



Bainbridge Island
Metro Park & Recreation District

PROJECT MANUAL

Project No. 20223
Ray Williamson Pool Renovation, PHASE 2

January 30, 2026

VOLUME 2, DIVISIONS 02 - 33
BID SET

STEMPER  **ARCHITECTURE**
COLLABORATIVE

Consultants:

The Greenbusch Group Engineers
TFWB Engineers
MLA Engineering
Jacobson Consulting Engineers



Bainbridge Island
Metro Park & Recreation District

**PROJECT MANUAL, VOLUME 2
TECHNICAL SPECIFICATIONS**

PROJECT NO. 20223

**RAY WILLIAMSON POOL IMPROVEMENTS
PHASE 2**

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PART 1 – GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Deconstruction and removal of selected portions of the building(s) or structure for reuse as identified in the construction documents.
 - 2. Demolition and removal of selected portions of the building or structure for disposal as identified for demolition in the construction documents.
 - 3. Salvage of building materials and equipment as identified in the construction documents.
 - 4. Surplus of building materials and equipment as identified in the construction documents.
- B. Related Sections:
 - 1. Section 01 11 00 – Summary of Work
 - 2. Section 01 74 19 - Construction Waste Management and Disposal
 - 3. Section 01 76 00 – Protection of Existing Facilities

1.02 DEFINITIONS

- A. Full Deconstruction: Removal by disassembly of a building in the reverse order in which it was constructed.
- B. Selective Deconstruction: Disassembly and removal of selected portions of building or structure.
- C. Salvage: Removal of disassembled building materials for the purpose of reuse or recycling.
- D. Demolish: Remove and legally dispose of off-site.
- E. Surplus: Remove and return item(s) to Owner. Coordinate surplus item storage with Owner.

1.03 REGULATORY REQUIREMENTS

- A. Conform to applicable Federal, State and Anchorage code for demolition work, safety of structure, occupants and pedestrians, and dust control.
- B. Obtain required permits from authorities.
- C. Notify affected utility companies before starting work and comply with their requirements.
- D. Do not close or obstruct egress width to exits.
- E. Do not disable or disrupt building fire or life safety systems without 3-day prior written notice to the Owner.
- F. Conform to procedures applicable when discovering hazardous or contaminated materials.

1.04 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, deconstruction waste becomes property of the Contractor.

1.05 SEQUENCING

- A. Sequence work under the provisions of Division 01 for Summary of Work.

1.06 SCHEDULE

- A. Perform noisy work to the hours permitted by local governing noise ordinances and the Owner.
- B. Schedule work to comply with requirements of Division 01

1.07 SUBMITTALS

- A. Qualification Data: For deconstruction firm.
- B. Schedule of Deconstruction Activities: Indicate the following:
 - 1. Detailed sequence of deconstruction and removal work, with starting and ending dates for each activity.
 - 2. Interruption of utility services. Indicate how long utility services will be interrupted.
 - 3. Coordination for shutoff, capping, and continuation of utility services.
 - 4. Use of elevator and stairs.
 - 5. Locations of proposed dust- and noise-control temporary partitions and means of egress.
 - 6. Means of protection for items to remain and items in path of material removal from building.
- C. Inventory: After deconstruction is complete, submit a list of items that have been salvaged, recycled and disposed of and documentation (receipts/scale tickets/waybills) showing the quantities.
- D. Deconstruction Photographic Documentation: Document general condition of materials to be salvaged prior to removal.
- E. Submit deconstruction plan prior to start of work.

1.08 QUALITY ASSURANCE

- A. Deconstruction Firm Qualifications: Company(ies) experienced and specializing in performing the Work of this Section with a minimum of two years and/or a minimum of five projects of documented experience in similar types of deconstruction work.
- B. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

1. Comply with noise and dust regulations of authorities having jurisdiction.
- C. Pre-Deconstruction Conference: Conduct conference at Project site. Review methods and procedures related to deconstruction including, but not limited to, the following:
 1. Inspect and discuss condition of building to be deconstructed.
 2. Review structural load limitations of existing structure.
 3. Review and finalize deconstruction schedule and verify availability of materials, personnel, equipment, and facilities needed to make progress and avoid delays.
 4. Review requirements of work performed by other trades that rely on substrates exposed by deconstruction operations.
 5. Review areas where existing construction is to remain and requires protection.
 6. Review method for removing materials from the site.
 7. Review staging area for materials on the site.

1.09 PROJECT CONDITIONS

- A. Hazardous Materials: It is unknown whether hazardous materials will be encountered in the Work.
 1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify the Consultant and the Owner. The Owner will remove hazardous materials under a separate contract.
- B. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during deconstruction operations.
 1. Maintain fire-protection facilities in service during deconstruction operations.

1.10 DECONSTRUCTION PLAN

- A. Material Identification: Indicate anticipated types and quantities of materials to be salvaged, recycled, and disposed of. Indicate quantities by weight or volume, but use same units of measure throughout.
- B. Procedure: Describe deconstruction methodology, sequencing, and materials handling and removal procedures. Include the anticipated final destination of each material.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Verify that utilities have been disconnected and capped.
- B. Survey existing conditions and correlate with requirements indicated to determine extent of deconstruction required.
- C. Inventory and record the condition of items to be removed and salvaged.

- D. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs or videotapes.

3.02 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS:

- A. Existing Services/Systems: Maintain services/systems indicated to remain and protect them against damage during deconstruction operations.
- B. Service/System Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems.

3.03 PREPARATION

- A. Site Access and Temporary Controls: Conduct deconstruction operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
- B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to workers.
 - 1. Provide protection to ensure safe passage of workers around deconstruction area.
 - 2. Provide weather protection for all salvage materials (and items to remain) before, during and after deconstruction.
- C. Protect existing materials, which are not to be demolished.
- D. Prevent movement of remaining structure. Provide bracing propping, and shoring.
- E. Mark location of utilities.

3.04 DECONSTRUCTION

- A. General: Deconstruct and remove existing construction in accordance with the materials identified for removal in the deconstruction plan. Use methods required to complete the Work within limitations of governing regulations and as follows:
 - 1. Proceed with deconstruction systematically, from higher to lower level. Complete deconstruction operations above each floor or tier before disturbing supporting members on the next lower level.
 - 2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing, prying or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
 - 3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 - 4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.

5. Maintain adequate ventilation when using cutting torches.
 6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site in accordance with all federal, state and local regulations.
 7. Remove structural framing members in such a way as to maintain their highest value.
 8. Locate deconstruction equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 9. Dispose of demolished items and materials promptly.
- B. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during deconstruction activities. When permitted by Engineer, items may be removed to a suitable, protected storage location during deconstruction and cleaned and reinstalled in their original locations after deconstruction operations are complete.

3.05 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain the Owner's property, remove demolished materials from Project site and legally dispose of them.
1. Do not allow demolished materials to accumulate on-site.
 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
 4. Comply with requirements specified in Division 01 for Waste Management & Disposal.
- B. Burning: Do not burn demolished materials.

3.06 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by deconstruction operations. Return adjacent areas to condition existing before deconstruction operations began.
- B. Any damage caused by demolition to the remaining or neighboring buildings, or on-site streets and public right-of-way shall be repaired.

3.07 SALVAGED MATERIALS FOR REUSE BY OWNER SCHEDULE

- A. Salvage and reuse items as noted on the drawing documents.

END OF SECTION

PART 1 – GENERAL

1.01 SCOPE

- A. This section covers the removal and disposal, or other impact, of asbestos-containing materials (ACMs) as necessary to accomplish the Work as defined by these Specifications. See Section 01 11 10, Summary of Hazardous Materials Work.
- B. Materials to be removed require confirmation in the field. Coordinate with the Environmental Consultant to properly record materials removed in each separate regulated work area.
- C. The Contractor shall refer to the Limited Hazardous Materials Survey Reports attached to these Specifications, which lists suspect materials in the areas of the Work. The Contractor shall ensure that copies of these reports are made available to and retained on the project site by all subcontractors.

1.02 RELATED WORK:

- A. Work performed under this specification section shall be governed by all related specification sections, including, but not limited to, the following:
 - 1. Division 00 - Procurement and Contracting Requirements;
 - 2. Division 01 - General Requirements; Section 01 11 10 Summary of Hazardous Materials Work

1.03 DEFINITIONS

- A. Authorized Visitor: The Owner or designated representative, or a representative of any regulatory or other agency having jurisdiction over the project, and having required training, medical, fit test, etc.
- B. Environmental Consultant: Environmental consultant specializing in asbestos abatement -- PBS Environmental -- or any subcontractor designated by PBS.
- C. Independent Testing Laboratory: A laboratory financially independent from and hired by the Owner or Contractor which is either AIHA-accredited for asbestos with demonstrated proficiency via the AIHA PAT program or has analysts proficient in the AIHA AAR program for air sample analysis.
- D. Owner: Representatives designated by the Owner, or designated employees of the Owner.
- E. Work Area: A regulated area where asbestos abatement activities are performed; isolated from non-work areas by negative pressure, containment barriers, decontamination enclosure systems and warning signs or demarcation tape with warning signs.

1.04 DOCUMENTS INCORPORATED BY REFERENCE

- A. The current issue of each document shall govern. Where conflict among requirements or with these Specifications exists, the most stringent requirements shall apply.
- B. U.S. Environmental Protection Agency National Emissions Standards for Hazardous Air Pollutants (NESHAPS). (Code of Federal Regulations Title 40, Part 61, Subparts A & B.)
- C. U.S. Environmental Protection Agency Office of Toxic Substances Guidance Document, *Guidance for Controlling Friable Asbestos-Containing Materials in Buildings*, EPA Report Number 560/5-85-024 ("Purple Book").
- D. U.S. Department of Labor Occupational Safety and Health Administration (OSHA):
 - 1. Title 29 Code of Federal Regulations Section 1910.1001--General Industry Standard For Asbestos.
 - 2. Title 29 Code of Federal Regulations Section 1910.134--General Industry Standard For Respiratory Protection.
 - 3. Title 29 Code of Federal Regulations Section 1910 *et al.*--Occupational Exposure to Asbestos; Final Rule.
 - 4. Title 29 Code of Federal Regulations 1926.1101--Construction Standard for Asbestos.
 - 5. Title 29 Code of Federal Regulations Section 1910.2--Access to Employee Exposure and Medical.
 - 6. Title 29 Code of Federal Regulations Section 1910.1200--Hazard Communication.
- E. Environmental Protection Agency 40 CFR Part 763, AHERA, Asbestos-Containing Materials in Schools; Final Rule and Notice.
- F. National Institute for Occupational Safety and Health (NIOSH), 30 CFR, Part II, Respirators.
- G. American National Standards Institute (ANSI) NY; ANSI Standard Z 88.2-1980 *American National Standards Practice for Respiratory Protection*, latest edition.
- H. CERCLA, Comprehensive Environmental Response, Compensation, and Liability Act (42 U.S.C. 9601 et seq.).
- I. RCRA, Resource Conservation and Recovery Act.
- J. Washington State General Occupational Health Standards, WISHA Chapter 296-62 Washington Administrative Code (WAC); Chapter 296-65 WAC Asbestos Removal & Encapsulation; Chapter 296-155 WAC Safety Standards for Construction Work.
- K. Puget Sound Clean Air Agency Regulation III, Article 4 Asbestos Control Standard.
- L. Washington Industrial Safety and Health Act (WISHA).
- M. Uniform Building Code (U.B.C.), latest edition, and regulations as applicable.
- N. Perform all electrical work in accordance with the National Electrical Code.

- O. All local ordinances, regulations, or rules pertaining to asbestos, including its storage, transportation, and disposal.

1.05 SUBMITTALS AND NOTICES

- A. No asbestos-related work will be permitted prior to submittals being processed by the Environmental Consultant. Allow fifteen (15) days for review prior to the commencement of abatement.
- B. Additional requirements for submittals are also described in other sections of these specifications. The requirements in this section pertain to asbestos-containing materials removal.
- C. Submit the "Contractor Acknowledgment of Asbestos Hazard Training, Respirator Training and Agreement to Undertake All Required Precautions", Form 028200-1 (attached to this Section). completed and signed by the Abatement Contractor in conjunction with pre-job submittals.
- D. Contractor shall submit to the Owner the following information prior to beginning work on the project:
 - 1. Work Plan: Include a detailed plan of the procedures proposed for use in complying with the requirements for each site, including the following:
 - a. A description of all special equipment, techniques, and methods to be used on the Project, including schematic drawings of work area layout(s) showing entries/exits, HEPA exhausts, decon units, and waste load-outs.
 - b. A specific clearance monitoring schedule indicating proposed start dates/times and completion dates/times for individual regulated areas as configured in the proposed Work Plan.
 - c. Specific information relating to handling, transport and disposal of asbestos-containing waste from each waste-generating site. Identify the designated proposed disposal site at which any waste material generated during the project will be disposed and furnish evidence of all necessary government approvals to dispose of the waste.
 - 2. Laboratory Qualification Information: Submit information pertaining to the proposed Air Monitoring Program for this project. Contractor's air monitoring shall include employee exposure monitoring. This information shall include the name(s) of personnel collecting air samples, types of equipment, sampling schedule, sampling procedures, calibration record keeping, name and address of proposed Independent Testing Laboratory, and evidence of analyst's NIOSH 582 course completion and AIHA PAT program participation.
 - 3. Worker Certification: Submit written proof that all employees performing asbestos-related work will have completed all necessary asbestos-related training in compliance with WAC Chapters 296-62 and 296-65. Written proof may be in the form of a notarized letter stating such intent and signed by an owner or principal of the appropriate firm(s).
 - 4. Written Certification: Submit written proof that all employees performing asbestos-related work will have completed all necessary asbestos-related training in compliance with WAC Chapters 296-62 and 296-65. Written proof may be in the

form of a notarized letter stating such intent and signed by an owner or principal of the appropriate firm(s).

5. Notifications and Policies: Submit copy of all required notifications and permits obtained by the contractor (Washington State Department of Labor and Industries, and PSCAA) and copies of all types of specified bonds and insurance. Submit upon receipt any approved amendments to notifications or re-notifications for multi-phase activities. See Paragraph 1.11 - Permits and Notifications for additional requirements.
6. Certified Asbestos Supervisor (CAS): Submit the name, Asbestos Supervisor Certification and resume of experience of the assigned on-site CAS. At a minimum, the foreman shall have successfully completed a supervisor-training course in compliance with WAC Chapter 296-65-007. References and work on similar projects will also be reviewed. The Owner and/or the General Contractor and Environmental Consultant reserve the right to remove the CAS from the work at any time during the project. The Contractor shall then submit another on-site CAS for approval as described above.

E. Daily Job Submittals

1. Personal Air Monitoring: Submit copies of all personal air monitoring data sheets, chain-of-custody and analytical results to the General Contractor and Environmental Consultant on a daily basis within 24 hours following sample collection.
2. Daily Logs: Submit copies of daily logs to the General Contractor and Environmental Consultant daily prior to the end of the next work shift. Daily logs shall indicate the date, time, site location, identity, company or agency represented, and reason for entry of all persons entering the work area, and the type, amount and location(s) of all ACMs removed.
3. Entry/Exit logs: Submit copies of regulated area entry/exit logs to the General Contractor and Environmental Consultant on a daily basis prior to the end of the next work shift

F. Periodic Submittals

1. Asbestos Training: Upon verbal request, immediately make available to the Environmental Consultant proof of Asbestos Worker Certification or Asbestos Supervisor Certification. Provide copies of worker training certification to the Owner upon request.
2. Work Plan modification/clarification: In the event that on-site activities will require departure from any and all aspects of the information outlined in the pre-approved Work Plan, submit written clarification/modification of proposed changes to the Owner and Environmental Consultant.

G. Post-Job Submittals shall be delivered to the General Contractor within 15-days of completion of asbestos-related work as specified by these Contract Documents and shall include the following:

1. Certifications: Provide written certification from the Abatement Contractor's Project Manager or Supervisor that Contractor has fully inspected the work area and completed work in strict accordance with the Specifications.
2. Air Monitoring: Submit documentation of all employee personal air monitoring results relative to OSHA and WISHA respiratory protection level compliance. Include

copies of all air monitoring data sheets, chain-of-custody documentation and analysis reports for sampling conducted at the site.

3. Project Record Documents: Provide project records including documentation of all contract changes, and copies of worksite entry logs, work area entry/exit logs, safety logs, safety meeting sign-in sheets, and supervisor's daily field reports.
4. Disposal Manifests: Submit copies of all asbestos waste transportation and disposal manifests including signed receipts from the landfill, and chain-of-custody.
5. Final payment will be issued by the Owner only with written approval, by the Environmental Consultant, of post-job submittals.

1.06 PERSONNEL PROTECTION

- A. Training: All personnel accomplishing removal of asbestos-containing materials shall have received the minimum training as required by the Washington State Department of Labor and Industries for the work to be performed.
 1. At a minimum, the supervisor shall be the bearer of a current "Certified Asbestos Supervisor Certificate" issued by the Washington State Department of Labor and Industries. Prior to commencement of work, Contractor shall ensure all workers have been trained as specified in WAC Chapter 296-65.
 2. Prior to commencement of work, Contractor shall ensure all workers have been trained as specified in WAC Chapter 296-65.
 3. The Contractor shall provide and post decontamination, respirator, and work procedures for abatement crew.
- B. Personnel Protective Equipment for Asbestos Removal
 1. Provide protective clothing and equipment per WAC 296-62.

1.07 AIR MONITORING BY CONTRACTOR:

- A. An Independent Testing Laboratory shall be retained by the Contractor for PCM sample analysis. All analysis shall be performed by an Industrial Hygienist. The Hygienist must be experienced and trained in asbestos sampling and analysis. At a minimum, documentation of prior asbestos sampling and analysis experience, plus satisfactory completion of the NIOSH 582 course or equivalent will be required. Air sample collection may be performed by an Industrial Hygienist or the Contractor's foreman at the Contractor's option. The Contractor shall perform sampling and analysis of air samples for asbestos in compliance with WAC Chapter 296-62-07735, Appendix A-WISHA reference method, or equivalent.
- B. Sample Documentation: Documentation shall be kept for each filter sample procured as to worker sampled, social security number, activity, work area location, date and time taken, volume of air drawn through filter, pump identification number and calibration. Report all data on copies of *Asbestos Air Sampling Data Form* bound in these Specifications or similar approved form within 48 hours. Fill in all information on every form. Submit chain-of-custody records along with all samples.
- C. Analysis Procedures: The samples shall be collected on 25 mm filters and analyzed within 12 hours using the membrane filter method at 400-500x magnification with phase contrast illumination--NIOSH Analytical Method No. 7400--for laboratory and field analysis. The

analyst shall sign and submit permanent records of all samples analyzed directly to the Environmental Consultant. The Independent Testing Laboratory shall seal the unused portion of all filters in airtight containers so that individual samples can be re-analyzed at a later date if necessary. The containers shall be clearly labeled with Project Name and Sample Number and shall become property of the Owner at work completion at the Owner's request.

- D. Controls: The Contractor's testing laboratory shall submit sample analysis results, chain-of-custody and equipment calibration records to the Environmental Consultant within 24 hours of collection.
- E. Contractor's Sampling During Abatement
 - 1. Sample Collection: Air monitoring shall be performed to determine worker exposure during the period of asbestos abatement in each work area. Begin sampling when asbestos removal commences. Samples are to be taken where Class I or II work is being conducted during each 8-hour work shift.
 - 2. Most Contaminated Worker: The Contractor shall determine which worker(s) in each work area is probably experiencing the most severe exposure. This is the "Most Contaminated Worker(s)". 8-hour TWA and 15-minute excursion samples shall be collected on this worker(s). This worker shall wear a personal sampling pump and the sample shall be drawn from the breathing zone of this worker.
 - 3. The number of air samples collected shall be in accordance with the Contractor's approved work plan, however, collect a minimum of one sample per work area daily.

1.08 AIR MONITORING BY OWNER

- A. Industrial Hygienist: The Owner will retain an experienced Industrial Hygienist/ Environmental Consultant to collect and analyze asbestos air samples prior to abatement, inside the work area, outside the work area, at HEPA exhaust and after visual inspection. Documentation of sample results will be forwarded to the Contractor as appropriate.
- B. Sampling and analysis of asbestos samples shall be performed in compliance with WAC Chapter 296-62-07735, Appendix A--WISHA reference method, or equivalent.
- C. The Owner reserves the right to monitor Contractor's performance via air samples on abatement workers in addition to the Contractor's air monitoring.

1.09 OWNER OCCUPANCY

- A. The area of abatement shall be occupied only by properly trained workers and authorized inspectors during abatement activities. Coordinate phasing of abatement areas to comply with occupancy requirements as defined in Section 011110, Summary of Work.

1.10 WORKING HOURS

- A. Submit proposed work schedule to Owner for approval in conjunction with submittals required by this Section. The Owner reserves the right to restrict and curtail any operations

which are considered, at the Owner's sole determination, to generate such noise or activities as to interfere with facility operations. Any revisions to the approved work schedule shall be submitted in writing to the Owner a minimum of 48 hours prior to the desired schedule change.

1.11 PERMITS AND NOTIFICATIONS

- A. The Contractor is responsible for obtaining all permits and notifications as required for the completion of the work by the Washington State Department of Labor and Industries, the U.S. E.P.A., the Puget Sound Clean Air Agency and any other permitting agency involved with the completion of the work included herein.

1.12 Personnel Training

- A. All personnel accomplishing removal of asbestos-containing materials shall have received the minimum training as required by the Washington State Department of Labor and Industries for the work to be performed. At a minimum, the supervisor shall be the bearer of a current "Certified Asbestos Supervisor Certificate" issued by the Washington State Dept. of Labor and Industries.

1.13 Liability

- A. The Contractor is an independent contractor and not an employee of the Owner, Architect or Environmental Consultant. The Owner, Architect and the Environmental Consultant shall have no liability to the Contractor or any third persons for Contractor's failure to faithfully perform and follow the provisions of these Specifications and the requirements of the governing agencies. Notwithstanding the failure of the Owner, Architect or the Environmental Consultant to discover a violation by the Contractor of any of the provisions of these Specifications, or to require the Contractor to fully perform and follow any of them, such failure shall not constitute a waiver of any of the requirements of these Specifications which shall remain fully binding upon the Contractor.

1.14 Subcontractors

- A. Subcontractors employed by the Contractor shall be bound to all the work and safety standards specified. Subcontractor's personnel shall meet requirements as specified and shall be supervised by the Contractor during performance of this work.

1.15 Quality Insurance

- A. On-Site Observation
 - 1. Pre-Removal: Environmental Consultant shall perform observations regarding: demarcation of regulated area, installation of critical barriers, integrity of negative pressure enclosures, waste load-out facilities, and other conditions affecting abatement work. Contractor shall request pre-removal observations a minimum of two hours prior to desired removal commencing. No abatement work shall be performed prior to pre-removal observations by the Environmental Consultant.

2. Observation: Environmental Consultant shall perform observations regarding: integrity of isolation barriers, decontamination facilities, worker protection, Contractor's air monitoring program, performance of abatement operations, and conformance to the Specification, EPA, OSHA, WISHA and PSCAA regulations.
3. Post Removal: Environmental Consultant shall perform visual inspections after the removal of asbestos-containing materials is complete. Upon completion of asbestos-related activities, all work areas shall be free of all accumulations of dust, debris or three-dimensional residue. Schedule post-removal inspections a minimum of 24 hours in advance.
4. No visual inspections will be performed on wet flooring areas. Ensure adequate drying time when scheduling inspections.
5. Stop Work: Environmental Consultant shall notify the Contractor in writing to stop work if the Environmental Consultant determines that work practices are in violation of regulations, these Specifications or work is endangering workers or occupants of the building. The Contractor shall continue work when conditions and actions are corrected and when written authorization is received from the Environmental Consultant.

B. Air Monitoring

1. Notification: If, at any time during the work, analysis of an air sample taken by the Contractor, Owner, or Environmental Consultant from a non-isolated regulated work area or a non-regulated area indicates a fiber concentration in excess of the applicable Control Limit, the Industrial Hygienist who analyzed the air sample shall immediately notify the Contractor's Foreman, the Environmental Consultant: PBS Environmental, the Owner and other workers, employees, occupants, etc. in affected area(s).
2. Maximum Allowable Fiber Concentrations:
 - a. Outside all Regulated Work Areas: 0.01 f/cc (fibers per cubic centimeter by PLM) or below pre-abatement;
 - b. Inside Non-Isolated Regulated Work Area: 0.05 f/cc or below pre-abatement levels;
 - c. Inside Isolated Regulated Work Area: 0.10 f/cc;
 - d. Post- Abatement: 0.01 f/cc, or 70 s/mm² by TEM, as applicable.
3. Procedures: Immediately upon being notified of fiber concentration in excess of the Control Limit, the Contractor shall perform the following steps in the order presented, at no additional cost to the Owner:
 - a. Stop abatement work and identify source of high fiber counts.
 - b. Corrective Actions: Immediately correct containment breaches, pressure differential changes and potential cause of high fiber counts. The Environmental Consultant will determine the affected are considered to be contaminated. The Environmental Consultant will determine the actions to be taken by the Contractor at no additional cost to the Owner.
 - c. Clean the affected area using wet methods and HEPA vacuuming.
 - d. Re-sample air until fiber counts are determined to be below the specified maximum levels.
 - e. Secure and repair containment barriers, repair or add equipment.
 - f. Modify work procedures and make other changes to reduce fiber counts.

4. Complete every part of the "Fiber Count Above Control Limit Data Form" bound into these Specifications. Resume work and air monitoring.
 5. Additional Costs: The Contractor shall be responsible for costs of any testing, cleanup, repair, down time loss, etc. that is a result of the Contractor's negligence, poor maintenance of isolated areas, failed post-abatement sampling and improper procedures.
- C. Performance: Work shall be performed in a skillful manner representing industry standards. Environmental Consultant shall require Contractor to remove from the work site employees and subcontractors the Environmental Consultant deems incompetent, careless or objectionable.

PART 2 – PRODUCTS

2.01 PROTECTIVE CLOTHING AND EQUIPMENT

- A. Protective Clothing: Provide approved clothing per WAC 296-62 for all workers and all official representatives of the Owner, State or other governmental entity, and the Environmental Consultant who may require such clothing.
- B. Respirators: At a minimum, respiratory protection shall be approved by NIOSH/MSHA (National Institute for Occupational Safety and Health/Mine Safety and Health Administration), United States Department of Labor, and U.S. Department of Health, Education and Welfare, Centers for Disease Control, in accordance with WAC Chapter 296-62-071. Respiratory protection shall provide workers with a maximum calculated fiber level inside the mask of 0.01 f/cc.
 1. Selection: As part of the Contractor's Respiratory Protection Program, all workers shall be provided with a selection of brands and sizes of respirators to choose from. At a minimum, all workers shall be quantitatively or qualitatively fit-tested at the time of respirator selection per WAC Chapter 296-62-07715.
 2. Contractor shall supply replacement filter cartridges as required. Cartridges which have become wet or clogged shall be replaced immediately.
 3. Contractor shall provide personal protective equipment and supplies to the Environmental Consultant and authorized visitors for use on the site.

2.02 MATERIALS

- A. Encapsulants (Sealants): Encapsulants shall be rated as "Acceptable" using the test method described in the EPA document published as National Technical Information Service report PB 88-113 329/AS [available from NITS, 5825 Port Royal Road, Springfield, VA 22161.] (The report is summarized in EPA publication EPA/600/S-87/091 [available from Center for Environmental Research Information, EPA 26 Martin Luther King, and Cincinnati, OH 45268].)
- B. Plastic Sheeting: Plastic sheeting shall be flame-retardant polyethylene material, sized in lengths and widths to minimize the frequency of joints. Exterior applications require reinforced plastic sheeting. Plastic sheeting shall be minimum thickness of 6-mil for specific uses itemized by applicable codes and regulations. For other applications plastic sheeting shall be of adequate thickness to achieve the intended level of protection or functionality.

- C. Warning Labels: Warning labels on plastic bags and disposal containers shall include the following information:

DANGER CONTAINS
ASBESTOS FIBERS MAY
CAUSE CANCER
CAUSES DAMAGE TO LUNGS
DO NOT BREATHE DUST
AVOID CREATING DUST

- D. Warning Signs: Warning signs shall be provided and displayed at each regulated area in accordance with WAC Chapter 296-62-07721. Warning signs shall include the following information:

DANGER
ASBESTOS
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNGS
AUTHORIZED PERSONNEL ONLY

PART 3 – EXECUTION

3.01 WORK AREA PREPARATION

A. Worker Decontamination Facilities

1. Modified Worker Decontamination Enclosure System

- a. At entrances to non-isolated work areas the Contractor shall construct a personnel decontamination enclosure system or area consisting of plastic sheeting barriers with a HEPA vacuum and water source and satisfying the requirements of WAC 296-62-07712. The system shall include a remote or adjoining decontamination area.
- b. Contractor shall not begin asbestos abatement work unless this system is functional, in good repair, and has been found acceptable for specification compliance by the Environmental Consultant.

B. Access to Work Areas by Others

1. Except for emergency personnel, the Contractor shall limit access to the work area to authorized visitors.
2. The Contractor shall provide protective clothing, respirators, and equipment for all authorized visitors, as specified.
3. All authorized visitors shall be subject to the personnel protection provisions specified above and shall sign in and out on the Worksite Entry Logbook.

C. Personnel Protection during Work in Non-Isolated Work Areas

1. Work clothes per 2.01-A, and respiratory protection per 2.01-B.
2. Clothing: Workers shall wear two layers of coveralls after removal of street clothes. Worker decontamination will consist of personal decontamination in a regulated area over drop plastic sheeting with a HEPA vacuum and wet methods. The first layer of coveralls must be removed when exiting the work area.

3. Workers shall not eat, drink or chew gum at the worksite except in the established clean room. Smoking or using other tobacco products is prohibited.
4. Workers shall be fully protected with respirators and protective clothing immediately prior to the first disturbance of asbestos-containing or contaminated material and until final cleanup is completed.

D. Emergency Precautions

1. Emergency Exits: The Contractor shall establish emergency and fire exits from the work area. Contractor shall ensure these exits are well marked and remain unobstructed.
2. First Aid: The Contractor shall be prepared to administer first aid to injured personnel after decontamination. Seriously injured personnel shall be treated immediately or evacuated without delay for decontamination.
3. Fire Department: Contractor shall notify the local fire department of the asbestos abatement project prior to beginning work area preparation.
4. Contractor shall provide fire extinguishers at all abatement work areas.
5. Emergency Clean-up: Contractor to submit to the Environmental Consultant for approval, an emergency control and cleanup plan to be followed in the event of asbestos contamination during work in non-isolated work areas. Contractor shall ensure all workers are thoroughly familiar with approved plan.

E. Building Security and Protection

1. The Contractor shall post adequate warning signs at all potential entrances to work areas.
2. Building Protection: Contractor shall protect all existing fixed equipment, existing building finishes that are to remain, and existing systems and functions from damage during the abatement process. Extra precautions are to be taken in protecting existing electrical panels, light fixtures, etc. Any damage to existing building, services, and/or equipment shall be remedied by the Contractor at his expense.
3. Power Failure: Contractor shall notify Environmental Consultant and Owner immediately when a power failure occurs. Asbestos abatement work will stop, and the work area will be misted with water. If power failure exceeds 15 minutes, workers shall use appropriate personnel decontamination procedures and shall seal the work area.
4. Contractor shall maintain access and use of existing fire lanes and maintain security measures to prevent unauthorized access, theft or vandalism.

3.02 NON-ISOLATED WORK AREA PREPARATION

- A. Performance: Contractor shall perform the following procedures in the order in which they are presented for work in non-isolated work areas according to the approved work plan. Any alternative control measures considered for Class II asbestos abatement work involving the removal of ACM that is not TSI, surfacing or sheet flooring materials shall be approved by the Environmental Consultant and performed in accordance with 29 CFR 1926.1101.
1. Coordinate to ensure shut down and isolation of any HVAC equipment near work areas. Coordinate with Owner regarding all electrical, safety and other service

connections, requirements and equipment. Contractor is responsible to detect operation of systems intended to be shut down during abatement.

2. Install critical barriers at any HVAC openings, adjacent doors, windows and other openings to work areas.
3. Completely pre-clean visible accumulation of any debris in work area using HEPA vacuum equipment or wet cleaning methods.
4. Set up a modified worker decontamination enclosure system as described above. Once this system is installed and abatement commences, it shall be utilized in the specified manner for decontamination of only personnel. All personnel shall sign the Worksite Entry Logbook each time they enter or exit the work area. Work performed outdoors in excavated areas shall be performed wearing two disposable suits.
5. Cover horizontal surfaces and other objects below work area with plastic sheeting.
6. Have emergency cleanup equipment and supplies, including HEPA vacuum, amended water, disposal bags, buckets, towels and sponges, on hand prior to start of abatement work.

- B. Compliance: No asbestos abatement work shall occur unless the work area has been found acceptable for Specification compliance by the Environmental Consultant. Notifications to perform asbestos abatement and the Hazardous Materials Inspection Summary shall be posted at the work site.

3.03 ISOLATED WORK AREA PREPARATION (NEGATIVE PRESSURE ENCLOSURE)

- A. Coordinate to ensure shut down and isolation of any HVAC equipment near work areas. Contractor shall coordinate all electrical, safety and other service connections, requirements and equipment. Contractor is responsible to detect operation of systems intended to be shut down during abatement.
- B. Remove all uncontaminated removable equipment, fixtures, and supplies from the Work Area before commencing Work. Completely pre-clean and cover all unmovable furnishings or equipment with two layers of polyethylene sheeting, securely taped in place with duct tape. Such fixtures and equipment shall be considered outside the Work Area unless plastic or seal is breached. Contractor is responsible for any damage to these items while working in these areas.
- C. Install critical barriers as follows:
 1. Individually clean and seal all ventilation openings (supply and exhaust), doorways, lighting fixtures, floor drains and all other openings into the Work Area with two layers of reinforced polyethylene sheeting, taped securely in place with duct tape. Maintain seal until all Work is completed. Provide scaffolding and rigid post as necessary for proper structure integrity when negative pressure is applied.
 2. Clean and seal all lighting fixtures and HVAC diffusers with duct tape, and plastic sheeting to provide an airtight and watertight seal. Take care to avoid wrapping plastic sheeting on light fixtures, which may generate heat. Ensure that all electrical conduit connections and other electrical devices inside the Work Area that are exposed to moisture are sealed.

3. Use duct tape to seal all seams of HVAC ductwork or other system components that extend through Work Area.
 4. Completely pre-clean visible accumulation of any debris in work area using HEPA vacuum equipment or wet cleaning methods.
 5. Seal all openings through the floor at columns and piping risers with a fire-stop sealant to provide an airtight and watertight separation between the Work Area and the floor below.
 6. Seal all doorways and openings into work areas with hard rigid barriers and cover with a layer of reinforced plastic sheeting for dust controls.
- D. Construct separate Decontamination Units in compliance with EPA, OSHA, and WISHA guidelines concerning number, size and placement of airlocks, etc. Shower in worker Decontamination Unit shall open into airlock on both contaminated and uncontaminated sides. Construct Decontamination Units of appropriate materials (including black plastic sheeting). Shower in personnel Decontamination Unit shall contain both hot and cold running water. Supply sufficient shower units to comply with OSHA regulations. Post OSHA decontamination procedures in Change Room and Equipment Room for duration of Project. Water for the showers shall be plumbed from an Owner-designated source.
- E. Trap shower wastewater using filters having a maximum pore size of 5.0 microns and drain into a sanitary sewer. Replace contaminated filters when they become clogged but not less than every third day. Dispose of filters as contaminated waste.
- F. Submit the proposed route of exhaust of negative air pressure to Environmental Consultant prior to initiating its use. Place Work Area under negative air pressure utilizing negative air equipment. Allow no air movement system or air filtering equipment to discharge unfiltered air outside the Work Area. Maintain a negative pressure in the Work Area continuously (24 hours per day) from the start of removal of asbestos-containing material until the area is decontaminated and certified as such by the required air testing. Ensure that the air within the Work Area is changed at least once every 15 minutes and maintain a pressure differential of at least - 0.02 inches of water between the air within the Work Area and the air outside the Work Area. Provide manometer device with paper read-out for all full enclosure/isolation Work Areas.
- G. Notify Environmental Consultant for observation and acceptance of all critical barriers, HEPA filtration systems, and Decontamination Units before proceeding with installation of Primary Barrier.
- H. Install Primary Barrier as Follows
1. Clean all surfaces in Work Area using a HEPA filtered vacuum and by wet wiping prior to the installation of the Primary Barrier.
 2. Cover floor of Work Area with one layer of reinforced polyethylene sheeting, turned up walls at least 12 inches. Form a sharp right-angle bend at junction of floor and wall so that there is no radius that could be stepped on causing the wall attachment to be pulled loose. Use spray cement and duct tape to seal all seams in floor covering.
supported and sealed with duct tape and spray cement. Seal all joints, including the

3. Cover all walls in Work Area with one layer of polyethylene sheeting, mechanically

supported and sealed with duct tape and spray cement. Seal all joints, including the

joining with the floor, with duct tape.

4. Notify Environmental Consultant for visual review and acceptance of Work Area preparation before proceeding with installation of Secondary Barrier.

I. Install Secondary Barrier as Follows:

1. Cover floor of Work Area with a second layer of polyethylene sheeting, turned up walls at least 12 inches. Form a sharp right-angle bend at junction of floor and wall so there is no radius of sheeting that could be stepped on causing the wall attachment to be pulled loose. Locate seams at least six feet from, or at right angles to, seams in Primary Barrier layer. Use spray cement and duct tape to seal entire length of all seams in floor covering.
2. Cover all walls in Work Area with a second layer of polyethylene sheeting. Support polyethylene sheeting on wall with duct tape; seal top of Secondary Barrier to Primary Barrier with duct tape so debris cannot get behind it.
3. Install sheeting so Secondary Barrier can be removed independently of the Primary Barrier.
4. Notify Environmental Consultant for visual review and acceptance of Secondary Barrier before proceeding with any abatement activities.

- J. Maintain emergency and fire exits from the Work Areas, or establish alternative exits satisfactory to fire officials.

- K. Ensure that all barriers remain effectively sealed and taped for the duration of abatement activities and subsequent cleaning. Repair damaged barriers and remedy defects immediately upon discovery. Visually inspect enclosure at the beginning of each Work period. Repair damaged barriers and remedy defects immediately upon discovery.

3.04 REMOVAL/IMPACT OF ASBESTOS-CONTAINING MATERIALS

- A. Contractor shall remove all asbestos-containing materials as defined in these Contract Documents as necessary to accomplish the Work in accordance with procedures outlined in the Pre-Job Submittals and in accordance with all local, state, and federal regulations.
- B. Contractor shall apply spray coat of amended water to asbestos materials to be removed. Keep material damp during entire removal process. A fine mist of water shall be continuously applied to all materials being removed using mechanical methods.
- C. Immediately place asbestos-containing materials in properly labeled asbestos waste bags following removal.
- D. Contractor shall maintain a safe and uncluttered work site including staging area, work area, worker decontamination system, and waste load-out area.
- E. Contractor shall make available at all times all regulated areas for inspection by the Environmental Consultant. At no time shall access to regulated areas be restricted to any authorized personnel.

- F. Contractor shall make penetrations of/attachments to asbestos-containing materials using proper work practices and engineering controls per applicable regulations and the pre-approved Work Plan.
- G. Measurement and payment for removal of hard-mudded pipe fitting insulation will be one linear foot (LF) per single hard-mudded fitting.

3.05 SELECTIVE DEMOLITION TO ACCESS MATERIALS TO BE ABATED

- A. Perform selective demolition as required to access asbestos materials to be removed.

3.06 DISPOSAL

- A. Regulations: The Contractor shall determine current waste handling, transportation, and disposal regulations for the work site and for each waste disposal landfill. The Contractor must comply with these regulations and U.S. Department of Transportation, PSAPCA Regulation II, Article 4 and EPA requirements. Double-bagged material in sealed containers shall be delivered to the pre-designated disposal site.
- B. Waste Load-Out: Contractor shall coordinate activities to ensure that all asbestos-containing waste is properly containerized and removed from all work areas prior to the end of each work shift. Contractor shall prevent the accumulation of waste containers within work areas and shall ensure that all waste containers are stored in lockable, properly sealed storage container(s) approved by the Owner at the end of each work shift.
 - 1. Protect stored items and finishes located in areas of waste load-out and entry/egress.
 - 2. Utilize waste load-out routes and times as defined in the pre-approved Work Plan.
- C. Transport: Contractor shall remove decontaminated containers from site within ten calendar days after collection for disposal at a waste disposal site operated in accordance with the provisions of 40 CFR 61.156. Notify disposal site in advance of delivery to ensure immediate disposal. Maintain chain-of-custody until accepted by the landfill.
- D. Submit disposal receipts (or "letter of acknowledgement") and chain-of custody for waste as specified. Contractor shall make available all disposal manifests and receipts upon request from the Environmental Consultant or Owner.

END OF SECTION

Hazardous Materials Survey Report

Bainbridge Aquatic Center Renovation – Ray Williamson
Pool Building Renovation
8521 Madison Ave N
Bainbridge Island, Washington

Prepared for:

Bainbridge Island Metro Park and Recreation District
11700 NE Meadowmeer Circle NE
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April 23, 2024

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APPENDICES

APPENDIX A: PLM Bulk Sampling Information

PLM Bulk Sample Inventory

PLM Bulk Sample Laboratory Data Sheets and Chain-of-Custody Documentation

APPENDIX B: AA Lead Paint Chip Sampling Information

AA Lead Paint Chip Sample Inventory

AA Lead Paint Chip Laboratory Data Sheets and Chain-of-Custody Documentation

APPENDIX C: PCB Sampling Information

PCB Sample Inventory

PCB Laboratory Data Sheets and Chain-of-Custody Documentation

APPENDIX D: Metals in Masonry Components Sampling Information

RCRA 8 Sample Inventory

RCRA 8 Laboratory Data Sheets and Chain-of-Custody Documentation

APPENDIX E: Certification

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1 INTRODUCTION

1.1 Project Background

PBS Engineering and Environmental LLC (PBS) performed a hazardous materials survey of the Ray Williamson Pool at the Bainbridge Island Aquatic Center located in Bainbridge Island, WA in conjunction with the planned renovation of the structure. One intent of this investigation is to ensure that Bainbridge Island Metro Park and Recreation District is in compliance with applicable regulatory requirements that a "good faith inspection" for asbestos-containing materials (ACMs) be performed prior to renovation activities.

At the request of the Bainbridge Island Metro Park and Recreation District all accessible building areas associated with the project were inspected for the presence of ACMs, lead-containing paint (LCP), mercury-containing fluorescent lamps, PCB-containing materials, and metals in masonry components.

1.2 Building Description

The Ray Williamson pool is a single-story masonry building with a concrete foundation built originally as an outdoor pool in 1970. A roof structure was added to the pool in 1977. The interior consists of the pool and pool deck area, locker rooms, and offices. The interior generally consists of concrete masonry unit (CMU) and gypsum wallboard walls, 2'x4' lay-in ceiling tile, wood deck, and gypsum wallboard ceilings, and carpet, ceramic tile, epoxy, and concrete flooring. Interior windows and doors are metal framed. The exterior consists of brick walls with metal framed window and doors. Heating and cooling is provided by a forced air HVAC system with uninsulated duct work. The roof area over the offices and locker rooms is flat with a built-up roof system.

The pitched section of roof was not included in this investigation.

1.3 Survey Process

All accessible areas were inspected by AHERA Certified Building Inspector Ryan Hunter (Cert. No. IRO-24-7254B, Exp. 3/05/2025) on March 28th and April 2nd, 2024. PBS endeavored to inspect all accessible areas within our scope of work. Inaccessible areas consist of those requiring selective demolition, fall protection, or confined space entry protocols in order to gain access.

When observed, suspect asbestos materials were sampled. All samples were assigned a unique identification number and transmitted for analysis to NVL Laboratories (NVLAP #102063-0) under chain-of-custody protocols. Samples were analyzed according to EPA Method 600R-93/116 using Polarized Light Microscopy (PLM), which has a reliable limit of quantification of 1% asbestos by volume. Information regarding the type and location of sampled materials can be found on the attached PLM Sample Inventory.

Suspect ACMs may exist in inaccessible areas. PBS endeavored to determine the presence and estimate the condition of suspect materials in all inaccessible areas included in the scope of work. While PBS has endeavored to identify the ACMs that may be found in concealed locations, additional unidentified ACMs may exist which may include waterproofing membrane, internal gaskets, insulation on buried pipe mechanical systems, caulking and sealants of HVAC equipment and construction adhesives and wall mastics.

2 FINDINGS

2.1 Asbestos-Containing Materials (ACMs)

Asbestos materials are defined by 40 CFR Part 763 AHERA as containing greater than 1% asbestos content. The following materials were determined to contain greater than 1% asbestos.

- **Tank Insulation – Hot Water Tank in Basement Mechanical Room – Approx. 210 Square Feet**

- **Exposed Hard Mudded Fitting Insulation associated with non-ACM Fiberglass Straight-run Insulation – Mechanical Rooms – Approx. 45 EA**
- **Concealed Hard Mudded Fitting Insulation associated with non-ACM fiberglass Straight-run Insulation – Wall and Ceiling Cavities – Estimated 50 EA**

The following materials were sampled and found **NOT** to contain detectable concentrations of asbestos.

- Fiberglass and plaster coating in pool
- Gypsum wallboard and joint compound
- Yellow carpet mastic
- Epoxy Flooring
- White 2'x4' lay-in ceiling tiles
- White 1" ceramic tile and grout
- Orange and green ceramic tile and grout
- Grout at metal window frame and concrete flooring
- Grout at concrete wall base and concrete flooring
- Interior brick and mortar
- Exterior brick and mortar
- Mortar associated with CMU
- Caulking at wall panels in showers
- Brown interior door frame caulk
- Brown interior window frame caulk
- Black interior window putty
- Black exterior window putty
- Exterior window frame caulk at rough opening and brick
- Exterior window frame caulk at metal and wood beam
- Exterior window frame caulk at frame and metal base
- Exterior window frame caulk at frame and metal column
- Gray caulk at roof exhaust
- Black felt paper behind wood siding
- Black asphaltic material in roof drain
- Parapet roofing at flat roofs
- Roofing at lobby windows
- Built-up Roofing on flat roofs

Refer to Appendix A for a complete listing of representative bulk sampling and associated laboratory analysis.

2.2 Lead-Containing Components

A total of eight (8) representative paint coatings were sampled throughout the structure for lead content. The samples were assigned unique identification numbers and transmitted to NVL Laboratories (AIHA IH #101861) in Seattle, WA under chain-of-custody protocols for analysis using Flame Atomic Absorption. The following describes specific testing that was conducted.

One (1) of the eight (8) samples collected was found to contain lead above detectable limits.

- **Blue paint** – on metal door frame at filter room (0.014% lead)

Samples determined **NOT** to contain lead above detectable limits include:

- White paint – on gypsum wallboard wall in Tutor Office #6
- White paint – on CMU wall at Pool deck west wall

- Blue paint – on brick wall at Pool Deck south wall
- White paint – on brick wall in Lobby Room #9
- Blue paint – on metal door frame at Lobby Room #9
- White paint – on metal support of spring board
- Brown paint – on exterior metal roof flashing

Refer to Appendix B for a complete listing of paint chip sampling and associated laboratory analysis.

2.3 Mercury-Containing Components

All fluorescent light tubes are presumed to contain mercury. PBS counted the number of fluorescent tubes in the areas to be impacted for the purposes of mercury vapor recovery prior to demolition activities.

- Approximately 100 four-foot fluorescent light tubes and 50 eight-foot light tubes were identified as part of this survey.

2.4 PCB-Containing Components

PBS used a Phillips electronic ballast checker to inspect all fluorescent light fixture ballasts throughout the building. Magnetic ballasts are presumed to contain PCB's while electronic ballasts do not contain PCB's. Light fixture ballasts inspected were observed to be electronic and magnetic. Approximately two (2) magnetic ballasts were observed in the rooftop mechanical rooms. Magnetic ballasts should be presumed to contain PCBs and properly removed, stored, transported and disposed of in accordance with Washington Administrative Code (WAC) 173-303 Dangerous Waste Regulations and 40 CFR Part 761 Subpart D. PBS recommends all light ballasts be inspected prior to disposal.

Four (4) representative caulking/sealant samples were collected and analyzed for the presence of PCBs. The samples were assigned a unique identification number and transmitted to NVL Laboratories in Seattle, Washington under chain-of-custody protocols for analysis. The samples were analyzed by EPA Method 8082.

The following material was sampled and determined to contain PCBs less than 50 ppm:

- Exterior window frame caulk at rough opening and brick wall at Lobby Entrance – 1.6 ppm

The following materials were sampled for PCB content and found **NOT** to contain PCBs:

- Interior door frame caulk at pool deck at east entrance
- Exterior window frame caulk at metal column and metal frame at east elevation
- Exterior door frame caulk at rough opening and brick at east elevation

Refer to Appendix C for locations and laboratory results of PCB samples.

2.5 Metals in Masonry Components

PBS collected a representative sample of the masonry mortar and analyzed the sample for the presence of the following regulated metals: arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver. One (1) suspect masonry mortar sample was collected and delivered to Fremont Analytical for analysis by EPA Method 6020/7471 for regulated metals.

The laboratory results indicated the presence of arsenic, barium, cadmium, chromium, lead, and silver. Impact to these materials requires compliance with applicable WAC regulations including but not limited to, 296-155, which includes development and implementation of a compliance plan, exposure assessments, and waste stream characterization by the contractor prior to demolition activities.

Based on concentrations of the regulated metals found, PBS does not anticipate the masonry mortar to be considered a dangerous waste for disposal purposes. However, this does not alleviate the Contractor's requirement to characterize the actual final waste streams generated during demolition activities.

See Appendix D for sample inventory, laboratory data and chain of custody information.

3 RECOMMENDATIONS

3.1 ACMs

PBS recommends that all ACMs that may be impacted by the planned renovation be removed prior to construction activities, or impacted, only by a qualified Washington State licensed asbestos abatement contractor according to applicable local, state and federal regulations.

The possibility exist that suspect ACM may be present at concealed locations in wall and ceiling cavities, within HVAC equipment and potentially in other select concealed areas. These may include, but are not limited to waterproofing membrane, vapor barriers, internal gasketing, mastics, caulking, and sealants on HVAC equipment, construction adhesives, electrical insulators, below grade pipe covering and insulation.

In the event that suspect ACMs not included in this report are encountered during construction, contractors should stop work immediately and inform the Owner promptly for confirmation testing. All untested materials should be presumed asbestos-containing or tested for asbestos content prior to impact.

3.2 Lead-Containing Components

Detectible levels of lead were identified in representative painted coatings sampled as part of this investigation.

Impact of painted surfaces with detectable concentrations of lead requires construction activities to be performed according to Washington Labor and Industries regulations for Lead in Construction (WAC 296-62 and 296-155). Workers impacting LCP should be provided the proper personal protective equipment and use proper work methods to limit occupational and environmental exposure to lead until an initial exposure assessment has been conducted.

Painted coatings may exist in inaccessible areas of the work area or in secondary coatings. Any previously unidentified painted coatings should be considered lead containing until sampled and proven otherwise. All waste shall be handled in accordance with WAC 173-303.

3.3 Mercury-Containing Components

PBS recommends that all fluorescent lamps be carefully handled and recycled in accordance with applicable regulations prior to demolition. Breakage of lamps should be avoided to prevent potential exposures to mercury. Washington Department of Safety and Health requires specific training, handling, engineering controls and disposal practices when performing this work.

3.4 PCB-Containing Components

PBS recommends all light ballasts be inspected prior to disposal. Magnetic ballasts should be presumed to contain PCBs and properly removed, stored, transported and disposed of in accordance with Washington Administrative Code (WAC) 173-303 Dangerous Waste Regulations and 40 CFR Part 761 Subpart D. Electronic ballasts do not contain PCB's and can be disposed of as general debris in compliance with applicable codes and endpoint facility requirements.

Impact of materials containing less than 50 ppm PCBs requires construction activities to be performed in accordance with Washington Labor and Industries regulations (WAC 296-62, 296-155, and 296-841). Workers impacting PCBs should be provided the proper personal protective equipment and use proper work methods to limit occupational and environmental exposure to PCBs until an initial exposure assessment has been conducted.

3.5 Metals in Masonry Components

Representative masonry mortar from the project site was sampled and found to contain regulated metals (i.e. arsenic, barium, cadmium, chromium, lead, and silver) by laboratory analysis.

Impact of masonry mortar with detectable concentrations of regulated metals requires construction activities to be performed according to Washington Labor and Industries regulations (WAC 296-62 and 296-155). Workers impacting regulated metals should be provided the proper personal protective equipment and use proper work methods to limit occupational and environmental exposures until an initial exposure assessment has been conducted. Additionally, this may include development and implementation of a metals-compliance plan, control of wastewater discharge/capture, and waste stream characterization.

Report prepared by:

Ryan Hunter
Project Manager / AHERA Building Inspector
Cert. # IRO-24-7254B, expiration 3/05/2025

APPENDIX A

PLM Bulk Sampling Information

PLM Bulk Sample Inventory

PLM Bulk Sample Laboratory Data Sheets

PLM Bulk Sample Chain-of-Custody Documentation

Bainbridge Aquatic Center Renovation - Ray Williamson Pool
Bainbridge Island Metro Park and Recreation District

PBS Engineering + Environmental
PBS Project #41924.000

PLM ASBESTOS SAMPLE INVENTORY

<u>PBS Sample</u>	<u>Material Type</u>	<u>Sample Location</u>	<u>Lab Description</u>	<u>Lab Result</u>	<u>Lab</u>
41924.000-001	Fiberglass Coating	Pool Wall Deep End East	Layer 1: White brittle fibrous material with white coating material	NAD	NVL
	Plaster		Layer 2: White brittle tile	NAD	
			Layer 3: Gray cementitious material	NAD	
41924.000-002	Fiberglass Coating	Pool Wall Deep End South	Layer 1: White brittle fibrous material with white coating material	NAD	NVL
	Plaster		Layer 2: White brittle tile	NAD	
			Layer 3: Gray cementitious material	NAD	
41924.000-003	Fiberglass Coating	Pool Wall Shallow End West	Layer 1: White brittle fibrous material with white coating material	NAD	NVL
	Plaster		Layer 2: White brittle tile	NAD	
			Layer 3: Gray cementitious material	NAD	
41924.000-004	Fiberglass Coating	Pool Wall Shallow End North	Layer 1: White brittle fibrous material with white coating material	NAD	NVL
	Plaster		Layer 2: White brittle tile	NAD	
			Layer 3: Gray cementitious material	NAD	
41924.000-005	Fiberglass Coating	Pool Cove North	Layer 1: White brittle fibrous material with white coating material	NAD	NVL
	Plaster		Layer 2: White brittle tile	NAD	
			Layer 3: Gray cementitious material	NAD	
41924.000-006	Fiberglass Coating	Pool Cove South	Layer 1: White brittle fibrous material with white coating material	NAD	NVL
	Plaster		Layer 2: White brittle tile	NAD	
			Layer 3: Gray cementitious material	NAD	
41924.000-007	Fiberglass Coating	Pool Deep End Floor	Layer 1: White brittle fibrous material with white coating material	NAD	NVL
	Plaster		Layer 2: White brittle tile	NAD	
			Layer 3: Gray cementitious material	NAD	

Bainbridge Aquatic Center Renovation - Ray Williamson Pool
Bainbridge Island Metro Park and Recreation District

PBS Engineering + Environmental
PBS Project #41924.000

PLM ASBESTOS SAMPLE INVENTORY

<u>PBS Sample</u>	<u>Material Type</u>	<u>Sample Location</u>	<u>Lab Description</u>	<u>Lab Result</u>	<u>Lab</u>
41924.000-008	Fiberglass Coating	Pool Shallow End Floor	Layer 1: White brittle fibrous material with white coating material	NAD	NVL
	Plaster		Layer 2: White brittle tile	NAD	
			Layer 3: Gray cementitious material	NAD	
41924.000-009	Joint compound	Northeast Storage	Layer 1: Off-white compacted powdery material with paint	NAD	NVL
	Gypsum wallboard		Layer 2: Beige chalky material with paper	NAD	
41924.000-010	Joint compound	Filter Room	Layer 1: White compacted powdery material with paint	NAD	NVL
	Gypsum wallboard		Layer 2: White chalky material with paper	NAD	
41924.000-011	Joint compound	Boy's Locker Room Ceiling	Layer 1: White compacted powdery material with paint	NAD	NVL
	Gypsum wallboard		Layer 2: Beige chalky material with paper	NAD	
41924.000-012	Yellow carpet mastic	Lobby	Layer 1: Yellow brittle mastic	NAD	NVL
41924.000-013	Epoxy floor	Stairs to Boy's Locker Room	Layer 1: Brown-red thin brittle material with paint	NAD	NVL
41924.000-014	Epoxy floor	Girl's Locker Room	Layer 1: Brown-red thin brittle material with paint	NAD	NVL
41924.000-015	White 2' x 4' lay-in ceiling tile	Pool Area	Layer 1: Off-white fibrous material with white paint	NAD	NVL
41924.000-016	White 1" ceramic tile	Pool Deck at Pool Edge	Layer 1: White ceramic tile	NAD	NVL
	Grout		Layer 2: White brittle material	NAD	
			Layer 3: Red crumbly material	NAD	
41924.000-017	Orange ceramic tile	Boy's Locker Room Wall	Layer 1: Orange brittle tile material	NAD	NVL
41924.000-018	Green ceramic tile	Girl's Locker Room Wall	Layer 1: Green brittle tile material	NAD	NVL
	Grout		Layer 2: Gray cementitious material	NAD	
41924.000-019	Grout at window frame and concrete	Pool Deck East Interior	Layer 1: Gray cementitious material	NAD	NVL
41924.000-020	Grout at Concrete wall base and slab	Pool Deck East Interior	Layer 1: Gray cementitious material with debris	NAD	NVL
41924.000-021	Red brick	Boy's Locker Room Wall	Layer 1: Brown-red brittle tile	NAD	NVL
	Mortar		Layer 2: Gray cementitious material	NAD	

Bainbridge Aquatic Center Renovation - Ray Williamson Pool
Bainbridge Island Metro Park and Recreation District

PBS Engineering + Environmental
PBS Project #41924.000

PLM ASBESTOS SAMPLE INVENTORY

<u>PBS Sample</u>	<u>Material Type</u>	<u>Sample Location</u>	<u>Lab Description</u>	<u>Lab Result</u>	<u>Lab</u>
41924.000-022	Mortar associated with CMU	Boy's Locker Room Wall	Layer 1: White brittle material with paint	NAD	NVL
41924.000-023	Wall panel caulking	Boy's Locker Room Shower Wall	Layer 1: White hard rubbery material	NAD	NVL
41924.000-024	Hard mudded pipe fitting	Mechanical Basement	Layer 1: White flaky fibrous material with white interwoven fibrous material and paint	3% Amosite	NVL
41924.000-025	Hard mudded pipe fitting	Mechanical Basement	Layer 1: White flaky fibrous material	2% Amosite	NVL
41924.000-026	Hard mudded pipe fitting	Filter Room	Layer 1: White flaky fibrous material	2% Amosite	NVL
41924.000-027	Tank insulation	Mechanical Basement	Layer 1: White flaky fibrous material with white fibrous mesh and paint	2% Amosite	NVL
41924.000-028	Tank insulation	Mechanical Basement	Layer 1: White flaky fibrous material with white fibrous mesh and paint	3% Amosite	NVL
41924.000-029	Tank insulation	Mechanical Basement	Layer 1: White flaky fibrous material with white fibrous mesh and paint	2% Amosite	NVL
41924.000-030	Brown interior door frame caulk	Lobby	Layer 1: Black soft sticky material with paint	NAD	NVL
41924.000-031	Brown interior door frame caulk	Pool Deck East Interior	Layer 1: Black soft sticky material with paint	NAD	NVL
41924.000-032	Brown interior door frame caulk	Pool Deck West Interior	Layer 1: Black soft elastic material	NAD	NVL
41924.000-033	Brown interior door frame caulk	Filter Room to Pool	Layer 1: Black soft elastic material	NAD	NVL
41924.000-034	Brown interior window frame caulk	Lobby	Layer 1: Black soft crumbly material	NAD	NVL
41924.000-035	Brown interior window frame caulk	Pool Deck West Interior	Layer 1: Black soft rubbery material	NAD	NVL
41924.000-036	Black interior window putty	Lobby Clerestory Windows	Layer 1: Black sticky material	NAD	NVL
41924.000-037	Exterior brick Mortar	East Elevation	Layer 1: Brown hard brittle material Layer 2: Gray sandy material with debris	NAD NAD	NVL

Bainbridge Aquatic Center Renovation - Ray Williamson Pool
Bainbridge Island Metro Park and Recreation District

PBS Engineering + Environmental
PBS Project #41924.000

PLM ASBESTOS SAMPLE INVENTORY

<u>PBS Sample</u>	<u>Material Type</u>	<u>Sample Location</u>	<u>Lab Description</u>	<u>Lab Result</u>	<u>Lab</u>
41924.000-038	Black exterior window putty patch	Roof Pool Windows	Layer 1: Black soft material with debris	NAD	NVL
41924.000-039	Black exterior window putty	Roof Pool Windows	Layer 1: Black soft/elastic material with debris	NAD	NVL
41924.000-040	Exterior window frame caulk at rough opening and brick	East Elevation North	Layer 1: Dark gray brittle material with debris	NAD	NVL
41924.000-041	Exterior window frame caulk at metal and wood beam	East Elevation Central	Layer 1: Gray soft material with debris	NAD	NVL
41924.000-042	Exterior window frame caulk at frame and metal base	East Elevation	Layer 1: Black soft/elastic material with debris	NAD	NVL
41924.000-043	Exterior window frame caulk at rough opening and brick	East Elevation South Side	Layer 1: Gray brittle material with debris	NAD	NVL
41924.000-044	Exterior window frame caulk at metal column and frame	South Elevation	Layer 1: Dark gray soft material with debris Layer 2: Clear soft/elastic material with debris	NAD NAD	NVL
41924.000-045	Exterior window frame caulk at metal and brick	South Elevation	Layer 1: Dark gray soft material with debris	NAD	NVL
41924.000-046	Exterior window frame caulk at frame and wood siding	Pool Roof Windows	Layer 1: Brown soft/elastic material with paint & debris Layer 2: Black thin brittle material with debris	NAD NAD	NVL
41924.000-047	Exterior window frame caulk at wood frame and metal	Roof Lobby Windows	Layer 1: Brown soft material with debris	NAD	NVL
41924.000-048	Gray caulk at roof exhaust	Roof East Side	Layer 1: Gray soft material with paint & debris	NAD	NVL
41924.000-049	Exterior window frame caulk at rough opening and brick	East Elevation	Layer 1: Black brittle material with debris	NAD	NVL
41924.000-050	Exterior window frame caulk at rough opening and brick	South Elevation	Layer 1: Black brittle material with debris	NAD	NVL
41924.000-051	Black felt paper behind wood siding	Roof Mech Room East	Layer 1: Brown asphaltic fibrous material	NAD	NVL

April 23, 2024

NAD - No Asbestos Detected

4 of 5

Bainbridge Aquatic Center Renovation - Ray Williamson Pool
Bainbridge Island Metro Park and Recreation District

PBS Engineering + Environmental
PBS Project #41924.000

PLM ASBESTOS SAMPLE INVENTORY

<u>PBS Sample</u>	<u>Material Type</u>	<u>Sample Location</u>	<u>Lab Description</u>	<u>Lab Result</u>	<u>Lab</u>
41924.000-052	Black felt paper behind wood siding	Roof Mech Room West	Layer 1: Brown asphaltic fibrous material	NAD	NVL
41924.000-053	Black asphaltic material in roof drain	Roof Center Drain	Layer 1: Black asphaltic material with debris Layer 2: Black asphaltic fibrous built-up material with debris	NAD NAD	NVL
41924.000-054	Parapet roofing	West Side	Layer 1: Silver paint with debris Layer 2: Multi-layered black asphaltic material with debris	NAD NAD	NVL
41924.000-055	Roofing at lobby windows	Roof South Windows	Layer 1: Silver paint with debris Layer 2: Black asphaltic fibrous built-up material with debris Layer 3: Black thin crumbly material (on wood) with debris Layer 4: Tan compressed fibrous material	NAD NAD NAD NAD	NVL
41924.000-056	Built-up roofing	Office Roof West Side	Layer 1: Silver paint Layer 2: Black asphaltic fibrous built-up material Layer 3: Multi-layered black asphaltic material Layer 4: Tan foamy material Layer 5: Multi-layered black asphaltic material	NAD NAD NAD NAD NAD	NVL
41924.000-057	Built-up roofing	Office Roof East Side	Layer 1: Silver paint Layer 3: Tan foamy material Layer 4: Multi-layered black asphaltic material	NAD NAD NAD	NVL

April 2, 2024



Ryan Hunter
PBS Environmental - Seattle
214 E Galer St. Suite. 300
Seattle, WA 98102

RE: Bulk Asbestos Fiber Analysis; NVL Batch # 2405662.00

Client Project: 41924.000

Location: Bainbridge Aquatic Center Renovation - Ray Williamson

Dear Mr. Hunter,

Enclosed please find test results for the 36 sample(s) submitted to our laboratory for analysis on 4/1/2024.

Examination of these samples was conducted for the presence of identifiable asbestos fibers using polarized light microscopy (PLM) with dispersion staining in accordance with **U. S. EPA 40 CFR Appendix E to Subpart E of Part 763**, Interim Method for the Determination of Asbestos in Bulk Insulation Samples and **EPA 600/R-93/116**, Method for the Determination of Asbestos in Bulk Building Materials.

For samples containing more than one separable layer of materials, the report will include findings for each layer (labeled Layer 1 and Layer 2, etc. for each individual layer). The asbestos concentration in the sample is determined by calibrated visual estimation.

For those samples with asbestos concentrations between 1 and 10 percent based on visual estimation, the EPA recommends a procedure known as point counting (NESHAPS, 40 CFR Part 61). Point counting is a statistically more accurate means of quantification for samples with low concentrations of asbestos.

The detection limit for the calibrated visual estimation is <1%, 400 point counts is 0.25% and 1000 point counts is 0.1%

Samples are archived for two weeks following analysis. Samples that are not retrieved by the client are discarded after two weeks.

Thank you for using our laboratory services. Please do not hesitate to call if there is anything further we can assist you with.

Sincerely,

A handwritten signature in black ink that reads 'Kunga Woser'.

Kunga Woser, Supervisor Asbestos Laboratory

The logo for NVLAP (National Voluntary Laboratory Accreditation Program). It features the letters 'NVLAP' in a large, stylized, outlined font. Below the letters, the word 'Testing' is written in a smaller, sans-serif font.

Testing

Lab Code: 102063-0

Enc.: Sample Results

Phone: 206 547.0100 | Fax: 206 634.1936 | Toll Free: 1.888.NVL.LABS (685.5227)
4708 Aurora Avenue North | Seattle, WA 98103-6516



Bulk Asbestos Fibers Analysis

By Polarized Light Microscopy

Client: PBS Environmental - Seattle

Address: 214 E Galer St. Suite. 300
Seattle, WA 98102

Batch #: 2405662.00

Client Project #: 41924.000

Date Received: 4/1/2024

Samples Received: 36

Samples Analyzed: 36

Method: EPA/600/R-93/116

Attention: Mr. Ryan Hunter

Project Location: Bainbridge Aquatic Center Renovation - Ray Williamson

Lab ID: 24034909 Client Sample #: 41924.000-001

Location: Bainbridge Aquatic Center Renovation - Ray Williamson

Layer 1 of 3	Description: White brittle fibrous material with white coating material	Non-Fibrous Materials:	Other Fibrous Materials: %	Asbestos Type: % None Detected ND
		Binder/Filler, Fine particles, Paint	Glass fibers 32%	
Layer 2 of 3	Description: White brittle tile	Non-Fibrous Materials:	Other Fibrous Materials: %	Asbestos Type: % None Detected ND
		Binder/Filler, Mineral grains, Fine particles	None Detected ND	
Layer 3 of 3	Description: Gray cementitious material	Non-Fibrous Materials:	Other Fibrous Materials: %	Asbestos Type: % None Detected ND
		Cement/Binder, Fine grains, Cementitious particles	None Detected ND	

Lab ID: 24034910 Client Sample #: 41924.000-002

Location: Bainbridge Aquatic Center Renovation - Ray Williamson

Layer 1 of 3	Description: White brittle fibrous material with white coating material	Non-Fibrous Materials:	Other Fibrous Materials: %	Asbestos Type: % None Detected ND
		Binder/Filler, Fine particles, Paint	Glass fibers 36%	
Layer 2 of 3	Description: White brittle tile	Non-Fibrous Materials:	Other Fibrous Materials: %	Asbestos Type: % None Detected ND
		Binder/Filler, Mineral grains, Fine particles	None Detected ND	
Layer 3 of 3	Description: Gray cementitious material	Non-Fibrous Materials:	Other Fibrous Materials: %	Asbestos Type: % None Detected ND
		Cement/Binder, Fine grains, Cementitious particles	None Detected ND	

Lab ID: 24034911 Client Sample #: 41924.000-003

Location: Bainbridge Aquatic Center Renovation - Ray Williamson

Sampled by: Client

Analyzed by: Akane Yoshikawa

Reviewed by: Kunga Woser

Date: 04/02/2024

Date: 04/02/2024

Kunga Woser, Supervisor Asbestos Laboratory

Kunga Woser

Note: If samples are not homogeneous, then subsamples of the components were analyzed separately. All bulk samples are analyzed using both EPA 600/R-93/116 and EPA 40 CFR Appendix E to Subpart E of Part 763 with the following measurement uncertainties for the reported % Asbestos (1%=0-3%, 5%=1-9%, 10%=5-15%, 20%=10-30%, 50%=40-60%). This report relates only to the items tested. If sample was not collected by NVL personnel, then the accuracy of the results is limited by the methodology and acuity of the sample collector. This report shall not be reproduced except in full, without written approval of NVL Laboratories, Inc. It shall not be used to claim product endorsement by NVLAP or any other agency of the US Government



Bulk Asbestos Fibers Analysis

By Polarized Light Microscopy

Client: PBS Environmental - Seattle

Address: 214 E Galer St. Suite. 300
Seattle, WA 98102

Batch #: 2405662.00

Client Project #: 41924.000

Date Received: 4/1/2024

Samples Received: 36

Samples Analyzed: 36

Method: EPA/600/R-93/116

Attention: Mr. Ryan Hunter

Project Location: Bainbridge Aquatic Center Renovation - Ray Williamson

Layer 1 of 3	Description: White brittle fibrous material with white coating material	Non-Fibrous Materials:	Other Fibrous Materials:%	Asbestos Type: %
		Binder/Filler, Fine particles, Paint	Glass fibers 42%	
Layer 2 of 3	Description: White brittle tile	Non-Fibrous Materials:	Other Fibrous Materials:%	Asbestos Type: %
		Binder/Filler, Mineral grains, Fine particles	None Detected ND	
Layer 3 of 3	Description: Gray cementitious material	Non-Fibrous Materials:	Other Fibrous Materials:%	Asbestos Type: %
		Cement/Binder, Fine grains, Cementitious particles	None Detected ND	

Lab ID: 24034912 Client Sample #: 41924.000-004

Location: Bainbridge Aquatic Center Renovation - Ray Williamson

Layer 1 of 3	Description: White brittle fibrous material with white coating material	Non-Fibrous Materials:	Other Fibrous Materials:%	Asbestos Type: %
		Binder/Filler, Fine particles, Paint	Glass fibers 37%	
Layer 2 of 3	Description: White brittle tile	Non-Fibrous Materials:	Other Fibrous Materials:%	Asbestos Type: %
		Binder/Filler, Mineral grains, Fine particles	None Detected ND	
Layer 3 of 3	Description: Gray cementitious material	Non-Fibrous Materials:	Other Fibrous Materials:%	Asbestos Type: %
		Cement/Binder, Fine grains, Cementitious particles	None Detected ND	

Lab ID: 24034913 Client Sample #: 41924.000-005

Location: Bainbridge Aquatic Center Renovation - Ray Williamson

Layer 1 of 3	Description: White brittle fibrous material with white coating material	Non-Fibrous Materials:	Other Fibrous Materials:%	Asbestos Type: %
		Binder/Filler, Fine particles, Paint	Glass fibers 44%	

Sampled by: Client

Analyzed by: Akane Yoshikawa

Reviewed by: Kunga Woser

Date: 04/02/2024

Date: 04/02/2024

Kunga Woser, Supervisor Asbestos Laboratory

Kunga Woser

Note: If samples are not homogeneous, then subsamples of the components were analyzed separately. All bulk samples are analyzed using both EPA 600/R-93/116 and EPA 40 CFR Appendix E to Subpart E of Part 763 with the following measurement uncertainties for the reported % Asbestos (1%=0-3%, 5%=1-9%, 10%=5-15%, 20%=10-30%, 50%=40-60%). This report relates only to the items tested. If sample was not collected by NVL personnel, then the accuracy of the results is limited by the methodology and acuity of the sample collector. This report shall not be reproduced except in full, without written approval of NVL Laboratories, Inc. It shall not be used to claim product endorsement by NVLAP or any other agency of the US Government



Bulk Asbestos Fibers Analysis

By Polarized Light Microscopy

Client: PBS Environmental - Seattle
Address: 214 E Galer St. Suite. 300
Seattle, WA 98102

Batch #: 2405662.00

Client Project #: 41924.000

Date Received: 4/1/2024

Samples Received: 36

Samples Analyzed: 36

Method: EPA/600/R-93/116

Attention: Mr. Ryan Hunter

Project Location: Bainbridge Aquatic Center Renovation - Ray Williamson

Layer 2 of 3	Description: White brittle tile	Non-Fibrous Materials:	Other Fibrous Materials:%	Asbestos Type: % None Detected ND
		Binder/Filler, Mineral grains, Fine particles	None Detected ND	
Layer 3 of 3	Description: Gray cementitious material	Non-Fibrous Materials:	Other Fibrous Materials:%	Asbestos Type: % None Detected ND
		Cement/Binder, Fine grains, Cementitious particles	None Detected ND	

Lab ID: 24034914 **Client Sample #: 41924.000-006**

Location: Bainbridge Aquatic Center Renovation - Ray Williamson

Layer 1 of 3	Description: White brittle fibrous material with white coating material	Non-Fibrous Materials:	Other Fibrous Materials:%	Asbestos Type: % None Detected ND
		Binder/Filler, Fine particles, Paint	Glass fibers 46%	
Layer 2 of 3	Description: White brittle tile	Non-Fibrous Materials:	Other Fibrous Materials:%	Asbestos Type: % None Detected ND
		Binder/Filler, Mineral grains, Fine particles	None Detected ND	
Layer 3 of 3	Description: Gray cementitious material	Non-Fibrous Materials:	Other Fibrous Materials:%	Asbestos Type: % None Detected ND
		Cement/Binder, Fine grains, Cementitious particles	None Detected ND	

Lab ID: 24034915 **Client Sample #: 41924.000-007**

Location: Bainbridge Aquatic Center Renovation - Ray Williamson

Layer 1 of 3	Description: White brittle fibrous material with white coating material	Non-Fibrous Materials:	Other Fibrous Materials:%	Asbestos Type: % None Detected ND
		Binder/Filler, Fine particles, Paint	Glass fibers 41%	
Layer 2 of 3	Description: White brittle tile	Non-Fibrous Materials:	Other Fibrous Materials:%	Asbestos Type: % None Detected ND
		Binder/Filler, Mineral grains, Fine particles	None Detected ND	

Sampled by: Client

Analyzed by: Akane Yoshikawa

Reviewed by: Kunga Woser

Date: 04/02/2024

Date: 04/02/2024

Kunga Woser, Supervisor Asbestos Laboratory

Kunga Woser

Note: If samples are not homogeneous, then subsamples of the components were analyzed separately. All bulk samples are analyzed using both EPA 600/R-93/116 and EPA 40 CFR Appendix E to Subpart E of Part 763 with the following measurement uncertainties for the reported % Asbestos (1%=0-3%, 5%=1-9%, 10%=5-15%, 20%=10-30%, 50%=40-60%). This report relates only to the items tested. If sample was not collected by NVL personnel, then the accuracy of the results is limited by the methodology and acuity of the sample collector. This report shall not be reproduced except in full, without written approval of NVL Laboratories, Inc. It shall not be used to claim product endorsement by NVLAP or any other agency of the US Government



Bulk Asbestos Fibers Analysis

By Polarized Light Microscopy

Client: PBS Environmental - Seattle
Address: 214 E Galer St. Suite. 300
Seattle, WA 98102

Batch #: 2405662.00

Client Project #: 41924.000

Date Received: 4/1/2024

Samples Received: 36

Samples Analyzed: 36

Method: EPA/600/R-93/116

Attention: Mr. Ryan Hunter

Project Location: Bainbridge Aquatic Center Renovation - Ray Williamson

Layer 3 of 3	Description: Gray cementitious material			
	Non-Fibrous Materials:	Other Fibrous Materials:%		Asbestos Type: %
	Cement/Binder, Fine grains, Cementitious particles	None Detected ND		None Detected ND

Lab ID: 24034916 **Client Sample #: 41924.000-008**

Location: Bainbridge Aquatic Center Renovation - Ray Williamson

Layer 1 of 3	Description: White brittle fibrous material with white coating material			
	Non-Fibrous Materials:	Other Fibrous Materials:%		Asbestos Type: %
	Binder/Filler, Fine particles, Paint	Glass fibers 41%		None Detected ND

Layer 2 of 3	Description: White brittle tile			
	Non-Fibrous Materials:	Other Fibrous Materials:%		Asbestos Type: %
	Binder/Filler, Mineral grains, Fine particles	None Detected ND		None Detected ND

Layer 3 of 3	Description: Gray cementitious material			
	Non-Fibrous Materials:	Other Fibrous Materials:%		Asbestos Type: %
	Cement/Binder, Fine grains, Cementitious particles	None Detected ND		None Detected ND

Lab ID: 24034917 **Client Sample #: 41924.000-009**

Location: Bainbridge Aquatic Center Renovation - Ray Williamson

Layer 1 of 2	Description: Off-white compacted powdery material with paint			
	Non-Fibrous Materials:	Other Fibrous Materials:%		Asbestos Type: %
	Binder/Filler, Fine grains, Fine particles	Cellulose 3%		None Detected ND
	Paint			

Layer 2 of 2	Description: Beige chalky material with paper			
	Non-Fibrous Materials:	Other Fibrous Materials:%		Asbestos Type: %
	Gypsum/Binder, Fine grains, Calcareous particles	Cellulose 18%		None Detected ND

Lab ID: 24034918 **Client Sample #: 41924.000-010**

Location: Bainbridge Aquatic Center Renovation - Ray Williamson

Sampled by: Client

Analyzed by: Akane Yoshikawa

Date: 04/02/2024

Kunga Woser

Reviewed by: Kunga Woser

Date: 04/02/2024

Kunga Woser, Supervisor Asbestos Laboratory

Note: If samples are not homogeneous, then subsamples of the components were analyzed separately. All bulk samples are analyzed using both EPA 600/R-93/116 and EPA 40 CFR Appendix E to Subpart E of Part 763 with the following measurement uncertainties for the reported % Asbestos (1%=0-3%, 5%=1-9%, 10%=5-15%, 20%=10-30%, 50%=40-60%). This report relates only to the items tested. If sample was not collected by NVL personnel, then the accuracy of the results is limited by the methodology and acuity of the sample collector. This report shall not be reproduced except in full, without written approval of NVL Laboratories, Inc. It shall not be used to claim product endorsement by NVLAP or any other agency of the US Government



Bulk Asbestos Fibers Analysis

By Polarized Light Microscopy

Client: PBS Environmental - Seattle
Address: 214 E Galer St. Suite. 300
Seattle, WA 98102

Batch #: 2405662.00

Client Project #: 41924.000

Date Received: 4/1/2024

Samples Received: 36

Samples Analyzed: 36

Method: EPA/600/R-93/116

Attention: Mr. Ryan Hunter

Project Location: Bainbridge Aquatic Center Renovation - Ray Williamson

Layer 1 of 2	Description: White compacted powdery material with paint			
		Non-Fibrous Materials:	Other Fibrous Materials:%	Asbestos Type: %
		Binder/Filler, Fine grains, Fine particles	None Detected ND	None Detected ND
		Paint		
Layer 2 of 2	Description: White chalky material with paper	Non-Fibrous Materials:	Other Fibrous Materials:%	Asbestos Type: %
		Gypsum/Binder, Fine grains, Calcareous particles	Cellulose 16%	None Detected ND
			Glass fibers 4%	

Lab ID: 24034919 **Client Sample #: 41924.000-011**

Location: Bainbridge Aquatic Center Renovation - Ray Williamson

Layer 1 of 2	Description: White compacted powdery material with paint			
		Non-Fibrous Materials:	Other Fibrous Materials:%	Asbestos Type: %
		Binder/Filler, Fine grains, Fine particles	Cellulose 2%	None Detected ND
		Paint		
Layer 2 of 2	Description: Beige chalky material with paper	Non-Fibrous Materials:	Other Fibrous Materials:%	Asbestos Type: %
		Gypsum/Binder, Fine grains, Calcareous particles	Cellulose 15%	None Detected ND
			Glass fibers 3%	

Lab ID: 24034920 **Client Sample #: 41924.000-012**

Location: Bainbridge Aquatic Center Renovation - Ray Williamson

Layer 1 of 1	Description: Yellow brittle mastic			
		Non-Fibrous Materials:	Other Fibrous Materials:%	Asbestos Type: %
		Mastic, Fine particles	None Detected ND	None Detected ND

Sampled by: Client

Analyzed by: Akane Yoshikawa

Reviewed by: Kunga Woser

Date: 04/02/2024

Date: 04/02/2024

Kunga Woser, Supervisor Asbestos Laboratory

Kunga Woser

Note: If samples are not homogeneous, then subsamples of the components were analyzed separately. All bulk samples are analyzed using both EPA 600/R-93/116 and EPA 40 CFR Appendix E to Subpart E of Part 763 with the following measurement uncertainties for the reported % Asbestos (1%=0-3%, 5%=1-9%, 10%=5-15%, 20%=10-30%, 50%=40-60%). This report relates only to the items tested. If sample was not collected by NVL personnel, then the accuracy of the results is limited by the methodology and acuity of the sample collector. This report shall not be reproduced except in full, without written approval of NVL Laboratories, Inc. It shall not be used to claim product endorsement by NVLAP or any other agency of the US Government



Bulk Asbestos Fibers Analysis

By Polarized Light Microscopy

Client: PBS Environmental - Seattle

Address: 214 E Galer St. Suite. 300
Seattle, WA 98102

Batch #: 2405662.00

Client Project #: 41924.000

Date Received: 4/1/2024

Samples Received: 36

Samples Analyzed: 36

Method: EPA/600/R-93/116

Attention: Mr. Ryan Hunter

Project Location: Bainbridge Aquatic Center Renovation - Ray Williamson

Lab ID: 24034921 Client Sample #: 41924.000-013

Location: Bainbridge Aquatic Center Renovation - Ray Williamson

Layer 1 of 1 Description: Brown-red thin brittle material with paint

Non-Fibrous Materials:	Other Fibrous Materials: %
Binder/Filler, Fine particles, Paint	None Detected ND

Asbestos Type: %
None Detected ND

Lab ID: 24034922 Client Sample #: 41924.000-014

Location: Bainbridge Aquatic Center Renovation - Ray Williamson

Layer 1 of 1 Description: Brown-red thin brittle material with paint

Non-Fibrous Materials:	Other Fibrous Materials: %
Binder/Filler, Fine particles, Paint	None Detected ND

Asbestos Type: %
None Detected ND

Lab ID: 24034923 Client Sample #: 41924.000-015

Location: Bainbridge Aquatic Center Renovation - Ray Williamson

Layer 1 of 1 Description: Off-white fibrous material with white paint

Non-Fibrous Materials:	Other Fibrous Materials: %
Binder/Filler, Perlite, Fine particles	Cellulose 38%
Paint	

Asbestos Type: %
None Detected ND

Lab ID: 24034924 Client Sample #: 41924.000-016

Location: Bainbridge Aquatic Center Renovation - Ray Williamson

Layer 1 of 3 Description: White ceramic tile

Non-Fibrous Materials:	Other Fibrous Materials: %
Ceramic/Binder, Fine particles	None Detected ND

Asbestos Type: %
None Detected ND

Layer 2 of 3 Description: White brittle material

Non-Fibrous Materials:	Other Fibrous Materials: %
Binder/Filler, Fine grains, Fine particles	None Detected ND

Asbestos Type: %
None Detected ND

Sampled by: Client

Analyzed by: Akane Yoshikawa

Reviewed by: Kunga Woser

Date: 04/02/2024

Date: 04/02/2024

Kunga Woser, Supervisor Asbestos Laboratory

Kunga Woser

Note: If samples are not homogeneous, then subsamples of the components were analyzed separately. All bulk samples are analyzed using both EPA 600/R-93/116 and EPA 40 CFR Appendix E to Subpart E of Part 763 with the following measurement uncertainties for the reported % Asbestos (1%=0-3%, 5%=1-9%, 10%=5-15%, 20%=10-30%, 50%=40-60%). This report relates only to the items tested. If sample was not collected by NVL personnel, then the accuracy of the results is limited by the methodology and acuity of the sample collector. This report shall not be reproduced except in full, without written approval of NVL Laboratories, Inc. It shall not be used to claim product endorsement by NVLAP or any other agency of the US Government



Bulk Asbestos Fibers Analysis

By Polarized Light Microscopy

Client: PBS Environmental - Seattle
Address: 214 E Galer St. Suite. 300
Seattle, WA 98102

Batch #: 2405662.00

Client Project #: 41924.000

Date Received: 4/1/2024

Samples Received: 36

Samples Analyzed: 36

Method: EPA/600/R-93/116

Attention: Mr. Ryan Hunter

Project Location: Bainbridge Aquatic Center Renovation - Ray Williamson

Layer 3 of 3	Description: Red crumbly material			
	Non-Fibrous Materials:	Other Fibrous Materials: %		Asbestos Type: %
	Binder/Filler, Fine particles, Paint/Binder	None Detected ND		None Detected ND

Lab ID: 24034925 **Client Sample #: 41924.000-017**

Location: Bainbridge Aquatic Center Renovation - Ray Williamson

Layer 1 of 1	Description: Orange brittle tile material			
	Non-Fibrous Materials:	Other Fibrous Materials: %		Asbestos Type: %
	Binder/Filler, Mineral grains, Fine particles	None Detected ND		None Detected ND

Lab ID: 24034926 **Client Sample #: 41924.000-018**

Location: Bainbridge Aquatic Center Renovation - Ray Williamson

Layer 1 of 2	Description: Green brittle tile material			
	Non-Fibrous Materials:	Other Fibrous Materials: %		Asbestos Type: %
	Binder/Filler, Mineral grains, Fine particles	None Detected ND		None Detected ND

Layer 2 of 2	Description: Gray cementitious material			
	Non-Fibrous Materials:	Other Fibrous Materials: %		Asbestos Type: %
	Cement/Binder, Fine grains, Cementitious particles	None Detected ND		None Detected ND

Lab ID: 24034927 **Client Sample #: 41924.000-019**

Location: Bainbridge Aquatic Center Renovation - Ray Williamson

Layer 1 of 1	Description: Gray cementitious material			
	Non-Fibrous Materials:	Other Fibrous Materials: %		Asbestos Type: %
	Cement/Binder, Fine grains, Cementitious particles	None Detected ND		None Detected ND

Lab ID: 24034928 **Client Sample #: 41924.000-020**

Location: Bainbridge Aquatic Center Renovation - Ray Williamson

Sampled by: Client

Analyzed by: Akane Yoshikawa

Reviewed by: Kunga Woser

Date: 04/02/2024

Date: 04/02/2024

Kunga Woser, Supervisor Asbestos Laboratory

Kunga Woser

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Bulk Asbestos Fibers Analysis

By Polarized Light Microscopy

Client: PBS Environmental - Seattle

Address: 214 E Galer St. Suite. 300
Seattle, WA 98102

Attention: Mr. Ryan Hunter

Project Location: Bainbridge Aquatic Center Renovation - Ray Williamson

Batch #: 2405662.00

Client Project #: 41924.000

Date Received: 4/1/2024

Samples Received: 36

Samples Analyzed: 36

Method: EPA/600/R-93/116

Layer 1 of 1	Description: Gray cementitious material with debris			
	Non-Fibrous Materials:	Other Fibrous Materials:%		Asbestos Type: %
	Cement/Binder, Fine grains, Cementitious particles	None Detected	ND	None Detected ND
	Debris			

Lab ID: 24034929 **Client Sample #: 41924.000-021**
Location: Bainbridge Aquatic Center Renovation - Ray Williamson

Layer 1 of 2	Description: Brown-red brittle tile			
	Non-Fibrous Materials:	Other Fibrous Materials:%		Asbestos Type: %
	Binder/Filler, Mineral grains, Fine grains	None Detected	ND	None Detected ND

Layer 2 of 2	Description: Gray cementitious material			
	Non-Fibrous Materials:	Other Fibrous Materials:%		Asbestos Type: %
	Cement/Binder, Fine grains, Cementitious particles	None Detected	ND	None Detected ND

Lab ID: 24034930 **Client Sample #: 41924.000-022**
Location: Bainbridge Aquatic Center Renovation - Ray Williamson

Layer 1 of 1	Description: White brittle material with paint			
	Non-Fibrous Materials:	Other Fibrous Materials:%		Asbestos Type: %
	Binder/Filler, Mineral grains, Fine particles	None Detected	ND	None Detected ND
	Paint			

Lab ID: 24034931 **Client Sample #: 41924.000-023**
Location: Bainbridge Aquatic Center Renovation - Ray Williamson

Layer 1 of 1	Description: White hard rubbery material			
	Non-Fibrous Materials:	Other Fibrous Materials:%		Asbestos Type: %
	Binder/Filler, Fine particles	None Detected	ND	None Detected ND

Sampled by: Client

Analyzed by: Akane Yoshikawa

Reviewed by: Kunga Woser

Date: 04/02/2024

Date: 04/02/2024

Kunga Woser, Supervisor Asbestos Laboratory

Kunga Woser

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Bulk Asbestos Fibers Analysis

By Polarized Light Microscopy

Client: PBS Environmental - Seattle

Address: 214 E Galer St. Suite. 300
Seattle, WA 98102

Batch #: 2405662.00

Client Project #: 41924.000

Date Received: 4/1/2024

Samples Received: 36

Samples Analyzed: 36

Method: EPA/600/R-93/116

Attention: Mr. Ryan Hunter

Project Location: Bainbridge Aquatic Center Renovation - Ray Williamson

Lab ID: 24034932 Client Sample #: 41924.000-024

Location: Bainbridge Aquatic Center Renovation - Ray Williamson

Layer 1 of 1 Description: White flaky fibrous material with white interwoven fibrous material and paint

Non-Fibrous Materials:	Other Fibrous Materials: %	Asbestos Type: %
Binder/Filler, Fine particles, Paint	Glass fibers 34%	Amosite 3%
	Cellulose 16%	

Lab ID: 24034933 Client Sample #: 41924.000-025

Location: Bainbridge Aquatic Center Renovation - Ray Williamson

Layer 1 of 1 Description: White flaky fibrous material

Non-Fibrous Materials:	Other Fibrous Materials: %	Asbestos Type: %
Binder/Filler, Fine particles	Glass fibers 44%	Amosite 2%
	Cellulose 2%	

Lab ID: 24034934 Client Sample #: 41924.000-026

Location: Bainbridge Aquatic Center Renovation - Ray Williamson

Layer 1 of 1 Description: White flaky fibrous material

Non-Fibrous Materials:	Other Fibrous Materials: %	Asbestos Type: %
Binder/Filler, Fine particles	Glass fibers 39%	Amosite 2%

Lab ID: 24034935 Client Sample #: 41924.000-027

Location: Bainbridge Aquatic Center Renovation - Ray Williamson

Layer 1 of 1 Description: White flaky fibrous material with white fibrous mesh and paint

Non-Fibrous Materials:	Other Fibrous Materials: %	Asbestos Type: %
Binder/Filler, Fine particles, Paint	Glass fibers 37%	Amosite 2%
	Cellulose 19%	

Sampled by: Client

Analyzed by: Akane Yoshikawa

Reviewed by: Kunga Woser

Date: 04/02/2024

Date: 04/02/2024

Kunga Woser, Supervisor Asbestos Laboratory

Kunga Woser

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Bulk Asbestos Fibers Analysis

By Polarized Light Microscopy

Client: PBS Environmental - Seattle

Address: 214 E Galer St. Suite. 300
Seattle, WA 98102

Batch #: 2405662.00

Client Project #: 41924.000

Date Received: 4/1/2024

Samples Received: 36

Samples Analyzed: 36

Method: EPA/600/R-93/116

Attention: Mr. Ryan Hunter

Project Location: Bainbridge Aquatic Center Renovation - Ray Williamson

Lab ID: 24034936 Client Sample #: 41924.000-028

Location: Bainbridge Aquatic Center Renovation - Ray Williamson

Layer 1 of 1 Description: White flaky fibrous material with white fibrous mesh and paint

Non-Fibrous Materials:	Other Fibrous Materials:%
Binder/Filler, Fine particles, Paint	Glass fibers 34%
	Cellulose 17%

Asbestos Type: %

Amosite 3%

Lab ID: 24034937 Client Sample #: 41924.000-029

Location: Bainbridge Aquatic Center Renovation - Ray Williamson

Layer 1 of 1 Description: White flaky fibrous material with white fibrous mesh and paint

Non-Fibrous Materials:	Other Fibrous Materials:%
Binder/Filler, Fine particles, Paint	Glass fibers 29%
	Cellulose 16%

Asbestos Type: %

Amosite 2%

Lab ID: 24034938 Client Sample #: 41924.000-030

Location: Bainbridge Aquatic Center Renovation - Ray Williamson

Layer 1 of 1 Description: Black soft sticky material with paint

Non-Fibrous Materials:	Other Fibrous Materials:%
Binder/Filler, Fine particles, Paint	None Detected ND

Asbestos Type: %

None Detected ND

Lab ID: 24034939 Client Sample #: 41924.000-031

Location: Bainbridge Aquatic Center Renovation - Ray Williamson

Layer 1 of 1 Description: Black soft sticky material with paint

Non-Fibrous Materials:	Other Fibrous Materials:%
Binder/Filler, Fine particles, Paint	None Detected ND

Asbestos Type: %

None Detected ND

Lab ID: 24034940 Client Sample #: 41924.000-032

Location: Bainbridge Aquatic Center Renovation - Ray Williamson

Sampled by: Client

Analyzed by: Akane Yoshikawa

Reviewed by: Kunga Woser

Date: 04/02/2024

Date: 04/02/2024

Kunga Woser, Supervisor Asbestos Laboratory

Kunga Woser

Note: If samples are not homogeneous, then subsamples of the components were analyzed separately. All bulk samples are analyzed using both EPA 600/R-93/116 and EPA 40 CFR Appendix E to Subpart E of Part 763 with the following measurement uncertainties for the reported % Asbestos (1%=0-3%, 5%=1-9%, 10%=5-15%, 20%=10-30%, 50%=40-60%). This report relates only to the items tested. If sample was not collected by NVL personnel, then the accuracy of the results is limited by the methodology and acuity of the sample collector. This report shall not be reproduced except in full, without written approval of NVL Laboratories, Inc. It shall not be used to claim product endorsement by NVLAP or any other agency of the US Government



Bulk Asbestos Fibers Analysis

By Polarized Light Microscopy

Client: PBS Environmental - Seattle

Address: 214 E Galer St. Suite. 300
Seattle, WA 98102

Attention: Mr. Ryan Hunter

Project Location: Bainbridge Aquatic Center Renovation - Ray Williamson

Batch #: 2405662.00

Client Project #: 41924.000

Date Received: 4/1/2024

Samples Received: 36

Samples Analyzed: 36

Method: EPA/600/R-93/116

Layer 1 of 1	Description: Black soft elastic material			
	Non-Fibrous Materials:	Other Fibrous Materials:%		Asbestos Type: %
	Binder/Filler, Fine particles	None Detected	ND	None Detected ND

Lab ID: 24034941 **Client Sample #: 41924.000-033**

Location: Bainbridge Aquatic Center Renovation - Ray Williamson

Layer 1 of 1	Description: Black soft elastic material			
	Non-Fibrous Materials:	Other Fibrous Materials:%		Asbestos Type: %
	Binder/Filler, Fine particles	Cellulose	<1%	None Detected ND

Lab ID: 24034942 **Client Sample #: 41924.000-034**

Location: Bainbridge Aquatic Center Renovation - Ray Williamson

Layer 1 of 1	Description: Black soft crumbly material			
	Non-Fibrous Materials:	Other Fibrous Materials:%		Asbestos Type: %
	Binder/Filler, Fine particles	None Detected	ND	None Detected ND

Lab ID: 24034943 **Client Sample #: 41924.000-035**

Location: Bainbridge Aquatic Center Renovation - Ray Williamson

Layer 1 of 1	Description: Black soft rubbery material			
	Non-Fibrous Materials:	Other Fibrous Materials:%		Asbestos Type: %
	Binder/Filler, Fine particles	None Detected	ND	None Detected ND

Lab ID: 24034944 **Client Sample #: 41924.000-036**

Location: Bainbridge Aquatic Center Renovation - Ray Williamson

Layer 1 of 1	Description: Black sticky material			
	Non-Fibrous Materials:	Other Fibrous Materials:%		Asbestos Type: %
	Binder/Filler, Fine particles	Cellulose	6%	None Detected ND

Sampled by: Client

Analyzed by: Akane Yoshikawa

Reviewed by: Kunga Woser

Date: 04/02/2024

Date: 04/02/2024

Kunga Woser, Supervisor Asbestos Laboratory

Kunga Woser

Note: If samples are not homogeneous, then subsamples of the components were analyzed separately. All bulk samples are analyzed using both EPA 600/R-93/116 and EPA 40 CFR Appendix E to Subpart E of Part 763 with the following measurement uncertainties for the reported % Asbestos (1%=0-3%, 5%=1-9%, 10%=5-15%, 20%=10-30%, 50%=40-60%). This report relates only to the items tested. If sample was not collected by NVL personnel, then the accuracy of the results is limited by the methodology and acuity of the sample collector. This report shall not be reproduced except in full, without written approval of NVL Laboratories, Inc. It shall not be used to claim product endorsement by NVLAP or any other agency of the US Government

ASBESTOS LABORATORY SERVICES



Company PBS Environmental - Seattle
Address 214 E Galer St. Suite. 300
 Seattle, WA 98102
Project Manager Mr. Ryan Hunter
Phone (206) 233-9639
Cell (484) 269-2138
NVL Batch Number 2405662.00
TAT 2 Days **AH** No
Rush TAT
Due Date 4/3/2024 **Time** 8:20 AM
Email ryan.hunter@pbsusa.com
Fax (866) 727-0140

Project Name/Number: 41924.000 **Project Location:** Bainbridge Aquatic Center Renovation - Ray Williamson

Subcategory PLM Bulk

Item Code ASB-02 EPA 600/R-93-116 Asbestos by PLM <bulk>

Total Number of Samples 36

Rush Samples

	Lab ID	Sample ID	Description	A/R
1	24034909	41924.000-001		A
2	24034910	41924.000-002		A
3	24034911	41924.000-003		A
4	24034912	41924.000-004		A
5	24034913	41924.000-005		A
6	24034914	41924.000-006		A
7	24034915	41924.000-007		A
8	24034916	41924.000-008		A
9	24034917	41924.000-009	Composite	A
10	24034918	41924.000-010	Composite	A
11	24034919	41924.000-011	Composite	A
12	24034920	41924.000-012		A
13	24034921	41924.000-013		A
14	24034922	41924.000-014		A
15	24034923	41924.000-015		A
16	24034924	41924.000-016		A
17	24034925	41924.000-017		A
18	24034926	41924.000-018		A

	Print Name	Signature	Company	Date	Time
Sampled by	Client				
Relinquished by	Client				

Office Use Only	Print Name	Signature	Company	Date	Time
Received by	Kelly AuVu		NVL	4/1/24	820
Analyzed by	Akane Yoshikawa		NVL	4/2/24	
Results Called by					
☐ Faxed ☐ Emailed					

Special Instructions:

Date: 4/1/2024
 Time: 9:41 AM
 Entered By: Kelly AuVu

ASBESTOS LABORATORY SERVICES



Company PBS Environmental - Seattle
Address 214 E Galer St. Suite. 300
 Seattle, WA 98102
Project Manager Mr. Ryan Hunter
Phone (206) 233-9639
Cell (484) 269-2138
NVL Batch Number 2405662.00
TAT 2 Days **AH** No
Rush TAT
Due Date 4/3/2024 **Time** 8:20 AM
Email ryan.hunter@pbsusa.com
Fax (866) 727-0140

Project Name/Number: 41924.000 **Project Location:** Bainbridge Aquatic Center Renovation - Ray Williamson

Subcategory PLM Bulk

Item Code ASB-02 EPA 600/R-93-116 Asbestos by PLM <bulk>

Total Number of Samples 36

Rush Samples

	Lab ID	Sample ID	Description	A/R
19	24034927	41924.000-019		A
20	24034928	41924.000-020		A
21	24034929	41924.000-021		A
22	24034930	41924.000-022		A
23	24034931	41924.000-023		A
24	24034932	41924.000-024		A
25	24034933	41924.000-025		A
26	24034934	41924.000-026		A
27	24034935	41924.000-027		A
28	24034936	41924.000-028		A
29	24034937	41924.000-029		A
30	24034938	41924.000-030		A
31	24034939	41924.000-031		A
32	24034940	41924.000-032		A
33	24034941	41924.000-033		A
34	24034942	41924.000-034		A
35	24034943	41924.000-035		A
36	24034944	41924.000-036		A

	Print Name	Signature	Company	Date	Time
Sampled by	Client				
Relinquished by	Client				

Office Use Only	Print Name	Signature	Company	Date	Time
Received by	Kelly AuVu		NVL	4/1/24	820
Analyzed by	Akane Yoshikawa		NVL	4/2/24	
Results Called by					
☐ Faxed ☐ Emailed					

Special Instructions:

Date: 4/1/2024
 Time: 9:41 AM
 Entered By: Kelly AuVu

Project: Bainbridge Aquatic Center Renovation – Ray Williamson

Project #: 41924.000 Page 1 of 2

Analysis requested: PLM

Date: 03/29/2024

Relinqu'd by/Signature: Ryan Hunter / *Ryan Hunter*

Date/Time: 08/29/2024

Received by/Signature: *Kenneth*

Date/Time: 9/1/24 820

Email ALL INVOICES to: seattleap@pbsusa.com

E-mail results to:

☐ Willem Mager	☐ Ferman Fletcher	☐ Nick San
☐ Gregg Middaugh	☐ Claire Tsai	☐ Katie King
☐ Mark Hiley	☐ Toan Nguyen	☐ Kameron DeMonnin
☐ Ryan Hunter	☐ Peter Stensland	☐ _____
☐ Janet Murphy	☐ Cameron Budnick	

TURN AROUND TIME:

☐ 1 Hour	☐ 24 Hours	☐ 3-5 Days
☐ 2 Hours	☒ 48 Hours	☐ Other _____
☐ 4 Hours		

NOTE: *Composite if positive**

SAMPLE DATA FORM			
Sample #	Material	Location	Lab
41924.000-001	Fiberglass and Plaster Finish	Pool Wall Deep End East	NVL
41924.000-002	Fiberglass and Plaster Finish	Pool Wall Deep End South	
41924.000-003	Fiberglass and Plaster Finish	Pool Wall Shallow End West	
41924.000-004	Fiberglass and Plaster Finish	Pool Wall Shallow End North	
41924.000-005	Fiberglass and Plaster Finish	Pool Cove North	
41924.000-006	Fiberglass and Plaster Finish	Pool Cove South	
41924.000-007	Fiberglass and Plaster Finish	Pool Deep End Floor	
41924.000-008	Fiberglass and Plaster Finish	Pool Shallow End Floor	
41924.000-009	Joint Compound*** / Gypsum Wallboard	Northeast Storage	
41924.000-010	Joint Compound*** / Gypsum Wallboard	Filter Room	
41924.000-011	Joint Compound*** / Gypsum Wallboard	Boy's Locker Room Ceiling	
41924.000-012	Yellow Carpet Mastic	Lobby	
41924.000-013	Epoxy Floor	Stairs to Boy's Locker Room	
41924.000-014	Epoxy Floor	Girl's Locker Room	
41924.000-015	White 2' x 4' Lay-in Ceiling Tile	Pool Area	
41924.000-016	White 1" Ceramic Tile and Grout	Pool Deck at Pool Edge	
41924.000-017	Orange Ceramic Tile and Grout	Boy's Locker Room Wall	
41924.000-018	Green Ceramic Tile and Grout	Girl's Locker Room Wall	

Project #: 41924.000 Page 2 of 2[illegible]

April 5, 2024



Ryan Hunter
PBS Environmental - Seattle
214 E Galer St. Suite. 300
Seattle, WA 98102

RE: Bulk Asbestos Fiber Analysis; NVL Batch # 2405938.00

Client Project: 41924.000
Location: Bainbridge Aquatic Center Renovation-Ray Williamson

Dear Mr. Hunter,

Enclosed please find test results for the 21 sample(s) submitted to our laboratory for analysis on 4/3/2024.

