PROJECT MANUAL

For

301 19TH Street

Oakland, CA

GMP- Addendum #1

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SECTION 01 1000

SUMMARY

PART 1 GENERAL

1.01 PROJECT

A. Project Name: _____.

B. OwnerOwner's Name: _____.

C. The Project consists of the construction of 224 apartment units, associated lounge, fitness center and other amenities, and shell space for future retail. .

1.02 OWNER OCCUPANCY

A. Owner intends to occupy the Project upon Substantial Completion.

B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.

C. Schedule the Work to accommodate Owner occupancy.

1.03 CONTRACTOR USE OF SITE AND PREMISES

A. Construction Operations: Limited to areas noted on Drawings.

B. Arrange use of site and premises to allow:

C. Provide access to and from site as required by law and by Owner:
   1. Do not obstruct roadways, sidewalks, or other public ways without permit.

D. Utility Outages and Shutdown:
   1. Limit disruption of utility services to hours the site is unoccupied.
   2. Prevent accidental disruption of utility services to other facilities.

1.04 SPECIFICATION SECTIONS APPLICABLE TO ALL CONTRACTS

A. Unless otherwise noted, all provisions of the sections listed below apply to all contracts. Specific items of work listed under individual contract descriptions constitute exceptions.

B. Section 01 3000 - Administrative Requirements.

C. Section 01 3553 - Security Procedures.

D. Section 01 4000 - Quality Requirements.

E. Section 01 5000 - Temporary Facilities and Controls.

F. Section 01 5100 - Temporary Utilities.

G. Section 01 6000 - Product Requirements.

H. Section 01 7000 - Execution and Closeout Requirements.

I. Section 01 7800 - Closeout Submittals.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 3000
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electronic document submittal service.

B. Preconstruction meeting.

C. Progress meetings.

D. Construction progress schedule.

E. Coordination drawings.

F. Submittals for review, information, and project closeout.

G. Submittal procedures.

1.02 RELATED REQUIREMENTS

A. Section 01 1000 - Summary: occupancy, contractor's use of site, requirements applicable to all trades.

B. Section 01 7000 - Execution and Closeout Requirements: Additional coordination requirements.

C. Section 01 7800 - Closeout Submittals: Project record documents.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 ELECTRONIC DOCUMENT SUBMITTAL SERVICE

A. All documents transmitted for purposes of administration of the contract are to be in electronic (PDF) format and transmitted via an Internet-based submittal service that receives, logs and stores documents, provides electronic stamping and signatures, and notifies addressees via email.
   1. Contractor and Architect are required to use this service.
   2. It is Contractor's responsibility to submit documents in PDF format.
   3. Users of the service need an email address, Internet access, and PDF review software that includes ability to mark up and apply electronic stamps (such as Adobe Acrobat, www.adobe.com, or Bluebeam PDF Revu, www.bluebeam.com), unless such software capability is provided by the service provider.
   4. All other specified submittal and document transmission procedures apply, except that electronic document requirements do not apply to samples or color selection charts.

B. Training: One, one-hour, web-based training session will be arranged for all participants, with representatives of Architect and Contractor participating; further training is the responsibility of the user of the service.

3.02 PRECONSTRUCTION MEETING

A. Owner will schedule a meeting after Notice of Award.

B. Attendance Required:
   1. Owner.
   2. Architect.
   3. Contractor.

C. Agenda:
   1. Submission of list of Subcontractors, schedule of values, and progress schedule.
   2. Designation of personnel representing the parties to Contract, Owner, Contractor and Architect.
   3. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
   4. Scheduling.

D. Record minutes and distribute copies within two days after meeting to participants, with copies to Architect, Owner, participants, and those affected by decisions made.

3.03 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of the Work at maximum semi-monthly intervals.

B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.

C. Attendance Required:
   1. Contractor.
   2. Owner.
   3. Architect.
   4. Contractor's Superintendent.
   5. Major Subcontractors.

D. Agenda:
   1. Review minutes of previous meetings.
   2. Review of Work progress.
   3. Field observations, problems, and decisions.
   4. Identification of problems that impede, or will impede, planned progress.
   5. Review of submittals schedule and status of submittals.
   6. Maintenance of progress schedule.
   7. Corrective measures to regain projected schedules.
   8. Planned progress during succeeding work period.
   9. Maintenance of quality and work standards.
   10. Effect of proposed changes on progress schedule and coordination.
   11. Other business relating to Work.

E. Record minutes and distribute copies within two days after meeting to participants, with copies to Architect, Owner, participants, and those affected by decisions made.

3.04 CONSTRUCTION PROGRESS SCHEDULE

A. Within 10 days after date of the Agreement, submit preliminary schedule defining planned operations for the first 60 days of Work, with a general outline for remainder of Work.

B. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
   1. Include written certification that major contractors have reviewed and accepted proposed schedule.

C. Within 30 days after joint review, submit complete schedule.

3.05 COORDINATION DRAWINGS

A. Review drawings prior to submission to Architect.

3.06 SUBMITTALS FOR REVIEW

A. When the following are specified in individual sections, submit them for review:
   1. Product data.
   2. Shop drawings.
   3. Samples for selection.
   4. Samples for verification.

B. Submit to Architect for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.

C. Samples will be reviewed only for aesthetic, color, or finish selection.

D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 7800 - Closeout Submittals.

3.07 SUBMITTALS FOR INFORMATION

A. When the following are specified in individual sections, submit them for information:
   1. Design data.
   2. Certificates.
   3. Test reports.
   4. Inspection reports.
   5. Manufacturer's instructions.
   6. Manufacturer's field reports.
   7. Other types indicated.

B. Submit for Architect's knowledge as contract administrator or for Owner.

3.08 SUBMITTALS FOR PROJECT CLOSEOUT

A. Submit Correction Punch List for Substantial Completion.

B. Submit Final Correction Punch List for Substantial Completion.

C. When the following are specified in individual sections, submit them at project closeout:
   1. Project record documents.
   2. Operation and maintenance data.
   3. Warranties.
   4. Bonds.
   5. Other types as indicated.

3.09 NUMBER OF COPIES OF SUBMITTALS

A. Electronic Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.

B. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.
   1. Retained samples will not be returned to Contractor unless specifically so stated.

3.10 SUBMITTAL PROCEDURES

A. Shop Drawing Procedures:
   1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting the Contract Documents and coordinating related Work.
   2. Generic, non-project specific information submitted as shop drawings do not meet the requirements for shop drawings.

B. Transmit each submittal with a copy of approved submittal form.

C. Transmit each submittal with approved form.

D. Sequentially number the transmittal form. Revise submittals with original number and a sequential alphabetic suffix.

E. Identify Project, Contractor, Subcontractor or supplier; pertinent drawing and detail number, and specification section number, as appropriate on each copy.

F. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of Products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents.

G. Schedule submittals to expedite the Project, and coordinate submission of related items.

H. For each submittal for review, allow 10 days excluding delivery time to and from the Contractor.

I. Identify variations from Contract Documents and Product or system limitations that may be detrimental to successful performance of the completed Work.

J. Provide space for Contractor and Architect review stamps.

K. When revised for resubmission, identify all changes made since previous submission.

L. Distribute reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.

M. Submittals not requested will not be recognized or processed.

END OF SECTION

SECTION 01 3553
SECURITY PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Security measures including entry control and miscellaneous restrictions.

1.02 RELATED REQUIREMENTS

A. Section 01 5000 - Temporary Facilities and Controls: Temporary lighting.

1.03 SECURITY PROGRAM

A. Protect Work and Owner's operations from theft, vandalism, and unauthorized entry.

B. Maintain program throughout construction period until Owner occupancy.

1.04 ENTRY CONTROL

A. Restrict entrance of persons and vehicles into Project site .

B. Allow entrance only to authorized persons with proper identification.

1.05 RESTRICTIONS

A. Do no work on Sundays.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 4000
QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. References and standards.

B. Submittals.

C. Control of installation.

D. Tolerances.

E. Testing and inspection agencies and services.

F. Control of installation.

G. Tolerances.

H. Manufacturers' field services.

I. Defect Assessment.

1.02 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittal procedures.

B. Section 01 4216 - Definitions.

C. Section 01 6000 - Product Requirements: Requirements for material and product quality.

1.03 REFERENCE STANDARDS

A. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection and/or Testing; 2014a.

B. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing; 2013.

C. IAS AC89 - Accreditation Criteria for Testing Laboratories; 2010.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Test Reports: After each test/inspection, promptly submit two copies of report to Architect and to Contractor.
   1. Include:
      a. Date issued.
      b. Project title and number.
      c. Name of inspector.
      d. Date and time of sampling or inspection.
      e. Identification of product and specifications section.
      f. Location in the Project.
      g. Type of test/inspection.
      h. Date of test/inspection.
      i. Results of test/inspection.
      j. Conformance with Contract Documents.
   2. Test report submittals are for Architect's knowledge as contract administrator for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents, or for Owner's information.

C. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.
   1. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
   2. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect.

D. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

1.05 TESTING AND INSPECTION AGENCIES AND SERVICES

A. Owner will employ and pay for services of an independent testing agency to perform other specified testing.

B. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.

B. Comply with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.

D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Have Work performed by persons qualified to produce required and specified quality.

F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.02 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

3.03 TESTING AND INSPECTION

A. Testing Agency Duties:
   1. Test samples of mixes submitted by Contractor.
   2. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
   3. Perform specified sampling and testing of products in accordance with specified standards.
   4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
   5. Promptly notify Architect and Contractor of observed irregularities or non-conformance of Work or products.
   6. Perform additional tests and inspections required by Architect.
   7. Submit reports of all tests/inspections specified.

B. Limits on Testing/Inspection Agency Authority:
   1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
   2. Agency may not approve or accept any portion of the Work.
   3. Agency may not assume any duties of Contractor.
   4. Agency has no authority to stop the Work.

C. Contractor Responsibilities:
   1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
   2. Cooperate with laboratory personnel, and provide access to the Work .
   3. Provide incidental labor and facilities:
      a. To provide access to Work to be tested/inspected.
      b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
      c. To facilitate tests/inspections.
      d. To provide storage and curing of test samples.
   4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
   5. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.

D. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Architect.

E. Re-testing required because of non-conformance to specified requirements shall be paid for by Contractor.

3.04 MANUFACTURERS' FIELD SERVICES

A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment as applicable, and to initiate instructions when necessary.

B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.05 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not conforming to specified requirements.

END OF SECTION

SECTION 01 4216
DEFINITIONS

PART 1 GENERAL

1.01 SUMMARY

A. Other definitions are included in individual specification sections.

1.02 DEFINITIONS

A. Furnish: To supply, deliver, unload, and inspect for damage.

B. Install: To unpack, assemble, erect, apply, place, finish, cure, protect, clean, start up, and make ready for use.

C. Product: Material, machinery, components, equipment, fixtures, and systems forming the work result. Not materials or equipment used for preparation, fabrication, conveying, or erection and not incorporated into the work result. Products may be new, never before used, or re-used materials or equipment.

D. Provide: To furnish and install.

E. Supply: Same as Furnish.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 5000
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Temporary telecommunications services.

B. Temporary sanitary facilities.

C. Temporary Controls: Barriers, enclosures, and fencing.

D. Vehicular access and parking.

E. Waste removal facilities and services.

F. Project identification sign.

G. Field offices.

1.02 RELATED REQUIREMENTS

A. Section 01 5100 - Temporary Utilities.

B. Section 01 3553 - Security Procedures.

1.03 TEMPORARY UTILITIES - SEE SECTION 01 5100

1.04 TELECOMMUNICATIONS SERVICES

A. Provide, maintain, and pay for telecommunications services to field office at time of project mobilization.

B. Telecommunications services shall include:
   1. Windows-based personal computer dedicated to project telecommunications, with necessary software and laser printer.
   2. Internet Connections: Minimum of one; DSL modem or faster.

1.05 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.

B. Maintain daily in clean and sanitary condition.

1.06 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public and to protect existing facilities and adjacent properties from damage from construction operations .

B. Provide barricades and covered walkways required by governing authorities for public rights-of-way .

C. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.07 FENCING

A. Construction: Contractor's option.

B. Provide 6 foot high fence around construction site; equip with vehicular gates with locks.

1.08 SECURITY - SEE SECTION 01 3553

1.09 VEHICULAR ACCESS AND PARKING

A. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for emergency vehicles.

B. Coordinate access and haul routes with governing authorities and Owner.

C. Provide and maintain access to fire hydrants, free of obstructions.

D. Provide means of removing mud from vehicle wheels before entering streets.

E. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

1.10 WASTE REMOVAL

A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.

B. Provide containers with lids. Remove trash from site as required by construction activities.

C. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.

D. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.11 PROJECT IDENTIFICATION

A. Provide project identification sign of design, construction, and location approved by Owner.

B. No other signs are allowed without Owner permission except those required by law.

1.12 FIELD OFFICES

A. Office: Weathertight, with lighting, electrical outlets, heating, cooling equipment, and equipped with sturdy furniture .

B. Provide space for Project meetings, with table and chairs to accommodate 6 persons.

1.13 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, materials, prior to Date of Substantial Completion inspection.

B. Clean and repair damage caused by installation or use of temporary work.

C. Restore new permanent facilities used during construction to specified condition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 5100
TEMPORARY UTILITIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Temporary Utilities: Electricity, lighting, heat, ventilation, and water.

1.02 RELATED REQUIREMENTS

A. Section 01 5000 - Temporary Facilities and Controls:

1.03 TEMPORARY ELECTRICITY

A. Cost: By Contractor.

B. Provide power service required from utility source.

C. Provide power outlets for construction operations, with branch wiring and distribution boxes located as required. Provide flexible power cords as required.

D. Provide main service disconnect and over-current protection at convenient location and meter.

E. Provide adequate distribution equipment, wiring, and outlets to provide single phase branch circuits for power and lighting.

1.04 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

A. Provide and maintain lighting for construction operations to achieve a minimum lighting level of 2 watt/sq ft .

B. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.

C. Maintain lighting and provide routine repairs.

D. Permanent building lighting may be utilized during construction.

1.05 TEMPORARY HEATING

A. Cost of Energy: By Contractor.

B. Provide heating devices and heat as needed to maintain specified conditions for construction operations.

1.06 TEMPORARY COOLING

A. Cost of Energy: By Contractor.

B. Provide cooling devices and cooling as needed to maintain specified conditions for construction operations.

1.07 TEMPORARY WATER SERVICE

A. Cost of Water Used: By Contractor.

B. Provide and maintain suitable quality water service for construction operations at time of project mobilization.

C. Connect to existing water source.
   1. Exercise measures to conserve water.

D. Extend branch piping with outlets located so water is available by hoses with threaded connections.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 5721

INDOOR AIR QUALITY CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Construction procedures to promote adequate indoor air quality after construction.

B. Testing residential unit air isolation.

1.02 PROJECT GOALS

A. Dust and Airborne Particulates: Prevent deposition of dust and other particulates in HVAC ducts and equipment.
   1. Cleaning of ductwork is not contemplated under this Contract.
   2. Contractor shall bear the cost of cleaning required due to failure to protect ducts and equipment from construction dust.

B. Residential Units Air Isolation: Units have been designed with impermeable party walls and sealed openings in walls and floors.

1.03 RELATED REQUIREMENTS

A. Section 01 4000 - Quality Requirements: Testing and inspection services.

1.04 DEFINITIONS

A. Adsorptive Materials: Gypsum board, acoustical ceiling tile and panels, carpet and carpet tile, fabrics, fibrous insulation, and other similar products.

B. Contaminants: Gases, vapors, regulated pollutants, airborne mold and mildew, and the like, as specified.

C. Particulates: Dust, dirt, and other airborne solid matter.

D. Wet Work: Concrete, plaster, coatings, and other products that emit water vapor or volatile organic compounds during installation, drying, or curing.

PART 3 EXECUTION

2.01 CONSTRUCTION PROCEDURES

A. Prevent the absorption of moisture and humidity by adsorptive materials by:
   1. Sequencing the delivery of such materials so that they are not present in the building until wet work is completed and dry.
   2. Delivery and storage of such materials in fully sealed moisture-impermeable packaging.
   3. Provide sufficient ventilation for drying within reasonable time frame.

B. Begin construction ventilation when building is substantially enclosed.

C. Use of HVAC equipment and ductwork for ventilation during construction is not permitted:
   1. Provide temporary ventilation equivalent to 1.5 air changes per hour, minimum.
   2. Exhaust directly to outside.
   3. Seal HVAC air inlets and outlets immediately after duct installation.

D. Do not store construction materials or waste in mechanical or electrical rooms.

E. Prior to use of return air ductwork without intake filters clean up and remove dust and debris generated by construction activities.
   1. Inspect duct intakes, return air grilles, and terminal units for dust.
   2. Clean plenum spaces, including top sides of lay-in ceilings, outsides of ducts, tops of pipes and conduit.
   3. Clean tops of doors and frames.
   4. Clean mechanical and electrical rooms, including tops of pipes, ducts, and conduit, equipment, and supports.
   5. Clean return plenums of air handling units.
   6. Remove intake filters last, after cleaning is complete.

F. Do not perform dusty or dirty work after starting use of return air ducts without intake filters.

2.02 RESIDENTIAL UNITS AIR ISOLATION TESTING

A. Residential units have been designed to have an airtight sealed membrane between units; inspect membrane seal at the following locations and repair as required:
   1. Between party walls and floor structure.
   2. Between party walls and roof structure.
   3. Around pipes, conduits, and ducts passing through floors and party walls.
   4. Weatherstripping on entrance doors.

B. Test airtight membrane in accordance with ASTM E779 or other appropriate method.

C. Acceptable Results: Maximum leakage of 0.23 cubic feet per minute per square foot at 1.1 pounds per square foot pressure .

END OF SECTION

SECTION 01 6000
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General product requirements.

B. Transportation, handling, storage and protection.

C. Product option requirements.

D. Substitution limitations and procedures.

E. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 RELATED REQUIREMENTS

A. Section 01 4000 - Quality Requirements: Product quality monitoring.

B. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions: Requirements for VOC-restricted product categories.

1.03 REFERENCE STANDARDS

A. 16 CFR 260.13 - Guides for the Use of Environmental Marketing Claims; Federal Trade Commission; Recycled Content; Current Edition.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 SUBMITTALS

A. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

B. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

C. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
   1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

PART 2 PRODUCTS

2.01 NEW PRODUCTS

A. Provide new products unless specifically required or permitted by the Contract Documents.

B. Where all other criteria are met, Contractor shall give preference to products that:
   1. If used on interior, have lower emissions, as defined in Section 01 6116.
   2. If wet-applied, have lower VOC content, as defined in Section 01 6116.
   3. Have a published GreenScreen Chemical Hazard Analysis.

2.02 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

2.03 MAINTENANCE MATERIALS

A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.

B. Deliver and place in location as directed; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 SUBSTITUTION PROCEDURES

A. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.

B. A request for substitution constitutes a representation that the submitter:
   1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
   2. Agrees to provide the same warranty for the substitution as for the specified product.
   3. Agrees to coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner.
   4. Waives claims for additional costs or time extension that may subsequently become apparent.

C. Substitution Submittal Procedure (after contract award):
   1. Submit three copies of request for substitution for consideration. Limit each request to one proposed substitution.
   2. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence. Burden of proof is on proposer.
   3. Architect will notify Contractor in writing of decision to accept or reject request.

3.02 TRANSPORTATION AND HANDLING

A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.

B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.

C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.

D. Transport and handle products in accordance with manufacturer's instructions.

E. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

F. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.

G. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.03 STORAGE AND PROTECTION

A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.

B. Store and protect products in accordance with manufacturers' instructions.

C. Store with seals and labels intact and legible.

D. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.

E. For exterior storage of fabricated products, place on sloped supports above ground.

F. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.

G. Comply with manufacturer's warranty conditions, if any.

H. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

I. Prevent contact with material that may cause corrosion, discoloration, or staining.

J. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

K. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

MATERIAL SUBSTITUTION REQUEST

Project: _____ Substitution Request Number: _____

_____ From: _____

To: _____ Date: _____

_____ A/E Project Number: _____

Re: _____ Contract For: _____

Specification Title: _____ Description: _____

Section: _____ Page: _____ Article/Paragraph: _____

Proposed Substitution: _____

Manufacturer: _____ Address: _____ Phone: _____

Trade Name: _____ Model No.: _____

Installer: _____ Address: _____ Phone: _____

History: ☐ New Product ☐ 2-5 Years Old ☐ 5-10 Years Old ☐ More Than 10 Years Old

Differences between proposed substitution and specified product: _____

☒ Point-By-Point comparative data sheet attached – REQUIRED BY A/E FOR THIS REQUEST.

Attached data includes product description, specifications, drawings, photographs, and performance and test data adequate for evaluation of the request, applicable portions of the data arc clearly identified.

Attached data also includes a description of changes to the Contract Documents that the proposed substitution will require for its proper installation.

The Undersigned certifies:

Proposed substitution has been fully investigated and determined to be equal or superior in all respects to the specified products performance.
Same warranty will be furnished for proposed substitution as for specified product.
Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
Proposed substitution does not affect dimensions and Functional Performance Values.
Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.

Submitted by: _____

Signed by: _____

Firm: _____

Address: _____

Telephone: _____

A/E's REVIEW AND ACTION

☐ Substitution approved - Substitution approved as noted - Make submittals in accordance with Specification Section 0 2370-1.6.

☐ Substitution rejected - Use specified materials.

☐ Substitution Request received too late - Use specified materials.

Signed by: Date:

Supporting Data Attached: ☐ Drawings ☐ Product Data ☐ Samples ☐ Tests ☐ Reports ☐ Other

SECTION 01 7000

EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Examination, preparation, and general installation procedures.

B. Requirements for alterations work, including selective demolition, except removal, disposal, and/or remediation of hazardous materials and toxic substances.

C. Pre-installation meetings.

D. Cutting and patching.

E. Surveying for laying out the work.

F. Cleaning and protection.

G. Starting of systems and equipment.

H. Demonstration and instruction of Owner personnel.

I. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.

J. General requirements for maintenance service.

1.02 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittals procedures, Electronic document submittal service.

B. Section 01 4000 - Quality Requirements: Testing and inspection procedures.

C. Section 01 5100 - Temporary Utilities: Temporary heating, cooling, and ventilating facilities.

D. Section 01 7800 - Closeout Submittals: Project record documents, operation and maintenance data, warranties and bonds.

E. Section 07 8400 - Firestopping.

F. Individual Product Specification Sections:
   1. Advance notification to other sections of openings required in work of those sections.

1.03 REFERENCE STANDARDS

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

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
   1. Submit a copy of certificate signed by the Land Surveyor, that the elevations and locations of the work are in conformance with Contract Documents.

C. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
   1. Structural integrity of any element of Project.
   2. Integrity of weather exposed or moisture resistant element.
   3. Efficiency, maintenance, or safety of any operational element.
   4. Visual qualities of sight exposed elements.
   5. Include in request:
      a. Identification of Project.
      b. Location and description of affected work.
      c. Necessity for cutting or alteration.
      d. Description of proposed work and products to be used.
      e. Date and time work will be executed.

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

1.05 QUALIFICATIONS

A. For demolition work, employ a firm specializing in the type of work required.

B. For survey work, employ a land surveyor registered in the State in which the Project is located and acceptable to Architect. Submit evidence of Surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate.

C. For design of temporary shoring and bracing, employ a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

1.06 PROJECT CONDITIONS

A. Use of explosives is not permitted.

B. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

C. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

D. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.

E. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.

F. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.

G. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.

H. Rodent Control: Provide methods, means, and facilities to prevent rodents from accessing or invading premises.

I. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

1.07 COORDINATION

A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements.

B. Notify affected utility companies and comply with their requirements.

C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

D. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

F. Coordinate completion and clean-up of work of separate sections.

G. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

A. New Materials: As specified in product sections; match existing products and work for patching and extending work.

B. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.

B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.

C. Examine and verify specific conditions described in individual specification sections.

D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.

E. Verify that utility services are available, of the correct characteristics, and in the correct locations.

F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 PREINSTALLATION MEETINGS

A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.

B. Require attendance of parties directly affecting, or affected by, work of the specific section.

C. Notify Architect two days in advance of meeting date.

D. Prepare agenda and preside at meeting:
   1. Review conditions of examination, preparation and installation procedures.
   2. Review coordination with related work.

E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.04 LAYING OUT THE WORK

A. Verify locations of survey control points prior to starting work.

B. Promptly notify Architect of any discrepancies discovered.

C. Protect survey control points prior to starting site work; preserve permanent reference points during construction.

D. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.

E. Utilize recognized engineering survey practices.

F. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:

1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
2. Grid or axis for structures.
3. Building foundation, column locations, ground floor elevations.

G. Maintain a complete and accurate log of control and survey work as it progresses.

3.05 GENERAL INSTALLATION REQUIREMENTS

A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.

B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.

C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.

E. Make neat transitions between different surfaces, maintaining texture and appearance.

3.06 CUTTING AND PATCHING

A. Whenever possible, execute the work by methods that avoid cutting or patching.

B. Perform whatever cutting and patching is necessary to:
1. Complete the work.
2. Fit products together to integrate with other work.
3. Provide openings for penetration of mechanical, electrical, and other services.
4. Match work that has been cut to adjacent work.
5. Repair areas adjacent to cuts to required condition.
6. Repair new work damaged by subsequent work.
7. Remove samples of installed work for testing when requested.
8. Remove and replace defective and non-conforming work.

C. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing.

D. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.

E. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

F. Restore work with new products in accordance with requirements of Contract Documents.

G. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

H. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07 8400, to full thickness of the penetrated element.

I. Patching:
1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
2. Match color, texture, and appearance.
3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.07 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and trash/rubbish from site as required by construction progress to maintain the site in a clean and orderly condition, and dispose off-site; do not burn or bury.

3.08 PROTECTION OF INSTALLED WORK

A. Protect installed work from damage by construction operations.

B. Provide special protection where specified in individual specification sections.

C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

G. Prohibit traffic from landscaped areas.

H. Remove protective coverings when no longer needed; reuse or recycle plastic coverings if possible.

3.09 SYSTEM STARTUP

A. Coordinate schedule for start-up of various equipment and systems.

B. Notify Architect and owner five days prior to start-up of each item.

C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.

D. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

E. Verify that wiring and support components for equipment are complete and tested.

F. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.

G. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.10 DEMONSTRATION AND INSTRUCTION

A. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at agreed time, at equipment location.

B. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

C. Provide a qualified person who is knowledgeable about the Project to perform demonstration and instruction of owner personnel.

3.11 ADJUSTING

A. Adjust operating products and equipment to ensure smooth and unhindered operation.

3.12 FINAL CLEANING

A. Use cleaning materials that are nonhazardous.

B. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

C. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.

D. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

E. Clean filters of operating equipment.

F. Clean debris from roofs, gutters, downspouts, scuppers, overflow drains, area drains, drainage systems, and _____.

G. Clean site; sweep paved areas, rake clean landscaped surfaces.

H. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.13 CLOSEOUT PROCEDURES

A. Make submittals that are required by governing or other authorities.

B. Accompany Project Coordinator on preliminary inspection to determine items to be listed for completion or correction in the Contractor's Correction Punch List for Contractor's Notice of Substantial Completion.

C. Notify Architect when work is considered ready for Architect's Substantial Completion inspection.

D. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's Substantial Completion inspection.

E. Conduct Substantial Completion inspection and create Final Correction Punch List containing Architect's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Architect.

F. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.

G. Notify Architect when work is considered finally complete and ready for Architect's Substantial Completion final inspection.

H. Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.

3.14 MAINTENANCE

A. Provide service and maintenance of components indicated in specification sections.

B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.

END OF SECTION

SECTION 01 7800
CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Project Record Documents.

B. Operation and Maintenance Data.

C. Warranties and bonds.

1.02 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.

B. Section 01 7000 - Execution and Closeout Requirements: Contract closeout procedures.

C. Individual Product Sections: Specific requirements for operation and maintenance data.

D. Individual Product Sections: Warranties required for specific products or Work.

1.03 SUBMITTALS

A. Project Record Documents: Submit documents to Architect for distribution to Owner.

B. Operation and Maintenance Data:
   1. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.

C. Warranties and Bonds:
   1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
   2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
   3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

A. Maintain on site one set of the following record documents; record actual revisions to the Work:
   1. Drawings.
   2. Specifications.
   3. Addenda.
   4. Change Orders and other modifications to the Contract.
   5. Reviewed shop drawings, product data, and samples.
   6. Manufacturer's instruction for assembly, installation, and adjusting.

B. Ensure entries are complete and accurate, enabling future reference by Owner.

C. Store record documents separate from documents used for construction.

D. Record information concurrent with construction progress.

E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
   1. Manufacturer's name and product model and number.
   2. Changes made by Addenda and modifications.

F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
   1. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.

2. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
3. Field changes of dimension and detail.
4. Details not on original Contract drawings.

3.02 OPERATION AND MAINTENANCE DATA

A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.

B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.

3.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

A. For Each Product, Applied Material, and Finish:
1. Product data, with catalog number, size, composition, and color and texture designations.
2. Information for re-ordering custom manufactured products.

B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.

C. Additional information as specified in individual product specification sections.

D. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

3.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

A. For Each Item of Equipment and Each System:
1. Description of unit or system, and component parts.
2. Identify function, normal operating characteristics, and limiting conditions.
3. Include performance curves, with engineering data and tests.
4. Complete nomenclature and model number of replaceable parts.

B. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

C. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.

D. Include color coded wiring diagrams as installed.

E. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

F. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

G. Provide servicing and lubrication schedule, and list of lubricants required.

H. Include manufacturer's printed operation and maintenance instructions.

I. Include sequence of operation by controls manufacturer.

J. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

K. Additional Requirements: As specified in individual product specification sections.

3.05 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

A. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.

B. Where systems involve more than one specification section, provide separate tabbed divider for each system.

C. Prepare instructions and data by personnel experienced in maintenance and operation of described products.

D. Prepare data in the form of an instructional manual.

E. Binders: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable plastic covers; 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.

F. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.

G. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants, Contractor and subcontractors, with names of responsible parties.

H. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.

I. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.

J. Text: Manufacturer's printed data, or typewritten data on standard office pound paper.

K. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

L. Arrange content by systems under section numbers and sequence of Table of Contents of this Project Manual.

M. Contents: Prepare a Table of Contents for each volume, with each product or system description identified, in three parts as follows:
   1. Part 1: Directory, listing names, addresses, and telephone numbers of Architect, Contractor, Subcontractors, and major equipment suppliers.
   2. Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:
      a. List of equipment.
      b. Parts list for each component.
      c. Operating instructions.
      d. Maintenance instructions for equipment and systems.
      e. Maintenance instructions for special finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
   3. Part 3: Project documents and certificates, including the following:
      a. Shop drawings and product data.

3.06 WARRANTIES AND BONDS

A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.

B. Verify that documents are in proper form, contain full information, and are notarized.

C. Co-execute submittals when required.

D. Retain warranties and bonds until time specified for submittal.

E. Manual: Bind in commercial quality 8-1/2 by 11 inch three D side ring binders with durable plastic covers.

F. Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.

G. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.

H. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

END OF SECTION

SECTION 02 4100
DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Abandonment and removal of existing utilities and utility structures.

1.02 RELATED REQUIREMENTS

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

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

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

1.03 REFERENCE STANDARDS

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

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

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

PART 3 EXECUTION

2.01 SCOPE

A. Remove paving and curbs as required to accomplish new work.

B. Remove other items indicated, for salvage, relocation, and recycling.

C. Fill excavations, open pits, and holes in ground areas generated as result of removals, using specified fill; compact fill as required so that required rough grade elevations do not subside within one year after completion.

2.02 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
   1. Obtain required permits.
   2. Provide, erect, and maintain temporary barriers and security devices.
   3. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
   4. Do not close or obstruct roadways or sidewalks without permit.
   5. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
   6. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.

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

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

D. If hazardous materials are discovered during removal operations, stop work and notify Architect and Owner; hazardous materials include regulated asbestos containing materials, lead, PCB's, and mercury.

E. Partial Removal of Paving and Curbs: Neatly saw cut at right angle to surface.

2.03 EXISTING UTILITIES

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

B. Protect existing utilities to remain from damage.

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

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

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

2.04 DEBRIS AND WASTE REMOVAL

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

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

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

END OF SECTION

SECTION 03 0505

UNDERSLAB VAPOR BARRIER

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sheet vapor barrier under concrete slabs on grade.

1.02 REFERENCE STANDARDS

A. ASTM E1643 - Standard Practice for Selection, Design, Installation and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs; 2011.

B. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2011.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit manufacturers' data on manufactured products.

C. Manufacturer's Installation Instructions: Indicate installation procedures and interface required with adjacent construction.

PART 2 PRODUCTS

2.01 MATERIALS

A. Underslab Vapor Barrier:
   1. Water Vapor Permeance: Not more than 0.010 perms, maximum.
   2. Thickness: 15 mils.
   3. Basis of Design:
      a. Stego Industries LLC; Stego Wrap Vapor Barrier (15-mil): www.stegoindustries.com.
      b. Approved Alternate: Vaporguard by Reef Industries, www.reefindustries.com.
      c. Approved Alternate: Sundance 15 mil Vapor Barrier by Sundance Inc., www.sundancepolymertech.com.

B. Accessory Products: Vapor barrier manufacturer's recommended tape, adhesive, mastic, etc., for sealing seams and penetrations in vapor barrier.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surface over which vapor barrier is to be installed is complete and ready before proceeding with installation of vapor barrier.

3.02 INSTALLATION

A. Install vapor barrier in accordance with manufacturer's instructions and ASTM E1643.

B. Install vapor barrier under interior slabs on grade; lap sheet over footings and seal to foundation walls.

C. Lap joints minimum 6 inches.

D. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions.

E. No penetration of vapor barrier is allowed except for reinforcing steel and permanent utilities.

F. Repair damaged vapor retarder before covering with other materials.

END OF SECTION

SECTION 03 1100

CONCRETE FORMWORK

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Provisions established in the Contract, Division 01 Specification Sections, and the drawings apply to this Section

1.02 SUMMARY

A. This Section includes:

1. Formwork for cast-in-place concrete with shoring bracing and anchorage.
2. Form Accessories.
3. Stripping forms.

1.03 SYSTEM DESCRIPTION

A. Design, engineer, and construct formwork, shoring, and bracing to meet design and code requirements, so that resultant concrete conforms to required shapes, lines, and dimensions.

B. Conform to applicable building codes.

1.04 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: for Formwork: Submit under provisions of Division 01 Section “Submittal Procedures.”

1. Prepare shop drawings under seal of professional engineer authorized to perform such work and registered in jurisdiction where project is located. Design and engineering of formwork and shoring, as well as its construction, is the responsibility of the subcontractor.

C. Submit manufacturer's installation instruction for void form materials and waterstops under provisions of Division 01 Section “Submittal Procedures.”

D. Submit a diagram of proposed construction joints. Submittal will be reviewed with respect to aesthetic criteria and for general design conformance only.

1.05 QUALITY ASSURANCE

A. Comply with ACI 347, "Guide to Formwork for Concrete."

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer’s packaging with installation instructions.

B. Store off ground in ventilated and protected area to prevent deterioration from moisture or damage.

C. Remove packaging from void forms prior to storage.

1.07 COORDINATION

A. Coordinate Work of this Section under provisions of Division 01 Section “Project Management and Coordination.”

B. Coordinate this Section with other Sections of work which require attachment of components to formwork.

PART 2 – PRODUCTS

2.01 WOOD FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

B. Rough-Formed Finished Concrete: Plywood, MDF panels, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

1. Lumber: No. 2 Grade or better with grade stamp clearly visible.
2. Use MDF facing panels where finished concrete will be exposed to view.

2.02 PREFABRICATED FORM-FACING MATERIALS

A. Pan Type: Minimum 14 gage steel of size and profile required.

B. Tubular Column Type: Round, spirally wound laminated fiber material, surface treated with release agent, non-reusable, of sizes required

C. Slab Void Forms:

1. Composition: Moisture resistant, corrugated, laminated, fiberboard; with interior fabrication of a uniform, cellular, configuration, composed of non-wax impregnated components.
2. Depth: As indicated on drawings.
3. Profile: Rectangular shape in cross section.
4. Strength: Capable of sustaining a working load of 1,000 psf.
5. Accessories: Of same composition and strengths as slab void forms, including the following:

    a. Column wrap.
    b. Angle expansion strip.

6. Acceptable Product/Manufacturer:

    a. Void, as manufactured by SureVoid Products Inc., Englewood, CO. 800-458-5444.
    b. Submit request for substitutions in accordance with Division 01 Section “Product Requirements.

2.03 FORMWORK ACCESSORIES

A. Form Ties: Snap-off metal of adjustable length; cone type; 1 inch break back dimension; free of defects that will leave holes no larger than 1-1/4 inches diameter in concrete surface.

B. Form Release Agent: Colorless material which will not stain concrete, absorb moisture or affect bond of subsequent surface finish, or impair natural bonding or color characteristics of coating intended for use on concrete.

1. Acceptable Manufacturers: Subject to compliance with requirements herein, provide products from one of the following:

a. The Burke Group, San Mateo, CA.
b. Safe Slip by Chem-Masters, Madison, OH.
c. Debond by L & M Construction Chemicals, Inc., Omaha, NE.
d. Nox-Crete Form Coating by Nox-Crete, Inc., Omaha, NE.
e. Cast-Off, Sonneborn Building Products, Minneapolis, MN.
f. Symons Corp., Des Plaines, IL.
g. Duogard Form Release Agen by W.R. Meadows, Inc., Elgin, IL.

C. Fillets for Chamfered Corners and other justifications: Wood strips, sizes and configurations as detailed.

D. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required; of strength and character to maintain formwork in place while placing concrete.

E. Shores:

1. Patentedshores of approved design and manufacture, or built-up on job of structural grade timbers of adequate strength and properly braced to safely support imposed loads.

F. Form Sealer, Acceptable Products:

1. Formfilm by W.R. Grace.
2. Pre-Form by Nox-Crete Co.
3. Submit request for substitutions in accordance with Division 01 Section “Product Requirements.”

G. Waterstop: 1 inch by ¾ inch size, composed of butyl rubber and bentonite clay.

1. Acceptable products:

a. Volclay Waterstop-RX by American Colloid Co.
b. Superstop Waterstop by Tremco, Inc.

H. Formed Construction Joints: Galvanized steel, tongue and groove type, knock-out holes spaced at 6 inches on center, with anchors.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify lines, levels, and measurements before proceeding with formwork.

3.02 EARTH FORMS

A. Earth forms not permitted, except for footings where soil is conducive and approval is received from authorities having jurisdiction and structural engineer

B. Hand trim sides and bottoms of earth forms, remove loose dirt prior to placing concrete.

3.03 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:

1. Class A, 1/8 inch for smooth-formed finished surfaces.
2. Class B, 1/4 inch, Class C, 1/2 inch for rough-formed finished surfaces.

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.

1. Install keyways, reglets, recesses, and the like, for easy removal.
2. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer exterior corners and edges of permanently exposed concrete.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement. The form agent shall be of high penetrating quality leaving no film on the surface of the forms that can be absorbed by the concrete or be incompatible with concrete paint.

3.04 ERECTION

A. Minimize form joints. Symmetrically align joints and make watertight to prevent leakage of mortar.

B. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

C. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

D. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

E. Arrange forms to allow stripping without removal of principal shores, where required to remain in place.

F. Provide bracing to ensure stability of formwork. Strengthen formwork liable to be overstressed by construction loads.

G. Camber elevated slabs and beams to achieve ACI 301 tolerances and per Structural Drawings.

H. Provide temporary ports in formwork to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain. Close ports with tight fitting panels, flush with inside face of forms, neatly fitted so that joints will not be apparent in exposed concrete surfaces.

I. Provide chamfer strips on external corners of beams, and columns where they will be exposed to view after completion of construction with ½ - inch by ½ - inch minimum triangular fillet.

J. Protect void forms from moisture before concrete placement in accordance with manufacturers' requirements. Protect from crushing during concrete placement. Prior to the concrete placement, replace void forms which have been damaged physically or by moisture.

K. Clean forms and adjacent surfaces to receive concrete.

L. Construct form full depth of concrete to be placed.

3.05 NOT USED

3.06 APPLICATION OF FORM RELEASE AGENT

A. Apply form release agent on formwork in accordance with manufacturer's instructions. Apply prior to placing reinforcing steel, anchoring devices, and embedded items.

B. Do not apply form release agent where concrete surfaces are scheduled to receive special finishes and applied coverings which may be affected by agent. Soak contact surfaces of untreated forms with clean water. Keep surfaces wet prior to placing concrete.

3.07 INSERTS, EMBEDDED PARTS, AND OPENINGS

A. Provide formed openings where required for work embedded in or passing through concrete.

B. Locate and set in place items which will be cast directly into concrete

C. Coordinate work of other Sections in forming and setting openings, slots, recesses, chases, sleeves, bolts, anchors, and other inserts.

D. Install accessories in accordance with manufacturer's instructions, level and plumb.

E. Install waterstop in single lengths where possible. Make provisions to support and protect water stops during progress of the work.

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. Install construction joint device in coordination with floor slab pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.

3.08 FORMWORK TOLERANCES

A. Construct formwork to maintain tolerances required by ACI 301.

B. Camber slabs and beams as indicated in Drawings.

3.09 FIELD QUALITY CONTROL

A. 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.

B. Refer to Division 03 Section “Cast-in-Place Concrete” for testing requirements.

3.10 FORM REMOVAL

A. Notify Structural Engineer via RFI prior to removing horizontal formwork.

B. Do not remove forms, shoring and bracing until concrete has sufficient strength to support its own weight and design loads which may be imposed upon it. Pay for and have testing laboratory make additional test cylinders to confirm strength requirements as required for early form recovery. Presume concrete to have reached this strength when either of the following conditions are met:

1. Method 1:

    a. Test cylinders, field cured along with concrete they represent, have reached 28 day strength required for removal of formwork.

2. Method 2:

    a. After concrete has cured for same length of time as age at test of laboratory-cured cylinders which reached specified 28 day strength.
    b. Length of time concrete has been cured in structure shall be determined by cumulative number of days or fractions thereof, not necessarily consecutive, during which temperature of air in contact with concrete is above 50 degrees F and

concrete has been damp or thoroughly sealed from evaporation and loss of moisture.

C. Perform reshoring before removing original shoring. Leave reshoring in place until members have attained required 28 day compressive strength, or as long as required to support additional construction loads. Do not remove shores until concrete is a minimum of 100 percent of 28 day strength, or as specified by Engineer.

D. Reshore structural members due to design requirements or construction conditions to permit successive construction.

1. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring.

E. Store reusable forms for exposed architectural concrete to prevent damage to contact surfaces.

F. When repair of surface defects or finishing is required at early age, remove forms as soon as concrete has hardened to resist damage from removal operation.

G. Perform needed repairs or treatment required on sloping surfaces at once and follow with curing.

H. Loosen wood forms for openings as soon as loosening can be accomplished without damage to concrete.

I. Remove formwork for walls, sides of beams, and other parts not supporting weight of concrete as soon as concrete has hardened sufficiently to resist damage from removal operations.

J. Whenever the formwork is removed during the curing period, the exposed concrete shall be protected and cured by one of the methods specified in Section 3 30 00.

K. For exposed concrete surfaces, do not patch formwork. Replace damaged formwork.

L. Do not place wood forms which cannot be retrieved after concrete placement. Use steel forms.

3.11 CLEANING

A. Clean forms to remove foreign matter as erection proceeds.

B. Ensure that water and debris drain to exterior through clean-out ports.

C. During cold weather remove ice and snow from forms. Do not use de-icing salts. Do not use water to clean out completed forms. Use compressed air to remove foreign matter.

3.12 REUSING FORMS

A. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

B. When forms are reused, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Contractor.

END OF SECTION

SECTION 03 2000

CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Provisions established in the Contract, Division 01 Specification Sections, and the drawings apply to this Section.

1.02 SUMMARY

A. This Section specifies reinforcement for cast-in place concrete for the following:

1. Footings.
2. Foundation walls.
3. Slabs-on-grade or Mat-slabs.
4. Suspended slabs.
5. Concrete toppings.
6. Building walls.

1.03 SUBMITTALS

A. Submit shop drawings under provisions of Division 01 Section “Submittal Procedures.”

B. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

C. Product Data: For each type of product indicated.

D. Welding certificates.

E. Qualification Data: For Installer, manufacturer and testing agency.

F. Material Certificates: For each of the following, signed by manufacturers:
1. Steel reinforcement and accessories.

G. Field quality-control test and inspection reports.

H. Minutes of pre-installation conference.

1.04 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code - Reinforcing Steel."

B. ACI Publications: Comply with:

1. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
2. ACI 301, "Specification for Structural Concrete.”
3. ACI 315, "Details and Detailing of Concrete Reinforcement.”
4. ACI 318, "Building Code Requirements for Reinforced Concrete.”

C. Pre-installation Conference: Conduct conference at Project site to comply with requirements

in Division 01 Section "Project Management and Coordination.

1. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
   a. Contractor's superintendent.
   b. Independent testing agency responsible for concrete design mixtures.
   c. Independent testing agency responsible for reinforcement testing.
   d. Ready-mix concrete manufacturer.
   e. Concrete subcontractor.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

1. Stack reinforcing steel in tiers and mark so that each length, size, shape and location can be readily determined. Exercise care to maintain reinforcement free of dirt, mud, paint or rust.

PART 2 – PRODUCTS

2.01 STEEL REINFORCEMENT

A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

B. Reinforcing Bars: ASTM A 615, Grade 60 for #4 & larger bars, Grade 60 for #3 and smaller bars, deformed.

C. Low-Alloy-Steel Reinforcing Bars: ASTM A 706, deformed.

D. Steel Bar Mats: ASTM A 184, fabricated from ASTM A 615, Grade 60 ASTM A 706, deformed bars, assembled with clips.

E. Waste: Provide 5 percent extra for each reinforcement type of reinforcement bar required to account for waste in field assembly procedures.

F. Plain-Steel Wire: ASTM A 82, as drawn.

1. Minimum 16 gage annealed type.

G. At reinforcing placed over sand or earth, use precast concrete cubes.

H. Mechanical Bar Splices: Xtender by Headed Reinforcement Corp. or equal to develop a minimum of 125% of yield strength to bar.

2.02 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A 615, Grade, plain-steel bars, cut bars true to length with ends square and free of burrs.

B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard

Practice," of greater compressive strength than concrete and as follows:

C. Mechanical Connectors (Type II): ASTM A536, Grade 85-60-06, section 21.2.6 per ACI 318.

2.03 FABRICATING REINFORCEMENT

A. Fabricate in accordance with ACI SP-66, providing concrete cover specified in Division 03 Section “Cast-in-Place Concrete."

B. Locate reinforcing splices not indicated on Structural Drawings at points of minimum stress. Indicate location of splices on shop drawings to be reviewed by Structural Engineer.

C. Weld reinforcing bars in accordance with ANSI/AWS D1.4.

D. Provide sufficient lap of splicing of reinforcement, where required, to permit transfer of stress in accordance with requirements of this specification. Splice wall vertical reinforcement at location of horizontal construction joints and/or wall to slab interface (where occurs).

E. Unless otherwise noted on the structural drawings to be greater, lap reinforcement 36 bar diameters (class “A” lap) at splices or have dowels of same bar section and spacing as the bars to be spliced. Lap bars at least 36 diameters (class “A” lap) at corners and at abrupt changes in direction of walls. Stagger splices in adjacent bars.

PART 3 – EXECUTION

3.01 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

1. Install anchor rods, accurately located, to elevations required.
2. Install dovetail anchor slots in concrete structures as indicated.

3.02 STEEL REINFORCEMENT

A. General: Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete. Per ASTM E 1643 in general.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Do not tack weld crossing reinforcing bars.

1. Weld reinforcing bars according to AWS D1.4, where indicated.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

F. No supporting devices shall be used that will impede the flow of concrete.

3.03 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage a special inspector] and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

END OF SECTION

SECTION 03 3000

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Provisions established in the Contract, Division 01 Specification Sections, and the Drawings apply to this Section.

1.02 SUMMARY

A. This Section specifies cast-in place concrete, including concrete materials, mixture design, placement procedures, and finishes.

1. Cast-in-place concrete foundation walls and supported slabs.

2. Floors and slabs on vapor barrier over fill.

3. Equipment pads, thrust blocks, light pole bases, metal pan stairs.

4. Floor toppings.

B. See Division 31 Section “Earth Moving” for drainage fill under slabs-on-grade.

1.03 SUBMITTALS

A. Submit under provisions of Division 01 Section “Submittal Procedures.”

B. Product Data: For each type of product indicated.

C. Design Mixtures: Submit mix designs and compressive strength test reports or mix history data for specified types of concrete.

D. Shop Drawings: For steel reinforcement and formwork. Material test reports.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94 requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

B. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301, "Specification for Structural Concrete,"

2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

C. Testing:

1. Perform testing, monitoring and analysis of concrete under provisions of Division 01 Section “Product Requirements.”

2. Submit proposed mix design of each class of concrete, along with recent, (taken within last 60 days maximum) test cylinder break reports which confirm that mix exceeds specified strengths, to appointed firm for review prior to commencement of work. Mixes will be reviewed and mix modifications made by testing laboratory only.

3. Provide free access to the work and cooperate fully with appointed testing laboratory.

4. Test for air entrainment on concrete exposed to freeze-thaw cycle.

D. Forward two copies of design mixes and cylinder break certifications for each type of concrete to Architect for review at least 10 working days prior to arrival of concrete on site to be placed.

E. Preinstallation Conference: Conduct conference at Project site.

1.05 DELIVERY STORAGE AND HANDLING

A. Deliver, store and handle materials in accordance with the requirements of Division 01 Section “Product Requirements.”

B. Schedule the delivery so that continuity of any pour will not be interrupted for over 15 minutes.

C. Place concrete on site within 90 minutes after proportioning materials at batch plant.

1.06 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Division 01 Section “Product Requirements.”

B. Accurately record actual locations of embedded utilities and components which are concealed from view.

1.07 SEQUENCING

A. Notify responsible trades of schedules of concrete pours so as to allow adequate time for installation of their work.

B. Obtain anchor bolts and other miscellaneous steel items to be cast into concrete from material supplier.

C. Coordinate size and location of mechanical equipment concrete pads with applicable trades.

PART 2 - PRODUCTS

2.01 FORM-FACING MATERIALS

A. Refer to Division 03 Section “Concrete Formwork” for requirements.

2.02 STEEL REINFORCEMENT

A. Refer to Division 03 Section “Concrete Reinforcing” for requirements.

2.03 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:

1. Portland Cement: ASTM C 150, Type II,
   Supplement with the following:

   a. Fly Ash: ASTM C 618, Class F – 25% Max.
   b. Type II to be modified with maximum alkali content of 0.6 percent (from only one source).

B. Normal-Weight Aggregates: ASTM C 33, graded nominal maximum coarse-aggregate size as indicated on structural drawings.

1. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Water: ASTM C 94 and potable.

D. Air-Entraining Admixture: ASTM C 260.

E. Synthetic Fiber: Monofilament or fibrillated fibers engineered and designed for use in concrete pavement, complying with ASTM C 1116, Type III, 1/2 to 1-1/2 inches long.

2.04 CHEMICAL ADMIXTURES

A. General: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

B. Water-Reducing Admixture: ASTM C 494, Type A.

C. Retarding Admixture: ASTM C 494, Type B.

D. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.

E. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.

F. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494, Type G.

G. Plasticizing and Retarding Admixture: ASTM C 1017, Type II.

H. Xypex Crystalline Waterproofing: C-500, C-1000 and C-2000 as required by mix design manufactured by Xypex Chemical Company. Use for concrete in water table.

2.05 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. Clear Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, non-dissipating, and certified by curing compound manufacturer to not interfere with bonding of floor covering.

F. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

G. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

H. Grout: Manufactured pre-mixed. Non-ferrous, non-staining, flowable grout which will not shrink as it cures, 4000 psi at 7 days.

2.06 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.

2.07 CONCRETE MIXTURES

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.

B. Cementitious Materials: Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not more than 15 percent.

C. Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: at 28 days (or 3 day where occurs) as indicated on structural drawings.

2. Maximum Water-Cementitious Materials Ratio: as indicated on structural drawings.

3. Air Content: 2.5 percent, plus or minus 1.5 percent at point of delivery for 1-1/2- inch (38mm) nominal maximum aggregate size.

