seals shall be of extruded EPDM. Frame seals shall be of extruded silicone. Seals to be secured in an integral slot within the aluminum extrusions.

E. Linkage hardware shall be installed in the frame side and constructed of aluminum and corrosion-resistant, zinc-plated steel, complete with cup-point trunnion screws for a slip-proof grip.

F. Dampers are to be designed for operation in temperatures ranging between -40°F and 185°F.

G. Dampers shall be available with either opposed blade action or parallel blade action. Provide opposed blade dampers for modulating damper applications and parallel blade damper action for open/closed damper applications.

H. Leakage shall not exceed 3 cfm/ft² against 1" w.g. differential static pressure.

I. Pressure drop of a fully open 48" x 48" damper shall not exceed .03" w.g. at 1000.

J. Dampers shall be made to size required without blanking off free area.

K. Dampers shall be available in two mounting types: i.e., "Installed in Duct" or "Flanged to Duct".

PART 3 EXECUTION

3.01 EXAMINATION

A. Division 01 - Administrative Requirements: Coordination and project conditions.

B. Verify rated walls are ready for fire damper installation.

C. Verify ducts and equipment installations are ready for accessories.

D. Check location of air outlets and inlets and make necessary adjustments in position to conform to architectural features, symmetry, and lighting arrangement.

3.02 INSTALLATION

A. Install accessories in accordance with manufacturer's instructions.

B. Install in accordance with NFPA 90A, and follow SMACNA HVAC Duct Construction Standards - Metal and Flexible. Refer to Section 23 3100 for duct construction and pressure class.

C. Provide balancing dampers at points on low pressure supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Use splitter dampers only where indicated. Locate dampers a minimum 15 feet upstream of all air inlets and outlets.

D. Provide balancing dampers on medium and high pressure systems where indicated.

E. Provide fire dampers at locations indicated, where ducts and outlets pass through fire rated components, and where required by authorities having jurisdiction. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.

F. Demonstrate re-setting of fire dampers to authorities having jurisdiction and Owner's representative.

G. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.

H. Provide flexible connections immediately adjacent to equipment in ducts associated with fans and motorized equipment. Cover connections to medium and high pressure fans with leaded vinyl sheet, held in place with metal straps.

I. Provide duct test holes where indicated and required for testing and balancing purposes.

J. Provide double width turning vanes at all constant cross-section rectangular duct elbows at 2" spacing across elbow diagonal. Provide at rectangular reducing elbows single width turning vanes with trailing edge sat 2" spacing across elbow diagonal.

K. Provide acoustical turning vanes at 2" spacing across elbow diagonal where indicated.

L. Access Doors: Install access doors at the following locations and as indicated on Drawings:
   1. Upstream of each reheat coil.
   2. Before and after each duct mounted filter.
   3. Before and after each duct mounted coil.
   4. Before and after each duct mounted fan.
   5. Before and after each automatic control damper.
   6. Downstream of each VAV box.

M. Access Door Sizes: Install minimum 8 x 8 inch size for hand access, 18 x 18 inch size for shoulder access, and as indicated on Drawings. Review locations prior to fabrication.

3.03 DEMONSTRATION

A. Division 01 - Execution and Closeout Requirements: Requirements for demonstration and training.

B. Demonstrate re-setting of fire dampers to Owner's representative.

END OF SECTION

SECTION 23 3400
HVAC FANS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Ceiling/Cabinet Fans.
   2. Roof Exhaust Fans.
   3. Utility Set Fans.

B. Related Sections:
   1. Section 23 0513 - Common Motor Requirements for HVAC Equipment: Product requirements for motors for placement by this section.
   2. Section 23 0548 - Vibration and Seismic Controls for HVAC Piping and Equipment: Product requirements for resilient mountings and snubbers for fans for placement by this section.
   3. Section 23 0700 - HVAC Insulation: Product requirements for power ventilators for placement by this section.
   4. Section 23 0923 - Direct-Digital Control System for HVAC: Controls remote from unit.
   5. Section 23 3100 - HVAC Ducts and Casings: Product requirements for hangers for placement by this section.
   6. Section 23 3300 - Air Duct Accessories: Product requirements for duct accessories for placement by this section.
   7. Section Division 26 - Equipment Wiring Connections: Execution and product requirements for connecting equipment specified by this section.

1.02 REFERENCES

A. American Bearing Manufacturers Association:
   1. ABMA 9 - Load Ratings and Fatigue Life for Ball Bearings.
   2. ABMA 11 - Load Ratings and Fatigue Life for Roller Bearings.

B. Air Movement and Control Association International, Inc.:
   1. AMCA 99 - Standards Handbook.
   2. AMCA 204 - Balance Quality and Vibration Levels for Fans.
   3. AMCA 210 - Laboratory Methods of Testing Fans for Aerodynamic Performance Rating.
   4. AMCA 300 - Reverberant Room Method for Sound Testing of Fans.
   5. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data.

C. American Refrigeration Institute:
   1. ARI 1060 - Air-to-Air Energy Recovery Ventilation Equipment Certification Equipment Program.

D. National Electrical Manufacturers Association:
   1. NEMA MG 1 - Motors and Generators.
   2. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

E. Underwriters Laboratories Inc.:
   1. UL 705 - Power Ventilators.

1.03 SUBMITTALS

A. See Section 01 3300 - submittal procedures.

B. Shop Drawings: Indicate size and configuration of fan assembly, mountings, weights, ductwork and accessory connections.

C. Product Data: Submit data on each type of fan and include accessories, fan curves with specified operating point plotted, power, RPM, sound power levels for both fan inlet and outlet at rated capacity, electrical characteristics and connection requirements.

D. Manufacturer's Installation Instructions: Submit fan manufacturer’s instructions.

E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.04 CLOSEOUT SUBMITTALS

A. Division 01 - Execution and Closeout Requirements: Closeout procedures.

B. Operation and Maintenance Data: Submit instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.

1.05 QUALITY ASSURANCE

A. Performance Ratings: Conform to AMCA 210.

B. Sound Ratings: AMCA 301, tested to AMCA 300.

C. UL Compliance: UL listed and labeled, designed, manufactured, and tested in accordance with UL 705.

D. Balance Quality: Conform to AMCA 204.

E. Energy Recovery Unit Wheel Energy Transfer Rating: Meet ARI 1060.

1.06 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

B. Installer: Company specializing in performing Work of this section with minimum three years experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Section 01 6000 - Materials and Equipment: Product storage and handling requirements.

B. Protect motors, shafts, and bearings from weather and construction dust.

1.08 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.09 WARRANTY

A. Division 01 - Execution and Closeout Requirements: Product warranties and product bonds.

1.10 MAINTENANCE SERVICE

A. Division 01 - Execution and Closeout Requirements: Requirements for maintenance service.

B. Furnish service and maintenance of fans for one year from Date of Substantial Completion.

C. Include systematic examination, adjustment, and lubrication of fans, and controls checkout and adjustments. Repair or replace parts in accordance with manufacturer's operating and maintenance data. Use parts produced by manufacturer of original equipment.

D. Perform work without removing fans from service during building normal occupied hours.

E. Provide emergency call back service at all hours for this maintenance period.

F. Maintain locally, near Place of the Work, adequate stock of parts for replacement or emergency purposes. Have personnel available to ensure fulfillment of this maintenance service, without unreasonable loss of time.

G. Perform maintenance work using competent and qualified personnel under supervision and in direct employ of manufacturer or original installer.

H. Do not assign or transfer maintenance service to agent or subcontractor without prior written consent of Owner.

1.11 EXTRA MATERIALS

A. Division 01 - Execution and Closeout Requirements: Spare parts and maintenance products.

B. Furnish two sets of belts for each fan.

PART 2 PRODUCTS

2.01 HVAC FANS

A. Manufacturers
   1. Panasonic.
   2. Greenheck Corp
   3. Loren Cook Company
   4. Substitutions: Section 01 2513 - Product Substitutions.

B. General
   1. Base performance on sea level conditions.
   2. Statically and dynamically balance fans to eliminate vibration or noise transmission to occupied areas.
   3. Fans used shall not decrease motor size, increase noise level, or increase tip speed by more than 10 percent, or increase inlet air velocity by more than 20 percent, from specified criteria. Fans shall be capable of accommodating static pressure variations of plus or minus 10 percent.

C. Motors and Drives
   1. Motors: As indicated, in compliance with Division 26.
   2. Bearings: ANSI/AFBMA 9, L-10 life at 100,000 hours heavy duty pillow block type, self-aligning, grease-lubricated ball bearings.
   3. Shafts: Hot rolled steel, ground and polished, with key-way; protectively coated with lubricating oil.
   4. V-Belt Drive: Cast iron or steel sheaves, dynamically balanced, keyed. Variable and adjustable pitch sheaves for motors 15 hp (11.2 kW) and under selected so required rpm is obtained with sheaves set at mid-position; fixed sheave for 20 hp (15 kW) and over, matched belts, and drive rated as recommended by manufacturer or minimum 1.5 times nameplate rating of the motor.
   5. Belt Guard: Fabricate to SMACNA Low Pressure Duct Construction Standards; of 12 gauge, ¾ inch diamond mesh wire screen welded to steel angle frame or equivalent, prime coated. Secure to fan or fan supports without short circuiting vibration isolation, with provision for adjustment of belt tension, lubrication, and use of tachometer with guard in place.

D. Wheel and Inlet
   1. Backward Inclined: Steel or aluminum construction with smooth curved inlet flange, heavy backplate, backwardly curved blades welded or riveted to flange and backplate; cast iron or cast steel hub riveted to backplate and keyed to shaft with set screws.
   2. Forward Curved: Galvanized steel construction with inlet flange, backplate, shallow blades with inlet and tip curved forward in direction of air flow, mechanically secured to flange and backplate; steel hub swaged to backplate and keyed to shaft with set screw.
   3. Airfoil Wheel: Steel construction with smooth curved inlet flange, heavy backplate die formed hollow airfoil shaped blades continuously welded at tip flange, and backplate; cast iron or cast steel hub riveted to backplate and keyed to shaft with set screws.
   4. Radial: Steel construction with inlet flange, heavy reinforced backplate, plate blades with reinforcing gussets and wearing strips welded or riveted to backplate and flange; cast iron or cast steel hub riveted to backplate and keyed to shaft with set screws

E. Housing
   1. Heavy gauge steel, spot welded for AMCA 99 designated Class I and II fans, and continuously welded for Class III, adequately braced, designed to minimize turbulence with spun inlet bell and shaped cut-off.
   2. Factory finish before assembly with enamel or prime coat. Prime coating on aluminum parts is not required.
   3. Provide bolted construction with horizontal flanged split housing.

2.02 INLINE CABINET FANS

A. General Description:
   1. Each fan shall bear a permanently affixed manufacture's engraved metal nameplate containing the model number and individual serial number
   2. Fans used shall not decrease motor size, increase noise level, or increase tip speed by more than 10 percent, or increase inlet air velocity by more than 20 percent, from specified criteria. Fans shall be capable of accommodating static pressure variations of plus or minus 10 percent.
   3. Base performance on sea level conditions.
   4. Statically and dynamically balance fans to eliminate vibration or noise transmission to occupied areas.
   5. Square design to provide a large discharge area, Inlet and discharge collars to provide easy duct connection.
   6. Two sided access panels, permit easy access to all internal components. Access panels located perpendicular to the motor mounting panel
   7. 1" Insulated housing for noise reduction.

B. Wheel:
   1. Non-overloading, backward inclined centrifugal wheel
   2. Constructed of aluminum
   3. Statically and dynamically balanced in accordance to AMCA Standard 204-05
   4. The wheel cone and fan inlet will be matched and shall have precise running tolerances for maximum performance and operating efficiency
   5. Single thickness blades are securely riveted or welded to a heavy gauge back plate and wheel cone.

C. Motor:
   1. Provide Electronically Commutated Motors, Open type motor enclosures.
   2. Motor to be a DC electronic commutation type motor (ECM) specifically designed for fan applications. AC induction type motors are not acceptable. Examples of unacceptable motors are: Shaded Pole, Permanent Split Capacitor (PSC), Split Phase, Capacitor Start and 3 phase induction type motors.
   3. Motors are permanently lubricated, heavy duty ball bearing type to match with the fan load and pre-wired to the specific voltage and phase.
   4. Internal motor circuitry to convert AC power supplied to the fan to DC power to operate the motor.
   5. Motor shall be speed controllable down to 20% of full speed (80% turndown). Speed shall be controlled by either a potentiometer dial mounted at the motor or by a 0-10 VDC signal.
   6. Motor shall be a minimum of 85% efficient at all speeds.
   7. Housing Supports and Drive Frame:
   8. Housing supports are constructed of structural steel with formed flanges
   9. Drive frame is welded steel which supports the motor

D. Accessories:
   1. Housing supports are constructed of structural steel with formed flanges
   2. Provide with NEMA 1 Disconnect Switch for positive electrical shut-off. Wired from fan motor to junction box.
   3. Provide vibration isolators.

2.03 ROOF EXHAUST FANS

A. The fan shall be of bolted and welded construction utilizing corrosion resistant fasteners. The fan shall be enclosed in a tiered extruded aluminum housing with hinge access for motor. The aluminum base shall have continuously welded curb cap corners for maximum leak protection. Bearings, drives, and motor shall be mounted on a minimum 12 gauge steel power assembly, isolated from the unit structure with rubber vibration isolators. Unit shall bear an engraved aluminum nameplate and shall be shipped in ISTA certified transit tested packaging.

B. Wheel shall be centrifugal backward inclined, constructed of 100% aluminum, including a precision machined cast aluminum hub. Wheel inlet shall overlap an aerodynamic aluminum inlet cone to provide maximum performance and efficiency. Wheel shall be balanced in accordance with AMCA Standard 204-05.

C. Motor shall be totally enclosed fan cooled, permanently lubricated, heavy duty ball bearing to match with the fan load and furnished at the specific voltage and phase. Motor shall be premium efficiency.

D. Provide with Insulated roof curb with integral sound attenuator and backdraft damper. Roof curb to have minimum 2" insulation, and raise the fan 24" above the roof line.

E. Finish: Hi-Pro-Z, two coat powder pain coating, resistant to saltwater. Provide color chart for color selection by Architect.

F. Tie Down Points: Four heavy gauge aluminum brackets to secure the fan in heavy wind applications.

2.04 UTILITY SET EXHAUST FANS

A. Fan shall be a single width, single inlet, airfoil steel or aluminum wheel, belt driven centrifugal vent set.

B. Certifications: Fan shall be manufactured at an ISO 9001 certified facility. Fan shall be listed by Underwriters Laboratories (UL 705) and UL listed for Canada (cUL 705). For restaurant applications, fan shall be listed by Underwriters Laboratories (UL 762) and UL listed for Canada (Power Ventilator for Restaurant Exhaust Appliances). Fan shall bear the AMCA certified ratings seal for sound and air performance.

C. Construction: The fan shall be of bolted and welded construction utilizing corrosion resistant fasteners. The scroll wrapper shall be a minimum 14 gauge steel and the scroll side panels shall be a minimum 12 gauge steel. The entire fan housing shall have continuously welded seams for leakproof operation. A performance cut-off shall be furnished to prevent the recirculation of air in the fan housing. The fan housing shall be field rotatable to any one of eight discharge positions and shall have a minimum 1-1/2 inch outlet discharge flange. Bearing support shall be minimum 10 gauge welded steel. Side access inspection ports shall be provided with quick release latches for access to the motor compartment without removing the weather cover. Lifting lugs shall be provided for ease of installation. Unit shall bear an engraved aluminum nameplate and shall be shipped in ISTA certified transit tested packaging.

D. Coating: All steel fan components shall be painted with an electrostatically applied, baked polyester powder coating. Each component shall be subject to a five stage environmentally friendly wash system, followed by a minimum 2 mil thick baked powder finish. Paint must exceed 1,000 hour salt spray under ASTM B117 test method.

E. Wheel: Wheel shall be steel centrifugal airfoil blade type. Blades shall be continuously welded to the backplate and deep spun inlet shroud. Wheel hub shall be keyed and securely attached to the fan shaft. Wheel inlet shall overlap a one piece aerodynamic aluminum inlet cone to provide maximum performance and efficiency. Wheel shall be balanced in accordance with AMCA Standard 204-96, Balance Quality and Vibration Levels for Fans.

F. Motor: Motor shall be heavy duty type with permanently lubricated sealed ball bearings and furnished at the specified voltage, phase and enclosure. Premium efficiency, in compliance with Division 16.

G. Bearings: Bearings shall be designed and tested specifically for use in air handling applications. Construction shall be heavy duty regreasable ball or roller type in a cast iron pillow block housing selected for a minimum L50 life in excess of 200,000 hours at maximum cataloged operating speed.

H. Blower Shaft: Blower shaft shall be AISI C-1045 hot rolled and accurately turned, ground and polished. Shafting shall be sized for a critical speed of at least 125% of maximum RPM.

I. Belts and Drives: Belts shall be oil and heat resistant, non-static type. Drives shall be precision machined cast iron type, keyed and securely attached to the wheel and motor shafts. Drives

shall be sized for 150% of the installed motor horsepower. The variable pitch motor drive must be factory set to the specified fan RPM.

J. Belt Guard: Fabricate to SMACNA Low Pressure Duct Construction Standards; of 12 gauge, ¾ inch diamond mesh wire screen welded to steel angle frame or equivalent, prime coated. Secure to fan or fan supports without short circuiting vibration isolation, with provision for adjustment of belt tension, lubrication, and use of tachometer with guard in place.

2.05 FUME HOOD EXHAUST FANS

A. The Housings and Impellers shall be constructed of UV treated Polypropylene and can withstand a temperature of up to 194 Deg. F

B. The blower housings shall be constructed of UV treated Polypropylene for maximum corrosion resistance and be able to withstand environmental elements. The housing shall allow easy access to the impeller if cleaning is neccessary. There shall be no metal parts in the airstream without protective coating.

C. The impeller shall be of a backward curved airfoiled (BCA) design and have non-overloading characteristics. The impeller shall be Injection molded from high strength glass reinforced polyamide. The impeller shall use a standard browning bushing fitting system to allow for easy motor replacement. Blower impellers shall be suitable for an RPM of up to 3450 on all models excluding CBI 315 and 355.

D. The motors shall be of heavy-duty ball bearing type for continuous duty. The motors shall have CE, CSA and UR or UL agency approvals. Motors shall have standard shaft size and no metric shaft sizes shall be allowed because of motor replacement availability.

E. Accessories:
   1. Backdraft Damper: Rigid PVC Welded Construction, corrosion resistant.
   2. Rain Cap: Rigid PVC Welded Construction, corrosion resistant.
   3. Balance Damper: Rigid PVC Welded Construction, corrosion resistant, lockable Handle.
   4. All accessories to be provided by same manufacturer as fume hood exhaust fan.

PART 3 EXECUTION

3.01 EXAMINATION

A. Division 01 - Administrative Requirements: Coordination and project conditions.

B. Verify roof curbs are installed and dimensions are as shown on shop drawings and instructed by manufacturer.

3.02 INSTALLATION

A. Secure wall fans with cadmium plated steel lag screws to structure.

B. Suspended Cabinet Fans: Install flexible connections specified in Section 23 3300 between fan and ductwork. Ensure metal bands of connectors are parallel with minimum one inch flex between ductwork and fan while running.

C. Install backdraft dampers on inlet to roof and wall exhaust fans.

D. Provide backdraft dampers on outlet from cabinet and ceiling fans and as indicated on Drawings.

E. Install safety screen where inlet or outlet is exposed.

F. Pipe scroll drains to nearest floor drain.

G. Install backdraft dampers on discharge of exhaust fans and as indicated on Drawings.

H. Provide sheaves required for final air balance.

3.03 MANUFACTURER'S FIELD SERVICES

A. Division 01 - Quality Requirements: Requirements for manufacturer’s field services.

B. Furnish services of factory trained representative for minimum of one to start-up, calibrate controls, and instruct Owner on operation and maintenance.

3.04 CLEANING

A. Division 01 - Execution and Closeout Requirements: Requirements for cleaning.

B. Vacuum clean coils and inside of fan cabinet.

3.05 DEMONSTRATION

A. Division 01 - Execution and Closeout Requirements: Requirements for demonstration and training.

B. Demonstrate fan operation and maintenance procedures.

3.06 PROTECTION OF FINISHED WORK

A. Division 01 - Execution and Closeout Requirements: Requirements for protecting finished Work.

B. Do not operate fans for until ductwork is clean, filters in place, bearings lubricated, and fan has been test run under observation.

END OF SECTION

SECTION 23 3600
AIR TERMINAL UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Variable volume terminal units.

B. Integral heating coils.

C. Integral damper motor operators.

1.02 RELATED SECTIONS

A. Section 23 0500 – Basic Mechanical Materials and Methods.

B. Section 23 0548 –Seismic Restraint.

C. Section 23 0923 – Building Automation System.

D. Section 23 2113 – Plumbing and Hydronic Piping.

E. Section 23 2116 – Hydronic Specialties.

F. Section 23 3100 – Ductwork.

G. Section 23 3300 – Ductwork Accessories.

H. Division 26 – Equipment Wiring Connections.

1.03 REFERENCES

A. See Section 01 3300 – submittal procedures.

B. NFPA 90A - Installation of Air Conditioning and Ventilation Systems.

C. UL 181 - Factory-Made Air Ducts and Connectors.

1.04 SUBMITTALS

A. Submit product data under provisions of Section 23 0500 and Section 01 3300.

B. Submit product data indicating configuration, general assembly, and materials used in fabrication. Include catalog performance ratings which indicate air flow, static pressure, and NC designation.

C. Submit manufacturer's installation instructions under provisions of Section 23 0500 and Section 01 3300.

1.05 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Section 23 0500 and Division 01 General Requirements.

B. Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts lists.

1.06 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum three years documented experience.

1.07 WARRANTY

A. Provide warranty under provisions of Division 01 General Requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Titus.

B. Price.

C. Trane.

D. Substitutions: Under provisions of Division 01 General Requirements.

2.02 VARIABLE AIR VOLUME (VAV) TERMINAL UNITS

A. Variable air volume supply air terminals for connection to single medium pressure duct, central air system. Provide hot water heating coil at units noted on the drawings.

B. Identify each VAV unit with clearly marked identification label and airflow indicator. Label shall include unit nominal air flow, maximum factory set air flow, minimum factory set air flow, and coil type.

C. The control system serving the VAV air terminal units shall be electronic DDC controls. The contractor shall coordinate fully with Specification Section 23 0923. Controls will be furnished by Section 23 0923 for field installation by the successful bidding VAV box manufacturer. Verify controls are compatible with VAV boxes and enclosures are sized to accommodate control components.

D. Boxes to be able to provide accurate flow measurements with 1-1/2 diameters or less of straight ductwork prior to unit inlet.

E. Casings: Minimum 22 gauge galvanized steel.

F. Lining: Minimum one inch thick neoprene or vinyl coated fibrous glass insulation, 3.0 lb./cu. ft. density, meeting NFPA 90A requirements and UL 181 erosion requirements. Line plenum sections with 2 inch thick insulation.

G. Access Doors: Locate an access door in each box, to allow adequate space for cleaning.

H. Assembly: Air volume damper, fans, and controls in single cabinet.

I. Plenum Air Inlets: S and drive connections for duct attachment.

J. Identify each airflow unit with clearly marked identification label and airflow indicator. Label shall include unit nominal airflow, maximum factory set air flow, minimum factory set air flow, and coil type.

K. Locate air volume damper and flow sensor assembly inside unit casing. Construct from extruded aluminum or 20 gauge galvanized steel components. Key damper blades into shaft with nylon fitted pivot points.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide ceiling access doors or locate units above easily removable ceiling components.

C. Support units individually from structure. Do not support from adjacent ductwork.

D. Label ceiling grid adjacent to ceiling tile for access to unit in accordance with Section 23 0500.

E. Connect to ductwork in accordance with Section 23 3100.

F. Field verify connection requirements to existing ductwork. Provide ductwork transition as required for connection to existing ductwork.

G. Provide gasketed access door in ductwork downstream of heating coil for access.

END OF SECTION

SECTION 23 3700
AIR OUTLETS AND INLETS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Diffusers.

1.02 RELATED SECTIONS

A. Division 08 - Louvers: Architectural Wall Louvers.

B. Division 09 - Painting and Coating: Execution and product requirements for Painting of ductwork visible behind outlets and inlets specified by this section.

C. Section 23 0923 - Direct-Digital Control System for HVAC: Operators for adjustable louvers.

D. Section 23 3300 - Air Duct Accessories: Volume dampers for inlets and outlets.

1.03 REFERENCES

A. See Section 01 3300 – submittal procedures.

B. Air Movement and Control Association International, Inc.:
   1. AMCA 500 - Test Methods for Louvers, Dampers, and Shutters.

C. American Society of Heating, Refrigerating and Air-Conditioning Engineers:
   1. ASHRAE 70 - Method of Testing for Rating the Performance of Air Outlets and Inlets.

D. Sheet Metal and Air Conditioning Contractors:
   1. SMACNA - HVAC Duct Construction Standard - Metal and Flexible.

1.04 SUBMITTALS

A. Section 01 3300 - Submittal Procedures.

B. Product Data: Submit sizes, finish, and type of mounting. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

C. Test Reports: Rating of air outlet and inlet performance.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.05 CLOSEOUT SUBMITTALS

A. Division 01- Execution and Closeout Requirements: Closeout procedures.

B. Project Record Documents: Record actual locations of air outlets and inlets.

1.06 QUALITY ASSURANCE

A. Test and rate diffuser, register, and grille performance in accordance with ASHRAE 70.

B. Test and rate louver performance in accordance with AMCA 500.

1.07 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

1.08 WARRANTY

A. Division 01- Execution and Closeout Requirements: Product warranties and product bonds.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS – DIFFUSERS, REGISTERS AND GRILLES

A. E. H Price Company.

B. Krueger.

C. Titus Model.

D. Tuttle and Bailey.

E. Substitutions: Section 01 2513 - Product Substitutions.

2.02 RECTANGULAR CEILING DIFFUSERS

A. Type: Square, multi-louvered diffuser to discharge air in 360 degree pattern.

B. Frame: Surface mount or Inverted T-bartype. In plaster ceilings, furnish plaster frame and ceiling frame.

C. Fabrication: Steel with baked enamel off-white finish.

D. Accessories: Radial opposed-blade damper and multi-louvered equalizing grid with damper adjustable from diffuser face.

PART 3 EXECUTION

3.01 EXAMINATION

A. Division 01- Administrative Requirements: Coordination and project conditions.

B. Verify inlet and outlet locations.

C. Verify ceiling, wall systems are ready for installation.

3.02 INSTALLATION

A. Install diffusers to ductwork with airtight connection.

B. Install balancing dampers on duct take-off to diffusers, grilles, and registers, whether or not dampers are furnished as part of diffuser, grille, and register assembly. Refer to Section 23 3300.

C. Paint visible portion of ductwork behind air outlets and inlets matte black. Refer to Division 09.

3.03 INTERFACE WITH OTHER PRODUCTS

A. Check location of outlets and inlets and make necessary adjustments in position to conform to architectural features, symmetry, and lighting arrangement.

END OF SECTION

SECTION 23 5100
BREECHINGS, CHIMNEYS, AND STACKS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Boiler Venting

1.02 RELATED SECTIONS

A. Section 23 0500 – Basic Mechanical Materials and Methods.

B. Section 23 0548 – Vibration Isolation and Seismic Restraint.

C. Section 23 5200 – Boilers.

1.03 REFERENCES

A. See Section 01 3300 – submittal procedures.

B. ASTM International:
   1. ASTM A167 - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
   2. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
   3. ASTM A924/A924M - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
   4. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.

C. National Fire Protection Association:
   1. NFPA 54 - National Fuel Gas Code.
   2. NFPA 211 - Standard for Chimneys, Fireplaces, Vents, and Solid Fuel Burning Appliances.

D. Sheet Metal and Air Conditioning Contractors:
   1. SMACNA - Guide for Steel Stack Construction.
   2. SMACNA - HVAC Duct Construction Standard - Metal and Flexible.

E. Underwriters Laboratories Inc.:
   1. UL 441 - Gas Vents.
   2. UL 1738 - Venting Systems for Gas-Burning Appliances, Categories II, III, and IV.

1.04 DEFINITIONS

A. Breeching: Vent Connector.

B. Chimney: Primarily vertical shaft enclosing at least one vent for conducting flue gases outdoors.

C. Smoke Pipe: Round, single wall vent connector.

D. Vent: That portion of a venting system designed to convey flue gases directly outdoors from a vent connector or from an appliance when a vent connector is not used.

E. Vent Connector: That part of a venting system that conducts the flue gases from the flue collar of an appliance to a chimney or vent, and may include a draft control device.

1.05 DESIGN REQUIREMENTS

A. Factory built vents and chimneys used for venting natural draft appliances shall comply with NFPA 211 and be UL listed and labeled.

B. Design stack supports for wind loading of 110 mph and seismic loads for the most restrictive IBC classification.

1.06 QUALIFICATIONS

A. Manufacturer: Company specializing in the manufacture of products specified in this Section with minimum three years documented experience.

1.07 REGULATORY REQUIREMENTS

A. Conform to NFPA 54 for installation of natural gas burning appliances and equipment.

1.08 SUBMITTALS

A. Submit product data under provisions of Section 23 0500 and Section 01 3300.

B. Shop Drawings: Indicate general construction, dimensions, weights, support and layout of breeching. Submit layout drawings indicating plan view and elevations.

C. Product Data: Submit data indicating factory built chimneys, including dimensional details of components and flue caps, dimensions and weights and connection requirements.

D. Engineering Data: Submit stack sizing calculations confirming proper stack sizing for the specific equipment used on this project.

E. Manufacturer's Installation Instructions: Submit assembly, support details, and connection requirements.

F. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.09 QUALITY ASSURANCE

A. Perform Work in accordance with Municipality of Anchorage standards.

B. Maintain one copy of each document on site.

C. Provide factory built vents and chimneys used for venting natural draft appliances complying with NFPA 211 and UL listed and labeled.

1.10 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Van-Packer

B. Selkirk Metalbestos.

C. Schebler Company.

D. Metal-Fab.

E. Heatfab.

F. Substitutions: Section 01 2513 - Product Substitutions.

2.02 BOILER VENTING

A. Provide all accessories for a complete system each bearing factory applied UL label, including but not limited to supports, roof penetrations, appliance connectors, drain fittings and terminations.

B. The factory built modular chimney shall be laboratory tested and listed in accordance with Underwriters Laboratories Standard UL 103 for use with building heating equipment burning gas, solid or liquid fuels with flue gases not exceeding 1400°F continuous operations and 1800°F intermittent operation. It shall also be tested and listed for use as a grease duct in accordance with UL 1978. Sections shall bear the UL listing mark. Sections shall be sealed with banded flanges utilizing joint sealant supplied by the manufacturer for the specific application.

C. Inner shell material shall be type 304 stainless steel for natural gas and oil fired appliances. Inner shell thickness shall be .036". All inner shell seams shall be full penetration welded the entire length of the pipe section. Riveted, tack or spot welded seams are not permitted.

D. Outer shell material shall be aluminized steel with a thickness of .034".

E. Outer shell thickness of optional type 304 or 316 stainless steel shall be .030". All outer shell seams shall be full penetration welded the entire length of the pipe section. Riveted, tack or spot welded seams are not permitted.

F. There shall be a minimum 2" of 1600°F rated low conductivity ceramic fiber insulation between the inner and outer shells. The insulation is to be securely attached to the inner shell with steel straps and insulating pins welded to the inner shell. Stainless steel centering clips shall be welded to the outer shell to maintain the 2" spacing and ensure concentricity of the shells.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide double wall, insulated vent continuous from appliance outlet to exterior termination. Vent shall be sloped to drain to appliance condensate treatment tank. Provide all necessary connections and additional piping as required to allow system to drain to condensate treatment tanks where slope cannot be maintained.

C. Install in accordance with recommendations of ASHRAE -Handbook, Equipment Volume, Chapter "Chimney, Gas, Vent, and Fireplace Systems", and NFPA 54.

D. Install breechings with minimum of joints. Align accurately at connections, with internal surfaces smooth.

E. Support breechings from building structure, rigidly with suitable ties, braces, hangers and anchors to hold to shape and prevent buckling. Support vertical breechings, chimneys, and stacks at 12 foot spacing, to adjacent structural surfaces, or at floor penetrations. Refer to SMACNA HVAC Duct Construction Standards - Metal and Flexible for equivalent duct support configuration and size.

F. Pitch breechings with positive slope up from fuel-fired equipment to chimney, vent or stack.

G. Maintain UL listed minimum clearances from combustibles. Assemble pipe and accessories as required for complete installation.

H. Assemble and install stack sections in accordance with NFPA 82, industry practices, and in compliance with UL listing. Join sections with acid-resistant joint cement to ANSI/ASTM C105. Connect base section to foundation using anchor lugs.

I. Level and plumb chimneys, vents and stacks.

J. Clean breechings, chimneys, vents, and stacks during installation, removing dust and debris.

K. At appliances, provide slip joints permitting removal of appliances without removal or dismantling of breechings, chimneys, or stacks.

L. No single wall vent connectors or breechings are permitted.

END OF SECTION

SECTION 23 5200
BOILERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Boilers.

B. Controls and Boiler Trim.

1.02 RELATED SECTIONS

A. Section 23 0500 - Basic Mechanical Materials and Methods.

B. Section 23 0548 - Vibration and Seismic Restraint.

C. Section 23 2113 – Plumbing and Hydronic Piping.

D. Section 23 2116 - Hydronic Piping Specialties.

E. Section 23 5100 – Breechings Chimneys and Stacks

F. Section 23 0923 – Building Automation Systems.

G. Section 23 0993 – Sequence of Operation.

H. Section 26 0503 - Equipment Wiring Connections.

1.03 REFERENCES

A. See Section 01 3300 – submittal procedures.

B. American National Standards Institute:

1. ANSI Z21.13 - Gas-fired Low Pressure Steam and Hot Water Boilers.

C. American Society of Heating, Refrigerating and Air-Conditioning Engineers:

1. ASHRAE 90.1 - Energy Standard for Buildings Except Low-Rise Residential Buildings.

D. American Society of Mechanical Engineers:

1. ASME Section IV - Boiler and Pressure Vessel Code - Heating Boilers.
2. ASME Section VIII - Boiler and Pressure Vessel Code - Pressure Vessels.
3. ASME CSD-1 (Controls and Safety Devices)

E. Hydronics Institute:

1. H.I. Heating Boiler Standard - Testing and Rating Standard for Heating Boilers.

F. National Fire Protection Association:

1. NFPA 54 - National Fuel Gas Code.

1.04 SUBMITTALS

A. Submit product data under provisions of Section 23 0500 and Section 01 3300.

B. Submit product data indicating gross input/output, I-B-R net rating, fuel type, electrical requirements, accessories, trim, controls, general layout, dimensions, and size and location of connections

C. Schematic Diagrams: Submit schematic flow diagram of gas valve trains and schematic wiring diagram of boiler control system of the ladder-type showing all components, all interlocks, etc. Schematic wiring diagram shall clearly identify factory wiring and field wiring.

D. Test Reports: Indicate boilers meet or exceed specified performance and efficiency. Submit results of combustion test.

E. Manufacturer's Installation Instructions: Submit assembly, support details, connection requirements, and include start-up instructions.

F. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

G. Manufacturer's Warranties: Manufacturer's printed warranties, as specified hereinafter, shall be submitted prior to final acceptance by the engineer.

H. Manufacturers Field Reports: Indicate condition of equipment after start-up including control settings and performance chart of control system.

I. Submit data showing boiler burner, controls and multiple boiler control panel.

1.05 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Section 23 0500 and Division 01 General Requirements.

B. Include manufacturer's descriptive literature, operating instructions, cleaning procedures, replacement parts list, and maintenance and repair data.

1.06 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum three years experience.

B. The equipment shall, at a minimum, be in strict compliance with the requirements of this specification and shall be the manufacturer's standard commercial product unless specified otherwise. Additional equipment features, details, accessories, appurtenances, etc. which are not specifically identified but which are a part of the manufacturer's standard commercial product, shall be included in the equipment being furnished.

C. The equipment shall be of the type, design, and size that the manufacturer currently offered for sale and appears in the manufacturer's current catalogue. The equipment shall be new and fabricated from new materials and shall be free from defects in materials and workmanship

D. All units of the same classification shall be identical to the extent necessary to insure interchangeability of parts, assemblies, accessories, and spare parts wherever possible.

E. In order to provide unit responsibility for the specified capacities, efficiencies, and performance, the boiler manufacturer shall certify in writing that the equipment being submitted shall perform as specified. The boiler manufacturer shall be responsible for guarantying that the boiler provides the performance as specified herein.

1.07 CERTIFICATIONS

A. Manufacturer's Certification: The boiler manufacturer shall certify the following:

1. The products and systems furnished are in strict compliance with the specifications.
2. The boiler, burner and other associated mechanical and electrical equipment have all been properly coordinated and integrated to provide a complete and operable boiler.
3. ASME certification.
4. UL certification.
5. The specified factory tests have been satisfactorily performed.
6. The specified field tests have been satisfactorily performed.

B. Contractor's Certification: The contractor shall certify the following:

1. The products and systems installed are in strict compliance with the specifications.

C. Boiler Inspectors' Certification: All boiler inspections during hydrostatic testing shall be performed by an authorized boiler inspector who is certified by the National Board of Boiler and Pressure Vessel Inspectors and shall be submitted in writing prior to final acceptance by the engineer.

1.08 REGULATORY REQUIREMENTS

A. Conform to ANSI/NFPA 70 code for internal wiring of factory wired equipment.

B. Conform to ANSI/ASME SEC4 and SEC 8D for boiler construction.

C. Units: AGA certified. UL labeled.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store. and protect products to site under provisions of Division 01 General Requirements.

B. Accept boilers and accessories on site in factory shipping packaging. Inspect for damage.

C. Protect boilers from damage by leaving packing in place until installation

D. Protect units before, during, and after installation from damage to casing by leaving factory shipping packaging in place until immediately prior to final acceptance.

1.10 WARRANTY

A. Provide one year warranty for the entire boiler under provisions of Division 01 General Requirements.

B. The vessel shall be warranted against thermal shock for twenty (20) years from date of original shipment, when utilized in a closed loop hydronic heating system. The warranty shall cover the pressure vessel, furnace, tubes, tube sheets, and shell against the effects of thermal shock.

C. The vessel shall be warranted against fireside corrosion for ten (10) years from date of original shipment. The warranty shall cover the pressure vessel, furnace, tubes, tube sheets, and shell on the fireside against the effects of condensation.

D. The warrantee for the burner canister (mesh burner) shall be five (5) years from date of original shipment. The warranty shall cover premature failure of the burner when the burner is operated under normal conditions and has had proper startup and maintenance.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Burnham

B. Buderus

C. DeDietrich.

D. Substitutions: Section 01 2513 - Product Substitutions.

2.02 MANUFACTURED UNITS

A. Hot water boiler shall be a high efficiency, pressurized, cast iron sectional wet base boiler and not require a refractory combustion chamber. It shall be suitable for forced draft firing and capable of achieving a minimum combustion efficiency of 88% fired with No. 2 oil. Thermal efficiency shall be a minimum of 86% with No. 2 oil. Heat transfer shall be enhanced by the addition of removable baffles.

B. Boiler shall be a 3-pass cast iron sectional type design with large combustion chamber and horizontal flue passes with cast fins. Class 25 high silicone content cast iron shall provide resistance to temperature variations and thermal stress. A high-temperature silicone-coated fiberglass rope gasket will be compressed into a cast tongue and groove connection around the perimeter of the section, providing a durable, gas tight seal.

C. Boiler shall have a return mixing tube with drilled openings in each section, allowing proportionate distribution of return water throughout the entire section assembly. Cool return water shall be pre-heated by the hot supply water as it enters the section assembly thereby reducing thermal stress on individual sections without the use of external mixing devices. Boiler supply water temperatures, measured on the supply manifold shall be no less than 130ºF. Return water coming back to the boiler may be no less than 80ºF. System piping shall be sized for a maximum temperature difference between the boiler supply and return water of 40ºF. However, a maxiumum delta T of 80ºF across the boiler is allowable.