Examination of these samples was conducted for the presence of identifiable asbestos fibers using polarized light microscopy (PLM) with dispersion staining in accordance with **U. S. EPA 40 CFR Appendix E to Subpart E of Part 763**, Interim Method for the Determination of Asbestos in Bulk Insulation Samples and **EPA 600/R-93/116**, Method for the Determination of Asbestos in Bulk Building Materials.

For samples containing more than one separable layer of materials, the report will include findings for each layer (labeled Layer 1 and Layer 2, etc. for each individual layer). The asbestos concentration in the sample is determined by calibrated visual estimation.

For those samples with asbestos concentrations between 1 and 10 percent based on visual estimation, the EPA recommends a procedure known as point counting (NESHAPS, 40 CFR Part 61). Point counting is a statistically more accurate means of quantification for samples with low concentrations of asbestos.

The detection limit for the calibrated visual estimation is <1%, 400 point counts is 0.25% and 1000 point counts is 0.1%

Samples are archived for two weeks following analysis. Samples that are not retrieved by the client are discarded after two weeks.

Thank you for using our laboratory services. Please do not hesitate to call if there is anything further we can assist you with.

Sincerely,

A handwritten signature in black ink, appearing to read 'Hilary Crumley'.

Hilary Crumley, Manager Asbestos Laboratory

The logo for NVLAP (National Voluntary Laboratory Accreditation Program). It features the letters 'NVLAP' in a large, stylized, outlined font. The 'P' has a unique design with a vertical line and a small circle at the bottom.

Testing

Lab Code: 102063-0

Enc.: Sample Results

Phone: 206 547.0100 | Fax: 206 634.1936 | Toll Free: 1.888.NVL.LABS (685.5227)
4708 Aurora Avenue North | Seattle, WA 98103-6516



Bulk Asbestos Fibers Analysis

By Polarized Light Microscopy

Client: PBS Environmental - Seattle

Address: 214 E Galer St. Suite. 300
Seattle, WA 98102

Attention: Mr. Ryan Hunter

Project Location: Bainbridge Aquatic Center Renovation-Ray Williamson

Batch #: 2405938.00

Client Project #: 41924.000

Date Received: 4/3/2024

Samples Received: 21

Samples Analyzed: 21

Method: EPA/600/R-93/116

Lab ID: 24037544 Client Sample #: 41924.000-037

Location: Bainbridge Aquatic Center Renovation-Ray Williamson

Layer 1 of 2 Description: Brown hard brittle material

Non-Fibrous Materials:
Binder/Filler, Mineral grains, Debris
Insect parts

Other Fibrous Materials:%
None Detected ND

**Asbestos Type: %
None Detected ND**

Layer 2 of 2 Description: Gray sandy material with debris

Non-Fibrous Materials:
Binder/Filler, Fine grains, Mineral grains
Debris

Other Fibrous Materials:%
Cellulose 2%

**Asbestos Type: %
None Detected ND**

Lab ID: 24037545 Client Sample #: 41924.000-038

Location: Bainbridge Aquatic Center Renovation-Ray Williamson

Layer 1 of 1 Description: Black soft material with debris

Non-Fibrous Materials:
Binder/Filler, Debris

Other Fibrous Materials:%
Polyethylene fibers 4%

**Asbestos Type: %
None Detected ND**

Lab ID: 24037546 Client Sample #: 41924.000-039

Location: Bainbridge Aquatic Center Renovation-Ray Williamson

Layer 1 of 1 Description: Black soft/elastic material with debris

Non-Fibrous Materials:
Binder/Filler, Debris

Other Fibrous Materials:%
Cellulose <1%

**Asbestos Type: %
None Detected ND**

Lab ID: 24037547 Client Sample #: 41924.000-040

Location: Bainbridge Aquatic Center Renovation-Ray Williamson

Sampled by: Client

Analyzed by: Kunga Woser

Reviewed by: Hilary Crumley

Date: 04/05/2024

Date: 04/05/2024

Hilary Crumley, Manager Asbestos Laboratory

Note: If samples are not homogeneous, then subsamples of the components were analyzed separately. All bulk samples are analyzed using both EPA 600/R-93/116 and EPA 40 CFR Appendix E to Subpart E of Part 763 with the following measurement uncertainties for the reported % Asbestos (1%=0-3%, 5%=1-9%, 10%=5-15%, 20%=10-30%, 50%=40-60%). This report relates only to the items tested. If sample was not collected by NVL personnel, then the accuracy of the results is limited by the methodology and acuity of the sample collector. This report shall not be reproduced except in full, without written approval of NVL Laboratories, Inc. It shall not be used to claim product endorsement by NVLAP or any other agency of the US Government



Bulk Asbestos Fibers Analysis

By Polarized Light Microscopy

Client: PBS Environmental - Seattle

Address: 214 E Galer St. Suite. 300
Seattle, WA 98102

Attention: Mr. Ryan Hunter

Project Location: Bainbridge Aquatic Center Renovation-Ray Williamson

Batch #: 2405938.00

Client Project #: 41924.000

Date Received: 4/3/2024

Samples Received: 21

Samples Analyzed: 21

Method: EPA/600/R-93/116

Layer 1 of 1	Description: Dark gray brittle material with debris			
	Non-Fibrous Materials:	Other Fibrous Materials:%		Asbestos Type: %
	Binder/Filler, Debris	Cellulose <1%		None Detected ND

Lab ID: 24037548 **Client Sample #: 41924.000-041**

Location: Bainbridge Aquatic Center Renovation-Ray Williamson

Layer 1 of 1	Description: Gray soft material with debris			
	Non-Fibrous Materials:	Other Fibrous Materials:%		Asbestos Type: %
	Binder/Filler, Debris	None Detected ND		None Detected ND

Lab ID: 24037549 **Client Sample #: 41924.000-042**

Location: Bainbridge Aquatic Center Renovation-Ray Williamson

Layer 1 of 1	Description: Black soft/elastic material with debris			
	Non-Fibrous Materials:	Other Fibrous Materials:%		Asbestos Type: %
	Binder/Filler, Debris	None Detected ND		None Detected ND

Lab ID: 24037550 **Client Sample #: 41924.000-043**

Location: Bainbridge Aquatic Center Renovation-Ray Williamson

Layer 1 of 1	Description: Gray brittle material with debris			
	Non-Fibrous Materials:	Other Fibrous Materials:%		Asbestos Type: %
	Binder/Filler, Debris	Cellulose <1%		None Detected ND

Lab ID: 24037551 **Client Sample #: 41924.000-044**

Location: Bainbridge Aquatic Center Renovation-Ray Williamson

Layer 1 of 2	Description: Dark gray soft material with debris			
	Non-Fibrous Materials:	Other Fibrous Materials:%		Asbestos Type: %
	Binder/Filler, Debris	Cellulose 2%		None Detected ND

Sampled by: Client

Analyzed by: Kunga Woser

Reviewed by: Hilary Crumley

Date: 04/05/2024

Date: 04/05/2024

Hilary Crumley, Manager Asbestos Laboratory

Note: If samples are not homogeneous, then subsamples of the components were analyzed separately. All bulk samples are analyzed using both EPA 600/R-93/116 and EPA 40 CFR Appendix E to Subpart E of Part 763 with the following measurement uncertainties for the reported % Asbestos (1%=0-3%, 5%=1-9%, 10%=5-15%, 20%=10-30%, 50%=40-60%). This report relates only to the items tested. If sample was not collected by NVL personnel, then the accuracy of the results is limited by the methodology and acuity of the sample collector. This report shall not be reproduced except in full, without written approval of NVL Laboratories, Inc. It shall not be used to claim product endorsement by NVLAP or any other agency of the US Government



Bulk Asbestos Fibers Analysis

By Polarized Light Microscopy

Client: PBS Environmental - Seattle

Address: 214 E Galer St. Suite. 300
Seattle, WA 98102

Attention: Mr. Ryan Hunter

Project Location: Bainbridge Aquatic Center Renovation-Ray Williamson

Batch #: 2405938.00

Client Project #: 41924.000

Date Received: 4/3/2024

Samples Received: 21

Samples Analyzed: 21

Method: EPA/600/R-93/116

Layer 2 of 2	Description: Clear soft/elastic material with debris			
	Non-Fibrous Materials:	Other Fibrous Materials: %		Asbestos Type: %
	Binder/Filler, Debris	Cellulose 2%		None Detected ND

Lab ID: 24037552 **Client Sample #: 41924.000-045**

Location: Bainbridge Aquatic Center Renovation-Ray Williamson

Layer 1 of 1	Description: Dark gray soft material with debris			
	Non-Fibrous Materials:	Other Fibrous Materials: %		Asbestos Type: %
	Binder/Filler, Debris	Cellulose <1%		None Detected ND

Lab ID: 24037553 **Client Sample #: 41924.000-046**

Location: Bainbridge Aquatic Center Renovation-Ray Williamson

Layer 1 of 2	Description: Brown soft/elastic material with paint & debris			
	Non-Fibrous Materials:	Other Fibrous Materials: %		Asbestos Type: %
	Binder/Filler, Paint, Debris	None Detected ND		None Detected ND

Layer 2 of 2	Description: Black thin brittle material with debris			
	Non-Fibrous Materials:	Other Fibrous Materials: %		Asbestos Type: %
	Binder/Filler, Debris	None Detected ND		None Detected ND

Lab ID: 24037554 **Client Sample #: 41924.000-047**

Location: Bainbridge Aquatic Center Renovation-Ray Williamson

Layer 1 of 1	Description: Brown soft material with debris			
	Non-Fibrous Materials:	Other Fibrous Materials: %		Asbestos Type: %
	Binder/Filler, Debris	Cellulose 2%		None Detected ND

Lab ID: 24037555 **Client Sample #: 41924.000-048**

Location: Bainbridge Aquatic Center Renovation-Ray Williamson

Sampled by: Client

Analyzed by: Kunga Woser

Reviewed by: Hilary Crumley

Date: 04/05/2024

Date: 04/05/2024

Hilary Crumley, Manager Asbestos Laboratory

Note: If samples are not homogeneous, then subsamples of the components were analyzed separately. All bulk samples are analyzed using both EPA 600/R-93/116 and EPA 40 CFR Appendix E to Subpart E of Part 763 with the following measurement uncertainties for the reported % Asbestos (1%=0-3%, 5%=1-9%, 10%=5-15%, 20%=10-30%, 50%=40-60%). This report relates only to the items tested. If sample was not collected by NVL personnel, then the accuracy of the results is limited by the methodology and acuity of the sample collector. This report shall not be reproduced except in full, without written approval of NVL Laboratories, Inc. It shall not be used to claim product endorsement by NVLAP or any other agency of the US Government



Bulk Asbestos Fibers Analysis

By Polarized Light Microscopy

Client: PBS Environmental - Seattle

Address: 214 E Galer St. Suite. 300
Seattle, WA 98102

Attention: Mr. Ryan Hunter

Project Location: Bainbridge Aquatic Center Renovation-Ray Williamson

Batch #: 2405938.00

Client Project #: 41924.000

Date Received: 4/3/2024

Samples Received: 21

Samples Analyzed: 21

Method: EPA/600/R-93/116

Layer 1 of 1 **Description:** Gray soft material with paint & debris

Non-Fibrous Materials:	Other Fibrous Materials:%
Binder/Filler, Paint, Debris	Cellulose 2%

Asbestos Type: %

None Detected ND

Lab ID: 24037556 **Client Sample #: 41924.000-049**

Location: Bainbridge Aquatic Center Renovation-Ray Williamson

Layer 1 of 1 **Description:** Black brittle material with debris

Non-Fibrous Materials:	Other Fibrous Materials:%
Binder/Filler, Debris	Cellulose 3%

Asbestos Type: %

None Detected ND

Lab ID: 24037557 **Client Sample #: 41924.000-050**

Location: Bainbridge Aquatic Center Renovation-Ray Williamson

Layer 1 of 1 **Description:** Black brittle material with debris

Non-Fibrous Materials:	Other Fibrous Materials:%
Binder/Filler, Debris	Cellulose <1%

Asbestos Type: %

None Detected ND

Lab ID: 24037558 **Client Sample #: 41924.000-051**

Location: Bainbridge Aquatic Center Renovation-Ray Williamson

Layer 1 of 1 **Description:** Brown asphaltic fibrous material

Non-Fibrous Materials:	Other Fibrous Materials:%
Asphalt/Binder, Asphaltic Particles	Cellulose 41%

Asbestos Type: %

None Detected ND

Lab ID: 24037559 **Client Sample #: 41924.000-052**

Location: Bainbridge Aquatic Center Renovation-Ray Williamson

Layer 1 of 1 **Description:** Brown asphaltic fibrous material

Non-Fibrous Materials:	Other Fibrous Materials:%
Asphalt/Binder, Asphaltic Particles	Cellulose 44%

Asbestos Type: %

None Detected ND

Lab ID: 24037560 **Client Sample #: 41924.000-053**

Location: Bainbridge Aquatic Center Renovation-Ray Williamson

Sampled by: Client

Analyzed by: Kunga Woser

Reviewed by: Hilary Crumley

Date: 04/05/2024

Date: 04/05/2024

Hilary Crumley, Manager Asbestos Laboratory

Note: If samples are not homogeneous, then subsamples of the components were analyzed separately. All bulk samples are analyzed using both EPA 600/R-93/116 and EPA 40 CFR Appendix E to Subpart E of Part 763 with the following measurement uncertainties for the reported % Asbestos (1%=0-3%, 5%=1-9%, 10%=5-15%, 20%=10-30%, 50%=40-60%). This report relates only to the items tested. If sample was not collected by NVL personnel, then the accuracy of the results is limited by the methodology and acuity of the sample collector. This report shall not be reproduced except in full, without written approval of NVL Laboratories, Inc. It shall not be used to claim product endorsement by NVLAP or any other agency of the US Government



Bulk Asbestos Fibers Analysis

By Polarized Light Microscopy

Client: PBS Environmental - Seattle
Address: 214 E Galer St. Suite. 300
Seattle, WA 98102

Batch #: 2405938.00

Client Project #: 41924.000

Date Received: 4/3/2024

Samples Received: 21

Samples Analyzed: 21

Method: EPA/600/R-93/116

Attention: Mr. Ryan Hunter

Project Location: Bainbridge Aquatic Center Renovation-Ray Williamson

Layer 1 of 2	Description: Black asphaltic material with debris	Non-Fibrous Materials:	Other Fibrous Materials:%	Asbestos Type: % None Detected ND
		Asphalt/Binder, Asphaltic Particles, Debris	Synthetic fibers 3%	
Layer 2 of 2	Description: Black asphaltic fibrous built-up material with debris	Non-Fibrous Materials:	Other Fibrous Materials:%	Asbestos Type: % None Detected ND
		Asphalt/Binder, Asphaltic Particles, Debris	Synthetic fibers 9%	
			Glass fibers 5%	

Lab ID: 24037561 Client Sample #: 41924.000-054

Location: Bainbridge Aquatic Center Renovation-Ray Williamson

Layer 1 of 2	Description: Silver paint with debris	Non-Fibrous Materials:	Other Fibrous Materials:%	Asbestos Type: % None Detected ND
		Metallic paint, Debris	Wollastonite 4%	
Layer 2 of 2	Description: Multi-layered black asphaltic material with debris	Non-Fibrous Materials:	Other Fibrous Materials:%	Asbestos Type: % None Detected ND
		Asphalt/Binder, Asphaltic Particles, Debris	Glass fibers 11%	
			Synthetic fibers 6%	

Lab ID: 24037562 Client Sample #: 41924.000-055

Location: Bainbridge Aquatic Center Renovation-Ray Williamson

Layer 1 of 4	Description: Silver paint with debris	Non-Fibrous Materials:	Other Fibrous Materials:%	Asbestos Type: % None Detected ND
		Metallic paint, Debris	Wollastonite 3%	
Layer 2 of 4	Description: Black asphaltic fibrous built-up material with debris	Non-Fibrous Materials:	Other Fibrous Materials:%	Asbestos Type: % None Detected ND
		Asphalt/Binder, Asphaltic Particles, Debris	Synthetic fibers 6%	

Sampled by: Client

Analyzed by: Kunga Woser

Reviewed by: Hilary Crumley

Date: 04/05/2024

Date: 04/05/2024

Hilary Crumley, Manager Asbestos Laboratory

Note: If samples are not homogeneous, then subsamples of the components were analyzed separately. All bulk samples are analyzed using both EPA 600/R-93/116 and EPA 40 CFR Appendix E to Subpart E of Part 763 with the following measurement uncertainties for the reported % Asbestos (1%=0-3%, 5%=1-9%, 10%=5-15%, 20%=10-30%, 50%=40-60%). This report relates only to the items tested. If sample was not collected by NVL personnel, then the accuracy of the results is limited by the methodology and acuity of the sample collector. This report shall not be reproduced except in full, without written approval of NVL Laboratories, Inc. It shall not be used to claim product endorsement by NVLAP or any other agency of the US Government



Bulk Asbestos Fibers Analysis

By Polarized Light Microscopy

Client: PBS Environmental - Seattle

Address: 214 E Galer St. Suite. 300
Seattle, WA 98102

Batch #: 2405938.00

Client Project #: 41924.000

Date Received: 4/3/2024

Samples Received: 21

Samples Analyzed: 21

Method: EPA/600/R-93/116

Attention: Mr. Ryan Hunter

Project Location: Bainbridge Aquatic Center Renovation-Ray Williamson

		Glass fibers	5%	
Layer 3 of 4	Description:	Black thin crumbly material (on wood) with debris		
		Non-Fibrous Materials:	Other Fibrous Materials:%	Asbestos Type: %
		Binder/Filler, Fine particles, Debris	Cellulose 6%	None Detected ND
		Organic debris		
Layer 4 of 4	Description:	Tan compressed fibrous material		
		Non-Fibrous Materials:	Other Fibrous Materials:%	Asbestos Type: %
		Binder/Filler, Wood flakes	Cellulose 85%	None Detected ND
Lab ID: 24037563	Client Sample #: 41924.000-056			
Location: Bainbridge Aquatic Center Renovation-Ray Williamson				
Comments:	Unsure of correct layer sequence.			
Layer 1 of 5	Description:	Silver paint		
		Non-Fibrous Materials:	Other Fibrous Materials:%	Asbestos Type: %
		Metallic paint	Wollastonite 4%	None Detected ND
Layer 2 of 5	Description:	Black asphaltic fibrous built-up material		
		Non-Fibrous Materials:	Other Fibrous Materials:%	Asbestos Type: %
		Asphalt/Binder, Asphaltic Particles	Synthetic fibers 9%	None Detected ND
			Glass fibers 5%	
Layer 3 of 5	Description:	Multi-layered black asphaltic material		
		Non-Fibrous Materials:	Other Fibrous Materials:%	Asbestos Type: %
		Asphalt/Binder, Asphaltic Particles	Glass fibers 11%	None Detected ND
Layer 4 of 5	Description:	Tan foamy material		
		Non-Fibrous Materials:	Other Fibrous Materials:%	Asbestos Type: %
		Foamy material	None Detected ND	None Detected ND

Sampled by: Client

Analyzed by: Kunga Woser

Reviewed by: Hilary Crumley

Date: 04/05/2024

Date: 04/05/2024

Hilary Crumley, Manager Asbestos Laboratory

Note: If samples are not homogeneous, then subsamples of the components were analyzed separately. All bulk samples are analyzed using both EPA 600/R-93/116 and EPA 40 CFR Appendix E to Subpart E of Part 763 with the following measurement uncertainties for the reported % Asbestos (1%=0-3%, 5%=1-9%, 10%=5-15%, 20%=10-30%, 50%=40-60%). This report relates only to the items tested. If sample was not collected by NVL personnel, then the accuracy of the results is limited by the methodology and acuity of the sample collector. This report shall not be reproduced except in full, without written approval of NVL Laboratories, Inc. It shall not be used to claim product endorsement by NVLAP or any other agency of the US Government



Bulk Asbestos Fibers Analysis

By Polarized Light Microscopy

Client: PBS Environmental - Seattle

Address: 214 E Galer St. Suite. 300
Seattle, WA 98102

Attention: Mr. Ryan Hunter

Project Location: Bainbridge Aquatic Center Renovation-Ray Williamson

Batch #: 2405938.00

Client Project #: 41924.000

Date Received: 4/3/2024

Samples Received: 21

Samples Analyzed: 21

Method: EPA/600/R-93/116

Layer 5 of 5	Description: Multi-layered black asphaltic material		Asbestos Type: % None Detected ND
	Non-Fibrous Materials: Asphalt/Binder, Asphaltic Particles	Other Fibrous Materials:% Glass fibers 14%	
Lab ID: 24037564 Client Sample #: 41924.000-057			
Location: Bainbridge Aquatic Center Renovation-Ray Williamson			
Layer 1 of 4	Description: Silver paint		Asbestos Type: % None Detected ND
	Non-Fibrous Materials: Metallic paint	Other Fibrous Materials:% Wollastonite 3%	
Layer 2 of 4	Description: Multi-layered black asphaltic material		Asbestos Type: % None Detected ND
	Non-Fibrous Materials: Asphalt/Binder, Asphaltic Particles	Other Fibrous Materials:% Glass fibers 12%	
	Synthetic fibers 5%		
Layer 3 of 4	Description: Tan foamy material		Asbestos Type: % None Detected ND
	Non-Fibrous Materials: Foamy material	Other Fibrous Materials:% None Detected ND	
Layer 4 of 4	Description: Multi-layered black asphaltic material		Asbestos Type: % None Detected ND
	Non-Fibrous Materials: Asphalt/Binder, Asphaltic Particles	Other Fibrous Materials:% Glass fibers 15%	

Sampled by: Client

Analyzed by: Kunga Woser

Reviewed by: Hilary Crumley

Date: 04/05/2024

Date: 04/05/2024

Hilary Crumley, Manager Asbestos Laboratory

Note: If samples are not homogeneous, then subsamples of the components were analyzed separately. All bulk samples are analyzed using both EPA 600/R-93/116 and EPA 40 CFR Appendix E to Subpart E of Part 763 with the following measurement uncertainties for the reported % Asbestos (1%=0-3%, 5%=1-9%, 10%=5-15%, 20%=10-30%, 50%=40-60%). This report relates only to the items tested. If sample was not collected by NVL personnel, then the accuracy of the results is limited by the methodology and acuity of the sample collector. This report shall not be reproduced except in full, without written approval of NVL Laboratories, Inc. It shall not be used to claim product endorsement by NVLAP or any other agency of the US Government

ASBESTOS LABORATORY SERVICES



Company PBS Environmental - Seattle
Address 214 E Galer St. Suite. 300
 Seattle, WA 98102
Project Manager Mr. Ryan Hunter
Phone (206) 233-9639
Cell (484) 269-2138
NVL Batch Number 2405938.00
TAT 2 Days **AH** No
Rush TAT
Due Date 4/5/2024 **Time** 5:00 PM
Email ryan.hunter@pbsusa.com
Fax (866) 727-0140

Project Name/Number: 41924.000 **Project Location:** Bainbridge Aquatic Center Renovation-Ray Williamson

Subcategory PLM Bulk

Item Code ASB-02 EPA 600/R-93-116 Asbestos by PLM <bulk>

Total Number of Samples 21

Rush Samples

	Lab ID	Sample ID	Description	A/R
1	24037544	41924.000-037		A
2	24037545	41924.000-038		A
3	24037546	41924.000-039		A
4	24037547	41924.000-040		A
5	24037548	41924.000-041		A
6	24037549	41924.000-042		A
7	24037550	41924.000-043		A
8	24037551	41924.000-044		A
9	24037552	41924.000-045		A
10	24037553	41924.000-046		A
11	24037554	41924.000-047		A
12	24037555	41924.000-048		A
13	24037556	41924.000-049		A
14	24037557	41924.000-050		A
15	24037558	41924.000-051		A
16	24037559	41924.000-052		A
17	24037560	41924.000-053		A
18	24037561	41924.000-054		A

	Print Name	Signature	Company	Date	Time
Sampled by	Client				
Relinquished by	Client				

Office Use Only	Print Name	Signature	Company	Date	Time
Received by	Rachelle Miller		NVL	4/3/24	1700
Analyzed by	Kunga Woser		NVL	4/5/24	
Results Called by					
☐ Faxed ☐ Emailed					

Special Instructions:

Date: 4/3/2024

Time: 5:09 PM

Entered By: Rachelle Miller

ASBESTOS LABORATORY SERVICES



Company PBS Environmental - Seattle
Address 214 E Galer St. Suite. 300
 Seattle, WA 98102
Project Manager Mr. Ryan Hunter
Phone (206) 233-9639
Cell (484) 269-2138
NVL Batch Number 2405938.00
TAT 2 Days **AH** No
Rush TAT
Due Date 4/5/2024 **Time** 5:00 PM
Email ryan.hunter@pbsusa.com
Fax (866) 727-0140

Project Name/Number: 41924.000 **Project Location:** Bainbridge Aquatic Center Renovation-Ray Williamson

Subcategory PLM Bulk

Item Code ASB-02 EPA 600/R-93-116 Asbestos by PLM <bulk>

Total Number of Samples 21

Rush Samples

	Lab ID	Sample ID	Description	A/R
19	24037562	41924.000-055		A
20	24037563	41924.000-056		A
21	24037564	41924.000-057		A

	Print Name	Signature	Company	Date	Time
Sampled by	Client				
Relinquished by	Client				

Office Use Only	Print Name	Signature	Company	Date	Time
Received by	Rachelle Miller		NVL	4/3/24	1700
Analyzed by	Kunga Woser		NVL	4/5/24	
Results Called by					
☐ Faxed ☐ Emailed					

Special Instructions:

Date: 4/3/2024
 Time: 5:09 PM
 Entered By: Rachelle Miller

Project: Bainbridge Aquatic Center Renovation – Ray Williamson

Project #: 41924.000 Page 1 of 2

Analysis requested: PLM

Date: 04/03/2024

Relinq'd by/Signature: Ryan Hunter / [Signature]

Date/Time: 04/03/2024

Received by/Signature: Rachelle Miller [Signature]

Date/Time: 4/3/24 @ 1200

Email ALL INVOICES to: seattleap@pbsusa.com

E-mail results to:

☐ Willem Mager	☐ Ferman Fletcher	☐ Nick San
☐ Gregg Middaugh	☐ Claire Tsai	☐ Katie King
☐ Mark Hiley	☐ Toan Nguyen	☐ Kameron DeMonnin
☒ Ryan Hunter	☐ Peter Stensland	☐ _____
☐ Janet Murphy	☐ Cameron Budnick	

TURN AROUND TIME:

☐ 1 Hour	☐ 24 Hours	☐ 3-5 Days
☐ 2 Hours	☒ 48 Hours	☐ Other _____
☐ 4 Hours		

NOTE: ***Composite if positive

SAMPLE DATA FORM			
Sample #	Material	Location	Lab
41924.000-037	Exterior Brick and Mortar	East Elevation	NVL
41924.000-038	Black Exterior Window Putty Patch	Roof Pool Windows	↓
41924.000-039	Black Exterior Window Putty	Roof Pool Windows	
41924.000-040	Exterior Window Frame Caulk at Rough Opening & Brick	East Elevation North	
41924.000-041	Exterior Window Frame Caulk at Metal and Wood Beam	East Elevation Central	
41924.000-042	Exterior Window Frame Caulk at Frame and Metal Base	East Elevation	
41924.000-043	Exterior Window Frame Caulk at Rough Opening and Brick	East Elevation South Side	
41924.000-044	Exterior Window Frame Caulk at Metal Column and Frame	South Elevation	
41924.000-045	Exterior Window Frame Caulk at Metal and Brick	South Elevation	
41924.000-046	Exterior Window Frame Caulk at Frame and Wood Siding	Pool Roof Windows	
41924.000-047	Exterior Window Frame Caulk at Wood Frame and Metal	Roof Lobby Windows	
41924.000-048	Gray Caulk at Roof Exhaust	Roof East Side	
41924.000-049	Exterior Door Frame Caulk at Rough Opening and Brick	East Elevation	
41924.000-050	Exterior Door Frame Caulk at Rough Opening and Brick	South Elevation	
41924.000-051	Black Felt Paper Behind Wood Siding	Roof Mech Room East	
41924.000-052	Black Felt Paper Behind Wood Siding	Roof Mech Room West	
41924.000-053	Black Asphaltic Material in Roof Drain	Roof Center Drain	
41924.000-054	Parapet Roofing	West Side	

APPENDIX B

AA Lead Paint Chip Sampling Information

AA Lead Paint Chip Sample Inventory

AA Lead Paint Chip Laboratory Data Sheets

AA Lead Paint Chip Chain-of-Custody Documentation

Bainbridge Aquatic Center Renovation - Ray Williamson Pool
Bainbridge Island Metro Park and Recreation District

PBS Engineering + Environmental
PBS Project #41924.000

AA LEAD PAINT CHIP SAMPLE INVENTORY

<u>PBS Sample #</u>	<u>Paint Color / Component or Substrate</u>	<u>Sample Location</u>	<u>Results (mg/kg)</u>	<u>Results (%)</u>	<u>Lab</u>
41924.000-Pb01	White / Gypsum Wallboard / Wall	Tutor Office 6	<48	<0.0048	NVL
41924.000-Pb02	White / Concrete Masonry Unit / Wall	Pool Deck West	<49	<0.0049	NVL
41924.000-Pb03	Blue / Brick / Wall	Pool at Control Office 7	<53	<0.0053	NVL
41924.000-Pb04	White / Brick / Wall	Lobby Room 9	<46	<0.0046	NVL
41924.000-Pb05	Blue / Wood / Frame	Lobby Door	<110	<0.011	NVL
41924.000-Pb06	Blue / Metal / Frame	Filter Room Door	140	0.014	NVL
41924.000-Pb07	White / Metal / Support	Spring Board	<49	<0.0049	NVL
41924.000-Pb08	Brown / Metal / Flashing	Parapet Cap at Roof	<130	<0.013	NVL

April 2, 2024

Ryan Hunter

PBS Environmental - Seattle

214 E Galer St. Suite. 300

Seattle, WA 98102



NVL Batch # 2405649.00

RE: Total Metal Analysis
Method: EPA 7000B Lead by FAA <paint>
Item Code: FAA-02

Client Project: 41924.000

Location: Bainbridge Aquatic Center Renovation - Ray Williamson

Dear Mr. Hunter,

NVL Labs received 7 sample(s) for the said project on 4/1/2024. Preparation of these samples was conducted following protocol outlined in EPA 3051/7000B , unless stated otherwise. Analysis of these samples was performed using analytical instruments in accordance with EPA 7000B Lead by FAA <paint>. The results are usually expressed in mg/Kg and percentage (%). Test results are not blank corrected.

For recent regulation updates pertaining to current regulatory levels or permissible exposure levels, please call your local regulatory agencies for more detail.

At NVL Labs all analyses are performed under strict guidelines of the Quality Assurance Program. This report is considered highly confidential and will not be released without your approval. Samples are archived after two weeks from the analysis date. Please feel free to contact us at 206-547-0100, in case you have any questions or concerns.

Sincerely,

A handwritten signature in black ink, appearing to read 'Nick Ly'.

Nick Ly, Technical Manager

Enc.: Sample results



Phone: 206 547.0100 | Fax: 206 634.1936 | Toll Free: 1.888.NVL.LABS (685.5227)
4708 Aurora Avenue North | Seattle, WA 98103-6516

Analysis Report

Total Lead (Pb)



Client: PBS Environmental - Seattle
Address: 214 E Galer St. Suite. 300
Seattle, WA 98102

Batch #: 2405649.00

Matrix: Paint
Method: EPA 3051/7000B
Client Project #: 41924.000
Date Received: 4/1/2024
Samples Received: 7
Samples Analyzed: 7

Attention: Mr. Ryan Hunter

Project Location: Bainbridge Aquatic Center Renovation - Ray Williamson

Lab ID	Client Sample #	Sample Weight (g)	RL in mg/Kg	Results in mg/Kg	Results in percent
24034794	41924.000-Pb01	0.2067	48	< 48	<0.0048
24034795	41924.000-Pb02	0.2048	49	< 49	<0.0049
24034796	41924.000-Pb03	0.1875	53	< 53	<0.0053
24034797	41924.000-Pb04	0.2155	46	< 46	<0.0046
24034798	41924.000-Pb05	0.0931	110	< 110	<0.011
24034799	41924.000-Pb06	0.1601	62	140	0.014
24034800	41924.000-Pb07	0.2061	49	< 49	<0.0049

Sampled by: Client

Analyzed by: Yasuyuki Hida

Reviewed by: Nick Ly

Date Analyzed: 04/01/2024

Date Issued: 04/02/2024

Nick Ly, Technical Manager

mg/ Kg =Milligrams per kilogram

Percent = Milligrams per kilogram / 10000

Note : Method QC results are acceptable unless stated otherwise.

Unless otherwise indicated, the condition of all samples was acceptable at time of receipt.

RL = Reporting Limit

'<' = Below the reporting Limit

Bench Run No: 2024-0401-06

FAA-02

LEAD LABORATORY SERVICES



Company PBS Environmental - Seattle
Address 214 E Galer St. Suite. 300
 Seattle, WA 98102
Project Manager Mr. Ryan Hunter
Phone (206) 233-9639
Cell (484) 269-2138
NVL Batch Number 2405649.00
TAT 2 Days **AH** No
Rush TAT
Due Date 4/3/2024 **Time** 8:00 AM
Email ryan.hunter@pbsusa.com
Fax (866) 727-0140

Project Name/Number: 41924.000 **Project Location:** Bainbridge Aquatic Center Renovation - Ray Williamson

Subcategory Flame AA (FAA)

Item Code FAA-02 EPA 7000B Lead by FAA <paint>

Total Number of Samples 7

Rush Samples

	Lab ID	Sample ID	Description	A/R
1	24034794	41924.000-Pb01		A
2	24034795	41924.000-Pb02		A
3	24034796	41924.000-Pb03		A
4	24034797	41924.000-Pb04		A
5	24034798	41924.000-Pb05		A
6	24034799	41924.000-Pb06		A
7	24034800	41924.000-Pb07		A

	Print Name	Signature	Company	Date	Time
Sampled by	Client				
Relinquished by	Drop Box				

Office Use Only	Print Name	Signature	Company	Date	Time
Received by	Rachelle Miller		NVL	4/1/24	800
Analyzed by	Yasuyuki Hida		NVL	4/1/24	
Results Called by					
☐ Faxed ☐ Emailed					

Special Instructions:

Date: 4/1/2024
 Time: 8:48 AM
 Entered By: Kelly AuVu

Project: Bainbridge Aquatic Center Renovation – Ray Williamson

Project #: 41924.000 Page 1 of 1

Analysis requested: FAA – Total Lead Paint Chip Analysis

Date: 03/29/2024

Relinq'd by/Signature: Ryan Hunter / [Signature]

Date/Time: 03/29/2024

Received by/Signature: [Signature]

Date/Time: 3-29-24

Email ALL INVOICES to: seattleap@pbsusa.com

820

E-mail results to:

- ☐ Willem Mager
☐ Gregg Middaugh
☐ Mark Hiley
☒ Ryan Hunter
☐ Janet Murphy

- ☐ Ferman Fletcher
☐ Claire Tsai
☐ Toan Nguyen
☐ Peter Stensland
☐ Cameron Budnick

- ☐ Nick San
☐ Katie King
☐ Kameron DeMonnin
☐ _____

TURN AROUND TIME:

- ☐ 1 Hour
☐ 2 Hours
☐ 4 Hours

- ☐ 24 Hours
☒ 48 Hours

- ☐ 3-5 Days
☐ Other _____

NOTE: *Composite if positive**

SAMPLE DATA FORM			
Sample #	Material	Location	Lab
41924.000-Pb01	White / GWB / Wall	Tutor	NVL
41924.000-Pb02	White / CMU / Wall	Pool Deck West	
41924.000-Pb03	Blue / Brick / Wall	Pool at Control	
41924.000-Pb04	White / Brick / Wall	Lobby	
41924.000-Pb05	Blue / Wood / Frame	Lobby Door	
41924.000-Pb06	Blue / Metal / Frame	Filter Room Door	
41924.000-Pb07	White / Metal / Support	Spring Board	

April 4, 2024

Ryan Hunter

PBS Environmental - Seattle

214 E Galer St. Suite. 300

Seattle, WA 98102



NVL Batch # 2405939.00

RE: Total Metal Analysis
Method: EPA 7000B Lead by FAA <paint>
Item Code: FAA-02

Client Project: 41924.000

Location: Bainbridge Aquatic Center Renovation-Ray Williamson

Dear Mr. Hunter,

NVL Labs received 1 sample(s) for the said project on 4/3/2024. Preparation of these samples was conducted following protocol outlined in EPA 3051/7000B , unless stated otherwise. Analysis of these samples was performed using analytical instruments in accordance with EPA 7000B Lead by FAA <paint>. The results are usually expressed in mg/Kg and percentage (%). Test results are not blank corrected.

For recent regulation updates pertaining to current regulatory levels or permissible exposure levels, please call your local regulatory agencies for more detail.

At NVL Labs all analyses are performed under strict guidelines of the Quality Assurance Program. This report is considered highly confidential and will not be released without your approval. Samples are archived after two weeks from the analysis date. Please feel free to contact us at 206-547-0100, in case you have any questions or concerns.

Sincerely,

A handwritten signature in black ink, appearing to read "Nick Ly".

Nick Ly, Technical Manager

Enc.: Sample results



Phone: 206 547.0100 | Fax: 206 634.1936 | Toll Free: 1.888.NVL.LABS (685.5227)
4708 Aurora Avenue North | Seattle, WA 98103-6516

Analysis Report

Total Lead (Pb)



Client: PBS Environmental - Seattle
Address: 214 E Galer St. Suite. 300
Seattle, WA 98102

Batch #: 2405939.00

Matrix: Paint
Method: EPA 3051/7000B
Client Project #: 41924.000
Date Received: 4/3/2024
Samples Received: 1
Samples Analyzed: 1

Attention: Mr. Ryan Hunter

Project Location: Bainbridge Aquatic Center Renovation-Ray Williamson

Lab ID	Client Sample #	Sample Weight (g)	RL in mg/Kg	Results in mg/Kg	Results in percent
24037565	41924.000-Pb08	0.0399	130	< 130	<0.013

Comments: Small sample size (<0.05g)

Sampled by: Client

Analyzed by: Yasuyuki Hida

Reviewed by: Nick Ly

Date Analyzed: 04/04/2024

Date Issued: 04/04/2024

A handwritten signature in black ink, appearing to read 'Nick Ly', is written over a horizontal line.

Nick Ly, Technical Manager

mg/ Kg =Milligrams per kilogram

Percent = Milligrams per kilogram / 10000

Note : Method QC results are acceptable unless stated otherwise.

Unless otherwise indicated, the condition of all samples was acceptable at time of receipt.

RL = Reporting Limit

'<' = Below the reporting Limit

Bench Run No: 2024-0404-01

FAA-02

LEAD LABORATORY SERVICES



Company PBS Environmental - Seattle
Address 214 E Galer St. Suite. 300
 Seattle, WA 98102
Project Manager Mr. Ryan Hunter
Phone (206) 233-9639
Cell (484) 269-2138
NVL Batch Number 2405939.00
TAT 2 Days **AH** No
Rush TAT
Due Date 4/5/2024 **Time** 5:00 PM
Email ryan.hunter@pbsusa.com
Fax (866) 727-0140

Project Name/Number: 41924.000 **Project Location:** Bainbridge Aquatic Center Renovation-Ray Williamson

Subcategory Flame AA (FAA)

Item Code FAA-02 EPA 7000B Lead by FAA <paint>

Total Number of Samples 1

Rush Samples

	Lab ID	Sample ID	Description	A/R
1	24037565	41924.000-Pb08		A

	Print Name	Signature	Company	Date	Time
Sampled by	Client				
Relinquished by	Client				

Office Use Only	Print Name	Signature	Company	Date	Time
Received by	Rachelle Miller		NVL	4/3/24	1700
Analyzed by	Yasuyuki Hida		NVL	4/4/24	
Results Called by					
☐ Faxed ☐ Emailed					

Special Instructions:

Date: 4/3/2024
 Time: 5:16 PM
 Entered By: Rachelle Miller

APPENDIX C

PCB Sampling Information

PCB Sample Inventory

PCB Laboratory Data Sheets

PCB Chain-of-Custody Documentation

Bainbridge Aquatic Center Renovation - Ray Williamson Pool
Bainbridge Island Metro Park and Recreation District

PBS Engineering + Environmental
PBS Project #41924.000

PCB SAMPLE INVENTORY

<u>PBS Sample #</u>	<u>Material</u>	<u>Sample Location</u>	<u>Analyte</u>	<u>Lab Results (mg/kg)</u>	<u>Lab</u>
41924.000-PCB01	Interior Door Frame Caulk	East Interior	Aroclor-1016	<1.2	NVL
			Aroclor-1221	<1.2	
			Aroclor-1232	<1.2	
			Aroclor-1242	<1.2	
			Aroclor-1248	<1.2	
			Aroclor-1254	<1.2	
			Aroclor-1260	<1.2	
			PCB, Total	<1.2	
41924.000-PCB02	Exterior Window Frame Caulk @ Rough Opening and Brick	East Elevation - South	Aroclor-1016	<1.1	NVL
			Aroclor-1221	<1.1	
			Aroclor-1232	<1.1	
			Aroclor-1242	<1.1	
			Aroclor-1248	<1.1	
			Aroclor-1254	1.6	
			Aroclor-1260	<1.1	
			PCB, Total	1.6	
41924.000-PCB03	Exterior Window Frame Caulk at Metal Column and Frame	South Elevation	Aroclor-1016	<19	NVL
			Aroclor-1221	<19	
			Aroclor-1232	<19	
			Aroclor-1242	<19	
			Aroclor-1248	<19	
			Aroclor-1254	<19	
			Aroclor-1260	<19	
			PCB, Total	<19	

Bainbridge Aquatic Center Renovation - Ray Williamson Pool
Bainbridge Island Metro Park and Recreation District
PCB SAMPLE INVENTORY

PBS Engineering + Environmental
PBS Project #41924.000

<u>PBS Sample #</u>	<u>Material</u>	<u>Sample Location</u>	<u>Analyte</u>	<u>Lab Results (mg/kg)</u>	<u>Lab</u>
41924.000-PCB04	Exterior Door Frame Caulk at Rough Opening and Brick	East Elevation	Aroclor-1016	<0.76	NVL
			Aroclor-1221	<0.76	
			Aroclor-1232	<0.76	
			Aroclor-1242	<0.76	
			Aroclor-1248	<0.76	
			Aroclor-1254	<0.76	
			Aroclor-1260	<0.76	
			PCB, Total	<0.76	

April 10, 2024

Ryan Hunter

PBS Environmental - Seattle

214 E Galer St. Suite. 300

Seattle, WA 98102



NVL Batch # 2405942.00

RE: Organics PCB
Method: 8082 PCB Aroclors <Bulk>
Item Code: ORG-05

Client Project: 41924.000

Location: Bainbridge Aquatic Center Renovation-Ray Williamson

Dear Mr. Hunter,

Enclosed please find test results for samples submitted to our laboratory for analysis. Preparation and analysis of these samples were conducted in accordance with published industry standards and methods specified on the attached analytical report.

The content of this package consists of the following:

- Case Narrative & Definition of Data Qualifiers
- Analytical Test Results
- Applicable QC Summary
- Client Chain-of-Custody (CoC)
- NVL Receiving Record

The report is considered highly confidential and will not be released without your approval. Samples are archived for two weeks following analysis. Samples that are not retrieved by the client will be discarded after two weeks.

Thank you for using our laboratory services. If you need further assistance, please contact us at 206-547-0100 or 1-888-NVLLABS.

Sincerely,

A handwritten signature in black ink, appearing to read 'Nick Ly', written over a white background.

Nick Ly, Technical Manager

Enc.: Sample results



NVL Batch # 2405942.00

Case Narrative:

The following summarizes samples received on date as shown on the accompanied Chain of custody by NVL Laboratories, Inc. from PBS Environmental - Seattle for Project Number 41924.000. Samples were logged in for PCB analysis per client request using both customer sample ID's and laboratory assigned ID's as listed on the Chain-of-Custody (CoC). All samples as received were processed and analyzed within specified turnaround time without any abnormalities and deviations that may affect the analytical results. All quality control requirements were acceptable unless stated otherwise. The conditions of all samples were acceptable at time of receipt and all samples submitted with this batch were analyzed unless stated otherwise on the CoC.

Test Results are reported in milligrams per kilogram (mg/kg) for PCB samples as shown on the analytical reports.



NVL Batch # 2405942.00

Definition Appendix

Terms

% Rec	Percent recovery.
<	Below Reporting Limit(RL) or Limit of Quantitation(LoQ) of the instrument.
B	Blank contamination. The recorded results is associated with a contaminated blank.
DF	Dilution Factor
J	The reported concentration is an estimated value because something may be present in the sample that interfered with the analysis.
J1	The reported concentration is an estimated value because the laboratory control sample (LCS) is out of control limits.
J2	The reported concentration is an estimated value because the percent recovery for matrix spike is out of control limits.
J3	The reported concentration is an estimated value because the relative percent difference(RPD) for duplicate analysis is out of control limits.
J4	Percent recovery is outside of established control limits.
LCS	Laboratory Control Sample.
LFS	Laboratory Fortified Spike
Limits	The upper and lower control limits for spike recoveries.
LN	Quality control sample is outside of control limits. This analyte was not detected in the sample.
LOQ	Limit of quantitation(same as RL)
mg/kg	Milligrams per kilogram.
ND	Analyte not detected or below the reporting limit of the instrument or methodology



NVL Batch # 2405942.00

Definition Appendix

Terms

PPM	Parts per Million.
QC Batch Group	Quality Control Batch Group. The entity that links analytical results and supporting quality control results.
R	The data are not reliable due to possible contamination or loss of material during preparation or analysis. Re-sampling and reanalysis are necessary for verification.
RL	Reporting Limit. The minimum concentration that can be quantified under routine operating conditions.
RPD	Relative Percent Difference. The relative difference between duplicate results(matrix spike, blank spike, or samples duplicate) expressed as a percentage.
RPD Limit	The maximum RPD allowed for a set of duplicate measurements(see RPD).
SSMI	Surrogate has matrix interference.
Spike Conc	The measured concentration, in sample basis units, of a spiked sample.
SURR-ND	Surrogate was not detected due to matrix interference or dilution.
ug/m ³	Micrograms per cubic meter.
ug/100cm ²	Micrograms per hundred square centimeter.

Analysis Report

Polychlorinated Biphenyls by Gas Chromatography



Client: PBS Environmental - Seattle
Address: 214 E Galer St. Suite. 300
Seattle, WA 98102

Batch #: 2405942.00

Matrix: Bulk
Analysis Method: EPA 8082
Preparation Method: EPA 3546
Client Project #: 41924.000
Date Received: 4/3/2024
Samples Received: 4
Samples Analyzed: 4

Attention: Mr. Ryan Hunter
Project Location: Bainbridge Aquatic Center Renovation-Ray Williamson

Sample Number **41924.000-PCB01**
Lab Sample ID 24037590
Initial Sample Size 1.7351 gm

Matrix Bulk
Units of Result mg/Kg

Analyte	RL	Final Result	Analysis Date
Aroclor-1016	1.2	< 1.2	4/4/2024
Aroclor-1221	1.2	< 1.2	4/4/2024
Aroclor-1232	1.2	< 1.2	4/4/2024
Aroclor-1242	1.2	< 1.2	4/4/2024
Aroclor-1248	1.2	< 1.2	4/4/2024
Aroclor-1254	1.2	< 1.2	4/4/2024
Aroclor-1260	1.2	< 1.2	4/4/2024
PCBs, Total	1.2	< 1.2	

Analysis Report

Polychlorinated Biphenyls by Gas Chromatography



Client: PBS Environmental - Seattle
Address: 214 E Galer St. Suite. 300
Seattle, WA 98102

Batch #: 2405942.00

Matrix: Bulk
Analysis Method: EPA 8082
Preparation Method: EPA 3546
Client Project #: 41924.000
Date Received: 4/3/2024
Samples Received: 4
Samples Analyzed: 4

Attention: Mr. Ryan Hunter
Project Location: Bainbridge Aquatic Center Renovation-Ray Williamson

Sample Number **41924.000-PCB02**
Lab Sample ID 24037591
Initial Sample Size 1.8076 gm

Matrix Bulk
Units of Result mg/Kg

Analyte	RL	Final Result	Analysis Date
Aroclor-1016	1.1	< 1.1	4/4/2024
Aroclor-1221	1.1	< 1.1	4/4/2024
Aroclor-1232	1.1	< 1.1	4/4/2024
Aroclor-1242	1.1	< 1.1	4/4/2024
Aroclor-1248	1.1	< 1.1	4/4/2024
Aroclor-1254	1.1	1.6	4/4/2024
Aroclor-1260	1.1	< 1.1	4/4/2024
PCBs, Total	1.1	1.6	

Quality Control Results

Client Project #: 41924.000			Batch #: 2405942.00		
			Project Manager: Mr. Ryan Hunter		
Preparation Method: EPA 3546			Analysis Method: EPA 8082		
Preparation Date: 4/4/2024			Analysis Description: Polychlorinated Biphenyls by Gas Chromatography		
Blank: 2405942					

Analyte	Blank Results	Units	DF	RL	Control Limit	Qualifiers
Aroclor-1016	ND	mg/Kg	1	1.00	1.00	
Aroclor-1221	ND	mg/Kg	1	1.00	1.00	
Aroclor-1232	ND	mg/Kg	1	1.00	1.00	
Aroclor-1242	ND	mg/Kg	1	1.00	1.00	
Aroclor-1248	ND	mg/Kg	1	1.00	1.00	
Aroclor-1254	ND	mg/Kg	1	1.00	1.00	
Aroclor-1260	ND	mg/Kg	1	1.00	1.00	
PCBs, Total	ND	mg/Kg	1			
<i>Surrogates:</i>				% Rec		
Tetrachloro-m-xylene			1	87	40-140	
Decachlorobiphenyl			1	110	40-140	

Lab Control Sample: LCS 1254-2405942

Analyte	Blank Spike Results	Units	DF	Spike Conc	% Rec	Limits	Qualifiers
Aroclor-1254	17	mg/Kg	1	20.00	85	40-140	
<i>Surrogates:</i>							
Tetrachloro-m-xylene			1		92	40-140	
Decachlorobiphenyl			1		110	40-140	

Lab Control Sample: LCS 1016+1260-2405942

Lab Control Sample Duplicate: LCS Dup 1016+1260

Analyte	Blank Spike Results	Units	DF	Spike Conc	% Rec	Limits	RPD %	RPD Limit	Qualifiers
Aroclor-1016	15	mg/Kg	1	20.00	75	40-140			
	15			20.00	75	40-140	5	50%	
Aroclor-1260	18	mg/Kg	1	20.00	90	40-140			
	18			20.00	90	40-140	2	50%	
<i>Surrogates:</i>									
Tetrachloro-m-xylene			1		92	40-140			
					81	40-140			
Decachlorobiphenyl			1		130	40-140			
					110	40-140			

* Recovery outside of control limits

Surrogate Recovery Summary Report

Client PBS Environmental - Seattle

Batch # 2405942.00

Project 41924.000

Customer Sample ID	Lab Sample ID	Analyte	Recovery	Limits
41924.000-PCB01	24037590	Decachlorobiphenyl	110%	40-140
41924.000-PCB01	24037590	Tetrachloro-m-xylene	95%	40-140
41924.000-PCB02	24037591	Decachlorobiphenyl	95%	40-140
41924.000-PCB02	24037591	Tetrachloro-m-xylene	75%	40-140
41924.000-PCB03	24037592	Decachlorobiphenyl	100%	40-140
41924.000-PCB03	24037592	Tetrachloro-m-xylene	68%	40-140
41924.000-PCB04	24037593	Decachlorobiphenyl	95%	40-140
41924.000-PCB04	24037593	Tetrachloro-m-xylene	82%	40-140

*Recovery outside of the limits

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Sample	Analyzed	Analyte	Target	Solution Conc	Unit	% Rec	Limits
ICV-1016	4/3/2024	Aroclor-1016	5.0	4.83	ug/mL	97	85-115
ICV-1254	4/3/2024	Aroclor-1254	5.0	5.04	ug/mL	101	85-115
ICV-1260	4/3/2024	Aroclor-1260	5.0	5.38	ug/mL	108	85-115
CCV1-1016	4/3/2024	Aroclor-1016	5.0	4.80	ug/mL	96	80-120
CCV1-1254	4/3/2024	Aroclor-1254	5.0	4.46	ug/mL	89	80-120
CCV1-1260	4/3/2024	Aroclor-1260	5.0	4.52	ug/mL	90	80-120
CCV2-1016	4/3/2024	Aroclor-1016	5.0	5.38	ug/mL	108	80-120
CCV2-1254	4/3/2024	Aroclor-1254	5.0	5.16	ug/mL	103	80-120
CCV2-1260	4/3/2024	Aroclor-1260	5.0	5.24	ug/mL	105	80-120
CCV3-1016	4/3/2024	Aroclor-1016	5.0	5.27	ug/mL	105	80-120
CCV3-1254	4/3/2024	Aroclor-1254	5.0	4.96	ug/mL	99	80-120
CCV3-1260	4/3/2024	Aroclor-1260	5.0	5.15	ug/mL	103	80-120
CCV4-1016	4/3/2024	Aroclor-1016	5.0	5.52	ug/mL	110	80-120
CCV4-1254	4/3/2024	Aroclor-1254	5.0	5.14	ug/mL	103	80-120
CCV4-1260	4/3/2024	Aroclor-1260	5.0	5.22	ug/mL	104	80-120

% Rec - Percent recovery

* Percent recovery not within control limits

ORGANICS LABORATORY SERVICES



Company PBS Environmental - Seattle
Address 214 E Galer St. Suite. 300
 Seattle, WA 98102
Project Manager Mr. Ryan Hunter
Phone (206) 233-9639
Cell (484) 269-2138
NVL Batch Number 2405942.00
TAT 5 Days **AH** No
Rush TAT
Due Date 4/10/2024 **Time** 5:00 PM
Email ryan.hunter@pbsusa.com
Fax (866) 727-0140

Project Name/Number: 41924.000 **Project Location:** Bainbridge Aquatic Center Renovation-Ray Williamson

Subcategory Quantitative analysis

Item Code ORG-05 8082 PCB Aroclors <Bulk>

Total Number of Samples 4

Rush Samples

	Lab ID	Sample ID	Description	A/R
1	24037590	41924.000-PCB01		A
2	24037591	41924.000-PCB02		A
3	24037592	41924.000-PCB03		A
4	24037593	41924.000-PCB04		A

	Print Name	Signature	Company	Date	Time
Sampled by	Client				
Relinquished by	Client				

Office Use Only	Print Name	Signature	Company	Date	Time
Received by	Rachelle Miller		NVL	4/3/24	1700
Analyzed by	Evelyn Ahulu		NVL	4/4/24	
Results Called by					
☐ Faxed ☐ Emailed					

Special Instructions:

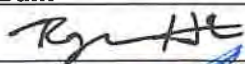
Date: 4/3/2024
 Time: 5:26 PM
 Entered By: Rachelle Miller

Project: Bainbrige Aquatic Center Renovation – Ray Williamson

Project #: 41924.000 Page 1 of 1

Analysis requested: EPA 8082 – PCB Bulk

Date: 04/03/2024

Relinquished by/Signature: Ryan Hunter / 

Date/Time: 04/03/2024

Received by/Signature: Rachelle Miller  MSZ

Date/Time: 4/3/24 @ 1:00

Email ALL INVOICES to: seattleap@pbsusa.com

E-mail results to:

- ☐ Willem Mager
☐ Gregg Middaugh
☐ Mark Hiley
☒ Ryan Hunter
☐ Janet Murphy

- ☐ Ferman Fletcher
☐ Claire Tsai
☐ Toan Nguyen
☐ Peter Stensland
☐ Cameron Budnick

- ☐ Nick San
☐ Katie King
☐ Kameron DeMonnin

TURN AROUND TIME:

- ☐ 1 Hour
☐ 2 Hours
☐ 4 Hours

- ☐ 24 Hours
☐ 48 Hours

- ☒ 5 Day
☐ Other _____

SAMPLE DATA FORM

Sample #	Material	Location	Lab
41924.000-PCB01	Interior Door Frame Caulk	East Interior	NVL
41924.000-PCB02	Exterior Window Frame Caulk @ Rough Opening and Brick	East Elevation - South	↓
41924.000-PCB03	Exterior Window Frame Caulk at Metal Column and Frame	South Elevation	
41924.000-PCB04	Exterior Rood Frame Caulk at Rough Opening and Brick	East Elevation	

APPENDIX D

Metals in Masonry Components Sampling Information

RCRA 8 Sample Inventory

RCRA 8 Laboratory Data Sheets

RCRA 8 Chain-of-Custody Documentation

Bainbridge Aquatic Center Renovation - Ray Williamson Pool
Bainbridge Island Metro Park and Recreation District
RCRA SAMPLE INVENTORY

PBS Engineering + Environmental
PBS Project #41924.000

<u>PBS Sample #</u>	<u>Material</u>	<u>Sample Location</u>	<u>Analyte</u>	<u>Lab Results (mg/kg)</u>	<u>Lab</u>
41924.000-RCRA01	Mortar associated with Brick	East Elevation	Arsenic	47.5	FA
			Barium	91.1	
			Cadmium	0.0427	
			Chromium	15.8	
			Lead	6.33	
			Mercury	ND	
			Selenium	ND	
			Silver	0.0222	



3600 Fremont Ave. N.
Seattle, WA 98103
T: (206) 352-3790
F: (206) 352-7178
info@fremontanalytical.com

PBS Engineering & Environmental

Ryan Hunter
214 E Galer St. Suite 300
Seattle, WA 98102

RE: Bainbridge Aquatic Center Renovation - Ray Williamson
Work Order Number: 2404100

April 11, 2024

Attention Ryan Hunter:

Fremont Analytical, Inc, an Alliance Technical Group company, received 1 sample(s) on 4/4/2024 for the analyses presented in the following report.

Total Metals by EPA Method 6020

This report consists of the following:

- Case Narrative
- Analytical Results
- Applicable Quality Control Summary Reports
- Chain of Custody

All analyses were performed according to our accredited Quality Assurance program. Please contact the laboratory if you should have any questions about the results.

Please note, while the appearance of our logo and branding will update, our commitment to accuracy, speed, and customer service remain values celebrated and shared by Alliance Technical Group. Thank you for the opportunity to serve you.

Sincerely,

Brianna Barnes
Project Manager

*DoD-ELAP Accreditation #79636 by PJLA, ISO/IEC 17025:2017 and QSM 5.4 for Environmental Testing
ORELAP Certification: WA 100009 (NELAP Recognized) for Environmental Testing
Washington State Department of Ecology Accredited for Environmental Testing, Lab ID C910*

Original

www.fremontanalytical.com

CLIENT: PBS Engineering & Environmental
Project: Bainbridge Aquatic Center Renovation - Ray
Work Order: 2404100

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Date/Time Collected	Date/Time Received
2404100-001	41924.000-RCRA01	04/04/2024 12:00 AM	04/04/2024 8:23 AM

Note: If no "Time Collected" is supplied, a default of 12:00AM is assigned

CLIENT: PBS Engineering & Environmental
Project: Bainbridge Aquatic Center Renovation - Ray Williamson

I. SAMPLE RECEIPT:

Samples receipt information is recorded on the attached Sample Receipt Checklist.

II. GENERAL REPORTING COMMENTS:

Results are reported on a wet weight basis unless dry-weight correction is denoted in the units field on the analytical report ("mg/kg-dry" or "ug/kg-dry").

Matrix Spike (MS) and MS Duplicate (MSD) samples are tested from an analytical batch of "like" matrix to check for possible matrix effect. The MS and MSD will provide site specific matrix data only for those samples which are spiked by the laboratory. The sample chosen for spike purposes may or may not have been a sample submitted in this sample delivery group. The validity of the analytical procedures for which data is reported in this analytical report is determined by the Laboratory Control Sample (LCS) and the Method Blank (MB). The LCS and the MB are processed with the samples and the MS/MSD to ensure method criteria are achieved throughout the entire analytical process.

III. ANALYSES AND EXCEPTIONS:

Exceptions associated with this report will be footnoted in the analytical results page(s) or the quality control summary page(s) and/or noted below.

Qualifiers:

- * - Flagged value is not within established control limits
- B - Analyte detected in the associated Method Blank
- D - Dilution was required
- E - Value above quantitation range
- H - Holding times for preparation or analysis exceeded
- I - Analyte with an internal standard that does not meet established acceptance criteria
- J - Analyte detected below Reporting Limit
- N - Tentatively Identified Compound (TIC)
- Q - Analyte with an initial or continuing calibration that does not meet established acceptance criteria
- S - Spike recovery outside accepted recovery limits
- ND - Not detected at the Reporting Limit
- R - High relative percent difference observed

Acronyms:

- %Rec - Percent Recovery
- CCB - Continued Calibration Blank
- CCV - Continued Calibration Verification
- DF - Dilution Factor
- DUP - Sample Duplicate
- HEM - Hexane Extractable Material
- ICV - Initial Calibration Verification
- LCS/LCSD - Laboratory Control Sample / Laboratory Control Sample Duplicate
- MCL - Maximum Contaminant Level
- MB or MBLANK - Method Blank
- MDL - Method Detection Limit
- MS/MSD - Matrix Spike / Matrix Spike Duplicate
- PDS - Post Digestion Spike
- Ref Val - Reference Value
- REP - Sample Replicate
- RL - Reporting Limit
- RPD - Relative Percent Difference
- SD - Serial Dilution
- SGT - Silica Gel Treatment
- SPK - Spike
- Surr - Surrogate

Client: PBS Engineering & Environmental

Collection Date: 4/4/2024

Project: Bainbridge Aquatic Center Renovation - Ray Williamson

Lab ID: 2404100-001

Matrix:

Client Sample ID: 41924.000-RCRA01

Analyses	Result	RL	Qual	Units	DF	Date Analyzed

Total Metals by EPA Method 6020

Batch ID: 43525

Analyst: ME

Arsenic	47.5	0.252		mg/Kg	1	4/10/2024 2:51:00 PM
Barium	91.1	0.504		mg/Kg	1	4/10/2024 2:51:00 PM
Cadmium	0.0427	0.0202		mg/Kg	1	4/10/2024 2:51:00 PM
Chromium	15.8	0.252		mg/Kg	1	4/10/2024 2:51:00 PM
Lead	6.33	1.01		mg/Kg	1	4/10/2024 2:51:00 PM
Mercury	ND	0.202		mg/Kg	1	4/10/2024 2:51:00 PM
Selenium	ND	1.01		mg/Kg	1	4/10/2024 2:51:00 PM
Silver	0.0222	0.0202		mg/Kg	1	4/10/2024 2:51:00 PM

Work Order: 2404100
CLIENT: PBS Engineering & Environmental
Project: Bainbridge Aquatic Center Renovation - Ray

QC SUMMARY REPORT

Total Metals by EPA Method 6020

Sample ID: MB-43525		SampType: MBLK		Units: mg/Kg		Prep Date: 4/10/2024			RunNo: 90893			
Client ID: MBLKS		Batch ID: 43525					Analysis Date: 4/10/2024			SeqNo: 1895282		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual	

Arsenic	ND	0.258									
Barium	ND	0.517									
Cadmium	ND	0.0207									
Chromium	ND	0.258									
Lead	ND	1.03									
Mercury	ND	0.207									
Selenium	ND	1.03									
Silver	ND	0.0207									

Sample ID: LCS-43525		SampType: LCS			Units: mg/Kg		Prep Date: 4/10/2024			RunNo: 90893		
Client ID: LCSS		Batch ID: 43525			Analysis Date: 4/10/2024					SeqNo: 1895283		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual	

Arsenic	39.5	0.244	39.06	0	101	80	120				
Barium	39.0	0.488	39.06	0	99.9	80	120				
Cadmium	2.03	0.0195	1.953	0	104	80	120				
Chromium	41.6	0.244	39.06	0	106	80	120				
Lead	20.7	0.977	19.53	0	106	80	120				
Mercury	1.00	0.195	0.9766	0	103	80	120				
Selenium	4.04	0.977	3.906	0	103	80	120				
Silver	2.00	0.0195	1.953	0	102	80	120				

Sample ID: 2404135-001AMS		SampType: MS			Units: mg/Kg-dry		Prep Date: 4/10/2024			RunNo: 90893		
Client ID: BATCH		Batch ID: 43525			Analysis Date: 4/10/2024			SeqNo: 1895286				
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual	

Arsenic	62.7	0.342	54.74	5.464	105	75	125				
Barium	156	0.684	54.74	86.49	127	75	125				S
Cadmium	4.12	0.0274	2.737	1.099	110	75	125				
Chromium	81.8	0.342	54.74	20.36	112	75	125				
Lead	224	1.37	27.37	168.9	201	75	125				ES

Work Order: 2404100
CLIENT: PBS Engineering & Environmental
Project: Bainbridge Aquatic Center Renovation - Ray

QC SUMMARY REPORT

Total Metals by EPA Method 6020

Sample ID: 2404135-001AMS		SampType: MS			Units: mg/Kg-dry		Prep Date: 4/10/2024		RunNo: 90893		
Client ID: BATCH		Batch ID: 43525			Analysis Date: 4/10/2024				SeqNo: 1895286		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Mercury	1.82	0.274	1.368	0.2384	115	75	125				
Selenium	6.24	1.37	5.474	0.5060	105	75	125				
Silver	3.20	0.0274	2.737	0.2368	108	75	125				

NOTES:

S - Spiked amount was low relative to sample concentration. Outlying spike recoveries may be expected.

Sample ID: 2404135-001AMSD	SampType: MSD				Units: mg/Kg-dry	Prep Date: 4/10/2024			RunNo: 90893		
Client ID: BATCH	Batch ID: 43525				Analysis Date: 4/10/2024			SeqNo: 1895287			
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Arsenic	58.2	0.314	50.17	5.464	105	75	125	62.71	7.54	20	S
Barium	159	0.627	50.17	86.49	145	75	125	156.1	2.13	20	
Cadmium	3.91	0.0251	2.509	1.099	112	75	125	4.122	5.24	20	
Chromium	72.9	0.314	50.17	20.36	105	75	125	81.76	11.4	20	ES
Lead	215	1.25	25.09	168.9	183	75	125	224.0	4.20	20	
Mercury	1.63	0.251	1.254	0.2384	111	75	125	1.816	10.6	20	
Selenium	5.84	1.25	5.017	0.5060	106	75	125	6.237	6.53	20	
Silver	2.93	0.0251	2.509	0.2368	107	75	125	3.205	8.88	20	

NOTES:

S - Spiked amount was low relative to sample concentration. Outlying spike recoveries may be expected.

Sample Log-In Check List

Client Name: PBS

Work Order Number: 2404100

Logged by: Morgan Wilson

Date Received: 4/4/2024 8:24:00 AM

Chain of Custody

1. Is Chain of Custody complete? Yes ☒ No ☐ Not Present ☐
2. How was the sample delivered? Client

Log In

3. Custody Seals present on shipping container/cooler?
(Refer to comments for Custody Seals not intact) Yes ☐ No ☐ Not Present ☒
4. Was an attempt made to cool the samples? Yes ☐ No ☒ NA ☐
5. Were all items received at a temperature of >2°C to 6°C * Unknown prior to receipt. Yes ☐ No ☐ NA ☒
6. Sample(s) in proper container(s)? Yes ☒ No ☐
7. Sufficient sample volume for indicated test(s)? Yes ☒ No ☐
8. Are samples properly preserved? Yes ☒ No ☐
9. Was preservative added to bottles? Yes ☐ No ☒ NA ☐
10. Is there headspace in the VOA vials? Yes ☐ No ☐ NA ☒
11. Did all samples containers arrive in good condition(unbroken)? Yes ☒ No ☐
12. Does paperwork match bottle labels? Yes ☒ No ☐
13. Are matrices correctly identified on Chain of Custody? Yes ☒ No ☐
14. Is it clear what analyses were requested? Yes ☒ No ☐
15. Were all hold times (except field parameters, pH e.g.) able to be met? Yes ☒ No ☐

Special Handling (if applicable)

16. Was client notified of all discrepancies with this order? Yes ☐ No ☐ NA ☒

Person Notified:		Date:	
By Whom:		Via:	☐ eMail ☐ Phone ☐ Fax ☐ In Person
Regarding:			
Client Instructions:			

17. Additional remarks:

Item Information

Item #	Temp °C
Sample	17.9

* Note: DoD/ELAP and TNI require items to be received at 4°C +/- 2°C

APPENDIX E

Certification

THIS IS TO CERTIFY THAT

RYAN HUNTER

HAS SUCCESSFULLY COMPLETED THE TRAINING COURSE

for

ONLINE AHERA ASBESTOS INSPECTOR REFRESHER

In accordance with TSCA Title II, Part 763, Subpart E, Appendix C of 40 CFR

Course Date: 03/05/2024

Course Location: Online

Certificate: IRO-24-7254B



CCB #SRA0615 4-Hr Training

4-Hour Online AHERA Inspector Refresher Training; AHERA is the Asbestos Hazard Emergency Response Act enacting Title II of Toxic Substance Control Act (TSCA)

Expiration Date: 03/05/2025

For verification of the authenticity of this certificate contact:
PBS Engineering and Environmental Inc.
4412 S Corbett Avenue
Portland, OR 97239
503.248.1939

A handwritten signature in black ink, reading "Andy Fridley".

Andy Fridley, Instructor

SECTION 03 01 23
EMBEDDED GALVANIC ANODES

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Installation of Anode Type IA Classic - galvanic anodes embedded within concrete repairs to provide corrosion control.
- B. Galvanic anodes will be installed in concrete patch repair locations where rust and pitting on exposed reinforcing steel is present.

1.02 RELATED SECTIONS

- A. Section 03 01 30 – Surface Preparation for Overlay.
- B. Section 03 01 30.71 – Concrete Rehabilitation.
- C. Section 03 20 00 – Concrete Reinforcement.
- D. Section 03 30 00 – Cast-in-Place Concrete.

1.03 SUMMARY

- A. This Section includes furnishing all labor, tools, materials, equipment and services necessary to properly install embedded galvanic anodes.
- B. Embedded galvanic anodes are designed to provide localized corrosion protection. When placed at the appropriate spacing along the perimeter of concrete patches or along the interface between new/existing concrete, the anodes mitigate active corrosion and the formation of new corrosion sites in the adjacent existing concrete.

1.04 REFERENCES

- A. ACI Guideline No. 222 – Corrosion of Metals in Concrete.
- B. ACI Repair Application Procedure (RAP) Bulletin 8 – Installation of Embedded Galvanic Anodes (2010).
- C. ACI 562 – Code Requirements for Evaluation, Repair, Rehabilitation of Concrete Buildings.
- D. ICRI Guideline 310.1R Guide for Surface Preparation for the Repair of Deteriorated Concrete resulting from Reinforcing Steel Corrosion.
- E. ASTM B418-12 – Standard Specification for Cast and Wrought Galvanic Zinc Anodes.
- F. ISO 12696 – Cathodic Protection of Steel in Concrete.

G. ASTM C 309 Curing Compounds for Concrete.

1.05 MANUFACTURER EXTENDED LIMITED WARRANTY

- A. Contractor shall provide a Limited Warranty with a notarized signature from a corporate officer of the anode manufacturer.
- B. The Limited Warranty shall state the following:
 - 1. The published anode spacing guidelines for anode size and spacing are based on an estimated 10–30-year anode service life.
 - 2. The galvanic anodes will remain electrochemically active and produce galvanic current in relation to the environment in which it is installed for a minimum of 5 years from the date of anode installation.
 - 3. The anode unit, including its constituents, does not include substances that may cause adverse effects to concrete or reinforcing steel and will not contribute to reinforcing steel corrosion damage over the life of the structure.
 - 4. The galvanic anodes meet all building and repair code requirements.

PART 2 – PRODUCTS

2.01 EMBEDDED GALVANIC ANODES

- A. Embedded galvanic anodes in concrete patch repairs shall be Anode Type 1A Class P with the following nominal dimensions: 2.6 in. diameter by 1.2 in. deep. The anodes shall be pre-manufactured with a nominal 60 grams of zinc in compliance with ASTM B418 Type II cast around a pair of uncoated, non-galvanized steel tie wires and encased in a highly alkaline cementitious shell with a pH of 14 or greater.
- B. Placed in drilled holes embedded galvanic anodes shall be Anode Type 2A Class C with the following nominal dimensions: 1 3/4 x 2 1/2 in. or 1 3/4 x 4 in. as indicated on the drawings. The anode units shall be pre-manufactured with zinc in compliance with ASTM B418 Type II cast around an uncoated, non-galvanized steel lead wire and encased in a highly alkaline cementitious shell with a pH of 14 or greater.
- C. The anode unit shall contain no intentionally added chloride, bromide or other constituents that are corrosive to reinforcing steel as per ACI 222R. Embedded galvanic anodes shall be Galvashield® XP and CC available from Vector Corrosion Technologies (www.vector-corrosion.com) USA (813) 830-7566, Canada (204) 489-9611 or approved equal.
- D. Application for galvanic anode approved equals shall include verification of the following information:
 - 1. The zinc anode is alkali-activated with an alkaline cementitious shell with a pH of 14 or greater.
 - 2. Contain no intentionally added constituents corrosive to reinforcing steel or detrimental to concrete, e.g. chloride, bromide, etc.
 - 3. Field installations showing that the anodes have achieved a minimum of 10 years service.
 - 4. A minimum of ten projects of similar size and application.

5. Anode units shall be supplied with solid zinc core (ASTM B418) cast around a uncoated non-galvanized, non-spliced steel wire and twisting to provide a durable steel-to-steel connection between the tie wire and reinforcement.
6. Third party product evaluation, such as from Concrete Innovations Appraisal Service, BBA, etc.

2.02 REPAIR MATERIALS

- A. Use an ionically conductive, cement-based repair mortar or concrete. Non-conductive repair materials such as epoxy, urethane, or magnesium phosphate shall not be permitted. Insulating materials such as epoxy bonding agents shall not be used unless otherwise called for in the design.
- B. If repair materials have a saturated bulk resistivity of 50,000 ohm-cm or greater, pack Galvashield® Embedding Mortar or another repair mortar with a resistivity of 15,000 ohm-cm or less between the anode and the substrate to provide an ionically conductive path to the substrate.

2.03 STORAGE

Deliver, store, and handle all materials in accordance with manufacturer's instructions. Anode units shall be stored in dry conditions in the original unopened containers in a manner to avoid exposure to extremes of temperature and humidity.

PART 3 – EXECUTION

3.01 EMBEDDED GALVANIC ANODES IN CONCRETE REPAIR

- A. Concrete Removal
 1. Remove loose or delaminated concrete.
 2. Undercut all exposed reinforcing steel by removing concrete from the full circumference of the steel as per ICRI R310.1R. The minimum clearance between the concrete substrate and reinforcing steel shall be $\frac{3}{4}$ inch (19 mm) or $\frac{1}{4}$ inch larger than the top size aggregate in the repair material, whichever is greater.
 3. Concrete removal shall continue along the reinforcing steel until no further delamination, cracking, or significant rebar corrosion exists and the reinforcing steel is well bonded to the surrounding concrete as per ICRI R310.1R.
- B. Cleaning and Repair of Reinforcing Steel
 1. Clean exposed reinforcing steel of rust, mortar, etc. to provide sufficient electrical connection and mechanical bond.
 2. If significant reduction in the cross section of the reinforcing steel has occurred, replace or install supplemental reinforcement as directed by the engineer of record.
 3. Secure loose reinforcing steel by tying tightly to other bars with steel tie wire.
 4. Verify electrical continuity of all reinforcing steel, including supplemental steel, as per Section 3.01.D.6.

5. If the reinforcing steel is to receive a barrier coating, do not coat the reinforcing steel within 1 in. (25mm) of the anode and do not apply coating to any surface of the anode or the steel tie wires.
- C. Edge and Surface Conditioning of Concrete
1. Concrete patches shall be square or rectangular in shape with squared corners per ICRI Guideline 310.1R.
 2. Saw cut the patch boundary ½ inch deep or less if required to avoid cutting reinforcing steel.
 3. Create a clean, sound substrate by removing bond-inhibiting materials from the concrete substrate by high pressure water blasting or abrasive blasting.
- D. Galvanic Anode Installation
1. Install anode units and repair material immediately following preparation and cleaning of the steel reinforcement.
 2. Galvanic anodes shall be installed along the perimeter of the repair and along the interface between new and old concrete.
 3. Place the galvanic anodes as close as possible to the patch edge while still providing sufficient clearance between anodes and substrate to allow the repair material to fully encase the anode with a minimum concrete or mortar cover over the anode of 1 in. (25mm). If necessary, increase the size of the repair cavity to accommodate the anodes.
 - a. Place the anode such that it is attached to a single bar or at the intersection between two bars and secure to each clean bar.
 - b. If less than 1 in. (25 mm) of concrete cover is expected, place anode beneath the bar and secure to clean reinforcing steel.
 4. The tie wires shall be wrapped around the cleaned reinforcing steel at least one full turn in opposite directions and then twisted tight to create a secure electrical connection and allow no anode movement during concrete placement.
 5. If repair materials with resistivity greater than 15,000 ohm-cm are to be used or if the resistivity is unknown, pack Galvashield Embedding Mortar between the anode and the substrate concrete to create a conductive grout bridge ensuring no voids exist.
 6. Electrical Continuity
 - a. Confirm electrical connection between anode tie wire and reinforcing steel by measuring DC resistance (ohm Ω) or DC potential (mV) with a multi-meter.
 - b. Electrical connection is acceptable if the DC resistance measured with the multi-meter is 1 Ω or less or the DC potential is 1 mV or less.
 - c. Confirm electrical continuity of the exposed reinforcing steel within the repair area. If necessary, electrical continuity shall be established by tying discontinuous steel to continuous steel using steel tie wire.
 - d. Electrical continuity between test areas is acceptable if the DC resistance measured with multi-meter is 1 Ω or less or the potential is 1 mV or less.
- E. Concrete or Mortar Replacement
1. If the repair procedures require the concrete surface to be saturated with water, do not damage the anode nor allow the anode units to be soaked for greater than 20 minutes.
 2. Complete the repair with the repair material, taking care not to damage, loosen or leave voids around the anode.

END OF SECTION

PART I - GENERAL

1.01 SECTION INCLUDES

- A. For concrete partial depth patch repairs, overlays and new structural strengthening work to provide a sound surface profile preparation in conformance with the details indicated on the Drawings. This includes removal of all delaminated, sound and unsound concrete within the repair limit areas shown on the Drawings and the removal of unsound and weakened concrete surfaces and voids and the preparation of a sound cavity substrate to be filled over overlaid with cementitious repair materials.

1.02 RELATED SECTIONS

- A. Section 02 41 00 – Demolition Work
- B. Section 31 40 00 – Shoring and Underpinning
- C. Section 03 20 00 - Concrete Reinforcement
- D. Section 03 30 00 - Cast-In-Place Concrete
- E. Section 03 01 30.71 - Concrete Rehabilitation.
- F. Section 03 64 23 – Epoxy Injection Concrete Crack Repair.

1.03 REFERENCES

- A. American Concrete Institute
 - 1. ACI-301 - Specifications for Structural Concrete for Buildings.
 - 2. ACI 318 - Building Code Requirements for Structural Concrete.
 - 3. ACI 546R - Concrete Repair Guide
- B. International Concrete Repair Institute
 - 1. ICRI Guideline No. 310.1R-2008 - Guide for Surface Preparation for Repair of Deteriorated Concrete Resulting from Reinforcing Steel Corrosion.
 - 2. ICRI Guideline No. 320.1R-2019 - Guide for Selecting Application Methods for the Repair of Concrete Surfaces.
 - 3. ICRI Guideline No. 301.2R-2013 - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays.
- C. Comply with the provisions of the above codes, specifications, and standards, except where more stringent requirements are shown on the drawings or specified herein.

PART 2 – PRODUCTS

Not Used

PART 3 - EXECUTION

3.01 GENERAL

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until satisfactory conditions are corrected and have been inspected by a third-party inspector retained by the Owner, the Engineer, or by the Owner's Project Representative.
- B. No concrete removal shall proceed within 60 lineal feet (min.) of new concrete placement areas until 72 hours of curing time has elapsed, unless otherwise approved by Engineer.

3.02 LOCATION AND MARKING OF WORK AREA

- A. Existing Concrete Surface (Partial Depth) Removal
 - 1. As shown on the drawings, layout and mark the concrete areas to be removed. Use chain dragging, hammer sounding, visual identification of slab lift off cracks and other methods to identify full areas of repair. Locations and areas shown on the Drawings are approximate; actual locations and layout shall be verified by the Engineer at the time the work is to be performed.
 - 2. The Engineer may define and mark additional unsound concrete areas for removal, if required.
 - 3. Areas to be removed shall be as straight and orthogonal as practical to encompass repair areas and to provide neat, straight overlay patch joints.

3.03 CONCRETE REMOVAL AND CAVITY PREPARATION

- A. Verify that shoring has been fully completed and secured to support those areas under repair prior to concrete removal.
- B. As designated on the drawings, concrete to be removed shall have its marked boundaries sawcut to a depth of 1/2 inch unless otherwise noted. All edges and overlay joints shall be straight. Do not overcut or leave sawcuts in the concrete to remain.
- C. All concrete shall be removed to the minimum depth limits shown on the drawings. The maximum size and chipping angle of pneumatic hammers used for concrete removal is as indicated on the drawings.
- D. Where embedded reinforcement is exposed by concrete removal, extra caution shall be exercised to avoid damaging it during removal of additional unsound concrete. If bond between exposed embedded reinforcement and adjacent concrete is impaired by the Contractor's removal operations the Contractor shall perform additional removal around and beyond the perimeter of the reinforcement along the entire affected length.
- E. If rust is present on embedded reinforcement where it enters sound concrete, then additional

removal of concrete along and beneath the reinforcement will be required. Such additional removal shall continue until non-rusted reinforcement is exposed or removal may be terminated as the Engineer directs.

- F. Following completion of concrete removal by pneumatic jack hammers and electric chipping tools to the limits and depth shown on the drawings the remaining concrete cavity surfaces shall be thoroughly water blasted (4,000 psi minimum) or sand blasted to remove concrete and aggregate loosened by chipping hammer removal.
- G. Concrete removal by conventional (jackhammer) removal methods may be performed by power chipping or hand tools except that pneumatic hammer heavier than 15 lb. class will not be permitted within 2" of final demolition or cavity limit of surfaces to be prepared for overlay. Such tools may be started in a vertical but must be immediately tilted to a maximum of 60-degree operation angle. Pneumatic hammers heavier than 15 lb. class will not be permitted for removals within 2" of demolition limit, or in areas directly above the top longitudinal reinforcing steel, or around primary girder reinforcing.
- H. At small spall areas and cracks where repair limit depths will be less than 1" deep, use needle scales, grinders and sawcuts as necessary to prepare a sound substrate, surface profile and detailed opening to receive and bond with repair material fill.

3.04 INSPECTION OF CAVITY SURFACES AND EXPOSED REINFORCING

- A. After concrete removal is complete but prior to final cleaning, the cavity and exposed reinforcement shall be inspected by the Contractor and verified by the Engineer for sound undamaged concrete surfaces. Where the Engineer can detect unsatisfactory cavity preparation the Engineer may direct the Contractor to perform additional removals. The Engineer will verify that additional removals have been performed as directed.
- B. The Contractor shall inspect embedded reinforcement exposed within the cavity for defects due to corrosion or damage resulting from removal operations.
- C. Replacement of damaged or defective reinforcement shall be performed according to this Section and as directed by the Engineer.

3.05 REINFORCEMENT IN REPAIR AREA

- A. All embedded reinforcement exposed during surface preparation that has lost more than 15% of the original cross-sectional area due to corrosion shall be considered defective. All non-defective exposed reinforcement that has lost section (to the extent specified above) as a direct result of Contractor's removal operations, shall be considered damaged.
- B. Supplement defective or damaged embedded reinforcement with a reinforcement of equal diameter having a Class "B" tension lap splices, minimum splice (ACI-318) beyond the damaged portion of the reinforcement. Secure the new reinforcement to the existing reinforcement with wire ties and/or approved anchors.

- C. Loose reinforcement exposed during surface preparation shall be securely anchored to the prepared substrate prior to patch placement. Loose reinforcement shall be adequately secured by wire ties to bonded reinforcement or shall have drilled-in anchors installed to the original deck. The Engineer shall determine the adequacy of wire ties and approve other anchoring devices prior to their use.
- D. Concrete shall be removed to provide a minimum of 3/4 inch clearance on all sides of exposed embedded reinforcement that is left in place unless otherwise noted on the drawings.

3.06 CLEANING OF EXPOSED REINFORCING

- A. All exposed reinforcing steel shall be cleaned of all rust, oil, dirt, concrete fragments, laitance, scale and other coatings that inhibit bond by sandblasting, waterblasting, needle scalers or other acceptable methods.
- B. Cleaning of reinforcing steel shall be completed immediately before overlay placement to ensure that the base metal is not exposed to the elements and further rusting for extended periods of time.

3.07 PREPARATION OF EXPOSED SOUND CONCRETE FOR OVERLAY PLACEMENT

- A. Concrete demolition limits and cavities will be examined prior to commencement of overlay or patching operations. Sounding the surface shall be part of the examination. Any delamination noted during the sounding shall be removed as specified in this Section.
- B. Cavities shall be waterblasted or sandblasted. Airblasting is required as a final step to remove all loose debris. All debris shall be removed from the site prior to the start of patching or placement of overlay.
- C. Concrete surfaces shall be cleaned to remove all existing membrane materials and all other substances detrimental to concrete bond. Shotblast followed by waterblast all surfaces to receive the new concrete overlay slab. Provide minimum 1/8" inch surface profile conforming to ICRI CSP5. Provide SSD conditions on substrate immediately prior to concrete placement.

END OF SECTION

PART 1 - GENERAL

1.0.1 SECTION INCLUDES

- A. Preparation of Concrete and Application of Repair Materials.
- B. Restoration of Concrete Surfaces.
- C. Repair of Unsound and Delaminated Concrete.

1.02 RELATED SECTIONS

- A. Section 03 01 23 – Embedded Galvanic Anodes.
- B. Section 03 01 30 – Surface Preparation for Overlay
- C. Section 03 30 00 – Cast-In-Place Concrete.
- D. Section 03 64 23 – Epoxy Injected Concrete Crack Repair.
- E. Section 07 92 00 – Joint Sealants.
- F. Section 09 91 14 Exterior Concrete Coating.
- G. Section 09 91 15 – High Performance Exterior Concrete Coating.
- H. Section 31 40 00 – Shoring and Underpinning

1.03 REFERENCES

- A. ASTM International.
 - 1. ASTM C-33 – Concrete Aggregates.
 - 2. ASTM C-150 - Portland Cement.
 - 3. ASTM C-39 - Compressive Strength.
 - 4. ASTM C-109 - Modified Compressive Strength.
 - 5. ASTM C-157 - Drying Shrinkage.
 - 6. ASTM C-387 - Packaged, Dry, Combined Materials for Mortar and Concrete.
 - 7. ASTM C-496 - Splitting Tensile Strength.
 - 8. ASTM C-666 - Freeze Thaw Resistance.
 - 9. ASTM C-881 - Epoxy-Resin-Base Bonding Systems for Concrete.
 - 10. ASTM C-882 - Modified Bond Strength.
 - 11. ASTM C-928 - Packaged, Dry, Rapid-Hardening, Cementitious Materials for Crack Repairs.
 - 12. ASTM C-469 - Elastic Modulus.
- B. American Concrete Institute.
 - 1. ACI 201.2R - Guide to Durable Concrete.
 - 2. ACI 223 - Standard Practice for the Use of Shrinkage-Compensating Concrete.
 - 3. ACI 308 - Standard Practice for Curing Concrete.

4. ACI 318 - Building Code Requirements for Structural Concrete.
 5. ACI 335.1R - State-of-the-Art Report on Anchorage to Concrete.
 6. ACI 503.4 - Standard Specifications for Repairing Concrete with Epoxy Mortars.
 7. ACI 504R - Guide to Sealing Joints in Concrete Structures.
 8. ACI 548R - Polymers in Concrete.
 9. ACI 548.1R - Guide for the Use of Polymers in Concrete.
 10. ACI 548.3R - State-of-the-Art Report on Polymer Modified Concrete.
 11. ACI 562 – Code Requirements for Evaluation Repair and Rehabilitation of Concrete Buildings.
- C. International Concrete Repair Institute.
1. ICRI Technical Guideline No. 310.2R-2013 – Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair.
 2. ICRI Concrete Surface Profile chips – set or 10.
 3. ICRI Technical Guideline No. 210.3R-2013 – Guide for Using In-Situ Tensile Pull off Tests to Evaluate Bond of Concrete Surface Materials.
 4. ICRI Technical Guideline No. 320.2R-2009 – Guide for Selecting Materials for Repair of Concrete Surfaces.
 5. ICRI Technical Guideline No. 310.1R-2008 – Guide for Surface Preparation for the Repair of Deteriorated Concrete Resulting from Reinforcing Steel Corrosion.
 6. ICRI Technical Guideline No. 310.3-2004 – Guide for the Preparation of Concrete Surfaces for Repair Using Hydrodemolition Methods.

1.04 SUBMITTALS

- A. Submit product data under provisions of Section 01 33 00 – Submittal Procedures.
- B. Submit substitutions under provisions of Section 01 60 00 – Product Requirements.
- C. Submit product data indicating product standards, physical and chemical characteristics, technical specifications, limitations, maintenance instructions, and general recommendations regarding each material.
- D. Identify the intended use of each product material submitted.

1.05 PRODUCT RECORD DOCUMENTS

- A. Submit documents under provisions of Section 01 70 00 – Execution Requirement and Closeout Requirements.
- B. Accurately record actual locations of structural concrete and reinforcement repairs, and type of repairs on Record Document Plans.

1.06 QUALITY ASSURANCE

- A. Materials Manufacturer: Company specializing in manufacturing the products specified in this Section with a minimum of ten (10) years of experience.

- B. Work people: Supervisor and lead technician with minimum of ten (10) years of specialized experience in concrete repair.
- C. Applicator: Company specializing in concrete repair with a minimum of eight (8) years documented experience, approved by materials manufacturer.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Deliver products to site under provisions of Section 01 60 00 – Product Requirements.
- B. Store and protect products under provisions of Section 01 60 00 – Product Requirements.
- C. Comply with instructions for storage, shelf-life limitations, and handling.

PART 2 - PRODUCTS

2.01 MANUFACTURER

- A. Cementitious Concrete Repair Materials.
 - 1. BASF, Products: Master Emaco T415, T430.
 - 2. Sika, Products: Sika Repair 222, Sika Repair 223 and Sika Repair SHB.
 - 3. Mapei: Planitop 15, Planitop 18, Planitop X.
 - 4. Substitutions in accordance with Section 01 60 00 – Products Requirements.
- B. Ready Mix Concrete – See Section 03 30 00 – Cast-In-Place Concrete.
- C. Concrete Repair Mortars, concrete and bonding agents shall be Portland Cement based materials with suitable electrical conductivity of less than 15,000 ohm-cm. Non-conductive repair materials such as epoxy, urethane, latex polymers, or magnesium phosphate shall not be permitted.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces are ready to receive work.
- B. Surfaces shall be sound concrete which exhibits a minimum of 125 psi pullout strength when tested in accordance with Appendix A of ACI 503 - Use of Epoxy Compounds with Concrete.
- D. Surfaces shall be free of any deleterious materials such as the residues, laitance, dust, dirt, and oil.
- E. Beginning of installation means installer accepts existing substrate.

3.02 PREPARATION

- A. Clean concrete surfaces of dirt, laitance, corrosion, or other contamination; wire brush using water.
- B. Flush out cracks and voids with air and/or water blasting to remove laitance and dirt.
- C. See Specification Section 03 01 30 – Surface Preparation for Overlay for demolition and surface preparation requirements.
- D. Refer to manufacturer's product data sheets for SSD or dry surface condition requirements at the time of concrete rehabilitation material placement on substrate.
- E. Wire brush, sand blast or needle scaler clean the exposed reinforcement steel surfaces to remove all laitance and expose white metal. Notify Engineer of any damaged portions of reinforcing steel for review prior to patching.

3.03 REHABILITATION WORK

- A. Place rehabilitation concrete as indicated on the Drawings.
- B. Ensure surfaces to receive rehabilitation have been prepared in strict accordance with Section 03 01 30 - Surface Preparation for Overlay.
- C. Prepare repair of spall and delaminated areas as indicated on the Drawings and specifications. Fill voids flush with adjacent surface.

3.04 APPLICATION

- A. Apply mortar, grouts and concrete materials in strict accordance with Manufacturer's instructions.
- B. At the time of application, the substrate shall be saturated surface dry (SSD) with no standing water, unless otherwise noted by the Product Manufacturer's instructions.
- C. Hand applied mortar and/or concrete shall be scrubbed into substrate filling all pour and voids. Fill repair areas in accordance with Manufacturer's directions for the repair material specified.
- D. Damp cure cementitious mortar, grout and concrete for four (4) days.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Cleaning and preparing concrete surfaces for application of cold liquid applied treatments by mechanical shotblast, hydrodemolition, diamond planning or cold planner with shot flaps. Hydroblasting, shotblast, and equivalent methods are preferred.