4. Air Content: 3.5 percent, plus or minus 1.5 percent at point of delivery for nominal maximum aggregate size.

5. Air Content: Do not allow air content of troweled finished floors to exceed 3 percent.

6. Synthetic Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than 1.5 lb/cu. yd.

2.08 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.01 FORMWORK

A. Refer to Division 03 Section “Concrete Formwork” for requirements.

3.02 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Embedded items shall be position accurately and supported against displacement. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.03 STEEL REINFORCEMENT

A. Refer to Division 03 Section “Concrete Reinforcement” for requirements.

B. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

C. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.

D. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

1. Weld reinforcing bars according to AWS D1.4, where indicated.

E. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

F. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.04 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect and Structural Engineer.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch (3.2 mm). Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.

2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3.2-mm-) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

3.05 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.

C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.

2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.

3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.

2. Maintain reinforcement in position on chairs during concrete placement.

3. Screed slab surfaces with a straightedge and strike off to correct elevations.

4. Slope surfaces uniformly to drains where required.

5. Begin initial floating using bull floats or darbies to form a uniform and open- textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.

2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

G. Hot-Weather Placement: Comply with ACI 301 and as follows:

1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.06 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture- retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover Material and waterproof tape.

2. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

    a. After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.

3. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.07 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Structural Engineer and/or Architect. Remove and replace concrete that cannot be repaired and patched to Structural Engineer and/or Architect's approval.

3.08 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing and Inspecting: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

C. Inspections:

1. Steel reinforcement placement.

2. Steel reinforcement welding.

3. Headed bolts and studs.

4. Verification of use of required design mixture.

5. Concrete placement, including conveying and depositing.

6. Curing procedures and maintenance of curing temperature.

7. Verification of concrete strength before removal of shores and forms from beams and slabs.

D. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

E. Formwork, Reinforcing Steel and Inserts

1. Prior to each concrete pour, inspect formwork for tightness of joints, proper shoring and bracing, and location of rustications, in accordance with ACI 347.

2. Prior to each concrete pour, inspect fabrication and bending of bars, bar sizes, spacing, placement and tying in accordance with ACI 315.

3. Prior to each concrete pour, inspect positioning of steel inserts and assemblies, sizes, and spacing, and test fusion-welded anchors and sheer connectors.

F. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Make and cure three specimen cylinders according to ASTM C31 for each 150 cubic yards, or fraction thereof, of each class poured at site each day.

2. Retain one cylinder for 7-day test and two for the 28-day test.

3. Number each cylinder 1A, 1B, 1C, 2A, 2B, 2C, etc; date each set; and keep accurate record of pour each set represents.

4. Transport specimen cylinders from job to laboratory after cylinders have cured for 24-hours on site. Cylinders shall be covered and kept at air temperatures between 60 and 80 degrees Fahrenheit.

5. Test specimen cylinders at age 7-days and age 28-days for specified strength according to ASTM C39.

6. Base strength value on average of two cylinders taken for 28-day test.

7. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.

8. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.

9. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.

9. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 250 psi.

10. Test results shall be reported in writing to Architect/Structural Engineer, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-

strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 3-,7- and 28-day tests.

11. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by Architect/Structural Engineer.

12. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

13. Correct deficiencies in the Work that test reports and inspections indicate does not comply with the Contract Documents.

G. Measure floor slab flatness and levelness according to ASTM E 1155 within 48 hours of finishing.

H. The Contractor shall:

1. Submit ticket for each batch of concrete delivered to job site. Ticket shall bear the following information:

a. Design mix number

b. Signature or initial of ready mix representative.

3.09 WORKMANSHIP

A. All concrete shall be placed, finished and cured, and all other pertinent construction practices shall be in accordance with the Specifications for Structural Concrete for Buildings (ACI 301) hereby made a part of these specifications.

B. In addition to the requirements of ACI 301, the following shall prevail:

1. Concrete shall be placed so that a uniform appearance of surface will be obtained.

2. The concrete shall be free of all rock pockets, honeycombs and voids.

3. Concrete shall be deposited as nearly as practical in its final position.

4. The subgrade shall be slightly moist when the concrete is placed for floor slabs to prevent excessive loss of water from the concrete mix.

3.10 DEFECTIVE WORK:

A. Work considered to be defective may be ordered to be replaced, in which case the Contractor shall remove the defective work at his expense. Work considered to be defective shall include, but not be limited to. The following:

1. Concrete in which defective or inadequate reinforcing steel has been placed.

2. Concrete incorrectly formed, or not conforming to details and dimensions on the drawings or with the intent of these documents, or concrete the surfaces or which are out of plumb or level.

3. Concrete below specified strength.

4. Concrete containing wood, cloth or other foreign matter, rock pockets, voids, honeycombs, cracks or cold joints not scheduled or indicated on the drawings.

3.11 CORRECTION OF DEFECTIVE WORK:

A. The Contractor shall, at his expense, make all such corrections as directed by the engineer.

B. Concrete work containing rock pockets, voids, honeycombs, cracks or cold joints not scheduled or indicated on the drawings shall be chipped out until all unconsolidated material is removed.

END OF SECTION

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SECTION 03 3511

CONCRETE FLOOR FINISHES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface treatments for concrete floors and slabs.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Finishing of concrete surface to tolerance; floating, troweling, and similar operations; curing.

1.03 ADMINISTRATIVE REQUIREMENTS

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

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's published data on each finishing product, including information on compatibility of different products and limitations.

C. Maintenance Data: Provide data on maintenance and renewal of applied finishes.

1.05 MOCK-UP

A. For coatings, construct mock-up area under conditions similar to those that will exist during application, with coatings applied.

B. Mock-Up Size: 10 feet square.

C. Locate where directed.

D. Mock-up may remain as part of the work.

PART 2 PRODUCTS

2.01 CONCRETE FLOOR FINISH APPLICATIONS

A. Low Gloss Finish Clear Sealer:
   1. Use at locations indicated "SC-1" on Finish Schedule.

B. Polished Finish:
   1. Use at locations indicated "C-1" on Finish Schedule.

2.02 COATINGS

A. Low Gloss Clear Coating: Transparent, non-yellowing, water- or solvent-based coating.
   1. Composition: Urethane fortified Acrylic polymer-based.
   2. Products:
      a. L.M. Scofield Company; Scofield Systems, Selectseal Plus www.scofield.com.
      b. Substitutions: See Section 01 6000 - Product Requirements.

2.03 POLISHED CONCRETE SYSTEM

A. Polished Concrete System: Materials, equipment, and procedures designed and furnished by a single manufacturer to produce dense polished concrete of the specified sheen.
   1. Acceptable Systems:
      a. L.M. Scofield Company; Scofield Formula One Ground & Polished Concrete Systems: www.scofield.com.
         1) Grade 1 Light Sand/Cream Finish; Class 2 Medium Reflectivity 800.
      b. Substitutions: See Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that floor surfaces are acceptable to receive the work of this section.

B. Verify that flaws in concrete have been patched and joints filled with methods and materials suitable for further finishes.

3.02 GENERAL

A. Apply materials in accordance with manufacturer's instructions.

3.03 COATING APPLICATION

A. Verify that surface is free of previous coatings, sealers, curing compounds, water repellents, laitance, efflorescence, fats, oils, grease, wax, soluble salts, residues from cleaning agents, and other impediments to adhesion.

B. Protect adjacent non-coated areas from drips, overflow, and overspray; immediately remove excess material.

3.04 POLISHED CONCRETE APPLICATION

A. Applicator shall examine the areas and conditions under which work of this section will be provided. The General Contractor shall correct conditions detrimental to the timely and proper completion of the work and the Applicator shall not proceed until unsatisfactory conditions are resolved.

B. Grind the concrete floor to within 2 - 3 inches of walls with 16, 25, 40, 60, 80, and/or 150 grit, removing construction debis, floor slab imperfections and unitl there is a uniform scratch pattern and desired concrete aggregate exposure.

C. Fill construction joints and cracks with filler products specified in accordance with the manufacturer's instructions colored to match with concrete color as specified by the architect.

D. Apply densifying impregnator undiluted at approximately 200 square feet per gallon using a stiff, long bristled broom. Cover the entire area liberally. Using a broom, work the densifier into the substrate for 30 minutes. During this 30-minute period, continually keep the substrate wet with densifier. Squeegee excess material off the floor. Allow 12 to 24 hours for full cure.

E. Grind the floor to within 2 - 3 inches of walls with metal bonded diamond grits of 150 and 300 - grinding 90 degrees from each previous grind and removing all the scratches from the previous grit. Vacuum the floorm thoroughly after each grind using a squeegee vacuum attachment.

F. Polish the floor, to desired sheen level, with phenolic resin bonded diamond grits of 100, 400, 800 - first polishing the edges with pads of the same grit and then the field of the floor removing all scratches from the previous grit. After each polish, cleam the floor thoroughly using clean water and an auto scrubber or a mop and a wet vacuum.

G. Polish with 800-grit resin bond grind.

H. Apply finish coat at 750 square feet per gallon.

I. Using a high speed (2000 - 3000 rpm) burnishing machine, and hogs hair burnishing pad, buff the surface to a high shine.

J. Protect finished surface as required and as recommended by manufacturer of polishing system. Do not cover the concrete with plastic sheeting.

END OF SECTION

SECTION 03 3713

SHOTCRETE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Provisions established in the Contract, Division 01 Specification Sections, and the drawings apply to this section.

1.02 SUMMARY

A. This Section includes shotcrete applied by wet-mix process.

1.03 SUBMITTALS

A. Submit under provisions of Division 01 Section “Submittal Procedures.”

B. Product Data: For manufactured materials and products.

C. Shop Drawings: For details of fabricating, bending, and placing reinforcement.

D. Design Mixes: Submit mix designs and compression strength test reports of mix history data for specified types of shotcrete.

E. Material test reports and certificates.

F. Mockup: Provide mockup under provisions of Division 01 Section “Quality Requirements.”

1. Erect sample panel 36 x 36 x 3.5 inches (min.) or of sufficient size to indicate special treatment of finish required.

2. Locate as directed by Contractor and Structural Engineer.

3. Schedule of placing for the Architect’s review before starting work.

1.04 QUALITY ASSURANCE

A. Comply with provisions of ACI 506.2, "Specification for Shotcrete.", unless more stringent requirements are indicated.

B. Applicator: Company specializing in performing the work of this Section with minimum 5 years documented experience.

C. Verify that field measurements are as shown on shop drawings.

D. Preinstallation Meeting: Hold a preinstallation meeting no later than one week prior to commencement of the Work of this Section under provisions of Division 01 Section “Project Management and Coordination.”

E. Preconstruction Testing Service: Owner will engage a qualified independent testing agency to perform preconstruction testing and inspections indicated below:

1. Produce test panels before shotcrete placement according to requirements in ACI 506.2 and ASTM C 1140 for each design mix, shooting orientation, and nozzle

operator. Produce test panels with dimensions of 36 by 36 inches minimum and of average thickness of shotcrete, but not less than 3-1/2 inches. From each test panel, testing agency will obtain six test specimens: one set of three specimens unreinforced and one set of three specimens reinforced. Agency will perform the following:

a. Test each set of unreinforced specimens for compressive strength according to ASTM C 42.

b. Visually inspect each set of reinforced shotcrete cores taken from test panels and determine mean core grades according to ACI 506.2.

c. Sample panel should represent most congested reinforcement area.

F. Shotcrete surface texture shall be uniform, dense, free from defects, and visible construction joints. Any portions showing cracks, damage, lack of uniformity in color or texture shall be repair or replaced by the Contractor.

1.05 PROJECT CONDITIONS

A. Cold- Weather Shotcreting: Protect shotcrete work from physical damage or reduced strength caused by frost, freezing, or low temperatures according to ACI 306.1.

B. Hot-Weather Shotcreting: Mix, place, and protectshotcrete according to ACI 305R when hot-weather conditions and high temperatures would seriously impair quality and strength of shotcrete.

PART 2 - PRODUCTS

2.01 REINFORCING MATERIALS

A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 60 percent.

B. Reinforcing Bars: ASTM A 615, Grade 60 or A706 as indicated on structural drawings, deformed.

C. Plain-Steel Wire: ASTM A 82, as drawn.

D. Plain-Steel-Welded Wire Fabric: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

E. Deformed-Steel-Welded Wire Fabric: ASTM A 497, flat sheet.

2.02 SHOTCRETE MATERIALS

A. Portland Cement: ASTM C 150, Type II, or Type V as indicated. Use only one brand and type of cement for Project.

B. Blended Hydraulic Cement: ASTM C 595, Type IS, IP, I(PM), and I(SM).

C. Normal-Weight Aggregates: ASTM C 33, from a single source, and as follows:

1. Aggregate Gradation: ACI 506R, Gradation No. 2 with 100 percent passing 1/2- inch

(13-mm) sieve.

D. Water: Potable, complying with ASTM C 94/C 94M.

E. Synthetic Fiber: Fibrillated polypropylene fibers engineered and designed for use in shotcrete, complying with ASTM C 1116, Type III, not less than 3/4 inch (19 mm) long.

F. Joint Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.

2.03 CHEMICAL ADMIXTURES

A. General: ASTM C 1141, Class A or B. Certify compatibility of admixtures with each other and with other cementitious materials.

B. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.

C. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.

D. Water-Reducing and Accelerating Admixture: ASTM C 494/C 494M, Type E.

E. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.

F. Air Entraining Admixture: ASTM C260.

G. Xypex Crystalline Waterproofing: C-500, C-1000 and C-2000 as required by mix design manufactured by Xypex Chemical Company. Use for concrete in water table.

2.04 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

2.05 SHOTCRETE MIXTURES, GENERAL

A. Prepare design mixes for each type and strength of shotcrete.

1. Limit use of fly ash to not exceed, in combination, 15 percent of portland cement by weight.

B. Limit water-soluble chloride ions to maximum percentage by weight of cement or cementitious materials permitted by ACI 301.

C. Synthetic Fiber: Uniformly disperse in shotcrete mix, according to manufacturer's written instructions, at a rate of 1.5 lb/cu. yd. (0.90 kg/cu. m).

D. Design-Mix Adjustments: Subject to compliance with requirements, shotcrete design-mix adjustments may be proposed when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant.

2.06 SHOTCRETE MIXTURES

A. Proportion wet mixtures according to ACI 211.1 and ACI 301, using materials to be used on Project, to provide shotcrete with the following properties:
   1. Compressive Strength 28 Days as indicated on the structural plans.

   2. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight, wet-mix shotcrete having an air content before pumping of 7 percent with a tolerance of plus or minus 1-1/2 percent.

PART 3 – EXECUTION

3.01 PREPARATION

A. Concrete: Before applying shotcrete, remove unsound or loose materials and contaminants that may inhibit shotcrete bonding. Chip or scarify areas to be repaired to extent necessary to provide sound substrate. Cut edges square and 1/2 inch deep at perimeter of work, tapering remaining shoulder at 1:1 slope into cavity to eliminate square shoulders. Dampen surfaces before shotcreting.

   1. Abrasive blast or hydroblast existing surfaces that do not require chipping to remove paint, oil, grease, or other contaminants and to provide roughened surface for proper shotcrete bonding.

B. Earth: Compact and trim to line and grade before placing shotcrete. Do not place shotcrete on frozen surfaces. Dampen surfaces before shotcreting.

C. Rock: Clean rock surfaces of loose materials, mud, and other foreign matter that might weaken shotcrete bonding.

D. Steel: Clean steel surfaces by abrasive blasting according to SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

3.02 FORMS

A. General: Design, erect, support, brace, and maintain forms, according to ACI 301, to support shotcrete and construction loads and to facilitate shotcreting. Construct forms so shotcrete members and structures are secured to prevent excessive vibration or deflection during shotcreting.

   1. Fabricate forms to be readily removable without impact, shock, or damage to shotcrete surfaces and adjacent materials.

   2. Construct forms to required sizes, shapes, lines, and dimensions using ground wires and depth gages to obtain accurate alignment, location, and grades in finished structures. Construct forms to prevent mortar leakage but permit escape of air and rebound during shotcreting. Provide for openings, offsets, blocking, screeds, anchorages, inserts, and other features required in the Work.

   3. Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

B. Form openings, chases, recesses, bulkheads, keyways, and screeds in formwork. Determine sizes and locations from trades providing such items. Accurately place and securely support items built into forms.

C. Refer to Division 03 Section “Concrete Reinforcing” for requirements.

D. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials that weaken shotcrete bonding.

E. Securely embed reinforcing anchors into existing substrates, located as required.

F. Accurately position, support, and rigidly secure reinforcement against displacement by formwork, construction, or shotcreting. Locate and support reinforcement by metal chairs, runners, bolsters, spacers, and hangers, as required.

G. Place reinforcement to obtain minimum coverage for shotcrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during shotcreting. Set wire ties with ends directed into shotcrete, not toward exposed shotcrete surfaces.

H. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

3.03 JOINTS

A. Construction Joints: Locate and install construction joints tapered to a 1:1 slope where joint is not subject to compression loads and square where joint is perpendicular to main reinforcement. Continue reinforcement through construction joints, unless otherwise indicated.

B. Contraction Joints: Construct contraction joints in shotcrete using saw cuts 1/8-inch-wide-by-1/3 slab depth or joint-filler strips 1/4-inch- wide-by-1/3 shotcrete depth, unless otherwise indicated.

1. After shotcrete has cured, remove strip inserts and clean groove of loose debris.

2. Space joints at 15 feet (4.5 m) o.c horizontally and vertically, UNO per Structural drawings.

3. Tool edges round on each side of strip inserts if floated or troweled finishes are required.

3.04 ALIGNMENT CONTROL

A. Ground Wires: Install ground wires to establish thickness and planes of shotcrete surfaces. Install ground wires at corners and offsets not established by forms. Pull ground wires taut and position adjustment devices to permit additional tightening.

3.05 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by shotcrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.06 APPLICATION

A. Apply temporary protective coverings and protect adjacent surfaces against deposit of rebound and overspray or impact from nozzle stream.

B. Moisten wood forms immediately before placing shotcrete where form coatings are not used.

C. Apply shotcrete according to ACI 506.2.

D. Apply wet-mix shotcrete materials within 90 minutes after batching.

E. Deposit shotcrete continuously in multiple passes, to required thickness, without cold joints and laminations developing. Place shotcrete with nozzle held perpendicular to receiving surface. Begin shotcreting in corners and recesses.

1. Remove and dispose of rebound and overspray materials during shotcreting to maintain clean surfaces and to prevent rebound entrapment.

F. Maintain reinforcement in position during shotcreting. Place shotcrete to completely encase reinforcement and other embedded items. Maintain steel reinforcement free of overspray and prevent buildup against front face during shotcreting.

G. Do not place subsequent lifts until previous lift of shotcrete is capable of supporting new shotcrete.

H. Do not permit shotcrete to sag, slough, or dislodge.

I. Remove hardened overspray, rebound, and laitance from shotcrete surfaces to receive additional layers of shotcrete; dampen surfaces before shotcreting.

J. Do not disturb shotcrete surfaces before beginning finishing operations.

K. Remove ground wires or other alignment control devices after shotcrete placement.

L. Shotcrete Core Grade: Apply shotcrete to achieve mean core grades not exceeding 2.5 according to ACI 506.2, with no single core grade exceeding 3.0.

M. Installation Tolerances: Place shotcrete without exceeding installation tolerances permitted by ACI 117R, increased by a factor of 2.

3.07 SURFACE FINISHES

A. General: Finish shotcrete according to descriptions in AC 506R for the following finish.

B. Flash-Coat and Final Finish: After screeding and rodding surface, apply up to 1/4-inch (6-mm) coat of shotcrete using ACI 506R, Gradation No. 1, fine-screened sand modified with maximum aggregate size not exceeding No. 4 sieve and apply rubber – float finish.

3.08 CURING

A. Protect freshly placed shotcrete during construction from premature drying and excessive cold or hot temperatures.
B. Start initial curing as soon as free water has disappeared from shotcrete surface after placing and finishing.
C. Curing Exposed Surfaces: Cure shotcrete by one of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for at least seven days with water, continuous water-fog spray, water-saturated absorptive covers, or moisture-retaining covers. Lap and seal sides and ends of covers.

2. Curing Compound: Apply curing compound uniformly in continuous operation by power spray according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

   a. Apply curing compound to natural- or gun-finished shotcrete at rate of 1 gal./100 sq. ft.

D. Curing Formed Surfaces: Cure formed shotcrete surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.

3.09 FORM REMOVAL

A. Forms not supporting weight of shotcrete may be removed after curing at not less than 50 degrees F for 24 consecutive hours after gunning, provided shotcrete is hard enough not to be damaged by form-removal operations and provided curing and protecting operations are maintained.

   1. Leave forms supporting weight of shotcrete in place until shotcrete has attained design compressive strength. Determine compressive strength of in-place shotcrete by testing representative field-cured specimens of shotcrete.

   2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing materials are unacceptable for exposed surfaces. Apply new form-coating compound as specified for new formwork.

3.10 FIELD QUALITY CONTROL

A. Owner will engage a qualified independent testing agency to sample materials, visually grade cores, perform tests, and submit reports during shotcreting.

B. Air Content: ASTM C 173, volumetric method or ASTM C 231, pressure method; 1 test for each compressive-strength test for each mix of air-entrained, wet-mix shotcrete measured before pumping.

C. Shotcrete Temperature: ASTM C 1064; 1 test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and 1 test for each set of compressive-strength specimens.

D. Test Panels: Make a test panel, reinforced as in structure, for each shotcrete mix and for each workday or for every 50 cu. yd. of shotcrete placed; whichever is less. Produce test panels with dimensions of 36 by 36 inches minimum and of average thickness of shotcrete, but not less than 4-1/2 inches (115 mm). From each test panel, testing agency will obtain six test specimens: one set of three specimens unreinforced and one set of three specimens reinforced.

   1. Test each set of unreinforced specimens for compressive strength according to ASTM C 1140 and construction testing requirements in ACI 506.2.

   2. Visually inspect each set of reinforced shotcrete cores taken from test panels and determine mean core grades according to ACI 506.2.

E. In-Place Shotcrete: Take a set of 3 unreinforced cores for each mix and for each workday or for every 50 cu. yd. of shotcrete placed; whichever is less. Test cores for compressive strength according to ACI 506.2 and ASTM C 42. Do not cut steel reinforcement.

F. Strength of shotcrete will be considered satisfactory when mean compressive strength of each set of 3 unreinforced cores equals or exceeds 85 percent of specified compressive strength, with no individual core less than 75 percent of specified compressive strength.

1. Mean compressive strength of each set of 3 unreinforced cubes shall equal or exceed design compressive strength with no individual cube less than 88 percent of specified compressive strength.

G. The contractor shall:

1. If shotcrete is ready – mixed, submit ticket for each batch of concrete delivered to job site. Ticket shall bear the following information in addition to the minimum data require by ASTM C94.

a. Design mix number.

b. Signature or initials of ready mix representative.

c. Type, brand, and amount of admixture.

d. Weight of cement and aggregates, including maximum aggregate site in each batch.

e. Information necessary to calculate the total mixing water added by the producer (including aggregate moisture, water added during batching and by the truck operator).

3.11 REPAIRS

A. Remove and replace shotcrete that is delaminated or exhibits laminations, voids, or sand/rock pockets exceeding limits for specified core grade of shotcrete.

1. Remove unsound or loose materials and contaminants that may inhibit bond of shotcrete repairs. Chip or scarify areas to be repaired to extent necessary to provide sound substrate. Cut edges square and 1/2 inch deep at perimeter of work, tapering remaining shoulder at 1:1 slope into cavity to eliminate square shoulders. Dampen surfaces and apply new shotcrete.

B. Repair core holes from in-place testing according to repair provisions in ACI 301 and match adjacent finish, texture, and color.

3.12 CLEANING

A. Remove and dispose of rebound and overspray materials from final shotcrete surfaces and areas not intended for shotcrete placement.

END OF SECTION

SECTION 03 3800

POST-TENSIONING OF CONCRETE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Provisions established in the Contract, Division 01 Specification Sections, and the Drawings apply to this Section.

1.02 SUMMARY

A. This Section includes the following:

1. Furnishing post-tensioning reinforcement and accessories including encapsulated or non-encapsulated pre-stressing tendons, pocket formers, support bars, bar chairs, and slab bolsters.
2. Installing post-tensioning tendons.
3. Performing post-tensioning operations including stressing and finishing tendons.
4. Recording tendon elongations and gage pressure.
5. Finishing tendon ends and patching stressing pockets.
6. Details for horizontal curvature around openings and at anchorages.
7. Diagrams and notes as necessary for positioning of nonprestressed reinforcement required for installing post-tensioning tendons including, but not limited to the following:

    a. Support bars.
    b. Backup bars and hairpins at anchorages.
    c. Hairpins at locations of horizontal curvature.
    d. Supplemental reinforcement at blockouts.

1.03 DEFINITIONS

A. Strand Tail: Excess strand length extending past the anchorage device.

B. Stressing Blockout: Opening created in the slab to allow access to stressing-end anchorages.

C. Stressing Pocket: Void formed by pocket former at stressing-end anchorage to provide required cover over wedges and strand tail.

D. Wedge Cavity: Cone-shaped hole in anchorage device designed to hold the wedges that anchor the strand.

E. Encapsulated Pre-Stressing Tendon: Complete water proofed system provided by: Permanent end-caps for both beam and slab tendons which completely seal the anchorages. Usage to be determined by the PT supplier.

1.04 PERFORMANCE REQUIREMENTS

A. Average Precompression:

1. Minimum Average Slab Precompression: 125 psi.

B. Comply with ACI 318 limits on stresses at transfer of prestress.

C. Comply with ACI 318 requirements for minimum bonded reinforcement.

D. Comply with ACI 318 requirements for concrete cover over reinforcement.

1.05 SUBMITTALS

A. Submit under provisions of Division 01 Section “Submittal Procedures.”

B. Product Data: For the following:
1. Post-tensioning coating.
2. Tendon sheathing.
3. Anchorage devices.
4. Tendon couplers.
5. Bar and tendon supports.
6. Pocket formers.
7. Sheathing repair tape.
8. Stressing-pocket patching material.
9. Encapsulation system.

C. Shop Drawings: Submit shop drawings indicating layout, tendon sizes, grouping, spacing, placing sequence, vertical profile information, supports and locations, tendon supports, accessories, and clearances required for jack.

1. Design Shop Drawings and friction/stress loss calculations.
2. Description of tensioning sequence, type of jack, pressure monitoring device, anchorage set, tendon elongation, and tendon cut-off procedures.
3. Construction joint locations, pour sequence, locations of anchorages and blockouts (where required for stressing).
4. Stressing procedures and jacking force to result in final effective forces used in determining number of tendons required.
5. Details for corners and other locations where tendon layouts may conflict with one another or nonprestressed reinforcing steel.

D. Samples for Verification: For the following products:

1. Each anchorage device assembly with a minimum of 24 inches (610 mm) of coated, sheathed strand.
   a. Include components of encapsulation system.
2. Each coupler assembly with a minimum of 24 inches (610 mm) of coated, sheathed strand.
   a. Include components of encapsulation system.
3. All components of encapsulation system, unassembled and clearly marked as to usage.

E. Product Certificates:

1. For each type of anchorage device and coupler, signed by product manufacturer.
2. For each type of encapsulation system, signed by product manufacturer.

F. Qualification Data: For Installer, manufacturer, and testing agency.. Include resume of individual supervising installation and stressing of post-tensioning tendons.

G. Mill Test Reports: Certified mill test reports for prestressing strand used on Project indicating that strand is low-relaxation and including the following:

1. Coil numbers or identification.
2. Breaking load.
3. Load at 1 percent extension.
4. Elongation at failure.
5. Modulus of elasticity.
6. Diameter and net area of strand.

H. Field quality-control test reports.

I. Procedures Statement: Procedures for cutting excess strand tail and patching stressing pocket.

J. Stressing Jack Calibration: Calibration certificates for jacks and gages to be used on Project. Calibrate each jack-and-gage set as a pair.

K. Stressing Records: Filled out by testing agency during stressing operation with the following information recorded:
1. Name of Project.
2. Date of approved installation drawings used for installation and stressing.
3. Floor number and concrete placement area.
4. Date of stressing operation.
5. Date of Concrete Placement.
6. Weather conditions including temperature and rainfall.
7. Name and signature of inspector.
8. Name of individual in charge of stressing operation.
9. Serial or identification numbers of jack and gage.
10. Date of jack-and-gage calibration certificates.
11. Gage pressure to achieve required stressing force per supplied calibration chart.
12. Tendon identification mark.
13. Calculated tendon elongation; include +/- 7% values.
14. Actual tendon elongation.
15. Actual gage pressure.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer whose full-time Project superintendent has successfully completed PTI's Level 1 - Field Fundamentals course or has equivalent verifiable experience and knowledge acceptable to Structural Engineer.
1. Superintendent must have received training from post-tensioning supplier in the operation of stressing equipment to be used on Project.

B. Manufacturer Qualifications: Fabricating plant certified by PTI according to procedures set forth in PTI's "Manual for Certification of Plants Producing Unbonded Single Strand Tendons."

C. Testing Agency Qualifications: An independent agency qualified according to ASTM E 329 for testing indicated, as documented according to ASTM E 548.
1. Testing Agency Inspector: Utilize only personnel for performing field inspections and measuring elongations that have successfully completed PTI's Level 1-Field Fundamentals course or have equivalent qualifications acceptable to Owner.

D. Source Limitations: Obtain post-tensioning materials and equipment from the same supplier.
1. Stressing jacks not provided by post-tensioning supplier must be calibrated and approved for use on Project by post-tensioning supplier.

E. ACI Publications: Comply with ACI 423.6, "Specification for Unbonded Single Strand Tendons," unless otherwise indicated in the Contract Documents.

F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to installation and stressing of post-tensioning tendons including, but not limited to, the following:

1. Construction schedule and availability of materials, personnel, and equipment needed to make progress and avoid delays.
2. Storage of post-tensioning materials on-site.
3. Structural load limitations.
4. Coordination of post-tensioning installation drawings and nonprestressed reinforcing steel placing drawings.

5. Horizontal and vertical tolerances on tendon and nonprestressed reinforcement placement.
6. Marking and measuring of elongations.
7. Submittal of stressing records and requirements for tendon finishing.
8. Removal of formwork.
9. Reshoring process/placement.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle post-tensioning materials according to PTI's "Field Procedures Manual for Unbonded Single Strand Tendons."

B. Inspect tendons and accessory items at time of their delivery to Project site, prior to off-loading. Notify post-tensioning supplier of observed damage prior to off-loading.

C. Keep accurate and current records of materials delivered and used.

D. Immediately remove from Project site any tendons with damaged strand.

1.08 COORDINATION

A. Attachments and Penetrations:

1. Attach permanent fixtures such as curtain-wall systems, handrails, fire-protection equipment, lights, and security devices to the slab using embedded anchors. Drilled anchors are not allowed unless authorized in writing by Contractor and Structural Engineer.
2. Power-driven fasteners are not allowed unless authorized in writing by Contractor and Structural Engineer.
3. Core drilling for sleeves or other penetrations is not allowed unless authorized in writing by Contractor and Structural Engineer.
4. Protect penetrations within 18 inches or influence area of an anchorage with ASTM A 53, Schedule 40 steel pipe.

PART 2 - PRODUCTS

2.01 PRESTRESSING TENDONS

A. Prestressing Strand: ASTM A 416, Grade 270 (Grade 1860), uncoated, 7-wire, low-relaxation, 0.5-inch- (12.7-mm-) diameter strand.

B. Post-Tensioning Coating: Compound with friction-reducing, moisture-displacing, and corrosion-inhibiting properties specified in ACI 423.6; chemically stable and nonreactive with prestressing steel, nonprestressed reinforcement, sheathing material, and concrete.

1. Minimum Coating Weight: 2.5 lb (1.14 kg) for 0.5-inch- per 100 feet (30 m) of strand.
2. Completely fill annular space between strand and sheathing over entire tendon length with post-tensioning coating.

C. Tendon Sheathing: Comply with ACI 423.6.

1. Minimum Thickness: 0.050 inch (1.25 mm) for polyethylene or polypropylene with a minimum density of 0.034 lb/cu. in. (0.9 g/cu. cm).
2. Continuous over the entire length of tendon between anchorages to prevent intrusion of cement paste or loss of coating for a non-encapsulated system.

D. Anchorage Device and Coupler Assembly: Assembly of strand, wedges, and anchorage device or coupler complying with static and fatigue testing requirements in ACI

423.6 and capable of developing 95 percent of actual breaking strength of strand.

1. Anchorage Bearing Stresses: Comply with ACI 423.6 for stresses at transfer load and service load.
2. Fixed-End Anchorage Device Assemblies: Plant fabricated with wedges seated at a load of not less than 80 percent and not more than 85 percent of breaking strength of strand.

E. Encapsulation System: Watertight encapsulation of prestressing strand consisting of the following:

1. Wedge-Cavity Caps: Attached to anchorages with a positive mechanical connection and completely filled with post-tensioning coating.

   a. Caps for Fixed and Stressing-End Anchorages Devices: Designed to provide watertight encapsulation of wedge cavity. Sized to allow required extension of strand past the wedges.

      1) Attach cap for fixed-end anchorage device in fabricating plant.

   b. Caps at Intermediate Anchorages: Open to allow passage of strand.

2. Sleeves: Attached to anchorage device with positive mechanical connection; overlapped a minimum of 4 inches (100 mm) with sheathing and completely filled with post-tensioning coating.

2.02 NONPRESTRESSED STEEL BARS

A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

B. Support Bars, Reinforcing Bars, Hairpins: ASTM A 615, Grade 60, deformed. Minimum support bar size is 1/2 inch (13 mm).

C. Low-Alloy-Steel Support Bars, Reinforcing Bars, Hairpins: ASTM A 706, deformed.

D. Galvanized Support Bars, Reinforcing Bars, Hairpins: ASTM A 615, Grade 60 ASTM A 706, deformed bars, ASTM A 767, Class [I] [II] zinc coated after fabrication and bending.

1. Zinc Repair Material: ASTM A 780, zinc-based solder, paint containing zinc dust, or sprayed zinc.

E. Epoxy-Coated Support Bars, Reinforcing Bars, Hairpins: ASTM A 615, Grade 60, ASTM A 706, deformed bars, ASTM A 775 epoxy coated with less than 2 percent damaged coating in each 12-inch (300-mm) bar length.

1. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating; compatible with epoxy coating on bars and complying with ASTM A 775. Repair damaged areas according to ASTM D 3963.

F. Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening tendons and tendon support bars in place. Manufacture bar supports, according to CRSI's "Manual of Standard Practice," from steel wire, plastic, or precast concrete of greater compressive strength than concrete, and as follows:

1. For uncoated bars, use all-plastic or CRSI Class 1 plastic-protected bar supports.

2. For epoxy-coated bars, use CRSI Class 1A epoxy-coated or other dielectric-polymer-coated wire bar supports.
3. For zinc-coated bars, use galvanized wire or dielectric-polymer-coated wire [all- plastic] bar supports.

2.03 ACCESSORIES

A. Pocket Formers: Capable of completely sealing wedge cavity; sized to provide the required cover over the anchorage and allow access for cutting strand tail.

B. Anchorage Fasteners: Galvanized steel nails, wires, and screws used to attach anchorage devices to formwork.

C. Sheathing Repair Tape: Elastic, self-adhesive, moistureproof tape with minimum width of 2 inches (50 mm), in contrasting color to tendon sheathing; nonreactive with sheathing, coating, or prestressing steel.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Adhesive Tape Products, Inc.; PWT-20. b.
   3M; Tape 226.
   c. Tyco Adhesives; Polyken 826.
   d. Similar Product approved by the Structural Engineer

2.04 PATCHING MATERIAL

A. Patching Material: One component, polymer-modified, premixed patching material containing selected silica aggregates and portland cement, suitable for vertical and overhead application.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Euclid Chemical Company (The); Verticoat Supreme. b.
   Fox Industries, Inc.; FX-228.
   c. Kaufman Products, Inc.; Patchwell Kit HB. d.
   Master Builders, Inc.; Emaco R350 CI.
   e. Sika Corporation, Inc.; SikaMonoTop 612.
   f. Similar Product approved by the Structural Engineer

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that site conditions are ready to receive work and field measurements are as indicated on shop drawings.

B. Commencement of Work means installer accepts existing conditions.

3.02 FORMWORK

A. Provide formwork for post-tensioned elements as specified in Division 03 Section "Concrete Formwork." Design formwork to support load redistribution that may occur during stressing operation. Ensure that formwork does not restrain elastic shortening, camber, or deflection resulting from application of prestressing force.

B. Do not remove forms supporting post-tensioned elements until concrete has reached its 28 day strength, tendons have been fully stressed and elongations have been approved in writing by Structural Engineer.

C. Do not place concrete in supported floors on supporting floors until concrete has reached its 28 day strength, tendons have been stressed and elongations have been approved in writing

by Structural Engineer.

3.03 NONPRESTRESSED STEEL REINFORCEMENT PLACEMENT

A. Placement of nonprestressed steel reinforcement is specified in Division 03 Section "Concrete Reinforcement." Coordinate placement of nonprestressed steel reinforcement with installation of post-tensioning tendons.

3.04 TENDON INSTALLATION

A. Install tendons according to approved installation drawings and procedures stated in PTI's "Field Procedures Manual for Unbonded Single Strand Tendons."

B. Tendon Supports: Provide continuous slab bolsters or bars supported on individual high chairs spaced at a maximum of 42 inches (1070 mm) o.c. to ensure tendons remain in their designated positions during construction operations and concrete placement.

1. Support tendons as required to provide profiles shown on installation drawings. Position supports at high and low points and at intervals not exceeding 48 inches (1220 mm). Ensure that tendon profiles between high and low points are smooth parabolic curves.
2. Attach tendons to supporting chairs and reinforcement without damaging tendon sheathing.
3. Support slab tendons independent of beam/slab reinforcement.
   a. End(s) of beam/slab reinforcement to have support bars and chairs.

C. Maintain tendon profile within maximum allowable deviations from design profile as follows:

1. 1/4 inch (6.3 mm) for member depth less than or equal to 8 inches (200 mm).
2. 3/8 inch (10 mm) for member depth greater than 8 inches (200 mm) and less than or equal to 24 inches (610 mm).
3. 1/2 inch (13 mm) for member depth greater than 24 inches (610 mm).

D. Maintain minimum radius of curvature of 480-strand diameters for lateral deviations to avoid openings, ducts, and embedded items. Maintain a minimum of 2 inches (50 mm) of separation between tendons at locations of curvature.

E. Limit tendon bundles to five tendons. Do not twist or entwine tendons within a bundle. Maintain a minimum distance of 12 inches (300 mm) between center of adjacent bundles.

F. If tendon locations conflict with nonprestressed reinforcement or embedded items, tendon placement governs unless changes are authorized in writing by Structural Engineer. Obtain Structural Engineer's approval before relocating tendons or tendon anchorages that interfere with one another.

G. Deviations in horizontal spacing and location of slab tendons are permitted when required to avoid openings and inserts.

H. Installation of Anchorage Devices:

1. Place anchorage devices at locations shown on approved installation drawings.
2. Do not switch fixed and stressing-end anchorage locations unless authorized in writing by Structural Engineer.
3. Attach pocket formers, intermediate anchorage devices, and stressing-end anchorage

devices securely to bulkhead forms. Install stressing-end and intermediate anchorage devices perpendicular to tendon axis.

4. Install tendons straight, without vertical or horizontal curvature, for a minimum of 12 inches (300 mm) behind stressing-end and intermediate anchorages.
5. Embed intermediate anchorage devices at construction joints in first concrete placed at joint.
6. Minimum splice length in reinforcing bars at anchorages is 24 inches (600 mm). Stagger splices a minimum of 60 inches (1500 mm).
7. Place fixed-end anchorage devices in formwork at locations shown on installation drawings. Support anchorages firmly to avoid movement during concrete placement.
8. Remove loose caps on fixed-end anchorages, refill with post-tensioning coating, and re-attach caps to achieve a watertight enclosure.

I. Maintain minimum concrete cover as follows:

1. From Exterior Edge of Concrete to Wedge Cavity: 2 inches (50 mm) .
2. From Exterior Edge of Concrete to Strand Tail: 3/4 inch (19 mm)
3. From Exterior Edge of Concrete to Wedge-Cavity Cap: 1 inch (25 mm).
4. Top, Bottom, and Edge Cover for Anchorage Devices: 3/4 inches.

J. Maintain minimum clearance of 2 inches (75 mm) between tendons and openings. K.

Prior to concrete placement, mark tendon locations on formwork with spray paint.

L. Do not install sleeves within 36 inches (914 mm) of anchorages after tendon layout has been inspected unless authorized in writing by Contractor and Structural Engineer.

M. Do not install conduit, pipe, or embeds requiring movement of tendons after tendon layout has been inspected unless authorized in writing by Contractor and Structural Engineer.

N. Do not use couplers unless location has been approved by Contractor and Structural Engineer

3.05 SHEATHING INSPECTION AND REPAIR

A. Inspect sheathing for damage after installing tendons. Repair damaged areas by restoring post-tensioning coating and repairing or replacing tendon sheathing.

1. Ensure that sheathing is watertight and there are no air voids.
2. Follow tape repair procedures in PTI's "Field Procedures Manual for Unbonded Single Strand Tendons."

B. Maximum length of exposed strand behind anchorages is as follows:

1. Fixed (Dead) End: 12 inch.
2. Intermediate and Stressing End: 0 inch.
   a. Cover exposed strand with sheathing repair tape to prevent contact with concrete.

C. Immediately remove and replace tendons that have damaged strand.

3.06 CONCRETE PLACEMENT

A. Do not place concrete until placement of tendons and nonprestressed steel reinforcement has been inspected by special inspector and Structural Engineer.

B. Provide Structural Engineer and special inspector a minimum of 48 hours notice before concrete placement.

C. Place concrete as specified in Division 03 Section "Cast-in-Place Concrete." Ensure compaction of concrete around anchorages.

D. Ensure that position of tendon and nonprestressed steel reinforcement does not change during concrete placement. Reposition tendons and nonprestressed steel reinforcement

moved during concrete placement.

E. Ensure that method of concrete placement does not damage tendon sheathing. Do not support pump lines, chutes, or other concrete placing equipment on tendons.

3.07 TENDON STRESSING

A. Calibrate stressing jacks and gages at start of job and at least every six months thereafter. Keep copies of calibration certificates for each jack-and-gage pair on Project site and available for inspection. Exercise care in handling stressing equipment to ensure that proper calibration is maintained.

B. Stress tendons only under supervision of qualified post-tensioning superintendent.

C. Do not begin stressing operations until concrete strength has reached 3000 psi (20.7 MPa) at 3 days as indicated by compression tests of field-cured cylinders.

D. Complete stressing within 96 hours of concrete placement.

E. If concrete has not reached required strength, obtain Contractor's and Structural Engineer's approval to partially stress tendons and delay final stressing until concrete has reached required strength.

F. Stage stress according to schedule shown on the Contract Drawings.

G. If detensioning and restressing of tendon is required, discard wedges used in original stressing and provide new wedges.

H. Mark and measure elongations according to PTI's "Field Procedures Manual for Unbonded Single Strand Tendons." Measure elongations to closest 1/8 inch (3.2 mm)

I. Submit stressing records within one day of completion of stressing. If discrepancies between measured and calculated elongations exceed plus or minus 7 percent, resolve these discrepancies to satisfaction of Structural Engineer.

J. Prestressing will be considered acceptable if gage pressures shown on stressing record correspond to required stressing force and calculated and measured elongations agree within 7 percent.

K. If measured elongations deviate from calculated elongations by more than 7 percent, additional testing, restressing, strengthening, or replacement of affected elements may be required.

3.08 TENDON FINISHING

A. Do not cut strand tails or cover anchorages until stressing records have been reviewed and approved by Structural Engineer.

B. Cut strand tails as soon as possible after approval of elongations.

C. Cut strand tail between 1/2 and 1 inch (13 and 19 mm) from wedges. Do not damage tendon or concrete during removal of strand tail. Acceptable methods of cutting strand tail include the following:
   1. Oxyacetylene flame.
   2. Abrasive wheel.
   3. Hydraulic shears.
   4. Plasma cutting.

D. Install caps and sleeves on intermediate anchorages within one day of stressing.

E. Cut strand tails and install caps on stressing-end anchorages within one day of Structural Engineer's acceptance of elongations.

F. Patch stressing pockets within one day of cutting strand tail. Clean inside surface of pocket

to remove laitance or post-tensioning coating before installing patch material. Finish patch material flush with adjacent concrete.

3.09 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports. Cooperate with testing agency to facilitate the execution of its duties.

1. Before concrete placement, special inspector and Structural Engineer will inspect the following for compliance with post-tensioning installation drawings and the Contract Documents:
   a. Location and number of tendons. b. Tendon profiles and cover.
   c. Installation of backup bars, hairpins, and other nonprestressed reinforcement shown on post-tensioning installation drawings.
   d. Installation of pocket formers and anchorage devices. e. Repair of damaged sheathing.
   f. Connections between sheathing and anchorage devices.
2. Special inspector will record tendon elongations during stressing.
3. Special inspector will immediately report deviations from the Contract Documents to Contractor and Structural Engineer.

3.10 PROTECTION

A. Do not expose tendons to electric ground currents, welding sparks, or temperatures that would degrade component.

B. Protect exposed components within one workday of their exposure during installation. C.

Prevent water from entering tendons during installation and stressing.

D. Provide weather protection to stressing-end anchorages if strand tails are not cut within 10 days of stressing the tendons.

3.11 REPAIRS

A. Submit repair procedure to Contractor and Structural Engineer for evaluation and approval.

B. Do not proceed with repairs requiring removal of concrete unless authorized in writing by Contractor and Structural Engineer.

END OF SECTION

SECTION 03 5400
CAST UNDERLAYMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Liquid-applied self-leveling floor underlayment.
   1. Use gypsum-based type at above grade floors where indicated on the drawings.
   2. Acoustical mat.

1.02 RELATED REQUIREMENTS

A. Section 01 7000 - Execution and Closeout Requirements: Alteration project procedures; selective demolition for remodeling.

1.03 REFERENCE STANDARDS

A. ASTM C472 - Standard Test Methods for Physical Testing of Gypsum, Gypsum Plasters and Gypsum Concrete; 1999 (Reapproved 2014).

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's data sheets documenting physical characteristics and product limitations of underlayment materials. Include information on surface preparation, environmental limitations, and installation instructions.

1.05 QUALITY ASSURANCE

A. Applicator Qualifications: Company specializing in performing the work of this section, and approved by manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Keep dry and protect from direct sun exposure, freezing, and ambient temperature greater than 105 degrees F.

1.07 REGULATORY REQUIREMENTS

A. Conform to applicable code for combustibility or flame spread requirements.

1.08 FIELD CONDITIONS

A. Do not install underlayment until floor penetrations and peripheral work are complete.

B. Maintain minimum ambient temperatures of 50 degrees F 24 hours before, during and 72 hours after installation of underlayment.

C. During the curing process, ventilate spaces to remove excess moisture.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acoustical Mat:
   1. Maxxon Corporation; Enkasonic, Basis of design.
   2. Substitutions: See Section 01 6000 - Product Requirements.

B. Gypsum Underlayment:
   1. Maxxon Corporation; Product Gyp-Crete 2000/3.2K: www.maxxon.com, basis of design.
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MATERIALS

A. Acoustical Mat: Entangled polymeric filament mat for sound control.
   1. Composite weight: 21.54 oz/sqare yard.

2. Thickness: 3/8 inch.
3. Surface burning characteristics: Flame spread/smoke developed index of 0/0 in accordance with ASTM E84.

B. Perimeter Isolation Strip:
1. Thickness: 1/4 inch.
2. Width: 1-1/2 inch.

C. Gypsum-Based Underlayment: Gypsum based mix, that when mixed with water in accordance with manufacturer's directions will produce self-leveling underlayment with the following properties:
1. Compressive Strength: Minimum 2500 psi, tested per ASTM C472.
2. Density: Maximum 115 lb/cu ft.
3. Final Set Time: 1 to 2 hours, maximum.
4. Thickness: 1-1/8 inch to maximum 1-1/2 inch or as indicated on the drawings
5. Surface Burning Characteristics: Flame spread/Smoke developed index of 0/0 in accordance with ASTM E84. NFPA Class A.
6. Water: Potable and not detrimental to underlayment mix materials.
7. Primer: Manufacturer's recommended type.
8. Joint and Crack Filler: Latex based filler, as recommended by manufacturer.

2.03 MIXING

A. Site mix materials in accordance with manufacturer's instructions.

B. Mix to self-leveling consistency without over-watering.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are clean, dry, unfrozen, do not contain petroleum byproducts, or other compounds detrimental to underlayment material bond to substrate.

3.02 PREPARATION

A. Remove substrate surface irregularities. Fill voids and deck joints with filler. Finish smooth.

B. Vacuum clean surfaces.

C. Prime substrate in accordance with manufacturer's instructions. Allow to dry.

D. Close floor openings.

3.03 APPLICATION

A. Install acoustical mat in accordance with manufacturer's instructions in locations indicated in drawings.

B. Install perimeter isolation strip at perimeter of all areas receiving acoustical mat, and around any protrusions through the installation. Adhere or staple to the wall per manufacturer's instructions.

C. Install gypsum underlayment in accordance with manufacturer's instructions.

D. Pump or pour material onto substrate. Do not retemper or add water.
1. Pump, move, and screed while the material is still highly flowable.
2. Be careful not to create cold joints.

E. Place to indicated thickness, with top surface level to 1/8 inch in 10 ft.

3.04 CURING

A. Once underlayment starts to set, prohibit foot traffic until final set has been reached.

B. Air cure in accordance with manufacturer's instructions.

3.05 PROTECTION

A. Protect against direct sunlight, heat, and wind; prevent rapid drying to avoid shrinkage and cracking.

B. Do not permit traffic over unprotected floor underlayment surfaces.

END OF SECTION

SECTION 04 2200

CONCRETE MASONRY UNITS

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. Work under this section includes: Provision of concrete masonry work, including but not limited to, masonry units, mortar, grout, reinforcing steel, control joints, testing and inspection.

1.02 APPLICABLE STANDARDS (LATEST EDITIONS APPLY.)

A. ASTM- American Society for Testing and Materials (ASTM), Referenced Standards.

B. ACI- American Concrete Institute's

1. ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures".
2. ACI 530-11/ ASCE 5-11/ TMS 402-11 “Building Code Requirements for Masonry Structures”

C. ICC- International Code Council.

1. CBC- California Building Code, 2013 Edition

D. ASCE/ SEI – American Society of Civil Engineers:

1. 07-10 – Minimum Design Loads for Buildings and Other Structures.

1.03 SUBMITTALS

A. Manufacturer's literature describing products.

B. Grout Mix Design.

C. Certificates for concrete masonry units.

D. Masonry prism test record or pre-construction masonry prism test results.

E. Reinforcing Steel Shop Drawings.

1.04 QUALITY ASSURANCE

A. Allowable Tolerances: Unit masonry shall be placed within 1/8 inch of dimensions noted.

B. Design Criteria:

1. Reinforcing steel shall not be permitted to rust where there is danger of staining exposed surfaces of adjacent concrete.
2. The Contractor shall replace rust-stained concrete and/or masonry at his expense.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Concrete Masonry Units (CMU): Hollow load-bearing concrete masonry units complying with ASTM C90, grade N, type I.

1. Provide compressive strength necessary to obtain masonry assemblage compressive strength indicated in drawings.
2. Color: Natural Grey, unless otherwise indicated on drawings.
3. Sizes as shown on the drawings; single open end units 2 cell blocks by 16 inches long unless otherwise noted. Maximum dimensional variation of ± 1/8 inch. Provide accessory shapes as indicated or otherwise required.

4. Lightweight units with a density less than 105 pcf and a maximum water absorption of 18 pcf.
5. Shrinkage of blocks shall not exceed 0.065 percent when tested per ASTM C426.
6. At the time of delivery to a job site, blocks shall not exceed a value in weight of contained water in excess of 30% of full saturated water content total for the unit tested. Units shall be shipped and stored with protection to prevent increase in water content from rain or other sources.
7. Block shall be cured a minimum of 28 days at the time of placement.