D. A single supply water manifold shall be located at the rear of the boiler with eight tappings for the installation of temperature and pressure controls, gauges, probe-type low water cut-offs, and electronic control sensors. A single top rear return connection shall be considered standard equipment.

E. Cast iron burner swing door shall be lined with lightweight refractory insulation and shall have reversible hinges. allowing a minimum of 90 ı swing to the left or right side of boiler, allowing unobstructed access to combustion chamber and flue passages. The flue passages and combustion chamber shall be accessible from the front of the boiler for cleaning, and from the back of the boiler to vacuum soot and combustion residue from the fireside.

F. Rear flue collector, with test tapping, shall be constructed of cast iron and shall be concealed under a highly insulated boiler jacket.

G. Boiler shall be equipped with a flange mounted flame retention type burner. Input, output and combustion efficiency shall be certified to efficiency test procedures specified in I=B=R/BTS-2000.

H. Boiler shall be constructed for 80 PSI water working pressure in accordance with the ASME Section IV Rules for Construction of Heating Boilers. Individual sections shall have been subjected to a hydrostatic pressure test of 200 PSIG at the factory before shipment and they shall be stamped or cast with the ASME 'H' symbol.

I. The boiler shall be provided with a heavy duty 20 gauge steel jacket with modular 4-inch thick insulation and have a rust resistant powder coat finish. The boiler jacket shall contain a concealed electrical chaseway for power and limit circuit wiring within the top jacket panels, providing a clean finished look when the jacket is installed. Individual lift-off jacket side panels may be installed after system piping and allow ease of access to the boiler sections.

J. Boiler trim shall include:

1. One (1) 3-1/2" inch dia. combination pressure-temperature gauge.
2. Safety high limit aquastat; auxiliary safety high limit aquastat with manual reset (must specify on order); low fire hold aquastat (LHL and full modulation burners only).
3. Firing rate controller.
4. Dial type stack thermometer, minimum 3" dial face, ½" NPT connection.
5. ASME Section IV safety relief valve sized to exceed the gross output of the boiler which shall be factory set to relieve pressure at (30) (50) (80) PSI water working pressure.
6. One (1) low water cutoff device with manual reset, to comply with CSD-1 requirements. Boiler shall be fitted with a probe type LWCO located above the lowest safe permissible water level established by the boiler manufacturer. LWCO shall be UL listed and FM approved, suitable for commercial hydronic heating service at 80 PSI.

2.03 FUEL BURNING SYSTEM

A. Burner Operation: Modulating with low fire position for ignition.

B. Oil Burner: High pressure atomizing type for No. 1 oil with combustion air blower, fuel pump, hinged flame inspection port, cadmium sulfide flame sensor, electrodes, ignition transformer, and oil nozzle.

C. Oil Burner Safety Controls: Energize burner motor and electric ignition, limit time for establishment of main flame, monitor flame continuously during burner operation and stop burner on flame failure with manual reset necessary, solenoid oil delay valve opens after burner motor energized and closes when de-energized.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in strict accordance with manufacturer's installation instructions.

B. Install equipment in strict compliance with state and local codes and applicable NFPA standards.

C. Maintain manufacturer's recommended clearances around sides and over top of equipment.

D. Install components that were furnished loose with equipment for field installation.

E. Provide all interconnecting electrical control and power wiring. Provide for connection to electrical service. Refer to Division 26.

F. Provide all piping for boiler pipe connections.

G. Pipe relief valves to glycol tank.

3.02 MANUFACTURER'S FIELD SERVICES

A. Prepare and start systems under provisions of Division 01 General Requirements. Instruct operating personnel.

B. Submit written report after start-up including control settings and performance chart of control system.

C. Provide boiler set-up and adjustment before firing. Submit results of combustion test prior to final acceptance, including: Overfire and flue collar draft, CO2 (CO for gas), net stack temperature, smoke number, and percent efficiency. Tests are to be run by approved technician specializing in boiler maintenance.

D. Coordinate all work with Specification Section 23 0923 and 23 0993. Perform start-up in conjunction with testing of BAS systems to insure interface between boiler controls and BAS controls are complete and fully functional. Verify system operation in accordance with the sequence of operation.

E. Commission Boilers per manufacturer's recommendations provide field start-up service by factory certified boiler technician.

F. Provide commissioning services in accordance with Section 23 0800.

END OF SECTION

SECTION 23 7500
CUSTOM PACKAGED OUTDOOR HVAC EQUIPMENT

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Provide AHUs fully factory assembled. As shipped from the AHU Manufacturer, AHUs shall meet the performance requirements shown on the equipment schedule. Units shall be for outdoor application and shall have all components and options as indicated on the schedule or drawings. Furthermore, units shall be constructed as detailed hereinafter. Field-provide components and options shall be unacceptable unless otherwise noted.

B. Provide all labor, materials, and equipment necessary for the complete engineering, production, factory assembly, packaging, and delivery of the custom AHUs and their related equipment. Provide high voltage components, factory engineered, mounted and wired.

1.02 SUBMITTALS

A. Shop Drawings and product data under provisions of Section 01 3300.

B. Shop drawings shall indicate assembly, unit dimensions, weight loading, required clearances, construction details, and field connection details. Drawings shall also indicate all electrical, piping, and ductwork requirements, including sizes, connection locations, and connection method recommendations. Each component of the unit shall be identified and shall include physical dimensions and material of construction.

C. Shop drawings shall include Panel-to-panel joint and corner details and panel-to-roof details, all showing Class "A" thermal breaks.

D. Product data shall indicate dimensions, weights, capacities, ratings, fan performance, motor electrical characteristics, and gauges and finishes of materials. Brand and model of fans, fan motors, coils, air filters, dampers, variable frequency drives, combination starter/disconnects, being furnished.

E. Provide fan curves with specified operating point clearly plotted.

F. Submit sound power levels for both fan outlet and casing radiation at rated capacity.

G. Submit product data of filter media, filter performance data, filter assembly, and filter frames.

H. Submit electrical requirements for power supply wiring including wiring diagrams for interlock and control wiring, clearly indicating factory-installed and field-installed wiring.

I. Submit controller product data, include electrical requirements for power supply wiring including wiring diagrams power and control wiring, clearly indicating factory-installed and field-installed wiring.

J. Manufacturer's Installation Instructions: Required.

K. Manufacturer's Certificate: Required.

1.03 CLOSEOUT SUBMITTALS

A. See Section 01 3300 – submittal procedures.

B. Operation and Maintenance Data: Required
   1. Include instructions for lubrication, filter replacement, motor and drive replacement, spare parts lists, and wiring diagrams.

1.04 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing Air Handler products specified in this section must show a minimum five years documented experience and complete catalog data on total product

B. Damper Leakage: Test in accordance with AMCA 500.

1.05 DEFINITIONS

A. Hereinafter, a Class "A" thermal break shall be defined as a thermal break that ensures no member on the exterior of the unit, including fasteners, has through metal contact with any member on the interior of the unit, including fasteners.

B. Hereinafter, wall assemblies shall include all unit wall panels around the air tunnel perimeter, all channels exposed to both the interior and exterior of the unit, and all removable wall access panels.

C. Hereinafter, door assemblies shall include interior and exterior unit door panels, door frames, and door channels.

D. Hereinafter, roof assemblies shall include exterior unit roof panels, interior unit ceiling panels, and all roof channels exposed to both the interior and exterior of the unit.

1.06 ENVIRONMENTAL REQUIREMENTS

A. Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters are in place, bearings lubricated, and fan has been test run under observation.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver products to site under provisions of Section 01 6000 in factory-fabricated protective containers, with factory-installed shipping skids and lifting lugs.

B. Store and protect products under provisions of Section 01 6000 Materials and Equipment.

C. Store in clean dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.

1.08 EXTRA STOCK

A. Provide one set of disposable panel filters under provisions of Division 01.

1.09 WARRANTY

A. Furnish one year manufacturer warranty for air handling units.

PART 2 PRODUCTS

2.01 AIR HANDLING UNITS – ACCEPTABLE MANUFACTURERS

A. Trane.

B. Huntair.

C. Substitutions: Section 01 2513 - Product Substitutions.

2.02 GENERAL DESCRIPTION

A. Configuration: Factory fabricate and test air handling units of sizes, capacities, and configuration as indicated and specified.

B. Fabricate units with fan or fan array section plus accessories, including heating coil, mixing box section, filter section, sound attenuator section, and discharge plenum section sized as necessary.

C. Labels for AHRI Standard 410 and the listing agency, either UL or ETL, shall be provided on the units.

D. Labels shall be provided on the units for unit rigging and coil piping and connection instructions. Labels shall be provided on fans indicating direction of rotation. Warning labels shall be provided on appropriate components indicating hazardous voltage. For each section which must be assembled to another, matching steel identification tags shall be welded at each mating joint to ensure correct assembly order.

E. Acoustics: Sound power levels (dB) for the unit shall not exceed the specified levels shown on the unit schedule. The manufacturer shall provide the necessary sound treatment to meet these levels if required.

F. Units not to exceed unit dimensions specified in the contract documents.

G. Base performance on sea level conditions.

2.03 UNIT CONSTRUCTION

A. Casing Performance

1. Unit air leakage shall not exceed 1.0% of design cfm at +12.0" w.g. in all positive-pressure sections and -12.0" w.g. in all negative-pressure sections. Leakage shall be calculated by totaling all leakage either in to or out of the unit.
2. Casing deflection shall not exceed L/200 at +12.0" w.g. in all positive-pressure sections and -12.0" w.g. in all negative-pressure sections, where L is defined as the panel span.

B. Bases & Floors

1. Base shall be constructed from welded structural aluminum channels around the perimeter and welded structural aluminum cross members. Formed steel channels are not acceptable. The maximum cross-member spacing shall be 24" on center with members located adequately to support fan, coils, and other large components. The height of each base channel shall be no less than the height indicated in the drawings. Each shipping section shall be provided with removable lifting lugs. Structural framework shall fully support the unit casing and all components during installation such that no section deflects more than L/1000 during rigging of that section, where L is defined as the distance between lifting lugs.
2. Floor shall be constructed from 3/16" aluminum safety tread plate surface. The floor surface shall be welded and all spaces and joints completely sealed with dams around all bottom penetrations. Floor deflection shall not exceed L/200 under a point load of 200 pounds, where L is defined as the floor span.
3. Insulation that meets a minimum R-value of 16.7 shall be provided underneath the entire unit floor. Insulation shall completely fill the panel cavity in all directions so that no voids exist. Base assemblies shall comply with NFPA 90 A.
4. Safety grates that provide a walking surface shall be provided across all bottom air openings. Safety grates shall support a minimum 300-pound load. Safety grates shall be made of Type IWA welded rod with a cross flow pattern of 1.1875" x 4". Grating shall be aluminum construction for units with aluminum floors. Safety grates shall be removable to ensure adequate access to the ductwork below.

C. Walls

1. Wall assemblies shall be double-wall construction with stainless steel solid exterior and stainless steel interior. The entire unit shall have a solid wall liner on the interior. All spaces and joints of wall assemblies shall be completely sealed. Wall shall meet the casing deflection limits contained herein.
2. A Class "A" thermal break shall be provided throughout the entire wall assembly.
3. Insulation that meets a minimum R-value of 16.7 shall be provided throughout all unit wall assemblies. Insulation shall completely fill the panel cavity in all directions so that no voids exist and settling of insulation is prevented. Wall assemblies shall comply with NFPA 90 A.
4. Removable wall access panels shall be provided in coil sections for service removal of components. A Class "A" thermal break shall be provided throughout all removal wall access panels.

D. Access Doors

1. Access doors shall be provided throughout units as indicated on the schedules and drawings. Access doors shall be double wall construction. Interior and exterior door panels shall be of the same construction as the interior and exterior wall panels, respectively.
2. A Class "A" thermal break shall be provided on all door assemblies throughout the unit.
3. Insulation that meets a minimum R-value of 16.7 shall be provided throughout all door assemblies. Insulation shall completely fill the panel cavity in all directions so that no voids exist and settling of insulation is prevented. Door assemblies shall comply with NFPA 90 A.

4. All doors shall be a minimum of 60" high if sufficient height is available, or the maximum height allowed by the unit height. All doors shall open against pressure to ensure an airtight seal and to prevent a safety hazard.
5. Door hinges shall be stainless steel type. Door handles shall be Allegis design for minimized leakage and to provide a Class "A" thermal break. Handles shall fasten against the door frame with a roller cam to eliminate wear of the door frame. All door handles shall be operable from both the unit exterior and interior.
6. Windows shall be provided in doors as indicated on the schedule and drawings. Windows shall be mounted in a metal frame and shall be a minimum of 8" x 8", with wire-reinforced safety glass. For any instance where a window cannot fit in a door, a narrower window 8" tall may be provided. Windows in doors with a thermal break shall be thermal, double-pane type.

E. Roofs

1. Roof assemblies shall be double wall construction. Exterior roof panels and interior ceiling panels shall be of the same construction as the exterior and interior wall panels, respectively. Sections in units with perforated interior wall liners shall have perforated interior ceiling liners. For perforated liners, a triple-wall panel shall be provided. This triple-wall panel shall be constructed such that two layers of the panel are solid, with the afore-mentioned class of thermal break between them to isolate the supply air from contact with the outside panel. The third, inner liner shall be perforated. All spaces and joints of roof assemblies shall be completely sealed. In addition to meeting the casing deflection limits contained herein, roof deflection shall not exceed L/200 under a point load of 200 pounds, where L is defined as the roof panel span.
2. A Class "A" thermal break shall be provided throughout the entire roof assembly.
3. Insulation that meets a minimum R-value of 16.7 shall be provided throughout all roof assemblies. Insulation shall completely fill the panel cavity in all directions so that no voids exist. Roof assemblies shall comply with NFPA 90 A.
4. Outdoor unit roofs shall incorporate a standing seam on the exterior to ensure a rigid roof construction. Outdoor roofs shall be sloped, not less than 1/8" per foot for water drainage. Where outdoor units are shipped in multiple sections, provide standing-seam joiners at each split with adhesive, hardware, and cover strips for field joining by the installing contactor. On outdoor units, rain gutters shall be provided over all doors to direct rain away from the door assembly.

F. Service Corridors

1. The AHU Manufacturer shall provide service corridors as indicated on the schedule and drawings. Service corridors shall be an integral part of the unit construction, sharing common base, wall, and roof structures with the unit. Service corridors shall be the full unit height and shall run the full length of the unit. Corridors that are constructed separately from the unit for the purposes of being attached to the unit after construction are not acceptable. Service corridor walls shall be double wall construction. Corridor interior and exterior walls panels shall be of the same construction as the unit interior and exterior wall panels, respectively. The corridor interior ceiling and exterior roof panels shall be of the same construction as the unit interior ceiling and exterior roof panels, respectively. The unit roof shall cover the entire unit and corridor, and shall be sloped for water drainage.
2. The depth of the service corridors shall be as indicated on the schedule and drawings. Adequate service clearance shall be provided for all components within the corridor and NEC requirements for minimum height and width clearances shall be met.
3. Service corridors shall be provided with doors as indicated on the schedule and drawings. Both an exterior access door and a "floor hatch" type access door shall be provided. Doors shall be double wall construction. Interior and exterior cabinet door panels shall be of the same construction as the unit interior and exterior door panels, respectively.
4. Insulation that meets a minimum R-value of 16.7 shall be provided throughout the entire service corridor assembly, including wall assemblies, door assemblies, roof assemblies, and floors. Insulation shall completely fill the wall, door, roof and floor cavities in all

directions so that no voids exist and settling of insulation is prevented. Service corridors shall comply with NFPA 90 A.

5. Service corridors shall be conditioned with an electric unit heater sized to maintain a temperature inside the corridor at no less than 65 degrees when outside air temperatures are -50 degrees. Opening and/or damper sizes and locations shall be provided as indicated on the drawings.

G. Unit Paint

1. External surfaces of all outdoor unit casings shall be prepared and painted. Paint shall be able to withstand a salt spray test in accordance with ASTM B117 for a minimum of 700 consecutive hours. Paint shall be AHU Manufacturer's standard color, unless otherwise indicated in the schedule and drawings. For units requiring a color other than the AHU Manufacturer's standard color, the Architect shall provide a quantity of four 2" x 2" paint samples to the AHU Manufacturer at the time of submittal approval.

2.04 FAN ASSEMBLIES

A. Acceptable fan assembly shall be a single width, single inlet, class II, belt-drive type plenum fan dynamically balanced as an assembly, as shown in schedule. Maximum fan RPM shall be below first critical fan speed. Fan assemblies shall be dynamically balanced by the manufacturer on all three planes and at all bearing supports. Copper lubrication lines shall be provided and extend from the bearings and attached with grease fittings to the fan base assembly near access door. If not supplied at the factory, contractor shall mount copper lube lines in the field. Fan and motor shall be mounted internally on a steel base. Factory mount motor on slide base that can be slid out the side of unit if removal is required. Provide access to motor, drive, and bearings through hinged access door.

1. Acceptable fan array assemblies shall be single width, single inlet, class II, direct-drive type plenum fans dynamically balanced as an assembly, as shown in schedule. Maximum fan RPM shall be below first critical fan speed. Fan array assemblies shall be dynamically balanced by the manufacturer on all three planes.
2. Single source power motor control panel with short circuit protection disconnect factory wired from panel to motors in conduit. VFD's shall be provided with Air Handling Units. VFD’s shall comply with the requirements of Specification Section 23 09 23.
3. Walk in access section placed downstream.
4. Isolation damper mounted upstream of fan for isolation of individual fans. Isolation dampers shall be factory mounted to prevent reverse airflow through any fan that fails. Dampers shall be sized and positioned to minimize impact on fan performance. All losses associated with the dampers shall be considered when making fan selections.
5. Fan array shall have 11 blade direct drive, class II fans with all painted construction.

B. Fan and motor shall be mounted internally on a steel base. Factory-mount motor on slide base that can be slid out the side of the unit if removal is required. Provide access to motor, drive, and bearings through hinged access door. Fan and motor assembly shall be mounted on 2" deflection spring vibration type isolators inside cabinetry. Seismic snubbers shall be provided.

C. Motors: Pentium efficiency, class F insulated, suitable for operation with variable frequency drive, 1.15 service factor. Totally enclosed fan cooled design

2.05 BEARINGS, SHAFTS, AND DRIVES

A. Bearings: Basic load rating computed in accordance with AFBMA - ANSI Standards. The bearings shall be designed for service with an L-50 life of 400,000 hours and shall be a heavy duty pillow block, self-aligning, grease-lubricated ball or spherical roller bearing type.

B. Shafts shall be solid, hot rolled steel, ground and polished, keyed to shaft, and protectively coated with lubricating oil. Hollow shafts are not acceptable.

C. V-Belt drives shall be cast iron or steel sheaves, dynamically balanced, bored to fit shafts and keyed. Fixed sheaves, matched belts, and drive rated based on motor horsepower. Minimum of 2 belts shall be provided on all fans with 10 HP motors and above. Standard drive service

factor minimum shall be 1.1 S.F. for 1/4 HP - 7.5 HP, 1.3 S.F. for 10 HP and larger, calculated based on fan brake horsepower.

2.06 ELECTRICAL

A. Fan motors shall be manufacturer provided and installed, Open Drip Proof, premium efficiency (meets or exceeds EPAct requirements), 1750 RPM, single speed, Complete electrical characteristics for each fan motor shall be as shown in schedule.

B. The air handler(s) shall be ETL and ETL-Canada listed by Intertek Testing Services, Inc. Units shall conform to bi-national standard ANSI/UL Standard 1995/CSA Standard C22.2 No. 236.

C. Wiring Termination: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclosed terminal lugs in terminal box sized to NFPA 70.

D. Manufacturer shall provide ASHRAE 90.1 Energy Efficiency equation details for individual equipment to assist Building Engineer for calculating system compliance.

E. Provide marine light, in each section as shown on project schedule, mounted and wired to a junction box with an on-off switch and GFI receptacle mounted in the service corridor of the cabinet.

F. A 15 amp, 115V GFCI convenience outlet shall be provided by the AHU Manufacturer. The outlet shall be mounted inside the service corridor. The outlet shall be wired by the AHU Manufacturer to the same circuit as the lights.

G. All electrical connection components shall be field provided and mounted as shown on project schedule.

2.07 HEATING COILS

A. Certification: Acceptable water cooling, water heating, steam, and refrigerant coils shall be certified in accordance with AHRI Standard 410 and bear the AHRI label. Coils exceeding the scope of the manufacturer's certification and/or the range of AHRI's standard rating conditions will be considered provided the manufacturer is a current member of the AHRI Forced Circulation Air-Cooling and Air-Heating Coils certification programs and that the coils have been rated in accordance with AHRI Standard 410. Manufacturer must be ISO 9002 certified.

B. Glycol heating coil shall be provided for heating with 50% propylene glycol. Provide access to coil(s) for service and cleaning. Enclose coil headers and return bends fully within unit casing. Unit shall be provided with coil connections that extend a minimum of 5" beyond unit casing for ease of installation. Drain and vent connections shall be provided exterior to unit casing. Coil connections must be factory sealed with grommets on interior and exterior panel liners to minimize air leakage and condensation inside panel assembly. If not factory packaged, Contractor must supply all coil connection grommets and sleeves. Coils shall be removable through side and/or top panels of unit without the need to remove and disassemble the entire section from the unit.

C. Headers shall consist of seamless copper tubing to assure compatibility with primary surface. Headers to have intruded tube holes to provide maximum brazing surface for tube to header joint, strength, and inherent flexibility. Header diameter should vary with fluid flow requirements.

D. Fins shall have a minimum thickness of 0.0075 inch aluminum plate construction. Fins shall have full drawn collars to provide a continuous surface cover over the entire tube for maximum heat transfer. Tubes shall be mechanically expanded into the fins to provide a continuous primary to secondary compression bond over the entire finned length for maximum heat transfer rates. Bare copper tubes shall not be visible between fins.

E. Coil tubes shall be 5/8 inch OD seamless copper, 0.020 inch nominal tube wall thickness, expanded into fins, brazed at joints. Soldered U-bends shall be provided to minimize the effects of erosion and premature failure having a minimum tube wall thickness of .025 inches.

F. Coil connections shall be copper tube, OD sweat connection. Connection size to be determined by manufacturer based upon the most efficient coil circuiting. Vent and drain fittings shall be furnished on the connections, exterior to the air handler. Vent connections

provided at the highest point to assure proper venting. Drain connections shall be provided at the lowest point to insure complete drainage and prevent freeze-up.

G. Coil shall be furnished as an uncased galvanized steel track to allow for thermal movement and slide into a pitched track for fluid drainage.

2.08 FILTERS

A. Furnish flat filter in mixing box section with 2-inch pleated MERV 13 filter with microbial resistant Intersept coating. Provide side loading and removal of filters.

B. Filter media shall be UL 900 listed, Class I or Class II.

C. Filter Magnehelic gauge(s) shall be furnished and mounted by equipment manufacturer.

2.09 MIXING BOX SECTION

A. Mixing box section shall be provided with configuration as indicated on drawings.

B. Return Dampers shall be hollow core galvanized steel airfoil blades, fully gasketed and have continuous vinyl seals between damper blades in a galvanized steel frame. Dampers shall have stainless steel jamb seals along end of dampers. Connecting linkage and ABS plastic end caps shall be provided when return and outside air dampers are each sized for full airflow. Damper Leakage: Leakage rate shall be less than two tenths of one percent leakage at 2 inches static pressure differential. Leakage rate tested in accordance with AMCA Standard 500.

C. Oustide Air Dampers blades shall be extruded aluminum profiles, internally insulated with expanded polyurethane foam and shall be thermally broken. Complete blade shall have an insulating factor of R-2.29 and a temperature index of 55. Blade seals shall be of extruded EPDM. Frame seals shall be of extruded silicone. Seals to be secured in an integral slot within the aluminum extrusions. Linkage hardware shall be installed in the frame side and constructed of aluminum and corrosion-resistant, zinc-plated steel, complete with cup-point trunnion screws for a slip-proof grip, fully gasketed and have continuous vinyl seals between damper blades in a galvanized steel frame. Damper Leakage: Leakage rate shall be less than two tenths of one percent leakage at 2 inches static pressure differential. Leakage rate tested in accordance with AMCA Standard 500.

D. Return and outside air dampers of different sizes must be driven separately.

E. Access section shall be provided for access between components.

2.10 PLENUM SECTION

A. Plenum section shall be provided and properly sized for inlet and/or discharge air flow (between 600 and 1500 feet per minute). The plenum shall provide single or multiple openings as shown on drawings and project schedule.

B. Access section shall be provided for access between components.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Prior to start-up verify the following items have been completed:
   1. All spring-isolated components have had their shipping restraints removed and the components have been leveled.
   2. On all field-joined units, that all interconnections have been completed, i.e., electrical and control wiring, piping, casing joints, bolting, welding, etc.
   3. All water and steam piping connections have been completed and hydrostatically tested and all waterflow rates have been set in accordance with the capacities scheduled on the Drawings.
   4. All ductwork connections have been completed and all ductwork has been pressure tested for its intended service.

5. All power wiring, including motor starters and disconnects, serving the unit has been completed.
6. All automatic temperature and safety controls have been completed.
7. All dampers are fully operational.
8. All shipping materials have been removed.
9. All (clean) filter media has been installed in the units.

3.02 START UP

A. Perform the following tests and services and submit a report outlining the results:
1. Record date, time, and person(s) performing service.
2. Lubricate all moving parts.
3. Check all motor and starter power lugs and tighten as required.
4. Verify all electrical power connections.
5. Conduct a start up inspection per the AHU Manufacturer's recommendations.
6. Record fan motor voltage and amperage readings.
7. Check fan rotation and spin wheel to verify that rotation is free and does not rub or bind.
8. Check fan for excessive vibration.
9. Check V belt drive or coupling for proper alignment.
10. Check V belt drive for proper tension. Tighten the belts in accordance with the AHU Manufacturer's directions. Check belt tension during the second and seventh day's operation and re-adjust belts, as may be required, to maintain proper tension as directed by the AHU Manufacturer.
11. Remove all foreign loose material in ductwork leading to and from the fan and in the fan itself.
12. Disengage all shipping fasteners on vibration isolation equipment.
13. Check safety guards to ensure they are properly secured.
14. Secure all access doors to the fan, the unit and the ductwork.
15. Switch electrical supply "on" and allow fan to reach full speed.
16. Physically check each fan at start up and shut down to ensure no abnormal or problem conditions exist.
17. Check entering and leaving air temperatures (dry bulb and wet bulb) and simultaneously record entering and leaving chilled water temperatures and flow, steam pressures and flow, and outside air temperature.
18. Check all control sequences.

3.03 TRAINING

A. Provide 2 hours minimum training for operation and service of the air handling unit.

END OF SECTION

SECTION 23 8216
TERMINAL HEAT TRANSFER UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Finned Tube Radiation.

B. Unit Heaters.

C. Cabinet Unit Heaters.

D. Radiant Panels.

1.02 RELATED SECTIONS

A. Section 23 0503 – HVAC Piping and Valves.

B. Section 23 2116 – Hydronic Piping Specialties.

C. Section 23 0700 – HVAC Insulation.

D. Section 23 0923 – Direct Digital Controls.

1.03 REFERENCES

A. See Section 01 3300 – submittal procedures.

B. ANSI/NFPA 70 - National Electrical Code.

1.04 SUBMITTALS

A. Submit product data under provisions of Section 01 3300.

B. Submit schedules of equipment and enclosures typically indicating length and number of pieces of element and enclosure, and comparison of specified heat required to actual heat output provided.

C. Indicate mechanical and electrical service locations and requirements, specifically indicating deviations from indicated products.

1.05 PROJECT RECORD DOCUMENTS

A. Submit record documents under provisions of Section 01 3300.

B. Accurately record actual locations of access doors in radiation cabinets required for access to valves and or controls.

1.06 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Section 01 3300.

B. Include manufacturers' descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listings.

1.07 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum three years experience.

1.08 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.09 REGULATORY REQUIREMENTS

A. Conform to applicable code for internal wiring of factory wired equipment.

1.10 DELIVERY, STORAGE AND HANDLING

A. Deliver products to site under provisions of Section 01 6000 Materials and Equipment.

B. Store and protect products under provisions of Section 01 6000 Materials and Equipment.

C. Protect units from physical damage by storing in protected areas and leaving factory covers in place.

1.11 WARRANTY

A. Provide one year manufacturer's warranty under provisions of Section 01 3300.

PART 2 PRODUCTS

2.01 MANUFACTURERS - FINNED TUBE RADIATION UNIT HEATERS, CABINET UNIT HEATERS

A. Trane.

B. Sterling.

C. Rittling.

D. Modine.

E. Substitutions: Section 01 2513 - Product Substitutions.

2.02 FINNED TUBE RADIATION

A. Heating Elements: ¾ inch or 1 inch ID seamless copper tubing, 0.042 inches minimum wall thickness, mechanically expanded into evenly spaced aluminum fins, suitable for soldered fittings.

B. Element Hangers: Quiet operating, ball bearing cradle type providing unrestricted longitudinal movement, on enclosure brackets.

C. Enclosures: 14 gauge steel. Provide easily jointed components, with male/female slip joints and 14 gauge gussets, for wall to wall installation. Support rigidly, on wall or floor mounted brackets at least 3 feet on center maximum.

D. Finish: Factory applied baked enamel of color as selected on visible surfaces of enclosure or cabinet.

E. Access Doors: For otherwise inaccessible valves, provide factory-made permanently hinged access doors, 6 x 7 inch minimum size, integral with cabinet.

F. Capacity: Based on 65° F entering air temperature, 170° F average water temperature.

2.03 HORIZONTAL UNIT HEATERS

A. Manufacturers:
   1. Modine.
   2. Substitutions: Section 01 2513 - Product Substitutions.

B. Coils: Seamless copper tubing, 0.025 inch minimum wall thickness, silver brazed to steel headers, and with evenly spaced aluminum fins mechanically bonded to tubing.

C. Casing: 18 gauge steel with threaded pipe connections for hanger rods.

D. Finish: Factory apply baked enamel color as selected on visible surfaces of enclosure or cabinet.

E. Fan: Direct drive propeller type, statically and dynamically balanced, with fan guard; horizontal models with permanently lubricated sleeve bearings; vertical models with grease lubricated ball bearings.

F. Air Outlet: Adjustable pattern diffuser on projection models and four way louvers on horizontal throw models.

G. Motor: Refer to Section 23 0513; horizontal models with permanently lubricated sleeve bearings; vertical models with grease lubricated ball bearings.

H. Control: Local disconnect switch.

I. Capacity: Based on 65° F entering air temperature, 120° F average water temperature.

2.04 VERTICAL UNIT HEATERS

A. Manufacturers:
   1. Modine.
   2. Substitutions: Section 01 2513 - Product Substitutions.

B. Coils: seamless copper tubing, brazed to headers, and with evenly spaced aluminum fins mechanically bonded to tubing, designed for 250 psi and 220º F.

C. Casing: 20 gauge minimum steel with threaded pipe connections for hanger rods.

D. Finish: Factory applied finish as selected on visible surfaces of enclosure.

E. Fan: Direct drive propeller type, statically and dynamically balanced, with OSHA fan guard; horizontal models with permanently lubricated sleeve bearings; vertical models with grease lubricated ball bearings.

F. Air Outlet: Vertical four way adjustable airflow.

G. Motor: Refer to Section 23 0513; horizontal models with permanently lubricated sleeve bearings; vertical models with grease lubricated ball bearings.

H. Control: Local disconnect switch.

I. Capacity: Based on 65° F entering air temperature, 120° F average water temperature.

2.05 CABINET UNIT HEATERS

A. Coils: Evenly spaced aluminum fins mechanically bonded to copper tubes, designed for 100 psi and 220º F.

B. Cabinet: 16 gauge steel with exposed corners and edges rounded, easily removed panels, glass fiber insulation, and integral air outlet and inlet grilles.

C. Finish: Factory applied baked enamel of color as selected on visible surfaces of enclosure or cabinet.

D. Fans: Centrifugal forward-curved double-width wheels, statically and dynamically balanced, direct driven.

E. Motor: Sleeve bearings, resiliently mounted.

F. Control: Multiple speed switch, factory wired, located in cabinet.

G. Filter: Easily removed one inch thick glass fiber throw-away type, located to filter air before coil.

H. Capacity: Based on 65° F entering air temperature, 170° F average water temperature.

2.06 MANUFACTURERS - HYDRONIC RADIANT PANELS

A. Airtex.

B. Substitutions: Section 01 2513 - Product Substitutions.

2.07 HYDRONIC RADIANT PANELS

A. Ceiling Panels: Constructed of linear 24 inch wide aluminum extrusions, 4-tube with interlocking edges; manufactured and assembled to sizes and configurations indicated.

B. Pipe Coil: 24-inch module to incorporate extruded void into which continuous ½ inch copper pipe is rolled and thermally bonded. Provide return bends for two water connections to each panel.

C. Cross brace entire assembly with structural members.

D. Air Tex HEF-2 Radiant Ceiling System or approved equal.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work and opening dimensions are as instructed by the manufacturer.

B. Verify that required utilities are available, in proper location, and ready for use.

C. Beginning of installation means installer accepts existing surfaces.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Coordinate installation of radiant panels with ceiling grid installation.

C. Locate finned tube radiation on outside walls and run cover wall-to-wall unless otherwise indicated. Center elements under windows. Where multiple windows occur over units, divide element into equal segments centered under each window. Align cabinet joints with window mullions. Install wall angles where units butt against walls.

D. Hang unit heaters from building structure, with pipe hangers anchored to building, not from piping. Mount as high as possible to maintain greatest headroom unless otherwise indicated.

E. Install cabinet unit heaters as indicated. Coordinate to assure correct recess size for recessed units.

F. Protect units with protective covers during balance of construction.

G. Provide terminal units with shut-off valve, strainer and control valve on supply and balance and isolation valve on return.

H. Verify that electrical wiring installation is in accordance with manufacturer’s submittals and installation requirements of Division 26.

3.03 INSTALLATION – RADIANT CEILING PANELS

A. Provide all accessory wall channel molding, accessory bracing and extruded aluminum frame for mounting consistent with the ceiling type for a complete installation. Insulate the entire top of the radiant ceiling panel with 2” flexible fiberglass insulation complete with FSK facing. Tuck and continuously tape the insulation between ceiling grid runner and radiant panel, use FSK tape. No exposed fiberglass shall be allowed.

B. All interconnecting of radiant panels shall consist of factory supplied inter-connecting loops and 180 degree u-bends or alternate method as recommend by radiant panel manufacturer.

C. All radiant panels shall run continuous from wall-to-wall and shall be field trimmed to length ensuring adequate expansion allowance while maintaining panel end coverage by architectural mouldings. Inactive filler panels will be permitted only where indicated on drawings.

D. All radiant panels shall be installed by personnel wearing clean white gloves, to avoid soiling of panel face. Hanger wires for safety and seismic restraint shall be installed at 4ft. (1220mm) o.c. or as recommended by the manufacturer.

3.04 CLEANING

A. Clean work under provisions of Division 01.

B. After construction is completed, including painting, clean exposed surfaces of units. Vacuum clean coils and inside of cabinets.

C. Touch-up marred or scratched surfaces of factory-finished cabinets, using finish materials furnished by manufacturer.

D. Install new filters.

END OF SECTION

SECTION 26 0126

TESTING AND MAINTENANCE OF ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Feeder Megohm Testing.

B. Receptacle Branch Circuit Testing.

C. Ground Fault Circuit Interrupter Testing.

D. Electrical Service Ground Testing.

E. Phase Rotation.

F. Additional Testing and Maintenance requirements in individual equipment and system Sections

1.02 REFERENCES

A. NETA ATS – Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

B. ANSI/IEEE Std 81-1983 Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System.

C. ANSI/TIA/EIA – 568-B.1 and Addendums, General Cabling System Requirements

1.03 SUBMITTALS

A. Division 01 - submittal procedures: Requirements for submittals and Section 26 0500.

B. Product Data: Submit technical information for each test instrument to include manufacturer, model number, serial number, ratings, accuracy, and National Institute of Standards and Technology (NIST) Traceable calibration certification.

1.04 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Submit Test Reports per Section 26 0500.

1.05 COORDINATION

A. Provide written 72 hours advance notice of all tests to be performed to allow Owner's Representative to witness testing.

1.06 REQUIRED TEST INSTRUMENTS

A. MEGOHMMETER
   1. Product Description: 1000 Volt DC, portable, insulation and resistance test Megohmmeter.
   2. Equipment Accuracy:
      a. 2000 Megohm Range - 3% of full Scale.

B. BRANCH CIRCUIT ANALYZER
   1. Product Description: Branch circuit analyzer capable of receptacle testing of voltage drop under load, hot-neutral-ground conductor resistances, common mode (N-G) Voltage, and G.F.C.I. trip point.
   2. Manufacturer: Ideal SureTest. Model: 61-156 ST-1THD Wiring/Harmonic Distortion Analyzer or approved equal.
   3. Equipment Accuracy:
      a. Accuracy 1% full scale ± 1 digit True RMS.

C. GROUND RESISTANCE CLAMP-ON METER
   1. Product Description: Digital, direct reading clamp-on resistance ground tester.
   2. Manufacturer: AEMC. Model: 3711 or approved equal.
   3. Equipment Accuracy:
      a. 1.0 to 50.0 Ohms 6 (1.5% + 0.1 Ohm)
      b. 50.0 to 100.0 Ohms 6 (2.0% + 0.1 Ohm)
      c. 100 to 200 6 (1.5% + 0.1 Ohm)

d. 200 to 400 Ohms 6 (1.5% + 0.1 Ohm).
e. 400 to 600 Ohms 6 (1.5% + 0.1 Ohm).

D. MULTIMETER
1. Product Description: Digital True RMS Multimeter.
2. Equipment Accuracy:
a. AC Voltage Range: 0.75% 6 3 last single digits at 60 Hz.
b. AC Current Range: 0.90% 6 3 last single digits at 60 Hz.
c. DC Voltage Range: 0.25% 6 1 last single digit.
d. DC Current Range: 0.75% 6 1 last single digit.
e. Resistance Ranges: 0.50% 6 1 last single digit.
f. Frequency Range: 0.10% 6 1 last single digit @ 60 Hz.

E. SOUND LEVEL METER
1. Product Description: Sound Level Meter meeting ANSI S.14a Type 2, Specifications for Sound Level Meters. Capable of A-Weighted measurement.

1.07 TEST INSTRUMENT CALIBRATION

A. All test equipment shall be in good mechanical and electrical condition.

B. Provide calibration for each test instrument directly traceable to the National Institute of Standards and Technology (NIST) of higher accuracy than that of the instrument tested.

C. Provide calibration labels visible on all test equipment. Records, which show date and results of instruments calibrated or tested, shall be kept up-to-date.

D. Calibrate instruments in accordance with the following frequency schedule:
1. Field instruments: 12 months maximum.
2. Up-to-date instrument calibration instructions and procedures shall be maintained for each test instrument with the equipment.

1.08 MINIMUM REPORT INFORMATION

A. Report Criteria: After each test, promptly submit one copy of report to the Owner's Representative. Include information on the ASD report form where included within this specification otherwise provide form with the minimum following information:
1. Date issued.
2. Project title and number.
3. Name and Model of Tester and witnesses.
4. Date and time of sampling or inspection.
5. Identification of product and specifications section.
6. Type of inspection or test.
7. Date of test.
8. Results of tests.
9. Indicate compliance or non-compliance with Contract Documents.
10. Final adjustment setting values where applicable.

B. Submit copy of all tests performed in the O&M manual.

1.09 GENERAL REQUIREMENTS

A. Submit test results within 3 working days of each test and included in the O&M manual. Submit all test data in hard copy and electronic format on CD-ROM or DVD-ROM.

B. Provide qualified personnel at site to perform all testing.

C. Perform specified testing of products in accordance with specified standards or as denoted in this specification whichever is more stringent.

D. Promptly notify Owner's Representative of irregularities or non-conformance of Work or products.

E. Perform additional tests when test is performed incorrectly, deemed inaccurate, or incorrectly documented.

F. The Contractor shall provide all forms, instrumentation and test equipment, loads, and other consumables required to demonstrate the systems to Owner's Representative satisfaction.