1.02 RELATED SECTIONS

- A. Section 03 01 30 - Concrete Rehabilitation.
- B. Section 03 30 00 - Cast-in-Place Concrete.
- C. Section 03 90 10 – Corrosion Inhibitor Treatment.
- D. Section 07 92 00 – Joint Sealants.

1.03 REFERENCES

- A. ASTM International.
 - 1. ASTM C 811 - Standard Practice for Surface Preparation of Concrete for Application of Chemical-Resistant Resin Monolithic Surfacing.
 - 2. ASTM D4258 - Practice for Surface Cleaning Concrete for Coating.
 - 3. ASTM D 4259 - Practice for Abrading Concrete.
 - 4. ASTM D 4262 - Test Method for pH of Chemically Cleaned or Etched Concrete Surface.
 - 5. ASTM D 4285 - Test Method for Indicating Oil or Water in Compressed Air.
 - 6. ASTM D 4260 - Practice for Acid Etching Concrete.
 - 7. ASTM D 4263 - Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method.
- B. American Concrete Institute.
 - 1. ACI 515.1R - A Guide to the Use of Waterproofing, Damp proofing, Protective and Decorative Barrier Systems for Concrete, 3.4 Surface Preparation.
 - 2. ACI 546.1R - Concrete Repair Guide.
 - 3. ACI 201.R - Guide for Durable Concrete.
- C. International Concrete Repair Institute
 - 1. ICRI Guideline 320-IR-2013 – Selecting and Specifying Concrete Surface preparation for sealers, coatings and polymer overlays.
 - 2. ICRI Guideline 310 2R Bundle-Concrete Surface Profile Chips, set of 10.

1.04 DEFINITIONS

- A. Clean: No foreign matter such as dust, dirt, loose surface material, grease, oil, oil-based substances or other contaminants.
- B. Dry: No free water present and no moisture vapor (ASTM D 4263).

- C. Free of Laitance: Remove high water-cement ratio gel that comes to surface in a concrete pour. This gel has very poor integrity and adhesion to the parent concrete.
- D. Surface Defects: Fins, ridges, projections, concrete droppings and variations in surface finish tolerance greater than 3/16 inch in 25 feet that may adversely affect coating application performance.
- E. Deteriorated areas: Section 03 01 30 – Surface Preparation for Overlay.
- F. Strength below surface of concrete: Ability of concrete to resist fractures due to stresses exerted on it by coating system. Because many coating systems and most protective barriers exert stresses on the concrete from shrinkage during curing or cooling after application, and when they undergo ambient temperature changes in service, the concrete itself must have strength to resist these stresses without failing.
- G. Structural Concrete: Reinforced, 4000 psi minimum.

1.05 QUALITY ASSURANCE

- A. Mockup: Provide mockup of typical preparation surface under provisions of Section 01 40 00 – Quality Requirements.
- B. Provide an area 20 feet long by 26 feet wide illustrating preparation surface.
- C. Locate in an area where directed and where it can remain as a reference throughout the project.
- D. Coat 1/2 of preparation surface according to Section 07 18 16.1 – Elastomeric Traffic Deck Coating to verify acceptable adhesion.
- E. Mockup may become part of the work at the completion of the project upon acceptance of the completed work.

PART 2 - PRODUCTS

2.01 EQUIPMENT AND MATERIALS

- A. Shotblast: Self-contained steel shotblasting unit.
 - 1. Constant self-propelled speed capability.
 - 2. 98% minimum steel shot recovery and containment.
 - 3. Vacuum features to retain dust, dirt and debris from shotblasting, leaving concrete pores open.
 - 4. Steel shot propelled by airless centrifugal center fed blast wheels rotating perpendicular to direction of travel.
 - 5. Blasts to 1/4 inch from walls, columns or other verticals.
 - 6. Abrasive aggregate: ASTM 136.
- B. High pressure water blast system (Hydrodemolition).
 - 1. Rotary head machine capable of providing 9,000 psi minimum.

2.02 ACCESSORIES

- A. Abrasive aggregate: ASTM C 136.
- B. Stiff bristle brooms.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify substrate is structural concrete and adequate strength below surface exists to accommodate work in Division 07 00 00.
- B. Verify “downtime” of area to be cleaned and submit to Owner.
- C. Verify surface temperature at application time for cleaning chemicals and removal are within limits of method specified.
- D. Verify surface conditions and required cleaning, profiling and removal are within limits of method specified.

3.02 PREPARATION

- A. Protect adjacent surfaces with drop cloths and tape to control dust, overspray damage and erosion chemical staining or etching of surrounding surfaces.
- B. Protection must be in place before application begins.

3.03 APPLICATION

- A. ACI 515.1R - Surface Preparation.
- B. Clean surfaces to receive coating in accordance with Manufacturer’s instructions for Section 07 18 16.1 – Elastomeric Traffic Deck Coating System.
- C. Provide clean, dry surface, free of laitance and deteriorated areas.
- D. Remove surface defects by mechanical grinding or impact method.
- E. Clean corners, around columns, near drains and other areas not able to be reached by specified method with mechanical grinder, stiff wire brush, or other hand held portable mechanical means capable of producing surface profile similar to specified surface conditions.
- F. Remove gum and other materials adhered to concrete surface.
- G. Prevent debris from being incorporated into material being applied by the specified method.
- H. Remove excess or rejected material from site promptly and properly to avoid damage, marring or staining existing surfaces.

3.04 APPLICATION - SHOTBLAST

- A. ASTM C 136, ASTM D 4259, and ASTM D 4285.
- B. Uniformly clean dry surface and profile.
- C. Leave concrete pores open to allow maximum adhesion/penetration of the concrete protection system.
- D. Remove 1/16 inch to 1/8 inch.
- E. See 1.02 – Related Sections and Drawings for ICRI minimum concrete surface profile requirements for each coating system.
- F. Magnetic sweep and then low pressure air blast surface to remove residual steel shot.

3.05 APPLICATION - AIR BLAST

- A. ASTM D 4258 and ASTM D 4285.
- B. Blast surface, cracks, and areas not reached by other methods with air.
- C. Remove debris and dirt from site and dispose of in accordance with local regulations.

3.06 FIELD QUALITY CONTROL

- A. ACI 515.1R - Tests for Surface Quality Prior to Application.
- B. Inspect the surface for uniformity. Protrusions must be less than 1/16 inch and holes less than 1/8 inch in diameter.
- C. Surface must be clean with no white powder appearing on a dark cloth wiped across the surface.
- D. Conduct water droplet test to determine oily condition. Droplets should spread out on the surface immediately. Droplets that bead up indicate oil or other agents present that will adversely affect coating adhesion.
- E. Determine surface dryness ASTM D 4263.
- F. Determine presence of laitance. No fine powder formed when knife scraped across surface.
- G. Tensile strength test of concrete surface. See coating system manufacturer requirements - 200 psi minimum.
- H. Perform adhesion test on coating applied to patch of prepared surface.

3.07 CLEANING

- A. Clean residue and debris promptly. Remove from site and dispose properly in accordance with local regulations.
- B. Clean site without damaging other surfaces.
- C. Leave surfaces treated as part of the Work of this Section and other surfaces uncontaminated clean and dry.

3.08 PROTECTION

- A. Protect cleaned surfaces from dirt, debris, dust, water and other contamination that will affect coating operation and overlays.

END OF SECTION

PART 1 – GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Formwork for cast-in place concrete.
 - 2. Shoring, bracing, and anchorage.
 - 3. Architectural form liners.
 - 4. Form accessories.
 - 5. Form stripping.
- B. Related Sections:
 - 1. Section 03 15 13 - PVC Waterstops.
 - 2. Section 03 20 00 - Concrete Reinforcing.
 - 3. Section 03 30 00 - Cast-In-Place Concrete.
 - 4. Section 05 50 00 - Metal Fabrications: Product requirements for metal fabrications for placement by this Section.

1.02 REFERENCES

- A. American Concrete Institute:
 - 1. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials.
 - 2. ACI 301 - Specifications for Structural Concrete.
 - 3. ACI 318 - Building Code Requirements for Structural Concrete.
 - 4. ACI 347 - Guide to Formwork for Concrete.
- B. American Forest and Paper Association:
 - 1. AF&PA - National Design Specifications for Wood Construction.
- C. The Engineered Wood Association:
 - 1. APA/EWA PS 1 - Voluntary Product Standard for Construction and Industrial Plywood.
- D. ASTM International:
 - 1. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
 - 2. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.
- E. West Coast Lumber Inspection Bureau:
 - 1. WCLIB - Standard Grading Rules for West Coast Lumber.

1.03 DESIGN REQUIREMENTS

- A. Design, engineer and construct formwork, shoring and bracing in accordance with ACI 318 to conform to design and applicable code requirements to achieve concrete shape, line and dimension as indicated on Drawings.

1.04 PERFORMANCE REQUIREMENTS

- A. Vapor Retarder Permeance: Maximum 1 perm when tested in accordance with ASTM E96, Procedure A.

1.05 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Shop Drawings:
 - 1. Submit formwork, shoring, and reshoring shop drawings.
 - 2. Indicate the following:
 - a. Pertinent dimensions, openings, methods of construction, types of connections, materials, joint arrangement and details, ties and shores, location of framing, studding and bracing, and temporary supports.
 - b. Means of leakage prevention for concrete exposed to view in finished construction.
 - c. Sequence and timing of erection and stripping assumed compressive strength at time of stripping, height of lift and height of drop during placement.
 - d. Vertical, horizontal and special loads in accordance with ACI 347, Section 2.2 and camber diagrams, when applicable.
 - e. Notes to formwork erector showing size and location of conduits and piping embedded in concrete in accordance with ACI 318, Section 6.3.
 - f. Procedure and schedule for removal of shores and installation and removal of reshores.
- C. Product Data: Submit data on void form materials and installation requirements.

1.06 QUALITY ASSURANCE

- D. Perform Work in accordance with ACI 301.
- E. For wood products furnished for work of this Section, comply with AF&PA.

1.07 QUALIFICATIONS

- A. Design formwork under direct supervision of Professional Engineer experienced in design of this Work and licensed in State of Washington.

1.08 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Coordinate this Section with other sections of work, requiring attachment of components to formwork.

PART 2 – PRODUCTS

2.01 WOOD FORM MATERIALS

- A. Form Materials: At discretion of Contractor.

- B. Plywood: Douglas Fir species; medium density overlaid one side grade; sound undamaged sheets with clean, true edges.
- C. Plywood Forms:
 - 1. Application: Use for exposed finish concrete.
 - 2. Forms: Conform to PS 1; full size 4 x 8 feet panels; each panel labeled with grade trademark of APA/EWA.
 - 3. Plywood where "Smooth Finish" is required, as indicated on Drawings: APA/EWA "HD Overlay Plyform Structural I Exterior" grade, minimum of 3/4 inch (19 mm) thick.

2.02 FORMWORK ACCESSORIES

- A. Form Ties: Snap-off type, galvanized metal, fixed length, cone type, with waterproofing washer, back break dimension of 1 1/4" inch, free of defects capable of leaving holes larger than 1 inch in concrete surface.
- B. Spreaders: Standard, non-corrosive metal form clamp assembly, of type acting as spreaders and leaving no metal within 1 inch (25 mm) of concrete face. Wire ties, wood spreaders or through bolts are not permitted.
- C. Form Anchors and Hangers:
 - 1. Do not use anchors and hangers at exposed concrete that leave exposed metal within 1-inch of concrete surface.
 - 2. Symmetrically arrange hangers supporting forms from structural steel members to minimize twisting or rotation of member.
 - 3. Penetration of structural steel members is not permitted.
- D. Form Release Agent: Colorless mineral oil that will not stain concrete, or absorb moisture, or impair natural bonding or color characteristics of coating intended for use on concrete.
 - 1. Manufacturers:
 - a. Arcal Chemical Corporation Arcal-80.
 - b. Industrial Synthetics Company Synthex.
 - c. Nox-Crete Company Nox-Crete Form Coating.
- E. Corners: Chamfer, wood strip type; 3/4 x 3/4 inch size; maximum possible lengths.
- F. Vapor Retarder: Where indicated on Drawings, 8 mil (0.2 mm) thick polyethylene sheet.
- G. Bituminous Joint Filler: ASTM D1751.
- H. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Size, strength and character to maintain formwork in place while placing concrete.

PART 3 – EXECUTION

3.01 EXAMINATION

- 1. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

2. Verify lines, levels, and centers before proceeding with formwork. Verify dimensions agree with Drawings.
3. When formwork is placed after reinforcement resulting in insufficient concrete cover over reinforcement before proceeding, request instructions from Architect/Engineer.

3.02 INSTALLATION

A. Earth Forms:

1. Earth forms are permitted for concrete under pool deck linear drains.
 - a. Trench earth forms neatly, accurately, and at least 2 inches (50 mm) wider than grade beam and footing widths indicated on Drawings.
 - b. Trim sides and bottom of earth forms.
 - c. Construct wood edge strips at top of each side of trench to secure reinforcing and prevent trench from sloughing.
 - d. Form sides of footings where earth sloughs.
 - e. Tamp earth forms firm and clean forms of debris and loose material before depositing concrete.

B. Formwork - General:

1. Provide top form for sloped surfaces steeper than 1.5 horizontal to 1 vertical to hold shape of concrete during placement, unless it can be demonstrated that top forms can be omitted.
2. Construct forms to correct shape and dimensions, mortar-tight, braced, and of sufficient strength to maintain shape and position under imposed loads from construction operations.
3. Camber forms where necessary to produce level finished soffits unless otherwise shown on Drawings.
4. Carefully verify horizontal and vertical positions of forms. Correct misaligned or misplaced forms before placing concrete.
5. Complete wedging and bracing before placing concrete.

C. Forms for Smooth Finish Concrete:

1. Use steel, plywood or lined board forms.
2. Use clean and smooth plywood and form liners, uniform in size, and free from surface and edge damage capable of affecting resulting concrete finish.
3. Use full size sheets of form lines and plywood wherever possible.
4. Tape joints to prevent protrusions in concrete.
5. Use care in forming and stripping wood forms to protect corners and edges.
6. Level and continue horizontal joints.
7. Keep wood forms wet until stripped.

D. Framing, Studding and Bracing:

1. Space studs at 16 inches (400 mm) on center maximum for boards and 12 inches (300 mm) on center maximum for plywood.
2. Size framing, bracing, centering, and supporting members with sufficient strength to maintain shape and position under imposed loads from construction operations.
3. Construct beam soffits of material minimum of 2 inches (50 mm) thick.
4. Distribute bracing loads over base area on which bracing is erected.

- 5. When placed on ground, protect against undermining, settlement or accidental impact.
- E. Erect formwork, shoring, and bracing to achieve design requirements, in accordance with requirements of ACI 301.
- F. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.
- G. Obtain Architect/Engineer's approval before framing openings in structural members not indicated on Drawings.
- H. Install chamfer strips on external corners of beams, joists, columns and walls.
- I. Do not reuse wood formwork more than 6 times for concrete surfaces to be exposed to view. Do not patch formwork.

3.03 APPLICATION - FORM RELEASE AGENT

- A. Verify that forms are clean and free of rust before applying release agent.
- B. Apply form release agent on formwork in accordance with manufacturer's recommendations.
- C. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.
- D. Do not apply form release agent where concrete surfaces are indicated to receive special finishes or applied coverings that are affected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.
- E. Reuse and Coating of Forms: Thoroughly clean forms and reapply form coating before each reuse. For exposed work, do not reuse forms with damaged faces or edges. Apply form coating to forms in accordance with manufacturer's specifications. Do not coat forms for concrete indicated to receive "scored finish". Apply form coatings before placing reinforcing steel.

3.04 INSTALLATION - INSERTS, EMBEDDED PARTS, AND OPENINGS

- A. Install formed openings for items to be embedded in or passing through concrete work.
- B. Locate and set in place items required to be cast directly into concrete.
- C. Coordinate with Work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other Work.
- D. Install accessories straight, level, and plumb. Ensure items are not disturbed during concrete placement.
- E. Install water stops continuous without displacing reinforcement. Heat seal joints watertight.
- F. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.

- G. Close temporary openings with tight fitting panels, flush with inside face of forms, and neatly fitted so joints will not be apparent in exposed concrete surfaces.
- H. Form Ties:
 - 1. Use sufficient strength and sufficient quantity to prevent spreading of forms.
 - 2. Place ties at least 1 inch (25 mm) away from finished surface of concrete.
 - 3. Leave inner rods in concrete when forms are stripped.
 - 4. Space form ties equidistant, symmetrical and aligned vertically and horizontally unless otherwise shown on Drawings.
- I. Arrangement: Arrange formwork to allow proper erection sequence and to permit form removal without damage to concrete.
- J. Construction Joints:
 - 1. Install surfaced pouring strip where construction joints intersect exposed surfaces to provide straight line at joints.
 - 2. Just prior to subsequent concrete placement, remove strip and tighten forms to conceal shrinkage.
 - 3. Show no overlapping of construction joints. Construct joints to present same appearance as butted plywood joints.
 - 4. Arrange joints in continuous line straight, true and sharp.
- K. Embedded Items:
 - 1. Make provisions for pipes, sleeves, anchors, inserts, reglets, anchor slots, nailers, water stops, and other features.
 - 2. Do not embed wood or uncoated aluminum in concrete.
 - 3. Obtain installation and setting information for embedded items furnished under other Specification sections.
 - 4. Securely anchor embedded items in correct location and alignment prior to placing concrete.
 - 5. Verify conduits and pipes, including those made of coated aluminum, meet requirements of ACI 318 for size and location limitations.
- L. Openings for Items Passing Through Concrete:
 - 1. Frame openings in concrete where indicated on Drawings. Establish exact locations, sizes, and other conditions required for openings and attachment of work specified under other sections.
 - 2. Coordinate work to avoid cutting and patching of concrete after placement.
 - 3. Perform cutting and repairing of concrete required as result of failure to provide required openings.
- M. Screeds:
 - 1. Set screeds and establish levels for tops of concrete slabs and levels for finish on slabs.
 - 2. Slope slabs to drain where required or as shown on Drawings.
 - 3. Before depositing concrete, remove debris from space to be occupied by concrete and thoroughly wet forms. Remove freestanding water.
- N. Screed Supports:

1. For concrete over waterproof membranes and vapor retarder membranes, use cradle, pad or base type screed supports which will not puncture membrane.
 2. Staking through membrane is not be permitted.
- O. Cleanouts and Access Panels:
1. Provide removable cleanout sections or access panels at bottoms of forms to permit inspection and effective cleaning of loose dirt, debris and waste material.
 2. Clean forms and surfaces against which concrete is to be placed. Remove chips, saw dust and other debris. Thoroughly blow out forms with compressed air just before concrete is placed.

3.05 FORM CLEANING

- A. Clean forms as erection proceeds, to remove foreign matter within forms.
- B. Clean formed cavities of debris prior to placing concrete.
- C. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.

3.06 FORM REMOVAL

- A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads and removal has been approved by Architect/Engineer.
- B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.
- C. Store removed forms in manner that surfaces to be in contact with fresh concrete will not be damaged. Discard damaged forms.
- D. Leave forms in place for minimum number of days as specified in ACI 347.

3.07 ERECTION TOLERANCES

- A. Tolerances: Construct formwork to produce completed concrete surfaces within construction tolerances specified in ACI 117.

3.08 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements, 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and that supports, fastenings, wedges, ties, and items are secure.
- C. Notify Owner's Project Representative and Architect/Engineer after placement of reinforcing steel in forms, but prior to placing concrete.
- D. Schedule concrete placement to permit formwork inspection before placing concrete.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. These adhesive anchors are to be used for reinforcing steel dowels for concrete repair and strengthening with concrete reinforcement anchored in beams, slabs, walls and columns.

1.02 RELATED WORK

- A. Section 03 20 00 – Concrete Reinforcement.
- B. Section 03 30 00 – Cast in Place Concrete
- C. Section 03 01 30.71 – Concrete Rehabilitation
- D. Section 05 50 00 – Miscellaneous Fabrication.

1.03 REFERENCES

- A. ASTM A36 - Structural Steel
- B. ASTM A307 - Bolts, Nuts and Washers
- C. ASTM A615 - Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
- D. ASTM A706 - Low-Alloy Steel Deformed Bars for Concrete Reinforcement
- E. ASTM E1512 - Standard Test for Testing Bond Performance of Adhesive Anchors
- F. ICBO ICC– ESR-3187.3814

1.04 SUBMITTALS

- A. Shop Drawings and Product data: Submit shop drawings and product data sheets for the approval of the Engineer as per Section 01 33 00 - Submittal Procedures.

1.05 QUALITY ASSURANCE

- A. Perform work in accordance with manufacturer's instructions.

1.06 PRODUCT DATA

- A. Submit product data under provisions of Section 01 33 00 - Submittal Procedures.
- B. Provide product data for specified products.

- C. Submit manufacturer's instructions under provisions of Section 01 60 00 – Product Requirements.
- D. Submit Evaluation Report from International Conference of Building Officials (ICBO).
- E. ICBO Evaluation Report submitted shall be for wind and seismic in cracked and un-cracked concrete conditions.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. HILTI HIT- HY 200 V3 Adhesive Anchoring System as manufactured by HILTI, P. O. Box 21148, Tulsa, Oklahoma 74121; Tel: #1-800-879-8000
- B. Submit documents for substitution as per Section 01 60 00 – Product Requirements.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Adhesive Epoxy Anchoring System will be used for installation of all reinforcing steel dowels or threaded anchor rods or inserts into existing concrete. Adhesives will be used only as per manufacturer's instructions. Injection adhesive will be formulated to include resin, hardener, cement and water to provide optimal curing speed as well as high strength and stiffness. Maximum curing time will be as per manufacturer's instructions.

3.02 INSPECTION

- A. Adhesive Anchor Installation.
- B. All special inspections shall be according to ICBO ES, Evaluation Report for specified product.
- C. All tests to be carried out according to ASTM E1512, Standard Test for Testing Bond Performance of Adhesive Anchors.

3.03 STORAGE OF MATERIALS

- A. All materials to be mixed by Contractor shall be stored in a clean, dry place, free of contaminating substances.

END OF SECTION

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Provision of waterstops embedded in concrete and spanning control, expansion and/or construction joints thus creating a continuous diaphragm, thus preventing fluid migration.
- B. Hydrophilic waterstops for use in concrete joints subject to water, chlorinated water, seawater and many waterborne chemicals.

1.02 RELATED SECTIONS

- A. Section 03 01 30.71 – Concrete Rehabilitation.
- B. Section 03 10 00 – Concrete Forming and Accessories.

1.03 REFERENCE

- A. HYDROPHILIC WATERSTOP
 - 1. COE CRD-C 513 - Handbook for Concrete and Cement Corps of Engineers Specifications for Rubber Waterstops; 1974.
 - 2. American Society of Testing Materials (ASTM)
 - 3. Bureau of Reclamation: C-902
 - 4. Canadian General Standards Board: 41-GP-35M Type 1 & 3
 - 5. Section 03 10 00-Concrete Forms and Accessories
 - 6. Section 03 30 00-Cast In Place Concrete

1.04 QUALITY ASSURANCE

- A. Waterstop manufacturer demonstrates five years (minimum) continuous, successful experience in production of hydrophilic waterstops.

1.05 SUBMITTALS

- A. Comply with Section 01 33 10 – Submittals.
- B. Submit manufacturer product data with physical properties and instructions for installation.
- C. Submit manufacturer 6-inch sample of hydrophilic waterstop.
- D. Submit certification from manufacturer that materials comply with specifications.
- E. Submit warranty from manufacturer

1.06 DELIVERY, STORAGE AND HANDLING

- A. Store waterstops in storage containers or under tarps to protect from oil, dirt, and sunlight/ultraviolet exposure.

PART 2 – PRODUCTS

2.01 MANUFACTURER

- A. Hydrophilic: Hydrotite CJ-1020-2K-ADH; www.sikausa.com; or equal.
- B. Sealant: Leakmaster, LV-1, by Sika, or equal

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Clean surface of concrete below waterstops. Install as indicated below and according to manufacturer's instructions. Provide both the hydrophilic waterstop and the continuous compatible sealant for setting hydrophilic waterstops at all construction joints and at all locations where a waterstop is shown on the Drawings.
- B. Locate hydrophilic waterstops and sealant with minimum clear cover recommended by the manufacturer and as shown on the Drawings, whichever is greater.
- C. Apply manufacturer's recommended adhesive to dry and clean concrete location.
- D. Press waterstop continuously into adhesive and sealant. Avoid butt joints where possible but follow manufacturers' recommendations if they are necessary.
- E. Cut coil ends square (or at proper angle for mitered corners) with shears or sharp blade to fit splices together without overlaps. At any joint, apply adhesive to both ends of waterstop and press together to form tight joint.
- F. Allow to cure fully as per manufacturer's recommendations before placing concrete.
- G. Apply Leakmaster LV-1, by Greenstreak, according to manufacturer's instructions, continuously below the waterside at all hydrophilic type waterstops.

3.02 PREPARATION

- A. Position waterstop to ensure proper distance from steel reinforcing bars and edges.
- C. Clean concrete joint after first pour to remove dirt and debris.
- D. Protect waterstop from damage during progress of work.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Summary.
 - 1. Reinforcing steel bars, welded steel wire fabric for cast-in-place concrete.
 - 2. Support chairs, bar supports, and spacers for supporting reinforcement.
 - 3. Concrete Accessories.

1.02 RELATED SECTIONS

- A. Section 03 01 23 – Embedded Galvanic Anodes.
- B. Section 03 01 30 – Surface Preparation for Overlay.
- C. Section 03 15 00.01 – Concrete Accessories: Adhesive Anchors.
- D. Section 03 30 00 - Cast-In-Place Concrete.

1.03 REFERENCES

- A. American Concrete Institute.
 - 1. ACI 301 - Specifications for Structural Concrete.
 - 2. ACI SP-66 - American Concrete Institute - Detailing Manual.
 - 3. ACI 318 - Building Code Requirements for Structural Concrete.
- B. ASTM International.
 - 1. ASTM A82 - Standard Specification for Cold Drawn Steel Wire for Concrete Reinforcement.
 - 2. ASTM A184/A184M – Standard Specification for Fabricated Deformed Steel Bar Mats for Concrete Reinforcement.
 - 3. ASTM A497 – Standard Specification for Steel Welded Wire Fabric, Deformed for Concrete Reinforcement.
 - 4. ASTM A615 – Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
 - 5. ASTM A706M – Standard Specification for Low Alloy Steel Deformed Bars for Concrete.
 - 6. ASTM A955/A955M – Standard Specification for Deformed and Plain Stainless Steel Bars for Concrete Reinforcement.
- C. Concrete Reinforcing Steel Institute.
 - 1. CRSI - Manual of Standard Practice.
 - 2. CRSI – Placing Reinforcing Bars.
- D. American Welding Society.
 - 1. AWS D1.4 – Structural Welding Code – Reinforcing Steel.
 - 2. AWS D1.6 – Structural Welding Code – Stainless Steel.

1.04 SUBMITTALS

- A. Section 01 33 00 – Submittal Procedures: Submittal procedures.
- B. Shop Drawings: Indicate bar sizes, spacing, locations, and quantities of reinforcing steel and welded wire fabric, bending and cutting schedules, and supporting and spacing devices.
- C. Certificates: Submit AWS qualification certificate for welders employed on the Work.
- D. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.
 - 1. Submit certified copies of mill test report of reinforcement materials analysis.

1.05 QUALITY ASSURANCE

- A. Perform concrete reinforcement work in accordance with CRSI - Manual of Standard Practice.
- B. Prepare Shop Drawings in accordance with ACISP-66.
- C. Conform to ACI 301.
- D. Installer Qualifications: Setting of all items shall be done by workers with experience in the trade.
- E. Certification: All welding shall be done by State of Washington Certified Welders.

1.06 QUALIFICATIONS

- A. Welders: AWS qualified within the previous 12 months.

1.07 INSPECTION AND TESTING

- A. Inspection and Testing will be performed in accordance with the provisions of Section 01 40 00 – Quality Requirements.
- B. The testing laboratory shall perform any or all of the following duties:
 - 1. Verify certification of welders.
 - 2. Verify size and accurate location of reinforcing.
 - 3. Inspect reinforcing bar welds.
 - 4. Perform tensile tests of sample welds of largest size bar for each type of welding.
 - 5. Verify the condition of surfaces for bond integrity with concrete, locations and sizes of all items to be embedded, and anchorage for prevention of displacement.
 - 6. Receive and review certificates for tests of reinforcing steel for compliance with specifications.
- C. Deficient welds will require Contractor to provide and pay for additional X-rays and tests as directed by the Engineer. Repair or replace defective welds to the satisfaction of the Engineer.

1.08 SHOP DRAWINGS

- A. Submit shop drawings under provisions of Section 01 30 00 – Administrative Requirements.

- B. Indicate sizes, spacing, locations and quantities of reinforcing steel, wire fabric, bending and cutting schedules, splicing, stirrup spacing, supporting and spacing devices.

1.09 CERTIFICATES

- A. Submit mill test certificates of supplied concrete reinforcing indicating physical and chemical analysis.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Reinforcing Steel: ASTM A615, 60 ksi yield grade billet-steel deformed bars, uncoated and epoxy coated finish for slab top steel and ASTM 706, Grade 60 for welded reinforcing steel. Ultimate tensile stress shall not be less than 1.25 tensile yield stress nor shall actual yield strength exceed specified yield strength by more than 1800 psi.
- B. Welded Steel Wire Fabric: ASTM A185 plain type; in flat sheets; uncoated finish.

2.02 ACCESSORY MATERIALS

- A. Tie Wire: Minimum 16-gage annealed type. Use coated wire ties only for all epoxy coated reinforcing steel.
- B. Chairs, Bolsters, Bar Supports, and Spacers: Sized and Shaped for Strength and Support of reinforcement during concrete placement conditions.
- C. Chairs, Bolsters, Bar Supports, and Spacers Adjacent to Weather Exposed Concrete Surfaces and within the Natatorium: Plastic tipped type; sized and shaped as required.
- D. Barlock (MBT) Coupler Splice.

2.03 FABRICATION

- A. Fabricate in accordance with CRSI Manual of Practice.
- B. Form standard hooks for 180 and 90 degrees bends, stirrup and tie hooks and seismic hooks as indicated on Drawings.
- C. Form reinforcement bends with minimum diameters in accordance with ACI 318.
- D. Locate reinforcing splices not indicated on drawings at points of minimum stress. Indicate location of splices on shop drawings.
- E. Weld reinforcing bars in accordance with AWS D1.4.

PART 3 - EXECUTION

3.01 PLACEMENT

- A. Before placing concrete, clean reinforcement of loose rust, mill scale, foreign particles and undesirable coatings, and accurately position, support, and secure in place to achieve not less than the minimum concrete coverage required for protection.
- B. Place, support, and secure reinforcement against displacement. Do not deviate from alignment or design measurements.
- C. Do not weld crossing reinforcement bars for assembly.
- D. Verify that anchors, seats, plates, waterstops, reinforcement and other items to be cast into the concrete are accurately placed, positioned securely, and will not interfere with concrete placement.
- E. Accommodate placement of formed openings.

3.02 ERECTION TOLERANCES

- A. Section 01 40 00 – Quality Requirements: Tolerances.
- B. Install reinforcement within the following tolerances for flexural members, wall, and compression members:

Reinforcement Depth	Depth Tolerances	Concrete Cover Tolerances
Greater than 8 inches	Plus or minus 3/8 inch	Minus 3/8 inch
Less than 8 inches	Plus or minus 1/2 inch	Minus 1/2 inch

3.03 FIELD QUALITY CONTROL

- A. Section 01 40 00 – Quality Requirements: Field inspection, testing, adjusting, and balancing.
- B. Field inspection and testing will be performed by Owner's testing laboratory in accordance with ACI 318.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Cast-in-place concrete for new pool deck slabs, elevated concrete slabs, exterior paving, concrete restoration and repair.

1.02 RELATED WORK

- A. Section 03 01 23 – Embedded Galvanic Anodes.
- B. Section 03 01 30.71 – Concrete Rehabilitation.
- C. Section 03 10 00 – Concrete Forming and Accessories.
- D. Section 03 15 13 – PVC Waterstops
- E. Section 03 20 00 – Concrete Reinforcement.
- F. Section 03 35 00 – Concrete Finishing.
- G. Section 03 90 10 – Corrosion Inhibitor Treatment.
- H. Section 31 40 00 – Shoring and Underpinning.
- I. Section 07 92 00 – Joint Sealants.

1.03 REFERENCES

- A. American Concrete Institute.
 - 1. ACI 211.1 - Selecting Proportions for Normal-Density and High Density Concrete.
 - 2. ACI 301 - Specifications for Concrete Construction.
 - 3. ACI 302.1 - Guide for Concrete Floor and Slab Construction.
 - 4. ACI 304 - Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.
 - 5. ACI 305.1 – Specification for Hot Weather Concreting.
 - 6. ACI 306.1 – Standard Specification for Cold Weather Concreting.
 - 7. ACI 308 - Standard Practice for Curing Concrete.
 - 8. ACI 318 - Building Code Requirements for Reinforced Concrete.
 - 9. ACI 347 - Recommended Practice for Concrete Formwork.
- B. ASTM International.
 - 1. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
 - 2. ASTM C33 - Standard Specification for Concrete Aggregates.
 - 3. ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
 - 4. ASTM C42/C42M - Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.

5. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.
6. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic Cement Concrete.
7. ASTM C150 - Standard Specification for Portland Cement.
8. ASTM C172 - Standard Practice for Sampling Freshly Mixed Concrete.
9. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
10. ASTM C157 - Standard Specification for Length Change of Hardened Hydraulic – Cement Mortar Concrete.
11. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
12. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
13. ASTM C330 - Standard Specification for Lightweight Aggregates for Structural Concrete.
14. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete.
15. ASTM C595 - Standard Specification for Blended Hydraulic Cements.
16. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
17. ASTM C685/C685M - Standard Specification for Concrete Made By Volumetric Batching and Continuous Mixing.
18. ASTM C845 - Standard Specification for Expansive Hydraulic Cement.
19. ASTM C989 - Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars.
20. ASTM C1017/C1017M - Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
21. ASTM C1064/C1064M - Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete.
22. ASTM C1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
23. ASTM C1116 - Standard Specification for Fiber-Reinforced Concrete and Shotcrete.
24. ASTM C1157 - Standard Performance Specification for Hydraulic Cement.
25. ASTM C1218 - Standard Test Method for Water-Soluble Chloride in Mortar and Concrete.
26. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures.
27. ASTM C1602 - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete.
28. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.
29. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.

1.04 SUBMITTALS

- A. Section 01 30 00 – Submittal Procedures.
- B. Product Data: Submit manufacturer's data on manufactured products showing compliance with specified requirements and installation instructions.
 1. For curing compounds, provide data on method of removal in the event of incompatibility with floor covering adhesives and/or mortars.
- C. Mix Design: Submit proposed concrete mix designs:
 1. Employ an independent testing laboratory to test proposed aggregate and design

- concrete mixes for each type of concrete required.
 - 2. For each submitted mix design, provide the area of structure for which it will be used.
 - 3. Submit aggregate test reports and mix designs for approval 14 days prior to placing concrete.
 - 4. Test each type of fine and coarse aggregate for conformance to ASTM C33.
 - 5. Design mixes in accordance with ACI 301, Section 3.8.2, Method 1 or Method 2.
 - 6. Pour Plan Drawings that show the extent of each pour and their sequence in plan. Include joints, penetrations, and embedments. Use the most recent MEP, Structural and Architectural Drawings to determine locations of all penetrations and embedded items, include element diameter and diameter required for block-outs.
 - 7. Manufacturer's Installation Instructions: Indicate installation procedures and interface required with adjacent construction for concrete accessories.
 - 8. Include Contractor's Certification that the proposed mix designs have been reviewed by admixture manufacturers and all additives, admixtures, surface color treatments, form release agents and curing methods are compatible.
- D. Samples:
- 1. Submit two, 6 inch-long samples of construction joint devices to be used.
- E. Test Reports: Submit report for each test or series of tests specified.
- F. Manufacturer's Installation Instructions: For concrete accessories, indicate installation procedures and interface required with adjacent construction.
- G. Project Record Documents: Accurately record actual locations of embedded utilities and components that will be concealed from view upon completion of concrete work.

1.05 QUALITY ASSURANCE

- A. Perform work of this section in accordance with ACI SPEC-301, ACI CODE-318, and ACI CODE-350 where applicable. Maintain one copy of each document on site.
- B. Follow recommendations of ACI 305 when concreting during hot weather.
- C. Follow recommendations of ACI 306 when concreting during cold weather.
- D. Pre-pour meeting: Contractor to conduct pre-pour conference whenever concrete is poured, at project site with all interested parties, including:
 - 1. Contractor's superintendent
 - 2. Independent testing agency responsible for concrete testing and reinforcing steel inspection
 - 3. Ready mix concrete manufacturer
 - 4. Concrete subcontractor's supervisor and concrete placer
 - 5. Owner's representative
 - 6. Engineer-of-Record or its designee
- E. Review at Pre-pour meeting the following topics:
 - 1. Items allowed and embedded in concrete.
 - 2. Special mix design; color and admixtures; batch control procedures.

3. Placement and inspection of waterstops.
 4. Construction joint preparation and approval.
 5. Testing and inspection agency procedures for ensuring field quality control.
 6. Concrete truck access to site, truck weights, concrete placement techniques, pour timing durations.
 7. Concrete consolidation techniques.
 8. All chemical admixtures proposed to be used.
 9. Finishing and finishes; hours of operation; noise generated
 10. Curing and protection.
 11. Concrete repair procedures, and concrete protection.
 12. Watertight testing procedures and schedule.
 13. Noise Considerations.
- F. The Contractor shall select a qualified concrete supplier and placer that is capable and experienced in meeting the specified project requirements.
- G. The concrete supplier shall be certified by the National Ready Mix Concrete Association and shall hold a valid certificate of conformance for concrete production facilities.
- H. Formwork Standards: Unless otherwise indicated, design construct, erect, maintain, and remove forms and related structures for concrete work in accordance with the applicable requirements of ACI 301, ACI 318, ACI 347, and ACI 350.
- I. Formwork Surface Materials: Provide material and work quality which will produce clean and uniform finished surfaces within the allowable tolerances specified and which will conform to the following requirements:
1. Concrete Exposed to View: Provide material and work quality that will produce clean, smooth, and uniform concrete surfaces. Refer to Architectural Drawings for additional finish requirements.
 2. Concrete Concealed from View: Provide material and work quality that will produce aligned concrete surfaces free of fins, honeycomb, and stains, and as required by ACI 301, where more stringent, for wall and slab construction.

1.06 TESTS

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00 – Quality Requirements.
- B. Testing and analysis of concrete will be performed in accordance with ACI 301 except as supplemented or modified by these Specifications.
- C. Concrete test samples shall be obtained as near as possible to its final placement location. For pumped mixes, test samples shall be obtained at the hose discharge end.
- D. Air content tests shall be performed at the point of discharge for each concrete batch delivered to the site.
- E. Three (3) concrete test cylinders for strength tests of concrete placed each day shall be taken not less than once a day, nor less than once for each 7 cubic yards of concrete, nor

less than once for each 250 square feet of surface area.

- F. One (1) additional test cylinder will be taken during cold weather and cured on site under same conditions as concrete it represents.
- G. Extra cylinders taken at Contractor's request shall be paid for by Contractor.
- H. One (1) slump test and a unit weight shall be taken from the same concrete sample as each set of compressive strength test cylinders cast.
- I. Load Tests of Cores: Should concrete test cylinders fail to meet specified strength requirements. Contractor shall make load tests or core the section as directed by Engineer. Contractor shall cooperate with and furnish material to testing laboratory. The Contractor shall pay for all costs of load tests and core tests.

1.06 COORDINATION

- A. Section 01 30 00 – Administrative Requirements: Coordination and project conditions.

PART 2 - PRODUCTS

2.01 FORMWORK AND ACCESSORIES MATERIALS

- A. Comply with requirements of Section 03 10 00 – Concrete Forming and Accessories.

2.02 REINFORCEMENT MATERIALS

- A. Comply with requirements of Section 03 20 00 – Concrete Reinforcement.

2.03 CONCRETE MATERIALS

- A. Cement: ASTM C150, Type I/II Portland type, low alkali, unless noted otherwise in Structural Drawings. Use one brand throughout project.
- B. Fine and Coarse Aggregates: ASTM C33.
 - 1. Acquire aggregates for entire project from same source.
 - 2. Clean and uniformly graded from 3/8" to maximum size indicated or specified.
 - 3. When not specified, provide 3/4" maximum size aggregate.
 - 4. Deleterious material in aggregates shall not exceed the limits specified in ASTM C33.
- C. Fly Ash: ASTM C618, Class F, with a maximum of 25 percent retained on the No. 325 mesh sieve and a loss of ignition of 1.0 percent maximum.
- D. Calcined Pozzolan: ASTM C618, Class F.
- E. Silica Fume: ASTM C1240, proportioned in accordance with ACI 211.1.

- F. Ground Granulated Blast Furnace Slag: ASTM C989.
- G. Corrosion Inhibitor
 - 1. Conform to ASTM C494, Type C.
 - 2. Manufacturer and product:
 - a. GCP Applied Technologies, DCI.
 - b. Masterlife CI 30.
- H. Water: ASTM C1602; clean potable, and free of impurities detrimental to concrete, admixtures, reinforcing bars, or other embedments in the concrete.

2.04 ADMIXTURES

- A. Chemical Admixtures – See General Notes on the Structural Drawings. No admixtures, including water, shall be added outside the approved mix designs.
 - 1. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.
 - 2. Provide all admixtures from one source. For any exception to this, request approval from the Engineer-of-Record.

2.05 CONCRETE MIX DESIGN

- A. Design of concrete mixes, including recommended amounts of admixture and water to be used in the mixes, shall be obtained by the Contractor from a qualified independent testing laboratory or agency, or from a mill or ready-mix plant, properly equipped to design concrete mixes. The design shall be performed and certified by a Professional Engineer licensed in the State where the Work is located. The laboratory, agency, mill, or ready-mix plant shall meet applicable requirements of ASTM E329 and shall be approved by the Engineer. Costs of obtaining the mix designs shall be paid by the Contractor.
- B. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.
- C. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended or required by manufacturer to meet the performance requirements indicated in the Construction Documents. Ensure that mix designs will produce concrete suited for proper placement and finishing.
- D. If concrete is to be placed by pumping, concrete mixes shall be designed in accordance with the applicable requirements of ACI 304 and shall include strengths and slumps.
- E. Mix designs shall indicate the location of each mix within the structure. Mix designs shall specify both coarse and fine aggregate sources.
- F. Upon receipt of acceptable mix designs from the prequalified testing laboratory or agency or concrete supplier, conforming with specified requirements, the Contractor shall submit these accepted mix designs to the Engineer for review, 21 days prior to batching or delivering any concrete.
- G. Admixtures containing calcium chloride shall not be permitted.

H. Maximum shrinkage: ASTM C157; 0.035% at 28 days.

2.06 MIXING

- A. Batching, mixing, and transporting Portland cement concrete shall conform to the applicable requirements of ACI 301 and ACI 304.
- B. Transit Mixers: Concrete shall be central-mixed concrete from a central batch plant, to be transported to the jobsite in a truck mixer, in accordance with the requirements of ASTM C94. Equipment used in the manufacture of concrete shall be kept clean at all times.
- C. Adding Water: If concrete arrives on-site with slump less than suitable for placement, do not add water that exceeds the maximum water-cement ratio or exceeds the maximum permissible slump as indicated in the approved mix-design submittal.
- D. Concrete in truck mixer shall be mixed continuously until discharged. The discharge time for concrete after the introduction of mixing water shall not exceed 60 minutes. The discharge time for concrete after cement has been mixed with aggregate shall not exceed 90 minutes. Delivery tickets shall show departure time from plants.
- E. Mixers shall be equipped with automatic devices for recording the number of revolutions of the drum prior to completion of mixing operation. Each transit mixer shall also be equipped with water measuring devices consisting of either accurately calibrated water tanks or water meters.
- F. Ready-mixed concrete shall be mixed for a period of not less than 10 minutes and at least 3 minutes of the mixing period shall be immediately prior to discharging at the job. The introduction of additional water into transit type mixers after leaving the plant will not be permitted.

2.06 CURING MATERIALS

- A. Curing Blankets complying with ASTM C171, approved products:
 - 1. Sika UltraCure NCF.
 - 2. Sika UltraCure DOT.
 - 3. ReliableCure SOG.
- B. Water: Potable, not detrimental to concrete.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Section 01 30 00 – Administrative Requirements: Coordination & Project Conditions.
- B. Verify requirements for concrete cover over reinforcement.
- C. Verify anchors, seats, plates, reinforcement, and other items to be cast into concrete are

accurately placed, held securely, and will not interfere with placing concrete.

3.02 PREPARATION

- A. Formwork: Comply with requirements of ACI 301 and Section 03 10 00 – Concrete Forming and Accessories.
- B. Prepare previously placed concrete surfaces to receive concrete in accordance with Section 03 01 30 – Concrete Surface Preparation for Overlay.
- C. In locations where new concrete reinforcement is doweled to existing work, drill holes in existing concrete perform work in accordance with Section 03 15 00.01 – Concrete Accessories – Adhesive Anchors.
- D. Remove standing water from areas receiving concrete before concrete is placed.

3.03 STORAGE OF MATERIALS

- A. All materials to be used by Contractor shall be stored in a clean, dry place, free of contaminating substances.

3.04 FORMWORK

- A. Provide bracing to ensure stability of formwork. Strengthen formwork liable to be overstressed by construction loads.
- B. The forms shall be held in place to prevent any offsets in panel edges. Panels shall be constructed to maintain a true aligned surface.
- C. Construct formwork to maintain tolerances in accordance with ACI 301.

3.05 FORM REMOVAL

- A. Do not remove forms and shoring until concrete has sufficient strength to support its own weight and construction and design loads which may be imposed upon it.
- B. During cold weather, remove ice and snow from forms. Do not use de-icing salts. Do not use water to clean out completed forms, unless formwork and construction proceed within heated enclosure. Use compressed air to remove foreign matter.
- C. Do not damage concrete surfaces during form removal.
- D. Store reusable forms for exposed architectural concrete to prevent damage to contact surfaces.

3.06 PLACING CONCRETE

- A. Notify Testing Agency minimum 24 hours prior to commencement of concreting operations.

- B. Place concrete in accordance with ACI 301.
- C. Hot Weather Placement: In accordance with ACI 301.
- D. Cold Weather Placement: In accordance with ACI 301 and 306.1.
- E. Install construction joint devices in coordination with the overlay slab pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.
- F. Ensure reinforcement, inserts, embedded parts, and formed joints are not disturbed during concrete placement.
- G. Temperature of concrete as placed shall not exceed 90 degrees F.
- H. The concrete shall be manipulated and struck off slightly above final grade. The concrete shall then be consolidated and finished to final grade with surface-vibration devices. Consolidation equipment used shall be approved by the Engineer.
- I. Deposit concrete at final position. Prevent segregation of mix.
- J. All concrete shall be placed in continuous operation and terminated only at designated control and pour joint predetermined locations.
- K. Provide continuous water misting of the fresh concrete surface during finishing operations to prevent rapid drying and cracking of the finish surfaces.
- L. Consolidate concrete.
- M. Place concrete continuously. Do not break or interrupt successive pours such that cold joints occur unless noted otherwise on Drawings.
- N. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify Engineer upon discovery.
- O. Maintain Records of concrete placement. Record date, location, quantity, air temperature, and test sample taken.

3.07 SLAB JOINTING

- A. Locate joints as indicated on Drawings.
- B. Anchor joint fillers and devices to prevent movement during concrete placement.
- C. Isolation Joints: Use preformed joint filler with removable top section for joint sealant, total height equal to thickness of slab, set flush with top of slab.
 - 1. Install wherever necessary to separate slab from other building members, including columns, walls, equipment foundations, footings, stairs, manholes, sumps, and drains.
- D. Install joint devices in accordance with manufacturer's instructions.

- E. Apply sealants in joint devices in accordance with Section 07 92 00.
- F. Place concrete continuously between predetermined expansion, isolation, and construction joints. Do not interrupt successive placement; do not permit cold joints to occur.
- G. Saw Cut Slab Contraction Joints: Saw cut slabs using soft cut method over green concrete as soon as slab will support foot traffic and before slab begins to experience shrinkage cracking unless shown otherwise on the Drawings.
 - 1. Space saw-cuts per ACI 360R and as follows:
 - a. At interior 4"-6" thick slabs and topping slabs, place at maximum 15'-0" oc
 - 2. Saw-cut joints minimum 1 inch deep and not less than 1/4 depth of concrete slab. Use a 3/16" wide blade.
 - 3. Saw-cut joints at 45-degree angle from corner of diamond shaped slab panels.
 - 4. Locate contraction joints along column centerlines, and under partition walls where feasible.
 - 5. Maximum length to width ratio of panels in floor slabs is 1.5 to 1, although 1 to 1 is preferred.
 - 6. Do not form T-shaped or L-shaped saw-cut joints in panels.
 - 7. Make joints continuous. Do not offset or stagger.
 - 8. Space contraction joints equal distance between contraction joints at column lines, over construction joints, supporting structural beams, and change of substrate.
 - 9. Burnish edges of joints while concrete is still green.
- H. Construction Joints: Where not otherwise indicated, use metal combination screed and key form, with removable top section for joint sealant.

3.08 CONCRETE FINISHING

- A. Finish concrete in accordance with ACI 301, ACI 302.1 and Section 03 35 00 – Concrete Finishes.

3.09 CURING

- A. Curing shall be in strict accordance with ACI 301 and ACI 308. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures and mechanical injury.
- B. Concrete temperature shall be held between 50 and 90-degrees F and in a continuously moist condition for at least the first ten (10) days after placement. Use moist curing mats/blankets to assure retention of moisture. Spray with water as necessary to avoid excessive moisture loss at relatively constant temperature.

3.10 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00 - Quality Requirements.

B. Inspection and Testing Services:

1. The Contractor shall keep records of all concrete placed. Copies of such records shall be submitted to the Contractor, Architect, and Engineer of Record (Engineer).
2. Provide free access to concrete operations at project site and cooperate with appointed firm.
3. Testing services for the Owner's quality control program, including concrete strength tests, will be provided by an independent testing laboratory or agency, procured by the Owner and approved by the Engineer, and will be performed in accordance with the applicable requirements of ACI 301. If, as a result of these tests, it is determined that the specified concrete properties are not being obtained, the Engineer will order such changes in proportions or materials, or both, as may be necessary to secure the specified properties.
4. Failure of the Engineer to detect defective work or material shall not prevent later rejection when such defect is discovered, nor shall it obligate the Engineer for final acceptance.
5. Additional inspection and testing services required by the Engineer because of changes in materials, sources, or proportions; or occasioned by failure of inspections and tests to meet specification requirements, shall be paid for by the Contractor.

C. Methods of Sampling and Testing:

1. Sampling: Representative composite samples will be taken by the Testing Agency in accordance with ASTM C172. Each sample shall be obtained from a different batch of concrete on a random basis.
2. Slump Tests: The above-specified Testing laboratory will perform slump tests of concrete during placing of concrete, as required, in accordance with ASTM C143. At least one test will be performed at the delivery trucks for each 50 cubic yards of concrete delivered.
3. Tests for Concrete Temperature: Freshly mixed concrete will be tested hourly when the ambient temperature is below 40 degrees F and above 80 degrees F, and each time compression test cylinders are made. The concrete temperature will be recorded on all compression test cylinders made. Refer to Referenced Standards herein for hot and cold weather remedial requirements.
4. Strength Tests:
 - a. The minimum number of test cylinders to be made for each class of concrete and for each placement shall be four cylinders for each 100 cubic yards or fraction thereof. When additional sets of test cylinders are required beyond the normal seven and 28-day tests, each set shall consist of a minimum of two test cylinders.
 - b. All cylinders in a set will be marked with a unique number on one end. The Contractor shall record this number on the record of concrete placed. All cylinders shall be cured by the Contractor's independent testing laboratory.
 - c. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.
 - d. From each set of cylinders cast, one cylinder shall be tested at seven days and two cylinders at 28 days in accordance with ASTM C39. If the 28-day tests are satisfactory, the fourth cylinder shall be discarded.
 - e. In the event the 28-day tests are below the specified strength requirements, the Laboratory shall then test the fourth cylinder at the age selected by the Engineer.
5. Tests for Contractor's Benefit: Tests required to verify early form removal, or other reasons for the Contractor's benefit, shall be performed at Contractor's expense as part

of the Contractor's quality control program.

D. Evaluation and Acceptance of Tests:

1. Acceptance of Concrete: The strength of the concrete shall be considered satisfactory, provided the averages of all sets of three consecutive strength test results equal or exceed the specified 28-day compressive strength, and no individual strength test result falls below the specified 28-day compressive strength by more than 500 psi.
2. Adjustments: The Independent testing laboratory will order adjustments to the mix proportions, increase in the minimum cement content, additional curing of the structure, or any combination of the above when strength tests acceptance criteria specified are not being met.
3. Test Cores:
 - a. When laboratory test results indicate concrete to be more than 300 psi below the specified strength, or if there is a likelihood of low strength concrete, a significant reduction in load-carrying capacity, or absence of desired durability or watertightness (for aquatic concrete) in the concrete, the Engineer will require tests of cores to be drilled from the areas in question.
 - b. Test cores shall be obtained from each member or area of suspect strength, from locations designated by the Engineer, and test specimens shall be prepared by the Contractor in accordance with ASTM C42.
 - c. Three cores shall be taken for each determination of in-place strength. Concrete in the area represented by the core tests will be considered structurally adequate if the average of the three cores is equal to at least 85 percent of the specified design strength and no single core is less than 75 percent of the design strength. Locations represented by erratic core strengths shall be retested at the direction of the Engineer.
 - d. Fill core holes by methods approved by the Engineer.
4. Rejection of Concrete; Repair and Replacement: The Engineer shall have authority to reject concrete work which does not meet specification requirements, and to require repair or replacement as necessary to complete the Work.

- E. Acceptance of Structure: Acceptance of the completed standard concrete work requires conformance with the dimensional tolerances, appearance, and strengths specified in these Specifications, in ACI 301, and in ACI 117. Acceptance of the completed Aquatic Concrete work has the additional requirement of watertightness as defined by ACI 350.1 and the requirements stated herein, and as noted at rebates on the Acrylic Panel manufacturer's shop drawings.

3.11 DEFECTIVE CONCRETE

- A. Test Results: The testing agency shall report test results in writing to the Owner's representative and Structural Engineer within 48 hours of the test.
- B. Defective Concrete: Concrete not complying with required lines, details, dimensions, tolerances or specified requirements.
- C. Repair or replacement of defective concrete will be determined by the Architect. The cost of additional testing shall be borne by Contractor when defective concrete is identified.

- D. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect for each individual area.

3.12 PROTECTION

- A. Do not permit traffic and other activities over unprotected concrete floor surface until fully cured.
- B. Protect in-place concrete in accordance with ACI 301, Section 1.8, and as follows:
 - 1. Cover to protect interior exposed concrete slabs subject to foot traffic or other damage with clean, unwrinkled kraft curing paper.
 - 2. Stack and stockpile materials and equipment in manner to prevent mechanical and chemical damage to concrete surfaces. Maintain stacking and stockpiling loading within structural tolerances.
 - 3. Contain and promptly clean spills to maintain concrete suitable for bonding of finish flooring and final finishing of exposed concrete slabs.

END OF SECTION

PART 1 – GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Finishing concrete slabs.
 - 2. Floor surface treatment.
- B. Related Sections:
 - 1. Section 03 30 00 – Cast-in-Place Concrete.
 - 2. Section 07 92 00 – Joint Sealants.
 - 3. Section 09 30 19 – Swimming Pool Ceramic Tile.

1.02 REFERENCES

- A. American Concrete Institute:
 - 1. ACI 117 - Specifications for Tolerances for Concrete Construction and Materials.
 - 2. ACI 301 - Specifications for Structural Concrete.
 - 3. ACI 302.1 - Guide for Concrete Floor and Slab Construction.
- B. ASTM International:
 - 1. ASTM E1155 - Standard Test Method for Determining Floor Flatness and of Levelness Using the F-number System.

1.03 SUBMITTALS

- A. Relevant sections of Division 1.
- B. Product Data: Submit data for curing papers and slip resistant treatment, compatibilities, and limitations.

1.04 CLOSEOUT SUBMITTALS

- A. Relevant sections of Division 1.

1.05 QUALITY ASSURANCE

- A. Perform Work in accordance with ACI 301 and ACI 302.1.

1.06 QUALIFICATIONS

- A. Installer: Company specializing in performing the work in this section with minimum ten (10) years documented experience.

1.07 MOCK-UP

- A. Section 01 45 00 – Quality Control: Requirements for mockup.

- B. Construct mock-up area under conditions similar to those which will exist during actual placing, 8 feet long by 8 feet wide, with specified finishes and curing methods applied.
- C. Locate mock-up as part of the pour schedule pattern(s) identified on the Drawings at location directed by the Architect/Engineer.
- D. Incorporate accepted mock-up as part of the work.

1.08 COORDINATION

- A. Coordinate the work with concrete floor placement and curing.

PART 2 – PRODUCTS - NOT USED

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Relevant sections of Division 1.
- B. Verify floor surfaces are acceptable to receive the Work of this section.

3.02 FLOOR FINISHING

- A. Finish concrete floor surfaces in accordance with ACI 301-16 and ACI 302.1R-15.
- B. Slab Finish: Place, consolidate, and immediately strike off concrete to obtain proper contour, grade, and elevation before bleedwater appears. Permit concrete to attain a set sufficient for floating and supporting the weight of the finisher and equipment. If bleedwater is present prior to floating the surface, drag the excess water off or remove by absorption with porous materials. Do not use dry cement to absorb bleedwater.
 - 1. Floated:
Use for surfaces to receive waterproofing membranes and exterior slabs where not otherwise specified. After the concrete has been placed, consolidated, struck off, and leveled, do not work the concrete further, until ready for floating. Whether floating with a wood, magnesium, or composite hand float, with a bladed power trowel equipped with float shoes, or with a powered disc, float shall begin when the surface has stiffened sufficiently to permit the operation. During or after the first floating, surface shall be checked with a 10-foot straightedge applied at no less than two different angles, one of which is perpendicular to the direction of strike off. High spots shall be cut down and low spots filled during this procedure to produce a surface level within 3/16 inch in 10 feet.
 - 2. Broomed:
Medium Broom Finish – Brooming texture to be approved by Engineer. Permit surface to harden sufficiently to retain the scoring or ridges. Broom transverse to traffic or at right angles to the slope of the slab.
- C. Place floor slabs in pattern indicated on plans.

- D. Screed floors maintaining surface flatness as noted herein. Pitch surfaces uniformly to drains.

3.03 FLOOR TOLERANCES

- A. Relevant sections of Division 1.
- B. Measure for F_f and F_l tolerances for floors in accordance with ASTM E1155, within 48 hours of placing concrete slab and prior to removal of forms.
- C. Finish concrete to achieve the following tolerances:
 - 1. Floor surface classification: Flat.
 - 2. Specified overall flatness: SO_{F_f} 35.
 - 3. Specified overall levelness: SO_{F_l} 25.
 - 4. Minimum local values for flatness (MLF_f) and levelness (MLF_l) shall equal 3/5 of SO_{F_f} and SO_{F_l} values, respectively.
- D. Correct the slab surface if tolerances are less than specified and as required to slope to drain.
- E. Correct defects in defined traffic floor by removal and replacement of defective Work. Areas requiring corrective Work will be identified. Re-measure corrected areas by same process.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Project Drawings and general provisions of the Construction Contract, including General and Supplementary Conditions, Division 01 Specification Sections and bidding requirements, apply to the work of this Section.
- B. Technical publications, standards, and reference documents as outlined in individual Technical Specification Sections and as indicated on the Project Drawings.

1.02 SUMMARY

- A. This Section includes a concrete topping that contains a blend of Portland cements and other hydraulic cements.
 - 1. ARDEX K 301™ Exterior Self-Leveling Concrete Topping
 - 2. ARDEX ARDIFIX™ Low Viscosity Polyurethane Crack Repair
 - 3. ARDEX EP 2000™ Substrate Preparation Epoxy Primer
 - 4. ARDEX CG™ Concrete Guard 2.0

1.03 REFERENCES

- A. ASTM C 109M, Compressive Strength Air-Cure Only
- B. ASTM C348, Flexural Strength of Hydraulic-Cement Mortars

1.04 SUBMITTALS

- A. Product Data: Submit manufacturer's product data, a Revit file with applicable materials meeting the Revit Content Style Guide, and installation instructions for each material and product used. Include manufacturer's Safety Data Sheets.
- B. Qualification Data: For Installer

1.05 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: The manufacturer shall be a company with at least five years' experience and regularly engaged in the manufacture and marketing of products specified herein. Contact Manufacturer Representative prior to installation. Installation of the ARDEX product must be completed by a factory-trained installer, certified applicator, such as an ARDEX Level-Master® Elite – Polished Concrete or Polished Preferred Contractor, using mixing equipment and tools approved by the manufacturer. Contact ARDEX Americas at (724) 203-5000 for a list of recommended installers.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver products in original packaging, labeled with product identification, manufacturer, batch number and shelf life.
- B. Store products in a dry area with temperature maintained between 50° and 85° F (10° and 29° C) and Protect from direct sunlight.
- C. Handle products in accordance with manufacturer's printed recommendations.

1.07 PROJECT CONDITIONS

- A. Do not install material below 50°F (10°C) surface and air temperatures. These temperatures must also be maintained during and for 48 hours after the installation of products included in this section. Install quickly if substrate is warm and follow warm weather instructions available from the ARDEX Technical Service Department.

PART 2 - PRODUCTS

2.01 HYDRAULIC CEMENT UNDERLAYMENT

- A. Self-Leveling Concrete Topping
 - 1. Acceptable Products:
 - a. ARDEX K 301™; Manufactured by ARDEX Americas, USA, (724) 203-5000, www.ardexamericas.com
- B. Performance and Physical Properties: Meet or exceed the following values:
 - 1. Application: Barrel Mix or Pump
 - 2. Walkable: 2 – 3 hours
 - 3. Flow Time: 10 minutes
 - 4. Compressive Strength: 4300 psi at 28 days, ASTM C109M.
 - 5. Flexural Strength: 1000 psi at 28 days, ASTM C348.
 - 6. Colors: Light Gray
- C. Or approved equal.

2.02 ARDEX ARDISEAL™ RAPID PLUS Semi-Rigid Joint Sealant; manufactured by ARDEX Americas, USA, (724) 203-5000, www.ardexamericas.com

2.03 ARDEX ARDIFIX™ Low Viscosity Polyurethane Crack Repair; Manufactured by ARDEX Americas, USA, (724) 203-5000, www.ardexamericas.com

2.04 ARDEX EP 2000™ Substrate Preparation Epoxy Primer; Manufactured by ARDEX Americas, USA, (724) 203-5000, www.ardexamericas.com

2.05 SEALER: ARDEX CG™ Concrete Guard™; Manufactured by ARDEX Americas, USA, (724) 203-

5000, www.ardexamericas.com

2.06 WATER: Water shall be clean, potable, and sufficiently cool (not warmer than 70°F).

PART 3 – EXECUTION

3.01 PREPARATION

- A. Concrete Subfloors: Prepare substrate in accordance with manufacturer's instructions.
 - 1. All concrete subfloors must be sound, solid, clean, and free of all oil, grease, dirt, curing compounds and any substance that might act as a bond breaker before priming. Mechanically clean to a minimum ICRI surface profile of CSP 3. Acid etching and the use of sweeping compounds and solvents are not acceptable.
- B. Joint and Crack Preparation:
 - 1. All Joints and Moving Cracks – Under no circumstances should ARDEX K 301™ be installed over any joints or moving cracks. All joints and moving cracks may be filled with ARDEX ARDISEAL™ Rapid Plus Semi-Rigid Joint Sealant.
 - 2. Dormant Cracks – Fill dormant cracks greater than 1/32" with ARDEX ARDIFIX™ Low Viscosity Rigid Polyurethane Crack & Joint Repair.

3.02 APPLICATION OF ARDEX K 301™

- A. Examine substrates and conditions under which materials will be installed. Do not proceed with installation until unsatisfactory conditions are corrected.
- B. Coordinate installation with adjacent work to ensure proper sequence of construction. Protect adjacent areas from contact due to mixing and handling of materials.
- C. Priming:
 - 1. Install ARDEX EP 2000™ Substrate Preparation Epoxy Primer. Apply the freshly mixed epoxy to the prepared surface using a short-nap paint roller or notched squeegee with back rolling for smoother surfaces and a longer nap for more uneven substrates. ARDEX EP 2000™ can also be worked into the surface with a paintbrush for hard-to-reach areas and corners
 - a. While in a fresh state, broadcast in-excess of fine sand (less than 1/50" in grain size or 98.5% passing sieve size #30 or #35) consistently over the entire area. After 16 hours, broom sweep and vacuum the surface to remove all loose sand. ARDEX recommends wearing an N-95 dust mask when broadcasting and sweeping up the excess sand
- D. Mixing: Comply with manufacturer's printed instructions and the following.
 - 1. When mixing sanded materials, ARDEX recommends using the ARDEX DUSTFREE™ or a standard "gutter hook" vacuum attachment in combination with a wet/dry (Shop-Vac® style) vacuum and HEPA dust extraction vacuum system. Additionally, each bag should be handled with care and emptied slowly to avoid creating a plume of dust. Contact the ARDEX Technical Service Department for more details on ARDEX products and air

quality management.

2. ARDEX K 301™ is mixed two bags at a time. Mix each 50 lb. (22.7 kg) bag with 5 quarts (4.73 L) of clean water.
3. Mix using a 1/2" (12 mm) heavy-duty mixing drill (650 rpm) with an ARDEX T-1 mixing paddle. Do not overwater.
4. Aggregate mix: For areas with thicknesses greater than 3/4" (19 mm), aggregate may be added to reduce material costs. Mix ARDEX K 301™ with water first, then add 1-part aggregate by volume of washed, well-graded pea gravel aggregate (1/8" to 3/8"; 3 to 9.5 mm). Do not use sand. If the aggregate is wet, reduce the amount of water to avoid overwatering. Note: The addition of aggregate will diminish the workability of the product and may make it necessary to install a finish coat to obtain a smooth surface. ARDEX recommends a finish coat to obtain a smooth surface. Allow the initial application to dry for 24 hours, and then prime this layer with ARDEX EP 2000™ and sand broadcast. All the primer to dry 16 hours before removing all excess sand and installing the neat coat of ARDEX K 301™.
5. For pump installations, ARDEX K 301™ shall be mixed using the ARDEX ARDIFLO™ Automatic Mixing Pumps. Contact ARDEX Technical Service Department (724) 203-5000 for complete pump operation instructions.

E. Application: Comply with manufacturer's printed instructions and the following.

1. ARDEX K 301™ may be installed at a minimum thickness of 1/4" (6 mm) up to 3/4" (19 mm) over large areas neat and up to 2" (5 cm) with the addition of proper aggregate.
2. Pour or pump the liquid ARDEX K 301™ onto the substrate and spread in place with the ARDEX T-4 Spreader. Immediately smooth the material with the ARDEX T-5 Smoother. Wear non-metallic cleats to avoid leaving marks in the liquid ARDEX K 301™.

F. Curing

1. Although ARDEX K 301™ requires no special curing procedures, avoid applying this product if rain is expected within 6 to 8 hours, or if freezing temperatures could occur within 48 hours of application. As with any cementitious material, the above conditions can alter the appearance and performance of the topping.

G. Sealing

1. The surface of ARDEX K 301™ must always be protected from oil, salt, water and surface wear by applying a suitable protection system. ARDEX recommends the use of ARDEX CG™ Concrete Guard 2.0 to seal ARDEX K 301™ that will be exposed to normal foot traffic.
2. For areas to receive heavier traffic, sealing should be done using an appropriate wear protection coating. As the performance of the coating systems varies greatly, the installer is responsible for assessing the suitability of these coatings.
 - a. If ARDEX CG™ Concrete Guard 2.0 or a waterborne sealer is to be applied at a thickness not-to-exceed a total of 20 mil (500 microns), the coating can be applied to the surface of the ARDEX K 301™ after 24 hours at 70°F (21°C).
 - b. When using a solvent-borne or 100% solids coating applied at a total thickness of

20 mils (500 microns) or less, the ARDEX K 301™ must cure for a minimum of 48 – 72 hours at 70°F (21°C).

- c. When the total application thickness will exceed 20 mils (500 microns), the ARDEX K 301™ must cure 7 days at 70°F (21°C) prior to installing the protection layer.

3.03 FIELD QUALITY CONTROL

- A. Where specified, field sampling of the Ardex topping is to be done by taking an entire unopened bag of the product being installed to an independent testing facility to perform compressive strength testing in accordance with ASTM C 109/modified: air-cure only. There are no in situ test procedures for the evaluation of compressive strength.

END OF SECTION

PART 1 – GENERAL

1.01 SUMMARY

- A. This Section includes grout for hollow metal frames at concrete walls.

1.02 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division- 01 Specification sections, apply to work of this section.

1.03 QUALITY ASSURANCE

- A. Fabricator Qualifications: A firm experienced in producing metal fabrications similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Deliver in original unopened containers and store under cover.

1.05 SUBMITTALS

- A. Product Data for grout.

1.06 QUALITY ASSURANCE

- A. Obtain grout ingredients of a uniform quality, from one manufacturer for each cementitious component and from one source or producer for each aggregate.

PART 2 – PRODUCTS

2.01 GROUT FOR HOLLOW METAL FRAME ASSEMBLIES

- A. Grout for Hollow Metal Frames: percolized gypsum material - "Struct-O-Lite or approved equal.
- B. Substitutions under provisions of Division 01.

PART 3 – EXECUTION

3.01 GROUTING HOLLOW METAL FRAMES

- A. Fill joints, voids, pockets, etc. completely full. Finish surfaces smooth that are exposed to view.
- B. Grout all hollow metal frames.

END OF SECTION

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Repair of cracks in the concrete as indicated on the Drawings or as directed by the Engineer on a unit cost basis.

1.02 RELATED SECTIONS

- A. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Addenda, and Sections in Division 1 of these Specifications.
- B. Section 03 01 30 - Surface Preparation for Overlay.
- C. Section 03 01 30.71 - Concrete Rehabilitation.
- D. Section 03 30 00 - Cast-In-Place Concrete.

1.03 REFERENCES

- A. American Society for Testing and Materials.
 - 1. ASTM C881 - Standard Specification for Epoxy Resin-Base Bonding Systems for Concrete.
 - 2. ASTM C882 - Bond Strength of Epoxy Resin Systems Used with Concrete.
 - 3. ASTM D570 - Test Method for Water Absorption of Plastics.
 - 4. ASTM D638 - Test Method for Tensile properties of Plastics.
 - 5. ASTM D695 - Compressive Properties of Rigid Plastics.
- B. American Concrete Institute.
 - 1. ACI 503.2 - Standard Specification for Bonding Plastic Concrete to Hardened Concrete to Hardened Concrete with a Multi-Component Epoxy Adhesive.
 - 2. ACI 503.4 - Standard Specification for Repairing Concrete with Epoxy Mortars.
 - 3. ACI 503.7 – Specification for Crack Repair by Epoxy Injection.
 - 4. ACI 504R - Guide to Joint Sealants for Concrete Structures.
- C. International Concrete Repair Institute.
 - 1. ICRI 110.2-2020 – Guide Specification for Epoxy Injection.
 - 2. ICRI 210.IR-2016 - Guide for Verifying Field Performance of Epoxy Injection of Concrete Cracks.
- D. American National Standards, Inc.
 - 1. ANSI Z129.1 - Precautionary Labeling of Hazardous Industrial Chemicals.
 - 2. K68.1 - Guide for Classifying and Labeling Epoxy Products According to their Hazardous Potentialities.

1.04 QUALIFICATION ASSURANCE

- A. Applicator's Qualifications: Epoxy injection shall be performed by a certified Applicator. The Applicator shall have a minimum of five (5) years of documented experience in successful repair projects on concrete structural components. The Applicator's qualifications shall be submitted to the Engineer at least two weeks before commencement of epoxy injection work.
- B. Workman's Qualifications: Applicator's workmen engaged in the epoxy injection process on concrete structural components shall have satisfactorily completed a program of instruction in the methods of restoring concrete structures utilizing the specific epoxy injection process indicated, or submit evidence of sufficient work experience in utilizing the process.
- C. Workman's Experience: Applicator's workmen engaged in the actual operation of the equipment used shall have a minimum of three (3) years experience in the operation of the same equipment. Workmen shall have participated in a minimum of eight (8) documented concrete repair projects.

1.05 QUALITY ASSURANCE

- A. Product Manufacturer: Company specializing in manufacturing quality concrete repair products with a minimum of five (5) years experience.
- B. Applicator: Company prequalified per Paragraph 1.04 of this Section.
- C. Dispenser Manufacturer: Written instructions for maintaining equipment and the ratio accuracy.

1.06 REGULATORY REQUIREMENTS

- A. Conform to all Federal, State and Local regulatory requirements.

1.07 SUBMITTALS

- A. The Contractor/Subcontractor shall submit the following documentation for approval under provisions of Section 01330 Submittal Procedures.
 - 1. Applicator's Qualifications: A list of projects, dates, locations, contact and contact's telephone number as per Paragraph 1.04A. of this Section.
 - 2. Workman's Qualifications and Experience: Proof of completion of a program of instruction as per Paragraph 1.04B. and 1.04C. of this Section.
 - 3. Epoxy Injection Adhesive: Provide material certifications and test results per Paragraph 2.02B. of this Section.
 - 4. Dispenser Equipment: Written instructions for maintaining equipment and the ratio accuracy.

1.08 INSPECTIONS

- A. Comply with the provisions of Paragraph 3.04 of this Section.

1.09 PERFORMANCE

- A. Designated cracks will be injected with epoxy, filling all voids.
- B. Following injection, all porting adapters and the cap shall be removed, leaving the surface of the concrete smooth with no epoxy or sealer materials showing outside of repaired crack width.
- C. The Owner imposes no procedural requirements or restrictions, and therefore will not be influenced by their inclusion or absence in appraisal of unsatisfactory results. The procedures and equipment selected to obtain the specified results are the Contractor's option and the Contractor's responsibility.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Named products are used herein to establish quality and type. The following are acceptable manufacturers.
- B. Injection Epoxy Resin Adhesive:
 - 1. Sika Corporation.
 - 2. BASF.
 - 3. ChemCo Systems, Inc.
 - 4. Simpson Strong-Tie
 - 5. Substitutions in accordance with Section 01 60 00 – Product Requirements.

2.02 MATERIALS

- A. Injection Adhesives.
 - 1. Injection adhesives for cracks that can be sealed on all faces – Use an adhesive conforms to the requirements of ASTM C 881/C 881 M, Type IV, Grade 1, and any additional requirements as defined in the Project Specifications.
 - 2. Injection adhesive for cracks that cannot be sealed on all faces – If all faces of the crack cannot be reached to apply a surface seal, use an injection adhesive that conforms to the requirements ASTM C 881/C 881 M, Type IV, Grades 1, 2 or 3, and has a viscosity that will allow it to achieve and maintain the penetration requirements specified in Section 1.5.7.1.
- B. Primer - Primers shall be used as recommended by the manufacturer.
- C. Epoxy Resin Adhesive for Injection for cracks that can be sealed all faces.
 - 1. Epoxy adhesive used for impregnation shall be an epoxy resin, two-component, low viscosity adhesive containing no solvents or non-reactive dilutants. Acceptable standard for epoxy is BASF “Mater Inject 1500”.
 - a. Epoxy shall be a two-part type, low viscosity epoxy adhesive material containing 100% solids and shall meet or exceed the following characteristics when tested in accordance with the standards specified.

b. Performance Requirements of Cured Adhesive.

<u>Characteristic</u>	<u>Test Method</u>	<u>Results</u>
Bond Strength, Slant Shear	ASTM C882	2,000 psi
Tensile Strength (7 Day)	ASTM D638	7,500 psi
Elongation of Break	ASTM D638	1% min.
Compressive Yield Strength	ASTM D-695	11,000 psi
Heat Deflection Temperature	ASTM D-648	124° F
Compression Modulus	ASTM D-695	250,000 psi

C. Epoxy Injection Adhesive for cracks that cannot be sealed on all faces.

1. Epoxy adhesive used for impregnation shall be an epoxy resin, two-component, low viscosity adhesive containing no solvents. Acceptable standard for epoxy is "MasterInject 1000" BASF.
 - a. Epoxy shall be a two-part, low viscosity material containing 100% solids and shall meet or exceed the following characteristics when tested in accordance with the standards specified.
 - b. Performance Requirements of Cured Adhesive.

<u>Characteristic</u>	<u>Test Method</u>	<u>Results</u>
Bond Strength, Slant Shear	ASTM C882	1,500 psi
Tensile Strength	ASTM D638	7,000 psi
Elongation	ASTM D638	1% min.
Compressive Yield Strength	ASTM D-695	10,000 psi
Heat Deflection	ASTM D-648	120° F min.
Flexural Strength	ASTM D-790	9,500 psi

D. Surface Seal:

1. Description: The surface seal material is that material used to confine the injection adhesive in the joints or cracks during injection and cure.
2. Properties: The surface seal material shall have adequate strength to hold injection fittings firmly in place and to resist injection pressures adequately to prevent leakage during injection and not leave residue or damages on the surface it is removed from.

2.03 EQUIPMENT

- A. Equipment for Injection: The equipment used to meter and mix the two injection adhesive components and inject the mixed adhesive into the crack shall be portable, positive displacement type pumps with interlock to provide positive ratio control of exact proportions of the two components at the nozzle. The pumps shall be electric or air powered and shall provide in-line metering and mixing.
 - 1. Discharge Pressure: The injection equipment shall have automatic pressure control capable of discharging the mixed adhesive at any preset pressure up to 200 psi plus/minus 5 psi and shall be equipped with a manual pressure control override.
 - 2. Ratio Tolerance: The equipment shall have the capability of maintaining the volume ratio for the injection adhesive prescribed by the manufacturer of the adhesive within a tolerance of plus/minus 5 percent by volume at any discharge pressure up to 200 psi.
 - 3. Automatic Shut-Off Control: The injection equipment shall be equipped with sensors on both the Component A and B reservoirs that will automatically stop the machine when only one component is being pumped to the mixing head.

2.04 QUALITY CONTROL

- A. Certification and Test Report.
 - 1. Manufacturer shall certify that every batch of material supplied to this Specification meets all of the requirements listed in Paragraph 2.02 of this Section.
- B. Label Information.
 - 1. The label shall include in a clear and distinct manner, the following information:
 - a. Product Name, Lot Number and Manufacturer.
 - 2. ANSI Hazardous Classification (formerly SPI Classification) and appropriate recommended ANSI precautions for handling.
 - 3. Mix ratio by volume.
- C. Storage
 - 1. The containers of the adhesive shall be stored at ambient temperatures below 100 degrees F.
- D. Shelf Life
 - 2. The adhesive has a shelf life of 18 months counted by the date of manufacture. Material older than 18 months shall be tested at the Contractor's expense to establish conformance of the material with this Specification. At the time of re-test, a new shelf life, not exceeding 18 months, shall be established by the manufacturer.

PART 3 - EXECUTION

3.01 GENERAL

- A. Concrete crack repairs shall consist of pressure injection of a high strength, low modulus, low viscosity epoxy bonding material into cracks and construction joint voids where indicated on the Drawings. Both the injection pressure and the two-component epoxy mix ratio are critical to the success of the process repair. In process tests of injection pressure and mix ratio shall be completed as specified herein. Cracks requiring

pressure injection shall be identified by the Engineer by markings adjacent to the crack. A paste gel cap seal is required on all exposed sides of the crack.

3.02 CLEANING

- A. Surfaces adjacent to joints or cracks or other areas of application shall be cleaned of the rubber products, dirt, dust, grease, oil or other foreign matter detrimental to bond of epoxy injection surface seal system. Acids and corrosives shall not be permitted for cleaning.
- B. The entire length of the cracks on each side shall be wire brushed cleaned or sanded to provide a clean, dry surface for application of the capping material.
- C. Knife score, water flush, air blast and vacuum surface to remove all loose debris from cracks to be repaired.

3.03 REPAIR AREAS

- A. At locations as indicated on the Drawings or as directed by Engineer. Lengths of cracks to be repaired shall be identified and directed by the Engineer.

3.04 EPOXY INJECTION

- A. Preparation
 - 1. Surfaces adjacent to and within cracks shall be cleaned to remove all foreign materials including dirt, dust, grease, oil, efflorescence, or other foreign matter and sealing materials detrimental to bond of the epoxy surface seal and epoxy adhesive surface seal and epoxy adhesive injection materials, respectively. Acids and corrosives shall not be permitted for cleaning.
 - 2. Provide entry ports along the crack at intervals of not less than the thickness of the concrete member at that location nor more than 6 inches. Entry ports shall be placed in the capping material along the crack plane on one side of the crack. The entry ports shall be in accordance with epoxy injection material Manufacturer's recommendations. A rotary impact drill used to drill holes 1/4 in. to 3/8 in. larger than the entry port pin size. Allow for curing of the capping material.
 - 3. Apply surface seal material to the face of the crack or end. For through cracks, apply surface seal to all exposed faces.
 - 4. Allow enough time for the surface seal material to gain adequate strength before proceeding with the injection.
- B. Epoxy Injection
 - 1. Injection of epoxy adhesive shall begin at lower entry port and continue until there is an appearance of epoxy adhesive at the next entry port adjacent to the entry being pumped.
 - 2. The mixed epoxy shall be continuously injected through a handheld mixing head and nozzle through an injection port and into the crack opening. To provide full penetration and filling of the crack when injecting from one side, the epoxy shall be injected into the first port at one end of the crack and allowed to rise into the injection tube of the adjacent injection port. At this point, the first injection tube shall be

capped and injection continued at the second port until epoxy rises in the third injection tube. This process shall be continued in sequence along the entire length of the crack until all ports have been filled.

3. If port-to-port travel of epoxy adhesive is not indicated, the work shall immediately be stopped and the Engineer notified.

C. Finishing.

1. When cracks or joints are completely filled, epoxy adhesive shall be cured for sufficient time to allow removal of injection or port sealing devices. After the epoxy has cured, the capping material and injection ports shall be removed from both sides of the crack and the adjacent concrete surfaces restored to their original condition.

D. Field Quality Control.

1. Pressure Test Method. The mixing head of the injection equipment shall be disconnected and the two-component adhesive delivery lines shall be attached to the pressure check device. The pressure check device shall consist of two independent valved nozzles capable of controlling flow rate and pressure by opening or closing the valve. There shall be a pressure gauge capable of sensing the pressure build-up behind each valve. The valves on the pressure check device shall be closed and the equipment operated until the gauge pressure on each line reads 160 psi. The pumps shall be stopped and gauge pressure shall not drop below 150 psi within 3 minutes.
2. Ratio Test Method. The mixing head of the injection equipment shall be disconnected and the two adhesive components shall be pumped simultaneously through the ratio check device. The ratio check device shall consist of two independent valved nozzles capable of controlling back pressure by opening or closing the valve. The discharge pressure shall be adjusted to 180 psi for both adhesive components. Both adhesive components shall be simultaneously discharged into separate calibrated containers. The amounts discharged into the calibrated containers simultaneously during the same time period shall be compared to determine if the volume discharge conforms to the manufacturer's recommendations.
3. Frequency of Testing: The pressure and ratio test for each injection unit shall be run every four (4) hours of operating time of each piece of equipment.
4. Proof of Pressure and Ratio Test.
 - a. At all times during the course of the work the Contractor shall keep complete and accurate records available to the Engineer of the pressure and ratio tests specified above.
 - b. In addition, the Engineer, at any time without prior notification of the Contractor, may request the Contractor to conduct the tests specified above in the presence of the Engineer.

3.05 QUALITY ASSURANCE - TESTING AND INSPECTION

- A. Contractor shall provide resin samples from dispenser whenever the Engineer requests them during the course of injection. Sample sizes shall not exceed three (3) fluid ounces.
- B. Contractor shall submit concrete cores taken at cracks repaired by injected epoxy resin adhesives where directed by the Engineer to determine if the specified results are being

obtained. The results as evidenced by the cores shall be the sole criteria in determining compliance with this specification.

1. Taking cores and repairing their core sockets by the Contractor is considered incidental with the work. Contractor shall assume a minimum of three (3) cores will be required.
2. Unless otherwise indicated by the Engineer, cores shall be taken at locations indicated on the drawings. Cores shall be 3 inches in diameter and a minimum of 8 inches in depth. Verify with Engineer prior to taking cores whether reinforcing steel encountered in the coring process can or cannot be cut. The Contractor shall index cores and core locations for future reference.
3. Core Frequency: Epoxy injection shall not proceed beyond the first 200 L.F. of exposed crack until the Engineer has examined and approved 3 cores. After this initial approval, one core for every 250 L.F. is required.
4. Core Inspection and Testing: The Engineer will inspect cores to confirm penetration requirements are met. This review includes wetting cores and examining them carefully as they dry. Fissures not filled with resin will remain damp, and therefore dark after the core surface has dried. Unfilled cracks will be detected in this manner. After reviewing fill of specified voids, demolish the core and inspect the fragments. If no breaks occur on the glue lines, the epoxy injection work performed is acceptable.

END OF SECTION

PART 1 – GENERAL

1.01 SCOPE

- A. Furnish all labor, materials, tools and equipment, and perform all operations necessary for embedded in slab metal electrical conduit plus concrete crack and joint water leakage fix with injection grouting work.
- B. Operation joint profile preparation, saturated oakum and closed cell backer rod placement and the injection grouting shall proceed as indicated in the sequence of work.
- C. Injection of grout is for filling voids in embedded metal electric conduit and concrete and for the repair of water leaking cracks.
- D. Holes will be drilled as required and grout injected at cracks. Grout shall be injected under low pressure so as not to damage the existing structure.

1.02 RELATED WORK UNDER OTHER SECTIONS:

- A. Section 03 01 30.71 – Concrete Rehabilitation.
- B. Section 03 15 00.01 – Concrete Accessories – Adhesive Anchors.
- C. Section 03 30 00 – Cast-in-Place Concrete.
- D. Section 07 92 00 – Joint Sealants.
- E. Division 16 – Electrical Work.

1.03 SUBMITTALS

- A. General: Submit in accordance with General Conditions
- B. Product Data: Submit manufacturer's product data sheets and description of recommended uses and installation procedures for each component used in chemical grouting the pool slab joints.

PART 2 – PRODUCTS

2.01 CHEMICAL GROUT

- A. **FOR CONCRETE CRACKS AND JOINTS**
The sealing materials shall be a polyurethane grout and accelerator system marketed under the names of GCP De Neef Hydro-Active Flex LV with accelerator Hydro-Active Flex Cat supplied by Grace Construction Products, Inc. or approved equal. All materials shall be delivered to the site in undamaged, unopened containers bearing the manufacturer's original labels. Grouting shall be performed in accordance with manufacturer's recommendations. Grouts shall be non-flammable and non-toxic.
- B. **FOR EMBEDDED METAL ELECTRICAL CONDUIT IN CONCRETE SLABS.**

The fill and sealing of metal electrical conduit pipe shall be by polyurethane grout and accelerator system marketed under the names of GCP DeNeef CFL PRe with accelerator Flex Cat PRe as supplied by Grace Construction Products, Inc or approved equal. All materials shall be delivered to site in undamaged, unopened containers bearing the manufacturers original labels. Grouting shall be performed in accordance with manufacturer's recommendations. Grouts shall be non-flammable and non-toxic.

C. **CHEMICAL GROUT**

The grouting compound shall be a hydrophobic polymer of the isocyanate type which is applied to a defective joint by use of a packer or injection port. When the grout is mixed with 1.0% of accelerator, the mixture will react when it comes in contact with moisture. Take into consideration the expansion factor of the chemical grout with lower pressure pumping into the joint to be filled.

D. **ACCELERATOR**

This shall be based on tertiary amines, and be able to control the reaction time from one (1) minute to thirty (30) minutes depending on the amount of accelerator and the temperature of the grout.

E. Deliver, store, and handle all materials in strict accordance with manufacturer's instructions.

PART 3 – EXECUTION

3.01 PREPARATION

- A. Rout and clean existing slab expansion joints to profile shape shown on the Drawings. Provide joint concrete nosing repairs where required as shown on the Drawings.

3.02 GROUT SEALS FOR CRACKS AND JOINTS

- A. Saturated oakum in DE NEEF Hydro Active Flex LV followed by submerging in water. Immediately place saturated oakum in the bottom of the prepared joint and allow to cure 40 minutes.
- B. Place closed cell backer rod in the top of the joint. Set top of backer rod approximately 3/8" below the slab surface.
- C. Insert 1/4" inch injection needles through the upper backer rod seal.

3.03 CHEMICAL GROUT

A. **STORAGE**

Store all chemical grouting materials shall be stored in a secured, dry, weather-tight structure. All basic chemical grout shall be furnished in containers acceptable for use in the work. A sufficient quantity of basic chemical grout and other components shall be stored at or near the site of the work to insure that grouting operations will not be delayed by shortages.

B. MIXING AND HANDLING

Mixing and handling of the chemical grout and the accelerator shall be in accordance with the recommendations of the manufacturer and all applicable safety codes and shall be performed in such a manner as to minimize hazard to personnel. It is the responsibility of the contractor to provide appropriate protective measures to ensure that the chemical or foam produced by said chemical are under control of the contractor at all times. Plastic or metal mixing tanks shall be used. Tanks of concrete or wood should not be used.

C. INSTALLATION

1. For concrete Cracks and Joints.
 - a. Provide saturated surface dry (SSD) condition on the exposed concrete sides in the joint immediately prior to grouting.
 - b. Pump De Neef Hydro Active Flex LV accelerated with 1 percent Flex Cat under low pressure taking into account the expansion of 3 to 5 times for the grout.
2. For embedded metal electrical conduit.
 - a. Remove light pole on level 4 and canopy light on level 3.
 - b. Remove all existing conductors from conduit.
 - c. Clean conduit to remove mineral deposit and dirt.
 - d. Plug conduit at a low point in conduit system.
 - e. Install injection ports and/or zerk fittings.
 - f. Mix CFL PRe resin and Flex Cat PRe accelerator to account for the rapid expansion of 15 times for the grout.
 - g. Inject resin and allow to cure.
 - h. Use injection needles and accelerator mixing to insure a minimum 8 inch length of fill inside conduit.

END OF SECTION

PART 1 – GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Surface applied concrete steel reinforcement corrosion inhibitor:

1.01 RELATED SECTIONS

- A. Section 03 01 30 – Surface Preparation for Overlay.
- B. Section 03 01 30.71 – Concrete Rehabilitation.
- C. Section 03 01 40 – Concrete Cleaning and Surface Preparation for Liquid Applied Treatment.
- D. Section 03 30 00 – Cast-in-Place Concrete.

1.02 SUBMITTALS

- A. Comply with Section 01 33 00, unless otherwise indicated. Substitution requests must be submitted 14 day prior to bid date.
- B. Product Data: Manufacturer's specifications and technical data including the following:
 - 1. Detailed specification of construction and fabrication.
 - 2. Manufacturer's installation instructions.
 - 3. Certified test reports indicating compliance with performance requirements specified herein
 - 4. Corporate Letter of compliance to section
- C. Quality Control Submittals:
 - 1. Statement of qualifications.
 - 2. Statement of compliance with Regulatory Requirements.
 - 3. Field Quality Control Submittals as specified in Part 3.
 - 4. Manufacturer's field reports.

1.03 QUALITY ASSURANCE

- A. Manufacturer's Qualification: Not less than 5 years experience in the actual production of specified products, plus the following:
 - 1. Manufacturing facility has achieved ISO 9001 Quality and ISO 14001 Environmental certifications.
- B. Installer's Qualifications: Firm experienced in installation or application of systems similar in complexity to those required for this Project, plus the following:
 - 1. Acceptable to or licensed by manufacturer.
 - 2. Not less than 3 years experience with systems.
 - 3. Successfully completed not less than 5 comparable scale projects using this system.

C. Product Performance Qualifications:

1. Surface Appearance - No change in the surface appearance or texture.
2. Will not leave a residue on nonporous surfaces (i.e.: windows, aluminum framing, etc...)
3. Color: Slightly amber (fugitive dye to be added)
4. Density: 7.3 to 7.4 lbs/gallon
5. Nitrite content: less than 1%
6. Chloride content: less than 20 ppm
7. Material must reduce total corrosion of heavily corroding concrete rebar by an average of 90%, at an internal concrete relative humidity of 75% or greater.
8. Must reduce corrosion by 90% or greater using FHWA RD-98-153 test protocol on crack slab black bars subjected to 48 weeks of cyclic saltwater ponding.
9. Must increase the resistance of chloride ions using AASHTO T277 "Rapid Determination of the Chloride Permeability of Concrete" by 90% minimum
10. Must reduce corrosion by 80% when the presence of chlorides is over 10 lbs/yd³ of concrete at the top level of reinforcing steel.

Note: A qualified independent laboratory must perform all corrosion and chloride testing.

- D. Regulatory Requirements: Products shall comply with State and local regulations concerning AIM (Architectural, Industrial and Maintenance) coatings regarding Volatile Organic Content (VOC).

1.04 DELIVERY STORAGE AND HANDLING

- A. Packing and Shipping: Deliver products in original unopened packaging with legible manufacturer's identification.
- B. Storage and Protection: Comply with manufacturer's recommendations.

1.05 PROJECT CONDITIONS

- A. Environmental Requirements:
1. Maintain ambient temperature above 20 degrees F during and 24 hours after installation.
 2. Do not proceed with application on materials if ice or frost is covering the substrate.
 3. Do not proceed with application if ambient temperature of surface exceeds 100 degree F.
 4. Do not proceed with the application of materials in rainy conditions or if heavy rain is anticipated with 4 hours after application.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Inhibitor shall be ready-to-use, non-water-borne, surface applied product manufactured in an ISO 9002 certified facility, meeting or exceeding the physical and performance characteristics of the following approved product:
1. Protectosil® CIT
Evonik Corporation: 299 Jefferson RD; Parsippany NJ 07054; 800-282-091

2. Others as they provide a Corporate Letter stating that they comply with all the requirements of Section 1.03 C. Product Performance Qualifications.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine areas and conditions under which Work is to be performed and identify conditions detrimental to proper or timely completion.
 1. Do not proceed until unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Protection:
 1. Unless inhibitor does not affect adhesion of sealants, paints and patching materials all adjacent surfaces shall be protected as necessary in accordance with the manufacturer's recommendations.
 2. Follow the manufacturer's recommendations regarding condition of concrete surfaces before, during and after application.
- B. Surface Preparation:
 1. Remove all paint coatings and line striping from concrete slab surface in application area(s).
 2. All caulking, joint sealants, repairing, and patching of concrete surfaces shall be installed and cured before application of inhibitor. Apply corrosion inhibitor to all newly routed cracks prior to application of sealant. Confirm with Inhibitor Manufacturer compatibility of materials.
 3. Prior to application of corrosion inhibitor, concrete surfaces shall be dry and cleaned of all dust, dirt, debris, grease, oil, grout, mortar, and other foreign matter. Concrete patches and all existing surfaces shall be prepared as recommended by the corrosion inhibitor manufacturer and acceptable to the Engineer.
 4. Shotblast surface to a CSP 3 (min.) surface profile.

3.03 FIELD QUALITY CONTROL

- A. Test Applications: Before application of inhibitor will be accepted, a test panel will be applied to the concrete to verify performance under the warranty provisions.

3.04 APPLICATION

- A. Product shall be applied as supplied by the manufacturer without dilution or alteration.
- B. Corrosion inhibitor shall be applied in accordance with the use of either spray, brush, or roller as per manufacturer's recommendations. Corrosion inhibitor shall be applied at a net coverage rate of 75 to 100 ft²/gallon in two equal coats with a minimum one hour dry time between coats.
- E. Follow manufacturer's recommendations concerning protection of glass, metal and other non-porous substrates. Contractor will be responsible to clean all surfaces that are contaminated by the corrosion inhibitor.

- F. Follow manufacturer's recommendation concerning protection of plants, grass and other vegetation. Contractor will be responsible for replacing all plants, grass or vegetation damaged by the corrosion inhibitor.

3.05 CLEANING

- A. While Work Progresses: Clean spillage and overspray from adjacent surfaces using materials and methods as recommended by water repellent manufacturer.
- B. Remove and dispose of all materials used to protect surrounding areas and nonmasonry surfaces, following completion of the work of this section.
- C. Clean site of all unused water repellents, residues, rinse water, wastes, and effluents in accordance with environmental regulations.
- D. Repair, restore, or replace to the satisfaction of the Architect, all materials, landscaping, and non-treated surfaces damaged by exposure to corrosion inhibitor.

3.06 COMPLETION

- A. Work that does not conform to specified requirements shall be corrected and/or replaced as directed by the Owners Representative at contractor's expense without extension of time.

END OF SECTION

PART 1 – GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Non-structural, non-load bearing metal framing systems as indicated.
 - 2. Blocking for surface mounted equipment.
- B. Related Sections:
 - 1. Section 06 10 00 Rough Carpentry

1.02 DEFINITIONS

- A. Conform with requirements of the following Specifications, except as modified and supplemented herein.
 - 1. North American Specification for the Design of Cold-Formed Steel Structural Members (2001 Edition), American Iron and Steel Institute.
 - 2. AISI "Standard for Cold Formed Steel Framing - General Provisions"
 - 3. Cold-Formed Steel Design Manual, American Iron and Steel Institute.
 - 4. AWS D1.3 "Structural Welding Code – Sheet Steel"
- B. Manufacturer's published specifications and installation instructions shall apply where more stringent than the requirements described herein or on the drawings.

1.03 SUBMITTALS

- A. Make submittals in accordance with Section 01 33 10 - Submittals.
- B. Shop Drawings: Submit for approval; show materials, sizes, thicknesses, welds, type and location of mechanical fasteners, and accessories or items required of other work for complete installation.
- C. Submit manufacturer's instructions for securing studs to tracks and for other framing connections.
- D. Product Data: Submit manufacturer's published literature for specified products and accessories as applicable, including manufacturer's specifications, physical characteristics, and performance data. Submit as a supplement, manufacturer's instructions and directions for application if not included in manufacturer's published literature.

PART 2 – PRODUCTS

2.01 MANUFACTURER & TYPE

- A. US Gypsum, Steeler, or approved equal; channel type structural framing.

2.02 MATERIALS

- A. Studs: Formed of galvanized steel conforming to ASTM A653 (ASTM A36 at 8 and 10 gage), coating weight G-60; size and thicknesses as indicated. Provide with factory cut-outs for wiring and plumbing as necessary, unless noted otherwise on plans. Where "light gauge" called for (non-structural, non-load bearing), use 25-gauge minimum unless stronger material required.
- B. Track, Bridging and Accessories: Formed of galvanized steel conforming to ASTM A653, coating weight G-60.
- C. Fasteners: Self-drilling, self-tapping steel screws; types and sizes as indicated.
- D. Blocking: 16-gauge galvanized steel channel sections by stud sizes indicated. Wood blocking and bracing is specified elsewhere. Provide metal blocking and bracing in framed partitions as required for rigidity and stability including wall stops for doors and other surface mounted items.
- E. Hot Dip Galvanized: All framing members within exterior insulated walls or adjacent to shower rooms or other wet areas shall be hot dip galvanized.