B. Mortar: Conform to ASTM C270, Type M.

1. Provide compressive strength necessary to obtain masonry assemblage compressive strength indicated on the drawings.
2. Proportions by Volume: 1 part Portland cement, 1/4 part lime, 3 ½ parts aggregate.
3. Color: Natural Grey, unless otherwise noted on drawings.
4. Portland Cement: ASTM C150, Type II
5. Hydrated Lime: ASTM C207, Type S
6. Quicklime: ASTM C5
7. Aggregates: Clean, dry, and protected against dampness, freezing and foreign matter. Conform to ASTM C144.
8. Water: Clean, potable, and free of injurious materials.

C. Grout: Course grout, transit mixed conform to ASTM C476 Table I.

1. Provide compressive strength as necessary for masonry assemblages to attain compressive strengths shown on the drawings.
2. Slump: 8 to 11 inches.
3. Portland Cement: ASTM C150, Type II
4. Hydrated Lime: ASTM C207, Type S
5. Quicklime: ASTM C5
6. Aggregates: Clean, dry, and protected against dampness, freezing and foreign matter. Conform to ASTM 404.
7. Water: Clean, potable, and free from impurities detrimental to concrete.
8. Additives and Admixtures: Only as authorized by the Engineer.

D. Reinforcing Bars: See Section 3200, Concrete Reinforcement.

E. Joint Reinforcement: Conforming to ASTM A951, minimum 1/8 inches in diameter.

F. Control Joints: Preformed rubber in profiles required or shown.

2.02 MORTAR MIXING

A. Mix in batch mechanical mixer of at least one-sack capacity permitting accurate control of water amounts.

B. Mix materials for at least three minutes with minimum of water to produce workable consistency.

C. Use and place mortar in final position within 2½ hours after mixing.

1. Mortar that has stiffened as a result of evaporation of water may be retempered with water as frequently as required to restore required consistency during this time period.

2.03 SOURCE QUALITY CONTROL

A. The Owner's Testing Agency will:

1. Collect mill test reports for reinforcements.
2. Sample and test concrete masonry units in accordance with ASTM C140.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas to receive masonry and verify the following:

1. Foundation surface is level to permit bed joint within range of 1/4 to 3/4 inch.
2. Edge is true to line to permit projection of masonry to less than 1/4 inch.
3. Projecting dowels are free from loose scale, dirt, concrete, or other bond-inhibiting substances and properly located.

B. Do not begin before unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Protect surrounding work to prevent damage from masonry work.

B. Clean concrete surfaces to receive masonry.

C. Remove laitance or other foreign material lodged in surface by sandblasting or other means as required.

D. Ensure masonry units are clean and free from dust, dirt, or other foreign materials before laying.

E. Roughen concrete below walls to expose aggregate; remove loose particles and saturate before laying blocks.

3.03 REINFORCEMENT

A. Place bars where noted in accordance with ACI 315 and do not disturb after start of masonry placement.

B. All horizontal reinforcement to be laid in bond beam units.

C. Minimum clearance between bar and CMU is 1/2 inch and between parallel bars is 1 inch.

3.04 PLACEMENT

A. General Requirements:

1. Ensure masonry units are sound, clean and free of cracking at time of placement. No fractional parts of units shall be used where whole units can be used.
2. Do not place masonry units when temperature is below 40 degrees.
3. Accurately cut and fit units as required to accommodate other work using masonry saws.
4. Lay masonry units plumb, true to line, with level courses accurately placed.
5. Adjust unit to final position while mortar is soft and plastic.
6. Align vertical cells accurately.
7. Remove units disturbed after stiffening of mortar, clean joints, and relay unit with fresh mortar.
8. Do not lay up one tier of wall more than 16 inches ahead of other tier.

9. Where necessary to stop longitudinal run, rack back 1/2 block length in each course.
10. Do not attach construction supports to walls, except where permitted by the Architect.
11. Install anchors, bolts, and other embedded items accurately as work progresses.

B. Joints:

1. Joints thickness 3/8" vertically and horizontally noted. Ensure full coverage of face shells in both horizontal and vertical joints and on webs.
2. Form concave joints unless otherwise noted. Tool joints as specified and achieve solid, smooth, watertight, compacted joints.
3. Joints Exposed to Weather: Point with pointing tools making solid, smooth, watertight joint well bonded to masonry at edges.
4. Immediately fill holes made by line pin with mortar when pin is withdrawn.
5. Remove surplus mortar from joints.

C. Coursing:

1. Place masonry to lines and levels indicated.
2. Maintain masonry courses to uniform width. Make vertical and horizontal joints equal and in a uniform thickness of 3/8 inch.
3. Lay concrete masonry units in running bond. Course one block unit and one mortar joint equal to 8 inches unless noted otherwise. Form concave mortar joints.

D. Tolerances:

1. Variation from Unit to Adjacent Unit: 1/32 inch maximum.
2. Variation from Plane of Wall: ¼ inch in 10 feet (6mm in 3m) and ½ inch in 20 feet or more.
3. Variation from plumb: ¼ inch per story (non-cumulative).
4. Variation from Level Coursing: 1/8 inch in 3 feet; ¼ inch in 10 feet; ½ inch maximum.
5. Variation of joint thickness: 1/8 inch in 3 feet.
6. Maximum variation from Cross Sectional Thickness of Walls: ¼ inch.

E. Control Joints: Install control joints as shown on the drawings.

F. Built-In Work: As work progresses, install veneer anchors, anchor bolts, plates, sleeves and other items to be built in the work supplied by other sections.

G. Cutting and Fitting:

1. Cut and fit for phases, pipes, conduit sleeves and grounds. Cooperate with other sections of work to provide correct size, shape and location.
2. Obtain approval prior to cutting or fitting any area not so indicated or where appearance or strength of masonry work may be impaired.

H. Cold Weather Requirements:

1. When daily temperature is below 40 degrees F., ensure reinforcing, masonry units, etc., contacting mortar, and grout are free of frost.
2. Protect all mortar and grout from freezing for at least 48 hours after installation whenever temperature falls below 40 degrees F.
3. Maintain mortar and grout at temperature no lower than 50 degrees F., while being used and until installed.

4. In freezing or near freezing weather, provide equipment of adequate size for heating of mortar and grout.

5. Do not add water to mix at temperature greater than 140 degrees F.

I. Protection:

1. Protect face materials against staining.

2. Remove misplaced grout or mortar immediately.

3. Protect sills, ledges, offsets, and similar items from mortar drippings or other damage during construction.

J. Requirements for Walls to be Grouted by High-Lift Method:

1. Lay up walls full story prior to grouting.

2. Build vertical grout barriers or dam of solid masonry across grout space at no more than 25 feet on centers to control horizontal flow of grout.

3. Provide cleanouts by leaving out every other unit in bottom course; seal after inspection and before grouting.

4. During laying up, remove mortar fins and other foreign matter from grout space with high-pressure jet stream or stick and compressed air.

3.05 GROUTING

A. General Requirements:

1. Use high-lift or low-lift grouting, at Contractor's option.

2. Grout voids between wythes and cells of concrete block.

3. Ensure grout flows into voids and completely surrounds reinforcing steel.

4. Stop grout approximately 1 inch below top of last course, except at top course; bring grout flush with top of block.

5. Grout from inside face of masonry wherever possible.

6. Where necessary to stop longitudinal run, provide suitable dam to retain grout in place.

7. Do not wet down grout spaces prior to grouting.

B. Low-Lift Grouting:

1. Pour grout to a maximum height of 4 feet, stopping ½ inch below top of unit or over horizontal steel which shall be fully embedded in grout.

2. Delay 3 to 5 minutes allowing the excess of water to be absorbed by the masonry unit, then consolidate by vibrating.

3. Layup and grout next 4 feet of walls.

C. High Lift Grouting

1. Ensure cleanout has been sealed before grouting.

2. If grout pour is 8 feet or less, it may be placed in one lift. If total pour exceeds 8 feet, the grout shall be placed in 4-foot lifts.

3. Pour first lift to a depth not in excess of 4 feet.

4. Delay 3 to 5 minutes allowing the excess of water to be absorbed by the masonry units, then consolidate by vibrating.

5. Complete pour in sequence with other lifts not in excess at 4 feet. Combined reconsolidation of previous lift with consolidation of following lift is permitted.

3.06 POINTING AND CLEANING

A. Point holes or defective mortar joints upon completion of work; where necessary, cut out and repoint defective joints.

B. Clean soiled surfaces with a non-acidic solution which will not harm masonry or adjacent materials.

C. Upon completion of work, remove from site surplus materials, rubbish and debris resulting from this work.

3.07 FIELD QUALITY CONTROL

A. Special Inspection:

When noted on the drawings, the Owner shall employ an approved, qualified masonry inspector to perform continuous masonry inspection. Acceptance by a State or Municipality having a program of examining and certifying masonry inspectors will be considered adequate qualifications. The masonry inspector shall be at the site during all masonry construction and perform the following duties:

1. Before masonry work commences, meet with the Contractor and the Architect in a joint meeting to establish the requirements for surveillance and quality control of the masonry work.
2. Check brand and type of cement, lime (if used) and source of sand.
3. Inspect the foundation or slab to ascertain that it is clean and ready to receive units.
4. Check reinforcing steel dowels for straightness, proper alignment, spacing, size and length.
5. Observe manner in which units are laid up to ensure that joints are full of mortar and kept tight during work. Inspect cells to assure that fins will not interfere with grouting or foaming. Instruct masons to keep cells clean of mortar droppings and inspect to determine compliance.
6. Observe placing of grout continuously.
7. Perform or supervise performance of required sampling and field testing as specified.
8. Keep complete record of inspection of work. Report daily to the Owner's Representative the progress of the masonry inspection.

B. Prism Test: The Owner's Testing Agency will perform prism testing in accordance with CBC Section 2105.2.2.2.

END OF SECTION

SECTION 04 2616
ADHERED MASONRY VENEER

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Thin Brick.

B. Mortar and Grout.

C. Adhesives.

D. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Wood stud backup for masonry veneer.

B. Section 07 2500 - Weather Barriers: Air barrier over sheathing.

C. Section 07 6200 - Sheet Metal Flashing and Trim: Through-wall masonry flashings.

D. Section 07 9005 - Joint Sealers.

1.03 REFERENCE STANDARDS

A. ASTM C1088 - Standard Specification for Thin Veneer Brick Units Made From Clay or Shale; 2014.

B. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation; 2015.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data for thin brick units, mortar, grout, and adhesive.

C. Samples: Submit three samples of thin brick units to illustrate color, texture, and extremes of color range.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of type specified and with at least five years of documented experience.

1.07 MOCK-UP

A. Construct a mock-up panel sized 4 feet long by 4 feet high; include grout and all unit types and sizes to be used and masonry joint treatment in mock-up.

B. Locate where directed.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

B. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

1.09 FIELD CONDITIONS

A. Do not install adhesives in an unventilated environment.

PART 2 PRODUCTS

2.01 THIN BRICK

A. Manufacturers:
   1. H.C. Muddox, basis of design: www.hcmuddox.com.
   2. Substitutions: See Section 01 6000 - Product Requirements.

B. Thin Brick: ASTM C1088.

1. Type: TBX.
2. Size: Manufacturer's standard Modular.
3. Thickness: 5/8 inch minimum thickness.
4. Tolerances: 1/16 inch.
5. Color, Texture, Range, Special Shapes: As shown on the drawings.
6. Protective Coating: Wax.

2.02 ADHESIVE MATERIALS

A. Manufacturers:
   1. LATICRETE International, Inc; LATICRETE Hi-Bond Masonry Mortar: www.laticrete.com.
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.03 MORTAR MIXES

A. Grout: ASTM C476. Consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches.

2.04 ACCESSORIES

A. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

B. Air and Water Barrier: Single component, fluid applied, vapor permeable; waterproofing, crack isolation, and air barrier membrane.
   1. Manufacturers:
      a. LATICRETE International, Inc; LATICRETE Air & Water Barrier, basis of design; www.laticrete.com.
      b. Substitutions: See Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive thin brick veneer.

B. Verify that related items provided under other sections are properly sized and located.

C. Verify that built-in items are in proper location, and ready for installation of thin brick veneer.

3.02 INSTALLATION

A. Exterior Applications: Comply with TCNA (HB) Method W201, W202, or W244E.

3.03 COURSING

A. Establish lines, levels, and coursing indicated. Protect from displacement.

B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

C. Brick Units:
   1. Bond: As indicated on the drawings.
   2. Coursing: Three units and three mortar joints to equal 8 inches.
   3. Mortar Joints: Concave.

3.04 PLACING AND BONDING

A. Remove excess mortar as work progresses.

B. Interlock intersections and external corners.

C. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

3.05 CONTROL AND EXPANSION JOINTS

A. Form joints as detailed on drawings.

3.06 TOLERANCES

A. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.

B. Maximum Variation from Plane of Wall: 1/4 inch in 10 feet and 1/2 inch in 20 feet or more.

C. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.

D. Maximum Variation from Level Coursing: 1/8 inch in 3 feet and 1/4 inch in 10 feet; 1/2 inch in 30 feet.

E. Maximum Variation of Joint Thickness: 1/8 inch in 3 ft.

3.07 CUTTING AND FITTING

A. Cut and fit for pipes and conduit. Coordinate with other sections of work to provide correct size, shape, and location.

3.08 CLEANING

A. Clean soiled surfaces with cleaning solution.

3.09 PROTECTION

A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

END OF SECTION

SECTION 05 1200
STRUCTURAL STEEL FRAMING

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Provisions established in the Contract, Division 01 Specification Sections, and the Drawings apply to this Section.

1.02 SUMMARY

A. This Section includes structural steel and grout.

1.03 PERFORMANCE REQUIREMENTS

A. Connections: Structural Engineer to provide details of connections required by the Contract Documents to be completed by structural-steel fabricator.

1.04 SUBMITTALS

A. Product Data: For each type of product indicated. B. Shop Drawings: Show fabrication of structural- steel components.

C. Welding certificates.

D. Mill test reports.

E. Source quality-control test reports.

1.05 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified fabricator who participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category Sbd.

B. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel."

C. Comply with applicable provisions of AISC's "Code of Standard Practice for Steel Buildings and Bridges."

D. Preinstallation Conference: Conduct conference at Project site.

PART 2 - PRODUCTS

2.01 STRUCTURAL-STEEL MATERIALS

A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 50 percent.

B. W-Shapes: ASTM A 992, Grade 50 (345).

C. Channels, Angles, M, S-Shapes: ASTM A 36. D.

Plate and Bar: ASTM A 36.

E. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B. F.

Steel Pipe: ASTM A 53, Grade B, Type E or S.

G. Welding Electrodes: Comply with AWS requirements.

2.02 BOLTS, CONNECTORS, AND ANCHORS

A. High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, heavy hex steel structural bolts; ASTM A 563 (ASTM A 563M) heavy hex carbon-steel nuts; and ASTM F 436 (ASTM F 436M) hardened carbon-steel washers.

1. Finish: Plain.
2. Direct-Tension Indicators: ASTM F 959, Type 325 (ASTM F 959M, Type 8.8,) compressible-washer type. a.

Finish: Plain.

B. High-Strength Bolts, Nuts, and Washers: ASTM A 490 (ASTM A 490M), Type 1, heavy hex steel structural bolts or tension-control, bolt-nut-washer assemblies with splined ends; ASTM A 563 (ASTM A 563M) heavy hex carbon-steel nuts; and ASTM F 436 (ASTM F 436M) hardened carbon-steel washers, plain.

1. Direct-Tension Indicators: ASTM F 959, Type 490 (ASTM F 959M,) Type 10.9, compressible-washer type, plain.

C. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, heavy hex head steel structural bolts with splined ends; ASTM A 563 (ASTM A 563M) heavy hex carbon-steel nuts; and ASTM F 436 (ASTM F 436M) hardened carbon-steel washers.

1. Finish: Plain.

D. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1, Type B.

E. Threaded Rods: ASTM A 36 or ASTM A 449.

1. Finish: Plain.

2.03 PRIMER

A. Primer: SSPC-Paint 25, Type II, iron oxide, zinc oxide, raw linseed oil, and alkyd.

B. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer.

2.04 GROUT

A. Metallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, metallic aggregate grout, mixed with water to consistency suitable for application and a 30-minute working

time.

B. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.05 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC's "Specification for Structural Steel Buildings."

B. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's written instructions.

2.06 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Slip critical.

B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.

2.07 SHOP PRIMING

A. Shop prime steel surfaces except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches (50 mm).
2. Surfaces to be field welded.
3. Surfaces to be high-strength bolted with slip-critical connections.
4. Surfaces to receive sprayed fire-resistive materials.
5. Galvanized surfaces.

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:

1. SSPC-SP 2, "Hand Tool Cleaning."
2. SSPC-SP 3, "Power Tool Cleaning."

C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a dry film thickness of not less than 1.5 mils (0.038 mm). Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

2.08 SOURCE QUALITY CONTROL

A. Owner will engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports. Comply with testing and inspection requirements of Part 3, Article "Field Quality Control."

B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

C. In addition to visual inspection, shop-welded shear connectors will be tested and inspected according to requirements in AWS D1.1 for stud welding.

PART 3 - EXECUTION

3.01 ERECTION

A. Examination: Verify elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments, with steel erector present, for compliance with requirements.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Set structural steel accurately in locations and to elevations indicated and according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and "Specification for Structural Steel Buildings."

C. Base and Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting base and bearing plates. Clean bottom surface of base and bearing plates.

1. Set base and bearing plates for structural members on wedges, shims, or setting nuts as required.
2. Weld plate washers to top of base plate, where required.
3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of base or bearing plate before packing with grout.
4. Promptly pack grout solidly between bearing surfaces and base or bearing plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

D. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

E. Splice members only where indicated.

3.02 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Slip critical.

B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.

1. Comply with AISC's "Code of Standard Practice for Steel Buildings and Bridges" and "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design" for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.

3.03 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.

B. Bolted Connections: Shop-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

C. Welded Connections: Field welds will be visually inspected according to AWS D1.1.

1. In addition to visual inspection, field welds will be tested according to AWS D1.1 and the following inspection procedures, at testing agency's option:

a. Liquid Penetrant Inspection: ASTM E 165.
b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
c. Ultrasonic Inspection: ASTM E 164.
d. Radiographic Inspection: ASTM E 94.

D. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

END OF SECTION

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SECTION 05 4000
STEEL STUDS

PART I - GENERAL

1.01 Description

A. Section Includes: Provision of light gauge steel stud and joist framing. Work includes, but is not necessarily limited to the following:

1. Load-bearing steel stud framing at exterior walls.

2. Interior stud wall and ceiling framing with studs 18-gauge and heavier.

3. Framing accessories.

B. Related Sections:

1. Section 05 12 00 - Structural Steel

2. Section 05 40 00 - Metal Framing Systems

3. Section 05 50 00 - Metal Fabrications

4. Section 09 24 00 – Cement Plaster

5. Section 09 23 00 - Gypsum Board Systems

1.02 References

A. Requirements of the GENERAL CONDITIONS and DIVISION NO. 1 apply to all Work in this Section.

B. Published specifications, standards, tests, or recommended methods of trade, industry, or governmental organizations apply to Work of this Section where cited by abbreviations noted below (latest editions apply).

1. American Society for Testing and Materials (ASTM).

2. Federal Specifications (FS).

3. American Welding Society (AWS) D1.3: "Structural Welding Code - Sheet Steel".

4. American Iron and Steel Institute (AISI): "Specifications for the Design of Cold-Formed Steel Structural Members".

5. Metal Lath Association (MLA): "Specifications for Metal Lath and Furring".

6. Steel Structures Painting Council (SSPC): "Painting Manual".

7. California Building Code (CBC), 2013 Edition.

1.03 Quality Assurance

A. Regulatory Requirements:

1. Comply with fire-resistance ratings as indicated and as required by governing authorities and codes.

2. Provide materials, accessories, and application procedures which have been listed by an approved testing agency or tested according to ASTM E119 for the type of construction shown.

3. Comply with requirements of CBC Section 2209 for design and identification of cold-formed steel.

4. Framing system shall conform to ICC-ES Report for stud gauge and spacing for all wall conditions.

B. Steel stud system shall conform to referenced AISI documents.

C. Installer: Company specializing in performing the work of this Section with minimum 3 years documented experience.

D. Welders: Qualified in accordance with AWS D1.3 for welding process, position, type of weld and type of steel.

1.04 Submittals

A. Submit in accordance with provisions of Section 01 33 00, "Submittals".

[Note to Specifier: Delete "B" where steel studs are detailed on drawings.]

B. Shop Drawings: Include plans and elevations at not less than 1/4 inch to 1'-0" scale, and details at not less than 3 inches to 1'-0" scale.

1. Indicate wall stud and ceiling joist layout.

2. Indicate component details, framed openings, bearing, anchorage to structure, type and location of fasteners and accessories, and items required of related work for complete installation of steel stud system.

C. Product Data: Manufacturer's ICC-ES report, specifications and installation instructions for steel studs, fasteners, and accessories.

D. Experience of installer if requested by Architect.

1.05 Product Delivery, Storage and Handling

A. Procedures: In accordance with Section 01 60 00, "Materials and Equipment".

B. Protect framing from rusting and damage.

C. Deliver in manufacturer's unopened containers or bundles fully identified with name, brand, type and grade.

D. Store inside a dry, ventilated space, and protect framing from rust and damage.

1.06 Job Conditions

A. Coordinate stud sizes and layouts with the work of the various trades. Where ductwork, conduit, piping, casework, and other such items exceed indicated available space, increase stud sizes or make other minor modifications as necessary to accommodate the work at no change in cost of the Work.

PART II - PRODUCTS

2.01 Manufacturers

A. Acceptable Manufacturers: Angeles Metal Systems, Western Metal Systems, or equal product substituted per Section 01 62 00.

2.02 Materials

A. Sheet Steel: ASTM A570, Grade 50.

B. Studs: Cee studs with punched web, unless otherwise noted, formed of gauge as specified on the Drawings.

1. Provide ASTM A570, Grade 50 and 30, shop-coat with manufacturer's standard rust-inhibitive primer after fabrication.

2. Minimum properties for each size stud shall be as follows, unless otherwise indicated on Drawings.

[Note to Specifier: Review Table and modify as appropriate.]

Size (inches)	Gauge	Flange Width (in.)	Moment of Inertia (in.)	Section Modulus (in^3)	Grade (ksi)
3-5/8	16	1-5/8	0.917	0.506	50
3-5/8	18	1-5/8	0.744	0.411	30
6	16	1-5/8	2.970	0.990	50
6	18	1-5/8	2.403	0.801	30
8	16	1-5/8	6.038	1.509	50

C. Floor Tracks: Formed from same gauge and grade of steel as used for studs: 1-1/4-inch legs.

1. Provide ASTM A446, Grade D, or shop-coat with rust-inhibitive primer after fabrication.

D. Ceiling Tracks: Formed from 16-gauge steel, 2-inch legs.

1. Provide ASTM A446, Grade D, or shop-coat with rust-inhibitive primer after fabrication.

E. Cold-Rolled Furring Channels: As specified in Section 09 22 00, "Metal Support Systems".

F. Partition Stiffeners or Bridging: Unpunched channel shape, formed of 16-gauge steel to required dimensions.

G. Powder-Driven Fasteners:

1. Tempered-steel pins with special corrosive-resistant plating or coating.

2. Pins shall have guide washers to accurately control penetration, minimum 1-1/4 inch.

3. Fastening shall be accomplished by low-velocity, piston-driven, powder-accentuated tool.

4. Pins and tool shall be Hilti Fastening Systems DN-32-P8 (ESR # 1752) or equal product substituted per Section 01 62 00.

H. Expansion Bolts: Hilti Fastening Systems "Kwik Bolt 3 Concrete Anchors" (ICC-ES #1385), or equal product substituted per Section 01 62 00.

I. Welding Electrodes: AWS low hydrogen, rod number and diameter as approved by the Owner's Testing Agency.

J. Bracing: Provide cross diagonal 3-inch wide by 14-gauge straps, welded as indicated on the Drawings and per stud manufacturer's specifications for frame stability.

K. Touch-up Primer for Galvanized Surfaces: SSPC Paint 20 zinc rich.

L. Metal Screws: Self-drilling and self-tapping; No. 8 pan head and larger as noted on Drawings.

PART III - EXECUTION

3.01 Preparation

A. Coordinate details and requirements of other Work which adjoins or fastens to studs and requires backing or special support framing included in this Section.

1. Items requiring backing or support include, but are not necessarily limited to casework, wall-specialties, and similar items.

2. Obtain Architect's approval of backing method proposed to satisfy requirements of this Section which differs from methods noted or shown.

3.02 Examination

A. Examine all parts of the supporting structure and the conditions under which studs will be installed.

B. Notify the Architect, in writing, of any conditions detrimental to the proper and timely completion of the Work.

C. Do not proceed with the installation of steel studs until unsatisfactory conditions have been corrected.

3.03 Installation

A. Tracks shall be securely anchored to supporting structure, with fasteners specified at not

more than 24 inches on center.

B. Complete, uniform, and level bearing support shall be provided for the bottom track at each bearing/stud location. Install full metal shims below bottom track at stud locations as needed, or set bottom track in high-strength grout.

C. Abutting or intersecting pieces or track shall be securely anchored to a common structural element or spliced together.

1. Splices or butt welds shall be used at all butt joints in the runner track.

2. Do not splice studs.

D. Studs shall sit squarely in the top and bottom runner track with firm abutment against track webs.

1. Studs shall be aligned or plumbed and securely fastened to the flanges of both top and bottom track.

2. Space studs 16 inches on center maximum unless otherwise noted on Drawings.

E. Framed wall openings shall include a header and multiple studs at each edge of opening as indicated on Drawings.

F. Diagonal bracing shall be installed at locations indicated for frame stability.

G. Install bridging as indicated on Drawings where studs are to be finished on one side only.

H. Form corners and intersections of partitions with three studs. Provide additional studs as indicated or required.

I. Joining of members shall be made with welding; wire tying of framing members shall not be permitted.

J. Welded connections shall be made by resistance spot fusion welding, fillet welding, or plug welding and shall be done in accordance with the latest recommended procedures and practices of the American Welding Society.

K. Do not cut or notch stud flanges or cut additional opening in stud web.

L. Field abrasions and welds shall be touched up with zinc rich primer.

M. Tolerance: Install members to provide surface plane with maximum variation of 1/4 inch in 10 feet in any direction.

3.04 Installation of Fire-Rated Assemblies

A. Install studs which are components of fire-rated wall assemblies as indicated.

3.05 Backing In Stud Partitions

A. Securely weld or screw cut sections of unpunched stud to at least three stud or furring supports, leaving flat surface of backing stud web to receive attachment of object to be secured.

B. Verify that any predrilling of backing and attachment of spacers to prevent crushing of

collateral material is done prior to application of collateral material.

C. If it is determined by the Architect that backing was not provided for any items as required, the Contractor shall remove the finish material and install backing. The Contractor shall patch and refinish surface to match adjacent area and finish.

3.06 Field Quality Control

A. The Owner's Testing Agency will:

1. Provide continuous inspection of welding, including prior fit-up, welding equipment, weld quality, and welder certification in accordance with CBC Section 1704.3.

2. Provide continuous inspection during installation as required to establish conformity of Work requirements.

END OF SECTION

SECTION 05 5000
METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Shop fabricated steel items, including:elevator pit ladders, guard rails, bollards, overhead door frames, elevator hoistway beams, elevator sill supports, countertop supports, reinforcement for low partitions, supports for mechanical and electrical equipment, shelf angles, and loose bearing and leveling plates for applications where they are not specified in other sections.

B. Furnished, but not installed: loose steel lintels, anchor bolts, steel pipe sleeves, slotted-channel inserts, wedge-type inserts indicated to be cast into concrete or built into masonry, and steel weld plates and angles for casting into concrete for applications where they are not specified in other sections.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Placement of metal fabrications in concrete.

B. Section 04 2000 - Unit Masonry: Placement of metal fabrications in masonry.

C. Section 04 2723 - Cavity Wall Unit Masonry: Placement of metal fabrications in masonry.

D. Section 05 5100 - Metal Stairs.

E. Section 09 9113 - Exterior Painting: Paint finish.

1.03 REFERENCE STANDARDS

A. ANSI A14.3 - American National Standard for Ladders -- Fixed -- Safety Requirements; 2008.

B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

C. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2013.

D. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength; 2014.

E. ASTM A325M - Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Minimum Tensile Strength (Metric); 2014.

F. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2013.

G. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2014.

H. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015.

I. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel; International Accreditation Service, Inc; 2011.

J. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).

K. SSPC-SP 2 - Hand Tool Cleaning; 1982 (Ed. 2004).

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.

C. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is accredited under IAS AC172.

1.05 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified steel fabricator that is accredited by IAS AC172.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

A. Steel Sections: ASTM A36/A36M.

B. Steel Tubing: ASTM A501/A501M hot-formed structural tubing.

C. Plates: ASTM A283/A283M.

D. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.

E. Bolts, Nuts, and Washers: ASTM A325 (ASTM A325M), Type 1, plain.

F. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

G. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

2.02 FABRICATION

A. Fit and shop assemble items in largest practical sections, for delivery to site.

B. Fabricate items with joints tightly fitted and secured.

C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

D. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.03 FABRICATED ITEMS

A. Ladders: Steel; in compliance with ANSI A14.3; with mounting brackets and attachments; prime paint finish.
   1. Side Rails: 3/8 x 2 inches members spaced at 20 inches.
   2. Rungs: one inch diameter solid round bar spaced 12 inches on center.
   3. Space rungs 7 inches from wall surface.

B. Bumper Posts and Guard Rails: As detailed; prime paint finish.

C. Bollards: Steel pipe, concrete filled, crowned cap, as detailed; prime paint finish.

D. Door Frames for Overhead Door Openings: Channel sections; prime paint finish.

E. Elevator Hoistway Divider Beams: Beam sections; prime paint finish.

2.04 FINISHES - STEEL

A. Prime paint all steel items.
   1. Exceptions: Do not prime surfaces in direct contact with concrete, where field welding is required, and items to be covered with sprayed fireproofing.

B. Prepare surfaces to be primed in accordance with SSPC-SP2.

C. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

D. Prime Painting: One coat.

2.05 FABRICATION TOLERANCES

A. Squareness: 1/8 inch maximum difference in diagonal measurements.

B. Maximum Offset Between Faces: 1/16 inch.

C. Maximum Misalignment of Adjacent Members: 1/16 inch.

D. Maximum Bow: 1/8 inch in 48 inches.

E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

3.03 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Field weld components as indicated on drawings.

D. Perform field welding in accordance with AWS D1.1/D1.1M.

E. Obtain approval prior to site cutting or making adjustments not scheduled.

F. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

SECTION 05 5010

MISCELLANEOUS METALS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Provisions established in the Contract, Division 01 Specification Sections, and the Drawings apply to this Section.

1.02 SUMMARY

A. Section Includes
1. Fencing at garage.
2. Elevator pit ladder.
3. Tube steel fencing.
4. Trench drain cover.
5. Metal grates at areaways.
6. Metal grille exhaust vent.
7. Elevator support beam.
8. Elevator sill support.
9. Elevator guide rail supports.
10. Rough hardware.
11. Stairs
12. Stairs guard and hand rails
13. Deck guard rails

B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.03 REFERENCES

A. AISC - American Institute of Steel Construction Inc.

B. ANSI - American National Standards Institute
1. A14.3 - Safety Requirements for Fixed Ladders.
2. B18.6.3 - Machine Screws and Machine Screw Nuts.
3. B18.21.1 - Lock Washers (Inch Series).
4. B18.22.1 - Plain Washers.

C. ASTM - American Society for Testing and Materials
1. A27 - Standard Specification for Steel Castings, Carbon, for General Application.
2. A36 - Standard Specification for Carbon Structural Steel.
3. A47 - Standard Specification for Ferritic Malleable Iron Castings.
4. A48 - Standard Specification for Gray Iron Castings.
5. A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
6. A283 - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.
7. A307 - Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
8. A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
9. A501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel

Structural Tubing.
10. A563 - Standard Specification for Carbon and Alloy Steel Nuts.
11. A786 - Standard Specification for Hot-Rolled Carbon, Low-Alloy, High-Strength Low-Alloy, and Alloy Steel Floor Plates.
12. B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
13. C109 - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-inch Cube Specimens).
14. C157 - Standard Test Method for Length Change of Hardened Hydraulic-Cement, Mortar, and Concrete.
15. C191 - Standard Test Method for Time of Setting of Hydraulic Cement by Vicat Needle.
16. D1187 - Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal.
17. E488 - Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements.
18. F593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws and Studs.
19. F594 - Standard Specification for Stainless Steel Nuts.

D. AWS - American Welding Society
1. D1.1 - Structural Welding Code - Steel.
2. D1.3 - Structural Welding Code - Sheet Steel.

E. CBC - California Building Code, 2007 Edition

F. NAAMM - National Association of Architectural Metal Manufacturers
1. MFM - Metal Finishes Manual for Architectural and Metal Products.

G. SSPC - The Society for Protective Coatings
1. PA 1 - Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel.
2. SP 2 - Surface Preparation Specification No. 2: Hand Tool Cleaning.
3. SP 3 - Surface Preparation Specification No. 3: Power Tool Cleaning.
4. SP 6 - Surface Preparation Specification No. 6: Commercial Blast Cleaning.

H. USGBC - U.S. Green Building Council
1. LEED - Leadership in Energy & Environmental Design Rating System.

1.04 SYSTEM DESCRIPTION

A. Performance Requirements
1. Wind Load Requirements for Exterior Items: Size members to withstand dead and live loads caused by pressure and suction of wind in accordance with CBC.
2. Work of this Section shall support normally imposed loads and in conformity with AISC requirements.
3. Provide for expansion and contraction.
4. Exterior items shall exclude water.

5. Elevator Pit Ladder: Fabricate ladder in accordance with requirements of NAAMM, except that for vertical ladders, the distance from ladder rung to elevator pit wall shall not be less than 4 inches. Ladder to extend vertically from 12 inches above pit floor to 42 inches above first floor elevator door sill.
6. Shop drawings and calculations for metal fabrications fabricated under work of this Section shall be prepared under direct supervision of State of California licensed Structural Engineer and shall be so wet stamped and wet signed.

1.05 SUBMITTALS

A. Product Data: Submit manufacturer's product data for warning strips, paint products, and grout.

B. Shop Drawings: Submit shop drawings detailing fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other Sections.

C. Quality Control Submittals: Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.

1.06 QUALITY ASSURANCE

A. Welding Standards: Comply with applicable provisions of AWS D1.1 and AWS D1.3.
1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Metal Surfaces, General: For metal fabrications exposed to view in the completed Work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

B. Steel and Iron
1. Steel Plates, Shapes, and Bars: ASTM A36.
2. Rolled Steel Floor Plate: ASTM A786, rolled from plate complying with ASTM A36 or ASTM A283, Grade C or D.
3. Cold-Formed Steel Tubing: ASTM A500.
4. Hot-Formed Steel Tubing: ASTM A501.
   a. For exterior installations and, where indicated, provide metalized-tubing.
5. Steel Pipe: ASTM A53, Type S, Grade B, Schedule 40, unless otherwise indicated, or another weight required by structural loads.
   a. Black finish, unless otherwise indicated.
   b. Prime with red oxide primer at locations detailed to receive paint.
6. Gray-Iron Castings: ASTM A48, Class 30.
7. Malleable-Iron Castings: ASTM A47, grade as recommended by fabricator for type of use indicated.
8. Concrete Inserts: Anchors of type indicated below, fabricated from corrosion resistant materials capable of sustaining, without failure, the load imposed within a safety factor of 4, as determined by testing per ASTM E488, conducted by a qualified independent testing agency.
   a. Threaded or wedge type ferrous castings, either ASTM A47 malleable iron or

ASTM A27 cast steel. Provide bolts, washers, and shims as required.

b. Provide weld plate imbedded in concrete as detailed in the Drawings. Coordinate location with other imbedded materials.

C. Fasteners: Provide plated fasteners complying with ASTM B633, Class Fe/Zn 25 for electrodeposited zinc coating, for exterior use or where built into exterior walls, concrete slabs, or ceilings. Select fasteners for the type, grade, and class required.

1. Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A, with hex nuts, ASTM A563, and, where indicated, flat washers.
2. Machine Screws: ANSI B18.6.3.
3. Plain Washers: Round, carbon steel, ANSI B18.22.1.
4. Lock Washers: Helical, spring type, carbon steel, ANSI B18.21.1.
5. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E488 conducted by a qualified independent testing agency.
   a. Material: Carbon steel components zinc-plated to comply with ASTM B633, Class Fe/Zn 5.
   b. Material: Group 1 alloy 304 or 316 stainless steel bolts and nuts complying with ASTM F593 and ASTM F594.
6. Epoxy Cement: As manufactured by Simpson Strong-Tie, “SET/ET/AT High Strength Anchoring Adhesives”.

D. Welding Materials: AWS D1.1 and AWS D1.3, type required for materials being welded.

2.02 STANDARD CATALOG PRODUCTS

A. Non-Shrink Grout

1. Premixed; containing no metallic particles, requiring only addition of water.
2. Shall have minimum working time of 15 minutes and initial set time of 30 to 45 minutes in accordance with ASTM C191.
3. Manufacturer: Master Builders Technologies, “Masterflow 928”; Five Star Products, Inc., “Five Star Grout 100”, or equal.

B. Expansion Cement

1. Non-metallic, non-corrosive, pourable hydraulic type cement that is quick-setting, high strength, and non-shrinking, with the following properties:
   a. Compressive Strength: 58,400 psi at 7 days in accordance with ASTM C109.
   b. Volume Change: Plus 0.31 at 7 days in accordance with ASTM C157.
2. Water: Potable.
3. Manufacturer: Custom Building Products, “Pour-Stone”; Minwax Construction Products, “Por-Rok Anchoring Cement”, or equal.

C. Coatings

1. Coatings for Protection of Dissimilar Materials
   a. Dissimilar Metals: Bituminous type materials in accordance with ASTM D1187.
   b. Aluminum in Contact with Concrete, Metal, Wood, or other Absorptive Material.
2. Shop Primer for Ferrous Metal: VOC compliant, fast-curing, lead and chromate free, universal modified alkyd primer with good resistance to corrosion, compatible with finish paint systems.

D. Fencing at Garage: As indicated on the Drawings and as manufactured by Omega II Fence Systems, or equal.

E. Trench Drain Cover: Provide perforated steel grate with 1/4-inch holes, Class C, as

indicated on the Drawings.

F. Metal Grates at Areaways: As manufactured by McNichols, “GCM-1”, or equal.

2.03 FABRICATION, GENERAL

A. Form metal fabrications from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on Construction Drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of each metal fabrication.

B. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.

C. Allow for thermal movement resulting from the following maximum change (range) in ambient temperature in the fabrication and installation of installed metal assemblies to prevent buckling, opening up of joints, and overstressing of welds and fasteners. Base fabrication calculations on actual surface temperatures of metals due to both solar heat gain and nighttime sky heat loss.
   1. Temperature Change (Range): 100 degrees Fahrenheit.

D. Shear and punch metals cleanly and accurately. Remove burrs.

E. Ease exposed edges to a radius of approximately 1/32-inch, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

F. Remove sharp or rough areas on exposed traffic surfaces.

G. Weld corners and seams continuously to comply with the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent.

H. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

J. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

K. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

L. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide

weep holes where water may accumulate.

2.04 STEEL LADDERS

A. General: Fabricate ladders for the locations shown, with dimensions, spacings, details and anchorages as indicated. Comply with requirements in accordance with NAAMM and ANSI A14.3.

B. Side Rails: Continuous, steel, 1-1/4 inch O.D. pipe, spaced 18 inches apart.

C. Bar Rungs: 3/4-inch diameter solid steel bars, spaced 12 inches on center.

D. Rung Ladders: Punch side rails to receive rungs. Extend rungs through rails, weld at ends, and grind smooth.

E. Tread Ladders: Use checker plate treads and weld continuous to stringers.

F. Provide angles, clips, anchors, and fastenings as required for installation.

G. Support each ladder at top and bottom and at intermediate points spaced not more than 60 inches on center with welded or bolted steel brackets.
   1. Size brackets to support dead and live loads indicated and to hold centerline of ladder rungs clear of the wall surface by not less than 7 inches for roof ladders.
   2. Extend side rails 42 inches above top rung, and return rails to wall or structure unless other secure handholds are provided. If the adjacent structure does not extend above the top rung, goose-neck the extended rails back to the structure to provide secure ladder access.
   3. Elevator Pit Ladder: Fabricate ladder in accordance with requirements of NAAMM, except that for vertical ladders, the distance from ladder rung to elevator pit wall shall not be less than 4 inches. Ladder to extend vertically from 12 inches above pit floor to 42 inches above first floor elevator door sill.

H. Provide nonslip surfaces on top of each rung by coating with abrasive material metallically bonded to the rung by a proprietary process, as manufactured by IKG Borden, “Mebac”; W. S. Molnar Co., “Slip-Not”.

I. Finish: Shop primed.

2.05 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports for applications indicated that are not a part of structural steel framework as required to complete the Work.

B. Fabricate units to sizes, shapes, and profiles indicated and required to receive other adjacent construction retained by framing and supports. Fabricate from structural steel shapes, plates, and steel bars of welded construction using mitered joints for field connection. Cut, drill, and tap units to receive hardware, hangers, and similar items.
   1. Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is placed.
      a. Except as otherwise indicated, space anchors 24 inches on center and provide minimum anchor units in the form of steel straps 1-1/4 inches wide by 1/4-inch thick by 8 inches long.

C. Shop prime miscellaneous interior and exterior framing and supports.

2.06 FINISHES, GENERAL

A. Comply with NAAMM's MFM for recommendations relative to applying finishes. Finish metal fabrications after assembly.

2.07 STEEL AND IRON FINISHES

A. Exterior metal components/fabrications that are intended to be exposed at the completion of construction and their attachments shall be shop primed and painted as indicated herewith.

B. Cleaning: Thoroughly clean all mill scale, rust, dirt, grease, and other foreign matter from ferrous metal prior to any galvanizing, hot phosphate treatment or painting.

C. Galvanizing: Provide a zinc coating for all items, complying with ASTM A-386 for galvanizing assembled steel products.

D. Preparation for Shop Priming: Prepare uncoated ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:
   1. Typical: SSPC SP 2, SSPC SP 3, as required.
   2. Architectural Exposed Steel Fabrications: SSPC SP 6.

C. Immediately after surface preparation, brush or spray primer in accordance with manufacturer's instruction, and at a rate to provide uniform dry film thichness of 2.0 mils for each coat, except those to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Use painting methods which will result in full coverage of joints, corners, edges, and exposed surfaces. Comply with requirements of SSPC PA 1 for shop painting.

D. Finish Painting: As specified in Section 09 90 00.

2.08 WELDING

A. Qualification of Welders. All welding shall be done by certified welders who have been previously qualified by tests, as prescribed in the "Qualification Procedure" of the American Welding Society, except that this provision need not apply to tack welds or other welds not later incorporated into finished weld carrying loads. Welds shall be checked by the Owner and those not doing satisfactory work may be removed and may be required to pass qualification test again.

B. Weld Details. The details of all welded shall comply with all of the requirements for joints which are exempt from qualification tests under the "Code of Arc and Gas Welding in Building Construction" of the American Welding Society. All members to be welded to each other shall be rigidly held together while welding.

C. Preparation of Surface. Surface to be welded shall be free of loose scale, slag, rust, grease, paint, and other foreign matter.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction. Include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors as required. Fastenings to post tension concrete shall be by cast-in-place embed only. Fasteners not installed but required after pour shall be submitted to the Architect for approval. Fastener shall not be installed until the Architect

approval is received.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing miscellaneous metal fabrications. Set metal fabrication accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels. No cutting or drilling shall occur in post tension concrete slab without Structural Engineer's approval.

C. Drill or punch holes; do not use cutting torch. Shearing and punching shall leave true lines and surfaces.

D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete masonry or similar construction.

E. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop-welded because of shipping size limitations.

F. Field Welding
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent.

G. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

H. Fencing at Garage: Install in accordance with manufacturer's written instructions.

I. Trench Drain Cover: Install in accordance with manufacturer's written instructions.

J. Metal Grates at Areaways: Install in accordance with manufacturer's written instructions.

3.02 SETTING

A. Set item shown or required to be installed in sleeves with quick-setting anchor cement unless otherwise noted.

B. Miter corners and angles of exposed moldings and framed unless otherwise noted.

C. Conceal all fastenings where practicable. Thickness of metal and details of assembly and supports shall give ample strength and stiffness. Form joints exposed to weather to exclude water.

D. Use non-shrink grout mixed in accordance with manufacturer's directions for setting plates, bolts, and similar items.

3.03 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and prime and paint exposed areas with same material as used for shop painting to comply with SSPC PA 1 requirements for touching up shop-painted surfaces.
   1. Apply by brush or spray to provide a 2.0-mil minimum dry film thickness.

END OF SECTION

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SECTION 05 5100

METAL STAIRS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Stairs with metal treads.

B. Structural steel stair framing and supports.

C. Handrails and guards.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Placement of metal anchors in concrete.

B. Section 05 5000 - Metal Fabrications.

C. Section 09 9113 - Exterior Painting: Paint finish.

1.03 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities; Final Rule; current edition; (ADA Standards for Accessible Design).

B. ASTM A6/A6M - Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling; 2014.

C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

D. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.

E. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.

F. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2013.

G. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength; 2014.

H. ASTM A325M - Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Minimum Tensile Strength (Metric); 2014.

I. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2013.

J. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2014.

K. ASTM A786/A786M - Standard Specification for Hot-Rolled Carbon, Low-Alloy, High-Strength Low-Alloy, and Alloy Steel Floor Plates; 2015.

L. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2015.

M. ASTM E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings; 2000 (Reapproved 2006).

N. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015.

O. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel; International Accreditation Service, Inc; 2011.

P. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).

Q. SSPC-SP 2 - Hand Tool Cleaning; 1982 (Ed. 2004).

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.

C. Delegated Design Data: As required by authorities having jurisdiction.

1.05 QUALITY ASSURANCE

A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located, or personnel under direct supervision of such an engineer.

B. A qualified steel fabricator that is accredited by the International Accreditation Service (IAS) Fabricator Inspection Program for Structural Steel in accordance with IAS AC172.

C. A company specializing in manufacturing products specified in this section, with not less than ten years of documented experience.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Prefabricated Metal Stairs:
   1. Pacific Stair Corporation: www.pacificstair.com.
   2. American Stair, Inc..
   3. Substitutions: See Section 01 6000 - Product Requirements.

2.02 METAL STAIRS - GENERAL

A. Metal Stairs: Provide stairs of the design specified, complete with landing platforms, vertical and horizontal supports, railings, and guards, fabricated accurately for anchorage to each other and to building structure.
   1. Regulatory Requirements: Provide stairs and railings complying with the most stringent requirements of local, state, and federal regulations; where requirements of the contract documents exceed those of regulations, comply with the contract documents.
   2. Structural Design: Provide complete stair and railing assemblies complying with the applicable local code.
      a. Stair Capacity: Uniform live load of 100 lb/sq ft and a concentrated load of 300 lb with deflection of stringer or landing framing not to exceed 1/360 of span.
      b. Railing Assemblies: Comply with ASTM E985.
   3. Dimensions: As indicated on drawings.
   4. Shop assemble components; disassemble into largest practical sections suitable for transport and access to site.
   5. No sharp or rough areas on exposed travel surfaces and surfaces accessible to touch.
   6. Separate dissimilar metals using paint or permanent tape.

B. Metal Jointing and Finish Quality Levels:
   1. Commercial: Exposed joints as inconspicuous as possible, whether welded or mechanical; underside of stair not covered by soffit IS considered exposed to view.
      a. Welded Joints: Intermittently welded on back side, filled with body putty, and sanded smooth and flush.
      b. Welds Exposed to View: Ground smooth and flush.
      c. Mechanical Joints: Butted tight, flush, and hairline.
      d. Bolts Exposed to View: Countersunk flat or oval head bolts; no exposed nuts.
      e. Exposed Edges and Corners: Eased to small uniform radius.
      f. Metal Surfaces to be Painted: Sanded or ground smooth, suitable for satin or matte finish.

C. Fasteners: Same material or compatible with materials being fastened; type consistent with design and specified quality level.

D. Anchors and Related Components: Same material and finish as item to be anchored, except where specifically indicated otherwise; provide all anchors and fasteners required.

2.03 METAL STAIRS WITH METAL TREADS

A. Jointing and Finish Quality Level: Commercial, as defined above.

B. Risers: Closed.

C. Treads: Checkered steel plate.
   1. Tread Thickness: 1/4 inch, minimum.
   2. Nosing: Plate bent to maximum radius of 9/16 inches with down return of 1 inch.
   3. Anchorage to Stringers: Welded to carrier angles welded to stringers.

D. Risers: Steel sheet.
   1. Riser Thickness: As required by design; 14 gage, 0.075 inch minimum.
   2. Riser/Nosing Profile: Sloped riser with rounded nosing of minimum radius.

E. Stringers: Rolled steel channels.
   1. Stringer Depth: 12 inches.
   2. End Closure: Sheet steel of same thickness as risers welded across ends.

F. Landings: Same construction as treads, supported and reinforced as required to achieve design load capacity.

G. Railings: Steel picket railings.

H. Finish: Shop- or factory-prime painted.

2.04 HANDRAILS AND GUARDS

A. Wall-Mounted Rails: Round pipe or tube rails unless otherwise indicated.
   1. Outside Diameter: 1-1/4 inch, minimum, to 1-1/2 inches, maximum.

B. Guards:
   1. Top Rails: Round pipe or tube rails unless otherwise indicated.
      a. Outside Diameter: 1-1/4 inch, minimum, to 1-1/2 inches, maximum.
   2. Infill at Picket Railings: Vertical pickets.
      a. Horizontal Spacing: Maximum 4 inches on center.
      b. Material: Solid steel bar.
      c. Shape: Square.
      d. Size: 1/2 inch square.
      e. Top Mounting: Welded to underside of top rail.
      f. Bottom Mounting: As indicated on drawings.
   3. End and Intermediate Posts: Same material and size as top rails.
      a. Horizontal Spacing: As indicated on drawings.
      b. Mounting: Welded to top surface of stringer.

2.05 MATERIALS

A. Steel Sections: ASTM A 36/A 36M.

B. Steel Tubing: ASTM A500/A500M or ASTM A501/A501M structural tubing, round and shapes as indicated.

C. Steel Plates: ASTM A6/A6M or ASTM A283/A283M.

D. Pipe: ASTM A 53/A 53M, Grade B Schedule 40, black finish.

E. Ungalvanized Steel Sheet: Cold-rolled only.
   1. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Designation CS (commercial steel).

F. Checkered Plate: ASTM A786/A786M, rolled steel floor plate; manufacturer's standard pattern.

2.06 SHOP FINISHING

A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

B. Do not prime surfaces in direct contact with concrete or where field welding is required.

C. Prime Painting: Use specified shop- and touch-up primer.
   1. Preparation of Steel: In accordance with SSPC-SP 2, Hand Tool Cleaning.

2. Number of Coats: One.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

A. When field welding is required, clean and strip primed steel items to bare metal.

B. Supply items required to be cast into concrete and connected to structure with setting templates.

3.03 INSTALLATION

A. Install components plumb and level, accurately fitted, free from distortion or defects.

B. Provide anchors, plates, angles, hangers, and struts required for connecting stairs to structure.

C. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

D. Provide welded field joints where specifically indicated on drawings. Perform field welding in accordance with AWS D1.1/D1.1M.

E. Other field joints may be either welded or bolted provided the result complies with the limitations specified for jointing quality levels.

F. Obtain approval prior to site cutting or creating adjustments not scheduled.

G. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

END OF SECTION

SECTION 05 5213
PIPE AND TUBE RAILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall mounted handrails.

B. Free-standing railings at steps.

C. Balcony railings and guardrails.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Placement of anchors in concrete.

B. Section 05 5100 - Metal Stairs: Attachment plates for handrails specified in this section.

C. Section 09 2116 - Gypsum Board Assemblies: Placement of backing plates in stud wall construction.

D. Section 09 9113 - Exterior Painting: Paint finish.

1.03 REFERENCE STANDARDS

A. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.

B. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2013.

C. ASTM E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings; 2000 (Reapproved 2006).

D. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).

E. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.

PART 2 PRODUCTS

2.01 RAILINGS - GENERAL REQUIREMENTS

A. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of ASTM E985 and applicable local code.

B. Allow for expansion and contraction of members and building movement without damage to connections or members.

C. Dimensions: See drawings for configurations and heights.

D. Provide anchors and other components as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.
   1. For anchorage to concrete, provide inserts to be cast into concrete, for bolting anchors.
   2. For anchorage to stud walls, provide backing plates, for bolting anchors.

E. Provide welding fittings to join lengths, seal open ends, and conceal exposed mounting bolts and nuts, including but not limited to elbows, T-shapes, splice connectors, flanges, escutcheons, and wall brackets.

2.02 STEEL RAILING SYSTEM

A. Steel Tube: ASTM A500/A500M, Grade B cold-formed structural tubing.

B. Steel Pipe: ASTM A 53/A 53M, Grade B Schedule 40, black finish.

C. Welding Fittings: Factory- or shop-welded from matching pipe or tube; seams continuously welded; joints and seams ground smooth.

D. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

2.03 FABRICATION

A. Accurately form components to suit specific project conditions and for proper connection to building structure.

B. Fit and shop assemble components in largest practical sizes for delivery to site.

C. Fabricate components with joints tightly fitted and secured.

D. Welded Joints:
   1. Exterior Components: Continuously seal joined pieces by continuous welds. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.
   2. Interior Components: Continuously seal joined pieces by continuous welds.
   3. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.

C. Anchor railings securely to structure.

D. Conceal anchor bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per floor level, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

SECTION 05 5305
GRATINGS AND FLOOR PLATES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Formed metal floor gratings.

B. Flat surface floor and stair tread plating.

C. Perimeter closure.

1.02 REFERENCE STANDARDS

A. ASTM A786/A786M - Standard Specification for Hot-Rolled Carbon, Low-Alloy, High-Strength Low-Alloy, and Alloy Steel Floor Plates; 2015.

B. ASTM B211M - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold-Finished Bar, Rod, and Wire (Metric); 2012.

C. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

D. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric]; 2013.

1.03 PERFORMANCE REQUIREMENTS

A. Conform to applicable code for loading and accessibility requirements.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide span and deflection tables.

C. Shop Drawings: Indicate details of component supports, openings, perimeter construction details, and tolerances.

D. Samples: Submit two samples, 6 by 6 inch in size illustrating surface finish, color, and texture.

E. Manufacturer's Installation Instructions: Indicate special requirements for opening and perimeter framing.

1.05 QUALITY ASSURANCE

A. Designer Qualifications: Design gratings and plates under direct supervision of a licensed Professional Engineer experienced in design of this type of work.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. McNichols: www.mcnichols.com: SAFE-T-GRID, TB-940, 2" depth.

B. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

A. Design Live (Pedestrian) Load: Uniform load of 100 lb/sq ft minimum; concentrated load of 300 lbs.

B. Maximum Allowable Deflection Under Live Load: 1/240 of span; size components by single support design.

C. Maximum Spacing Between Bars: 3/8".

2.03 MATERIALS

A. Steel Floor Plate: ASTM A786/A786M; manufacturer's standard pattern.

B. Aluminum For Lock Forming: ASTM B221 (ASTM B221M), extruded, shapes as indicated.

C. Cross Bars: ASTM B211 (ASTM B211M) solid bars.

2.04 ACCESSORIES

A. Perimeter Closure: Of same material as grating.

2.05 FABRICATION

A. Fabricate grates and plates to accommodate design loads.

B. Mechanically clinch joints of intersecting metal sections.

C. Top Surface: Non-slip.

2.06 FINISHES

A. Aluminum: Mill finish.

B. Non-Slip Surfacing: Aluminum oxide.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated on drawings.

B. Verify that opening sizes and dimensional tolerances are acceptable.

C. Verify that supports are correctly positioned.

3.02 INSTALLATION

A. Install components in accordance with manufacturer's instructions.

B. Place frames in correct position, plumb and level.

C. Set perimeter closure flush with top of grating and surrounding construction.

D. Secure to prevent movement.

3.03 TOLERANCES

A. Maximum Space Between Adjacent Sections: 3/8 inch.

B. Maximum Variation From Top Surface Plane of Adjacent Sections: 1/4 inch

3.04 SCHEDULES

A. Stair Treads to Main Mezzanine: Pressure locked aluminum bars, mill finish, 75 lb/sq ft live pedestrian load.

B. Pedestrian walkway at Mezzanine: Pressure locked aluminum T-shapes, 2" deep.

END OF SECTION

SECTION 05 7000
DECORATIVE METAL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Custom outdoor railings

1.02 RELATED REQUIREMENTS

A. Section 05 5000 - Metal Fabrications: Supports.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate railing system elevations and sections, details of profile, dimensions, sizes, connection attachments, anchorage, size and type of fasteners, and accessories. Indicate anchor and joint locations, brazed connections, transitions, and terminations.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Installation by manufacturer.

B. Templates: Supply installation templates, reinforcing and required anchorage devices.

C. Mock-Ups: Construct an example of each item specified. Locate mock-ups where directed. Mock-ups may remain as part of the work.

PART 2 PRODUCTS

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate and site conditions are acceptable and ready to receive work.

B. Verify field dimensions of locations and areas to receive work.

C. Notify Architect immediately of conditions that would prevent satisfactory installation.

D. Do not proceed with work until detrimental conditions have been corrected.

E. Furnish components to be installed in other work to installer of that other work, including but not limited to blocking, sleeves, inserts, anchor bolts, embedded plates and supports for attachment of anchors.

3.02 PREPARATION

A. Protect existing work.

B. Review installation drawings before beginning installation. Coordinate diagrams, templates, instructions and directions for installation of anchorages and fasteners.

C. Clean surfaces to receive units. Remove materials and substances detrimental to the installation.

3.03 INSTALLATION

A. Comply with manufacturer's drawings and written instructions.

B. Install components plumb and level, accurately fitted, free from distortion or defects and with tight joints, except where necessary for expansion.

C. Anchor securely to structure.

D. Conceal anchor bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

E. Isolate dissimilar materials with bituminous coating, bushings, grommets or washers to prevent electrolytic corrosion.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per floor level, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

3.05 CLEANING

A. Remove protective film from exposed metal surfaces.

B. Metal: Clean exposed metal finishes with potable water and mild detergent, in accordance with manufacturer recommendations; do not use abrasive materials or chemicals, detergents or other substances that may damage the material or finish.

3.06 PROTECTION

A. Protect installed components and finishes from damage after installation.

B. Repair damage to exposed finishes to be indistinguishable from undamaged areas.

1. If damage to finishes and components cannot be repaired to be indistinguishable from undamaged finishes and components, replace damaged items.

END OF SECTION

SECTION 06 1000
ROUGH CARPENTRY

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Provisions established in the Contract, Division 01 Specification Sections, and the Drawings apply to this Section

1.02 SUMMARY

A. This Section includes the following:

1. Framing with dimension lumber.
2. Framing with engineered wood products.
3. Rooftop equipment bases and support curbs.
4. Wood blocking, cants, and nailers.
5. Wood furring and grounds.
6. Wood sleepers.
7. Plywood backing panels.
8. Backing for wall mounted equipment, railings, toilet partitions, toilet accessories.
9. Rough hardware, including tie-downs, post caps, etc.

1.03 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product.

1. Include data for wood-preservative and fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.
2. Product information for rough hardware.

B. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the American Lumber Standards Committee Board of Review.

C. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:

1. Wood-preservative-treated wood.
2. Fire-retardant-treated wood.
3. Engineered wood products.
4. Power-driven fasteners.
5. Powder-actuated fasteners.
6. Expansion anchors.
7. Metal framing anchors.

PART 2 - PRODUCTS

2.01 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules- writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency

certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.
3. Provide dressed lumber, S4S, unless otherwise indicated.

B. Engineered Wood Products: Provide engineered wood products acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.

1. Allowable Design Stresses: Provide engineered wood products with allowable design stresses, as published by manufacturers that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

2.02 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA C2, except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWPA C31 with inorganic boron (SBX).

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
2. All preservative treated lumber shall be field-applied with preservative where cut and drilled on site with copper napthenate (2% copper as metal).

B. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

C. Application: Treat items indicated on Drawings, and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
4. Wood framing members that are less than 18 inches (460 mm) above the ground in crawlspaces or unexcavated areas.
5. Wood floor plates that are installed over concrete slabs.

2.03 FIRE-RETARDANT-TREATED MATERIALS

A. General: Comply with performance requirements in AWPA C20 (lumber) and AWPA C27 (plywood).

1. Use Exterior type for exterior locations and where indicated.
2. Use Interior Type A, High Temperature (HT) for enclosed roof framing, framing in attic spaces, and where indicated.
3. Use Interior Type A, unless otherwise indicated.

B. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.

C. Application: Treat items indicated on Drawings.

2.04 ARCHITECTURAL GRADE DECAY RESISTANT MATERIAL

A. General: Lumber exposed to weather that is Architectural grade, Alaskan Yellow Cedar AYC No. 2.

2.05 DIMENSION LUMBER FRAMING

A. Maximum Moisture Content: 19 percent.

B. Non-Load-Bearing Interior Partitions: Standard or Stud grade, D.F. C.

Exterior and Load Bearing Walls:
1. 2x, 3x, 4x; D.F. #2
2. 6x6 or larger; D.F. #1

D. Horizontal Framing Members:
1. 2x, 4x12 or smaller; D.F. #2
2. 4x14 or larger, 6x, 8x; D.F. #1

2.06 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.
3. Rooftop equipment bases and support curbs.
4. Cants.
5. Furring.
6. Grounds.

B. For items of dimension lumber size, provide Standard or Stud grade lumber with 19 percent maximum moisture content of any species.

C. For concealed boards, provide lumber with 19 percent maximum moisture content and any species.

2.07 PLYWOOD BACKING PANELS

A. Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exterior, AC in thickness indicated or, if not indicated, not less than 1/2-inch (13-mm) nominal thickness.

2.08 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified.

1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Power-Driven Fasteners: LARR# 2582

C. Wire Nails: Common, unless otherwise noted. General nailing per CBC Table 2304.9.1.

D. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

E. Lag Screws and Lag Bolts: Simpson SDS, RSS type by GRK fasteners.

F. Wood Screws: FF-S-111.

G. Steel plate washers at all sill plates.

H. All hardware in contact with preservative treated members shall be protected by hot-dipped galvanizing.

2.09 GLUE:

A. General: AFG-01 approved. PL Premium polyurethane construction adhesive by Chem Pex, Inc., or equal.

2.10 METAL FRAMING ANCHORS

A. Basis-of-Design Products: Subject to compliance with requirements, provide products indicated on Drawings or comparable products by one of the following:
1. Simpson Strong-Tie Co., Inc. or equivalent.

B. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

B. Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 (Z180) coating designation.

2.11 MISCELLANEOUS MATERIALS

A. Sill-Sealer Gaskets: Glass-fiber-resilient insulation, fabricated in strip form, for use as a sill sealer; 1-inch (25-mm) nominal thickness, compressible to 1/32 inch (0.8 mm); selected from manufacturer's standard widths to suit width of sill members indicated.

B. Flexible Flashing: Self-adhesive, rubberized-asphalt compound, bonded to a high-density, polyethylene film to produce an overall thickness of not less than 0.025 inch (0.6 mm).

PART 3 - EXECUTION

3.01 GENERAL FRAMING

A. Joist, rafters, and beams shall be cut as required to provide a full even and horizontal seating on the support, unless otherwise shown. Do not overcut.

B. Notches and bored holes in joists and beams shall be limited as shown on the drawings.

3.02 INSTALLATION

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

B. Framing Standard: Comply with AF&PA's "Details for Conventional Wood Frame Construction," unless otherwise indicated.

C. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.

D. Metal Framing Anchors: Install metal framing to comply with manufacturer's written instructions.

E. Do not splice structural members between supports, unless otherwise indicated.

F. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

G. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. LARR# 2582 for power-driven fasteners.
2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.

H. Framing for Pipes:

1. Framing members for passage of pipes and ducts to avoid cutting structural members. Do not cut, notch or bore framing members for passage of pipes or conduits without Architect’s authorization.
2. Pipes 1” diameter or less may pass through a neatly bored hole in the center of plates. Hole location is subject to the Architect’s acceptance.

I. Firestops: Provide 2” nominal firestops in conformance with CBC.

J. Blocking: Provide solid blocking in all walls for wall mounted items.

K. Furring: Provide furring, stripping, blocking, backing, and grounds where indicated or where necessary to support, or to furnish suitable spacing for finish materials and accessories.

L. Nailing:

1. All nailing shall conform to CBC, except where more stringent requirements are shown on drawings.
2. Penetration of nails or spikes into piece receiving point shall be not less than 1/2 length of nail or spike, except, that 16 penny nails may be used to connect pieces of 2” thickness.
3. Drive nails and spikes no closer together than 2/3 their length nor closer to edge of member than 1/2 their length, except when detailed otherwise.
4. Place nails without splitting wood. Predrill holes whenever nailing tends to split wood or plywood. Replace split members.
5. Use of machine nailing is subject to a satisfactory job site demonstration. Acceptance is subject to continued satisfactory performances. If nail heads penetrate the outer ply of plywood more than would be normal for a hand hammer or if the minimum allowable edge distances are not maintained the performance will be deemed unsatisfactory.

M. Bolts and Lag Screws:

1. Provide bolts and lag screws, bearing on wood, with steel plate washers of sizes indicated under heads and nuts. All nuts and screws shall be tightened when placed and re-tightened at completion of the job or immediately prior to closing with finish construction. Nuts shall be secured against loosening.
2. Except where otherwise indicated on details, bore holes for bolts with a bit 1/32” to 1/16” larger than nominal diameter as the bolt.
3. Bore lag screw holes the same diameter and depth as shank, continue hole to depth equal to length of lag screw and with a diameter equal to 75% of the diameter of the shank.
4. Screw all lag screws: do not drive into place. Embed threaded portion of lag screws in each timber a minimum of seven times their shank diameter.

N. Field-Applied Preservative Treatment: Treat all framing in direct contact with concrete or masonry construction with wood preservative, as follows:

1. Use brush, dip, or spray method as recommended by manufacturer.

O. Glue plywood for floor sheathing to supporting members.

1. Use brush, dip, or spray method as recommended by manufacturer.

P. Coordinate work of this Section with work by others. Check lines and levels indicated on such other work as has been completed, before commencing work of this Section. Report discrepancies in writing to the Owner for correction and adjustment, or in the event of failure to do so, correct errors without additional cost to the Owner.

Q. Install temporary bracing as required. Make proper provision to take care of stresses resulting from construction loads, whenever piles of materials, erection equipment or other loads are carried by frame during its erection.

3.03 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION

SECTION 06 16 00

SHEATHING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Provisions established in the Contract, Division 01 Specification Sections, and the Drawings apply to this Section

1.02 SUMMARY

A. This Section includes the following:

1. Wall sheathing.
2. Roof sheathing.
3. Subflooring.

1.03 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment and fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements.

B. Research/Evaluation Reports: For the following:

1. Preservative-treated plywood.
2. Fire-retardant-treated plywood

1.04 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: For assemblies with fire-resistance ratings, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Stack plywood and other panels flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.01 WOOD PANEL PRODUCTS, GENERAL

A. Plywood: Either DOC PS 1 or DOC PS 2, unless otherwise indicated.

B. Oriented Strand Board: DOC PS 2.

C. All hardwood plywood, particleboard and medium density fiberboard composite wood products used on the interior or exterior of the building shall meet the requirements for formaldehyde as specified in ARB's Air Toxics Control Measure for Composite Wood (17 CCR 93120 et seq.).

2.02 PRESERVATIVE-TREATED PLYWOOD

A. Preservative Treatment by Pressure Process: AWPA C9.

B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.

C. Application: Treat items indicated on Drawings and plywood in contact with masonry or concrete or used with roofing, flashing, vapor barriers, and waterproofing.

2.03 FIRE-RETARDANT-TREATED PLYWOOD

A. General: Comply with performance requirements in AWPA C27.

1. Use Exterior type for exterior locations and where indicated.
2. Use Interior Type A, High Temperature (HT) for roof sheathing and where indicated.
3. Use Interior Type A, unless otherwise indicated.

B. Kiln-dry material after treatment to a maximum moisture content of 15 percent.

C. Identify fire-retardant-treated plywood with appropriate classification marking of UL, U.S.Testing, Timber Products Inspection, or another testing and inspecting agency acceptable to authorities having jurisdiction.

D. Application: Treat plywood indicated on Drawings.

2.04 WALL SHEATHING

A. Plywood Wall Sheathing: Exposure 1 sheathing.

B. Oriented-Strand-Board Wall Sheathing: Exposure 1 sheathing.

1. Type and Thickness: Indicated on Drawings.

2.05 ROOF SHEATHING

A. Plywood Roof Sheathing: Exposure 1 sheathing.

2.06 SUBFLOORING AND UNDERLAYMENT

A. Plywood Combination Subfloor-Underlayment: DOC PS 1, Exposure 1, Underlayment single-floor panels.

B. Oriented-Stand-Board Combination Subfloor-Underlayment: Exposure 1 single-floor panels.

C. Plywood Subflooring: Exposure 1 single-floor panels or sheathing.

D. Oriented-Strand-Board Subflooring: Exposure 1, single-floor panels or sheathing.

E. Plywood Underlayment for Resilient Flooring: DOC PS 1, Exposure 1 Underlayment with fully sanded face.

F. Plywood Underlayment for Ceramic Tile: DOC PS 1, Exterior, C-C Plugged, not less than 5/8-inch (15.9-mm) nominal thickness, for ceramic tile set in epoxy adhesive.

G. Plywood Underlayment for Carpet: DOC PS 1, Interior.

2.07 FASTENERS

A. General: Provide fasteners of size and type indicated.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. Securely attach to substrate by fastening as indicated, complying with the following:

1. LARR# 2582 for power-driven fasteners.
2. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."

B. Coordinate sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that exclude exterior moisture.

C. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

3.02 WOOD STRUCTURAL PANEL INSTALLATION

A. General: Complywith applicable recommendations in APA Form No. E30K, "APA Design/Construction Guide: Residential & Commercial."

1. Comply with "Code Plus" installation provisions in guide referenced in paragraph above.

B. Fastening Methods: Fasten panels as indicated below:

1. Combination Subfloor-Underlayment:

a. Glue and nail to wood framing.
b. Screw to cold-formed metal framing.

2. Subflooring:

a. Glue and nail to wood framing.
b. Screw to cold-formed metal framing.

3. Wall and Roof Sheathing:

a. Nail to wood framing.
b. Screw to cold-formed metal framing.
c. Moisture content shall be below 18 percent before applying covering material.

END OF SECTION

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SECTION 06 1800

GLUED-LAMINATED CONSTRUCTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Provisions established in the Contract, Division 01 Specification Sections, and the Drawings apply to this Section

1.02 SUMMARY

A. Section includes framing using structural glued-laminated timber.

1.03 SUBMITTALS

A. Product Data: For each type of product indicated.

C. Certificates of Conformance: Issued by a qualified testing and inspecting agency indicating that structural glued-laminated timber complies with requirements in AITC A190.1.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Provide factory-glued structural units produced by an AITC- or APA-licensed firm “wood glu-laminated lumber” Note #1 from Sheet SW-0.

1. Factory mark each piece of structural glued-laminated timber with AITC Quality Mark or APA-EWS trademark. Place mark on surfaces that will not be exposed in the completed Work.

B. Quality Standard: Comply with AITC A190.1.

1.05 DELIVERY, STORAGE, AND HANDLING

A. General: Comply with provisions in AITC 111.

B. Individually wrap members using plastic-coated paper covering with water-resistant seams.

PART 2 - PRODUCTS

2.01 STRUCTURAL GLUED-LAMINATED TIMBER

A. General: Provide structural glued-laminated timber that complies with AITC 117 or research/evaluation reports acceptable to authorities having jurisdiction.

1. Provide structural glued-laminated timber made from solid lumber laminations; do not use laminated veneer lumber.
2. Provide structural glued-laminated timber made with wet-use adhesive complying with AITC A190.1.

a. Use adhesive that contains no urea-formaldehyde resins.

B. Species and Grades for Structural Glued-Laminated Timber: Douglas fir-larch that complies with beam stress classifications indicated.

C. Species and Grades for Beams:

1. Species and Beam Stress Classification: Douglas fir-larch, 24F-1.8E.
2. Lay-up: Balanced.

D. Appearance Grade: Framing, complying with AITC 110.

E. End Sealer: Manufacturer's standard, transparent, colorless wood sealer that is effective in retarding the transmission of moisture at cross-grain cuts and is compatible with indicated finish.

F. Penetrating Sealer: Manufacturer's standard, transparent, penetrating wood sealer that is compatible with indicated finish.

2.02 TIMBER CONNECTORS

A. General: Unless otherwise indicated, fabricate from the following materials:

1. Structural-steel shapes, plates, and flat bars complying with ASTM A 36.
2. Round steel bars complying with ASTM A 575, Grade M 1020.
3. Hot-rolled steel sheet complying with ASTM A 1011, Structural Steel, Type SS, Grade 33.

B. Finish steel assemblies and fasteners with rust-inhibitive primer, 2-mil (0.05-mm) dry film thickness.

C. Hot-dip galvanize steel assemblies and fasteners after fabrication to comply with ASTM A 123 or ASTM A 153.

2.03 FABRICATION

A. Shop fabricate for connections to greatest extent possible, including cutting to length and drilling bolt holes.

B. Camber: Fabricate horizontal and inclined members of less than 1:1 slope with either circular or parabolic camber equal to 1/500 of span.

C. End-Cut Sealing: Immediately after end cutting each member to final length, apply a saturation coat of end sealer to ends and other cross-cut surfaces, keeping surfaces flood coated for not less than 10 minutes.

D. Seal Coat: After fabricating, sanding, and end-coat sealing, apply a heavy saturation coat of penetrating sealer on surfaces of each unit.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General: Erect structural glued-laminated timber true and plumb, and with uniform, close-fitting joints. Provide temporary bracing to maintain lines and levels until permanent supporting members are in place.

1. Lift with padded slings and protect corners with wood blocking.

B. Fit structural glued-laminated timber by cutting and restoring exposed surfaces to match specified surfacing.

1. Predrill for fasteners using timber connectors as templates.
2. Dress exposed surfaces as needed to remove planing and surfacing marks.
3. Coat cross cuts with end sealer.

C. Cutting: Avoid cutting after fabrication. Where field fitting is unavoidable, comply with requirements for shop fabrication.

D. Repair damaged surfaces after completing erection. Replace damaged structural glued-laminated timber if repairs are not approved by Architect.

E. Do not remove wrappings on individually wrapped members until they no longer serve a useful purpose including protection from weather, sunlight, soiling, and damage from work of other trades.

1. Slit underside of wrapping to prevent accumulation of moisture inside the wrapping.

END OF SECTION

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SECTION 06 2000
FINISH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Finish carpentry items.

B. Wood door frames, glazed frames.

C. Wood casings and moldings.

D. Hardware and attachment accessories.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Support framing, grounds, and concealed blocking.

B. Section 08 1416 - Flush Wood Doors.

C. Section 08 1433 - Stile and Rail Wood Doors.

D. Section 09 9113 - Exterior Painting: Painting and finishing of finish carpentry items.

E. Section 12 3530 - Residential Casework: Shop fabricated cabinet work.

1.03 REFERENCE STANDARDS

A. ANSI A208.1 - American National Standard for Particleboard; 2009.

B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014.

C. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.0; 2016.

D. BHMA A156.9 - American National Standard for Cabinet Hardware; 2010.

E. PS 1 - Structural Plywood; 2009.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with plumbing rough-in, electrical rough-in, and installation of associated and adjacent components.

B. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect work from moisture damage.

PART 2 PRODUCTS

2.01 FINISH CARPENTRY ITEMS

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Interior Woodwork Items:
   1. Door frames and casings.
   2. Wood baseboards and moldings.
   3. Loose Shelving, Closet Hardware: Material and finish as indicated on the drawings.

2.02 WOOD-BASED COMPONENTS

A. Wood fabricated from old growth timber is not permitted.

2.03 SHEET MATERIALS

A. Softwood Plywood, Not Exposed to View: Any face species, medium density fiberboard core; PS 1 Grade A-B, glue type as recommended for application.

B. Particleboard: ANSI A208.1; Composed of wood chips, sawdust, or flakes of medium density, made with waterproof resin binders; of grade to suit application; sanded faces.

2.04 PLASTIC LAMINATE MATERIALS

A. Low Pressure Laminate: Melamine; _____ color, _____ pattern and gloss surface texture.

B. Laminate Adhesive: Type recommended by laminate manufacturer to suit application; not containing formaldehyde or other volatile organic compounds.

2.05 FASTENINGS

A. Fasteners: Of size and type to suit application; exposed finish in concealed locations and concealed finish in exposed locations.

B. Concealed Joint Fasteners: Threaded steel.

2.06 ACCESSORIES

A. Wood Filler: Solvent base, tinted to match surface finish color.

2.07 HARDWARE

A. Hardware: Comply with BHMA A156.9.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

3.02 INSTALLATION

A. Install work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.

B. Set and secure materials and components in place, plumb and level.

C. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.

3.03 PREPARATION FOR SITE FINISHING

A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.

B. Site Finishing: See Section 09 9000.

3.04 TOLERANCES

A. Maximum Variation from True Position: 1/16 inch.

B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

END OF SECTION

SECTION 06 4100
ARCHITECTURAL WOOD CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Specially fabricated cabinet units.

B. Cabinet hardware.

C. Factory finishing.

D. Preparation for installing utilities.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Support framing, grounds, and concealed blocking.

B. Section 06 6100 - Simulated Stone Fabrications: Cast plastic countertops.

1.03 REFERENCE STANDARDS

A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014.

B. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.0; 2016.

C. BHMA A156.9 - American National Standard for Cabinet Hardware; 2010.

D. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014.

E. BHMA A156.9 - American National Standard for Cabinet Hardware; 2010.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.

C. Product Data: Provide data for hardware accessories.

D. Samples: Submit actual samples of architectural cabinet construction, minimum 12 inches square, illustrating proposed cabinet and shelf unit substrate and finish.

1.05 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect units from moisture damage.

PART 2 PRODUCTS

2.01 CABINETS

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Plastic Laminate Faced Cabinets: Custom grade.

C. Cabinets at all locations, unless otherwise indicated:
   1. Finish - Exposed Interior Surfaces: Decorative laminate.
   2. Door and Drawer Front Edge Profiles: square edge.
   3. Casework Construction Type: Type A - Frameless.
   4. Interface Style for Cabinet and Door: Style 1 - Overlay; flush overlay.
   5. Cabinet Design Series: As indicated on drawings.
   6. Cabinet Style: Flush overlay.
   7. Cabinet Doors and Drawer Fronts: Flush style.
   8. Drawer Side Construction: Multiple-dovetailed.
   9. Drawer Construction Technique: Dovetail joints.

2.02 WOOD-BASED COMPONENTS

A. Wood fabricated from old growth timber is not permitted.

2.03 LAMINATE MATERIALS

A. Manufacturers:
   1. As noted on the drawings
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.04 ACCESSORIES

A. Adhesive: Type recommended by fabricator to suit application.

B. Fasteners: Size and type to suit application.

C. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; chrome-plated finish in concealed locations and stainless steel finish in exposed locations.

D. Concealed Joint Fasteners: Threaded steel.

E. Grommets: Standard plastic grommets for cut-outs, in color to match adjacent surface.

2.05 HARDWARE

A. Hardware: BHMA A156.9, types as recommended by fabricator for quality grade specified.

B. Adjustable Shelf Supports: Standard side-mounted system using multiple holes for pin supports and coordinated self rests, polished chrome finish, for nominal 1 inch spacing adjustments.

C. Drawer and Door Pulls: square corner, unless noted otherwise on the drawings.

D. Drawer Slides:
   1. Type: Extension types as scheduled.
   2. Static Load Capacity: Commercial grade.
   3. Mounting: Side mounted.
   4. Stops: Integral type.
   5. Features: Provide self closing/stay closed type.
   6. Manufacturers:
      a. Grass America Inc: www.grassusa.com.
      b. Substitutions: See Section 01 6000 - Product Requirements.

E. Hinges: European style concealed self-closing type, steel with polished finish.
   1. Manufacturers:
      a. Grass America Inc: www.grassusa.com.
      b. Substitutions: See Section 01 6000 - Product Requirements.

2.06 FABRICATION

A. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.

B. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.

C. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.

D. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.

E. Provide cutouts for plumbing fixtures and appliances. Verify locations of cutouts from on-site dimensions. Prime paint cut edges.

2.07 SHOP FINISHING

A. Sand work smooth and set exposed nails and screws.

B. For opaque finishes, apply wood filler in exposed nail and screw indentations and sand smooth.

C. On items to receive transparent finishes, use wood filler matching or blending with surrounding surfaces and of types recommended for applied finishes.

D. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify location and sizes of utility rough-in associated with work of this section.

3.02 INSTALLATION

A. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.

B. Use fixture attachments in concealed locations for wall mounted components.

C. Use concealed joint fasteners to align and secure adjoining cabinet units.

D. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.

E. Secure cabinets to floor using appropriate angles and anchorages.

F. Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces.

3.03 ADJUSTING

A. Adjust installed work.

B. Adjust moving or operating parts to function smoothly and correctly.

3.04 CLEANING

A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

END OF SECTION

SECTION 06 8200
GLASS FIBER REINFORCED PLASTIC

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Glass fiber reinforced, resin fabrications.

1.02 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified component products.

C. Samples: Submit two samples of wall panels, 4 x 4 inch in size, illustrating color, texture, and finish.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Protect components from damage by retaining shipping protection in place until installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Glass Fiber and Resin Fabrications:
   1. Marlite, Inc.. www.marlite.com
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MATERIALS

A. Fiberglass reinforced thermosetting polyester resin panel sheets complying with ASTM D 5319.
   1. Coating: Multilayer print, primer and finish coats.
   2. Thickness: 0.090 inch.
   3. Panel width: 48 inches.
   4. Panel length: 8 or 10 feet.

2.03 FINISH

A. Color: As selected by architect.

B. Exposed to view Surface Texture: Pebbled.

2.04 TRIM

A. Thin-wall semi-rigid extruded PVC.

B. Color: manufacturer's standard to match panel color.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install fabrications in accordance with shop drawings and fabricator's instructions.

3.02 TOLERANCES

A. Maximum variation from true position: 1/4 inch.

B. Maximum offset from true alignment: 1/8 inch.

3.03 CLEANING

A. Clean components of foreign material without damaging finished surface.

B. Hand rub smooth surfaces with polishing cream.

C. Clean fabrications in accordance with fabricator's instructions.

3.04 PROTECTION

A. Place protective structural covering over installed units.

END OF SECTION

SECTION 07 1300
SHEET WATERPROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sheet Waterproofing:

B. Below-grade waterproofing accessories.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete substrate.

1.03 ABBREVIATIONS

1.04 REFERENCE STANDARDS

A. ASTM E154/E154M - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover; 2008a (Reapproved 2013).

B. NRCA (WM) - The NRCA Waterproofing Manual; 2005.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data for membrane.

C. Manufacturer's Installation Instructions: Indicate special procedures.

D. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.06 FIELD CONDITIONS

A. Maintain ambient temperatures above 40 degrees F for 24 hours before and during application and until liquid or mastic accessories have cured.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Contractor shall correct defective Work within a five year period after Date of Substantial Completion; remove and replace materials concealing waterproofing at no extra cost to Owner.

PART 2 PRODUCTS

2.01 WATERPROOFING APPLICATIONS

A. Composite HDPE/Bentonite Sheet Waterproofing: Use at Elevator pits and all walls in contact with earth..
   1. Vertical Surfaces: Adhesive bonded to substrate.
   2. Horizontal Surfaces: Loose-laid.

2.02 MEMBRANE MATERIALS

A. Composite Geomembrane/Bentonite Sheet: Comprised of black/grey granular bentonite with spun polypropylene fabric facing.
   1. Minimum Thickness: 0.090 inch
   2. Sheet Width: 40 inch, minimum.
   3. Manufacturers:
      a. CETCO; SWELLTITE: www.cetco.com.
      b. Epro Services, Inc; Bento-Pro Plus: www.eproserv.com.
      c. Substitutions: See Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions are acceptable prior to starting this work.

B. Verify substrate surfaces are durable; free of matter detrimental to adhesion or application of waterproofing system.

C. Verify items that penetrate surfaces to receive waterproofing are securely installed.

3.02 PREPARATION

A. Protect adjacent surfaces from damage not designated to receive waterproofing.

B. Do not apply waterproofing to surfaces unacceptable to membrane manufacturer.

3.03 INSTALLATION - MEMBRANE

A. Install membrane waterproofing in accordance with manufacturer's instructions and NRCA (WM) applicable requirements.

B. Roll out membrane, and minimize wrinkles and bubbles.

C. Mechanically Fastened Membrane: Install mechanical fasteners in accordance with manufacturer's instructions, and bond sheet to membrane discs.

D. Overlap edges and ends, minimum 3 inches, seal permanently waterproof by method recommended by manufacturer, and apply uniform bead of sealant to joint edge.

E. Reinforce membrane with multiple thickness of membrane material over joints, whether joints are static or dynamic.

F. Weather lap joints on sloped substrate in direction of drainage, and seal joints and seams.

G. Flexible Flashings: Seal items watertight that penetrate through waterproofing membrane with flexible flashings.

END OF SECTION

SECTION 07 1400

HOT FLUID-APPLIED WATERPROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fluid-Applied Waterproofing:
   1. Hot-applied rubberized asphalt waterproofing.

B. Below-grade waterproofing accessories.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete substrate.

1.03 ABBREVIATIONS

1.04 REFERENCE STANDARDS

A. AATCC Test Method 30 - Antifungal Activity, Assessment on Textile Materials: Mildew and Rot Resistance of Textile Materials; 2004.

B. ASTM C836/C836M - Standard Specification for High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course; 2012.

C. ASTM C1306 - Standard Test Method for Hydrostatic Pressure Resistance of a Liquid-Applied Waterproofing Membrane; 2008.

D. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2006a (Reapproved 2013).

E. 1 - Standard Test Methods for Emulsified Bitumens Used As Protective Coatings; 2003.

F. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2014.

G. ASTM E154/E154M - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover; 2008a (Reapproved 2013).

H. ICC-ES AC29 - Acceptance Criteria for Cold, Liquid-Applied, Below-Grade, Exterior Dampproofing and Waterproofing Materials; 2011.

I. NRCA (WM) - The NRCA Waterproofing Manual; 2005.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data for membrane, flexible flashings, and joint cover sheet.

C. Certificate: Certify that products meet or exceed specified requirements.

D. Manufacturer's Installation Instructions: Indicate special procedures and acceptable installation temperatures.

E. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than 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.

1.07 FIELD CONDITIONS

A. Maintain ambient temperatures above 40 degrees F for 24 hours before and during application and until cured.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturer warranty for waterproofing failing to resist penetration of water, except where such failures are the result of structural failures of building. Hairline cracking of concrete due to temperature change or shrinkage is not considered a structural failure.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Hot-Applied Rubberized Asphalt Waterproofing Manufacturers:
   1. CETCO; www.cetco.com.
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 WATERPROOFING APPLICATIONS

A. Hot-Applied Rubberized Asphalt Waterproofing: Use at Inside walls and floors of planters..

2.03 MEMBRANE AND FLASHING MATERIALS

A. Hot-Applied Rubberized Asphalt Waterproofing: Elasticized rubberized asphaltic compound, hot-applied and quick setting.
   1. Suitable for installation over concrete substrates.
   2. Ultimate Elongation: 1000 percent, minimum, measured in accordance with ASTM D412.
   3. Water Vapor Permeance: 0.3 perms, maximum, measured in accordance with ASTM E96/E96M.
   4. Reinforcing: Continuous; manufacturer's standard reinforcing fabric, approved for use with specified product.
   5. Finished Horizontal Coating Thickness: 215 mils (0.215 inch), minimum.
   6. Finished Vertical Coating Thickness: 180 mils (0.180 inch) minimum.
   7. Products:
      a. CETCO StrataSeal HR System "Landscaped Assembly" at planters.
      b. Substitutions: See Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify substrate surfaces are free of frozen matter, dampness, loose particles, cracks, pits, projections, penetrations, or foreign matter detrimental to adhesion or application of waterproofing system.

C. Verify that substrate surfaces are smooth, free of honeycomb or pitting, and not detrimental to full contact bond of waterproofing materials.

D. Verify items that penetrate surfaces to receive waterproofing are securely installed.

3.02 PREPARATION

A. Protect adjacent surfaces from damage not designated to receive waterproofing.

B. Clean and prepare surfaces to receive waterproofing in accordance with manufacturer's instructions; vacuum substrate clean.

C. Do not apply waterproofing to surfaces unacceptable to waterproofing manufacturer.

D. Seal cracks and joints with sealant using methods recommended by sealant manufacturer.

3.03 INSTALLATION

A. Install waterproofing to specified minimum thickness in accordance with manufacturers instructions and NRCA (WM) applicable requirements.

B. Apply extra thickness of waterproofing material at corners, intersections, and angles.

C. Extend waterproofing material into drain clamp flange, apply adequate coating of liquid membrane to assure clamp ring seal. Coordinate with drain installation in Section 22 1006.

D. Seal membrane and flashings to adjoining surfaces.

3.04 PROTECTION

A. Do not permit traffic over unprotected or uncovered membrane.

END OF SECTION

SECTION 07 1417

COLD FLUID-APPLIED WATERPROOFING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Cold fluid-applied waterproofing, horizontal deck applications.

1.02 RELATED REQUIREMENTS

A. Section 07 2500 "Weather Barriers" for wall waterproofing and interface coordination.

B. Section 07 6200 "Sheet Metal Flashing and Trim" for deck flashing

C. Section 07 92 00 "Joint Sealants" for joint sealants and accessories and joint preparation.

1.03 REFERENCES

A. General: Versions of the following standards current as of the date of issue of the project apply to the Work of this Section.

B. ASTM International (ASTM): www.astm.org <http://www.astm.org>:
   1. ASTM E 96/E 96M - Standard Test Methods for Water Vapor Transmission of Materials
   2. ASTM A756 - Test Method for Freeze-Thaw Cycle for deleterious effects

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Conference: Conduct conference at Project Site.
   1. Review requirements for waterproofing products and installation, including surface preparation, substrate conditions, project and manufacturer's details, installation procedures, mockups, testing and inspection requirements, protection and repairs, and coordination and sequencing of waterproofing work with work of other Sections.

1.05 ACTION SUBMITTALS

A. Product Data:
   1. Technical data indicating compliance with requirements.
   2. Substrate preparation instructions and recommendations.

1.06 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and manufacturer.
   1. Certification of manufacturer's approval of Installer.

1.07 QUALITY ASSURANCE

A. Installer Qualifications: A manufacturer-approved firm with minimum five (5) years experience in installation of specified products in successful use on similar projects, employing workers trained by manufacturer, including a full-time on-site supervisor with a minimum of five (5) years experience installing similar work.

B. Manufacturer Qualifications: A qualified manufacturer with minimum five (5) years experience in manufacture of waterproofing as one of its principal products.
   1. Manufacturer's product submitted has been in satisfactory operation on five similar installations for at least five years.

C. Mockups: Provide waterproofing mockup application within mockups required in other sections, or if not specified, in an area of not less than 30 sq. ft. (14 sq. m) of surface where directed by Architect for each type of substrate condition. Include examples of surface preparation, crack and joint treatment, waterproofing application, and flashing, transition, and termination conditions, to set quality standards for execution. Mockup may be retained as part of final construction, at the discretion of the Owner.
   1. Include intersection of deck waterproofing with adjacent vertical waterproofing and moisture control system.

1.08 DELIVERY, STORAGE AND HANDLING

A. Accept materials on site in manufacturer's unopened original packaging.

B. Store products in weather protected environment, clear of ground and moisture, within temperature ranges recommended by waterproofing manufacturer.

1.09 ENVIRONMENTAL REQUIREMENTS

A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer.
   1. Protect substrates from environmental conditions that affect waterproofing performance.
   2. Do not apply waterproofing during snow, rain, fog, or mist.

1.10 SCHEDULING

A. Coordinate installation of waterproofing with completion of roofing and other work requiring interface with waterproofing.

B. Schedule work so waterproofing applications may be inspected prior to concealment.

C. Ensure waterproofing materials are cured before covering with other materials.

1.11 WARRANTY

A. Special Manufacturer's Warranty: Manufacturer's standard form in which waterproofing manufacturer agrees to furnish waterproofing material to repair or replace those materials installed according to manufacturer's written instructions that exhibit material defects or otherwise fail to perform as specified under normal use within warranty period specified.
   1. Access for Repair: Owner shall provide unimpeded access to the Project and the waterproofing system for purposes of testing, leak investigation, and repair, and shall reinstall removed cladding and overburden materials upon completion of repair.
   2. Cost Limitation: Manufacturer's obligation for repair or replacement shall be limited to the original installed cost of the work.
   3. Warranty Period: 5 years from date of Substantial Completion.

B. Special warranties specified in this article exclude deterioration or failure of waterproofing materials from the following:
   1. Movement of the structure caused by structural settlement or stresses on the waterproofing exceeding manufacturer's written specifications for elongation.
   2. Mechanical damage caused by outside agents.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis-of-Design Products: Provide waterproofing products manufactured by Pli-Dek Systems, Inc.
   1. Pli-Dek System "F" over structural plywood decks.
   2. Con-Dek over concrete decks.

B. Source Limitations: Provide waterproofing system materials and accessory products from single source from single manufacturer.

2.02 PERFORMANCE REQUIREMENTS

A. General: Waterproofing system shall be capable of performing as a continuous watertight installation and as a moisture drainage plane transitioned to adjacent flashings and discharging water to the building exterior. Waterproofing shall accommodate normal substrate movement and seal expansion and control joints, construction material transitions, opening transitions, penetrations, and perimeter conditions without resultant moisture deterioration.

B. Compatibility: Provide waterproofing system materials that are compatible with one another and with adjacent materials under conditions of service and application required, as demonstrated by waterproofing manufacturer based on testing and field experience.

2.03 WATERPROOFING COMPONENTS

A. GU80-1 Base Coat (gray): Portland cement and silicon dioxide composition that is to be mixed with GU80-1 Liquid Admixture.
   1. GU80-1 Liquid Admixture: An acrylic polymer emulsion.
   2. Pli-Dek fiberglass reinforced resin top coat.

2.04 ACCESSORY MATERIALS

A. General: Accessory materials as described in manufacturer's written installation instructions, recommended to produce complete waterproofing system meeting performance requirements, and compatible with waterproofing material and adjacent materials.

B. Substrate Patching Material: Waterproofing manufacturer's standard trowel-grade filler material.

C. Galvanized Expanded Metal Lath weighing 2.5lb./sq.yd. Lath must be dipped, not electro-galvanized.

D. Joint Sealant: ASTM C 719, high performance, medium-modulus, low-VOC, UV-stable, non-sag polyurethane sealant approved by waterproofing manufacturer for adhesion and compatibility with waterproofing and accessories.
   1. Basis of Design Product: Vulkem 931.

PART 3 EXECUTION

3.01 EXAMINATION

A. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INTERFACE WITH OTHER WORK

A. Sequencing of Work: Coordinate sequencing of waterproofing work 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 work 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 FLASHING

A. Flashing shall be minimum 26 gauge galvanized sheet metal.

B. Proper flashing must be installed at all doors, walls, fascia edges, posts, penetrations, etc. Refer to Manufacturer's details for further instructions. (See Pli-Dek Details)

C. Flashing must be installed to accommodate all exterior wall coating applications from coming in contact with the deck surface. Exterior siding, stucco, etc. must be held off the protective topping layer a minimum of 2".

D. All flashing splices must be overlapped a minimum of 4" and caulked between any two pieces of flashing with a urethane sealant (Vulkem 931 or equal)

E. Flashing at walls must be installed behind the building paper.

3.04 PREPARATION

A. Clean, prepare, and treat substrates in accordance with waterproofing manufacturer's written instructions.
   1. Mask adjacent finished surfaces.
   2. Remove contaminants and film-forming coatings from substrates.
   3. Remove projections and excess materials and fill voids with substrate patching material.
   4. Prepare and treat joints and cracks in substrate per ASTM D 4258 and waterproofing manufacturer's written instructions.

B. Detail Preparation: Prepare non-moving shrinkage cracks, large cracks, construction joints, expansion joints, projections and protrusions, penetrations, drains, and changes in plane in accordance with waterproofing manufacturer's written instructions and details, using accessory materials specified.

1. Gaps in plywood deck shall be covered with 2" wide flashing paper and tacked in place, per manufacturer's instructions.
2. Lay out and fasten expanded metal lath in accordance with manufacturer's installation instructions.

3.05 WATERPROOFING INSTALLATION

A. General: Apply waterproofing material to form a seal with strips and transition strips and to achieve continuous waterproofing according to waterproofing manufacturer's written instructions. Apply fluid waterproofing material within manufacturer's recommended application temperature ranges.

B. Cold Fluid-Applied Waterproofing:
1. Apply waterproofing in total wet film thickness and with methods recommended in writing by waterproofing manufacturer. Allow to dry prior to applying subsequent layers.
2. Lay out fiberglass reinforcing mat and apply resin in accordance with manufacturer's instructions. Allow to cure prior to applying top coat.
3. Apply top coat of resin, finish texture as established in mock-up.

C. Standard Application: Horizontal:
1. Apply using roller or squeegee.

D. Terminations: Install terminations of waterproofing membrane in accordance with ASTM C 898 Standard Guide for Use of High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane with Separate Wearing Course and ASTM C 1471 Standard Guide for Use of High Solids Content Cold Liquid-Applied Elastomeric Waterproofing Membrane on Vertical Surfaces, as applicable to application, at not less than minimum height recommended by waterproofing manufacturer.

E. Correct deficiencies in or remove waterproofing that does not comply with requirements; repair substrates and reapply waterproofing components.

3.06 FIELD QUALITY CONTROL

A. Contractor's Inspector: Contractor shall engage manufacturer's qualified Inspector full-time during the Work to perform tests and inspections, including documenting of waterproofing prior to concealment.

B. Reporting: Forward written inspection reports to the Architect within 10 working days of the inspection and test being performed.

C. Correction of Work: Correct deficient applications not passing tests and inspections, make necessary repairs, and retest as required to demonstrate compliance with requirements.

3.07 CLEANING AND PROTECTING

A. Clean spills, stains, and overspray resulting from application utilizing cleaning agents recommended by manufacturers of affected construction. Remove masking materials.

B. Protect waterproofing from damage from subsequent work. Protect waterproofing materials from exposure to UV light for period in excess of that acceptable to waterproofing manufacturer; replace overexposed materials and retest.

END OF SECTION

SECTION 07 1900
WATER REPELLENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Water repellents applied to exterior masonry and concrete surfaces.

B. Anti-Graffiti coating applied to exterior masonry and concrete surfaces.

C. Pressure washing.

1.02 RELATED REQUIREMENTS

A. Section 07 9200 - Joint Sealants.

B. Section 09 9000 - Paints and Coatings.

1.03 REFERENCE STANDARDS

A. ASTM C140/C140M - Standard Test Methods of Sampling and Testing Concrete Masonry Units and Related Units; 2014.

B. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; current edition, www.paintinfo.com.

C. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition, www.paintinfo.com.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a meeting at least one week prior to starting work; require attendance of affected installers; invite Architect and Owner.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide product description and limitations.

C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Water Repellent Material: Two gallons of the type installed.
   3. Extra Anti-Graffiti Material: Two gallons of the type installed.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum five years documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum five years experience.

1.07 MOCK-UP

A. Prepare a representative surface 36 by 36 inch in size using specified materials and preparation and application methods on surfaces identical to those to be coated; approved mock-up constitutes standard for workmanship.

B. For proposed substitutions, prepare side-by-side mock-ups of specified and substitute products.

C. Locate where directed.

D. Mock-up may remain as part of the Work.

1.08 FIELD CONDITIONS

A. Protect liquid materials from freezing.

B. Do not apply water repellent when ambient temperature is lower than 50 degrees F or higher than 100 degrees F.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Silane, Siloxane, Silane-Siloxane Blend, and Siliconate Water Repellents:
   1. Sherwin-Williams Company; Product Loxon Water Repellent: www.sherwin-williams.com.
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MATERIALS

A. Water Repellent: Non-glossy, colorless, penetrating, water-vapor-permeable, non-yellowing sealer, that dries invisibly leaving appearance of substrate unchanged.
   1. Applications: Vertical surfaces and non-traffic horizontal surfaces.
   2. Number of Coats: Two.
   3. Moisture Absorption When Applied to Masonry: 5 percent, maximum, when tested in accordance with ASTM C140/C140M using masonry sample completely coated with water repellent.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify joint sealants are installed and cured.

C. Verify surfaces to be coated are dry, clean, and free of efflorescence, oil, or other matter detrimental to application of water repellent.

3.02 PREPARATION

A. Protection of Adjacent Work:
   1. Protect adjacent landscaping, property, and vehicles from drips and overspray.
   2. Protect adjacent surfaces not intended to receive water repellent.

B. Prepare surfaces to be coated as recommended by water repellent manufacturer for best results.

C. Pressure wash surfaces to be coated:

3.03 APPLICATION

A. Apply water repellent in accordance with manufacturer's instructions, using procedures and application methods recommended as producing the best results.

B. Apply two coats, minimum.

C. Remove water repellent from unintended surfaces immediately by a method instructed by water repellent manufacturer.

END OF SECTION

SECTION 07 2100
THERMAL INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Batt insulation and vapor retarder in exterior wall, ceiling, and roof construction.

B. Batt insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.

C. Batt insulation, unfaced, in interior sound rated walls.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Supporting construction for batt insulation.

B. Section 07 2500 - Weather Barriers: Separate air barrier and vapor retarder materials.

C. Section 07 5423 - Thermoplastic Polyolefin (TPO) Membrane Roofing: Rigid Polyisocyanurate insulation specified in that section.

D. Section 07 8400 - Firestopping: Insulation as part of fire-rated through-penetration assemblies.

E. Section 09 2116 - Gypsum Board Assemblies: Acoustic insulation inside walls and partitions.

1.03 REFERENCE STANDARDS

A. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2012.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

C. ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace At 750 Degrees C; 2012.

D. ASTM E2357 - Standard Test Method for Determining Air Leakage of Air Barrier Assemblies; 2011.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Insulation:
   1. Certain Teed Corporation
   2. Owens Corning Corporation
   3. Substitutions: See Section 01 6000 - Product Requirements.

2.02 APPLICATIONS

A. Insulation in Wood Framed Walls: Batt insulation with separate vapor retarder.

B. Insulation in Wood Framed Ceiling (Roof) Structure: Batt insulation with integral vapor retarder.

2.03 BATT INSULATION MATERIALS

A. Where batt insulation is indicated, either glass fiber or mineral fiber batt insulation may be used, at Contractor's option.

B. Glass Fiber Batt Insulation: Flexible preformed batt or blanket, complying with ASTM C665; friction fit.
   1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
   2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
   3. Combustibility: Non-combustible, when tested in accordance with ASTM E136, except for facing, if any.

4. Formaldehyde Content: Zero.
5. Thermal Resistance: R-value of:.
    a. 4" Wall [R-13]
    b. 6" Wall [R-21]
    c. 11 7/8" Floor [R-30]
    d. 9 1/2" Roof [R-26]
6. Thickness: varies 3 1/2-10 inch.
    a. 4" Wall [3.5" thickness]
    b. 6" Wall [5.5" thickness]
    c. 11 7/8" Floor [10" thickness]
    d. 9 1/2" Roof [8" thickness]
7. Facing: Asphalt treated Kraft paper, one side.
8. Manufacturers:
    a. CertainTeed Corporation: www.certainteed.com.
    b. Johns Manville: www.jm.com.
    c. Owens Corning Corp: www.owenscorning.com.
9. Substitutions: See Section 01 6000 - Product Requirements.

C. Mineral Fiber Batt Insulation: Flexible preformed batt or blanket, complying with ASTM C665; friction fit; unfaced flame spread index of 0 (zero) when tested in accordance with ASTM E84.
    1. Where indicated, provide foil facing on one side; with flame spread index of 25 or less, when tested in accordance with ASTM E84.