G. Perform and submit all testing prior to substantial completion and system acceptance.

H. Retest all material, cables etc that are disturbed after testing.

I. Replace and retest all material installed which does not meet or exceed the minimum acceptable limits set forth in this specification in accordance with the contract original requirements at no additional charge to Contract Sum/Price.

J. Owner's Representative shall be notified in writing at least 3 days prior to any testing being performed.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.01 FEEDER CONDUCTOR TEST

A. Tests Criteria:
   1. Use Megohm meter to test all feeder cables.
   2. Perform insulation-resistance test on each conductor with respect to ground and adjacent conductors. Applied potential 1000 volts DC for 600 volt rated cable.
   3. Perform test immediately after installation.
   4. Clean exposed cable ends with clean cloth and alcohol.
   5. Test duration shall be one minute.
   6. Disconnect conductors from all equipment.
   7. Record the resistance of the insulated conductor under test with all other conductors connected together and to ground (metallic raceway, grounding conductor, etc).
   8. Perform continuity test to insure correct cable connection.
      a. Submit test results to Owner's Representative.

B. Test Values:
   1. Minimum insulation-resistance value: 50 megohms.
   2. Investigate deviations between adjacent phases.

3.02 RECEPTACLE GROUND FAULT CIRCUIT INTERRUPTER TEST

A. Test Criteria:
   1. Use Branch Circuit Analyzer to perform test of each GFCI protected receptacle.
   2. Record trip level in ma for each outlet.
   3. Submit test results to Owner's Representative.

B. Test Values:
   1. Trip Range: Between 6-9 mA.

3.03 ELECTRICAL SERVICE GROUND TEST

A. Test Criteria:
   1. Use ground resistance clamp-on meter to measure the resistance of service ground with meter clamped between system neutral bond and each grounding electrode. Perform this test on new or existing services and all separately derived systems.
   2. Record resistance value in Ohms.
   3. Submit test results to Owner's Representative.

B. Test Values:
   1. Ground maximum resistance: 10 Ohms.

3.04 PHASE ROTATION TEST

A. Test each three phase circuit and feeder for consistent phase rotation for the entire power system with a phase rotation meter.

B. Bump test each motor for proper rotation prior to use.

C. Correct conductor phase relationship to provide proper phase rotation.

D. Record the rotation sequence on each panelboard, MDP and Service circuit schedule.

E. Submit test results of each panelboard, MDP and Service to the Owner's Representative.

3.05 PHASE LOAD BALANCE TEST

A. After energizing building loads conduct a phase load balance test for each panelboard with a clamp on ammeter.

B. Shift loads to provide current balance within 10% of the other phases. Revise circuit directory to reflect any changes.

C. Notify Owner's Representative at least 72 hours in advance before test.

END OF SECTION

SECTION 26 0500
COMMON WORK RESULTS FOR ELECTRICAL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General Requirements specifically applicable to Division 26, in addition to Division 01 provisions.

B. The electrical system equipment and installation shall comply with all provisions and requirements of this specification, as well as any and all applicable national, state and local codes and standards.

1.02 WORK SEQUENCE

A. Construct Work in sequence under provisions of Division 01.

1.03 COORDINATION

A. See Division 01 – submittal procedures.

B. Coordinate the Work specified in this Division under provisions of Division 01.

C. Prepare drawings showing proposed rearrangement of Work to meet job conditions, including changes to Work specified under other Sections. Obtain permission of Architect prior to proceeding.

1.04 REFERENCES

A. ANSI/NFPA 70 - National Electrical Code, latest adopted edition including all state and local amendments.

B. NECA - Standard of Installation.

C. NETA ATS – Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

D. Electrical Reference Symbols: The Electrical "Legend" on drawings is standardized version for this project. All symbols shown may not be used on drawings. Use legend as reference for symbols used on plans.

E. Electrical Drawings: Drawings are diagrammatic; complimentary to the Architectural drawings; not intended to show all features of work. Install material not dimensioned on drawings in a manner to provide a symmetrical appearance. Do not scale drawings for exact equipment locations. Review Architectural, Structural, and Mechanical Drawings and adjust work to conform to conditions shown thereon. Field verification of dimensions, locations and levels is directed.

1.05 REGULATORY REQUIREMENTS

A. Conform to ANSI/NFPA 70.

B. Conform to the latest adopted edition of the International Building Code and the International Fire Code including all state and local amendments thereto.

C. Obtain electrical permits, plan review, and inspections from authority having jurisdiction.

1.06 SUBMITTALS

A. Submit inspection and permit certificates under provisions of Division 01.

B. Include certificate of final inspection and acceptance from authority having jurisdiction.

C. Submittal review is for general design and arrangement only and does not relieve the Contractor from any requirements of Contract Documents. Submittal not checked for quantity, dimension, fit or proper operation. Where deviations of substitute product or system performance have not been specifically noted in the submittal by the Contractor, provisions of a complete and satisfactory working installation is the sole responsibility of the Contractor.

D. In addition to requirements referenced in Division 01, the following is required for work provided under this division of the specification.
   1. Provide material and equipment submittals containing complete listings of material and equipment shown on Electrical Drawings and specified herein, bound in hard cover, loose-leaf binders separate from work furnished under other divisions. Index and clearly identify all material and equipment by item, name or designation used on drawings and in specifications.
   2. Submit only pages which are pertinent; mark each copy of standard printed data to identify pertinent products, referenced to Specification Section and Article number. Show reference standards, performance characteristics, and capacities; wiring diagrams and controls; component parts; finishes; dimensions; and required clearances.
   3. Modify manufacturer's standard schematic drawings and diagrams to supplement standard information and to provide information specifically applicable to the work. Delete information not applicable.
   4. Review submittals prior to transmittal; determine and verify field measurements, field construction criteria, manufacturer's catalog numbers, and conformance of submittal with requirements of Contract Documents.
   5. Coordinate submittals with requirements of work and of Contract Documents.
   6. Sign or initial each sheet of shop drawings and product data, and each sample label to certify compliance with requirements of Contract Documents. Notify Architect/Engineer in writing at time of submittal, of any deviations from requirements of Contract Documents.
   7. Do not fabricate products or begin work which requires submittals until return of submittal with Architect/Engineer acceptance.
   8. Equipment scheduled by manufacturer's name and catalog designations, manufacturer's published data and/or specification for that item, in effect on bid date, are considered part of this specification. Approval of other manufacturer's item proposed is contingent upon compliance therewith.
   9. Submittals for Division 26 shall be complete and submitted at one time. Unless given prior approval, partial submittals will be returned unreviewed.

1.07 SUBSTITUTIONS

A. In accordance with the General Conditions and the General Requirements, Substitution and Product Options, all substitute items must fit in the available space, and be of equal or better quality including efficiency performance, size, and weight, and must be compatible with existing equipment.

1.08 PROJECT RECORD DRAWINGS

A. Maintain project record drawings in accordance with Division 01.

B. In addition to the other requirements, mark up a clean set of drawings as the work progresses to show the dimensioned location and routing of all electrical work which will become permanently concealed. Show routing of work in permanently concealed blind spaces within the building. Show complete routing and sizing of any significant revisions to the systems shown.

C. Record drawing field mark-ups shall be maintained on-site and shall be available for examination of the Owner’s Representative at all times.

1.09 OPERATION AND MAINTENANCE MANUALS

A. Provide operation and maintenance manuals for training of Owner's Representative in operation and maintenance of systems and related equipment. In addition to requirements referenced in Division 01, the following is required for work provided under this section of the specifications.

B. Manuals shall be hard cover, loose-leaf binders with pages reinforced to prevent pullout and shall be separate from work furnished under other divisions. Prepare a separate chapter for instruction of each class of equipment or system. Index and clearly identify each chapter and provide a table of contents.

C. Unless otherwise noted in Division 01, provide one copy of all material for approval. After approval, provide five corrected approved copies.

D. The following is the suggested outline for operation and maintenance manuals and is presented to indicate the extent of items required in manuals.
   1. List chapters of information comprising the text. The following is a typical Table of Contents:
      a. Electrical power distribution
      b. Lighting
      c. Fire alarm
      d. Structured Cabling
      e. Other chapters as necessary
   2. Provide the following items in sequence for each chapter shown in Table of Contents:
      a. Describe the procedures necessary for personnel to operate the system including start-up, operation, emergency operation and shutdown.
         1) Give complete instructions for energizing equipment and making initial settings and adjustments whenever applicable.
         2) Give step-by-step instructions for shutdown procedure if a particular sequence is required.
         3) Include test results of all tests required by this and other sections of the specifications.
      b. Maintenance Instructions:
         1) Provide instructions and a schedule of preventive maintenance, in tabular form, for all routine cleaning and inspection with recommended lubricants if required for the following:
            a) Lighting fixtures
            b) Distribution equipment
            c) Fire alarm and detection equipment
            d) Structured Cabling
         2) Provide instructions for minor repair or adjustments required for preventive maintenance routines, limited to repairs and adjustments which may be performed without special tools or test equipment and which requires no special training or skills.
         3) Provide manufacturers' descriptive literature including approved shop drawings covering devices used in system, together with illustrations, exploded views, etc. Also include special devices provided by the Contractor.
         4) Provide any information of a maintenance nature covering warranty items, etc., which have not been discussed elsewhere.
         5) Include list of all equipment furnished for project, where purchased, technical representative if applicable and a local parts source with a tabulation of descriptive data of all electrical-electronic spare parts and all mechanical spare parts proposed for each type of equipment or system. Properly identify each part by part number and manufacturer.

1.10 DEMONSTRATION OF ELECTRICAL SYSTEMS

A. During substantial completion inspection:
   1. Conduct operating test for approval under provisions of Division 01.
   2. Demonstrate installation to operate satisfactorily in accordance with requirements of Contract Documents.
   3. Should any portion of installation fail to meet requirements of Contract Documents, repair or replace items failing to meet requirements until items can be demonstrated to comply.
   4. Have instruments available for measuring light intensities, voltage and current values, and for demonstration of continuity, grounds, or open circuit conditions.
   5. Provide personnel to assist in taking measurements and making tests.

1.11 WARRANTY

A. In addition to the requirements of Division 01, warrant all materials, installation and workmanship for one (1) year from date of acceptance.

B. Copies of manufacturer product warranties for all equipment shall be included in the operation and installation manuals.

1.12 INSTRUCTION OF OPERATING PERSONNEL

A. In accordance with the requirements of Division 01 and this section provide services of qualified representative of supplier of each item or system listed below to instruct designated personnel of Owner in operation and maintenance of item or system.

B. Make instruction when system is complete, of number of hours indicated, and performed at time mutually agreeable.

System or Equipment	Hours of Instruction
Fire alarm system	4

C. Certify that an Anchorage, Fairbanks or Nome based authorized service organization regularly carries complete stock of repair parts for listed equipment or systems, that organization is available and will furnish service within 48 hours after request. Include name, address and telephone number of service organization.

D. Have approved operation and maintenance manuals and parts lists for all equipment on hand at time of instruction.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. All Materials and Equipment shall be new and shall be listed by Underwriters Laboratories or equivalent third party listing agency for the use intended.

B. Materials and Equipment shall be acceptable to the authority having jurisdiction as suitable for the use intended when installed per listing and labeling instructions.

C. No materials or equipment containing asbestos in any form shall be used. Where materials or equipment provided by this Contractor are found to contain asbestos such items shall be removed and replaced with non-asbestos containing materials and equipment at no cost to the Owner.

D. In describing the various items of equipment, in general, each item will be described singularly, even though there may be numerous similar items.

PART 3 EXECUTION

3.01 WORKMANSHIP

A. Install Work using procedures defined in NECA Standard of Installation and/or the manufacturer's installation instructions.

3.02 TESTS

A. Notify Contracting Officer at least 72 hours prior to conducting any tests.

B. Following completion of installation, test system ground in accordance with the requirements of NETA ATS 7.13. and all feeders in accordance with NETA ATS 7.3. Submit logs of values obtained, and nameplate data of instruments used prior to final inspection. Include a copy of all data in the power distribution section of the Operation and Maintenance Manuals.

C. Perform additional tests required under other sections of these specifications.

D. Perform all tests in the presence of the Owner's authorized representative.

E. The Contractor shall provide written notification to the Owner's authorized representative and the State Electrical Inspector thirty days in advance of requests for rough-in and substantial completion inspections.

END OF SECTION

SECTION 26 0503
EQUIPMENT WIRING CONNECTIONS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Electrical connections to equipment specified under other Sections. or furnished by Owner.

1.02 RELATED WORK

A. Division 01 - Administrative Requirements; Summary: Owner-furnished equipment.

B. Division 08 - Overhead Coiling Doors, Overhead Sectional Doors, Automatic Entrances, Revolving Door Entrances, Door Hardware.

C. Division 11 – Loading Dock Equipment, Residential Appliances, Food Services Equipment, Projection Screens, Laboratory Equipment, Basketball Backstops, Waste Compactors and Destructors.

D. Division 12 – Window Treatments, Horizontal Louver Blinds, Drapery and Track Accessories.

E. Division 22 – Plumbing Equipment.

F. Division 23 – HVAC Equipment.

G. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables.

H. Section 26 0533 - Raceway and Boxes for Electrical Systems.

1.03 REFERENCES

A. Division 01 – submittal procedures.

B. FS W-C-596 - Electrical Power Connector, Plug, Receptacle, and Cable Outlet.

C. National Electrical Manufacturers Association:

1. NEMA WD 1 - General Purpose Wiring Devices.
2. NEMA WD 5 - Specific-Purpose Wiring Devices.

1.04 SUBMITTALS

A. Division 01 – Submittal Procedures.

B. Product Data: Submit wiring device manufacturer’s catalog information showing dimensions, configurations, and construction.

C. Manufacturer's installation instructions.

1.05 COORDINATION

A. Division 01 - Administrative Requirements: Coordination and project conditions.

B. Obtain and review shop drawings, product data, manufacturer’s wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.

C. Determine connection locations and requirements.

D. Sequence rough-in of electrical connections to coordinate with installation of equipment.

E. Sequence electrical connections to coordinate with start-up of equipment.

PART 2 PRODUCTS

2.01 CORDS AND CAPS

A. Straight-blade Attachment Plug: NEMA WD 1.

B. Locking-blade Attachment Plug: NEMA WD 5.

C. Attachment Plug Configuration: Match receptacle configuration at outlet provided for equipment.

D. Cord Construction: Oil-resistant thermoset insulated Type SO multiconductor flexible cord with identified equipment grounding conductor, suitable for extra hard usage in damp locations.

E. Cord Size: Suitable for connected load of equipment and rating of branch circuit overcurrent protection.

PART 3 EXECUTION

3.01 INSPECTION

A. Verify that equipment is ready for electrical connection, wiring, and energization.

3.02 PREPARATION

A. Review equipment submittals prior to installation and electrical rough-in. Verify location, size, and type of connections. Coordinate details of equipment connections with supplier and installer.

3.03 EXISTING WORK

A. Remove exposed abandoned equipment wiring connections including abandoned connections above accessible ceiling finishes.

B. Disconnect abandoned utilization equipment and remove wiring connections. Remove abandoned components when connected raceway is abandoned and removed. Install blank cover for abandoned boxes and enclosures not removed.

C. Extend existing equipment connections using materials and methods compatible with existing electrical installations, or as specified.

3.04 INSTALLATION

A. Use wire and cable with insulation suitable for temperatures encountered in heat-producing equipment.

B. Make conduit connections to equipment using flexible conduit. Use Liquidtight flexible conduit in damp or wet locations.

C. Install pre-finished cord set where connection with attachment plug is indicated or specified by the equipment manufacturer's installation instructions, or use attachment plug with suitable strain-relief clamps.

D. Provide suitable strain-relief clamps for cord connections to outlet boxes and equipment connection boxes.

E. Make wiring connections in control panel or in wiring compartment of pre-wired equipment in accordance with manufacturer's instructions. Provide interconnecting wiring where required.

F. Install disconnect switches, controllers, control stations, and control devices such as limit switches and temperature switches and connect with conduit and wiring as indicated in the equipment manufacturer's installation instructions.

G. Coolers and Freezers: Cut and seal conduit openings in freezer and cooler walls, floor, and ceilings.

3.05 ADJUSTING

A. Cooperate with utilization equipment installers and field service personnel during checkout and starting of equipment to allow testing and balancing and other startup operations. Provide personnel to operate electrical system and checkout wiring connection components and configurations.

END OF SECTION

SECTION 26 0519

LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Building wire.

B. Cable.

C. Wiring connections and terminations.

1.02 RELATED SECTIONS

A. Section 26 0553 – Identification for Electrical Systems

B. Division 31 – Trenching

C. Division 31 – Backfill

1.03 REFERENCES

A. Division 01 – submittal procedures.

B. Federal Specification FS-A-A59544 – Cable and Wire, Electrical (Power, Fixed Installation)

C. Federal Specification FS-J-C-30B – Cable Assembly, Power, Electrical

D. ANSI/NEMA WC 70-2009 – Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy.

E. NETA ATS – Acceptance testing specifications for Electrical Power Distribution and Systems.

F. NFPA 70 – National Electrical Code.

G. NFPA 262 – Standard Method of test for flame travel and smoke of wires and cables for use in air-handling spaces.

H. UL 4 – Standard for Armored Cable.

I. UL 62 – Flexible Cords and Cables.

J. UL 83 – Thermoplastic Insulated Wire and Cable.

K. UL 1063 – Standard for Machine and Tool Wire and Cable.

L. UL 1424 – Standard for Cables for Power-Limited Fire Alarm.

M. UL 1479 – Standard for Fire Tests of Through Wall Penetration Fire Stops.

N. UL 1569 – Standard for Metal Clad Cable.

O. UL 1581 – Reference Standard for Electrical Wires, Cables and Flexible Cords.

1.04 QUALITY ASSURANCE

A. Provide wiring materials located in plenums with peak optical density not greater than 0.5, average optical density not greater than 0.15, and flame spread not greater than 5 feet (1.5m) when tested in accordance with NFPA 262.

PART 2 PRODUCTS

2.01 BUILDING WIRE

A. Thermoplastic-insulated Building Wire: NEMA WC 5.

B. Feeders and Branch Circuits Larger Than 6 AWG: Copper, stranded conductor, 600 volt insulation, THW, THHN/THWN or XHHW-2 as indicated.

C. Feeders and Branch Circuits 6 AWG and Smaller: Copper conductor, 600 volt insulation, THHN/THWN or XHHW-2. 6 and 8 AWG, stranded conductor; smaller than 8 AWG, solid conductor.

D. Branch Circuit Wire Color Code:

1. Color code wires by line or phase as follows:
   a. Black, red, blue and white for 120/208V systems.

2. For conductors 6 AWG and smaller, insulation shall be colored. For conductors 4 AWG and larger, identify with colored phase tape at all terminals, splices, and boxes.
3. When two or more neutrals are installed in one conduit, identify each with the proper circuit number in accordance with Section 26 05 53.
4. Grounding conductors 6 AWG and smaller shall have green colored insulation. For 4 AWG and larger, use green tape at both ends and at all other visible points in between, including pull and junction boxes.

E. Control Circuits: Copper, stranded conductor 600 volt insulation, THHN/THNN or XHHW-2.

F. Fire Alarm Notification Appliance Circuits: Copper, solid or stranded conductor 600 volt insulation, THHN/THNN or XHHW-2.

G. Wire and cables in cable trays shall be specifically approved for installation in cable trays.

2.02 METAL CLAD CABLE

A. UL 83, 1063, 1479, 1569, and 1581 listed, meets Federal Specification A-A-59544 (formerly J-C-30B). UL rated for installation in cable trays and environmental air handling spaces. Fire wall rated for 1, 2, and 3-hour through penetrations.

B. Type MC Cable, Size 12 Through 10 AWG: Solid copper conductor, 600 volt thermoplastic insulation, rated 90º C dry, 75º wet, insulated green grounding conductor, and galvanized steel armor over mylar.

C. Fire Alarm/Control Type MC Cable, Size 18 through 12 AWG: Complying with UL 62, 83, 1424, 1479, 1569, 1581, and NFPA 262 (formerly UL 910), solid copper conductor, 300 volt thermoplastic insulation, rated 105º C, insulated green grounding conductor, and red-striped galvanized steel armor over mylar. Conductor insulation shall be color-coded in accordance with Section 28 31 00.

D. All metal clad cable shall be provided with color-coded insulation on all ungrounded conductors in accordance with NEC 210.5(C) and Part 3 of this section.

2.03 REMOTE CONTROL AND SIGNAL CABLE

A. Control Cable for Class 1 Remote Control and Signal Circuits: Copper conductor, 600 volt insulation, rated 90º C, individual conductors twisted together, shielded, and covered with an overall PVC jacket; UL listed.

B. Control Cable for Class 2 or Class 3 Remote Control and Signal Circuits: Copper conductor, 300 volt insulation, rated 90º C, individual conductors twisted together, shielded or unshielded (as required), and covered with a PVC jacket; UL listed.

C. Plenum Cable for Class 2 or Class 3 Remote Control and Signal Circuits: Copper conductor, 300 volt insulation, rated 90º C, individual conductors twisted together, shielded or unshielded (as required), and covered with a nonmetallic jacket; UL listed for use in air handling ducts, hollow spaces used as ducts, and plenums.

2.04 WIRING CONNECTIONS AND TERMINATIONS

A. For conductors 8 AWG and smaller:
1. Dry interior areas: Spring wire connectors, pre-insulated “twist-on” rated 105 degrees C per UL 468C. Where stranded conductors are terminated on screw type terminals, install crimp insulated fork or ring terminals. Thomas & Betts Sta-Kon or equal.
2. Motor connections: Spring wire connectors, pre-insulated “twist-on” rated 105 degrees C per UL 468C. Provide a minimum of 8 wraps of Scotch 33+ electrical tape around conductors and connector to eliminate connector back off.
3. Wet or exterior: Spring wire connectors, pre-insulated “twist-on”, resin filled rated for direct burial per UL 486D.

B. For conductors 6 AWG and larger:
1. Bus lugs and bolted connections: 600 V, 90 degrees C., two hole long barrel irreversible compression copper tin plated. Thomas & Betts or approved equal.

2. Motor connection: 600 V, 90 degrees C., copper tin plated compression motor pigtail connector, quick connect/disconnect, slip on insulator. Thomas & Betts or approved equal.
3. Two way connector for splices or taps: 600 V, 90 degrees C., compression long barrel, copper tin plated. Thomas & Betts or approved equal. Insulate with Scotch 23 rubber insulating base covering and Scotch 33+ outer wrap.

PART 3 EXECUTION

3.01 GENERAL WIRING METHODS

A. Use no wire smaller than 12 AWG for power and lighting circuits, and no smaller than 18 AWG for control wiring.

B. Use 10 AWG conductor for 20 ampere, 120 volt branch circuit home runs longer than 75 feet, and for 20 ampere, 277 volt branch circuit home runs longer than 200 feet.

C. Splice only in junction or outlet boxes.

D. Neatly train and lace wiring inside boxes, equipment, and panelboards.

E. Make Conductor lengths for parallel circuits equal.

F. Wiring in lighting fixture channels shall be rated for 90º C minimum.

G. Do not share neutral conductors. Provide a dedicated neutral conductor for each branch circuit that requires a neutral.

3.02 WIRING INSTALLATION IN RACEWAYS

A. Pull all conductors into a raceway at the same time. Verify that raceway is complete and properly supported prior to pulling conductors. Use UL listed wire pulling lubricant for pulling 4 AWG and larger wires.

B. Install wire in raceway after interior of building has been physically protected from the weather and all mechanical work likely to injure conductors has been completed.

C. Do not install XHHW-2 conductors when ambient temperatures are below –5 degrees C and THHN/THWN conductors when ambient temperatures are below 0 degrees C.

D. Conductors shall be carefully inspected for insulation defects and protected from damage as they are installed in the raceway. Where the insulation is defective or damaged, the cable section shall be repaired or replaced at the discretion of the Owner and at no additional cost to the Owner.

E. Place an equal number of conductors for each phase of a circuit in same raceway or cable.

F. Route conductors from each system in independent raceway system and not intermix in the same raceway, enclosure, junction box, wireway, or gutter as another system unless otherwise shown on the plans.

G. No more than three current carrying conductors shall be installed in any homerun unless otherwise indicated on the drawings.

H. Completely and thoroughly swab raceway system before installing conductors.

3.03 CABLE INSTALLATION

A. Provide protection for exposed cables where subject to damage.

B. Support cables above accessible ceilings; do not rest on ceiling tiles. Use spring metal clips or cable ties to support cables from structure. Do not support cables from ceiling suspension system. Include bridle rings or drive rings.

C. Use suitable cable fittings and connectors.

D. Trench and backfill for direct buried cables per Division 31. Install warning tape along entire length of direct burial cables.

3.04 WIRING CONNECTIONS AND TERMINATIONS

A. Splice only in accessible junction boxes.

B. Thoroughly clean wires before installing lugs and connectors.

C. Make splices, taps and terminations to carry full ampacity of conductors without perceptible temperature rise.

D. Terminate spare conductors with twist on connectors or heat shrink insulation to proper voltage rating.

E. Control systems wiring in conjunction with mechanical or miscellaneous equipment, including motor control center, switchboards, etc., to be identified in accordance with wiring diagrams furnished with equipment.

F. Code sound and signal systems wiring and any special equipment in accordance with manufacturer's diagrams or recommendations.

G. Do not exceed manufacturer's recommended pull tensions.

H. Use suitable reducing connectors or mechanical connector adapters for connecting aluminum conductor to copper conductors.

3.05 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Division 01.

B. Inspect wire and cable for physical damage and proper connection.

C. Torque conductor connections and terminations to manufacturer's recommended values.

D. Perform continuity test on all power and equipment branch circuit conductors. Verify proper phasing connections.

3.06 WIRE AND CABLE INSTALLATION SCHEDULE

A. All Locations: Building wire and/or remote control and signal cable in raceways metal clad cable.

B. At the Contractor’s option Metal Clad cable may be used for branch circuit wiring other than homeruns. Homeruns shall be building wire in raceway. Metal Clad cable used for branch circuit wiring from a light switch to the light fixture shall include a spare conductor for future use.

END OF SECTION

SECTION 26 0526
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Power system grounding.

B. Electrical equipment and raceway grounding and bonding.

1.02 RELATED SECTIONS

A. The Work under this section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions, and sections under Division 01 General Requirements.

B. Section 26 0500 – Common Work Results for Electrical.

1.03 REFERENCE STANDARDS

A. Division 01 – submittal procedures.

B. ANSI/NEMA GR-1, Ground Rod Electrodes and Ground Rod Electrode Couplings.

C. ANSI/NFPA 70 – National Electrical Code.

D. ASTM B 3 – Standard Specification for Soft or Annealed Copper Wire.

E. AWS A5.8/A5.8M – Specification for Filler Metals for Brazing and Braze Welding.

F. IEEE Std 81 – Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System.

G. IEEE Std 142 – Recommended Practice for Grounding of Industrial and Commercial Power System.

H. UL 467 – Standard for Grounding and Bonding Equipment.

1.04 SYSTEM DESCRIPTION

A. Provide a complete grounding system for services and equipment as required by State Codes, NEC, applicable portions of other NFPA codes, and as indicated herein.

1.05 SUBMITTALS

A. Product Data: Submit product data for all components provided, showing material type and dimensions. Each catalog sheet should be clearly marked to indicate exact part number provided, including all options and accessories.

B. Shop Drawings: Submit shop drawings indicating layout of ground ring, location of main grounding bus, system grounding electrode connections (ground rods, concrete encased electrode, etc.), routing of grounding electrode conductor, and size/type of bonding conductors and termination locations of all major bonding connections (water, piping, steel, fuel tanks, etc..

1.06 CLOSEOUT SUBMITTALS

A. Project Record Drawings
   1. Accurately indicate actual locations of main grounding bus, all grounding rods, concrete encased electrodes, etc.
   2. Show the actual installed layout of ground ring, routing of grounding electrode conductor, and size/type of bonding conductors and termination locations of all major bonding connections (water, piping, steel, fuel tanks, etc.).

B. Test Reports
   1. The results of electrical ground resistance test, performed on the installed grounding system shall be submitted in accordance with the paragraph entitled “Field Quality Control” of this section.
   2. Each test report shall include:
      a. Date of test, soil moisture content, and soil temperature
      b. Test operator

c. Instrument or other test equipment used
d. Electrode designation or location matching that shown on shop drawings
e. Ground impedance in ohms
f. Assumptions made - if required

1.07 COORDINATIONS

A. Division 01 – Administrative Requirements: Requirements for Coordination.

B. Complete grounding and bonding of building reinforcing steel prior to concrete placement.

PART 2 PRODUCTS

2.01 MATERIALS

A. Solid Ground Rods: Copper-encased steel, ¾ inch diameter, minimum length 10 feet. Ground rods shall be clean and smooth.

B. Bonding Conductors: Solid bare copper wire for sizes No. 8 AWG and smaller diameter. Stranded bare copper wire for sizes No. 6 AWG and larger diameter. Conductors may be insulated conductors if used provide green insulation.

C. Grounding Conductors: Copper conductor bare or green insulated.

D. Telecommunications Bonding Backbone: Bare copper, 2 AWG, stranded conductor.

E. Telecommunications Bonding Busbar: As specified in Section 27 10 00. Wall-mounted, solid copper, 12 inch by 4 inch by ¼ inch thick busbar with two insulators and standoff brackets. Chatsworth #40153-012 or approved equal.

F. Mechanical Grounding and Bonding Connectors: Non-reversible crimp type lugs only. Use factory made compression lug for all terminations.

G. Exothermic Grounding and Bonding Connectors: Exothermic welded type. Welding procedure shall include the proper mold and powder charge and shall conform to the manufacturer's recommendations.

H. In external locations, clamping shall be used only where a disconnect type of connection is required. Connection device may utilize threaded fasteners. Device shall be constructed such that positive contact pressure shall be maintained at all times. Machine bolts with spring-type lock washers shall be used.

PART 3 EXECUTION

3.01 INSTALLATION

A. Provide a separate, insulated equipment-grounding conductor in all feeder and branch circuits. Terminate each end on a grounding lug, bus, or bushing. Multiple conductors on single lug not permitted. Each grounding conductor shall terminate on its own terminal lug.

B. Connect grounding electrode conductors to metal water pipe using a suitable ground clamp. Make connections to flanged piping at street side of flange. Provide bonding jumper around water meter and back flow preventors.

C. Supplementary Grounding Electrode: Use driven ground rod on exterior of building in main service equipment area. Use effectively grounded metal frame of the building.

D. Telecommunications Bonding Backbone: Leave 10 feet slack conductor at terminal cabinet. Terminate at the electrical service entrance and at the ground bar or grounding lug on telecommunications rack.

E. Provide grounding and bonding at Utility Company's metering equipment.

F. Bond together system neutrals, service equipment enclosures, exposed non-current carrying metal parts of electrical equipment, metal raceway systems, grounding conductor in raceways and cables, receptacle ground connectors, and plumbing systems.

G. Grounding conductors for branch circuits shall be sized in accordance with NEC, except minimum size grounding conductor shall be No. 12 AWG.

H. Grounding conductor is in addition to neutral conductor and in no case shall neutral conductor serve as grounding means.

I. Ground rods shall be installed so that the top of the rod is not less than 12 inches below finished grade.

3.02 FIELD QUALITY CONTROL

A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.

B. Upon completion of the ground installation and before connection to the permanent facility power the Contractor shall measure the ground resistance of the grounding electrode system. The testing shall utilize a clamp-on ground meter. The Contractor shall notify the Owner's representatives a minimum of 5 business days prior to the scheduled ground testing date so they may be present at the time of testing. The Contractor shall immediately notify the Owner's representative if the measured ground resistance is above 20 ohms. The Contractor shall submit a copy of the test report to the Owner's representative within 10 days after testing and before the ground system becomes inaccessible.

C. Ground Isolation Test: Ground systems shall be tested for isolation from other ground system.

D. Continuity Test: Continuity test shall be performed on all power receptacles to ensure that the ground terminals are properly grounded to the facility ground system.

END OF SECTION

SECTION 26 0529

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDED

A. Conduit supports.

B. Formed steel channel.

C. Spring steel clips.

D. Firestopping relating to electrical work.

E. Equipment bases and supports.

1.02 RELATED WORK

A. The Work under this section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions, and sections under Division 01 General Requirements, and Section 26 0500 – Common Work Results for Electrical.

B. Division 03 - Cast-In-Place Concrete: Product requirements for concrete for placement by this section.

1.03 REFERENCES

A. Division 01– submittal procedures.

B. International Building Code (IBC), Chapter 16 – Structural Design.

C. ASTM International:
   1. ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops.

D. Underwriters Laboratories Inc.:
   1. UL 1479 - Fire Tests of Through-Penetration Firestops.

1.04 DEFINITIONS

A. Firestopping (Through-Penetration Protection System): Sealing or stuffing material or assembly placed in spaces between and penetrations through building materials to arrest movement of fire, smoke, heat, and hot gases through fire rated construction.

1.05 SYSTEM DESCRIPTION

A. Firestopping Materials: ASTM E814 and UL 1479 to achieve fire ratings as noted on Drawings for adjacent construction, but not less than 1 hour fire rating.
   1. Ratings may be 3-hours for firestopping in through-penetrations of 4-hour fire rated assemblies unless otherwise required by applicable codes.

1.06 PERFORMANCE REQUIREMENTS

A. Firestopping: Conform to UL for fire resistance ratings and surface burning characteristics.

1.07 SUBMITTALS

A. Division 01 – Submittal Procedures: Requirements for submittals.

B. Product Data:
   1. Firestopping: Submit data on product characteristics, performance and limitation criteria.

C. Manufacturer's Installation Instructions:
   1. Firestopping: Submit preparation and installation instructions.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

E. Seismic Restraint Calculations:
   1. Provide structurally engineered shop drawings for seismic restraint of all electrical equipment required by the International Building Code (IBC), Chapters 16, 17. Structural design shall be based on the Seismic Use Category and Seismic Design Category as designated in these chapters.

2. Shop drawings shall be stamped by a professional engineer registered in the State of Alaska.

1.08 COORDINATION

A. Coordinate size, shape and location of concrete pads with Division 03.

1.09 QUALITY ASSURANCE

A. Support systems shall be adequate for weight of equipment and conduit, including wiring, which they carry.

B. Through Penetration Firestopping of Fire Rated Assemblies: UL 1479 or ASTM E814 with 0.10 inch water gage (24.9 Pa) minimum positive pressure differential to achieve fire F-Ratings and temperature T-Ratings as indicated on Drawings, but not less than 1-hour.
   1. Wall Penetrations: Fire F-Ratings as indicated on Drawings, but not less than 1-hour.
   2. Floor and Roof Penetrations: Fire F-Ratings and temperature T-Ratings as indicated on Drawings, but not less than 1-hour.
   3. Floor Penetrations Within Wall Cavities: T-Rating is not required.

C. Perform Work in accordance with State of Alaska Standard Specifications.

1.10 ENVIRONMENTAL REQUIREMENTS

A. Division 01 – Temporary Environmental Controls: Environmental conditions affecting products on site.

B. Do not apply firestopping materials when temperature of substrate material and ambient air is below 60 degrees F (15 degrees C).

C. Maintain this minimum temperature before, during, and for minimum 3 days after installation of firestopping materials.

PART 2 PRODUCTS

2.01 CONDUIT SUPPORTS

A. Manufacturers:
   1. Allied Tube & Conduit Corp.
   2. Minerallac Fastening Systems.
   3. O-Z Gedney Co.
   4. Substitutions: Section 01 2513 - Product Substitutions.

B. Hanger Rods: Threaded high tensile strength galvanized carbon steel with free running threads.

C. Beam Clamps: Malleable Iron, with tapered hole in base and back to accept either bolt or hanger rod. Set screw: hardened steel.

D. Conduit clamps for trapeze hangers: Galvanized steel, notched to fit trapeze with single bolt to tighten.

E. Conduit clamps - general purpose: One-hole malleable iron for surface mounted conduits.

F. Cable Ties: High strength nylon temperature rated to 185 degrees F (85 degrees C). Self locking.

2.02 FORMED STEEL CHANNEL

A. Manufacturers:
   1. B-Line Systems
   2. Allied Tube & Conduit Corp.
   3. Unistrut Corp.
   4. Substitutions: Section 01 2513 - Product Substitutions.

B. Product Description: Galvanized 12 gage thick steel. With holes 1-1/2 inches on center.

2.03 FIRE STOPPING

A. Manufacturers:
   1. Dow Corning Corp.
   2. 3M Fire Protection Products.
   3. Fire Trak Corp.
   4. Substitutions: Section 01 2513 - Product Substitutions.

B. Product Description: Different types of products by multiple manufacturers are acceptable as required to meet specified system description and performance requirements; provide only one type for each similar application.
   1. Silicone Firestopping Elastomeric Firestopping: Single component silicone elastomeric compound and compatible silicone sealant.
   2. Foam Firestopping Compounds: Single component foam compound.
   3. Formulated Firestopping Compound of Incombustible Fibers: Formulated compound mixed with incombustible non-asbestos fibers.
   4. Fiber Stuffing and Sealant Firestopping: Composite of mineral fiber stuffing insulation with silicone elastomer for smoke stopping.
   5. Mechanical Firestopping Device with Fillers: Mechanical device with incombustible fillers and silicone elastomer, covered with sheet stainless steel jacket, joined with collars, penetration sealed with flanged stops.
   6. Intumescent Firestopping: Intumescent putty compound which expands on exposure to surface heat gain.
   7. Firestop Pillows: Formed mineral fiber pillows.

2.04 FIRESTOPPING ACCESSORIES

A. Primer: Type recommended by firestopping manufacturer for specific substrate surfaces and suitable for required fire ratings.

B. Installation Accessories: Provide clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.

C. General:
   1. Furnish UL listed products or products tested by independent testing laboratory.
   2. Select products with rating not less than rating of wall or floor being penetrated.

D. Non-Rated Surfaces:
   1. Stamped steel, chrome plated, hinged, split ring escutcheons or floor plates or ceiling plates for covering openings in occupied areas where conduit is exposed.
   2. For exterior wall openings below grade, furnish modular mechanical type seal consisting of interlocking synthetic rubber links shaped to continuously fill annular space between conduit and cored opening or water-stop type wall sleeve.

PART 3 EXECUTION

3.01 EXAMINATION

A. Division 01: Verification of existing conditions before starting work.

B. Verify openings are ready to receive firestopping.

3.02 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter affecting bond of firestopping material.

B. Remove incompatible materials affecting bond.

C. Install damming materials to arrest liquid material leakage.

D. Obtain permission from Owner’s Representative before using powder-actuated anchors.

E. Obtain permission from Owner’s Representative before drilling or cutting structural members.

3.03 INSTALLATION - GENERAL

A. Fasten hanger rods, conduit clamps, and outlet and junction boxes to building structure using precast insert system, expansion anchors, preset inserts, beam clamps, or spring steel clips.

B. Use toggle bolts or hollow wall fasteners in hollow masonry partitions and walls; expansion anchors or preset inserts in solid masonry walls; self-drilling anchors or expansion anchor on concrete surfaces; sheet metal screws in sheet metal studs; and wood screws in wood construction.

C. Do not support raceways, low voltage pathways, cables, telecommunication pathways or boxes from ceiling suspension wires or suspended ceiling systems. Provide support from building structure independently to allow ceiling removal and replacement without removal of electrical system. If dedicated support wires are used, wires and wire clips must be painted or color-coded. Exception: Outlet boxes for ceiling-mounted light fixtures, speakers, and smoke detectors may be mounted in the ceiling system.

D. Do not fasten supports to piping, ductwork, mechanical equipment, conduit, or ceiling suspension system.

E. Do not penetrate by drilling or screwing into metal roof decking. All penetrations into metal roof decking must be approved by the Project Manager in writing.

F. Fabricate supports from structural steel or steel channel, rigidly welded or bolted to present a neat appearance. Use hexagon head bolts with spring lock washers under all nuts.

G. In wet locations install free-standing electrical equipment on concrete pads. Pad top shall be a minimum of 3 ½” above the surrounding grade and shall be reinforced in accordance with Division 3 of these specifications.