2.03 FABRICATION

- A. Fabricate assemblies of sizes and profiles required, with joints fitted, and secured, reinforced, and braced to suit design requirements.
- B. Fit and assemble in largest practical sections for delivery to site and installation.
- C. Cut right angle connections to framing components to fit squarely against abutting members. Torch cutting of load bearing members shall not be permitted.
- D. Fastening of components shall be with self-drilling screws or welding. Screws shall be of sufficient size to insure the strength of the connection. Wire tying of components shall not be permitted. All welds shall be touched up with zinc-rich paint.
- E. Insulation equal to that specified elsewhere shall be provided in all doubled jamb studs and doubled headers not accessible to insulation contractors.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Align floor and ceiling tracks, locating to wall layout. Secure in place.
- B. Place studs at 16" o.c., unless otherwise indicated, and not more than 2" from abutting walls and at each side of openings. Position ends against the inside runner of web prior to fastening. Connect studs to tracks using welding or self-drilling screws.

- C. Place joists at 16" o.c., unless otherwise indicated. Terminate joists in C-closure sections, and weld or screw connect to channel over studs below. Joists to align with studs, unless noted otherwise on plans.
- D. Construct corners using minimum 3 studs. Double studs at door jambs. Install intermediate studs above and below openings to match wall stud spacing.
- E. Attach cross studs or furring channels to studs for attachment of wall-hung equipment, accessories and other items anchored to partitions or walls.
- F. Install framing between studs and joists for attachment of electrical boxes and other mechanical and electrical items.
- G. Install bracing straps per manufacturer's recommendations.
- H. Provide horizontal stiffeners in stud system, spaced at 48" o.c. maximum (vertical dimension). Weld or screw attach at each intersection.
- I. Erect load bearing studs and joists one-piece full length. Splicing and wire tying of framing components is not permitted.
- J. Erect load bearing studs and joists, brace, and reinforce to develop full strength to meet design requirements.
- K. Make provision for erection stresses. Provide temporary alignment and bracing. Touch-up field welds and scratched or damaged galvanizing.
- L. Ensure framing provides true and flat surfaces, ready to receive finishing materials.
- M. Install framing and bracing consistent with approved, fire-rated systems where required for rated walls.

END OF SECTION

PART 1 – GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Aluminum decorative railings.

1.02 COORDINATION AND SCHEDULING

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible.
- B. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver items to Project site in time for installation.

1.03 ACTION SUBMITTALS

- A. Product Data:
 - 1. Manufacturer's product lines of decorative metal railings assembled from standard components.
 - 2. Fasteners.
 - 3. Post-installed anchors.
 - 4. Handrail brackets.
 - 5. Shop primer.
 - 6. Intermediate coats and topcoats.
 - 7. Nonshrink, nonmetallic grout.
 - 8. Anchoring cement.
 - 9. Metal finishes.
- B. Shop Drawings: Include plans, elevations, sections, and attachment details.
- C. Samples for Verification: For each type of exposed finish required.
 - 1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters
 - 2. Fittings, end caps, and brackets.
 - 3. Welded connections.
 - 4. Brazed connections.
 - 5. Assembled Sample of railing system, made from full-size components, including top rail, post, and handrail. Sample need not be full height.
 - a. Show method of connecting and finishing members at intersections.

1.04 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. Product Test Reports: For tests on railings performed by a qualified testing agency, in accordance with ASTM E894 and ASTM E935.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Protect mechanical finishes on exposed surfaces of railings from damage by applying a strippable, temporary protective covering before shipping.

1.06 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturers:
 - 1. Promenaid.com, customerservice@promenaid.com, 1-888-992-4943
 - 2. Or approved equal.

2.02 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design railings, including attachment to building construction.
- B. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Handrails and Top Rails of Guards:
 - a. Uniform load of 125 lbf/ft. (1.52 kN/m) applied in any direction.
 - b. Concentrated load of 500 lbf (2.22 kN) applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 - 2. Infill of Guards:
 - a. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).
 - b. Infill load and other loads need not be assumed to act concurrently.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior railings by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
 - 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.02 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Brackets, Flanges, and Anchors: Same metal and finish as supported rails unless otherwise indicated.

2.03 ALUMINUM DECORATIVE RAILINGS

- A. Basis-of-Design Manufacturer: Subject to compliance with requirements, provide Promenaid Channelgrip and Schedule 40 Sprocketlock handrails or comparable product by one of the following:
 - 1. Hollaender Mfg. Co.
 - 2. Inpro Architectural Products.
 - 3. R & B Wagner, Inc.
- B. Source Limitations: Obtain aluminum decorative railing components from single source from single manufacturer.
- C. Aluminum, General: Provide alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with strength and durability properties for each aluminum form required not less than that of alloy and temper designated below.
- D. Extruded Bars and Shapes, Including Extruded Tubing: ASTM B221 (ASTM B221M), Alloy 6063-T5.
- E. Extruded Structural Round Tubing: ASTM B429/B429M, Alloy 6063-T6.
 - 1. Provide Standard Weight (Schedule 40) pipe unless otherwise indicated.
- F. Die Castings: ASTM AG40A (UNS Z33520), aluminum-zinc Alloy 3.

2.04 FASTENERS

- A. Fastener Materials:
 - 1. Aluminum Railing Components: Type 316 stainless steel fasteners.
 - 2. Finish exposed fasteners to match appearance, including color and texture, of railings.
- B. Fasteners for Anchoring to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction.
- C. Provide concealed fasteners for interconnecting railing components and for attaching railings to other work unless exposed fasteners are unavoidable.
 - 1. Provide tamper-resistant flat-head machine screws for exposed fasteners unless otherwise indicated.

- D. Post-Installed Anchors: Fastener systems with working capacity greater than or equal to the design load, in accordance with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193.
 - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, unless otherwise indicated.

2.05 MISCELLANEOUS MATERIALS

- A. L-Shape Handrail Brackets: Two-piece interlocking die-cast zinc, center of handrail 2-1/2 inches (63.5 mm) from wall with interlocking top flange that conceals anchorage in handrail channel.
- B. T-Shape Handrail Brackets: Two-piece interlocking die-cast zinc, center of handrail 2-1/2 inches (63.5 mm) from mounting surface with interlocking top flange that conceals anchorage in handrail channel, allowing up to 5-degree sloped installation.
- C. Handrail Collars: Two-piece interlocking die-cast zinc, 1.65-inch (42-mm) diameter by 1-inch (25.4-mm) straight collar for connecting handrails or bends with concealed sprocket connector.
- D. Fixed Bends: Two-piece interlocking die-cast zinc, 1.65-inch (42-mm) diameter modular bends for forming required angles and bends between railing sections. Provide combinations of bends as indicated on Drawings to achieve continuous handrails. Provide in 5-, 14-, 32-, and 90-degree increments.
- E. Compound Adjustable Bends: One-piece die-cast zinc, 1.65-inch (42-mm) diameter with adjustable segments for forming continuous handrail around wall surface irregularities from 1 to 4 inches (25.4 to 101.6 mm).
- F. Domed Disks Terminations: One-piece die-cast zinc, 1.65-inch (42-mm) diameter domed disks for terminating railings or bends with concealed sprocket or handrail profile connectors.
- G. 90-Degree Bend Terminations: One-piece die-cast zinc, 1.65-inch (42-mm) diameter 90-degree bend with domed termination short of wall for terminating railings with concealed handrail profile connectors.
- H. Spacers: Two-piece interlocking die-cast zinc, 1.65-inch (42-mm) diameter by 1/2-inch (12.7-mm) stackable spacer for extending handrails, bends, terminations, and brackets with concealed sprocket connector.
- I. Connectors: One-piece die-cast zinc concealed insert with double-sided sprocket connector or channel profile and sprocket connection allowing modular construction of handrails, bends, terminations, and brackets.
- J. Welding Rods and Bare Electrodes: Select in accordance with AWS specifications for metal alloy welded.

1. For aluminum railings, provide type and alloy as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.
- K. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
 1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- L. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- M. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.
 1. Water-Resistant Product: At all locations, provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

2.06 FABRICATION

- A. Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage.
- B. Shop assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations.
 1. Clearly mark units for reassembly and coordinated installation.
 2. Use connections that maintain structural value of joined pieces.
- C. Cut, drill, and punch metals cleanly and accurately.
 1. Remove burrs and ease edges to a radius of approximately **1/32 inch (1 mm)** unless otherwise indicated.
 2. Remove sharp or rough areas on exposed surfaces.
- D. Form work true to line and level with accurate angles and surfaces.
- E. Fabricate connections that will be exposed to weather in a manner to exclude water.
 1. Provide weep holes where water may accumulate.
 2. Locate weep holes in inconspicuous locations.
- F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- G. Connections: Fabricate railings with welded or mechanical connections unless otherwise indicated.

- H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
 - 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 flux immediately.
 - 4. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #1 welds; ornamental quality with no evidence of a welded joint.
- I. Welded Connections for Aluminum Pipe: Fabricate railings to interconnect members with concealed internal welds that eliminate surface grinding, using manufacturer's standard system of sleeve and socket fittings.
- J. Mechanical Connections: Connect members with concealed mechanical fasteners and fittings.
 - 1. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
 - 2. Fabricate splice joints for field connection using an epoxy structural adhesive if this is manufacturer's standard splicing method.
- K. Form changes in direction as follows:
 - 1. By inserting prefabricated elbow fittings.
 - 2. By inserting prefabricated flush-elbow fittings.
 - 3. By inserting prefabricated elbow fittings of radius indicated.
 - 4. By bending to smallest radius that will not result in distortion of railing member.
- L. Bend members in jigs to produce uniform curvature for each configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- M. Close exposed ends of hollow railing members with prefabricated cap and end fittings of same metal and finish as railings.
- N. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns, unless clearance between end of rail and wall is 1/4 inch (6 mm) or less.
- O. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, handrail brackets, miscellaneous fittings, and anchors to interconnect railing members to other Work unless otherwise indicated.
 - 1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers or other means to transfer loads through wall finishes to structural supports and to prevent bracket or fitting rotation and crushing of substrate.
- P. Provide inserts and other anchorage devices for connecting railings to concrete or masonry Work.
 - 1. Fabricate anchorage devices capable of withstanding loads imposed by railings.
 - 2. Coordinate anchorage devices with supporting structure.

- Q. For railing posts set in concrete, provide stainless steel sleeves not less than 6 inches (150 mm) long with inside dimensions not less than 1/2 inch (13 mm) greater than outside dimensions of post, with metal plate forming bottom closure.
- R. For removable railing posts, fabricate slip-fit sockets from stainless steel tube or pipe whose ID is sized for a close fit with posts; limit movement of post without lateral load, measured at top, to not more than one-fortieth of post height.
 - 1. Provide socket covers designed and fabricated to resist being dislodged.

2.07 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipment.
- C. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

2.08 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.
- B. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.
 - 1. Color: Satin black.
- C. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils (0.04 mm). Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
 - 1. Color and Gloss: Satin black.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements have been clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.02 INSTALLATION, GENERAL

- A. Perform cutting, drilling, and fitting required for installing railings.

1. Fit exposed connections together to form tight, hairline joints.
 2. Install railings level, plumb, square, true to line; without distortion, warp, or rack.
 3. Set railings accurately in location, alignment, and elevation; measured from established lines and levels.
 4. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 5. Set posts plumb within a tolerance of 1/16 inch in 3 ft. (2 mm in 1 m).
 6. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 ft. (6 mm in 3 m).
- B. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
1. Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
- C. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- D. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.03 RAILING CONNECTIONS

- A. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Use wood blocks and padding to prevent damage to railing members and fittings. Seal recessed holes of exposed locking screws, using plastic cement filler colored to match finish of railings.
- B. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article, whether welding is performed in the shop or in the field.
- C. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve, extending 2 inches (50 mm) beyond joint on either side; fasten internal sleeve securely to one side; and locate joint within 6 inches (150 mm) of post.

3.04 ANCHORING POSTS

- A. Use stainless steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions.
- B. Form or core-drill holes not less than 5 inches (125 mm) deep and 3/4 inch (20 mm) larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout or

anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions.

- C. Cover anchorage joint with flange of same metal as post, attached to post with set screws.
- D. Leave anchorage joint exposed with anchoring material flush with adjacent surface.
- E. Anchor posts to metal surfaces with flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:
 - 1. For aluminum railings, attach posts as indicated, using fittings designed and engineered for this purpose.
- F. Install removable railing sections, where indicated, in slip-fit metal sockets cast in concrete.

3.05 ATTACHING RAILINGS

- A. Anchor railing ends to concrete and masonry with sprockets concealed within and [brackets on underside of rails connected to railing ends and anchored to wall construction with anchors and bolts.
- B. Anchor railing ends to metal surfaces with sprockets bolted to metal surfaces and connected to railing ends, using nonwelded connections.
- C. Attach handrails to walls with wall brackets, except where end sprockets are used. Provide brackets with 1-1/2-inch (38-mm) clearance from inside face of handrail and finished wall surface.
 - 1. Use type of bracket with sprocket for concealed anchorage.
 - 2. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
- D. Secure sprockets and wall brackets to building construction as follows:
 - 1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
 - 2. For hollow masonry anchorage, use toggle bolts.
 - 3. For wood stud partitions, use hanger or lag bolts set into studs or wood backing between studs. Coordinate with carpentry work to locate backing members.
 - 4. For steel-framed partitions, use hanger or lag bolts set into fire-retardant-treated wood backing between studs. Coordinate with stud installation to locate backing members.
 - 5. For steel-framed partitions, fasten brackets directly to steel framing or concealed steel reinforcements using self-tapping screws of size and type required to support structural loads.
 - 6. For steel-framed partitions, fasten brackets with toggle bolts installed through flanges of steel framing or through concealed steel reinforcements.

3.06 REPAIR

- A. Touchup Painting:

1. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - a. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.

3.07 CLEANING

- A. Clean aluminum by washing thoroughly with clean water and soap, rinsing with clean water, and wiping dry.

3.08 PROTECTION

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.
- B. Restore finishes damaged during installation and construction period, so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Miscellaneous rough carpentry work including work not specified as part of other sections and which is described below:
 - 1. Structural floor, built-up structural beams and columns; sills, miscellaneous framing and sheathing, and concealed wood blocking.

1.02 RELATED REQUIREMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to the work of this section.
- B. Section 02 41 19 – Selective Demolition
Section 08 11 13 – Hollow Metal Doors and Frames

1.03 GENERAL NOTES

- A. Dimensions, as contained in these Specifications or as scaled from the Detail Drawings shall be presumed to be approximate. In the event that site conditions uncovered during the work require modification to, or alteration of those dimensions to accomplish the work in accordance with the intent of these Specifications, the Contractor shall make the adjustments as required to comply with that intent.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Arrange for installation of miscellaneous carpentry by a firm that can demonstrate successful experience in installing carpentry items similar in type and quality to those required for this project.
- B. Conform to requirements of the following Reference Standards or as modified and supplemented within this specification.
 - 1. 2018 International Building Code (IBC)
- C. Conformance with Standards and Tests: Materials and handling shall conform to the following organizations' standards for materials testing and handling. Each standard is hereafter referred to by its organizational designation only. All materials and handling techniques shall conform to the appropriate standard.
 - 1. Lumber Grading Agency: Certified by DOC PS 20.
 - 2. Wood Structural Panel Grading Agency: Certified by EWA – the Engineered Wood Association.
 - 3. Lumber: DOC PS 20.
 - 4. Wood Structural Panels: DOC PS 1 or DOC PS 2.
 - 5. ASTM A 123 - American Society for Testing and Materials Zinc (Hot Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and

Strips.

6. ASTM A 153 - American Society for Testing and Materials Zinc Coating (Hot-Dip) on Iron and Steel Hardware
7. ASTM A 307 - American Society for Testing and Materials Carbon Steel Externally Threaded Standard Fasteners
8. ASTM A 563 - American Society for Testing and Materials Carbon and Alloy Steel Nuts
9. C2 - American Wood Preservers Association Lumber, Timbers, Bridge Ties, and Mine Ties Preservative Treatment by Pressure Process
10. M4 - American Wood Preservers Association Standard for the Care of Pressure Treated Wood Products

1.05 PRODUCT HANDLING

- A. Delivery and Storage: Keep materials dry at all times. Protect against exposure to weather and contact with damp or wet surfaces. Stack lumber as well as plywood and other panels; provide for air circulation within and around stacks and under temporary coverings including polyethylene and similar material stacks. Store in a safe location, out of pedestrian and vehicular traffic and protected from weather. Repair or replace any damaged components before installation. Do not store materials directly in contact with the ground.

1.06 PROJECT CONDITIONS

- A. Environmental Conditions: Obtain and comply with rough carpentry materials manufacturer's and installer's recommendations for optimum temperature and humidity conditions for rough carpentry during its storage and installation.
- B. Coordination: Fit carpentry work to other work; scribe and cope as required for accurate fit.
- C. Safety Requirements: Commencement of the work of this Section implies an absolute commitment to managing the materials used in the execution of the work to avoid loss into the surrounding site. Contamination of the surrounding landscape with loose nails, screws, wood and metal scraps, splinters, and spilled paints or solvents will be avoided by covering adjacent areas with protective tarps or other approved means. Loose materials will be collected on a daily basis to avoid unintentional loss

PART 2 – PRODUCTS

2.01 STANDARDS

- A. Latest Standard Grading Rules for West Coast Lumber, by West Coast Lumber Inspection Bureau (WCLIB) or Western Woods Products Association (WWPA).
- B. National Design Specifications for stress grade lumber and its fastenings, latest

edition.

- C. Plywood: US Product Standard PS 1-83 of Construction and Industrial Plywood.
- D. Preservative Treatment: American Wood Preserver's Association (AWPA) Standard TT-W-571.
- E. APA Engineered Wood Association.
 - 1. ANSI/APA PRP210-08 – Standard for Performance – Rated Engineered Wood Siding.
 - 2. APA PDS-12 – Panel Design Specification.
- F. American Wood-Preservers' Association:
 - 1. AWPA C1 - All Timber Products - Preservative Treatment by Pressure Process.
 - 2. AWPA C20 - Structural Lumber - Fire-Retardant Treatment by Pressure Processes.
- G. ASTM International:
 - 1. ASTM C1280 - Standard Specification for Application of Gypsum Sheathing.
 - 2. ASTM C1396/C1396M - Standard Specification for Gypsum Board.
 - 3. ASTM D5456 - Standard Specification for Evaluation of Structural Composite Lumber Products.
 - 4. ASTM F1667 – Standard Specification for Driven Fasteners: Nails, Spikes, and Staples.
- H. U. S Department of Commerce National Institute of Standards and Technology:
 - 1. DOC PS 1 - Construction and Industrial Plywood.
 - 2. DOC PS-2 – Performance Standard for Wood Based Structural-Use Panels.
 - 3. DOC PS 20 - American Softwood Lumber Standard.
- I. West Coast Lumber Inspection Bureau:
 - 1. WCLIB - Standard Grading Rules for West Coast Lumber.
- J. Western Wood Products Association:
 - 1. WWPA G-5 - Western Lumber Grading Rules.

2.02 STRUCTURAL WOOD MEMBERS:

- A. All wood used shall be Hem-Fir, Select Structural or better, unincised, Pressure Treated to AWPA Quality Standard C2, retaining a minimum of 0.25 lbs / cf ACQ or CBA preservative.

2.03 LUMBER, GENERAL

- A. Nominal sizes are indicated, except as shown by detail dimensions.
- B. Provide dressed lumber S4S, unless otherwise indicated.
- C. Inspection Agencies: Inspection agencies and the abbreviation used to reference them

with lumber grades and species include the following:

1. WCLIB - West Coast Lumber Inspection Bureau
2. WWPA - Western Wood Products Association

- D. Grade Stamps: Provide lumber with each piece factory-marked with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill.
- E. Provide seasoned lumber with 19% maximum moisture content at time of dressing shipment for sizes 2" or less in nominal thickness, unless otherwise indicated.

2.04 DIMENSION LUMBER

- A. For framing, nailers, curbs, and etc.: (2" to 3" thick), #2 and btr. DF-L graded under WCLIB rules.
- B. For framing members 4 x and larger, #1 and BTR, DF-L graded under WCLIB rules.

2.05 FINISHES

- A. Wood Finishes: Following acceptance of all wood construction, an approved water-based commercial sealer shall be applied to the manufacturer's written specifications.
- B. Preservative-Treated Materials: Labeled by an inspection agency approved by ALSC's Board of Review. Materials kiln-dried after treatment, lumber to 19 percent moisture content, and plywood to 15 percent.
1. Standards: For lumber, AWWA C15 as applicable to the specific use or C2 where C15 does not apply; for plywood AWWA C9.
 2. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
 - a. ACZA-treated lumber is not acceptable for foundation sill plates.
 - b. Coordinate preservative-treatment chemical types with corrosion-resistance requirements for metal framing hardware and fasteners specified elsewhere in this section. Provide only preservative-treated materials for which compatible hardware and fasteners are available.
 3. Treat indicated items, items required by codes in effect, and the following:
 - a. Wood members used in connection with roofing, exposed exterior flashing, and waterproofing membranes.
 - b. Concealed members in contact with masonry or concrete.
 - c. Wood framing members less than 18 inches above grade.
 - d. Wood floor plates installed over concrete slabs directly in contact with earth.

2.06 MISCELLANEOUS MATERIALS

- A. Corrosion-resistant metal: Where stainless steel or galvanizing are indicated, comply with the following:
 - 1. Stainless Steel: Type 304.
 - 2. Galvanized Steel:
 - a. Mechanically Galvanized Steel: Use for threaded galvanized fasteners; ASTM B698, coating Class 55 or greater coating weight.
 - b. Hot-Dip Galvanized Steel: Use for all other galvanized fasteners and hardware; ASTM A 153, coating weight as indicated in this Section, or where not otherwise indicated, standard coating weight.
- B. Metal Framing Anchors: Of structural capacity, type, and size indicated, material types as follows:
 - 1. In contact with ACQ-C, ACQ-D, CBA-A, or CA-B treatment lumber: HD Galvanized, G-185 coating weight.
 - 2. In contact with ACZA-treated lumber: Stainless steel.
 - 3. In contact with untreated or borate-treated lumber: HD Galvanized, G-60 coating weight.
 - 4. Other preservative treatments not listed above: Comply with recommendations of treatment and framing anchor manufacturers.
- C. Fasteners: Size and type indicated. For fasteners of any type to remain exposed in completed work, provide types as accepted by Architect through submittals.
 - 1. Minimum corrosion-resistant materials requirements:
 - a. For fastening metal framing anchors: Use the same material as the framing anchor, i.e., galvanized fasteners for galvanized anchors, and stainless steel fasteners for fastening stainless steel.
 - b. In contact with ACZA-treated lumber: Stainless steel.
 - c. In contact with other lumber materials: HD Galvanized.
- D. Specifications for nails, screws, bolts, nuts, washers, and anchoring devices. Provide metal hangers and framing anchors of the size and type recommended by the manufacturer for each use including recommended nails. Do not use explosive fasteners into masonry.
 - 1. Bolts, Nuts, Washers shall be galvanized steel, SAE, sized per the Contract Drawings. Bolts, nuts, and washers shall conform to the applicable requirements of specification FF-B-571 and FF-B-575.
 - 2. Wire nails shall be hot-dipped galvanized and conform to specification FF-N-105.
 - 3. Screws (countersunk or bugle head) Philips, stainless steel for all exterior and interior uses.
 - 4. Steel Plate connectors shall be 3 gauge with 7 gauge strap anchors where applicable, galvanized after fabrication, factory primed finish gray, Strong-Tie Connectors as manufactured by Simpson Strong-Tie Company, Inc., (800) 999-5099, or approved equal.
- E. Adhesive for Field Gluing Panels to Framing: APA AFG-01. Adhesive for Field Gluing Panels to Framing: APA AFG-01., or approved equal.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Prior to commencing the work of this Section, verify existing conditions and report any discrepancies to the owner immediately.
- B. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting installation and performance of finish carpentry. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL

- A. All wood assembly shall comply with construction documents.
- B. Make provisions for erection loads and for sufficient temporary bracing to maintain structure safe, plumb, and in alignment until completion of erection and installation of permanent bracing.
- C. Discard units of material with defects that might impair quality of work, and units that are too small to use in fabricating work with minimum joints or optimum joint arrangement.
- D. Set carpentry work to required levels and lines, with members plumb and true to line and cut and fitted.
- E. Securely attach carpentry work to substrate by anchoring and fastening as shown in construction drawings and as required by recognized standards.
- F. Use common wire nails, except as otherwise indicated. Use finishing nails for finish work. Make tight connections between members. Install fasteners without splitting of wood; pre-drill as required.
- G. Do not use carpentry materials that are unsound, warped, bowed, twisted, improperly finished, not adequately seasoned, or too small to fabricate with proper jointing arrangements.
- H. Install carpentry plumb, level, true, and aligned with adjacent materials. Use concealed shims where required for alignment.
- I. Scribe and cut finish carpentry to fit adjoining work.
- J. Install to tolerance of 1/8 inch in 8 feet for plumb and level. Install adjoining finish carpentry with 1/16-inch maximum offset for flush installation and 1/8-inch maximum offset for reveal installation.

- K. Coordinate finish carpentry with materials and systems that may be in or adjacent to standing and running trim. Provide cutouts for mechanical and electrical items that penetrate exposed surfaces of trim.
- L. Assemble Arbor structures in conformance with the Contract Drawings.
- M. All shop fabricated and field cuts and borings shall be treated with waterborne ACQ or CBA to APWA C2 quality standards.
- N. All vertical supports shall be installed plumb unless otherwise noted. Allow additional height for adjustment of horizontal members in the event that post bases are not installed at exact, equal elevations.
- O. Install all horizontal members to true level unless otherwise specifically noted by an indication of intended slope. Prior to making final connection, trim added height from vertical members to achieve the intent of the drawings.
- P. Mechanical Connections
 - 1. Securely clamp and brace wood members to be connected to establish precise location and true level in bolt holes and lag screw pilot holes. Protect surfaces of permanent wood members from compression damage with scrap 1"x material. Do not use temporary nailing.
 - 2. Machine or Carriage Bolt connections shall be pre-drilled to 1/16" larger diameter than the specified connector.
 - 3. Lag Screw connections shall be pre-drilled to ¼" minimum under size of specified connector.
 - 4. Make countersink borings to accept washers ¼" over diameter of specified washer and depth to allow bolt or screw head to tighten to between flush and ¼" beneath lumber surface. Do not allow bolt heads or ends to protrude beyond wood surface, and do not reduce the thickness of the structural connection by over-boring.
 - 5. Make all connections tight without overly distorting or compressing wood surfaces or countersink borings.
 - 6. Wood-to-Steel connections shall be separated by standard, medium weight roofing felt. Trim excess as directed.
- Q. Screw Connections
 - 1. Pre-drill all screwed connections to a 3/32" diameter pilot hole with an integral counter-sink bit.
 - 2. Apply standard wood glue to pilot holes prior to making connection.
 - 3. Counter-sink simple screwed connections so that screw-head is 1/8" to ¼" below surface.
 - 4. Fill all counter-sunk screw holes with weatherproof filler.
- R. Mechanical Connections
 - 1. Securely clamp and brace wood members to be connected to establish precise location and true level in bolt holes and lag screw pilot holes. Protect surfaces of permanent

wood members from compression damage with scrap 1"x material. Do not use temporary nailing.

2. Machine or Carriage Bolt connections shall be pre-drilled to 1/16" larger diameter than the specified connector.
3. Lag Screw connections shall be pre-drilled to ¼" minimum under size of specified connector.
4. Make countersink borings to accept washers ¼" over diameter of specified washer and depth to allow bolt or screw head to tighten to between flush and ¼" beneath lumber surface. Do not allow bolt heads or ends to protrude beyond wood surface, and do not reduce the thickness of the structural connection by over-boring.
5. Make all connections tight without overly distorting or compressing wood surfaces or countersink borings.
6. Wood-to-Steel connections shall be separated by standard, medium weight roofing felt. Trim excess as directed.

S. Screw Connections

1. Pre-drill all screwed connections to a 3/32" diameter pilot hole with an integral counter-sink bit.
2. Apply standard wood glue to pilot holes prior to making connection.
3. Counter-sink simple screwed connections so that screw-head is 1/8" to ¼" below surface.
4. Fill all counter-sunk screw holes with weatherproof filler.

3.03 FINISHES

- A. Moisture Testing on Exterior Wood Surfaces: Prior to painting, moisture reading shall be taken with an approved professional grade moisture meter. This reading shall not exceed 19%. If environmental conditions are not favorable and wood tested regularly over a period of days does not show a drying trend, finishing operations may, at the discretion of the architect, be suspended until such time as conditions become appropriate.
- B. Following acceptance of moisture testing, apply sealer to approved manufacturers specifications.
- C. All fabricated steel components shall arrive at the work site pre-galvanized and pre-primed. Following installation the architect may direct additional field galvanization or priming as necessary to correct damage that may have occurred during installation. Following acceptance of the prepared surface, apply 2 coats of approved Alkyd Enamel, following manufacturer's written specification for cure time between coats.
- D. Immediately clean all surfaces that receive incidental and/or unspecified finishes.

3.04 CLEAN UP

- A. Remove all construction debris including loose nails, screws, sawdust, wood and metal

scraps, splinters, and spilled paints or solvents from all adjacent and surrounding surfaces and landscape areas. Use magnets or metal detectors to verify for the owner that no loose nails or screws remain in surrounding soils.

3.05 ACCEPTANCE

- A. Upon completion of the fabrication, assembly and finish work, and cleanup, the owner may require spot-tightening of various connection hardware. During the scheduled final inspection, insure that all of the tools and equipment necessary for this task are on hand. Following this final adjustment the owner will consider the work complete.

END OF SECTION

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. This Section includes but is not limited to the installation of a reinforced (2-ply) cold fluid-applied polymer modified waterproofing with all the materials, labor and supervision necessary to provide a continuous waterproofing system below grade.
- B. Related Sections:
 - 1. Section 03 30 00 – Cast In Place Concrete
 - 2. Section 07 92 00 – Joint Sealants

1.03 REFERENCE STANDARDS

- A. ASTM International (ASTM): www.astm.org:
 - 1. ASTM C836 – Standard Test Methods for Crack Cycling
 - 2. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers – Tension
 - 3. ASTM D624 - Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers
 - 4. ASTM D903 - Standard Test Method for Peel or Stripping Strength of Adhesive Bonds
 - 5. ASTM D3767 - Standard Practice for Rubber—Measurement of Dimensions
 - 6. ASTM D1970 - Standard Specification for Self-Adhering Polymer Modified Bituminous
 - 7. ASTM D4833 - Standard Test Method for Index Puncture Resistance of Geomembranes and Related Products
 - 8. ASTM D5385/5385M - Standard Test Method for Hydrostatic Pressure Resistance of Waterproofing Membranes
 - 9. ASTM E96/E 96M - Standard Test Methods for Water Vapor Transmission of Materials
 - 10. ASTM D4068 - Standard Specification for Chlorinated Polyethylene (CPE) Sheeting for Concealed Water-Containment Membrane
 - 11. ASTM D5385 - Standard Test Method for Hydrostatic Pressure Resistance of Waterproofing Membranes
 - 12. ASTM D570 - Standard Test Method for Water Absorption of Plastic
 - 13. U. S. Environmental Protection Agency (EPA): www.epa.gov.

1.04 SUBMITTALS

- A. Product Data: Product Data: Include manufacturer's written instructions for evaluating, preparing, and treating substrate, technical data, and tested physical and performance properties of waterproofing.
- B. Shop Drawings: Show locations and extent of waterproofing. Include details for substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions.
- C. Samples: For each exposed product and for each color and texture specified, including the following products:
 - 1. 8-by-8-inch (200-by-200-mm) square of waterproofing and flashing sheet.
 - 2. 4-by-4-inch (100-by-100-mm) square of drainage panel.
- D. Product test reports shall yield the following results:
 - 1. Liquid Adhesive applied at the rate of two gallons per square (100 sq. ft.) yields the following test results.
 - a. ASTM D-529-82, Weathering Daily Cycle B. No cracking or crazing. No slump. Turns a slight gray color.
 - b. Hardness: Attains a Shore Hardness of 60 max.
 - c. Ductility; ASTM D-113-79; at 1 cm per minute (39.2oF=4oC) 125% elongation min.
 - d. Wind up-lift pull=150 lbs. using test apparatus.
 - e. Water permeability; ASTM E-96-80; 0.005 perms/hr./sq. ft. f. Dry Film Thickness: 9 mils per gallon per 100 sq. ft. min.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer, approved by manufacturer to install manufacturer's products. Installer is responsible for inspecting project for all relevant field conditions prior to installation. Conditions noted by installer are to be corrected prior to installation of the waterproofing system. Commencement of installation indicates acceptance of substrate conditions by the contractor.
 - 1. Installer shall have not less than 5 waterproofing projects similar to requirements for this Project with satisfactory in-service, leak-free performance.
- B. Pre installation Conference: Conduct conference at Project site. Minimum of 2 weeks prior to starting Work of this Section.
 - 1. Preinstallation conference shall include but not be limited to the following attendees.
 - a. Owner
 - b. Architect/ Engineer/ Consultant
 - c. Waterproofing contractor
 - d. Manufacturer's authorized technical representative
 - e. General contractor and subcontractors having impact on the waterproofing system.
 - 2. Review waterproofing submittal status, waterproofing requirements including surface preparation, substrate condition and pretreatment, Manufacturer approval of substrate,

minimum curing period, forecasted weather conditions, special details and sheet flashings, installation procedures, safe, adequate temporary protection to be erected to allow concrete to surface dry and waterproofing work to proceed on dry substrates despite inclement weather, dewatering and associated pumping and storing of water to facilitate successful waterproofing application, testing and inspection procedures, and protection and repairs, material deliveries and site storage installation monitoring, correction of noted deficiencies, overnight and weekend seals, well-secured tenting and temporary protection requirements if applicable

1.06 FIELD CONDITIONS

- A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate.
 - 1. Do not apply waterproofing in snow, ice, rain, fog, morning dew, or mist.
 - 2. Do not apply waterproofing or related drainage mat materials during precipitation.
 - 3. Do not apply waterproofing where groundwater is present until all water has been fully removed from areas to receive waterproofing and substrate is dry and prepared
- B. Maintain adequate ventilation during preparation and application of waterproofing materials.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by waterproofing manufacturer.
- B. Remove and replace liquid materials that cannot be applied within their stated shelf life. Protect stored materials from direct sunlight.
- C. Boxes containing the Waterproofing Sheet must be stored flat at all times, approximately 5 boxes high, on pallets or other means to keep off the ground.
- D. If indoor or trailer storage is not available, tarp in with canvas tarpaulins only.
- E. DO NOT USE POLYETHYLENE OR OTHER NON-BREATHING FILMS TO COVER THE BOXES.
- F. Remove rolls of Waterproofing Sheet from boxes when ready to use. Do not discard boxes for restoring of any unused or partial rolls.
- G. Store in cool places only. If trailer storage is used, it should be well ventilated for summer storage and 60F (maximum) or winter storage.

1.08 HEALTH AND SAFETY

- A. Safety and Health: Comply with the requirements of State of Washington Department of Labor and Industries (L&I), Washington Industrial Safety and Health Act (WISHA), Division of Occupational Safety and Health (DOSH), Occupational Safety and Health (NIOSH), and all local governing authority for workplace safety.
- B. Protection and General Safety: Protect building interior and exterior and adjacent areas and spaces from precipitation, weather, dust, debris, construction-related scraps, odors, and fumes. Use staged fans to divert fumes, maintain adequate ventilation during application, drying and curing of substrates and to facilitate application and curing of waterproofing materials.
 - 1. Set dumpsters and or daily mobile dump truck with covering or tenting to capture construction debris, material wrappers and avoid air-born dust and debris, and provide other implements and provisions, as required to assure the health and safety inside and outside the building and surrounding environment, including protecting Owner(s), Staff(s), Public, parking lots, workers, work areas, driveways, and associated grounds during the Project.
- C. Protection from falling material, equipment and debris, shall be exercised at hoisting points to protect, Owner(s), staff, public, workers and personnel, building, structure, adjacent walls, fenestration, decks, hardscape, and landscape.
 - 1. Route for removal of existing demolition materials and delivery of new materials shall be through the route designated and agreed during the Pre-Construction Meeting.

1.09 SCHEDULING

- A. Schedule work so waterproofing applications may be inspected prior to concealment.

1.10 WARRANTY

- A. Manufacturer's Warranty: Manufacturer's standard form, signed by manufacturer and installer, and agreeing to repair or replace waterproofing that does not comply with requirements or that does not remain watertight after date of Substantial Completion.
 - 1. Warranty Period: Five (5) years from date of Substantial Completion.
- B. Installer's Special Warranty: Specified form, signed by Installer, covering Work of this Section, for warranty period of five (5) years.
 - 1. Warranty includes removing and reinstalling protection board and drainage panels,

PART 2 – PRODUCTS

2.01 MATERIALS, GENERAL

- A. Source Limitations: Provide waterproofing system materials and accessory products from a single-source system manufacturer.

2.02 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
- B. Products: Subject to compliance with requirements, provide one of the following:
 - 1. Single-Component, reinforced cold fluid applied rubber modified asphalt waterproofing:
 - a. Laureco Waterproofing System, as manufactured by FBC Chemical Corp.

2.03 WATERPROOFING MATERIALS

- A. Waterproofing:
 - 1. Cold Fluid-Applied Waterproofing: Comply with ASTM C 836
 - 2. Or approved equal
- B. Adhesive: Specially formulated Asphalt modified with compatible polymers using long fibers and clean aliphatic solvent.
 - 1. Compatible polymers are combinations of Neoprene, Butyl and/or N.B.R.
 - 2. Solid Content 55% min.
 - 3. Meets or exceeds ASTM D-2823, Type 1 and Federal Specification SS-A-694D.
 - 4. Using ASTM Test Method D-1004-70, Tensile Strength shall be 1070 p.s.i. average; using Tear Die C 77lbs. per inch average of sheets and adhesive.
- C. Sheet Flashing and Reinforcing Sheet: 50-mil-(1.3 mm) minimum, proprietary chloroprene rubber.
 - 1. Specially formulated Asphalt modified with Chloroprene Rubber (Neoprene*) plus appropriate fillers, curing agents and plasticizer.
 - 2. Thickness of waterproofing sheet is 50 mils. plus or minus 5%.
 - 3. Tensile strength of waterproofing sheet = 75 lbf/in. Min. (ASTM D 146-90, section 13) and (ASTM E 154-99, section 9). Two Ply Waterproofing System > 180 lbf/in.
 - 4. Puncture resistance of waterproofing sheet = 215 lbs. (ASTM E 154-99, section 10). Two Ply Waterproofing System > 450 lbs.
 - 5. Ductility of Modified Asphalt for use on waterproofing sheet: (ASTM D-113-69) at 39.2 degree F. using 1cm. per min. pull-10% to 12.5% plus, at 75 degree F. using 5 cm. per min. pull = 100% to 125% plus.
 - 6. Softening point of modified asphalt used on waterproofing sheet: (ASTM D 36-70 using distilled water) = 160° degree F. min.
 - 7. Penetration of Modified Asphalt used on waterproofing sheet: (ASTM D 5-73) = 30 max. at 77 degree F. using 3 oz. seamless metal container.
 - 8. Ductility of Sheet: 1.360 degree bend on 1" O.D. bar at 39.2° degree F. at 5cm. per min. flex. Minimum. Mesh or polyester fabric.
- D. Performance Criteria or Sheet and Adhesive:

1. Water Permeability-Inverted cup @ 75° degrees F. 25 day duration (ASTM. E96-95 Procedure BW) using Manufacturer's sheet and adhesive in System form 0.005 grams/hr./sq. ft.
2. Weather test on waterproofing sheet and adhesive in System form (ASTM Test Method D 529-73, Daily Cycle B) 25 days. Hardness range of 60 plus or minus 5 pt. variation of a range of 0-99 Shore A hardness and no further changes after 10 cycles-Materials stable with no cracking or crazing. Cycles continued for 25 days.
3. Pull Test: Using 1" thick concrete slab and waterproofing system (2 plies Sheet and Adhesive) pull at rate of 2 inches per minimum. Results = 26.39 lbs. plus p.s.i. or 3800 lbs. plus per minimum. (slabs all broke under pull test-1" thick were used to accommodate machine) See Tensile Strength.
4. Waterhead Test: Results incomplete as 210 foot limit of machine was reached at end of 28 days with no leakage.
5. Mullen Burst Test: (Membrane Sheets and Adhesive) shall attain 160 p.s.i. minimum.

E. Protection Course:

1. Smooth surfaced, premium polymer modified reinforced asphaltic protection sheet complying with ASTM D5147 with minimum thickness of 94 or 120 mils.
 - a. Laurenco SPC
 - b. Laurenco PPC
2. Unfaced extruded polystyrene board insulation; ASTM C 578, Type X, 1 inch thick minimum. (Vertical application only)

F. Molded-Sheet Drainage Panels

1. Composite drainage panels, 3 dimensional, non-biodegradable, manufactured with a permeable geotextile bonded to molded plastic-sheet drainage core and designed to effectively convey water.
2. Geotextile: Nonwoven geotextile fabric of polypropylene or polyester fibers or combination of both.
3. Film Backing Plastic: Plastic, protective film backing sheet attached to surface facing waterproofing.
4. Compressive Strength core: 15,000 psf when tested according to ASTM D 1621 for use on pedestrian areas.
5. Compressive Strength core and root inhibitor: 15,000 psf when tested according to ASTM D 1621 for use in planter areas.
6. Compressive Strength core: 30,000 psf when tested according to ASTM D 1621 for use on vehicular traffic areas.
7. Available Products: Subject to compliance with requirements, products that may be incorporated into the work include but are not limited to:
 - a. Waterproofing Manufacturer's proprietary drainage panel
 - b. Waterproofing Manufacturer Approved drainage panel.

G. Root Barrier

1. High density polyethylene sheet manufactured for use as a mechanical barrier and root deflector to prevent tree roots from damaging waterproofing of planters and installed directly over protection board.
2. Available products: Subject to compliance with requirements, products that may be incorporated into the work include but are not limited to;
 - a. Waterproofing manufacturers proprietary root barrier.
 - b. Waterproofing manufacturers Approved root barrier.

2.04 INSULATION BOARD (where required)

- A. Extruded Polystyrene:
1. Minimum 40 psi compressive strength extruded polystyrene (XPS) with integrated drainage channels. (Unless separate drainage mat installed.)
 2. Comply with ASTM C 578

PART 3 - EXECUTION

3.01 SURFACE PREPARATION

- A. Clean and prepare substrate according to manufacturer's written recommendations. Provide clean, dust-free, and dry substrate for waterproofing application.
1. Verify that substrate is visibly dry and free of excessive moisture.
- B. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.
- C. Remove fins, ridges, and other projections and fill honeycomb, aggregate pockets, and other voids.
- D. Prepare vertical and horizontal surfaces at terminations and penetrations through waterproofing and at expansion joints, drains, and sleeves according to ASTM C 898 and manufacturer's written instructions.
1. Apply a double thickness of waterproofing and embed a joint reinforcing strip in preparation coat when recommended by waterproofing manufacturer.
- E. Prepare, treat, rout, and fill joints and cracks in substrate according to ASTM C 898 and waterproofing manufacturer's written instructions. Remove dust and dirt from joints and cracks complying with ASTM D 4258 before coating surfaces.
- F. Repair damaged or spalling substrates for roughness with repair mortar patches or one component cementitious parge coatings rated for vertical and overhead use that have early strengths and are resistant to freeze thaw. Provide a finish suitable for waterproofing installation; broom finish minimum.

- G. Install Proprietary LW PMMA liquid flashing and bond to deck and wall substrates where indicated or required according to waterproofing manufacturer's written instructions.
 - 1. Extend sheet flashings onto perpendicular surfaces and other work penetrating substrate according to ASTM C 898.
- H. Surface Preparation:
 - 1. Remove or grout projections higher than $\frac{1}{16}$ inch. i.e., fins
 - 2. Grout all tie-wire hole.
 - 3. Grout all honeycombs and voids larger than a US 25 cent coin and deeper than $\frac{1}{4}$ " inch.
 - 4. Remove all latencies, spatters, dirt, etc., by scraping surfaces to be waterproofed. Do not grind.
 - 5. Scrape off knife-like edges of exterior corners and grout to a continuous smooth surface all exterior and interior corners. Good wood float finish is preferred; good wood screed is acceptable.
 - 6. Remove all dirt and debris. Use A.C.I. 515, 1R-79, Chapter 3, and A.C.I. 301- 72 (revised 1975), Chapters 9, 10, 11 (11,8,2 Finished Surfaces) as reference information guide. Water cure only if surface cannot be waterproofed immediately. Propane weed burners or hot air torches may be carefully used to surface dry. Surface dry only.

3.02 INTERFACE WITH OTHER WORK

- A. Sequencing of Work: Coordinate sequencing of waterproofing installation with work of other sections that form portions of building envelope moisture control to ensure that flashings and transition materials can be properly installed and inspected.
- B. Subsequent Work: Coordinate waterproofing installation with work of other sections installed subsequent to waterproofing to ensure complete inspection of installed waterproofing and sealing of waterproofing penetrations necessitated by subsequent work.

3.03 WATERPROOFING APPLICATION

- A. GENERAL:
 - 1. Install fully adhered sheets over entire area to receive waterproofing according to manufacturer's written instructions.
 - 2. Accurately align sheets and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps of each ply.
 - 3. Uniformly distribute bonding adhesive. Warning, excessive adhesive will interfere with installation and coring of waterproofing membrane.
 - 4. Roll waterproofing sheet into adhesive. Work sheet into adhesive with wood head squeegee following waterproofing manufacturers written installation instructions.
 - 5. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Slit, flatten and adhere fishmouths and blisters. Patch with sheet waterproofing extending beyond repaired areas in all directions.

B. FIRST PLY INSTALLATION:

1. Apply adhesive to prepared substrate at rate of 1.5 to 1.75 gallons maximum per 100 square feet. Do not exceed amount of specified adhesive.
 - a. Roll first ply of waterproofing sheets into adhesive after “tack” develops. Use push broom or water filled lawn roller to alleviate trapped air by working air pockets from center outward toward sheet edges.

C. SECOND PLY INSTALLATION:

1. Apply adhesive at rate of 1.0 to 1.25 gallons maximum per 100 square feet. Do not exceed amount of adhesive specified.
2. Install second ply of waterproofing sheets using “cap sheet” application method only. Side and end laps of 1st ply must be offset a minimum of 8 inches.
3. Roll second ply of waterproofing sheets with side laps offset a minimum of 8 inches from first ply of rolls after tack develops.

D. CURING AND SETTING

1. Allow completed waterproofing to cure for 12 to 48 hours prior to water testing or application of protection board.
2. Verify proper curing and setting of waterproofing in accordance with manufacturers written instructions before proceeding.
3. Where water testing is required, it is recommended to perform testing prior to the installation of the protection course.

3.04 PROTECTION COURSE INSTALLATION

- A. Install protection course over waterproofing membrane according to manufacturer’s written instructions and before beginning subsequent construction operations.
- B. Clean and dry membrane before applying adhesive and setting protection course in adhesive.
- C. Apply adhesive at a rate of 2.0 to 2.5 gallons per 100 square feet.
- D. Set protection board course into adhesive after tack occurs. Apply sheets with 3” side and end-laps adhesively sealed.

3.05 MOLDED-SHEET DRAINAGE PANEL INSTALLATION

- A. Place and secure molded-sheet drainage panels to substrate according to manufacturer's written instructions. Protect installed molded-sheet drainage panels during subsequent construction.

3.06 CURING, PROTECTING, AND CLEANING

- A. Cure waterproofing according to manufacturer's written recommendations, taking care to prevent contamination and damage during application stages and curing.
- B. Protect waterproofing from damage and wear during remainder of construction period.
- C. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes:
 - 1. Water Resistive Barrier/Air Barrier – Sheet
 - 2. Water Resistive Barrier – Liquid Applied
 - 3. Liquid Applied Flashing
 - 4. Self-Adhesive Membrane Flashing
- B. Related Sections:
 - 1. Section 07 62 00 – Sheet Metal Flashing and Trim

1.02 SUBMITTALS

- A. General, submit in accordance with Division 01.
- B. Membrane System Product Data: Provide current standard printed product literature indicating characteristics of membrane materials, flashing materials, components, and accessories product specification and installation.
- C. Product Samples: Submit product samples of membrane and flashing materials showing color, texture, thickness and surfacing representative of the proposed system for review and approval by the Architect.
- D. Submit sample copies of both the Manufacturer and Applicator warranties for the periods stipulated. Each specimen must be a preprinted representative sample of the issuing company's standard warranty for the system specified.
- E. Submit copies of current Material Safety Data Sheets (MSDS) for all components of the work.

1.03 REFERENCES

- A. National Roofing Contractors Association (NRCA) Roofing and Waterproofing Manual.
- B. ACI-308 - Recommended Practice for Curing Concrete
- C. ASTM - D638 - Test Methods for Tensile Properties of Plastics
- D. ASTM - D4258 - Standard Practice for Surface Cleaning Concrete for Coatings
- E. ASTM - D4259 - Standard Practice for Abrading Concrete
- F. ASTM - D4541 - Method for Pull-Off Strength of Coatings using Portable Adhesion Tester
- G. ASTM - E96(A) - Test Methods of Moisture Transmission of Material

- H. ASTM E-108, ANSI/UL 790 for fire resistance.
- I. International Concrete Repair Institute Guideline 03732 Concrete Surface Preparation

1.04 QUALITY ASSURANCE

- A. Evaluate moisture content of substrate materials. Contractor shall determine substrate moisture content throughout the work and record with Daily Inspection Reports or other form of reporting acceptable to the Owner or designated Representative, and Membrane Manufacturer.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Protect WRB materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing and protecting during installation.
- B. Materials shall be delivered in original, unopened containers bearing name of manufacturer, product identification and reference to UL testing.
- C. Store solvent-bearing solutions, resins, additives, inhibitors or adhesives in accordance with the MSDS and/or local fire authority.

1.06 WARRANTY

- A. Manufacturer's Standard Warranty: Provide 10 year manufacturer's standard warranty under provisions of this section. This warranty provides for cost of labor and materials for loss of watertightness, limited to amounts necessary to effect repairs necessitated by either defective material or defects in related installation workmanship, with total expenditure limited to the original cost to the Owner.
- B. Submit (2) executed copies of both the manufacturer and applicator warranties for the periods stipulated, starting from the date of substantial completion. Each warranty must be signed by an authorized representative of the issuing company.

PART 2 – PRODUCTS

2.01 MEMBRANE, SHEET

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Air-Infiltration Barrier (noted as "Water Resistive Barrier" on the drawings): Triple-layered heat-bonded polypropylene fabric sheets with a middle layer of spun-bonded polypropylene fabric, equal to VaproShield WrapShield Water-Resistive Vapor- Permeable Air Barrier Sheet.
 - 1. Referenced Standards:
 - a. AATCC 127 Test Method for Water Resistance: Hydrostatic Pressure Test
 - b. ASTM D 882 Test Method for Tensile Properties of Thin Plastic Sheeting
 - c. ASTM E 84 Test Method for Surface Burning Characteristics of Building Materials.

- d. ASTM E 96/ E96 M Test Methods for Water Vapor Transmission of Materials
- e. ASTM E 283 Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
- f. ASTM E 21780 Standard Test Method for Air Permeance of Building Materials
2. Accessories:
 - a. Fasteners to secure Wrapshield: Vapro Caps and bugle head screws.
 - b. Sealant to seal vertical laps in the Wrapshield: Dow 758 sealant.

2.02 WATER BASED PRIMER FOR RAW GYPSUM BOARD EDGES AT FLUID APPLIED WRB

- A. Acceptable product: PROSOCO R-GUARD® GypPrime
 1. Substitutions under provisions of 01 25 00
- B. Description: (for use with liquid applied flashing assembly) GypPrime consolidates and seals the cut edges of gypsum wallboards where they are exposed in rough openings for windows and doors. The sealed edge makes a compatible surface for easy application of R-GUARD Joint & Seam Filler fiber-reinforced fill coat and seam treatment for through-wall components. GypPrime brushes or sprays on easily and is usually dry in 30 minutes.
- C. Characteristics:
 1. Form: milky blue liquid, mild odor
 2. Specific Gravity: 1.01
 3. pH: 8.5
 4. Weight per Gallon: 8.41 pounds
 5. Active Content: 18 percent
 6. Total Solids: 18 percent ASTM-D-2369
 7. Volatile Organic Content (VOC): less than 100 grams per Liter
 8. Flash point: greater than 212 degrees Fahrenheit (greater than 100 degrees Celsius) ASTM-D-3278
 9. Freeze Point: 32 degrees Fahrenheit (0 degrees Celsius)
 10. Shelf Life: 1 year in tightly sealed, unopened container

2.03 JOINT & SEAM FILLER FIRE REINFORCED FILL COAT AND SEAM FILLER AT FLUID APPLIED WRB

- A. Characteristics:
 1. Thickness: Apply according to manufacturer's instructions. See product data sheet.
 2. Hardness: Shore A, 45-50 when tested in accordance with ASTM C661.
 3. Water vapor permeability: Minimum 14 perms when tested in accordance with ASTM E-96.
 4. Tensile strength: 225 psi when tested in accordance with ASTM D412.
 5. Lap shear strength: 275 psi when tested in accordance with ASTM D1002.
 6. Elongation at break: 275% when tested in accordance with ASTM D412.
 7. Peel strength: 30 pli when tested in accordance with ASTM D1781.
 8. Shrinkage: None.
 9. Form: pale red, gun-grade sealant
 10. Specific gravity: 1.40 to 1.50
 11. pH: not applicable

12. Weight per gallon: 11.8 pounds
13. Active content: 99 percent
14. Total solids: 99 percent
15. Volatile organic content (VOC): 30 grams per Liter, maximum
16. Flash point: no data
17. Freeze point: no date
18. Shelf life: 1 year in tightly sealed, unopened container

2.04 LIQUID-APPLIED FLASHING MEMBRANE at fluid applied wrb

- A. Acceptable product: PROSOCO R-GUARD® FastFlash®
 1. Substitutions under provisions of 01 25 00
- B. Description: (for use with liquid applied flashing assembly) FastFlash® is a gun-grade waterproofing, adhesive and detailing compound that combines the best of silicone and polyurethane properties. This single component, 99% solids, Silyl-Terminated-Poly-Ether (STPE) is easy to gun, spread and tool to produce a highly durable, seamless, elastomeric flashing membrane in rough openings of structural walls.
- C. Characteristics:
 1. Thickness: Apply according to manufacturer's instructions.
 2. Water vapor permeability: Minimum 14 perms when tested in accordance with ASTM E96.
 3. Water penetration (cyclical static air pressure difference): No uncontrolled water penetration when tested in accordance with ASTM E547.
 4. Hardness: Shore A, 40-45 when tested in accordance with ASTM C661.
 5. Tensile strength: 180 psi when tested in accordance with ASTM D412.
 6. Elongation at break: 400% when tested in accordance with ASTM D412.
 7. Peel strength: 25 pli when tested in accordance with ASTM D1781.
 8. Form: Brick Red, Gun Grade Sealant.
 9. Specific gravity: 1.45 to 1.60
 10. pH: not applicable
 11. Weight per gallon: 12.5 pounds
 12. Active content: 99 percent
 13. Total solids: 99 percent
 14. Volatile organic content (VOC): 30 grams per Liter, maximum
 15. Flash point: no data
 16. Freeze point: no data

Shelf life: 1 year in tightly sealed, unopened container

2.05 FLUID APPLIED WATER RESISTIVE BARRIER SYSTEM

- A. Fluid applied, waterproofing and air and water barrier membrane (for use over concrete substrates). Noted as 'Weather Resistive Barrier, Fluid Applied' on the drawings.
- B. Acceptable product: PROSOCO R-Guard Cat 5.
 1. Substitutions under provisions of 01 25 00

- C. Description: Cat 5® Air & Water-Resistive Barrier is a fluid applied, waterproofing and air barrier that combines the best of silicone and polyurethane properties. This single component, 98% solids Silyl-Terminated-Poly-Ether (STPE) is roller applied to produce a highly durable, seamless, elastomeric weatherproofing membrane on structural sheathing and back-up CMU walls.
- D. Characteristics:
1. Thickness: Apply in accordance with manufacturer's instructions. See product data sheet.
 2. Air infiltration: Less than 0.004 cfm per square foot (0.02 L/s/sq m) when tested in accordance with ASTM E2178 or ASTM E283.
 3. Water vapor permeability: Minimum 23 perms when tested in accordance with ASTM E96.
 4. Structural performance: Air and water-resistive barrier system shall withstand positive and negative wind pressure loading when tested in accordance with ASTM E330.
 5. Water penetration (static pressure): No uncontrolled water penetration when tested in accordance with ASTM E331, with differential static pressure not less than 6.24 psf.
 6. Water penetration (cyclical static air pressure difference): No uncontrolled water penetration when tested in accordance with ASTM D547.
 7. Hardness: Shore A, 20-25 when tested in accordance with ASTM C661.
 8. Tensile strength: 110 psi when tested in accordance with ASTM D412.
 9. Elongation at break: 300% when tested in accordance with ASTM D412.
 10. Peel strength: 30 pli when tested in accordance with ASTM D1781 or C794.
 11. Shrinkage: None.
 12. Form: adobe brown heavy liquid
 13. Specific gravity: 1.5 to 1.7
 14. pH: not applicable
 15. Weight per gallon: 13.312 pounds
 16. Active content: 98 percent
 17. Total solids: 98 percent
 18. Volatile organic content (VOC): 30 grams per Liter, maximum
 19. Flash point: greater than 200 degrees Fahrenheit (greater than 93 degrees Celsius)
 20. Freeze point: not applicable
 21. Shelf life: 1 year in tightly sealed, unopened container

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces and site conditions are ready to receive work.
- B. All surfaces must be sound, clean and free of oil, grease, dirt, excess mortar or other contaminants detrimental to the adhesion of the water resistive air barrier flashings. Fill voids, gaps in substrate to provide an even surface. Strike masonry joints full-flush.
- C. Minimum application temperature self-adhered membrane flashings to be above 20 degrees F (minus 6.0 degrees C).

- D. Ensure all preparatory Work is complete prior to applying primary water-resistive weather barrier membrane.
- E. Mechanical fasteners used to secure sheathing boards or penetrate sheathing boards shall be set flush with sheathing and fastened into solid backing.

3.02 SURFACE PREPARATION

- A. Air, water-resistive and waterproofing membrane and accessories may be applied to green concrete 16 hours after removal of forms.
- B. Refer to manufacturer's product data sheets for requirements for condition of and preparation of substrates.
 - 1. Surfaces shall be sound and free of voids, spalled areas, loose aggregate and sharp protrusions.
 - 2. Remove contaminants such as grease, oil and wax from exposed surfaces.
 - 3. Remove dust, dirt, loose stone and debris.
 - 4. Use repair materials and methods that are acceptable to manufacturer of the air and water-resistive barrier system.
- C. Masonry and concrete substrates:
 - 1. Masonry head and bed joints should be fully filled and tooled.
 - 2. Mechanically remove loose mortar fins, mortar accumulations and protrusions, and debris.
- D. Metal Studs:
 - 1. Cover knockouts in metal studs with flat stock sheet metal mechanically attached with pan head screws to provide substrate for the liquid flashing.

3.03 INSTALLATION OF JOINT TREATMENT (PREPARE):

- A. Apply Joint & Seam Filler for seams, joints, cracks, gaps, primed rough gypsum edges at sheathing, rough openings:
 - 1. Fill or repair cracks larger than one-half inch.
 - 2. Fill surface defects and over driven fasteners with Joint & Seam Filler.
 - 3. Using a dry knife, trowel or spatula, tool and spread the product. Spread one inch beyond seam at each side to manufacturer's recommended thickness. See product data sheet.
 - 4. Allow to skin before installing other waterproofing or air barrier components.
 - 5. Apply in accordance with manufacturer's Application Guideline illustrations.

3.04 FLASHING AT WINDOWS, DOORS, OPENINGS AND PENETRATIONS (PREPARE):

- A. Apply liquid flashing membrane over surfaces prepared with Joint & Seam Filler to seal and waterproof rough openings:
 - 1. Apply a thick bead of liquid flashing membrane over any visible gaps in the prepared rough opening.
 - 2. Immediately press and spread the wet product into gaps.
 - 3. Allow treated surface to skin.

4. Starting at the top, apply a thick bead of liquid flashing membrane in a zigzag pattern to the structural wall surrounding the rough opening.
5. Spread the wet product to create an opaque, monolithic flashing membrane which surrounds the rough opening and extends 4 to 6 inches over the face of the structural wall. Apply and spread additional product as needed to create an opaque, monolithic flashing membrane free of voids and pin holes.
6. Apply additional product in a zigzag pattern over a structural framing inside the rough opening.
7. Apply liquid flashing membrane within temperature and weather limitations as required by manufacturer.
8. Apply liquid flashing membrane perimeters, sills and adjacent sheathing and building face, in accordance with manufacturer's product data sheet and R-GUARD Installation Guidelines illustrations.
9. Extend flashing onto building face 4 to 6 inches.
10. Install preparation products in accordance with manufacturer's Application Guideline illustrations.

3.05 AIR & WATER-RESISTIVE BARRIER INSTALLATION (PROTECT):

- A. Apply appropriate air and water-resistive barrier to a clean, dry substrate (clean, dry, and/or damp substrates –waterproofing air-barrier membrane), within temperature and weather limitations as required by manufacturer.
 1. Apply to recommended thickness. Proper thickness is achieved when coating is opaque.
 2. Allow product to cure and dry.
 3. Inspect membrane before covering. Repair any punctures, translucent or damaged areas by applying additional material.
 4. Specifier Note: If air or surface temperature exceed 95 degrees Fahrenheit (35 degrees Celsius), apply to shaded surfaces and before daytime air and surface temperatures reach their peak.
 5. On CMU wall construction back roll as necessary to ensure there are no pinholes, voids or gaps in the membrane. R-GUARD Cat 5° is roller applied.

3.06 FLASHING TRANSITIONS (TRANSITION)

- A. Apply Joint & Seam Filler and liquid flashing membrane as a liquid flashing membrane to waterproof the transitions in rough opening and between dissimilar materials.
 1. Fill any voids between the top of the flashing leg and the vertical wall with Joint & Seam Filler. Tool to direct water from the vertical wall to the flashing.
 2. Apply a generous bead of liquid flashing membrane to the top edge of the flashing leg.
 3. Spread the wet products to create a monolithic "cap-flash" flashing membrane extending 2 inches up the vertical face of the structural wall and 1 inch over the flashing membrane. Apply additional product as needed to achieve a void and pinhole free surface. This "liquid termination bar" helps secure the flashing and ensures positive drainage from the wall surface to the flashing.
 4. Allow coated surfaces to skin before installing other wall assembly, waterproofing or air barrier components.

3.07 AIR AND WEATHER BARRIER SEALANT FOR WINDOWS AND DOORS INSTALLATION

- A. Install sealant with professional grade caulking gun in continuous beads without air gaps or air pockets.
 - 1. Apply sealant to a clean, dry or damp surface
 - 2. Install Backer rod: Compressible, closed cell rod stock as recommended by manufacturer for compatibility with sealant. Provide size and shape of rod to control joint depth
 - 3. Install sealant to provide uniform, continuous ribbons without gaps or air pockets, with complete wetting of the joint bond surfaces.
 - 4. Tool sealant immediately to ensure complete wetting of joint bond surface and to produce a smooth, concave joint profile flush with the edges of the adjacent surfaces. Where horizontal and vertical surfaces meet, tool sealant to create a slight cove so as to not trap moisture or debris.
 - 5. Do not allow materials to overflow onto adjacent surfaces. Prevent staining of adjacent surfaces.
 - 6. Remove excess and misplaced materials as work progresses. Clean the adjoining surfaces to remove misplaced materials, without damage to adjacent surfaces or finishes.

3.08 PROTECTION

- A. Protect wall areas covered with primary water-resistive vapor permeable air barrier from damage due to construction activities, high wind conditions, and extended exposure to inclement weather.
- B. Review condition of water-resistive weather barrier prior to installation of cladding. Repair, or remove and replace damaged sections with new membrane.
- C. Recommend to cap and protect exposed back-up walls against wet weather conditions during and after application of membrane, including wall openings and construction activity above completed primary water-resistive weather barrier installations.
- D. Remove and replace water-resistive vapor barrier permeable air barrier affected by chemical spills or surfactants.

END OF SECTION

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Drawings and general provisions of the Project Manual apply to the work of this section.

1.02 RELATED SECTIONS

- A. Section 03 01 30.71 – Concrete Rehabilitation
- B. Section 03 30 00 – Cast In-Place Concrete
- C. Section 08 41 13 Aluminum Storefront
- D. Section 09 55 00 – High Performance Architectural Coatings

1.03 REFERENCED STANDARDS

- A. Work shall conform, at a minimum, to the requirements of the 2018 International Building Code (IBC).
- B. ASTM C 1193-16 (Most Current Edition), Standard Guide for Use of Joints Sealants.
- C. ASTM C920-16 (Most Current Edition), Standard Specification for Elastomeric Joint Sealants.
- D. ASTM C 1248 “Standard Test Method for Staining of Porous Substrate by Joint Sealants”
- E. ASTM C 1311 “Standard Specification for Solvent Release Sealants”
- F. ASTM C 1330 “Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants”
- G. Sealants: The Professionals’ Guide, published by the Waterproofing & Restoration Institute (SWR), 1995 or most current edition.

1.04 SUMMARY

- A. Extent of each type of sealant work is indicated on drawings and by provisions of this section.
- B. This section includes sealants for the following applications
 - 1. Exterior joints: in the following vertical surfaces and non-traffic horizontal surfaces:
 - a. Joints between different materials.
 - 2. Sealant Work: At all locations where sealant performs as the primary or secondary weather barrier for the various Project related sheet metal and trim, roofing and related accessories, rough carpentry, wall cladding, locations, such as in joints and overlaps of the sheet metal-to-saddle junctions, sheet metal coping joints, counterflashing, at metal joinery equipment, the tops of lead plumbing flashings, storm collars, where flashing materials are sequenced into the new specified roof membrane system, new roof system, and/or wall cladding, architectural features, door frames at building transitions, and all other junctures where materials intersect, remove old sealants (if and where present), clean and, as required, prime substrates, and apply new specified sealant, watertight and airtight in proper configuration that will allow long-term successful performance and dimensional movement of the sealant section.

3. Sealing of all random cracks, formed in the existing portions of the deck slab and against building and exterior barrier walls, as required for membrane system coatings and as indicated on Drawings.

1.05 SYSTEM PERFORMANCE REQUIREMENTS

- A. Provide elastomeric joint sealants that have been produced and installed to establish and to maintain watertight and airtight continuous seal without causing staining or deterioration of joint substrates.
- B. Compliance with ASTM C920, Standard Specification for Elastomeric Joint Sealants
- C. Compliance with ASTM C1193, Standard guide for use of Joint Sealants.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to project site in original unopened containers or bundles with labels informing about manufacturer, project name and designation, color, expiration period for use, pot life, curing time and mixing instructions for multi-component materials.
- B. Store and handle materials to prevent their deterioration or damage due to moisture, temperature change, contaminants, or other causes.

1.07 SUBMITTALS

- A. General: Submit in accordance with Division 01 Submittals.
- B. Product Safety Data Sheets from manufacturers for each joint sealant required.
- C. Samples for initial selection purposes in form of manufacturer's standard bead samples, consisting of strips of actual products showing full range of colors available, for each product exposed to view.
- D. Submit Manufacturer's letter of certification that the products meet or exceed specified requirements and are appropriate for the uses indicated..
- E. Submit proposed method and details for treatment of cracks and other defects on concrete surface.

1.08 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer who has completed joint sealant application similar in material, design, and extent to that indicated for Project that have resulted in construction with a record of successful in-service performance.
- B. Joint Sealant Materials: Install joint sealant materials from a single approved manufacturer for each different product required.
- C. Install exterior sealant joint that are long term watertight, waterproof, and weatherproof.

1.09 PROJECT CONDITIONS

- A. Environmental Conditions: Do not proceed with installation of joint sealers under the following conditions:

1. When ambient and substrate temperature conditions are outside the limits permitted by joint sealant manufacturers. Or below 40 deg. F (4.4 deg. C)
 2. When joint substrates are wet due to rain, frost, condensation, or other causes
- B. Joint Width Conditions: Do not proceed with installation of joint sealers when joint widths are less than allowed by joint sealant manufacturer for application indicated.
- C. Joint Substrate Conditions: Do not proceed with installation of joint sealers until contaminants capable of interfering with their adhesion are removed from joint substrates.

1.10 SEQUENCING AND SCHEDULING

- A. Sequence installation of joint sealers work of other trades so that substrates to be sealed are ready for sealant, so that locations to receive sealant are not covered by other work before sealant is applied, and so that sealant joints are allowed to fully cure without damage from construction.
- B. Sequence installation of joint sealers to occur not less than 21 nor more than 30 days after completion of waterproofing unless otherwise indicated.

1.11 WARRANTY

- A. Installer's warranty: Written warranty, signed by installer agreeing to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within the specified warranty period.
1. Warranty period: 1 year from the date of Physical Completion
- B. Manufacturer's warranty: Written warranty, signed by elastomeric sealant manufacturer agreeing to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
1. Warranty period: 10 years from the date of Physical Completion

PART 2 – PRODUCTS

2.01 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealers, joint fillers and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by testing and field experience.
- B. Colors: Provide selection made by Engineer from manufacturer's standard colors for products of type indicated.
- C. Sealants and Primers - General: Provide only products having lower volatile organic compound (VOC) content than required by South Coast Air Quality Management District Rule No.1168, VOC Limits, effective January 7, 2005.
1. Sealants: 250 g/L (less water).

2. Sealant Primers for Nonporous Substrates: 250 g/L (less water).
3. Sealant Primers for Porous Substrates: 775 g/L (less water).

2.02 ELASTOMERIC JOINT SEALANTS

- A. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealant which complies with ASTM C 920 requirements, including those for Type, Grade, Class, and intended uses indicated in the 'Joint Sealant Schedule' located at end of this section.
- B. Available Products: Subject to compliance with requirements, elastomeric sealants that may be incorporated in the Work include, but are not limited to, the products specified in the "Joint Sealant Schedule" located at the end of this section.

2.03 TAPE SEALANTS

- A. Tape Sealant: Manufacturer's standard, solvent-free, butyl-based tape sealant with a solids content of 100 percent formulated to be non-staining, paintable, and non-migrating in contact with nonporous surfaces with or without reinforcement thread to prevent stretch and packaged on rolls with a release paper on one side.
- B. Available Products: Subject to compliance with requirements, tape sealants that may be incorporated in the Work include, but are not limited to, the following:
 1. "Extr-Seal Tape," Pecora Corporation
 2. "Shim-Seal Tape," Pecora Corporation
 3. "PTI 606," Protective Treatments, Inc.
 4. "Tremco 440 Tape," Tremco, Inc.
 5. "MBT-35," Tremco, Inc.

2.04 JOINT SEALANT BACKING:

- A. General: Provide sealant backings of material and type that are non-staining; are compatible with joint substrates, sealants, primers and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Plastic Foam Backer Rod: Preformed, compressible, resilient, non-staining, non-waxing, non-extruding strips of flexible plastic foam of material indicated below and of size and shape, and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- C. Closed-cell polyethylene foam, nonabsorbent to liquid water and gas, non-out-gassing in unruptured state and with diameter 40% greater than the joint width.
- D. Bond Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint filler materials or joint surfaces at back or joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.05 SELF LEVELING POLYURETHANE SEALANT

A. Product Manufacturers

1. Sonneborn, Product: Sonolastic SL2, Degussa
2. Iso-Flex 880 GB, Lyntal
3. Sika, Product: Sikaflex-2x SL and NS, Sika
4. THC-900/THC-901 or Vulkem 245, Tremco
5. Substitutions in accordance with Section 01 60 00 - Product Requirements.

B. Color to match existing concrete. Grey.

2.06 MISCELLANEOUS MATERIALS

A. Primer: Provide type recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from pre-construction joint sealant substrate and field tests.

B. Cleaners for Nonporous Surfaces: Provide non-staining, chemical cleaner of type acceptable to manufacturer of sealant and sealant backing materials, which are not harmful to substrates and adjacent nonporous materials.

C. Masking Tape: Provide non-staining, pressure sensitive non-absorbent type compatible with joint sealants and to surfaces adjacent to joints as applicable, easily removable upon completion.

D. Accessory Materials for Fire-Stopping Sealants: Provide forming, joint fillers, packing and other accessory materials for installation of fire-stopping sealants as applicable to installation conditions indicated.

E. Other Materials: Bond breaker, closed cell backer rod.

PART 3 – EXECUTION

3.01 INSPECTION

A. Require installer to inspect joints indicated to receive joint sealers for compliance with requirements for joint configurations, installation tolerances and other conditions affecting joint sealant performance.

B. Do not allow joint sealant work to proceed until unsatisfactory conditions have been corrected. Beginning of installation means installer accepts existing substrate.

3.02 PREPARATION

A. Sawcut and grind cracks to be sealed to provide a crack opening profile as shown on the Drawings.

- B. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealers to comply with recommendations of joint sealant manufacturers and the following requirements:
- C. Remove all foreign material from joint substrates which could interfere with adhesion and cohesion of joint sealer, including dust; paints, except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer; oil; grease; waterproofing; water repellents; water; surface dirt, fungus, efflorescence, laitance, release agents, and frost.
- D. Clean porous joint substrate surfaces to produce a clean, sound substrate capable of developing optimum bond with joint sealers. Remove loose particles remaining from cleaning operations by vacuuming or blowing out joints with oil-free compressed air.
- E. Clean non- porous surfaces by chemical cleaners or other means, which are not harmful to substrates or leave residues capable of interfering with adhesion of joint sealers as recommended by joint sealant manufacturer.
- F. Joint Priming: Prime joint substrates where indicated or where recommended by joint sealant manufacturer based on pre-construction joint sealer-substrate tests or prior experience. Apply primer to comply with joint sealant manufacturer's recommendations. Confine primer to areas of joint sealant bond; do not allow spillage or migration onto adjoining surfaces.
- G. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces which otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing seal.

3.03 INSTALLATION OF JOINT SEALERS

- A. General: Comply with joint sealant manufacturer's printed installation instructions, including "tooling" and all techniques applicable to products and applications indicated, except where more stringent requirements apply
- B. Elastomeric Sealant Installation Standard: Comply with recommendations of ASTM C 962 for use of joint sealants as applicable to materials, applications and conditions indicated.
- C. Latex Sealant Installation Standard: Comply with requirements of ASTM C 790 for use of latex sealants
- D. Installation of Sealant Backings: Install sealant backings to comply with the following requirements:
 - 1. Install joint fillers of type indicated to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths, which allow optimum sealant movement capability.
 - a. Do not leave gaps between ends of joint fillers.
 - b. Do not stretch, twist, puncture, or tear joint fillers

- c. Remove absorbent fillers, which have become wet prior to
 - d. sealant application and replace with dry material.
- 2. Install bond breaker tape between sealants and joint fillers, compression seals, or back of joints where adhesion of sealant to surfaces at back of joints could result in sealant failure.
- E. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint widths which allow optimum sealant movement capability.
- F. Tooling of non-sag Sealants: Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated, to eliminate air pockets, and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents which discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.
 - 1. Provide concave joint configuration per Figure 6A in ASTM C 962, unless otherwise indicated.
 - a. Use masking tape to protect adjacent surfaces of recessed tooled joints

3.04 PROTECTION AND CLEANING

- A. Protect joint sealers during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of physical completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealers immediately and reseal joints with new materials to produce joint sealant installations with repaired areas indistinguishable from original work and watertight.
- B. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealers and of products in which joints occur.
- C. When using flammable solvents, avoid heat, sparks and open flames. Provide necessary ventilation. Follow all precautions and safe handling recommendations from the solvent Manufacturer and pertinent local, state and federal regulations.

3.05 ELASTOMERIC JOINT SEALANT SCHEDULE

- A. Non-staining Silicone Joint Sealants:
 - 1. No staining of substrates when tested according to ASTM C 1248.
 - 2. Silicone, Non-staining, S, NS, 50, NT: Non-staining, single-component, non-sag, plus 50 percent and minus 50 percent movement capability, non-traffic-use,
 - 3. neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Use NT.
 - 4. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Dow Corning 795;
 - b. Pecora 895 NST;

- c. GE Momentive – SCS2000 Silpruf;
 - d. or Project Approved Equal submitted through the Substitution Request and Potentially Approved by the Project Architect.
- B. Polyurethane Joint Sealants
 - 1. Urethane, S, NS, 25, NT: One-part silyl-terminated, non-sag, non-traffic use, plus 25 percent and minus 25 percent movement capability, urethane joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.
 - 2. Use related to Joint Substrates: M, G, and as applicable, to joint substrates indicated, O.
 - 3. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. BASF – Master Seal 150
 - b. or Project Approved Equal submitted through the Substitution Request
- C. Self-leveling Polyurethane Sealant
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. BASF, Product: Master Seal SL2
 - b. Iso-Flex 880 GB, Lyntal
 - c. Sika, Product: Sikaflex-2x SL, Sika
 - d. THC-900/THC-901 or Vulkem 245, Tremco
 - e. or Project Approved Equal submitted through the Substitution Request
- D. Butyl Joint Sealants
 - 1. Non-Skinning Butyl-Rubber-Based Joint Sealants: ASTM C 1311.
 - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Sika – Sikalastomer 511;
 - b. Pecora BA-98;
 - c. Tremco – JS-773 Synthetic Butyl Sealant;
 - d. or Project Approved Equal submitted through the Substitution Request and Potentially Approved by the Project Architect.

END OF SECTION

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. Standard and custom hollow metal doors and frames.
- 2. Steel sidelight, borrowed lite and transom frames.
- 3. Light frames and glazing installed in hollow metal doors.
- 4. Zinc coating for hollow metal doors in a marine environment

- B. Related Sections:

- 1. Division 01 Section "General Conditions".
- 2. Division 04 Section "Unit Masonry" for embedding anchors for hollow metal work into masonry construction.
- 3. Division 08 Section "Glazing" for glass view panels in hollow metal doors.
- 4. Division 08 Section "Door Hardware".
- 5. Division 09 Sections "High Performance Coatings" for painting hollow metal doors and frames.

- C. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

- 1. ANSI/SDI A250.8 - Recommended Specifications for Standard Steel Doors and Frames.
- 2. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frames Anchors and Hardware Reinforcing.
- 3. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
- 4. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
- 5. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames.
- 6. ASTM A1008 - Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
- 7. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- 8. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
- 9. ASTM C 1363 - Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus.
- 10. ANSI/BHMA A156.115 - Hardware Preparation in Steel Doors and Frames.
- 11. ANSI/SDI 122 - Installation and Troubleshooting Guide for Standard Steel Doors and Frames.
- 12. ANSI/NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association.

13. ANSI/NFPA 105: Standard for the Installation of Smoke Door Assemblies.
14. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association.
15. UL 10C - Positive Pressure Fire Tests of Door Assemblies.
16. UL 1784 - Standard for Air Leakage Tests of Door Assemblies.

1.03 QUALITY ASSURANCE

- A. Source Limitations: Obtain hollow metal doors and frames through one source from a single manufacturer wherever possible.
- B. Quality Standard: In addition to requirements specified, furnish SDI-Certified manufacturer products that comply with ANSI/SDI A250.8, latest edition, "Recommended Specifications for Standard Steel Doors and Frames".
- C. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to UL10C (neutral pressure at 40" above sill) or UL 10C.
 1. Oversize Fire-Rated Door Assemblies Construction: For units exceeding sizes of tested assemblies, attach construction label certifying doors are built to standard construction requirements for tested and labeled fire rated door assemblies except for size.
 2. Temperature-Rise Limit: Where indicated and at vertical exit enclosures (stairwell openings) and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire-test exposure.
 3. Smoke Control Door Assemblies: Comply with NFPA 105.
 - a. Smoke "S" Label: Doors to bear "S" label, and include smoke and draft control gasketing applied to frame and on meeting stiles of pair doors.
- D. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257. Provide labeled glazing material.
- E. Storm Shelter Openings: Provide complete door systems for hurricane or tornado storm shelters, and other areas of refuge, complying and tested according to ICC 500 (2014/2020), ICC/NSSA Standard for the Design and Construction of Storm Shelters.
 1. Each unit to bear third party permanent label indicating compliance with the referenced testing standards.
- F. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and procedures for installing hollow metal doors and frames and to verify installation of electrical knockout boxes and conduit at frames with electrified or access control hardware.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project site storage. Do not use non-vented plastic.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch high wood blocking. Do not store in a manner that traps excess humidity.
 - 1. Provide minimum 1/4-inch space between each stacked door to permit air circulation. Door and frames to be stacked in a vertical upright position.

1.05 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.06 COORDINATION

- A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.
- B. Building Information Modeling (BIM) Support: Utilize designated BIM software tools and obtain training needed to successfully participate in the Project BIM processes. All technical disciplines are responsible for the product data integration and data reliability of their Work into the coordinated BIM applications.

1.07 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
- B. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide steel doors and frames from a SDI Certified manufacturer:
 - 1. CECO Door Products (C).
 - 2. Curries Company (CU).

2.02 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

- B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.
- C. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than 38 percent.
- D. Frame Anchors: ASTM A 653/A 653M, Commercial Steel (CS), Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

2.03 HOLLOW METAL DOORS

- A. General: Provide 1-3/4 inch doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8 and ANSI/NAAMM HMMA 867.
- B. Exterior Doors: Face sheets fabricated of commercial quality hot-dipped zinc coated steel that complies with ASTM A 653/A 653M, Coating Designation A60. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
 - 1. Design: Flush panel.
 - 2. Core Construction: Manufacturer's standard polystyrene. Where indicated, provide doors fabricated as thermal-rated assemblies with a minimum R-value of 2.8 or better.
 - 3. Level/Model: Level 3 and Physical Performance Level A (Extra Heavy Duty), Minimum 16 gauge (0.053-inch - 1.3-mm) thick steel, Model 2.
 - 4. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet. Doors with an inverted top channel to include a steel closure channel, screw attached, with the web of the channel flush with the face sheets of the door. Plastic or composite channel fillers are not acceptable.
 - 5. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
 - 6. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.
- C. Interior Doors: Face sheets fabricated of commercial quality cold rolled steel that complies with ASTM A 1008/A 1008M. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
 - 1. Design: Flush panel.
 - 2. Core Construction: Manufacturer's standard kraft-paper honeycomb, or one-piece polystyrene core, securely bonded to both faces.
 - a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.
 - 3. Level/Model: Level 2 and Physical Performance Level B (Heavy Duty), Minimum 18 gauge (0.042-inch - 1.0-mm) thick steel, Model 2.

4. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet.
5. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
6. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

D. Manufacturers Basis of Design:

1. Curries Company (CU) - Polystyrene Core - 707 Series.

2.04 HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

B. Exterior Frames: Fabricated of hot-dipped zinc coated steel that complies with ASTM A 653/A 653M, Coating Designation A60.

1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
2. Frames: Minimum 16 gauge (0.053-inch -1.3-mm) thick steel sheet.
3. Manufacturers Basis of Design:
 - a. Curries Company (CU) – M CM Series.

C. Interior Frames: Fabricated from cold-rolled steel sheet that complies with ASTM A 1008/A 1008M.

1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
2. Frames: Minimum 16 gauge (0.053-inch -1.3-mm) thick steel sheet.
3. Manufacturers Basis of Design:
 - a. Curries Company (CU) - M Series.

D. Fire rated frames: Fabricate frames in accordance with NFPA 80, listed and labeled by a qualified testing agency, for fire-protection ratings indicated.

E. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 Table 4 with reinforcement plates from same material as frames.

2.05 FRAME ANCHORS

A. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, formed from A60 metallic coated material, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
2. Stud Wall Type: Designed to engage stud and not less than 0.042 inch thick.

B. Floor Anchors: Floor anchors to be provided at each jamb, formed from A60 metallic coated material, not less than 0.042 inches thick.

C. Mortar Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.06 LIGHT OPENINGS AND GLAZING

- A. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints at fabricator's shop. Fixed and removable stops to allow multiple glazed lites each to be removed independently. Coordinate frame rabbet widths between fixed and removable stops with the type of glazing and installation indicated.
- B. Moldings for Glazed Lites in Doors and Loose Stops for Glazed Lites in Frames: Minimum 20 gauge thick, fabricated from same material as door face sheet in which they are installed.
- C. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch (16 mm) high unless otherwise indicated. Provide fixed frame moldings and stops on outside of exterior and on secure side of interior doors and frames.
- D. Preformed Metal Frames for Light Openings: Manufacturer's standard frame formed of 0.048-inch-thick, cold rolled steel sheet; with baked enamel or powder coated finish; and approved for use in doors of fire protection rating indicated. Match pre-finished door paint color where applicable.

2.07 ACCESSORIES

- A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.
- B. Grout Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.08 FABRICATION

- A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. When shipping limitations so dictate, frames for large openings are to be fabricated in sections for splicing or splining in the field by others.
- B. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/SDI A250.8.
- C. Hollow Metal Doors:
 - 1. Exterior Doors: Provide optional weep-hole openings in bottom of exterior doors to permit moisture to escape where specified.
 - 2. Glazed Lites: Factory cut openings in doors with applied trim or kits to fit. Factory install glazing where indicated.
 - 3. Astragals: Provide overlapping astragals as noted in door hardware sets in Division 08 Section "Door Hardware" on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted.

4. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge strap for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".
- D. Hollow Metal Frames:
1. Shipping Limitations: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
 2. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
 - a. Welded frames are to be provided with two steel spreaders temporarily attached to the bottom of both jambs to serve as a brace during shipping and handling. Spreader bars are for bracing only and are not to be used to size the frame opening.
 3. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
 4. High Frequency Hinge Reinforcement: Provide high frequency hinge reinforcements at door openings 48-inches and wider with mortise butt type hinges at top hinge locations.
 5. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge straps for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".
 6. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops, provide security screws at exterior locations.
 7. Mortar Guards: Provide guard boxes at back of hardware mortises in frames at all hinges and strike preps regardless of grouting requirements.
 8. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
 9. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - 1) Two anchors per jamb up to 60 inches high.
 - 2) Three anchors per jamb from 60 to 90 inches high.
 - 3) Four anchors per jamb from 90 to 120 inches high.
 - 4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.
 - b. Stud Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - 1) Three anchors per jamb up to 60 inches high.
 - 2) Four anchors per jamb from 60 to 90 inches high.
 - 3) Five anchors per jamb from 90 to 96 inches high.
 - 4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
 - 5) Two anchors per head for frames above 42 inches wide and mounted in metal stud partitions.
 10. Door Silencers: Except on weatherstripped or gasketed doors, drill stops to receive door silencers. Silencers to be supplied by frame manufacturer regardless if specified in Division 08 Section "Door Hardware".
 11. Bituminous Coating: Where frames are fully grouted with an approved Portland Cement based grout or mortar, coat inside of frame throat with a water based bituminous or

asphaltic emulsion coating to a minimum thickness of 3 mils DFT, tested in accordance with UL 10C and applied to the frame under a 3rd party independent follow-up service procedure.

- E. Hardware Preparation: Factory prepare hollow metal work to receive template mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."
 - 1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
 - 2. Reinforce doors and frames to receive non-template, mortised and surface mounted door hardware.
 - 3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
 - 4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

2.09 STEEL FINISHES

- A. Prime Finishes: Doors and frames to be cleaned, and chemically treated to insure maximum finish paint adhesion. Coating system for exterior and interior doors and frames in environments with aggressive corrosion, coastal exposure, or physical abuse.
- B. Basis of Design: Tnemec Company
 - 1. System Type: Organize zinc rich/ Epoxy/Fluorourethane
 - 2. Surface Preparation: SSPC-SP6
 - 3. Shop Primer: Series 294 Perimeprime. DFT 2.5 to 3.5 mils
 - 4. Shop or Field Intermediate Coat: Series N689 Expoxoline II @3.0 to 5.0 mils
 - 5. Field Finish Coat: Series 1071V Fluoronar DFT 2.0 to 3.0 mils
 - 6. Total DFT: 7.5-11.5 mils

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. General Contractor to verify the accuracy of dimensions given to the steel door and frame manufacturer for existing openings or existing frames (strike height, hinge spacing, hinge back set, etc.).
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Remove welded in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

- B. Prior to installation, adjust and securely brace welded hollow metal frames for square, level, twist, and plumb condition.
- C. Tolerances shall comply with SDI-117 "Manufacturing Tolerances Standard Steel Doors and Frames."
- D. Drill and tap doors and frames to receive non-template, mortised, and surface-mounted door hardware.
- E. Verify tolerances against manufacturers installations instructions for tornado and hurricane storm shelter openings.

3.03 INSTALLATION

- A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
- B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11 and NFPA 80 at fire rated openings.
 - 1. Set frames accurately in position, plumbed, leveled, aligned, and braced securely until permanent anchors are set. After wall construction is complete and frames properly set and secured, remove temporary braces, leaving surfaces smooth and undamaged. Shim as necessary to comply with installation tolerances.
 - 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
 - 3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar.
 - 4. Grout Requirements: Do not grout head of frames unless reinforcing has been installed in head of frame. Do not grout vertical or horizontal closed mullion members.
- C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.
 - 1. Non-Fire-Rated Standard Steel Doors:
 - a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
 - b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
 - c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
 - d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.
 - 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
- D. Field Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.

3.04 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace

- defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow metal work immediately after installation.
 - C. Prime-Coat and Painted Finish Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat, or painted finishes, and apply touchup of compatible air drying, rust-inhibitive primer, zinc rich primer (exterior and galvanized openings) or finish paint.

3.05 FIELD QUALITY CONTROL

- A. Field Inspection (Punch Report): Reference Division 01 Sections “Closeout Procedures”. Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.
 - 1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

END OF SECTION

PART 1-GENERAL

1.01 RELATED DOCUMENTS

- A. Project Drawings and general provisions of the Construction Contract, including General and Supplementary Conditions, Division 01 Specification Sections and bidding requirements, apply to the work of this Section.

1.02 SUMMARY

- A. General: Furnish all labor, materials, equipment, and services necessary and incidental to execution and completion of removal of existing fenestration system and installation of new, exterior Aluminum Framed fenestration systems according to the Contract Documents, this Section, and the Project Drawings where indicated. Installation shall coordinate with fenestration rough opening flashings, sealants, and shall be long-term weather proof, with all associated accessories as necessary for thorough water-tight and weather-proof installation of new extruded aluminum fenestration.
- B. This Section Includes Sliding Aluminum-framed glass doors including factory glazing, operating hardware and accessories designed for exterior applications.
- C. Related Sections:
 - 1. Section 02 41 19 – Selective Demolition
 - 2. Section 06 10 00 – Rough Carpentry
 - 3. Section 07 25 00 – Water Resistive Barrier
 - 4. Section 07 92 00 – Joint Sealants
 - 5. Section 08 41 13 – Aluminum Storefront
 - 6. Section 08 70 00 – Glazing
- D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
 - 1. 2018 International Building Code (IBC), as amended by the State of Washington
 - 2. 2018 Washington State Energy Code.
 - 3. NFPA 80-Fire Doors and Windows.
- E. Standards:
 - 1. General: The following documents, industry standards, publications, and the information contain therein, shall guide the work, as applicable. The work shall be evaluated in compliance with the benchmark references and the Contract Documents, notify the Consultant promptly. The more conservative published requirement shall guide the work.
 - a) Architectural Sheet Metal Manual, published by Sheet Metal and Air Conditioning Contractors National Association (SMACNA), (1979[3rd Ed.] and 2003 [6th Ed], and most current edition).
 - b) Sealants: The Professionals' Guide, published by the Waterproofing & Restoration Institute (SWR), 1995.

- c) Manufacturers' technical data sheets, MSDS sheets, and installation instructions for each product specified and/ or used.
- 2. ASTM-American Society for Testing and Materials:
 - a) ASTM E 283-04 "Standard Test Method for Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors.
 - b) ASTM E330-02 "Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference."
 - c) ASTM E331-00 "Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference."
 - d) ASTM E 547 "Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Cyclic Static Air Pressure Differential."
 - e) ASTM G85 Modified Salt Spray (Fog) Testing.
 - f) ASTM E774-00 "Specification for Sealant Insulating Glass Units."
 - g) 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.
 - h) ASTM E-1886-02 "Standard for Testing Windows and Doors for Cyclic Wind Pressures."
 - i) ASTM E 1996-02 "Standards for Testing Windows and Doors for Windborne Debris (large Missile and small Missile)."
 - j) ASTM C1193, Standard Guide for Use of Joint Sealants.
 - k) ASTM E241, Standard Guide for Limiting Water Induced Damage of Buildings.
 - l) ASTM E2112-07 "Standard Practice for Installation of Exterior Windows, Doors and Skylights."
- 3. AAMA- America Architectural Manufacturers Association:
 - a) AAMA /NWWDA 101/ I.S.2-97 "Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors."
 - b) AAMA 503-03 "Voluntary Specification for Field Testing of Windows and Sliding Glass Doors. "No reduction allowed.
 - c) AAMA 611-98 "Voluntary Specification for Anodized Architectural Aluminum."
 - d) AAMA 701-00 "Voluntary Specification for Pile Weather Stripping."
 - e) AAMA 800-92 "Voluntary Specification for Test Methods for Sealants,"
 - f) AAMA 906-96 "Voluntary Specification for Sliding Glass Door Roller Assemblies."
 - g) AAMA 1503-98 "Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, and Doors, and Glazed Wall Sections."
 - h) AAMA 2605-05 "Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels."
 - i) AAMA CW-10-97 "Care and Handling of Architectural Aluminum from Shop to Site."

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Pre-installation Meeting: Convene one week before starting work of this section. Conduct conference at Project site with location as mutually agreed by owner's Project manager, General Contractor, Project Architect.
- B. Purpose and Agenda

1. Before the scheduled commencement of the Aluminum Framed storefront/ Entrance fenestration installation and associated flashing work, the Fenestration Installation Subcontractor, and related subcontractors (e.g., sheet metal subcontractors, etc.), and lead installers (foreperson) of each component of associated work, and other work in and around fenestration installation which must precede or follow fenestration installation shall attend a pre-Installation conference.
2. The meeting shall be conducted by the General Contractor and shall be attended by the Project Architect, Aluminum Fenestration Installation Subcontractor, and other directly concerned with the installation of the materials and performance of the Work including Aluminum Fenestration Manufacturer(s), other subcontractors, insurers, test agencies, and governing authorities. After the meeting, the Architect will furnish Pre-Installation Meeting Minutes to the parties in attendance. At the meeting, the group shall review the materials specified and procedures related to the Fenestration Installation Work, including but not necessarily limited to the following:
 - a. Distribution of any additional sets of Project Manuals, as may be needed.
 - b. Review requirements of Project Documents (Including Specifications and Drawings) as part of the Contract and submittals (both completed and yet to be submitted)
 - c. Review governing regulations and requirements for insurance, bonding, and certification. General safety and fall protection plans shall be described by the General Contractor. The consultants will explain project monitoring and testing as may be applicable.
 - d. Review Project Abatement Consultant's abatement requirements to ensure all abatement, containment, cleanup, and safety precautions are followed at all areas where asbestos containing, lead paint, or other hazardous materials are known, discovered, or suspected.
 - e. Review and finalize the General Contractor's Preliminary construction schedule related to fenestration Installation work, including the General Contractor's plan for coordination or the work of the various trades involved, and other items/ events impacting the Work. The contractor shall furnish a quality control plan for the Aluminum fenestration installation, including protection measures for the stored materials, installed components, property, building, and grounds, etc.
 - f. Review material(s) availability and the procurement of materials(s) and equipment yet to be delivered, material and equipment storage locations, and facilities needed to make continuous progress and avoid delays.
 - g. Review the Aluminum Fenestration installation subcontractor's supervisory and lead personnel, including cell phone numbers and emergency contact information. Equipment, power needs, any temporary facilities required for continuous Work progress and avoidance of delays will also be reviewed.
 - h. Review, discuss, and coordinate the interrelationship of Aluminum fenestration with other exterior wall components. Include provisions for anchoring, flashing, weeping, sealing perimeters, and protecting finishes.
 - i. Review and discuss the sequence of work required to construct a watertight and weather-tight exterior building envelope.
 - j. Inspect and discuss the condition of substrate and other preparatory work performed by other trades.
 - k. Review Aluminum fenestration system and building protection requirements for construction period extending beyond fenestration installation, through final clean-

up and removal of all construction materials, demolished materials, and surplus materials, and review requirements for leak free terminations and tie-offs.

- l. Tour representative areas of the building, review and discuss scope of work for Aluminum fenestration installation, and related work. Review Alternated accepted by Owner related to the Project. As well as other preparatory work that may be performed by other trades.
- m. Review weather and forecast weather conditions, and discuss protection and procedures for coping with unfavorable conditions, emergencies, and other potential circumstances including possibility of temporary protection of buildings.

1.04 SUBMITTALS

A. See Section 01 33 10 Submittals, for submittal procedures.

B. ACTION SUBMITTALS

1. Installation of fenestration shall not commence until complete submittal package for storefronts are reviewed and approved by the Project Architect[RS1].
2. Product Data: Submit Manufacturer's descriptive technical literature, data sheets, and installation instructions, including but not limited to:
 - a. Provide clear technical information regarding model numbers, series numbers, types, sizes, all accessories, and all other pertinent information
 - b. Construction details, material descriptions, fabrication methods, dimensions of individual components and profiles, hardware, and operating instructions for each type of storefront indicated.
 - c. Submit color of Aluminum frame for review and approval by Owner, and Architect[RS2].
 - d. Licensed Structural Engineer stamped wind design pressure calculations indicating fenestration units and their attachment to building meet International Building Code Requirements[RS3].
3. Shop Drawings: Include plans, elevations, sections, details, hardware, accessories, attachment to other Work, and operational clearances. Include dimensions, relations to construction of adjacent work, air seal and weather seal to adjacent construction, component anchorage/ fastenings and locations, anchor/ fastening intervals, flashing details, methods and materials, and hardware details. Specifically include the following:
 - a. Fastening requirements, anchorage requirements, and rough opening requirement. Attachment details.
 - b. Mullion details, including integral reinforcement and stiffeners.
 - c. Fenestration schedule
 - d. Joinery Details
 - e. Expansion provisions
 - f. Weather stripping and gasketing details.
 - g. Fenestration rough opening flashing, sheet metal sill and head flashing, and associated flexible flashings.
 - h. Written certificate verifying specified flashing and sill pan is acceptable to Fenestration Manufacturer and will not negatively impact the Manufacturer's warranty.
 - i. Thermal break details
 - j. Glazing details.