2.04 ACCESSORIES

A. Tape: Bright aluminum self-adhering type, mesh reinforced, 2 inch wide.

B. Tape joints of rigid insulation in accordance with roofing and insulation manufacturers' instructions.

C. Insulation Fasteners: Appropriate for purpose intended and approved by roofing manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.

3.02 BATT INSTALLATION

A. Install insulation and vapor retarder in accordance with manufacturer's instructions.

B. Install in exterior wall and roof spaces without gaps or voids. Do not compress insulation.

C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

E. Install with factory applied vapor retarder membrane facing warm side of building spaces. Lap ends and side flanges of membrane over framing members.

F. Staple or nail facing flanges in place at maximum 6 inches on center.

G. Tape seal butt ends, lapped flanges, and tears or cuts in membrane.

H. At wood framing, place vapor retarder on warm side of insulation by stapling at 6 inches on center. Lap and seal sheet retarder joints over member face.

I. At metal framing, place vapor retarder on warm side of insulation; lap and seal sheet retarder joints over member face.

J. Tape seal tears or cuts in vapor retarder.

K. Extend vapor retarder tightly to full perimeter of adjacent window and door frames and other items interrupting the plane of the membrane. Tape seal in place.

3.03 PROTECTION

A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION

SECTION 07 2500
WEATHER BARRIERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Water-Resistive Barrier: Under exterior wall cladding, over sheathing or other substrate; not air tight or vapor retardant.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Water-resistive barrier under exterior cladding.

B. Section 07 6200 - Sheet Metal Flashing and Trim: Metal flashings installed in conjunction with weather barriers.

C. Section 09 2400 - Portland Cement Plastering.

1.03 DEFINITIONS

A. Vapor Retarder: Air tight barrier made of material that is relatively water vapor impermeable, to the degree specified, with sealed seams and with sealed joints to adjacent surfaces.
   1. Water Vapor Permeance: For purposes of conversion, 57.2 ng/(Pa s sq m) = 1 perm.

B. Water-Resistive Barrier: Water-shedding barrier made of material that is moisture resistant, to the degree specified, intended to be installed to shed water without sealed seams.

1.04 REFERENCE STANDARDS

A. AATCC Test Method 30 - Antifungal Activity, Assessment on Textile Materials: Mildew and Rot Resistance of Textile Materials; 2013.

B. AATCC Test Method 127 - Water Resistance: Hydrostatic Pressure Test; 2014.

C. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 2009.

D. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2013.

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

F. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2014.

G. ICC-ES AC212 - Acceptance Criteria for Water-Resistive Coatings Used as Water-Resistive Barriers over Exterior Sheathing; ICC Evaluation Service, Inc; 2015.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on material characteristics.

1.06 FIELD CONDITIONS

A. Maintain temperature and humidity recommended by the materials manufacturers before, during and after installation.

PART 2 PRODUCTS

2.01 WEATHER BARRIER ASSEMBLIES

A. Water-Resistive Barrier: Provide on exterior walls under exterior cladding.
   1. Use building paper unless otherwise indicated.
   2. Under Portland cement stucco, use two separate layers of building paper.
   3. Under siding, use one layer of building paper unless otherwise noted on the drawings.

2.02 WATER-RESISTIVE BARRIER MATERIALS (NEITHER AIR BARRIER NOR VAPOR RETARDER)

A. Building Paper: Asphalt-saturated Kraft building paper complying with requirements of ICC-ES AC38 Grade D.

1. Manufacturers:
    a. Two-Ply Super Jumbo Tex 60 Minute.
    b. Substitutions: See Section 01 6000 - Product Requirements.

2.03 VAPOR RETARDER MATERIALS (AIR BARRIER AND WATER-RESISTIVE)

A. Vapor Retarder Sheet: ASTM D1970/D1970M.
1. Type: Rubberized asphalt bonded to thermoplastic sheet, self-adhesive.
2. Thickness: 40 mil (0.040 inch), nominal.
3. Water Vapor Permeance: 0.05 perm, maximum, when tested in accordance with ASTM E96/E96M.
4. Seam and Perimeter Tape: As recommended by sheet manufacturer.
5. Products:
    a. Grace Perm-A-Barrier Wall Membrane.
    b. Substitutions: See Section 01 6000 - Product Requirements.

2.04 ACCESSORIES

A. Flexible Flashing: Self-adhesive sheet flashing complying with ASTM D1970/D1970M, except slip resistance requirement is waived if not installed on a roof.
1. Composition: Modified bituminous sheet laminated to polyethylene sheet.
2. Thickness: 40 mil (0.040 inch), nominal.
3. Products:
    a. Grace Vycor V40.
    b. Substitutions: See Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and conditions are ready to accept the work of this section.

3.02 PREPARATION

A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.

3.03 INSTALLATION

A. Install materials in accordance with manufacturer's instructions.

B. Water-Resistive Barriers: Install continuous barrier over surfaces indicated, with sheets lapped to shed water but with seams not sealed.

C. Vapor Retarders: Install continuous air tight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.

D. Mechanically Fastened Sheets - On Exterior:
1. Install sheets shingle-fashion to shed water, with seams generally horizontal.
2. Overlap seams as recommended by manufacturer but at least 6 inches.
3. Overlap at outside and inside corners as recommended by manufacturer but at least 12 inches.
4. Install water-resistive barrier over jamb flashings.
5. Install air barrier and vapor retarder UNDER jamb flashings.
6. Install head flashings under weather barrier.
7. At openings to be filled with frames having nailing flanges, wrap excess sheet into opening; at head, seal sheet over flange and flashing.

E. Self-Adhesive Sheets:
1. Prepare substrate in manner recommended by sheet manufacturer; fill and tape joints in substrate and between dissimilar materials.
2. Lap sheets shingle-fashion to shed water and seal laps air tight.
3. Once sheets are in place, press firmly into substrate with resilient hand roller; ensure that all laps are firmly adhered with no gaps or fishmouths.

4. Use same material, or other material approved by sheet manufacturer for the purpose, to seal to adjacent construction and as flashing.
5. At wide joints, provide extra flexible membrane allowing joint movement.

F. Openings and Penetrations in Exterior Weather Barriers:
1. Install flashing over sills, covering entire sill frame member, extending at least 5 inches onto weather barrier and at least 6 inches up jambs; mechanically fasten stretched edges.
2. At openings to be filled with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with at least 4 inches wide; do not seal sill flange.
3. At openings to be filled with non-flanged frames, seal weather barrier to all sides of opening framing, using flashing at least 9 inches wide, covering entire depth of framing.
4. At head of openings, install flashing under weather barrier extending at least 2 inches beyond face of jambs; seal weather barrier to flashing.
5. At interior face of openings, seal gap between window/door frame and rough framing, using joint sealant over backer rod.
6. Service and Other Penetrations: Form flashing around penetrating item and seal to weather barrier surface.

3.04 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Do not cover installed weather barriers until required inspections have been completed.

3.05 PROTECTION

A. Do not leave materials exposed to weather longer than recommended by manufacturer.

B. Do not leave paper- or felt-based barriers exposed to weather for longer than one week.

END OF SECTION

SECTION 07 4243

COMPOSITE WALL PANELS

P1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum-faced composite panels, attachments and sealants.

1.02 RELATED SECTIONS

A. Section 05 1000 – Structural Metal Framing.

B. Section 06 1000 – Rough Carpentry.

C. Section 07 2000 – Thermal Protection.

D. Section 07 6000 – Flashing and Sheet Metal.

E. Section 07 9200 – Joint Sealants.

F. Section 08 4413 - Glazed Aluminum Curtain Walls.

G. Section 09 2116 – Gypsum Board Assemblies.

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM) B209 - Aluminum and Aluminum-Alloy Sheet and Plate.

B. American Society for Testing and Materials (ASTM) C481 - Laboratory Aging of Sandwich Constructions.

C. American Society for Testing and Materials (ASTM) E72 - Standard Test Methods of Conducting Strength Tests of Panels for Building Construction.

D. American Society for Testing and Materials (ASTM) E84 - Surface Burning Characteristics of Building Materials.

E. American Society for Testing and Materials (ASTM) E283 - Rate of Air Leakage through Exterior Windows, Curtain Walls, and Doors.

F. American Society for Testing and Materials (ASTM) E289 - Linear Thermal Expansion of Rigid Solids with Interferometry.

G. American Society for Testing and Materials (ASTM) E330 - Structural Performance of Exterior Windows, Curtain Walls, and Doors.

H. American Society for Testing and Materials (ASTM) E331 - Water Penetration for Exterior Windows, Curtain Walls, and Doors.

I. American Society for Testing and Materials (ASTM) D1781 - Climbing Drum Peel for Adhesives.

J. American Society for Testing and Materials (ASTM) - Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

K. American Architectural Manufacturers Association (AAMA) 501 – Water Penetration using Dynamic Pressure.

L. American Architectural Manufacturers Association (AAMA) 605.2 - Voluntary Specification for High Performance Organic Coatings on Architectural Extrusions and Panels.

M. American Architectural Manufacturers Association (AAMA) TIR-a11 - Maximum Allowable Deflection of Framing Systems for Building Cladding Components at Design Wind Loads.

1.04 SYSTEM DESCRIPTION

A. Design Requirements:

1. Design system to accommodate movement of components without buckling, failure of joint seals, undue stress on fasteners, or other detrimental effects when subjected to temperature and humidity ranges reasonably anticipated.
2. Design system to accommodate tolerances of structure.

B. Performance Requirements:

1. Submit test data witnessed by an independent testing agency for the following requirements:
    a. Structural tests for wind loads by "Chamber Method" in compliance with ASTM E72.
        1) Standard test design loading: 20 psf (960 Pa) positive and negative wind load.
        2) Design panel system to withstand code imposed design loads and a deflection limit of L/180 shall apply to positive load pressures only.
        3) Design panel system to withstand code imposed design loads and a deflection limit of L/175 shall apply to positive load pressures only.
    b. Air Infiltration: 0.06 cfm per square foot (32 lps per square meter) air leakage under a static pressure of 1.56 psf (7.65 kg per square meter) when tested in accordance with ASTM E283.
    c. Water Penetration: No uncontrolled water penetration through the standard vertical panel and sealed joints at a static pressure of 6.24 psf (30.5 kg per square meter) when tested in accordance with ASTM E331.

1.05 SUBMITTALS

A. Submit under provisions of Section 01 30 00.

B. Manufacturer's data sheets on each product to be used, including:
    1. Preparation instructions and recommendations.
    2. Storage and handling requirements and recommendations.
    3. Installation methods.

C. Shop Drawings: Submit shop drawings showing layout, flashings, drainage, ventilation, vapor barriers, vapor retarders, profiles and product components, including anchorage, accessories, finish colors, patterns and textures.

D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

E. Verification Samples: For each finish product specified, two samples, minimum size 3 inches (76 mm) by 5 inches (128 mm) representing actual product, color, and patterns.

F. Quality Assurance Submittals: Submit the following:
    1. Test reports: Certified test reports showing compliance with specified performance characteristics and physical properties.
    2. Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria, and physical requirements.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer capable of providing field service representation during construction, approving acceptable installer and approving application method.

B. Installer Qualifications:
    1. Installer experienced in performing work of this section who has specialized in installation of work similar to that required for this project.
    2. Panel Installer shall assume responsibility for all components of the exterior panel system including, but not limited to attachment to sub-construction, panel to panel joinery, panel to dissimilar material joinery, and joint seal associated with the panel system.

C. Pre-installation Meetings: Conduct pre-installation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions, and manufacturer's warranty requirements.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store panels horizontally, off-the-ground, in manufacturer's unopened packaging until ready for installation.

B. Examine delivered materials upon receipt to insure that no damage has occurred during shipment. Store metal-faced composite wall panels horizontally, covered with a suitable weather tight and ventilated covering. Store metal-faced composite wall panels to ensure dryness, with a positive slope for drainage of water. Do not store metal-faced composite wall

panels in contact with other materials that might cause staining, denting, or other surface damage. DO NOT allow storage space to exceed 120 degrees F (49 degrees C).

C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.08 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 absolute limits.

1.09 WARRANTY

A. Finish Warranty: Commencing on Date of Substantial Completion.
   1. Provide 10-year written warranty with economy or standard finish color coated metal finish covering color fading, chalking, and film integrity.
   2. Provide 20-year written warranty with PVDF fluoropolymer finish color coated metal finish covering color fading, chalking, and film integrity.
   3. Finish coating shall not peel, blister, chip, crack or check.
   4. Chalking, fading or erosion of finish measured by the following tests:
      a. Finish coating shall not chalk in excess of 8 numerical ratings when measured in accordance with ASTM D659.
      b. Finish coating shall not change color or fade in excess of 8 NBS units as determined by ASTM D2244.

B. Material and Installation Warranty: Commencing on Date of Substantial Completion.
   1. When installed as directed by Laminators Incorporated, panels covered by this warranty are warranted not to delaminate (separate) at any Laminators produced glue line for a period of five years.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: Laminators Incorporated; 3255 Penn St., Hatfield, PA 19440. (Distributed by Architectural Building Products: 800-870-7595 www.abp-distributors.com)

B. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00.

2.02 ALUMINUM-FACED COMPOSITE PANELS

A. Panel Construction: Finished aluminum sheet over a corrugated polyallomer (CPA) core with backer sheet.

B. Panel Facing: Smooth face, minimum 0.021 inch (0.53 mm) thick, ASTM B209 aluminum sheet.

C. Panel Backing: Random painted aluminum sheet, minimum 0.013 inch (0.33 mm) thick, ASTM B209 aluminum sheet.

D. Panel Thickness: 6 mm (1/4 inch).

E. Fire Test Performance: ASTM E84: Class A.

F. Bond Test Performance: ASTM C481-A Cyclic Aging: Pass.

G. Finish: Kynar 500 - PVDF fluoropolymer paint system meeting AAMA 2605.

H. Finish Colors: As indicated on drawings.

I. Aluminum Composite Panel Installation System:
   1. "Clip and Caulk" System at Zero-Lot-Line conditions.
   2. "1-Piece Tight-Fit Extrusion" System in locations indicated on Drawings.
   3. "Route and Return" System in locations indicated on Drawings.

J. Individual panels for installation in Aluminum curtain wall system. Installation by others.

2.03 ACCESSORIES

A. Manufacturer's Sealants and Accessories: Provide manufacturer's recommended sealants and accessories for product installation.

B. Flashing: Fabricate flashing materials from 0.030 inch (0.76 mm) minimum thickness aluminum sheet painted to match the adjacent curtain wall/panel system where exposed. Provide a 12 inch (305 mm) wide lap strap under the flashing at abutted conditions and seal lapped surfaces with a full bed of non-hardening sealant.

2.04 FABRICATION

A. Panels shall be fabricated and finished as required to provide material construction and performance as specified and as required by manufacturer to comply with warranty provisions.
   1. Tolerances: Length and Width: plus or minus 1/16 inch (1.6mm).
   2. Squareness (Diagonals): equal within 1/8 inch (3.2mm).

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. Examine substrates, areas, and conditions, with substrate installer present, for compliance with requirements for structural soundness, installation tolerances, metal panel supports, and other conditions affecting performance of work.
   1. Examine primary and secondary wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances listed below.
      a. 1/4 inch (6 mm) in any 20 feet (6 m) length vertically or horizontally.
      b. 1/2 inch (12 mm) in any building elevation.
   2. Examine solid wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required.
   3. For the record, prepare written report, endorsed by panel installer and substrate installer, listing remedy for conditions detrimental to performance of work.

C. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before metal panel installation.

D. Proceed with installation only after all unsatisfactory conditions have been corrected.

E. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 INSTALLATION

A. Comply with manufacturer's installation guides and product data, including product technical bulletins, product catalog installation instructions, and product carton instructions for installation type selected.

B. Work shall be done and completed in a thorough and workmanlike manner by mechanics skilled in their various trades.

C. Caulk Installation:
   1. Use only approved sealants as described in manufacturer's Installation Guidelines.
   2. The sealant manufacturer’s instructions shall be followed in preparing and installing sealants.
   3. Joints to receive sealant shall be clean, dry and free from dust, grit and contaminants.
   4. The sealant shall completely fill the glazing pockets.

3.03 FIELD QUALITY CONTROL

A. 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 instructions.

3.04 CLEANING AND PROTECTION

A. Protection: Protect installed product and finish surfaces from damage during construction.

B. Cleaning: Remove temporary coverings and protection of adjacent work areas. Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to owner's acceptance. Remove construction debris from project site and legally dispose of debris.

C. Protect installed products until completion of project.

D. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 07 5100
BUILT-UP BITUMINOUS ROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Built-up roofing membrane, conventional application.

B. Insulation, flat and tapered.

C. Deck sheathing.

D. Base flashings.

E. Roofing cant strips, accessories, and walkways.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Wood nailers and curbs.

B. Section 07 6200 - Sheet Metal Flashing and Trim: Counterflashings, reglets and copings.

C. Section 07 7200 - Roof Accessories: Roof-mounted units.

D. Section 22 1006 - Plumbing Piping Specialties: Roof drains.

1.03 REFERENCE STANDARDS

A. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2015a.

B. ASTM C728 - Standard Specification for Perlite Thermal Insulation Board; 2013.

C. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2013.

D. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2014.

E. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2014.

F. ASTM D41/D41M - Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing; 2011.

G. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 2009.

H. ASTM D312/D312M - Standard Specification for Asphalt Used in Roofing; 2015.

I. ASTM D2178/D2178M - Standard Specification for Asphalt Glass Felt Used in Roofing and Waterproofing; 2013a.

J. ASTM D3909/D3909M - Standard Specification for Asphalt Roll Roofing (Glass Felt) Surfaced with Mineral Granules; 2014.

K. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 2007 (Reapproved 2012).

L. ASTM D4897/D4897M - Standard Specification for Asphalt-Coated Glass-Fiber Venting Base Sheet Used in Roofing; 2001 (Reapproved 2009).

M. ASTM D6380/D6380M - Standard Specification for Asphalt Roll Roofing (Organic Felt); 2003 (Reapproved 2013).

N. FM (AG) - FM Approval Guide; current edition.

O. NRCA (RM) - The NRCA Roofing Manual; 2017.

P. NRCA ML104 - The NRCA Roofing and Waterproofing Manual; Fifth Edition, with interim updates.

Q. UL (FRD) - Fire Resistance Directory; current edition.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with installation of associated counterflashings installed by other sections as the work of this section proceeds.

B. Preinstallation Meeting: Convene one week before starting work of this section.
   1. Review preparation and installation procedures and coordinating and scheduling required with related work.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data indicating membrane and bitumen materials, base flashing materials, insulation, and surfacing.

C. Shop Drawings: Indicate joint or termination detail conditions, conditions of interface with other materials, and setting plan for tapered insulation.

D. Manufacturer's Field Reports: Indicate procedures followed, ambient temperatures, and supplementary instructions given.

E. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience and approved by manufacturer.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver products in manufacturer's original containers, dry, undamaged, with seals and labels intact.

B. Store products in weather protected environment, clear of ground and moisture.

C. Protect foam insulation from direct exposure to sunlight.

1.08 FIELD CONDITIONS

A. Do not apply roofing membrane during unsuitable weather.

B. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.

C. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.

1.09 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a two year period after Date of Substantial Completion.

C. Provide twenty year manufacturer's material and labor warranty to cover failure to prevent penetration of water.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Sheet and Bitumen Materials:
   1. Basis of Design: Johns Manville; 4GNC CR: www.jm.com.
   2. Substitutions: See Section 01 6000 - Product Requirements.

B. Insulation:
   1. Dow Chemical Company: www.dow.com.
   2. GAF: www.gaf.com/sle.
   3. Owens Corning Corporation: www.owenscorning.com.

4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 ROOFING - CONVENTIONAL APPLICATION

A. Built-up Bituminous Roofing: Asphalt felt membrane, four ply plus base sheet, with vapor retarder and insulation.

B. Roofing Assembly Requirements:
   1. Roof-Ceiling Fire Resistance Rating: Conform to UL (FRD) Assembly Design No. GA File No. RC 2601 or RC 2602 (1-hour) .
   2. Insulation Thermal Resistance (R-Value): 3 per inch, minimum; provide insulation of thickness required.

C. Acceptable Insulation Types - Constant Thickness Application: Any of the types specified.
   1. Single layer of polyisocyanurate board.

D. Acceptable Insulation Types - Tapered Application: Any of the types specified.
   1. Tapered polyisocyanurate board.

E. Surfacing: Aggregate, as indicated on drawings.

2.03 SHEET MATERIALS

A. Vapor Retarder Felt: Asphalt-saturated organic, ASTM D226/D226M, Type I ("No.15") felt, unperforated.

B. Base Sheet: Asphalt-saturated and -coated, venting glass fiber felt; ASTM D4897/D4897M Type II, heavy-duty.

C. Roofing Felt: ASTM D2178/D2178M; Asphalt-saturated glass fiber felt; standard duty.

D. Mineral Surface Cap Sheet: ASTM D3909/D3909M; Asphalt-saturated glass fiber roll roofing; white colored mineral granules.

E. Base Flashing Material: Modified bitumen, reinforced, smooth surface.

F. Flexible Flashing Material: Modified bitumen, SBS type; conforming to the following:

2.04 BITUMINOUS MATERIALS

A. Bitumen: ASTM D312/D312M Type I, asphalt.

B. Primer: ASTM D41/D41M, asphalt type.

C. Roof Cement: ASTM D4586/D4586M, Type I, asbestos free.

2.05 INSULATION

A. Polyisocyanurate Board Insulation: Rigid cellular foam, complying with ASTM C1289, Type I, aluminum foil both faces; Class 1, non-reinforced foam core, and with the following characteristics:
   1. Compressive Strength: 16 psi
   2. Board Size: 48 by 96 inch.
   3. Board Thickness: 3.0 inch minimum.
   4. Tapered Board: Slope as indicated; minimum thickness 1 inch; fabricate of fewest layers possible.
   5. Board Edges: Square.
   6. Manufacturers:
      a. Dow Chemical Company: www.dow.com.
      b. GAF; _____: www.gaf.com/sle.

2.06 SURFACING MATERIALS - CONVENTIONAL APPLICATION

A. Walkway Pads: Suitable for maintenance traffic, contrasting color or otherwise visually distinctive from roof membrane.
   1. Composition: Asphaltic with mineral granule surface.
   2. Size: As indicated.

2.07 ACCESSORIES

A. Cant and Edge Strips: Bitumen-impregnated wood fiberboard, compatible with roofing materials; cants formed to 45 degree angle, tapered edge strips, and other configurations as detailed.

B. Insulation Fasteners: Appropriate for purpose intended and approved by roofing manufacturer.
   1. Length as required for thickness of insulation material and penetration of deck substrate, with metal washers.

C. Roofing Nails: Galvanized, hot dipped type, size and configuration as required to suit application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and site conditions are ready to receive work.

B. Verify deck is supported and secure.

C. Verify deck is clean and smooth, flat, free of depressions, waves, or projections, properly sloped and suitable for installation of roof system.

D. Verify deck surfaces are dry and free of snow or ice.

E. Verify that roof openings, curbs, and penetrations through roof are solidly set, and cant strips are in place.

3.02 WOOD DECK PREPARATION

A. Verify flatness and tightness of joints of wood decking. Fill knot holes with latex filler.

B. Confirm dry deck by moisture meter with 12 percent moisture maximum.

C. Conventional Application: Apply mopped two-ply vapor retarder; nail along ply laps at 12 inches on center.

3.03 CONCRETE DECK PREPARATION

A. Fill surface honeycomb and variations with latex filler.

B. Confirm dry deck by moisture meter with 12 percent moisture maximum.

C. Conventional Application: Apply mopped two-ply vapor retarder.

3.04 VAPOR RETARDER INSTALLATION - CONVENTIONAL APPLICATION

A. Mopped Two-ply Vapor Retarder:
   1. Apply primer at a rate of 1.0 gal/square (100 sq ft) and allow to dry.
   2. Mop surface with hot bitumen and embed two plies of vapor retarder felt; lap plies 19 inches, full mop each ply.
   3. Apply bitumen at 20 lbs/square (100 sq ft).
   4. Glaze top surface of the vapor retarder with bitumen if insulation is not placed immediately.

B. Extend vapor retarder under cant strips and blocking.

3.05 INSULATION INSTALLATION - CONVENTIONAL APPLICATION

A. Attachment of Insulation:
   1. Mechanically fasten first layer of insulation to deck in accordance with roofing manufacturer's instructions and FM (AG) Factory Mutual approved requirements.
   2. Embed second layer of insulation into flood coat mopping of hot bitumen in accordance with roofing and insulation manufacturers' instructions.

B. Lay subsequent layers of insulation with joints staggered minimum 6 inch from joints of preceding layer.

C. Place tapered insulation to the required slope pattern in accordance with manufacturer's instructions.

D. Lay boards with edges in moderate contact without forcing. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.

E. Do not apply more insulation than can be covered with membrane in same day.

3.06 MEMBRANE APPLICATION

A. Install built-up bituminous roofing system in accordance with manufacturers recommendations and NRCA (RM) applicable requirements.

B. Equiviscous Temperature (EVT) at Point of Application: Comply with NRCA (RM) recommendations.

C. Apply membrane plies, weather lap edges and ends, and mop with 20 lbs/square (100 sq ft) of bitumen per ply. Apply plies 2 on 2 in same direction.

D. Apply smooth, free from air pockets, wrinkles, fish-mouths, or tears.

E. At end of day's operation, install two plies membrane and bitumen glaze coat for cut-off. Glaze exposed felts. Remove cut-off before resuming roofing.

F. At intersections with vertical surfaces:
   1. Extend membrane and base sheet over cant strips and up a minimum of 6 inches onto vertical surfaces or as indicated on the drawings.
   2. Mop on base flashing of two additional plies of felt and one ply of base flashing material.

G. Around roof penetrations, mop in and seal flanges and flashings with two additional plies of felt.

H. Install walkway pads in cold mastic at 2 gal/sq ft. Set joints 6 inches apart.

I. Coordinate installation of roof drains and related flashings.

3.07 ROOF COATING INSTALLATION - CONVENTIONAL APPLICATION

A. Apply roof coatings in accordance with roofing and coating manufacturers' instructions.

3.08 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for field quality control and inspection.

B. Require site attendance of roofing and insulation material manufacturers daily during installation of the Work.

3.09 CLEANING

A. Remove bituminous markings from finished surfaces.

B. In areas where finished surfaces are soiled by bitumen or other source of soiling caused by work of this section, consult manufacturer of surfaces for cleaning advice and conform to their documented instructions.

C. Repair or replace defaced or damaged finishes caused by work of this section.

3.10 PROTECTION

A. Protect installed roofing and flashings from construction operations.

B. Where traffic must continue over finished roof membrane, protect surfaces using durable materials.

END OF SECTION

SECTION 07 6200

SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fabricated sheet metal items, including flashings, counterflashings, and scuppers, other items noted on the drawings.

B. Sealants for joints within sheet metal fabrications.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Wood nailers for sheet metal work.

B. Section 07 7123 - Manufactured Gutters and Downspouts.

C. Section 07 7200 - Roof Accessories: Manufactured metal roof curbs.

D. Section 09 9000 - Painting and Coating: Field painting.

1.03 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.

B. ASTM B32 - Standard Specification for Solder Metal; 2008 (Reapproved 2014).

C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2014.

D. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 2007 (Reapproved 2012).

E. CDA A4050 - Copper in Architecture - Handbook; current edition.

F. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

1.06 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA (ASMM) and CDA A4050 requirements and standard details, except as otherwise indicated.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

B. Prevent contact with materials that could cause discoloration or staining.

PART 2 PRODUCTS

2.01 SHEET MATERIALS

A. Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24 gage (0.0239 inch) thick base metal.

2.02 ACCESSORIES

A. Fasteners: Galvanized steel, with soft neoprene washers.

B. Primer: Zinc chromate type.

C. Protective Backing Paint: Zinc molybdate alkyd.

D. Sealant to be Concealed in Completed Work: Non-curing butyl sealant.

E. Sealant to be Exposed in Completed Work: ASTM C920; elastomeric sealant, 100 percent silicone with minimum movement capability of plus/minus 25 percent and recommended by manufacturer for substrates to be sealed; clear.

F. Sealant: Type 2 specified in Section 07 9005.

G. Plastic Cement: ASTM D4586/D4586M, Type I.

H. Solder: ASTM B32; Sn50 (50/50) type.

2.03 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Form pieces in longest possible lengths.

C. Hem exposed edges on underside 1/2 inch; miter and seam corners.

D. Form material with flat lock seams, except where otherwise indicated. At moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.

E. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.

F. Fabricate flashings to allow toe to extend 2 inches over roofing gravel. Return and brake edges.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.

B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.02 PREPARATION

A. Install starter and edge strips, and cleats before starting installation.

B. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil.

3.03 INSTALLATION

A. Secure flashings in place using concealed fasteners.

B. Apply plastic cement compound between metal flashings and felt flashings.

C. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.

D. Solder metal joints for full metal surface contact. After soldering, wash metal clean with neutralizing solution and rinse with water.

END OF SECTION

SECTION 07 7123

MANUFACTURED GUTTERS AND DOWNSPOUTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pre-finished aluminum gutters and downspouts.

1.02 RELATED REQUIREMENTS

A. Section 07 6100 - Sheet Metal Roofing.

B. Section 07 6200 - Sheet Metal Flashing and Trim.

1.03 REFERENCE STANDARDS

A. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2015.

B. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

C. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric]; 2014.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on prefabricated components.

C. Samples: Submit two samples, 8 inch long illustrating component design, finish, color, and configuration.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Stack material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope to drain.

B. Prevent contact with materials that could cause discoloration, staining, or damage.

PART 2 PRODUCTS

2.01 MATERIALS

A. Pre-Finished Aluminum Sheet: ASTM B209 (ASTM B209M); 0.032 inch thick.
   1. Finish: Plain, shop pre-coated with modified silicone coating.
   2. Color: As scheduled.

2.02 COMPONENTS

A. Gutters: Profile as indicated.

B. Downspouts: Profile as indicated.

C. Anchors and Supports: Profiled to suit gutters and downspouts.
   1. Anchoring Devices: Type recommended by fabricator.
   2. Gutter Supports: Brackets.
   3. Downspout Supports: Brackets.

D. Fasteners: Same material and finish as gutters and downspouts, with soft neoprene washers.

2.03 FABRICATION

A. Form gutters and downspouts of profiles and size indicated.

B. Fabricate with required connection pieces.

C. Form sections square, true, and accurate in size, in maximum possible lengths, free of distortion or defects detrimental to appearance or performance. Allow for expansion at joints.

D. Hem exposed edges of metal.

E. Fabricate gutter and downspout accessories; seal watertight.

2.04 FINISHES

A. Modified silicone polyester coating: Baked enamel system conforming to AAMA 2603.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that surfaces are ready to receive work.

3.02 PREPARATION

A. Paint concealed metal surfaces and surfaces in contact with dissimilar metals with protective backing paint to a minimum dry film thickness of 15 mil.

3.03 INSTALLATION

A. Install gutters, downspouts, and accessories in accordance with manufacturer's instructions.

B. Connect downspouts to storm sewer system. Seal connection watertight.

END OF SECTION

SECTION 07 7200
ROOF ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manufactured curbs, equipment rails, and pedestals.

1.02 RELATED REQUIREMENTS

A. Section 07 6200 - Sheet Metal Flashing and Trim: Roof accessory items fabricated from sheet metal.

B. Section 07 7123 - Manufactured Gutters and Downspouts.

1.03 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used.
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.
   4. Maintenance requirements.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store products under cover and elevated above grade.

PART 2 PRODUCTS

2.01 MANUFACTURED CURBS

A. Manufactured Curbs, Equipment Rails, and Other Roof Mounting Assemblies:
   1. AES Industries Inc; _____: www.aescurb.com.
   2. Substitutions: See Section 01 6000 - Product Requirements.

B. Manufactured Curbs, Equipment Rails, and Other Roof Mounting Assemblies: Factory-assembled hollow sheet metal construction with fully mitered and welded corners, integral counterflashing, internal reinforcing, and top side and edges formed to shed water.
   1. Sheet Metal: Hot-dip zinc coated steel sheet complying with ASTM A653/A653M, SS Grade 33 ; G60 coating designation; 18 gage, 0.048 inch thick.
   2. Roofing Cants: Provide integral sheet metal roofing cants dimensioned to begin slope at top of roofing insulation; 1:1 slope; minimum cant height 4 inches.
   3. Manufacture curb bottom and mounting flanges for installation directly on roof deck, not on insulation; match slope and configuration of roof deck.
   4. Provide the layouts and configurations shown on the drawings.

C. Curbs Adjacent to Roof Openings: Provide curb on all sides of opening, with top of curb horizontal for equipment mounting.
   1. Insulate inside curbs with 1-1/2 inch thick fiberglass insulation.
   2. Height Above Finished Roof Surface: 6 inches, minimum, unless otherwise indicated on the drawings.
   3. Height Above Roof Deck: 14 inches, minimum, unless otherwise indicated on the drawings.

D. Equipment Rails: Two-sided curbs in straight lengths, with top horizontal for equipment mounting.
   1. Height Above Finished Roof Surface: 6 inches, minimum, unless otherwise indicated on the drawings.

2. Height Above Roof Deck: 14 inches, minimum.

E. Pipe, Duct, and Conduit Mounting Pedestals: Vertical posts, minimum 8 inches square unless otherwise indicated.
   1. Provide sliding channel welded along top edge with adjustable height steel bracket, manufactured to fit item supported.
   2. Height Above Finished Roof Surface: 6 inches, minimum.
   3. Height Above Roof Deck: 14 inches, minimum.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions, in manner that maintains roofing weather integrity.

3.04 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 07 7600
DECK PEDESTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Adjustable Deck Pedestals.

1.02 RELATED SECTIONS

A. Section 07 5423 - TPO Membrane Roofing.

1.03 SUBMITTALS

A. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.

B. Installation methods.

C. Shop Drawings: Submit shop drawings detailing the installation methods. Coordinate placement with locations noted on the Contract Drawings.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications:
   1. All primary products specified in this section will be supplied by a single manufacturer with a minimum of ten (10) years experience.

B. Installer Qualifications:
   1. The deck support system installer must have a minimum of two (2) years proven construction experience, be capable of estimating and building from blueprint plans and details, determine elevations, and properly handle materials. All Work must comply with the Bison installation application procedures for deck support work specified herein.

C. Special Considerations:
   1. The contractor assumes the responsibility for and must take into consideration the structural capability and adequacy of the structure to carry the dead and live load weight(s) involved, and that the density of any insulation is satisfactory to resist crushing and damaging the waterproofing membrane.

D. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
   1. Finish areas designated by Architect.
   2. Do not proceed with remaining work until workmanship is approved by Architect.
   3. Refinish mock-up area as required to produce acceptable work.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store Bison Deck Supports and system components with labels intact and legible.

B. Inspect all delivered materials to insure they are undamaged and in good condition.

C. Store and dispose of solvent-based materials such as construction adhesive, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.06 PROJECT CONDITIONS

A. There are no pedestal installation temperature restriction guidelines other than the practical considerations of working in any unsafe condition or inclement weather.

B. Deck supports specified are to be for used with pedestrian traffic only.

C. Pedestrian decks must be restrained by perimeter blocking or walls on all sides. Lateral movement greater than 1/8” is unacceptable and will be subject to rejection.

D. It is recommended that the deck surfacing pavers sit above the waterproofing integral flashing and or counter flashing. In situations where the perimeter of the deck comes into contact with

the flashing material, protective wall covering should be specified if deemed necessary by specifier.

E. Heavy Roof Top Features and flat bottom features such as planters, heavy benches, water features, hot tubs, etc. always require individual support that is in addition to the deck pedestal system.
   1. A minimum of one additional pedestal support must be installed for every 500 lbs. (or portion thereof) of static loading. These additional support pedestals must be installed directly under the decking and evenly spaced immediately below the feature locations. One additional pedestal must be placed under corner of any rectangular feature.
      a. When installing Bison Cubes, additional support may be needed under the center and corners of the cubes depending on the size and anticipated weight loads.
      b. Features supported by legs or feet are not advised or considered unacceptable because of the consequences of point loading.
      c. Any feature that creates vibration must be provided for in special consultation and written agreement with Bison. Cell phone towers, heavy planters and other similar features require their own separate curb designed by an architect or engineer.

F. All decks shall be designed to not exceed the design capacity of the pedestal.

G. The substrate immediately below the pedestals shall provide positive drainage.

H. In the case of decks over roofing substrates, roof systems must meet local building code and be in accordance with the NRCA recommended good construction practices. Only roofing manufacturer approved systems shall be used.

I. For applications over roofing and waterproofing membranes Bison Innovative Products recommends that a 12” x 12” piece of the same type of membrane be installed as a separate protection slip sheet underneath each pedestal.

J. Bison Pedestal Installation: Bison pedestals must be installed on surfaces with a minimum 40 psi bearing capacity.

1.07 WARRANTY

A. At project closeout and upon request, Bison Deck Supports can provide to the Owner or Owners Representative, an executed copy of the manufacturer’s standard document outlining the terms, conditions and limitations of their limited warranty against manufacturing defect for a period of three (3) years. The Contractor warrants that his work will remain free from defects of labor and materials used in conjunction with his work in accordance with the General Conditions for this project or a minimum of three (3) years. It is the responsibility of the Contractor installing the product listed in this section to coordinate warranty requirements with any related sections or adjacent Work. Notify the Architect immediately of any potential lapses or limitations in warranty coverage. For use with pedestrian traffic only – Never use Bison Deck Supports to support decks that have wheeled, motorized or equipment traffic. Decks should be restrained on all sides and not have lateral movement in excess of 1/8 inch.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: Bison Innovative Products; 888-412-4766. www.BisonIP.com.

B. Requests for substitutions will be considered in accordance with provisions of Section 01600.

2.02 APPLICATIONS/SCOPE

A. Furnish and install a complete adjustable deck support system with a maximum cavity height of up to:

B. Screwjack Pedestals maximum cavity height 16 inches (305 mm) without additional bracing.

C. Deck supports are not designed for supporting decks that carry vehicular traffic or equipment including but not limited to snow removal equipment, ATV’s, forklifts, or any motorized vehicles.

D. Consult the Manufacturer and the Project Engineer regarding the following:

1. When spacer tab condition or design requires spacing between decking tiles or concrete pavers other than the standard spacing required by the manufacturer.
2. When considering use for other than a raised decks (e.g. interior floors, stairs, etc.).
3. When the required pedestal height exceeds the safe limits as determined by the Manufacturer.
4. When pedestal load capacity exceeds the maximum listed.
5. When anticipating installation of any items with excess weight on top of the deck.
6. When using Bison Deck Supports pedestals on grade (soil).
7. When greater pedestal load capacity is required.

2.03 SCREWJACK DECK PEDESTALS

A. Typical Height Range 0-16 inches

B. Weight Bearing Design Capacity 1000 lbs/pedestal FS:2

C. Integral 4.5 mm (3/16 inch) spacer tabs.

2.04 PEDESTALS:

A. Model B1: 1 1/4 inches to 2 inches (32mm - 51mm).

B. Model B2: 2 inches to 3 inches (51mm - 76mm).

C. Model B3: 3 inches to 4 3/4 inches (76mm - 121mm).

D. Model B4: 4 3/4 inches to 7 3/4 inches (121mm - 197mm).

E. Model B3 + C4: 7 3/4 inches to 9 inches (197mm - 229mm).

F. Model B4 + C4: 9 inches to 12 inches (229mm - 305mm).

G. Top Unit: 5/32 inch (4mm) thick plate
   1. Bearing Surface Area: 29 square inches (187 sq. cm.) nominal
   2. Material: Mineral Filled High Density Copolymer Polypropylene. Bison #B-PP-2025
   3. Base Leveler Disks:

H. Model: LD4 - Placed beneath pedestals to compensate for slopes up to 1 inch per foot.
   1. Slope: 1/4 inch per foot. Stack up to four LD4's under one pedestal for up to 1 inch of slope compensation.
   2. Dimensions: Center point thickness 3/8 inch (9.5mm).
   3. Material: Mineral Filled High Density Copolymer Polypropylene. Bison #B-PP-2025
   4. Shims:

I. Model: PS1 Rigid Poly Shims 1/8 inch (3.175mm
   1. Use no more than 2 shims. If using only 1/4 segment, adhere it to the pedestal with construction adhesive.
   2. Material: Mineral Filled High Density Copolymer Polypropylene. Bison #B-PP-2025
      a. Contains 20% Post-industrial recycled material.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Verify all elevations, required pedestal heights and deck dimensions before commencing work.

3.02 PREPARATION

A. Establish accurate lines, levels and visual pattern.

B. The substrate surface that will receive the deck supports must be well compacted (on grade) and structurally capable of carrying the dead and live loads anticipated.

C. The substrate must be clean and free of projections and debris that could impair the performance of the pedestals or the total deck system.

D. Once a starting point and the finished elevation of the deck surface have been determined, the support system elevation (finished elevation minus deck material thickness) is established and marked around the perimeter using a transit “torpedo” water level or laser leveling device.

E. Precise measurements should be taken and deck area should be accurately defined. Mark off and square all outside edges with control lines (chalk lines or spray paint). Install two (2) lines that are perpendicular to each other across the deck area. Continue to mark a grid of lines in both directions marking the location of each pedestal. To assure a square layout, use the control lines as references to periodically check the layout during installation.

3.03 INSTALLATION

A. Install in accordance with Bison and other contributing manufacturer's instructions.

B. Place a Floating Insulation Base (FIB) board or Floating Foundation Base (FFB) in the location on the grid of each pedestal. Under each base, place a 12" x 12" square slip sheet of TPO roof membrane matching the material used for the waterproofing. Coordinate with the roofing supplier for procurement of this additional roofing material.

C. Next, a deck support must be placed where each measured grid line meets the perimeter. Remove two (2) spacer tabs in line with one another on top of each deck support placed around the perimeter. Remove all four (4) spacer tabs at corners.

D. Adjust each deck support to a “top of pedestal” elevation marked around the perimeter. Normally the deck support is positioned as close to the perimeter as possible, with the two remaining spacer tabs aligned with the grid line. Using the “top of pedestal” elevation marked on the perimeter, stretch a mason’s line along and slightly ahead of the second row of deck supports. A laser leveling device may also be used for this purpose.

E. On larger decks, it is recommended that pedestals be pre-sorted and pre-set to the proper elevation and placed in position prior to the installation of pavers or tiles.

F. As the deck supports located along the grid lines are loaded with pavers or tiles, fine vertical adjustment can be made by rotating the base or bottom of the deck support. Clockwise rotation of the pedestal base will raise the bearing surface and the deck. Counter-clockwise rotation will lower the top bearing surface.

G. Bison pedestals have built in height limit indicator ‘bumps’. When pedestal is fully extended, height limit indicator “bumps” will be felt and heard, indicating the maximum height of the pedestal. Do not extend pedestal beyond the height limit indicators. Do not exceed maximum height listed on pedestal, use the next size pedestal. A C4 coupler must be added to the B4 model to achieve greater heights. Always maintain adequate thread engagement. Never over extend any pedestal.

H. Slight irregularities in decking panel thickness can be compensated for by using one to two shim segments. Place on top of the pedestal, under the corner(s) of the decking tile or paver. Use no more than two (2) shims on top of the pedestal and always adhere quartered (1/4) wedges with construction adhesive.

I. Slope Compensation:
   1. Preferred Method: A base leveler disk should be used to level the pedestal base. Place one to four disks under the pedestal base to compensate for up to 1 inch per foot of slope. Compensate for slope by placing the disks’ thickest edge (located on the edge by a small finger tab) at the down slope side of the deck support, one disk compensates for 1/4 inch per foot of slope. Using two to four disks, rotate one in relation to the other to create a level deck support.
   2. Shims may be used in multiples, whole or segmented, and placed under the base to level the deck support.
   3. Under a pedestal: All shims under a pedestal must be adhered with construction adhesive to each other – never to the membrane. Shim no more than 1/8 inch (3mm) beneath each pedestal.
   4. On top of a pedestal: Use no more than 2 shims.

3.04 DECK SUPPORT PLACEMENT AND FINAL ADJUSTMENT

A. Deck supports and the deck surface panels must be placed as the manufacturer directs in these written instructions. Use of labor saving devices, such as paver lifters, is encouraged, especially on large jobs.

B. Pedestals are designed to be rotated for final slight adjustment when pedestals are fully loaded. Deck supports should be leveled in each succeeding row as the installation proceeds. Final height adjustment or maintenance is easily made by simply rotating the Screwjack support in a clockwise or counter-clockwise direction to raise or lower the deck surface material.

C. Additional sections of shims may be used and should be available for regular maintenance. Shims may be used in multiples, whole or segmented, and placed under the base or on top the pedestal to level the deck support.

D. On top of pedestal: Use construction adhesive to adhere sections of shims. Construction adhesive is not required when using whole shims on top of a pedestal.

E. Beneath a pedestal: Use a small amount of construction adhesive to adhere sections of shims and/or whole shims to each other or to the pedestal. Unless specified to do so, DO NOT use construction adhesive to adhere pedestal or shims to insulation, roofing or waterproofing membrane..

3.05 PERIMETER CONTAINMENT

A. Any area of a deck that is not restrained by a parapet or foundation wall must be ‘boxed-in’ and contained. The deck panels will move if all sides are not adequately restrained. Perimeter framing and edging boards located at the outside of the deck perimeter must be installed to provide restraint. No movement should be allowed at the perimeter of the deck system greater than 1/8 inch.

3.06 FIELD QUALITY CONTROL

A. Inspect often during installation to assure that grid spacer lines are being maintained in a straight and consistent pattern and that deck panels or pavers are level and not rocking.

B. Confirm that deck pedestal height does not exceed the specified height of 16 inches (406.4mm).

C. Unless otherwise specified in writing to allow for expansion, inspect to assure that all paver spacing between tiles and at perimeter containment does not exceed a 1/8 inch. Particular attention should be made to assure that all pedestrian entry or access points to the deck are level and that the deck surface tiles are not randomly raised or uneven creating a tripping or safety hazard.

3.07 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

3.08 IMMEDIATELY FOLLOWING INSTALLATION

A. The Owner, or the Owner’s Agent, shall carefully inspect the deck system to be positive that:
   1. The new deck system is adequately blocked on all sides to contain the surface decking and related components.
   2. There is no more than 1/8 inch spacing between any deck panels and at all sides of the deck perimeter.
   3. There is no ballasting rock used to fill in any perimeter voids.
   4. There is no ‘rocking’ of deck panels as foot traffic is applied to the surface decking.
   5. All required spacer tabs are in place and visible.

3.09 ROUTINE MAINTENANCE AND CARE

A. Installer and/or Architect has a duty to instruct the deck owner about performing routine maintenance of the deck. Check for rocking pavers and adjust or shim immediately. Pedestals can settle and may have to be realigned. Failure to do so can cause a tripping hazard. Periodically check spacer tabs and immediately replace broken tabs to limit deck movement. Make sure the edge restraint stays intact and structurally sound.

END OF SECTION

SECTION 07 8100
APPLIED FIREPROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fireproofing of interior structural steel not exposed to damage or moisture.

1.02 RELATED REQUIREMENTS

A. Section 05 1200 - Structural Steel Framing.

B. Section 05 3100 - Steel Decking.

C. Section 07 8120 - Intumescent Fire Resistive Materials.

D. Section 09 2116 - Gypsum Board Assemblies: Gypsum board fireproofing.

1.03 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

B. ASTM E736 - Standard Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members; 2000 (Reapproved 2011).

C. ASTM E760/E760M - Standard Test Method for Effect of Impact on Bonding of Sprayed Fire-Resistive Material Applied to Structural Members; 1992 (Reapproved 2015)e1.

D. ASTM E937 - Standard Test Method for Corrosion of Steel by Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members; 1993 (Reapproved 2011).

E. UL (FRD) - Fire Resistance Directory; current edition.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittals procedures.

B. Product Data: Provide data indicating product characteristics.

1.05 FIELD CONDITIONS

A. Do not apply spray fireproofing when temperature of substrate material and surrounding air is below 40 degrees F or when temperature is predicted to be below said temperature for 24 hours after application.

B. Provide ventilation in areas to receive fireproofing during application and 24 hours afterward, to dry applied material.

C. Provide temporary enclosure to prevent spray from contaminating air.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Sprayed-On Fireproofing:
   1. Grace Construction Products; Monokote MK-6: www.na.graceconstruction.com.
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 FIREPROOFING ASSEMBLIES

A. Provide assemblies as indicated on the drawings.

B. Provide fire resistance ratings for the following building elements as required by the building code:
   1. Primary structural frame, including columns, girders, and trusses: 3 hour at Type I-A, 1 hour at Type III-A.
   2. Bearing walls, exterior: 2 hour at Type III-A.
   3. Bearing walls, interior: 3 hour at Type I-A, 1 hour at Type III-A.
   4. Nonbearing walls and partitions, exterior: N/A.
   5. Nonbearing walls and partitions, interior: 0 hour at Type I-A, 0 hour at Type III-A.

6. Floor construction, including supporting beams and joists: 2 hour at Type I-A, 1 hour at Type III-A.
7. Roof construction, including supporting beams and joists: 1-1/2 hour at Type I-A, 1 hour at Type III-A.

2.03 MATERIALS

A. Sprayed Fire-Resistive Material for Interior Applications, Concealed: Manufacturer's standard factory mixed material, which when combined with water is capable of providing the indicated fire resistance, and conforming to the following requirements:
   1. Composition: Gypsum-based; not mineral-fiber-based.
   2. Bond Strength: 150 pounds per square foot, minimum, when tested in accordance with ASTM E736 when set and dry.
   3. Compressive Strength: 8.33 pounds per square inch, minimum.
   4. Effect of Impact on Bonding: No cracking, spalling or delamination, when tested in accordance with ASTM E760/E760M.
   5. Corrosivity: No evidence of corrosion, when tested in accordance with ASTM E937.
   6. Surface Burning Characteristics: Maximum flame spread index of 0 (zero) and maximum smoke developed index of 0 (zero), when tested in accordance with ASTM E84.
   7. Products:
      a. GCP Applied Technologies; Monokote MK-6: www.gcpat.com/fireproofing/sle.
      b. Substitutions: See Section 01 6000 - Product Requirements.

2.04 ACCESSORIES

A. Primer Adhesive: Of type recommended by fireproofing manufacturer.

B. Water: Clean, potable.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive fireproofing.

B. Verify that clips, hangers, supports, sleeves, and other items required to penetrate fireproofing are in place.

C. Verify that ducts, piping, equipment, or other items that would interfere with application of fireproofing have not been installed.

D. Verify that voids and cracks in substrate have been filled. Verify that projections have been removed where fireproofing will be exposed to view as a finish material.

3.02 PREPARATION

A. Perform tests as recommended by fireproofing manufacturer in situations where adhesion of fireproofing to substrate is in question.

B. Remove incompatible materials that could affect bond by scraping, brushing, scrubbing, or sandblasting.

C. Prepare substrates to receive fireproofing in strict accordance with instructions of fireproofing manufacturer.

D. Protect surfaces not scheduled for fireproofing and equipment from damage by overspray, fall-out, and dusting.

E. Close off and seal duct work in areas where fireproofing is being applied.

3.03 APPLICATION

A. Apply primer adhesive in accordance with manufacturer's instructions.

B. Apply fireproofing in thickness and density necessary to achieve required ratings, with uniform density and texture.

3.04 CLEANING

A. Remove excess material, overspray, droppings, and debris.

B. Remove fireproofing from materials and surfaces not required to be fireproofed.

END OF SECTION

SECTION 07 8120

INTUMESCENT FIRE RESISTIVE MATERIALS

PART 1 - GENERAL

1.01 SCOPE

1.02 1.1.1 THIS SPECIFICATION COVERS LABOR, MATERIALS, EQUIPMENT, AND APPLICATION

A. necessary for, and incidental to, the complete and proper installation of intumescent fire protection for application to steel structures and supports in accordance with all applicable requirements of contract documents.