H. Install surface-mounted cabinets and panelboards with minimum of four anchors.

I. Bridge studs top and bottom with channels to support flush-mounted cabinets and panelboards in stud walls.

J. Securely fasten fixtures and equipment to building structure in accordance with manufacturer's recommendations and to provide necessary earthquake anchorage.

K. Provide wall attached fixtures and equipment weighing less than 50 pounds with backing plates of at least 1/8" x 10" sheet steel or 2" x 10" fire retardant treated wood securely built into the structural walls. Submit attachment details of heavier equipment for approval.

L. Earthquake Anchorages:
   1. Equipment weighing more than 50 pounds shall be adequately anchored to the building structure to resist lateral earthquake forces.
   2. Total lateral (earthquake) forces shall be 1.5 times the equipment weight acting laterally in any direction through the equipment center of gravity. Provide adequate backing at structural attachment points to accept the forces involved.

M. For light fixtures installed in exposed areas (i.e. with no ceiling system), provide safety chains capable of supporting a minimum of 200 pounds. Attach safety chains to building structure and to each end of the light fixtures so as to not allow fixture to drop more than 6 inches upon primary fixture support failure.

N. Provide two minimum color-coded dedicated seismic support wires for each ceiling mounted light fixture weighing less than 50 pounds. Attach support wires to building structure independent from ceiling system and on opposing corners of the light fixtures to not allow fixture to drop more than 6 inches upon ceiling failure. Secure each end with three tight wraps within 1 inch at each end of the wire.

O. Attach the supporting cables for all pendant fixtures to both the building structure and to the ceiling grid which they pass through.

P. Replace or repair any fireproofing damaged by the installation of supporting equipment or devices.

Q. Power-driven fasteners are prohibited for tension load applications (such as supporting luminaries or conduit racks from ceiling above). Use drilled-in expansion anchors, or drilled and screw-in anchors such as Kwik-Con II or Tapcon.

3.04 INSTALLATION - FIRESTOPPING

A. Install material at fire rated construction perimeters and openings containing penetrating sleeves, piping, ductwork, conduit and other items, requiring firestopping.

B. Apply primer where recommended by manufacturer for type of firestopping material and substrate involved, and as required for compliance with required fire ratings.

C. Apply firestopping material in sufficient thickness to achieve required fire and smoke rating,to uniform density and texture.

D. Place intumescent coating in sufficient coats to achieve rating required.

E. Fire Rated Surface:
   1. Seal opening at floor, wall, partition, ceiling, and roof as follows:
      a. Install sleeve through opening and extending beyond minimum of 1 inch on both sides of building element.
      b. Size sleeve allowing minimum of 1 inch void between sleeve and building element.
      c. Pack void with backing material.
      d. Seal ends of sleeve with UL listed fire resistive silicone compound to meet fire rating of structure penetrated.

F. Where cable tray, conduit, or wireway penetrates fire rated surface, install firestopping product in accordance with manufacturer's instructions.

G. Non-Rated Surfaces:
   1. Seal opening through non-fire rated wall, partition floor, ceiling, and roof opening as follows:
      a. Install sleeve through opening and extending beyond minimum of 1 inch on both sides of building element.
      b. Size sleeve allowing minimum of 1 inch void between sleeve and building element.
      c. Install type of firestopping material recommended by manufacturer.

H. Install escutcheons floor plates or ceiling plates where conduit, penetrates non-fire rated surfaces in occupied spaces. Occupied spaces include rooms with finished ceilings and where penetration occurs below finished ceiling.

I. Exterior wall openings below grade: Assemble rubber links of mechanical seal to size of conduit and tighten in place, in accordance with manufacturer's instructions.

3.05 INSTALLATION - SLEEVES

A. Exterior watertight entries: Seal with adjustable interlocking rubber links.

B. Conduit penetrations not required to be watertight: Sleeve and fill with silicon foam.

C. Set sleeves in position in forms. Provide reinforcing around sleeves.

D. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

E. Extend sleeves through floors 1 inch (25 mm) above finished floor level. Caulk sleeves.

F. Where conduit or raceway penetrates floor, ceiling, or wall, close off space between conduit or raceway and adjacent work with fire stopping insulation and caulk airtight. Provide close fitting metal collar or escutcheon covers at both sides of penetration.

G. Install chrome plated steel escutcheons at finished surfaces.

3.06 FIELD QUALITY CONTROL

A. Division 01 – Quality Control (Testing): Field inspecting, testing, adjusting, and balancing.

B. Inspect installed firestopping for compliance with specifications and submitted schedule.

3.07 CLEANING

A. Division 01: Requirements for cleaning.

B. Clean adjacent surfaces of firestopping materials.

3.08 PROTECTION OF FINISHED WORK

A. Division 01: Requirements for protecting finished Work.

B. Protect adjacent surfaces from damage by material installation.

END OF SECTION

SECTION 26 0533
RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal conduit.
B. Flexible metal conduit.
C. Liquidtight metal conduit.
D. Electrical metallic tubing.
E. Nonmetallic conduit.
F. Surface Mounted Raceway.
G. Auxiliary Gutter
H. Fittings and conduit bodies.
I. Wall and ceiling outlet boxes.
J. Pull and junction boxes.

1.02 RELATED SECTIONS

A. The Work under this section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions,
B. Division 01 - General Requirements, Summary, Administrative Requirements
C. Division 07 Thermal and Moisture Protection.
D. Division 08 Openings: Access Doors and Frames.
E. Section 26 0500 – Common Work Results for Electrical.
F. Section 26 0519 – Low Voltage Electrical Power Conductors and Cables.
G. Section 26 0526 – Grounding and Bonding for Electrical Systems.
H. Section 26 0529 – Hangers and Supports for Electrical Systems.
I. Section 26 0553 – Identification for Electrical Systems.
J. Section 26 2716 – Cabinets and Enclosures.
K. Section 26 2726 – Wiring Devices.
L. Section 27 1000 – Structured Cabling.

1.03 REFERENCES

A. See Division 01– submittal procedures.
B. American National Standards Institute (ANSI):
   1. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.
   2. ANSI C80.3 - Electrical Metallic Tubing, Zinc Coated.
   3. ANSI C80.5 - Rigid Aluminum Conduit.
C. American Society for Testing and Materials (ASTM):
   1. ASTM A 123 – Specification for Zinc Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars and Strip.
D. National Electrical Manufacturers Association (NEMA):
   1. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
   2. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
   3. NEMA RN 1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
   4. NEMA TC 2 - Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80).
   5. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.

6. NEMA TC 7 - Smooth-Wall Coilable Polyethylene Electrical Plastic Conduit.
7. UL651B – Continuous Length HDPE Conduit.
8. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

E. National Fire Protection Association (NFPA):
1. NFPA 70 - National Electrical Code.

F. Telecommunications Industry Association (TIA) and Electronics Industries Association (EIA)
1. ANSI/TIA/EIA 568-B Commercial Building Telecommunications Cabling Standard

G. Building Industry Consulting Service International (BICSI):
1. BICSI Telecommunication Design Methods Manual

H. International Building Code (IBC):
1. IBC chapters 16 and 17 seismic requirements.

1.04 RACEWAY AND BOX INSTALLATION SCHEDULE

A. Raceway Minimum Size:
1. Below Grade: Provide 1 inch minimum, unless otherwise noted.
2. Above Grade or Slab on Grade: Provide 1/2 inch minimum, unless otherwise noted. Raceway may be reduced to ½ inch for final connection of raceway up to 6 feet for connection to fixture or device where maximum conduit entry size is ½ inch.

B. Underground more than 5 feet from foundation wall:
1. Raceway: Provide rigid steel conduit or intermediate metal conduit. Schedule 40 plastic conduit. HDPE conduit.
   a. Provide detectable warning tape over all underground raceways per 26 0553.
   b. Provide 3-inch minimum spacing between raceways.
   c. Provide 3/4 inch minus material 6 inches above and below conduit. Backfill remaining trench free of debris or rocks greater than 1 inch in diameter.
2. Boxes and Enclosures: Provide concrete type 1A handhole.

C. Under or in concrete slab, or underground within 5 feet of foundation wall:
1. Raceway: Provide rigid steel conduit or intermediate metal conduit All conduit in contact with concrete or block shall be rigid steel conduit half lapped wrapped with pipe wrap or be plastic-coated conduit. Provide transition to rigid steel conduit 12 inches prior to exit penetration through foundations, concrete walls, or block walls. Provide transition to rigid steel conduit elbow and riser for penetration through slab. Arrange raceway so the curved portion of bend is not visible above finished slab.
2. Boxes and Enclosures: Provide concrete tight cast and sheet metal steel metal boxes.

D. In or through CMU walls:
1. Raceway: Provide rigid steel conduit or intermediate metal conduit. EMT conduit may penetrate through CMU walls where the EMT is installed in a sleeve and does not come in direct contact with the CMU.
2. Boxes and Enclosures: Provide concrete tight cast and sheet metal steel metal boxes.

E. Outdoor Above Grade, Damp or Wet Interior Locations:
1. Raceway: Provide rigid steel conduit or intermediate metal conduit.
2. Boxes and Enclosures: Provide weatherproof galvanized steel for branch circuit junction and outlet boxes. Provide weatherproof NEMA 3R galvanized steel, 316 stainless steel sheet metal enclosures for safety and disconnect switches and NEMA 4 sheet metal enclosures with gaskets for motor controllers and control panels.
3. Fittings: Provide galvanized malleable iron with gaskets. Provide Myers threaded hubs for all conduit entries into top and side of sheet metal enclosures.

F. Concealed Dry Locations:
1. Raceway: Provide rigid steel conduit, intermediate metal conduit, or electrical metallic tubing.
2. Boxes and Enclosures: Provide sheet-metal boxes.
3. Fittings: Provide galvanized malleable iron and steel.

G. Exposed Dry Locations:
   1. Raceway: Provide rigid steel conduit or intermediate metal conduit. EMT conduit may be used where exposed conduit is allowed where it is not subject to physical damage or where installed on the ceiling or a minimum of ten feet above the floor.
   2. Boxes and Enclosures: Provide sheet-metal boxes with raised steel covers.
   3. Fittings: Provide galvanized malleable iron and steel.
   4. Surface Raceway and Boxes. Where specifically noted on the Drawings, provide surface raceway and boxes.

H. Telecommunication Grounding:
   1. Raceway: Provide aluminum or PVC conduit (non-ferrous) where the grounding conductor is not concealed within the wall or ceiling; or if the grounding conductor is exposed to physical damage.
   2. Boxes and Enclosure: Provide non-ferrous as required.
   3. Fittings: Provide non-ferrous as required.

I. Fiber Optic Cable:
   1. Raceway: Provide plenum-rated flexible nonmetallic optical fiber raceway. Optical fiber raceway shall be routed in either conduit or J-hooks, as indicated on the Drawings.

J. Telecommunications Cable:
   1. Raceway: Where portions of cabling system are installed in raceway, provide rigid steel conduit, intermediate metal conduit, or electrical metallic tubing.
   2. Boxes and Enclosures: Provide sheet metal boxes.
   3. Fittings: Provide galvanized malleable iron and steel

K. Fire Alarm Cable:
   1. Raceway: Provide fire alarm EMT in all interior locations. Where portions of raceway are installed outdoors, in or under the slab, and in or through CMU walls, comply with all other requirements of this section, as noted above.
   2. Boxes and Enclosures: Provide sheet metal boxes.
   3. Fittings: Provide galvanized malleable iron and steel

L. Hazardous Locations (Classified Wiring):
   1. Raceway: Provide rigid steel conduit.
   2. Boxes and Enclosures: Provide galvanized malleable iron rated Class 1 Division 1, NEMA FB1.

M. Equipment Connections: Provide short extensions (three feet maximum) of flexible metal conduit for connections to light fixtures, motors, transformers, vibrating equipment or equipment that requires removal for maintenance or replacement. Use Liquidtight flexible conduit and fittings for motors and equipment in damp or wet locations or subject to spilling of liquids as at pumps, kitchen equipment, in mechanical rooms, boiler rooms, pump rooms, etc.

N. Liquidtight flexible nonmetallic conduit and electrical nonmetallic tubing are <u>not</u> approved raceway systems for this project.

1.05 DESIGN REQUIREMENTS

A. Raceway Minimum Size:
   1. Line Voltage Circuits: Raceway is sized on the drawings for copper conductors with 600-Volt type XHHW insulation, unless otherwise noted. Where a raceway size is not shown on the drawings, it shall be calculated to not exceed the percentage fill specified in the NEC Table 1, Chapter 9 using the conduit dimensions of the NEC Table 4, Chapter 9 and conductor properties of the NEC Table 5, Chapter 9.
   2. Fire Alarm, Telecom, Intercom and other Low-Voltage Circuits: Raceway size shall be calculated to not exceed the percentage fill specified in the NEC Table 1, Chapter 9, using the conduit dimensions of the NEC Table 4, Chapter 9, and cable diameter provided by the manufacturer.

B. Box Minimum Size: Provide all boxes sized and configured per NEC Article 370 and as specified in this section.

C. Seismic Support: Provide support in accordance with section 26 0529.

D. Telecommunication Pathways Layout and Configuration: BICSI Telecommunication Design Methods Manual and ANSI/TIA/EIA 568-B Commercial Building Telecommunications Cabling Standard.

1.06 SUBMITTALS

A. Division 01- Submittals and Section 26 0500 - Electrical General Provisions.

B. Product Data: Submit data for products to be provided.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

B. Protect PVC conduit from sunlight.

PART 2 PRODUCTS

2.01 RIGID METAL CONDUIT (RMC)

A. Rigid Steel Conduit: ANSI C80.1, UL 6.

B. Rigid Aluminum Conduit: ANSI C80.5.

C. Fittings and Conduit Bodies: NEMA FB 1, UL 514B; Galvanized malleable iron with threaded hubs for all conduit entries. Provide threaded connections and couplings only. Set Screw and running thread fittings are not permitted. Provide copper free aluminum fittings and conduit bodies with Aluminum Conduit.

D. Provide insulated throat bushings at all conduit terminations.

2.02 PVC COATED RIGID METAL CONDUIT

A. Product Description: NEMA RN 1; rigid steel conduit with external 40-mil PVC coating and internal galvanized surface.

B. Fittings and Conduit Bodies: NEMA FB 1; steel fittings with insulated throat bushings and external PVC coating to match conduit.

2.03 INTERMEDIATE METAL CONDUIT (IMC)

A. Product Description: ANSI C80.6, UL 1242; Galvanized Steel Conduit.

B. Fittings and Conduit Bodies: NEMA FB 1, UL 514B; use fittings and conduit bodies specified above for rigid steel conduit.

C. Provide insulated throat bushings at all conduit terminations.

2.04 FLEXIBLE METAL CONDUIT (FMC)

A. Product Description: UL 1, FS WW-C-566; galvanized or zinc-coated flexible steel, full-wall thickness. Reduced-wall flexible metal conduit is not acceptable.

B. Fittings and Conduit Bodies: ANSI/NEMA FB 1; steel or malleable iron with insulated throat bushings. Die cast zinc or threaded inside throat fittings are not acceptable.

2.05 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

A. Product Description: UL 360, flexible metal conduit with interlocked steel construction and PVC jacket.

B. Fittings and Conduit Bodies: ANSI/NEMA FB 1; liquid tight steel or malleable iron with insulated throat bushings. Die cast fittings are not acceptable.

2.06 ELECTRICAL METALLIC TUBING (EMT)

A. Product Description: ANSI C80.3, UL 797; galvanized steel tubing.

B. Fire Alarm EMT: Provide EMT with factory-applied red topcoating.

C. Fittings and Conduit Bodies: ANSI/NEMA FB 1; steel or malleable iron, compression or set screw type with insulated throat bushings. Zinc die cast, or indentor fittings are not acceptable.

D. Maximum size shall be 2". Provide factory elbows on sizes 1-½" and larger.

2.07 RIGID NONMETALLIC CONDUIT (RNC)

A. Product Description: NEMA TC 2; Schedule 40 PVC, rated for 90º C cable.

B. Fittings and Conduit Bodies: NEMA TC 3.

C. Provide PVC-coated rigid steel or Reinforced Thermosetting Resin Conduit (RTRC) factory elbows for bends in all plastic conduit runs, regardless of length.

2.08 HIGH DENSITY POLYETHYLENE CONDUIT (HDPE)

A. Conduit: NEMA TC 7; HDPE conduit rated for 90º C cable. Provide Schedule 40 conduit for trade sizes up to 2” and Schedule 80 conduit for trade sizes above 2”.

B. Provide conduit with pullstring installed.

C. Fittings and Conduit Bodies: NEMA TC 7.

D. HDPE to RMC Couplings: Basis of design is Duraline “Shur-Lock II” or equal.

E. HDPE to HDPE Couplings: Butt-fusion, electro-fusion couplers, self-threading couplings, or drive-on couplings. All couplings shall be UL listed for the intended purpose.

2.09 ELECTRICAL NONMETALLIC TUBING (ENT)

A. Not approved for use on this project.

2.10 FLEXIBLE NONMETALLIC OPTICAL FIBER RACEWAY

A. Product Description: UL2024 Plenum Rated; Indoor, corrugated, 1-inch in diameter. Color Orange

B. Fittings: By same manufacturer as optical fiber raceway. Plenum Rated.

2.11 AUXILIARY GUTTERS

A. Manufacturers:
   1. Square D.
   2. Circle AW.
   3. Hoffmann.
      a. Substitutions: Division 01– Submittal Procedures.

B. Auxiliary Gutters: General purpose Raintight type wireway, with knockouts.

C. Size and length as indicated on Drawings.

D. Cover: Hinged cover.

E. Connector: Slip-in construction; hinged cover.

F. Fittings: Lay-in type with removable top, captive screws.

G. Finish: Rust inhibiting primer coat with gray enamel finish.

2.12 OUTLET BOXES

A. Sheet Metal Outlet Boxes: ANSI/NEMA OS 1, UL514A galvanized steel, with plaster ring where applicable.
   1. Minimum Size: 4 inches square or octagonal, 1-1/2 inches deep, unless otherwise noted.
   2. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; furnish 1/2 inch male fixture studs where required. Minimum Size: 4 inches square or octagonal, 2-1/8 inches deep.
   3. Concrete and Masonry: Concrete type with field installed tape cover to prevent concrete entry to raceway system. Minimum Size: 4 inches square, 2-1/8 inches deep.
   4. Telecommunications Outlets: Minimum size 4-11/16 inches square, 2-1/8 inches deep.

B. Cast Boxes: NEMA FB 1, Type FD, galvanized malleable iron. Furnish gasketed cover by box manufacturer. Furnish threaded hubs. “Bell” boxes are not acceptable.

C. Wall Plates: As specified in Section 26 2726.

2.13 PULL AND JUNCTION BOXES

A. Sheet Metal Pull and Junction Boxes: ANSI/NEMA OS 1, UL514A galvanized steel.
   1. Minimum Size: 4 inches square or octagonal, 1-1/2 inches deep, unless otherwise noted.
   2. Residential Construction: Minimum size is same as sheet metal outlet boxes.

B. Sheet Metal Boxes Larger Than 12 Inches in Any Dimension: Hinged enclosure in accordance with Section 26 27 16.

C. Cast Metal Boxes for Outdoor and Wet Location Installations: NEMA 250, Type 4X; flat-flanged, surface mounted junction box, UL listed as raintight:
   1. Material: Galvanized cast iron or copper-free cast aluminum.
   2. Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover and screws.

2.14 EXPANSION FITTINGS

A. Galvanized malleable iron, galvanized with grounding bond jumper.

2.15 RACEWAY SEALING FITTINGS

A. Galvanized malleable iron, galvanized filled with sealing compound.
   1. Class 1 Division 1 boundary lines and isolation of arcing devices use Class 1 Division 1 sealing compound.

2.16 BUSHINGS

A. Non-grounding: Threaded impact resistant plastic.

B. Grounding: Insulated galvanized malleable iron/steel with hardened screw bond to raceway and conductor lug.

2.17 LOCKNUTS

A. Threaded Electro Zinc Plated Steel designed to cut through protective coatings for ground continuity.

2.18 WIREWAY

A. Product Description: General purpose type wireway. Size per NEC minimum fill capacity required.

B. Knockouts: Field-installed, no factory knockouts acceptable.

C. Cover: Screw cover.

D. Fittings and Accessories: Include factory couplings, offsets, elbows, adapters and support straps required for a complete system. Provide internal ground bonding jumper bonded to each section.

PART 3 EXECUTION

3.01 INSTALLATION

A. Ground and bond raceway and boxes in accordance with Section 26 0526.

B. Provide seismic support and fasten raceway and box supports to structure and finishes in accordance with Section 26 0529.

C. Identify raceway and boxes with origin and destination in accordance with Section 26 0553.

D. Unless otherwise noted, do not inter-mix conductors from separate panelboards or any other system in the same raceway system or junction boxes.

3.02 INSTALLATION - GENERAL RACEWAY

A. Install raceway for all systems, unless otherwise noted.

B. Install an equipment grounding conductor inside of all flexible raceways containing line voltage conductors.

C. Provide raceways concealed in construction unless specifically noted otherwise, or where installed at surface cabinets, motor and equipment connections and in Mechanical and

Electrical Equipment rooms. Do not route conduits on roofs, outside of exterior walls, or along the surface of interior finished walls unless specifically noted on the plans.

D. Raceway routing and boxes are shown in approximate locations unless dimensioned. Where raceway routing is not denoted, field-coordinate to provide complete wiring system.

E. Do not route raceways on floor. Arrange raceway and boxes to maintain a minimum of 6 feet 6 inches of headroom and present a neat appearance. Install raceways level and square to a tolerance of 1/8" per 10 feet. Route exposed raceways and raceways above accessible ceilings parallel and perpendicular to walls, ceiling, and adjacent piping.

F. Maintain minimum 6-inch clearance between raceway and mechanical and piping and ductwork. Maintain 12-inch clearance between raceway and heat sources such as flues, steam pipes, heating pipes, heating appliances, and other surfaces with temperatures exceeding 104 degrees F.

G. Do not install raceway imbedded in spray applied fire proofing. Seal raceway penetrations of fire-rated walls, ceilings, floors in accordance with the requirements of Section 26 0500 and Division 07.

H. Route raceway through roof openings for piping and ductwork where possible; otherwise, route through roof jack with pitch pocket. Coordinate all requirements with Division 07 of these specifications.

I. Where raceway penetrates fire-rated walls and floors, provide mechanical fire-stop fittings with UL listed fire rating equal to wall or floor rating, seal opening around conduit with UL listed firestop sealant or intumescent firestop, preserving the fire time rating of the construction. Install in accordance with Division 07 and Section 26 0529 Hangers and Supports for Electrical Systems.

J. Raceways and penetrating vapor barriers or penetrating areas from cold to warm shall be provided with UL listed mechanical seals to prevent the accumulation of moisture, and shall include a vapor barrier on the outside.

K. Boxes penetrating vapor barriers or penetrating areas from cold to warm shall be taped and sealed with a non-hardening duct sealing compound to prevent the accumulation of moisture, and shall include a vapor barrier on the outside.

L. Conduit embedded in concrete or solid masonry shall not be larger than 1/3 the thickness of the wall or slab and shall be spaced not less than three diameters apart. No cutting of reinforcing bars shall be permitted unless specifically approved. Should structural members prevent the installation of conduit or equipment, notify the Contracting Officer before proceeding.

M. Route conduits in slabs to have 1 inch minimum cover. Conduits in slab shall not compromise the structural integrity of the slab.

N. Arrange raceway supports to prevent misalignment during wiring installation. Support raceway using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.

O. Do not attach raceway to ceiling support wires or other piping systems and do not fasten raceway with wire or perforated pipe straps. Remove all wire used for temporary raceway support during construction, before conductors are pulled. Raceway shall be installed to permit ready removal of equipment, piping, ductwork, or ceiling tiles.

P. Group raceway in parallel runs where practical and use conduit rack constructed of steel channel with conduit straps or clamps, as specified in Section 26 0529 Hangers and Supports for Electrical Systems. Provide space on each rack for 25 percent additional raceway.

Q. Cut conduit square; de-burr cut ends. Bring conduit to the shoulder of fittings and couplings and fasten securely. Where locknuts are used, install with one inside box and one outside with dished part against box

R. Use threaded raintight conduit hubs for fastening conduit to cast boxes, and for fastening conduit to sheet metal boxes in damp or wet locations. Sealing locknuts are not acceptable.

S. Install no more than the equivalent of four 90-degree bends between boxes.

T. Install conduit bodies to make sharp changes in direction, such as around beams. “Goosenecks” in conduits are not acceptable.

U. Use hydraulic one-shot conduit bender or factory elbows for bends in conduit larger than 2 inch size.

V. Provide protective plastic bushings or insulated throat bushings at each raceway termination not installed to an enclosure. Bushings shall be threaded to the raceway end or connector.

W. Avoid moisture traps; install junction box with drain fitting at low points in raceway system.

X. Install fittings and flexible metal conduit to accommodate 3-axis movements where raceway crosses seismic joints

Y. Install fittings designed and listed to accommodate expansion and contraction where raceway crosses control and expansion joints.

Z. Stub a minimum of 2 inches above floor all raceways terminated beneath free standing service equipment, pad mounted equipment, etc.

AA. Provide weatherhead on all raceway stub ups which are outdoors and do not terminate into equipment

BB. Use cable sealing fittings forming a watertight non-slip connection to pass cords and cables into conduit. Size cable sealing fitting for the conductor outside diameter. Use Appleton CG series or equal cable sealing fittings.

CC. Use suitable caps to protect installed raceway against entrance of dirt and moisture.

DD. Provide nylon "jet-line" or approved equal pull string in empty raceway, except sleeves and nipples.

EE. Paint all exposed conduit to match surface to which it is attached or crosses. Clean greasy or dirty conduit prior to painting in accordance with paint manufacturer's instructions. Where raceway penetrates non-rated ceilings, floors or walls, provide patching, paint and trim to retain architectural aesthetics similar to surroundings

FF. Coat non-ferrous conduit threads prior to joining with conductive metallic grease antioxidant.

GG. Join nonmetallic conduit using cement as recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cement to entire area that will be inserted into fitting. Let joint cure for 20 minutes minimum.

3.03 INSTALLATION – GENERAL BOXES

A. Provide electrical boxes as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and code compliance. All electrical box locations shown on Drawings are approximate unless dimensioned.

B. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only. Where installation is inaccessible, install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaries. Coordinate locations and sizes of required access doors with Division 08.

C. Coordinate layout and installation of boxes to provide adequate headroom and working clearance. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes.

D. Align wall-mounted outlet boxes for switches, thermostats, and similar devices.

E. Use multiple-gang boxes where more than one device are mounted together; do not use sectional boxes. Provide barriers to separate wiring of different voltage systems and where normal and emergency power circuits occur in the same box.

F. Verify location of floor boxes in offices and work areas prior to rough-in. Set boxes level and flush with finish flooring material.

G. Adjust box location up to 6 feet prior to rough-in to accommodate intended purpose.

H. Orient boxes to accommodate wiring devices oriented as specified in Section 26 2726.

I. Unless otherwise specifically noted, locate outlet boxes for light switches within 6 inches of the door jamb on the latch side of the door.

J. Position outlets to locate luminaires as shown on reflected ceiling plans.

K. Locate and install boxes to maintain headroom and to present a neat appearance.

L. Locate flush-mounted box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.

M. Provide knockout closures for unused openings.

N. Install boxes in walls without damaging wall insulation or reducing its effectiveness.

O. Provide recessed outlet boxes in finished areas; secure boxes to interior wall and partition studs, accurately positioning to allow for surface finish thickness. For outlet boxes in walls with combustible finished surfaces such as wood paneling or fabric wall coverings, position box to be flush with finished surface per NEC requirements.

P. Use stamped steel stud bridges for flush outlets in hollow stud wall, and adjustable steel channel fasteners for flush ceiling outlet boxes. Accurately position bridges to allow for surface finish thickness.

Q. Do not install flush mounted boxes back-to-back in walls; install with minimum 6 inches separation.

R. Install with minimum 24 inches separation in fire rated walls. Limit penetrations in fire rated walls to 16 square inches each and a maximum total combined penetration area of 100 square inches in any given 100 square feet of wall. Where penetrations are in excess of these requirements provided UL listed fire stop wrap acceptable to Authority having Jurisdiction.

S. Do not fasten boxes to ceiling support wires or other piping systems.

T. Support boxes independently of conduit.

U. Clean interior of boxes to remove dust, debris, and other material and clean exposed surfaces and restore finish

V. Provide blank covers or plates for all boxes that do not contain devices.

3.04 INSTALLATION – AUXILIARY GUTTER

A. Bolt auxiliary gutter to steel channels fastened to the wall or ceiling or in self-supporting structure. Install level.

B. Gasket each joint in oil-tight gutter.

C. Mount raintight gutter in horizontal position only.

3.05 INSTALLATION – BURIED CONDUITS

A. Excavation and backfilling shall be in accordance with these specifications and the applicable portions of Division 31:
   1. Excavate and backfill as necessary for proper installation or work.
   2. Provide bracing and shoring as necessary or required.
   3. Compact backfill under footings, floor slabs and paving using materials and methods specified under Division 31, Earthwork.
   4. All conduits outside the building perimeter shall be buried a minimum of 24 inches below grade. Bottom of trench shall be smoothed and all rocks and cobbles 3 inches and larger shall be removed. Conduits shall be bedded in a minimum of 2 inches of sand and shall have a cover of 2 inches minimum of sand. Trench shall be backfilled with non-frost susceptible material and compacted.
   5. Conduits below slab on grade shall be installed in the top 6 inches of classified material.
   6. Damage to existing underground utilities shall be repaired immediately by the Contractor at no cost to the Owner.

3.06 INSTALLATION – TELECOMMUNICATION RACEWAYS AND SLEEVES

A. Provide continuous pathway system for all telecommunication cables. Provide cable pathway support in accordance with section 26 0529.

B. Provide separation clearances in accordance with Section 27 1000.

C. Install the telecommunication pathways in accordance with requirements for Installation of General Conduit and General Boxes above unless superceded by more stringent requirements of this section or ANSI/EIA/TIA568-B and the latest published edition of the BICSI Telecommunication Distribution Methods Manual guidelines and recommendations.

D. Provide pathways for all telecommunication cables with Surface Raceway, Conduit, Cable tray, J-hooks, and chases for the entire length of each cable. Provide pathway capacity throughout entire system for each telecommunication outlet served sized to accommodate a minimum of four 4-pair 100-Ohm UTP cables from each outlet location to telecommunication room denoted on the plans.

E. Conduit Pathways:
   1. Install pull boxes in continuous straight runs of conduit longer than 100 feet.
   2. Maximum allowable continuous conduit section length of 100 feet between pull boxes.
   3. Contain no more than two 90-degree bends or de-rate conduit capacity 15% for up to one additional 90-degree bend. Conduits less than 33 feet long, oversized one trade size or with one of the 90-degree bends within 12 inches of a pull box may have up to three 90 degree bends without de-rating.
   4. Rate each offset as a 90-degree bend.
   5. Bond each conduit to telecommunication ground system.
   6. Condulets (LB fittings) shall not be installed in any telecommunications raceway.
   7. Do not use flexible metal conduit unless specifically noted on the plans or approved by the engineer where it is the only practical alternative. Increase raceway one trade size above required size where flexible metal conduit is used.
   8. Terminate conduits routed to cable trays within 6 inches of tray. Provide conduit support to building structure within 24 inches of cable tray.
   9. Terminate conduits and chases that protrude through floor in telecommunication rooms to 3 inches above finished floor. Terminate conduits and chases that protrude through finished ceiling or above within 12 inches of ladder rack, distribution frame or cable organizer.
   10. Provide bend radius of 6 times of the internal conduit diameter of conduits up to 2 inches; 10 times of the internal conduit diameter of conduits above 2 inches and for all fiber optic raceways.
   11. Provide conduit pathways through walls with insulated bushings on each end for all wall penetrations of cables.
   12. Provide minimum conduit size of ¾ inch. Size all other conduits, sleeves and chases according to the following table:

Conduit Trade size	Conduit Maximum Cable Capacity Based on two 90 degree bends and < 100 ft (Inches OD of Cable)									
	(0.13”)	(0.18”)	(0.22”)	(0.24”)	(0.29”)	(0.31”)	(0.37”)	(0.53”)	(0.62”)	(0.70”)
0.75”	6	5	4	3	2	2	1	0	0	0
1”	8	8	7	6	3	3	2	1	0	0
1.25”	16	14	12	10	6	4	3	1	1	1
1.5”	20	18	16	15	7	6	4	2	1	1
2”	30	26	22	20	14	12	7	4	3	2
2.5”	45	40	36	30	17	14	12	6	3	3
3”	70	60	50	40	20	20	17	7	6	6
3.5”							22	12	7	6
4”							30	14	12	7

F. Provide J-Hooks in accordance with Section 26 0529 to provide telecommunication pathway anywhere cable tray, conduit, or ladder rack is not denoted on the plans and one or more telecommunication cables are routed.

G. Provide innerduct the entire length in conduits denoted to contain innerducts. Size innerducts to use entire available capacity of the outer conduit.

H. Do not install innerduct and other cables in the same raceway.

3.07 INSTALLATION – TELECOMMUNICATION BOXES

A. Boxes:
   1. All boxes shall be readily accessible.
   2. Do not use boxes for angle pulls or change pathway direction. Locate pull boxes in straight through sections of horizontal conduit pathways.
   3. Provide pull boxes for 3/4-inch and 1-inch through pull for horizontal UTP cabling. Provide all other boxes sized per the following table:

Maximum Trade Size Conduit	Minimum Size of Pull Box in Inches			For each additional conduit increase width in inches
	Width	Length (direction of conduit)	Depth	
0.75”	4	12	3	2
1”	4	16	3	2
1.25”	6	20	3	3
1.5”	8	27	4	4
2”	8	36	4	5
2.5”	10	42	5	6
3”	12	48	5	6
3.5”	12	54	6	6
4”	15	60	8	8

END OF SECTION

SECTION 26 0536
CABLE TRAYS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cable trays.

B. Cable tray accessories.

1.02 RELATED SECTIONS

A. The Work under this section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions, and sections under Division 01 General Requirements, and Section 26 0500 – Common Work Results for Electrical.

B. Section 26 0529 – Hangars and Supports for Electrical Systems.

1.03 REFERENCES

A. Division 01– submittal procedures.

B. NEMA VE 1 - Cable Tray Systems.

1.04 SUBMITTALS

A. Submit shop drawings and product data under provisions of Division 01.

B. Indicate tray type, dimensions, support points, finishes and load data.

C. Submit manufacturer's installation instructions under provisions of Division 01.

1.05 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Division 01.

B. Include cleaning and bolt-tightening procedures.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Cablofil “EZ-Tray”.

B. GS Metals “FlexTray”.

C. CMS “Snake Tray”.

D. Mono-Systems “Mono-Mesh”.

E. Panduit “Wyr-Grid”.

F. Substitutions: Division 01 - Product Substitutions.

2.02 FLEXIBLE CABLE TRAYS

A. Tray: U.L. listed, continuous, rigid, welded steel wire mesh cable tray with welded intersections and continuous safety edge T-welded wire lip.

B. Material and Finish of Tray, Fittings, and Accessories:
   1. Material: Carbon steel wire, ASTM A 510, Grade 1008. Wire welded, bent, and surface treated after manufacture.

C. Nominal Dimensions:
   1. Mesh: 2 by 4 inches.
   2. Straight Section Lengths: 80 and 118 inches.
   3. Width: 18 inches.
   4. Internal Depth: 2 inches.
   5. Wire Diameter: .177 inch, minimum.

D. Fittings: Field fabricated from straight sections in accordance with manufacturer's instructions.

E. Accessories and Fittings: Manufacturer's standard clamps, hangers, brackets, splice plates, reducer plates, blind ends, shielding divider strips, connectors, elbows, tees, crosses, risers, dropouts, grounding lugs and other accessories as required for a complete system.

F. Covers: Solid covers, pre-galvanized steel, width to match tray.

2.03 WARNING SIGNS

A. Engraved Nameplates: ½ inch high black letters on yellow laminated plastic nameplate, engraved with the following wording:

WARNING! DO NOT USE CABLE TRAY AS WALKWAY, LADDER, OR SUPPORT. USE ONLY AS MECHANICAL SUPPORT FOR CABLES AND TUBING!

PART 3 EXECUTION

3.01 INSTALLATION

A. Installation: In conformance with NEMA VE 1 requirements and in accordance with manufacturer's instructions.

B. Assemble cable trays so that joints are not made at support brackets. Install trays level, straight and true to line or grade within plus or minus 1/8 inch in 10 feet and within an accumulative maximum of ½ inch. Make vertical structures plum within a tolerance of 1/8 inch. Install trays to leave no exposed raw edges.

C. Use expansion connectors where indicated in NEMA VE 1.

D. Cut standard straight sections to length in field. Cut wires in one clean cut using side action bolt cutters to eliminate grinding or touch-up.

E. Install warning signs at 50-foot centers along route of cable tray, located to be visible.

F. Provide bonding continuity between cable tray sections and fittings in accordance with manufacturer's instructions.

G. Securely fasten all wires, cables, and bundles to the tray with nylon cable straps to maintain their relative positions in the trays. On horizontal runs, install the fastenings at a maximum interval of 15 feet. On vertical runs, the maximum interval shall be 5 feet.

H. Attach cable tray to structural walls and ceilings as required to route cable tray around existing mechanical piping and ductwork.

I. Where cable tray penetrates fire rated floors, ceilings, or walls, fire stop the opening in accordance with Section 26 0500 and Division 07.

END OF SECTION

SECTION 26 0553
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Nameplates and tape labels.

B. Wire and cable markers.

C. Conduit color-coding.

D. Wire markers.

E. Conduit markers.

F. Underground warning tape.

G. Working clearance striping.

H. Power one-line diagram and panel map.

I. Low-voltage one-line diagrams and system maps.

1.02 RELATED WORK

A. The Work under this section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions, and sections under Division 01 General Requirements, and Section 26 0500 – Common Work Results for Electrical.

B. Section 26 0519 – Low Voltage Electrical Power Conductors and Cables.

C. Section 26 0533 – Raceway and Boxes for Electrical Systems.

D. Section 26 2416 – Panelboards.

E. Section 26 2726 – Wiring Devices.

F. Section 27 1000 – Structured Cabling System.

G. Section 28 3100 – Fire Detection and Alarm Systems.

1.03 SUBMITTALS

A. Division 01 – Submittal Procedures and Section 26 0500 – Common Work Results for Electrical.

B. Product Data:
   1. Submit manufacturer’s catalog literature for each product required.
   2. Submit electrical identification schedule including list of wording, symbols, letter size, color-coding, tag number, location, and function.

C. Manufacturer's Installation Instructions: Indicate installation instructions, special procedures, and installation.

D. Prior to installation, submit power one-line diagram and panel map for review.

E. Prior to Substantial Completion, submit copies of all panel schedules for review by the Owner. The Owner will note any changes to the room numbers/names and the Contractor shall provide revised typed panel schedules to reflect all changes, at no additional cost to the Owner.

F. Electrical One-Line Diagrams and Panel Maps: Provide electronically in AutoCAD format, submitted with the O&M manuals.

1.04 ENVIRONMENTAL REQUIREMENTS

A. Install labels and nameplates only when ambient temperature and humidity conditions for adhesive are within range recommended by manufacturer.

PART 2 PRODUCTS

2.01 NAMEPLATES

A. Product Description: Laminated three-layer plastic with engraved white letters on black background. Nameplate for service disconnect shall be engraved white letters on red background.

B. Letter Size:
   1. 1/4-inch high letters for identifying individual panel or equipment.
   2. 1/8-inch high letters for remaining lines with 1/8 inch spacing between lines.

C. Minimum nameplate size: 1/8 inch thick with a consistent length and height for each type of nameplate wherever installed on the project.

2.02 TAPE LABELS

A. Product Description: Adhesive tape labels, with 3/16 inch Bold Black letters on clear background made using Dymo RhinoPro 5000 label printer or approved equal.