- k. Stops, fasteners, and all other accessories
- 4. Samples for each exposed product and for each color specified, 12-inch long section with weather stripping, glazing bead, and factory applied color finish.
- 5. Samples for Verification:
 - a. Exposed finishes: 2" by 4" in color and finish selected by Owner/ Architect.
 - b. Exposed Hardware: Full Size units.
- C. INFORMATION SUBMITTALS
 - 1. Qualification Data: For installer, manufacturer and testing agency.
 - a. Manufacturer shall provide written documentation certifying that storefront assemblies have been tested, and meet specific structural and water penetration requirements, and all design requirements specified and drawn for Project.
 - i. Muller assemblies shall be tested according to AAMA 450 Option 1
 - 2. Published Maintenance Data: For all fenestration types.
 - 3. Qualification Data" For manufacturer and Installer.
 - 4. Sample Warranties: For manufacturer's warranties.
- D. CLOSEOUT SUBMITTALS
 - 1. Maintenance Data: For finishes, weather stripping, operable panels, and operating hardware to include in maintenance manuals.

1.05 QUALITY CONTROL

- A. Contractor Requirements:
 - 1. Contractor shall provide experienced supervisors (i.e., Superintendent and Foreperson) and personnel (i.e., crew) to perform the work, who are trained in the application of the materials and procedures specified in this Specification. Contractor shall provide documentation from the Manufacturer that the contractor meets experience and training requirement for the specified system. Contractor shall maintain on-site supervision continuously to assure on going quality control for superior quality application.
 - 2. Contractor must have minimum five (5) years experience and specialize in installing Aluminum framed fenestration.
 - 3. The contractor shall be responsible for the quality control of all of their own work, as well as the work performed by the subcontractors working under this Specification, and/ or related specification which is considered part of the Project Contract.
 - 4. Contractor shall notify the Architect/ Consultant of any conflicts that may result in a deviation from the Manufacturer's Specifications, Industry standards, code compliance, job safety, or function as a result of the Project scope of Work, Specifications, and/ or Project Drawings.
 - 5. If the Architect, Consultant and/ or Specified Manufacturer determine that the quality of work does not conform to the Specifications, and Project drawings, and /or Manufacturer's requirements, as well as Industry Standards, the Contractor must correct all deficiencies and advise the Architect Consultant and Manufacturer of the corrective actions taken.

6. Contractor must demonstrate the ability to perform the work in a quality, timely manner with minimum noise and disruption to or impact on Owners, Guests, Employees, Patrons, and the Public.
 7. No modification to the Specifications, Project Drawings or substitutions of specified products shall be made without direct approval by the Project Architect. Contractor shall provide consultant with a written request for review and potential approval.
- B. Manufacturer's Responsibilities:
1. Manufacturer capable of fabricating extruded Aluminum framed fenestration that meets or exceeds performance requirements indicated and of documenting this performance by inclusion in lists and by labels, test reports, and calculations
 2. Demonstrate a minimum of ten (10) years of successful performance on similar projects:
 3. Manufacturer's Technical services representatives shall be available for technical information and project-site meetings, and be thoroughly experienced with the products to be installed, installation requirements and practices, quality control of the installation.
 4. Prior installation, Manufacturer shall provide any and all published special considerations for the suitability, installation, use, and maintenance of their Product(s) in the geographical area and climate where construction will take place.
- C. Source Limitations: Single source responsibility
1. Obtain extruded aluminum-framed fenestration system from single source from single manufacturer.

1.06 QUALITY ASSURANCE

- A. The General Contractor and Subcontractor shall be responsible for complete, watertight, and weatherproof building envelope systems and assemblies. The contractor shall establish and follow best practices for the trade and of quality-control and quality assurance to assure each and every building envelope systems successful completion.
- B. On-Site Observation: The Owner reserves the right to have the Consultant perform observation or monitoring of the flashings and fenestration installation. Such observation shall not relieve the Contractor of responsibility for proper execution and thorough completion of the work.
- C. Outstanding items and efforts to resolve them may be reviewed during Construction Progress Meetings. Action Items identified in Field Reports shall be attended to by the Contractor. The Contractor and their Subcontractors shall cooperate fully with the Consultant, the Consultant's Monitors, and all mock-ups and testing.
- D. Performance Testing: Select installed fenestration shall be tested per ASTM E1105 to ensure fully weather tight, leak-free performance. No reduction in test pressure shall be allowed.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to site undamaged in Manufacturer's or sales branch's original, unopened containers and packaging, with labels clearly identifying manufacturer and product name. Include installation instructions.
- B. Handle fenestration to prevent damage to components and to finishes.
- C. Protect fenestration from moisture, construction traffic, full sun, and damage. Store fenestration out of contact with ground, fully upright, and protected from wracking, bending, or other distortion and/ or breakage. Protect fenestration in well-ventilated and covered, dry area. Extruded aluminum framed fenestration systems shall be kept dry until installed and flashed.
- D. Protect window sashes, glazing, frames, and extrusions. Replace units delivered with damaged frames or components. Units with damage to frames are not to be repaired and must be removed from the site and replaced with new.
- E. Protect fenestration from condensation; do not use non-vented plastic or other covering that causes condensation. Provide ¼". Space between units to promote air circulation.

1.08 PROJECT AND ENVIRONMENTAL CONDITIONS

- A. Field Measurements: The Contractor shall verify fenestration rough openings by field measurements before fabrication and indicate measurements on Shop Drawings. The Contractor shall provide the Project Team with a fenestration rough opening schedule that can be used for fenestration manufacture. Verify the size of each individual fenestration system rough opening to ensure the opening is adequate in size to accommodate the manufactured fenestration unit and all flashings and related components.
- B. Ensure substrates are clean, dry, fully prepared, and uncontaminated to allow full and successful bonding of flashing membrane and sealant. Do not install flashings and sealant to damp or wet substrates.
- C. Protect installed fenestration from construction, work of other trades, and weather and moisture, until fenestration are incorporated into complete weather resistive barrier and cladding and the Project is complete.

1.09 MOCK-UPS

- A. Conduct in-situ mock-ups for flashing and installation of fenestration. The mock-ups may be scheduled and conducted to coincide with the Pre-Installation Meeting.
 - 1. Fenestration units shall be installed per Technical Specifications and Contract Drawings, including all rough opening flashing, sheet metal flashing, and sealant. Provide and install all necessary fenestration units, associated materials and components, labor, and services for the successful completion of the mock-ups.
 - 2. Plan, schedule, and execute the mock-ups such that the Owner's Representative, Architect and Consultant are present to observe construction and successful completion of the mock-ups.
 - 3. Construct full scale, in-situ mock-ups, which if accepted, may remain in place.

4. Verify that fenestration utilized in mock-ups conform to the performance requirements specified by this Section.
5. Confirm installation means and methods that will be repeated throughout work of this Section, including sealing of perimeter joint systems, installation of flashings, and primary watertight and secondary water shedding interface with adjacent construction.
6. Conform to Architectural intent and allow for minor adjustments.
7. Location: As directed by Architect and Envelope consultant.
8. Installation of fenestration flashing shall not commence until the mock-ups of each fenestration types are reviewed and approved by the Owner's Representative and Architect.
9. Approved mock-ups shall represent minimum quality required for the Work.
10. The fenestration mock-ups shall be coordinated with required Sealant Pull Testing (See Section 07 92 00 – Sealant) and water spray testing as applicable.

1.10 REGULATORY AGENCY REQUIREMENTS

- A. General: Contractor shall comply with all applicable requirements to ensure the Owners' safety and security as specified herein, and with all applicable Federal, Washington State, and Local City of Bainbridge Island regulations, laws, and ordinances
- B. The Contractor shall comply with current Washington State and City of Bainbridge Island Building Codes. Report and conflicts with Material Manufacturer's installation instructions, Project Specifications, Detail Drawings, and/ or Applicable Codes to the Project Architect prior[RS4] to proceeding with the Work.
- C. The Contractor shall comply with the requirements of State of Washington Department of Industrial Relations, Washington Division of Occupational Safety and Health, Occupational Safety and Health Administration (OSHA), National Industry Occupational and Health (NIOSH), and all local governing authorities (e.g.,) for work place safety.

1.11 SEQUENCING AND SCHEDULING

- A. Deliver to job in time for proper and timely installation.
- B. Coordinate with flashing of fenestration rough openings.
- C. Coordinate with all adjacent trades and systems to allow proper flashing of fenestration rough openings, and proper integration of fenestration rough opening flashing.

1.12 CERTIFICATIONS

- A. Manufacture's Certification that products:
 1. Furnished for the Project meet or exceed specified requirements.
 2. Are suitable for the indicated use.

1.13 MANUFACTURER'S WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace Aluminum fenestration that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Failure to meet performance requirements.
 - b. Structural failures including excessive deflection, water leakage, condensation, and air infiltration.
 - c. Faulty operation of movable sash and hardware.
 - d. Deterioration of materials and finishes beyond normal weathering.
 - e. Corrosion.
 - f. Failure of insulating glass.
 - 2. Warranty Period
 - a. Fenestration Unit: 2 years from date of Substantial Completion.
 - b. Glazing Units: 10 years from date of Substantial Completion.

1.14 GUARANTIES

- A. Contractor's Guarantee:
 - 1. Contractor shall guarantee that all fenestration are installed in accordance with the Project Documents, and will be free from defective workmanship and that the work will remain weatherproof with no premature defects for a period five (5) years from the date of substantial completion in addition to Project Warranty. [RS5][RS6]

PART 2 – PRODUCTS

2.01 MANUFACTURERS

- A. Source Limitations: Obtain Aluminum fenestration from single source from single manufacturer.
- B. Acceptable Manufacturers:
 - 1. Arcadia Architectural Products, Inc., 60 Bonner Street, Stamford, CT. 203-316-8000, fax 203-316-8200
 - 2. Or Approved equal.

2.02 WINDOWS PERFORMANCE REQUIREMENTS

- A. General: Provide fenestration systems capable of complying with performance requirements indicated, based on testing of manufacturer's fenestration systems that are representative of those specified and that are of size indicated.
- B. Manufacturer of Fenestration systems shall comply with ASTM-E331 for water infiltration, ASTM-E283 for air infiltration, ASTM-E330 for structural performance, requirements indicated in AAMA/NWDA/101/1.S.2 for type, grade, and performance class of fenestration required and as to meet the design criteria indicated in this Specification and on the Project Drawings.
 - 1. Fenestration system components to allow for expansion and contraction caused by a cycling temperature range of 180 degrees F without causing detrimental effects to fenestration components, anchorages, other building elements and weather tightness.

2. Design and size members to withstand dead and live, and environmental loads caused by pressure and suction of wind as calculated in accordance with Washington Building Code, Current Edition.
 3. Water entering Joints, condensation occurring in glazing channels, or migrating moisture occurring within fenestration system, shall promptly, and thoroughly drain to the exterior.
- C. Certifications:
1. Provide fenestration units independently tested and certified for air infiltration, water penetration, and structural performance by AAMA, for thermal transmission and solar heat gain performance by NFRC, and insulating glass certified by ASTM E774. Provide testing data for water penetration with air vents open and air vents closed.
 2. Manufacturer shall provide written certification that fenestration assembly has been tested in the configuration that it will be installed in the field, and meets water penetration resistance requirements, per this Section.
- D. Thermal Transmittance: NFRC 100 maximum whole unit U-factor per project documents^[RS7]
- E. Solar Heat Gain Coefficient (SHGC): NFRC 200 maximum whole unit SHGC per project documents^[RS8]
- F. Condensation Resistance Factor (CRF): Provide aluminum fenestration systems tested for thermal performance according to AAMA 1503, showing a CRF of 63 at frame and 56 at glass.
- G. Thermal Movements: Provide aluminum fenestration, including anchorage, that allow for thermal movements resulting from the following maximum change (rang) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change: 120 deg F ambient; 180 deg F material surfaces.

2.03 ALUMINUM FRAMED SLIDING DOOR SYSTEM

- A. Sliding door and Ribbon wall:
1. For use at Ray Williamson Pool, Natatorium area as depicted in the Project Drawings.
 2. Approved Basis of Design Products:
 - a. Arcadia 5000 Series Thermal Heavy Commercial Sliding Doors
 - b. Or Approved Equal.
 3. Operating Types:
 - a. OXXO

2.04 MATERIALS

- A. All doors shall be fabricated from aluminum extrusions of 6063-T5 alloy and temper with a minimum wall thickness of 0.100" for the sill member and a minimum of 0.072" for all other

members, including frame, sash and optional sash dividers. The aluminum shall be free of defects which impair strength and appearance.

- B. Component parts and accessories shall be of aluminum alloy, stainless steel or non-metallic materials, which will neither deteriorate nor promote corrosion.
- C. The thermal break barrier shall provide a thermal separation throughout the perimeter of the frame and sash. The thermal barrier shall be continuous and consist of a low thermal conductive material (polyurethane) poured into a special pocket in the aluminum extrusion that cures hard and strong. The underside of this pocket is then fully “de-bridged” or ripped so as to separate the connected aluminum wall leaving the polyurethane as the only bond between the outside and inside walls of the extrusion. In some instances the underside of this pocket is partially removed in a skipping pattern where every 18-20” of aluminum is fully debridged and in between, a 1-2” bridge in the aluminum remains. This is called “Skip Debridging”. Either method constitutes a “Thermally Broken Product”.
- D. Sill shall have a full-length roll-formed 0.025” thick, stainless steel track cap.
- E. Operable sash shall be equipped with two steel tandem ball bearing (all stainless steel tandem rollers and housings optional).
- F. Locking device Adams-Rite maximum security lock MS+1850 with stainless steel hook bolt standard. Fully Stainless Steel MS 1950 lock available as an option.
- G. Operating panels shall have an extruded 3/4” diameter 8” O.C. aluminum wire pull handle set in black anodize finish – other colors available.
- H. Fixed and/or sliding sash members shall be constructed to allow for either factory or field glazing. Sash glazing shall be accomplished using a “marine” style reusable, wraparound black flexible PVC or EPDM material per commercial standard CS230-60 without the need for separate glazing beads or putty style bedding compounds. The glazing channel shall be provided with the unit for 1” insulating glass.
- I. All assembly and installation screws shall be 18-8 or 410 stainless steel.
- J. Screens made of extruded aluminum frame and screened with 18 x 16 fiberglass mesh.

2.05 GLAZING

- A. Glass and Glazing: Manufacturer’s standard glazing system that produces weather tight seal.
 - 1. Glass: ASTM C1036, Type I, q3, Category II Safety glass complying with testing requirements in 16 CFR 1201.
 - 2. Safety Glazing Labeling: Permanently mark safety glazing with certification label of the SHGC or the manufacturer. Label shall indicate manufacturer’s name, type of glass, thickness, and safety glazing standard with which glass complies.
 - 3. Insulating-Glass Units: ASTM E 2190
 - a. Maximum U-value as required to meet the overall window U-value including glazing and frame listed in the current version of the Washington State Energy Code.

- b. Filling: Fill space between glass lites with argon as required to meet overall window U-value.
- c. Spacer: Extruded thermoplastic butyl with integrated desiccant.
- d. Glazing Gaskets: Gaskets shall be of material and design compatible with adjacent materials and coatings and to neither degrade nor promote corrosion of adjacent Aluminum or other components.
 - (1) "Marine" Style reusable, wraparound black flexible PVC or EPDM material per commercial standard CS2323-60 without the need for separate glazing beads or putty style bedding compounds.
 - (2) Glazing channel for 1" insulated glass^[RS9]

2.06 FINISHES

- A. Finish all exposed areas of aluminum and components as indicated.
 - 1. Fluorocarbon Coating: AAMA 2605.
 - a. Resin: 70% PVDF Kynar 500/Hylar 5000.
 - b. Substrate: cleaned and pretreated with chromium phosphate.
 - c. Primer: Manufacturer's standard resin base compatible coating. Dry film thickness.
 - 1) Extrusion: Minimum 0.20 mil.
 - d. Color Coat: 70% PVDF, dry film thickness.
 - 1) Extrusion: 1.0 mil.
 - e. Color:
 - 1) Dark Bronze
 - f. Acceptable Coatings Manufacturers:
 - 1) PPG Industries, Inc.
 - 2) Valspar Corporation

2.07 ACCESSORIES

- A. Fasteners, screws, and internal components: aluminum alloy, stainless steel, or non-metallic materials, which will neither deteriorate nor promote corrosion.
- B. Sheet Metal Flashing: Provide and install sill flashing L-metal back dams at sills and head flashings both with fully watertight soldered end dams for fenestration as depicted in Project Drawings.
- C. Shims: Provide and install shims as depicted in Project Drawings and as required by manufacturer. Shims shall be non-compressible inorganic composite shims suitably sized to fit the application.
- D. Sealant and Backer Rod:
 - 1. Provide and install sealant and backer rod at interior air and water seal and exterior perimeter joints as show in Project Drawings, and as specified in Section 07 92 00- Sealants.
 - 2. Sealant Faces: Where extrusion frame shapes do not provide a continuous, watertight flat surface for bonding of sealant joints for exterior or interior air and water seals at jambs and head, provide and install inserts also called caulk stops,

manufactured and provided by fenestration system manufacturer for that purpose and for use with the fenestration system.

- E. Rough Opening Flashing:
 - 1. General: Provide and install reinforced flexible membrane rough opening flashing and stainless steel back dams as shown in Project Drawings, and as specified in this and other Specification Sections.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Inspect fenestration rough openings, substrates, framing members, anchorage, and related conditions, with the Installer and the Installer's foreperson present, for compliance with requirements for installation tolerances before beginning installation. Verify that rough opening size is correct and will accommodate fenestration unit and all associated flashing and components, and adhere to manufacturer's recommendations. Examine rough opening for: level, plumb, and square rough opening, and without twist.
- B. Modify rough opening per Project Details to accommodate associated sheet metal flashings and trim.
- C. Examine wall flashings, water and weather barriers, and other built-in components to ensure a coordinated, watertight aluminum framed storefront installation.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.
 - 1. Start of installation of fenestration system shall indicate that the Installer finds conditions of the rough opening, rough opening flashing, substrates, and framing members to be suitable for successful fenestration installation per Project Documents and Manufacturer's requirements.

3.02 PREPARATION

- A. Prior to installation of fenestration system, protect fenestration, wood, concrete, plaster, and gypsum substrates from weather, moisture, and damage. Install water-resistive barrier system and membrane and sheet metal flashing to clean, dry substrates.
- B. Fully protect installed fenestration from damage during construction and prior to building completion and turn-over.
- C. Prior to installation, remove all adhesive labels and contaminants from frames to ensure full-adhesion of flashing and sealant.

3.03 INSTALLATION

- A. General: Comply with Manufacturer's recommendations, Drawings, and Approved Shop Drawings for installation of fenestration, hardware, rough openings flashing, and other components.

- B. Install fenestration plumb, level, and true to line, without twist, warp or rack of frames or sash. Anchor securely in place. Maintain alignment with adjacent work. Secure assembly to frame opening without distortion or stress.
- C. Install fenestration for proper, easy operation, and leak-free fully weather-tight and secure performance.
- D. Coordinate installation with rough opening and exterior wall flashing and other components of the work. See Drawings for fenestration installation and flashing details prior to fenestration installation.
- E. Do not install fenestration units in rough opening if flashing is damaged. Correct fenestration rough opening flashing prior to unit installation
- F. Install fenestration, and components to drain condensation, water penetrating joints, and moisture migrating within fenestration to exterior.
- G. Set sill members in bed of sealant or with gaskets, as indicated, to provide weather tight installation.
- H. Separate Aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials according to ASTM E 2112 Section 5.12 "Dissimilar Materials."
- I. Rough Opening Flashing: Prior to installation of fenestration, flash fenestration rough opening per Project Drawings for fully leak-free and watertight performance of the installed fenestration assembly.
- J. Attach new fenestration per Manufacturer's written recommendations and Structural Engineer Approved Shop Drawings. Do not place fasteners through rough opening flashing at horizontal surface of sill.
- K. Exterior Sealant Joints: Install properly backed sealant joints at exterior fenestration as shown in Project Drawings.
 - 1. Install backer rod between fenestration frame and membrane flashed rough opening framing. Where sufficient clearance does not exist to install back rod, install bond breaker tape as specified in Section 07 92 00 – Joint Sealants.
 - 2. Install sealant joint at fenestration perimeter per Section 07 92 00 – Joint Sealants. Ensure joint is continuous and watertight. Allow no air leakage around the fenestration.
- L. Interior Perimeter Air Seal: Install continuous sealant joint at interior perimeter of fenestration.
 - 1. Install backer rod between fenestration frame and rough opening flashing.
 - 2. Install continuous sealant joint at fenestration perimeter. Ensure that joint is continuous, watertight, and does not allow air leakage around the fenestration.

3.04 TOLERANCES

- A. Maximum Variation from Level or Plumb: 1/16 inches every 3 ft (1.5 mm/m) non-cumulative or 1/8 inches per 8 ft (3 mm/3 m), whichever is less.

3.05 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for independent field testing and inspection requirements, and requirements for monitoring quality of specified product installations.
- B. Repair or replace fenestration components that have failed designated field testing, and retest to verify performance complies with specified requirements.

3.06 CLEANING

- A. Refer to Section 01 74 19 - Construction Waste Management and Disposal, for additional requirements.
- B. Lubricate hardware and moving parts.
- C. Adjust operating sashes and hardware for a tight fit at contact points and weather stripping for smooth operation and weather tight closure.
- D. Adjust hardware for proper alignment, smooth operation, and proper latching without unnecessary force or excessive clearance.
- E. Clean exposed surfaces immediately after installing fenestration. Prevent damage to protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.
 - 1. Keep protective films and covering in place until final cleaning.
- F. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.[RS10]
- G. Protect fenestration surfaces from contact with contaminating substances resulting from construction operations. If contaminating substances do contact fenestration surfaces, remove contaminants immediately according to manufacturer's written instructions.
- H. Replace units when repair is unsatisfactory to the Consultant or Owner, or is impractical.

3.07 SCHEDULE

Type C: (2) 18'0 x 8'0" (verify in field); Factory Glazed, OXXO system

END OF SECTION

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

- A. Project Drawings and general provisions of the Construction Contract, including General and Supplementary Conditions, Division 01 Specification Sections and bidding requirements, apply to the work of this Section.
- B. Technical publications, standards, and reference documents as outlined in individual Technical Specification Sections and as indicated on the Project Drawings.

1.02 SUMMARY

- A. General: Furnish all labor, materials, equipment, and services necessary and incidental to execution and completion of removal of existing fenestration system and installation of new, exterior and interior Aluminum Framed fenestration systems according to the Contract Documents, this Section, and the Project Drawings where indicated. Installation shall coordinate with fenestration rough opening flashings, sealants, and shall be long-term weather proof, with all associated accessories as necessary for thorough water-tight and weather-proof installation of new extruded aluminum fenestration.
- B. Section Includes, aluminum framed glass storefront fenestration and entrance door systems at Ray Williamson Pool Natatorium area scheduled for removal and replacement.
- C. Aluminum-Framed Storefront
 - 1. Arcadia, Inc., AG451T Series, 2" x 4-1/2" Thermally broken; center glazed system, screw spline, shear block, compensating stick or punched opening fabrication for 1" glass. At exterior.
 - 2. Arcadia, Inc., AR450 Series, 2" x 4½" Non-Thermal; center glazed, screw spline, shear block, compensating stick or punched opening fabrication for ¾" glass. At Interior.
 - 3. Arcadia, Inc., MS362 Series, Medium Stile Door 1-3/4". At exterior and interior.
- D. Related Sections:
 - 1. Divisions 00 and 01 – All related Sections
 - 2. Section 02 41 19 - Selective Demolition
 - 3. Section 06 10 00 – Rough Carpentry
 - 4. Section 07 92 00 – Joint Sealants
 - 5. Section 08 32 13 Aluminum Framed Sliding Glass Door
 - 6. Section 08 80 00 – Glazing

1.03 BENCHMARK REFERENCES AND STANDARDS

- A. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
 - 1. 2018 International Building code (IBC), as amended by the State of Washington
 - 2. 2018 Washington State Energy code.
- B. ASTM-American Society for Testing and Materials:

1. ASTM E 283-04 "Standard Test Method for Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors."
 2. ASTM E330-02 "Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference."
 3. ASTM E 547 "Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Cyclic Static Air Pressure Differential."
 4. ASTM G85 Modified Salt Spray (Fog) Testing.
 5. ASTM E774-00 "Specification for Sealant Insulating Glass Units."
 6. ASTM E-1886-02 "Standard for Testing Windows and Doors for Cyclic Wind Pressures."
 7. ASTM E 1996-02 "Standards for Testing Windows and Doors for Windborne Debris (large Missile and small Missile)."
 8. ASTM C1193, Standard Guide for Use of Joint Sealants.
 9. ASTM E241, Standard Guide for Limiting Water Induced Damage of Buildings.
- C. AAMA- America Architectural Manufacturers Association:
1. AAMA /NWWDA 101/ I.S.2-97 "Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors."
 2. AAMA 503-03 "Voluntary Specification for Field Testing of Windows and Sliding Glass Doors. "No reduction allowed.
 3. AAMA 611-98 "Voluntary Specification for Anodized Architectural Aluminum."
 4. AAMA 701-00 "Voluntary Specification for Pile Weather Stripping."
 5. AAMA 800-92 "Voluntary Specification for Test Methods for Sealants,"
 6. AAMA 906-96 "Voluntary Specification for Sliding Glass Door Roller Assemblies."
 7. AAMA 1503-98 "Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, and Doors, and Glazed Wall Sections."

D. AA – Aluminum Association

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Pre-installation Meeting: Convene before starting work of this section. Conduct conference at Project site with location as mutually agreed by owner's Project manager, General Contractor, Project Architect.
- B. Purpose and Agenda
1. Before the scheduled commencement of the Aluminum Framed storefront/ Entrance fenestration installation and associated flashing work, the Fenestration Installation Subcontractor, and related subcontractors (e.g., sheet metal subcontractors, etc.), and lead installers (foreperson) of each component of associated work, and other work in and around fenestration installation which must precede or follow fenestration installation shall attend a pre-Installation conference.
 2. The meeting shall be conducted by the General Contractor and shall be attended by the Project Architect, Aluminum Fenestration Installation Subcontractor, and other directly concerned with the installation of the materials and performance of the Work including Aluminum Fenestration Manufacturer(s), other subcontractors, insurers, test agencies, and governing authorities. After the meeting, the Architect will furnish Pre-Installation Meeting Minutes to the parties in attendance. At the meeting, the group shall review

the materials specified and procedures related to the Fenestration Installation Work, including but not necessarily limited to the following:

- a. Review requirements of Project Documents (Including Specifications and Drawings) as part of the Contract and submittals (both completed and yet to be submitted)
- b. Review governing regulations and requirements for insurance, bonding, and certification. General safety and fall protection plans shall be described by the General Contractor. The consultants will explain project monitoring and testing as may be applicable.
- c. Review Project Abatement Consultant's abatement requirements to ensure all abatement, containment, cleanup, and safety precautions are followed at all areas where asbestos containing, lead paint, or other hazardous materials are known, discovered, or suspected.
- d. Review and finalize the General Contractor's Preliminary construction schedule related to fenestration Installation work, including the General Contractor's plan for coordination or the work of the various trades involved, and other items/ events impacting the Work. The contractor shall furnish a quality control plan for the Aluminum fenestration installation, including protection measures for the stored materials, installed components, property, building, and grounds, etc.
- e. Review material(s) availability and the procurement of materials(s) and equipment yet to be delivered, material and equipment storage locations, and facilities needed to make continuous progress and avoid delays.
- f. Review the Aluminum Fenestration installation subcontractor's supervisory and lead personnel, including cell phone numbers and emergency contact information. Equipment, power needs, any temporary facilities required for continuous Work progress and avoidance of delays will also be reviewed.
- g. Review, discuss, and coordinate the interrelationship of Aluminum fenestration with other exterior wall components. Include provisions for anchoring, flashing, weeping, sealing perimeters, and protecting finishes.
- h. Review and discuss the sequence of work required to construct a watertight and weather-tight exterior building envelope.
- i. Inspect and discuss the condition of substrate and other preparatory work performed by other trades.
- j. Review Aluminum fenestration system and building protection requirements for construction period extending beyond fenestration installation, through final clean-up and removal of all construction materials, demolished materials, and surplus materials, and review requirements for leak free terminations and tie-offs.
- k. Tour representative areas of the building, review and discuss scope of work for Aluminum fenestration installation, and related work. As well as other preparatory work that may be performed by other trades.
- l. Review weather and forecast weather conditions, and discuss protection and procedures for coping with unfavorable conditions, emergencies, and other potential circumstances including possibility of temporary protection of buildings.

1.05 SUBMITTALS

- A. See Section 01 33 10 Submittals, for submittal procedures.

- B. Installation of fenestration shall not commence until complete submittal package for storefronts are reviewed and approved by the Project Architect.
- C. Product Data: Submit Manufacturer's descriptive technical literature, data sheets, and installation instructions, including but not limited to:
 - 1. Provide clear technical information regarding model numbers, series numbers, types, sizes, all accessories, and all other pertinent information
 - 2. Construction details, material descriptions, fabrication methods, dimensions of individual components and profiles, hardware, and operating instructions for each type of storefront indicated.
 - 3. Submit color of Aluminum frame for review and approval by Owner, and Architect.
 - 4. Licensed Structural Engineer stamped wind design pressure calculations indicating fenestration units and their attachment to building meet International Building Code Requirements.
- D. Shop Drawings: Include plans, elevations, sections, details, hardware, accessories, attachment to other Work, and operational clearances. Include dimensions, relations to construction of adjacent work, air seal and weather seal to adjacent construction, component anchorage/ fastenings and locations, anchor/ fastening intervals, flashing details, methods and materials, and hardware details. Specifically include the following:
 - 1. Fastening requirements, anchorage requirements, and rough opening requirement. Attachment details.
 - 2. Mullion details, including integral reinforcement and stiffeners.
 - 3. Fenestration schedule
 - 4. Joinery Details
 - 5. Weather stripping and gasketing details.
 - 6. Fenestration rough opening flashing, sheet metal sill and head flashing, and associated flexible flashings.
 - 7. Written certificate verifying specified flashing and sill pan is acceptable to Fenestration Manufacturer and will not negatively impact the Manufacturer's warranty.
 - 8. Thermal break details
 - 9. Glazing details.
 - 10. Stops, fasteners, and all other accessories
- E. Samples for Verification:
 - 1. Fenestration corner sample
 - 2. Consultant reserves the right to require additional samples that show fabrication techniques, workmanship, and design or hardware and accessories
 - 3. Exposed finishes: 2" by 4" in color and finish selected by Owner/ Architect.
 - 4. Exposed Hardware: Full Size units.

1.06 QUALITY CONTROL

- A. Contractor Requirements:
 - 1. Contractor shall provide experienced supervisors (i.e., Superintendent and Foreperson) and personnel (i.e., crew) to perform the work, who are trained in the application of the materials and procedures specified in this Specification. Contractor shall provide documentation from the Manufacturer that the contractor meets experience and

training requirement for the specified system. Contractor shall maintain on-site supervision continuously to assure on going quality control for superior quality application.

2. Contractor must have minimum five (5) years experience and specialize in installing Aluminum framed fenestration.
3. The contractor shall be responsible for the quality control of all of their own work, as well as the work performed by the subcontractors working under this Specification, and/ or related specification which is considered part of the Project Contract.
4. Contractor shall notify the Architect/ Consultant of any conflicts that may result in a deviation from the Manufacturer's Specifications, Industry standards, code compliance, job safety, or function as a result of the Project scope of Work, Specifications, and/ or Project Drawings.
5. If the Architect, Consultant and/ or Specified Manufacturer determine that the quality of work does not conform to the Specifications, and Project drawings, and /or Manufacturer's requirements, as well as Industry Standards, the Contractor must correct all deficiencies and advise the Architect Consultant and Manufacturer of the corrective actions taken.
6. Contractor must demonstrate the ability to perform the work in a quality, timely manner with minimum noise and disruption to or impact on Owners, Guests, Employees, Patrons, and the Public.
7. No modification to the Specifications, Project Drawings or substitutions of specified products shall be made without direct approval by the Project Architect. Contractor shall provide consultant with a written request for review and potential approval.

1.07 SYSTEM DESCRIPTION

- A. General: In addition to requirements shown or specified, comply with:
 1. Applicable provisions of AAMA Aluminum Storefront and Entrance Manual for design, materials, fabrication and installation of component parts.
- B. Design Requirements:
 1. Arcadia AG451T Series is a framing system that provides for flush glazing on all sides without projected stops, with glass in the center of the frame. Framing system suitable for outside or inside glazing.
 2. Arcadia AR450 Series is a framing system suitable for outside or inside glazing.
 3. Arcadia MS362 Series Medium Stile Entrance is a single source package of door, doorframe and hardware that is engineered for moderate to high traffic.
- C. Performance Requirements:
 1. Limit air leakage through assembly to 0.06 CFM/min/sq. ft. ($.00003 \text{ m}^3/\text{sm}^2$) of wall area at 6.24 PSF (300 Pa) as measured in accordance with ASTM E283.
 2. Water Resistance: No water leakage when measured in accordance with ASTM E331 with a static test pressure of 8 PSF(383 Pa) for AG451T and 10 PSF(480 Pa) for AR450.
 3. Limit mullion windload deflection of L/175 with full recovery of glazing materials, when measured in accordance with ASTM E 330.
 4. System shall not deflect more than 1/8" at the center point, or 1/16" at the center point of a horizontal member, once deadload points have been established.

5. System shall accommodate expansion and contraction movement due to surface temperature differential of 180 degrees F.
6. Seismic testing shall conform to AAMA recommended static test method for evaluating performance of curtain walls and storefront wall systems due to horizontal displacements associated with seismic movements and building sway.
7. Thermal Performance – When tested in accordance with AAMA 1503.1 the following results should be attained: U-Maximum .63/CRF – minimum of 59.
8. National Fenestration Rating Council (NFRC) specific application evaluation.
9. Each assembly tested by a recognized testing laboratory or agency in accordance with specified test methods.
 - a. Tested by the dual moment corner joint strength test.

1.08 QUALITY ASSURANCE

- A. The General Contractor and Subcontractor shall be responsible for complete, watertight, and weatherproof building envelope systems and assemblies. The contractor shall establish and follow best practices for the trade and of quality-control and quality assurance to assure each and every building envelope systems successful completion.
- B. On-Site Observation: The Owner reserves the right to have the Consultant perform observation or monitoring of the flashings and fenestration installation. Such observation shall not relieve the Contractor of responsibility for proper execution and thorough completion of the work.
- C. Single Source Responsibility:
 1. Obtain entrances, storefronts, ribbon walls, window walls, curtain walls, window systems, and finish through one source from a single manufacturer.
 2. Provide test reports from AAMA accredited laboratories certifying the performances as specified in 1.07.

1.09 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to site undamaged in Manufacturer's or sales branch's original, unopened containers and packaging, with labels clearly identifying manufacturer and product name. Include installation instructions.
- B. Protect fenestration from moisture, construction traffic, and full sun. Store fenestration out of contact with ground, fully upright, and protected from wracking, bending, or other distortion and/ or breakage. Protect fenestration in well-ventilated and covered, dry area. Extruded aluminum framed fenestration systems shall be kept dry until installed and flashed. Handle fenestration to prevent damage to components and to finishes.
- C. Protect window sashes, glazing, frames, and extrusions. Replace units delivered with damaged frames or components. Units with damage to frames are not to be repaired and must be removed from the site and replaced with new.
- D. Protect fenestration from condensation; do not use non-vented plastic or other covering that causes condensation. Provide ¼". Space between units to promote air circulation.

1.10 PROJECT AND ENVIRONMENTAL CONDITIONS

- A. Hazardous Materials: Prior to removal of existing fenestration or commencement of fenestration related work, ensure that all abatement procedures are executed in strict coordination with all activities.
- B. Field Measurements: The Contractor shall verify fenestration rough openings by field measurements before fabrication and indicate measurements on Shop Drawings. The Contractor shall provide the Project Team with a fenestration rough opening schedule that can be used for fenestration manufacture. Verify the size of each individual fenestration system rough opening to ensure the opening is adequate in size to accommodate the manufactured fenestration unit and all flashings and related components.
- C. Ensure substrates are clean, dry, fully prepared, and uncontaminated to allow full and successful bonding of flashing membrane and sealant. Do not install flashings and sealant to damp no wet substrates.
- D. Protect installed fenestration from construction, work of other trades, and weather and moisture, until fenestration are incorporated into complete weather resistive barrier and cladding and the Project is complete.

1.11 WARRANTY

- A. System shall be warranted against failure and/or deterioration of metals due to manufacturing process for a period Warranty Period of:
 - 1. Fenestration Unit: 2 years from date of Substantial Completion.
 - 2. Glazing Units: 10 years from date of Substantial Completion.
 - 3. Aluminum Finish: 10 years from date of Substantial Completion.
- B. Contractor's Guarantee:
 - 1. Contractor shall guarantee that all fenestration are installed in accordance with the Project Documents, and will be free from defective workmanship and that the work will remain weatherproof with no premature defects for a period five (5) years from the date of substantial completion.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturers:
 - 1. Basis of Design: Arcadia, Inc., 2301 E Vernon, Vernon, CA. Telephone:(323)269-7300
- B. Or approved equal.

2.02 ALUMINUM FRAMED STOREFRONT SYSTEMS

- A. Storefront Fenestration:

1. For use at Ray Williamson Pool Natatorium area as depicted in the Project Drawings.
2. Approved Basis of Design Products:
 - a. Arcadia AG451T Series; 2" x 4 1/2" – exterior
 - b. Arcadia AR450 Series; 2" x 4 1/2" – interior
 - c. Arcadia MS362 Medium stile door; 1-3/4" – exterior and interior
 - 1) Vertical Stiles: 3-1/2 inches.
 - 2) Top Rail: 3-5/8 inches.
 - 3) Bottom Rail: 10/12 inches.
 - 4) Glazing Stops: Square snap-in type for 1 inch infill.
 - 5) Major portions of the door stiles a nominal .125 inches and glass stops .050 inches thick.
3. Or Approved equal.
4. Operating Types: Provide the following operating types in locations indicated on Drawings:

2.03 GLAZING

- A. Glass and Glazing: Manufacturer's standard glazing system that produces weathertight seal.
 1. Glass: ASTM C1036, Type I, q3, Category II Safety glass complying with testing requirements in 16 CFR 1201.
 2. Safety Glazing Labeling: Permanently mark safety glazing with certification label of the SHGC or the manufacturer. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
 3. Insulating-Glass Units: ASTM E 2190
 - a. Maximum U-value as required to meet the overall window U-value including glazing and frame listed in the current version of the Washington State Energy Code.
 - b. Filling: Fill space between glass lites with argon as required to meet overall window U-value.
 - c. Spacer: Extruded thermoplastic butyl with integrated desiccant.
 - d. 'Low-E Coating: Sputtered on second surface and fourth surface.
 - e. Glazing Gaskets: Gaskets shall be of material and design compatible with adjacent materials and coatings and to neither degrade nor promote corrosion of adjacent Aluminum or other components.
 - (1) Compression type design, replaceable, molded or extruded, or ethylene propylene diene monomer (EPDM).
 - (2) Shall be or type that locks securely into the glazing reglet to prevent glazing gaskets from disengaging.

2.04 FRAMING MATERIALS AND ACCESSORIES

- A. Framing members, transition members, mullions, adaptors, and mounting: Extruded 6063-T6 aluminum alloy (ASTM B221 – Alloy G.S. 10a T6).
- B. Screws, fastening devices, and internal components: Aluminum, stainless steel, or zinc-plated steel in accordance with ASTM.A-164. Perimeter anchors shall be aluminum or steel, providing the steel is properly isolated from aluminum.
- C. Glazing Gasket

1. Compression-type design, replaceable, molded or extruded, or ethylene propylene diene monomer (EPDM).
 2. Shall be of type that locks securely into the glazing reglet to prevent glazing gaskets from disengaging.
- D. Sealant and Backer Rod:
1. Provide and install sealant and backer rod at interior air and water seal and exterior perimeter joints as show in Project Drawings, and as specified in Section 07 92 00 - Sealants.
 2. Sealant Faces: Where extrusion frame shapes do not provide a continuous, watertight flat surface for bonding of sealant joints for exterior or interior air and water seals at jambs and head, provide and install inserts also called caulk stops, manufactured and provided by fenestration system manufacturer for that purpose and for use with the fenestration system.

2.05 FINISHES

- A. Finish all exposed areas of aluminum and components as indicated.
1. Fluorocarbon Coating: AAMA 2605.
 - a. Resin: 70% PVDF Kynar 500/Hylar 5000.
 - b. Substrate: cleaned and pretreated with chromium phosphate.
 - c. Primer: Manufacturer's standard resin base compatible coating. Dry film thickness.
 - 1) Extrusion: Minimum 0.20 mil.
 - d. Color Coat: 70% PVDF, dry film thickness.
 - 1) Extrusion: 1.0 mil.
 - e. Color:
 - 1) AR450 - Silver Grey
 - 2) AG451T – Dark Bronze
 - 3) MS362 Series - Silver Grey at interior double leaf; Dark Bronze at exterior single leaf.
 - f. Acceptable Coatings Manufacturers:
 - 1) PPG Industries, Inc.
 - 2) Valspar Corporation

2.06 HARDWARE

- A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. **Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process.** Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.
- B. Entrance door hardware furnished and installed by the door manufacturer, and include the following standard hardware:
1. Hinge: Arcadia standard continuous hinge – Aluminum finish
 2. Door closer: Corbin Russwin Hardware (RU) - DC8000 Series or Norton Rixson (NO) - 7500 Series

3. Exit indicator: Arcadia exit indicator/ header sign – Aluminum finish
4. Lock: Arcadia Adams Rite MS + 1890 Deadlock/Latch Lock - Aluminum finish
5. Cylinder - Cylinder with interchangeable cores to match Owner standards.
6. Push/Pull hardware - Arcadia Radius Push/Pull Set.
7. Threshold: Extruded Aluminum with ribbed surface.
8. Sill Sweeps: Brush strip (concealed).
9. Panic Devices: (Cross, touch bar, flush mid panel.)

2.07 SYSTEM FABRICATION

- A. Continuous sub-sill shall be provided under sill members to collect water infiltration and divert from the interior of the system.
- B. Framing members shall be internally reinforced and secured at head and sill as necessary for structural performance requirements, for hardware attachment, and as indicated.
- C. Fasteners shall be so located as to ensure concealment from view in the final assembly.
- D. Stiles and rails shall be tubular sections accurately joined, flush and hairline at corners with heavy concealed reinforcement brackets secured with machine bolts, with optional MIG weld. Exposed screws not permitted.
- E. Each door leaf equipped with an adjusting mechanism, located in the top rail near the lock stile.
- F. Prepare internal reinforcement for door hardware.
- G. Custom hardware templates and physical hardware must be submitted prior to any fabrication.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Inspect fenestration rough openings, substrates, framing members, anchorage, and related conditions, with the Installer and the Installer's foreperson present, for compliance with requirements for installation tolerances before beginning installation. Verify that rough opening size is correct and will accommodate fenestration unit and all associated flashing and components, and adhere to manufacturer's recommendations. Examine rough opening for: level, plumb, and square rough opening, and without twist.
- B. Examine wall flashings, water and weather barriers, and other built-in components to ensure a coordinated, watertight aluminum framed storefront installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.
 1. Start of installation of fenestration system shall indicate that the Installer finds conditions of the rough opening, rough opening flashing, substrates, and framing

members to be suitable for successful fenestration installation per Project Documents and Manufacturer's requirements.

3.02 INSTALLATION

- A. General: Comply with Manufacturer's recommendations, Drawings, and Approved Shop Drawings for installation of fenestration, hardware, rough openings flashing, and other components.
- B. Install fenestration plumb, level, and true to line, without twist, warp or rack of frames or sash. Anchor securely in place. Maintain alignment with adjacent work. Secure assembly to frame opening without distortion or stress.
- C. Install fenestration for proper, easy operation, and leak-free fully weather-tight and secure performance.
- D. Set sill members in bed of sealant or with gaskets, as indicated, to provide weathertight installation.
- E. Rough Opening Flashing: Prior to installation of fenestration, flash fenestration rough opening per Project Drawings for fully leak-free and watertight performance of the installed fenestration assembly.
- F. Attach new fenestration per Manufacturer's written recommendations and Structural Engineer Approved Shop Drawings. Do not place fasteners through rough opening flashing at horizontal surface of sill.
- G. Exterior Sealant Joints: Install properly backed sealant joints at exterior fenestration as shown in Project Drawings.
 - 1. Install backer rod between fenestration frame and membrane flashed rough opening framing. Where sufficient clearance does not exist to install back rod, install bond breaker tape as specified in Section 07 92 00 – Joint Sealants.
 - 2. Install sealant joint at fenestration perimeter per Section 07 92 00 – Joint Sealants. Ensure joint is continuous and watertight. Allow no air leakage around the fenestration.
- H. Interior Perimeter Air Seal: Install continuous sealant joint at interior perimeter of fenestration.
 - 1. Install backer rod between fenestration frame and rough opening flashing.
 - 2. Install continuous sealant joint at fenestration perimeter. Ensure that joint is continuous, watertight, and does not allow air leakage around the fenestration.

3.03 TOLERANCES

- A. Maximum Variation from Level or Plumb: 1/16 inches every 3 ft (1.5 mm/m) non-cumulative or 1/8 inches per 8 ft (3 mm/3 m), whichever is less.

3.04 FIELD QUALITY CONTROL

- A. Test the Aluminum storefront for water leaks in accordance with AAMA 501.2. Conduct test in the presence of the Architect.
- B. Repair or replace fenestration components that have failed designated field testing, and retest to verify performance complies with specified requirements.

3.05 CLEANING

- A. Adjust operating sashes and hardware for a tight fit at contact points and weather stripping for smooth operation and weather tight closure.
- B. Adjust hardware for proper alignment, smooth operation, and proper latching without unnecessary force or excessive clearance.
- C. Clean exposed surfaces immediately after installing fenestration. Prevent damage to protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.
 - 1. Keep protective films and covering in place until final cleaning.
- D. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.
- E. Protect fenestration surfaces from contact with contaminating substances resulting from construction operations. If contaminating substances do contact fenestration surfaces, remove contaminants immediately according to manufacturer's written instructions.
- F. Replace units when repair is unsatisfactory to the Consultant or Owner, or is impractical.

SCHEDULE

Type A: (2) Door 1 and 4 - 3'0" x 7'0" (verify in field); Factory Glazed, Thermally broken operable glazed door

Type B: (4) 18'0" x 8'0" (verify in field); Factory Glazed, Fixed storefront

Type D: 18'0" x 9'0" (with Door 9 and 10 6'0" x 7'0" included) (verify in field); Factory Glazed, operable glazed doors and fixed storefront

END OF SECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes commercial door hardware for the following:
 - 1. Swinging doors.
 - 2. Sliding doors.
 - 3. Other doors to the extent indicated.
- B. Door hardware includes, but is not necessarily limited to, the following:
 - 1. Mechanical door hardware.
 - 2. Cylinders specified for doors in other sections.
- C. Related Sections:
 - 1. Division 08 Section Hollow Metal Doors and Frames
 - 2. Division 08 Section Aluminum Storefronts
- D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
 - 1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
 - 2. ICC/IBC - International Building Code.
 - 3. NFPA 70 - National Electrical Code.
 - 4. NFPA 80 - Fire Doors and Windows.
 - 5. NFPA 101 - Life Safety Code.
 - 6. NFPA 105 - Installation of Smoke Door Assemblies.
 - 7. State Building Codes, Local Amendments.
- E. Standards: All hardware specified herein shall comply with the following industry standards as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:
 - 1. ANSI/BHMA Certified Product Standards - A156 Series.
 - 2. UL10C - Positive Pressure Fire Tests of Door Assemblies.
 - 3. ANSI/UL 294 - Access Control System Units.
 - 4. UL 305 - Panic Hardware.
 - 5. ANSI/UL 437- Key Locks.

1.03 SUBMITTALS

- A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.
- B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing, fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 - 1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
 - 2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
 - 3. Content: Include the following information:
 - a. Type, style, function, size, label, hand, and finish of each door hardware item.
 - b. Manufacturer of each item.
 - c. Fastenings and other pertinent information.
 - d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
 - e. Explanation of abbreviations, symbols, and codes contained in schedule.
 - f. Mounting locations for door hardware.
 - g. Door and frame sizes and materials.
 - h. Warranty information for each product.
 - 4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
- C. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.
- D. Informational Submittals:
 - 1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.
- E. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Procedures.

1.04 QUALITY ASSURANCE

- A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.
- B. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).
- C. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- D. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.
- E. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.
 - 1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
- F. Each unit to bear third party permanent label indicating compliance with the referenced testing standards.
- G. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:
 - 1. Function of building, purpose of each area and degree of security required.
 - 2. Plans for existing and future key system expansion.
 - 3. Requirements for key control storage and software.
 - 4. Installation of permanent keys, cylinder cores and software.
 - 5. Address and requirements for delivery of keys.
- H. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.
 - 1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment

of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.

2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
 3. Review sequence of operation narratives for each unique access controlled opening.
 4. Review and finalize construction schedule and verify availability of materials.
 5. Review the required inspecting, testing, commissioning, and demonstration procedures
- I. At completion of installation, provide written documentation that components were applied according to manufacturer's instructions and recommendations and according to approved schedule.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.
- B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.
- C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.06 COORDINATION

- A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.
- B. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.07 WARRANTY

- A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

- B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:
 - 1. Structural failures including excessive deflection, cracking, or breakage.
 - 2. Faulty operation of the hardware.
 - 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 4. Electrical component defects and failures within the systems operation.
- C. Warranty Period: Unless otherwise indicated, warranty shall be one year from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 SCHEDULED DOOR HARDWARE

- A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.
- B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:
 - 1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.
- C. Please note that ASSA ABLOY is transitioning the Yale Commercial brand to ASSA ABLOY ACCENTRA. This affects only the brand name; the products and product numbers will remain unchanged. The brand transition is expected to be complete in or about May of 2024, and products shipping after that time will be branded ASSA ABLOY ACCENTRA.
- D. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.02 BUTT HINGES

- A. Hinges: ANSI/BHMA A156.1 butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.
 - 1. Quantity: Provide the following hinge quantity:
 - a. Two Hinges: For doors with heights up to 60 inches.
 - b. Three Hinges: For doors with heights 61 to 90 inches.

- c. Four Hinges: For doors with heights 91 to 120 inches.
 - d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.
- 2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:
 - a. Widths up to 3'0": 4-1/2" standard or heavy weight as specified.
 - b. Sizes from 3'1" to 4'0": 5" standard or heavy weight as specified.
- 3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:
 - a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
 - b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.
- 4. Hinge Options: Comply with the following:
 - a. Non-removable Pins: With the exception of electric through wire hinges, provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out-swinging lockable doors.
- 5. Manufacturers:
 - a. McKinney (MK) - TA/T4A Series, 5-knuckle.

2.03 DOOR OPERATING TRIM

- A. Door Push Plates and Pulls: ANSI/BHMA A156.6 door pushes and pull units of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.
 - 1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
 - 2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
 - 3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
 - 4. Pulls, where applicable, shall be provided with a 10" clearance from the finished floor on the push side to accommodate wheelchair accessibility.
 - 5. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets.
 - 6. Manufacturers:
 - a. Rockwood (RO).

2.04 CYLINDERS AND KEYING

- A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.
 - 1. Manufacturers:
 - a. Match Existing, Field Verify.

- B. Cylinder Types: Original manufacturer cylinders able to supply the following cylinder formats and types:
 - 1. Threaded mortise cylinders with rings and cams to suit hardware application.
 - 2. Rim cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
 - 3. Bored or cylindrical lock cylinders with tailpieces as required to suit locks.
 - 4. Tubular deadlocks and other auxiliary locks.
 - 5. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
 - 6. Keyway: Manufacturer's Standard.
- C. Large Format Interchangeable Cores: Provide removable cores (LFIC) as specified, core insert, removable by use of a special key, and for use with only the core manufacturer's cylinder and door hardware.
- D. Keying System: Each type of lock and cylinders to be factory keyed.
 - 1. Supplier shall conduct a "Keying Conference" to define and document keying system instructions and requirements.
 - 2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
 - 3. New System: Key locks to a new key system as directed by the Owner.
- E. Key Quantity: Provide the following minimum number of keys:
 - 1. Change Keys per Cylinder: Two (2)
 - 2. Master Keys (per Master Key Level/Group): Five (5).
 - 3. Construction Keys (where required): Ten (10).
- F. Construction Keying: Provide construction master keyed cylinders.
- G. Key Registration List (Bitting List):
 - 1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
 - 2. Provide transcript list in writing or electronic file as directed by the Owner.

2.05 MORTISE LOCKS AND LATCHING DEVICES

- A. Mortise Locksets, Grade 1 (Heavy Duty): Provide ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed mortise locksets. Listed manufacturers shall meet all functions and features as specified herein.
 - 1. Manufacturers:
 - a. Corbin Russwin Hardware (RU) – ML 2000 Series.
 - b. No substitutions.

2.06 LOCK AND LATCH STRIKES

- A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:
 - 1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
 - 2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
 - 3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
 - 4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.
- B. Standards: Comply with the following:
 - 1. Strikes for Mortise Locks and Latches: BHMA A156.13.
 - 2. Strikes for Bored Locks and Latches: BHMA A156.2.
 - 3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
 - 4. Dustproof Strikes: BHMA A156.16.

2.07 CONVENTIONAL EXIT DEVICES

- A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:
 - 1. Exit devices shall have a five-year warranty.
 - 2. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
 - 3. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer's catalog and template book for specific requirements.
 - 4. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.
 - 5. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.
 - 6. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.
 - a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
 - b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.
 - 7. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.

8. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2" wide stiles.
 9. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
 10. Rail Sizing: Provide exit device rails factory sized for proper door width application.
 11. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.
- B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed exit devices. Listed manufacturers shall meet all functions and features as specified herein.
1. Manufacturers:
 - a. Corbin Russwin Hardware (RU) – ED5000 Series.
 - b. No substitutions.

2.08 DOOR CLOSERS

- A. All door closers specified herein shall meet or exceed the following criteria:
1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers.
 2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
 3. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.
 4. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
 5. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
 6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.
- B. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard..
1. Manufacturers:
 - a. Corbin Russwin Hardware (RU) - DC8000 Series.
 - b. Norton Rixson (NO) - 7500 Series.

2.09 ARCHITECTURAL TRIM

A. Door Protective Trim

1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.
2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1" LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.
3. Where plates are applied to fire rated doors with the top of the plate more than 16" above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer's catalog and template book for specific requirements for size and applications.
4. Protection Plates: ANSI/BHMA A156.6 protection plates (kick, armor, or mop), fabricated from the following:
 - a. Stainless Steel: 300 grade, 050-inch thick.
5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.
6. Manufacturers:
 - a. Rockwood (RO).

2.10 DOOR STOPS AND HOLDERS

- A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.
- B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.
1. Manufacturers:
 - a. Rockwood (RO).

2.11 ARCHITECTURAL SEALS

- A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.
- B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.
1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

- C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.
 - 1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NPFA 252, Standard Methods of Fire Tests of Door Assemblies.
- D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.
- E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.
- F. Manufacturers:
 - 1. Pemko (PE).

2.12 FABRICATION

- A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.13 FINISHES

- A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.
- B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware
- C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.02 PREPARATION

- A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.
- B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.03 INSTALLATION

- A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.
 - 1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.
- B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
 - 1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
 - 2. DHI TDH-007-20: Installation Guide for Doors and Hardware.
 - 3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
 - 4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.
- C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
- D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."
- E. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.04 FIELD QUALITY CONTROL

- A. Field Inspection (Punch Report): Reference Division 01 Sections "Closeout Procedures". Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.

1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

3.05 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.06 CLEANING AND PROTECTION

- A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.
- B. Clean adjacent surfaces soiled by door hardware installation.
- C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.07 DEMONSTRATION

- A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.08 DOOR HARDWARE SETS

- A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.
 1. Quantities listed are for each pair of doors, or for each single door.
 2. The supplier is responsible for handling and sizing all products.
 3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.
 4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.
- B. Manufacturer's Abbreviations:
 1. MK – McKinney
 2. RU - Corbin Russwin

3. AD - Adams Rite
4. RO – Rockwood
5. PE – Pemko
6. SU - Securitron

Hardware Sets

Set: 1.0

Doors: 1, 2

3	Hinge, Full Mortise	TA2314 x NRP	US32D	MK
1	Entrance Lock	ML2054 PSA C6	630	RU
1	Surface Closer	7500	689	NO
1	Kick Plate	K1050 __X1.5LDW CSK BEV	US32D	RO
1	Wall Stop	409	US32D	RO
1	Gasketing	S44GR		PE

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

- A. Project Drawings and general provisions of the Construction Contract, including General and Supplementary Conditions, Division 01 Specification Sections and bidding requirements, apply to the work of this Section.
- B. Technical publications, standards, and reference documents as outlined in individual Technical Specification Sections and as indicated on the Project Drawings

1.02 SUMMARY

- A. Section includes:
 - 1. Glass.
 - 2. Glazing compounds and accessories.

1.03 RELATED REQUIREMENTS

- A. Section 08 41 13 – Aluminum Storefront

1.04 REFERENCE STANDARDS

- A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; current edition.
- B. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
- C. ASTM C1036 - Standard Specification for Flat Glass.
- D. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass.
- E. ASTM C1193 - Standard Guide for Use of Joint Sealants.
- F. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings.
- G. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation.
- H. GANA (SM) - GANA Sealant Manual; Glass Association of North America.

1.05 SUBMITTALS

- A. See Section 01 33 10 - Submittals.
- B. Product Data on Glass Types: Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements for each glass product and glazing material indicated.

- C. Product Data on Glazing Compounds: Provide chemical, functional, and environmental characteristics, limitations, special application requirements. Identify available colors.
- D. Samples: For the following products, in the form of 12" square samples for each type of glass.
- E. Glazing Schedule: Use same designation on Drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.
- F. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.
- G. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- H. Preconstruction Adhesion and Compatibility Test Report: From glazing sealant manufacture indicated glazing sealants were tested for adhesion to glass and glazing channel substrates and for compatibility with glass and other glazing materials.
- I. Product Test Reports: From a qualified testing agency indicated the following products comply with requirements, based on comprehensive testing of current products:
 - 1. Glazing sealants.
 - 2. Glazing gaskets.
- J. Warranties: Special Warranties specified in this Section.

1.06 QUALITY ASSURANCE

- A. Installer Qualifications: an experienced installer who has completed glazing similar in material, design, and extent to that indicated for Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Source Limitations for Clear Glass: Obtain clear float glass from one primary glass manufacturer.
- C. Source Limitations for coated Glass: Obtain coated glass from one manufacturer for each type of coating and each type and class of float glass indicated.
- D. Source Limitations for Laminated Glass: Obtain laminated-glass units from one manufacturer using the same type of glass lites and interlayers for each type of unit indicated.
- E. Source Limitations for Glazing Accessories: Obtain glazing accessories from one source for each product and installation method indicated.
- F. Safety Glass: Category II materials complying with testing requirements in 16 CFR 1201 and ANSI Z97.1.
 - 1. Subject to compliance with requirements, permanently mark safety glass with certification label of Safety Glazing Certification Council or another certification agency

acceptable to authorities having jurisdiction.

- G. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
 - 1. GANA Publications: GANA's "Glazing Manual" and "Laminated Glass Design Guide."
 - 2. AAMA Publications: AAMA GDSG-1, "Glass Design for Sloped Glazing," and AAMA TIR-A7, "Sloped Glazing Guidelines."
 - 3. SIGMA Publications: SIGMA TM-3000, "Vertical Glazing Guidelines," and SIGMA TB-3001, "Sloped Glazing Guidelines."

1.07 ENVIRONMENTAL REQUIREMENTS

- A. Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
- B. Maintain minimum ambient temperature before, during, and 24 hours after installation of glazing compounds.

1.08 FIELD MEASUREMENTS

- A. Verify that field measurements are as indicated on shop Drawings.

1.09 WARRANTY

- A. General Warranty: special warranties specified in this Section shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Manufacturer's Special Warranty on Coated-Glass Products: Written warranty, made out to Owner and signed by coated-glass manufacturer agreeing to furnish replacements for those coated-glass units that deteriorate as defined in Article 1.04 "Definitions" above, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
 - 1. Warranty Period: Ten (10) years from date of Substantial Completion.
- C. Manufacturer's Special Warranty on Laminated Glass: Written warranty, made out to Owner and signed by laminated-glass manufacturer agreeing to furnish replacements for laminated glass units that deteriorate as defined in Article 1.04 "Definitions" above, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
 - 1. Warranty Period: Five (5) years from date of Substantial Completion.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

- A. Float Glass Manufacturers:
 - 1. Vitro Architectural Glass, <https://www.vitroglazings.com/>
 - 2. AGC Glass North America, Inc; www.agcglass.com/#sle
 - 3. Cardinal Glass Industries; www.cardinalcorp.com/#sle
 - 4. Guardian Glass, LLC; www.guardianglass.com/#sle
 - 5. Pilkington North America Inc; www.pilkington.com/na/#sle
 - 6. Substitutions: Refer to Section 01 60 00 – Product Requirements

2.02 PERFORMANCE REQUIREMENTS – EXTERIOR GLAZING ASSEMBLIES:

- A. Provide type and thickness of exterior glazing assemblies.

2.03 EXTERIOR GLAZING ASSEMBLIES

- A. Performance Criteria: Select type and thickness of glass to withstand dead and live loads caused by positive and negative wind pressure acting normal to plane of glass.
 - 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. Glass thicknesses listed are minimum

2.04 GLASS MATERIALS

- A. Float Glass Manufacturers:
 - 1. AGC Glass Company North America, Inc: www.us.agc.com.
 - 2. Guardian Industries Corp: www.sunguardglass.com.
 - 3. PPG Industries, Inc: www.ppgideascape.com.
- B. 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), free of tong marks.
 - 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.

2.05 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

2.06 GLAZING COMPOUNDS

- A. Butyl Sealant: Single component; ASTM C920, Grade NS, Class 12-1/2, Uses M and A, Shore A hardness of 10 to 20; black color.

- B. Silicone Sealant, Type S: Single component; neutral curing; capable of water immersion without loss of properties; non-bleeding, non-staining; ASTM C920, Type S, Grade NS, Class 50, Uses M, A, and G; with cured Shore A hardness range of 15 to 25; black color.
- C. Elastomeric Glazing Sealant Standard: Comply with ASTM C920 and other requirements indicated for each liquid-applied, chemically curing sealant in Glazing Sealant Schedule at the end of Part 3, including those referencing ASTM C920 classifications for type, grade, class, and uses.
- D. Glazing Sealant for Fire-Resistive Glazing Products: Identical to product used in test assembly to obtain fire-protection rating.

2.07 GLAZING ACCESSORIES

- A. Setting Blocks: Neoprene, 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot (25 mm for each square meter) of glazing or minimum 4 inch (100 mm) x width of glazing rabbet space minus 1/16 inch (1.5 mm) x height to suit glazing method and pane weight and area.
- B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Minimum 3 inch (75 mm) long x one half the height of the glazing stop x thickness to suit application, self adhesive on one face.
- C. Glazing Tape, Back Bedding Mastic Type: Preformed, butyl-based, 100 percent solids compound with integral resilient spacer rod applicable to application indicated; hardness range of 5 to 30 cured Shore A durometer; coiled on release paper; black color.
- D. Expanded Cellular Glazing Tape: Closed-cell, PVC foam tape; factory coated with adhesive on both surfaces; packaged on rolls with release liner protecting adhesive; and complying with AAMA 800 for the following types:
 - 1. Type 1, for glazing applications in which tape acts as the primary sealant.
 - 2. Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.
- E. Glazing Gaskets: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; black color.
- F. Glazing Clips: Manufacturer's standard type.

2.08 GLAZING GASKETS

- A. Lock-Strip Gaskets: Neoprene extrusions in size and shape indicated, fabricated into frames with molded corner units and zipper lock strips, and complying with ASTM C-542, black.

- B. Dense Compression Gaskets: Molded or extruded gaskets of material indicated below, complying with standards' referenced with mane of elastomer indicated below, and of profile and hardness required to maintain watertight seal:
 - 1. Neoprene, ASTM C 864
 - 2. EPDM, ASTM C 864
 - 3. Silicone, ASTM C 115
 - 4. Thermoplastic polyolefin rubber, ASTM C 1115
 - 5. Any material noted above
- C. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned gaskets of material indicated below, complying with ASTM C 509, Type II, black; and of profile and harness required to maintain watertight seal:
 - 1. Neoprene
 - 2. EPDM
 - 3. Silicone
 - 4. Thermoplastic polyolefin rubber
 - 5. Any material noted above.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Examine framing glazing, with Installer present, for compliance with the following:
 - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 - 2. Presence and functioning
- B. Verify that openings for glazing are correctly sized and within tolerance.
- C. 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.

3.02 PREPARATION

- A. Clean contact surfaces with solvent and wipe dry.
- B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- C. Prime surfaces scheduled to receive sealant.
- D. Install sealants in accordance with ASTM C1193 and GANA Sealant Manual.
- E. Install sealants in accordance with manufacturer's instructions

3.03 INSTALLATION – EXTERIOR/INTERIOR DRY METHOD (GASKET GLAZING)

- A. Place setting blocks at 1/4 points with edge block no more than 6 inch (152 mm) 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.

3.04 STANDARDS AND PERFORMANCE

- A. Watertight and weathertight installation of each glass product is required, except as otherwise shown. Each installation must withstand normal temperature changes, wind loading, impact loading (for operating sash and doors), without failure including loss or breakage of glass, failure of sealants or gaskets to remain water-tight and air-tight, deterioration of glazing materials and other defects in the work.
- B. Protect glass from edge damage during handling and installation, and subsequent operation of glazed components of the work. During installation, discard units with significant edge damage or other imperfections.
- C. Glazing channel dimensions as shown are intended provide for necessary bite on glass, minimum edge clearance, and adequate sealant thickness, with reasonable tolerances. Adjust as required by job conditions at time of installation.
- D. Comply with combined recommendations and technical reports by manufacturers of glass and glazing products as used in each glazing channel, and with recommendations of Flat Glass Marketing Association "Glazing Manual," except where more stringent requirements are indicated.
- E. Install insulating glass units to comply with recommendations by Sealed Insulating Glass Manufacturers Association, except as otherwise specifically indicated or recommended by glass and sealant manufacturers.

3.04 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.
- C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.
- E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- G. Provide spacers for glass lites where the length plus width is larger than 50 inches as follows:
 - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
 - 2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.05 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Where framing joints are vertical, cover these joints by applying tapes to heads and sills first and then to jambs. Where framing joints are horizontal, cover these joints by applying tapes to jambs and then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

- E. Do not remove release paper from tape until just before each glazing unit is installed.
- F. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

3.06 GASKET GLAZING (DRY)

- A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with stretch allowance during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Install gaskets so they protrude past face of glazing stops.

3.07 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.08 LOCK-STRIP GASKET GLAZING

- A. Comply with ASTM C716 and gasket manufacturer's written instructions. Provide supplementary wet seal and weep system, unless otherwise indicated.

3.09 CURE, PROTECTION AND CLEANING

- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances

do come into contact with glass, remove them immediately as recommended by glass manufacturer.

- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for build-up of dirt, scum, alkaline deposits, or stains; remove as recommended by glass manufacturer.
- D. Remove and replace glass which is broken, chipped, cracked, abraded or damaged in other ways during construction period, including natural causes, accidents and vandalism.
- E. Wash and polish glass on both faces not more than 4 days prior to date scheduled for inspections intended to establish date of substantial completion in each area of project. Comply with glass product manufacturer's recommendations for final cleaning.

3.10 GLASS SCHEDULE

- A. Type **S-1** - Sealed Insulating Glass Units: Safety glazing.
 - 1. Application: All exterior glazing unless otherwise indicated.
 - 2. Outboard Lite: Fully tempered float glass, 1/4 inch (6 mm) thick, minimum. Or as required to meet energy code and within the manufacturer's window frame.
 - a. Tint: Clear
 - b. Surface 1: Self cleaning coating
 - c. Surface 2: Low E coating; Solarban 70 Solar Control (Sputtered)
 - 3. Interspace Content: Argon w/ Warm Edge spacer
 - 4. Inboard Lite: Fully tempered float glass, 1/4 inch (6 mm) thick, minimum.
 - a. Tint: Clear
 - b. Surface 3: No Coating
 - c. Surface 4: No Coating
 - 5. Total Thickness: 1 inch (25 mm).
 - 6. Visible light Transmittance: 64%
 - 7. Maximum U-value: As necessary to achieve a maximum overall U-Value of 0.34 including the glazing and frame (fixed)
 - 8. Total Solar Heat Gain Coefficient: 0.38 max, nominal for South/East/West orientation and 0.51 max, nominal for North orientation
- B. Type **S-2**: Uncoated Clear Fully Tempered Float Glass.
 - 1. Kind FT (fully tempered) – Glass where indicated on drawings.
 - a. Overall Unit Thickness: 1/4"
 - b. Glass Edge Treatment: Flat polished.

3.11 SEALANT SCHEDULE

- A. **GS-1**: Low-Modulus, Nonacid-Curing Silicone Glazing Sealant (GS-1)
 - 1. For use at all exterior glazing:
 - 2. Where glazing sealants of this designation are indicated, provide products complying with the following:
 - a. Dow Corning: 790
 - b. GE Silicones; Silpruf

- c. NUCO Industries, Inc: HiFlex 331
- d. Substitutions under provisions of 01630
- 3. Type and Grade: S (single component
- 4. Class: 25
- 5. Use related to exposure: NT (non-traffic) and glazing substrates: M, G, A.

END OF SECTION

PART 1 – GENERAL

1.01 WORK INCLUDED

- A. Furnish and install all swimming pool porcelain tile detailed on the Drawings, including, but not limited to, the following:
 - 1. Gutter Cap Tile.
 - 2. Lane Marker Tile
 - 3. Water Polo Marker Tile.
 - 4. Depth Marker Tile (at cantilever deck and pool deck).
 - 5. Trim Tile
 - 6. NO DIVING Marker Tile.

1.02 QUALITY ASSURANCE

- A. All Work of this Section shall be performed or supervised by the Swimming Pool Contractor.
- B. Qualifications of Workers:
 - 1. The contractor / subcontractor for this portion of the Work shall have been successfully engaged in the respective trade for at least five (5) years immediately prior to commencement of this work, and shall demonstrate to the approval of the Owner's Representative that his record of workmanship is satisfactory. See Division 01, for all requirements.
 - 2. For actual construction operations, use only thoroughly trained and experienced workers completely familiar with the materials and methods specified.
 - 3. Provide at least one person who shall be present at all times during execution of this portion of the Work and who shall be thoroughly familiar with the type of materials being installed, the referenced standards, and the requirements of this Work, and who shall direct all Work performed under this Section.
- C. Standards: In addition to complying with all pertinent codes and regulations:
 - 1. Manufacture of all tile shall be in accordance with ANSI A-137.1-1976.
 - 2. Install porcelain tile in accordance with the recommendations contained in 2006 Handbook for Ceramic Tile Installation of the Tile Council of America, Inc.
- D. Tolerances: Install all swimming pool porcelain tile straight, true, plumb and square within a tolerance horizontally of one in 200 and a tolerance vertically of one in 500. Waterline and gutter bullnose tile shall be level to 1/8" (+/- 1/16") around entire perimeter of swimming pool(s).
- E. Single Source Responsibility: Obtain each type and color of tile from a single source. Obtain each type and color of mortar, adhesive and grout from the same source
- F. Maintain one copy of and ANSI A108/A118/A136.1 and TCNA (HB) on site.

1.03 PERFORMANCE REQUIREMENTS

- A. Static Coefficient of Friction: Tile on walkway surfaces shall be provided with the following values as determined by testing in conformance with ASTM C 1028.
 - 1. Level Surfaces: Minimum of 0.6 (Wet).
 - 2. Step Treads: Minimum of 0.6 (Wet).

1.04 SUBMITTALS AND SUBSTITUTIONS

- A. Provide submittals in accordance with the requirements of Division 01.
- B. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, ceramic accessories, and setting details.
- C. Samples: Submit five (5) samples of each color and pattern in the specified groups. Character samples can be representative for review prior to screening of actual tile. Mount tile and apply grout on two plywood panels, illustrating pattern, color variations, and grout joint size variations.
- D. Master Grade Certificate: Prior to opening ceramic tile containers, submit a Master Grade Certificate, signed by the manufacturer of the tile used and issued when the shipment is made, stating the grade, kind of tile, identification marks for the tile containers, and the name and location of the Project.
- E. Specifications: Submit manufacturer's recommended installation specifications for this Work.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Delivery: Deliver all materials to the Project Site in the manufacturer's original unopened containers with all labels intact and legible.
- B. Storage: Store all materials under cover in a manner to prevent damage and contamination, and store only the specified materials at the Project site.
- C. Protection: Use all means necessary to protect swimming pool tile before, during and after installation and to protect the installed Work of all other trades.
- D. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Owner's Representative.
- E. Store Portland cement mortars and grouts in a dry location.

1.06 PROJECT/SITE CONDITIONS

- A. Provide ventilation and protection of environment as recommended by manufacturer.

- B. Prevent carbon dioxide damage to ceramic tile, mosaics, pavers, trim, thresholds, as well as adhesives, mortars, grouts and other installation materials, by venting temporary heaters to the exterior.
- C. Maintain ambient temperatures not less than 50°F (10°C) or more than 100°F (38°C) during installation and for a minimum of seven (7) days after completion. Setting of Portland cement is retarded by low temperatures. Protect work for extended period of time and from damage by other trades. Protect Portland cement based mortars and grouts from direct sunlight, radiant heat, forced ventilation (heat & cold) and drafts until cured to prevent premature evaporation of moisture. Epoxy mortars and grouts require surface temperatures between 60°F (16°C) and 90°F (32°C) at time of installation. It is the General Contractor's responsibility to maintain temperature control.

1.07 SEQUENCING AND SCHEDULING

- A. Coordinate installation of tile work with related work.
- B. Proceed with tile work only after drains, piping, and other projections through substrate have been installed and when substrate construction and framing of openings have been completed.

1.08 WARRANTY

- A. The manufacturer of tile warrants the products will be free of defect for a period of one year.

1.09 MAINTENANCE

- A. Submit maintenance data. Include cleaning methods, cleaning solutions recommended, stain removal methods, as well as polishes and waxes recommended.

1.10 EXTRA MATERIALS STOCK

- A. Upon completion of the work of this Section, deliver to the Owner 10% minimum additional tile and trim shape of each type, color, pattern and size used in the Work, as well as extra stock of adhesives, mortars, grouts and other installation materials for the Owner's use in replacement and maintenance. Extra stock is to be from same production run or batch as original tile and installation materials.

PART 2 – PRODUCTS

2.01 CERAMIC TILE

- A. Manufacturers: All products by the same manufacturer.
 - 1. Dal-Tile Corporation: www.daltile.com.
 - a. Keystones, Keystones Mosaic Depth Markers
 - (1) Finishes: Unglazed, textured
 - (2) Sizes: 1x1, 2x2, 6 x6, custom 14x47 NO DIVING sign

- (3) Grout Thickness: 1/8 inch
- 2. InLays Inc. www.inlaysinc.com
 - a. Standard Ceramic Depth Markers C611094 (waterline) C621094 (deck)
 - (1) Finishes: Unglazed, textured
 - (2) Sizes: 6 x6
 - (3) Grout Thickness: 1/8 inch
- 3. Custom 3x3 depth marker at vertical gutter face.
- 4. Or approved equal.

2.02 TILE SCHEDULE

RAY WILLIAMSON POOL

- A. Gutter Cap Tile (main body at top of gutter): T1, T2, and T3
 - 1. Material: All gutter cap tile shall be unglazed porcelain tile as manufactured and/or distributed by Dal-Tile or approved equal.
 - 2. Size: 1x 1, inches
 - 3. Color: Dal-Tile
 - a. T1 - D209 "Navy Speckle"
 - b. T2 - D208 "Suede Gray Speckle"
 - c. T3 – D037 "Pepper White"
- B. Water Polo Course Markers: T4, T5, and T8
 - 1. Material: All water polo course marker tile shall be unglazed porcelain tile as manufactured and/or distributed by Dal-Tile or approved equal.
 - 2. Size: 1 x 1 inches.
 - 3. Color: Dal-Tile
 - a. T4 - D017 "Red" (polo and 5 foot depth line)
 - b. T5 - D620 "Sunshine"
 - c. T8 - D617 "Artic White" (polo and middle of pool marker at all lanes)
- C. Trim Tile: (edge of deck bullnose tile shape S886) T6
 - 1. Material: Tile shall be unglazed porcelain tile as manufactured and/or distributed by Dal-Tile or approved equal.
 - 2. Size and shape: 2 x 2
 - 3. Color: Dal-Tile T6 – D209 "Navy Speckle"
- D. Depth Marker Tile: (at top of deck) T7
 - 1. Material: All depth marker tile shall be unglazed ceramic tile as manufactured and/or distributed by Dal-Tile, Precision Tile Co., or approved equal.
 - 2. Size: 6 x 6 inches.
 - 3. Color: T7 - White with 4" black numbers/ letters.
- E. Depth Marker Tile: (vertical edge face of gutter) **Custom tile.**
 - 1. Material: All depth marker tile shall be unglazed ceramic tile as manufactured and/or distributed by Dal-Tile, Precision Tile Co., or approved equal.
 - 2. Size: 3 x 3 inches.
 - 3. Color: White with black numbers/ letters.

- F. Water level Tile: T2 and T9 (at water level gutter edge)
 - 1. Material: Tile shall be unglazed porcelain tile as manufactured and/or distributed by Dal-Tile or approved equal.
 - 2. Size: 1 x 1
 - 3. Color: Dal-Tile
 - a. T2 – D208 “Suede Gray Speckle”
 - b. T9 – D208 “Suede Gray Speckle” (shape S882 bullnose tile at edge)
- G. Lane Line / Target Tile: T10 (at underwater lanes)
 - 1. Material: All gutter cap tile shall be unglazed porcelain tile as manufactured and/or distributed by Dal-Tile or approved equal.
 - 2. Size: 2 x 2 inches
 - 3. Color: Dal-Tile
 - a. T10 – D621 “Nautical Blue”
- H. NO DIVING Markers:
 - 1. Material: All tile shall be unglazed porcelain tile as manufactured and/or distributed by Dal-Tile or approved equal.
 - 2. Size: Custom Mosaic 14 x 46 inches made of (1) 12 inch No Diving Symbols and 5 inch NO DIVING mosaic

2.03 MORTAR

- A. Two component, solvent free epoxy mortar. Mapei, Karapoxy 410 or approved equal.

2.04 GROUT

- A. All tile grout shall be waterproof non-shrink epoxy grout complying with the recommendations of referenced standards. Grout color shall be gray, (verify colors with architect). Mapei Kerapoxy CQ epoxy grout or approved equal.

2.05 OTHER MATERIALS

- A. All other materials, not specifically described but required for a complete and proper installation of ceramic tile as indicated on the Drawings, shall be new, first quality of their respective kinds, and subject to the approval of the Owner’s Representative.

PART 3 – EXECUTION

3.01 SURFACE CONDITIONS

- A. Inspection:
 - 1. Prior to all Work of this Section, carefully inspect the installed Work of other trades and verify that all such Work is complete to the point where this installation may properly commence.
 - 2. Verify that tile can be installed in accordance with the original design and all referenced standards.

3. Verify that sub-floor surfaces are dust-free, and free of substances which would impair bonding of setting materials to sub-floor surfaces, and are smooth and flat within tolerances specified in ANSI A137.1.
 4. Verify that concrete sub-floor surfaces are ready for tile installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within limits recommended by tile manufacturer and setting materials manufacturer.
 5. Verify that required floor-mounted utilities are in correct location.
- B. Discrepancies:
1. In the event of discrepancy, immediately notify the Owner's Representative.
 2. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.
 3. Failure to notify the Owner's Representative and give written notice of discrepancies shall constitute acceptance by the Contractor of existing conditions as fit and proper to receive its Work.

3.02 PREPARATION

- A. Remove coatings, including curing compounds, and other substances that contain soap, wax, oil, or silicone and are incompatible with tile-setting materials by using a terrazzo or concrete grinder, a drum sander, or a polishing machine equipped with a heavy-duty wire brush.
- B. Provide concrete substrates for tile floors installed with dry-set or latex-portland cement mortars that comply with flatness tolerances specified in referenced ANSI A108 series of tile installation standards for installations indicated.
1. Use trowelable leveling and patching compounds per tile-setting material manufacturer's written instructions to fill cracks, holes, and depressions.
 2. Remove protrusions, bumps, and ridges by sanding or grinding.
- C. Blending: For tile exhibiting color variations within the ranges selected during Sample submittals, verify that tile has been blended in the factory and packaged so tile units taken from one package show the same range in colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.03 INSTALLATION

- A. Method:
1. Install all ceramic tile in strict accordance with installation method P601-90 of the 2006 Handbook for Ceramic Tile Installation of the Tile Council of America, Inc., applicable requirements of ANSI A108.1 through A108.13, and manufacturer's instructions.
 2. Be certain to install all ceramic tile perfectly level, flush, plumb, and to the finish grades and elevations indicated on the Drawings.
 3. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align joints.
 4. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make joints watertight, without voids, cracks, excess mortar, or excess grout.

5. Keep expansion joints free of adhesive or grout. Apply sealant to joints.
 6. Allow tile to set for a minimum of 48 hours prior to grouting.
 7. Grout tile joints. Use standard grout unless otherwise indicated.
 8. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.
- B. Interface:
1. Carefully establish and follow the required horizontal and vertical elevations to insure proper and adequate space for the work and materials of other trades.
 2. Coordinate and cooperate as required with other trades to insure proper and adequate interface of ceramic tile Work with the Work of other trades.
- 3.04 GROUTING
- A. Follow grout manufacturer's recommendations as to grouting procedures and precautions.
- B. Remove all grout haze, observing grout manufacturer's recommendations as to use of acid and chemical cleaners.
- 3.05 PROTECTION OF FINISHED WORK
- A. Do not permit traffic over finished floor surface for 72 hours after installation.
- B. Cover floors with kraft paper and protect from dirt and residue from other trades.
- 3.06 CLEAN-UP
- A. Upon completion of the swimming pool ceramic tile installation, thoroughly clean and polish the exposed surfaces of tile work. Completely clean work area of debris and rubbish occasioned by this Work and dispose of to the approval of the Owner's Representative.

END OF SECTION

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Suspended metal grid ceiling system.
- B. Acoustical units.
- C. Supplementary acoustical insulation above ceiling.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 Rough Carpentry
- B. Section 09 95 00 High Performance Coatings

1.03 REFERENCE STANDARDS

- A. ASTM C635/C635M - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2013a.
- B. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2014.
- C. 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 33 10 for submittal procedures.

1.06 QUALITY ASSURANCE

- A. Fire-Resistive Assemblies: Complete assembly listed and classified by UL (FRD) for the fire resistance indicated.

1.07 FIELD CONDITIONS

- A. Maintain uniform temperature of minimum 60 degrees F (16 degrees C), and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Acoustic Panels:
 - 1. Armstrong World Industries, Inc.
 - 2. USG Interiors

- B. Suspension Systems:
 - 1. Armstrong World Industries, Inc.
 - 2. USG Interiors

C. Or approved equal.

2.02 ACOUSTICAL UNITS

- A. Acoustical Units - General: ASTM E1264, Class A.
 - 1. Units for Installation in Fire-Rated Suspension System: Listed and classified for the fire-resistive assembly as part of suspension system.
- B. Acoustical Tile Type IV: Painted mineral fiber, with the following characteristics:
 - 1. Size: 24 by 48 inches
 - 2. Edge: Beveled Tegular 15/16 in.
 - 3. Products: Ultima
 - 4. Color: White

2.03 SUSPENSION SYSTEM(S)

- A. Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with stabilizer bars, clips, splices, perimeter moldings, and hold down clips as required.
- B. Fire-Rated Exposed Steel Suspension System Type for use at rated ceiling assemblies: Formed steel, commercial quality cold rolled; light-duty.
 - 1. Profile: Tee; 9/16 inch (14 mm) wide face.
 - 2. Product: Suprafine XL Fireguard
- C. Exposed Steel Suspension System Type for use at non-rated assemblies: Formed steel, commercial quality cold rolled; light-duty.
 - 1. Profile: Tee; 9/16 inch (14 mm) wide face.
 - 2. Product: Suprafine XL Peakform.

2.04 ACCESSORIES

- A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified such as stabilizer bars, hold-down clips, splices, and edge moldings required for suspended grid system.
- B. Perimeter Moldings: Same material and finish as grid.
 - 1. At Exposed Grid: Provide W-shaped molding for mounting at same elevation as face of grid.

PART 3 - EXECUTION

3.01 INSTALLATION - SUSPENSION SYSTEM

- A. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

- B. Install after major above-ceiling work is complete. Coordinate the location of hangers with other work.
- C. 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.
- D. 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.
- E. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.
- F. Support fixture loads using supplementary hangers located within 6 inches (150 mm) of each corner, or support components independently.
- G. Do not eccentrically load system or induce rotation of runners.
- H. 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.

3.02 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. Make field cut edges of same profile as factory edges.
- G. Install hold-down clips on each panel to retain panels tight to grid system; comply with fire rating requirements.

3.03 TOLERANCES

- A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet (3 mm in 3 m).
- B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General, Supplemental, and Special Conditions and other Division 1 Specification Sections, apply to this Section.

1.02 DESCRIPTION

- A. Provide labor and materials for surface cleaning, preparation, coating and finishing of the following:
 - 1. Interior brick/ CMU surfaces.
 - 2. GWB surfaces.
 - 3. Walking surfaces.
 - 4. Hollow Metal Doors.
 - 5. Other surfaces, and existing metal surfaces indicated to be coated or re-coated on the Drawings

1.03 REFERENCES

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.
- B. Applicable ASTM and SSPC standards.
- C. Paint Application Specification No. 1 "Shop, Field, and Maintenance of Painting of Steel" published in 2004 by The Society for Protective Coatings (SSPC).
- D. Paint Application Specification No. 2 "Procedure for Determining Conformance of Dry Coating Thickness Requirements" revised in 2015 by The Society for Protective Coatings (SSPC).
- E. Surface Preparation Specification No. 1 "Solvent Cleaning" published in 2015 by The Society for Protective Coatings (SSPC).
- F. Surface Preparation Specification No. 2 "Hand Tool Cleaning revised in 2004 by the Society for Protective Coatings (SSPC).
- G. Surface Preparation Specification No. 3 "Power Tool Cleaning" revised in 2004 by The Society for Protective Coatings (SSPC).
- H. Joint Surface Preparation Standard SSPC- SP10/NACE No. 2 "Near White Metal Blast Cleaning" issued in 2007 by the Society for Protective Coatings (SSPC)
- I. ASTM D7091-13 "Standard Practice for Nondestructive Measurement of Dry Film Thickness of Nonmagnetic Coatings Applied to Ferrous Metals and Nonmagnetic, Nonconductive Coatings Applied to Non-Ferrous Metals.
- J. ASTM D 523 "Standard Test Method for Specular Gloss"

1.04 SUBMITTALS

- A. Product Data: Provide complete list of products to be used, with the following information for each:
 - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "acrylic enamel").
 - 2. Cross-reference to specified coating system(s) product is to be used in; include description of each system.
 - 3. Submit current published product data, product specifications and "Material Safety Data Sheets" (MSDS) equivalent to OSHA Form 20 for each product.
 - 4. Include data to indicate chemical characteristics, performance criteria, limitations, substrate preparation, installation requirements, and curing requirements.
 - 5. Include information for accessories and other required components.
 - 6. No substitutions are allowed.
- B. Certification by manufacturer that products comply with Contract Documents and are compatible with applicable substrates and with each other.
- C. Submit three paper drawdowns, 8-1/2 by 11 inches in size, illustrating requested colors for each finishing product specified.
- D. VOC content of all interior opaque coatings actually used.
- E. Maintenance Data: Submit data on cleaning, touch-up, and repair of coated and coated surfaces.
- F. Submittals must identify specific project-relevant products. Indiscriminate submittals are not allowed.
- G. Requests for substitution shall include evidence of satisfactory past performance in similar environment.
- H. Substitutions will not be considered that change the number of coats or do not meet specified dry film thicknesses. Manufacturer's certified test reports showing the substitute product(s) performance.
- I. Contractor shall submit a safety plan in accordance with regulatory requirements.

1.05 FIELD MOCKUP

- A. Provide field mock-up of approximately 4 (four) square feet to illustrate the surface preparation, color, texture, and finish. Step down mock-up to expose each step.
- B. Install field mockup of surface preparation and the stepped down coating system at location determined by owner.
- C. Owner shall review field mockup installed for acceptability of quality of finish. Accepted area will serve as the standard for the work.

- D. Accepted mockup may remain as part of the Work.

1.06 QUALITY ASSURANCE

- A. The General Contractor and Subcontractors shall be responsible for complete, watertight, weatherproof, and fully adhered building envelope systems and assemblies. The Contractor shall establish and follow best practices for the trade and of quality-control and quality assurance to assure each and every building envelope systems' successful completion.
- B. Single Source Responsibility: Provide primers and other under coatings produced by same manufacturer as finish coats. Use only thinners approved by manufacturer, and use only within recommended limits.
- C. Applicator Qualifications: A single applicator ("Painting Contractor") shall perform the work of this section; and shall be a firm with successful experience in painting projects similar in scope to that required for this project and familiar with the painting systems specified herein.
 - 1. Contractor(s) must provide written documentation of having minimum five (5) years' experience and specialize in applying the coating.
- D. Applicator shall provide all personnel trained in the application of the materials and systems and shall maintain supervision as specified elsewhere.
- E. Coordination of Work: Review other sections of these specifications in which surface preparation and prime paints are to be provided to ensure compatibility of total coating system for various substrates. Upon request from other trades, furnish information or characteristics of finish materials provided for use, to ensure compatible prime coats are used.
- F. Conformance Standards: Work in this section shall conform to the minimum standards for material and work as set forth in the Steel Structures Painting Council, Vols. 1 and 2 for steel cleaning methods.
- G. Material Safety Data Sheet (MSDS): Submit MSDS for all materials, equipment, chemicals, and chemical containing products for Engineer's review prior to its application and use.
- H. Mandatory (1) yr Anniversary Review: At the end of (1) year Owner shall inspect completed work and Contractor shall be responsible to repair any examples of poor workmanship at no cost to the Owner.

1.07 QUALIFICATIONS

- A. Manufacturer's Qualifications: Company with at least 20 years of experience in the manufacture of high performance architectural coatings equal to those specified in this section.
- B. Contractor's Qualifications: Coating contractor with a record of successful in-service coating applications similar to the material, design, and extent of the work described in this section.

1. Coating Contractor must submit three successful projects of the same scale and nature, including the type of coating system specified herein, to be considered qualified for approval.
- C. Technicians Qualifications: Workers thoroughly skilled and trained in the techniques for applying High Performance Architectural Coatings.

1.08 REGULATORY REQUIREMENTS

- A. Conform to applicable federal, state, and local regulatory requirements.
- B. Flammable Liquids: Observe regulations regarding flammable liquids such as posting "No Smoking" signs. Allow no open flames, welding, or other ignition sources in the work area.
- C. Conform to applicable laws, codes, and regulations for disposal of materials, debris, and containers.
- D. High Performance coatings materials shall be VOC compliant.

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 50° F.
- B. Container Label: Include manufacturer's name, type of coating, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Coating Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.
- D. Submit invoices for verification of accurate material purchase.
- E. Remove materials and empty containers from the area of work at the close of each day.

1.10 JOB CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the coating product manufacturer.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Do not apply paint in mist, rain, fog, or snow or when there is a probability of precipitation during application and dry time. Do not apply paint when relative humidity exceeds 85 percent or at temperatures less than 5°F (3° C) above the dew point. DO not apply paint to damp or wet surfaces. Take adequate precautions to ensure that materials, substrates, and applied paint, are protected from possible moisture, damage, or contamination.

- D. Minimum Application Temperatures for Acrylic Coatings: 45 degrees F for interiors; 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.

1.11 EXTRA MATERIALS

- A. Provide the owner with a written list of paint manufacturer, product name, color, number, sheen, and the area in which the paint was used. Provide touch-up quart of each color and type to the owner.
- C. Label each container with color, texture, and project locations, and date, in addition to the manufacturer's label.

1.12 WARRANTY

- A. The contractor will issue a five-year warranty for the work covered under this Section. Warranty period will extend for five years from the date of physical completion of the work and shall cover any failure of paint adhesion during this period.
 - 1. Exception: coating for steel substrates shall issue a performance warranty period of fifteen (15) years.
- B. The Coating manufacturer will provide a five (5) year limited material warranty.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Specific products indicated are from Tnemec Co., Inc.
 - 1. Coating(s) Basis of Design: Tnemec Company Inc. Local Source: TNW Inc. 206-762-5755, email: tnwoffice@tnemec.com
- B. Or approved equal

2.02 MATERIALS

- A. High Performance Coatings and Paint: Product designed for field application containing uniformly dispersed pigments in a homogeneous coating with good flow properties; capable of air-drying or curing free of discoloration
- B. Materials shall not be altered except for reducing in accordance with the recommendations of the manufacturer
- C. Colors: Colors shall be custom tinted by the manufacturer for each finish product specified as selected by the Owner. Owner will provide colors in advance of the coating operation. Owner' agent will select from Standard Colors to the greatest extent possible.
- D. Coating Products Manufactured by Tnemec Company are used as the standard of Quality. Other materials will not be considered.

2.03 COLOR SYSTEMS

- A. Each coat, including primer, intermediate coat and finish coat are to be a discernibly different tone to allow for confirmation of specified coating application.
- B. Submit samples for Consultant's approval. Provide separate color samples for primer and finish coats.

2.04 COATING FOR CMU SUBSTRATES

- A. Includes existing interior CMU walls as specified, indicated in contract documents and/or directed by Architect.
- B. Surface Preparation: Abrade 100% to create a dull substrate with a 1.5 mil angular profile, minimum. Followed by SSPC-SP1 solvnet cleaning. The surface should be clean, dull and dry.
- C. Primer:
 - 1. Hi-Build Epoxiline II Tnemec Series N69F, Polyamidoamine Epoxy. 4.0- to 6.0- mil Dry Film Thickness
- D. Finish Coat:
 - 1. CRU Tnemec Series 290, Aliphatic Polyester Polyurethane. 2.0- to 3.0- mil Dry Film Thickness

2.05 COATING FOR GWB SUBSTRATES

- A. Includes existing and non-galvanized & previously painted as schedule to remain; columns in storefront system, fire sprinkler pipes, and other steel materials as specified, indicated in contract documents and/or directed by Architect.
- B. Primer:
 - 1. Epoxiline WB Tnemec Series 1224, Hybrid water based Epoxy. 4.0- to 6.0- mil dry film thickness;
- C. Intermediate Coat:
 - 1. Hi-Build Epoxiline II Tnemec Series N69, Polyamidoamine Epoxy. 4.0- to 6.0- mil dry film thickness per coat;
- D. Finish Coat:
 - 1. CRU Tnemec Series 290, Aliphatic Polyester Polyurethane. 2.0- to 3.0- mil Dry Film Thickness

2.06 COATING FOR CONCRETE WALKING SUBSTRATES

- A. Includes existing walking surfaces as specified, indicated in contract documents and/or directed by Architect.
- B. Surface Preparation: Grind per SSPC-SP13 to create ICRI - CSP2 minimum profile.

- C. Primer:
 - 1. Tnemec-Fastcure Tnemec Series 161 Polyamide Epoxy. . 4.0- to 6.0- mil dry film thickness;
- D. Intermediate Coat:
 - 1. Tnemec-Fastcure Tnemec Series 161 Polyamide Epoxy. . 4.0- to 6.0- mil dry film thickness;
- E. Finish Coat:
 - 1. CRU Tnemec Series V290 Aliphatic Polyester Polyurethane. 2.0- to 3.0- mil dry film thickness per coat with; glass beads added at 2-4 oz per gallon.
- F. Note: If heavier nonskid is required, 30-50 mesh silica sand can be seeded and backrolled into the intermediate coat of 161.

2.07 COATING FOR STEEL SUBSTRATES

- A. Includes hollow metal steel doors and handrails for aggressive corrosion, coastal exposure, and/or physical abuse; shown as specified and as indicated in contract documents and/or directed by Architect.
- B. System Type: Organic zinc-rich/Epoxy/Fluorourethane; Basis of Design: Tnemec Company, Inc.
- C. Surface Preparation: Grind per SSPC-SP 6; Ensure surfaces are clean of salts and dry. Use Holdtight 102 or Chlo-Rid.
- D. Primer: Shop Primer: Series 394 Perimeprime. DFT 2.5 to 3.5 mils;
- E. Shop or Field Intermediate Coat: Series N69 Epoxoline II @ 3.0 to 5.0 mils;
- F. Field Finish Coat: Series 1071V Fluoronar DFT 2.0 to 3.0 mils;
- G. Total DFT: 7.5 to 11.5 mils.
- H. Performance Criteria
 - i. QUV - ASTM D 4141, Method C (EMMAQUA):
No blistering, cracking or chalking. No less than 79% gloss retention, no more than 9 units gloss loss and no more than 0.45 DEHunter color change (white) after 3,500 MJ/m² (128,951 MJ/m² total) EMMAQUA exposure.
 - ii. QUV - ASTM D 6695 Xenon Arc Weathering:
No blistering, cracking or chalking. No less than 90% gloss retention (2.4 units gloss change) and no greater than 0.20 DE00 color change (beige) after 8,000 hours Xenon Arc exposure. (TR5972)
 - iii. Flexibility & Elongation - ASTM D 522 (Method A, Conical Mandrel).
No less than 12.80% elongation, average of three tests.
 - iv. Cleanability - MIL-PRF-85285D Section 4.6.13.^[1]

- v. No less than 99% cleaning efficiency, average of two tests

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Applicator must examine areas and conditions under which coating work is to be applied and notify Contractor in writing of conditions detrimental to proper and timely completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Applicator.
- B. Begin coating application only after unsatisfactory conditions have been corrected and surfaces thoroughly prepared, wiped clean and dry, and well protected. Starting of coating work will be construed as Applicator's acceptance of surfaces and conditions within any particular area.
- C. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.
- D. Do not coat over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions otherwise detrimental to formation of durable coat film.

3.02 PREPARATION - SURFACES TO RECEIVE COATING

- A. General: Perform preparation and cleaning procedures in accordance with coating manufacturer's instructions and as herein specified, for each particular substrate condition.
- B. Clean substrates of substances that could impair bonds of paints, including dirt, oil, grease, salt, rust, and incompatible paints and encapsulates.
 - 1. Remove incompatible primers and re-prime substrate with compatible primers as required to produce paint systems indicated.
 - 2. Grind, wire brush, and sand, as required removing corrosion, scale, existing paint build-up or any other residual contaminant that may inhibit proper paint adhesion.
- C. Preparation of Painted Surfaces: Remove old paint not tightly and fully bonded to the surface. Prepare substrate using published methods and as recommended by paint manufacturer.
- D. Preparation of steel surfaces: SSPC SP3 power tool, followed by SSPC-SP1 solvent wipe.
 - 1. All the scale needs to be removed before priming.