1.03 SECTION INCLUDES

A. Intumescent fire protection material.

1.04 RELATED SECTIONS

A. Section 051200: Structural Steel.

B. SECTION 07 8400: FIRESTOPPING.

C. SECTION 09 9000: PAINTING.

1.05 REFERENCES

A. Underwriters Laboratories (UL) Fire Resistance Directory.

1.06 TEST STANDARDS AND PRACTICES

A. ANSI/UL 263 (ASTM E119) - Fire Tests of Building Construction and Materials

B. CAN/ULC-S101 - Standard Methods of Fire Endurance Tests of Building Construction and Materials

C. ASTM E84 (UL723, CAN/ULC-S102) - Surface Burning Characteristics of Building Materials. Flame Spread Maximum: 5 and Smoke Developed Maximum: 35

D. ASTM D2240 – Durometer Hardness (Shore D Only). Minimum: 67 Shore D

E. ASTM D2794 – Impact Resistance. Intrusion minimum: 152 inch-lb. (17.17 Nm)

F. ASTM D4060 – Abrasion Resistance. Maximum 0.2600 grams/1000 cycles

G. ASTM D4541 – Bond Strength. Minimum: 340 psi. (2344 k Pa.)

H. ASTM E2924 – Standard Practice for Intumescent Coatings

I. Steel Structures Painting Council (SSPC) Surface Preparation Standards.

J. Material manufacturer's current published information including, but not limited to, application guide.

K. AWCI Technical Manual 12-B "Standard Practice for the Testing and Inspection of Field Applied Thin-Film Intumescent Fire-Resistive Materials; an Annotated Guide", Latest Edition.

1.07 SYSTEM DESCRIPTION

A. THE INTUMESCENT FIRE PROTECTION MATERIALS SHALL BE APPLIED AT THE REQUIRED THICKNESS TO PROVIDE THE UL FIRE RESISTIVE RATINGS.

1.08 SUBMITTALS

A. Manufacturer's Data: Submit manufacturer's specifications, including independent laboratory physical property test reports and certifications as may be required to show material compliance with contract documents.

1.09 QUALITY ASSURANCE

A. Comply with ASTM E2924 for the testing, labeling, transportation, delivery, storage, shelf life, application and inspection of intumescent coatings.

1.10 MANUFACTURER

A. THE INTUMESCENT FIRE RESISTIVE MATERIAL SHALL BE MANUFACTURED UNDER THE FOLLOW-UP SERVICE PROGRAM OF UL OR ULC AND BEAR THE UL AND/OR ULC LABEL (MARK).

1.11 APPLICATOR - A FIRM WITH EXPERTISE IN THE INSTALLATION OF FIRE RESISTIVE OR SIMILAR MATERIALS.

1.12 PRODUCT - THE PRODUCT SHALL BE APPROVED BY THE ARCHITECT AND APPLICABLE AUTHORITIES HAVING JURISDICTION

1.13 DELIVERY, STORAGE AND HANDLING

A. DELIVER MATERIALS TO THE PROJECT IN MANUFACTURER'S UNOPENED PACKAGES, FULLY IDENTIFIED AS TO TRADE NAME, TYPE AND OTHER IDENTIFYING DATA. PACKAGED MATERIALS SHALL BEAR THE APPROPRIATE LABELS, SEALS AND UL LABEL (MARK) FOR FIRE RESISTIVE RATINGS AND SHALL BE STORED AT TEMPERATURES IN COMPLIANCE WITH MANUFACTURER INSTRUCTIONS IN A DRY INTERIOR LOCATION AWAY FROM DIRECT SUNLIGHT.

B. DO NOT FREEZE.

1.14 PROJECT/SITE CONDITIONS

A. WHEN THE TEMPERATURE AT THE JOB SITE IS LESS THAN 50º F (10º C), A MINIMUM SUBSTRATE AND AMBIENT TEMPERATURE OF 50º F (10º C) SHALL BE MAINTAINED PRIOR TO, DURING, AND A MINIMUM OF 72 HOURS AFTER APPLICATION. IF NECESSARY FOR JOB SCHEDULE, THE GENERAL CONTRACTOR SHALL PROVIDE ENCLOSURES AND HEAT TO MAINTAIN PROPER TEMPERATURES AND HUMIDITY LEVELS IN THE APPLICATION AREAS.

B. In enclosed areas, ventilation shall not be less than 4 complete air exchanges per hour until the material is dry.

C. RELATIVE HUMIDITY SHALL NOT EXCEED 85% THROUGHOUT THE TOTAL PERIOD OF APPLICATION AND DRYING FOR THE INTUMESCENT FIRE RESISTIVE MATERIAL, AND MUST NOT EXCEED 85% THROUGHOUT THE APPLICATION AND DRYING FOR THE PROTECTIVE DECORATIVE TOPCOAT.

1.15 SEQUENCING AND SCHEDULING

A. Applicator shall cooperate in the coordination and scheduling of fire protection work to avoid delays in job progress.

B. THE INSTALLATION OF PIPING, DUCTS, CONDUIT OR OTHER SUSPENDED EQUIPMENT SHALL NOT COMMENCE UNTIL THE APPLICATION OF THE THIN-FILM FIRE RESISTIVE MATERIAL IS COMPLETE IN THAT AREA.

PART 2 - PRODUCTS

2.01 COMPATIBLE METAL PRIMER

A. PRIMER SHALL BE APPROVED BY MANUFACTURER AND APPLIED IN FULL ACCORDANCE WITH THE PRIMER MANUFACTURER'S WRITTEN INSTRUCTIONS.

2.02 INTUMESCENT FIRE PROTECTION SYSTEM

A. The intumescent fire resistive material shall be CAFCO® SprayFilm® WB 5™ or CAFCO® SprayFilm® WB 3™ as supplied by Isolatek International or CAFCO INDUSTRIES.

B. Intumescent fire resistive material shall be applied in accordance with drawings and/or specifications, and shall have been tested in accordance with the procedures of ANSI/UL 263 or ASTM E119 or CAN/ULC-S101, and reported by Underwriters Laboratories, Inc. or Underwriters Laboratories of Canada only.

2.03 THIN-FILM FIRE-RESISTIVE INTUMESCENT MASTIC COATING: FACTORY-MIXED FORMULATION.

A. Water-Based Formulation: Approved by manufacturer and authorities having jurisdiction for indicated use.

B. Verify with manufacturer that products selected are suitable for use indicated.

C. UL Fire Tested Designs Only based on ANSI/UL 263 (ASTM E119).

D. Current Third Party Evaluation Service Report

E. To assure an acceptable Architectural finish, no mesh is allowed.

F. A representative mock-up sprayed Architectural finish sample must be submitted, reviewed, and accepted by the architect in advance.

PART 3 - EXECUTION

3.01 PREPARATION

A. ALL SURFACES TO RECEIVE THIN-FILM FIRE RESISTIVE MATERIAL SHALL BE CLEAN, DRY AND FREE OF OIL, GREASE, LOOSE MILL SCALE, DIRT, DUST OR OTHER MATERIALS WHICH WOULD IMPAIR BOND OF THE THIN-FILM FIRE RESISTIVE MATERIAL TO THE SURFACE. ANY CLEANING OF THE SURFACES TO RECEIVE FIRE RESISTIVE MATERIAL SHALL BE THE RESPONSIBILITY OF THE GENERAL CONTRACTOR OR STEEL ERECTOR, AS OUTLINED IN THE STRUCTURAL STEEL SECTION.

B. CONFIRM COMPATIBILITY OF SURFACES TO RECEIVE THIN-FILM FIRE RESISTIVE MATERIAL. STEEL SURFACES SHALL BE PRIMED WITH A COMPATIBLE PRIMER APPROVED BY THE THIN-FILM FIRE RESISTIVE MATERIAL MANUFACTURER.

C. Provide masking, drop cloths or other suitable coverings to prevent overspray onto surfaces not intended to be coated with intumescent coating.

3.02 APPLICATION

A. The thin-film fire resistive material shall be applied at the required dry film thickness per the appropriate UL design number guidelines and manufacturers written application instructions.

3.03 CLEAN UP AND REPAIR

A. Upon completion of installation, all excess material, overspray and debris shall be cleared and removed from the job site.

B. ALL PATCHING OF AND REPAIR TO THIN-FILM FIRE RESISTIVE MATERIAL, DUE TO DAMAGE BY OTHER TRADES, SHALL BE PERFORMED UNDER THIS SECTION AND PAID FOR BY THE TRADE RESPONSIBLE FOR THE DAMAGE. PATCHING SHALL BE PERFORMED BY AN APPLICATOR WITH EXPERTISE IN THE INSTALLATION OF FIRE RESISTIVE OR SIMILAR MATERIALS. REPAIR SHALL BE IN ACCORDANCE WITH UL DESIGN NUMBER GUIDELINES AND MANUFACTURERS WRITTEN APPLICATION INSTRUCTIONS.

3.04 INSPECTION AND TESTING

A. In addition to continuous Wet Film Thickness checks performed by applicator during application, the installed intumescent material shall be inspected by a qualified independent testing laboratory for thickness in accordance with the AWCI Technical Manual 12-B "Standard Practice For The Testing and Inspection Of Field Applied Thin-Film Intumescent Fire-Resistive Materials; an Annotated Guide", Latest Edition, before application of the topcoat.

B. The results of the above tests shall be made available to all parties at the completion of each area and approved prior to the application of topcoat.

END OF SECTION

SECTION 07 8210

CURTAIN WALL INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Perimeter Fire Containment Systems.

1.02 RELATED SECTIONS

A. Section 07 8400 - Firestopping: Joint and penetration protection in fire resistance rated and smoke resistant assemblies.

B. Section 08 4413 - Glazed Aluminum Curtain Walls.

1.03 REFERENCES

A. ASTM C 177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.

B. ASTM C 518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

C. ASTM C 553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.

D. ASTM C 612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation.

E. ASTM C 665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

F. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

G. ASTM E 119 - Standard Test Methods for Fire Tests of Building Construction and Materials.

H. ASTM E 2307 - Standard Test Method for Determining Fire Resistance of Perimeter Fire Barrier Systems Using Intermediate-Scale, Multi-story Test Apparatus.

I. ASTM E 2393 - Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers.

J. Federal Specification HH-I-521F: Insulation Blankets, Thermal (Mineral Fiber, For Ambient Temperatures).

K. National Fire Protection Association (NFPA) Life Safety Code

L. Underwriters Laboratories (UL) - UL 2079 Standard test method for fire resistance of Building Joint Systems.

1.04 SUBMITTALS

A. Submit under provisions of Section 01 3000.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

C. Performance Data:
   1. Submit appropriate research reports or evaluation data for products listed in this section.

D. Shop Drawings: Submit manufacturers shop drawings describing the type and location of each product specified.

E. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Single manufacturer with a minimum of ten years experience manufacturing or marketing products in this section shall provide all products listed.

B. Installer Qualifications:

1. Products listed in this section shall be installed by a single organization with at least two (2) years experience successfully installing insulation on projects of similar type and scope as specified in this section.
2. If the installation of the curtain wall is the responsibility of a different installer, coordinate specified installations prior to commencement of work to ensure the complete system meets the specified ratings.
3. Certification per FM 4991, Underwriters Laboratories, Intertek (OPL) Laboratories, or by the Firestop Contractors International Association (FCIA).

C. Fire- Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by Underwriters Laboratories (UL), Intertek (OPL) or another testing and inspecting agency acceptable to authorities having jurisdiction.
1. Identify materials appropriate markings of applicable testing and inspecting agency.
2. Surface-Burning Characteristics: ASTM E 84. Unfaced material will have a maximum flame spread 0 and smoke-developed of 0. Foil Faced material will have maximum flame spread 25 and smoke-developed of 0.
3. Fire-Resistance Ratings:
4. ASTM E 2307 pertains to perimeter fire containment. ASTM E 119 pertains to fire rated walls, floors and ceilings. ASTM E 814 pertains to poke-throughs and penetration assemblies. ASTM E 1966 pertains to fire resistive joint systems.
5. Combustion Characteristics: Rated as non combustible as defined by NFPA standard 220 when tested in accordance with ASTM E 136.

D. Manufacturer's identification tags or marks are not acceptable on surfaces where products are considered to be finish material.
1. Evidence of patching after removal of tags or marks is not acceptable.

E. Field Inspection: Follow criteria outlined in ASTM E 2393 Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials to the job site in original packages, containers, or bundles bearing the brand name and manufacturer's identification.

B. Storage: Store materials in dry locations with adequate ventilation, free from water, and in such a manner to permit easy access for inspection and handling.

C. Handling: Handle materials to avoid damage. When installing or otherwise handling these insulation products, wear a NIOSH approved dust mask or respirator, gloves and long sleeved, loose fitting clothing closed at the neck and wrists. Wear safety glasses when installing.

1.07 PROJECT CONDITIONS

A. Protect adjacent work of other trades from damage. Clean substrates of substances harmful to insulation or vapor retarders, including removal of projections which might puncture vapor retarders. In cold weather, during installation of smoke sealant material, temperatures within the building shall be maintained above 55oF. Provide adequate ventilation to carry-off excess moisture.

1.08 WARRANTY

A. At project closeout, provide to the owner or owners representative an executed copy of the manufacturer's warranty document outlining the terms, conditions, and exclusions of their Standard Limited Warranty against Manufacturing Defect.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturer: Thermafiber, Inc. Web: www.thermafiber.com

B. Requests for substitutions will be considered in accordance with provisions of Section 01 3000.

2.02 PERIMETER FIRE CONTAINMENT

A. General: Where indicated for gaps between the perimeter edge of fire-resistance-rated floor assemblies and non-fire-resistance-rated exterior curtain walls, provide a perimeter fire-containment system with the fire test response characteristics indicated, as determined by testing identical systems per the Underwriters Laboratories or Intertek (OPL) Laboratories, or another testing and inspecting agency accountable to authorities having jurisdiction. If no tested system exists, an engineering judgment as specified by the International Firestop Council must accompany the design.

B. Curtain Wall Insulation:
   1. 1. Thickness as noted in tested and listed design.
   2. Type: Thermafiber FireSpan 90 Insulation.
      a. R-Value: 4.2 per inch.
      b. b. Facing: Foil Faced.
      c. c. Density: 8.0 pcf (nominal).
      d. d. Surface-Burning Characteristics: ASTM E 84. Unfaced material will have a maximum flame spread 0 and smoke-developed of 0. Foil Faced material will have maximum flame spread 25 and smoke-developed of 0.

C. Safing Insulation:
   1. Type: Thermafiber Safing Insulation.
      a. R-Value: 4.2 per inch.
      b. Facing: Foil Faced.
      c. Density: 8.0 pcf (actual).
      d. d. Surface-Burning Characteristics: ASTM E 84. Unfaced material will have a maximum flame spread 0 and smoke-developed of 0. Foil Faced material will have maximum flame spread 25 and smoke-developed of 0.

D. Safing Clips: Z-Shaped galvanized steel clips formed from 1 inch (25mm) wide strips of 20 gauge galvanized steel. 3 inches (76mm) high with 2 inch (51mm) and 3 inch (76mm) upper and lower horizontal legs. See specific UL or OPL/Intertek design to verify if safing clips are required.

E. Hardware:
   1. Thermafiber Impasse hardware for attaching curtain wall insulation.

F. Mullion Covers:
   1. 2 inch (51 mm) Thermafiber FireSpan 90 Insulation for protection of mullions.

G. Backer / Reinforcement Member: Thermafiber Impasse T-Bar or other light gauge steel channel or angle approved by the primary manufacturer. Place horizontally at the safe-off line to support the curtain wall insulation to prevent bowing of curtain wall insulation caused by compression fitting of the Safing insulation.

H. Smoke Barrier: Smoke sealant as listed in the appropriate fire tested assembly and approved by the Architect and Manufacturer.

I. Vapor Retarder Tape: Compatible with specified facer and comparable perm rating. For taping insulation joints and repairing tears.

PART 1 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 BACKER REINFORCEMENT MEMBERS

A. Install backer reinforcement member in accordance with manufacturer's instructions.

B. Install Thermafiber Impasse T-Bar or an approved light steel angle or channels, placed horizontally at the safing line, attached to the vertical mullions either within the insulation at a horizontal splice, or behind the insulation and mechanically attached to vertical mullions. This detail prevents the bowing of the curtain wall insulation due to the compression fit of the safing insulation.

3.04 CURTAIN WALL INSULATION

A. Install curtain wall insulation in accordance with Underwriters Laboratories / Intertek (OPL) Laboratories listed system and manufacturer's instructions.

B. Install backer bar assembly in accordance with the tested design. Not applicable when the Thermafiber No Backer Bar™ system is specified.

C. Retain insulation in place with mechanical fasteners within the mullions and transoms (spandrel area), spaced at intervals recommended by tested assembly to hold insulation securely in place without touching the exterior wall. Maintain cavity width of dimension indicated between insulation and exterior wall.

3.05 SAFING INSULATION

A. Install safing insulation in accordance with manufacturer's instructions.

B. Install safing insulation of proper size in safe off area between curtain wall insulation and floor slab as prescribed by the listed and tested assembly.

C. Safing insulation direction and compression as well as the absence of safing Z-clips are prescribed by the listed and tested assembly.

D. Install Safing insulation of proper density and size into construction joints (head-of-wall, floor-to-floor, floor-to-wall, etc.) as prescribed by the listed and tested assembly.

E. Install Safing insulation of proper density and size into poke-throughs and penetrations as prescribed by the listed and tested assembly.

3.06 SMOKE BARRIER SYSTEM

A. Install smoke barrier system in accordance with manufacturer's instructions.

B. Utilize foil faced FireSpan curtain wall Insulation with Thermafiber safing Insulation. Apply approved smoke sealant in accordance with the tested assembly.

C. Install Safing insulation of proper density and size as prescribed by the tested assembly. Apply approved smoke sealant in accordance with the tested assembly.

D. Install Safing insulation of proper density and size into poke-throughs and penetrations as prescribed by the tested assembly. Apply approved smoke sealant in accordance with the tested assembly.

3.07 VAPOR RETARDER INSTALLATION

A. Seal all joints in curtain wall insulation or exterior wall insulation with vapor retarder tape. Apply vapor retarder tape at intersection of insulation with framing, adjacent pieces and similar intersections to insure a vapor tight seal. Repair all tears in insulation foil facing with vapor retarder tape.

3.08 PROTECTION

A. Protect installed products until completion and project closeout.

B. Touch-up, repair or replace damaged products before Substantial Completion.

3.09 CLEAN-UP

A. Prior to project closeout, remove all related rubbish, excess material, scaffolding, tools and equipment from the site. Dispose of waste material in a manner approved by applicable jurisdictions.

END OF SECTION

SECTION 07 8400
FIRESTOPPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Firestopping systems.

B. Firestopping of all joints and penetrations in fire resistance rated and smoke resistant assemblies, whether indicated on drawings or not, and other openings indicated.

1.02 RELATED REQUIREMENTS

A. Section 07 8210 - Curtain Wall Insulation: Fire Safing at floor levels.

B. Section 08 4413 - Glazed Aluminum Curtain Walls: Fire Safing at floor levels.

C. Section 09 2116 - Gypsum Board Assemblies: Gypsum wallboard fireproofing.

1.03 REFERENCE STANDARDS

A. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2015.

B. ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops; 2013a.

C. ASTM E1966 - Standard Test Method for Fire Resistive Joint Systems; 2007 (Reapproved 2011).

D. ITS (DIR) - Directory of Listed Products; current edition.

E. FM (AG) - FM Approval Guide; current edition.

F. UL 2079 - Standard for Tests for Fire Resistance of Building Joint Systems; Current Edition, Including All Revisions.

G. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

H. UL (FRD) - Fire Resistance Directory; current edition.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.

C. Product Data: Provide data on product characteristics, performance ratings, and limitations.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Certificate from authority having jurisdiction indicating approval of materials used.

1.05 QUALITY ASSURANCE

A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.
   1. Listing in UL (FRD), FM (AG), or ITS (DIR) will be considered as constituting an acceptable test report.
   2. Valid evaluation report published by ICC Evaluation Service, Inc. (ICC-ES) at www.icc-es.org will be considered as constituting an acceptable test report.
   3. Submission of actual test reports is required for assemblies for which none of the above substantiation exists.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.06 FIELD CONDITIONS

A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation. Maintain minimum temperature before, during, and for 3 days after installation of materials.

PART 2 PRODUCTS

2.01 FIRESTOPPING - GENERAL REQUIREMENTS

A. Manufacturers:
   1. Basis of design: Hilti, Inc: www.us.hilti.com/#sle.
   2. Substitutions: See Section 01 6000 - Product Requirements.

B. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Type required for tested assembly design.

C. Fire Ratings: Refer to drawings for required systems and ratings.

2.02 FIRESTOPPING ASSEMBLY REQUIREMENTS

A. Floor-to-Floor, Wall-to-Wall, and Wall-to-Floor Joints, Except Perimeter, where both are fire-rated: Use any system that has been tested according to ASTM E1966 or UL 2079 to have fire resistance F Rating equal to required fire rating of the assembly in which the joint occurs.
   1. Movement: In addition, provide systems that have been tested to show movement capability as indicated.
   2. Air Leakage: In addition, provide systems that have been tested to show L Rating as indicated.
   3. Listing by FM (AG), ITS (DIR), UL (DIR), or UL (FRD) in their certification directories will be considered evidence of successful testing.

B. Through Penetration Firestopping: Use any system that has been tested according to ASTM E814 to have fire resistance F Rating equal to required fire rating of penetrated assembly.
   1. Temperature Rise: In addition, provide systems that have been tested to show T Rating as indicated.
   2. Air Leakage: In addition, provide systems that have been tested to show L Rating as indicated.
   3. Listing by FM (AG), ITS (DIR), UL (DIR), or UL (FRD) in their certification directories will be considered evidence of successful testing.

2.03 FIRESTOPPING FOR FLOOR-TO-FLOOR, WALL-TO-FLOOR, AND WALL-TO-WALL JOINTS

A. Concrete and Concrete Masonry Walls and Floors:
   1. Floor to Floor Joints:
      a. 2 Hour Construction: UL System FF-D-1013; Hilti CFS-SP WB Firestop Joint Spray and CP 672.
   2. Top of Wall Joints at Concrete/Concrete Masonry Wall to Concrete Floor:
      a. 2 Hour Construction: UL System HW-D-0268; Hilti CP 606 Flexible Firestop Sealant.
   3. Concrete/Concrete Masonry Wall to Wall Joints:
      a. 2 Hour Construction: UL System WW-D-0032; Hilti CP 606 Flexible Firestop Sealant.

B. Gypsum Board Walls:
   1. Wall to Wall Joints:
      a. 2 Hour Construction: UL System WW-D-0067; Hilti CP 606 Flexible Firestop Sealant.
      b. 1 Hour Construction: UL System WW-D-0067; Hilti CP 606 Flexible Firestop Sealant.
   2. Top of Wall Joints at Underside of Flat Concrete:
      a. 2 Hour Construction: UL System HW-D-1068; Hilti CFS-SP WB Firestop Joint Spray and CP 672.
      b. 1 Hour Construction: UL System HW-D-1068; Hilti CFS-SP WB Firestop Joint Spray and CP 672.

2.04 FIRESTOPPING PENETRATIONS THROUGH CONCRETE AND CONCRETE MASONRY CONSTRUCTION

A. Blank Openings:
   1. In Floors or Walls:
      a. 2 Hour Construction: UL System C-AJ-0090; Hilti FS-ONE MAX Intumescent Firestop Sealant.

B. Penetrations Through Floors or Walls By:
   1. Multiple Penetrations in Large Openings:
      a. 3 Hour Construction: UL System C-AJ-8110; Hilti CFS-BL Firestop Block.
   2. Bathtub Drains:
      a. Up to 3 Hour Construction: UL System F-A-1037, F-A-1038, F-A-2094, or F-A-2095; Hilti CP 681 Tub Box Kit.

C. Penetrations Through Floors By:
   1. Multiple Penetrations in Large Openings:
      a. 3 Hour Construction: UL System F-A-1023; Hilti CP 680-P/M Cast-In Device.
      b. 2 Hour Construction: UL System F-A-8012; Hilti CFS-S SIL GG Firestop Silicone Sealant Gun-Grade or CFS-S SIL SL Firestop Silicone Sealant Self-Leveling.
   2. Uninsulated Metallic Pipe, Conduit, and Tubing:
      a. 2 Hour Construction: UL System F-A-1016; Hilti CP 680-P/M Cast-In Device.
   3. Uninsulated Non-Metallic Pipe, Conduit, and Tubing:
      a. 2 Hour Construction: UL System F-A-2213; Hilti CFS-DID Drop-In Device.
      b. 2 Hour Construction: UL System F-A-2053; Hilti CP 680-P Cast-In Device.
      c. 2 Hour Construction: UL System F-A-2058; Hilti FS-ONE Intumescent Firestop Sealant.

D. Penetrations Through Walls By:
   1. Uninsulated Metallic Pipe, Conduit, and Tubing:
      a. 2 Hour Construction: UL System W-J-1067; Hilti FS-ONE MAX Intumescent Firestop Sealant.
      b. 1 Hour Construction: UL System W-J-1067; Hilti FS-ONE MAX Intumescent Firestop Sealant.
   2. Insulated Pipes:
      a. 2 Hour Construction: UL System C-AJ-5090; Hilti FS-ONE MAX Intumescent Firestop Sealant.
      b. 2 Hour Construction: UL System C-AJ-5091; Hilti FS-ONE MAX Intumescent Firestop Sealant.
      c. 2 Hour Construction: UL System W-J-5028; Hilti FS-ONE Intumescent Firestop Sealant.
      d. 1 Hour Construction: UL System C-AJ-5090; Hilti FS-ONE MAX Intumescent Firestop Sealant.
      e. 1 Hour Construction: UL System C-AJ-5091; Hilti FS-ONE MAX Intumescent Firestop Sealant.
      f. 1 Hour Construction: UL System W-J-5028; Hilti FS-ONE Intumescent Firestop Sealant.

2.05 FIRESTOPPING PENETRATIONS THROUGH GYPSUM BOARD WALLS

A. Blank Openings:
   1. 2 Hour Construction: UL System W-L-3334; Hilti CP 653 Speed Sleeve.
   2. 1 Hour Construction: UL System W-L-3334; Hilti CP 653 Speed Sleeve.

2.06 FIRESTOPPING SYSTEMS

A. Firestopping: Any material meeting requirements.
   1. Fire Ratings: Use any system that is listed by FM (AG), ITS (DIR), or UL (FRD) and tested in accordance with ASTM E814 or ASTM E119 with F Rating equal to fire rating of penetrated assembly and minimum T Rating Equal to F Rating and in compliance with other specified requirements.
   2. Fire Ratings: See Drawings for required systems and ratings.

B. Firestopping Between Edge of Floor Slab and Curtain Wall (without Penetrations): Fiber firestopping with smoke seal coating;UL Design No. CW-D-2046, F Rating 2 hour.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify openings are ready to receive the work of this section.

3.02 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter that could adversely affect bond of firestopping material.

B. Remove incompatible materials that could adversely affect bond.

3.03 INSTALLATION

A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.

B. Do not cover installed firestopping until inspected by authorities having jurisdiction.

3.04 CLEANING

A. Clean adjacent surfaces of firestopping materials.

3.05 PROTECTION

A. Protect adjacent surfaces from damage by material installation.

END OF SECTION

SECTION 07 9200
JOINT SEALANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nonsag gunnable joint sealants.

B. Self-leveling pourable joint sealants.

C. Joint backings and accessories.

1.02 RELATED REQUIREMENTS

A. Section 07 8400 - Firestopping: Firestopping sealants.

B. Section 07 9513 - Expansion Joint Cover Assemblies: Sealants forming part of expansion joint cover assemblies.

C. Section 08 7100 - Door Hardware: Setting exterior door thresholds in sealant.

D. Section 08 8000 - Glazing: Glazing sealants and accessories.

E. Section 09 2116 - Gypsum Board Assemblies: Sealing acoustical and sound-rated walls and ceilings.

F. Section 09 2216 - Non-Structural Metal Framing: Sealing between framing and adjacent construction in acoustical and sound-rated walls and ceilings.

G. Section 09 3000 - Tiling: Sealant between tile and plumbing fixtures and at junctions with other materials and changes in plane.

1.03 REFERENCE STANDARDS

A. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer; 2006 (Reapproved 2011).

B. ASTM C834 - Standard Specification for Latex Sealants; 2014.

C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2014.

D. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2013.

E. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants; 2008 (Reapproved 2012).

F. ASTM C1311 - Standard Specification for Solvent Release Sealants; 2014.

G. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants; 2002 (Reapproved 2013).

H. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness; 2005 (Reapproved 2010).

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data for Sealants: Submit manufacturer's technical data sheets for each product to be used, that includes the following.
   1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
   2. List of backing materials approved for use with the specific product.
   3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
   4. Substrates the product should not be used on.

C. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.

D. Samples for Verification: Where custom sealant color is specified, obtain directions from Architect and submit at least two physical samples for verification of color of each required sealant.

1.05 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective work within a five year period after Date of Substantial Completion.

C. Warranty: Include coverage for installed sealants and accessories that fail to achieve watertight seal , exhibit loss of adhesion or cohesion, or do not cure.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Non-Sag Sealants: Permits application in joints on vertical surfaces without sagging or slumping.
   1. Dow Corning Corporation: www.dowcorning.com/construction/sle.
   2. Hilti, Inc: www.us.hilti.com/#sle.
   3. Tremco Global Sealants: www.tremcosealants.com.
   4. Sika Corporation: www.usa-sika.com.
   5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 JOINT SEALANT APPLICATIONS

A. Scope:
   1. Exterior Joints: Seal open joints, whether or not the joint is indicated on the drawings, unless specifically indicated not to be sealed. Exterior joints to be sealed include, but are not limited to, the following items.
      a. Wall expansion and control joints.
      b. Joints between door, window, and other frames and adjacent construction.
      c. Joints between different exposed materials.
      d. Openings below ledge angles in masonry.
      e. Other joints indicated below.
   2. Interior Joints: Do not seal interior joints unless specifically indicated to be sealed. Interior joints to be sealed include, but are not limited to, the following items.
      a. Joints between door, window, and other frames and adjacent construction.
      b. Other joints indicated below.
   3. Do not seal the following types of joints.
      a. Intentional weepholes in masonry.
      b. Joints indicated to be treated with manufactured expansion joint cover or some other type of sealing device.
      c. Joints where sealant is specified to be provided by manufacturer of product to be sealed.
      d. Joints where installation of sealant is specified in another section.
      e. Joints between suspended panel ceilings/grid and walls.

B. Exterior Joints: Use nonsag non-staining silicone sealant, unless otherwise indicated.

C. Interior Joints: Use nonsag polyurethane sealant, unless otherwise indicated.
   1. Wall and Ceiling Joints in Non-Wet Areas: Acrylic emulsion latex sealant; Type OP.

2.03 NONSAG JOINT SEALANTS

A. Non-Staining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
   1. Movement Capability: Plus and minus 50 percent, minimum.
   2. Non-Staining To Porous Stone: Non-staining to light-colored natural stone when tested in accordance with ASTM C1248.
   3. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
   4. Manufacturers:
      a. Dow Corning Corporation; 791 Silicone Weatherproofing Sealant: www.dowcorning.com/construction/sle.

b. Dow Corning Corporation; 795 Silicone Building Sealant: www.dowcorning.com/construction/sle.
c. Substitutions: See Section 01 6000 - Product Requirements.

B. Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multicomponent; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: Plus and minus 25 percent, minimum.

C. Acrylic Emulsion Latex: Water-based; ASTM C834, single component, non-staining, non-bleeding, non-sagging; not intended for exterior use.
1. Color: Standard colors matching finished surfaces, Type OP (opaque).
2. Manufacturers:
a. Hilti, Inc; CP 506 Smoke and Acoustical Sealant: www.us.hilti.com/#sle.
b. Sherwin-Williams Company; 850A Acrylic Latex Caulk: www.sherwin-williams.com.
c. Sherwin-Williams Company; 950A Siliconized Acrylic Latex Caulk: www.sherwin-williams.com.
d. Substitutions: See Section 01 6000 - Product Requirements.

D. Butyl Sealant: Solvent-based; ASTM C1311; single component, nonsag; not expected to withstand continuous water immersion or traffic.
1. Hardness Range: 10 to 30, Shore A, when tested in accordance with ASTM C661.
2. Color: Match adjacent finished surfaces.
3. Manufacturers:
a. Sherwin-Williams Company; Storm Blaster All Season Sealant: www.sherwin-williams.com.

2.04 SELF-LEVELING SEALANTS

A. Self-Leveling Polyurethane Sealant: ASTM C920, Grade P, Uses M and A; single or multicomponent; explicitly approved by manufacturer for traffic exposure; not expected to withstand continuous water immersion .
1. Movement Capability: Plus and minus 25 percent, minimum.
2. Hardness Range: 35 to 55, Shore A, when tested in accordance with ASTM C661.
3. Color: Gray.
4. Service Temperature Range: Minus 40 to 180 degrees F.
5. Manufacturers:
a. Sika Corporation; Sikaflex-1c SL: www.usa-sika.com.
b. Substitutions: See Section 01 6000 - Product Requirements.

B. Semi-Rigid Self-Leveling Polyurea Joint Filler: Two-component, 100 percent solids; Intended for filling cracks and control joints not subject to significant movement; rigid enough to support concrete edges under traffic.
1. Hardness: 75, Shore A, minimum, when tested in accordance with ASTM D2240 after 7 days.
2. Color: Concrete gray.
3. Joint Width, Minimum: 1/8 inch.
4. Joint Width, Maximum: 3/4 inch.
5. Joint Depth: Provide product suitable for joints from 1/8 inch to 1-1/2 inches in depth excluding space for backer rod.
6. Manufacturers:
a. ARDEX Engineered Cements; ARDISEAL RAPID PLUS: www.ardexamericas.com.
b. Substitutions: See Section 01 6000 - Product Requirements.

2.05 ACCESSORIES

A. Backer Rod: Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application.
1. Type for Joints Not Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type O - Open Cell Polyurethane.

2. Open Cell: 40 to 50 percent larger in diameter than joint width.

B. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.

C. Masking Tape: Self-adhesive, nonabsorbent, non-staining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.

D. Joint Cleaner: Non-corrosive and non-staining type, type recommended by sealant manufacturer; compatible with joint forming materials.

E. Primers: Type recommended by sealant manufacturer to suit application; non-staining.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that joints are ready to receive work.

B. Verify that backing materials are compatible with sealants.

C. Verify that backer rods are of the correct size.

3.02 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

3.03 INSTALLATION

A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Perform installation in accordance with ASTM C1193.

C. Install bond breaker backing tape where backer rod cannot be used.

D. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.

E. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.

F. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

G. Concrete Floor Joint Filler: After full cure, shave joint filler flush with top of concrete slab.

END OF SECTION

SECTION 08 1113
HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Non-fire-rated hollow metal doors and frames.

B. Hollow metal frames for wood doors.

C. Fire-rated hollow metal doors and frames.

D. Accessories, including glazing and louvers.

1.02 RELATED REQUIREMENTS

A. Section 08 7100 - Door Hardware.

B. Section 08 8000 - Glazing: Glass for doors and borrowed lites.

C. Section 09 9000 - Paints and Coatings: Field painting.

1.03 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2011.

C. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2014.

D. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2011.

E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.

F. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2015.

G. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2014.

H. BHMA A156.115 - American National Standard for Hardware Preparation in Steel Doors and Steel Frames; 2014.

I. ITS (DIR) - Directory of Listed Products; current edition.

J. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames; 2002.

K. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames; 2011.

L. NAAMM HMMA 840 - Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames; 2007.

M. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2016.

N. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives; 2016.

O. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2012.

P. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

Q. UL (BMD) - Building Materials Directory; Underwriters Laboratories Inc.; current edition.

R. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

S. UL 1784 - Standard for Air Leakage Tests of Door Assemblies; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced standards/guidelines.

C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.

B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Hollow Metal Doors and Frames:
   1. Ceco Door, an Assa Abloy Group company: www.assaabloydss.com.
   2. Steelcraft, an Allegion brand: www.allegion.com/sle.
   3. Substitutions: See Section 01 6000 - Product Requirements.

2.02 DESIGN CRITERIA

A. Requirements for Hollow Metal Doors and Frames:
   1. Steel used for fabrication of doors and frames shall comply with one or more of the following requirements; Galvannealed steel conforming to ASTM A653/A653M, cold-rolled steel conforming to ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel conforming to ASTM A1011/A1011M, Commercial Steel (CS) Type B for each.
   2. Accessibility: Comply with ICC A117.1 and ADA Standards.
   3. Exterior Door Top Closures: Flush end closure channel, with top and door faces aligned.
   4. Door Edge Profile: Manufacturers standard for application indicated.
   5. Typical Door Face Sheets: Flush.
   6. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings. Style: Manufacturers standard.
   7. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
   8. Finish: Factory primed, for field finishing.

2.03 HOLLOW METAL DOORS

A. Exterior Doors: Thermally insulated.
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 1 - Standard-duty.
      b. Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.
      c. Model 1 - Full Flush.
      d. Door Face Metal Thickness: 20 gage, 0.032 inch, minimum.
   2. Core Material: Manufacturers standard core material/construction and in compliance with requirements.
   3. Door Thickness: 1-3/4 inch, nominal.
   4. Weatherstripping: Refer to Section 08 7100.
   5. Door Finish: Factory primed and field finished.

B. Interior Doors, Non-Fire Rated:
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 1 - Standard-duty.
      b. Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.
      c. Model 1 - Full Flush.
      d. Door Face Metal Thickness: 20 gage, 0.032 inch, minimum.
   2. Core Material: Manufacturers standard core material/construction and in compliance with requirements.
   3. Door Thickness: 1-3/4 inch, nominal.
   4. Door Finish: Factory primed and field finished.

C. Fire-Rated Doors:
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 1 - Standard-duty.
      b. Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.
      c. Model 1 - Full Flush.
      d. Door Face Metal Thickness: 20 gage, 0.032 inch, minimum.
   2. Fire Rating: As indicated on Door Schedule, tested in accordance with UL 10C and NFPA 252 ("positive pressure fire tests").
      a. Provide units listed and labeled by UL (DIR) or ITS (DIR).
      b. Attach fire rating label to each fire rated unit.
      c. Smoke and Draft Control Doors (Indicated with letter "S" on Drawings and/or Door Schedule): Self-closing or automatic closing doors in accordance with NFPA 80 and NFPA 105, with fire-resistance-rated wall construction rated the same or greater than the fire-rated doors, and the following;
         1) Maximum Air Leakage: 3.0 cfm/sq ft of door opening at 0.10 inch w.g. pressure, when tested in accordance with UL 1784 at both ambient and elevated temperatures.
         2) Gasketing: Provide gasketing or edge sealing as necessary to achieve leakage limit.
         3) Label: Include the "S" label on fire-rating label of door.
   3. Core Material: Manufacturers standard core material/construction in compliance with requirements.
   4. Door Thickness: 1-3/4 inch, nominal.
   5. Door Finish: Factory primed and field finished.

2.04 HOLLOW METAL FRAMES

A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.

B. General:
   1. Finish: Factory primed, for field finishing.
   2. Frames in Masonry Walls: Size to suit masonry coursing with head member 4 inches high to fill opening without cutting masonry units.

C. Exterior Door Frames: Full profile/continuously welded type.
   1. Frame Finish: Factory primed and field finished.
   2. Weatherstripping: Separate, see Section 08 7100.

D. Interior Door Frames, Non-Fire Rated: Slip-on type at gypsum board walls, and knock-down type at masonry walls.
   1. Frame Finish: Factory primed and field finished.

E. Door Frames, Fire-Rated: Knock-down type.
   1. Fire Rating: Same as door, labeled.
   2. Frame Finish: Factory primed and field finished.

F. Frames for Wood Doors: Comply with frame requirements in accordance with corresponding door.

G. Frames in Masonry Walls: Size to suit masonry coursing with head member 4 inch high to fill opening without cutting masonry units.

2.05 ACCESSORIES

A. Louvers: Roll formed steel with overlapping frame; finish same as door components; factory-installed.

B. Glazing: As specified in Section 08 8000.

C. Removable Stops: Formed sheet steel, shape as indicated on drawings, mitered or butted corners; prepared for countersink style tamper proof screws.

D. Astragals for Double Doors: Specified in Section 08 7100.

E. Mechanical Fasteners for Concealed Metal-to-Metal Connections: Self-drilling, self-tapping, steel with electroplated zinc finish.

F. Grout for Frames: Portland cement grout with maximum 4 inch slump for hand troweling; thinner pumpable grout is prohibited.

G. Silencers: Resilient rubber, fitted into drilled hole; 3 on strike side of single door, 3 on center mullion of pairs, and 2 on head of pairs without center mullions.

H. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

2.06 FINISHES

A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Verify that finished walls are in plane to ensure proper door alignment.

3.02 INSTALLATION

A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.

B. Install fire rated units in accordance with NFPA 80.

C. Coordinate frame anchor placement with wall construction.

D. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.

E. Coordinate installation of hardware.

F. Coordinate installation of glazing.

3.03 TOLERANCES

A. Maximum Diagonal Distortion: 1/16 in measured with straight edge, corner to corner.

3.04 ADJUSTING

A. Adjust for smooth and balanced door movement.

3.05 SCHEDULE

A. Refer to Door and Frame Schedule on the drawings.

END OF SECTION

SECTION 08 1415

MOLDED PANEL INTERIOR WOOD DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Flush wood doors; flush and flush glazed configuration; molded hardboard; fire rated and non-rated.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Wood framing.

B. Section 06 2000 - Finish Carpentry: Wood door frames.

C. Section 08 1113 - Hollow Metal Doors and Frames.

D. Section 08 7100 - Door Hardware.

E. Section 08 8000 - Glazing.

F. Section 09 9123 - Interior Painting: Field finishing of doors.

1.03 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; current edition.

B. ANSI A135.4 - American National Standard for Basic Hardboard; 2012.

C. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.

D. AWI (QCP) - Quality Certification Program; current edition at www.awiqcp.org.

E. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014.

F. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.0; 2016.

G. ITS (DIR) - Directory of Listed Products; current edition.

H. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2016.

I. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2012.

J. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

K. UL 10B - Standard for Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

L. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

M. UL 1784 - Standard for Air Leakage Tests of Door Assemblies; Current Edition, Including All Revisions.

N. WI (CCP) - Certified Compliance Program (CCP); current edition at www.woodworkinstitute.com/certification.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.

C. Shop Drawings: Show doors and frames, elevations, sizes, types, swings, undercuts, beveling, blocking for hardware, factory machining, factory finishing, cutouts for glazing and other details.

1.05 QUALITY ASSURANCE

A. Maintain one copy of the specified door quality standard on site for review during installation and finishing.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section, with not less than three years of documented experience.

1. Accredited participant in the specified certification program prior to the commencement of fabrication and throughout the duration of the project.

C. Quality Certification: Comply with AWI (QCP) woodwork association quality certification service/program in accordance with requirements for work specified in this section.
   1. Provide labels or certificates indicating that the installed work complies with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade or grades specified.
   2. This AWI (QCP) project is registered as project number _____.
   3. Provide designated labels on shop drawings as required by certification program.
   4. Provide designated labels on installed products as required by certification program.
   5. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.
   6. Arrange and pay for inspections required for certification.
   7. Replace, repair, or rework all work for which certification is refused.

D. Installed Fire-Rated Door and Transom Panel Assembly: Conform to 1 for fire-rating as indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Package, deliver and store doors in accordance with specified quality standard.

B. Accept doors on site in manufacturer's packaging. Inspect for damage.

C. Protect doors with resilient packaging sealed with heat shrunk plastic. Do not store in damp or wet areas; or in areas where sunlight might bleach veneer. Seal top and bottom edges with tinted sealer if stored more than one week. Break seal on site to permit ventilation.

1.07 EXTRA MATERIALS

A. Provide three (3) additional doors of each type and size used on the project.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Interior Doors: Provide manufacturer's warranty for 2 years.

C. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Molded Wood Fiber Faced Doors:
   1. Masonite International; Heritage Series: www.masonite.com
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 DOORS

A. Doors: Refer to drawings for locations and additional requirements.
   1. Quality Level: Custom Grade, Standard Duty performance, in accordance with AWI/AWMAC/WI (AWS).

B. Interior Non-Unit Doors: 1-3/4 inches thick unless otherwise indicated; flush construction.
   1. Provide solid core doors at each location, except provide hollow core doors at _____.
   2. Fire-Rated Doors: Tested to 20 minutes, 60 minutes, 90 minutes, and ratings as indicated on drawings in accordance with NFPA 252 or UL 10B - Negative (Neutral) Pressure; UL (DIR) or ITS (DIR) labeled without any visible seals when door is open.
   3. Smoke and Draft Control Doors (Indicated as "S" on Drawings): In addition to required fire rating, provide door assemblies tested in accordance with UL 1784 with maximum air leakage of 3.0 cfm per sq ft of door opening at 0.10 inch wg pressure at both ambient and elevated temperatures for "S" label; if necessary, provide additional gasketing or edge sealing.
   4. Hardboard facing with factory opaque finish as indicated on drawings.

C. Interior Unit Doors: 1-3/8 inches thick unless otherwise indicated.

2.03 DOOR AND PANEL CORES

A. Non-Rated Solid Core and 20 Minute Rated Doors: Type particleboard core (PC), plies and faces as indicated.

B. Fire-Rated Doors: Mineral core type, with fire resistant composite core (FD), plies and faces as indicated above; with core blocking as required to provide adequate anchorage of hardware without through-bolting.

C. Hollow Core Doors: Type - Standard (FSHC); plies and faces as indicated above.

2.04 DOOR FACINGS

A. Hardboard Facing for Opaque Finish: ANSI A135.4, Class 1 - Tempered, S2S (smooth two sides) hardboard, 1/8 inch thick.

2.05 DOOR CONSTRUCTION

A. Fabricate doors in accordance with door quality standard specified.

B. Cores Constructed with stiles and rails:
   1. Provide solid blocks at lock edge for hardware reinforcement.
   2. Provide solid blocking for other throughbolted hardware.

C. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.

D. Provide edge clearances in accordance with the quality standard specified.

2.06 FACTORY FINISHING - WOOD VENEER DOORS

A. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
   1. Opaque:
      a. System - 1, Lacquer, Nitrocellulose.
      b. Color: As selected by Architect.
      c. Sheen: Flat.

B. Seal door top edge with color sealer to match door facing.

2.07 ACCESSORIES

A. Wood Door Frames: As specified in Section 06 2000.

B. Wood Louvers:
   1. Material and Finish: Birch species.
   2. Louver Blade: Flush louver.

C. Glazed Openings:
   1. Heat-Strengthened and Fully Tempered Glass: ASTM C1048.
   2. Fire-Protection-Rated Glass: Safety Certification, 16 CFR 1201, Category II.
   3. Glazing: Single vision units, 1/4 inch thick glass.

D. Glazing Stops: Wood, of same species as door facing, butted corners; prepared for countersink style tamper proof screws.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install doors in accordance with manufacturer's instructions and specified quality standard.
   1. Install fire-rated doors in accordance with NFPA 80 requirements.

B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.

C. Field-Finished Doors: Trimming to fit is acceptable.
   1. Adjust width of non-rated doors by cutting equally on both jamb edges.
   2. Trim maximum of 3/4 inch off bottom edges.
   3. Trim fire-rated doors in strict compliance with fire rating limitations.

D. Use machine tools to cut or drill for hardware.

E. Coordinate installation of doors with installation of frames and hardware.

F. Coordinate installation of glazing.

3.02 ADJUSTING

A. Adjust doors for smooth and balanced door movement.

B. Adjust closers for full closure.

END OF SECTION

SECTION 08 1613
FIBERGLASS DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fiberglass doors.

B. Glazing.

C. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 08 7100 - Door Hardware.

B. Section 08 8000 - Glazing.

C. Section 09 9123 - Interior Painting: Field painting.

1.03 REFERENCE STANDARDS

A. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2011.

B. ASTM D635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position; 2014.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

D. ASTM E2112 - Standard Practice for Installation of Exterior Windows, Doors and Skylights; 2007.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Obtain hardware templates from hardware manufacturer prior to starting fabrication.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard details, installation instructions, hardware and anchor recommendations.

C. Selection Samples: Submit two complete sets of color chips, illustrating manufacturer's available finishes, colors, and textures.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer’s original, unopened, undamaged containers with identification labels intact.

B. Store materials in original packaging, under cover, protected from exposure to harmful weather conditions and from direct contact with water.
   1. Store at temperature and humidity conditions recommended by manufacturer.
   2. Do not use non-vented plastic or canvas shelters.
   3. Immediately remove wet wrappers.

C. Store in position recommended by manufacturer, elevated minimum 4 inch above grade, with minimum 1/4 inch space between doors.

1.07 FIELD CONDITIONS

A. Do not install doors until structure is enclosed.

B. Maintain temperature and humidity at manufacturer's recommended levels during and after installation of doors.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide five (5) year manufacturer warranty covering materials and workmanship, including degradation or failure due to chemical contact.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Molded Fiberglass Doors:
   1. Basis of design: Andersen; www.andersenwindows.com
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 DOOR AND FRAME ASSEMBLIES

A. Door and Frame Assemblies: Factory-fabricated, prepared and machined for hardware.
   1. Door and frame pre-assembled, complete with hinges; shipped with braces, spreaders, and packaging as required to prevent damage.
   2. Physical Endurance: Swinging door cycle test to ANSI/SDI A250.4, Level A (1,000,000 cycles) minimum; tested with hardware and fasteners intended for use on project.
   3. Screw-Holding Capacity: Tested to 890 lbs, minimum.
   4. Surface Burning Characteristics: Flame spread index (FSI) of 0 to 25, Class A, and smoke developed index (SDI) of 450 or less, when tested in accordance with ASTM E84.
   5. Flammability: Self-extinguishing when tested in accordance with ASTM D635.
   6. Clearance Between Door and Frame: 1/8 inch, maximum.
   7. Clearance Between Bottom of Door and Finished Floor: 3/4 inch, maximum; not less than 1/4 inch clearance to threshold.

2.03 COMPONENTS

A. Doors: Fiberglass construction with reinforced core.
   1. Thickness: 1-3/4 inch, nominal.
   2. Core Material: Manufacturer's standard core material for application indicated.
   3. Construction:
   4. Face Sheet Texture: Smooth.
   5. Subframe and Reinforcements: Manufacturer's standard materials.
   6. Waterproof Integrity: Provide factory fabricated edges, cut-outs, and hardware preparations of fiberglass reinforced plastic (FRP); provide cut-outs with joints sealed independently of glazing, louver inserts, or trim.
   7. Hardware Preparations: Factory reinforce, machine, and prepare for door hardware including field installed items; provide solid blocking for each item; field cutting, drilling or tapping is not permitted; obtain manufacturer's hardware templates for preparation as necessary.
   8. Gel Coating: Ultraviolet stabilized polyester, with smooth high gloss final finish.
   9. Gel Coating Thickness: Minimum 15 mils wet, plus/minus 3 mils.
   10. Gel Coating Color: As selected by the Architect from the manufacturer's standard line of colors.
   11. Primer: Aliphatic urethane for field finishing.

B. Hinge and Hardware Fasteners: Stainless steel, Type 304; wood screws.

2.04 ACCESSORIES

A. Glazing Stops: Pultruded fiberglass unless otherwise indicated or required by fire rating; provided by door manufacturer to fit factory made openings, color and texture to match door; fasteners not penetrating waterproof integrity.
   1. Exterior Doors: Provide non-removable stops on exterior side with continuous compression gasket weatherseal.
   2. Opening Sizes and Shapes: As indicated on drawings.

B. Glazing: Fully tempered float glass, 1/4 inch thick, clear.

C. Hardware: As specified in Section 08 7100.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

3.02 PREPARATION

A. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

B. Clean and prepare substrate in accordance with manufacturer's directions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions; do not penetrate frames with anchors.

B. Install exterior doors in accordance with ASTM E2112.

C. Set units plumb, level, and true-to-line, without warping or racking doors, and with specified clearances; anchor in place.

D. Separate aluminum and other metal surfaces from sources of corrosion of electrolytic action at points of contact with other materials.

E. Repair or replace damaged installed products.

3.04 ADJUSTING

A. Lubricate, test, and adjust doors to operate easily, free from warp, twist or distortion, and to fit watertight for entire perimeter.