B. Embossed adhesive tape will <u>not</u> be permitted for any application.

2.03 WIRE MARKERS

A. Power and Lighting Description: Cloth tape type wire markers for all neutrals and Phase conductors.

B. Low Voltage System Description: Self-adhesive machine printed label with unique wire number that is shown on shop drawing for system.

C. Telecommunications Cable Markers: Self-laminating vinyl with translucent band and minimum 1”W x .5”H printable area with matte white finish. Brady #B-427 series or approved equal.

2.04 FIRE ALARM CONDUIT AND BOX IDENTIFICATION

A. Product Description: Red spray paint for fire alarm boxes.

B. Fire alarm conduit shall have red finish, as specified in Section 26 0533.

2.05 UNDERGROUND WARNING TAPE

A. Product Description: Red, 6-inch wide, detectable.

B. Wording to read “Caution – Buried Electric Line Below”.

2.06 LOW-VOLTAGE SYSTEMS ONE-LINE DIAGRAMS AND MAPS

A. Provide one-line diagrams and system maps for low-voltage and special systems, such as fire, security, telecommunications, intercom, etc. Requirements are specified in individual specification sections for each system.

PART 3 EXECUTION

3.01 GENERAL INSTALLATION

A. Degrease and clean surfaces to receive nameplates and tape labels.

B. Install nameplates and tape labels parallel to equipment lines.

C. Underground Warning Tape Installation: Install underground warning tape along length of each underground conduit, raceway, or cable 6 to 8 inches below finished grade, directly above buried conduit, raceway, or cable.

3.02 NAMEPLATE INSTALLATION

A. Secure nameplates to equipment fronts using machine screws tapped and threaded into panelboard, or using rivets. The use of adhesives is not acceptable. Machine screws to not protrude more than 1/16 inch on back side.

B. Service Disconnect Nameplate: Provide nameplate on exterior service disconnect that reads “SERVICE DISCONNECT”.

C. Distribution Panel Nameplates:
   1. Provide overall equipment identification.
      a. Line 1: Distribution panel name.
      b. Line 2: Source which panelboard is fed.
      c. Line 3: Voltage, phase and wire configuration.
      d. Line 4: AIC rating of the panel.
      e. Line 5: Where applicable, indicate that panel is series-rated.
   2. Provide circuit breaker identification for each feeder breaker.
      a. Line 1: Name of panelboard or equipment served.
      b. Line 2: Location of served panelboard.

D. Branch Panelboard Nameplates:
   1. Provide nameplate for each panelboard with the following information:
      a. Line 1: Panelboard name.
      b. Line 2: Source from which the panelboard is fed.
      c. Line 3: Voltage, phase and wire configuration.
      d. Line 4: AIC rating of the panelboard.

E. Transformers:
   1. Provide nameplate for each transformer with the following information:
      a. Line 1: Transformer name.
      b. Line 2: Source from which the transformer is fed.
      c. Line 3: Primary and secondary voltage, phase and wire configuration.
      d. Line 4: Secondary load and location.

F. Disconnects, Starters, or Contactors:
   1. Provide nameplate for each device with the following information:
      a. Line 1: Load served.
      b. Line 2: Panelboard and circuit number from which the device is fed.
      c. Line 3: Fuse or Circuit amperage and poles. Where fused disconnect is installed, denote the maximum fuse size to be installed.

G. Control or Low Voltage System Panels:
   1. Provide nameplate for each control panel with the following information:
      a. Line 1: Unique panel name as shown on the shop drawings.
      b. Line 2: System description such as Fire Alarm, Intercom, BAS, Security, etc.
      c. Line 3: Panelboard and circuit number from which the panel is fed if applicable.

3.03 LABEL INSTALLATION

A. Conduit Feeder Labels - Provide conduit labels on all feeder raceways as follows:
   1. Distribution Panels – “PANEL xxxx IN ROOM #xxx”.
   2. Panelboards – “PANEL xxxx FED FROM MDP xxx”.

B. Spare Raceways: Provide raceway label on each individual raceway denoting the source and termination point at each end.

C. Fire Alarm Device Labels: As specified in Section 28 3100.

D. Low-Voltage System Device Labels: Provide label on each device, denoting device ID or address where applicable. Affix label to device faceplate for ceiling-mounted devices or wall-mounted devices above 8’-0” AFF. Affix label inside backbox for exterior devices.

3.04 WIRE IDENTIFICATION

A. Provide wire markers on each conductor in panelboard gutters, pull boxes, outlet and junction boxes, and at load connection. Identification shall be as follows:
   1. Markers shall be located within one inch of each cable end, except at panelboards, where markers for branch circuit conductors shall be visible without removing panel deadfront.
   2. Each wire and cable shall carry the same labeled designation over its entire run, regardless of intermediate terminations.
   3. Color code phases, neutral, and ground per NEC requirements and Section 26 0519.

4. Color-code all low-voltage system wires and cables in accordance with the individual sections in which they are specified.
5. For power and lighting circuits, identify with branch circuit or feeder number.
6. Control Circuits: Control wire number as indicated on schematic and shop drawings.
7. Fire Alarm Circuits: Provide cable markers showing NAC or SLC loop identification number at all fire alarm junction boxes and pullboxes.
8. Provide cable markers on each cable, indicating device designation (e.g. “Camera 27”) for all security, intercom, door control, CCTV, MATV, and CATV systems. Cables shall be labeled at each end, as well as at any intermediate junction boxes or pullboxes.

B. Provide pull string markers at each end of all pull strings. Marker shall identify the location of the opposite end of the pull string.

3.05 JUNCTION BOX IDENTIFICATION

A. Fire Alarm: In accessible ceiling spaces, exposed ceiling spaces, mechanical/electrical rooms, and other non-public spaces, paint fire alarm junction boxes and pullboxes with red spray paint. In all finished spaces where fire alarm boxes are visible, they shall be painted to match the surrounding finish. If there are any questions as to whether fire alarm boxes shall be painted red in a specific area, the Contractor shall get clarification from the Owner prior to painting.

B. Paint all junction boxes designated for future expansion with blue spray paint.

C. Label each lighting and power junction box with the panelboard name and circuit number.

D. Label all junction boxes for intercom, door control, CCTV, MATV, and CATV systems with the type of system cables contained in the box.

E. For junction boxes above ceilings, mark the box cover with the circuit or system designation using permanent black marker. For junction boxes in finished areas, mark the inside of the cover with the circuit or system designation using permanent black marker.

3.06 DEVICE PLATE IDENTIFICATION

A. Label each receptacle device plate or point of connection denoting the panelboard name and circuit number.

B. Install adhesive label on the top of each plate.

3.07 PANELBOARD IDENTIFICATION

A. Provide panelboard circuit directories in accordance with Section 26 2416.

3.08 LOW-VOLTAGE SYSTEM IDENTIFICATION

A. Install all labeling in accordance with the requirements of this section and of each section where the individual systems are specified.

END OF SECTION

SECTION 26 0590
SELECTIVE ELECTRICAL DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electrical demolition.

1.02 RELATED SECTIONS

A. Division 01 - Alternates.

B. Division 02 - Minor Demolition for Remodeling.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Materials and equipment for patching and extending work: As specified in individual Sections.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify field measurements and circuiting arrangements are as shown on Drawings.

B. Verify that abandoned wiring and equipment serve only abandoned facilities.

C. Demolition Drawings are based on casual field observation and existing construction documents. Report discrepancies to Architect/Engineer before disturbing existing installation.

D. Beginning of demolition means installer accepts existing conditions.

3.02 PREPARATION

A. Disconnect electrical systems in walls, floors, and ceilings scheduled for removal.

B. Coordinate utility service outages with Utility Company.

C. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.

D. Existing Electrical Service: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Obtain permission from Owner at least 24 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area.

E. Existing Telephone System: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Notify Owner and Telephone Utility Company at least 24 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area.

3.03 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

A. Demolish and extend existing electrical work under provisions of Division 01, Division 02, and this Division.

B. Remove, relocate, and extend existing installations to accommodate new construction.

C. Remove abandoned wiring to source of supply.

D. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.

E. Where abandoned conduit is installed below existing slab not scheduled for demolition, remove the conductors, cut conduit flush with floor, and patch surface.

F. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets which are not removed.

G. Disconnect and remove abandoned panelboards and distribution equipment.

H. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.

I. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.

J. Repair adjacent construction and finishes damaged during demolition and extension work. T-bar ceiling tiles damaged under normal construction conditions or having voids where junction boxes were removed shall be replaced by the Contractor.

K. Maintain access to existing electrical installations which remain active.

L. Extend existing installations using materials and methods as specified.

M. Where materials or equipment are to be turned over to Owner or reused and installed by the Contractor, it shall be the Contractor's responsibility to maintain condition of materials and equipment equal to the existing condition of the equipment before the work began. Repair or replace damaged materials or equipment at not additional cost to the Owner.

N. Relocate existing lighting fixtures as indicated on Drawings. Test fixture to see if it is in good working condition before installation at new location.

3.04 EXISTING PANELBOARDS

A. Remove existing panelboards, feeders and branch circuits as shown on the drawings.

B. Ring out circuits to remain and prepare for extension to new panel locations as shown on the plans.

3.05 CLEANING AND REPAIR

A. Clean and repair existing materials and equipment which remain or are to be reused.

B. Luminaires: Remove existing luminaires for cleaning. Use mild detergent to clean all exterior and interior surfaces; rinse with clean water and wipe dry. Replace lamps, ballasts, and broken electrical parts.

3.06 INSTALLATION

A. Install relocated materials and equipment under the provisions of Division 01.

END OF SECTION

SECTION 26 0800
ELECTRICAL SYSTEMS COMMISSIONING

PART 1 GENERAL

1.01 DESCRIPTION

A. Electrical Systems commissioning process includes the following tasks:
   1. Testing and startup of selected Electrical Systems.
   2. Equipment and system pre-functional verification checks.
   3. Assistance in functional performance testing to verify testing and balancing, and equipment and system performance.
   4. Provide qualified personnel to assist in commissioning tests.
   5. Ensure all equipment and systems are fully operational and ready for functional performance testing.
   6. Provide equipment, materials, and labor necessary to correct deficiencies found during commissioning process to fulfill contract and warranty requirements.
   7. Provide operation and maintenance information to Commissioning Authority for review.

B. Provide labor, tools, instruments, and materials as required to participate in the commissioning process and to commission the electrical systems as defined in Division 1 and within these specifications.

C. It is anticipated most of the functional performance testing and data acquisition will be performed prior to occupancy. It is also anticipated that, in the process of testing system deficiencies will be identified. Where these deficiencies are the result of construction work not complete in compliance with the contract documents, the affected work shall be promptly repaired or replaced by the Contractor.

D. This section will in no way diminish the responsibility of the Contractors and suppliers in performing all aspects of the work and testing as outlined in the contract documents.

1.02 COORDINATION

A. All testing and startup procedures and documentation requirements specified within Division 26.

B. Division commissioning requirements in addition to this section as follows:
   1. Division 01 - Commissioning
   2. Section 23 0800 - Mechanical Commissioning

1.03 SUBMITTALS

A. Division 01 - submittal procedures.

B. Division 01 - Commissioning: Requirements for commissioning submittals.

C. Draft Forms: Submit draft of start-up plan, pre-functional verification checklists.

D. Test Reports: Indicate data on pre-functional verification checklists for each piece of equipment and system as specified.

E. Field Reports: Indicate deficiencies preventing completion of equipment or pre-functional verification checklists or system to achieve specified performance.

PART 2 PRODUCTS

2.01 GENERAL

A. Provide test equipment and instrumentation as necessary for functional performance testing of mechanical systems and completion of functional performance tests.

PART 3 EXECUTION

3.01 SYSTEMS/EQUIPMENT TO BE COMMISSIONED

A. Systems that shall be included in the commissioning process as follows:
   1. Lighting Control System.
   2. Electrical Power Connections to Mechanical Equipment.

3.02 CONTRACTOR / SUPPLIER RESPONSIBILITIES

A. Attend meetings conducted by the commissioning agent to review the overall commissioning process and procedures.

B. Assist the General Contractor in developing a commissioning schedule for completion of the commissioning work.

C. Review draft commissioning plan prepared by the Commissioning Authority.

D. Develop pre-functional verification checklists.

E. Review the Functional Performance Test procedures that describe the step-by-step process to functionally test the system.

F. Develop electrical startup and initial checkout plan.

G. Prior to startup, inspect, check, and verify correct and complete installation of equipment and system components for pre-functional verification checks.

H. Perform and document completed startup and pre-functional verification checklists.

I. Assist commissioning authority in performing functional performance tests on equipment and systems.

K. Provide the Commissioning Authority with completed equipment start-up forms, pre-functional verification checklists, point-to-point checklists, balancing logs, pre-test acquisition forms and other information appropriate to the commissioning process.

L. Provide and assign qualified individuals with working knowledge of the operating system to operate the system during the Startup and Functional Performance Test. Provide manufacturer's representatives to execute starting of equipment where specified.

N. Operate the systems and equipment during functional performance testing and provide manpower to assist the commissioning team in the execution of the commissioning plan.

P. Correct deficiencies discovered by the commissioning team and report their resolution.

Q. Ensure the installation work is complete, is in compliance with the Contract Documents, and is ready for commissioning. Coordinate testing and commissioning effort with commissioning team, subcontractors, suppliers, vendors, and controls contractor.

R. Execute the commissioning plan and perform the functional performance tests. This shall include operating the systems and equipment and demonstrating the proper sequences of operation and function of indicators, accessories, alarms, shut downs, and any other features as required for completion of the functional performance test procedures.

S. Provide instrumentation and take measurements and readings of system and equipment performance characteristics as required for functional performance testing and completion of the functional performance test procedures and the commissioning work.

END OF SECTION

SECTION 26 2416
PANELBOARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Service and distribution panelboards.

B. Lighting and appliance branch circuit panelboards.

C. TVSS Equipment

1.02 RELATED SECTIONS

A. The Work under this section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions, and sections under Division 01 General Requirements, and Section 26 0500 – Common Work Results for Electrical.

B. Section 26 0526 – Grounding and Bonding for Electrical Systems.

C. Section 26 0553 – Identification for Electrical Systems.

1.03 REFERENCES

A. Division 01 – submittal procedures.

B. NEMA AB 1 - Molded Case Circuit Breakers.

C. NEMA KS 1 - Enclosed Switches.

D. NEMA PB 1 - Panelboards.

E. NEMA PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.

F. NEMA PB 2.2 - Application Guide for Ground-fault Protective Devices for Equipment.

G. UL 50 – Enclosures for Electrical Equipment

H. UL 67 – Panelboards

I. UL 98 - Enclosed and Dead-front Switches

J. UL 489 – Molded Case Circuit Breakers and Circuit Breaker Enclosures

K. Federal Specification W-C-375B/Gen – Circuit Breakers, Molded Case, Branch Circuit and Service

L. Federal Specification W-C-865C - Fusible Switches

1.04 SUBMITTALS

A. Submit data under provisions of Division 01 and Section 26 0500.

B. Product Data: Submit product data for all components provided which fall under this section showing configurations, finishes, and dimensions. Each catalog sheet should be clearly marked to indicate exact part number provided, including all options and accessories.

C. Shop drawings: Submit shop drawings for each panelboard indicating features and device arrangement and size. Include outline and support point dimensions, voltage, main bus ampacity, and integrated short circuit ampere rating.

D. Submit final panel schedules in Microsoft Excel format with the O&M manuals.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver products to site under provisions of Section 01 6000.

B. Upon arrival at the site inspect equipment and report on any damage.

C. Handle carefully on site to avoid any damage to internal components, enclosures and finishes.

D. Store in a clean, dry environment. Maintain factory packaging and provide an additional heavy canvas or plastic cover to protect enclosures from dirt, water, construction debris and traffic.

1.06 OPERATION AND MAINTENANCE MATERIALS

A. Submit data under provisions of Division 01 and Section 26 0500.

B. Provide product data and shop drawing information including replacement parts list.

C. Provide installation, operation and maintenance information per manufacturer.

D. Project record data: Submit final record panel schedules as hardcopy and in Microsoft Excel format.

1.07 WARRANTY

A. Manufacturer shall warrant specified equipment to be free of defects for a period of one year from the date of installation.

1.08 SPARE PARTS

A. Keys: Furnish 2 each to Owner.

PART 2 PRODUCTS

2.01 MANUFACTURERS - PANELBOARDS

A. Square D.

B. Cutler Hammer.

C. General Electric.

D. Siemens.

E. Substitutions: Under provisions of Section 01 2513.

2.02 MAIN AND DISTRIBUTION CIRCUIT BREAKER PANELBOARDS

A. Panelboards: NEMA PB 1; circuit breaker type.

B. Enclosure: NEMA PB 1; 3R Stainless Steel.

C. Provide cabinet front with door-in-door cover and hinged door with flush lock.

D. Interior trim shall be dead-front construction to shield user from all energized parts.

E. Main circuit breaker and main lug interiors shall be field convertible for top or bottom incoming feed.

F. Panelboard bussing shall be fully rated with sequential phase distribution. Bussing shall be plated copper and the plating shall run the entire length of the busbar.

G. Provide UL Listed short circuit current ratings as indicated on the drawings. Minimum short circuit rating shall be 10,000 amperes RMS symmetrical for 250 volt panelboards.

H. A solidly bonded copper equipment ground bar shall be provided.

I. Solid neutral bus bars shall be provided. Neutral bus shall be of same material as the phase busses. Solid neutral bars shall be equipped with a full capacity bonding strap for service entrance applications. Gutter mounted neutrals will not be accepted.

J. Provide UL Listed panelboards with 200% rated neutrals as shown on the plans. 200% neutral bars shall be copper neutral bus for non-linear load applications.

K. Panelboards shall have nameplates containing the following information:
   1. Catalog number.
   2. Factory order number.
   3. UL Listed Label.
   4. Short Circuit Current Rating.
   5. Main Circuit Breaker or Main Lug Rating
   6. System Voltage

L. Thermal Magnetic Molded Case Circuit Breakers: NEMA AB 1; provide circuit breakers with integral thermal and instantaneous magnetic trip in each pole. Provide circuit breakers UL listed as Type HACR for air conditioning equipment branch circuits. Breaker ampacity and AIC rating shall be visible on breaker without removing panel deadfront or cover.

M. Thermal Magnetic Current-Limiting Molded Case Circuit Breakers: NEMA AB 1; provide bolt-on type circuit breakers with integral thermal and instantaneous magnetic trip in each pole, coordinated with replaceable automatically resetting current-limiting elements in each pole. Interrupting rating 100,000 symmetrical amperes, let-through current and energy level less than permitted for same size Class RK-5 fuse.

2.03 BRANCH CIRCUIT PANELBOARDS

A. Lighting and Appliance Branch Circuit Panelboards: NEMA PB 1; circuit breaker type.

B. Enclosure: NEMA PB 1; Type 1. Boxes shall be galvanized steel constructed in accordance with UL50 requirements. Interiors shall be field convertible for top or bottom incoming feed. Main lug interiors up to 400 amperes shall be field convertible to main breaker. Interior leveling provisions shall be provided for flush mounted applications.

C. Cabinet Size: 6 inches deep; 20 inches wide minimum.

D. Provide flush or surface cabinet front as indicated on the Drawings with door-in-door cover concealed trim clamps, concealed hinge and flush lock all keyed alike. Finish in manufacturer's standard gray enamel.

E. Provide panelboards with copper bus, ratings as scheduled on Drawings. Provide one continuous bus bar per phase each. Panelboards shall have sequentially phased branch circuit connectors suitable for bolt-on branch circuit breakers. Bussing shall be fully rated

F. Integrated Short Circuit Rating: Provide panelboards with short circuit ratings as shown on the Drawings. Minimum ratings shall be 10,000 amperes RMS symmetrical for 250 volt panelboards; 14,000 amperes RMS symmetrical for 600 volt panelboards.

G. Main/Sub Feed Circuit Breakers: NEMA AB 1; Provide vertical mount main and/or sub feed circuit breaker in panelboards as shown on the drawings.
   1. Circuit breakers shall be operated by a toggle-type handle and shall have a quick-make, quick-break over-center switching mechanism that is mechanically trip-free. Automatic tripping of the breaker shall be clearly indicated by the handle position. Contacts shall be nonwelding silver alloy and arc extinction shall be accomplished by means of DE-ION arc chutes. A push-to-trip button on the front of the circuit breaker shall provide a local manual means to exercise the trip mechanism.
   2. Lugs shall be UL Listed to accept copper and aluminum conductors and shall be suitable for 90°C rated wire, sized according to the 75 ^{o}C temperature rating per NEC Table 310-16. Lug body shall be bolted in place.
   3. Main circuit breakers shall be UL listed for use with the following accessories:
      a. Shunt Trip.
      b. Under Voltage Trip.
      c. Ground Fault Shunt Trip.
      d. Auxiliary Switch.
      e. Alarm Switch.
      f. Mechanical Lug Kits.
      g. Compression Lug Kits.

H. Branch Circuit Breakers: NEMA AB 1; Provide panelboards with bolt-on type thermal magnetic trip circuit breakers.
   1. Circuit breakers shall be operated by a toggle-type handle and shall have a quick-make, quick-break over-center switching mechanism that is mechanically trip-free with common trip handle for all poles.
   2. Lugs shall be UL Listed to accept copper and aluminum conductors and shall be suitable for 90°C rated wire, sized according to the 75 ^{o}C temperature rating per NEC Table 310-16. Lug body shall be bolted in place.
   3. Provide circuit breakers UL listed as Type SWD for lighting circuits.
   4. Provide circuit breakers UL listed as type HACR for use with heating, air conditioning and refrigeration equipment.
   5. Provide UL Class A ground fault interrupter circuit breakers where scheduled on Drawings.

2.04 PANELBOARD IDENTIFICATION

A. For each panelboard provide typed schedule denoting each circuit load by the load type and final name and room number actually designated by the Owner. Schedule shall not be typed with names shown on the Contract Drawings unless names are acceptable to the Owner.

B. Provide panel schedule in O&M manual for every new panelboard.

C. Where more than one nominal voltage system is present on the premises, the conductor color-coding legend shall be permanently posted at each branch circuit and distribution panelboard per NEC requirements.

D. All panelboards shall have signage for arc hazard installed. The marking shall be located to be clearly visible to qualified personnel before examination, adjustment, servicing or maintenance of the equipment. At a minimum the signage shall state the following:

Warning

Arc Flash and Shock Hazard

Appropriate PPE Required

2.05 TRANSIENT VOLTAGE SURGE SURPRESSOR

A. Integral Surge Suppresser:

1. The manufacturer of the TVSS shall be the same as the manufacturer of the distribution equipment in which the devices are installed and shipped. Also, this distribution equipment shall be fully tested and certified to the following UL standards:
   UL 67 = Panelboards,
   UL 891 = Switchboards,
   UL 1558 = Low Voltage Switchgear.
2. Component recognized in accordance with UL 1449 and UL 1283.
3. Independently tested with category C3 high exposure waveform (20 kV-1.2/50us, 10kA-8/20 us) per IEEE C62.41.
4. Furnish copper bus bars for surge current path.
5. Construct using surge current modules (MOV based). Each module fused with user replaceable 200,000 AIR rated fuses. Status of each module monitored on front cover of panelboard enclosure and on module.
6. Furnish with audible alarm activated when one of surge current modules has failed. Furnish alarm on/off to silence alarm and alarm push-to-test switch to test alarm. Locate switches and alarm on front cover of panelboard enclosure.
7. Meet or exceed the following criteria:
   a. Minimum surge current rating shall be 160 kA per phase (80 kA per mode) for service entrance and 80 kA per phase (40 kA per mode) for distribution applications.
   b. Pulse Lift Test: Capable of protecting against and surviving 5000 IEEE C62.41 Category C transients without failure or degradation.
   c. UL 1449 clamping voltage must not exceed the following:

VOLTAGE	L-N	L-G	N-G
240/120	800/400V	800/400V	400V
208Y/120	400V	400V	400V
480Y/277	800V	800V	800V

8. Furnish response time no greater than five nanoseconds for individual protection modes.
9. Designed to withstand maximum continuous operating voltage (MCOV) of not less than 115 percent of nominal RMS voltage.
10. Furnish visible indication of proper suppresser connection and operation. Lights indicate operable phase and module.
11. Furnish minimum EFI/RFI filtering of 34 dB at 100 kHz with insertion loss ratio of 50: 1 using Mil Std. 220A methodology.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install panelboards plumb and flush with wall finishes, in conformance with NEMA PB 1.1.

B. Height: 6 feet, 6 inches to top of panelboard.

C. Provide filler plates for unused spaces in panelboards.

D. Panel Schedules: Revise schedules to reflect circuiting changes required to balance phase loads.

E. Stub 5 empty one inch conduits to accessible location above ceiling below floor out of each recessed panelboard.

3.02 FIELD QUALITY CONTROL

A. Measure steady state load currents at each panelboard feeder. Should the difference at any panelboard between phases exceed 20 percent, rearrange circuits in the panelboard to balance the phase loads within 20 percent. Take care to maintain proper phasing for multi-wire branch circuits

B. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for circuit breakers.

END OF SECTION

SECTION 26 2716
CABINETS AND ENCLOSURES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Hinged cover enclosures.

B. Cabinets.

C. Terminal blocks and accessories.

1.02 RELATED SECTIONS

A. The Work under this section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions, and sections under Division 01 General Requirements, and Section 26 0500 – Common Work Results for Electrical.

B. Section 26 0526 – Grounding and Bonding for Electrical Systems.

C. Section 26 0533 – Raceway and Boxes.

D. Section 26 0553 – Identification for Electrical Systems.

1.03 REFERENCES

A. Division 01 – submittal procedures.

B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

C. ANSI/NEMA ICS 1 - Industrial Control and Systems.

D. ANSI/NEMA ICS 4 - Terminal Blocks for Industrial Control Equipment and Systems.

E. ANSI/NEMA ICS 6 - Enclosures for Industrial Control Equipment and Systems.

1.04 SUBMITTALS

A. Submit product data under provisions of Division 01.

B. Shop Drawings for Equipment Panels: Include wiring schematic diagram, wiring diagram, outline drawing and construction diagram as described in ANSI/NEMA ICS 1.

PART 2 PRODUCTS

2.01 HINGED COVER ENCLOSURES

A. Construction: NEMA 250; Type 1, 3R, 4, steel.

B. Finish: Manufacturer's standard enamel finish.

C. Covers: Continuous hinge, held closed by flush latch operable by key.

D. Panel for Mounting Terminal Blocks or Electrical Components: 14 gauge steel, white enamel finish.

2.02 CABINETS

A. Cabinet Boxes: Galvanized steel with removable endwalls, 24inches wide, 6 inches deep. Provide ¾ inch thick plywood backboard painted matte white, for mounting terminal blocks.

B. Cabinet Fronts: Steel, flush type with concealed trim clamps, concealed hinge and flush lock keyed to match branch circuit panelboard; finish in gray baked enamel.

2.03 TERMINAL BLOCKS AND ACCESSORIES

A. Terminal Blocks: ANSI/NEMA ICS 4; UL listed.

B. Power Terminals: Unit construction type, closed-back type, with tubular pressure screw connectors, rated 600 volts.

C. Signal and Control Terminals: Modular construction type, channel mounted; tubular pressure screw connectors, rated 300 volts.

2.04 FABRICATION

A. Shop assemble enclosures and cabinets housing terminal blocks or electrical components in accordance with ANSI/NEMA ICS 6.

B. Provide knockouts on enclosures.

C. Provide protective pocket inside front cover with schematic diagram, connection diagram, and layout drawing of control wiring and components within enclosure.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install cabinets and enclosures plumb; anchor securely to wall and structural supports at each corner, minimum.

B. Provide accessory feet for free-standing equipment enclosures.

C. Install trim plumb.

END OF SECTION

SECTION 26 2726
WIRING DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall switches.

B. Receptacles.

C. Occupancy sensors.

D. Photocells.

E. Timer switches.

F. Device plates and box covers.

1.02 RELATED SECTIONS

A. The Work under this section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions, and sections under Division 01 - General Requirements and Section 26 0500 – Common Work Results for Electrical.

B. Section 26 0526 – Grounding and Bonding for Electrical Systems

C. Section 26 0533 – Raceway and Boxes for Electrical Systems

D. Section 26 0553 – Identification for Electrical Systems

1.03 REFERENCE STANDARDS

A. Division 01 – submittal procedures.

B. FS W-C-596 – Federal Specification for Electrical Power Connector, Plug, Receptacle, and Cable Outlet.

C. FS W-S-896 – Federal Specification for Switches, Toggle (Toggle And Lock), Flush Mounted.

D. NEMA WD 1 - General Color Requirements for Wiring Devices

E. ANSI/NEMA WD 6 – Wiring Devices – Dimensional Requirement

F. UL 20 – General-Use Snap Switches

G. UL 498 - Attachment Plugs and Receptacles

H. UL 943 – Ground-Fault-Circuit-Interrupters

1.04 SUBMITTALS

A. Product Data: Submit product data for all components provided that are specified in this section showing configurations, finishes, and dimensions. Each catalog sheet should be clearly marked to indicate exact part number provided, including all options and accessories.

B. Fixture Compatibility: Submitted occupancy sensors shall have wattage ratings to match the circuits on which they are connected and shall be compatible with submitted lamps and ballasts in the fixtures which they will control.

C. Submit scaled shop drawings of occupancy sensor layout, showing coverage areas and any overlap areas. Shop drawings shall be prepared by occupancy sensor manufacturer. The occupancy sensors on the Contract Drawings are shown in suggested locations. The final quantity, locations, coverage areas, and aiming directions of all sensors shall be determined by the occupancy sensor manufacturer and shown on the shop drawings. Final sensor layout in the rooms shall be coordinated with air diffuser locations to avoid false ON signals. Sensor layout shall also be coordinated with furniture and equipment locations to avoid false OFF signals, due to obstruction of sensors. This coordination is the responsibility of the Contractor.

1.05 CLOSEOUT SUBMITTALS

A. Project Record Drawings: Indicate actual locations and mounting heights of all wiring devices on the project record drawings.

B. Operation and Maintenance Manuals: Submit manufacturer's instructions for occupancy sensor maintenance and adjustment.

1.06 SPARE PARTS

A. Keyed Light Switches: Provide Owner 2 keys to operate switches.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS - WALL SWITCHES.

A. Hubbell.

B. Leviton.

C. Pass & Seymour.

D. Substitutions: Under provisions of Division 01.

2.02 WALL SWITCHES

A. Wall Switches for Lighting Circuits: UL 20; NEMA WD 1; and Federal Specification FS W-S-896 AC industrial grade snap switch with toggle handle, rated 20 amperes and 120-277 volts AC. Handle: White [ivory] nylon. Provide single-pole, 3-way, or 4-way switches as indicated on Plans.

B. Pilot Light Type: UL 20; NEMA WD 1; and Federal Specification FS W-S-896 AC industrial grade snap switch, rated 20 amperes and 120-277 volts AC. Handle: Red pilot light toggle (illuminated when load is on). Provide single pole unless otherwise indicated on Plans.

C. Keyed Switches for Lighting Circuits: UL 20; NEMA WD 1; and Federal Specification FS W-S-896 AC industrial grade snap switch with keyed handle, rated 20 amperes and 120-277 volts AC. Handle: White nylon. Provide single-pole, 3-way, or 4-way switches as indicated on Plans.

2.03 ACCEPTABLE MANUFACTURERS - RECEPTACLES

A. Hubbell.

B. Leviton.

C. Pass & Seymour.

D. Substitutions: Under provisions of Division 01.

2.04 RECEPTACLES

A. Convenience and Straight-blade Receptacles: UL 498, NEMA WD 1 and Federal Specification FS W-C-596 industrial grade receptacle.

B. Locking-Blade Receptacles: NEMA WD 5.

C. Convenience Receptacle Configuration: NEMA WD 1; Type 5-20R, white nylon face.

D. Specific-use Receptacle Configuration: NEMA WD 1 or WD 5; type as indicated on Drawings, black phenolic face.

E. GFCI Receptacles: 20A, duplex convenience receptacle with integral class 'A' ground fault current interrupter, LED indicator lamp, and integral lockout function.

F. Tamper-Resistant Receptacles: Complying with the requirements of UL 498 (section 131) and NEC 406.12-14.

G. Weather-Resistant Receptacles: Listed to the weather-resistant supplement of UL498 and complying with the requirements of NEC 406.9.

2.05 ACCEPTABLE MANUFACTURERS – OCCUPANCY SENSORS

A. Hubbell.

B. Leviton.

C. Lithonia.

D. Novitas.

E. Wattstopper.

F. Substitutions: Under provisions of Division 01.

2.06 OCCUPANCY SENSORS

A. Ceiling-Mounted Dual-Tech Occupancy Sensor: Dual-technology PIR and ultrasonic sensor with white housing, self-adjusting settings, automatic dual-mode operation, built-in circadian calendar for testing, red/green LEDs for indication of PIR/ultrasonic motion, and non-volatile memory to retain automatic and manual settings during power outages. Provide specific coverage area and either 180° or 360° coverage patterns, as required in the space to prevent unintentional tripping in adjacent spaces. Sensor shall have four selectable timer settings between 8 and 30 minutes. Sensor shall retain all manually adjusted or "learned" settings in event of a power outage.

B. Single-Relay, Dual-Tech Occupancy Sensor Wall Switch: Decora style, dual-technology, PIR and ultrasonic sensor with self-adjusting delayed-OFF time interval, self-adjusting ambient light override, 180° adjustable field of view, "walk-through" feature, manual ON/OFF pushbutton, LED indicator light to verify that detection is active, and non-volatile memory to retain automatic and manual settings during power outages. Sensor shall have four selectable timer settings between 4 and 30 minutes. Device color shall match other switches. Fluorescent Ratings: 1800VA @120V, 4000VA @ 277V. Incandescent Ratings: 1800W @ 120V.

C. Dual-Relay, Dual-Tech Occupancy Sensor Wall Switch: Decora style dual-technology, PIR and ultrasonic sensor suitable for switching two separate banks of lights from a single unit. Sensor shall have self-adjusting delayed-OFF time interval, self-adjusting ambient light override, 180° adjustable field of view, "walk-through" feature, two manual ON/OFF pushbuttons, LED indicator light to verify that detection is active, and non-volatile memory to retain automatic and manual settings during power outages. Sensor shall have four selectable timer settings between 4 and 30 minutes. Device color shall match other switches. Fluorescent Ratings: Primary Relay - 1200VA @120V, 2700VA @ 277V; Secondary Relay - 800VA @ 120V, 1200VA @ 277V. Incandescent Ratings: Primary/Secondary Relay - 800W @ 120V.

D. Sensor Power Packs: Provide sensor power packs as recommended by the sensor manufacturer and as required for all connected devices and the specified sequence of operation. Note that control of fixtures with multi-level switching may require additional power packs.

E. Sensor Masking: Infrared and dual-technology sensors shall include masking segments for adjusting the coverage of the infrared sensor to avoid false-tripping. If masking is not included with sensor, it shall be provided by Contractor at no additional cost to the Owner.

2.07 ACCEPTABLE MANUFACTURERS – PHOTOCELLS

A. Intermatic.

B. Substitutions: Under provisions of Division 01.

2.08 PHOTOCELLS

A. Dusk-to-dawn lighting control with a delay action.

B. Sonic-welded polycarbonate case and lens to seal out moisture.

C. Fully enclosed weatherproof housing.

D. Rated for mounting on building exterior and -40°F temperature operation.

2.09 ACCEPTABLE MANUFACTURERS – TIMER SWITCHES

A. Wattstopper

B. Intermatic.

C. Tork.

D. Hubbell.

E. Substitutions: Under provisions of Division 01.

2.10 TIMER SWITCHES

A. Digital Timer Switch: Pushbutton operation, luminescent LCD showing timer countdown, optional audible/visual warnings prior to time-out, and white finish. Time-out adjustment range shall be from 5 minutes to 12 hours, in 5-minute increments up to 1 hour then 15-minute increments up to 12 hours. Switch shall be compatible with all electronic ballasts and motor loads, have no minimum load requirement, and shall be suitable for installation in a single-gang box. Disable audible warning prior to installation.

2.11 ACCEPTABLE MANUFACTURERS – DEVICE PLATES

A. Hubbell.

B. Leviton.

C. Pass & Seymour.

D. Mullberry.

E. Red Dot.

F. Raco.

G. Substitutions: Under provisions of Division 01.

2.12 DEVICE PLATES

A. Decorative Cover Plate: Smooth 430 or 302 stainless steel with metal, counter sunk screws to match device plate.

B. Weatherproof Cover Plate: UL listed, cast aluminum, hinged outlet cover/enclosure, with gasket between the enclosure and the mounting surface, suitable for wet locations while in use.

C. Exposed Work Cover Plate: ½ inch raised, square, pressed, galvanized or cadmium plated steel cover plate supporting devices independent of the outlet box.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install wall switches 48 inches above floor, OFF position down.

B. Unless otherwise noted install wall switches within 6 inches of the door jamb on the strike side.

C. Install wall dimmers 48 inches above floor; derate ganged dimmers as instructed by manufacturer; do not use common neutral.

D. Install convenience receptacles 18 inches above floor, 4 inches above counters or backsplash, grounding pole on bottom.

E. Install specific-use receptacles at heights shown on Contract Drawings.

F. Unless otherwise noted, mounting heights are for finished floor to center line of outlet.

G. Install decorative plates on switch, receptacle, and blank outlets in finished areas. Use midsize or jumbo plates for outlets installed in masonry walls, where required to cover up imperfections in the wall opening.

H. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface-mounted outlets.

I. Install devices and wall plates flush and level.

J. Ground receptacles to boxes with a grounding wire. Grounding through the yoke or screw contact is not an acceptable alternate to the ground wire.

K. Install circuit label on each receptacle and light switch in accordance with Section 26 0553.

3.02 OCCUPANCY SENSOR TESTING AND CALIBRATION

A. Set the “Delayed Off” time on all sensors to 30 minutes.

B. Do not activate the “Ambient Light Override” feature on any sensors.

C. Wall Sensors:
   1. Provide masking on infrared lens to restrict field of view if necessary to prevent unwanted switching from adjacent spaces such as hallways.

D. Ceiling Sensors:
   1. Provide masking on infrared lens to restrict field of view if necessary to prevent unwanted switching from adjacent spaces such as hallways.
   2. Adjust range on sensor to match room size, as a percentage of total sensor coverage. Example: For a 10’ x 10’ room, the maximum sensing distance in front of the sensor (40’) is adjusted down to the minimum setting of 36% coverage.
   3. Adjust the PIR and ultrasonic sensitivity settings as required to avoid false tripping due to air movement.

E. Immediately prior to the start of the Engineer/Owner inspection, the Contractor shall ensure that all light switches are in the ON position in rooms where ceiling occupancy sensors are installed. The intent is that the sensors are energized and ready for testing during the inspection, without having to turn the light switches on and then wait for the sensors to time out and turn the lights off.

END OF SECTION

SECTION 26 2819
ENCLOSED SWITCHES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Disconnect switches.

B. Double Throw Switches

C. Fuses.

D. Enclosures.

1.02 RELATED SECTIONS

A. The Work under this section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions, and sections under Division 01 General Requirements and Section 26 0500 – Common Work Results for Electrical.

B. Division 01 – Quality Requirements.

C. Section 26 0526 – Grounding and Bonding for Electrical Systems.

D. Section 26 0548 – Vibration and Seismic Controls for Electrical Systems.

E. Section 26 0553 – Identification for Electrical Systems.

1.03 REFERENCE STANDARDS

A. Division 01 – submittal procedures.

B. ANSI/UL 98 Enclosed and Dead Front Switches.

C. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).

D. NETA ATS – Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

1.04 SUBMITTALS

A. Product Data: Submit product data for all components provided, showing electrical characteristics, material, and dimensions. Each catalog sheet should be clearly marked to indicate exact part number provided, including all options and accessories.

B. Shop Drawings: Submit shop drawings include outline drawings with dimensions, and equipment ratings for voltage, capacity, horsepower, and short circuit current interrupting rating.

1.05 CLOSEOUT SUBMITTALS

A. Project Record Drawings: Accurately indicate actual location of enclosed switches and ratings of actual installed fuses.