3.03 APPLICATION

- A. General: Apply coating in accordance with manufacturer's directions. Use applications and techniques best suited for substrate and type of material being applied. Use identifiably different colors for all separate components of specified coating systems.

1. Mixing: Precondition to temperature as required by the manufacturer. Mix using a mechanical mixer to achieve a uniform consistency immediately prior to use.
- B. Do not apply coatings or paint to surfaces that are not dry. Allow applied coats to dry as required before next coat is applied. Do not exceed recoat window listed on product data sheet.
- C. Batch-mix multiple containers of a single color to assure a continuous balance of colors and ingredients.
- D. Clean surfaces free of loose particles just prior to coating and painting application.

3.04 FIELD QUALITY CONTROL

- A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when paints are being applied:
 1. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product and/or application requirements. Contractor shall remove non-complying paint materials from project site, pay for testings, and re-prepare, prime as may be required, 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.
- B. Contractor's Responsibilities:
 1. Contractor shall provide experienced supervisors and personnel to perform the work, who are trained in the application of the materials and procedures specified in this Specification. Contractor shall provide documentation from the Manufacturer that the Contractor meets the experience and training requirement for the specified system. Contractor shall maintain on-site supervision continuously to assure on-going quality control for superior quality application.
 2. The Contractor shall be responsible for the quality control of all their own work, as well as the work performed by the subcontractors working under this Specification, and/or related specification which is considered part of the Project Contract.
 3. Contractor shall notify the Project Architect of any conflicts that may result in a deviation from the Manufacturer's Specifications, industry standards, code compliance, job safety, or function as a result of the Project's Scope of Work, Specifications, and/or Project Drawings.
 4. Any modifications to the Specifications, Detail Drawings, or Substitutions of specified products shall not be made without direct consultation, and written request for review and written approval from the Project Architect and Owner's Project Manager.
 5. If the Project Architect, and/or Specified Manufacturer determine that the quality of work does not conform to the Specifications, and Project Drawings, and/or Manufacturer's requirements or Industry Standards, the Contractor must correct all deficiencies and advise the project team of the corrective actions taken.
 6. Contractor must demonstrate the ability to perform the work in a quality, timely manner with minimal noise and disruption to/ or impact on building operations, and the Public.

7. Contractor shall notify the Project Architect and Building Envelope Consultant a minimum of fourteen (14) days prior to commencement of Work.

3.05 CLEAN-UP AND PROTECTION

- A. Clean-Up: During progress of work, remove from site discarded coating materials, rubbish, cans and rags at end of each work day.
- B. After completing paint application, clean overspray-spattered and otherwise effected surfaces. Remove overspray-spattered and otherwise effected paints, fallout dust(s), etc. by washing, careful scour padding, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protection: Protect work of other trades, existing surfaces, and surroundings against damage by coating and finishing work. Correct any damage by cleaning, repairing or replacing, and recoating, as required and acceptable to Consultant and Engineer.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.06 PAINT AND COATING COLOR SCHEDULE

- A. Exterior concrete high performance coatings and painting, colors indicated below:
 1. Exterior
- B. Finish Schedule: (Refer to Drawings for exact location(s))
 1. Interior CMU walls walls
 - a. Color CT-1: by Benjamin Moore, as selected by Architect
 2. Interior GWB walls
 - a. Color CT-2: by Benjamin Moore, as selected by Architect
 3. Walking surfaces
 - a. Color CT-3: by Benjamin Moore, as selected by Architect
 4. Interior Hollow Metal Doors
 - a. Color CT-4: submit full range of colors available, selected by Architect
 5. Interior Handrails at existing ramp, east-west steps in natatorium
 - a. Color CT-5: submit full range of colors available, selected by Architect

END OF SECTION

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Swimming pool fittings and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete.
- B. Section 09 30 13 – Swimming Pool Ceramic Tiling
- C. Section 22 14. 26.19 – Precast Trench Drain System.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene two weeks before starting work of this section to meet with the Owner/Owner's Representative, Subcontractors, to review and coordinate anchor sockets and fittings locations and installation methods.

1.04 SUBMITTALS

- A. All submittals shall be made in accordance with the requirements of Division 01 – General Requirements and in strict compliance with procedures and guidelines.
- B. Product Data: Provide data on accessories, anchors, and fittings to be installed; include finish, color, and texture, sizing.
- C. Shop Drawings: Indicate pool layout plan for fitting locations.
- D. Include complete product data indexed, tabbed, and referenced to specifications with 8 1/2" x 11" cover sheet covering: Inserts and anchor sockets, deck equipment.
- E. Include maintenance and installation methods for accessories and fittings.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this Section with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.06 REGULATORY REQUIREMENTS

- A. Conform to applicable code for pools and associated equipment.

- B. The fittings and anchors shall be laid out and installed to meet all national and local codes and be in compliance with applicable sections of the American National Standards Institute I National Spa and Pool Institute (ANSI /NSPI-1 2014) and the rules and regulations of USA Swimming (USA) National Federation of State High School Associations (NFSHSA) - Federation Internationale De Natation Amateur (FINA).
- C. The system shall comply with all necessary approvals obtained by the Consultant from local regulatory agencies governing the design and construction of public swimming pools.
- D. The Contractor shall give all necessary notices, obtain all permits and pay all government fees, and other costs in connection with his work; file all necessary drawings, prepare all documents and obtain all necessary approvals of governmental departments having jurisdiction; obtain all required certificates of inspection for his work and deliver same to the Consultant before request for acceptance and final payment for the work.
- E. The Contractor shall include in the work, without extra cost to the Engineer, any labor, materials, services, apparatus or drawings in order to comply with all applicable laws, ordinances, rules and regulations, whether or not shown on drawings and/or specified.

1.07 WARRANTY

- A. Refer to Division 01 - Closeout Submittals, for additional warranty requirements.
- B. Warrant all pool deck equipment and accessories against defects in material, manufacturer and installation for a period of five (5) years from Date of Substantial Completion.
- C. Correct defective Work within a five year period from Date of Substantial Completion.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

- A. SR Smith
- B. Paragon Aquatics (Pentair)
- C. Spectrum Aquatics
- D. Or approved equal

2.02 ACCESSORIES

- A. Anchors: non-corrosive.
- B. Stainless steel fittings shall be 316L.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. For existing conditions carefully examine all of the contract documents for requirements that affect the work of this section. Prior to starting any work, notify the General Contractor of defects requiring correction. Do not start work until conditions are satisfactory.
- B. Verify that all work by others, related to this section, has been completed. This includes all earthwork, concrete work, and mechanical, electrical and plumbing connections.
- C. Verify surfaces are clean, smooth, and without voids or irregularities.
- D. Verify grounding of electrical and metallic components before concrete or deck finish work occurs:
 - 1. Per NEC 680.26 Contractor is responsible for bonding any equipment removed and reinstalled/replaced that is metallic. All grounding connections are to be cadweld connected. Bonding conductors #8 AWG or larger are to be solid copper and connected per NEC 250.
- E. Protect all materials and work completed by other from damage while completing the work in this section.

3.02 INSTALLATION - POOL AND DECK FINISH

- A. Install concrete deck and/or finish in accordance with Section 03 30 00 and Section 09 67 23.

3.03 INSTALLATION – ACCESSORIES

- A. Sockets and anchors shall be provided as stainless steel or cast bronze for swimming pool accessories and set prior to placing any concrete. The CONTRACTOR shall confirm compatibility of deck equipment and deck anchors with the deck equipment manufacturer. All anchors or sockets shall be furnished with flush closure caps and escutcheons with set screws where indicated. Escutcheons shall be of the keyhole or oblong shape, similar to the casted, electro-polished stainless steel escutcheon with set screw by Paragon #28303SS, or approved equal.
 - 1. Anchor sockets for all railings and grab rails shall be of the wedge type, cast of grade 300 series stainless steel, 6 inches in depth and made to receive 1.50 inch OD tubing as manufactured by Spectrum Products #24090, Paragon #28105SS, or approved equal. The wedge shall be cast brass (85-5-5-5), incorporate a stainless steel tightening bolt and flat washer, and be designed as the sacrificial element to the anchor system. All metallic components shall be passivated, in compliance with ASTM A967-99, incorporating organic acid passivation techniques for maximum corrosion resistance.
 - 2. Anchor sockets for all stanchions shall be of cast bronze, sized to receive a full 6 inches penetration of 1.900 inch OD tubing as manufactured by Paragon Aquatics Catalog No. 38201TC, Spectrum Products No. 23626, or approved equal. Each anchor socket is to be furnished with a flush threaded, vandal proof closure cap Paragon Aquatics Catalog No. 38201TC or Spectrum Products No. 23628, and a grounding lug with screw. Furnish

Paragon Aquatics catalog no. 38303, Spectrum Products catalog no. 23630, or approved equal spanner wrenches for removing the closure cap.

3. Cup anchors for racing lane lines, water polo tether and boundary lines etc. shall be incorporated into the perimeter overflow system. Cup anchors shall be (Commercial) Paragon Aquatics catalog no. 70316SE, Spectrum Products catalog no. 58316, or approved equal. Cup anchor shall be a stainless steel with eye bolt having a 3/8"-16N.C. threads.
4. Anchors sockets for single post starting platforms located on the deck level gutter shall be stainless steel, 6 inches deep socket with a flush closure cap. They shall be factory welded to a spacer bar to provide anchorage and proper spacing between them. Anchors for starting platforms shall be provided by the contractor and equal to SR Smith RockSolid Starting Platform Anchor 27-107 or approved equal.
5. Recessed steps shall be a single molding of white ABS with an integral slip resistant tread surface. The step shall be 16.5 in. wide by 6 in. deep. All portions of the backside shall be completely filled with non-shrink grout and set into the wall block-out and mortared in with non-shrink grout. Step by KDI Paragon, S.R. Smith, or approved equal.
6. Hand rails for pool steps shall be secure, non-slip, and stable grip. Minimum installation width of 20-24", stainless steel (316L), minimum diameter of 1.25". Rails are required on both sides.

3.04 INSTALLATION – DECK EQUIPMENT

- A. Deck equipment such as grab rails, starting blocks, lifeguard chairs, diving stands, pool lifts, and the like, are furnished by Owner and installed by Contractor. Coordinate with Owner/Owner Representative prior to installation of deck equipment.

3.05 EQUIPMENT AND SYSTEMS INSTALLATION

- A. The CONTRACTOR shall assemble and install all fittings, equipment, special parts and accessories as shown on pool drawings, specifications and shop drawings of the equipment suppliers.
- B. The CONTRACTOR shall furnish all anchors and inserts to be imbedded in the deck including all fittings, inserts and structure sleeves and required anchorage as shown on the plans and as indicated in this section of the specifications, unless otherwise indicated. Equipment shall be set true and plumb, using factory jigs where available. Removable equipment items shall be easily removable from anchors and shall fit without noticeable wobble.
- C. Provide templates for all equipment anchors. Provide anchor bolts of the size and spacing as required by the equipment manufacturer. All anchor bolts shall be stainless steel Type 316L and of a length capable of adequate anchorage into rough slab-on-grade allowing for finish deck tile and setting bed. Anchors shall be set and cast into place during building concrete work. Inspect all anchor settings for horizontal and vertical alignment prior to placing concrete.
- D. The CONTRACTOR shall install all equipment and systems in accordance with manufacturer's directions. Equipment shall all be assembled and in place for final observation.

- E. All items necessary to complete this section are shown on the plans or described in the specifications including items that may be purchased by the Engineer. Items are detailed and specified as a guide for dimensional purposes. The CONTRACTOR must make provisions accordingly and submit shop drawings and submittals based on that data.

3.06 CONCLUSION

- A. It is the intention of these specifications to provide a complete installation. All accessory construction and apparatus necessary in the operation or testing of the performance of the work shall be included. The omission of specific reference to any part of the work necessary for such complete installation shall not be interpreted as relieving the CONTRACTOR from furnishing and installing such parts. Any such omission or clarification shall be brought to the attention of the Consultant prior to bidding as provided in this section

END OF SECTION

PART 1 – GENERAL

1.01 SUMMARY

- A. Provide a proprietary aggregate plaster finish, Diamond Brite to the pool structures. A ceramic tile trim shall be furnished and installed on the pool perimeter tile band, vertical tile band, floor, walls, stairs, nosings, ry, depth markings, wall targets, floor lane markings and all other tile installations as shown and detailed on the contract drawings and in strict accordance with these specifications.
- B. Provide water analysis and pre-fill requirements.

1.02 SUBMITTALS

- A. Samples
 - 1. Prepare 12-inch square panel at the site showing color and texture for pool plaster. Finished plaster work shall match the approved sample panel.
- B. Certificates
 - 1. Submit certificates attesting that the materials furnished meet the requirements specified herein.
- C. Test Report
 - 1. Submit results of domestic water analysis and calculation of amounts of chemicals required to balance pool water on initial fill of pool.

1.03 PRODUCT DELIVERY AND STORAGE

- A. Deliver manufactured materials to site in manufacturers' original unbroken packages or containers bearing manufacturers' name and brand labels. Keep cementitious materials dry until ready to be used and stored off the ground, under cover and away from damp surfaces.

1.04 JOB CONDITIONS

- A. Apply plaster in swimming pool only when ambient temperature is above 40 degrees F and below 90 degrees F, and protect applied plaster from rapid drying by sun or wind until curing is completed or pool is filled with water. Confirm and comply with all applicable manufacturers installation requirements.

1.05 QUALITY ASSURANCE

- A. Plaster installers shall have two years' experience in similar pool projects which the Owner may require written proof thereof and proper tools to install plaster.

PART 2 – PRODUCTS

2.01 GENERAL MATERIALS AND REQUIREMENTS

- A. Portland Cement
 - 1. ASTM C150, type I white Portland cement.

B. Hydrated Lime

1. ASTM C206, type S.

C. Aggregates for Conventional Pool Plaster Finish Coat

1. White marble aggregates uniformly graded within following limits, all passing the no. 30 sieve (percentage retained (by weight plus or minus 2%) on each sieve):

<u>Sieve Size</u>	<u>Minimum</u>	<u>Maximum</u>
No. 30	0	0
No. 50	25	50
No. 100	75	90
No. 200	90	100

D. Water

1. Clean, fresh, from domestic potable source.

E. Bonding Agent

1. A multicoat scratch coat system super bonding, synthetic resin modified cementitious bond coating is to be provided. As manufactured by Multicoat Corporation, or approved equal.

F. Proportions and Mixing

1. Materials are specified on a volume basis and shall be measured in approved containers which will ensure that the specified proportions will be controlled and accurately maintained during the progress of the work. Measuring materials with shovels ("shovel count") is not permitted.
2. Conventional White Marble Pool Plaster Finish Coat: Mix finish in proportion of one part by volume of white Portland cement to not more than two parts by volume of aggregates (specified white marble dust).
3. Mixing
 - a. Perform mixing in approved mechanical mixers of the type in which quantity of water can be controlled accurately and uniformly. While mixer is in continuous operation, charge approximately 90% of estimated quantity of water, half of sand, all cement, and the other one-half of the sand into mixer in that sequence and mix thoroughly with remainder of water until mixture is uniform in color and consistency. Avoid excess mixing to prevent hasty solution of cement resulting in accelerated set. Discard plaster that has begun to set before it is used; re-tempering is not allowed. Do not use any caked or lump materials. Completely empty mixer and mixing boxes after each batch is mixed and keep free of old plaster.

2.02 DIAMOND BRITE

- A. The CONTRACTOR shall install a slip-resistant proprietary plaster finish in the areas indicated on the drawings. Description: Diamond Brite finish shall be a blend of selected quartz aggregates and fortified white Portland cement. Color and texture shall be selected by the Architect. Confirm all installation requirements with the manufacturer.

B. Surface Preparation

1. Surface shall be structurally sound and free of any foreign substances and debris that could reduce or impair adhesion, free of dirt, oil, grease or other foreign materials. Sound and remove all loose concrete to firm substrate. Surfaces shall be roughened by sand blasting, water jetting, shot blasting, scarifying, or grinding. Pressure-wash the entire surface. Wash with trisodium phosphate (TSP) using a stiff broom. Thoroughly wash/rinse with clean potable water. Surface defects or holes in the substrate shall be patched per manufacturer's recommendations. Lightly moisten walls and floors prior to application of Diamond Brite.

C. Bond Coat

1. Multicoat scratch coat system super bonding, synthetic resin modified cementitious bond coating. As manufactured by Multicoat Corporation, O.A.E.

D. Mixing

1. Thoroughly mix Diamond Brite to a homogeneous lump-free consistency using 1-1/2 to 2 gallons of potable water per 80 lb. bag.

E. Application

1. Diamond Brite shall be applied to a uniform thickness of 3/8" to 1/2" over the entire surface. The walls shall be scratch-coated followed by a finish coat. Material applied to the floor after the walls have been applied shall be accelerated to assure uniform setting time throughout the pool surface.

F. Coverage

1. Each 80 lb. bag shall cover approximately 25 square feet to a thickness of 3/8".

G. Proprietary plaster finish is to be applied by a licensed applicator as approved by the manufacturer.

PART 3 – EXECUTION

3.01 PREPARATION OF SURFACES AND BOND COAT

- A. Clean base surfaces of projections, dust, loose particles, grease, bond breakers, and foreign matter; make sufficiently rough to provide a strong mechanical bond. Wash entire concrete pool shell with acidic solution within 24 hours of plastering. Do not apply plaster directly to the surfaces of masonry or concrete that is coated with any acidic solution compound or similar agent until compound or agent is completely removed by water blasting. Thoroughly wash entire surface with 2,000 psi high-pressure water immediately prior to plastering. Wet cementitious base surfaces with a fine fog water spray to produce a uniformly moist condition and check screeds, pool equipment, and accessories for correct alignment before plastering is started. Do not apply plaster to base surfaces containing frost. Install temporary coverings as required to protect adjoining surfaces from staining or damage by plastering operations.
- B. Scrub bond coat into the prepared concrete surface immediately prior to plastering. Use stiff bristle brush to ensure total coverage and penetration of the bond coat slurry.

3.02 APPLICATION OF PLASTER

A. General

1. Confirm all application requirements with the manufacturer. Apply finish plaster to the properly prepared substrate at the minimum thickness required by the manufacturer, but no less than 3/8-inch thickness at any location. Apply finish plaster by hand or machine. If plastering machine is used, control fluidity of plaster to have a slump not exceeding 2-1/2 inches when tested using a 2" by 4" by 6" high slump cone. Do not add additional water to the mix subsequent to determining water content to meet this slump. Perform slump test according to following procedure:
 - a. Place cone on level, dry non-absorptive base plate.
 - b. While holding cone firmly against base plate, fill cone with plaster taken directly from hose or nozzle of plastering machine, tamping with a metal rod during filling to release all air bubbles.
 - c. Screed off plaster level with top of cone. Remove cone by lifting it straight up with a slow and smooth motion.
 - d. Place cone in a vertical position adjacent to freed plaster sample suing care not to jiggle base plate.
 - e. Lay straightedge across top of cone being careful not to vibrate cone; measure slump in inches from bottom edge of straightedge to the top of slumped plaster sample.

B. Workmanship

1. Unless otherwise required by the manufacturer, apply finish plaster in two coats by "double-back" method with second coat applied as soon as first coat is tamped and initially floated. Apply plaster with sufficient pressure to provide a good bond on bases. Work plaster to screeds at intervals of from 5 feet to 8 feet on straight surfaces. Apply smooth trowel finish without waves, cracks, trowel marks, ridges, pits, crazing, discoloration, projections, or other imperfections. Form plaster carefully around curves and angles, well up to screeds. Take special care to prevent sagging and consequent drooping of applications. Produce surfaces free of visible junction marks in finish coat where one day's work adjoins another. Finish proprietary plaster as required by the manufacturer.

C. Curing

1. Curing plaster with fine fog water spray applied to finish coat as frequently as required to prevent dry- out of plaster. Keep plaster damp until pool is filled. Prevent damage or staining of plaster by troweling or curing.

D. Patching, Pointing, and Clean Up

1. Upon completion, cut out and patch loose, cracked, damaged, or defective plaster; patches matching existing plaster in texture, color, and finish, flush with adjoining plaster. Perform pointing and patching of surfaces and plasterwork abutting or adjoining any other finish work in a neat and workmanlike manner. If 10 percent or more of the pools plaster finish is found to be defective, the plaster shall be removed and replaced complete from all surfaces. Remove plaster droppings or spattering from all surfaces. Leave plaster surfaces in clean, unblemished condition ready for pool

filling. Remove protective coverings from adjoining surfaces. Remove rubbish and debris from the site.

3.03 PRE-FILL SPECIFICATION

- A. Contractor shall employ a qualified water testing agency to analyze the domestic water with which the pool will be filled within 2 weeks of the plaster date, and shall employ a swimming pool experienced water chemistry consultant to determine types and quantities of chemicals required to ensure calcium- balanced water immediately upon the completion of water filling. Comply with commercial pool water filling requirements for water safety, chemical balance, filling methods, and infrastructure protection. Coordinate with Bainbridge Island Metropolitan Pool District Representatives prior to pool filling. Have on hand quantities of the chemicals as determine above, plus 25% overage for follow-up treatment. These chemicals, typically including calcium chloride, bicarbonate of soda, and muriatic acid are in addition to standard bromine/chlorine products and alkalizer/pH control products required elsewhere.
- B. The pool(s) shall not be plastered until directed by the Owner's representative and the filtration system and chlorination system are complete and ready for start-up. The Contractor shall supply all chemicals required for treatment of the pool water.
- C. The Contractor shall submit domestic water analysis to the Owner and/or Architect at least 2 weeks prior to filling the pool(s).

END OF SECTION

PART 1 GENERAL

1.1 WORK INCLUDED

- A. Work includes the following: Provide all materials, equipment, labor, supervision, tools and items necessary for the construction, installation, connection, testing and operation of all mechanical work for this project.
- B. Work includes the following:
 - 1. Motors
 - 2. Motor Control equipment
 - 3. Supports and support accessories
 - 4. Anchoring Hardware
 - 5. Identification
 - 6. Balancing work

1.2 DEFINITIONS AND ABBREVIATIONS

- A. The word "provide", as used in these specifications, means "furnish and install".
- B. The word "accepted", as used in these specifications, means the acceptance of the Engineer.
- C. Definitions and abbreviations of all terms shall be in accordance with applicable definitions of:

ANSI	American National Standards Institute
ASHRAE	American Society of Heating, Refrigerating & Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWS	American Welding Society
CISPI	Cast Iron Soil Pipe Institute
FM	Factory Mutual Engineering Corporation
HI	Hydraulic Institute
MSS	Manufacturers' Standardization Society of the Valve and Fittings Industry, Inc.
NEC	National Electric Code
NEMA	National Electrical Manufacturer's Association
NFPA	National Fire Protection Association
NSF	National Sanitation Foundation
OSHA	Occupational Safety and Health Administration
SMACNA	Sheet Metal and Air-Conditioning Contractors' National Association
UL	Underwriters' Laboratories, Inc.
IBC	Washington State Building Code
UPC	Uniform Plumbing Code
IMC	Washington State Mechanical Code
WAC	Washington Administrative Code
WSEC	Washington State Energy Code
WISHA	Washington Industrial Safety & Health Act
WSPSC	Washington Swimming Pool and Spa Code

- D. Refer also to Division 1 for additional acronyms and for additional definitions and explanations of terms.
- E. Some of these abbreviations may not be used. All other abbreviations shall have the definition commonly associated with them by the trade or industry. Confirm the meaning of any unclear or unknown definitions with the Architect before proceeding with any work.

1.3 PLANS AND SPECIFICATIONS

- A. The drawings and specifications are intended to cover all mechanical work, unless otherwise shown. Provide all materials that are necessary for the proper completion of the installation or operation of the equipment.
- B. The drawings are diagrammatic and do not show exact or complete piping configurations or the necessary number and types of fittings. Provide all labor and materials required to complete the work indicated.
- C. Any questions occurring during bidding or construction shall be resolved by direction in writing from the Architect. Any issues not so resolved or any conflicts shall result with the contractor bidding, furnishing and installing the most stringent condition. No exceptions.

1.4 LAW AND ORDINANCES

- A. General:
 - 1. All mechanical work specified under this contract shall be in strict accordance with the latest rules and regulations of all applicable codes.
 - 2. Contractor is not relieved from furnishing and installing work shown or specified which may be beyond requirements of ordinances, laws, regulations, and codes. This work shall be included within the construction contract.
- B. Approval: File necessary plans, prepare documents and obtain necessary approval of governmental departments having jurisdiction and required certificates of inspection for work and deliver same to Architect before requesting acceptance and final payment for work.
- C. Permits, Certificates and Taxes: Procure and pay for all the necessary permits, certificates, and taxes for all work as required in the General and Supplementary Conditions. In addition, perform all ordinance and performance tests in the presence of the Architect, and be responsible for advance notification. Submit copies of signed and accepted permits to the Architect.

1.5 MATERIAL REVIEW, SUBMITTALS AND SHOP DRAWINGS:

- A. General:
 - 1. Provide submittals for all equipment and systems indicated and specified by the Contract Documents.
- B. Prepare and distribute submittals:
 - 1. Identify each transmittal using the 6-digit specification section number and section title.
 - 2. Pay for all costs associated with materials, reproduction, and distribution.
- C. Submittals shall be complete, containing the information describing the equipment and systems of all trades. All submittals and submittal information shall be submitted at the same time, organized as described below.
- D. The project construction schedule, beginning with the acceptance of the bid and confirmation of the successful bidder, is not the responsibility of the Architect / Engineer. The contractor's schedule shall recognize and accommodate the review intervals specified herein. The schedule shall identify and accommodate the specified submittal and re-submittal review and response period. The contractor shall not anticipate or base the construction schedule on expedited reviews or reviews of partial submittals. Submittals shall be organized and delivered as specified. No exceptions.
- E. Review all items prior to submission. Submittals shall bear the General Contractors stamp, certifying that the contractor has:
 - 1. Verified all field dimensions and quantities.
 - 2. Verified all field construction criteria, materials, catalog numbers and similar data.
 - 3. Reviewed and coordinated submittal data with requirements of the work and the Contract Documents.

- F. Indicate any item, component, material or portion of work which deviates from Contract Documents and completely describe and illustrate nature and extent of deviation. Unless such departures are accepted as indicated in paragraph "Engineer Review", such departures shall not be permitted.
- G. Make submittals sufficiently in advance of required acceptance date to allow Architect / Engineer 10 working days for each review and resubmission if necessary.
 - 1. Items submitted without Contractor's review stamp will be returned without action, for resubmission.
 - 2. Items not submitted in accordance with provisions of this section will be returned, without action, for re-submittal.
 - 3. Submission of items not accepted as specified by the project manual or addenda will be rejected.
- H. Do not place orders for materials, fixtures, or equipment until acceptance is obtained from Architect/Engineer in writing. Oral acceptance will not be considered.

1.6 SUBMITTALS AND SHOP DRAWINGS

- A. Submit:
 - 1. Provide five copies of the submittals in 3-ring notebook(s), organized by specification section, large enough to accept total volume of material. Reference project information shall include:
 - a. Project title,
 - b. Project number and Location,
 - c. Architect,
 - d. Engineer,
 - e. Contractor,
 - f. Subcontractor(s),
 - g. Submission date,
 - h. Specification sections submitted.
 - 2. Label cover and binder end. Clearly indicate any items not included with submitted assemblies. Architect / Engineer will not take responsibility for collating submitted information into notebooks. Submittals not bound and organized as specified will be rejected.
 - 3. The contractor shall make every attempt to respond to the Architect and Engineer comments in a timely manner. Submittal material requiring more than three Engineering reviews will be considered non-responsive. The Architect / Engineer may elect to charge the contractor on an hourly basis for additional consultation as required to secure a responsive submittal.
- B. Standards Compliance and Certification:
 - 1. Where equipment or materials are specified to conform with requirements of standards of recognized technical or industrial organizations such as American National Standards Institute (ANSI), American Society for Mechanical Engineers (ASME), Underwriters Laboratories Refrigeration Institute (ARI), or National Electrical Manufacturer's Association (NEMA) that use a label or published listing as a method of indicating compliance, proof of such conformance shall be submitted and accepted.
 - 2. Submit certification for the product submitted and not pre-printed certifications. Do not make statements in the certifications that could be interpreted to imply the product does not meet all requirements specified, such as "as good as"; "achieve the same end use and results as materials formulated in accordance with the referenced publications"; "equal or exceed the service and performance of the specified material." Simply state that the product conforms to the requirements specified.
- C. Substitution of Materials:
 - 1. Substitutions of materials will only be considered where specified materials can not be obtained. All work and equipment required incidental to the substitution is the

responsibility of the Contractor. Substitutions are only permitted if approved in writing by the Owner. Verbal approvals shall not be binding.

2. Refer also to Division 1.

D. Shop Drawings:

1. Submit in mailing tube if drawing cannot be shipped flat. Do not fold.
2. Submit drawings 8-1/2" x 11", 11" x 17" or 24" x 36" unless size of the items depicted makes such sizes impractical. Scale of drawings shall match that of the construction documents.
3. Prepare shop drawings on a background furnished by the Architect.
4. Prior to any installation or fabrication of the system components, the contractor shall submit five complete sets of shop drawings to the Architect for approval by the Architect, Engineer and the Owner.
5. Contractor shall schedule submittal to Architect and include sufficient resources with bid to accommodate an additional revision and re-submittal.
6. Incomplete shop drawings will be rejected unless prior approval is requested and given from the Architect and Owner for partial submittals.
7. Review of the shop drawings by the Architect, Owner, or AHJ does not relieve the contractor from coordinating the installation of the work with all other trades, nor from compliance with all applicable codes and standards.

E. Engineer Review:

1. Review is general and does not:
 - a. Permit departure from Contract Documents.
 - b. Relieve Contractor from responsibility for error in detail, quantities, dimensions or related items.
 - c. Accepted departure from previous instructions or detail.
 - d. Relieve Contractor of responsibility to provide all components, wiring, etc., required to make item operational or usable.
 - e. Imply acceptance of items for which no data is submitted.
 - f. Work which requires submittals shall not be started without Architect's / Engineer's review.
 - g. Allow ten working days for engineering review.
 - h. Acceptance will be indicated by a signed stamp affixed to the submittal, or a letter over the Architect's / Engineer's signature. No exceptions.

F. Re-submittals:

1. Items of materials, fixtures and equipment not accepted by Architect shall be resubmitted within 30 days after engineering review. If Contractor fails to submit items listed below for approval or resubmit in the event of disapproval within specified time, Contractor shall provide materials, fixtures and equipment as scheduled on drawings. Where equipment is not scheduled the Contractor shall provide materials, fixtures and equipment as identified in the specifications.

G. Decision of Architect shall be final and binding and items shall be provided without change in contract price or time.

H. Electronic submittals are acceptable in lieu of physical copies noted above. If electronic submittals are disorganized or illegible they shall be rejected and physical copies will be requested.

1.7 SAFETY AND PROTECTION:

A. Drive Guards: Provide OSHA-accepted drive and shaft guards for all exposed, rotating shafts and drive connections between motors and driven equipment. Include steel frames

securely fastened for easy removal to the equipment frame. Provide tachometer cut-out at shafts where applicable.

- B. Head Protection: Where pipe hangers, equipment support angles, etc., are exposed in walkways, or in access ways for any maintenance, cover all such potentially injurious protrusions less than 7' 2" above the floor with padding; secure and permanently fasten, and finish to match adjacent finishes.

1.8 TESTING, DEMONSTRATION AND COMMISSIONING

- A. Demonstrate that all equipment operates as indicated and in accordance with manufacturer's recommendations. Support the inspections and testing of components and systems called for to commission the mechanical system. Perform tests in the presence of the Architect and Owner's Project Manager; give minimum one-week notice prior to test. Provide all instruments and personnel required to conduct the tests.

1.9 OPERATIONS AND MAINTENANCE MANUALS

- A. Furnish operations and maintenance (O&M) manuals to the Architect before conducting owner instruction session in accordance with Section 017700. Furnish copies of the O & M manuals for review in accordance with Section 017700.
- B. O & M manuals shall include full descriptions of all systems and products installed under this contract. Furnish complete narrative descriptions, product and originals of equipment descriptions with exploded diagrams, parts lists including part numbers, disassembly and assembly instructions and control wiring diagrams.

1.10 RECORD DOCUMENTS

- A. Maintain record documents as construction commences. Evaluation of pay requests shall be partially based on the level of completion indicated by the record documents.
- B. Mechanical Subcontractor shall transfer marks from the jobsite record set to electronic records (AutoCAD) and furnish a reproducible plan set and electronic records (As-Built Drawings) at the conclusion of the contract. This includes but is not limited to detailed and accurate drawings of all site and building piping, equipment, and appurtenances.

1.11 INSTRUCTION PERIODS FOR OWNER'S PERSONNEL

- A. Description: Following installation of all mechanical equipment and prior to acceptance of the mechanical work, conduct demonstrations and instruction periods to point out locations of servicing points and required points of maintenance and operation to Owner's Project Manager. Refer also to the requirements of Section 017700.

1.12 PUNCH LIST & WARRANTY

- A. Refer to the requirements of Section 017700 and Section 017800.
- B. INDUSTRY STANDARDS, CODES AND SPECIFICATIONS
- C. All materials, equipment, and systems shall conform to the following applicable industry standards, codes and specifications:

ANSI	AWS	IBC	NEMA	SMACNA	WISHA
ASHRAE	CISPI	IMC	NFPA	UL	WSEC
ASME	FM	MSS	NSI	UPC	
ASTM	HI	NEC	OSHA	WAC	

- D. Where differences occur between state laws, local ordinances, industry standards, utility company regulations and contract documents, the most stringent shall govern.

1.13 QUALITY ASSURANCE:

- A. Regulatory Requirements: Comply with all applicable City, County, and State codes and ordinances. In case of conflict with drawings or specifications, the more stringent requirements govern.
- B. All equipment specified herein, including but not limited to motors, motor control equipment, starters, panels, etc., shall be UL listed. European standard shall not be considered as an equivalent.
- C. Basis: Washington State Building Code, Uniform Plumbing Code; Washington State Mechanical Code and local amendments to the same.
- D. Installing Contractor Qualifications: Plumbing and piping systems shall be installed by experienced, licensed plumbing contractors and licensed installers. The installation of fixtures, piping and plumbing systems shall be by journeyman plumbers or by journeyman plumbers supervising apprentice plumbers. Installers shall be employed directly by the contractor, and not subcontracted. Journeymen shall have minimum 5 years of experience successfully installing plumbing and piping systems similar to those described by these contract documents.

PART 2 PRODUCTS

2.1 GENERAL

- A. Comply with "Quality Assurance" provisions, Specifications, and Manufacturers' Data. Where these may be in conflict, the more stringent requirements govern. Coordinate work with Division 26.

2.2 MOTORS

- A. Provide motors conforming to the following unless noted otherwise:
 - 1. Design and Construction: Unless otherwise indicated, provide electric motors and enclosures described by this specification conforming to the applicable definitions and requirements of NEMA MG-1.
 - 2. Standard Commercial Product: Provide motors of manufacturers' standard commercial product. A standard commercial product is a product which has been or will be sold on the commercial market through advertisements or manufacturers' catalogs or brochures, and represents the latest production model(s).
 - 3. Nameplates: Provide all motors with readily visible nameplates containing the information required in NEMA MG-1.

2.3 MOTOR REQUIREMENTS:

- A. Manufacturer: General Electric, Lincoln, Allis-Chalmers, Goulds or U.S. Motors or accepted equal.
- B. Type: Furnish High Efficiency motors. Motor efficiencies shall meet or exceed the efficiency values required by the Washington State Energy Code.

2.4 MOTOR CONTROL EQUIPMENT

- A. General: The mechanical contractor is responsible for providing and installing motor control equipment as required for mechanical equipment and systems, unless otherwise indicated or directed. Refer also to the requirements of Division 26. Motor control equipment shall be comprised of and comply with the following:
 - 1. Magnetic motor starters: Where equipment is under automatic control and is furnished with a disconnecting means, provide magnetic motor starters. Starters shall conform to or contain items called for below and unless noted otherwise, shall be full voltage non-reversing for NEMA size 3 and under. No starters smaller than NEMA size 0 and no half size starters are permitted. Provide starters with protection for phase loss, phase

imbalance, overload, and ground fault. Wye-delta type must have motor designed for this use. Coordinate work as required.

- a. Overload devices: Melting alloy or bimetallic type. One overload shall be provided for each phase. Provide ambient compensated overload devices only when the motor is at a constant temperature and the controller is subject to a separate, varying temperature. Automatic reset overload devices are not permitted.
 - b. Accessories: Each magnetic motor controller shall include, "HAND-OFF-AUTO" selector switch, 120 volt coil (unless noted otherwise), red running pilot light, green off pilot light, 100VA (minimum) control transformer (except for 115 volt motors), surge suppression kit, with fused primary and secondary, two spare auxiliary interlock contacts and all other accessories required or noted.
 - c. Enclosures: Motor controllers shall be contained in an enclosure suitable for the environment in which the controller is mounted. Enclosures located in damp, moist locations and outdoors shall be NEMA 3R throughout.
- B. Combination motor controller Motor starter and disconnect. Where equipment is under automatic control and is not provided with a disconnecting means, provide combination motor starter and disconnect. Provide as specified above, and also include a disconnecting means. Shall be fused switch type (Class RK5), or motor circuit protector type rated for 22,000 RMS A.I.C. minimum unless noted otherwise and containing all accessories as listed above. If externally powered control circuits are used, provide an auxiliary switch on the disconnect switch or protector and fuse in lieu of the control transformer. Switch or protector shall be capable of being padlocked in the off position.
- C. Manual Starters: Where equipment is under manual control, provide manual starter. Starter shall be toggle switch type, lockable in the "off" position, with overload relays, pilot light and enclosure per above.
- D. Accepted Manufacturers: Allen Bradley or as accepted through prior approval.

2.5 EXPANSION SHELLS AND BOLTS

- A. Expansion Shells for Rod Hangers
 1. Phillips, Gregory, Omark, or Fastite in holes drilled in concrete.
- B. Expansion Bolts for Equipment
 1. USM or McCullough in holes drilled in concrete.
 2. No screwed adapters underground.

2.6 FORMED STEEL CHANNELS AT SLAB

- A. Provide for all equipment; number and size per manufacturer's recommendations or as indicated.

2.7 ANCHOR BOLTS

- A. Provide for all equipment; number and size per manufacturers' recommendations or as indicated.

2.8 SUPPLEMENTARY STEEL FRAMING

- A. Standard structural steel shapes or Schedule 40 steel pipe, galvanized with extra-heavy finish.

2.9 SLEEVES

- A. Refer to Specification Section 220517.

2.10 WELDING TO BUILDING STRUCTURAL MEMBERS

- A. Not allowed except as indicated.

2.11 NAMEPLATES

- A. Laminated black plastic with lettering cut through to white background. Plastic strips with raised letters made by a marking device are not acceptable.

2.12 VALVE TAGS

- A. Shall be 0.030" thick brass, 1" diameter size; state the service and destination of the line controlled. Provide tag inscriptions made with a lettering device with 5/16" high cut lettering. Laminated plastic tags, construction similar to nameplates will also be acceptable.

2.13 PIPING IDENTIFICATION

- A. Self adhesive, pre-printed identification labels indicating direction of flow and pipe contents, using common industry abbreviations. Identify pipe at every change of direction.

2.14 SPECIAL MAINTENANCE MATERIALS

- A. Provide for equipment requiring frequent replacement of maintenance materials. Provide an extra set of filters, and belts; together with application devices and instructions.

2.15 PAINTING

- A. Paint all exposed fixtures and equipment in conformance with Division 9. Coordinate color with Architect. Refer to Architectural documents for paint and application requirements.

2.16 EQUIPMENT LISTING REQUIREMENTS

- A. Whenever UL Standards exist for equipment provide UL-accepted equipment bearing the UL label.

PART 3 EXECUTION

3.1 INSPECTION

- A. Verify installation conditions as satisfactory to receive work of this Section. Do not install until any unsatisfactory conditions are corrected. Beginning work constitutes acceptance of conditions as satisfactory.

3.2 PREPARATION

- A. Field Measurements: Field-verify locations of new and existing work prior to commencing work of this Section.
- B. Protect surrounding areas and surfaces to preclude damage from work of this Section.

3.3 INSTALLATION, ERECTION, AND PERFORMANCE

- A. Install, apply, erect, and perform the work in accordance with "Quality Assurance" provisions, Specifications, and manufacturers' installation instructions and directions. Where these may be in conflict, the more-stringent requirements govern.

3.4 CLEANING

- A. Promptly remove waste material and rubbish caused by mechanical construction work. At completion of the project, clean all equipment, piping and fixtures installed or provided under this Contract.

3.5 CUTTING AND PATCHING

- A. Cut all openings and holes required for mechanical work. Carefully examine existing conditions prior to commencing work.

3.6 ACCESSIBILITY

- A. Locate valves, controls, etc., to be easily accessible.
- B. Install all equipment that requires periodic servicing or repairs to be readily accessible. Otherwise, obtain Architect's approval of location. Where valve and equipment is concealed behind access panels or by ceiling tiles, label panel or tile appropriately.
- C. Provide access panels as indicated or required for piping, valve or equipment access. Refer to Architectural Documents to determine fire-rating requirements. The access panel size shall be in proportion to the equipment, piping, or valve requiring access. Minimum access panel size shall be 12" x 12".

3.7 SPECIAL PROTECTION

- A. Exercise maximum precaution to provide positive protection for the existing building and equipment from damage of any kind, and in particular prevent any water and dust seepage into the existing building.
- B. Storage of materials: Make all necessary provisions to prevent damage or corrosion of materials.

3.8 EQUIPMENT INSTALLATION

- A. General: Provide supports for all equipment and appurtenances as required, including braces as required for seismic restraint; these include frames or supports for pumps and air handlers and all mechanical equipment. Bracing shall conform with the requirements of IBC and IMC. Include the design, engineering and installation of these members is the responsibility of the contractor.
- B. Suspended Equipment: Provide hangers from structure as required; span between structural members with additional structural steel as required to mount equipment in locations shown. Do not fasten hangers to metal deck. Do not use powder-actuated fasteners.
- C. Floor-Mounted Equipment - General:
 - 1. Provide machine and floor or foundation fastenings; set equipment on concrete pads. Provide equipment base drawings, bolt-setting information, and anchors for all floor-mounted equipment. Provide concrete expansion anchors through concrete equipment pads, installed into existing structural concrete slabs.
 - 2. Install all equipment at the locations, and to the dimensions indicated. Set equipment accurately with principal centerlines and level, using manufacturers' leveling screws, blocks, shims, or wedges. Do not distort equipment or base plates.
 - 3. Install all equipment and piping such as to provide adequate access for service. This includes access to equipment covered in other divisions or sections of this specification.

3.9 PIPE SUPPORTS

- A. Attach hangers and support rigidly to the building structure; provide supplementary steel framing and bracing at all changes in pipe direction to resist thrust of flowing water. Provide seismic bracing as required by codes. Do not fasten hangers to metal deck. Do not use powder-actuated fasteners.
- B. Provide additional steel support for piping runs through tight confinements. Provide trapeze system with vibration isolation and seismic restraint for piping through joists and as applicable, due to accessibility of ductwork and mechanical equipment.
- C. Where pipe is located below slab on grade, or structure on grade, provide support of pipe from structure such that pipe is protected from damage or displacement should the ground settle away from the structure.

3.10 EXPANSION SHELLS AND BOLTS

- A. Use only where necessary to support piping or equipment from existing concrete slabs or walls.

3.11 SLEEVES AND SEALING OF SLEEVES

- A. Provide all sleeving and sealing of sleeves for pipes.
- B. Provide annular clear space of approximately 1/4" to 1/2"; size to accommodate insulation passing through sleeve where applicable.
- C. Wherever piping passes through any floor slab above occupied space or equipment, provide pipe sleeves extending 1" above floor.
- D. Set sleeves in place prior to pouring of concrete in new construction; core drill and grout sleeves in place for unit masonry construction and existing construction.
- E. Sealing of sleeves through floor slabs and firewalls: Provide firestop system by 3M or accepted equal.
- F. Sealing of sleeves for below grade floors and walls: Provide Link Seal. Refer to 221000.

3.12 NAMEPLATES

- A. Provide for all equipment; fasten mechanically. Label access panel or ceiling appropriately for concealed equipment.

3.13 VALVE TAGS

- A. Provide on all new valves; fasten with brass chain to the valve stem.
- B. Provide a framed valve map based on the as-built locations of all new pipe, as well as the field verified arrangement of the existing pipe, and coordinate location of valve map with Owner.

3.14 PIPING IDENTIFICATION

- A. Provide pipe identification labels on not less than 10 foot centers, on both sides of a wall penetration, and at every change in direction, so that a label is visible from a standing position on the floor, not more than three feet from the wall.
- B. Provide valve location indicators on exposed finish side of adjacent surfaces. Labeling color and style shall be at the discretion of Architect.

3.15 PAINTING

- A. General Paint exposed equipment, piping, and mechanical system appurtenances unless noted otherwise. Coordinate color with Architect. Refer also to Division 9.
- B. Application:
 - 1. Thoroughly clean surfaces to be painted to remove dirt, grease and scale. Wash galvanized surfaces with mild solution of acid prior to painting to effectively clean oils from surface and to etch zinc.
 - 2. Paint insulated surfaces and covered piping with one primer coat and two finish coats.
 - 3. Paint exposed equipment, pipes and supports with one primer coat and two finish coats. Paint factory painted equipment to match colors selected by the Architect: touch up damaged areas with paint to match factory color.
 - 4. Paint the supporting devices for mechanical devices or systems specified to be painted.

3.16 MISCELLANEOUS EQUIPMENT AND FIXTURE CONNECTIONS

- A. Provide piping and make all final mechanical connections in accordance with manufacturers' recommendations for Owner-furnished equipment and fixtures, and equipment and fixtures specified.

- B. Perform on-site review and refer to manufacturers' shop drawings for details of connections.
Provide rough-in at locations to conveniently serve items.

3.17 WIRING

- A. Wiring shall conform to applicable sections of these specifications. Provide wiring from branch circuit over current device to motor controller to motor terminals, including installation of starter and all connections. Provide raceway and conductors as shown for remote control, or interlock connections. Coordinate other control wiring with Divisions 23 and 26 of the Specifications. Provide overload elements in controllers sized to match motor nameplate full load amperes. Space within controllers shall not be used as a junction box.

END OF SECTION

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. Sleeves.
 - 2. Sleeve-seal systems.
 - 3. Silicone sealants.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

PART 2 PRODUCTS

2.1 SLEEVES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Advance Products & Systems, Inc.
 - 2. CALPICO, Inc.
 - 3. GPT; an EnPro Industries company.
- B. Cast-Iron Pipe Sleeves: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop collar.
- C. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, anticorrosion coated or galvanized, with plain ends and integral welded waterstop collar.
- D. Galvanized-Steel Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.
- E. PVC Pipe Sleeves: ASTM D 1785, Schedule 40.
- F. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.
- G. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

2.2 SLEEVE-SEAL SYSTEMS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. Metraflex Company (The).
- B. Description:
 - 1. Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
 - 2. Designed to form a hydrostatic seal of 20 psig minimum.
 - 3. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
 - 4. Pressure Plates: Carbon steel .
 - 5. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, ASTM B 633 of length required to secure pressure plates to sealing elements.

2.3 SILICONE SEALANTS

- A. Silicone, S, NS, 25, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant, ASTM C 920, Type S, Grade NS, Class 25, Use NT.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. GE Construction Sealants; Momentive Performance Materials Inc.
 - b. Sherwin-Williams Company (The).
 - c. The Dow Chemical Company.
2. Verify sealant has a VOC content of 250 g/L or less.
- B. Silicone, S, P, 25, T, NT: Single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade P, Class 25, Uses T and NT. Grade P Pourable (self-leveling) formulation is for opening in floors and other horizontal surfaces that are not fire rated.
 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. May National Associates, Inc.; a subsidiary of Sika Corporation.
 2. Verify sealant has a VOC content of 250 g/L or less.
- C. Silicone Foam: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.
 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Smooth-On.
 2. Verify sealant has a VOC content of 250 g/L or less.

PART 3 EXECUTION

3.1 SLEEVE INSTALLATION

- A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.
- B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.
 1. Sleeves are not required for core-drilled holes.
- C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.
 1. Cut sleeves to length for mounting flush with both surfaces.
 - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.
 2. Using silicone sealant, seal the space outside of sleeves in slabs and walls without sleeve-seal system.
- D. Install sleeves for pipes passing through interior partitions.
 1. Cut sleeves to length for mounting flush with both surfaces.
 2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
 3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint.
- E. Fire-Resistance-Rated Penetrations, Horizontal Assembly Penetrations, and Smoke Barrier Penetrations: Maintain indicated fire or smoke rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with fire- and smoke-stop materials. Comply with requirements for firestopping and fill materials specified in Section 078413 "Penetration Firestopping."

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.
- B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and

sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.3 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Leak Test: After allowing for a full cure, test sleeves and sleeve seals for leaks. Repair leaks and retest until no leaks exist.
- B. Sleeves and sleeve seals will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

3.4 SLEEVE AND SLEEVE-SEAL SCHEDULE

- A. Use sleeves and sleeve seals for the following piping-penetration applications:
 - 1. Exterior Concrete Walls above Grade:
 - a. Piping Smaller Than NPS 6: Steel pipe sleeves
 - 2. Exterior Concrete Walls below Grade:
 - a. Piping Smaller Than NPS 6: Steel pipe sleeves with sleeve-seal system.
 - 1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
 - 3. Concrete Slabs-on-Grade:
 - a. Piping Smaller Than NPS 6: Steel pipe sleeves with sleeve-seal system.
 - 1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
 - 4. Concrete Slabs above Grade:
 - a. Piping Smaller Than NPS 6: Steel pipe sleeves.
 - 5. Interior Partitions:
 - a. Piping Smaller Than NPS 6: Steel pipe sleeves.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes insulating the following plumbing piping services:
 - 1. Domestic cold-water piping.
 - 2. Domestic hot-water piping.
 - 3. Domestic recirculating hot-water piping.
 - 4. Storm-water piping exposed to freezing conditions.
 - 5. Roof drains and rainwater leaders.
 - 6. Supplies and drains for handicap-accessible lavatories and sinks.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory and field applied if any).
- B. Sustainable Design Submittals:
 - 1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
 - 2. Product Data: For adhesives, mastics, and sealants, indicating VOC content.
 - 3. Laboratory Test Reports: For adhesives, mastics, and sealants, indicating compliance with requirements for low-emitting materials.

1.3 QUALITY ASSURANCE

- A. Comply with the following applicable standards and other requirements specified for miscellaneous components:
 - 1. Supply and Drain Protective Shielding Guards: ICC A117.1.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation system materials are to be delivered to the Project site in unopened containers. The packaging is to include name of the manufacturer, fabricator, type, description, and size.

1.5 COORDINATION

- A. Coordinate sizes and locations of supports, hangers, and insulation shields.
- B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.
- C. Coordinate installation and testing of heat tracing.

1.6 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products in accordance with ASTM E84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation, jacket materials, adhesive, mastic, tapes, and cement material containers with appropriate markings of applicable testing agency.

1. All Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

2.2 INSULATION MATERIALS

- A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials are applied.
- B. Products do not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come into contact with stainless steel have a leachable chloride content of less than 50 ppm when tested in accordance with ASTM C871.
- D. Insulation materials for use on austenitic stainless steel are qualified as acceptable in accordance with ASTM C795.
- E. Foam insulation materials do not use CFC or HCFC blowing agents in the manufacturing process.
- F. Glass-Fiber, Preformed Pipe: Glass fibers bonded with a thermosetting resin; suitable for maximum use temperature up to 850 deg F in accordance with ASTM C411. Comply with ASTM C547.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Johns Manville; a Berkshire Hathaway company.
 - b. Knauf Insulation.
 - c. Manson Insulation Inc.
 - d. Preformed Pipe Insulation: Type I, Grade A with factory-applied ASJ .
 - e. Fabricated shapes in accordance with ASTM C450 and ASTM C585.
 - f. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
- G. Mineral Wool, PREFORMED Pipe: Mandrel-wound mineral wool fibers bonded with a thermosetting resin, unfaced; suitable for maximum use temperature up to 1200 deg F in accordance with ASTM C447. Comply with ASTM C547.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Johns Manville; a Berkshire Hathaway company, or approved equal.
 2. Preformed Pipe Insulation: Type II, Grade A with factory-applied ASJ .
 3. Fabricated shapes in accordance with ASTM C450 and ASTM C585.
 4. INSULATING CEMENTS
- H. Glass-Fiber and Mineral Wool Insulating Cement: Comply with ASTM C195.

2.3 ADHESIVES

- A. Materials are compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.
- B. Glass-Fiber and Mineral Wool Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Childers Brand; H. B. Fuller Construction Products.
 - b. Foster Brand; H. B. Fuller.
 - c. Mon-Eco Industries, Inc.
 2. Adhesive: As recommended by mineral fiber manufacturer and with a VOC content of 80 g/L or less.
 3. Verify adhesive complies with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of

Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

- C. Phenolic Adhesive: Solvent-based resin adhesive, with a service temperature range of minus 75 to plus 300 deg F.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Childers Brand; H. B. Fuller Construction Products.
 - b. Foster Brand; H. B. Fuller, or approved equal.
 - 2. Adhesive: As recommended by phenolic manufacturer and with a VOC content of 50 g/L or less.
 - 3. Verify adhesives and sealants comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- D. ASJ Adhesive and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A, for bonding insulation jacket lap seams and joints.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Childers Brand; H. B. Fuller Construction Products.
 - b. Foster Brand; H. B. Fuller.
 - c. Mon-Eco Industries, Inc.
 - 2. Verify adhesives have a VOC content of 80 g/L or less.
 - 3. Verify adhesives and sealants comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.4 MASTICS AND COATINGS

- A. Materials are compatible with insulation materials, jackets, and substrates.
 - 1. Mastics: As recommended by insulation manufacturer and with a VOC content of 50 g/L or less.
 - 2. Verify mastics comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- B. Vapor-Retarder Mastic, Water Based: Suitable for indoor use on below-ambient services.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Childers Brand; H. B. Fuller Construction Products.
 - b. Foster Brand; H. B. Fuller.
 - c. Knauf Insulation.
 - d. Mon-Eco Industries, Inc.
 - 2. Water-Vapor Permeance: Comply with ASTM E96/E96M or ASTM F1249.
 - 3. Service Temperature Range: 0 to plus 180 deg F .
 - 4. Comply with MIL-PRF-19565C, Type II, for permeance requirements.
 - 5. Color: White .

2.5 LAGGING ADHESIVES

- A. Adhesives comply with MIL-A-3316C, Class I, Grade A, and are compatible with insulation materials, jackets, and substrates.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Childers Brand; H. B. Fuller Construction Products.

- b. Foster Brand; H. B. Fuller, or approved equal.
- 2. Verify adhesive is as recommended by insulation manufacturer and has a VOC content of 50 g/L or less.
- 3. Verify adhesive complies with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- 4. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over pipe insulation.
- 5. Service Temperature Range: 0 to plus 180 deg F.
- 6. Color: White.

2.6 SEALANTS

- A. Materials are as recommended by the insulation manufacturer and are compatible with insulation materials, jackets, and substrates.
- B. ASJ Flashing Sealants and PVC Jacket Flashing Sealants:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Childers Brand; H. B. Fuller Construction Products.
 - b. Foster Brand; H. B. Fuller, or approved equal.
 - 2. Fire- and water-resistant, flexible, elastomeric sealant.
 - 3. Service Temperature Range: Minus 40 to plus 250 deg F.
 - 4. Color: White.
 - 5. Verify sealant has a VOC content of 420 g/L or less.
 - 6. Verify sealant complies with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.7 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C1136.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. 3M Industrial Adhesives and Tapes Division.
 - b. Avery Dennison Corporation, Specialty Tapes Division.
 - c. Ideal Tape Co., Inc., an American Biltrite Company.
 - d. Knauf Insulation.
 - 2. Width: 3 inches .
 - 3. Thickness: 11.5 mils .
 - 4. Adhesion: 90 ounces force/inch in width.
 - 5. Elongation: 2 percent.
 - 6. Tensile Strength: 40 lbf/inch in width.
 - 7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

2.8 PROTECTIVE SHIELDING GUARDS

- A. Protective Shielding Pipe Covers:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Buckaroos, Inc.
 - b. McGuire Manufacturing.

- c. MVG Molded Products.
- 2. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
 - 1. Verify that systems to be insulated have been tested and are free of defects.
 - 2. Verify that surfaces to be insulated are clean and dry.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:
 - 1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils thick and an epoxy finish 5 mils thick if operating in a temperature range of between 140 and 300 deg F. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
 - 2. Carbon Steel: Coat carbon steel operating at a service temperature of between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
- C. Coordinate insulation installation with the tradesman installing heat tracing. Comply with requirements for heat tracing that apply to insulation.
- D. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping, including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and of thicknesses required for each item of pipe system, as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, compress, or otherwise damage insulation or jacket.
- D. Install insulation with longitudinal seams at top and bottom (12 o'clock and 6 o'clock positions) of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during storage, application, and finishing. Replace insulation materials that get wet during storage or in the installation process before being properly covered and sealed in accordance with Contract Documents.
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends attached to structure with vapor-barrier mastic.
3. Install insert materials and insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- L. Install insulation with factory-applied jackets as follows:
 1. Draw jacket tight and smooth, but not to the extent of creating wrinkles or areas of compression in the insulation.
 2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward-clinching staples along both edges of strip, spaced 4 inches o.c.
 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward-clinching staples along edge at 4 inches o.c.
 - a. For below-ambient services, apply vapor-barrier mastic over staples.
 4. Cover joints and seams with tape, in accordance with insulation material manufacturer's written instructions, to maintain vapor seal.
 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.
- M. Cut insulation in a manner to avoid compressing insulation.
- N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches in similar fashion to butt joints.
- P. For above-ambient services, do not install insulation to the following:
 1. Vibration-control devices.
 2. Testing agency labels and stamps.
 3. Nameplates and data plates.
 4. Cleanouts.

3.4 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this article generally apply to all insulation materials, except where more specific requirements are specified in various pipe insulation material installation articles below.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, Mechanical Couplings, and Unions:
 1. Install insulation over fittings, valves, strainers, flanges, mechanical couplings, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
 2. Insulate pipe elbows using preformed fitting insulation or mitered or routed fittings made from same material and density as that of adjacent pipe insulation. Each piece is butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.

3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as that used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as that used for adjacent pipe. Overlap adjoining pipe insulation by not less than 2 times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than 2 times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers, so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
6. Insulate flanges, mechanical couplings, and unions, using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than 2 times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Stencil or label the outside insulation jacket of each union with the word "union" matching size and color of pipe labels.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services not specified to receive a field-applied jacket, except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing, using PVC tape.
- C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.
- D. Install removable insulation covers at locations indicated. Installation conforms to the following:
 1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as that of adjoining pipe insulation.
 2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union at least 2 times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless steel or aluminum bands. Select band material compatible with insulation and jacket.
 3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
 4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
 5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.5 INSTALLATION OF GLASS-FIBER AND MINERAL WOOL INSULATION

- A. Insulation Installation on Straight Pipes and Tubes:
 - 1. Secure each layer of preformed pipe insulation to pipe with wire or bands, and tighten bands without deforming insulation materials.
 - 2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
 - 3. For insulation with jackets on above-ambient surfaces, secure laps with outward-clinched staples at 6 inches o.c.
 - 4. For insulation with jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive, as recommended by insulation material manufacturer, and seal with vapor-barrier mastic and flashing sealant.
- B. Insulation Installation on Pipe Flanges:
 - 1. Install prefabricated pipe insulation to outer diameter of pipe flange.
 - 2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
 - 3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with glass-fiber or mineral-wool blanket insulation.
 - 4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.
- C. Insulation Installation on Pipe Fittings and Elbows:
 - 1. Install prefabricated sections of same material as that of straight segments of pipe insulation when available.
 - 2. When prefabricated insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.
- D. Insulation Installation on Valves and Pipe Specialties:
 - 1. Install prefabricated sections of same material as that of straight segments of pipe insulation when available.
 - 2. When prefabricated sections are not available, install fabricated sections of pipe insulation to valve body.
 - 3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
 - 4. Install insulation to flanges as specified for flange insulation application.

3.6 FINISHES

- A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section 099000 "Painting and Coating."
 - 1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
 - a. Finish Coat Material: Interior, flat, latex-emulsion size.
- B. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.
- C. Do not field paint aluminum or stainless steel jackets.

3.7 PIPING INSULATION SCHEDULE, GENERAL

- A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.
- B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
 - 1. Drainage piping located in crawl spaces.
 - 2. Underground piping.
 - 3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.8 INDOOR PIPING INSULATION SCHEDULE

- A. Domestic Cold Water:
 - 1. NPS 1 and Smaller: Insulation is one of the following:
 - a. Glass-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
 - b. Mineral Wool, Preformed Pipe Insulation, Type II: 1 inch thick.
 - 2. NPS 1-1/4 and Larger: Insulation is one of the following:
 - a. Glass-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
 - b. Mineral Wool, Preformed Pipe Insulation, Type II: 1 inch thick.
 - 3. Domestic Hot and Recirculated Hot Water:
 - 4. NPS 1-1/4 and Smaller: Insulation is one of the following:
 - a. Glass-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
 - b. Mineral Wool, Preformed Pipe Insulation, Type II: 1 inch thick.
- B. Stormwater and Overflow:
 - 1. All Pipe Sizes: Insulation is one of the following:
 - a. Glass-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
 - b. Mineral Wool, Preformed Pipe Insulation, Type II: 1 inch thick.
 - 2. Roof Drain and Overflow Drain Bodies:
 - 3. All Pipe Sizes: Insulation is one of the following:
 - a. Glass-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
 - b. Mineral Wool, Preformed Pipe Insulation, Type II: 1 inch thick.
- C. Exposed Sanitary Drains, Domestic Water, Domestic Hot Water, and Stops for Plumbing Fixtures for People with Disabilities:
 - 1. All Pipe Sizes: Insulation is one of the following:
 - a. Glass-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
 - b. Mineral Wool, Preformed Pipe Insulation, Type II: 1 inch thick.
- D. INDOOR, FIELD-APPLIED JACKET SCHEDULE
- E. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.
- F. If more than one material is listed, selection from materials listed is Contractor's option.
- G. Piping, Exposed:
 - 1. 20 mils thick.
 - 2. Painted Aluminum, Smooth: 0.016 inch thick.

END OF SECTION

A. GENERAL

I. SECTION INCLUDES:

1. Hub-and-spigot, cast-iron soil pipe and fittings.
2. Hubless, cast-iron soil pipe and fittings.

II. ACTION SUBMITTALS

1. Product Data
 - a. Hub-and-spigot, cast-iron soil pipe and fittings.
 - b. Hubless, cast-iron soil pipe and fittings.
2. Shop Drawings: For hubless, single-stack drainage system. Include plans, elevations, sections, and details.

III. WARRANTY

1. Listed manufacturers to provide labeling and warranty of their respective products.

B. PRODUCTS

I. PERFORMANCE REQUIREMENTS

1. Components and installation are capable of withstanding the following minimum working pressure unless otherwise indicated:
 - a. Soil, Waste, and Vent Piping: 10 ft. head of water.
 - b. Waste, Force-Main Piping: 150 psig.

II. PIPING MATERIALS

1. Piping materials to bear label, stamp, or other markings of specified testing agency.
2. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

III. HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AB & I Foundry; a part of the McWane family of companies.
 - b. Charlotte Pipe and Foundry Company.
 - c. Tyler Pipe; a part of McWane family of companies.
2. Pipe and Fittings:
 - a. Marked with CISPI collective trademark.
 - b. ASTM A74, service cast iron.
3. Gaskets: ASTM C564, rubber.
4. Caulking Materials: ASTM B29, pure lead and oakum or hemp fiber.

IV. HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AB & I Foundry; a part of the McWane family of companies.
 - b. Charlotte Pipe and Foundry Company.
 - c. Tyler Pipe; a part of McWane family of companies.
2. Pipe and Fittings:
 - a. Marked with CISPI collective trademark.
 - b. ASTM A888 or CISPI 301.
3. Single-Stack Aerator Fittings: ASME B16.45, hubless, cast-iron aerator and deaerator drainage fittings.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - i. Conine Manufacturing Co., Inc.
 - ii. SE Sovent, or approved equal.
4. CISPI, Hubless-Piping Couplings:
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - i. Charlotte Pipe and Foundry Company.
 - ii. Fernco Inc.
 - iii. Tyler Pipe; a subsidiary of McWane Inc.

- b. Standards: ASTM C1277 and CISPI 310.
- c. Description: Stainless steel corrugated shield with stainless steel bands and tightening devices; and ASTM C564, rubber sleeve with integral, center pipe stop.

C. EXECUTION

I. INSTALLATION OF PIPING

1. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems.
 - a. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations.
 - b. Install piping as indicated unless deviations to layout are approved on coordination drawings.
2. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
3. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
4. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
5. Install piping to permit valve servicing.
6. Install piping at indicated slopes.
7. Install piping free of sags and bends.
8. Install fittings for changes in direction and branch connections.
9. Install piping to allow application of insulation.
10. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends.
 - a. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical.
 - b. Use long-turn, double Y-branch, and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe.
 - i. Straight tees, elbows, and crosses may be used on vent lines.
 - c. Do not change direction of flow more than 90 degrees.
 - d. Use proper size of standard increasers and reducers if pipes of different sizes are connected.
 - i. Reducing size of waste piping in direction of flow is prohibited.
11. Lay buried building waste piping beginning at low point of each system.
 - a. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream.
 - b. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
 - c. Maintain swab in piping and pull past each joint as completed.
12. Install soil and waste and vent piping at the following minimum slopes unless otherwise indicated:
 - a. Building Sanitary Waste: Two percent downward in direction of flow for piping NPS 3 and smaller; 2 percent downward in direction of flow for piping NPS 4 and larger.
 - b. Horizontal Sanitary Waste Piping: Two percent downward in direction of flow.
 - c. Vent Piping: One percent down toward vertical fixture vent or toward vent stack.
13. Install cast-iron soil piping in accordance with CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
 - a. Install encasement on underground piping in accordance with ASTM A674 or AWWA C105/A 21.5.
14. Install underground piping in accordance with ASTM D2321.
15. Install engineered soil and waste and vent piping systems as follows:
 - a. Combination Waste and Vent: Comply with standards of authorities having jurisdiction.
 - b. Hubless, Single-Stack Drainage System: Comply with ASME B16.45 and hubless, single-stack aerator fitting manufacturer's written installation instructions.
 - c. Reduced-Size Venting: Comply with standards of authorities having jurisdiction.
16. Install underground, ductile-iron, force-main piping according to AWWA C600.
 - a. Install buried piping inside building between wall and floor penetrations and connection to sanitary sewer piping outside building with restrained joints.
 - b. Anchor pipe to wall or floor. Install thrust-block supports at vertical and horizontal offsets.
 - c. Install encasement on piping in accordance with ASTM A674 or AWWA C105/A 21.5.
17. Install underground, copper, force-main tubing in accordance with CDA's "Copper Tube Handbook."

- a. Install encasement on piping in accordance with ASTM A674 or AWWA C105/A 21.5.
- 18. Install force mains at elevations indicated.
- 19. Plumbing Specialties:
 - a. Install backwater valves in sanitary waster gravity-flow piping.
 - i. Comply with requirements for backwater valves specified in Section 221319 "Sanitary Waste Piping Specialties."
 - b. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary waste gravity-flow piping.
 - i. Install cleanout fitting with closure plug inside the building in sanitary drainage force-main piping.
 - ii. Comply with requirements for cleanouts specified in Section 221319 "Sanitary Waste Piping Specialties."
 - c. Install drains in sanitary waste gravity-flow piping.
 - i. Comply with requirements for drains specified in Section 221319 "Sanitary Waste Piping Specialties."
- 20. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
- 21. Install sleeves for piping penetrations of walls, ceilings, and floors.
 - a. Comply with requirements for sleeves specified in Section 220500 "Common Work Results for Plumbing."
- 22. Install sleeve seals for piping penetrations of concrete walls and slabs.
 - a. Comply with requirements for sleeve seals specified in Section 220500 "Common Work Results for Plumbing."
- 23. Install escutcheons for piping penetrations of walls, ceilings, and floors.

II. JOINT CONSTRUCTION

- 1. Hub-and-Spigot, Cast-Iron Soil Piping Gasketed Joints: Join in accordance with CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.
- 2. Hub-and-Spigot, Cast-Iron Soil Piping Caulked Joints: Join in accordance with CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead-and-oakum caulked joints.
- 3. Hubless, Cast-Iron Soil Piping Coupled Joints:
 - a. Join hubless, cast-iron soil piping in accordance with CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.
- 4. Threaded Joints: Thread pipe with tapered pipe threads in accordance with ASME B1.20.1.
 - a. Cut threads full and clean using sharp dies.
 - b. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - i. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 - ii. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
 - iii. Do not use pipe sections that have cracked or open welds.
- 5. Grooved Joints: Cut groove ends of pipe in accordance with AWWA C606. Lubricate and install gasket over ends of pipes or pipe and fitting. Install coupling housing sections over gasket, with keys seated in piping grooves. Install and tighten housing bolts.
- 6. Flanged Joints: Align bolt holes. Select appropriate gasket material, size, type, and thickness. Install gasket concentrically positioned. Use suitable lubricants on bolt threads. Torque bolts in cross pattern.
- 7. Plastic, Nonpressure-Piping, Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings in accordance with the following:
 - a. Comply with ASTM F402 for safe-handling practice of cleaners, primers, and solvent cements.
 - b. ABS Piping: Join in accordance with ASTM D2235 and ASTM D2661 appendixes.
 - c. PVC Piping: Join in accordance with ASTM D2855 and ASTM D2665 appendixes.
- 8. Joint Restraints and Sway Bracing:
 - a. Provide joint restraints and sway bracing for storm drainage piping joints to comply with the following conditions:
 - i. Provide axial restraint for pipe and fittings 5 inches and larger, upstream and downstream of all changes in direction, branches, and changes in diameter greater than two pipe sizes.

- ii. Provide rigid sway bracing for pipe and fittings 4 inches and larger, upstream and downstream of all changes in direction 45 degrees and greater.
- iii. Provide rigid sway bracing for pipe and fittings 5 inches and larger, upstream and downstream of all changes in direction and branch openings.

III. INSTALLATION OF SPECIALTY PIPE FITTINGS

- 1. Transition Couplings:
 - a. Install transition couplings at joints of piping with small differences in ODs.
 - b. In Waste Drainage Piping: Shielded, nonpressure transition couplings.
 - c. In Aboveground Force Main Piping: Fitting-type transition couplings.
 - d. In Underground Force Main Piping:
 - i. NPS 1-1/2 and Smaller: Fitting-type transition couplings.
 - ii. NPS 2 and Larger: Pressure transition couplings.
- 2. Dielectric Fittings:
 - a. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
 - b. Dielectric Fittings for NPS 2 and Smaller: Use dielectric nipples.
 - c. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric nipples.
 - d. Dielectric Fittings for NPS 5 and Larger: Use dielectric flange kits.

IV. INSTALLATION OF VALVES

- 1. Shutoff Valves:
 - a. Install shutoff valve on each sewage pump discharge.
 - b. Install gate valve for piping NPS 2 and smaller.
 - c. Install gate valve for piping NPS 2-1/2 and larger.

V. INSTALLATION OF HANGERS AND SUPPORTS

- 1. Comply with requirements for pipe hanger and support devices and installation.
 - a. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
 - b. Install stainless steel pipe hangers for horizontal piping in corrosive environments.
 - c. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
 - d. Install stainless steel pipe support clamps for vertical piping in corrosive environments.
 - e. Vertical Piping: MSS Type 8 or Type 42 clamps.
 - f. Install individual, straight, horizontal piping runs:
 - i. 100 Ft. (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.
 - ii. Longer Than 100 Ft. (30 m): MSS Type 43, adjustable roller hangers.
 - iii. Longer Than 100 Ft. (30 m) if Indicated: MSS Type 49, spring cushion rolls.
 - g. Multiple, Straight, Horizontal Piping Runs 100 Ft. (30 m) or Longer: MSS Type 44 pipe rolls. Support pipe rolls on trapeze.
 - h. Base of Vertical Piping: MSS Type 52 spring hangers.
- 2. Install hangers for cast-iron soil piping, with maximum horizontal spacing and minimum rod diameters, to comply with MSS SP-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- 3. Install hangers for piping, with maximum horizontal spacing and minimum rod diameters, to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- 4. Support horizontal piping and tubing within 12 inches of each fitting, valve, and coupling.
- 5. Support vertical runs of cast-iron soil piping to comply with MSS SP-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- 6. Support vertical runs of piping to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

VI. CONNECTIONS

- 1. Drawings indicate general arrangement of piping, fittings, and specialties.
- 2. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.
- 3. Connect waste and vent piping to the following:
 - a. Plumbing Fixtures: Connect waste piping in sizes indicated, but not smaller than required by plumbing code.

- b. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
- c. Plumbing Specialties: Connect waste and vent piping in sizes indicated, but not smaller than required by plumbing code.
- d. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.
- e. Install horizontal backwater valves with cleanout cover flush with floor.
- f. Comply with requirements for cleanouts and drains specified in Section 221319 "Sanitary Waste Piping Specialties."
- g. Equipment: Connect waste piping as indicated.
 - i. Provide shutoff valve if indicated and union for each connection.
 - ii. Use flanges instead of unions for connections NPS 2-1/2 and larger.
- 4. Connect force-main piping to the following:
 - a. Sewage Pump: To sewage pump discharge.
- 5. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.
- 6. Make connections in accordance with the following unless otherwise indicated:
 - a. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
 - b. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

VII. IDENTIFICATION

- 1. Identify exposed sanitary waste and vent piping.

VIII. PIPING SCHEDULE

- 1. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.
- 2. Aboveground, soil and waste piping NPS 4 and smaller are to be the following:
 - a. Service cast-iron soil pipe and fittings; gaskets; and gasketed joints.
 - b. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.
 - c. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.
- 3. Above ground, soil and waste piping NPS 5 and larger are to be the following:
 - a. Service cast iron, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
 - b. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.
 - c. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.
- 4. Above ground, vent piping NPS 4 is to be the following:
 - a. Service cast iron, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
 - b. Hubless, cast-iron soil pipe and fittings; hubless-piping couplings; and coupled joints.
 - c. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.
- 5. Underground, soil, waste, and vent piping NPS 4 and smaller are to be the following:
 - a. Service cast-iron soil piping; gaskets; and gasketed joints.
 - b. Hubless, cast-iron soil pipe and fittings; hubless-piping couplings; and coupled joints.
 - c. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.
- 6. Underground, soil and waste piping NPS 5 and larger are to be the following:
 - a. Service, cast-iron soil piping; gaskets; and gasketed joints.
 - b. Hubless, cast-iron soil pipe and fittings; hubless-piping couplings; coupled joints.
 - c. PVC pipe, PVC socket fittings, and solvent-cemented joints.
 - d. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

END OF SECTION

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. Cleanouts.
 - 2. Miscellaneous sanitary drainage piping specialties.

1.3 DEFINITIONS

- A. ABS: Acrylonitrile butadiene styrene.
- B. PVC: Polyvinyl chloride.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings:
 - 1. Show fabrication and installation details for frost-resistant vent terminals.

PART 2 PRODUCTS

2.1 ASSEMBLY DESCRIPTIONS

- A. Sanitary waste piping specialties shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF 14 for plastic sanitary waste piping specialty components.

2.2 CLEANOUTS

- A. Cast-Iron Exposed Cleanouts:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Jay R. Smith Mfg Co; a division of Morris Group International.
 - b. Josam Company.
 - c. MIFAB, Inc.
 - d. WATTS; A Watts Water Technologies Company.
 - e. Zurn Industries, LLC.
 - 2. Standard: ASME A112.36.2M.
 - 3. Size: Same as connected drainage piping
 - 4. Body Material: Hubless, cast-iron soil pipe test tee as required to match connected piping.
 - 5. Closure: Countersunk or raised-head , cast-iron plug.
 - 6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
- B. Cast-Iron Exposed Floor Cleanouts :
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Jay R. Smith Mfg Co; a division of Morris Group International.
 - b. Josam Company.
 - c. MIFAB, Inc.
 - d. WATTS; A Watts Water Technologies Company.
 - e. Zurn Industries, LLC.
 - 2. Standard: ASME A112.36.2M for heavy-duty, adjustable housing cleanout.
 - 3. Size: Same as connected branch.

4. Type: Heavy-duty, adjustable housing.
5. Body or Ferrule: Cast iron.
6. Clamping Device: Required.
7. Outlet Connection: Threaded.
8. Closure: Brass plug with straight threads and gasket.
9. Adjustable Housing Material: Cast iron with threads.
10. Frame and Cover Material and Finish: Polished bronze.
11. Frame and Cover Shape: Round.
12. Top-Loading Classification: Extra Heavy Duty.
13. Riser: ASTM A74, Extra-Heavy Class, cast-iron drainage pipe fitting and riser to cleanout.

2.3 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

- A. Floor-Drain, Trap-Seal Primer Fittings:
 1. Description: Cast iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.
 2. Size: Same as floor drain outlet with NPS 1/2 side inlet.
- B. Floor-Drain, Inline Trap Seal:
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Jay R. Smith Mfg Co; a division of Morris Group International.
 - b. Josam Company.
 - c. MIFAB, Inc.
 2. Description: Inline floor drain trap seal, forming a physical barrier to slow trap evaporation while not impeding flow from drain.
 3. Material: Polymer.
 4. Standard: Tested and certified in accordance with ASSE 1072.
 5. Listing: IAPMO listed.
 6. Size: Same as floor drain outlet or strainer throat.
- C. Air-Gap Fittings:
 1. Standard: ASME A112.1.2, for fitting designed to ensure fixed, positive air gap between installed inlet and outlet piping.
 2. Body: Bronze or cast iron.
 3. Inlet: Opening in top of body.
 4. Outlet: Larger than inlet.
 5. Size: Same as connected waste piping and with inlet large enough for associated indirect waste piping.
- D. Stack Flashing Fittings:
 1. Description: Counterflashing-type, cast-iron fitting, with bottom recess for terminating roof membrane, and with threaded or hub top for extending vent pipe.
 2. Size: Same as connected stack vent or vent stack.
- E. Vent Caps:
 1. Description: Cast-iron body with threaded or hub inlet and vandal-proof design. Include vented hood and setscrews to secure to vent pipe.
 2. Size: Same as connected stack vent or vent stack.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:
 1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
 2. Locate at each change in direction of piping greater than 45 degrees.

3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
4. Locate at base of each vertical soil and waste stack.
- B. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.
- C. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.
- D. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.
 1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
 2. Size: Same as floor drain inlet.
- E. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.
- F. Install sleeve and sleeve seals with each riser and stack passing through floors with waterproof membrane.
- G. Install vent caps on each vent pipe passing through roof.
- H. Install expansion joints on vertical stacks and conductors. Position expansion joints for easy access and maintenance.
- I. Install frost-proof vent caps on each vent pipe passing through roof. Maintain 1-inch clearance between vent pipe and roof substrate.
- J. Install wood-blocking reinforcement for wall-mounting-type specialties.
- K. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

3.2 PIPING CONNECTIONS

- A. Comply with requirements in Section 221316 "Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment, to allow service and maintenance.

3.3 LABELING AND IDENTIFYING

- A. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit.

3.4 PROTECTION

- A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.
- B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Selection, necessary work and installation of modular precast trench drain systems at locations shown on the drawings.

1.02 RELATED SECTIONS

- A. Section 02 41 00 – Demolition.
- B. Section 03 01 30.71 – Concrete Rehabilitation.
- C. Section 03 10 00 – Concrete Forming and Accessories.
- D. Section 03 30 00 – Cast-in-Place Concrete.
- E. Section 03 35 00 – Concrete Finishing.
- F. Section 22 05 00 – Common Work Results for Plumbing.

1.03 SYSTEM DESCRIPTION

- A. System requirements: Provide a trench drain system of prefabricated modular components. The system can incorporate a frame when required to carry the specified load.
- B. Gratings shall comply with the load requirements of AASHTO or DIN/EN loading specifications as required by the Engineer.
- C. Integral frames which extend onto the concrete slab shall include consolidation vent ports which help minimize air entrapment under the frame when proper vibration techniques are used.
- D. Frames which extend onto the concrete slab shall include anchoring studs which secure the frame into the surrounding concrete. Anchoring studs shall be a minimum of 0.5 in (6mm) in diameter and shall extend at least 3 in (75 mm) from the frame. The anchor studs shall be spaced 24 in (610 mm) or less along the length of the grate.
- E. Installation chairs which support the channels and help resist system floating during concrete placement shall be utilized as supplied by the manufacturer. Chairs also allow for system adjustment and alignment prior to concrete placement.
- F. Polymer concrete systems shall include a continuous anchoring rib at the base of each side of the channels to help resist floating during concrete placement.
- G. All piping interface connections shall be compatible with PVC or ABS adhesive.

- H. Fiberglass systems shall either include surface veil or gel coat on the media bearing surface with a UV inhibitor package.

1.04 REFERENCES

- A. AASHTO M306 – Standard Specification for Drainage, Sewer, Utility and Related Castings.
- B. American Society of Mechanical Engineers (ASME):
 - 1. ASME A112.6.3, Section 7.12 Heel Resistant Strainers and Grates.
- C. The Americans with Disabilities Act (ADA) of 1990: Section 4.5.4 – Gratings.
- D. ASTM International (ASTM):
 - 1. ASTM A 36 – Standard Specification for Carbon Structural Steel.
 - 2. ASTM A 48 – Standard Specification for Gray Iron Castings.
 - 3. ASTM D 536 – Standard Specification for Ductile Iron Castings.
 - 4. ASTM D 543-06 – Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents.
 - 5. ASTM D 570-05 – Standard Test Method for Water Absorption of Plastics.
 - 6. ASTM D 635-06 – Standard Test Method for Rate of Burning and/or Extent and Time of Burning Plastics in a Horizontal Position.
 - 7. ASTM D 695 – Compressive Properties of Rigid Plastics.
 - 8. ASTM D 2444-05 – Standard Test Method for Determination of the Impact Resistance of Thermoplastic Pipe and Fittings by Means of a Tup (Falling Weight).
- E. Federal Aviation Administration (FAA): 150-5320-6E – Airport Pavement Design and Evaluation, Appendix 3.

1.05 SUBMITTALS

- A. Submittals are to comply with Section 01 33 10 – Submittals.
- B. Product Data: Submit product data and installation instruction including manufacturer's data sheets for specified products.
- C. Product Drawings: Submit drawings showing layout, profiles and product components, including anchorage, accessories, finish colors, patterns and textures.
- D. Quality Assurance Submittals: Upon request, submit the following:
 - 1. Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties. Reports shall be stamped by a licensed Professional Engineer.
 - 2. Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- E. Manufacturer and Contractor Warranty Documents: Upon request.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.
- B. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- C. Storage and Protection: Store materials protected from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.
- D. Handling: Protect materials and finish from damage during handling and installation.

1.07 PROJECT CONDITIONS

- A. Field Measurements: Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings.

1.08 WARRANTY

- A. Project Warranty: Refer to Conditions of the Contract for project warranty provisions.
- B. Manufacturer's Warranty: Upon request, submit for project acceptance, manufacturer's standard warranty document executed by authorized company official.

PART 2 - PRODUCTS

2.01 MANUFACTURER

- A. Manufacturer: Hubbell Power Systems, Inc.
3621 Industrial Park Drive
Lenoir City, TN 37771
Telephone: (800) 346-3061, (865) 986-9726
Fax: (865) 986-0585
Website: www.polycastdrain.com

2.02 MATERIALS

- A. Polycast 500-Series Polymer Concrete Drain System.
 - 1. Material: Polymer concrete.
 - 2. Channels: 4.25 inch (108 mm) internal width.
 - 3. Length: 48 inch (1.2 m).
 - 4. Slope: Neutral.
 - 5. DG0675 Duraguard Transverse (ADA Compliant).
 - 6. DA0675 Stainless Steel Lockdown. Color: Black or Grey as Selected by Owner.
- B. Polycast 600-Series Polymer Concrete Drain Sections.
 - 1. Material: Polymer concrete.
 - 2. Channel: 4.25 inch internal width.

3. Length: 48 inch.
4. Slope: 601 Section.
5. Grate: DG0675 Duraguard Transverse (ADA Compliant).

2.03 PRODUCT SUBSTITUTIONS

- A. Substitutions: No substitutions permitted.

PART 3 - EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

- A. Comply with all manufacturer product data, product technical bulletins, product catalog, installation instructions and installation section drawings.

3.02 EXAMINATION

- A. Site Verification of Conditions: Verify substrate conditions, which have been previously installed under other sections, are acceptable for product installation in accordance with manufacturer's instructions.
- B. Notify Architect and Engineer of conditions that would adversely affect installation or subsequent use. Do not proceed with installation until unsatisfactory conditions are corrected.

3.03 INSTALLATION

- A. Install precast trench drain per manufacturer installation instructions at locations indicated on the drawings.
- B. Trench Drain Channels shall fit with existing and new Expansion, Construction and Control Joints shown on the Architectural and Structural Drawings. The system shall not be used as an expansion, construction or control joint in the direction of flow. Expansion, construction and control joints oriented transverse to the direction of flow shall cross the system at a channel joint.
- C. Precast Trench Drain System Installation: Ensure channels are surrounded on all sides by concrete of minimum 4000 psi compressive strength. Check relevant installation section drawings for minimum suggested dimensions required.
- D. Concrete Edge: Concrete shall be screeded and finished flush to the top surface of the trench drain system. No secondary edge-finishing tools shall be used.
- E. Site Tolerances:
 1. Vertical deviation from concrete grade: 3/16" maximum.
 2. Horizontal deviation from alignment: 3/8" per 12 feet and 3/4" inch maximum.
- F. Related Products Installation: Refer to other section in Related Sections paragraph herein for

related products installation.

3.05 FIELD QUALITY CONTROL

- A. Inspection:
 - 1. Ensure grates are in correct position and captive.
 - 2. Ensure pipe and outlet connections are cleared and checked.
- B. Manufacturer's Field Services: Upon Owner's request, provide manufacturer's field service consisting of product use recommendations and periodic site visit for inspection of product installation in accordance with manufacturer's instruction:
 - 1. Site Visits: One visit minimum at each pool

3.06 CLEANING

- A. Cleaning: Remove temporary coverings and protection of adjacent work areas. Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instruction prior to Owner's acceptance. Remove construction debris from project site and legally dispose of debris.

3.07 PROTECTION

- A. Protection: Protect installed product and finish surface from damage during construction.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

- A. Pool Water Pipe and Pipe Fittings, Valves, Strainers.
- B. Ultraviolet Sterilization
- C. Filters and Filter Tanks
- D. Chemical Control Equipment

1.2 RELATED DIVISIONS

- A. Division 1, Division 16.

1.3 SUBMITTALS

- A. See Division 1 and Division 23 Section 230500 for Submittal requirements.
- B. Product Data:
 - 1. Include data on pipe materials, pipe fittings, valves and accessories.
 - 2. Include component sizes, rough-in requirements, service sizes, and finishes.
 - 3. Include product description, model, dimensions, component sizes, rough-in requirements, service sizes, and finishes.
 - 4. Include dimensions of tanks, tank lining methods, anchors, attachments, lifting points, trappings, and drains.
 - 5. Provide electrical characteristics and connection requirements.
- C. Shop Drawings: Indicate detailed assembly of components of each system or sub-system.
- D. Manufacturer's Instructions: Indicate installation details, components assembly, and start-up procedures.
- E. Manufacturer's Field Reports: Indicate results of water treatment system set-up and testing.
- F. Project Record Documents: Record actual locations of controlling devices and underfloor piping.
- G. Operation Data: Include installation instructions, lubrication instructions, and assembly views.
- H. Maintenance Data: Include maintenance and inspection data, replacement part numbers and availability, and service depot location and telephone number.
- I. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.
- J. Checkout, and Instruction material shall be provided prior to the activities to which they relate. Submittal of these checklists, start-up sheets, and manuals shall be noted on the project schedule.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with NSF 50. Maintain one copy on site.
- B. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum five years of documented experience.
- C. Installer Qualifications: Company specializing in performing the type of work specified in this section with minimum 5 years of experience. Individual installer shall be certified to this type of work or shall be a journeyman under the direct supervision of a certified installer.

1.5 REGULATORY REQUIREMENTS

- A. Conform to all applicable codes for installation of all systems.
- B. Perform work in accordance with local regulations.

- C. Provide certificate of compliance from authority having jurisdiction indicating approval of installation.

1.6 DELIVERY, STORAGE, AND PROTECTION

- A. Accept equipment on site in shipping containers with labeling in place. Inspect for damage.
- B. Protect equipment from damage and elements by maintaining shipping packaging in place until installation. Maintain temporary inlet and outlet caps in place until installation.

1.7 WARRANTY

- A. See Division 1 -Closeout Submittals, for additional warranty requirements.

1.8 TESTING AND DEMONSTRATION

- A. Submit a start-up procedure for Architect to review and approve. Coordinate all testing procedures and schedules with Architect. All testing shall be documented with test procedures, results and initials of witnessing personnel.
- B. Perform all hydrostatic tests required in codes and ordinances. Additional tests may be required under balancing and testing.
- C. Systems Operation Demonstration: Subject systems to such operating tests as are required to demonstrate that the equipment installed will operate within the specified limits through normal ranges and sequences including simulation of possible abnormal conditions. Operate every device manually and automatically, in accordance with its purpose. Operating test duration; not less than 24 hours after all major corrections have been made. If tests do not demonstrate satisfactory system performance, correct deficiencies and retest systems.
- D. Operation of Equipment and Systems: Contractor is responsible during all periods of start-up and balancing and testing.
- E. Provide all equipment, instruments, personnel and supplies required to conduct all tests.

1.9 SYSTEM START-UP

- A. Contractor shall start-up and check all systems for proper operation. Use industry standard or manufacturer check-off sheets for start-up. Provide copy of check sheets used to Architect for review and approval.
- B. No systems shall be operated until after all finish work (i.e., painting, trim installation, etc.) has been completed. Except that short-time runs are allowed to verify unit start/stop, run direction, etc. System shall not be run more than six (6) weeks prior to substantial completion.

1.10 INSTRUCTION FOR OWNER'S PERSONNEL

- A. Contractor's representatives, in general, who conduct these instructions and demonstrations shall be qualified foremen or superintendents acquainted with this project and from the trade involved. For control systems, the representative shall be the control engineer who performs testing and adjustment. For major equipment, the representative shall be manufacturer's representatives with operating experience and substantial design experience on this project. Their qualifications shall be submitted to the Architect before conducting the instruction period.
- B. Present at these meetings may include Owner, operating, and maintenance personnel; and for fire protection systems, representatives of City Fire Department.
- C. General Description of Instruction Periods: Each period shall include preliminary discussion and presentation of information from operation and maintenance manuals with appropriate references to Drawings, followed by tours of equipment spaces explaining maintenance

requirements, access methods, servicing, and maintenance procedures, temperature settings, and available system and equipment adjustments.

D. Duration of Instruction Periods:

1. Filter Systems 1/2 day or as determined by filter manufacturer.

PART 2 PRODUCTS

2.1 POOL PIPE AND FITTINGS

- A. PVC Pipe: ASTM D 1785, Schedule 80.
 - 1. Fittings: ASTM D 2467, PVC.
 - 2. Joints: ASTM D 2855, clear solvent weld.
- B. True unions for pipe sizes 2 inch and under: PVC for plastic piping.
- C. Flanges for pipe sizes over 2 inch:
 - 1. PVC Flanges for plastic piping. Spears Class 150 Flanges or approved equal.
 - 2. Bronze Flanges for copper piping.
- D. Bolts: Tripac Hex Bolt T-316 or approved equal.
- E. All fasteners potentially exposed to corrosive environments shall be 316L stainless steel.
- F. Solvents shall be low VOC Cements and Primers by IPS. All solvent welds shall be installed per ASTM D2855 by a certified installer.
 - 1. IPS 2705 for pipe up to 4-inch pipe.
 - 2. IPS 2717 for pipe 4-inch to 12-inch pipe.
 - 3. Primer shall be P-70 clear.

2.2 POOL VALVES

- A. Valves: PVC plastic body and ball, double lever handle, double union with socket ends, EPDM seals, teflon seats.
 - 1. Valves Less than 3-inches: Ball Valves, manufactured to ASTM F1970 and constructed of PVC (ASTM Type I or Type IV), o-rings shall be EPDM, valve handles shall be made of polypropylene with built in lock-out mechanism, valve components shall be replaceable, NSF rated for potable water use and rated for 235 psi operation.
 - a. Basis of Design: Spears True Union Ball Valves.
 - 2. Valves 3-inches and Larger: Butterfly valves with PVC body with Polypropylene disc and EPDM seat and seals, valve stem to be stainless steel, handle to be locking, provide with mounting ready to accept electric actuation, rated at 150 psi.
 - a. Basis of Design: Asahi Type-57 Butterfly Valves.
- B. Controls and Actuation: All valves to be provided with manual operator. All valves to be installed with clearance for electric actuator. System to be provided with removable manual operators.
- C. Valves located in areas where they may become submerged or are permanently submerged shall be provided with remote actuators.

2.3 WATER FILTERS

- A. Filter System
 - 1. The installed filter system shall be certified by NSF International to ANSI/ NSF Standard 50 for fresh water applications.
 - 2. The filter system specified under this section shall be of a pressurized design and shall consist of "Non-Corrosive" Hi-Rate Permanent Media Filters.
 - 3. The filter system shall be of the vertical type requiring one grade of filter media and shall have a maximum flow of 13 U.S. gallons/minute per square foot of filter area. Refer to drawings and filter schedule for exact design sizes and capacities.
 - 4. The filter tank system shall consist of a vertical filter tank(s), internal overhead distribution system, internal lower collection system, gauge panel with 2-100 PSIG gauges, internal

automatic air relief, external air relief with a manually adjusted shut off valve, integrally molded manhole, integrally molded drain/dump port, 2-FRP saddle supports. The filter system shall be fabricated in a fully assembled state by the original equipment manufacturer, then disassembled for shipping to prevent damage to internal parts or face piping.

B. Filter Tanks

1. Filters shall be one piece. The completed filter tank must meet all NSF and ASME Ratings as a similar one-piece tank. Sealed Engineering drawings, assembly instructions, certification and proper supervision are to be provided.
2. The filter shall be manufactured of material that is able to withstand long term exposure to high concentrations of chlorine.
3. The filter shall be designed for a maximum working pressure of 60 PSIG with 100 PSIG rating. The body and dished heads shall vary in thickness to provide durability at the points of maximum stress and the thickness shall be determined through a Finite Element Stress Analysis. A high quality professional finish shall be achieved through the application of a smooth, gelcoated outside surface.
4. An integrally molded manhole complete with FRP/ acrylic cover, o-ring, bolt and yoke, shall be located in the front head of the filter tank(s). All o-ring contact points on the manhole port of the head and manhole cover shall have a smooth finish to provide a continuous watertight seal. Manhole shall have a clear window for viewing during backwash. Manhole shall be located to facilitate ease of entry for maintenance.
5. An integrally molded drain shall be located in the filter tank bottom-front. Consider final placement orientation for ease of use.
6. The filter shall have influent and effluent connections that provide a continuous, watertight exterior seal through the use of grooved Sch 120 PVC nipples, clamps and gaskets. The filter tank(s) shall be mounted on support legs which shall be designed to satisfy local earthquake conditions when anchored according to manufacturer's specifications. Stamped calculations showing compliance with applicable seismic requirements shall accompany filter shop drawings and anchorage details.

C. Internal Collection System

1. Internal filter tank equipment shall be hydraulically balanced to prevent turbulence and/or displacement of the filter media during service operation or backwash. Standard pipe arrangement or an internal valving system will not be acceptable.
2. The system shall include hydraulic distribution pipes; injection molded ABS plastic, located in multiple sets of two over the filter bed. They shall be joined to the influent nipple connection by means of an o-ring seal to a Schedule 80 tee, header, PVC nipples and elbows.
3. The collection system shall include laterals; injection molded ABS or PVC plastic, designed to retain multiple types of granular filter media or a single grade of #20 silica sand. The laterals shall be strategically placed to produce minimum head loss while providing full filter bed coverage. The laterals shall be self-cleaning through the use of a molded V slot configuration, which promotes thorough filter media cleansing through balanced fluidization during backwash.

D. Filter Area: Refer to drawings and filter schedule for exact design sizes and capacities.

E. Filter Media

- a. Filter media shall consist of uniformly graded silica with a minimum combined mean percent of silica by weight of 90%, which shall be free of limestone or clay. The media shall be angularly shaped particles of #20 grade silica with an effective size range .45-.55 mm, roundness value between 0.0 and 0.15 and a uniformity coefficient of 1.5 maximum. Round or Sub-rounded particle shapes are not acceptable as suitable media. The specific gravity of the media shall not be less than 2.5 with a minimum hardness of 7

mos. The filter(s) will require a filter bed depth, which shall extend to an approximate level of 9.81" below the top of the hydraulic distribution pipe.

- F. Pressure Gauge Panel: The pressure gauge panel shall consist of two gauges scaled from 0-100 PSIG. The pressure gauges shall be mounted in a molded FRP panel with a printed system nameplate. The pressure gauges shall be connected to influent and effluent pressure points with air relief cocks, lab cocks, compression fittings and polyethylene tubing.
- G. Manufacturers:
 - 1. The filtration system shall be by manufacturer: Nemato, Miami Filter, or Neptune-Benson
 - 2. The filter tank shall be by manufacturer: Nemato, Miami Filter, or Neptune-Benson
 - 3. No other manufacturer shall be approved unless documentation for a fresh-water filter with 5-years or more of proven service is provided with substitution request.

2.4 ULTRAVIOLET STERILIZATION

- A. Existing to remain.

2.5 CHEMICAL CONTROL EQUIPMENT

- A. Chlorine Generator: stand-alone chlorine generator capable of producing 48 lbs. of pH neutral equivalent chlorine per 24 hours. System shall consist of build in pumps for internal flow regulation and build in safety sensor for air, water, pressure, and level sensor.
- B. Plumbing requirements:
 - 1. Extension pipe from the main branch shall be 3-inch Schedule 40 PVC.
 - 2. 2-inch inlet and outlet, booster pump is required to maintain a flow of 80 gpm in both inlet and outlet.
 - 3. 25 psi of maximum return line pressure.
- C. Control
 - 1. Connect to existing water quality (PH, CL, etc.) controller for chlorine concentration control.
 - a. Provide relays and wire necessary for interconnection.
- D. Manufacturer:
 - 1. Nexgen, Chlorking, or Equal.

2.6 FLOW METERS/SENSORS

- A. Existing to remain.

2.7 PRESSURE SENSORS

- A. Pressure Sensors: Injection molded PVDF body and ceramic diaphragm. Provide insertion unit and transmitter. Unit size shall be 1/2-inch on pipe 3-inches or smaller and 3/4-inch on all other lines. Pressure range shall be 0-1100psi; verify pressure range of application with Owner and Architect. Provide manufacturer recommended tee or tap for sensor. All pressure sensor locations shall be field located by Owner Staff. Drawings note which sensors are to be replaced. Basis of Design: Signet 2450.
- B. All fittings and sensor taps shall be Schedule 80 PVC and selected based on the appropriate sensor manufacturer's recommendations. Where no new sensor is being provided but future control system work is being performed provide a well/tap and coordinate with owner and Controls Contractor. All pressure sensor locations shall be field located by Owner Staff.