B. Adjust hardware for smooth and quiet operation.

C. Adjust doors to fit snugly and close without sticking or binding.

3.05 CLEANING

A. Clean installed products in accordance with manufacturer’s instructions prior to owner’s acceptance.

3.06 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 08 1700

INTEGRATED DOOR OPENING ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Factory-assembled and factory-finished hollow metal doors and frames, including hardware for door opening assemblies.

1.02 RELATED REQUIREMENTS

A. Section 08 7100 - Door Hardware: Door hardware submittal requirements.

B. Section 08 7100 - Door Hardware: Additional hardware to be installed on these doors.

1.03 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2014.

C. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2011.

D. BHMA A156.3 - American National Standard for Exit Devices; 2014.

E. BHMA A156.4 - American National Standard for Door Controls - Closers; 2013.

F. BHMA A156.15 - American National Standard for Release Devices - Closer Holder, Electromagnetic and Electromechanical; 2011.

G. BHMA A156.18 - American National Standard for Materials and Finishes; 2012.

H. BHMA A156.22 - American National Standard for Door Gasketing and Edge Seal Systems, Builders Hardware Manufacturers Association; 2012.

I. BHMA A156.26 - American National Standard for Continuous Hinges; 2012.

J. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2009.

K. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2016.

L. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2012.

M. UL 1784 - Standard for Air Leakage Tests of Door Assemblies; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced grade standard.

C. Shop Drawings: Indicate details of each opening showing elevations, glazing, frame profiles, hardware, and different finish locations, if any.

D. Hardware Schedule: Detailed list of each hardware item to be provided on each door.
   1. Refer to Section 08 7100 for additional submittal requirements.

E. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.

F. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

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 minimum three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver units preassembled and prefinished, with door hardware mounted and functioning, and packaged to protect contents from damage.

B. Store in a clean, dry, and ventilated space having controlled temperature and relative humidity between 30 and 60 percent and in accordance with manufacturer's written instructions.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide manufacturer's standard warranty against defects in material and workmanship:
   1. For entire door opening assembly, provide two year warranty period after Date of Substantial Completion.
   2. For locksets, hanger rods, and panic exit devices, provide lifetime limited warranty.
   3. Warranty shall be void unless units are stored in accordance with manufacturer's instructions prior to installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Integrated Door Opening Assemblies - Basis of Design: Total Door Systems: www.totaldoor.com..

2.02 ASSEMBLIES

A. Door, Frame, and Hardware Assemblies: Provide fully functional, factory-assembled and factory-finished door opening units, complete with door, frame, and hardware; complying with specified requirements.
   1. Accessibility: Comply with ICC A117.1 and ADA Standards.
   2. Provide additional hardware as specified in Section 08 7100.

B. Applications: Provide Dual-Egress integrated door assemblies at area separation cross-corridor locations, denoted "Type DE" in the Door Schedule.

2.03 COMPONENTS

A. Hollow Metal Doors: Doors complying with ANSI/SDI A250.8 (SDI-100) construction requirements exceeding Level 3 and Physical Performance Level A, Model 1 - Full Flush; electrogalvanized prior to finishing; manufacturer's standard core and reinforcements.
   1. Door Thickness: 1-3/4 inches.
   2. Fire-Rated Doors: 16 gage, 0.053 inch thick faces and edges.

B. Hollow Metal Door Frames: Formed steel cased opening complying with ANSI/SDI A250.8 (SDI-100) construction requirements exceeding Level 3 and Physical Performance Level A; electrogalvanized prior to finishing.
   1. Type: Prefinished and preassembled with door; for installation after wall finishes; face welded frame 16 gage, 0.053 inch thick with proper reinforcement for applied hardware and adjustable type anchors as necessary for door application.
   2. Provide frame anchors for secure installation and to comply with opening performance requirements.

2.04 DOOR HARDWARE

A. Manufacturers: Door hardware manufacturers are as determined by manufacturer of Integrated Door Opening Assemblies in compliance with specified hardware requirements for applications indicated.

B. Continuous Hinges: Full height; complying with BHMA A156.26, Grade 1.

C. Concealed Door Closers: Provide concealed overhead closer, cam-action track mounted in top of door, 135 degree swing, positive stop, adjustable sizing, latching, and closing speed; complying with BHMA A156.4, Grade 1.
   1. Normally Closed Doors: Provide concealed closer, including arm, when door is closed.
   2. Normally Open Doors: Provide concealed closer, including arm, when door is open.

D. Flush Panel Exit Devices: Provide flush panel exit device, recessed into door; extruded aluminum, natural anodized finish; complying with BHMA A156.3, Grade 1.
   1. Projection From Face of Door: Maximum of 1/8 inch when door is open, minimum of 5/8 inch when closed.
   2. Face Insert: To match door finish.

E. Lever Handle Trim: Provide lever handle trim to operate locksets or latchsets; lever design selected from door manufacturer's full line; rectangular escutcheon.
   1. Material: As selected by Architect.
   2. Finish: Satin.
   3. Style: As selected by Architect.

F. Electromagnetic Door Holders: Provide magnetic portion recessed into door; conceal power transfer device to frame, internal wiring; wall-mounted steel fixture and separate transformer; complying with BHMA A156.15.
   1. Size: 1-3/8 inch diameter, 1/8 inch projection.
   2. Holding Force: 40 pounds-force.
   3. Voltage: 12 VDC, and provide power supplies by same manufacturer as holders.

G. Gasketing: Complying with BHMA A156.22.
   1. Door Sweep Type: Encased in retainer.
   2. Material: Aluminum, with brush weatherstripping.
   3. Provide gasketing for smoke and draft control doors (Indicated as "S" on Drawings) that complies with local codes and requirements of assemblies tested in accordance with UL 1784.

2.05 FINISHES

A. Doors and Frames:
   1. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

B. Door Hardware: Provide door hardware of same finish, unless otherwise indicated.
   1. Finish: 626; satin chromium plated over nickel, with brass or bronze base material (former US equivalent US26D); BHMA A156.18.
   2. Exceptions:
      a. Where base material metal is specified to be different, provide finish that is an equivalent appearance in accordance with BHMA A156.18.

2.06 ACCESSORIES

A. Frame Spreader Bar: Provide for preassembled welded frames, unless otherwise indicated.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting this Work.

B. Verify that opening sizes and tolerances are acceptable.

3.02 INSTALLATION

A. Install doors in accordance with manufacturer's requirements and the specified performance requirements.

B. Install fire rated units in accordance with NFPA 80.

C. Coordinate frame anchor placement with wall construction.

3.03 TOLERANCES

A. Clearances Between Door and Frame: As specified in ANSI/SDI A250.8 (SDI-100).

B. Maximum Diagonal Distortion: 1/16 in measured with straight edge, corner to corner.

3.04 ADJUSTING

A. Adjust for smooth and balanced door movement.

END OF SECTION

SECTION 08 3100
ACCESS DOORS AND PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall and ceiling access door and frame units.

1.02 RELATED REQUIREMENTS

A. Section 09 9113 - Exterior Painting: Field paint finish.

1.03 REFERENCE STANDARDS

A. UL (FRD) - Fire Resistance Directory; current edition.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.

PART 2 PRODUCTS

2.01 ACCESS DOORS AND PANELS ASSEMBLIES

A. Wall-Mounted Units:
   1. Size: 12 inch by 12 inch, unless otherwise noted.
   2. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
   3. Gypsum Board Mounting Criteria: Provide drywall bead frame with door surface flush with wall surface.

B. Fire-Rated Wall-Mounted Units:
   1. Wall Fire-Rating: As indicated on drawings.
   2. Material: Steel.
   3. Size: 12 inch by 12 inch, and 30 inch by 48 inch, as indicated in the plans and door schedule.
   4. At 12 inch by 12 inch units, provide tool-operated spring or cam lock; no handle.
   5. At large units, provide knurled knob and cylinder-operated cam latch; provide two keys per lock.

C. Ceiling-Mounted Units:
   1. Material: Steel.
   2. Size - Lay-In Grid Ceilings: To match module of ceiling grid.
   3. Size - Other Ceilings: 12 inch by 12 inch.
   4. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.

D. Fire-Rated Ceiling-Mounted Units:
   1. Ceiling Fire-Rating: As indicated on drawings.
   2. Material: Steel.
   3. Size: 12 inch by 12 inch.
   4. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.

2.02 WALL & CEILING-MOUNTED UNITS

A. Manufacturers:
   1. ACUDOR Products Inc: www.acudor.com.
   2. Karp Associates, Inc: www.karpinc.com.
   3. Nystrom, Inc; Model UW: www.nystrom.com.
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Wall & Ceiling-Mounted Units: Factory fabricated door and frame, fully assembled units with corner joints welded, filled and ground flush; square and without rack or warp; coordinate requirements with type of installation assembly being used for each unit.
   1. Material: Steel.

2. Style: Recessed door panel for infill with wall/ceiling finish.
    a. Gypsum Board Mounting Criteria: Use drywall bead type frame.
3. Door Style: Single thickness with rolled or turned in edges.
4. Frames: 16 gage, 0.0598 inch, minimum thickness.
5. Single Steel Sheet Door Panels: 1/16 inch, minimum thickness.
6. Units in Fire-Rated Assemblies: Fire rating as required by applicable code for fire-rated assembly that access doors are being installed.
7. Steel Finish: Primed.
8. Hardware:
    a. Hardware for Fire-Rated Units: As required for listing.
    b. Hinges for Non-Fire-Rated Units: Concealed, constant force closure spring type.
    c. Latch/Lock: Cylinder lock-operated cam latch, two keys for each unit.
    d. Number of Locks/Latches Required: As recommended by manufacturer for size of unit.
    e. Inside Latch Release: Mechanism that allows door/panel to be opened from inside.
    f. Gasketing: Extruded neoprene, around perimeter of door panel.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that rough openings are correctly sized and located.

3.02 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Install frames plumb and level in openings, and secure units rigidly in place.

C. Position units to provide convenient access to concealed equipment when necessary.

END OF SECTION

SECTION 08 3213

INTERIOR SLIDING GLASS DOORS

SUMMARY

1.01 SECTION INCLUDES GLAZED ALUMINUM-FRAMED SLIDING DOORS AND FRAMES.

A. Related Requirements:
   1. Section 08 71 00 – Door Hardware.

B. References:
   1. American Society for Testing and Materials (ASTM).
      a. ASTM B308, Aluminum 6061-T6 Standard Structural Profiles.
      b. ASTM C1048, Heat-Treated Flat Glass – Kind HS, Kind FT Coated and Uncoated Glass.
      c. ASTM C1172, Laminated Architectural Flat Glass.
      d. ASTM C1036, Standard Specification for Flat Glass.
   2. American Architectural Manufacturers Association (AAMA).
      a. AAMA 611, Anodized Architectural Aluminum.
   3. American National Standards Institute (ANSI).
      a. ANSI Z97.1-2009, Impact Class A.
   4. U.S. Consumer Product Safety Commission (CPSC).
      a. CPSC 16 CFR 1201, Category II, Safety Standard for Architectural Glazing Materials.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Field-verify dimensions and clearances for openings scheduled to receive work of this section.

B. Scheduling:
   1. Ordering and Delivery: Order products with sufficient lead time to avoid delays in project schedule.
   2. Installation: To extent practical, install work after surrounding finish work is complete. (Last trade in)

1.03 ACTION SUBMITTALS

A. Product Data: Include fabrication details, aluminum finishes, glass types, installation and operating instructions for each type of sliding door.

B. Samples for Verification:
   1. Extrusions: Approximately 8 inches long, showing finish.
   2. Glass: Approximately 3 inches square.

1.04 CLOSEOUT SUBMITTALS

A. Operation and maintenance data (If frosted glass is selected, please see specific cleaning details). Include Frosted Glass Warning.

B. Executed warranty.

1.05 QUALITY ASSURANCE

A. Installer: Approved by manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver products after space is enclosed and wet work is complete.

B. Acceptance: Inspect packaging and report noticeable damage to manufacturer within 48 hours of receiving.

C. Storage: Store in original packaging, up to ten degrees from vertical, on level floor surface.

D. Handling: Handle in accordance with manufacturer’s installation instructions and to prevent damage.

1.07 WARRANTY

A. See separate warranty document.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Basis of design: The Sliding Door Company, Inc.: www.slidingdoorco.com

B. Substitutions:
   1. Substitutions will be considered according to provisions of Section 01 6000.

2.02 COMPONENTS

A. Framing, General:
   1. Material: Aluminum extrusions, 6061 alloy.
   2. Finish:
      a. Clear Anodized Aluminum: AAMA 611, Class II.

B. Beams and Columns: Size shown on Drawings, 0.102 inch minimum thickness.

C. Top Tracks: 0.064 inch minimum thickness, with number of channels required for door operation indicated.

D. Bottom Tracks:
   1. Aluminum 6061 extrusions, 0.057 inch minimum metal thickness, 0.325 inch high, barrier-free per ADA.
   2. Installation: Surface-mounted.
   3. Channels: Single and Double: Interlocking tracks with number of channels required for door operation indicated.
   4. Finish: Clear Anodized Aluminum: AAMA 611, Class II.

E. Doors:
   1. Stiles and Rails:
      a. 1.5 inch wide, 0.051 inch minimum thickness.

F. Glass: Category II Safety Glazing per CPSC 16 CFR 1201.
   1. Monolithic Clear Tempered Glass: 5 mm thick, ASTM C1048, Kind FT.
      a. Glazing Pattern:
         1) Frosted: Sandblasted and etched back.

2.03 HARDWARE

A. Handles:
   1. Round Designer Handle Stainless Steel: Single, 12” ht, 3/4” Dia] .

B. Upper Roller Carriages: Vinyl rollers with steel bearings.

C. Lower Carriages: Sliding wheel-to-track with locking mechanism and polyoxymethylene (POM) copolymer wheels with steel bearings.

D. Locks and Latches:
   1. Flush Latch ADA with Safety Hole, Stainless Steel

E. Door Stop: For head or bottom track, as indicated in shop drawings.

2.04 FABRICATION AND ASSEMBLY

A. Door Design:
   1. Solo: Single light.

B. Factory Assembly: Fabricate frame components and doors to finished sizes in factory.

2.05 ACCESSORIES

A. Silicone Adhesive: Clear, construction grade silicone adhesive.

B. Fasteners: As indicated in Shop Drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that openings and substrates are acceptable for installation of work of this section.

3.02 INSTALLATION

A. Install systems according to Shop Drawings and manufacturer's installation instructions.

3.03 ADJUSTING, CLEANING AND PROTECTION

A. Adjust doors for smooth operation.

B. Comply with manufacturer's written recommendations for cleaning and maintenance.

C. Clean aluminum and glass surfaces immediately after installing sliding doors.

D. Protect surfaces from impact and from contact with contaminating substances resulting from other construction operations. Typically this product is last trade in.

E. Clean immediately before Substantial Completion.

3.04 NOTE: CONTRACTOR HAS FULL OWNERSHIP FOR SITE CONDITIONS AND READINESS PRIOR TO THE SLIDING DOOR COMPANY PRODUCT BEING INSTALLED.

END OF SECTION

SECTION 08 3300

HIGH SPEED ROLLING DOORS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. High-speed roll-up doors.

B. Wiring from electric circuit disconnect to operator to control station.

C. REFERENCES
   1. NEMA - National Electrical Manufacturers Association.
   2. LED - Light Emitting Diode.

D. SYSTEM DESCRIPTION
   1. Motor type: AC drive, and variable speed with soft acceleration and braking. Mechanical release lever on side column allows door to be easily opened in the event of a power failure.

E. SUBMITTALS
   1. Submit the following:
      a. Shop Drawings: Indicate pertinent dimensioning, anchorage methods, hardware locations, and installation details.
      b. Product Data: Provide general construction, component connections and details, and electrical equipment, operation instructions, and information.
      c. Samples: Submit samples of door slat material.
      d. Manufacturer's Installation: Indicate installation sequence and procedures, adjustment, and alignment procedures.

F. MAINTENANCE DATA
   1. Scheduled maintenance program available to include lubrication requirements and frequency, periodic adjustments required, scheduled maintenance suggested, manufacturer’s data sheets, and equipment inter-connection diagrams.

G. REGULATORY REQUIREMENTS
   1. Electrical components UL listed.
   2. Electrical control panel NEMA approved.

H. QUALITY ASSURANCE
   1. Furnish high-speed roll doors and all components and accessories by one manufacturer.
   2. Specific door model used must have a proven track record of successful installations in similar applications of no less than 3 years. References to be provided upon request.

I. FIELD MEASUREMENTS
   1. Verify field measurements are as indicated on shop drawings.

J. COORDINATION
   1. Coordinate the work with installation of electric power and locations and sizes of conduit.

K. WARRANTY
   1. Five-year limited warranty on mechanical components, including motor assembly
   2. Two-year limited warranty on electrical components
   3. Two-year limited warranty on standard door panels, rollers, hinges and door tracks

PART 2 - PRODUCTS

2.01 PRODUCTS

A. Rytec Corporation Spiral VT Door (Ventilated)

B. Rytec Corporation Spiral LH VT Door (Low Headroom Ventilated)

C. MATERIALS
   1. Door Panel: Double-walled, perforated aluminum slats are 6 inches high by 1 3/16 inches thick.

2. Integral rubber weatherseal between each of the panels. Door slats are connected by hinge system to provide additional rigidity and security to door panel. Door curtain does not require a tensioning system for additional wind/pressure resistance. Doors which require the use of a tensioning system for additional wind/pressure resistance will not be accepted.
3. Side Frames: Galvanized steel side frames with full height weatherseal on both sides to seal against door panel. Dual thru-beam photo-eyes mounted within door jamb. Doors using an external coil cord will not be accepted.
4. Bottom Bar: Extruded aluminum bottom bar with electric, reversing edge that reverses the door upon contacting an object.
5. Counterbalance: Up to six extension springs in each side column, depending on the size of the door. Springs assist the motor in opening the door. Mechanical release lever on side column allows door to be easily opened in the event of a power failure. Doors using torsion springs for counterbalance or doors with springs located within a barrel will not be accepted.
6. Drive system: Minimum 2 HP motor with variable speed AC drive which allows for soft acceleration and braking. Doors using a motor with a clutch or pump will not be accepted.
7. Travel Speed: Opens at up to 60 inches per second and closes at 30 inches per second.
8. Electrical Controls
    a. Rytec controller housed in a UL/cUL Listed NEMA 4X-rated enclosure with factory set parameters.
    b. Parameter changes and all door configurations can be made from the face of the control box, no exposure to high voltage. Control panels that require opening of the control box and reaching inside to make parameter changes will not be accepted.
    c. Controls include a variable speed AC drive system capable of infinitely variable speed control in both directions.
    d. Programmable inputs and outputs accommodate special control applications (traffic lights, horns, actuation devices, timing sequences, etc.) without the need for additional electrical components.
    e. Self-diagnostic scrolling two-line vacuum fluorescent display provides expanded informational messages for straightforward installation, control adjustments and error reporting.
    f. Complete history of door, at least two years, is logged and encrypted onto a USB flash drive. All errors have a time and date stamp for reference. Control panels not logging up to two years of door history will not be accepted.
9. Door to use rotary encoder to regulate door travel limits. Limits to be self-adjusting, without the use of tools, from floor level at the control panel. Doors using mechanical limits switches or doors that require tools to set the limits will not be accepted.
10. Door Track: Spiral rollup design features no metal-to-metal contact which results in whisper-quiet, low maintenance operation and eliminates wear on panel slats. Doors that roll up on a barrel or whose track design allows metal-to-metal contact will not be accepted.
11. Windload: Door testing indicates the door is capable of withstanding winds up to and exceeding 88 mph (20 psf).
12. All components factory finished.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that opening sizes, tolerances, and conditions are acceptable.

3.02 INSTALLATION

A. Install door unit assembly in accordance with manufacturer's instructions.

B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.

C. Fit and align assembly including hardware; level to plumb to provide smooth operation.

D. Coordinate installation of electrical service. Complete wiring from disconnect to unit components.

3.03 ADJUSTING

A. Adjust door and operating assemblies.

B. Test and adjust door(s), if necessary, for proper operation.

3.04 CLEANING

A. Clean door and components.

END OF SECTION

SECTION 08 3323
OVERHEAD COILING DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Overhead coiling doors, operating hardware, fire-rated, non-fire-rated, and exterior, manual and electric operation.

B. Wiring from electric circuit disconnect to operator to control station.

1.02 RELATED REQUIREMENTS

A. Section 07 9200 - Joint Sealants: Sealing joints between frames and adjacent construction.

B. Section 08 7100 - Door Hardware: Cylinder cores and keys.

C. Section 09 9113 - Exterior Painting: Field paint finish.

D. Section 28 3100 - Fire Detection and Alarm: Fire alarm interconnection.

E. Section 26 2717 - Equipment Wiring: Power to disconnect.

F. Section 26 0534 - Conduit: Conduit from electric circuit to operator and from operator to control station.

G. Section 26 0534 - Conduit: Conduit from fire alarm system.

H. Section 26 2717 - Equipment Wiring: Power to disconnect.

1.03 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.

C. ITS (DIR) - Directory of Listed Products; current edition.

D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.

E. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2000 (R2005), with errata, 2008.

F. NEMA MG 1 - Motors and Generators; 2014.

G. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2016.

H. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide general construction, electrical equipment, and component connections and details.

C. Shop Drawings: Indicate pertinent dimensioning, anchorage methods, hardware locations, and installation details.

D. Maintenance Data: Indicate lubrication requirements and frequency and periodic adjustments required.

1.05 QUALITY ASSURANCE

A. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Overhead Coiling Doors:
   1. Alpine Overhead Doors, Inc: www.alpinedoors.com.
   2. Cornell Iron Works, Inc: www.cornelliron.com.

3. The Cookson Company: www.cooksondoor.com.
4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 COILING DOORS

A. Exterior Coiling Doors: Steel slat curtain.
   1. Single thickness slats.
   2. Nominal Slat Size: 2 inches wide x required length.
   3. Finish: Factory painted, color as selected.
   4. Guides: Angles; primed steel.
   5. Hood Enclosure: Manufacturer's standard; primed steel.
   6. Electric operation.
   7. Mounting: Within framed opening.

B. Fire-Rated Coiling Doors: Steel slat curtain; conform to NFPA 80.
   1. 1-1/2 hour fire rating, or as indicated in Door Schedule.
   2. Provide products listed and labeled by ITS (DIR) or UL (DIR) as suitable for the purpose specified and indicated.
   3. Nominal Slat Size: 2 inches wide by required length.
   4. Finish: Factory painted, color as selected.
   5. Guides: Angles; primed steel.
   6. Hood Enclosure: Manufacturer's standard; primed steel.
   7. Fire Alarm Release Mechanism: Electric-motor operated from fire alarm system.
   8. Electric operation.
   9. Mounting: As indicated.

2.03 MATERIALS

A. Steel Coiling Doors:
   1. Coiling Door Curtain Construction: Interlocking slats.
      a. Slat Ends: Each slat fitted with end locks to act as wearing surface in guides and to prevent lateral movement.
      b. Curtain Bottom: Fitted with angles to provide reinforcement and positive contact in closed position.
      c. Weatherstripping: Moisture and rot proof, resilient type, located at jamb edges, bottom of curtain, and where curtain enters hood enclosure of exterior doors.
      d. Steel Slats: Minimum thickness, 22 gage, 0.03 inch; ASTM A653/A653M galvanized steel sheet.

B. Guide Construction: Continuous, of profile to retain door in place with snap-on trim, mounting brackets of same metal.
   1. Steel Guides: ASTM A36/A36M steel angles, size as indicated, prime painted.

C. Hood Enclosure: Internally reinforced to maintain rigidity and shape.
   1. Prime paint.
   2. Lock Hardware:
      a. For motor operated units, additional lock or latching mechanisms are not required.
      b. Latch Handle: Manufacturer's standard.

D. Roller Shaft Counterbalance: Steel pipe and helical steel spring system, capable of producing torque sufficient to ensure smooth operation of curtain from any position and capable of holding position at mid-travel; with adjustable spring tension; requiring 25 lb nominal force to operate.

2.04 ELECTRIC OPERATION FOR OVERHEAD COILING DOORS

A. Electric Operators:
   1. Mounting: Side mounted.
   2. Motor Enclosure:
      a. Exterior Doors: NEMA MG 1, Type 4; open drip proof.
      b. Interior Doors: NEMA MG 1, Type 1; open drip proof.
   3. Motor Rating: 1/3 hp; continuous duty.

4. Motor Controller: NEMA ICS 2, full voltage, reversing magnetic motor starter.
5. Controller Enclosure: NEMA 250, Type 1.
6. Opening Speed: 12 inches per second.
7. Brake: Adjustable friction clutch type, activated by motor controller.
8. Manual override in case of power failure.

B. Control Station: Standard key-operated three position (OPEN-STOP-CLOSE) momentary control for each operator.
1. 24 volt circuit.
2. Surface mounted.

C. Safety Edge: Located at bottom of curtain, full width, electro-mechanical sensitized type, wired to stop operator upon striking object, hollow neoprene covered.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that opening sizes, tolerances and conditions are acceptable.

3.02 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Install fire-rated doors in accordance with NFPA 80.

C. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.

D. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.

E. Fit and align assembly including hardware; level and plumb, to provide smooth operation.

F. Coordinate installation of electrical service with Section 26 2717.

G. Complete wiring from disconnect to unit components.

H. Complete wiring from fire alarm system.

I. Coordinate installation of sealants and backing materials at frame perimeter as specified in Section 07 9005.

3.03 TOLERANCES

A. Maintain dimensional tolerances and alignment with adjacent work.

B. Maximum Variation From Plumb: 1/16 inch.

C. Maximum Variation From Level: 1/16 inch.

D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch per 10 ft straight edge.

3.04 ADJUSTING

A. Adjust operating assemblies for smooth and noiseless operation.

3.05 CLEANING

A. Clean installed components.

B. Remove labels and visible markings.

END OF SECTION

SECTION 08 3485

FIRE RATED AUTOMATIC SMOKE CURTAINS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Fire protective smoke containment curtain system designed to provide a tight-fitting, smoke- and draft-control assembly as well as fire protection.

B. Products Supplied But Not Installed Under This Section:
   1. Group Control Panel unit.
   2. Emergency Up Buttons

C. Related Sections:
   1. 06 1000 - Rough Carpentry: Wood framing in housing mounting area.
   2. 08 3100 - Access Panels.
   3. 09 2116 - Gypsum Board Assemblies: Metal backing in housing mounting area.
   4. 09 9000 - Paints and coatings: Field painting of specified components.
   5. 28 3000 - Detection and Alarm: Provision of smoke detectors.
   6. Division 26 Sections for 120VAC and control circuit power including conduit, boxes, conductors, wiring devices, and emergency power.

1.02 REFERENCES

A. ASTM E84-10 test report with calculated smoke development (CSD) of 2 and a smoke developed index (SDI) of 0 and a calculated flame spread (CFS) of 0.

B. ICC Evaluation Service ESR-3322 - Legend Report showing compliance with opening force, cyclic force, expansion characteristics

C. NFPA Codes and Standards:
   1. 70 - National Electrical Code.
   2. 105 - Recommended Practice for the Installation of Smoke-Control Door Assemblies.
   3. ASTM - E84 Test report with Calculated Smoke Developed (CSD) of 2 and a Smoke Developed Index (SDI) of 0 and a Calculated Flame Spread (CFS) of 0.

D. UL Minimum Performance Standards
   1. UL 10B Fire test for door assemblies
   2. UL10C Positive pressure fire test for door assemblies
   3. UL 10D- Fire test for protective curtains
   4. UL Oversized Certificate
   5. UL 864 - Classified Control Units for Fire Protective Signaling Systems.
   6. UL 1784 - Air Leakage Tests for Door Assemblies.
   7. Impact test required by independent testing laboratory
   8. Gravity fail-safe design. No battery back-up will be required for deployment
   9. Certified to ISO 9001 1994 for the design, manufacturing, installation, and commissioning of Automatic Smoke Barriers and Partitions.
   10. UL follow up service report required

E. California Department of Forestry and Fire Protection and Office of the State Fire Marshal Listing

1.03 SUBMITTALS

A. Product Data: For each type of product
   1. Shop Drawings: Show fabrication and installation details for automatic smoke curtains. Include plans, sections details, attachments to other work and the following:
      a. Operating clearances
      b. Requirements for supporting automatic smoke curtains, track, equipment.
      c. Locations of equipment components, switches, motors and controls. Differentiate between manufacturer-installed and field installed wiring
   2. Quality Assurance/Control Submittals:

a. Certifications: Copy of specified items.
b. Manufacturer's installation instructions and testing procedures

1.04 CLOSEOUT SUBMITTALS

A. Comply Section 01 7700-Closeout Submittals; submit following items:
1. Operation and Maintenance Manual
2. Manufacturer's Warranties

1.05 QUALITY ASSURANCE

A. Overall Standards:
1. Manufacturer shall maintain a quality control program in accordance with ICC-ES Acceptance Criteria.
2. UL follow up Service Report
3. Product must bear a UL label. "Tested in accordance to" standard not acceptable for fire rated smoke curtains. Intertek label not acceptable..

B. Qualifications:
1. Manufacturer Qualifications: Minimum five years experience in producing smoke containment systems of the type specified.
2. Installer Qualifications: Factory trained by manufacturer.

C. Certifications:
1. Impact test report by independent laboratory
2. California Department of Forestry and Fire Protection and Office of the State Fire Marshal Listing.
3. UL 10B Fire test of door assemblies time temperature curve (no hose stream)
4. UL 10C Positive Pressure fire test for door assemblies time temperature curve (no hose stream)
5. UL Testing Laboratory Label.
6. UL 1784 UL Labeled, listed, classified, certified and marked Smoke & Draft assembly with no more than an air leakage of 3.CFM
7. UL 864 UL Labeled, listed, classified, certified and marked control units and accessories for Fire Alarm Systems
8. UL Oversized certificate labeled, listed, classified, certified and marked
9. UL-10D One Hour Fire Protective Curtain Listing Label.
10. OSHPD Anchorage Pre-Approval No. OPA-2855-10

D. Pre-Installation Meeting:
1. Schedule and convene a pre-installation meeting prior to commencement of field operations with representatives of the following in attendance: Owner, Architect, General Contractor, smoke containment system sub-contractor, painting sub-contractor, and electrical sub-contractor.
2. Review substrate conditions, requirements of related work, installation instructions, storage and handling procedures, and protection measures.
3. Keep minutes of meeting including responsibilities of various parties and deviations from specifications and installation instructions.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Reference Section 01 6600-Product Storage and Handling Requirements.

B. Follow manufacturer's instructions.

1.07 WARRANTY

A. Provide manufacturer's standard one year warranty.

B. Maintenance and Testing:
1. Perform minimum annual maintenance and testing on each smoke and fire containment system as required by the manufacturer's warranty, code agency evaluation reports, and as required by local authority having jurisdiction.
2. Provide test documentation.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Basis of Design: Model DSI SD-60GS Fire Rated Automatic Smoke Curtain by Door Systems, Inc.

B. Manufacturer:
   1. DSI Smoke and Fire Protective Curtains; www.doorsysinc.com

2.02 PERFORMANCE REQUIREMENTS

A. Air Leakage: Not to exceed 3 cfm (0.001416 m3/s) per sf of door opening.

B. Fire Rating: UL-10D The enclosure shall be rated at the same rating as the curtain fabric.

2.03 COMPONENTS

A. The curtain head box shall be manufactured from 1.2mm galvanized steel. The enclosure shall be rated at the same temperature as the curtain fabric.

B. Removable cover plates shall be incorporated to allow access to the curtain rollers.

C. Standard head box sizes shall be 7 ¼" x 7 ¼" for single rollers (maximum width 18'-0") and 12 ¼" x 8 ¼" for multiple rollers (over 18'-0" wide). Larger head boxes may be required where the curtain drop is in excess of 9'-10".

D. A weighted bottom bar shall be provided to prevent deflection and ensure correct operation under gravity.

E. The roller shall be constructed from an octagonal tube which will incorporate a 24v D.C. motor and gearbox and a sealed heavy duty ball bearing assembly.

F. A motor control circuit housed in a steel enclosure shall be mounted onto the motor end of the head box.

G. Provide each motorized curtain with back Electromagnetic force controlled speed of descent of no less than 6 inches per second and no more than 24 inches per second.

H. The fabric curtain shall be manufactured from X32K woven glass cloth incorporating a 'Panama' weave for increased stability. The woven glass fiber fabric shall have a nominal weight of no less than 540g/square meter and shall be UL listed for one hour.

I. The fabric curtain shall include a fabric egress door to be outlined by stenciling. The curtain fabric will include an overlap with magnets at the center. The fabric door will include stenciling reading "Push to Open" on one side and "Pull to Open" on the opposite side. A fabric grab strap will be mounted on the pull side of the egress door at 42" A.F.F. Egress slot is acceptable in lieu of egress door.

2.04 OPERATION

A. The smoke and fire curtain shall deploy upon a signal from the fire alarm system in an emergency situation.

B. The system must be proven to "fail safe" to the operational position on total loss of primary and auxiliary power. The system must contain a housed battery system at the Group Control Panels.

C. Under normal operating conditions the curtains would be held in the retracted position via the motors operating at low voltage. The manufacture must be able to confirm that the motor windings are suitable for this type of operation.

D. Upon activation of the fire alarm the control panel will remove the supply voltage and the curtain shall descend under the power of gravity in a controlled manner. A dynamic braking system housed in the motor control circuit shall control the speed of the descent of the curtain. The descent shall be electronically synchronized on overlapping curtains with a bottom bar.

E. To retract the curtain the control panel shall supply 24v to the motor control circuits and motors will drive the curtains to the upper position. As the bottom bar or stopping bar hits the curtain head box a current limiting circuit will step back the voltage and current and hold the bottom bar in the retracted position.

F. Limit switches are not to be used to control the upper position of the curtain.

G. An optional braking system is available at the manufacture stage to allow a two stage descent during gravity deployment. Should the main power fail to the group control panel, the supply is automatically switched to the integral standby battery. The curtain remains in the retracted position for 1 hour (fully retracted loaded system). The curtain will remain fully operational until the battery low voltage cut off facility reads a voltage of 21v; the curtains will then safely descend under the power of gravity to the operational position.

H. Group Control Panel: Provide Group Control Panel (GCP) capable of controlling up to 5 no. BLE24v motor assemblies. During normal operation, the GCP will provide a 24v AC supply to the curtain motor holding them in the retracted position. Should smoke be detected, the fire alarm contact in the GCP will be opened by the fire alarm control system, the GCP will remove the 24v supply to the curtain motors and the curtains will descend under the power of gravity in a controlled manner.

I. Open on fire- configured to be gravity fail safe

J. Test Facility- key switch required

K. All push to exit buttons must contain internal battery back-up power supply for fail safe operation for ICC ES requirements.

L. Weight of bottom to be 1.5 pounds per linear foot for curtain to for secondary means of egress for compliance with ICC ES requirements.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates upon which work will be installed.
   1. Verify related work performed under other sections is complete and in accordance with Shop Drawings.
   2. Verify wall surfaces and elevator door frames are acceptable for installation of smoke containment system components.

3.02 INSTALLATION

A. Install smoke containment system components in accordance with manufacturer's installation instructions.

3.03 FIELD QUALITY CONTROL

A. Field Test: Follow manufacturer's cycle test procedures.
   1. Notify Owner's Representative, local Fire Marshal, alarm sub-contractor a minimum one week in advance of scheduled testing.
   2. Complete maintenance service record.

3.04 DEMONSTRATION

A. Demonstrate required testing and maintenance procedures to Owner's Representative.

B. Maintenance and Testing:
   1. Perform minimum annual maintenance and testing on each smoke and fire curtain system as required by the manufacturer's warranty, code agency evaluation reports, and as required by local authority having jurisdiction.
   2. Retain permanent record of tests.

C. Qualified Door Systems, Inc Inspector assesses units after exposure to a fire event.

3.05 MAINTENANCE

A. Engage an authorized service representative to test, adjust and maintain the system once per annum as required per NFPA 101 and NFPA 80.

END OF SECTION 08 34 85

SECTION 08 4313
ALUMINUM-FRAMED STOREFRONTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum-framed storefront, with vision glass.

B. Infill panels of metal and glass.

C. Aluminum doors and frames.

D. Weatherstripping.

1.02 RELATED REQUIREMENTS

A. Section 05 1200 - Structural Steel Framing: Steel attachment members.

B. Section 07 2500 - Weather Barriers: Sealing framing to weather barrier installed on adjacent construction.

C. Section 07 9200 - Joint Sealants: Sealing joints between frames and adjacent construction.

D. Section 08 7100 - Door Hardware: Hardware items other than specified in this section.

E. Section 08 8000 - Glazing: Glass and glazing accessories.

1.03 REFERENCE STANDARDS

A. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site; 2015.

B. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections; 2009.

C. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels; 2013.

D. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; 2010, with 2013 Supplements and Errata.

E. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

F. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric]; 2013.

G. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004 (Reapproved 2012).

H. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014.

I. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2009).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with installation of other components that comprise the exterior enclosure.

B. Preinstallation Meeting: Conduct a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related Work, expansion and contraction joint location and details, and field welding required.

C. Hardware Schedule: Complete itemization of each item of hardware to be provided for each door, cross-referenced to door identification numbers in Contract Documents.

1.06 QUALITY ASSURANCE

A. Manufacturer and Installer Qualifications: Company specializing in manufacturing aluminum glazing systems with minimum five years of experience, and approved by manufacturer.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Handle products of this section in accordance with AAMA CW-10.

B. Protect finished aluminum surfaces with strippable coating. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

C. Provide three year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.

D. Provide three year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.01 BASIS OF DESIGN -- FRAMING FOR MONOLITHIC GLAZING

A. Center-Set Style:
   1. Basis of Design: EFCO Corporation; Series 402, Non-Thermal Storefront Framing. Shear block joints.
   2. Vertical Mullion Dimensions: 2 inches wide by 4-1/2 inches deep. Center-set, inside glazed.

2.02 BASIS OF DESIGN -- SWINGING DOORS

A. Medium Stile, Insulating Glazing, Not Thermally-Broken:
   1. Basis of Design: EFCO Corporation; Series D318 Durastile Heavy Duty: www.efcocorp.com/sle.
   2. Thickness: 1-3/4 inches.

B. Substitutions: See Section 01 6000 - Product Requirements.
   1. For any product not identified as "Basis of Design", submit information as specified for substitutions.

2.03 STOREFRONT

A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
   1. Glazing Rabbet: For 1/4 inch monolithic glazing.
   2. Finish: Class II natural anodized.
      a. Factory finish all surfaces that will be exposed in completed assemblies.
      b. Touch-up surfaces cut during fabrication so that no natural aluminum is visible in completed assemblies, including joint edges.
      c. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.
   3. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors and hardware; fasteners and attachments concealed from view; reinforced as required for imposed loads.
   4. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
   5. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.

6. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
7. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.

2.04 COMPONENTS

A. Aluminum Framing Members: Tubular aluminum sections, drainage holes and internal weep drainage system.
   1. Framing members for interior applications need not be thermally broken.
   2. Glazing Stops: Flush.
   3. Cross-Section: As indicated on drawings.

B. Glazing: As specified in Section 08 8000.
   1. For Exterior Doors: Type G-2.
   2. For Interior Framing: Type G-1 or G-2; See Drawings for Tempered Glazing, "T"..
   3. For Interior Door Glazing and Adjacent Panels: G-2.

C. Swing Doors: Glazed aluminum.
   1. Thickness: 1-3/4 inches.
   2. Top Rail: 4 inches wide.
   3. Vertical Stiles: 4-1/2 inches wide.
   4. Bottom Rail: 10 inches wide.
   5. Glazing Stops: Square.
   6. Finish: Same as storefront.

2.05 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

B. Fasteners: Stainless steel.

C. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

2.06 FINISHES

A. Superior Performing Organic Coatings: AAMA 2605 multiple coat, thermally cured polyvinylidene fluoride (PVDF) system.
   1. Polyvinylidene fluoride (PVDF) multi-coat thermoplastic fluoropolymer coating system, including minimum 70 percent PVDF color topcoat and minimum total dry film thickness of 0.9 mil; color and gloss as indicated on drawings.
      a. Manufacturers:
         1) PPG Metal Coatings; Duranar: www.ppgideascapes.com.
         2) Kynar500 by Arkema: www.kynar500.com
         3) Substitutions: See Section 01 6000 - Product Requirements.

B. Color: As indicated on drawings.

C. Touch-Up Materials: As recommended by coating manufacturer for field application.

2.07 HARDWARE

A. Door Hardware: As specified in Section 08 7100.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other work.

3.02 INSTALLATION

A. Install wall system in accordance with manufacturer's instructions.

B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Provide alignment attachments and shims to permanently fasten system to building structure.

D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

E. Install glass and infill panels in accordance with Section 08 8000, using glazing method required to achieve performance criteria.

F. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.03 TOLERANCES

A. Maximum Variation from Plumb: 0.06 inches every 3 ft non-cumulative or 1/16 inches per 10 ft, whichever is less.

B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

3.04 ADJUSTING

A. Adjust operating hardware and sash for smooth operation.

3.05 CLEANING

A. Remove protective material from pre-finished aluminum surfaces.

B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.

C. Remove excess sealant by method acceptable to sealant manufacturer.

3.06 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 08 4333

FOLDING GLASS STOREFRONTS

PART 1 GENERAL

1.01 SUMMARY

A. Section includes furnishing and installing a floor track supported, sliding-folding, thermally broken, aluminum-framed glass panel system that includes:
   1. Aluminum frame
   2. Threshold
   3. Panels
   4. Sliding-folding and locking hardware
   5. Weatherstripping
   6. Glass and glazing
   7. Accessories as required for a complete working installation.
      a. Related Documents and Sections: Contractor to examine Contract Documents for requirements that directly affect or are affected by Work of this Section. A list of those Documents and Sections include, but is not limited to, the following:
         1) Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 General Requirements, Specification Sections, apply to this Section.
         2) Section 07 62 00, Sheet Metal Flashing and Trim: Flashing and other sheet metal work.
         3) Section 07 92 00, Joint Sealants
         4) Section 08 44 13, Glazed Aluminum Curtain Walls
         5) Section 09 21 16, Gypsum Board Assemblies: Metal framing R.O. and reinforcement.

B. REFERENCES
   1. Reference Standards in accordance with Division 01 and current editions from the following:
      a. AAMA. American Architectural Manufacturers Association; www.aamanet.org <http://www.aamanet.org/>
         1) <<http://www.aamanet.org/>>
         2) AAMA 503, Voluntary Specification for Field Testing of Newly Installed Storefronts,
            (a) Curtain Walls, and Sloped Glazing Systems
            (b) AAMA 611, Voluntary Specification for Anodized Architectural Aluminum
            (c) AAMA 920, Operation / Cycling Performance
            (d) AAMA 1304, Voluntary Specification for Forced Entry Resistance of Side-Hinged Door Systems
            (e) AAMA 2604, Voluntary Specifications, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels
            (f) AAMA/WDMA/CSA 101/I.S.2/A440, NAFS, North American Fenestration Standard - Specification for Windows, Doors and Skylights
               (1) ANSI. American National Standards Institute; www.ansi.org <http://www.ansi.org/>
               (2) <<http://www.ansi.org/>>
               (3) ANSI Z97.1, Safety Performance Specifications and Methods of Test for Safety Glazing Material Used In Buildings
               (4) ASTM. ASTM International; www.astm.org <http://www.astm.org/><<http://www.astm.org/>>
               (5) ASTM C1036, Standard Specification for Flat Glass
               (6) ASTM C1048, Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass

(7) ASTM E283, Test Method for Rate of Air Leakage through Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
(8) ASTM E330, Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
(9) ASTM E331 Standard Test Method for Water Penetration of Exterior Windows, Skylights,
(10) Doors, and Curtain Walls by Uniform Static Air Pressure Difference
(11) ASTM E413, Classification for Rating Sound Insulation
(12) ASTM E547, Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Cyclic Static Air Pressure Differential.
(13) ASTM E1332, Standard Classification for Rating Outdoor-Indoor Sound Attenuation
(14) BSI Group. The British Standards Institution;
(15) <<http://www.bsigroup.com/en-GB/>>
(16) PAS 24 (Publicly Available Specification), Enhanced security performance requirements for door assemblies
(17) CPSC. Consumer Product Safety Commission; www.cpsc.gov <http://www.cpsc.gov/>
(18) <<http://www.cpsc.gov/>>
(19) CPSC 16CFR-1201, Safety Standard for Architectural Glazing Materials
(20) CSA Group (Canadian Standards Association); www.csagroup.org/global/en/home <http://www.csagroup.org/global/en/home>
(21) <<http://www.csagroup.org/global/en/home>>

C. ADMINISTRATIVE REQUIREMENTS
1. Coordination: Coordinate Folding Glass Storefront system and framing R.O.
2. Preinstallation Meetings: See Section 01 30 00.

D. SUBMITTALS
1. For Contractor submittal procedures see Section 01 30 00.
a. Product Data: Submit manufacturer’s printed product literature for each Folding Glass Storefront system to be incorporated into the Work. Show performance test results and details of construction relative to materials, dimensions of individual components, profiles and colors.
b. Shop Drawings: Indicate Folding Glass Storefront system component sizes, dimensions and framing R.O., configuration, swing panels, direction of swing, stacking layout, typical head jamb, side jambs and sill details, type of glazing material, handle height and field measurements.
1) Delegated-Design Submittal: For structural performance of Folding Glass Storefront system, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
2) Manufacturers' Instructions: Submit manufacturer's installation instructions.
3) Operation and Maintenance Data: Submit Owner’s Manual from manufacturer. Identify with project name, location and completion date, and type and size of unit installed.

E. QUALITY ASSURANCE
1. Manufacturer Qualifications: Manufacturer capable of providing complete, precision built, engineered, pre-fitted units with a minimum twenty-five (25) years’ experience in the sale of folding-sliding door systems for large openings in the North American market.
2. Installer Qualifications: Installer experienced in the installation of manufacturer’s products or other similar products for large openings. Installer to provide reference list of at least

three (3) projects of similar scale and complexity successfully completed in the last three (3) years.
    a. Installer to be trained and certified by manufacturer.
    b. Single Source Responsibility: Furnish Folding Glass Storefront system materials from one manufacturer for entire Project.

F. DELIVERY, STORAGE, AND HANDLING
    1. Comply with manufacturer's instructions and recommendations, Section 01 60 00 requirements, and as follows:
        a. Deliver materials to job site in sealed, unopened cartons or crates.
            1) Upon receipt, inspect the shipment to ensure it is complete, in good condition and meets
            2) project requirements.
                (a) Store material under cover in a clean and dry location, protecting units against weather and defacement or damage from construction activities, especially to the edges of panels.

G. FIELD MEASUREMENTS Contractor to field verify dimensions on rough openings (R.O.) and threshold depressions to receive sill. Mark field measurements on shop drawings.

H. WARRANTY
    1. Manufacturer Warranty: Provide Folding Glass Storefront system manufacturer's standard limited warranty as per manufacturer's published warranty document in force at time of purchase, subject to change, against defects in materials and workmanship.
    2. Warranty Period beginning with the earliest of 120 days from Date of Delivery or Date of Substantial Completion:
        a. Rollers and Glass Seal Failure: Ten (10) years
        b. All Other Components Except Screens: Ten (10) years
            1) Exception: Five (5) years if NOT installed by manufacturer's certified trained installer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: NanaWall SL60 by NANA WALL SYSTEMS, INC.; www.nanawall.com

B. DESIGN CRITERIA:
    1. Sizes and Configurations: As indicated by the Drawings for selected number and size of panels, location of swing panels, and location of tracks and stacking bays.
    2. Unit Operation: Sliding and folding hardware with top and bottom tracks;
        a. Inswing type.
            1) Mounting Type:
            2) Floor track supported
            3) Panel Configuration: Straight
            4) Panel Type: Hinged
            5) Panel Pairing Configuration: I3L2R.
    3. MATERIALS
        a. Thermally Broken Aluminum Framed Folding Glass Storefront Description: Narrow stile frame and top hung or floor track supported system. Manufacturer's standard frame and panel profiles, with head track, side jambs and panels with dimensions as shown on Drawings.
            1) Panels:
                (a) Single lite.
    4. NOTE: Select finish type below, edit to requirements and delete items not used.
        a. Anodized (AAMA 611): Clear.
        b. Locking Hardware and Handles:
            1) Main Entry Panels for Models with a Pair of Swing Panels: Provide manufacturer's standard lever handles on the inside and outside, and a lockset

with a lockable latch, and multi-point locking with a dead bolt and rods at the top and bottom on primary panel only.
(a) Rods to be concealed and not edge mounted.
(b) After turn of key or thumbturn, depression of handles withdraws latch.
(c) Lifting of handles engages rods and turn of key or thumb turn engages deadbolt and operates lock.
(d) Secondary Swing Panel: Provide matching dummy lever handles on both sides and concealed flush bolts that operate the rods at the top and the bottom for the secondary swing panel.

2) ADA handle only available in "Brushed satin stainless steel."
(a) Locking:
(1) Standard profile cylinder
(2) Adapter for Small Format Interchangeable Core (SFIC)
(3) Push-pull handles in a brushed stainless steel finish and stainless steel flat handles in a brushed satin finish.

c. Sliding- Folding Hardware: Provide manufacturer's standard combination sliding and folding hardware with top and bottom tracks and threshold. All running carriages to be with sealed, self- lubrication, ball bearing multi- rollers. Surface mounted hinges and running carriages not acceptable.
1) For Each Pair of Folding Panels:
(a) Floor Mounted System (SL60/u): Provide upper guide carriage and lower running carriage with two vertical stainless steel wheels and two horizontal wheels. Vertical wheels to ride on stainless steel guide track covers over the full length of sill track and lie above the water run-off level.
(b) Lower Running Carriage Carrying Capacity: 220 lbs. (100 kg)
2) Sill Type:
(a) Surface mounted interior sill (not thermally broken)
(b) Finish: Aluminum with a clear anodized finish.
(c) For ADA Compliance: Provide gasket to cover the channel in the sill at swing doors.
3) Weatherstripping: Manufacturer's double layer EPDM between panels, EPDM gasket and Q-lon gasket, or brush seal between panel and frame, or brush seals with a two-layer fiberglass reinforced polyamide fin attached at both inner and outer edge of bottom of door panels with a recessed sill or on frame for sealing between panels and between panel and frame.
(a) NOTE: The manufacturer's weatherstripping is determined at the factory by the direction of swing, the panel configuration, the type of locking and the type of sill.
4) Fasteners: Tapered pins or stainless steel screws for connecting frame components.

5. FABRICATION
a. Folding Glass Wall: Extruded aluminum frame and panel profiles, corner connectors and hinges, sliding and folding hardware, locking hardware and handles, glass and glazing and weatherstripping components needed to construct a folding glass wall.
1) Each unit factory pre-assembled and shipped with complete system components and installation instructions.
2) Exposed work to be carefully matched to produce continuity of line and design with all joints.
3) No raw edges visible at joints.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examination and Acceptance of Conditions per Section 01 70 00 and as follows:
1. Carefully examine rough openings with Installer present, for compliance with requirements affecting Work performance.

a. Examine surfaces of openings and verify dimensions; verify rough openings are level, plumb, and square with no unevenness, bowing, or bumps on the floor; and other conditions as required by the manufacturer for readiness to receive Work.

2. INSTALLATION
   a. General: Install Folding Glass Storefront system in accordance with the Drawings, approved submittals, manufacturer's recommendations and installation instructions, and as follows:
      1) Properly flash, waterproof and seal around opening perimeter.
      2) Securely attach anchorage devices to rigidly fit frame in place, level, straight, plumb and square. Install frame in proper elevation, plane and location, and in proper alignment with other work
      3) When lower track is designed to drain, provide connections to allow for drainage.
      4) Install panels, handles, lockset, screens and other accessories in accordance with manufacturer's recommendations and instructions.
3. FIELD QUALITY CONTROL
   a. Field Tests and Inspections per Section 01 40 00 of the following:
      1) Verify the Folding Glass Storefront system operates and functions properly. Adjust hardware for proper operation.
      2) Non-Conforming Work: Repair or replace non-conforming work as directed by the Architect; see General and Supplementary Conditions, and Division 01, General Requirements.
4. CLEANING AND PROTECTION
   a. Keep units closed and protect Folding Glass Storefront installation against damage from construction activities.
   b. Remove protective coatings and use manufacturer recommended methods to clean exposed surfaces.