1.06 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS - ENCLOSED SWITCHES

A. Square D.

B. Siemens.

C. Cutler Hammer.

D. General Electric.

E. Substitutions: Under provisions of Division 01.

2.02 ENCLOSED SWITCHES

A. Nonfusible Switch Assemblies: NEMA KS 1; Heavy Duty type; quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position.

B. Enclosures: NEMA KS 1; Type 1, 3R or 4 as indicated on Drawings.

C. Disconnect Switches For Elevators: Fusible switch assembly, as specified above, with one normally open and one normally closed electrical interlock contact.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install enclosed switches where indicated on Drawings, and where required for NEC required disconnect of equipment specified under other divisions, but installed under division 26.

B. Install fuses in fusible disconnect switches.

C. All enclosed switches shall have signage for arc hazard installed. The marking shall be located to be clearly visible to qualified personnel before examination, adjustment, servicing or maintenance of the equipment. At a minimum the signage shall state the following:

Warning

Arc Flash and Shock Hazard

Appropriate PPE Required

3.02 FIELD QUALITY CONTROL

A. Field inspecting, testing, adjusting and balancing.

B. Inspect and test in accordance with NETA ATS, exception Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.5.

END OF SECTION

SECTION 31 2000
EARTH MOVING

PART 1 - GENERAL

1.01 WORK INCLUDES

A. Excavate and grade exterior areas at building perimeter, parking, access drives and other areas shown on the Drawings.

1.02 RELATED REQUIREMENTS

A. Section 02 4100, Demolition

B. Section 02 6500, Underground Tank Removal

C. Section 03 3053, Exterior Cast-in-Place Concrete

D. Division 22, Plumbing

E. Division 26, Electrical

1.03 DEFINITIONS

A. Finished grade shall mean the final grade elevations indicated on the Drawings. Spot elevations indicated on the Drawings shall govern over elevation contours in case of conflict.

B. Non-Frost Susceptible (NFS) Soil: Granular self-draining soils free of organic material and containing less, by weight, than ten percent finer than a No. 200 sieve and three percent finer than 0.02 millimeters that can be compacted to a tight, unyielding surface.

C. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below General Fill.

1.04 TESTING

A. The Contractor shall provide soil testing and inspection service by an independent geotechnical-civil engineering firm experienced in performing soil analysis. The testing firm shall be approved by code enforcement authorities and the Owner prior to commencing work.

B. The testing firm shall inspect and report on imported fill material, backfill compaction, and existing bearing soil for compliance with the Drawings and Specifications.

1.05 TEST AND INSPECTION REPORTS REQUIRED

A. Imported Fill Materials: One sieve particle size test for every different borrow source and one for every 1,000 cubic yards of fill.

B. Fill Compaction: One test for each lift layer placed and not less than one test per 2,500 square feet at locations designated by the Engineer.

C. Existing Subgrade: One inspection for loose or deleterious soil is required of existing soils under planned foundations after the existing has been over-excavated to a depth of 2'-0".

D. Reports shall be signed by a civil engineer registered to practice in the state of Alaska.

1.06 ENVIRONMENTAL REQUIREMENTS

A. Do no earthwork when outside temperature is, or is expected to be below 35 degrees F (40 degrees F for asphalt paving) or when the subgrade has standing water or snow.

B. Do not place frozen fill materials.

1.07 PROTECTION

A. Protect existing structures, sidewalks, paving, and curbs from equipment and vehicular traffic by timber cribbing, screens or other appropriate shielding.

B. Protect above and below grade utilities which are to remain.

C. Protect excavations by shoring, bracing, sheet piling, underpinning, or other methods required to prevent cave-in or loose soil from falling into excavation.

D. Underpin adjacent structures which may be damaged by excavation work, including service utilities and pipe chases.

PART 2 - PRODUCTS

2.01 EXISTING SOILS ON SITE

A. All foundation, slab-bearing and pavement soils are to be prepared as required in Part 3.

B. Excavated inorganic subsoil materials may be used for non-structural fill in areas which require grading.

2.02 DELETERIOUS SUBSTANCES

A. Substances such as sod, organics, peat, wood chips, frozen material or construction debris is not allowed in fill material.

2.03 BASE COURSE

A. Used as a base layer beneath asphalt concrete pavements.

B. Crushed stone, or crushed gravel consisting of sound, tough, durable fragments of uniform quality. Free from clay balls, vegetable matter, or other deleterious matters.

C. Meet the following testing requirements:

a. L.A. Wear (AASHTO T 96): 50% Maximum

b. Degradation Value (ATM 313): 45 Minimum

c. Fracture (WAQTC FOP for AASHTO TP 61): 70 Minimum

d. Plastic Index (WAQTC FOP for AASHTO T 90): 6 Maximum

e. Sodium Sulfate Loss (AASHTO T 104): 9% Maximum (5 cycles)

D. Meet the following gradations, as determined by WAQTC FOP for AASHTO T 27/T 11 in Percent Passing by Weight:

1-inch:	100%
3/4-inch:	70% - 100%
3/8-inch:	50% - 80%
No. 4:	35% - 65%
No. 8:	20% - 50%
No. 50:	8% - 30%
No. 200:	0% - 6%

E. Upon written approval of the engineer, recycled asphalt concrete pavement (RAP) may be substituted for Base Course, on an inch for inch basis.

2.04 RECYCLED ASPHALT CONCRETE PAVEMENT (RAP)

A. The RAP shall consist of crushed gravel, rock, sand, or other approved material. The aggregate shall be derived from recovered AC pavement and be free from lumps, balls of clay, or other objectionable matter, and shall be durable and sound. The portion of the material retained on a No. 4 sieve shall be known as coarse aggregate. Maximum RAP conglomerate (prior to extraction) shall pass the one inch (1”) sieve.

a. Coarse Aggregate: The coarse aggregate material conforming to the requirement specified above shall have a percentage of wear not to exceed fifty (50) after five hundred (500) revolutions, as determined by the current requirements of ASTM C-131. It shall consist of angular fragments, reasonably uniform in density and quality, and reasonably free from thin elongated pieces, dirt, and other objectionable material. At least fifty percent (50%) of the coarse aggregate particles shall have at least two (2) mechanically fractured faces. Asphalt extraction and sieve analysis shall be performed in accordance with ASTM D-2172-A or B, AASHTO T-164-A or B, and AASHTO T-30.

b. Fine Aggregate: The fine aggregate shall consist of material free of organic or other objectionable matter. The fine aggregate, either naturally combined with the coarse aggregate or separately obtained and mixed therewith, shall be of such character that the composite material will conform to the gradation and other requirement specified.

2.05 GENERAL FILL

A. Used for embankments and to backfill utility trenches.

B. Aggregate containing no muck, frozen material, roots, sod or other deleterious matter and the following requirements:

a. Plasticity index not greater than 6 as tested by WAQTC FOPs for AASHTO T 89 and T 90.

b. Gradation as tested by WAQTC FOP for AASHTO T 27/T 11: Sieve Percent Passing by Weight No. 200 0-10% determined on the minus 3-inch portion of the sample.

2.06 DRAIN ROCK

A. Meet the following gradations, as determined by WAQTC FOP for AASHTO T 27/T 11 in Percent Passing by Weight:

8-inch:	100%
6-inch:	50% - 80%
4-inch:	25% - 50%
3-inch:	0% - 25%
2-inch:	0% - 10%
No. 200:	0% - 1%

2.07 RIGID BOARD INSULATION

A. Polystyrene insulation board, specifically intended for underground use.

B. Conforms to AASHTO M 230, Type VI, except that extrusion is not required

C. Maximum water absorption by weight is 10%, as determined by ASTM C 272.

D. Meets or exceeds the specified R value.

2.08 GEOTEXTILE, EROSION CONTROL

A. Meets the requirements of AASHTO M 288 for Permanent Erosion Control.

PART 3 - EXECUTION

3.01 INSPECTION OF SITE

A. Examine site surfaces and elevations, subsurface soils report, existing site plans and details on Drawings for defects that will adversely affect the work.

B. Start of work shall mean acceptance of existing conditions as capable of producing an acceptable job.

3.02 DEWATERING

A. Do not allow water to accumulate in excavations. Remove and convey standing water from excavations by pumping if necessary.

3.03 MATERIAL STORAGE

A. Stockpile reusable soils to prevent cave-in or excess load on adjacent foundations.

B. Shape stockpiles for drainage.

3.04 EXCAVATION

A. Conform to elevations and dimensions shown on the Drawings and as specified. Remove any loose and protruding rock over four inches from edges of excavation.

B. Do not disturb bottom of excavation which receives building foundation or pipes. Smooth and compact as required to lines and grades indicated.

3.05 OVEREXCAVATION

A. Over-excavation shall be restored to compacted condition at no cost to Owner with approved soils.

3.06 SUBGRADE PREPARATION

A. Scarify and moisture condition all subgrade to receive fill as necessary to ensure proper bond and compaction.

B. Areas to receive fill shall be approved by the Architect/Soils Engineer before any fill is placed.

C. Plow, strip or break up sloped surfaces steeper than one vertical to four horizontal.

3.07 PLACING FILL

A. Prior to fill or footing placement proof-roll excavated subgrades to identify any soft or loose zones. Over-excavate and replace with compacted subgrade fill until firm, unyielding subgrade is produced.

B. Place and compact fill horizontal layers not of more than 12 inches loose depth (four inches if hand compacted).

C. Moisture condition by adding water or drying as necessary for compaction.

D. Spread fill with spreader boxes, wide tracked vehicles, or other approved methods that minimize re-handling and rutting the underlying course.

E. Do not dump fill from vehicles into large piles which require extensive re-handling. Take care to avoid segregation or pockets of fine or course material.

F. Do not spread more than 1,000 square yards in advance of compaction.

G. Backfill around foundations and pipes carefully by hand if necessary to avoid damage to structure and waterproofing.

3.08 COMPACTION

A. Compact fill to required density with mechanical tampers of heavy vibrator type where possible.

B. Compact to not less than the following percentages of maximum dry density (relative compaction) for material which exhibits a well-defined moisture density relationship determined in accordance with ASTM D1557-78.

Location	ASTM D1557
Within building areas and within ten feet beyond perimeter building lines	95 percent
Areas to be paved	95 percent
Areas to be landscaped	90 percent

3.09 ELECTRICAL RACEWAYS

A. Trench for at least six inch clearance each side of pipe.

B. Smooth bottom of excavation to lines and grades required without disturbing bottom of excavation. Bed pipe in four inches of sub-base fill to lower 1/4 of pipe.

C. Do not backfill until mechanical-electrical systems have been tested, inspected and approved.

D. Bring backfill up evenly around and eight inches above pipe or raceway in eight inch maximum loose layers. Compact each layer using hand tampers within twenty inches of pipe. Except for areas to receive asphalt or Portland cement concrete pavement, remainder of backfill may be existing site soils.

E. Do not use vehicular compactors over or within twenty-four inches of pipes.

3.10 BUILDING FOUNDATIONS

A. Excavate existing soils as required to rehabilitate the foundations.

B. Furnish, replace and compact existing soils and/or General Fill.

3.11 CONCRETE SLABS

A. Remove organic topsoil.

B. Scarify and compact upper 6 inches of soil.

C. Furnish and place compacted General Fill as necessary to attain grades.

3.12 GRADING

A. Grade top of compacted fill to allow for paving and landscaping topsoil elevations indicated.

B. Slope finished grades adjacent to the building to prevent ponding of water and to convey water away from foundations.

C. Bring top of fill to a firm unyielding layer. Correct soft spots or depressions that develop under compaction by removing and replacing material until the surface is smooth and uniform.

D. Provide adequate water supply for compaction.

3.13 WASTE DISPOSAL

A. Any excess soil shall be removed and legally disposed of off site. Coordinate landscaping topsoil reuse and remove excess.

3.14 MAINTENANCE

A. Keep fills in satisfactory condition for pavement and building construction following final grading. Provide drainage and erosion control until completion of covering work.

B. Where completed compacted areas are disturbed by subsequent construction operation or adverse weather, scarify, compact and grade prior to further construction.

C. Should subsurface bearing surfaces of natural soil previously approved become softened by frost or moisture before final covering, re-excavate to firm bearing and extend backfill to suit, or dry and re-compact subsurfaces if approved by the Engineer.

3.15 CLEAN UP

A. Smooth grade transition to existing soils grade at any depressions or disturbed areas adjacent to the backfilled areas. Repair any damage to existing structure or roadways which results from earthwork.

B. Remove excess soil, and construction debris.

3.16 TOLERANCES

A. Surface grades uniform to elevations indicated within plus or minus 0.10 foot in ten feet.

END OF SECTION

SECTION 32 1216
ASPHALT PAVING

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Prepare sub-grade to receive base course.

B. Place stabilizing base courses, work and compact.

C. Place asphalt pavement.

1.02 RELATED WORK

A. Section 31 2000 - Earth Moving

B. Section 32 1723 - Pavement Markings

1.03 TESTING

A. The Contractor shall provide asphalt testing and inspection service by an independent, experienced asphalt testing laboratory. The testing firm shall be approved by code enforcement authorities and the Owner prior to commencing work.

B. The testing firm shall inspect and report on Marshall series, and density and thickness for compliance with the Drawings and Specifications.

1.04 TEST AND INSPECTION REPORTS REQUIRED

A. One truck sample of each day's run for Marshall series.

B. One core sample correlated to truck sample for density and thickness.

1.05 REFERENCE STANDARDS

A. Alaska Department of Transportation and Public Facilities Standard Specifications for Highway Construction, ADOT&PF (2004).

1.06 ENVIRONMENTAL REQUIREMENTS

A. Do no paving when outside temperature is, or is expected to be, below 40 degrees F, or when the subgrade has standing water or snow.

B. Do not place on frozen materials.

PART 2 – PRODUCTS

2.01 ASPHALT CONCRETE

A. Asphalt concrete conforming to the requirements of “Class C” Asphalt Mix Design Requirements in Section 401 of ADOT&PF (2004).

PART 3 - EXECUTION

3.01 INSPECTION OF SITE

A. Examine site surfaces and elevations and details of Drawings for defects that will adversely affect the work.

B. Start of work shall mean acceptance of existing grades as capable of producing an acceptable job.

3.02 GENERAL

A. Conform to referenced ADOT&PF Standard Specifications, including but not limited to:

1. Weather limitations.
2. Preparation of area to be paved.
3. Material quality, preparation and transport.
4. Spreading and compaction.

3.03 TOLERANCES

A. 3/16 inch in ten feet (non-cumulative) smooth surface alignment to elevations indicated on Drawings, without any local depressions.

END OF SECTION

SECTION 32 1723
PAVEMENT MARKINGS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. This work shall consist of furnishing all materials and placing painted pavement markings shown on the Drawings and as specified herein.

1.02 RELATED WORK

A. Section 32 1216 - Asphalt Paving

1.03 ENVIRONMENTAL REQUIREMENTS

A. Apply paint at temperatures and surface conditions recommended in writing by paint manufacturer and these Specifications.

B. Maintain dry surfaces with air and surface temperatures between 40 and 75 degrees F, tenting and heating as necessary before, during, and until paint materials are dry or cured.

PART 2 - PRODUCTS

2.01 PAINT

A. Pavement marking paint shall conform to AASHTO M248, Type F (Alkyd Resin), non-reflective.

PART 3 - EXECUTION

3.01 INSPECTION OF SITE

A. Examine site asphalt pavement surfaces and details on Drawings for defects that will adversely affect the work.

B. Start of work shall mean acceptance of existing grades as capable of producing an acceptable job.

3.02 PAINT PREPARATION AND APPLICATION

A. Remove dirt, oil, grease, and other foreign matter from pavement areas to be painted.

B. Apply paint only to pavements that are clean, dry, and warmer than 40 °F.

C. Protect and mask adjacent surfaces as necessary to prevent overspray.

D. Apply the paint at the rate of 80 square feet/gallon (approximately 20 mils wet film thickness). A tolerance not to exceed 10% is allowed for film thickness or yield.

E. Provide a minimum of a four-inch wide stripe along twenty feet of each side of all parking spaces.

END OF SECTION

SECTION 32 3101
CHAIN LINK FENCE

PART 1 - GENERAL

1.01 WORK INCLUDES

A. This item includes all labor, materials, equipment and plant required for the supply and installation of chain link, in accordance with the drawings and these specifications in conformity with the lines and grades shown or established by the Engineer; plus all incidental work not specified or shown elsewhere.

B. Supply and installation of material for the chain link fence includes posts, fence fabric, tension wire, brace rails, truss rods and tighteners, gate frames and posts, gate stops, grounding rods and wire, post tops and caps, tie wires, concrete, and all fittings and hardware for a complete fence installation.

1.02 RELATED REQUIREMENTS

A. Section 03 3053 Exterior Cast-in-Place Concrete

1.03 SUBMITTALS

A. See Section 01 3300 - Submittal Procedures.

B. Submit technical data sheets for all fence components.

PART 2 - PRODUCTS

2.01 GENERAL

A. Posts, gate frames, braces, rails, stretcher bars, and truss rods shall be of steel; reinforcing wires shall be of high carbon steel; and gate hinges, posts caps, stretcher bar bands, and other parts shall be of steel, malleable iron, or equal except that ties and clips may be of aluminum.

B. Workmanship shall be of good quality. Parts shall be formed accurately to dimensions. All steel and iron parts shall be zinc coated after fabrication, using zinc grade “E” in accordance with Federal Specifications QQ-Z-351.

C. The weight of the zinc coating per square foot of actual surface shall average not less than 1.2 ounces and no individual specimen shall show less than 1.0 ounce. Zinc-coated surfaces shall be free from imperfectly coated spots.

D. The fence height shall be 6 feet, unless otherwise noted on the Plans.

2.02 FABRIC

A. Fencing fabric shall be zinc coated by the hot-dip process after fabrication. The zinc coating shall be commercially uniform. It shall not have less than 1.2 ounces per square foot when tested. The fabric shall be woven with a 9-gauge steel wire in a 2-inch mesh. Fabric height shall be 6 feet, unless otherwise noted on the Plans.

2.03 GATES

A. Gates shall be single, swing type, unless otherwise specified on the Plans. Provide latches, stops, keepers, and hinges.

B. Gate frames shall be constructed of tubular members, and shall be constructed in a manner such as to provide a rigid frame and ample strength and shall be free from sag and twist.

C. Fabric shall be attached securely to the gate frame at intervals not to exceed fifteen (15”) inches.

D. Hinges shall be of heavy pattern, of adequate strength for the gate, and with large bearing surfaces for clamping them in position. The hinges shall not twist or turn under

the action of the gate. The gates shall be capable of being opened and closed easily by one person.

E. Latches, stops and keepers shall be provided for all gates. Latches shall have the plunger-bar arranged to engage the gate stop, except that for single gates with opening less than ten feet (10') wide, a forked latch may be provided. Latches shall be arranged for locking. Center stops shall consist of a device arranged to be set in concrete and to engage the plunger of the bar latch of double gates. No stop is required for single gates. Keepers shall consist of a mechanical device for securing the free end of the gate when in the full open position.

F. Gate exterior frame members shall be round with an outside diameter of 1.90 inches and have a nominal weight per foot of 2.085 pounds.

G. Interior bracing members shall be round with an outside diameter of 1.66 inches and have a nominal weight per foot of 1.806 pounds.

2.04 POSTS

A. Posts shall be for a fabric height of 6 feet.

B. End, corner and pull posts shall be round with an outside diameter of 2.375 inches and have a nominal weight per foot of 3.65 pounds.

C. Intermediate posts shall be round with an outside diameter of 1.90 inches and have a nominal weight per foot of 2.72 pounds.

D. Gate posts:

1. For a width of 6 feet or less shall be round with an outside diameter of 2.875 inches and have a nominal weight per foot of 5.79 pounds.

2. For a width of 6 to 13 feet shall be round with an outside diameter of 4.00 inches and have a nominal weight per foot of 9.10 pounds.

2.05 POST BRACES

A. Post braces shall be provided for each gate, corner, pull, and end post for use with fabric five feet (5') or more in height, and shall consist of a round tubular brace extending to each adjacent post and midheight of the fabric, and a truss consisting of a rod not less than three-eighth inches (3/8") in nominal diameter from the adjacent post back to the gate, corner, pull, or end post, with a turnbuckle or other equivalent provision for adjustment.

B. Post braces shall be round with an outside diameter of 1.660 inches and have a nominal weight per foot of 1.806 pounds.

2.06 POST TOPS

A. Post tops shall be ornamental type. The top shall be provided with a hole suitable for the through passage of the top rails. The post tops shall fit over the outside of the posts and shall exclude moisture from the tubular posts.

2.07 TOP RAILS

A. Top rails shall be round (tubular), shall be in length not less than eighteen feet (18'), and shall be fitted with couplings for connecting the lengths into a continuous run. The coupling shall be not less than six inches (6") long, shall provide a substantial connection, and shall allow for expansion and contractor of the rail. Suitable ties for clips shall be provided in sufficient number for attaching the fabric securely to the top rail at intervals not exceeding two feet (2'). Means shall be provided for attaching the top rail to each gate, corner, pull, and end post.

B. Top rails shall be round with an outside diameter of 1.660 inches and have a nominal weight per foot of 1.806 pounds.

2.08 STRETCHER BARS

A. Stretcher bars shall not be less than three-sixteenth inch (3/16") by three quarter inch (3/4") and shall be of length one inch (1") less than the full height of the fabric with which they are to be used. The stretcher bars shall be arranged for attaching the fabric to all terminal posts by threading through the fabric, by bands, or by other positive mechanical means.

2.09 TIES OR CLIPS

A. Ties or clips of adequate strength shall be provided for attaching the fabric to lineposts.

2.10 FABRIC BANDS

A. Fabric bands of adequate strength shall be provided for attaching the fabric and stretcher bars to all terminal posts.

2.11 TENSION WIRES

A. A bottom tension wire shall be provided unless otherwise specified. The tension wire shall be of coiled spring wire not less than 7 gauge plus or minus 0.005 inches in diameter. Ties or clips shall be provided for attaching each wire to the fabric at intervals not exceeding two feet (2').

2.12 CONCRETE

A. As specified in Section 03 3053 Exterior Cast-in-Place Concrete.

2.13 MARKING

A. Each roll of fabric shall carry a tag showing the kind of base metal, kind of coating, the gauge of the wire, the length of fencing in the roll, the name of the manufacturer, and where used on project site.

B. Posts, wire, and other fittings shall be identified as to manufacturer, kind of base metal, and kind of coating.

PART 3 - EXECUTION

3.01 CLEARING AND GRADING

A. All obstacles which would interfere with the construction of the fence shall be removed and disposed of at a contractor-provided disposal area and shall be considered incidental. The fence shall be constructed in such a manner as to follow a smooth profile. Throughout the fence length the distance between the ground surface and the bottom tension wire shall not be greater than four inches (4"), nor less than two inches (2"). Grading for all specific conditions shall be such that water will not be allowed to pond in the immediate area of the fence. Where drainage is required across the fence line, the Engineer shall be consulted and channels provided in accordance with his decision.

3.02 INSTALLING POSTS

A. Set the tops of all posts to the required grade and alignment. Do not cut the tops of the posts.

B. Posts shall be placed not more than ten lineal feet (10') apart.

C. All posts shall be set in concrete to a minimum depth of three feet (3') below finished grade. The minimum depth of concrete shall be four feet (4') from finished grade.

D. The concrete should be thoroughly compacted around the posts by tamping or vibrating and shall have a smooth finish slightly higher than the finished ground and sloped to drain away from the posts. All posts shall be set plumb and to the required grade and alignment. Install temporary guts or braces as required to hold the posts in proper position until the concrete has set sufficiently to hold the post. No materials shall be

installed on the posts, nor shall the posts be disturbed in any manner within 7 days after the individual posts footing is completed.

E. Treat changes in line where the angle of deflection is 30 degrees or more as a corner and install corner posts. Provide bracing, truss rods, etc. on each of the two 10-foot fence sections at the corner.

3.03 INSTALLING BRACES

A. Horizontal brace rails, with diagonal truss rods and turnbuckles, shall be installed at all terminal posts.

3.04 FABRIC

A. Fabric shall be placed on the side directed by the Engineer, stretched taut, and securely fastened to the posts.

B. Fastening to the end, gate, corner and pull posts shall be with stretcher bars and fabric bands spaced at intervals of fifteen inches (15”) or less. Fastening to the line posts shall be with ties or clips at fifteen-inch (15”) intervals.

C. Rolls of wire fabric shall be joined by weaving a single strand into the ends of the rolls to form a continuous mesh. Horizontal splices will not be permitted.

3.05 TOP RAIL

A. Top rails shall pass through the ornamental tops of the line posts, forming a continuous brace from end to end of each stretch of fence. Lengths of tubular top rail shall be joined by sleeve couplings. Top rails shall be securely fastened to terminal posts by pressed galvanized steel fittings or other appropriate means.

3.06 TENSION WIRE

A. One continuous length of tension wire shall be used between pull posts. Sufficient tension shall be applied to avoid excess sag between the posts. Tension wires shall be tied or otherwise fastened to end, gate, corner, or pull posts by methods approved by the engineer.

3.07 ELECTRICAL GROUNDS

A. Electrical grounds shall be constructed at 250-foot intervals and directly below points where power lines pass over the fence. The ground shall be accomplished with a copper clad rod 8 feet long and a minimum of 5/8 inch in diameter driven vertically until the top is 6 inches below the ground surface. A No. 6 solid copper conductor shall be clamped to the rod and to the fence in such a manner that each element of the fence is grounded. Installation of ground rods shall not constitute a pay item and shall be considered incidental to fence construction.

END OF SECTION

SECTION 26 42 13

SACRIFICIAL ANODE CATHODIC PROTECTION SYSTEM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Requirements for installation of a form type galvanic anode cathodic protection system that will protect the steel columns. The cathodic protection system panels will be utilized as part of the form for the concrete encasement around the building columns. The cathodic protection systems include, but are not limited to, manufactured zinc mesh anode panels, structure connections (exothermic welds), and junction boxes.

1.02 RELATED SECTIONS

A. Section 01 33 00 – Submittals.

B. Section 03 11 00 – Concrete Forms.

C. Section 09 97 13.23 – Exterior Coating Systems for Structural Steel

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM D638 Standard Test Method for tensile Properties of Plastics.

2. ASTM D790 Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.

3. ASTM D796 Standard Practice for Compression Molding Test Specimens of Phenolic Molding Compounds

4. ASTM D1248 Standard Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable

B. National Association of Corrosion Engineers (NACE):

1. SP0169-2007 Control of External Corrosion on Underground or Submerged Metallic Piping Systems.

1.04 SUBMITTALS

A. Refer to Section 01 33 00 – Submittals, for submittal requirements and procedures.

B. The Contractor shall submit the following for approval, prior to procuring materials:

1. Manufacturer's Product and Catalog Cut Information: Product data and catalog cut information shall be submitted for each item listed in this Specification. Product information shall include the manufacturer's name, recommended installation instructions (if any) and sufficient information to demonstrate that the materials meet the requirements of the drawings and specifications. Where more than one item or catalog number appears on a catalog cut, the applicable item(s) proposed for use shall be clearly identified.

2. Drawings: The Contractor shall maintain accurate as-built drawings of the cathodic protection system installations over the course of the construction project. Drawings shall be legibly revised to show exact location of junction box locations, cable routing and exothermically welded structure connection locations. Completed as-built drawing originals shall be submitted to the State of Alaska or their designated Project Representative.

3. CP Commissioning Report: Three (3) copies of the cathodic protection (CP) testing and commissioning data shall be submitted to the State of Alaska or their designated Project Representative. The report shall document CP surveyor name(s) and valid NACE certification(s), all collected test data, final test station locations and configurations, commissioning results, and system testing/activation date(s).

1.05 QUALITY CONTROL

A. Qualifications: Contractor's must have a valid Contractor's license issued by the State of Alaska and a minimum of two years experience installing cathodic protection systems.

B. Drawings: The cathodic protection system drawings are based on best available information and are not scaled for exact locations unless otherwise noted or dimensioned on a specific drawing or detail. Some conditions may vary requiring field survey and location of components (prior to excavation) to avoid interference with, or damage to, existing utilities or structures.

C. Exothermic Welds: Unless specified herein, the cadweld manufacturer's printed recommendations and instructions for handling, surface preparation, and application of exothermic welds shall be strictly observed.

D. Inspection: It is the Contractor's responsibility to perform work to the requirements of this Specification and to conduct the necessary inspections and tests to ensure proper installation and compliance. The Owner may conduct any inspection deemed necessary to verify compliance.

1.06 DELIVERY, STORAGE AND HANDLING

A. Inspect all cathodic protection materials upon delivery to verify components are of the proper make, model and part number (as specified herein and on the project drawings); are free of damage; and are provided in sufficient quantities to complete the project as designed.

B. Store all cathodic protection materials in a dry, protected location to prevent impact, spark and weather related damage.

PART 2 PRODUCTS

2.01 ZINC ANODE CATHODIC PROTECTION PANEL SYSTEM

A. The zinc anode cathodic protection panel system shall consist of a pre-wired zinc mesh composite anode cast on a rigid cement board, as manufactured by Jarden or an approved equal. The zinc anode placed within the anode panels shall be an expanded zinc mesh conforming to "high purity" Alloy 190 with the following metal composition:

Element	Percent Composition

Lead	0.003 percent (max.)
Iron	0.001 percent (max)
Cadmium	0.002 percent (max)
Titanium	0.001 percent (max)
Copper	0.7 to 0.9 percent
Aluminum	0.001 percent (max)
Zinc	Remainder

B. The mesh anode shall have the following physical properties:

Property	Specification
Electrical conductivity	27% ± 1% IACS
Solid zinc density	0.259 lbs/in^3
Expanded mesh weight	1.60 lb/ft^2 ± 0.05 lb/ft^2
Expanded mesh open area, ref only	53%
Solid zinc sheet thickness	0.100 ± 0.005 inch

C. The expanded mesh anode shall conform to the following nominal geometry to allow proper mortar encapsulation; these values represent industry standards for ½" pattern, and are to be considered ref only:

Property	Specification
Hex pattern	0.500 inch hex pattern
Strand width in the short direction	0.125 inch
Strand width in the long direction	0.562 inch
Short opening	0.312 inch
Long opening	0.500 inch

D. The anode panels shall be provided with a copper strand lead wire connected to the zinc mesh. The lead wire shall not be spliced and shall be of sufficient length to reach the junction box as shown in the construction drawings. The connection shall be made by soldering and then coating the soldered area with a 100% solids epoxy. The connection wire should be #10 AWG copper strand wire

E. The anode panels include an integrated fiber cement board outer cover, which is durable and able to withstand normal environmental conditions, such as exposure to wind and UV light. The panel shall be a nominal overall thickness of 0.500".

F. The anode panels shall possess the following mechanical and physical properties:

Property	Specification
Ultimate Tensile Strength (ASTM D638)	1,000 psi, min
Compressive Strength (ASTM D790)	2,500 psi, min
Elastic Modulus (ASTM D796)	580,000 psi, min
Panel Weight, ref only	3.5 lb/SF

G. The anode panels shall possess the following electro-chemical properties:

Property	Specification
Electro-potential (saturated 100% humidity)	-750 to -1100 mV, CSE
Auto-Corrosion	Less than 0.1mm / year
pH	11.5 max

Resistivity	400 to 500 ohm-cm

H. The anode panels will be trimmed on site to fit and installed with concrete formwork such that they form the exterior surface of the new concrete pour once the formwork is removed.

I. The anode panels shall be coated after installation with the appropriate coating system as detailed in the project specifications, or as per the Engineer's direction.

2.02 JUNCTION BOXES

A. The cathodic protection junction box shall be a NEMA Type 4X Polyester Enclosure, as manufactured by Hoffman Model No. A1084PHC or an approved equal. The following components shall be installed in each junction box:

1. A copper bus bar with the required number of solderless lugs on a non-conductive back panel as detailed on the project drawings.
2. Two 1.25-inch straight fitting compression connectors as detailed on the project drawings.
3. A phenolic tag marked with the piling designation as detailed on the project drawings.

2.04 JUNCTION BOX LEAD WIRES

A. Junction box structure lead wires shall be black No. 10 AWG, 7-strand copper cables with HMWPE insulation in accordance with ASTM D1248, Type 1, Class C. The anode panels come with black No. 10 AWG, 7-strand copper cables with HMWPE insulation attached.

B. Lead wires shall be continuous and splice free from point of origin (anode or steel column) to the junction box.

C. Junction box wires shall be labeled with legible heat shrink identification. Labels shall include descriptive verbiage noting the point of origin for each cable (example: "North Panel Anode", "South Panel Anode", "Structure Connection", etc.).

2.05 EXOTHERMIC WELD CONNECTIONS

A. Charges and Molds: Exothermic weld charges and molds shall be appropriately sized for the specific connection application per manufacturer recommendations. Connection applications shall plate-to-test lead installations.

B. Approved exothermic weld manufactures include Erico Cadweld® or Continental Industries ThermOweld® materials. Specific materials for each application are as follows:

1. Plate-to-Test Lead Installation:

Manufacturer:	Erico	ThermOweld
Mold:	CAVST-1K	M-1956
Charge:	CA25	25CP
Cable Sleeve:	CAB-133-1K	38-0208-00

PART 3 EXECUTION

3.01 PREPARATION

A. Prior to commencing installation activities, the Contractor should review the Project Drawings and Specifications to become familiar with the scope of work and general location of the work to be performed.

B. The Contractor is responsible for verifying actual field conditions, location of underground structures, and assuring adequate physical separation from other structures and utilities.

C. Some field location of the junction box and/or the associated lead wires may be required to accommodate the site conditions.

D. Barricade or flag work areas and advise local personnel of safety hazards.

3.02 STRUCTURE LEAD WIRE INSTALLATION

A. Attach structure test leads to the steel column by exothermic welding prior to coating. Two structure leads will be attached to each column using a minimum of 6-inch spacing between attachment points.

B. Prepare the steel surface to receive structure test lead attachments by cleaning the exposed bare metal surfaces per the manufacturers instructions. The weld attachment areas must be thoroughly cleaned, and dry with the correct surface profile to ensure a proper weld.

C. Remove approximately 2 inches of the lead wire insulation to expose the bare copper conductor. Clean the exposed conductor with a file or a rasp (removing any oxide or corrosion scale) and dry as required.

D. Preheat the prepared steel surface(s) with a propane torch, taking care to minimize damage to the surrounding coating. The structural steel should not be less than 70° Fahrenheit when the structure lead is exothermically attached.

E. Place the exothermic weld mold over the pre-heated bare structure lead attachment point and insert the lead wire conductor into the mold as noted in the exothermic weld manufacturer's instructions.

Note:	*No. 10 AWG lead wires will require the use of manufacturer specified copper sleeves inserted over the end of the exposed cable conductors to prevent cable burn-through.*

F. Install the supplied metal disk into the bottom of the mold and pour the weld metal into the mold cavity. Pour the weld charge into the mold and squeeze/tap any residual ignition powder (typically at the bottom of the charge capsule) to spread over the installed weld material.

G. Close the mold cover and ignite the ignition powder per manufacturer's instructions using a flint gun.

H. Remove the mold from the completed installation and clean the weld of slag or any other debris that may be present.

I. Verify proper adherence and attachment to the structure metal by striking the weld with a two pound hammer. Additionally, verify that the lead wire is solidly connected by examining and pulling on the cable. If the weld is not secure or the wire appears to be compromised, repeat the procedure at an adjacent location (using a minimum 6-inch separation from the previous attempt).

J. Route structure lead wires up the column channel and affix them to the column with duct tape or another appropriate temporary adhesive mechanism. Leave the lead wires secured and out of the way until the column coating has been completed per section 09 9713.23 Exterior Coating for Structural Steel and the column encasement form work is completed per Specification 03 1100 – Concrete Forms.

3.03 ZINC ANODE CATHODIC PROTECTION PANEL SYSTEM INSTALLATION

A. Install the anode panel cathodic protection concrete boards in the formwork as shown on the project drawings such that the anode lead wires will be routed through and encased in the new concrete pour to the point where they will be routed into the junction box. All junction boxes will be mounted on the interior of the foundation.

B. For each of the nine columns on the ocean side of the office building, grid line A, field locate the junction box on one of the CP panels on the interior of the building. At the base of the junction box location, drill two 1.25" holes for the installation of conduit per the project drawings.

C. For the eleven remaining perimeter columns on grid lines B and C provide a penetration through the existing foundation wall adjacent to each column sized to accommodate the anode lead wire and two structure connections. Route cabling through this penetration and seal to prevent material loss during the concrete placement.

D. Affix the junction boxes to the panel or the existing foundation with the mounting hardware as indicated on the project drawings.

E. Terminate the conduit in the base of the junction box.

F. Install the phenolic tag with the column designation.

G. Route the anode panel lead wires and the structure lead wires through the conduits as shown on the project drawings.

H. Band the test lead wires entering each conduit together via nylon banding or ty-rap.

I. Complete concrete placement in accordance with Specification 03 1100 while taking care not to put stress on the junction box lead wires.

J. After concrete placement is complete, connect the structure lead wires and the panel anode lead wires to the applicable junction box terminal board solderless lugs as shown on the Project Drawings. Lead wires shall be labeled with legible heat shrink identification noting point of origin (i.e. "Structure Connection", "North Panel", etc..).

3.04 FIELD QUALITY CONTROL

A. All cathodic protection materials should be inspected for defect or damage prior to installation.

B. After surface preparation work, inspect surfaces to receive exothermic welds and repair all defects prior to weld attachment.

C. Prior to placing concrete, all anode and structure lead wires shall be checked for nicks, cuts, or abrasions. Bring any damage to the attention of the field engineer for dispositioning.

D. Verify all test station lead wires are properly labeled per the Project Drawings and this Specification.

3.05 CATHODIC PROTECTION SYSTEM TESTING & COMMISSIONING

A. Verify with the Contractor and State of Alaska Project Representative that all cathodic protection system installation and concrete installation has been completed.

B. Examine junction box lead wire terminations for proper labeling and termination points. Document the final installation data and configuration via legible hand sketch or digital photo.

C. Temporarily disconnect each of the anode panel lead wires. Measure the anode current output from each panel to the steel column using a calibrated ammeter or multi-meter. Document the individual measurements of each disconnected lead wire and reconnect lead wires in their original configuration. Sketch/photograph the final junction box wiring configuration.

D. All CP system testing and commissioning shall be performed by a NACE certified Cathodic Protection Tester (or greater) and shall be performed in accordance with NACE SP0169-2007 procedures.

E. Collected data, sketches and photographs shall be compiled in a CP System Commissioning Report and submitted to the State of Alaska.

END OF SECTION

SECTION 26 5100
INTERIOR LIGHTING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Interior Luminaires and Accessories.

B. Lamps.

C. Ballasts.

D. Fluorescent Luminaire Disconnect.

1.02 RELATED WORK

A. The Work under this section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions, and sections under Division 01 General Requirements, and Section 26 0500 – Common Work Results for Electrical.

B. Division 09 – Finishes: Painting and ceilings.

C. Section 26 0526 - Grounding and Bonding for Electrical Systems.

D. Section 26 0529 - Hangers And Supports For Electrical Systems.

E. Section 26 5200 - Emergency Lighting.

F. Section 26 5600 – Exterior Lighting.

1.03 REFERENCES

A. Division 01 – submittal procedures.

B. ANSI C62.41 – Specification for Surge Voltages in AC Power Circuits Rated up to 600V.

C. ANSI C82.11 - Specification for High-Frequency Operation Of Fluorescent Lamp Ballasts.

D. ANSI C82.4 - Specification for High-Intensity-Discharge Lamp Ballasts (Multiple Supply Type).

E. NEMA LE 2 - H-I-D Lighting System Noise Criterion (LS-NC) Ratings.

F. USGBC LEED NC 2.2 – Leadership in Energy and Environmental Design.

G. UL 935 – Specification for Fluorescent-Lamp Ballasts.

1.04 SUBMITTALS

A. Product Data: Submit the following:
   1. Luminaires: Include manufacturer's product data sheets and/or shop drawings including outline drawings showing support points, weights, and accessory information for each luminaire type.
   2. Lamps: Submit manufacturer's product data sheets for each lamp used on the project. Indicate luminaire type where each lamp is used.
   3. Ballasts: Submit manufacturer's product data sheets for each different type of ballasts used on the project. Indicate which luminaires each ballast is used in.