2.8 MAIN DRAIN

- A. Provide pre-fabricated main drain sump and grate suitable for use in a pool environment and compliant with ANSI/APSP-16 2017.
 - 1. Sump Material: Stainless Steel
 - 2. Grate Material: Stainless Steel or Fiberglass
 - 3. Sump Outlets: One main drain at size shown on plan and one 2" hydrostatic relief valve.

- B. Drain shall be VGB compliant and be unlockable to prevent entrapment.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install all work in accordance with State of Washington, City of Bainbridge Island, local Health Department, and Industry standards.
- B. Install equipment in accordance with manufacturer's instructions.
- C. Install piping to conserve building space, not interfere with use of space and other work. Route piping in orderly manner, and maintain gradient. Group whenever practical at common elevations. Coordinate shop drawings with all other work in space.
- D. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Provide access to valves and fittings.
- E. All hanger systems shall be rated to 1000 lbs, minimum, as to be acceptable for fall protection tie-off.
- F. Pipe backwash drain and all and any filter tank relief valve fittings to waste pit.
- G. Install unions downstream of valves and at equipment or apparatus connections.
- H. All main drain covers must display GPM rating, manufacturer name, model number, and VGB compliance.
- I. Filter Tanks:
 - 1. Provide support for tanks independent of building structural framing members.
 - 2. Clean tank or tank sections prior to delivery to site. Seal all openings to prevent contamination until pipe connections are made.
 - 3. Start up equipment and prepare reports as required by Division 23 and Division 1.
 - 4. Leak Testing: Piping shall be tested and prove tight prior to concealment under a test pressure not less than 1-1/2 times working pressure. System shall maintain the test pressure for not less than 15 minutes.
 - 5. Sterilization: Sterilize system in accordance with AWWA C601 or local plumbing authority. Flush system, introduce chlorine or chlorine compound sufficient to provide residual of 50 ppm. Flush system after 24 hour contact period to eliminate all traces of chlorine. Do not place into service until approved by Plumbing Inspector.
 - 6. Produce report, including documentation, of flushing and sanitization.

END OF SECTION

PART 1 GENERAL

1.1 WORK INCLUDED

- A. Work includes the following: Provide all materials, equipment, labor, supervision, tools and items necessary for the construction, installation, connection, testing and operation of all mechanical work for this project.
- B. Work includes the following:
1. Motors
 2. Motor Control equipment
 3. Supports and support accessories
 4. Anchoring Hardware
 5. Identification
 6. Balancing work
 7. Painting
- C. DEFINITIONS AND ABBREVIATIONS
1. The word "provide", as used in these specifications, means "furnish and install".
 2. The word "accepted", as used in these specifications, means the acceptance of the Engineer.
 3. Definitions and abbreviations of all terms shall be in accordance with applicable definitions of:

ANSI	American National Standards Institute
ASHRAE	American Society of Heating, Refrigerating & Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWS	American Welding Society
CISPI	Cast Iron Soil Pipe Institute
FM	Factory Mutual Engineering Corporation
HI	Hydraulic Institute
MSS	Manufacturers' Standardization Society of the Valve and Fittings Industry, Inc.
NEC	National Electric Code
NEMA	National Electrical Manufacturer's Association
NFPA	National Fire Protection Association
NSF	National Sanitation Foundation
OSHA	Occupational Safety and Health Administration
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association
UL	Underwriters' Laboratories, Inc.
IBC	Washington State Building Code
UPC	Uniform Plumbing Code
IMC	Washington State Mechanical Code
WAC	Washington Administrative Code
WSEC	Washington State Energy Code
WISHA	Washington Industrial Safety & Health Act
- D. Refer also to Division 1 for additional acronyms and for additional definitions and explanations of terms.
- E. Some of these abbreviations may not be used. All other abbreviations shall have the definition commonly associated with them by the trade or industry. Confirm the meaning of any unclear or unknown definitions with the Architect before proceeding with any work.

1.2 PLANS AND SPECIFICATIONS

- A. The drawings and specifications are intended to cover all mechanical work, unless otherwise shown. Provide all materials that are necessary for the proper completion of the installation or operation of the equipment.
- B. The drawings are diagrammatic and do not show exact or complete ductwork and piping configurations or the necessary number and types of fittings. Provide all labor and materials required to complete the work indicated.
- C. Any questions occurring during bidding or construction shall be resolved by direction in writing from the Architect. Any issues not so resolved or any conflicts shall result with the contractor bidding, furnishing and installing the most stringent condition. No exceptions.

1.3 LAW AND ORDINANCES

- A. General:
 - 1. All mechanical work specified under this contract shall be in strict accordance with the latest rules and regulations of all applicable codes.
 - 2. Contractor is not relieved from furnishing and installing work shown or specified which may be beyond requirements of ordinances, laws, regulations, and codes. This work shall be included within the construction contract.
- B. Approval: File necessary plans, prepare documents and obtain necessary approval of governmental departments having jurisdiction and required certificates of inspection for work and deliver same to Architect before requesting acceptance and final payment for work.
- C. Permits, Certificates and Taxes: Procure and pay for all the necessary permits, certificates, and taxes for all work as required in the General and Supplementary Conditions. In addition, perform all ordinance and performance tests in the presence of the Architect, and be responsible for advance notification. Submit copies of signed and accepted permits to the Architect.

1.4 MATERIAL REVIEW, SUBMITTALS AND SHOP DRAWINGS

- A. General:
 - 1. Provide submittals for all equipment and systems indicated and specified by the Contract Documents.
- B. Prepare and distribute submittals:
 - 1. Identify each transmittal using the 6-digit specification section number and section title.
 - 2. Pay for all costs associated with materials, reproduction, and distribution.
- C. Submittals shall be complete, containing the information describing the equipment and systems of all trades. All submittals and submittal information shall be submitted at the same time, organized as described below.
- D. The project construction schedule, beginning with the acceptance of the bid and confirmation of the successful bidder, is not the responsibility of the Architect / Engineer. The contractor's schedule shall recognize and accommodate the review intervals specified herein. The schedule shall identify and accommodate the specified submittal and re-submittal review and response period. The contractor shall not anticipate or base the construction schedule on expedited reviews or reviews of partial submittals. Submittals shall be organized and delivered as specified. No exceptions.
- E. Review all items prior to submission. Submittals shall bear the General Contractors stamp, certifying that the contractor has:
 - 1. Verified all field dimensions and quantities.
 - 2. Verified all field construction criteria, materials, catalog numbers and similar data.
 - 3. Reviewed and coordinated submittal data with requirements of the work and the Contract Documents.
- F. Indicate any item, component, material or portion of work which deviates from Contract Documents and completely describe and illustrate nature and extent of deviation. Unless

such departures are accepted as indicated in paragraph "Engineer Review", such departures shall not be permitted.

- G. Make submittals sufficiently in advance of required acceptance date to allow Architect / Engineer 10 working days for each review and resubmission if necessary.
 - 1. Items submitted without Contractor's review stamp will be returned without action, for resubmission.
 - 2. Items not submitted in accordance with provisions of this section will be returned, without action, for re-submittal.
 - 3. Submission of items not accepted as specified by the project manual or addenda will be rejected.
- H. Do not place orders for materials, fixtures, or equipment until acceptance is obtained from Architect/Engineer in writing. Oral acceptance will not be considered.

1.5 SUBMITTALS AND SHOP DRAWINGS

- A. Submit:
 - 1. Provide electronic copy of the submittals. Reference project information shall include:
 - a. Project title,
 - b. Project number and Location,
 - c. Architect,
 - d. Engineer,
 - e. Contractor,
 - f. Subcontractor(s),
 - g. Submission date,
 - h. Specification sections submitted.
 - 2. Label cover and binder end. Clearly indicate any items not included with submitted assemblies. Architect / Engineer will not take responsibility for collating submitted information into notebooks. Submittals not bound and organized as specified will be rejected.
 - 3. The contractor shall make every attempt to respond to the Architect and Engineer comments in a timely manner. Submittal material requiring more than three Engineering reviews will be considered non-responsive. The Architect / Engineer may elect to charge the contractor on an hourly basis for additional consultation as required to secure a responsive submittal.
- B. Standards Compliance and Certification:
 - 1. Where equipment or materials are specified to conform with requirements of standards of recognized technical or industrial organizations such as American National Standards Institute (ANSI), American Society for Mechanical Engineers (ASME), Underwriters Laboratories Refrigeration Institute (ARI), or National Electrical Manufacturer's Association (NEMA) that use a label or published listing as a method of indicating compliance, proof of such conformance shall be submitted and accepted.
 - 2. Submit certification for the product submitted and not pre-printed certifications. Do not make statements in the certifications that could be interpreted to imply the product does not meet all requirements specified, such as "as good as"; "achieve the same end use and results as materials formulated in accordance with the referenced publications"; "equal or exceed the service and performance of the specified material." Simply state that the product conforms to the requirements specified.

1.6 SUBSTITUTION OF MATERIALS:

- A. Substitutions of materials will only be considered where specified materials can not be obtained. All work and equipment required incidental to the substitution is the responsibility of the Contractor. Substitutions are only permitted if approved in writing by the Owner. Verbal approvals shall not be binding.

B. Refer also to Division 1.

1.7 SHOP DRAWINGS:

- A. Submit in mailing tube if drawing cannot be shipped flat. Do not fold.
- B. Submit drawings 8-1/2" x 11", 11" x 17" or 24" x 36" unless size of the items depicted makes such sizes impractical. Scale of drawings shall match that of the construction documents.
- C. Prepare shop drawings on a background furnished by the Architect.
- D. Prior to any installation or fabrication of the system components, the contractor shall submit five complete sets of shop drawings to the Architect for approval by the Architect, Engineer and the Owner.
- E. Contractor shall schedule submittal to Architect and include sufficient resources with bid to accommodate an additional revision and re-submittal.
- F. Incomplete shop drawings will be rejected unless prior approval is requested and given from the Architect and Owner for partial submittals.
- G. Review of the shop drawings by the Architect, Owner, or AHJ does not relieve the contractor from coordinating the installation of the work with all other trades, nor from compliance with all applicable codes and standards.
- H. Electronic submittals are acceptable in lieu of physical copies noted above. If electronic submittals are disorganized or illegible they shall be rejected and physical copies will be requested.

1.8 SUBMITTAL REVIEW:

- A. Review is general and does not:
 - 1. Permit departure from Contract Documents.
 - 2. Relieve Contractor from responsibility for error in detail, quantities, dimensions or related items.
 - 3. Approve departure from previous instructions or detail.
 - 4. Relieve Contractor of responsibility to provide all components, wiring, etc., required to make item operational or usable.
 - 5. Imply approval of items for which no data is submitted.
- B. Work which requires submittals shall not be started without Architect's / Engineer 's review.
 - 1. Allow ten working days for engineering review.
 - 2. Approval will be indicated by a signed stamp affixed to the submittal, or a letter over the Architect's / Engineer's signature. No exceptions.

1.9 RE-SUBMITTALS:

- A. Items of materials, fixtures and equipment not accepted by Architect shall be resubmitted within 30 days after engineering review. If Contractor fails to submit items listed below for approval or resubmit in the event of disapproval within specified time, Contractor shall provide materials, fixtures and equipment as scheduled on drawings. Where equipment is not scheduled the Contractor shall provide materials, fixtures and equipment as identified in the specifications.
- B. Decision of Architect shall be final and binding and items shall be provided without change in contract price or time

1.10 SAFETY AND PROTECTION:

- A. Drive Guards: Provide OSHA-accepted drive and shaft guards for all exposed, rotating shafts and drive connections between motors and driven equipment. Include steel frames securely fastened for easy removal to the equipment frame. Provide tachometer cut-out at shafts where applicable.

- B. Head Protection: Where pipe hangers, equipment support angles, etc., are exposed in walkways, or in access ways for any maintenance, cover all such potentially injurious protrusions less than 7' 2" above the floor with padding; secure and permanently fasten, and finish to match adjacent finishes.

1.11 TESTING, DEMONSTRATION AND COMMISSIONING

- A. Demonstrate that all equipment operates as indicated and in accordance with manufacturer's recommendations. Support the inspections and testing of components and systems called for to commission the mechanical system. Commissioning shall be by the general contractor with construction administration oversight by the Architect / Engineer team. Perform tests in the presence of the Architect and Owner's Project Manager; give minimum one-week notice prior to test. Provide all instruments and personnel required to conduct the tests.

1.12 OPERATIONS AND MAINTENANCE MANUALS

- A. Furnish operations and maintenance (O&M) manuals to the Architect before conducting owner instruction session in accordance with Section 017800. Furnish copies of the O & M manuals for review in accordance with Section 017800.
- B. O & M manuals shall include full descriptions of all systems and products installed under this contract. Furnish complete narrative descriptions, product and originals of equipment descriptions with exploded diagrams, parts lists including part numbers, disassembly and assembly instructions and control wiring diagrams.

1.13 RECORD DOCUMENTS

- A. Maintain record documents as construction commences. Evaluation of pay requests shall be partially based on the level of completion indicated by the record documents. Refer to Section 017800.
- B. Mechanical Subcontractor shall transfer marks from the jobsite record set to electronic records and furnish a reproducible plan set and electronic records (As-Built Drawings) at the conclusion of the contract. This includes but is not limited to detailed and accurate drawings of all site and building piping, equipment, and appurtenances.

1.14 INSTRUCTION PERIODS FOR OWNER'S PERSONNEL

- A. Description: Following installation of all mechanical equipment and prior to acceptance of the mechanical work, conduct demonstrations and instruction periods to point out locations of servicing points and required points of maintenance and operation to Owner's Project Manager. Refer also to the requirements of Section 017700.

1.15 PUNCH LIST & WARRANTY

- A. Refer to the requirements of Section 017700 and Section 017800.

1.16 INDUSTRY STANDARDS, CODES AND SPECIFICATIONS

- A. All materials, equipment, and systems shall conform to the following applicable industry standards, codes and specifications:

ANSI	AWS	IBC	NEMA	SMACNA	WISHA
ASHRAE	CISPI	IMC	NFPA	UL	WSEC
ASME	FM	MSS	NSI	UPC	
ASTM	HI	NEC	OSHA	WAC	

- B. Where differences occur between state laws, local ordinances, industry standards, utility company regulations and contract documents, the most stringent shall govern.

1.17 QUALITY ASSURANCE:

- A. Regulatory Requirements: Comply with all applicable City, County, and State codes and ordinances. In case of conflict with drawings or specifications, the more stringent requirements govern.
- B. All equipment specified herein, including but not limited to motors, motor control equipment, starters, panels, etc., shall be UL listed. European standard shall not be considered as an equivalent.
- C. Basis: Washington State Building Code, Uniform Plumbing Code; Washington State Mechanical Code and local amendments to the same.
- D. Installing Contractor Qualifications: HVAC, sheetmetal and air moving equipment systems shall be installed by experienced, sheetmetal contractors and experienced installers. The installation of ductwork and air moving systems shall be by journeyman sheetmetal workers or by journeyman sheetmetal works supervising apprentices. Installers shall be employed directly by the contractor, and not subcontracted. Journeymen shall have minimum 5 years of experience successfully installing HVAC, sheetmetal and air moving equipment systems similar to those described by these contract documents.

PART 2 PRODUCTS

2.1 GENERAL

- A. Comply with "Quality Assurance" provisions, Specifications, and Manufacturers' Data. Where these may be in conflict, the more stringent requirements govern. Coordinate work with Division 26.

2.2 MOTORS

- A. Provide motors conforming to the following unless noted otherwise:
 - 1. Design and Construction: Unless otherwise indicated, provide electric motors and enclosures described by this specification conforming to the applicable definitions and requirements of NEMA MG-1.
 - 2. Standard Commercial Product: Provide motors of manufacturers' standard commercial product. A standard commercial product is a product which has been or will be sold on the commercial market through advertisements or manufacturers' catalogs or brochures, and represents the latest production model(s).
 - 3. Nameplates: Provide all motors with readily visible nameplates containing the information required in NEMA MG-1.

2.3 MOTOR REQUIREMENTS:

- A. Manufacturer: General Electric, Lincoln, Allis-Chalmers, Goulds or U.S. Motors or accepted equal.
- B. Type: Furnish High Efficiency motors. Motor efficiencies shall meet or exceed the efficiency values required by the Washington State Energy Code.

2.4 MOTOR CONTROL EQUIPMENT

- A. General: The mechanical contractor is responsible for providing and installing motor control equipment as required for mechanical equipment and systems, unless otherwise indicated or directed. Refer also to the requirements of Division 26. Motor control equipment shall be comprised of and comply with the following:
- B. Magnetic motor starters: Where equipment is under automatic control and is furnished with a disconnecting means, provide magnetic motor starters. Starters shall conform to or contain items called for below and unless noted otherwise, shall be full voltage non-reversing for NEMA size 3 and under. No starters smaller than NEMA size 0 and no half size starters are permitted. Provide starters with protection for phase loss, phase imbalance, overload, and

ground fault. Wye-delta type must have motor designed for this use. Coordinate work as required.

1. Overload devices: Melting alloy or bimetallic type. One overload shall be provided for each phase. Provide ambient compensated overload devices only when the motor is at a constant temperature and the controller is subject to a separate, varying temperature. Automatic reset overload devices are not permitted.
 2. Accessories: Each magnetic motor controller shall include, "HAND-OFF-AUTO" selector switch, 120 volt coil (unless noted otherwise), red running pilot light, green off pilot light, 100VA (minimum) control transformer (except for 115 volt motors), surge suppression kit, with fused primary and secondary, two spare auxiliary interlock contacts and all other accessories required or noted.
 3. Enclosures: Motor controllers shall be contained in an enclosure suitable for the environment in which the controller is mounted. Enclosures located in damp, moist locations and outdoors shall be NEMA 3R throughout.
- C. Combination motor controller, motor starter and disconnect. Where equipment is under automatic control and is not provided with a disconnecting means, provide combination motor starter and disconnect. Provide as specified above, and also include a disconnecting means. Shall be fused switch type (Class RK5), or motor circuit protector type rated for 22,000 RMS A.I.C. minimum unless noted otherwise and containing all accessories as listed above. If externally powered control circuits are used, provide an auxiliary switch on the disconnect switch or protector and fuse in lieu of the control transformer. Switch or protector shall be capable of being padlocked in the off position.
- D. Manual Starters: Where equipment is under manual control, provide manual starter. Starter shall be toggle switch type, lockable in the "off" position, with overload relays, pilot light and enclosure per above.
- E. Accepted Manufacturers: Allen Bradley or as accepted through prior approval.

2.5 EXPANSION SHELLS AND BOLTS

- A. Expansion Shells for Rod Hangers
1. Phillips, Gregory, Omark, or Fastite in holes drilled in concrete.
- B. Expansion Bolts for Equipment
1. USM or McCullough in holes drilled in concrete.
 2. No screwed adapters underground.

2.6 FORMED STEEL CHANNELS AT SLAB

- A. Provide for all equipment; number and size per manufacturer's recommendations or as indicated.

2.7 ANCHOR BOLTS

- A. Provide for all equipment; number and size per manufacturers' recommendations or as indicated.

2.8 SUPPLEMENTARY STEEL FRAMING

- A. Standard structural steel shapes or Schedule 40 steel pipe, galvanized with extra-heavy finish.

2.9 SLEEVES

- A. Materials, General Schedule: 40 galvanized steel pipe with unthreaded ends, or standard structural steel shapes.
- B. Firestopping: Three-hour rated penetration sealing system per UL 1479 and ASTM E-814. 3M Fire Barrier, Dow Chemical RTV, Manville Cerafiber, or accepted.
- C. Seal: Seal annulus with bolted compression type seal. Link Seal or accepted equal.

2.10 WELDING TO BUILDING STRUCTURAL MEMBERS

- A. Not allowed except as indicated.

2.11 NAMEPLATES

- A. Laminated black plastic with lettering cut through to white background. Plastic strips with raised letters made by a marking device are not acceptable.

2.12 VALVE TAGS

- A. Shall be 0.030" thick brass, 1" diameter size; state the service and destination of the line controlled. Provide tag inscriptions made with a lettering device with 5/16" high cut lettering. Laminated plastic tags, construction similar to nameplates will also be acceptable.

2.13 PIPING IDENTIFICATION

- A. Self adhesive, pre-printed identification labels indicating direction of flow and pipe contents, using common industry abbreviations. Identify pipe at every change of direction.

2.14 SPECIAL MAINTENANCE MATERIALS

- A. Provide for equipment requiring frequent replacement of maintenance materials. Provide an extra set of filters, and belts; together with application devices and instructions.

2.15 PAINTING

- A. Paint all exposed fixtures and equipment in conformance with Section 109900. Coordinate color with Architect. Refer to Architectural documents for paint and application requirements.

2.16 EQUIPMENT LISTING REQUIREMENTS

- A. Whenever UL Standards exist for equipment provide UL-accepted equipment bearing the UL label.

PART 3 EXECUTION

3.1 INSPECTION

- A. Verify installation conditions as satisfactory to receive work of this Section. Do not install until any unsatisfactory conditions are corrected. Beginning work constitutes acceptance of conditions as satisfactory.

3.2 PREPARATION

- A. Field Measurements: Field-verify locations of new and existing work prior to commencing work of this Section.
- B. Protect surrounding areas and surfaces to preclude damage from work of this Section.

3.3 INSTALLATION, ERECTION, AND PERFORMANCE

- A. Install, apply, erect, and perform the work in accordance with "Quality Assurance" provisions, Specifications, and manufacturers' installation instructions and directions. Where these may be in conflict, the more-stringent requirements govern.

3.4 CLEANING

- A. Promptly remove waste material and rubbish caused by mechanical construction work. At completion of the project, clean all equipment, piping and fixtures installed or provided under this Contract.

3.5 CUTTING AND PATCHING

- A. Cut all openings and holes required for mechanical work. Carefully examine existing conditions prior to commencing work.

3.6 ACCESSIBILITY

- A. Locate valves, dampers, controls, etc., to be easily accessible.
- B. Install all equipment that requires periodic servicing or repairs to be readily accessible. Otherwise, obtain Architect's approval of location. Where valve and equipment is concealed behind access panels or by ceiling tiles, label panel or tile appropriately.
- C. Provide access panels as indicated or required for piping, valve or equipment access. Refer to Architectural Documents to determine fire-rating requirements. The access panel size shall be in proportion to the equipment, piping, or valve requiring access. Minimum access panel size shall be 12" x 12".

3.7 SPECIAL PROTECTION

- A. Exercise maximum precaution to provide positive protection for the existing building and equipment from damage of any kind, and in particular prevent any water and dust seepage into the existing building.
- B. Storage of materials: Make all necessary provisions to prevent damage or corrosion of materials.

3.8 EQUIPMENT INSTALLATION

- A. General: Provide supports for all equipment and appurtenances as required, including braces as required for seismic restraint; these include frames or supports for pumps and air handlers and all mechanical equipment. Bracing shall conform with the requirements of IBC and IMC. Include the design, engineering and installation of these members is the responsibility of the contractor.
- B. Suspended Equipment: Provide hangers from structure as required; span between structural members with additional structural steel as required to mount equipment in locations shown. Do not fasten hangers to metal deck. Do not use powder-actuated fasteners.
- C. Floor-Mounted Equipment - General:
 - 1. Provide machine and floor or foundation fastenings; set equipment on concrete pads. Provide equipment base drawings, bolt-setting information, and anchors for all floor-mounted equipment. Provide concrete expansion anchors through concrete equipment pads, installed into existing structural concrete slabs.
 - 2. Install all equipment at the locations, and to the dimensions indicated. Set equipment accurately with principal centerlines and level, using manufacturers' leveling screws, blocks, shims, or wedges. Do not distort equipment or base plates.
 - 3. Install all equipment, piping and ducting such as to provide adequate access for service. This includes access to equipment covered in other divisions or sections of this specification.

3.9 PIPE SUPPORTS

- A. Attach hangers and support rigidly to the building structure; provide supplementary steel framing and bracing at all changes in pipe direction to resist thrust of flowing water. Provide seismic bracing as required by codes. Do not fasten hangers to metal deck. Do not use powder-actuated fasteners.
- B. Provide additional steel support for piping runs through tight confinements. Provide trapeze system with vibration isolation and seismic restraint for piping through joists and as applicable, due to accessibility of ductwork and mechanical equipment.

3.10 EXPANSION SHELLS AND BOLTS

- A. Use only where necessary to support piping or equipment from existing concrete slabs or walls.

3.11 SLEEVES AND SEALING OF SLEEVES

- A. Provide all sleeving and sealing of sleeves for pipes and ducts.
- B. Provide annular clear space of approximately 1/4" to 1/2"; size to accommodate insulation passing through sleeve where applicable.
- C. Wherever piping passes through any floor slab above occupied space or equipment, provide pipe sleeves extending 1" above floor.
- D. Set sleeves in place prior to pouring of concrete in new construction; core drill and grout sleeves in place for unit masonry construction and existing construction.
- E. Sealing of sleeves through floor slabs and firewalls: Provide firestop system by 3M or accepted equal.
- F. Sealing of sleeves for below grade floors and walls: Provide Link Seal. Refer to 232113.

3.12 NAMEPLATES

- A. Provide for all equipment; fasten mechanically. Label access panel or ceiling appropriately for concealed equipment.

3.13 VALVE TAGS

- A. Provide on all new valves; fasten with brass chain to the valve stem.

3.14 PIPING IDENTIFICATION

- A. Provide pipe identification labels on not less than 10 foot centers, on both sides of a wall penetration, and at every change in direction, so that a label is visible from a standing position on The floor, not more than three feet from the wall. Refer also to this Section for pipe labeling requirements.

3.15 PAINTING

- A. General Paint exposed equipment, ducts, piping, sheet metal work and mechanical system appurtenances unless noted otherwise. Coordinate color with Architect. Refer also Division 9.
- B. Application:
 - 1. Thoroughly clean surfaces to be painted to remove dirt, grease, and scale. Wash galvanized surfaces with mild solution of acid prior to painting to effectively clean oils from surface and to etch zinc.
 - 2. Paint insulated surfaces and covered piping with one primer coat and two finish coats.
 - 3. Paint exposed equipment, pipes and supports with one primer coat and two finish coats. Paint factory painted equipment to match colors selected by the Architect: touch up damaged areas with paint to match factory color.
 - 4. Paint the supporting devices for mechanical devices or systems specified to be painted.

3.16 MISCELLANEOUS EQUIPMENT AND FIXTURE CONNECTIONS

- A. Provide piping, ductwork, and make all final mechanical connections in accordance with manufacturers' recommendations for Owner-furnished equipment and fixtures, and equipment and fixtures specified.
- B. Perform on-site review and refer to manufacturers' shop drawings for details of connections. Provide rough-in at locations to conveniently serve items.

3.17 WIRING

- A. Wiring shall conform to applicable sections of these specifications. Provide wiring from branch circuit over current device to motor controller to motor terminals, including installation of starter and all connections. Provide raceway and conductors as shown for remote control, or interlock connections. Coordinate other control wiring with Division 23 of the Specifications. Provide overload elements in controllers sized to match motor nameplate full load amperes. Space within controllers shall not be used as a junction box.

END OF SECTION

PART 1 GENERAL

1.1 WORK INCLUDED

- A. Work includes general requirements for piping and associated appurtenances.

1.2 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with applicable City, County, and State Codes and ordinances. In case of conflict with drawings or specifications, the codes and ordinances govern.
- B. Basis: International Building Code; International Mechanical Code; Uniform Plumbing Code.

1.3 SUBMITTALS

- A. General: Submit in accordance with Division 1 and the following:
- B. Shop drawings, prepared on the architectural background.
- C. Product Data:
 - 1. Pipe and Fittings,
 - 2. Valves,
 - 3. Gaskets,
 - 4. Strainers,
 - 5. Sleeves,
 - 6. Seals,
 - 7. Unions,
 - 8. Dielectric Unions,
 - 9. Pipe, Hangers and Support,
 - 10. Accessories.

1.4 STANDARDS

- A. The latest edition, at time of issuance of the Contract Documents, of the following is hereby referenced.
- B. American National Standards Institute, Inc. (ANSI):
 - 1. B1.1 Unified Screw Threads,
 - 2. B2.1 Pipe Threads (Except Dry Seal),
 - 3. B16.1 Cast-Iron Pipe Flanges & Flanged Fittings, 125, and 250 psi,
 - 4. B16.3 Malleable Iron Threaded Fittings, Class 150 and 300 Pound,
 - 5. B16.5 Steel Pipe Flanges, Flanged Valves and Fittings Including Ratings for Class 150.
 - 6. B16.18 Cast Bronze Solder Joint Fitting,
 - 7. B16.22 Wrought Copper and Bronze Solder-Joint Pressure Fittings,
 - 8. B18.2.1 Square Hex Bolts, Screws, Including Askey.
- C. American Society for Testing and Materials (ASTM):
 - 1. A53 Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded, and Seamless,
 - 2. A120 Pipe, Steel, Black and Hot-Dipped, Zinc-Coated (Galvanized), Welded and Seamless, for Ordinary Uses,
 - 3. A47 Malleable Iron Castings,
 - 4. A536 Ductile Iron Castings,
 - 5. A183 Heat-Treated, Carbon-Steel Track Bolts and Carbon-Steel Nuts,
 - 6. A126 Gray Iron Castings for Valves, Flanges, and Pipe Fittings,
 - 7. A181 Forgings, Carbon Steel for General Purpose Piping,
 - 8. A307 Carbon Steel Externally-Threaded Standard Fasteners,
 - 9. A36 Structural Steel,
 - 10. B32 Solder Metal,
 - 11. B61 Seam or Valve Bronze Casting,
 - 12. B62 Composition Bronze or Ounce-Metal Castings,
 - 13. B88 Seamless Copper Water Tube.

- D. Federal Specification (Fed. Spec.):
 - 1. WW-H-171D Hangers and Supports, Pipe.
- E. Manufacturers' Standardization Society (MSS):
 - 1. SP-69 Pipe Hangers and Supports - Selection and Application.
- F. Applicable Standards, listed in Section 23 05 00.

PART 2 PRODUCTS

2.1 GENERAL

- A. Pressure Ratings: Provide components with minimum pressure rating of 150 psig steam working pressure.

2.2 PIPE MATERIALS

- A. Coil Condensate, Drip Drainage Piping (C): DWV copper.
- B. Heat Pump Loop Piping (HPWS, HPWR): Mechanical Joint, Welded Steel or Brazed Copper as specified herein.
- C. Other piping as specified under related sections (potable water, sanitary, waste, vent).

2.3 ACCEPTABLE MANUFACTURERS

- A. Pipe:
 - 1. Copper Tubing: Chase, Anaconda, Revere, Mueller, Phelps-Dodge, Reading Tube, Bridgeport.
- B. Fittings:
 - 1. Copper/Brass Fittings: Nibco, Tube Turns, Crane, Anaconda, Chase, Revere, Phelps-Dodge.
- C. Valves:
 - 1. General: Crane, Lunkenheimer, Jenkins, Walworth, Kennedy, Stockham, Nibco, W-K-M, Milwaukee, Powell, DeZurik, Homestead, Ohio.
 - 2. Non-metallic: Corrosion Resistant, Valves, ASAHI/ American or equal.

2.4 COPPER PIPING

- A. Above Ground: Type L hard drawn seamless copper water tube, ANSI H23.1, ASTM B88 with cast brass or wrought copper pressure fittings, ANSI B16.22.
- B. Below Ground (Exterior): Direct-bury, pre-insulated piping
 - 1. Pipe: Type K copper tube, ANSI H23.1, ASTM B88, with cast-bronze braze joint fittings and screwed adapters, ANSI B16.18
 - 2. Insulation: Closed cell polyurethane foam, ASTM C-591 with Type 1, Grade 1 PVC, ASTM D-1784, or High Density Polyethylene (HDPE) jacket.
 - 3. Basis of Design: Thermacor Copper-Therm or approved equal.
- C. Unions:
 - 1. For Similar Materials: Wrought-copper solder joint unions, ANSI B16.22; cast-bronze solder joint fittings, ANSI B16.18.
 - 2. For Dissimilar Materials: See Dielectric Unions Below.
- D. Flanges and Flanged Fittings: Cast bronze, 125-pound Class, ASME Standards.
- E. Joint Compound: Teflon Type
- F. Solder, above ground piping 2-1/2 inch and smaller: 95 percent tin, 5 percent antimony solder, ASTM B32, 95TA.
- G. Solder, above ground piping 3" and greater: Sil-fos or Sil-braz.
- H. Strainers: 250-pound cast bronze, Y-pattern, screwed or solder end, ASTM B61; 0.045 inch perforations, brass screen, ANSI B2.1.
- I. Valves:

1. Gate: 150-pound bronze, screwed or solder end, union bonnet, rising stem, solid bronze disc, repackable under pressure, ASTM B62.
 2. Globe or Angle: 150-pound bronze, screwed or solder end, union bonnet, rising stem, solid bronze 500 BHN disc and seat ring or Teflon disc, repackable under pressure, ASTM B62.
 3. Check: 150-pound bronze screwed or solder end, screwed cap, Y pattern, swing disc, regrindable seat, ASTM B62.
 4. Ball: 150-pound bronze or brass body, ball and stem; solder or screwed ends, three piece construction, Teflon seat and seal.
- J. Sleeves:
1. Footing Encasement Sleeve: Schedule 80 PVC sleeve.
 2. Floor, Wall and Roof Sleeves: Schedule 40 steel pipe, ASTM 120/A53, standard weight.
 3. Underground walls, floors: Rubberized link assembly fitting in the wall/pipe annulus with compression/expansion adjusted by through bolts. Link Seal or accepted equal.

2.5 STEEL PIPING

- A. Black Steel Pipe
1. Steel pipe: 2 inches and smaller; ASTM A120/A53, Grade B, Type E or S, Schedule 40, standard weight.
 2. Steel Pipe: 2-1/2 inches and larger: ASTM A120/A53, Grade B, Type E or S, Schedule 40, standard weight.
 3. Steel Pipe Underground: Pre-insulated piping system with Closed cell polyurethane foam, ASTM C-591 with Type 1, Grade 1 PVC, ASTM D-1784, or High Density Polyethylene (HDPE) jacket. Thermacor Copper-Therm or approved equal.
 4. Couplings and Joints, above ground, 2 inch and larger: Mechanical Joint (Victaulic or accepted equal), or Welded.
 5. Couplings and Joints, above ground, smaller than 2 inch: Mechanical Joint (Victaulic or accepted equal), Screwed or welded.
 6. Couplings and Joints, underground: Welded.
- B. Galvanized Steel Pipe
1. Steel pipe 2 inches and smaller: Schedule 40.
- C. Unions
1. 2 inch diameter and less: 150-pound black malleable iron, screwed, ASTM A197, brass seat.
 2. 2-1/2 inch diameter and greater: Flanges: 125-pound, cast-iron screwed, ANSI B16.1 and ASTM A126, Class B; 150-pound forged steel weld neck or slip-on, ANSI B16.5 and ASTM A181, Grade I; 150-pound forged steel socket weld, ANSI B16.5 and ASTM A181, Grade I.
- D. Joint Compound: Pipe dope or teflon tape.
- E. Strainers
1. 150-pound cast iron, Y-pattern, 0.045" perforations, stainless steel screen.
- F. Valves, 2 Inches and Smaller
1. Gate: 150-pound bronze, screwed, union bonnet, rising stem, solid bronze disc, repackable under pressure, ASTM B61.
 2. Globe and Angle: 150-pound bronze, screwed, union bonnet, rising stem, 500 BHN stainless steel plug and seat, ASTM B61.
 3. Check: 150-pound bronze, screwed cap, Y-pattern, swing disc, regrindable seat, ASTM B61.
 4. Ball: 150-pound bronze or brass body, ball and stem; screwed, three-piece construction, Teflon seat and seal; 2-inch size may use carbon steel body and pipe ends.
- G. Valves, 2-1/2 inches and larger

1. Gate: 150 pound bronze, flanged, union bonnet, repackable under pressure, solid bronze disc, ASTM B61.
2. Globe: 150 pound bronze, flanged, union bonnet, rising stem, 500 BHN stainless steel plug and seat, ASTM B61.
3. Butterfly valves: 175 minimum psi working pressure for all sizes provided; ethylene propylene rubber liner, molded with steel or plastic fiber composition reinforcing ring integral to the liner or molded integral with valve body. Cast iron or ductile iron valve body; aluminum bronze disc; stainless steel stem. Lever handle type operator with 10 position latch-lock handle and visible stem position indicator.

2.6 PIPE HANGERS AND SUPPORTS

- A. Description: Provide in accordance with Federal Specification WW-H-171D and MSS SP-69.
- B. Acceptable Manufacturers: ITT-Grinnell, Fee & Mason, Elcen, Unistrut, Powerstrut, Superstrut, or accepted.
- C. Materials:

1. Match piping material at point of contact with piping; carbon steel, cast iron or malleable iron for black steel pipe; carbon steel, iron or malleable with zinc coating or cadmium-plated for galvanized steel pipe; carbon steel or malleable iron with copper finish or PVC plastic coated for copper pipe or plastic pipe.
2. Rods: Hot rolled steel, ASTM A36. Size in conformance with the following:

Rod Diameter (Inches)	Pipe Size (Inches)	Load at 650F (Pounds)
3/8	2 and smaller	610
1/2	2-1/2 and 3-1/2	1,130
5/8	4 and 5	1,810
3/4	6	2,710
7/8	8 to 12	3,770

D. Components

1. Ring Hangers:
 - a. 2" and smaller: Adjustable swivel type, Grinnell 97 or 104.
 - b. 2-1/2" and larger: Adjustable split-ring swivel type, Grinnell Figure 104.
2. Clevis Hangers: Grinnell Figure 260
3. Trapeze Hangers and Multiple Pipe Supports: Structural steel shapes in conformance with Section 23 05 00, supported by rods or structural steel shapes as required.
4. Horizontal Pipes at Walls:
 - a. 2-1/2" and smaller: Malleable-iron, one-hole clamp, Grinnell 126.
 - b. 3" and larger: Welded-steel bracket, Grinnell Figure 213, 194, 195, 199, used in conjunction with ring or clevis hangers.
5. Vertical Pipes at Walls:
 - a. 1" and smaller: Galvanized steel pre-formed metal shapes, Unistrut P1100 Series with P2024 clamps for O.D. tubing and P2909 clamps for pipe.
 - b. 2-1/2" and smaller: Galvanized steel pre-formed metal shapes, Unistrut P1100 Series with P2558 pipe straps.
 - c. 3" and larger: Welded-steel brackets as specified for horizontal pipes at walls, connected to Grinnell Figure 212 pipe clamp with Figure 110R eye socket.
6. Insulation Protection: Provide jackets where operator may come in contact with hot pipe and where moist air is present.

2.7 ACCESSORIES

- A. Dielectric Unions:
1. Provide at each joint between dissimilar metals:

- a. 2" and smaller: Capital insulating unions per Specification Sheet IUS-2; Epco dielectric unions per Catalog 12-70.
- b. 2-1/2" and larger: Capital insulating flange union per companion, 1/2 flange union with bolt insulators, dielectric gasket, bolts and nuts per Catalog 12-70.
- B. Pressure Gauges:
 - 1. Construction: 4-1/2" size, stem mounting, injection molded ABS plastic or cast-brass case without back flange, cast-metal threaded ring; range approximately twice normal operating pressure, with uniformly-spaced graduations. Identify units of measurement by means of a factory-applied inscription on the faceplate of each gauge such as pounds-per-square inch gauge (psig).
 - 2. Appurtenances: 1/2" nipples, gauge valve, reducer, and snubber.
 - 3. Acceptable Manufacturers: Loneragan, Marsh, Crosby, U.S. Gauge, Ashcroft, or accepted.
- C. Test Ports (aka "Pete's Plugs):
 - 1. Test port shall be a 1/4" fitting to receive either a temperature or pressure probe 1/8" OD. Fitting shall be solid brass with two valve cores of Neoprene (Max 200°F) at 500 PSI, or Nordel (Max 275°F) at 500 PSI, fitted with a color coded cap strap with gasket, and shall be rated at 1000 PSI at 140°F.
- D. Hose End Drain Valves:
 - 1. Bronze body, composition seat, screwed or solder joint ends, loose key operated, 3/4" hose thread adapter 125 psi rated.

PART 3 EXECUTION

3.1 INSPECTION

- A. Verify installation conditions as satisfactory to receive work of this Section. Do not install until unsatisfactory conditions are corrected. Beginning work constitutes acceptance of conditions as satisfactory.

3.2 PREPARATION

- A. Field Measurements: Field verify locations of new and existing work prior to commencing work of this Section.
 - 1. Protect surrounding areas and surfaces to preclude damage from work of this Section.

3.3 INSTALLATION, APPLICATION, ERECTION AND PERFORMANCE

- A. Install, apply, erect, and perform the work in accordance with provisions, Specifications, and manufacturers' written installation instructions and directions. Where these may be in conflict, the more stringent requirements govern.
- B. Provide thrust bracing of all ells and tees on piping systems 3" and larger in size.
 - 1. Thrust bracing shall be affixed to fittings with metallic clamp devices with minimum 1-1/4" schedule 40 pipe struts. Paint metallic parts for corrosion protection. Meet requirement of NFPA-13 for fire sprinkler piping thrust bracing.

3.4 INSTALLATION OF PIPING:

- A. General: Install pipe generally sloped to permit drainage at all low points, free from traps, and in a manner to conserve space for other work; cap or plug open ends.
- B. Location of Piping:
 - 1. Piping plans, sections, details and diagrams are diagrammatic indicating general arrangement of piping installation. Locate piping to avoid interference with building structural members, equipment, building openings, light fixtures, ductwork, electrical work, and other obstructions. Provide offsets as required.
 - 2. Arrange piping to allow access for operation, service, disconnection, and removal and replacement of valves, fixtures and equipment. Do not permit installed piping to

- encroach on maintenance clearance space. Coordinate with Sprinkler, Sheetmetal and Electrical contractors prior to installation.
- a. Do not block maintenance access of equipment covered elsewhere in this technical specification or in other divisions.
- 3. In general, maintain the maximum possible headroom in ways of egress, including pedestrian walkways and maintenance aisles, maintain a headroom of 7' 2" from the floor to the bottom of any component.
- 4. Route piping parallel to column lines and perpendicular to floor unless indicated otherwise.
- C. Provide unions or flanges at valves, fixtures and equipment if a means of disconnection is not otherwise provided.
- D. Provide reducing fittings for changes in pipe size; bushings are not acceptable: Eccentric type as shown.
- E. Use fittings for all changes in direction of piping.
- F. Position valve stems horizontal or above.
- G. Install valves at every branch off the main, to a maximum of 10 fixtures per branch.

3.5 SLEEVES

- A. Pipes passing through walls, floors or roofs shall be sleeved by schedule 40 steel pipe sleeves sized two inches greater than the pipe diameter. Fill annular space with fire rated, non-hardening caulking/safing compound. Piping shall not directly contact the sleeve.
- B. Pipes passing through underground exterior walls shall be sleeved and sealed with a link-type seal.

3.6 JOINTS

- A. Soldered:
 - 1. Cut ends square and remove all fins and burrs. Replace dents and damaged tubing with new tubing.
 - 2. Remove grease and oil from joints by wiping with clean cloth saturated with a suitable chemical solvent and then clean with energy cloth.
 - 3. After cleaning, apply non-corrosive flux, apply heat and solder and hold joint rigidly until solder has hardened.
 - 4. Before soldering, remove stems and washers of solder-joint valves.
 - 5. For refrigerant piping either thoroughly clear mechanically interior of pipe after soldering or maintain an inert nitrogen atmosphere within the pipe while soldering.
- B. Brazed or Soldered:
 - 1. Cut ends square and remove all fins and burrs. Replace all dents and damaged tubing with new tubing.
 - 2. Remove all grease and oil from all joints by wiping with clean cloth saturated with a suitable chemical solvent and then clean with energy cloth.
 - 3. After cleaning, apply non-corrosive flux, apply heat and solder and hold joint rigidly until brazing or solder has hardened.
 - 4. Before brazing or soldering, remove stems and washers of solder-joint valves.
- C. Welded:
 - 1. Description: Weld 2-1/2" and larger steel piping, and shaped nipples to existing piping for connection of new piping.
 - 2. Employ only skilled welders who hold one of the following certificates dated within the preceding 12 months:
 - 3. Certificate of the National Certified Pipe Welding Bureau.
 - 4. Certificate from a recognized testing laboratory indicating satisfactory welding test results in accordance with the American Petroleum Institute "Standard for Field Welding of Pipe Lines" or ASME Boiler and Unfired Pressure Vessel Code, Section IX, "Welding Qualifications".

5. Beveling: Perform mechanically or by flame cutting. Where beveling is done by flame cutting, thoroughly clean surfaces of scale and oxidation just prior to welding.
6. Erection: Do not split, bend, flatten or otherwise deform piping before, during or after installation. During erection, take care to remove all dirt, scale and other foreign matter from inside the piping by use of a pipe swab or pipe "pig" before connecting sections, valves, equipment and fittings. Where the pipe temperature falls to 32 degrees F or lower, heat the pipe to approximately 100 degrees F for a distance of 1 foot each side of the weld before welding, and finish the weld before the pipe cools to 32 degrees F.

3.7 UNDERGROUND PIPING:

- A. Trench and backfill for piping in conformance with Division 2.

3.8 PIPE HANGERS AND SUPPORTS:

- A. Spacing of Hangers and Supports:

1. Maximum Spacing between supports for straight runs of piping:

Nominal Pipe Size (Inches)	Maximum Span (Feet)		
	STEEL	COPPER	PVC-CPVC
1	7	6	3
1-1/2	9	6	3
2	10	8	4
2-1/2	11	10	4
3	12	10	4
4	14	10	5
5	16	--	5
6 & Larger	17	--	5
6	17	--	5
8	--	--	6
10	--	--	7

2. Support piping independent from connected equipment. Provide additional hangers or supports at concentrated loads such as flanges, valves, equipment, and similar items.
3. Refer to applicable industry standards.
- B. In general, route vertical piping in a manner in which it can be attached to adjacent walls or columns.
- C. Anchoring, Guiding and Supporting Piping:
 1. Anchor piping and support in a manner such that expansion and contraction will take place in the direction desired.
 2. Prevent vibration with vibration dampers and prevent undue strains on equipment served.
 3. Fabricate hangers used for the support of 2" nominal pipe size and larger piping to permit adequate adjustment after erection while still supporting the load.
 4. Use wall brackets where the pipes are adjacent to walls or other vertical supports which may be used for supports.
 5. Provide supports to adequately carry the weight of the lines and maintain proper alignment.
 6. Provide inserts and sleeves for supports in concrete where necessary.
 7. Provide pipe guides and anchors at all points where necessary to keep pipes in accurate alignment, to direct the expansion movement, and to prevent buckling, swaying and undue strain.
 8. Provide seismic bracing and thrust bracing on all piping.

- D. Insulation Protection: Provide insulated piping with a pipe insulation protection device at each support.

3.9 TEST PORTS

- A. In order to facilitate commissioning, test ports shall be provided adjacent to all sensors, thermometers, and gauges.

3.10 AIR VENTS

- A. Provide air vents at all high points of hydronic systems unless otherwise indicated; provide discharge piped to drain.

3.11 LOW POINT DRAINS

- A. Provide hose-end drain valves at all low points of hydronic, and plumbing systems, and as indicated so all systems may be drained. Low point drains in plumbing systems shall have backflow preventers.

3.12 FLUSHING

- A. Description: Flush piping after fabrication and prior to connecting into existing systems and pressure testing.
- B. Screens: Remove strainer screens during flushing except those protecting control equipment. Clean the screens protecting control equipment during flushing and after flushing is completed.
- C. Chemical Flushing: Prior to water flushing, chemically flush condensate and make-up piping systems with a trisodium phosphate solution; provide 1 pound of trisodium phosphate for each 50 gallons of water in system, circulate mixture for 2 hours, then drain system and flush with water; dispose of the effluent in an acceptable manner.
- D. Water Flushing: Flush piping systems by circulating water through a 100-mesh screen at 7.5 feet-per-second for a minimum of one hour.

3.13 PRESSURE TESTING

- A. Provide equipment and apparatus necessary for the tests. Rectify defects disclosed by the tests without additional cost to the Owner. Make test in the presence of the Architect and Owner. Furnish report on letterhead indicating that the testing has been successfully completed.
- B. Test piping systems after the lines have been cleaned and flushed, and before any insulation has been applied.
- C. Test Pressures: Test piping systems at pressure of one and one-half times the design working pressure or at 50 psig, whichever is greater.
- D. Hydrostatically test liquid piping using water not exceeding 100F.
- E. Test Procedure:
 - 1. Before tests, remove or valve off from the system all gauges, traps and other apparatus which may be damaged by the test procedure.
 - 2. Subject the system to a calibrated test pressure for a sufficient length of time to enable an inspection to be made at all joints and connections.
 - 3. Maintain the required test pressure for a sufficient length of time to enable an inspection to be made at all joints and connections.
 - 4. Rectify defects which develop during testing and retest the piping systems until they show no defect or weakness and are tight.
 - 5. Systems Which Connect to Existing Piping: Isolate new piping system from existing system by the closest valve or valves to the existing system.

3.14 PRESSURE GAUGES AND THERMOMETERS:

- A. General: Provide where indicated by the contract documents or required to monitor conditions. Provide nipple and pipe tapping, isolation valve, and gauge. Mount so that the gauge or thermometer is easily readable by an observer standing on the floor.
- B. Pumps: Provide two pressure gauges and gauge valves to suction and discharge connections of each pump, consisting of nipples at pump tapplings, gauge valves, couplings, snubbers and tee into gauge.

END OF SECTION

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. Single-wall rectangular ducts and fittings.
 - 2. Single-wall round ducts and fittings.
 - 3. Sheet metal materials.
 - 4. Duct liner.
 - 5. Sealants and gaskets.
 - 6. Hangers and supports.
 - 7. Seismic-restraint devices.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of the following products:
 - 1. Liners and adhesives.
 - 2. Sealants and gaskets.
 - 3. Seismic-restraint devices.
- B. Shop Drawings:
 - 1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
 - 2. Factory- and shop-fabricated ducts and fittings.
 - 3. Duct layout indicating sizes, configuration, liner material, and static-pressure classes.
 - 4. Elevation of top and bottom of ducts.
 - 5. Dimensions of all duct runs from building grid lines.
 - 6. Fittings.
 - 7. Reinforcement and spacing.
 - 8. Seam and joint construction.
 - 9. Penetrations through fire-rated and other partitions.
 - 10. Equipment installation based on equipment being used on Project.
 - 11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
 - 12. Hangers and supports, including methods for duct and building attachment, seismic restraints, and vibration isolation.

1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Duct hangers, supports and seismic restraints shall withstand the effects of gravity and seismic loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and ASCE/SEI 7
 - 1. Refer to Structural plans for project specific seismic data.
- B. Airstream Surfaces: Surfaces in contact with airstream shall comply with requirements in ASHRAE 62.1.
- C. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment," and Section 7 - "Construction and System Startup."
- D. ASHRAE/IES Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."

- E. Duct Dimensions: Unless otherwise indicated, all duct dimensions indicated on Drawings are inside clear dimensions and do not include insulation or duct wall thickness.

2.2 LOUVERS

- A. Louvers specified in Architectural sections. Mechanical scope includes:
1. Insect screen: Mesh fiberglass insect screen, set in aluminum frame, furnished with provisions for screw attachment.
 2. Bird Screen: Interwoven aluminum wire mesh; ½ in square grid, open weave, set in extruded aluminum frame, removable. Provide to each louver.
 3. Louvers should be wind-driven rain resistant.
 4. Motor operated dampers where indicated on plan.
 5. Fasteners and supports: Aluminum or stainless steel.
 6. Final duct connections, collars, sleeves, and blank offs as required for installation.
 7. Thermal insulation to meet local energy code requirements.
 8. AMCA licensed, double drainable, high performance louver. Wind-driven rain rated.
- B. If not otherwise specified all louvers shall also meet these requirements:
1. Nominal Free Area: 45 to 55 percent
 2. Maximum Pressure Drop: 0.10-inch W.G.
 3. Type: 4 inch deep with extruded aluminum stormproof blades on 45 degree slope with center baffle and return bend, heavy channel frame, bird screen with 1/2 inch square mesh for exhaust and 3/4 inch for intake. Louvers shall be provided with factor 2-position control dampers.
 4. Fabrication: 16 gage thick galvanized steel or 12 gage thick extruded aluminum, welded assembly, with factory prime coat; color to be selected by the architect.
 5. Mounting: Furnish with exterior angle flange screw holes in jambs for installation.

2.3 NATATORIUM DUCTWORK REQUIREMENTS

- A. All duct work in the natatorium shall be constructed, and supported by, materials suitable for use in a corrosive environment.
- B. The basis of design intent is to use plastic-coated galvanized sheet metal.
- C. Plastic and FRP ductwork will be considered if offered up as a substitution. Substituted materials must result in the same or lower static pressure losses to the fan systems to which they are attached.

2.4 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.
1. Construct ducts of galvanized sheet steel unless otherwise indicated.
 2. For ducts exposed to weather, construct of Type 304 stainless steel indicated by manufacturer to be suitable for outdoor installation.
- B. Transverse Joints: Fabricate joints in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
1. For ducts with longest side less than 36 inches, select joint types in accordance with Figure 2-1.
- C. Longitudinal Seams: Select seam types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

- D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Ch. 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.5 SINGLE-WALL ROUND DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Ch. 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.
1. Construct ducts of galvanized sheet steel unless otherwise indicated.
 2. For ducts exposed to weather, construct of Type 304 stainless steel indicated by manufacturer to be suitable for outdoor installation.
- B. Flat-Oval Ducts: Indicated dimensions are the duct width (major dimension) and diameter of the round sides connecting the flat portions of the duct (minor dimension).
- C. Longitudinal Seams: Select seam types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- D. Tees and Laterals: Select types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.6 SHEET METAL MATERIALS

- A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
1. Galvanized Coating Designation: G60.
 2. Finishes for Surfaces Exposed to View: Mill phosphatized.
- C. Carbon-Steel Sheets: Comply with ASTM A 1008/A 1008M, with oiled, matte finish for exposed ducts.
- D. Stainless-Steel Sheets: Comply with ASTM A480/A480M, Type 304 or 316, as indicated in "Duct Schedule" Article; cold rolled, annealed, sheet. Exposed surface finish shall be No. 2B, No. 2D, No. 3, or No. 4 as indicated in "Duct Schedule" Article.
- E. Aluminum Sheets: Comply with ASTM B 209 Alloy 3003, H14 temper; with mill finish for concealed ducts, and standard, one-side bright finish for duct surfaces exposed to view.
- F. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.
- G. Tie Rods: Galvanized steel, 1/4-inch- minimum diameter for lengths 36 inches or less; 3/8-inch- minimum diameter for lengths longer than 36 inches.

2.7 DUCT LINER

- A. Fibrous-Glass Duct Liner: Comply with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Johns Manville; a Berkshire Hathaway company.
 - b. Knauf Insulation.
 - c. Owens Corning.
 2. Maximum Thermal Conductivity:
 - a. Type I, Flexible: 0.27 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
 - b. Type II, Rigid: 0.23 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
 3. Antimicrobial Erosion-Resistant Coating: Apply to the surface of the liner that will form the interior surface of the duct to act as a moisture repellent and erosion-resistant coating. Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.
 4. Water-Based Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.
 - a. Verify adhesive has a VOC content of 80 g/L or less.
- B. Insulation Pins and Washers:
1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.
 2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick galvanized or stainless steel (to match associated duct material); with beveled edge sized as required to hold insulation securely in place, but not less than 1-1/2 inches in diameter.

2.8 SEALANT AND GASKETS

- A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested in accordance with UL 723; certified by an NRTL.
- B. Water-Based Joint and Seam Sealant:
1. Application Method: Brush on.
 2. Solids Content: Minimum 65 percent.
 3. Shore A Hardness: Minimum 20.
 4. Water resistant.
 5. Mold and mildew resistant.
 6. VOC: Maximum 75 g/L (less water).
 7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
 8. Service: Indoor or outdoor.
 9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.
 10. Verify sealant has a VOC content of 420 g/L or less.
 11. Maximum Static-Pressure Class: 10-inch wg, positive or negative.
 12. Service: Indoor or outdoor.
 13. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.
- C. Flanged Joint Sealant: Comply with ASTM C 920.
1. General: Single-component, acid-curing, silicone, elastomeric.
 2. Type: S.
 3. Grade: NS.
 4. Class: 25.
 5. Use: O.
 6. Verify sealant has a VOC content of 420 g/L or less.

2.9 HANGERS AND SUPPORTS

- A. Hanger Rods: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.
- B. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."
- C. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.
- D. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.
- E. Steel Cable End Connections: Galvanized-steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.
- F. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- G. Trapeze and Riser Supports:
 - 1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
 - 2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
 - 3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

2.10 SEISMIC-RESTRAINT DEVICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Kinetics Noise Control, Inc.
 - 2. Mason Industries, Inc.
 - 3. Unistrut; Atkore International.
- B. General Requirements for Restraint Components: Rated strengths, features, and applications shall be as defined in reports by an agency acceptable to authorities having jurisdiction.
 - 1. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they will be subjected.
- C. Channel Support System: Shop- or field-fabricated support assembly made of slotted steel channels rated in tension, compression, and torsion forces and with accessories for attachment to braced component at one end and to building structure at the other end. Include matching components and corrosion-resistant coating.
- D. Restraint Cables: ASTM A 603, galvanized or ASTM A 492, stainless-steel cables with end connections made of galvanized-steel assemblies with brackets, swivel, and bolts designed for restraining cable service; and with an automatic-locking and clamping device or double-cable clips.
- E. Hanger Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections or reinforcing steel angle clamped to hanger rod.
- F. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type. Select anchor bolts with strength required for anchor and as tested in accordance with ASTM E 488/E 488M.

PART 3 EXECUTION

3.1 DUCT INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and coordination drawings.
- B. Install ducts in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.
- C. Install ducts in maximum practical lengths with fewest possible joints.

- D. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.
- E. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
- F. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- G. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.
- H. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.
- I. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.
- J. Install fire dampers where indicated on Drawings and as required by code, and by local authorities having jurisdiction. Comply with requirements in Section 233300 "Air Duct Accessories" for fire and smoke dampers and specific installation requirements of the damper UL listing.
- K. Install heating coils, cooling coils, air filters, dampers, and all other duct-mounted accessories in air ducts where indicated on Drawings.
- L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials both before and after installation. Comply with SMACNA's "IAQ Guidelines for Occupied Buildings Under Construction," Appendix G, "Duct Cleanliness for New Construction Guidelines."
- M. Elbows: Use long-radius elbows wherever they fit.
 - 1. Fabricate 90-degree rectangular mitered elbows to include turning vanes.
 - 2. Fabricate 90-degree round elbows with a minimum of three segments for 12 inches and smaller and a minimum of five segments for 14 inches and larger.
- N. Branch Connections: Use lateral or conical branch connections.

3.2 INSTALLATION OF EXPOSED DUCTWORK

- A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.
- B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.
- C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.
- D. Maintain consistency, symmetry, and uniformity in arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.
- E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3 ADDITIONAL INSTALLATION REQUIREMENTS FOR KITCHEN GREASE HOOD EXHAUST DUCT

- A. Install ducts in accordance with NFPA 96, "Ventilation Control and Fire Protection of Commercial Cooking Operation"; SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; and SMACNA's "Kitchen Ventilation Systems and Food Service Equipment Fabrication and Installation Guidelines" unless otherwise indicated.
- B. Install all ducts without dips and traps that may hold grease, and sloped a minimum of 2 percent to drain grease back to the hood.
- C. All ducts exposed to view shall be constructed of stainless steel as per "Duct Schedule" Article. All ducts concealed from view shall be stainless steel as per "Duct Schedule" Article.
- D. All joints shall be welded and shall be telescoping, bell, or flange joint as per NFPA 96.

- E. Install fire-rated access panel assemblies at each change in direction and at maximum intervals of 12 feet in horizontal ducts, and at every floor for vertical ducts, or as indicated on Drawings.
- F. Do not penetrate fire-rated assemblies except as allowed by applicable building codes and authorities having jurisdiction

3.4 ADDITIONAL INSTALLATION REQUIREMENTS FOR EXHAUST DUCTS SERVING WASHERS AND OTHER HIGH-HUMIDITY LOCATIONS

- A. Install washer exhaust ducts and other exhaust ducts from wet, high-humidity locations without dips and traps that may hold water. Slope ducts a minimum of 2 percent back to washer or toward drain.
- B. Provide a drain pocket at each low point and at the base of each riser with a 1-inch trapped copper drain from each drain pocket to open site floor drain.
- C. Minimize number of transverse seams.
- D. Do not locate longitudinal seams on bottom of duct.

3.5 DUCTWORK EXPOSED TO WEATHER

- A. All external joints are to have secure watertight mechanical connections. Seal all openings to provide weatherproof construction.
- B. Construct ductwork to resist external loads of wind, snow, ice, and other effects of weather. Provide necessary supporting structures.
- C. Single Wall:
 - 1. Ductwork shall be Type 304 stainless steel.
 - 2. Where ducts have external insulation, provide weatherproof aluminum jacket.

3.6 DUCT SEALING

- A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- B. Seal ducts at a minimum to the following seal classes in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":
 - 1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 - 2. Outdoor, Supply-Air Ducts: Seal Class A.
 - 3. Outdoor, Exhaust Ducts: Seal Class C.
 - 4. Outdoor, Return-Air Ducts: Seal Class C.
 - 5. Unconditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class B.
 - 6. Unconditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class A.
 - 7. Unconditioned Space, Exhaust Ducts: Seal Class C.
 - 8. Unconditioned Space, Return-Air Ducts: Seal Class B.
 - 9. Conditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class C.
 - 10. Conditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class B.
 - 11. Conditioned Space, Exhaust Ducts: Seal Class B.
 - 12. Conditioned Space, Return-Air Ducts: Seal Class C.

3.7 HANGER AND SUPPORT INSTALLATION

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."
- B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. Where practical, install concrete inserts before placing concrete.
 2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
 3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
 4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
 5. Do not use powder-actuated concrete fasteners for seismic restraints.
- C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.
- D. Hangers Exposed to View: Threaded rod and angle or channel supports.
- E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.
- F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.8 SEISMIC-RESTRAINT-DEVICE INSTALLATION

- A. Install ducts with hangers and braces designed to support the duct and to restrain against seismic forces required by applicable building codes.
- B. Select seismic-restraint devices with capacities adequate to carry present and future static and seismic loads.
- C. Install cables so they do not bend across edges of adjacent equipment or building structure.
- D. Install cable restraints on ducts that are suspended with vibration isolators.
- E. Attachment to Structure: If specific attachment is not indicated, anchor bracing and restraints to structure, to flanges of beams, to upper truss chords of bar joists, or to concrete members.
- F. Drilling for and Setting Anchors:
1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcement or embedded items during drilling. Notify Architect if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
 2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
 3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
 4. Set anchors to manufacturer's recommended torque, using a torque wrench.
 5. Install zinc-coated steel anchors for interior applications and stainless-steel anchors for applications exposed to weather.

3.9 CONNECTIONS

- A. Make connections to equipment with flexible connectors complying with Section 233300 "Air Duct Accessories."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.10 PAINTING

- A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer.

Paint materials and application requirements are specified in Section 099000 "Painting and Coating."

3.11 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Leakage Tests:
 - 1. Comply with SMACNA's "HVAC Air Duct Leakage Test Manual." Submit a test report for each test.
 - 2. Test the following systems:
 - a. Outdoor-Air Ducts with a Pressure Class of 2 Inch wg or Higher: Test representative duct sections totaling no less than 100 percent of total installed duct area for each designated pressure class.
 - 3. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
 - 4. Testing of each duct section is to be performed with access doors, coils, filters, dampers, and other duct-mounted devices in place as designed. No devices are to be removed or blanked off so as to reduce or prevent additional leakage.
 - 5. Test for leaks before applying external insulation.
 - 6. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If static-pressure classes are not indicated, test system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure.
 - 7. Give seven days' advance notice for testing.
- C. Duct system will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

3.12 DUCT CLEANING

- A. Clean new duct system(s) before testing, adjusting, and balancing.
- B. Use duct cleaning methodology as indicated in NADCA ACR.
- C. Use service openings for entry and inspection.
 - 1. Provide openings with access panels appropriate for duct static-pressure and leakage class at dampers, coils, and any other locations where required for inspection and cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer.
 - 2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
 - 3. Remove and reinstall ceiling to gain access during the cleaning process.
- D. Particulate Collection and Odor Control:
 - 1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.
 - 2. When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.
- E. Clean the following components by removing surface contaminants and deposits:
 - 1. Air outlets and inlets (registers, grilles, and diffusers).
 - 2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
 - 3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
 - 4. Coils and related components.
 - 5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.

6. Supply-air ducts, dampers, actuators, and turning vanes.
 7. Dedicated exhaust and ventilation components and makeup air systems.
- F. Mechanical Cleaning Methodology:
1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
 2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
 3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
 4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.
 5. Clean coils and coil drain pans in accordance with NADCA ACR. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
 6. Provide drainage and cleanup for wash-down procedures.
 7. Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents in accordance with manufacturer's written instructions after removal of surface deposits and debris.

3.13 DUCT SCHEDULE

- A. Fabricate ducts with galvanized sheet steel except as otherwise indicated and as follows:
1. Fabricate all ducts to achieve SMACNA pressure class, seal class, and leakage class.
 - a. Exposed to View or Concealed: Type 304, stainless-steel sheet.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Floor-mounted, forced-draft, fire-tube condensing boilers.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For boilers, boiler trim, and accessories.

1. Include plans, elevations, sections, mounting, and attachment details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

C. Delegated Design Submittal: For each boiler.

1. Design calculations and vibration isolation base details, signed and sealed by a qualified professional engineer.
 - a. Design Calculations: Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
 - b. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans and sections, drawn to scale and coordinated with each other, using input from installers of the items involved.

B. Seismic Qualification Data: Certificates, for boiler, accessories, and components, from manufacturer.

C. Source quality-control reports.

D. Field quality-control reports.

E. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.5 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of boilers that fail in materials or workmanship within specified warranty period. Where "prorated" is indicated, the boiler manufacturer will cover the indicated percentage of cost of replacement parts. With "prorated" type, covered cost decreases as age of equipment increases.

1. Warranty Period for Floor-Mounted Fire-Tube Condensing Boilers:
 - a. Heat Exchanger and Tank: Free from defects in material and workmanship.
 - b. Warranty Coverage: 1 year from date of installation.

PART 2 PRODUCTS

2.1 BOILER

A. Reuse of existing boiler.

PART 3 EXECUTION

3.1 BOILER INSTALLATION

- A. Equipment Mounting:
 - 1. Install floor-mounted boilers on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."
 - 2. Install wall-hung boilers where indicated on Drawings using suitable hangers. Comply with manufacturer's mounting instructions.
 - 3. Comply with requirements for vibration isolation and seismic-restraint devices selected as part of delegated design.
- B. Install gas-fired boilers according to NFPA 54.
- C. Assemble and install boiler trim.
- D. Install electrical devices furnished with boiler but not specified to be factory mounted.
- E. Install control wiring to field-mounted electrical devices.

3.2 PIPING CONNECTIONS

- A. Comply with requirements for hydronic piping specified in Section 232113 "Hydronic Piping."
- B. Connect piping to boilers, except safety relief valve connections, with flexible connectors of materials suitable for service.
- C. Drawings indicate general arrangement of piping, fittings, and specialties.
- D. When installing piping adjacent to boiler, allow space for service and maintenance of condensing boilers. Arrange piping for easy removal of condensing boilers.
- E. Install condensate drain piping to condensate-neutralization unit and from neutralization unit to nearest floor drain. Piping shall be at least full size of connection. Install piping with a minimum of 2 percent downward slope in direction of flow.
- F. Connect gas piping to boiler gas-train inlet with union. Piping shall be at least full size of gas-train connection. Provide a reducer if required.
- G. Connect hot-water piping to supply- and return-boiler tapplings with shutoff valve, and union or flange at each connection.
- H. Install piping from safety relief valves to nearest floor drain.

3.3 DUCT CONNECTIONS

- A. Boiler Venting:
 - 1. Install flue-venting kit and combustion-air intake.
 - 2. Retain first subparagraph below and delete second subparagraph below if Installer is to field fabricate all boiler vent and combustion-air ducts in accordance with boiler manufacturer's instructions.
 - 3. Field fabricate and install boiler vent and combustion-air intake.
 - 4. Utilize vent and intake duct material, size, and configuration as indicated in boiler manufacturer's instructions and to comply with UL 1738.
 - 5. Connect boiler vent full size to boiler connections.

3.4 ELECTRICAL CONNECTIONS

- A. Connect wiring in accordance with Division 26.
- B. Ground equipment according to Division 26.
- C. Install electrical devices furnished by manufacturer, but not factory mounted, according to NFPA 70 and NECA 1.
- D. Install nameplate for each electrical connection, indicating electrical equipment designation and circuit number feeding connection.
 - 1. Nameplate shall be laminated acrylic or melamine plastic signs.

3.5 CONTROL CONNECTIONS

- A. Install control and electrical power wiring to field-mounted control devices.
- B. Connect control wiring in accordance with Division 26.

- C. Install nameplate for each control connection, indicating field control panel designation and I/O control designation feeding connection.
 - 1. Nameplate shall be laminated acrylic or melamine plastic signs with a black background and engraved white letters at least ½ inch high.

3.6 FIELD QUALITY CONTROL

- A. Perform tests and inspections with the assistance of a factory-authorized service representative:
- B. Tests and Inspections:
 - 1. Perform installation and startup checks in accordance with manufacturer's written instructions.
 - 2. Leak Test: Hydrostatic test. Repair leaks and retest until no leaks exist.
 - 3. Operational Test: Start units to confirm proper motor rotation and unit operation. Adjust air-fuel ratio and combustion.
 - 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - a. Check and adjust initial operating set points and high- and low-limit safety set points of fuel supply, water level, and water temperature.
 - b. Set field-adjustable switches and circuit-breaker trip ranges as indicated.
- C. Boiler will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.
- E. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.7 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain boilers.
 - 1. Instructor shall be factory trained and certified.
 - 2. Provide not less than two hours of training.
 - 3. Train personnel in operation and maintenance and to obtain maximum efficiency in plant operation.
 - 4. Owner training shall be held at Project site.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. This section includes general electrical requirements for all Division 26 work and is supplemental and in addition to the requirements of Division 01.
- B. Section Includes:
 - 1. Electrical equipment coordination and installation.
 - 2. Sleeves for raceways and cables.
 - 3. Sleeve seals.
 - 4. Grout.
 - 5. Common electrical installation requirements.
- C. General Requirements: Conform to Contract Documents. This section is supplemental and in addition to requirements of Division 01.
- D. Conditions and Requirements: Conditions and requirements of the General Provisions, Supplemental General provisions and Special Provisions are hereby made a part of the Electrical Division of this Specification. If requirements disagree, the more stringent requirement will become the contractual obligation.
- E. Provide a complete working installation with all equipment called for in proper operating condition. Documents do not undertake to show or list every item to be provided. When an item not shown or specified is clearly necessary for proper operation of equipment shown or specified, provide an item which will allow the system to function at no increase in Contract Sum.
- F. Workmanship shall be of the best quality and competent and experienced electricians shall be employed and shall be under the supervision of a competent and experienced foreman.
- G. The drawings and specifications are complimentary and what is called for (or shown) in either is required to be provided as if called for in both.

1.02 DEFINITIONS

- A. Definitions of all terms shall be in accordance with applicable definitions of:
 - 1. AIA - American Institute of Architects
 - 2. IEEE - Institute of Electrical and Electronic Engineers
 - 3. IES - Illuminating Engineering Society
 - 4. NEMA - National Electrical Manufacturers Association
 - 5. NEC - National Electrical Code
 - 6. IBC - International Building Code
 - 7. IFC - International Fire Code
 - 8. ADA - Americans with Disabilities Act
 - 9. NFPA - National Fire Protection Association

1.03 CODES

- A. Codes for installation of electrical work shall be State of Washington Electrical Code, Electrical Safety Code, applicable rules and regulations and OSHA and Washington Industrial Safety and Health Act. Any violation of the above Safety Codes shall be cause for immediate termination of Contractor's authority to proceed with work, and recourse to surety for completion of the project.

1.04 PERMITS AND INSPECTIONS

- A. Obtain permits and pay fees required by governmental agencies having jurisdiction over this work.
- B. Arrange for inspections required during construction. On completion of work, furnish satisfactory evidence to show all work installed in accordance with codes.

1.05 CLEARANCES

- A. Adequate working space shall be provided around electrical equipment for maintenance and operation. Minimum clearances shall conform to Art. 110-16 of N.E. Code.

1.06 TESTS

- A. Test all wiring and connections for continuity and grounds before any fixtures or equipment are connected, and run a Megger test. Where such tests indicate faulty insulation or other defects, all such defects and faults shall be located, repaired and tested again.
- B. Make check of proper load balance on 3-wire system and on phases of 3-phase system. Check direction of rotation and lubrication on all motors after final service connections have been made.
- C. Make final tests in presence of Architect.

1.07 INDUSTRY STANDARDS, CODES AND SPECIFICATIONS

- A. All materials, equipment, and systems shall conform to the following applicable Industry Standards, Codes and Specifications:
 - 1. ANSI - American National Standards Institute
 - 2. IEEE - Institute of Electrical and Electronic Engineers
 - 3. IES - Illuminating Engineering Society
 - 4. IPCEA - Insulated Power Cable Engineers Association
 - 5. NFPA - National Fire Protection Association
 - 6. NEMA - National Electrical Manufacturers Association
 - 7. UL - Underwriters Laboratory
 - 8. IBC - International Building Code
 - 9. IFC - International Fire Code
 - 10. IMC - International Mechanical Code
 - 11. ADA - Americans with Disabilities Act (Washington State ADA/WAC51-30)

12. WAC - Washington Administrative Code

- B. Where differences occur between state laws, local ordinances, industry standards, utility company regulations and the Contract Documents, the most stringent shall govern.

1.08 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Nothing in the Drawings or Specifications shall be construed to permit Work not conforming to applicable laws, ordinances, rules or regulations.
2. When Drawings or Specifications exceed requirements of applicable laws, ordinances, rules, or regulations, comply with documents establishing the more stringent requirements.

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Ship equipment in its original package to prevent damage or entrance of foreign matter. Perform all handling and shipping in accordance with manufacturer's recommendations. Provide protective coverings during construction.
- B. Identify materials and equipment delivered to the Site to permit check against approved materials list, and reviewed submittals.

1.10 PROJECT CONDITIONS

A. Equipment Rough-In:

1. Rough-in locations for equipment furnished under other Divisions and for equipment furnished by Owner are approximate only. Obtain exact rough-in locations from the following sources:
 - a) From Shop Drawings for Contractor provided equipment.
 - b) From Architect for Owner furnished, Contractor installed equipment.

1.11 MATERIAL AND EQUIPMENT ENVIRONMENT

- A. All equipment and material shall be suitable for the environment of the installation, and the installation including equipment shall satisfy the governmental agencies having jurisdiction

1.12 DRAWINGS AND SPECIFICATIONS

- A. Specifications, with drawings, are intended to cover installation of all electrical equipment. Materials shown and called for on drawings, but not mentioned in specifications, or vice versa, necessary for proper completion and operation of equipment, shall be furnished the same as if called for in both.
- B. Electrical drawings do not attempt to show complete details of project construction which affect electrical installations. Refer to architectural, structural and mechanical drawings for additional details which affect installation of this work.

1.13 COORDINATION

- A. Coordinate arrangement, mounting, and support of electrical equipment:
 - 1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
 - 2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
 - 3. To allow right of way for piping and conduit installed at required slope.
 - 4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.
- B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.
- C. Coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in Division 08 Section "Access Doors and Frames."
- D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."
- E. Before installation Contractor shall make proper provisions for electrical work and to avoid interferences with installation of other work. Any changes caused by neglect to do so shall be made at Contractor's expense.
- F. Electrical drawings and specifications shall be compared with drawings and specifications of other trades and any discrepancies between them reported to the Architect prior to installation of work.
- G. Coordinate and arrange work so there is no interference between wiring outlets, lighting fixtures, and raceways with sheet metal work, insert hangers, mechanical piping, and structural members.

1.14 CUTTING AND PATCHING

- A. Do all cutting and patching for installation of the work. All cutting done carefully to prevent damage to work of other trades, and all patching done by mechanics skilled in the trade affected, and subject to approval by Architect. Provide all work per Division 01. Work shall include:
 - 1. All openings for removed equipment shall be patched or entire system replaced. No openings shall remain at completion of work.
 - 2. Exterior cutting and patching shall be done by qualified Contractors. Patching of asphalt and concrete shall be per Division 01 and approved by Civil Engineers and Architect. Grass and earth patching, seeding, and sod work shall be per Division 01 and approved by the Landscaper, Civil Engineer, and Architect. All backfill per Division 01.
 - 3. Painting: All exposed conduit, boxes, surface metal raceway, enclosures, multi-outlet assemblies shall be painted to match wall color. Where exact color unknown, coordinate with Architect to obtain color. All items shall be painted regardless of whether wall, ceiling, floor finish is painted.

1.15 RUBBISH AND CLEAN-UP

- A. Contractor shall promptly remove waste material and rubbish caused by workers.
- B. At completion of work, clean all fixtures, electrical panel interiors, switchboards, distribution centers, and all other equipment installed.

1.16 SCOPE OF WORK

- A. Mention herein or indication on drawings of articles, materials, operations or methods, requires that Contractor provide each item mentioned or indicated, of quality, or subject to qualifications noted; perform according to conditions stated, each operation prescribed.
- B. Work included under this contract provides for all labor, equipment, and materials to complete all electrical work as outlined in drawings and specifications for project.
- C. The scope of this work is listed generally but is not limited to as follows:
 - 1. Lighting System and fixtures
 - 2. Branch wiring, power, lighting, and equipment
 - 3. Equipment connections
 - 4. Site electrical work
 - 5. Low Voltage Lighting Control

1.17 SUBMITTALS

- A. General:
 - 1. Submittals shall be in accordance with requirements of Division 01 and as specified.
 - 2. Forward all submittals to the Architect, together, at one time. Individual or incomplete submittals are not acceptable.
 - 3. Organize submittals in same sequence as they appear in Specification Sections.
 - 4. Identify each submittal item by reference to Specification Section paragraph in which item is specified, or Drawing and Detail number.
 - 5. Identify each item by manufacturer, brand, trade name, number, size, rating, or whatever other data is necessary to properly identify and review materials and equipment. Words "as specified" are not sufficient identification.
- B. Shop Drawings:
 - 1. Show physical arrangement, construction details, finishes, materials used in fabrication, provisions for conduit entrance, access requirements for installation and maintenance, physical size, electrical characteristics, foundation and support details, and weights.
 - 2. Catalog cuts and published material may be included to supplement Shop Drawings.
- C. Contract Closeout Submittals:
 - 1. Provide full size copies of "Record" one-line diagrams, in metal frames with glass fronts. Locate diagrams as directed.
 - 2. Operation and Maintenance:
 - a) Subsequent to final completion, and testing operations, instruct Owner's authorized representatives in operation, adjustment, and maintenance of electrical plant.

- b) Before Owner's personnel assume operation of systems, submit operating and maintenance instructions, manuals, parts lists on electrical plant, its component parts, including all equipment which requires, or for which the manufacturer recommends, maintenance in a specified manner. Data sheets shall show complete internal electrical wiring, ratings, and characteristics, catalog data on components parts whether furnished by equipment manufacturer or others, names, addresses, and telephone numbers of source of supply for parts subject to wear or electrical failure, and description of operating, test, adjustment, and maintenance procedures.

D. Submit the equipment for final review.

1.18 ELECTRICAL EQUIPMENT MAINTENANCE MANUALS

- A. The Electrical Contractor shall prepare maintenance manuals for the servicing of all equipment installed as a part of the construction contract.
- B. The information contained in the manuals shall be grouped in an orderly arrangement under basic categories, i.e., Secondary Systems Equipment, Special Raceways, Motors & Controls, Lighting Equipment, etc.
- C. Bind in 3-ring binder with label clearly indicating project.

1.19 JOB RECORD INFORMATION

- A. Record drawings shall be continuously maintained in the field by the Contractor. Drawings used for this purpose shall be the latest revision and shall be kept neat and clean.
- B. Drawings shall include dimensions on all underground conduit.

1.20 NAMEPLATES AND TAGS IN ADDITION TO 260553

- A. The following items shall be equipped with tags or nameplates with etched letters:
 - 1. All motors, transformers, motor starters, pushbutton stations, control panels and time switches.
 - a) Disconnect switches, fused or unfused; switchboards and panelboards; circuit breakers, contactors or relays in separate enclosures.
 - 2. Wall switches controlling outlets, or equipment where the outlets are not located within sight of the controlling switch. All low voltage lighting switches.
 - 3. Special electrical systems shall be properly identified at junction and pull boxes, terminal cabinets and equipment racks.
 - 4. Label all junction boxes with pen indicating type of system (i.e. Power, Data, etc.), circuit voltage, panel and circuit number and switch leg.
 - 5. Paint all junction boxes with the following color code.

a) Security	Yellow
b) Normal 120/208	White
c) Normal 277/480	Brown
d) Low Voltage	Black

6. Tags shall adequately describe the function of, or use of, the particular equipment involved. Tags for panelboards and switchboards shall include the panel designation, voltage and phase of the supply. For example, "Panel A, 240/120V." The name of the machine shall be the same as the one used on all motor starter, disconnect and P.B. station tags for that machine.
7. Tags for 120/240 volts shall be laminated phenolic plastic with white engraved letters on black background. Lettering shall be 3/16" high at pushbutton stations, thermal overload switches, receptacles, wall switches and similar devices, where the tag is attached to the device plate. All other locations, lettering shall be 1/4" high, unless otherwise detailed on the drawings. Tags shall be securely fastened to the equipment with screws or brass bolts. Contact cement is approved in dry locations. All tags and their installation are a part of this work.

1.21 FINAL SUBMITTALS

- A. After completion of all electrical work and prior to final inspection, submit the following:
 1. Letter addressed to Engineer, stating that Contractor, or superintendent in charge of job, has personally made a complete inspection of the job; that those items found to be defective in material or workmanship or not in conformance with drawings and specifications have been corrected; and that entire electrical job is ready for final observation by Engineer.
 2. One copy of the electrical equipment maintenance manual (see 1.15) to be sent direct to Engineer for review, containing the following:
 - a) Letter of transmittal, addressed to Engineer, containing a list of suppliers of replacement parts for all electrical equipment used on job.
 - b) Panel, switchboard, and control drawings corrected to agree with Engineer's notations.
 - c) Catalog cuts of all lighting fixtures, lamps, transformers, starters, special devices, door control system, and all other equipment used on job.
 - d) All available maintenance data published.
 - e) Wiring diagrams and operating instructions for all systems installed.
 - f) Marked-up set of prints showing exact location of all conduits and outlets deviating from original plans. Purchase prints new for this purpose. Prints not required to be bound in maintenance manual.
 - g) Signed receipts for all loose items i.e. keys, instructions and guarantee, etc.
 3. Refer to Division 01 for Operations and Maintenance Manuals.

1.22 WARRANTY

- A. Warranties shall be provided per Division 01. Where not indicated provide minimum 1 year (or standard manufacturer's warranty if longer) warranty for all equipment installed on this project. Warranty shall include all labor, site visit, installation costs.

1.23 COMMISSIONING

- A. The lighting control systems (photocells, relay controls, occupancy sensors, dimmer boards) will be commissioned on this project by an owner directed Commissioning Agent. Contractor shall provide for 4 meetings with the commissioning agent and provide complete systems at time directed by commissioning agent. After commissioning report contractor shall provide all corrections noted in the Commissioning report.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Materials and Equipment General Requirements:

1. All items of materials in each category of equipment shall be of one manufacturer.
2. Groups of items having same or similar function shall be by single manufacturer to facilitate maintenance and service.
3. Compatible with space allocated. Modifications necessary to adjust items to space limitations shall be at Contractor's expense.
4. Conform with conditions shown and specified. Coordinate with other trades for best possible assembly of completed Work.
5. Install fully operating without objectionable noise or vibration.

B. Access Doors:

1. Furnish under this Division where shown, required by regulatory agencies, and for access to all concealed electrical items requiring access. Access doors shall be in accordance with requirements of Division 08. Doors in this Division, Division 08, and Division 15 shall be from the same manufacturer for identical appearance and keying. Furnish fire rated doors where required. Deliver access doors for installation under Division 08. Mark each access door to accurately establish its location.

C. Firestopping and Smokestopping: Provide in accordance with Division 07.

1. Provide firestopping where wiring, conduit, or cable tray penetrates fire wall or floor.
2. Provide smokestopping where wiring, conduit, or cable tray penetrates smoke barrier.

2.02 SLEEVES FOR RACEWAYS AND CABLES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel or EMT, plain ends.

B. Sleeves for Rectangular Openings: Galvanized sheet steel.

1. Minimum Metal Thickness:
 - a) For sleeve cross-section rectangle perimeter less than 50 inches and no side more than 16 inches, thickness shall be 0.052 inch.
 - b) For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches and 1 or more sides equal to, or more than, 16 inches, thickness shall be 0.138 inch.

2.03 SLEEVE SEALS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

1. Basis-of-Design Product: Subject to compliance with requirements, provide comparable product by one of the following:
 - a) Advance Products & Systems, Inc.
 - b) Calpico, Inc.
 - c) Metraflex Co.
 - d) Pipeline Seal and Insulator, Inc.

2. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
3. Pressure Plates: Plastic, Carbon steel. Include two for each sealing element.
4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.04 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Mounting Heights: To center of device unless noted:
 1. Convenience outlets -----1'-6" above floors,
(Wiremold 4000) 6" above counters,
3" above back splashes
 2. Wall Switches ----- 48" to top above floor
 3. Card Reader ----- 48" to top above floor
- B. Follow manufacturer's directions in all cases where manufacturers of articles used furnish directions covering points not shown or specified.
- C. Accurately set and level equipment with supports neatly placed and properly fastened. No allowance of any kind will be made for negligence on the part of the Contractor to foresee means of bringing in and installing equipment in position inside the building.
- D. Conduit System:
 1. Work into complete integrated arrangement with like elements. Make Work neat and finished appearing.
 2. Run concealed, except where shown otherwise. Where exposed run parallel with walls or structural elements with vertical runs plumb, horizontal runs level; groups racked together neatly with bends parallel and uniformly spaced.
 3. Flash and counterflash all penetrations through roof in accordance with requirements of Division 07 and as shown.
- E. Provide hangers, supports, anchors and chases as required for installation of Electrical Work.
- F. Concrete: In accordance with requirements of Division 3.
- G. Interface with other products:
 1. For purposes of clarity and legibility, Drawings are essentially diagrammatic to the extent that many offsets, bends, special fittings, and exact locations of items are not indicated, unless specifically dimensioned. Exact routing of wiring, and locations of outlets, panels, and other items shall be governed by structural conditions or obstructions. Contractor shall make

use of data in Contract Documents. In addition, Architect reserves right, at no increase in Contract Sum, to make any reasonable change in location of electrical items exposed at ceilings or on partitions to group them in orderly relationships or to increase their utility. Verify requirements in this regard prior to roughing-in.

2. Take dimensions, location of doors, partitions, and similar features from Architectural Drawings. Verify at the Site under this Division. Consult Architectural Drawings for exact location of outlets, and other items to center with architectural features. Coordinate location of all ceiling mounted items with Division 09.

3.02 FIELD QUALITY CONTROL

- A. Test panels and circuits for grounds and shorts with mains disconnected from feeders, branch circuits connected, and circuit breakers closed, all fixtures in place, permanently connected, grounding jumper to neutral lifted, and with all wall switches closed.

3.03 CLEANING

- A. Properly prepare Work under this Division to be finish painted under Division 01.

3.04 EQUIPMENT IDENTIFICATION

- A. Properly identify panelboards, circuit breakers in panelboards, disconnect switches, starters, and other apparatus used for operation or control of circuits, appliances or equipment.

3.05 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

- A. Comply with NECA 1.
- B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.
- C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.
- D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
- E. Right of Way: Give to piping systems installed at a required slope

3.06 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Electrical penetrations occur when raceways, cables, wireways, cable trays, or busways penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.
- B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

- C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
- D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
- E. Cut sleeves to length for mounting flush with both surfaces of walls.
- F. Extend sleeves installed in floors 2 inches above finished floor level.
- G. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable, unless indicated otherwise.
- H. Seal space outside of sleeves with grout for penetrations of concrete and masonry
 - 1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.
- I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants."
- J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials. Comply with requirements in Division 07 Section "Penetration Firestopping."
- K. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.
- L. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

3.07 SLEEVE-SEAL INSTALLATION

- A. Install to seal exterior wall penetrations.
- B. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.08 FIRESTOPPING

- A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electrical installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping."

3.09 DEMOLITION AND REMODEL

- A. Demolition drawings do not show every removal of individual devices, concealed items or circuits and raceways. Contractor shall remove all devices and equipment, raceway, wire, etc no longer required.
- B. Maintain existing fire alarm, telephone, intercom, clock, television, intrusion alarm, Data/voice, and Wide Area Network, at all times except as scheduled with the Architect.
- C. Where remodeling work disrupts continuity of existing circuits or systems to remain, restore same at no additional cost to Owner.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes the following:
 - 1. Building wires and cables rated 600 V and less.
 - 2. Connectors, splices, and terminations rated 600 V and less.

1.02 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

1.03 COORDINATION

- A. Set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

PART 2 - PRODUCTS

2.01 CONDUCTORS AND CABLES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Alcan Products Corporation; Alcan Cable Division.
 - 2. American Insulated Wire Corp.; a Leviton Company.
 - 3. General Cable Corporation.
 - 4. Senator Wire & Cable Company.
 - 5. Southwire Company.
- B. Copper Conductors: Comply with NEMA WC 70. Minimum size - No. 12 AWG. Stranded or solid
- C. Aluminum: Stabloy type in sizes No. 2 and larger only. Burndy Hy-lug or Hy-plug terminations.
- D. Conductor Insulation: Comply with NEMA WC 70. Drawings are based on using copper THHN-THWN cables. Contractor shall increase conduit size for any other insulation.
- E. Ground Wire: Provide NEC sized equipment ground wire in all circuits, sized per code. Raceway shall not be used as ground.
- F. Control and Low Voltage Cable: Cable shall be as recommended by manufacturer. Contractor shall coordinate location of plenums in building with all other trades. Provide plenum rated cable whenever cable passes through a plenum for the entire length.

2.02 CONNECTORS AND SPLICES

A. Splices and Terminations

1. 600 Volt

- a. Splices: Solderless type only. Pre-insulated "twist-on" type permitted on solid conductor size number 10 and smaller. Hydraulic compression long barrel type with application preformed insulated cover, heat shrinkable tubing or plastic insulated tape for all stranded conductors. For stranded conductors provide terminations designed for use with stranded conductors.
 - b. Terminations: 250 kcmil and above – two-hole long barrel compression lugs. Below 250 kcmil - single hole compression lug. Conductors No. 12 and smaller: provide eye or forked tongue compression lugs at bolted or screw connections - no lugs required for compression style terminal blocks.
 - c. Cable Ties: Nylon or accepted, locking type. Use a torque limiting tool for installation of ties.
- #### 2. Control Cable Splices and Terminations
- a. Splices: Pre-insulated crimp pigtail or butt splice connectors.
 - b. Terminations: Locking spade, insulated, compression lugs.

B. Splices and Terminations When Aluminum Wire Permitted

1. Burndy Hy-Lug or Hy-Plug on both ends.

C. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems, Inc.
2. Hubbell Power Systems, Inc.
3. O-Z/Gedney; EGS Electrical Group LLC.
4. 3M; Electrical Products Division.
5. Tyco Electronics Corp.

D. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 - EXECUTION

3.01 CONDUCTOR MATERIAL APPLICATIONS

- A. Submit schedule of proposed aluminum wire for review. Contractor to increase conduit size to accommodate aluminum wire.

3.02 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Type THHN-THWN, single conductors in raceway.
- B. Branch Circuits: Type THHN-THWN, single conductors in raceway.
- C. Class 1 Control Circuits: Type THHN-THWN, in raceway.

- D. Class 2 Control and Low Voltage Circuits: Type THHN-THWN, in raceway, or as required by manufacturer. Plenum rated where required. Cable shall not be installed in slab or under ground. All circuits shall be installed in raceway when installed in walls and non-accessible spaces.

3.03 BRANCH WIRING

- A. General: Complete system of conduit required to all light outlets, receptacles, switches, etc. as shown. Conduit size as shown on drawings, except where no size is shown, conduit shall be sized per National Electrical Code. No conduit shall carry more than 8 neutral and hot conductors. All exposed switches, receptacles or outlet boxes for other purposes, install die cast boxes, except where specifically noted otherwise. Feeder cables shall have each phase identified according to the established code.
- B. Coding: Branch circuit color code shall be: For 120/240V – Phase A, Black – Phase B, Blue – Neutral, White – Ground, Green. For 120/208 V. Black – Phase A, Red – Phase B, Blue – Phase C, White – Neutral, Green – Ground, Isolated Ground – Green with Yellow stripe, Purple “Travellers” on 3 and 4 way switching. For 277/480V. Brown (A), Orange (B), Yellow (C), and Gray neutral. Where colors are not available (No. 4 and larger) all terminals shall be coded, both on the wire and on the terminal. Phase and neutral wires shall appear in the same position and rotation at all appearances.

3.04 EQUIPMENT WIRING

- A. General: Wiring connections for power and control for all equipment shall be complete including disconnect switches and controls unless otherwise specified or noted on drawings.
- B. Control wiring for mechanical systems installed under this section of specifications shall be in accordance with mechanical drawings and specifications.

3.05 INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in raceway in finished walls, ceilings, and floors, unless otherwise indicated.
- B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- D. Exposed cables not permitted.
- E. Support cables according to Division 26 Section "Hangers and Supports for Electrical Systems."
- F. Identify and color-code conductors and cables according to Division 26 Section "Identification for Electrical Systems."

3.06 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
 - 1. Use oxide inhibitor in each splice and tap conductor for aluminum conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches of slack.

3.07 FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.
- B. Tests and Inspections:
 - 1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors, and branch conductors for compliance with requirements.
 - a. Megger Test, #4 and bigger
 - 2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
- C. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes methods and materials for grounding.

1.02 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Field quality-control test reports.
 - 1. Operation and Maintenance Data: For grounding include the following in emergency, operation, and maintenance manuals:
 - 2. Instructions for periodic testing and inspection of grounding features at test wells, ground rings, grounding connections for separately derived systems, based on NFPA 70B.
 - a. Tests shall be to determine if ground resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if they do not.
 - b. Include recommended testing intervals.

1.03 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.01 CONDUCTORS

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
 - 1. Solid Conductors: ASTM B 3.
 - 2. Stranded Conductors: ASTM B 8.
 - 3. Tinned Conductors: ASTM B 33.

2.02 CONNECTORS

- A. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.
- B. Insulated Ground Conductors: Per 260519.

PART 3 - EXECUTION

3.01 APPLICATIONS

- A. Equipment Ground Conductors: Green colored insulation. Provide in all raceways.
- B. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.

3.02 GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.
- B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
 - 1. Feeders and branch circuits.
 - 2. Lighting circuits.
 - 3. Receptacle circuits.
 - 4. Single-phase motor and appliance branch circuits.
 - 5. Flexible raceway runs.
 - 6. Armored and metal-clad cable runs.
- C. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.
 - 1. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-2-by-12-inch grounding bus.
 - 2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

3.03 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Consult with code authority and comply with all code authority requirements.

3.04 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections and prepare test reports:
 - 1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes the following:
 - 1. Hangers and supports for electrical equipment and systems.
 - 2. Construction requirements for concrete bases.

1.02 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. IMC: Intermediate metal conduit.
- C. RMC: Rigid metal conduit.
- D. IBC: International Building Code

1.03 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.
- C. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.
- D. All supports shall comply with IBC, Washington Seismic Zone, Building Use Group III.

1.04 SUBMITTALS

- A. Product Data: For the following:
 - 1. Steel slotted support systems.
 - 2. Nonmetallic slotted support systems.

1.05 QUALITY ASSURANCE

- A. Comply with NFPA 70.

1.06 COORDINATION

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

- B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Section "Roof Accessories."

PART 2 - PRODUCTS

2.01 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allied Tube & Conduit.
 - b. Cooper B-Line, Inc.; a division of Cooper Industries.
 - c. ERICO International Corporation.
 - d. GS Metals Corp.
 - e. Thomas & Betts Corporation.
 - f. Unistrut; Tyco International, Ltd.
 - g. Wesanco, Inc.
 - 2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
 - 3. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
 - 4. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
- B. Nonmetallic Slotted Support Systems: Not permitted.
- C. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
- D. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- E. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.
- F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
 - 1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Hilti Inc.
 - 2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
 - 3) MKT Fastening, LLC.
 - 4) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.

2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Cooper B-Line, Inc.; a division of Cooper Industries.
 - 2) Empire Tool and Manufacturing Co., Inc.
 - 3) Hilti Inc.
 - 4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
 - 5) MKT Fastening, LLC.
3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.

PART 3 - EXECUTION

3.01 APPLICATION

- A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
- B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.
- C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
 1. Secure raceways and cables to these supports with two-bolt conduit clamps.

3.02 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.
- B. Raceway Support Methods: In addition to methods described in NECA 1, EMT may be supported by openings through structure members, as permitted in NFPA 70.
- C. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
 1. To Wood: Fasten with lag screws or through bolts.
 2. To New Concrete: Bolt to concrete inserts.
 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 4. To Existing Concrete: Expansion anchor fasteners.
 5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater.

Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.

6. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.

- D. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.03 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

3.04 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.
- B. Touchup: Comply with requirements in Division 09 for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

1.02 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. ENT: Electrical nonmetallic tubing.
- C. EPDM: Ethylene-propylene-diene terpolymer rubber.
- D. FMC: Flexible metal conduit.
- E. IMC: Intermediate metal conduit.
- F. LFMC: Liquidtight flexible metal conduit.
- G. LFNC: Liquidtight flexible nonmetallic conduit.
- H. NBR: Acrylonitrile-butadiene rubber.
- I. RNC: Rigid nonmetallic conduit.
- J. RGS: Rigid galvanized steel
- K. PVC: Polyvinyl Chloride

1.03 SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.
- B. Shop Drawings: For the following raceway components. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Custom enclosures and cabinets.
 - 2. For handholes and boxes for underground wiring, including the following:
 - a. Duct entry provisions, including locations and duct sizes.
 - b. Frame and cover design.
 - c. Grounding details.
- C. Manufacturer Seismic Qualification Certification: Submit certification that enclosures and cabinets and their mounting provisions, including those for internal components, will withstand seismic forces defined in Division 26 Section "Vibration and Seismic Controls for Electrical Systems." Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - a. The term "withstand" means "the cabinet or enclosure will remain in place without separation of any parts when subjected to the seismic forces specified."
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

D. Qualification Data: For professional engineer and testing agency.

E. Source quality-control test reports.

1.04 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.01 METAL CONDUIT AND TUBING

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. AFC Cable Systems, Inc.
 2. Alflec Inc.
 3. Allied Tube & Conduit; a Tyco International Ltd. Co.
 4. Anamet Electrical, Inc.; Anaconda Metal Hose.
 5. Electri-Flex Co.
 6. Manhattan/CDT/Cole-Flex.
 7. Maverick Tube Corporation.
 8. O-Z Gedney; a unit of General Signal.
 9. Wheatland Tube Company.
- B. Rigid Steel Conduit: ANSI C80.1.
- C. Aluminum Rigid Conduit: Not permitted.
- D. IMC: ANSI C80.6.
- E. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.
 1. Comply with NEMA RN 1.
 2. Coating Thickness: 0.040 inch, minimum.
- F. EMT: ANSI C80.3. Hot dipped galvanized inside and outside.