B. **Interior Fixture Substitutions:** Submit calculations to show that substitute interior lighting fixtures meet or exceed the lighting levels, uniformity ratios, fixture electrical load (less than or equal) to comply with designed energy efficiency per anticipated LEED EA1.

1.05 CLOSEOUT SUBMITTALS

A. Project Record Drawings: Indicate actual locations and mounting heights of all lighting fixtures and accessories on the project record drawings.

B. Operation and Maintenance Manuals:
   1. Provide recommended luminaire cleaning and re-lamping schedule. If any luminaire lenses require special lubricants for cleaning, include this in the schedule.
   2. Provide detailed bill of materials for all items purchased in this section including distributor's contact name, phone number and pertinent information.
   3. Provide luminaire manufacturer's installation instructions.

4. Include any specific warranty information provided by the manufacturer for luminaires, lamps and ballasts.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site, store and protect under provisions of Division 01.

1.07 EXTRA STOCK

A. Provide spare parts under provisions of Division 01.

B. Lamps: Provide one of each size and type of HID lamp installed. Provide one carton (30 lamps) of T8 lamps and 10 of each size of compact fluorescent lamps installed.

C. Lenses: Three percent of quantity furnished, minimum of one of each size and type.

D. Ballasts: One of each size and type installed.

1.08 COMMISSIONING

A. Fully commission all systems, subsystems and equipment provided by this section in accordance with 26 0800 Electrical Commissioning.

PART 2 PRODUCTS

2.01 INTERIOR LUMINAIRES AND ACCESSORIES

A. Luminaires: Provide UL listed luminaires as scheduled on the drawings or as approved equal.

B. Listing: Luminaires shall be listed for use in the environment in which they are installed. For example, luminaires installed in return air plenums, direct contact with insulation, or in hazardous, wet, damp, or corrosive locations shall be UL listed for such application.

C. Accessories: Provide all mounting kits, supports, interconnecting wiring, power supplies, trim kits, gaskets, etc. for a complete installation.

D. Luminaires using a metal halide lamp other than a thick-glass parabolic reflector lamp (PAR) shall be provided with a containment barrier that encloses the lamp, or shall be provided with a physical means that only allows the use of a lamp that is Type ‘O’ (listed for use in open luminaires).

2.02 ACCEPTABLE MANUFACTURERS - LAMPS

A. Phillips Lighting Company.

B. Osram Sylvania.

C. General Electric.

D. Venture Lighting International.

E. Substitutions: Under provisions of Division 01.

2.03 LAMPS - FLUORESCENT

A. All fluorescent lamp wattages and types shall be as scheduled on the Plans with a configuration and pin base as required for installation in the specified light fixtures.

B. All fluorescent lamps shall be low-mercury type that passes the Toxicity Characteristic Leaching Procedure (TCLP) test at end of life.

C. Energy Saving 28W T8 Lamps (EST8): 3500 K, tri-phosphor, energy saving, linear fluorescent lamps with a minimum lumen output of 2725, a minimum CRI of 85, and rated life of 30,000 hours (based on 3 hours per start using programmed start ballast). Acceptable Manufacturer/Model: Sylvania “Octron XP Supersaver”, Philips “Energy Advantage”, or approved equal.

D. High Performance 32WT8 Lamps (HPT8): 3500° K, tri-phosphor, energy saving, linear fluorescent lamps with a minimum lumen output of 3100, a minimum CRI of 85, and rated life of 30,000 hours (based on 3 hours per start using programmed start ballast). Acceptable Manufacturer/Model: Sylvania “Octron XPS 800 Ecologic”, Philips “Advantage T8”, GE “Starcoat HL” or approved equal.

2.04 LAMPS – LED

A. Light Emitting Diode (LED): 3500° K, with minimum 75CRI and a minimum rated life of 50,000 hours at 75 degrees F average indoor ambient temperature, -40 degrees F for outdoors.

2.05 ACCEPTABLE MANUFACTURERS - BALLASTS

A. Advance.

B. Osram/Sylvania.

C. Universal.

D. Substitutions: Under provisions of Division 01.

2.06 BALLASTS - FLUORESCENT

A. All fluorescent ballasts shall have the following minimum criteria:
   1. Ballasts shall operate with no visible flicker (<3% flicker index) from 60 Hz input source of 120 through 277 Volts, and sustain variations of ± 10% (Voltage & Frequency) with no damage to the ballasts.
   2. Ballast shall have Class "A" sound rating, a Power Factor greater than 98% when used with primary lamp, and a Lamp Current Crest Factor (ratio of peak to RMS current) of 1.7 or less in accordance with lamp manufacturer recommendation and ANSI C82.11-1993.
   3. Input current Total Harmonic Distortion shall not exceed 10% for the primary lamp.
   4. Ballasts shall comply with FCC Part 18 Non-Consumer Equipment for EMI (power line conducted) and RFI (Radiated), shall provide transient immunity as recommended by ANSI C62.41-1991, Location A2, and shall tolerate sustained open circuit and short circuit output conditions without damage.
   5. Ballasts shall be Underwriters Laboratory (UL 935) listed, Class P, Type 1 Outdoor, and CSA certified where applicable.
   6. Ballasts shall have a five year warranty.

B. Programmed Start T8 Electronic Ballasts: Provide multi-volt (120-277V), programmed start, high power factor type (above 95%), operating lamps at a frequency of 42 kHz or higher with a ballast factor between 0.81 and 1.0. Ballast shall have a minimum start temperature of 0°F, a maximum ionization current (glow current) of 10mA during the preheating interval and shall have a minimum Rh/Rc ratio (resistance measured hot vs. room temperature) >4.00 to ensure proper lamp starting. Manufacturer/Model: Advance "Optanium", Universal "Accustart", or Osram/Sylvania "Quicktronic Professional" or approved equal.

C. Instant Start T8 Electronic Ballasts: Provide multi-volt, high power factor (above 95%) instant start type ballast for use on fixtures not anticipated to be dimmed or utilize occupancy sensors. Ballasts (1-4 lamp) shall operate as a parallel circuit, allowing remaining lamp(s) to maintain full light output if one or more lamps fail. Ballasts shall operate lamps at a frequency of 42 kHz or higher with a ballast factor between 0.81 and 1.0. Manufacturer/Model: Advance "Optanium", Universal "Accustart", Osram/Sylvania "Quicktronic Professional" or approved equal.

2.07 POWER SUPPLY – LED

A. Provide UL listed power supply as recommended by the LED fixture manufacturer for operation of the specified LED lamps. Power supply shall be integral to the luminaire unless otherwise noted on the Plans. Power supply shall operate at the supply voltage indicated on the Plans and shall be listed for starting and operating the lamps at -40F where installed outdoors.

2.08 FLUORESCENT LUMINAIRE DISCONNECT

A. UL listed, 4A, 600V, luminaire disconnect with tin-plated brass contacts, finger-safe polycarbonate female housing, 105º C temperature rating, and two or three-pole configuration to match load served. Ideal "PowerPlug" series or approved equal.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install lamps in luminaires and lampholders.

B. Unless otherwise noted on Plans, provide ballast integral to luminaires, pre-wired and installed at the factory, suitable for use with the selected lamp.

C. Where remote ballasts are required on Plans, locate ballast to allow free air movement in accordance with manufacturer's installation instructions. Unless otherwise noted on Plans, install ballasts on ¾" plywood backboard securely mounted to structure with minimum 4 anchors. Locate backboard in mechanical, electrical, or utility room that provides adequate sound dampening and install backboard in room to provide adequate working clearance in front of equipment.

D. Step-Dimming Ballasts: All fluorescent lamps used with step-dimming ballasts shall be burned-in for a minimum of 12 hours at 100% output prior to dimming.

E. Support surface-mounted luminaires directly from building structure.

F. Install recessed luminaires to permit removal from below. Use plaster frames in hard ceilings.

G. Support luminaries in suspended ceilings from structure above using a minimum of (4) anchors in accordance with Section 26 0529.

H. Rigidly align continuous rows of lighting fixtures for true in-line appearance.

I. Provide luminaire disconnecting means in ballast channel of each fluorescent fixture in accordance with NEC requirements. Where the luminaire is fed from a multi-wire branch circuit, provide multi-pole disconnect to simultaneously break all supply conductors to the ballast, including the grounded conductor.

J. Mechanical Rooms: Lighting fixture locations shown on Plans in mechanical and electrical equipment rooms are approximate. Coordinate mounting height and location of lighting fixtures to clear mechanical, electrical and plumbing equipment and to adequately illuminate meters, gauges and equipment. Support all lighting fixtures independently of duct work or piping.

K. LED Power Supplies: Install power supplies to be readily accessible. Where power supplies are installed in plenum areas, provide plenum rated listing.

3.02 RELAMPING

A. Re-lamp luminaires at completion of Work.

3.03 ADJUSTING AND CLEANING

A. Align luminaires and clean lenses and diffusers at completion of Work. Clean paint splatters, dirt, and debris from installed luminaires.

B. Touch up luminaire finish at completion of work.

END OF SECTION

SECTION 26 5200
EMERGENCY LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Emergency lighting units.

B. Emergency exit signs.

C. Emergency ballast power supplies.

1.02 RELATED SECTIONS

A. The Work under this section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions, and sections under Division 01 General Requirements, and Section 26 0500 – Common Work Results for Electrical.

B. Section 26 0519 – Conductor and Cables

C. Section 26 0533 - Raceway and Boxes for Electrical Systems

D. Section 26 0553 – Identification for Electrical Systems.

E. Section 26 5000 – Interior Lighting.

1.03 REFERENCE STANDARDS

A. Division 01 – submittal procedures.

B. NFPA 101 - Code for Safety to Life from Fire in Buildings and Structures.

C. NECA/IESNA 500 – Recommended Practice for Installation Indoor Commercial Lighting System.

D. UL 924 - Emergency Lighting and Power Equipment.

1.04 REGULATORY REQUIREMENTS

A. Conform to State and local building code and NFPA 101 for installation requirements.

B. Furnish emergency lighting units and exit signs that are UL 924 listed and labeled for their indicated use and location on this project.

1.05 WARRANTY

A. Emergency Lighting Units: Submit a warranty, mutually executed by the manufacturer and the installer, agreeing to replace emergency lighting units that fail in materials or workmanship within five years, beginning on the date of manufacturer.

B. LED Exit Signs: Submit a warranty, mutually executed by the manufacturer and the installed, agreeing to replace LED exit signs that fail in materials or workmanship within five years, beginning on the date of substantial completion.

C. Emergency Ballasts: Three year warranty minimum.

1.06 SUBMITTALS

A. Product Data: Submit product data under describing emergency lighting including data substantiating that materials comply with specified requirements. Arrange data for luminaires in the order of fixture designation.

B. Provide product data on emergency lighting units, exit signs, emergency ballasts, emergency lighting inverters and emergency fluorescent lamp power supply units.

C. Performance Curves/Data: Submit certified photometric data for emergency lighting units.

1.07 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Manuals: Submit maintenance instructions for inclusion in the operating and maintenance manuals.

PART 2 PRODUCTS

2.01 EMERGENCY LIGHTING UNITS

A. Provide emergency lighting units as scheduled on the Plans or approved equal.

2.02 EXIT SIGNS

A. Provide exit signs as scheduled on the Plans or approved equal.

2.03 ACCEPTABLE MANUFACTURERS –EMERGENCY BALLASTS

A. Bodine.

B. Iota.

C. Lithonia.

D. Substitutions: Under provisions of Section 01 2513.

2.04 EMERGENCY BALLAST

A. Standard T8 Unit: UL listed self-contained, with automatic transfer to battery supply on power failure, including test switch, AC ON pilot light, fully-automatic two-rate charger, End-Of-Life (EOL) detection, maintenance free nickel cadmium battery, and Class P, 120/277V power supply capable of operating a F34T12 or an F32T8 lamp with a minimum output of 1100 lumens for a minimum of 90 minutes. Bodine #B50 or approved equal.

B. LED Unit: UL listed self-contained emergency LED driver with automatic transfer to battery supply on power failure, optional test switch, AC ON pilot light, fully-automatic two-rate charger, ni-cad battery, and power supply capable of operating an LED load of up to the rated fixture wattage (as shown on the Plans) at rated current (700mA) for a minimum of 90 minutes. Bodine #BSL series or approved equal.

C. Test Switches:
   1. Standard and Low-Profile Units:
      a. Recessed Linear Fluorescent Fixtures (T8): Mount test switch in ballast channel so that it is accessible from below. In parabolic fixtures, mount test switch so that it is visible and accessible through the louvers. Affix red ballast identification label (supplied with ballast) to door trim on fixture to denote location of emergency ballast.
      b. Pendant Fixtures: Mount test switch in end cap of fixture, at end closest to ballast. Affix red ballast identification label (supplied with ballast) to bottom of fixture housing below test switch to denote location of emergency ballast.
   2. High Output Unit: Self-testing, as specified above.
   3. Recessed Downlights: Mount test switch in ceiling, in recessed single-gang box adjacent to downlight.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install units plumb and level.

B. Aim directional lampheads to illuminate the path of egress.

C. Install fluorescent emergency ballast {or single fixture emergency transfer device} in the ballast channel of the fixtures or the mounting tray of compact fluorescent fixtures indicated on the drawings. Provide an unswitched source of power to the emergency ballast from the same circuit that powers the fixture the ballast is installed in.

3.02 FIELD QUALITY CONTROL

A. Tests: Perform tests listed below according to manufacturer's written instructions. Test unit functions, operations, and protective features. Adjust to ensure operation complies with Specifications. Perform tests required by NFPA 70, Articles 700 and 701. Perform tests on completion of unit installation and after building circuits have been energized. Provide instruments to permit accurate observation of tests. Include the following tests:
   1. Simulate power outage: Verify proper operation of each individual emergency power supply.

2. Verify emergency supply duration.
3. Verify operation of remote test switches
4. Provide reports for load test conducted on individual batteries.

B. Retest: Correct deficiencies identified by tests and observations and retest until specified requirements are met.

3.03 ADJUSTING

A. Aim lamp on wall-mounted emergency lighting units to obtain the following illumination of egress pathway:
1. An average of 1 foot-candle.
2. A minimum at any point of 0.1 foot-candle measured along the path of egress at floor level.
3. Maximum-to-minimum illumination uniformity ratio of 40 to 1 shall not be exceeded.

B. Test emergency lighting equipment in accordance with the manufacturer's instructions and NECA/IESNA 500.

3.04 CLEANING

A. On completion of installation, inspect unit components. Remove paint splatters and other spots, dirt, and debris. Touch up scratches and abrasions in finish to match original finish. Clean unit internally using methods and materials recommended by manufacturer.

3.05 DEMONSTRATION

A. Walk owner's representative through the emergency lighting system. Note how to maintain, test and troubleshoot all units. Provide maintenance schedule for NFPA required testing and note locations of remote test switches, and which units have self-diagnostic features.

END OF SECTION

SECTION 27 1000
TELECOMMUNICATIONS RACEWAY AND WIRING SYSTEM

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Requirements for the design and installation of a telecommunications cabling system including communications cable, equipment racks, patch panels, telecommunications jacks, raceways, etc. as required for a complete and functional telecommunications cabling system.

1.02 RELATED SECTIONS

A. Section 26 0536 – Cable Trays.

B. Section 26 0533 – Raceway and Boxes for Electrical Systems.

C. Section 26 0529 – Hangers and Supports for Electrical Systems.

D. Section 26 0553 –Identification for Electrical Systems.

1.03 PROJECT RECORD DOCUMENTS

A. Division 01 – submittal procedures.

B. Submit documents under the provisions of Division 01.

C. Accurately record location of jacks, pull boxes and equipment racks, routing of all telecommunications raceways and cables, numbering scheme and identification number of all cables and jacks.

D. Provide AutoCAD drawings of the facility on contract size sheets and on CD showing the following:
   1. On a separate layer show each telecommunication jack location and indicate each jack and cable number by the jack location.
   2. Show all cable counts at all cable junction boxes, sleeves, and J-hook intersections.
   3. On a separate layer show the cable path from the telecommunications equipment room to the end jack location.

E. Submit test results for all cables prior to Substantial Completion.

1.04 WARRANTY

A. A minimum fifteen (15) year manufacturer channel warranty shall be provided. This warranty shall guarantee that the installed system:
   1. Will be free from defects in materials, workmanship and installation labor provided or carried out by the Certified Installer.
   2. Will exceed applicable TIA/EIA and ISO/IEC specifications in force at the time of installation and will comply with design and performance requirements for recognized cabling media installed in the system.
   3. Will support, at a minimum, 1000BaseT, 100Base-TX, 155 Mbps ATM, or any other current or future application that is designed for transmission over a cabling system as defined by the above referenced standards and manufacturers data sheet in effect at the time of the installation.

B. Proof of pre-project warranty registration with manufacturer shall be provided. The Contractor shall also provide proof of manufacturer's acceptance of warranty after completion of project.

1.05 LISTINGS AND STANDARDS

A. Furnish products listed and classified by Underwriters Laboratories, Inc. and suitable for purpose specified and indicated.

B. Where a UL Standard is in effect equipment shall meet that standard and shall bear the UL label.

1.06 REFERENCE CODES AND STANDARDS

A. The publications listed below form a part of the specification to the extent referenced. The publications are referred to in the text by basic designation only, latest edition. The reference codes and standards are minimum requirements:

1. ANSI/NFPA 70 — 2008 National Electrical Code
2. BICSI — Telecommunications Distributions Methods Manual
3. TIA/EIA 568-B.1 — Commercial Building Telecommunications Cable Standard, Part 1: General Cabling System Requirements
4. TIA/EIA 568-B.2 — Commercial Building Telecommunications Cable Standard, Part 2: Balanced Twisted-Pair Cabling Components
5. TIA/EIA-568-B.3 — Optical Fiber Cabling Components Standard
6. TIA/EIA 455-61 — Measurement of Fiber or Cable Attenuation Using an OTDR
7. TIA/EIA 569-A — Commercial Building Standard for Telecommunications Pathways and Spaces
8. TIA/EIA 606-A — Administration Standards for the Telecommunications Infrastructure of Commercial Buildings
9. TIA/EIA 607-A — Commercial Building Grounding and Bonding Requirements for Telecommunications

1.07 QUALITY ASSURANCE

A. Install telephone service entrance in accordance with Telephone Utility Company's Rules and regulations.

B. Install all work in accordance with the above reference standards and codes. The Owner reserves the right to reject all or a portion of the work performed either on technical or aesthetic grounds.

C. All telecommunications cabling system layout and installation shall be overseen by a BICSI-certified Registered Communications Distribution Designer (RCDD). The installer shall either have an RCDD on permanent staff or shall have an RCDD on contract for the duration of the project. The RCDD shall sign and attest to all cable distribution design submittals and project record drawings and shall attest to the completeness and accuracy of the system layout and installation.

D. All workmen employed for installation of equipment and cabling specified under this section shall be specifically trained and certified in the installation of the specified Category 5e UTP and fiber optic cabling systems, and shall have at least three years experience installing, terminating, and testing Category 5e UTP and fiber optic cable on this size and complexity of project.

E. The intended function of the telecommunications cable system is to transmit voice and data signals from a central location to individual telecommunications outlet locations. Upon completion of the work, the UTP cable system shall be capable of transmitting a data signal that meets and exceeds the requirements of Category 5e and supports data rates up to and including 1000BaseT, 1000Base-TX, and 155 Mbps ATM. The multimode fiber optic cable system shall be capable of transmitting signals with a minimum bandwidth of 160MHz at 850 nm and 500 Mhz at 1300 nm. The loss of each strand of fiber shall not exceed 3.0/1.0 dB per kilometer at 850/1300 nm and the loss of each connector shall not exceed .2 dB.

1.08 SUBMITTALS

A. Submit product data under provisions of Division 1. Provide factory test results for cables and connectors. Provide product data for the following products:

1. Telecommunications rack and associated rack hardware
2. UTP and Fiber Telecommunications Cable
3. UTP Telecommunications Jacks and Faceplates
4. Fiber Connectors
5. UTP Modular Patch Panel
6. Fiber Connector Housings and Panels

7. UTP and Fiber Patch Cables
8. Cable Management Panels
9. UTP and Fiber Telecommunications Cable Tester
10. UTP and Fiber Sample Test Report (with all required testing parameters shown).

B. Submit certification for RCDD.

C. Submit qualifications and certifications to install the specified cabling system, including proof of pre-project warranty registration.

D. Submit scaled drawings showing the locations of all telecommunications jacks, equipment racks, telecommunications pullboxes, raceway and cable routing, and all penetrations of fire-rated walls and ceilings. Drawings shall show jack labels and cable counts. Submit elevations of each equipment rack. Provide a complete schedule of all telecommunications jacks with their jack numbers and associated cable number. Shop drawings shall be approved prior to installation of any portion of the telecommunications system. Electronic AutoCAD® drawings of the facility are available upon request for preparation of the shop drawings.

1.09 LABELING SYSTEM

A. Labeling shall conform to ANSI/TIA/EIA-606 standards. In addition, provide the following:
1. Labels on all outlets shall have minimum 3/16-in. high characters and shall be installed behind recessed clear plastic covers on faceplate.
2. Provide labels on face of data patch panels and on inside cover of fiber connector housings. Provide facility assignment records in a protective cover at the telecommunications rack.
3. Labels shall be machine-printed. Hand-lettered labels are not acceptable.
4. Label outlets with room number in which outlet is located (xxx), followed by a single number to indicate the particular outlet within the room (Jx). Example: 161-J2.
5. Label patch panels with room number in which outlet is located (xxx), followed by a single number to indicate the particular outlet within the room (Jx), followed by a single number to indicate the particular connector in the outlet. Example: 161-J2-3.
6. Label telecommunications racks with telecom room designation (TRx), followed by the rack designation in the closet (Rx). For example, in Telecommunications Room 1, racks 1 and 2 would be labeled: TR1-R1 and TR1-R2.
7. Label fiber connector housings with rack designation at both ends of the backbone cable. Example: TR1-R1 – TR6-R2.
8. Provide computer-generated Project Record Drawing drawings showing outlet locations, type, and designation. Turn these drawings over to the Owner's Representative two (2) weeks prior to substantial completion, to allow the Owner's Personnel to connect and test Owner-provided equipment in a timely fashion.
9. Provide telecommunications outlet list, one-line diagram and as-built building floor plan of outlets associated with the specific telecom closet where the outlets are terminated. In each telecom closet, mount list and plans on backer board with minimum 1/8 inch clear Plexiglas cover screwed to wall on four corners. Provide list and plans electronically in AutoCAD format, submitted with the O&M manuals.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Throughout this specification, specific manufacturers and manufacturer's catalog numbers are cited. These citations are for the purpose of establishing quality and performance criteria and are not intended to be proprietary. All products in the structured cabling system shall be provided from one of the three approved systems listed in each section, or an alternate system shall be substituted under the provisions of Division 01. All decisions regarding approval of non-specified manufacturers and products will be at the discretion of the Owner.

B. Structured Category 5e cabling systems shall include, but not be limited to, UTP and fiber telecommunications cable, UTP jacks, faceplates, modular patch panels, fiber connector panels, and UTP and fiber patch cables.

2.02 TELECOMMUNICATIONS BACKBOARD

A. Material: ACX Plywood.

B. Size: As indicated, ¾" thick.

C. Wall-mounted, solid copper, 12 inch by 4 inch by ¼ inch thick busbar with two insulators and standoff brackets. Chatsworth #40153-012 or approved equal.

D. Cable Support: Provide cable management rings and cable support straps for all cables routed on backboard.

E. Wall-mounted equipment rack, as specified below.

2.03 TELEPHONE PUNCHDOWN BLOCKS

A. Wall-mounted type 66 block for cross-connect with incoming telephone utility cable: 50-pair capacity with cable management.
   1. Siemon S66B3-50 with S20A cable management

B. Wall-mounted type 110 wiring block with 100-pair capacity and standoff legs for cross-connect of intra-building telephone backbone cables. Use 5-pair connecting blocks.
   1. CommScope Systimax #110AW2-100
   2. Ortronics #OR-30200145
   3. Leviton #41AW2-100

2.04 TELECOMMUNICATIONS CABINETS

A. Free-standing Single User Cabinets: Chatsworth M-Series MegaFrame® Cabinet System or approved equal:
   1. Provide freestanding equipment cabinets to store computer, data storage and networking equipment in the data centers, computer rooms and equipment rooms. Each cabinet enclosure shall have a rectangular frame with removable top panel, side panels and doors. Installed cabinets shall include thermal, power, and cable management accessories that control airflow through the cabinet and keep network and power cables separate and organized.
   2. The cabinet frame shall be rectangular with four corner posts, manufactured from aluminum with bolted frame construction. The sides of the frame shall have three supports located near the top, middle and bottom to allow attachment of equipment mounting rails and thermal, cable and power management accessories.
   3. Each cabinet shall include two pairs of equipment mounting rails. Mounting rails shall bolt to the supports located near the top, middle and bottom of the frame and shall be fully adjustable in depth to provide front and rear support for equipment. Equipment Mounting Rails shall be spaced horizontally to support 19" (482.6 mm) wide EIA-310-D compliant rack-mount equipment and shall provide up to 39" (990 mm) of rail-to-rail depth for equipment. Mounting rails will be L-shaped. The front flange shall be square-punched according to the EIA-310-D Universal hole pattern with equipment mounting holes on alternating 5/8" – 5/8" – 1/2" (15.9 mm – 15.9 mm – 12.7 mm) vertical hole centers. Square-punched holes shall accept cage nut hardware with various threads. Rack mount spaces or units (RMU) shall be 1-3/4" (44.45 mm) high and shall be marked and numbered on the mounting rails. Numbering shall start at the bottom of the rail. Mounting rails shall provide 42 RMU for equipment.
   4. The cabinet shall include a solid top panel with a vented section for a top-mount fan near the front and rear of the panel and edge-protected cable access ports along the right and left sides of the panel.
   5. The cabinet shall include two locking solid side panels with keyed latches for easy installation and removal.
   6. The cabinet shall include a single front door with a perforated metal panel and quick-release hinge pins. The door shall be removable and reversible to open from the right or left. The front door shall have a single-point, spring-loaded, push-button latch with a keyed lock.

7. The cabinet shall include a single rear door with a perforated metal panel and quick-release hinge pins. The door shall be removable and reversible to open from the right or left. The rear door shall have a single-point, spring-loaded, push-button latch with a keyed lock.
8. The cabinet frame, top panel, side panels and doors shall be manufactured from aluminum. Door panels shall be aluminum or plexiglass. The door latch, door hinges and top panel cable access ports will be plastic. The cabinet frame, doors and components shall assemble with hardware.
9. The cabinet shall be UL Listed as a Communications Circuit Accessory to standard UL 1863 under category DUXR. UL Listing will be stated in the manufacturer's product literature.
10. The cabinet frame and door frames shall be anodized aluminum. The top panel, side panels, mounting rails and door panels shall be painted black with epoxy-polyester hybrid powder coat paint. Plastic components shall be black. The plexiglass door panel shall be tinted (not clear).
11. The cabinet shall include (4) leveling feet, (4) clamps for securing the leveling feet to the floor, a baying kit, and a means for bonding the cabinet to the Telecommunications Grounding Busbar. The manufacturer of the cabinet shall sell compatible casters and equipment mounting hardware as an accessory.
12. Each installed cabinet shall be equipped with a vertical cable manager to store network cables. The vertical cable manager shall attach to the side of the cabinet frame in the space between the frame and the side panel and shall be adjustable in depth to match equipment requirements. The vertical cable manager shall have individual C-shaped plastic cable rings. The rings shall be able to align with the side or the front/rear of the cabinet.
13. Each installed cabinet shall be equipped with two horizontal U-shaped cable trays that will connect the vertical cable managers at the front and rear of the cabinet. The trays shall be located along the side of the cabinet frame in between the front and rear vertical cable managers positioned near the top and middle of the cable managers. The trays shall be designed to adjust in depth to match the depths of the front and rear vertical cable managers.
14. Each installed cabinet shall be equipped with a rack-mount shelf with brush-sealed cable pass-through ports along the front surface to create a front-to-back pathway for cables. The shelf shall be 19" EIA rack-mount and 1 RMU high. The shelf shall attach to the front and rear pair of equipment mounting rails. The shelf shall adjust in depth to attach to mounting rails located between 22" (558 mm) and 40" (1016 mm) apart. The brush-sealed cable pass-through ports shall be sized to hold 48 patch cords.
15. Each installed cabinet shall be equipped with a rack-mount horizontal cable manager to organize cables in the RMU above and below each patch panel or network switch within the cabinet. The horizontal cable manager shall be 19" EIA rack-mount and 1 RMU high. The horizontal cable manager shall be a single-sided U-shaped trough with a front-facing snap on cover or a double-sided H-shaped trough with front and rear snap on covers. Plastic T-shaped cable guides along the top and bottom edge of the cable manager shall divide cable openings that allow cables to exit or enter the top or bottom of the manager. The cable manager shall be at least 4" (100 mm) deep and shall be sized to hold 24 patch cords per RMU.

B. Free-standing Co-Locate Equipment Cabinets Chatsworth E-Series ISP Co-Location Cabinet:
1. Provide freestanding equipment cabinets with separate secure compartments to store computer, data storage and networking equipment in the data centers, computer rooms and equipment rooms. Each cabinet enclosure shall have a rectangular frame with removable top panel, side panels and doors. Installed cabinets shall include thermal, power, and cable management accessories that control airflow through the cabinet and keep network and power cables separate and organized.
2. The cabinet frame shall be rectangular with four corner posts, manufactured from aluminum with bolted frame construction. The frame shall be divided into two separate

compartments. Within each compartment, the sides of the frame shall have two supports located near the top and bottom of the compartment to allow attachment of equipment mounting rails and thermal, cable and power management accessories.

3. Each compartment in the cabinet shall include two pairs of equipment mounting rails. Mounting rails shall bolt to the supports located near the top and bottom of the compartment and shall be fully adjustable in depth to provide front and rear support for equipment. Equipment Mounting Rails shall be spaced horizontally to support 19” (482.6 mm) wide EIA-310-D compliant rack-mount equipment and shall provide up to 36” (910 mm) of rail-to-rail depth for equipment. Mounting rails will be L-shaped. The front flange shall be square-punched according to the EIA-310-D Universal hole pattern with equipment mounting holes on alternating 5/8” – 5/8” – 1/2“ (15.9 mm – 15.9 mm – 12.7 mm) vertical hole centers. Square-punched holes shall accept cage nut hardware with various threads. Rack mount spaces or units (RMU) shall be 1-3/4” (44.45 mm) high and shall be marked and numbered on the mounting rails. Numbering shall start at the bottom of the rail. Mounting rails shall provide 21 RMU per compartment for equipment.
4. The cabinet shall include a solid top panel with two cable openings located near the rear corners of the cabinet.
5. The cabinet shall include two locking solid side panels with keyed latches for easy installation and removal.
6. Each compartment in the cabinet shall include a single front door with a perforated metal panel and quick-release hinge pins. The doors shall be removable and reversible to open from the right or left. Each front door shall have a single-point, spring-loaded, push-button latch with a keyed lock.
7. The cabinet shall include a pair of three-channel raceways for vertical cable management. The raceways shall align with the openings in the top panel and shall provide secure cable routing into each of the three compartments in the cabinet.
8. The cabinet shall include a power strip inside each compartment to distribute power to equipment in that compartment. The power strip will be rated for 125 VAC and 15 Amp and will have an IEC C20 inlet and a detachable 8’2”L (2.4 m) power cord with a NEMA 5-15P plug and eight NEMA 5-15R outlets.
9. The cabinet frame, top panel, side panels and doors shall be manufactured from aluminum. Door panels shall be aluminum or plexiglass. The door latch, door hinges and top panel cable access ports will be plastic. The cabinet frame, doors and components shall assemble with hardware.
10. The cabinet frame and door frames shall be anodized aluminum. The top panel, side panels, mounting rails and door panels shall be painted black with epoxy-polyester hybrid powder coat paint. Plastic components shall be black. The plexiglass door panel will be tinted (not clear).
11. The cabinet shall include (4) leveling feet, (4) clamps for securing the leveling feet to the floor, a baying kit, and a means for bonding the cabinet to the Telecommunications Grounding Busbar. The manufacturer of the cabinet shall sell compatible casters and equipment mounting hardware as an accessory.
12. Each Co-locate cabinet shall be provided with cable management and accessories similar to items 12 through 15 in subparagraph A above.

2.05 UTP TELECOMMUNICATIONS CABLE

A. Unless otherwise noted on the drawings provide and install plenum-rated CL2P riser-rated CL2, as required by the space the cable is passing through, Category 5e, 4 pair, 24 AWG, solid copper conductor telecommunications cable from each telecommunications jack to the corresponding patch panel.
   1. CommScope Systimax #2061 [1061]
   2. Berk-Tek “LANmark 350” CMP [CMR]
   3. Superior Essex “Cobra” #52-241 [52-240]

2.06 UTP TELECOMMUNICATIONS JACKS

A. All UTP telecommunications jacks shall be type RJ-45, Category 5e, T568A/B, 8P8C, single, white finish, telecommunications jack with 45° exit for wall outlets and flush exit for outlets in horizontal dual-channel surface raceway. Unless otherwise noted on the drawings, install each telecommunications jack in a single gang faceplate at each telecommunications outlet. The quantity of faceplate openings shall match the quantity of jacks at each location. The Contractor shall verify the actual wiring configuration (T568A or 568B) with the Owner prior to submittal.

B. UTP Jacks:
   1. CommScope Systimax #MPS100E-246 for T568A/B wiring
   2. Ortronics “TracJack Clarity 5e” #OR-TJ5E00 for T568A/B wiring
   3. Leviton “GigaMax 5e+” #5G110-RW5 for T568A/B wiring

2.07 TELECOMMUNICATIONS OUTLET FACEPLATES

A. Unless otherwise noted, all faceplates shall be single-gang plastic faceplates with white finish. The number of openings in each faceplate shall match the jack count of each outlet shown on the Drawings. (x in part numbers = designation for number of openings in faceplate).

B. Faceplates For Wall Outlets:
   1. CommScope Systimax #M1xL-246
   2. Ortronics “TracJack” #OR-4030054x
   3. Leviton #41080-xWP

C. Faceplates For Horizontal Dual-Channel Surface Raceway:
   1. CommScope Systimax: Same as for wall outlets.
   2. Ortronics: Same as for wall outlets.
   3. Leviton: Same for wall outlets.

2.08 FACEPLATE ICONS

A. Color coded icons shall be provided to distinguish between designated telephone and data outlets in all faceplates as follows:

B. Designated telephone outlets in workstation faceplates: Red “telephone” icon.
   1. CommScope Systimax #L2300-RD
   2. Ortronics #OR40322100
   3. Leviton: No icon available. Use red telecom jack.

C. Designated telephone outlets in workstation faceplates: Blue “data” icon.
   1. CommScope Systimax #L2300-BL
   2. Ortronics #OR40326200
   3. Leviton: No icon available. Use blue telecom jack.

2.09 UTP MODULAR PATCH PANEL

A. Provide and install high-density 48 port, Category 5e, modular patch panels in each equipment rack. The front of the patch panels shall be equipped with RJ-45, T568A/B, 8P8C Category 5e compliant jacks (and integral wire management rings for CommScope patch panels). The jacks shall be factory wired to a 110 type IDC connector. The complete assembly shall exceed the requirements of TIA/EIA 568-B (Category 5e), and be factory tested to 1000 Mbps data rates. Install the number of patch panels in each equipment rack as shown on the drawings or as required to terminate all UTP cables at the rack plus 25% spare capacity. The Contractor shall verify the actual wiring configuration (T568A or 568B) with the Owner prior to submittal.
   1. CommScope Systimax “Patchmax” #PM2150PSE-48 for T568A/B wiring.
   2. Ortronics “Clarity5e” #OR-PHD5E6U48 for T568A/B wiring.
   3. Leviton “GigaMax” #5G596-U48 for T568A/B wiring.

2.10 UTP CABLE MANAGEMENT PANELS

A. Horizontal cable management panels shall have five metal horizontal cable rings. For the Berk-Tek/Ortronics and Leviton structured cabling systems, install cable management panels in the equipment rack. Unless otherwise noted on the drawings, install one cable management panel between each patch panel and below the last patch panel.
   1. CommScope Systimax - Integral to patch panel.
   2. Ortronics #OR-60400057
   3. Leviton #4925C-BCM

B. Vertical cable management panels shall have four horizontal cable rings and four vertical cable rings. Panels shall be installed in wall-mounted telecommunications racks, as shown on the Drawings.
   1. CommScope Systimax #1100D1-35-19
   2. Ortronics #OR-808004410
   3. Leviton: Not available. Use one of the products above.

2.11 UTP PATCH CABLES

A. All patch cables shall be factory manufactured to match the applicable cable/connectivity solution (i.e. the Berk-Tek/Ortronics system shall use Ortronics manufactured patch cords, etc.).

B. Telephone Cross-Connect: Provide 7-foot Category 5e patch cables with white or ivory jacket for cross-connect between the telephone patch panel and the telecommunications patch panels. Provide one patch cable for each port in all the telephone patch panels.
   1. CommScope Systimax #CPC6642-05F007
   2. Ortronics #OR-MC5E07-09
   3. Leviton #5D460-07W

C. Network Equipment Connections: Provide Category 5e patch cables with blue jacket for installation between network equipment in the rack and dedicated data ports in the telecommunications patch panels. Provide one patch cable for each port in all the telecommunications patch panels. Where the patch panels and switches are in the same rack, provide 7' cables. Where the patch panels and switches are in different racks, provide 15' (14' for CommScope) cables. (xx in part numbers = cable length)
   1. CommScope Systimax #CPC6642-02F0xx
   2. Ortronics #OR-MC5Exx-06
   3. Leviton #5D460-xxB

D. VoIP Connections: Provide 7-foot Category 5e patch cables with yellow jacket for cross-connect between the VoIP switch ports and the telecommunications patch panels. Provide ___ patch cables for each 48-port patch panel installed.
   1. CommScope Systimax #CPC6642-09F007
   2. Ortronics #OR-MC5E07-04
   3. Leviton #5D460-07Y

E. Wireless Access Point Connections: Provide [plenum-rated] 7-foot Category 5e patch cables with white or ivory jacket for connection to wireless access points. Provide one patch cable for each access point location shown on the Drawings.
   1. CommScope Systimax #CPC6642-05F007
   2. Ortronics #OR-MC5E07-09
   3. Leviton #5D460-07W

F. Computer Connections: Provide 10-foot (9-foot for Ortronics) long Category 5e patch cable with white or ivory jacket for installation between the data jacks in each telecommunications outlet and the Owner-provided computers. Provide one patch cable for each data jack in all the telecommunications outlets, plus 25% additional cables for future expansion or replacement cables.
   1. CommScope Systimax #CPC6642-05F010

2. Ortronics #OR-MC5E09-09
3. Leviton #5D460-10W

2.12 VOICE BACKBONE CABLE

A. Unless otherwise noted on the drawings provide and install plenum-rated CL2P riser-rated CL2, as required by the space the cable is passing through, Category 3, 24 AWG, solid copper conductor multi-pair telephone backbone cable. (xx in part numbers = pair count, as shown on Drawings)
   1. CommScope Systimax #10100xxAGY
   2. Berk-Tek #230xxx
   3. Superior Essex #18-xxx-46

2.13 FIBER OPTIC BACKBONE CABLE

A. All multimode fiber optic cables that stay within the building envelope shall be UL listed, plenum-rated, tight buffered, 62.5/125 micron, multimode, FDDI indoor fiber optic cable meeting National Electrical Code plenum (OFNP) standards. Cables shall have a flame-resistant PVC outer jacket and operate in a range from -20°C to 70°C. (xx in part numbers = fiber count, as shown on Drawings)
   1. CommScope Systimax “OptiSPEED” #ABC-0xxD-LPX
   2. Berk-Tek #PDP0xx-CB3510/25
   3. Superior Essex #440xxx6G01

B. All multimode fiber optic cables that stay within the building envelope and are installed in conduits shall be UL listed, riser-rated, tight buffered, 62.5/125 micron, multimode, FDDI indoor fiber optic cable meeting National Electrical Code riser (OFNR) standards. Cables shall have a flame-resistant PVC outer jacket and operate in a range from -20°C to 70°C. (xx in part numbers = fiber count, as shown on Drawings)
   1. CommScope Systimax “OptiSPEED” #ABC-0xxD-LRX
   2. Berk-Tek #PDR0xx-GB3510/25
   3. Superior Essex #430xxx6G01

C. All multimode fiber optic backbone cables that exit the building envelope shall be UL listed, plenum-rated, loose tube, 62.5/125 micron, multimode, FDDI, indoor/outdoor, fiber optic cable meeting National Electrical Code plenum (OFNP) standards. The cable shall utilize dry water-blocking technology, have a UV-stabilized, flame-resistant PVC outer jacket, and operate in a range from -40°C to 70°C. (xx in part numbers = fiber count, as shown on Drawings)
   1. CommScope Systimax “Option1” #AT-RU912O6-0xx
   2. Berk-Tek “Adventum” #LTP0xx-CB3510/25
   3. Corning Cable Systems “FREEDM/LST” #0xx-KSF-14130A20

2.14 FIBER CONNECTORS

A. All fibers shall be terminated with SC [ST] [MTRJ] type connectors with ceramic ferrule. The termination method shall be a mechanical crimp [an adhesive (3M Hotmelt, Avaya Anaerobic, Corning Cable Anaerobic)] system.
   1. CommScope Systimax #P6201A-Z-126
   2. Corning Cable Systems “Unicam” #95-000-40
   3. Leviton “FastCAM SC” #49991-MSC

2.15 FIBER CONNECTOR PANELS

A. All fiber connector panels shall have three duplex SC fiber adapters with ceramic sleeve and fiber designation strip.
   1. CommScope Systimax #12SC1-Duplex-EW
   2. Ortronics #OR-615SCDSM3C-L
   3. Leviton “Opt-X” #SF100-3SC

2.16 FIBER CONNECTOR HOUSINGS

A. Single-drawer housing with space for horizontally mounted connector panels to terminate up to 24 fibers. Housing shall have slide-out drawer with label sheet, smoked shatterproof

polycarbonate door with latch, and deep front shelf area to provide adequate strain relief for cables.

1. CommScope Systimax #600B2
2. Ortronics #OR-615MMC-36P-00
3. Leviton “Opt-X” #5R460-00N

2.17 FIBER STORAGE RING

A. Leviton #48900-IFR or approved equal 12-inch diameter inside plant fiber storage ring with Velcro retaining loops. Provide one storage ring in each closet, adjacent to the rack where the fiber cables are terminated.

2.18 FIBER PATCH CORDS

A. All multimode fiber optic patch cords shall be UL listed, 62.5/125 micron, multimode, 3-meter (10-foot) long, fiber cords with flame-resistant PVC outer jacket. Cables shall have duplex SC type connectors with ceramic ferrule. Patch cords shall be factory terminated and tested to 1000 Mbps data rates. Include copy of factory test report with submittal.

1. CommScope Systimax #FL2SC-SC-10
2. Ortronics #OR-61150D62003M99C
3. Leviton #62DSC-M03

2.19 CABLE SUPPORT

A. All cables not installed in conduit shall be supported using J-hooks, Caddy CableCat series or approved equal, with a minimum J-hook size equivalent to Caddy #Cat32 or approved equal. Size all J-hooks to support the quantity of cables installed, plus a minimum of 25% spare capacity. Fiber optic cables shall be routed in 1” innerduct that is supported on a separate J-hook above the J-hook supporting the copper cables.

B. Cables shall be bundled using Velcro “One-Wrap” or approved equal reusable straps with a minimum ¾ inch width. Plastic tie-wraps or cinch-straps are not allowed.

2.20 EXTRA MATERIALS

A. Furnish to the owner the following spares parts:

1. Five (5) percent of each type of UTP telecommunications jack.
2. Five (5) percent of each type of telecommunications faceplate.
3. Identification icons: Provide two spare bags (25 icons per bag) each of telephone and data icons.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work.

3.02 GENERAL INSTALLATION

A. Incoming outside plant telephone cable shall be terminated on punchdown blocks located on the telecommunications backboard. One or more multi-pair cables shall be routed from the cross-connect blocks to the telephone patch panel in the telecommunications rack. Patch cords shall be used between the telephone and telecommunications patch panels to connect a telephone line to a specific jack in the building.

B. Follow cable manufacturer’s specification regarding handling methods, retaining/support methods, bending radius and maximum pulling tension limitations. Where manufacturer does not provide bending radius information, minimum bending radius shall be 10 times the diameter of the cable. Use a tension-monitoring device to ensure that the maximum pulling tension that may be applied to the cable to be pulled into a conduit section is not exceeded. Provide replacement cable if cable manufacturer’s maximum pulling tension is exceeded at any time during a pull.

C. Cable shall be carefully inspected for sheath defects or other irregularities as it is paid out from the reel. When defects are detected, pulling shall stop immediately and the cable section shall be repaired or replaced at the discretion of the Contracting Agency. A system of

communications shall be maintained between pulling and feed locations so that pulling can be stopped instantly, when required.

D. Adequate care shall be exercised when handling and storing reels of cable to prevent damage to the cable. Cable with dents, flat spots, or other sheath distortions shall not be installed.

E. Install termination backboards plumb, and attach securely at each corner.

F. Store a maximum of one foot of slack UTP cable for each UTP jack at each telecommunications outlet.

G. In the telecommunications closet, ten feet of slack UTP cable shall be provided at the racks. Route the service loop around the cable runway above the racks. No cables shall encroach or interfere with rack equipment space. All cables shall be protected from physical damage and should not be routed on the floor. Coiling the slack cable adjacent to the rack is not acceptable. The intent of this installation method is to provide slack cable for future work without causing increased inductance by coiling the cables.

H. In the telecommunications closet, a twenty-foot service loop for each fiber cable shall be provided on the fiber storage ring adjacent to the rack. All incoming fiber cables shall be stored on this ring to maintain the minimum bending radius of the fiber cable.

I. All cabling shall be run continuous with no splices from each telecommunications jack to the cable connector at the patch panels. Telecommunications cables shall be terminated at each end on their respective jack. No cable run shall exceed 90 meters (295 feet) in length from the jack on the peripheral end to the patch panel.

J. All fiber optic cables shall be run continuous with no splices from rack to rack.

K. All cable shall be routed in such a way as to minimize EMI and RFI interference. Cables shall be routed to maintain the following minimum distances from noise producing devices:

5 inches from power lines of 2 kVA or less.

12 inches from fluorescent and HID ballasts

36 inches from 5 kVA or greater power lines

40 inches from transformers and motors

3.03 TERMINATIONS

A. The jacket of UTP cables shall be maintained to a point within one half inch of the telecommunications jack. The twists on the individual pairs shall be maintained as close as possible to the contacts of the termination points but shall in no case exceed 1/4 inch.

B. Pairs from each cable shall be terminated sequentially from left to right, top to bottom starting with the lowest assigned number at the upper left-hand corner of the panel.

C. Fibers shall be terminated sequentially from left to right in connector housing, based on standard color code sequence of individual fiber coatings.

3.04 PATHWAYS AND RACEWAYS

A. Unless otherwise noted, all cables shall be installed in conduit from the telecommunications jack to the space above the accessible ceiling, within 18” of the J-hook pathway. Portions of cables not installed in conduit shall be supported in accordance with TIA/EIA standards at intervals not exceeding four (4) feet in length using J-hooks. The cable shall not be supported from ducts, pipes, conduits, ceiling grid hangar wires, etc. At any point where the cable changes direction, slack shall be provided to prevent rubbing or binding on the corner supports. Extreme care shall be taken to ensure that the cable is not compressed, kinked or otherwise deformed during installation. Any cable that is stretched, compressed, kinked or otherwise deformed shall be replaced at no cost to the Owner.

B. Cables to be installed in raceway, cable tray, continuous cable support system or J-hooks (as specified above) for the entire length of each cable. Provide raceway through areas that will not be accessible for future cable replacement or additions.

C. Provide pathway capacity throughout entire system for each telecommunication outlet served, sized to accommodate a minimum of four 4-pair cables from each outlet location to the designated telecommunication room, as shown on the plans.

D. Telecommunication cables shall not be installed in the same raceway or pathway as power cables.

E. Provide dedicated optical fiber raceway pathway for all optical fiber cable.

F. Install polyethylene pulling string in each empty conduit containing a bend or over 10 feet in length.

G. Install all telecommunications outlets in outlet boxes under the provisions of Section 16130. Unless otherwise noted on the Drawings or in the Specifications, outlets shall be mounted at 18 inches above floor, 4 inches above counters or backsplash, with the jacks oriented in the standard “pins down” position..

H. Support raceways, cable tray, outlet boxes, junction boxes and equipment racks under the provisions of Section 16190.

3.05 LABELING

A. Label equipment racks as noted here-in and under the provisions of Section 16195.

B. Furnish and install labels and documentation to identify all cables, jacks, and connections in accordance with TIA/EIA standards, as shown on the Drawings, and under the provisions of Section 16195. As a minimum each jack in each faceplate shall have a unique identifier that matches the identifier at the patch panel. Identifiers shall be installed on the front of the telecommunications faceplate, on the cable behind the faceplate, and on the front of the patch panel at the associated jack.

3.06 GROUNDING

A. Provide and install as indicated on the Drawings, a #2 AWG, copper telecommunications bonding backbone (TBB) conductor from the grounding lug at the equipment rack to the ground bus in the main switchboard.

B. The TBB shall be routed along the telecom backbone pathway. In areas above accessible ceilings, the TBB conductor may be routed exposed. In inaccessible areas, the TBB conductor shall be routed in conduit and shall be bonded at both ends. All grounding and bonding shall be done in accordance with TIA/EIA standards.

3.07 CABLE ACCEPTANCE TESTING

A. Prior to any cable testing, use the rack-mounted LAN static discharge unit to remove static charges from all cables. Cable testers with built-in static discharge capability are also acceptable.

B. Each UTP cable shall be tested for compliance with TIA/EIA 568-B.1 and TIA/EIA 568B.2 Category 5e standards after installation using a Fluke #DTX or approved equal tester. At a minimum, the Contractor shall perform the following tests with the maximum frequency of the tester set at 350MHz:

1. Signal Attenuation / Insertion Loss
2. Near End Cross Talk (NEXT)
3. Power Sum Near End Cross Talk (PS-NEXT)
4. Equal Level Far End Cross Talk (ELFEXT)
5. Power Sum Equal Level Far End Cross Talk (PS-ELFEXT)
6. Attenuation to Crosstalk Ratio (ACR)
7. Power Sum Attenuation to Crosstalk Ratio – Near End (PSACR-N)
8. Power Sum Attenuation to Crosstalk Ratio – Far End (PSACR-F)
9. Propagation Delay
10. Delay Skew
11. Return Loss
12. Wiremap
13. Overall Cable Length

C. Test, analyze, and record compliance for the following network protocols:
   1. 10 Base-T
   2. 100 Base-T
   3. 1000 Base-T
   4. 155 Mbps ATM

D. The Contractor shall provide 100% testing for each “permanent link” (i.e. from the work area outlet to the patch panel). Provide test results for all tests noted above in the form of printouts from the test equipment and provide an electronic copy of the test data for each cable on CD. If proprietary software is used, the submitted CD shall include any necessary software required to view test results. If the results are delivered in a standard format such as Excel or Access, the viewing software need not be provided. At the front of the test report, the Contractor shall provide an index showing the pass/fail results of each cable, along with the cable length and a corresponding cable label.

E. Initially test each fiber optic cable with a light source and power meter, utilizing procedures as stated in TIA/EIA-526-14A: OFSTP-14A Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant and TIA/EIA-526-7 (currently Standard Proposal Number 2974-B). Measured results shall be plus/minus 1dB of submitted loss budget calculations. If loss figures are outside this range, test cable with an Optical Time Domain Reflectometer (OTDR) in accordance with TIA/EIA 455-61 to determine the cause of variation. Improper terminations shall be re-done and damaged cable shall be replaced at no additional cost to the Owner. The maximum acceptable signal loss through the entire fiber path, including cable, couplings, and jumpers shall not exceed TIA/EIA 568-B.3 standards. Test each multimode cable in both directions for signal attenuation at 850 and 1300 nm, using “Method B” – One jumper reference.

F. Where any portion of the system does not meet the Specifications, the Contractor shall correct the deviation and repeat any applicable testing at no additional cost to the Owner.

G. Provide three working days advance notice of tests. The Owner’s Representative shall reserve the right to be present during the testing of any or all cables in the system. Submit a copy of the test report for each cable prior to substantial completion of the project.

H. Acceptance of the telecommunications system shall be based on the results of the above tests, functionality, and the receipt of documentation.

I. Prior to Substantial Completion, submit the measured values for the telecommunications rack AC ground resistance and the voltage at the dedicated plug strip on the telecommunications rack.

3.08 SYSTEM CROSS-CONNECT

A. Provide all labor and materials as required to cross-connect between the installed telecommunications cabling system and the Owner’s telephone and computer systems. This shall include the following:
   1. Telephone System: Provide cross-connect between Owner’s telephone switch and the telephone punchdown blocks or patch panel. The intent is to connect the Owner’s telephone system to the installed telecommunications cabling system so that designated ports throughout the facility can be activated as telephone lines with dial tone capability. All telephone system programming required for this function shall be provided by the Owner under separate Contract. For bidding purposes, assume a 50-pair cross-connect but coordinate with the Owner for the exact requirements prior to installation.
   2. Network System: Provide cross-connect between Owner’s network switches and the installed fiber patch panels and horizontal patch panels. The intent is to assist the Owner in activating designated computer ports throughout the facility. All network programming required for this function shall be provided by the Owner under separate Contract. For bidding purposes, assume a total of 50 cross-connections between the network cabling system and the active equipment.

END OF SECTION

SECTION 28 3100

ADDRESSABLE FIRE ALARM AND SMOKE DETECTION SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Contractor designed and installed addressable fire alarm and smoke detection system. This is a performance type specification describing the minimum acceptable fire alarm system. The Contractor shall design and install the fire alarm and smoke detection system in accordance with the requirements of NFPA 72 and ICC/ANSI A117.1. The fire alarm devices on the drawings are shown in suggested locations. The final locations of all devices shall be solely determined by the Contractor and shall be in accordance with NFPA 72 and ICC/ANSI A117.1.

1.02 RELATED SECTIONS

A. Division 25 – Mechanical: Fire/Smoke dampers.

B. Section 26 0519 – Conductors and Cables.

C. Section 26 0533 – Raceway and Boxes for Electrical Systems.

D. Section 26 0553 – Identification for Electrical Systems.

1.03 REFERENCES

A. Division 01 – submittal procedures.

B. NFPA 72 - National Fire Alarm Code.

C. NFPA 101 - Life Safety Code.

D. International Mechanical Code (IMC).

E. Americans with Disabilities Act (ADA) and ADA Guidelines for Buildings and Facilities (ICC/ANSI A117.1)

1.04 REGULATORY REQUIREMENTS

A. System: UL and FM listed.

B. Conform to the requirements of UL 864.

C. Conform to requirements of NFPA 101.

D. Conform to requirements of ICC/ANSI A117.1.

E. Install system in accordance with NFPA 72.

F. Comply with requirements of ANSI A17.1.

1.05 SYSTEM DESCRIPTION

A. Fire Alarm System: Contractor designed and installed, microprocessor controlled manual and automatic fire alarm system with individually addressable initiating devices. The Contractor shall design and install the fire alarm and smoke detection system in accordance with the requirements of these specifications, NFPA 72, NFPA 101, ANSI A17.1, and ICC/ANSI A117.1. The fire alarm devices on the drawings are shown in suggested locations. The Contractor shall modify these device locations as necessary to accommodate actual architectural, structural, or mechanical conditions, at no cost to the Owner.

B. System Supervision: Provide electrically-supervised class B, addressable fire alarm system with fault tolerant supervised signaling line circuits and notification appliance circuits. Occurrence of single ground or open condition in signaling line circuit or notification appliance circuit places circuit in TROUBLE mode. Component or power supply failure places system in TROUBLE mode. Occurrence of single ground or open condition in signaling line circuit does not disable that circuit from transmitting in ALARM. Occurrence of single ground or open condition on notification appliance circuit does not disable that circuit from transmitting in ALARM.

C. Alarm Sequence of Operation: Actuation of manual fire alarm station or automatic initiating device causes system to enter ALARM, which includes the following operations:
   1. Sound and display local fire alarm notification appliances with ANSI S3.41 compliant temporal signal and synchronized flash.
   2. Transmit alarm signal to activate the digital alarm communicator.
   3. Indicate location and address of device in alarm on fire alarm control panel.
   4. Record the time, date and location of the alarm in the fire alarm panels' accessible history database.
   5. Transmit signal for closure of all fire/smoke dampers and shutdown of all building supply and return air fans as indicated on the drawings.

D. Alarm Reset: Key-accessible RESET function resets alarm system out of ALARM if alarm has cleared.

E. Trouble Sequence of Operation: System trouble, including grounding or open circuit of signaling line or notification appliance circuits, or power or system failure causes system to enter TROUBLE mode, including the following operations:
   1. Activate visual and audible trouble alarm by device at the fire alarm panel.
   2. Activate visual and audible trouble alarm by device [area of building] at annunciator panel.
   3. Manual ACKNOWLEDGE function at control panel silences audible trouble alarm; visual alarm is displayed until initiating trouble is cleared.
   4. Record the time, date and location of the trouble condition in the panel's accessible history database.
   5. Transmit alarm signal to activate the digital alarm communicator automatic telephone dialer.

F. Drill Sequence of Operation: Manual DRILL function causes ALARM mode operation to sound and display local fire alarm notification appliances.

G. Lamp Test: Manual LAMP TEST function causes each indicator lamp/LED at the fire alarm control panel to illuminate.

H. The system shall be 100% field programmable for additions and deletions, and shall be capable of being expanded and field programmed at any time from the fire alarm control panel with a plug-in programmer without returning the devices or operating system to the factory for program change. System software and training shall be provided to the Owner as part of this contract.

I. The fire alarm control panel shall report and identify the failure of any device connected to the system, a device removed from a signaling line or notification appliance circuit, or a transmitting device component failure while all other line devices on the channel shall continue to function. The control panel shall report failures by specific channel and address number and permanently record the event including time and date on the system database.

J. Addressable control relays connected to the system shall be continuously monitored for proper state and position of contacts. Incorrect positions shall be automatically corrected by command from the control panel. If control relay fails to respond to the corrective command; the trouble signal shall sound, and the panel shall identify and permanently record the location of the fault. The control panel shall also monitor addressable control relays for proper state (position) after the system has commanded the relay to operate. Failure of the control relay to operate (change state) shall cause the panel to generate a trouble signal, identify and permanently record the location of the fault.

1.06 QUALIFICATIONS

A. The installation of the system shall conform to the State of Alaska requirements and be supervised by a representative with a current State Fire Alarm License.

B. Manufacturer: Company specializing in addressable smoke detection and fire alarm systems with five years documented experience.

C. System Supplier: Factory authorized to provide the submitted fire alarm system.

D. Installer: Installation of the system shall be 100% field checked by a factory trained and authorized NICET Level III technician certified in the Fire Alarm System Program. The actual supervising technician must be approved prior to start of work.

E. System Certifier: Company specializing in smoke detection and fire alarm systems certified by UL as an agency with the authority to provide a “Certificated Alarm System”.

1.07 SUBMITTALS

A. Submit product data under the provisions of Division 01.

B. Submit manufacturer's installation instructions.

C. Submit shop drawings prepared and signed by a NICET Level III technician certified in fire alarm systems under the provisions of Division 01. Shop drawings shall have the following requirements:

1. The Shop Drawings shall be reproduced electronically from a Master Copy supplied in digital format. Electronic copy of the Contract Drawings will be available at no charge to use as base plan for generation of electronic submittal. Shop Drawings shall be printed at Contract Drawing size and scale of floor plans on Shop Drawings shall match Contract Drawings.
2. All text on the drawings shall be legible without magnification when the shop drawings are reduced to 11” x 17”.
3. Provide minimum 1/8” scale floor plans with all new fire alarm control and auxiliary panels, field devices, raceway and conductor routing, quantities and connection requirements for every component.
4. Provide point-to-point system wiring diagrams showing interconnection of all devices.
5. Provide a riser diagram showing all devices on each NAC, SLC, and auxiliary circuit connected to the fire alarm control panel. Individual device addresses on riser diagram are not required for initial shop drawing submittal but shall be provided on the as-built drawings.
6. Provide calculations to support battery size selection. Provide voltage drop calculations for each SLC and NAC circuit. Show the voltage drop at the furthest notification appliance from the control panel. Show all formulas and acceptable limits for all calculations. All calculations shall be shown on the shop drawings.

D. Submit shop drawings and product data to the State Fire Marshal for review and approval. All shop drawings and product data shall be reviewed and approved by the authority having jurisdiction prior to procurement and installation of materials or devices for the system.

E. Device Names: All device names that are displayed on the LCD text annunciators in the fire alarm panel shall be approved by the Owner. The Contractor shall request a list of approved room names for the facility prior to programming the fire alarm panel or any field devices.

1.08 PROJECT RECORD DRAWINGS

A. Submit documents under the provisions of Division 01.

B. Accurately indicate actual locations of notification appliances, initiating devices, fire alarm control panel, annunciators, etc..

C. Provide Point to Point as-built wiring diagrams of the entire Life Safety System as installed. This shall include all connected devices with actual addresses and locations of all T-taps. All drawings shall be provided in AutoCAD .DWG format. Paper plots of each sheet shall also be provided.

1.09 OPERATION AND MAINTENANCE DATA

A. Submit operating instructions and maintenance and repair procedures under the provisions of Division 01.

B. Include manufacturer representative’s letter stating the system is operational.

C. Include an 11” x 17” set of the fire alarm system project record drawings.

D. Include a completed copy of the NFPA 72 Inspection and Testing Form and the completed application for the UL Certificated Alarm System.

1.10 DEMONSTRATION AND TRAINING

A. The Manufacturer's Representative shall be responsible for an on-site demonstration of the operation of the system and initial staff training.

B. Under the provisions of Division 01 and Section 26 0500, provide formal instruction in the operation, maintenance, and troubleshooting of all equipment, provided at the project site with manufacturer's representative with the Owner's personnel

1.11 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site, store and protect, under provisions of Division 01.

1.12 EXTRA MATERIALS

A. Provide spare parts under provisions of Division 01.

B. Provide two keys of each type.

C. Provide four addressable smoke detectors.

D. Provide two 135°F addressable heat detectors.

E. Provide one fire alarm horn/strobe.

F. Provide two fire alarm strobe lights.

1.13 WARRANTY

A. The Contractor shall be able to provide initial contact on warranty service and/or service contract requests from their principal location within eight (8) hours of notification. During the warranty period, the Contractor may choose to attempt troubleshooting of the system by telephone, with the facility maintenance staff. If the problem cannot be resolved within 24 hours, the Contractor shall travel to the facility on the next available flight to repair the system.

1.14 MAINTENANCE CONTRACT

A. As part of this project, include the UL required maintenance of the fire alarm system for one year from the date of substantial completion for the project as required to maintain the system as a UL Certificated Alarm System. At the end of one year, the Owner shall have the option of extending or canceling the maintenance of the system to maintain the UL certification.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Edwards Systems Technology (EST)

B. Siemens.

C. Simplex.

D. Substitutions: Under provisions of Section Division 01.

2.02 FIRE ALARM AND SMOKE DETECTION CONTROL PANEL

A. Control Panel: Microprocessor controlled, addressable panel with modular construction and flush wall-mounted enclosure.

B. Power Supply: Adequate to serve control panel modules, initiating devices, notification appliances, remote annunciators, door holders, fire/smoke dampers, relays, duct smoke detectors, etc. plus 25 percent spare capacity to allow for future system load growth. Include battery-operated emergency power supply with capacity for operating system in standby mode for 24 hours followed by alarm mode for 5 minutes. Size battery capacity to allow for a 25 percent growth of the system load while complying with the above requirements.

C. Signaling Line Circuits: Class B, Style 4, signaling line circuit with capacity sufficient for all initiating devices connected to the circuit plus 25 percent spare capacity to allow for future load growth.

D. Notification Appliance Circuits: Class B, Style Y, notification appliance circuit complying with ANSI S3.41 with capacity sufficient for all notification appliances connected to the circuit plus 25 percent spare capacity to allow for future load growth.

E. Control Relays: Provide sufficient addressable control relays to provide accessory functions specified and required by the drawings.

F. Provide TROUBLE ACKNOWLEDGE, DRILL, and ALARM SILENCE switch.

2.03 INITIATING DEVICES

A. Manual Station: Semi-flush mounted, single action addressable manual station. Provide with high impact clear polycarbonate protective cover in gymnasium and multipurpose rooms.

B. Duct Mounted Smoke Detector: Addressable, NFPA 72, photoelectric type with auxiliary SPDT relay contact, duct sampling tubes extending the width of duct, and visual indication of detector activation, in duct-mounted housing. Provide with remote visual indicator, test, and reset station. Suitable for operation on existing control panel power supply and signaling line circuit.

C. Provide any specialized tools or interface equipment as required to program the addressable devices (i.e. Siemens “Device Programming Unit”). Turn over one of each type of tool to Owner at completion of project.

2.04 INTELLIGENT MODULES

A. A control relay/transponder shall be installed where building services (i.e. fan shutdown, door holder or release, etc.) are to be automatically controlled by the fire alarm system during a fire emergency. The control relay shall be of a type that only consumes power momentarily while transferring from the deenergized to the energized state or back again. The command to change state shall come from the control panel in accordance with the system program. The control relay shall be condition (deenergized or energized) supervised, and its condition shall be confirmed and corrected, if necessary, during each polling cycle. The control relay/transponder shall be capable of operating on the same communication channel with initiating devices/transponders so that it can be located within 3 feet of the building service device it is controlling as required by NFPA 101-Life Safety Code while its integrity is being monitored from the control panel. The address code of the control relay transponder shall be field selectable and changeable in the same manner as for other transponders. The control relay/ transponder type code shall be factory preset and not be field changeable.

2.05 NOTIFICATION APPLIANCES

A. All appliances shall be U.L. Listed for Fire Protective Service.

B. All appliances shall be of the same manufacturer as the Fire Alarm Control Panel specified to assure absolute compatibility between the appliances and the control panels, and to assure that the application of the appliances is done in accordance with the single manufacturer’s instructions.

C. Any appliances that do not meet the above requirements, and are submitted for use must show written proof of their compatibility for the purposes intended. Such proof shall be in the form of documentation from all manufacturers that clearly states that their equipment (as submitted) is 100% compatible with each other for the purposes intended.

D. Fire Alarm Strobe Lights: NFPA 72 compliant, flush [surface] wall [ceiling] mounted, self-synchronizing, xenon, fire alarm strobe lamp and flasher with flashrate of one flash per second, complying with the requirements of ICC/ANSI A117.1. Provide red lettered FIRE on clear lens. The strobe shall be field-selectable to provide 15, 30 75, or 110 candela synchronized flash outputs. The settings of all strobes shall be determined by the Contractor during the shop drawing process.

E. Fire Alarm Horn: ANSI S3.41 and NFPA 72 compliant, flush [surface] mounted fire alarm horn with adjustable sound output level. Sound Rating: 87 dBA (reverberant) at 10 feet on the “high” setting and 82 dBA (reverberant) at 10 feet on the “low” setting. Provide minimum sound pressure level of 15 dBA above the average ambient sound level in every occupied space

within the building. Provide integral fire alarm strobe light as specified above where indicated on the drawings.

F. Fire Alarm Chime and Strobe: ANSI S3.41 and NFPA 72 compliant, flush [surface] mounted fire alarm chime with adjustable sound output level. Sound Rating: 70 dBA (reverberant) at 10 feet on the maximum volume setting and 64 dBA (reverberant) at 10 feet on the minimum volume setting. Provide minimum sound pressure level of 15 dBA above the average ambient sound level in areas where mini-horns are used. Provide integral fire alarm strobe light as specified above.

G. Notification appliances shall be listed for use on the existing fire alarm control panel power supply.

H. Automatic Telephone Dialer: Provide an automatic telephone dialer complete with power supply, battery back-up, built-in line seizure, remote turn-off, EEPROM memory, 4 voice message alarm zones, and the ability to call a minimum of 8 preprogrammed telephone numbers on a signal from the fire alarm system. United Security Products (USP) #AD2000F or approved equal.

2.06 AUXILIARY DEVICES

A. Vandal-Resistant Pull Station Cover: UL listed polycarbonate pull station cover with integral 100dB horn and internal 9-Volt battery power supply. Covers for both flush-mounted and surface-mounted pull stations shall be provided as required to match the installation (i.e. flush covers for flush pull stations). STI “Stopper II” series or approved equal.

B. NAC Booster Power Supplies:
   1. Existing Power Supplies: New notification appliances may be connected to existing booster power supplies if the unit and batteries have sufficient capacity.
   2. Power supply quantity, rating and battery size shall be determined by the Contractor. All locations of new power supplies shall be approved by the Owner prior to shop drawing submittal. Provide one or more dedicated circuits for all new power supplies. Each circuit shall have a handle lock on the breaker.
   3. Smoke Detection: Provide a smoke detector to protect each NAC booster power supply in accordance with NFPA 72 requirements. Note that because the quantity and locations of NAC boosters are determined by the Contractor, these smoke detectors are <u>not</u> shown on the Contract Drawings but they shall be provided at no additional cost to the Owner.

2.07 FIRE ALARM WIRE AND CABLE

A. Fire Alarm System Power Branch Circuits: Building wire as specified in Section 26 0519.

B. Notification Appliance Circuits: Minimum #12 AWG copper building wire, as specified in Section 26 0519.

C. Initiating and Signaling Line Circuits: Twisted, shielded or unshielded fire alarm cable as recommended by the fire alarm system manufacturer. Minimum size #16 AWG.

2.08 FIRE ALARM SYSTEM MAP

A. On wall beside each fire alarm panel and text annunciator, provide a system map under clear 1/8” plexiglass with black metal frame permanently screwed to the wall with 4 screws around the perimeter of the map.

B. Map to denote locations of all panels, annunciator, and device address and room numbers that correlate with text display on panel to locate system event.

C. Orientate each map consistent with location the map is installed. Provide call denoting “YOU ARE HERE” at the installation point for each map.

D. The map shall be color-coded for clarity.

E. The final layout to be approved prior to final printing.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install the fire alarm system in accordance with the manufacturer's instructions.

B. Install manual station with operating handle not less than 42 inches and not more than 48 inches above finished floor. Install audible notification appliances with top of device not less than 90 inches above finished floor, and not less than 6 inches below finished ceiling. Install visual notification appliances such that the entire lens is not less than 80 inches and not greater than 96 inches above finished floor.

C. Install all fire alarm system wiring in a dedicated conduit system separate from any other system wiring. Provide minimum 8 inch wire tails at each device box and 50 inch wire tails at the fire alarm control panel.

D. Make conduit and wiring connections to door release devices, sprinkler water flow switches, sprinkler valve tamper switches, fire/smoke dampers, and other items as shown on the drawings or required by NFPA 72. Note that the sprinkler system is a design build system and not all valve tamper switches and flow switches may be shown on the drawings. The Contractor is responsible to field coordinate all tamper and flow switch locations and connect all switches to the fire alarm system.

E. The Contractor is responsible to field coordinate the final location of all initiating devices and notification appliances to comply with the requirements of NFPA 72. Any initiating devices or notification appliances that are not installed in accordance with NFPA 72 shall be relocated to comply with the requirements of NFPA 72 at no cost to the Owner.

F. Detectors shall not be installed until after the construction clean up of all trades is complete and final. Protective dust covers shall be installed on all detectors prior to final clean-up. Detectors that have been installed without dust covers prior to final clean-up shall be replaced at no cost to the Owner.

G. Field locate remote visual indicators and test/reset stations for duct detectors in an accessible location.

H. Where surface mounted devices are used, the Contractor shall install the manufacturer’s approved surface mounting boxes and decorative skirts. The use of standard outlet boxes as specified in Section 16130 is not acceptable.

I. Provide two dedicated telephone lines for connection of the automatic telephone dialer.

J. Program the system to identify each device with the submitted and approved designation in the LCD annunciators on the control panel and remote text annunciator.

3.02 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 01 4000.

B. Test in accordance with NFPA 72 and local fire department requirements. Provide a completed NFPA 72 Inspection and Testing Form for inclusion in the Operation and Maintenance manual at the completion of testing and commissioning the fire alarm system.

C. Provide all equipment, devices and manpower as necessary to test each and every device in the fire alarm system both for function and supervision. Demonstrate that all devices connected to the system function properly.

D. The facility will not be accepted as substantially complete until the fire alarm system has been tested and demonstrated to the Owner's authorized representative as 100 percent complete and fully functional, a completed NFPA 72 Inspection and Testing form is submitted and the paperwork has been filed for the UL Certificated Alarm System.

3.03 MANUFACTURER'S FIELD SERVICES

A. Provide manufacturer's field services under provisions of Division 01.

B. Include services of a certified technician to supervise installation, adjustments, final connections, programming and system testing.

3.04 FIRE ALARM SYSTEM IDENTIFICATION

A. Wire and Cable: Provide fire alarm unit conductors with color coded insulation, or use color coded tape at each conductor termination and in each junction box as follows:
   1. Power Branch Circuit Conductors: Black, red, white.
   2. Initiating Device Circuit: Black, red.
   3. Detector Power Supply: Violet, brown.
   4. Notification Appliance Circuit: Blue (positive), white (negative).
   5. Door Release: Gray, gray

B. Identify all circuit conductors at all terminal and junction boxes per NEC 760.30. Use the circuit designations (i.e. “NAC 1”, “SLC 1”, etc.), as indicated on the shop drawings.

C. Fire Alarm Device Labels:
   1. Install machine-printed device address labels on all addressable devices, including smoke/heat detectors, control relays, monitor modules, etc. Unless otherwise noted, in public spaces where devices are mounted below +80” on walls, install label on inside cover of device. At all other locations, install label on exterior cover of device. Device labels shall show the unique device address corresponding to the text annunciator description. For smoke detectors, the label shall be affixed to the base and not to the detector itself.
   2. Provide label on each remote test station indicating description and location of device being tested.
   3. Provide label on telephone conductors at each end denoting FACP lines for use with the digital alarm communicator transmitter (DACT) telephone dialer.

D. The circuit disconnecting means for the fire alarm control panel circuit, remote power booster supply, 120V door holders, or other control equipment circuits shall have a painted red handle and handle lock. The circuit(s) shall be labeled “Fire Alarm Circuit”. The circuit assignment and panel location shall be permanently identified on all fire alarm control equipment.

END OF SECTION

SECTION 33 7173
ELECTRICAL UTILITY SERVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Arrangement with Utility Company for permanent electric service including payment of Utility Company charges for service.

B. Underground service entrance.

1.02 RELATED SECTIONS

A. The Work under this section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions, and sections under Division 01 General Requirements and Section 26 0500 – Common Work Results for Electrical.

B. Division 03 - Concrete Work.

C. Section 26 0526 – Grounding and Bonding for Electrical System.

D. Section 26 0533 – Raceway and Boxes for Electrical Systems.

E. Section 26 0553 – Identifications for Electrical Systems.

1.03 REFERENCE STANDARDS

A. See Section 01 3300 – submittal procedures.

B. NEMA 250 – 2003 Enclosures for Electrical Equipment (1000 Volts Maximum).

C. UL 50 – 1995 Enclosures for Electrical Equipment.

D. UL 414 – 1999 Standard for Meter Sockets.

1.04 SYSTEM DESCRIPTION

A. System Voltage: 120/208 volts, three phase, four-wire, 60 Hertz.

B. Service Entrance: Underground

1.05 SUBMITTALS

A. Product Data: Submit product data for all components provided, showing electrical characteristics, material, finishes, and dimensions. Each catalog sheet should be clearly marked to indicate exact part number provided, including all options and accessories.

B. Shop Drawings: Submit shop drawings and manufacturer’s literature for self-contained meter base with circuit breaker disconnecting means, transformer rated meter base, current transformer cabinet.

1.06 CLOSEOUT SUBMITTALS

A. Project Record Drawings: Indicate actual locations and mounting heights of service entrance equipment on the project record drawings.

B. Operation and Maintenance Manuals: Submit manufacturer’s instructions for shunt trip pushbutton operator maintenance.

1.07 QUALITY ASSURANCE

A. Utility Company: Nome Joint Utilities

B. Install service entrance in accordance with Utility Company's rules and regulations.

PART 2 PRODUCTS

2.01 METERING EQUIPMENT

A. Meter: Furnished and installed by the Utility Company.

B. Transformer Rated Meter Base: NEMA 3R 4X, 13-terminal, transformer rated 20 amperes, 600 volts with mounting provisions to accommodate a covered test switch with test switch cover sealing provisions. The test switch mounting provisions shall accept a 10 pole covered test

switch with a base dimension of 9.5 inches in width and a depth (the dimension from the rear edge of the test switch base to the top of the cover sealing stud) of no less than 3.375 inches. The lower cover of the meter socket shall seat fully with a covered test switch in place. Meet requirements of NEMA standards for watthour meter sockets-NEMA EI17-1978 (similar to EUSERC Drawing No. 339). The utility company will furnish and install the test switch and CT wiring.

C. Current Transformer Cabinet: NEMA 3R 4X, UL 414 listed, minimum size as shown on the drawings. All current transformer cabinets and compartments shall have hinged front cover access to the current transformers. The hinged front cover shall be lockable and shall accept a padlock with a shackle diameter of not less than 5/16 inch. Current transformer cabinets for services from 201 Amperes to 800 Amperes shall have ¼ x 20 mounting studs on the enclosure body spaced to accept a current transformer mounting base.

D. All removable covers for compartments containing un-metered conductors shall be sealable or lockable with sealable latches, stud and wing-nuts, sealing screws, or slot and tab devices. All top cover panels, side cover panels and rear cover panels providing access to un-metered conductors shall be secured in place with devices that can not be loosened from the outside, screws or bolts requiring special tools for installation or removal are not acceptable alternates. No removable panel or cover requiring sealing or locking shall be located behind other panels, covers or doors except for rain-tight enclosures. Hinged cover panels shall be lockable on the side opposite the hinges. Hinged panel covers shall accept a padlock with a shackle diameter of not less than 5/16 inch. Stud and wing-nut sealing assemblies shall consist of a ¼ inch x 20 (minimum) stud and associated wing-nut, each drilled 0.0635 inch (minimum) for sealing purposes. The stud shall be securely attached so as to not loosen or back out when being fastened. Sealing screws shall be drilled 0.0635 inch (minimum) for sealing purposes. All securing screws for removable panel covers shall be captive.

E. Current Transformer: Provided by Utility.

PART 3 EXECUTION

3.01 INSTALLATION

A. Make arrangements with Utility Company to obtain permanent electric service to the Project.

B. Underground: Install service entrance conduits Utility Company's terminal pole to building service entrance equipment. Utility Company will connect service lateral conductors to service entrance conductors.

C. Meter sockets shall be installed with the centerline of the socket opening no more than 72 inches and no less than 60 inches above finished grade. The meter socket shall be installed with a minimum 10 inches of side clearance to each side of the socket. On current transformer rated meter sockets, the conduit connecting the meter socket and the current transformer cabinet shall be rigid steel or IMC and have a minimum diameter of 1 inch, shall not be longer than 25 feet, shall have no access points (junction boxes, condulets, etc.), and shall connect to the meter socket at a factory supplied knockout located below the test switch mounting provisions.

D. Wall mounted current transformer enclosures shall be mounted with the top of the cabinet no more that 96 inches above grade and the bottom of the cabinet no less than 16 inches above grade.

E. Current transformer cabinets shall not be used as a junction point to service other metered services or as a splicing chamber.

F. All service entrance equipment shall have signage for arc hazard installed. The marking shall be located to be clearly visible to qualified personnel before examination, adjustment, servicing or maintenance of the equipment. At a minimum the signage shall state the following:

Warning

Arc Flash and Shock Hazard

Appropriate PPE Required

END OF SECTION