- G. FMC: Aluminum.
- H. LFMC: Flexible steel conduit with PVC jacket.
- I. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.
 - 1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886.
 - 2. Fittings for EMT: Steel, compression or set screw type.
 - 3. Coating for Fittings for PVC-Coated Conduit: Minimum thickness, 0.040 inch, with overlapping sleeves protecting threaded joints.
- J. Joint Compound for Rigid Steel Conduit or IMC: Listed for use in cable connector assemblies, and compounded for use to lubricate and protect threaded raceway joints from corrosion and enhance their conductivity.
- K. NMSC, NMC: Not permitted.

2.02 NONMETALLIC CONDUIT AND TUBING

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. AFC Cable Systems, Inc.
 - 2. Anamet Electrical, Inc.; Anaconda Metal Hose.
 - 3. Arnco Corporation.
 - 4. CANTEX Inc.
 - 5. CertainTeed Corp.; Pipe & Plastics Group.
 - 6. Condux International, Inc.
 - 7. ElecSYS, Inc.
 - 8. Electri-Flex Co.
 - 9. Lamson & Sessions; Carlon Electrical Products.
 - 10. Manhattan/CDT/Cole-Flex.
 - 11. RACO; a Hubbell Company.
 - 12. Thomas & Betts Corporation.
- B. ENT: NEMA TC 13. Not permitted
- C. RNC: NEMA TC 2, Type EPC-40-PVC, unless otherwise indicated as PVC 80.
- D. LFNC: Not permitted.
- E. Fittings for Elbows and Sweeps shall be plastic coated rigid galvanized steel or fiberglass
- F. RNC: NEMA TC 3; match to conduit or tubing type and material.
- G. Fittings for LFNC: Not permitted.

2.03 BOXES, ENCLOSURES, AND CABINETS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
 - 2. EGS/Appleton Electric.
 - 3. Erickson Electrical Equipment Company.
 - 4. Hoffman.
 - 5. Hubbell Incorporated; Killark Electric Manufacturing Co. Division.
 - 6. O-Z/Gedney; a unit of General Signal.
 - 7. RACO; a Hubbell Company.
 - 8. Robroy Industries, Inc.; Enclosure Division.
 - 9. Scott Fetzer Co.; Adalet Division.
 - 10. Spring City Electrical Manufacturing Company.
 - 11. Thomas & Betts Corporation.
 - 12. Walker Systems, Inc.; Wiremold Company (The).
 - 13. Woodhead, Daniel Company; Woodhead Industries, Inc. Subsidiary.
- B. Sheet Metal Outlet and Device Boxes: NEMA OS 1. Minimum size: 4-inch by 4-inch by 1 ½-inch. Voice/data/AV boxes minimum 2 1/8-inch deep.
 - 1. Exception: AV boxes shall be deep, minimum 3" for special applications shown on shop drawings
- C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, aluminum, Type FD, with gasketed cover.
- D. Nonmetallic Outlet and Device Boxes: Not permitted.

2.04 SLEEVES FOR RACEWAYS

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- C. Sleeves for Rectangular Openings: Galvanized sheet steel with minimum 0.052- or 0.138-inch thickness as indicated and of length to suit application.
- D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."

2.05 SLEEVE SEALS

- A. Basis-of-Design Product:
 - 1. Advance Products & Systems, Inc.
 - 2. Calpico, Inc.
 - 3. Metraflex Co.
 - 4. Pipeline Seal and Insulator, Inc.

- B. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and cable.
 - 1. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
 - 2. Pressure Plates: Carbon steel. Include two for each sealing element.
 - 3. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

PART 3 - EXECUTION

3.01 RACEWAY APPLICATION

- A. All conduit sizes on drawings are based on EMT. Any alternate raceway used shall have its size adjusted per the NEC
- B. Outdoors: Apply raceway products as specified below, unless otherwise indicated:
 - 1. Exposed Conduit: Rigid steel conduit.
 - 2. Concealed Conduit, Aboveground: Rigid steel conduit, IMC, EMT.
 - 3. Underground Conduit: Rigid Steel Conduit or RNC, Type EPC-40-PVC, direct buried with plastic coated RGS bends and sweeps. See 260543.
 - 4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
 - 5. Boxes and Enclosures, Aboveground: NEMA 250, Type 4.
- C. Comply with the following indoor applications, unless otherwise indicated:
 - 1. Open Ceiling Spaces: Exposed conduit is not permitted, conduit shall be run in the rigid insulation space in IMC or RGS.
 - 2. Exposed, Not Subject to Physical Damage: EMT. Exposed and Subject to Severe Physical Damage: Rigid steel conduit. Includes raceways in the following locations:
 - a. Loading dock.
 - b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
 - 3. Concealed in Ceilings and Interior Walls and Partitions: EMT. Homeruns minimum 3/4". MC Cable may be used for branch circuitry in rooms above ceilings and in walls. No MC for homeruns or between rooms.
 - 4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
 - 5. Damp or Wet Locations: Rigid steel conduit.
 - 6. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4, stainless steel in damp or wet locations.
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.
 - 1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.
 - 2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with that material. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer.

3.02 INSTALLATION

- A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.
- B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- C. Complete raceway installation before starting conductor installation.
- D. Support raceways as specified in Division 26 Section "Hangers, Supports and Fasteners."
- E. Arrange stub-ups so curved portions of bends are not visible above the finished slab.
- F. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications conduits, for which fewer bends are allowed. Instances requiring more than 3 bends shall be submitted for approval to the engineer.
- G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.
- H. Raceways Embedded in Slabs:
 - 1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
 - 2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
 - 3. Change from RNC Type EPC-40-PVC to plastic coated rigid steel conduit or EMT before rising above the floor.
- I. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- J. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.
- K. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.
- L. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:
 - 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 - 2. Where otherwise required by NFPA 70.
- M. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall.

3.03 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."
- B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
- C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
- D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
- E. Cut sleeves to length for mounting flush with both surfaces of walls.
- F. Extend sleeves installed in floors 2 inches above finished floor level.
- G. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway unless sleeve seal is to be installed or unless seismic criteria require different clearance.
- H. Seal space outside of sleeves with grout for penetrations of concrete and masonry and with approved joint compound for gypsum board assemblies.
- I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway, using joint sealant appropriate for size, depth, and location of joint. Refer to Division 07 Section "Joint Sealants" for materials and installation.
- J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway penetrations. Install sleeves and seal with firestop materials. Comply with Division 07 Section "Penetration Firestopping."
- K. Aboveground, Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

3.04 SLEEVE-SEAL INSTALLATION

- A. Install to seal underground, exterior wall penetrations.
- B. Use type and number of sealing elements recommended by manufacturer for raceway material and size. Position raceway in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.05 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping."

3.06 PROTECTION

- A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes the following:
 - 1. Receptacles, receptacles with integral GFCI, and associated device plates.
 - 2. All receptacles are tamperproof

1.02 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. GFCI: Ground-fault circuit interrupter.
- C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

1.03 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.
- C. Samples: One for each type of device and wall plate specified, in each color specified.
- D. Field quality-control test reports.
- E. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing label warnings and instruction manuals that include labeling conditions.

1.04 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of wiring device and associated wall plate through one source from a single manufacturer. Insofar as they are available, obtain all wiring devices and associated wall plates from a single manufacturer and one source.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:

1. Cooper Wiring Devices; a division of Cooper Industries, Inc. (Cooper).
2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
3. Leviton Mfg. Company Inc. (Leviton).
4. Pass & Seymour/LeGrand; Wiring Devices & Accessories (Pass & Seymour).

B. All wiring devices shall be white color.

2.02 STRAIGHT BLADE RECEPTACLES

- A. Convenience Receptacles, tamper resistant, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.
- B. Description: Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle. Square face Configuration: NEMA WD 6, Configuration 5-20R.
- C. Standards: Comply with UL 498.
- D. Products: Subject to compliance with requirements, provide one of the following:
 1. Hubbell; HBL5362TR (duplex).
 2. Leviton; 5362SG (duplex).
 3. Pass & Seymour; TR5362 (duplex).

2.03 GFCI RECEPTACLES

- A. All exterior receptacles, receptacles within ten feet of sinks and mop sinks shall be GFCI type whether indicated on drawings or not.
- B. General Description: Straight blade. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped.
- C. Duplex GFCI Convenience Receptacles, 125 V, 20 A:
 1. Products: Subject to compliance with requirements, provide one of the following:
 2. Pass & Seymour; TR2097NA (No substitute).
 3. Exterior GFCI receptacles shall bear the "WR" Weather resistant label. 2097TRWRNAW

2.04 WALL PLATES

- A. Single and combination types to match corresponding wiring devices, stainless steel.
 1. Plate-Securing Screws: Metal with head color to match plate finish.
 2. Material for Finished Spaces: 0.035-inch- thick, satin-finished stainless steel.
 3. Material for Unfinished Spaces: Galvanized steel.
 4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in "wet locations."
- B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with type 3R weather-resistant, die-cast aluminum while in use with lockable cover.
 1. Hubbell #WP8M/WP26M

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.
- B. Coordination with Other Trades:
 - 1. Take steps to insure that devices and their boxes are protected. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of the boxes.
 - 2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
 - 3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
 - 4. Install wiring devices after all wall preparation, including painting, is complete.
- C. Conductors:
 - 1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.
 - 2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
 - 3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
 - 4. Existing Conductors:
 - a. Cut back and pigtail, or replace all damaged conductors.
 - b. Straighten conductors that remain and remove corrosion and foreign matter.
 - c. Pigtailling existing conductors is permitted provided the outlet box is large enough.
- D. Device Installation:
 - 1. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete.
 - 2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
 - 3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
 - 4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
 - 5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to 3/4 of the way around terminal screw.
 - 6. Use a torque screwdriver when a torque is recommended or required by the manufacturer.
 - 7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
 - 8. Tighten unused terminal screws on the device.
 - 9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.
- E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the right.
- F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.
- G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

3.02 FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.
 1. Test Instruments: Use instruments that comply with UL 1436.
 2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated LED indicators of measurement.
- B. Tests for Convenience Receptacles:
 1. Line Voltage: Acceptable range is 105 to 132 V.
 2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is not acceptable.
 3. Ground Impedance: Values of up to 2 ohms are acceptable.
 4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
 5. Using the test plug, verify that the device and its outlet box are securely mounted.
 6. The tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

END OF SECTION

PART 1 – GENERAL

1.01 SUMMARY

- A. Work includes but is not limited to the following:
 - 1. Locate and document existing utilities and controls.
 - 2. Save and protect from harm any trees, structures, features, and facilities to remain.
 - 3. Provide temporary chain link construction fencing to secure construction site.
 - 4. Adjust and relocate temporary chain link construction fencing per stage as necessary to secure site.
 - 5. Provide staging and stockpiling locations.
 - 6. Remove and dispose of curbs, pavement, fencing, signs, lights, pavement markings, topsoil, trees, bollards, and other items shown on plans and as required to install new improvements.
 - 7. Remove and dispose of utility materials from below the ground surface as required.
 - 8. Cap and abandon utilities where not required to be removed.
 - 9. Identify, and coordinate with the Owner's Representative and/or utility purveyor(s), the disconnection, capping, abandonment, and/or removal of utilities as required.
 - 10. Clear and grub areas of the site as required and designated for new construction. Remove trees and plantings in such a manner to protect those that are to remain.
 - 11. Salvage existing materials as specified.
 - 12. Dispose of material from the site.

1.02 RELATED SECTIONS

- A. Coordinate related work specified in other parts of the Project Manual, including but not limited to following:
 - 1. Section 01 57 13 – TESC
 - 2. Section 31 22 00 – Earthwork

1.03 REFERENCES

- A. Comply with Section 01 33 10.
- B. Washington State Department of Ecology Stormwater Management Manual for Western Washington (2019) as adopted by the City of Bainbridge Island.
- C. WSDOT - Standard Specifications for Road, Bridge and Municipal Construction, latest edition; Washington State Department of Transportation. Standard Plans, current edition.
- D. Hydrogeologic Data Report prepared by PanGEO Inc., dated June 27, 2025.
- E. City of Bainbridge Island Design and Construction Standards and Specifications, dated December 2016.

1.04 SUBMITTALS

- A. Comply with Section 01 33 10.
- B. Submit surveyor's Certificate of Insurance
- C. Submit demolition procedures and operational sequence for review and acceptance by the Owner's Representative. Include permits for transport and disposal of debris as required.
- D. Prior to mobilization, submit for review a complete site access, staging, and stockpiling plan using a copy of the basic site layout plan. Identify all areas to be used for access, staging, and stockpiling throughout various phases of the construction sequence. Provide a legend or key as appropriate where phasing affects location.
- E. Submit shop drawing of portable temporary fencing panels and connection hardware.
- F. Submit Record Drawings according to Section 01 33 10 identifying and accurately locating capped utilities and other subsurface structural, electrical and mechanical conditions.

1.05 MATERIAL OWNERSHIP

- A. All site demolition materials shall become the Contractor's property unless otherwise noted in the project documents.

1.06 EXISTING CONDITIONS

- A. Protection of existing improvements
 - 1. Provide, erect, and maintain barricades, coverings, or other types of protection necessary to prevent damage to existing improvements to remain.
 - 2. Restore any existing on or off-site improvements damaged by this work to their original condition, as acceptable to Owner's Representative. Restoration includes but is not limited to landscaping, pavement, walks, structures and fences.
 - 3. Restore to original grades and conditions, areas adjacent to site disturbed or damaged as a result of site preparation and demolition work.
- B. Contact all necessary utility purveyors including City of Bainbridge Island (Storm, Sewer, Water), and other purveyors including communications to coordinate utility cutoffs and removals. Verify that all appropriate services have been disconnected.
- C. Do not shut off or cap utilities without prior notice and Coordination. Site utilities shall remain in service unless otherwise directed. Coordinate work with Division 01 requirements.
- D. Objectionable Noises: Limit use of air hammers and other noisy equipment. Conform to local governing requirements regarding Noise Control.
- E. Maintain vehicular and pedestrian traffic routes:
 - 1. Contractor shall maintain the pedestrian access from the parking lot and to the pool building. The Contractor will be allowed only limited closure of the access with prior coordination with the Bainbridge Island School District.
 - 2. Ensure minimum interference with roads, streets, sidewalks, and adjacent facilities for all areas that are not under construction.
 - 3. Do not close or obstruct streets, sidewalks, or passageways without permission from authorities having jurisdiction.
 - 4. If required by governing authorities, provide alternate routes around closed or obstructed traffic ways.
- F. Verify location and elevation of existing utilities at points of connection prior to commencing work on new utility that is to be connected to the existing utility. Coordinate with Owner's Representative if actual conditions are at variance with plans.
- G. Verify location and elevation of existing utilities sufficiently in advance of construction to allow for coordination and mitigation of conflicts without down time or project delays.

1.07 DIMENSIONS AND LAYOUTS

- A. The Contractor is responsible for furnishing, setting, and marking all line and location stakes including offsets and general construction staking. When work requiring control is required, all necessary related equipment and instruments shall be on site. A qualified layout engineer, surveyor, or technical specialist shall be assigned to the Contractor Crew for this work. The equipment and personnel must be available, at no additional cost to the Bainbridge Island School District for the purposes of verifying layout, conformance of grading, and certifying the accuracy of the work per the contract documents.
- B. The Contractor is responsible for preserving all benchmarks and stakes and is required to replace any stakes or benchmarks that are displaced or missing.
- C. The Contractor is responsible for review of all utility purveyor and City records relating to the existing underground utilities. The Contractor is responsible for avoiding damage to these facilities and shall restore all utilities at Contractor's own expense. The Contractor is to notify the Owner's Representative immediately if underground utilities not shown on record documents are encountered.
- D. If any discrepancies are found by the surveyor between the drawings and actual field conditions, the contractor shall immediately notify the Owner's Representative.

1.08 REGULATORY REQUIREMENTS

- A. Schedule the required pre-construction meeting with the Bainbridge Island School District and Owner/Architect.
- B. Comply with all applicable Federal, State, and Local codes and safety regulations. If there are any conflicts among referenced standards, the more stringent requirements shall govern.
- C. Coordinate demolition work with the appropriate utility purveyors.
- D. Obtain all necessary permits.

PART 2 – PRODUCTS

2.01 CONSTRUCTION FENCING

- A. See Section 01 50 00.
- B. Provide galvanized chain link fencing a minimum of 6 feet high.
- C. Posts shall be minimum 1 5/8" diameter galvanized steel pipe. At contractor's option, Schedule 40 galvanized steel pipes may be driven into ground where fencing is placed on pervious and/or uneven surfaces and a continuous roll of fence fabric may be used; use

minimum 9-gauge aluminum wire ties to attach fabric to posts. On hard surfaces or where fences will be moved frequently, use fence panels supported with concrete blocks (min 80lbs each) and strapped together with saddle clamps. Fence sections shall have top and bottom rails.

- D. Provide interwoven 2" by 2" diamond mesh steel wire fabric, 11 gauge minimum chain-link. Knuckled or twisted selvage is acceptable. Barbed wire is not allowed.
- E. Provide prefabricated fence panel gates of an appropriate size and location for Contractor's operations. Gates shall be double-padlocked. Owner will provide 1 lock keyed for City personnel for each entry, and Contractor will provide a lock for Contractor and Subcontractor entry at each gate. Hinged sides of each gate panel shall include double bracketing.
- F. Bracing: provide additional panels or outriggers as necessary to provide a rigid, stable run of fence.
- G. Provide warning signage every 50 LF of fence running line. Signage shall be a minimum of 18 inches square, brightly colored, with contrasting lettering as follows: "WARNING CONSTRUCTION KEEP OUT."
 - 1. Where approved, Temporary PVC Fencing may be used in low-security, short term applications. Provide 4-ft wide rolls of orange PVC web fencing, 6-ft lengths of #5 deformed steel reinforcing bar for posts, and safety caps for the #5 reinforcing bar.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Do not begin work prior to receiving Notice to Proceed from Owner.
- B. Verify that site improvement removal may safely and appropriately begin.
- C. Obtain required permits and permission from local governing authorities and Owner prior to commencing work.
- D. Prior to beginning site removals and clearing, meet with the Owner's Representative and review demolition plan. Indicate all existing trees that will be affected by construction and coordinate with the Bainbridge Island School District. Coordinate removal of landscape materials with the Owner's Representative and City Arborist, if applicable.

3.02 DOCUMENTATION OF UTILITIES AND CONTROLS

- A. Maintain a separate drawing to be stored on-site for identifying key utilities and controls. Identify and apply color-coded markings identifying shut-offs for domestic water, irrigation

water, power, and gas. Identify sanitary sewerage, stormwater discharge, gas, fiber optics, and telephone (all as appropriate) lines, which are to be maintained in service during the work. Color-code emergency contact information for each utility directly on the drawing.

- B. In accordance with Section 31 22 00, identify and accurately locate all capped utilities, utilities to be abandoned in place and other subsurface piping, structural, electrical and mechanical existing improvement to remain.

3.03 GENERAL

- A. Install perimeter Temporary Erosion and Sedimentation Control (TESC) measures in accordance with Section 01 57 13, and flag or fence, as shown on plans, all clearing limits prior to clearing or grubbing of the site.
- B. The Contractor shall note that the soils are generally moisture sensitive, and the erosion potential of the site soils is high and that a significant amount of the clearing and earthwork may be conducted during wet weather. See Geotechnical Engineering Report and Section 31 22 00. The Contractor shall implement and employ means and methods necessary to execute site demolition work in accordance with the Contract requirements and project schedule.
- C. The contractor shall schedule site demolition work to minimize existing soil disturbances. The Contractor's ability to perform site demolition work with the existing moisture sensitive soils may be impossible during different periods of the work and may require the contractor to cease operations until some soil healing occurs. Inactive workdays or wet weather days shall be expected and planned for in the Contractor's schedule and bid without extra cost to the Owner, except in abnormal wet weather cases. Abnormal wet weather cases shall be in accordance with the General Conditions. Time delays caused by the inability to perform work in existing saturated soils shall not be a basis for additional money or time claims.
- D. Prior to commencing site demolition and clearing, locate and flag all limits. Save and protect all areas to outside limits or existing improvements to remain. Contractor shall repair to equal or better condition areas outside limits impacted by Contractor's work. Prior to site clearing and demolition, contact utility location service (both public and private) and have all underground utilities on the site and adjacent right of ways clearly marked. Locate, flag, and protect existing underground utilities to remain.
- E. Approximate locations of existing utilities have been obtained from available records and are shown for convenience. The contractor shall be responsible for verification of the locations shown and for discovery of possible additional utilities not shown so as to avoid damage or disturbance. The underground utility location service shall be contacted for field location prior to any construction. The Owner's Representative shall be contacted if a utility conflict exists.
- F. Protect from weather existing soils exposed by site clearing and demolition activities. Protect exposed soils from erosion by covering with straw mulch or plastic. Prevent

disturbance from vehicular/construction traffic. Coordinate with TESC requirements in accordance with Section 01 57 13.

- G. Protect and maintain benchmarks and survey control points from disturbance during construction.
- H. The Contractor shall provide temporary barricades, barriers, guard railing, shoring etc. as necessary to protect personnel, structures, and utilities to remain intact during the operation of this contract. Conduct work in such a way to prevent damage to adjacent buildings, structures, other facilities and injury to persons. The Contractor shall clean adjacent structures and improvements of dust, dirt or debris caused by demolition and clearing operations. Any damage to existing facilities to remain or to improvements on adjacent properties shall be repaired, replaced and/or reconstructed by the Contractor at their expense to its original condition or better as directed by the Owner's Representative.
- I. Conduct site demolition and clearing in such a way to ensure minimum interference with roads and other adjacent properties. Do not close or obstruct streets or other occupied or used facilities without permission from authorities having jurisdiction.

3.04 CLEARING

- A. Specifically locate and establish clearing limits by physical means as required by the documents. The chain-link security fence shall also be allowed to establish the clearing limits.
- B. Clear areas of the site as required and designated for new construction. Remove trees and plantings in such a manner to protect those that are to remain. Cut and remove entire stumps of trees designated to be removed. Completely remove all roots, stumps, vegetation and all other organic debris within the clearing limits as required for new construction and as indicated on the documents.
- C. Save and protect trees indicated on plans to remain. Protect all off-site trees along adjacent roadways and on surrounding properties.
- D. Remove growth and underbrush within the clearing limits as required for new construction and as indicated. Perform removal operations in a manner to protect existing property and trees and plants to remain.
- E. Do not drive heavy equipment outside of clearing limits to perform any clearing or tree removal. Replace all fencing and TESC measures damaged by logging at no additional cost to the Owner.
- F. Dispose of clearing debris off site in a legal manner. Remove all debris and litter found on-site.

3.05 DRAINAGE AND GROUNDWATER

- A. Review and follow the Geotechnical recommendations concerning sub-grade protection.
- B. Control all surface and sub-surface water in order to prevent damage to the project site and adjacent properties. Provide all means necessary to immediately resolve surface water drainage problems generated on the construction site. Protect disturbed areas from inclement weather and surface runoff during construction process to provide a suitable working platform for all phases of the construction. Provide proper grading to prevent standing water.
- C. Intercept and route upstream stormwater around the project site as applicable.
- D. Keep natural drainage ways open for drainage at all times. Provide erosion control and stormwater turbidity control facilities as required according to the Plan, Section 01 57 13, and per the City inspector to prevent sediment transport and turbid stormwater discharge either downstream or offsite. TESC facilities shall be installed prior to clearing and demolition. At no time shall more than one foot of sediment be allowed to accumulate within a catch basin, ditch, or swale. All catch basins and conveyance ditches shall be cleaned prior to paving. Mud/sediment build-up shall be removed, and the cleaning operation shall not flush sediment-laden water into the downstream system.
- E. Keep open pits and holes caused as a result of demolition work free of standing water. All water shall be discharged in a stabilized manner to the site TESC system.
- F. Keep all trenches, holes and pits free of water during clearing, grubbing, excavation, construction of structures and installation of drains. Control surface run-off in order to prevent collection of water in areas not indicated to hold run-off.
- G. Prior to clearing and demolition, in the event dewatering is required, submit to the Owner's Representative a statement of the method, installation, and details of the dewatering systems in accordance with Division 1. Provide, install, and operate all necessary equipment to keep excavations free from water during construction. Dewater and dispose of the water in order to not cause damage to public/private property or to cause a nuisance/menace to the public. The Contractor shall have at all times sufficient pumping equipment and machinery in good working condition for all ordinary emergencies, including power outages. Have available, at all times, competent workers for the operation of the pumping equipment.
- H. Control ground water to prevent softening of the base of the excavation or formation of quick conditions or boils during excavation. Design and operate dewatering systems in order to prevent removal of natural soils and to eliminate turbidity of the discharge water.

3.06 GENERAL SITE REMOVALS

- A. Materials not designated for salvage shall be broken up, loaded, and legally disposed of by the Contractor. Care shall be taken removing items to ensure that damage does not occur to the existing trees and improvements which are to remain in place.
- B. Sprinkle excavated material and access roads as necessary to limit dust to the lowest practicable level. Do not use water to such an extent as to cause flooding, contaminated runoff, or icing.
- C. Explosive blasting is forbidden.

3.07 PAVEMENT DEMOLITION

- A. Raze, remove, and dispose of curb, concrete and asphalt pavements and appurtenances, concrete walls, concrete plaza and patios, concrete site stairs, and other Pavement removals adjacent to existing pavement to remain shall be accomplished by making a neat vertical sawcut at the limits of removal for asphalt and to the nearest joint on concrete. All concrete walk removals shall be sawcut at the next adjacent joint. Adjacent pavement materials designated to remain that are damaged by the Contractor during the work shall be replaced at no additional cost to the Owner.
- B. Contractor may elect to crush (rubbelize, grind, pulverize etc.) and stockpile existing concrete and/or asphalt on-site for use per Section 31 22 00. Special care shall be taken to not mix recycled material with onsite soils.
- C. Recycled Portland cement concrete rubble may be considered for construction aggregate with approval from the geotechnical engineer that it meets the material specification and if it has not been painted or exposed to dangerous or hazardous materials. It may also be considered for structural fill if it meets the requirements for structural fill per section 31 22 00. Recycled Portland cement concrete may not be used in the following areas or under the following conditions:
 - 1. Planting areas
 - 2. Where exposed to the elements
 - 3. Where free drainage is required
 - 4. Where wet conditions exist or are anticipated to exist

3.08 UTILITY DEMOLITION

- A. Contractor shall coordinate with applicable utility owners, purveyors and Owner's Representative to provide timely completion of utility removal work to be done by others.

Installation of temporary utilities may be required to accomplish the required work and shall be considered incidental to the work.

- B. Locate all existing underground and above ground utilities in area of work. Save, support and protect utilities to remain. All utility piping and structures not designated for removal are to remain until new services are tested and in operation and shall be protected during construction unless indicated otherwise. Damage to existing utilities which are to remain shall be repaired immediately at the Contractor's expense. In the event the Contractor encounters utility lines not shown on the site plan or otherwise indicated to be saved, removed, or abandoned, the location of such lines shall be marked in the field and the Owner's Representative notified.
- C. Locate, identify, disconnect, remove and dispose of utilities to be shown to be demolished. Arrange with utility owners and purveyors to shut off indicated utilities. Disconnect and/or remove existing utilities and/or structures as shown on plans and any additional utilities found in the construction area that conflict with improvements as part of this work.
- D. Asbestos piping: Asbestos cement utility piping may be encountered during the demolition work. The existing asbestos cement piping shall be demolished or abandoned in place as necessary and in accordance with the local, State and federal regulations.
- E. Storm drainage pipe demolition shall be performed prior to removal of building foundation unless otherwise authorized by the inspector. The Contractor shall cap the end of the storm drainage pipe to remain in place. Storm drainage pipe demolition shall be performed in the presence of the City of Bainbridge Island personnel (inspector). To abandon existing storm pipe, install a cured-in-place liner inside the storm drainage pipe and fill storm drainage pipe to be abandoned with controlled density fill. Removal of structures shall be completed only after the pipes have been removed or properly abandoned. Remove all utility piping as necessary to compete improvements, within the building and structure footprints, other drainage facilities, and where utility will be less than 4 feet below finished grade.
- F. Existing site irrigation facilities are present on site. The many locations of the existing irrigation facilities are unknown. Where the contractor finds existing irrigation system within the work area not designated to remain, the contractor shall coordinate with the Bainbridge Island School District for removal. It shall be anticipated that the contractor will trace and remove all piping and wiring such that no further system facilities are remaining. Capping and abandoning existing irrigation system is not allowed. Removal and demolition of the existing irrigation system work shall be incidental to the site demolition.

3.09 DISPOSAL OF MATERIALS

- A. Refer to Section 01 74 19 Construction Waste Material and Disposal.
- B. All site demolition materials shall become the Contractor's property unless otherwise noted in the project documents.

- C. The refuse resulting from site preparation shall be disposed of by the Contractor in a manner consistent with all government regulations. In no case shall refuse material be left on the project site, shoved onto abutting private properties, or be buried in embankments or trenches on the project site. Debris shall not be deposited in any stream or body of water, or in any public right-of-way or upon any private property except by written consent of the private property owner. On-site burning is not allowed. Maintain hauling routes clean and free of any debris resulting from work of this Section.
- D. The Owner encourages the salvage and recycling of materials from demolished structures. The Contractor shall salvage or recycle, in an acceptable manner to environmental agencies and the Owner, at his/her option any of the materials designated for disposal.
- E. Non-salvageable or non-recyclable demolition, contaminated soils, and creosote debris shall be transported to an approved lined landfill with a leachate collection system.
- F. The Contractor has the option to secure its own demolition debris, asphalt, concrete, and creosote materials disposal or recycle site(s) provided it has acquired all permits and approvals necessary from governing agencies and the Owner.
- G. The Contractor shall submit to the Owner's Representative copies of trip tickets and receiver tickets for all material transported to approved landfills and/or recyclers to ensure disposal at proper facilities. Trip tickets will not be used to quantify material.
- H. Leave the project area in a neat and orderly condition to meet the approval of the Owner/Owner's Representative.

3.10 CONSTRUCTION FENCING

- A. Contractor shall install construction fencing including gates as necessary to secure site. Fence shall be inspected and maintained on a regular basis.
- B. Contractor shall coordinate any work outside of construction fencing with the Bainbridge Island School District prior to performing work.
- C. Secure the project site from trespass or unintentional entrance by unauthorized personnel.
- D. All disturbed ground stockpiles, staging and on-site transport routes shall be fully enclosed by a perimeter security fence. Areas either under construction or completed but not specifically accepted by the Owner's Representative as Substantially Complete shall be completely enclosed. Areas included in the Contract but not yet under construction may be left open to public access at the discretion of the Owner's Representative.
- E. Temporary chain link fence panels shall be connected mechanically by means of pre-fabricated, bolted brackets manufactured specifically for the purpose. Fence panels shall not be wired together.
- F. Where long straight runs result in an unstable condition, sufficient out-rigging shall be incorporated to maintain fencing upright. Use only pre-manufactured outriggers or

additional fence panels. Out-riggers shall be placed on the interior side of the fence unless approved by the Owner's Representative. Alternatively, and where appropriate, a "zig-zag" arrangement of panels for stability may be used.

- G. Uneven Terrain: Where uneven terrain will not allow the use of pre-manufactured portable fence panels, or where otherwise directed by the Owner's Representative, drive posts directly into the earth plumb and 8 ft on center along the approved alignment. It is the Contractor's responsibility to perform a complete locates for underground utilities in any area to receive driven posts. Drive posts to sufficient depth to assure stability and durability for the life of the installation, maintaining a minimum of 6 ft above grade. Reset loose posts at the direction of the Owner's Representative. Secure chain link fabric to posts using approved wire ties within 6 inches of the top and bottom of each post, and a minimum of 18 inches on center between. Provide posts at each end of each driven post installation at a point that is sufficiently level to clamp prefabricated portable fence panels directly to the driven post installation.
- H. Where approved, temporary PVC Fencing may be installed in low-security, short term applications. Attach 4-ft wide rolls of orange PVC web fencing with wire ties to driven 6-ft #5 deformed steel reinforcing bar posts located at 5 ft on center. Cap each reinforcing bar with a safety cap manufactured for the #5 reinforcing bar.

3.11 TREE PROTECTION FENCING

- A. Tree protection fencing shall be installed in accordance with the plans and coordinated with the Civil Engineer.

3.12 REMOVAL OF TREE PROTECTION AND SECURITY FENCING

- A. Remove Temporary Tree Protection and Security Fencing within 2 weeks of establishment of the Contract Work as Substantially Complete. The Owner reserves the right of transfer of any rental agreement or contract for Temporary Fence installations, with the cost of eventual removal to be covered by the Contractor upon transfer.

3.13 PROTECTION OF STOCKPILES

- A. Protect stockpile areas from release of sediment. Cover stockpiles at all times while not in use to keep stored material dry. Surround materials stockpiled on pavement by two rows of straw bales or compost filter sock with joints staggered.

END OF SECTION

PART 1 – GENERAL

1.01 SUMMARY

- A. Work includes but is not limited to the following:
 - 1. Accomplishing indicated and required excavation, filling, compaction, and rough grading as required for walkways, site grading, utility construction, and the construction of other miscellaneous improvements.
 - 2. Protection and conditioning of on-site materials.
 - 3. Removing and disposing of materials that are unsuitable for reuse from the site.
 - 4. Importing any additional required materials.
 - 5. Coordinating earthwork operations with the other work of the Project.
- B. Work shall be in accordance with the Standard Specifications for Road, Bridge and Municipal Construction, latest edition, Washington State Department of Transportation/APWA.
- C. Related sections include but are not limited to:
 - 1. Section 31 10 00 – Site Preparation
 - 2. Section 32 13 13 – Concrete Paving
 - 3. Section 33 40 00 – Storm Drainage

1.02 REFERENCES

- A. ASTM D6938-17a Test Method for Density of Soil in Place by Nuclear Densometer.
- B. ASTM C136 Standard Method for Sieve Analysis of Fine and Coarse Aggregate.
- C. ASTM D1557-91 Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lb/cu ft).
- D. Hydrogeologic Data Report, prepared by PanGEO, Inc., dated June 27, 2025.
- E. WSDOT - Standard Specifications for Road, Bridge and Municipal Construction, current edition, Washington State Department of Transportation/American Public Works Association.
- F. WSDOT STD PLAN - Standard Plans for Road, Bridge and Municipal Construction (M 21-01), Washington State Department of Transportation/APWA.

- G. Washington State Department of Ecology Stormwater Management Manual for Western Washington (2019) as adopted by the City of Bainbridge Island.
- H. City of Bainbridge Island Design and Construction Standards and Specifications, dated December 2016.

1.03 SUBMITTALS

- A. Comply with Section 01 30 10.
- B. Samples:
 - 1. Submit sieve analysis of each type of material from an independent testing agency. Review and acceptance of a sieve analysis does not constitute approval of the actual product, which may be subject to additional testing at any time.
 - 2. Submit to onsite Geotechnical Engineer a 50-pound sample of proposed fill material at least seven (7) days prior to importing material to the site.
- C. WSDOT pit certifications for each pit.
- D. Health and Safety Plan - Prepare and submit a Worker Health and Safety Plan. Although certain requirements are identified here and elsewhere in these specifications, it is the sole responsibility of the Contractor to provide a safe work environment and adequate protection to individuals under their employ. Maintain a copy of the Health and Safety Plan in a conspicuous location on the Job Site and reinforce the requirements of the document at weekly Job Site Safety Meetings.
- E. Safety Products - Submit for the Engineer's approval manufacturer's product data for each worker safety product specified.
- F. Provide current calibration certificates for each piece of mechanical monitoring equipment to be used in the work. Perform field testing of equipment for the Engineer's approval prior to commencing excavation.

1.04 EXISTING CONDITIONS

- A. Documentation regarding existing conditions, in addition to the current survey supplied in the Contract Drawings, includes the following for reference only:
 - 1. Hydrogeologic Data Report, prepared by PanGEO, Inc., dated June 27, 2025.
- B. Protection of existing improvements:
 - 1. Provide protection necessary to prevent damage to existing vegetation and improvements not indicated for removal. Restore site improvements, including

but not limited to landscaping, pavement, walks, structures, fences and planters, damaged by this work to their original condition, as acceptable to Owner's Representative. Restore to original grades and conditions, areas adjacent to site disturbed or damaged as a result of site preparation and demolition work.

2. Minimize the impact to the surrounding area during construction and installation of utilities and other improvements by using the minimum size of equipment required to perform the work.

1.05 DEWATERING

- A. High groundwater was observed near the ground surface in the geotechnical explorations. Contractor shall review Geotechnical Engineering Report, and shall be prepared to address perched ground water and dewatering during construction.
- B. Design, furnish, install, operate, maintain, and remove a dewatering system(s) to achieve proper completion of work performed under this Contract. Meet the requirements set forth by the City of Bainbridge Island and the Minimum Standards for Construction and Maintenance of Wells, Chapter 173-160 WAC, specified by the Department of Ecology, State of Washington.
- C. Furnish, install, operate, and remove any additional machinery and equipment necessary to keep excavations free from water during construction. Contractor shall design and implement and obtain any necessary permits associated with the construction dewatering. Strategically placed sumps and pumps shall be used to adequately dewater trench excavations such that the appropriate material can be placed in the dry. Dewater and dispose of the water so as not to cause injury to public or private property, or to cause a nuisance or a menace to the public. Maintain on site sufficient pumping equipment and machinery in good working condition for emergencies, including power outage and flooding. Have available at all times competent workers for the continuous and successful operation of the dewatering systems. Do not shut down dewatering system between shifts, on holidays, on weekends, or during work stoppages without written permission from the Owner's Representative. Pumps shall have adequate pumping capacity and head to manage all stormwater routed to it such that stormwater does not cause flooding downstream. Contractor is responsible for providing temporary power, adequate to handle the size and quantity of needed pump systems. Pumps and power supply shall be in accordance meet all jurisdictional noise requirements.
- D. Control groundwater in a manner such that softening of the bottom of excavations or formation of "quick" conditions or "boils" during excavation does not occur. Design and operate dewatering systems so as to prevent removal of the natural soils.
- E. During excavation, installation of pipelines, placement of working base, and trench backfilling, and prior to the acceptance of the work or any portion of the work, keep excavations free of water. Control surface runoff so as to prevent entry or collection of water in excavations or in other isolated areas of the site. Design dewatering

system using accepted and professional methods of design and engineering consistent with the best modern practice. Maintain groundwater levels at a depth of two feet below the base of excavation. Control dewatering operations so as to not cause subsidence of adjacent structures or utilities.

- F. The Contractor shall be solely responsible for proper design, installation, operation, and maintenance of any component of the dewatering system, as well as any failure of any component of the system for this Contract.
- G. For any method of dewatering, secure the area from unauthorized access.
- H. Discharge from dewatering operations must be to an approved location. Prior to initiating the dewatering operation, review the discharge point with the City of Bainbridge Island inspector.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Stockpile materials on site within clearing limits and at approved locations. The Contractor shall be responsible for delivery coordination, placement and protection of stockpiled material.
- B. Direct surface water away from stockpile site to prevent erosion and/or deterioration of materials. Place stockpile or grade site surface around stockpile to prevent ponding of surface water.
- C. Remove stockpile and construction debris, restore area as indicated on plans or to pre-existing state, leave area in a clean and neat condition.
- D. Trench spoils and stockpiles shall be located at least 6 feet from edges of trenches and excavations and shall be graded such that surface water is prevented from discharging into excavations or trenches. Large stock piles from site grading should not be located within 20 feet of utility trench excavations.

1.07 DIMENSIONS AND LAYOUTS

- A. Furnish, set, and mark all line location stakes. Assign a qualified layout engineer, surveyor, or technical specialist for this work; this person shall be on site at all times when work requiring control is being performed, together with necessary equipment, supplies and instruments related thereto. This equipment and personnel must be available, at any time and at no additional cost to the Owner, for the purpose of verifying layout, grades, and certifying the accuracy of work on the site.
- B. Preserve benchmarks and stakes and replace stakes or benchmarks that are displaced or missing.

1.08 MANUFACTURER'S QUALIFICATIONS

- A. The Contractor shall select materials that are products of firms that are regularly

engaged in the manufacture of the specified materials.

1.09 BASE BID REQUIREMENTS

- A. Contractor shall include in the base bid all costs of achieving final grades as shown on the Contract Documents including all excavation to suitable bearing soil, export, legal disposal, import, placement, compaction, and protection. The existing conditions are represented by the Project Survey and documented in the Geotechnical Report. The Geotechnical Report is included in the Project Manual for reference only. The Contractor accepts the provided information as existing condition upon commencing land disturbing clearing or earthwork activities.
- B. The Contractor has the option to perform, at their own expense, a topographic survey of existing conditions and submit their survey for Owner's Review and approval for use for earthwork calculations prior to Contractor's land disturbing clearing or earthwork activities.
- C. The cost of excavation and off-site disposal of material and imported fill and its placement and compaction required to meet sub-grade elevations as defined in the Contract Documents shall be included in the base bid amount and shall not be compensated using unit prices. In the base bid it should not be assumed that the on-site soils may be used structural fill or fill in landscape areas.
- D. Subgrade: For the purpose of the Contractor Bid, the following shall define the required base bid subgrade elevations after stripping:
 - 1. Footings: The elevation at the bottom of the footings.
 - 2. Building Slab: Two (2) feet below the Finished Floor Elevation.
 - 3. Paving: The elevation of bottom of paving section.
 - 4. Utilities Trenches: The elevation of the bottom of pipe bedding.
 - 5. Landscape: The elevation below the stripping depth or the soil planting.
- E. If the Contractor's sequencing of the Work includes stock piling and double handling of materials, it shall be included within the base bid amount and shall be at no additional cost to the Owner.
- F. Note per geotechnical investigation that the onsite soils are moisture sensitive and will likely be impossible to work with or utilize during periods of wet weather. The soil integrity will be influenced by weather conditions and by the Contractor's sequencing, handling and protection of the material. It is the sole responsibility of the Contractor to protect the soils from wet weather conditions, and/or disturbance from construction activities. Contractor shall review and follow recommendation as outlined in the geotechnical report for subgrade protection and wet weather considerations. Failure by the Contractor to do so shall not be compensated using Unit Prices.
- G. The Contractor shall be solely responsible for all unauthorized excavation and import

and shall be at no additional cost to the Owner. The Unit Price shall not be applied to unauthorized excavation or import. Unauthorized excavations shall be backfilled with structural fill and compacted as required.

- H. Removal, disposal, and placement of soils deemed unsuitable as a result of the Contractor's sequencing, handling and protection of the materials will not be compensated using unit prices.

1.10 UNIT PRICES

- A. Refer to Section 01 22 10, for description of unit prices for over excavation and off-site disposal of un-anticipated unsuitable soils and imported structural fill to replace un-anticipated over-excavated materials.
- B. Contractor shall notify the Architect, Owner, and Testing Agency/Geotechnical engineer when work designated as a unit price is to be performed. No work associated with the unit price shall be performed until direction to proceed is received from the Owner's representative. Measurement of material shall be as specified in these specifications, and shall be completed prior to work being covered. Contractor shall not receive credit or payment for work designated as a unit price if the Contractor fails to properly facilitate measurement of materials.
- C. The Contractor shall be compensated at their bid unit price per Division 1 only as verified and documented by Owner's testing agency or Geotechnical Engineer in the field. All work must be pre-approved in writing by the Owner's representative. No compensation will be made to the Contractor for unverified and undocumented quantities.

1.11 QUALITY ASSURANCE

- A. Crew Foreman shall have a minimum of six years working experience and four years' experience as foreman performing similar work.
- B. All work shall comply with WSDOT Standard Specifications and City of Edmonds Standards. Where in conflict the City of Edmonds Standards will prevail.
- C. Testing:
 - 1. The Owner will engage a qualified independent Geotechnical Engineer and/or testing agency to perform field quality-control testing including but not limited to, soil bearing verification, fill compaction testing, and laboratory gradation and other index testing of on-site and imported materials for compliance with these specifications.
 - 2. If the material is found to be non-compliant with the Contract, the Contractor shall bear the cost of testing, removal of all non-compliant materials from the project site, and replacement of the materials with materials meeting the requirements of the Contract.

- D. It is the responsibility of the Contractor to verify the accuracy of all survey information provided by the Owner prior to commencing excavations or filling operations. Commencement of these operations constitutes acceptance of the survey information as appropriate to meet the intent of the Contract.
- E. Grading Tolerance: Finished grade will match contours and elevation shown will be within 1/10 foot.

PART 2 – PRODUCTS

2.01 FILL MATERIALS

- A. Existing onsite soil shall not be anticipated for use as structural fill.
- B. Approval of Fill Material: All material which is proposed to be used as fill, bedding or backfill shall be graded and tested for moisture content and compactability. Gradation and test results shall be submitted for review and acceptance by the Owner's Geotechnical Engineer prior to placement of fill. Materials shall be checked during the course of importation to ensure they continue to meet the Specifications.
- C. Material used in filling shall be appropriate to the site and the intended for use in that portion of the site.
- D. Topsoil shall not be used as a fill material.
- E. No frozen or thawing material shall be used as fill.
- F. Utility Trench Backfill:
 - 1. Shall be Gravel Borrow for onsite areas unless native material is suitable.
 - a. Imported Gravel Borrow containing recycled material is allowed to be used as trench backfill on-site as long as it meets the Gravel Borrow Specifications, hazardous materials testing in conformance with WSDOT 9-03.21(1) is provided, and the material conforms to City of Bainbridge Island Standards.
 - b. Recycled material generated on-site is not allowed for use as utility trench backfill.
 - 2. Native material will be deemed suitable if it is:
 - a. Capable of attaining the degree of compaction specified.
 - b. Within a range of two percent of the optimum moisture content for compaction.

- c. Free of organic material, clay, frozen lumps, rocks or pavement chunks larger than 6 inches, or other deleterious matter.
 - d. Less than 35% silt and clay.
 - e. Recycled material generated on-site is not allowed for use as utility trench backfill.
 - f. IF THE ON-SITE NATIVE MATERIAL IS UNSUITABLE, THE CONTRACTOR MUST IMPORT GRAVEL BORROW AS PART OF THE BASE BID AT NO ADDITIONAL COST TO THE OWNER.
3. Remove native material that is unsuitable for use as trench backfill from the site if it does not meet the requirements for use elsewhere on site.

G. Controlled Density Fill (CDF, aka flowable fill):

- 1. Shall be a mixture of Portland Cement, admixture (optional), Fly Ash, aggregates and water. It shall be proportioned to provide a non-segregating, free flowing, self-consolidating and excavatable material that will result in a non-settling fill which has measurable unconfined compressive strength.
- 2. Materials testing shall be with unconfined compressive test cylinders. Test data may be either laboratory trial batch test data or field test data of the same mix within the previous 6 months. Alternate mix designs may be required at the Engineer's discretion. The unconfined compressive strength at 28 days shall be a minimum of 50 psi and a maximum of 300 psi. Material shall be a sand/grout slurry proportioned to be hand-excavatable after long term strength gain.
- 3. Materials shall meet the requirements of the following sections of the WSDOT Standard Specifications:

Portland Cement	9-01
Fine Aggregate for Portland Cement Concrete	9-03.1(2)
Admixture for Concrete	9-23.6
Fly Ash	9-23.9
Water	9-25

4. Controlled density fill shall meet the following requirements:

<u>Ingredients</u>	<u>Amount per CY</u>
Portland Cement	50 lb.
Aggregates Class I or 2	3300 lb.
Air Entrainment Admixture	Per Manufacturer's recommendations
Fly Ash Class F	300 lb.
Water	300 lb. (maximum)

5. The material consistency shall be flowable (approx. slump 3-10 inches). If requested by the Contractor, the proportions may be adjusted with the approval of the Owner's Representative.
- H. Pipe Bedding:
1. Storm and sewer solid wall pipe bedding shall be Gravel Backfill for Pipe Zone Bedding in accordance with WSDOT Section 9-03.12(3).
 2. Perforated drain pipe bedding shall be Gravel Backfill for Drains in conformance with WSDOT 9-03.12(4).
- I. Gravel Backfill for Drains: shall be in accordance with WSDOT 9-03.12(4).
1. Washed Rock: shall be in accordance with Gravel Backfill for Drains.
- J. Crushed Surfacing Top and Base Course shall be in accordance with WSDOT Section 9-03.9(3), except that the percent by weight passing the U.S. No, 200 sieve shall not exceed 5 percent and shall have a minimum of two mechanically fractured surfaces.
- K. Common Borrow: Common Borrow material shall consist of on-site excavated soils free of organic and deleterious or objectionable material and of such size and gradation that the specified compaction can be readily attained. Maximum particle size shall not exceed 6-inches. The moisture of Common Borrow material at the time of placement shall be within a range of two percent of the optimum moisture content for compaction. Common Borrow shall at meet the requirements of WSDOT Section 9-03.14(3) except that the percent by weight passing the U.S. 200 sieve shall be less than 35 percent unless authorized for use by Owner's Representative. Common Borrow shall not be used for earthwork activities during periods of wet weather.
- L. Gravel Borrow: per WSDOT Section 9-03.14(1) except that the percent by weight passing the U.S. No, 200 sieve shall not exceed 5 percent.
- M. Base Sand shall be a washed sand conforming to WSDOT Section 9-03.13 Backfill for Sand Drains.

2.02 IMPORTED RECYCLED CRUSHED MATERIALS

- A. Recycled material generated off-site should not be used onsite without approval from the geotechnical engineer and acceptance by the Bainbridge Island School District. The use of recycled material will be subject to performance criteria, gradation requirements, and hazardous materials testing in conformance with WSDOT 9-03.21(1). Recycled glass and steel furnace slag is not allowed. Imported recycled material is not allowed for use as utility trench backfill within the ROW.

2.03 FILTER FABRIC

- A. Filter fabric indicated in drainage applications shall be Non-woven Mirafi 140N or approved equal, unless otherwise noted on plans.
- B. Filter fabric under gravel working pads should be Mirafi 500X or approved equal, unless otherwise noted on the plans.

2.04 COCONUT FIBER MATTING

- A. Coconut fiber matting shall be of clean, wheel-spun coconut fiber material (coir), woven with uniformly twisted strands into a flexible mesh. The fabric shall have the following properties:

<u>MATERIAL PROPERTY STANDARD</u>	<u>SIZE OR LIMIT</u>	<u>TESTING</u>
Tensile Strength (wet)	38 x 24 lb/inch	ASTM D 4595
Elongation (wet)	47% x 44%	ASTM C 4595
Weight	400 grams / square meter	ASTM D 3776
Open Area	65% maximum	Measured

2.05 SAFETY, MONITORING, AND RESPONSE EQUIPMENT

- A. The Contractor shall provide barricades, safety guards, temporary fencing, signage and/or other methods to secure trenches, open excavations, and other unsafe conditions resulting from this construction. Undertake work in full compliance with all applicable regulatory requirements.

2.06 CONDUCTIVE WARNING TAPE

- A. Conductive warning tape is required over all pipes and shall be located 12-inches below the proposed finished subgrade. Tape shall be manufacturer's standard permanent, bright-colored, continuous printed plastic tape, aluminum backed, intended for direct-burial service. Tape shall be not less than 6" wide x 4 mils thick. Tape Schedule:

<u>Piping</u>	<u>Color</u>	<u>Wording</u>
Domestic Water	Blue	Caution Domestic Water
Fire Service	Blue	Caution Fire Service
Storm Sewer	Green	Caution Storm Sewer
Sanitary Sewer	Green	Caution Sanitary Sewer

PART 3 – EXECUTION

3.01 GENERAL

- A. All earthwork shall conform to the Washington Administrative Code (WAC) 296-155 requirements for Excavation, Trenching and Shoring.
- B. Supplemental to these requirements the Contractor shall note that the existing site soils are generally moisture sensitive and the erosion potential of the site soils is high. See Geotechnical Engineering Report. The Contractor shall expect to perform site earthwork during the spring, summer, fall, and winter months. The Contractor shall not assume that the on-site soils are suitable for re-use during wet weather conditions. The Contractor shall implement and employ means and methods necessary to execute earthwork in accordance with the Contract requirements and project schedule. The Contractor shall execute earthwork to minimize existing soil disturbances. Inactive workdays or wet weather days shall be expected and planned for in the Contractor's schedule and bid without extra cost to the Owner, except in abnormal wet weather cases. Abnormal wet weather cases shall be in accordance with the General Conditions. Time delays caused by the inability to perform work in existing saturated soils shall not be a basis for additional money or time claims.

3.02 SAFETY MONITORING AND RESPONSE

- A. Maintain conformance to the Contractor's Health and Safety Plan.

3.03 PROTECTION OF EXISTING FACILITIES

- A. Utilities:
 - 1. The Contractor shall protect from damage private and public utilities in accordance with WSDOT Section 1-07.17. Contractor shall, before excavation begins, call the Utilities Underground Location Center 1-800-424-5555. Contractor shall pay for location of existing utilities.
 - 2. The Contractor shall, at their own expense, make excavations and borings ahead of the work, as necessary, to determine the exact location of utilities and underground structures.
 - 3. It is understood that there will be interfering utilities, service laterals and other underground pipes, drains, or structures encountered that are not shown or areas shown incorrectly on the plans or have not been previously discovered in the field. Contractor agrees this is a normal and usual occurrence in the construction of underground improvements. Furthermore, Contractor understands and agrees that work in some cases must be done in close proximity to said utilities and underground pipes, drains, and structures not shown or shown incorrectly on the plans which may require a change in operations and may cause sloughing of the trench, additional

traffic control, additional pavement and backfill costs and time. The Contractor agrees that these occurrences are usual and ordinary, and are reflected in the Bid and plan of operation.

- B. Pavement: The Contractor shall protect from damage all pavement or paved areas including curbs intended to remain. Contractor shall be responsible for replacement if damage occurs to pavement or curbs to remain.

- 1. Repair and/or replacement of damaged facilities will be accomplished at the Contractor's expense.
 - 2. Dust Control: Per Section 31 10 00.

3.04 PROTECTION OF WORK IN PROGRESS

- A. It is the responsibility of the Contractor to protect all work in progress from damage due to extremes of cold, moisture, or drying, or mechanical damage from equipment traffic or foot traffic. Alert the Owner's Representative to the presence or likelihood of conditions that may adversely affect the quality of the work, the physical structure of soils, or transport of site soils off-site.
- B. Do not work frozen soils.
- C. Protect soils from excessive moisture. See Geotechnical Report recommendations. During periods of prolonged precipitation, take aggressive steps to avoid over-saturation, erosion, or homogenization of soils by covering with protective plastic sheeting, collection and controlled dewatering, detention for sediment removal, and not disturbing wet soils. It shall be the Contractor's sole responsibility to manage soils that are too wet or too dry for use.
- D. Protect foundation subgrades as necessary from foot and equipment traffic and ponding of water during wet weather conditions. Typical measures of protection include compacted crushed rock or a lean-mix concrete mat placed over a properly prepared subgrade. Contractor should place foundation concrete and backfill excavations as soon as possible to protect the bearing surface.
- E. Apply supplemental moisture to overly dry soils, but not to the extent that would cause runoff, puddling, or erosion.
- F. Do not operate heavy equipment near excavations where trench wall or slope failure may result.

3.05 SITE GRADING

- A. Required contours and elevations are shown on the Drawings; if indicated information conflicts with actual conditions, notify Owner's Representative and obtain direction before proceeding with grading of area in conflict.

- B. In areas to be graded, remove trees as indicated in plans, brush, and other deleterious material.
- C. Remove organic topsoil and stockpile in accordance with Section 31 10 00.
- D. Provide subgrades required for various backfill soils and soil amendments as shown on Plans and Details.
- E. Following clearing, grubbing, stripping, excavations to reach subgrade and prior to placement of any fill, the exposed subgrade in areas to be occupied by paving, or structures shall be proof rolled and compacted to a dense, unyielding condition with a loaded dump truck, large vibrating roller or equivalent. Site clearing, proof rolling and compacting shall be observed by the Geotechnical Engineer to identify soft spots or unsuitable material. Over-excavate per the Geotechnical Engineer's recommendations areas that cannot be reworked and/or compacted. Replace over-excavated material with imported structural fill unless otherwise directed.
- F. Unless otherwise approved or not recommended during winter construction by the Geotechnical Engineer, scarify soils surfaces to receive compacted fill to a depth of at least eight (8) inches. Moisture condition scarified soil to obtain moisture to near optimum moisture content. Compact scarified soils to a minimum relative compaction as listed in this section.
- G. Place fill in controlled layers in thicknesses that are compatible with the type of equipment being used. Do not exceed a loose thickness of eight (8) inches for each fill layer. Compact each layer to a minimum relative compaction as listed in this Section. Determine the field density of the compacted soils by the ASTM D2922 and D3017 test method.
- H. All areas to receive compacted fill shall be field reviewed and tested by Geotechnical Engineer prior to the placement of new fill.
- I. Fill soils shall be granular and shall meet the specifications graduation requirements. The testing agency shall evaluate and/or test material for its conformance with specification prior to delivery to site. The Contractor shall notify the Geotechnical Engineer 72 hours (three working days) prior to importing fill to the site.
- J. The Geotechnical Engineer shall observe the placement of compacted fills and conduct in place field density tests on the compacted material to check for adequate moisture content and required relative compaction. Where less than required relative compaction or inadequate moisture is indicated, remove and replace the substandard fill or apply additional compactive effort and moisture conditioning as necessary until relative compaction, as specified in this section, is achieved. Additional testing (re-testing) is at the Contractor's own expense.
- K. Provide a level testing pad for Geotechnical Engineer's field density tests.
- L. The Contractor shall grade the site and control drainage at all times to prevent water from ponding in construction areas and/or flowing into excavations. Exposed grades shall be

crowned, sloped, and smooth drum-rolled at the end of each day to facilitate drainage. Accumulated water must be removed from subgrades and work areas immediately prior to performing further work in the area. Soil deemed unfit due to Contractor's inattention to drainage or lack of soil protection shall be replaced with imported structural fill at the Contractor's own expense.

- M. Perched ground water could be encountered in excavations completed during construction. See Geotechnical Engineering Report. The Contractor shall be prepared to intercept any ground water seepage entering the excavations and route it to a suitable discharge location.
- N. Slope prepared surfaces to have positive drainage and direct flows to TESC facilities.
- O. Refer to Tree Protection in the Drawings and specifications for grading in the vicinity of trees to be protected.

3.06 SLOPES

- A. The Contractor is responsible for the stability and safety of all temporary slopes. Refer to Geotechnical Engineering Report for guidance regarding maximum recommended temporary and permanent slopes on site.

3.07 PREPARATION

- A. Subgrade preparation and protection shall be per Section 2-06 of WSDOT, except Contractor shall perform all staking.

3.08 EXCAVATION, EMBANKMENT AND BACKFILLING

A. General:

1. Exercise sound engineering and construction practices for excavations and trenches. Maintain trenches such that no damage will occur to any foundation, structure, pole, utility or other facility due to sloughs or any other cause. If as a result of trenching operation, there is disturbance of the ground which may endanger or damage other property and require repair, the Contractor shall take remedial action at no additional expense to the Owner.
2. Provide dewatering, shoring and other types of stabilization, in addition to shoring required for Safety by State codes to maintain the integrity of the trench or excavation and protect adjacent utilities or structures. All earthwork shall conform to the Washington Administrative Code (WAC) 296-155 requirements for excavation, trenching and Shoring.

B. Excavation Material:

1. Common Excavation: The naturally occurring sand, gravel, clays, or mixtures of the above, required to be moved for the construction of roadways and for the establishment of proposed site grades. Common excavation material shall be moved

with the use of mechanical equipment, such as shovels, loaders, bulldozers, graders, rippers, etc., but shall not require drilling and blasting or drilling and line breaking. Excavation by sluicing method will not be permitted.

- a. Unsuitable Excavation: Shall consist of unstable materials, such as topsoil, peat, muck, water-impregnated clays, yielding or wet soils, swampy or other undesirable materials, including buried logs, stumps, abandoned utility and product delivery lines, or trash. Excavated material shall be replaced with Structural Fill.
 - b. Unsuitable materials beneath structures, roadways, or embankments shall be removed to the depth designated by the Owner's Representative and backfilled with Structural Fill.
- C. Catch basins, manholes and similar structures: Excavate to a distance necessary to allow required soil compaction between sides of excavation and outer surfaces of structure. Take care to excavate to exact depths required; fill over excavation with compacted backfill for utility trenches.
- D. Trench Excavation, bedding and backfill for Storm Drains:
- 1. Trench excavation, foundation bedding, and backfill for Storm Drains shall be in accordance with this Section, WSDOT Section 7-08.3(1) and City of Edmonds Standards.
 - 2. Backfilling of trenches in the vicinity of structures shall not take place until the cement in the masonry has become thoroughly hardened. Walking on the pipe shall not be allowed until at least one foot of earth has been placed upon it.
 - 3. Backfill shall be in accordance with the plans and WSDOT Section 7-08.3(3) of with the following exception: In-place density will be determined by ASTM D6938-17a - Test for Density of Soil in-place by the nuclear method.
 - 4. Trench dams shall be installed as required to prevent stormwater from utilizing the trench backfill and bedding as a conduit.
- E. Catch basins, manholes and similar structures:
- 1. Excavate to furnish a minimum of 12 inches between sides of excavation and outer surfaces of structure. Take care to excavate to exact depths required; fill over excavation with compacted backfill for utility trenches.
 - 2. Excavation and backfill shall be in accordance with WSDOT Section 2-09 and City of Edmonds Standards unless otherwise noted in the Project Documents.

F. Structural Fill:

1. Placement of structural fill shall be in accordance project geotechnical report.

G. Moisture Conditioning and Temporary Stockpiling:

1. Excavated material shall not be considered for reuse.
2. The Contractor shall stockpile excavated material when no fill material is required at the time of excavation. The Contractor shall be responsible for preventing the stockpiled material from becoming saturated beyond the critical moisture limits for fill placement.
3. Stockpiled selected material, which becomes saturated beyond allowable limits for placement as fill, shall be removed and disposed of and replaced with Gravel Borrow or Structural fill, as appropriate for the intended use and weather conditions during installation at the expense of the Contractor.

3.09 DISPOSAL OF EARTH MATERIALS

- A. Contractor shall remove all excavated material that is not acceptable for use as fill on site. Legally dispose of excess material off site, at Contractor's expense.

3.10 FIELD QUALITY CONTROL

- A. General: Control soil compaction during construction providing minimum percentage of density specified for area classification. In landscape areas, do not allow equipment traffic to overly compact areas beyond specified percentages. Remediate over-compaction as directed by the Engineer including ripping, re-grading and re-compaction or over-excavation and in-kind replacement per plan.
- B. Percentage of Maximum Density Requirements: Compact soil to not less than the percentages below for maximum density for soils which exhibit a well-defined moisture density relationship determined in accordance with ASTM D1557; and not less than the following percentages of relative density.
- C. Compaction:
1. Compact all fill and backfill to prevent subsequent settlement.
 2. Water settling or jetting will not be permitted as a means of compaction.
 3. Furnish heavy rollers or compactors except as follows:
 4. Use pneumatic hand tampers for trenches and areas not accessible to heavy equipment.

5. Compact areas within 3-feet of footings, foundations and walls with hand equipment.
6. Required compaction: Compact fill and backfill to the following minimum relative compaction (percentage of maximum dry density determined in accordance with ASTM D1557).

Locations	Required Minimum Relative Compaction
Utility Trenches: (under non roadway and greater than 2 feet below surface below walks and roadways)	90%*
Utility Trenches: (under foundation slabs, roadways, or within 2 feet of the surface below walks and roadways)	95%
Under Slabs on Grade and Foundations	95%
Under Walks and Pedestrian Paving	95%
Retaining Wall Subgrade	95%
Within 3-feet of Back of Retaining Walls	90%
Subgrade in Planting and Landscape areas	85%-90%*
Subgrade in lawn areas	90%
Planting soils (not tested)	85%
Structural fill	95%
Fills on slopes steeper than 3:1	95%
Parking, fire lanes, and vehicular drive lanes	95%

* Firm and unyielding suitable for support of construction equipment per Geotechnical Engineer is acceptable.

D. Moisture Control:

1. Before compaction, moisten or aerate each layer as necessary to provide optimum content. Compact each layer to required percentages of maximum dry density or relative dry density for each area classification.
2. Do not perform compaction operations on excessively wetted soils.

3.11 DISPOSAL OF EXCESS AND/OR WASTE MATERIALS:

- A. Remove from the Owner's property, all waste materials, including unacceptable excavated material as determined by the Owner's Representative, trash and debris, and dispose of it off site in a legal and timely manner. Provide dump receipts from an approved dump site if directed.

END OF SECTION

SECTION 31 23 19

DEWATERING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Dewatering system.
- B. Observation wells.

1.2 RELATED SECTIONS

- A. Section 00 31 00 – Available Project Information (Hydrogeological Report)
- B. Section 31 22 00 – Earthwork
- C. Section 33 40 00 – Storm Drainage

1.3 SUBMITTALS

- A. Submit under provisions of Section 01 33 00.
- B. Shop Drawings: Submit shop drawings indicating layout of dewatering system, details of construction, connections, a list of equipment, and relationship with adjacent construction.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Minimum 3 years experience installing similar products.

1.5 PRE-INSTALLATION MEETINGS

- A. Convene minimum two weeks prior to starting work of this section and coordinate with Bainbridge Island Metropolitan Parks and Recreation Representative, the General Contractor, and Architect/Engineer.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store products in manufacturer's unopened packaging bearing the brand name and manufacturer's identification until ready for installation.

1.7 PROJECT 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 recommended limits.
- B. The Contractor must operate and maintain all pumps, tanks and other equipment necessary for the environmentally safe removal and disposal of water from the

various parts of the work. The method proposed by the Contractor for removal of water from excavations shall be subject to the approval of the Owner. The Owner has the right and authority to disapprove any method proposed for discharge of water from excavations.

- C. When discharge of water from the site is subject to approval of any Federal, State or local agency, the Contractor is responsible for obtaining such approval before commencing any pumping or de-watering operation.
- D. The Contractor must include measures for control and treatment of any wastewater created from dewatering activities in the Environmental Pollution Control Plan.

1.8 SEQUENCING

- A. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

1.9 PERMITS

- A. The Contractor shall be responsible for submitting the applications and obtaining the required permits for the well construction including obtaining approval from the Washington State Department of Ecology for the Construction Stormwater General Permit (CSWGP) and comply with all terms and conditions required.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers:

- 1. Pumps and Filtration Systems
 - a. Xylem, Inc.
 - b. Hydac Technology Corporation
 - b. or approved equal
- 2. Filter Press
 - a. Nanneer Solutions
 - b. or approved equal
- 3. Dewatering containers and boxes
 - a. GritCat/AquaCat RO
 - b. E-Tank
 - c. FleetGenius
 - d. or approved equal.

- B. Requests for substitutions will be considered in accordance with provisions of Section 01 25 00 - Product Requirements.

2.2 DEWATERING SERVICE PROVIDERS:

- A. Magna Services, Contact: todd@magnaservices.net, (425) 457-0706

2.3 MATERIALS

- C. Dewatering:
 - 1. Provide a system to lower and control groundwater in order to permit construction activities. Install sufficient dewatering equipment to drain water-bearing strata above and below bottom of foundations, drains, and other excavations.
 - 2. Operate dewatering system continuously until dewatering is no longer required. Dispose of water removed from excavations in a manner to avoid endangering public health, property, and portions of work under construction or completed. Provide flow control devices as required by governing authorities.
- D. Observation Wells:
 - 1. Provide, take measurements, and maintain observation wells indicated and additional observation wells as may be required by governing authorities.
 - 2. Remove observation wells when dewatering is completed.

PART 3 EXECUTION

3.1 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.

3.2 INSTALLATION

- A. The Contractor shall bear the sole responsibility for the design, installation, operation, monitoring, and removal of the dewatering system to comply with the requirements of this section and any applicable regulatory agencies. Install additional dewatering equipment as may be required throughout the duration of the project to maintain groundwater levels.
- B. Install in accordance with manufacturer's instructions and in proper relationship with adjacent construction. Test for proper operation and adjust until satisfactory results are obtained. Install system to provide the following:
 - 1. Lowering and controlling groundwater levels during excavation and construction.
 - 2. Control of hydrostatic pressures during excavation and construction.
 - 3. Control of surface and subsurface water, ice, and snow related to dewatering.
 - 4. Standby equipment for system back-up.
 - 5. Establishment and monitoring of observation wells.
 - 6. Legal disposal of water removed from excavations.
 - 7. Removal of observation wells when no longer required.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Single post shores, steel framing, and walers.
- B. Shim at designated points on steel framing, and shoring posts.
- C. Provisions of this Specification will pertain, as applicable, for concrete repair work.

1.02 RELATED SECTIONS

- A. Section 02 41 00 – Demolition Work.
- B. Section 03 01 30 – Surface Preparation for Overlay.
- C. Section 03 01 30.71 – Concrete Rehabilitation.
- D. Section 03 30 00 – Cast-In-Place Concrete.

1.03 REFERENCES

- A. PS20 - American Softwood and Lumber Standards.
- B. NFPA - National Design Specification for Wood Construction.
- C. AISC - American Institute of Steel Construction.
- D. SSI - Scaffolding and Shoring Institute Recommended Shoring Procedures.
- E. State of California, Department of Transportation – False work Manual.

1.04 SUBMITTALS

- A. Submit plans and schedule of shoring operation for the parking deck slab removal and replacement, including structural data on equipment to be used.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Protect items to be used from weather while in transit and on site.

1.06 QUALITY ASSURANCE

- A. Contractor shall be responsible for meeting all Municipal, State and National Safety Codes, Ordinances and Regulations, and Material and Equipment Quality Regulations.
- B. Rough Carpentry Lumber: Visible grade stamp of Agency certified by National Forest

Products Association (NFPA).

PART 2 - PRODUCTS

2.01 GENERAL

- A. General: Shores are defined as vertical, horizontal or inclined support members designed to carry their self weight, concrete, and construction loads above. When patented shores, patented splices in shoring, or patented methods of shoring are used, manufacturer's recommendations as to load-carrying capacities may be followed but only if supported by test reports of a qualified and recognized testing agency. The shoring designer must carefully follow the manufacturer's recommendations as to bracing and working loads for unsupported shore lengths.
- B. Multistory Structures: Shores shall be designed to carry the full weight of the concrete, supports and construction loads of all floors above them. No shoring shall be removed until the concrete has gained sufficient strength to support the loads that will be transferred to the structure upon removal of such shoring.

In determining the number of floors to be shored or reshored, the factors to be considered should include but are not necessarily limited to the following:

- 1. Design load capacity of the slab or member including live load, and other loads for which the Engineer designed the slab. Where the Engineer included allowances for construction loads, such values should be shown on the Structural Drawings.
- 2. Dead load weight of the concrete and shoring.
- 3. Construction live loads, such as placing crews and equipment or stored materials.
- 4. Design strength of concrete specified.
- 5. Cycle time between partial demolition and new concrete overlay placement on successive floors.
- 6. Strength of concrete at time it is required to support shoring loads from above.
- 7. Span of slab or structural member between permanent supports.
- 8. Type of shoring systems; i.e., span of horizontal components, individual shore loads, etc.

2.02 SHORING SYSTEM DESIGN

- A. Planning: Shores are intended to pick up lost load carrying capacity when deteriorated concrete is removed and to carry the load until the concrete is replaced and cured. Any shoring regardless of size should be planned in every particular prior to its construction or assembly. A design analysis should be made for all shoring. Stability and buckling should be investigated in all cases.
- B. Shoring Drawings: Before constructing shoring, the Contractor shall submit detailed drawings and/or design calculations of the proposed system for review and approval by the Engineer and the Municipality of Anchorage, Department of Public Works. If such drawings are not in conformity with Contract Documents as determined by the Engineer, the Contractor shall make such changes as may be required prior to start of work.

The review of the Shoring Drawings in no way relieves the Contractor of his responsibility for

- adequately constructing and maintaining the shoring so that it will function properly. Such review indicates that the assumed design loading in combination with design stresses shown, proposed construction methods, placement rates, equipment, sequences, the proposed materials, and the overall scheme are deemed capable of producing the desired support in an acceptable manner. All major design values and loading conditions should be shown on the Shoring Drawings. These include assumed values of live load, rate of placement, temperature, weight of moving equipment which may operate on shoring, foundation pressure, design stresses, and other pertinent information if applicable. In addition to specifying types of materials and products, sizes, lengths, and connection details, Shoring Drawings should provide for applicable details such as:
1. Procedures, sequence, and timing for removal of forms, shores, and reshores.
 2. Design allowance for construction loads on new slabs should be shown when such allowance will affect the development of shoring and/or reshoring schemes.
 3. Field adjustment of shoring during placing of concrete.
 4. Screeds and grade strips.
 5. Sequence of concrete placement and minimum elapsed time between adjacent placement.
 6. Mudsills or other foundation provisions.
 7. Special provisions such as safety, fire, drainage, and protection from vehicular impact in areas open to the public.
- C. Design and Erection: Shoring should be designed to support and maintain simple span, multi span and cantilevered concrete slabs, existing dimensions, shape, alignment, elevation, and position. Shoring should also be designed, erected, supported, braced, and maintained so that it will safely support all vertical and lateral loads that might be applied until such loads can be supported by the concrete structure. Vertical and lateral loads must be carried to the ground by the shoring system or by the in-place construction that has adequate strength for that purpose.
- D. Loads:
1. Vertical Loads: Vertical loads consist of dead load and live load. The weight of shoring plus the weight of the existing concrete and new concrete overlay is dead load. The live load includes the weight of workmen, equipment, material storage, runways, and impact.
Vertical loads assumed for shoring and reshoring design for multistory construction must include all loads transmitted from the floors above as dictated by the proposed construction schedule.
Vertical supports and horizontal framing should be designed for a minimum live load of 20 lbs. for construction or 50 psf regular live load in areas accessible by the public for each square foot of horizontal projection.
 2. Special Loads: Imposition of any unusual construction loads on the partially completed structure should not be allowed except with the approval of the Engineer.
- E. Unit Stresses: Unit stresses for use in the design of shoring, exclusive of accessories, are given in the applicable codes or specifications. When fabricated shoring, or scaffolding units are used, manufacturer's recommendations for allowable loads may be followed if supported by test reports or successful experience records; for shoring materials, which will experience substantial reuse, reduced values may be required.

For materials with limited reuse, allowable stresses specified in the appropriate design codes, or specifications for temporary structures, or for temporary loads on permanent structures may be used. Where there will be a considerable number of reuses or where shoring is fabricated from materials such as steel, aluminum, or magnesium, it is recommended that the system be designed as a permanent structure carrying permanent loads.

2.03 WOOD CONSTRUCTION

- A. Lumber: PS20, graded in accordance with established grading rules; maximum moisture content of 16% of following species and grades:
 - 1. Structural Light Framing: Stress Group A, No. 1.
- B. Nails, Spikes and Staples: Galvanized for exterior locations, high humidity locations; plain finish for interior locations; size and type to suit application.
- C. Shims: Shims shall be made of Douglas Fir No. 1 or hardwood with Fc perpendicular to grain greater than or equal to 625 psi.. They shall be used in pairs cut at the same angle of about 15 degrees normally, with parallel outside surfaces, but shall approximately divide the angle difference between the number of shims in non-parallel situations. The slipping surface between the shims shall be the finished surface. The wood grain shall be parallel to the sliding surface. Shims shall be a minimum of 4 inches wide and 12 inches long.
- D. Splices: Field-constructed butt or lap splices of timber shoring are not recommended unless they are made using fabricated hardware devices of demonstrated strength and stability. If plywood or lumber splices are made for timber shoring, they should be designed against buckling and bending as for any other structural compression member.
- E. Scaffold type shoring may be used in lieu of lumber as long as it is strong enough to carry the anticipated loads. Provide complete data on system to be used.

PART 3 - EXECUTION

3.01 WOOD FRAMING

- A. Erect wood framing true to lines and levels. Nail members securely as shown on plans. Space vertical and horizontal members per drawings.
- B. Jack and shim structure to take imposed load on shoring so reparations may be made.

3.02 SHIMMING

- A. Pairs of shims can be used to maintain a uniform pressure and bearing. The angle of the shims shall be such that no slipping shall occur. The outside finished surfaces of wood shall be made to bear on one another. Tighten shims until solid bearing is achieved and the member is brought under their support. When final placement has been set, shims shall be toe-nailed to prevent slipping.

- B. Screwjacks can be used to maintain a uniform pressure and bearing. At least one bearing plate shall be mounted on a swivel base to allow uniform bearing on supported members. Tighten screw until solid bearing is achieved and the member is brought under its support.

3.03 SCAFFOLD AND POST SHORING SYSTEM

- A. Erect scaffolding and post shoring per manufacturer's recommendations and plans and schedule as submitted. Any deviation from these documents shall immediately be brought to the attention of the Engineer. Shim per Paragraph 3.02, Shimming.
- B. Bracing: The system should transfer all horizontal loads to the ground or to completed construction in such a manner as to insure safety at all times. Bracing should be provided in vertical and horizontal planes where required to provide stiffness and to prevent buckling of individual members. Where the only bracing requirement is to prevent buckling of individual members, bracing should be provided in whatever directions are necessary. The braced system should be anchored in a manner to insure stability of the total system.
- C. Foundations for Shoring: Proper foundations on ground such as mudsills, spread footings, or pile footings should be provided. If soil under mudsills is or may become incapable of supporting superimposed loads without appreciable settlement, it should be stabilized or other means of support should be provided. No foundation shall be supported on frozen ground.
- D. Settlement: Shoring should be so designed and constructed such that vertical adjustments can be made to compensate for take-up and settlements, and that settlements under full load will be a minimal.

Provided they comply with allowable lumber stress, a pair of wood wedges may be used at the top or bottom of shores, but not at both ends, to facilitate vertical adjustment, to correct uneven settlements, or to facilitate dismantling of the shoring. Screwjacks for pipe shores or scaffold-type shoring may be used at both top and bottom so long as they are secured by the shore or scaffold leg against loosening or falling out. A minimum of 8 inch embedment in the pipe leg or sleeve is required, or manufacturer's recommendations based on test results may be followed.

- E. Plumb all shores and scaffolding frames as erection proceeds.
- F. Align all shores and scaffolding frames between floors as erection proceeds.
- G. Verify all base plates, shore heads and shimming members are in firm contact with footing, horizontal shoring beams, and supported structure surfaces.

3.04 TIGHTENING OF SHORES

- A. To achieve the intended loading on the shores, the shims and/or screwjacks must be tightened to take on sixty percent (60%) of the load applied. As demolition takes place, the slab's decreased strength will shift load onto the shores. These loads will be monitored as indicated elsewhere. If uneven loading occurs, as indicated by the

monitoring procedure, the shims and/or screwjacks may require adjustment from time to time as directed by the Engineer.

3.05 FIELD QUALITY CONTROL

- A. Inspect all shoring equipment before use. Do not use equipment that is damaged.
- B. Approved Shoring System Drawings shall be available and used on the jobsite at all times.
- C. Inspect erected shoring system a minimum of once daily. Inspect shoring system prior to and during demolition, and during and after new concrete overlay placement until the concrete has set.

END OF SECTION

PART 1 – GENERAL

1.01 WORK INCLUDED

- A. The contractor shall provide all labor, materials and appurtenances necessary for installation of the welded ornamental steel fence system defined herein as shown on drawings.

1.02 RELATED SECTIONS

- A. Section 01 56 39 Temporary Tree, Vegetation and Soil Protection
- B. Section 01 57 00 Construction Stormwater Control
- C. Section 01 57 13 TESC
- D. Section 03 33 00 Poured in Place Concrete

1.03 SYSTEM DESCRIPTION

- A. Basis of Design: The manufacturer shall supply a total fence system of Montage Commercial® standard picket space, **Welded and Rackable** (ATF – All Terrain Flexibility) Ornamental Steel (Genesis™) design. The system shall include all components (i.e., panels, posts, gates and hardware) required.

1.04 QUALITY ASSURANCE

- A. The contractor shall provide laborers and supervisors who are thoroughly familiar with the type of construction involved and materials and techniques specified.

1.05 REFERENCES

- A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.
- B. ASTM B117 - Practice for Operating Salt-Spray (Fog) Apparatus.
- C. ASTM D523 - Test Method for Specular Gloss.
- D. ASTM D714 - Test Method for Evaluating Degree of Blistering in Paint.
- E. ASTM D822 - Practice for Conducting Tests on Paint and Related Coatings and Materials using Filtered Open-Flame Carbon-Arc Light and Water Exposure Apparatus.
- F. ASTM D1654 - Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments.
- G. ASTM D2244 - Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.

- H. ASTM D2794 - Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
- I. ASTM D3359 - Test Method for Measuring Adhesion by Tape Test.
- J. ASTM F2408 – Ornamental Fences Employing Galvanized Steel Tubular Pickets.

1.06 SUBMITTAL

- A. The manufacturer's literature shall be submitted prior to installation.

1.07 PRODUCT HANDLING AND STORAGE

- A. Upon receipt at the job site, all materials shall be checked to ensure that no damage occurred during shipping or handling. Materials shall be stored in such a manner to ensure proper ventilation and drainage, and to protect against damage, weather, vandalism and theft.

1.08 PRODUCT WARRANTY

- A. All structural fence components (i.e. rails, pickets, and posts) shall be warranted within specified limitations, by the manufacturer for a period of 20 years from date of original purchase. Warranty shall cover any defects in material finish, including cracking, peeling, chipping, blistering or corroding.
- B. Reimbursement for labor necessary to restore or replace components that have been found to be defective under the terms of manufactures warranty shall be guaranteed for five (5) years from date of original purchase.

PART 2 – MATERIALS

2.01 MANUFACTURER

- A. Basis of Design: The fence system shall conform to Montage Commercial standard picket space, Welded and Rackable (ATF – All Terrain Flexibility) Ornamental Steel, (Genesis) design, extended picket bottom rail treatment, 3-Rail style manufactured by Ameristar Fence Products, Inc., in Tulsa, Oklahoma.
- B. Or approved equal.

2.02 MATERIAL

- A. Steel material for fence panels and posts shall conform to the requirements of ASTM A653/A653M, with a minimum yield strength of 45,000 psi (344 MPa) and a minimum zinc (hot-dip galvanized) coating weight of 0.60 oz/ft² (184 g/m²), Coating Designation G-60.
- B. Material for pickets shall be 3/4" square x 14 Ga. tubing. The rails shall be steel channel, 1.5" x 1.4375" x 14 Ga. Picket holes in the rail shall be spaced (4.675" o.c. for standard

picket space). Fence posts and gate posts shall meet the minimum size requirements of Table 1.

2.03 FABRICATION

- A. Pickets, rails and posts shall be pre-cut to specified lengths. Rails shall be pre-punched to accept pickets.
- B. Pickets shall be inserted into the pre-punched holes in the rails and shall be aligned to standard spacing using a specially calibrated alignment fixture. The aligned pickets and rails shall be joined at each picket-to-rail intersection by Ameristar's proprietary fusion welding process, thus completing the rigid panel assembly (Note: The process produces a virtually seamless, spatter-free good-neighbor appearance, equally attractive from either side of the panel).
- C. The manufactured panels and posts shall be subjected to an inline electrodeposition coating (E-Coat) process consisting of a multi-stage pretreatment/wash, followed by a duplex application of an epoxy primer and an acrylic topcoat. The minimum cumulative coating thickness of epoxy and acrylic shall be 2 mils (0.058 mm). The color shall be Black. The coated panels and posts shall be capable of meeting the performance requirements for each quality characteristic shown in Table 2 (Note: The requirements in Table 2 meet or exceed the coating performance criteria of ASTM F2408).
- D. The manufactured fence system shall be capable of meeting the vertical load, horizontal load, and infill performance requirements for Industrial weight fences under ASTM F2408.
- E. Gates with an out-to-out leaf dimension less than and including 72 inches shall be fabricated using Montage Commercial ornamental panel material and 1-3/4" sq. x 14ga. gate ends. Gate leafs greater than 72 inches shall be fabricated using ForeRunner rails, intermediate uprights, gussets and 1-3/4" sq. x 14ga. gate ends. All rail and upright intersections shall be joined by welding. All picket and rail intersections shall also be joined by welding.
- F. Pedestrian swing gates shall be self-closing, having a gate leaf no larger than 48" width. Integrated hinge-closer set (2 qty) shall be ADA compliant that shall include a variable speed and final snap adjustment with compact design (no greater than 5" x 6" footprint). Hinge-closer set (2 qty) shall be tested to a minimum of 500,000 cycles and capable of self-closing gates up to a maximum gate weight of 260 lbs. and maximum weight load capacity of 1,500 lbs. Hinge-closer device shall be externally mounted with tamper-resistant security fasteners, with full range of adjustability, horizontal (.5" - 1.375") and vertical (0 - .5"). Maintenance free hinge-closer set shall be tested to operate in temperatures of negative 20 F to 200 F degrees, and swings to negative 2 degrees to ensure reliable final lock engagement.

PART 3 – EXECUTION

3.01 PREPARATION

- A. All new installation shall be laid out by the contractor in accordance with the construction plans.

3.02 FENCE INSTALLATION

- A. Fence post shall be spaced according to Table 3, plus or minus 1/4". For installations that must be raked to follow sloping grades, the post spacing dimension must be measured along the grade. Fence panels shall be attached to posts with brackets supplied by the manufacturer. Posts shall be set in concrete footers having a minimum depth of 36" (Note: In some cases, local restrictions of freezing weather conditions may require a greater depth). Coordinate material requirements with the "concrete" sections of specifications, and as shown on the Drawings. Posts setting by other methods such as plated posts or grouted core-drilled footers are permissible only if shown by engineering analysis to be sufficient in strength for the intended application.

3.03 FENCE INSTALLATION MAINTENANCE

- A. When cutting/drilling rails or posts adhere to the following steps to seal the exposed steel surfaces; 1) Remove all metal shavings from cut area. 2) Apply zinc-rich primer to thoroughly cover cut edge and/or drilled hole; let dry. 3) Apply 2 coats of custom finish paint matching fence color. Failure to seal exposed surfaces per steps 1-3 above will negate warranty. Ameristar spray cans or paint pens shall be used to prime and finish exposed surfaces; it is recommended that paint pens be used to prevent overspray. Use of non-Ameristar parts or components will negate the manufactures' warranty.

3.04 GATE INSTALLATION

- A. Gate posts shall be spaced according to the manufacturers' gate drawings, dependent on standard out-to-out gate leaf dimensions and gate hardware selected. Type and quantity of gate hinges shall be based on the application; weight, height, and number of gate cycles. The manufacturers' gate drawings shall identify the necessary gate hardware required for the application. Gate hardware shall be provided by the manufacturer of the gate and shall be installed per manufacturer's recommendations.

3.05 CLEANING

- A. The contractor shall clean the jobsite of excess materials; post-hole excavations shall be scattered uniformly away from posts.

Table 1 – Minimum Sizes Posts			
Fence Posts	Panel Height		
2-1/2" x 14 Ga.	Up to & Including 6' Height		
2-1/2" x 12 Ga.	Over 6' Up to & Including 8' Height		
Gate Leaf	Gate Height		
	Up to & Including 4'	Over 4' Up to & Including 6'	Over 6' Up to & Including 8'
Up to 4'	2-1/2" x 12 Ga.	3" x 12 Ga.	3" x 12 Ga.
4'1" to 6'	3" x 12Ga.	4" x 11 Ga.	4" x 11 Ga.
6'1" to 8'	3" x 12 Ga.	4" x 11 Ga.	6" x 3/16"

8'1" to 10'	4" x 11 Ga.	6" x 3/16"	6" x 3/16"
10'1" to 12'	4" x 11 Ga.	6" x 3/16"	6" x 3/16"
12'1" to 14'	4" x 11 Ga.	6" x 3/16"	6" x 3/16"
14'1" to 16'	6" x 3/16"	6" x 3/16"	6" x 3/16"

Table 2 – Coating Performance Requirements		
Quality Characteristics	ASTM Test Method	Performance Requirements
Adhesion	D3359 – Method B	Adhesion (Retention of Coating) over 90% of test area (Tape and knife test).
Corrosion Resistance	B117, D714 & D1654	Corrosion Resistance over 1,500 hours (Scribed per D1654; failure mode is accumulation of 1/8" coating loss from scribe or medium #8 blisters).
Impact Resistance	D2794	Impact Resistance over 60 inch lb. (Forward impact using 0.625" ball).
Weathering Resistance	D822 D2244, D523 (60° Method)	Weathering Resistance over 1,000 hours (Failure mode is 60% loss of gloss or color variance of more than 3 delta-E color units).

Table 3 –Post Spacing By Bracket Type										
Span	For INVINCIBLE® 8' Nominal (91-1/2" Rail)				For CLASSIC, GENESIS, & MAJESTIC 8' Nominal (92-5/8" Rail)					
Post Size	2-1/2"	3"	2-1/2"	3"	2-1/2"	3"	2-1/2"	3"	2-1/2"	3"
Bracket Type	Industrial Flat Mount (BB301)*		Industrial Line 2-1/2" (BB319) 3" (BB320)		Industrial Universal 2.5" (BB302) 3" (BB303)		Industrial Flat Mount (BB301)		Industrial Swivel (BB304)*	
Post Settings ± 1/2" O.C.	94-1/2"	95"	94-1/2"	95"	96"	96-1/2"	96"	96-1/2"	*96"	*96-1/2"
*Note: When using BB304 swivel brackets on either or both ends of a panel installation, care must be taken to ensure the spacing between post and adjoining pickets meets applicable codes. This will require trimming one or both ends of the panel. When using the BB301 flat mount bracket for Invincible style, rail may need to be drilled to accommodate rail to bracket attachment.										

PART 1 – GENERAL

1.01 SUMMARY

- A. Work includes but is not limited to the following:
 - 1. Furnish and install cleanouts, footing drain lines, and storm drainage piping and fittings of the type and sizes designated.

1.02 RELATED SECTIONS

- A. Coordinate related work specified in other parts of the Project Manual, including but not limited to the following:
 - 1. Section 01 57 13 – TESC
 - 2. Section 31 10 00 – Site Preparation
 - 3. Section 31 22 00 – Earthwork

1.03 REFERENCES

- A. Washington State Department of Ecology Stormwater Management Manual for Western Washington (2019) as adopted by the City of Bainbridge Island.
- B. WSDOT - Standard Specifications for Road, Bridge and Municipal Construction, latest edition; Washington State Department of Transportation. Standard Plans, current edition.
- C. Hydrogeologic Data Report prepared by PanGEO Inc., dated June 27, 2025.
- D. City of Bainbridge Island Design and Construction Standards and Specifications, dated December 2016.

1.04 PERMITS

- A. The Contractor is responsible for obtaining any permits and arranging any inspections required for connection of private storm drain to the City of Bainbridge Island public storm drain.

1.05 DIMENSIONS AND LAYOUTS

- A. The Contractor will be responsible for furnishing, setting, and marking all line location stakes. A qualified layout engineer, surveyor, or technical specialist must be assigned to the Contractor's crew for this work and shall be on site at all times when work requiring control is being performed, together with all necessary equipment, supplies and instruments related thereto. This equipment and personnel must be available, at no additional cost to the Owner, for the purpose of verifying layout and

certifying the accuracy of work on the site.

- B. The Contractor is responsible for review of all City and other records relative to the existing underground utilities. The Contractor is responsible for avoiding damage to these facilities and restoring all active utilities at the Contractor's own expense.
- C. The Contractor is to notify the Owner's Representative immediately of underground utilities encountered which are not shown on the drawings or Owner's survey or record drawings.

1.06 SUBMITTALS

- A. Comply with Section 01 33 10.
- B. No installation of material shall be made prior to until written approval has been obtained from the Engineer. Approval of material and equipment shall in no way preclude compliance with the plans and specifications.
- C. Submit material product information including pipe, fittings, structures, etc.
- D. Record Drawings:
 - 1. One complete set of drawings shall be provided as record drawings which shall be separated, clean prints reserved for the purpose of showing a complete picture of the work as actually installed. The contractor shall coordinate the record drawing requirements with the Utility Inspector in accordance with City of Bainbridge Island standards.
 - 2. Record drawings shall also serve as work progress plans and the Contractor shall maintain daily a daily record of work progress with neat, legible notations. These drawings shall be kept at the job site and shall be available for inspection at all times.
 - 3. All buried piping and indicated future connections exterior to the building shall be located both by depth and by location with respect to the project benchmark. All notations on record drawings of buried pipes shall be made before backfilling of that section of pipe is started.
 - 4. At completion of the work, the Contractor shall sign, date, and provide the record drawings to the Architect, representing that it is an accurate depiction of the work completed.

E. As built Survey:

1. At the completion of the project, the Contractor is required to provide a complete underground utility survey (both PDF and AutoCAD) of all utilities installed as part of this project. This survey shall be performed, stamped and signed by a licensed surveyor, and shall be presented to Owner, Engineer and City for review and acceptance. Any changes to the survey prior to acceptance are the responsibility of the Contractor.

PART 2 – PRODUCTS

2.01 STORM DRAIN PIPE

- A. Pipe material, joints, and protective treatment shall conform to the requirements set forth in Section 9-05 of the WSDOT/APWA Standard Specifications. Pipe used for Storm Drains located within the site shall be one or more of the following:
1. Solid wall Polyvinyl Chloride (PVC) pipe meeting ASTM D3034 SDR 35 for diameters up to 15 inches and ASTM F 679 for sizes 18 to 27 inches in diameter, with restrained gasketed joints. Limited use to areas of a minimum 3 feet of cover or more.
 2. High Density Polyethylene (HDPE) ADS N-12, or approved equal, WT (Water Tight) IB pipe (per ASTM F2648) shall have a smooth interior and annular exterior corrugations. Fittings shall conform to ASTM F 2306. Bell and spigot connections shall utilize a spun-on or welded bell and valley or saddle gasket meeting the watertight joint performance requirements of ASTM F 2306.
 3. Corrugated polyethylene storm sewer pipe (CPEP), with smooth interior.
 4. Ductile Iron Pipe (DIP), Class 52.
- B. Footing drain, wall drain, and underdrain pipe shall be Polyvinyl Chloride (PVC) Pipe, SDR 35 with factory provided slotted perforations.
1. 90-degree bend fittings shall not be used on footing drains. Pipe bends shall be made by combination of multiple fitting of less than 90 degrees each, such as two 45-degree fittings.

2.02 CLEANOUTS

- A. Cleanouts shall conform to the contract documents. Size to match connection pipe.
- B. Cleanout covers for cleanouts within landscaped areas shall be a Carson 10-inch diameter HDPE round valve box (Model #0910-18) or approved equal.

- C. Cleanout covers for cleanouts within paved areas and for downspout connections shall be Olympic Foundry Part #M1007 D/T cast iron cover and ring marked "SDCO" or approved equal.
- D. Footing Drain Cleanout shall be provided at every 100 feet maximum and at bends that total 90 degrees. Locate cleanouts up stream of bends.
- E. All covers shall be bolt locking.

2.03 BEDDING AND BACKFILL MATERIAL

- A. Bedding and Backfill materials shall be in accordance with Section 31 22 00.

2.04 FOAM BLOCKING

- A. Plastic Foam for pipe protection and separation between pipes shall meet the Federal Spec. PPP-C-1752B Type 1, Class 2 or approved equivalent.

2.05 CONDUCTIVE WARNING TAPE

- A. Conductive warning tape shall be per Section 31 22 00.

PART 3 – EXECUTION

3.01 COORDINATION WITH OTHER WORK

- A. Verify location from the records.
- B. Before installation Contractor shall make proper provisions for site storm lines to avoid interferences with installation of other work and/or other Contractors. Any changes caused by Contractor's neglect to coordinate work shall be made by Contractor at Contractor's expense.
- C. Site storm drain Drawings and Specifications shall be compared with Drawings and Specifications of other trades and any discrepancies between the documents shall be reported to the Owner's Representative prior to installation of work.
- D. Abandoning Existing Storm Sewer System - Where shown on the Plans or where directed by the Owner's Representative, existing storm sewer pipes and structures shall be abandoned by:
 - 1. Plugging pipe ends. In addition to plugging pipe ends, fill pipes larger than 8 inches with controlled density fill or approved equal.
 - 2. Removing the existing structure to four (4) feet below the finished subgrade and

filling existing pipes and the remaining structure with controlled density fill or approved equal.

3. Removing existing pipes or structures. - If the storm system is removed, unless otherwise directed by the Owner's Representative, all trenches will be backfilled with the appropriate material. When native material has been determined as suitable backfill, backfill of the trench will be considered incidental to and included in the contract price for pipe. Excavated trench material that is not suitable as backfill shall be hauled to disposal in accordance with the special provisions at no additional cost to the Owner. Suitability of excavated material for trench backfill shall be at the sole discretion of the Owner's Representative.
4. When filling existing storm sewer pipe or structures that are to be abandoned, care shall be used in placing the controlled density fill to ensure the pipe or structure is completely filled and no voids remain.

3.02 PIPE LAYING

- A. Pipe laying shall be in conformance with WSDOT Section 7-08.3(2).

3.03 PIPE CROSSINGS

- A. Where pipe crossings are separated by less than 6 inches, place foam blocking for separation and protection per manufacturer's recommendations.

3.04 CATCH BASIN AND STRUCTURE INSTALLATION OR MODIFICATION

- A. Structures shall be installed or modified in accordance with WSDOT Section 7-05.3 and City of Bainbridge Island Standards.
- B. Adjustments to existing structures to remain shall be in accordance with WSDOT Section 7-05.3(1) and City of Bainbridge Island Standards.

3.05 CLEANING AND TESTING

- A. Cleaning and testing shall be in conformance with WSDOT Section 7-04.3(1) with the following exceptions:
 1. The Contractor shall be responsible for providing DVDs of video inspection.
 2. The Contractor shall be responsible for notifying the Owner's Representative 48 hours in advance of the backfill of any storm drain line.

3. The minimum amount of testing required by these specifications shall be as follows:

<u>Item</u>	<u>Frequency of Tests</u>
Air Testing Storm Drains	One (1) test from structure to structure

4. The frequency of tests shown above shall govern the actual quantity of tests. Any retesting that is required due to failure of initial testing to show compliance with these contract documents, shall be provided and paid for at the Contractor's sole expense.

3.06 PERMANENT CONNECTIONS TO EXISTING SYSTEMS

- A. Where indicated on the plans, make permanent connections to existing storm drainage systems.
- B. Where existing pipe is to be connected to a new structure, replace existing pipe and/or add fittings and pipe as necessary to provide an approved connection per WSDOT and City of Bainbridge Island Standards.

END OF SECTION