END OF SECTION

SECTION 08 4413

GLAZED ALUMINUM CURTAIN WALLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum-framed curtain wall, with vision glazing and glass and aluminum composite infill panels.

B. Associated louvers.

C. Firestopping between curtain wall and edge of floor slab.

1.02 RELATED REQUIREMENTS

A. Section 05 1200 - Structural Steel Framing: Steel attachment members.

B. Section 05 5000 - Metal Fabrications: Steel attachment devices.

C. Section 07 2500 - Weather Barriers: Sealing framing to weather barrier installed on adjacent construction.

D. Section 07 4243 - Composite Wall Panels.

E. Section 07 8400 - Firestopping: Firestop at system junction with structure.

F. Section 07 9200 - Joint Sealants: Sealing joints between frames and adjacent construction.

G. Section 08 4313 - Aluminum-Framed Storefronts: Entrance framing and doors.

H. Section 08 8000 - Glazing.

I. Section 09 2116 - Gypsum Board Assemblies: Metal stud and gypsum board wall at interior of curtain wall.

1.03 REFERENCE STANDARDS

A. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site; 2015.

B. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2012.

C. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections; 2009.

D. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels; 2013.

E. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; 2010, with 2013 Supplements and Errata.

F. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

G. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

H. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric]; 2013.

I. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004 (Reapproved 2012).

J. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014.

K. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2009).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with installation of other components that comprise the exterior enclosure.

B. Preinstallation Meeting: Conduct a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related Work, expansion and contraction joint location and details, and field welding required.

C. Design Data: Provide framing member structural and physical characteristics and engineering calculations, and identify dimensional limitations; include load calculations at points of attachment to building structure.

D. Test Reports: Submit results of full-size mock-up testing. Reports of tests previously performed on the same design are acceptable.

1.06 QUALITY ASSURANCE

A. Designer Qualifications: Design structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed at the State in which the Project is located.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with not less than three years of documented experience.

C. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Handle products of this section in accordance with AAMA CW-10.

B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a three year period after Date of Substantial Completion.

C. Provide three year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.

D. Provide three year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.01 BASIS OF DESIGN

A. Pressure Cap at Four Sides; Factory and Pre-Glazeable:
   1. Basis of Design: EFCO, a Pella Company; System 5600PG, 2-1/2 inch wide face: www.efcocorp.com/sle.

B. Substitutions: See Section 01 6000 - Product Requirements.
   1. For any product not identified as "Basis of Design", submit information as specified for substitutions.

2.02 CURTAIN WALL

A. Aluminum-Framed Curtain Wall: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
   1. **Curtain Wall System 1:** 2-12 inches wide by 7-1/4 inches deep; unbraced vertical span no greater than 15 feet.
   2. **Curtain Wall System 2:** 2-1/2 inches wide by 10 inches deep; unbraced vertical span no greater than 24 feet.
   3. Fabrication Method: Either shop/factory or field fabricated system.
   4. Glazing Method: Field glazed system.
   5. Finish: Superior performing organic coatings.
      a. Factory finish surfaces that will be exposed in completed assemblies.

b. Touch-up surfaces cut during fabrication so that no natural aluminum is visible in completed assemblies, including joint edges.
c. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.

6. Provide flush joints and corners, weathersealed, accurately fitted and secured; prepared to receive anchors; fasteners and attachments concealed from view; reinforced as required for imposed loads.
7. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
8. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.

B. Structural Performance Requirements: Design and size components to withstand the following load requirements without damage or permanent set.
1. Design Wind Loads: Comply with the requirements of ASCE 7.
a. Zone 4 = 16 psf (windward); -15 psf (leeward)
b. Zone 5 = 16 psf (windward); -27 psf (leeward)
c. Measure performance by testing in accordance with ASTM E330/E330M, using test loads equal to 1.5 times the design wind loads and 10 second duration of maximum pressure.
d. Member Deflection: For spans less than 13 feet 6 inches, limit member deflection to flexure limit of glass in any direction, and maximum of 1/175 of span or 3/4 inch, whichever is less and with full recovery of glazing materials.
e. Member Deflection: For spans over 13 feet 6 inches and less than 40 feet, limit member deflection to flexure limit of glass in any direction, and maximum of 1/240 of span plus 1/4 inch, with full recovery of glazing materials.
2. Seismic Loads: Design and size components to withstand seismic loads and sway displacement in accordance with requirements of ASCE 7.

C. Water Penetration Resistance: No uncontrolled water on indoor face when tested as follows:
1. Test Pressure Differential: 10 psf.
2. Test Method: ASTM E331.

D. Air Leakage: Maximum of 0.06 cu ft/min sq ft of wall area, when tested in accordance with ASTM E283 at 6.27 psf pressure differential across assembly.

E. Thermal Performance Requirements:
1. Condensation Resistance Factor of Framing: 50, minimum, measured in accordance with AAMA 1503.

2.03 COMPONENTS

A. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system.
1. Cross-Section: As indicated on drawings.

B. Glazing: As specified in Section 08 8000.
1. For Exterior Framing: Type IG-1 or IG-2 pending application.
2. Glass Spandrel Panels: Type G-2.

C. Infill Panels: Insulated, Aluminum Composite Wall Panel sheet face and back, with square edges to fit glazing channel and sealed.
1. Face Sheet: 1/4 inch thick.
2. Core: Glass fiber insulation core with R-value of 2.
3. Back Sheet: 1/4 inch thick.
4. Exterior Finish: Superior performing organic coatings.
5. Interior Finish: Clear anodized.

D. Louvers: Extruded aluminum blades and frame, 4 inches deep; fabricated to eliminate blade flutter.

1. Blades: 45 degree slope with storm-proof shape.
2. Finish: Same as curtain wall mullion sections.

E. Architectural Fins: Shop fabricated, shop finished, extruded aluminum outriggers, and fascia, free of defects impairing strength, durability or appearance.
1. Aluminum Fin Configuration: As indicated on drawings.
2. Sun Screen Angle: zero degrees from horizontal.
3. Outrigger Shape: Straight.
4. Design Criteria: Design and fabricate to resist the same loads as curtain wall system as well as the following loads without failure, damage, or permanent deflection:
   a. Live: 20 psf; minimum.
   b. Thermal Movement: Plus/minus 1/8 inch, maximum.
5. Sizes: As indicated on drawings.

2.04 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

B. Structural Steel Sections: ASTM A36/A36M; shop primed.

C. Structural Supporting Anchors: See Section 05 1200.

D. Structural Supporting Anchors Attached to Structural Steel: Design for bolted attachment.

E. Structural Supporting Anchors Attached to Reinforced Concrete Members: Design for welded attachment to weld plates embedded in concrete.

F. Fasteners: Stainless steel; type as required or recommended by curtain wall manufacturer.

G. Exposed Flashings: Aluminum sheet, 20 gage, 0.032 inch minimum thickness; finish to match framing members.

H. Concealed Flashings: Sheet aluminum, 26 gage, 0.017 inch minimum thickness.

I. Firestopping: As specified in Section 07 8400.

J. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

K. Glazing Accessories: As specified in Section 08 8000.

2.05 FINISHES

A. Superior Performing Organic Coatings: AAMA 2605 multiple coat, thermally cured polyvinylidene fluoride system.
1. Manufacturers:
   a. PPG Metal Coatings; Duranar: www.ppgideascapes.com.
   b. Arkema; Kynar 500: www.kynar500.com.
   c. Substitutions: See Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other related work.

B. Verify that curtain wall openings and adjoining air and vapor seal materials are ready to receive work of this section.

C. Verify that anchorage devices have been properly installed and located.

3.02 INSTALLATION

A. Install curtain wall system in accordance with manufacturer's instructions.

B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Provide alignment attachments and shims to permanently fasten system to building structure.

D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

E. Provide thermal isolation where components penetrate or disrupt building insulation.

F. Install sill and head flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.

G. Coordinate attachment and seal of perimeter air and vapor barrier materials.

H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

I. Install louvers and associated flashings.

J. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.03 TOLERANCES

A. Maximum Variation from Plumb: 0.06 inches every 3 ft non-cumulative or 0.5 inches per 100 ft, whichever is less.

B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

C. Sealant Space Between Curtain Wall Mullions and Adjacent Construction: Maximum of 3/4 inch and minimum of 1/4 inch.

3.04 CLEANING

A. Remove protective material from pre-finished aluminum surfaces.

B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.

C. Remove excess sealant by method acceptable to sealant manufacturer.

3.05 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 08 5313

VINYL WINDOWS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Vinyl-framed, factory-glazed windows: Fixed, Hopper, and Casement.

B. Operating hardware.

C. Insect screens.

1.02 RELATED REQUIREMENTS

A. Section 07 9200 - Joint Sealants: Sealing joints between frames and adjacent construction.

B. Section 08 8000 - Glazing.

C. Section 09 2400 - Portland Cement Plastering.

1.03 REFERENCE STANDARDS

A. AAMA/WDMA/CSA 101/I.S.2/A440 - North American Fenestration Standard/Specification for windows, doors, and skylights; 2011.

B. AAMA 701/702 - Combined Voluntary Specifications for Pile Weatherstrip and Replaceable Fenestration Weatherseals; 2011.

C. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections; 2009.

D. AAMA 1801 - Voluntary Specification for the Acoustical Rating of Exterior Windows, Doors, Skylights and Glazed Wall Sections; 2013.

E. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009.

F. ASTM E413 - Classification for Rating Sound Insulation; 2010.

G. 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; 2015.

H. ASTM E1332 - Standard Classification for Rating Outdoor-Indoor Sound Attenuation; 2010a.

I. ASTM E1423 - Standard Practice for Determining the Steady State Thermal Transmittance of Fenestration Systems; 2014.

J. ASTM E1425 - Standard Practice for Determining the Acoustical Performance of Windows, Doors, Skylight, and Glazed Wall Systems; 2014.

K. ASTM E1996 - Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes; 2014.

L. ASTM E2112 - Standard Practice for Installation of Exterior Windows, Doors and Skylights; 2007.

M. ASTM F588 - Standard Test Methods for Measuring the Forced Entry Resistance of Window Assemblies, Excluding Glazing Impact; 2014.

N. NFRC 100 - Procedure for Determining Fenestration Product U-factors; 2014.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week week before starting work of this section.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide component dimensions, anchors, fasteners, glass, and internal drainage.

C. Shop Drawings: Indicate opening dimensions, framed opening tolerances, affected related work, and installation requirements.

D. Manufacturer's Certificate: Certify that products of this section meet or exceed specified requirements.

E. Grade Substantiation: Prior to submitting shop drawings or starting fabrication, submit one of the following showing compliance with specified grade:
   1. Evidence of AAMA Certification.
   2. Evidence of WDMA Certification.
   3. Evidence of CSA Certification.
   4. Test report(s) by independent testing agency itemizing compliance and acceptable to authorities having jurisdiction.

F. Test Reports: Prior to submitting shop drawings or starting fabrication, submit test report(s) by independent testing agency showing compliance with performance requirements in excess of those prescribed by specified grade.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect finished surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond when exposed to sunlight or weather.

B. Jig, brace, and box the window frame assemblies for transport to minimize flexing of members or joints.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a three year period after Date of Substantial Completion.

C. Provide three year manufacturer warranty for insulated glass units from seal failure, interpane dusting or misting, and replacement of same. Include coverage for degradation of color finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Vinyl Windows:
   1. VPI Endurance Series Windows: www.vpiwindows.com
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 DESCRIPTION

A. Vinyl Windows: Factory fabricated frame and sash members of extruded, hollow, ultra-violet-resistant, polyvinyl chloride (PVC) with integral color; with factory-installed glazing, hardware, related flashings, anchorage and attachment devices.
   1. Configuration: As indicated on drawings: Fixed; combination casement and fixed, non-operable sash; and combination hopper and fixed, non-operable sash.
      a. Product Type: FX - Fixed Window, C - Casement window and H - Hopper Window.
   2. Color: Color as selected.
   3. Size to fit openings with minimum clearance around perimeter of assembly providing necessary space for perimeter seals.
   4. Framing Members: Fusion welded corners and joints, with internal reinforcement where required for structural rigidity; concealed fasteners.
   5. System Internal Drainage: Drain to exterior side by means of weep drainage network any water entering joints, condensation within glazing channel, or other migrating moisture within system.
   6. Glazing Stops, Trim, Flashings, and Accessory Pieces: Formed of rigid PVC, fitting tightly into frame assembly.

7. Mounting Flange: Integral to frame assembly, providing weather stop at entire perimeter of frame.
8. Insect Screens: Tight fitting for operating sash location.

B. Performance Requirements: Provide products that comply with the following:
1. Grade: AAMA/WDMA/CSA 101/I.S.2/A440 requirements for specific window type:
a. Performance Class (PC): R.
2. Grade Substantiation: Either AAMA Certification Label or independent test report itemizing compliance will constitute acceptable evidence of compliance.
3. Wind-Borne-Debris Resistance: Identical full-size glazed assembly without auxiliary protection, tested by independent agency and passed in accordance with ASTM E1996 for Wind Zone 4 - Additional Protection for Large and Small Missile impact and pressure cycling at design wind pressure.
4. Condensation Resistance Factor: CRF of 50, minimum, the lower value of the glass and frame window components and determined in accordance with AAMA 1503.
5. Thermal Transmittance: U-factor of 0.35, maximum, that includes window glazing and frame system based on average window size required for project and determined in accordance with AAMA 1503, ASTM E1423, or NFRC 100.
6. Forced Entry Resistance (FER): Tested to comply with ASTM F588 requirements having at least Grade 10 performance for each required window assembly.
7. Acoustical Performance: STC rating of 30, OITC rating of ___, when tested in accordance with ASTM E90, ASTM E1425, or AAMA 1801 and ratings derived from ASTM E413 and ASTM E1332, respectively.

2.03 COMPONENTS

A. Glazing: Insulated double pane, annealed glass, clear, low-E coated, manufacturer's standard fill, with glass thicknesses as recommended by manufacturer for specified wind conditions and acoustic rating indicated.
1. Glass Stops: Snap-on PVC glazing bead with color to match sash and frame.
2. Glazing Tape: Closed cell foam type with double sided adhesive.
3. Setting Blocks: Manufacturer's standard.

B. Insect Screens: Aluminum, extruded or roll-formed frame with mitered and reinforced corners; apply screen mesh taut to frame; secure to window with hardware to allow easy removal.
1. Hardware: Manufacturer's standard; quantity as required per screen.
2. Screen Mesh: Vinyl-coated fiberglass, window manufacturer's 18 x 16 mesh.
3. Frame Finish: Manufacturer's standard, color to match window frame and sash color.

C. Operable Sash Weatherstripping: Wool pile; permanently resilient, profiled to maintain weather seal in accordance with AAMA 701/702.

D. Fasteners: Stainless steel.

E. Sealants for Setting Window Sill Pan Flashing: Provide butyl tape, non-hardening butyl, polyurethane, or silicone sealant; in compliance with ASTM E2112 installation practices.

2.04 HARDWARE

A. Sash lock: Lever handle and keeper with cam lock, provide at least one for each operating sash.

B. Casement/Awning/Hopper Sash: Steel rotary arm sash operating mechanism with fold-down handle and two bar adjustable hinges and keepers fitted to projecting sash arms with limit stops.

C. Projecting Sash Arms: Cadmium plated steel, friction pivot joints with nylon bearings, removable pivot clips for cleaning.

D. Sash lock: Lever handle with cam lock.

E. Finish of Exposed Hardware: Baked enamel, match interior sash and frame color.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify wall openings and adjoining air and vapor seal materials are ready to receive this work.

3.02 INSTALLATION

A. Install window unit assemblies in accordance with manufacturers instructions and applicable building codes.

B. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities as necessary.

C. Align window plumb and level, free of warp or twist, and maintain dimensional tolerances and alignment with adjacent work.

D. Provide thermal isolation where components penetrate or disrupt building insulation. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

E. Install operating hardware.

3.03 TOLERANCES

A. Maximum Variation from Level or Plumb: 0.06 inches every 3 ft non-cumulative or 0.5 inches per 100 ft, whichever is less.

3.04 FIELD QUALITY CONTROL

A. Test installed windows for compliance with performance requirements for water penetration, in accordance with ASTM E1105 using uniform pressure and same pressure difference as specified for laboratory tests.
   1. Test one window of each type, as directed by Architect.
   2. If any window fails, test additional windows at Contractor's expense.

B. Replace windows that have failed field testing and retest until performance is satisfactory.

3.05 ADJUSTING

A. Adjust hardware for smooth operation and secure weathertight closure.

3.06 CLEANING

A. Remove protective material from pre-finished surfaces.

B. Wash surfaces by method recommended and acceptable to window manufacturer; rinse and wipe surfaces clean.

C. Remove excess glazing sealant by moderate use of mineral spirits or other solvent acceptable to sealant manufacturer and appropriate for application indicated.

END OF SECTION

SECTION 08 7100

DOOR HARDWARE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions of Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes items known commercially as finish or door hardware that are required for swing, sliding, and folding doors, except special types of unique hardware specified in the same sections as the doors and door frames on which they are installed.

B. This Section includes the following, but is not necessarily limited to:
   1. Door Hardware, including electric hardware.
   2. Storefront and Entrance door hardware.
   3. Gate Hardware.
   4. Digital keypad access control devices.
   5. Hold-open closers with smoke detectors.
   6. Wall or floor-mounted electromagnetic hold-open devices.
   7. Power supplies for electric hardware.
   8. Low-energy door operators plus sensors and actuators.
   9. Thresholds, gasketing and weather-stripping.
   10. Door silencers or mutes.

C. Related Sections: The following sections are noted as containing requirements that relate to this Section, but may not be limited to this listing.
   1. Division 8: Section - Steel Doors and Frames.
   2. Division 8: Section - Wood Doors.
   3. Division 8: Section - Aluminum Storefront
   4. Division 28: Section - Fire/Life-Safety Systems & Security Access Systems.

1.03 REFERENCES (USE DATE OF STANDARD IN EFFECT AS OF BID DATE.)

A. 2013 California Building Code, CCR, Title 24.

B. BHMA – Builders' Hardware Manufacturers Association

C. CCR – California Code of Regulations, Title 24, Part 2, California State Accessibility Standards.

D. DHI – Door and Hardware Institute

E. NFPA - National Fire Protection Association.
   1. NFPA 80 - Fire Doors and Other Opening Protectives
   2. NFPA 105 - Smoke and Draft Control Door Assemblies

F. UL - Underwriters Laboratories.
   1. UL 10C - Fire Tests of Door Assemblies
   2. UL 305 - Panic Hardware

G. WHI - Warnock Hersey Incorporated

H. SDI - Steel Door Institute

1.04 SUBMITTALS & SUBSTITUTIONS

A. General: Submit in accordance with Conditions of the Contract and Division 1 Specification sections.

B. Submit product data (catalog cuts) including manufacturers' technical product information for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.

C. Submit six (6) copies of schedule organized vertically into “Hardware Sets” with index of doors and headings, indicating complete designations of every item required for each door or opening. Include following information:
   1. Include a Cover Sheet with;
      a. Job Name, location, telephone number.
      b. Architects name, location and telephone number.
      c. Contractors name, location, telephone number and job number.
      d. Suppliers name, location, telephone number and job number.
      e. Hardware consultant's name, location and telephone number.
   2. Job Index information included;
      a. Numerical door number index including; door number, hardware heading number and page number.
      b. Complete keying information (referred to DHI hand-book "Keying Systems and Nomenclature"). Provision should be made in the schedule to provide keying information when available; if it is not available at the time the preliminary schedule is submitted.
      c. Manufacturers' names and abbreviations for all materials.
      d. Explanation of abbreviations, symbols, and codes used in the schedule.
      e. Mounting locations for hardware.
      f. Clarification statements or questions.
      g. Catalog cuts and manufacturer’s technical data and instructions.

D. Make substitution requests in accordance with Division 1. Substitution requests must be made prior to bid date. Include product data and indicate benefit to the project. Furnish samples of any proposed substitution.

E. Wiring Diagrams: Provide product data and wiring and riser diagrams for all electrical products listed in the Hardware Schedule portion of this section.

F. Keying Schedule: Submit separate detailed schedule indicating clearly how the Owner's final instructions on keying of locks has been fulfilled.

G. Templates for doors, frames, and other work specified to be factory prepared for the installation of door hardware. Check shop drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

H. Furnish as-built/as-installed schedule with close-out documents, including keying schedule and transcript, wiring/riser diagrams, manufacturers’ installation and adjustment and maintenance information.

I. Fire Door Assembly Testing: Submit a written record of each fire door assembly to the Owner to be made available to the Authority Having Jurisdiction (AHJ) for future building inspections.

J. LEED Certification Points: Submit information and certifications necessary to achieve maximum points for LEED certification; coordinate and cooperate with Owner and Architect in providing information necessary for required LEED rating.

1.05 QUALITY ASSURANCE

A. Obtain each type of hardware (latch and lock sets, hinges, closers, exit devices, etc.) from a single manufacturer.

B. Supplier Qualifications: A recognized architectural door hardware supplier, with warehousing facilities in the project's vicinity, that has a record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this project and that employs an experienced architectural hardware consultant (AHC) who is available to Owner, Architect, and Contractor, at reasonable times during the course of the Work, for consultation.
   1. Responsible for detailing, scheduling and ordering of finish hardware.
   2. Meet with Owner to finalize keying requirements and to obtain final instructions in writing.
   3. Stock parts for products supplied and are capable of repairing and replacing hardware items found defective within warranty periods.

C. Hardware Installer: Company specializing in the installation of commercial door hardware with five years documented experience.

D. Fire-Rated Openings: Provide door hardware for fire-rated openings that complies with NFPA Standard No. 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and tested by UL or Warnock Hersey for given type/size opening and degree of label. Provide proper latching hardware, door closers, approved-bearing hinges and seals whether listed in the Hardware Schedule or not.
   1. Where emergency exit devices are required on fire-rated doors, (with supplementary marking on doors' UL labels indicating "Fire Door to be Equipped with Fire Exit Hardware") provide UL label on exit devices indicating "Fire Exit Hardware".

E. Exit Doors: Operable from inside with single motion without the use of a key or special knowledge or effort.

1.06 DELIVERY, STORAGE AND HANDLING

A. Coordinate delivery of packaged hardware items to the appropriate locations (shop or field) for installation.

B. Hardware items shall be individually packaged in manufacturers' original containers, complete with proper fasteners. Clearly mark packages on outside to indicate contents and locations in hardware schedule and in work.

C. Provide locked storage area for hardware, protect from moisture, sunlight, paint, chemicals, etc.

D. Inventory door hardware jointly with representatives of hardware supplier and hardware installer until each is satisfied that count is correct.

1.07 EXTRA MATERIALS

A. Provide additional materials to the Owner as follows:
   1. 3 Unit thresholds
   2. 3 Door sweeps
   3. 15 Door stops
   4. 15 Passage latchsets
   5. 15 Privacy locksets
   6. 20 Entry door smoke seals

1.08 WARRANTY

A. Provide warranties of respective manufacturers' regular terms of sale from day of final acceptance as follows:
   1. Locksets: Ten (10) years.
   2. Electronic Locks: One (1) year.
   3. Closers: Ten (10) years
   4. Exit devices: Ten (10) years.
   5. All other hardware: Two (2) years.

1.09 MAINTENANCE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

1.10 PRE-INSTALLATION CONFERENCE

A. Convene a pre-installation conference at least one week prior to beginning work of this section.

B. Attendance: Architect, Construction Manager, Contractor, Security Contractor, Hardware Supplier, Installer, Key District Personnel, and Project Inspector.

C. Agenda: Review hardware schedule, products, installation procedures and coordination required with related work. Review District's keying standards.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

Item	Manufacturer	Acceptable Substitutes
Hinges	Ives	Hager, Stanley, McKinney
Locks, Latches & Cylinders	Falcon	Schlage
Exit Devices	Falcon	Von Duprin
Closers	Falcon	LCN
Push, Pulls & Protection Plates	Ives	Trimco, BBW, DCI
Flush Bolts	Ives	Trimco, BBW, DCI
Dust Proof Strikes	Ives	Trimco, BBW, DCI
Coordinators	Ives	Trimco, BBW, DCI
Stops	Ives	Trimco, BBW, DCI
Overhead Stops	Glynn-Johnson	Or Approved Equal
Thresholds	National Guard	Pemko, Zero
Seals & Bottoms	National Guard	Pemko, Zero

2.02 MATERIALS

A. Hinges: Exterior out-swinging door butts shall be non-ferrous material and shall have stainless steel hinge pins. All doors to have non-rising pins.
   1. Hinges shall be sized in accordance with the following:
      a. Height:
         1) Doors up to 42" wide: 4-1/2" inches.
         2) Doors 43" to 48" wide: 5 inches.
      b. Width: Sufficient to clear frame and trim when door swings 180 degrees.
      c. Number of Hinges: Furnish 3 hinges per leaf to 7'-5" in height. Add one for each additional 2 feet in height.
   2. Furnish non-removable pins (NRP) at all exterior out-swing doors and interior key lock doors with reverse bevels.

B. Continuous Hinges: As manufactured by Ives, an Allegion Company. UL rated as required.

C. Heavy Duty Cylindrical Locks and Latches: Falcon "T" Series as scheduled with "Quantum" design, fastened with through-bolts and threaded chassis hubs.
   1. Chassis: cylindrical design, corrosion-resistant plated cold-formed steel, through-bolted.
   2. Backset: 2-3/4" typically, more or less as needed to accommodate frame, door or other hardware.
   3. Lever Trim: accessible design, independent operation, minimum 2” clearance from lever mid-point to face of door.
   4. Certifications:
      a. ANSI A156.2, 1994, Series 4000, Grade 1.
      b. UL listed for B, 1-1/2 label and lesser class single doors up to 4ft x 8ft.
   5. Furnish at Common Area Doors

D. Unit Entry Locks: Furnish Schlage CS200 Series interconnected locks with “Neptune” levers.

E. Unit Interior Locks: Furnish Schlage F Series with “Jazz” levers.

F. Exit devices: Falcon as scheduled.
   1. General features:
      a. Push-through push-pad design.
      b. 0.75-inch throw deadlocking latchbolts where scheduled.
      c. Roller strikes where scheduled.
      d. Non-handed basic device design.
      e. Releasable in normal operation with 15-lb. maximum operating force per UBC Standard 10-4, and with 32 lb. maximum pressure under 250-lb. load to the door.

f. Comply with CBC Section 1003.3.1.9.
g. The unlatching force shall not exceed 15 lbs. applied in the direction of travel at fire rated doors.
h. Provide exit devices UL certified to meet maximum 5 pound requirements according to the California Building Code section 11B-309.4, and UL listed for Panic Exterior Fire Exit Hardware at non rated doors.

2. Specific features:
a. Non-Fire Rated Devices: with dogging.
b. Lever Trim: Breakaway type, forged brass, bronze or stainless steel escutcheon to match lockset lever design.
c. Rod and latch guards with sloped full-width kickplates for doors fitted with surface vertical rod devices with bottom latches.
d. Fire-Labeled Devices: UL label indicating “Fire Exit Hardware”. Vertical rod devices less bottom rod (LBR) unless otherwise scheduled.
e. Electrically Operated Devices: Single manufacturer source for electric latch retraction devices, electrically controlled trim, power transfers, power supplies, monitoring switches and controls.

Removable Mullions: Steel, secured with machine screws.

G. Surface Closers: (Falcon SC series)
1. Full rack-and-pinion type cylinder.
1. Non-sized and adjustable. Place closers inside building, stairs and rooms.
2. Plates, brackets and special templating when needed for interface with particular header, door and wall conditions and neighboring hardware.
3. Maximum effort to operate closers shall not exceed 5 lbs., such pull or push effort being applied at right angles to hinged doors. Compensating devices or automatic door operators may be utilized to meet the above standards. When fire doors are required, the maximum effort to operate the closer may be increased but shall not exceed 15 lbs. when specifically approved by fire marshal. All closers shall be adjusted to operate with the minimum amount of opening force and still close and latch the door. These forces do not apply to the force required to retract latch bolts or disengage other devices that hold the door in a closed position. Per 11B-404.2.8.1, door shall take at least 5 seconds to move from an open position of 90 degrees to a position of 12 degrees from the latch jamb.
4. Separate adjusting valves for closing speed, latching speed and backcheck, fourth valve for delayed action where scheduled.
5. Heavy duty parallel arms as scheduled.
6. Exterior doors do not require seasonal adjustments in temperatures from 120 degrees F to –30 degrees F, furnish data on request.
7. Non-flaming fluid, will not fuel door or floor covering fires.
8. Pressure Relief Valves (PRV): unsafe, not permitted.
9. Certifications: ANSI A156.4, 1994, Grade 1.

H. Flush Bolts & Dust Proof Strikes: Automatic Flush Bolts shall be of the low operating force design. Utilize the top bolt only model for interior doors where applicable and as permitted by testing procedures.
1. Manual flush bolts only permitted on storage or mechanical openings as scheduled.
2. Provide dust proof strikes at openings using bottom bolts.

I. Door Stops:
1. Unless otherwise noted in Hardware Sets, provide floor type with appropriate fasteners. Where wall type cannot be used, provide floor type. If neither can be used, provide overhead type.
2. Do not install floor stops more than four (4) inches from the face of the wall or partition (CBC Section 11B-307).
3. Overhead stops shall be made of stainless steel and non-plastic mechanisms and finished metal end caps. Field-changeable hold-open, friction and stop-only functions.

J. Protection Plates: Fabricate either kick, armor, or mop plates with four beveled edges. Provide kick plates 10" high and 2" LDW. Sizes of armor and mop plates shall be listed in the Hardware Schedule. Furnish with machine or wood screws of bronze or stainless to match other hardware.

K. Thresholds: As Scheduled and per details.
   1. Thresholds shall not exceed 1/2" in height, with a beveled surface of 1:2 maximum slope.
   2. Set thresholds in a full bed of butyl-rubber or polyisobutylene mastic sealant complying with requirements in Division 7 “Thermal and Moisture Protection”.
   3. Use ¼” fasteners, red-head flat-head sleeve anchors (SS/FHSL).
   4. Thresholds shall comply with CBC Section 11B-404.2.5.

L. Seals: Provide silicone gasket at all rated and exterior doors.
   1. Fire-rated Doors, Resilient Seals: UL10C Classified complies with NFPA 80 & NFPA 252. Coordinate with selected door manufacturers' and selected frame manufacturers' requirements.
   2. Fire-rated Doors, Intumescent Seals: Furnished by selected door manufacturer. Furnish fire-labeled opening assembly complete and in full compliance with UL10C Classified complies with NFPA 80 & NFPA 252. Where required, intumescent seals vary in requirement by door type and door manufacture -- careful coordination required.
   3. Smoke & Draft Control Doors, Provide UL10C Classified complies with NFPA 80 & NFPA 252 for use on “S” labeled Positive Pressure door assemblies.

M. Door Shoes & Door Top Caps: Provide door shoes at all exterior wood doors and top caps at all exterior out-swing doors.

N. Silencers: Furnish silencers for interior hollow metal frames, 3 for single doors, 2 for pairs of doors. Omit where sound or light seals occurs, or for fire-resistive-rated door assemblies.

2.03 KEYING

A. Furnish a Proprietary Falcon masterkey system as directed by the owner or architect. Key system to be designated and combinated by the Schlage Master Key Department even if pinned by the Authorized Key Center, Authorized Security Center or a local authorized commercial dealer.

B. A detailed keying schedule is to be prepared by the owner and/or architect in consultation with a representative of Allegion or an Authorized Key Center or Authorized Security Center. Each keyed cylinder on every keyed lock is to be listed separately showing the door #, key group (in BHMA terminology), cylinder type, finish and location on the door.

C. Establish a new masterkey system for this project as directed by the keying schedule.

D. Furnish all cylinders in the Falcon conventional style.

E. Furnish construction keying for doors requiring locking during construction.

F. Furnish all keys with visual key control.
   1. Stamp key “Do Not Duplicate”.
   2. Stamp (BHMA) key symbol on key.

G. Furnish all cylinders with visual key control.
   1. Stamp (BHMA) key symbol on face of cylinder plug (VKC).

H. Furnish mechanical keys as follows:
   1. Furnish 2 cut change keys for each different change key code.
   2. Furnish 1 uncut key blank for each change key code.
   3. Furnish 6 cut masterkeys for each different masterkey set.
   4. Furnish 3 uncut key blanks for each masterkey set.
   5. Furnish 2 cut control keys cut to the top masterkey for permanent I/C cylinders.
   6. Furnish 1 cut control key cut to each SKD combination.

2.04 FINISHES

A. Generally to be satin chrome US26D (626 on bronze and 652 on steel) unless otherwise noted.

B. Furnish push plates, pull plates and kick or armor plates in satin stainless steel US32D (630) unless otherwise noted.

C. Door closers shall be powder-coated to match other hardware, unless otherwise noted.

D. Aluminum items to be finished anodized aluminum except thresholds which can be furnished as standard mill finish.

2.05 FASTENERS

A. Screws for strikes, face plates and similar items shall be flat head, countersunk type, provide machine screws for metal and standard wood screws for wood.

B. Screws for butt hinges shall be flathead, countersunk, full-thread type.

C. Fastening of closer bases or closer shoes to doors shall be by means of sex bolts and spray painted to match closer finish.

D. Provide expansion anchors for attaching hardware items to concrete or masonry.

E. All exposed fasteners shall have a phillips head.

F. Finish of exposed screws to match surface finish of hardware or other adjacent work.

G. All Exit Devices and Lock Protectors shall be fastened to the door by the means of sex bolts or through bolts.

PART 3 - EXECUTION

3.01 INSPECTION

A. Verify that doors and frames are square and plumb and ready to receive work and dimensions are as instructed by the manufacturer.

B. Beginning of installation means acceptance of existing conditions.

C. Fire-Rated Door Assembly Inspection: Upon completion of the installation, all fire door assemblies shall be inspected to confirm proper operation of the closing device and latching device and that only the manufacturer's furnished fasteners are used for installation and that it meets all criteria of a fire door assembly per NFPA 80 (Standard for Fire Doors and Other Opening Protectives) 2007 Edition. A written record shall be maintained and transmitted to the Owner to be made available to the Authority Having Jurisdiction (AHJ). The inspection of the swinging fire doors shall be performed by a certified FDAI (Fire Door Assembly Inspector) with knowledge and understanding of the operating components of the type of door being subjected to the inspection. The record shall list each fire door assembly throughout the project and include each door number, an itemized list of hardware set components at each door opening, and each door location in the facility.

3.02 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions and requirements of DHI.

B. Use the templates provided by hardware item manufacturer.

C. Mounting heights for hardware shall be as recommended by the Door and Hardware Institute. Operating hardware will to be located between 30" and 44" AFF.

D. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

E. Drill and countersink units that are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

F. Set thresholds for exterior doors in full bed of butyl-rubber sealant.

G. If hand of door is changed during construction, make necessary changes in hardware at no additional cost.

H. Hardware Installer shall coordinate with security contractor to route cable to connect electrified locks, panic hardware and fire exit hardware to power transfers or electric hinges at the time these items are installed so as to avoid disassembly and reinstallation of hardware.

I. Hardware Installer shall also be present with the security contractor when the power is turned on for the testing of the electronic hardware applications. Installer shall make adjustments to solenoids, latches, vertical rods and closers to insure proper and secure operation.

J. All wiring for electro-mechanical hardware mounted on the door shall be connected through the power transfer and terminated in the interface junction box specified for in the Electrical Section.

K. Conductors shall be minimum 18 gage stranded, multicolored. A minimum 12 in. loop of conductors shall be coiled in the interface junction box. Each conductor shall be permanently marked with its function.

L. If a power supply is specified in the hardware sets, all conductors shall be terminated in the power supply. Make all connections required for proper operation between the power supply and the electro-mechanical hardware. Provide the proper size conductors as specified in the manufacturer's technical documentation.

3.03 ADJUST AND CLEAN

A. Adjust and check each operating item of hardware and each door, to ensure proper operation or function of every unit. Replace units which cannot be adjusted to operate freely and smoothly as intended for the application made.

B. Clean adjacent surface soiled by hardware installation.

C. Final Adjustment: Wherever hardware installation is made more than one month prior to acceptance or occupancy, return to that work area and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

D. Instruct Owner's Personnel in proper adjustment and maintenance of hardware finishes, during the final adjustment of hardware.

E. Continued Maintenance Service: Approximately six months after the completion of the project, the Contractor accompanied by the Architectural Hardware Consultant, shall return to the project and re-adjust every item of hardware to restore proper functions of doors and hardware. Consult with and instruct Owner's personnel in recommended additions to the maintenance procedures. Replace hardware items which have deteriorated or failed due to faulty design, materials or installation of hardware units. Prepare a written report of current and predictable problems (of substantial nature) in the performance of the hardware.

3.04 HARDWARE LOCATIONS

A. Conform to CCR, Title 24, Part 2; and ADAAG; and the drawings for access-compliant positioning requirements for the disabled.

3.05 FIELD QUALITY CONTROL

A. Hardware supplier is responsible for providing the services of an Architectural Hardware Consultant (AHC) or a proprietary product technician to inspect installation and certify that hardware and its installation have been furnished and installed in accordance with manufacturers' instructions and as specified herein.

3.06 SCHEDULE

A. The items listed in the following schedule shall conform to the requirements of the foregoing specifications.

B. The Door Schedule on the Drawings indicates which hardware set is used with each door.

Manufacturers Abbreviations (Mfr.)

ADA	=	Adams Rite Mfg.	Aluminum Door Hardware
FAL	=	Falcon	Locks, Closers, Exit Devices
GLY	=	Glynn-Johnson Corporation	Overhead Door Stops
IVE	=	Ives	Hinges, Pivots, Bolts, Coordinators, Dust Proof Strikes, Push Pull & Kick Plates, Door Stops & Silencers
SDC	=	Sliding Door Co.	Sliding door hardware
SCE	=	Schlage Electronics	Electronic Door Components
SCH	=	Schlage	Unit lock and latches
ZER	=	Zero International	Thresholds, Gasketing & Weather-stripping

SPEXTRA: 314833

GROUP NO. 01

3	EA	HW HINGE	3CB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	FIRE EXIT HARDWARE	F-25-R-L-NL-QUA	626	FAL
1	EA	MORTISE CYLINDER	986	626	FAL
1	EA	SURFACE CLOSER	SC81 HDPA FC	689	FAL
1	EA	FLOOR STOP	FS444	626	IVE
1	EA	GASKETING	188S-BK	S-BK	ZER
1	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	PER DETAIL		

GROUP NO. 02

3	EA	HINGE	3CB1 4.5 X 4.5	630	IVE
1	EA	FIRE EXIT HARDWARE	F-25-R-L-BE-QUA	626	FAL
1	EA	SURFACE CLOSER	SC81 REG OR PA AS REQ FC	689	FAL
1	EA	WALL STOP	WS406/407CVX	630	IVE
1	EA	GASKETING	188S-BK	S-BK	ZER
1	EA	DOOR SWEEP	153A	A	ZER
1	EA	THRESHOLD	PER DETAIL		

GROUP NO. 03

3	EA	HINGE	3CB1 4.5 X 4.5	630	IVE
1	EA	PANIC HARDWARE	AX-25-R-L-QUA	626	FAL
1	EA	MORTISE CYLINDER	986	626	FAL
1	EA	SURFACE CLOSER	SC81 REG OR PA AS REQ FC	689	FAL
1	EA	WALL STOP	WS406/407CVX	630	IVE
1	EA	GASKETING	188S-BK	S-BK	ZER
1	EA	DOOR SWEEP	153A	A	ZER
1	EA	THRESHOLD	PER DETAIL		

GROUP NO. 04

3	EA	HINGE	3CB1 4.5 X 4.5	630	IVE
1	EA	STOREROOM LOCK	T581P6 QUA	626	FAL
1	EA	SURFACE CLOSER	SC81 REG OR PA AS REQ FC	689	FAL
1	EA	FLOOR STOP	FS444	626	IVE
1	EA	GASKETING	188S-BK	S-BK	ZER
1	EA	DOOR SWEEP	153A	A	ZER
1	EA	THRESHOLD	PER DETAIL		

GROUP NO. 05

4	EA	HINGE	3CB1 4.5 X 4.5 NRP	630	IVE
1	EA	STOREROOM LOCK	T581P6 QUA	626	FAL
1	EA	LOCK GUARD	LG1	630	IVE
1	EA	SURFACE CLOSER	SC81 HDPA FC	689	FAL
1	EA	FLOOR STOP	FS444	626	IVE
1	EA	GASKETING	188S-BK	S-BK	ZER
1	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	PER DETAIL		

GROUP NO. 06

2	EA	CONT. HINGE	112HD	628	IVE
1	EA	PANIC HARDWARE	CD-24-C-C-ER24-718	626	FAL
1	EA	PANIC HARDWARE	CD-24-C-EO-ER24	626	FAL
1	EA	RIM CYLINDER	951	626	FAL
2	EA	MORTISE CYLINDER	986	626	FAL
2	EA	LONG DOOR PULL	9264 36" 20" STD	630	IVE
2	EA	OH STOP & HOLDER	90H	630	GLY
2	EA	CONCEALED CLOSER	2030 ST-2211	689	LCN
2	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	PER DETAIL		
1	EA		WEATHERSTRIP BY DOOR/FRAME MANUFACTURER		

GROUP NO. 07

2	EA	CONT. HINGE	112HD EPT	628	IVE
2	EA	POWER TRANSFER	EPT10	689	FAL
1	EA	ELEC PANIC HARDWARE	RX-EL-24-C-C-ER24-718	626	FAL
1	EA	ELEC PANIC HARDWARE	RX-EL-24-C-EO-ER24	626	FAL
1	EA	RIM CYLINDER	951	626	FAL
2	EA	LONG DOOR PULL	9264 36" 20" STD	630	IVE
2	EA	CONCEALED CLOSER	2030 SERIES	689	LCN
2	EA	FLOOR STOP	FS444	626	IVE
1	EA	THRESHOLD	PER DETAIL		
1	EA		WEATHERSTRIP BY DOOR/FRAME MANUFACTURER		

READER, POWER SUPPLY, CONTACT AND WIRING BY ACCESS CONTROL VENDOR. REX INTEGRAL WITH EXIT DEVICE.

GROUP NO. 08

8	EA	HW HINGE	5BB1HW 4.5 X 4.5	652	IVE
2	EA	POWER TRANSFER	EPT10	689	FAL
1	EA	ELEC FIRE EXIT HARDWARE	RX-EL-AX-F-25-C-C-ER24-718	626	FAL
1	EA	ELEC FIRE EXIT HARDWARE	RX-EL-AX-F-25-C-EO-ER24	626	FAL
1	EA	RIM CYLINDER	951	626	FAL
2	EA	LONG DOOR PULL	9264 36" 20" STD	630	IVE
2	EA	CONCEALED CLOSER	2030 SERIES	689	LCN
2	EA	FLOOR STOP	FS444	626	IVE
1	EA	GASKETING	188S-BK	S-BK	ZER
2	EA	MEETING STILE	328AA	AA	ZER
2	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	PER DETAIL		

READER, POWER SUPPLY, CONTACT AND WIRING BY ACCESS CONTROL VENDOR. REX INTEGRAL WITH EXIT DEVICE.

GROUP NO. 09

1	EA	CONT. HINGE	112HD EPT	628	IVE
1	SET	LONG DOOR PULL	PR 9266 36" 20" N	630	IVE
1	EA	CONCEALED CLOSER	2030 SERIES	689	LCN
1	EA	FLOOR STOP	FS439	682	IVE

GROUP NO. 10

4	EA	HW HINGE	3CB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	FIRE EXIT HARDWARE	F-25-R-L-NL-QUA	626	FAL
1	EA	MORTISE CYLINDER	986	626	FAL
1	EA	SURFACE CLOSER	SC71 DS	689	FAL
1	EA	GASKETING	188S-BK	S-BK	ZER

GROUP NO. 11

3	EA	HINGE	3CB1 4.5 X 4.5	652	IVE
1	EA	FIRE EXIT HARDWARE	F-25-R-L-BE-QUA	626	FAL
1	EA	SURFACE CLOSER	SC81 REG OR PA AS REQ FC	689	FAL
1	EA	WALL STOP	WS406/407CVX	630	IVE
1	EA	GASKETING	188S-BK	S-BK	ZER
1	EA	DOOR BOTTOM	355A	A	ZER
1	EA	THRESHOLD	PER DETAIL		

GROUP NO. 12

3	EA	HINGE	3CB1 4.5 X 4.5	652	IVE
1	EA	FIRE EXIT HARDWARE	F-25-R-L-BE-QUA	626	FAL
1	EA	OH STOP	100S ADJ	630	GLY
1	EA	SURFACE CLOSER	SC81 HDPA FC	689	FAL
1	EA	GASKETING	188S-BK	S-BK	ZER
1	EA	DOOR BOTTOM	355A	A	ZER
1	EA	THRESHOLD	PER DETAIL		

GROUP NO. 13

2	EA	HINGE	3CB1 4.5 X 4.5	652	IVE
1	EA	ELECTRIC HINGE	3CB1 4.5 X 4.5 TW8	652	IVE
1	EA	EU STOREROOM LOCK	T881P QUA	626	FAL
1	EA	SURFACE CLOSER	SC71 REG OR PA AS REQ	689	FAL
1	EA	WALL STOP	WS406/407CVX	630	IVE
1	EA	GASKETING	188S-BK	S-BK	ZER

READER, POWER SUPPLY, CONTACTS, REX AND WIRING BY ACCESS CONTROL VENDOR.

GROUP NO. 14

3	EA	HW HINGE	3CB1HW 4.5 X 4.5	652	IVE
1	EA	ELECTRIC HW HINGE	3CB1HW 4.5 X 4.5 TW8	652	IVE
1	EA	EU STOREROOM LOCK	T881P QUA	626	FAL
1	EA	SURFACE CLOSER	SC71 REG OR PA AS REQ	689	FAL
1	EA	WALL STOP	WS406/407CVX	630	IVE
1	EA	GASKETING	188S-BK	S-BK	ZER

READER, POWER SUPPLY, CONTACTS, REX AND WIRING BY ACCESS CONTROL VENDOR.

GROUP NO. 15

2	EA	HW HINGE	3CB1HW 4.5 X 4.5	652	IVE
1	EA	ELECTRIC HW HINGE	3CB1HW 4.5 X 4.5 TW8	652	IVE
1	EA	EU STOREROOM LOCK	T881P QUA	626	FAL
1	EA	SURFACE CLOSER	SC71 REG OR PA AS REQ	689	FAL
1	EA	WALL STOP	WS406/407CVX	630	IVE
1	EA	GASKETING	188S-BK	S-BK	ZER
1	EA	DOOR SWEEP	153A	A	ZER
1	EA	THRESHOLD	PER DETAIL		

READER, POWER SUPPLY, CONTACTS, REX AND WIRING BY ACCESS CONTROL VENDOR.

GROUP NO. 16

3	EA	HINGE	3CB1 4.5 X 4.5 NRP	630	IVE
1	EA	STOREROOM LOCK	T581P6 QUA	626	FAL
1	EA	SURFACE CLOSER	SC81 REG OR PA AS REQ FC	689	FAL
1	EA	WALL STOP	WS406/407CVX	630	IVE
1	EA	GASKETING	188S-BK	S-BK	ZER

GROUP NO. 17

3	EA	HINGE	3CB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	T581P6 QUA	626	FAL
1	EA	SURFACE CLOSER	SC81 DS FC	689	FAL
1	EA	GASKETING	188S-BK	S-BK	ZER

GROUP NO. 18

3	EA	HINGE	3CB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	T581P6 QUA	626	FAL
1	EA	WALL STOP	WS406/407CVX	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

GROUP NO. 19

3	EA	HINGE	3CB1 4.5 X 4.5	652	IVE
1	EA	CLASSROOM LOCK	T561P6 QUA	626	FAL
1	EA	SURFACE CLOSER	SC81 REG OR PA AS REQ FC	689	FAL
1	EA	WALL STOP	WS406/407CVX	630	IVE
1	EA	GASKETING	188S-BK	S-BK	ZER
1	EA	DOOR SWEEP	153A	A	ZER
1	EA	THRESHOLD	PER DETAIL		

GROUP NO. 20

3	EA	HINGE	3CB1 4.5 X 4.5	652	IVE
1	EA	CLASSROOM LOCK	T561P6 QUA	626	FAL
1	EA	SURFACE CLOSER	SC71 DS	689	FAL
1	EA	GASKETING	188S-BK	S-BK	ZER
1	EA	DOOR SWEEP	153A	A	ZER
1	EA	THRESHOLD	PER DETAIL		

GROUP NO. 21

3	EA	HINGE	3CB1 4.5 X 4.5	652	IVE
1	EA	ENTRY LOCK	T501P6 QUA	626	FAL
1	EA	WALL STOP	WS406/407CVX	630	IVE
1	EA	GASKETING	188S-BK	S-BK	ZER

GROUP NO. 22

3	EA	HINGE	3CB1 4.5 X 4.5	652	IVE
1	EA	CLASSROOM SEC LOCK	T381P6 QUA	626	FAL
1	EA	SURFACE CLOSER	SC81 REG OR PA AS REQ FC	689	FAL
1	EA	WALL STOP	WS406/407CVX	630	IVE
1	EA	GASKETING	188S-BK	S-BK	ZER
1	EA	DOOR SWEEP	153A	A	ZER

GROUP NO. 23

3	EA	HINGE	3CB1 4.5 X 4.5	652	IVE
1	EA	PRIVACY LOCK	L9040 17A L583-363 L283-722	626	SCH
1	EA	SURFACE CLOSER	SC81 REG OR PA AS REQ FC	689	FAL
1	EA	WALL STOP	WS406/407CVX	630	IVE
1	EA	GASKETING	188S-BK	S-BK	ZER

GROUP NO. 24

3	EA	HINGE	3CB1 4.5 X 4.5	652	IVE
1	EA	PASSAGE SET	T101S QUA	626	FAL
1	EA	SURFACE CLOSER	SC81 REG OR PA AS REQ FC	689	FAL
2	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE
1	EA	GASKETING	188S-BK	S-BK	ZER
1	EA	DOOR BOTTOM	355A	A	ZER
1	EA	THRESHOLD	PER DETAIL		

GROUP NO. 25

3	EA	HINGE	3CB1 4.5 X 4.5	652	IVE
1	EA	PASSAGE SET	T101S QUA	626	FAL
1	EA	SURFACE CLOSER	SC81 REG OR PA AS REQ FC	689	FAL
1	EA	WALL STOP	WS406/407CVX	630	IVE
1	EA	GASKETING	188S-BK	S-BK	ZER
1	EA	DOOR BOTTOM	355A	A	ZER
1	EA	THRESHOLD	PER DETAIL		

GROUP NO. 26

1	EA	PIVOT SET	7215 SET	626	IVE
1	EA	INTERMEDIATE PIVOT	7215 INT	626	IVE
1	EA	MAGNETIC LOCK	M450	628	SCE
1	SET	LONG DOOR PULL	PR 9266 36" 20" P	630	IVE
1	EA	FLOOR STOP	FS439	682	IVE
1	EA	PUSHBUTTON	623GIDEX	629	SCE
1	EA	MOTION SENSOR	SCANII	WHT	SCE
1	EA	POWER SUPPLY	PS902 900-BBK FA900	LGR	SCE

READER, CONTACT AND WIRING BY ACCESS CONTROL VENDOR. POWER SUPPLY AND REX SWITCH INCLUDED IN HARDWARE SET.

GROUP NO. 27

7	EA	HW HINGE	3CB1HW 4.5 X 4.5	652	IVE
1	EA	ELECTRIC HW HINGE	3CB1HW 4.5 X 4.5 TW8	652	IVE
1	SET	AUTO FLUSH BOLT	FB31P	630	IVE
1	EA	DUST PROOF STRIKE	DP1	626	IVE
1	EA	EU STOREROOM LOCK	T881P QUA	626	FAL
1	EA	COORDINATOR	COR X FL	628	IVE
2	EA	MOUNTING BRACKET	MB	689	IVE
2	EA	SURFACE CLOSER	SC71 HDPA	689	FAL
2	EA	FLOOR STOP	FS439	682	IVE
1	EA	GASKETING	188S-BK	S-BK	ZER
1	EA	ASTRAGAL	44SP OR BY HM DOOR MFR.	SP	ZER

READER, POWER SUPPLY, CONTACTS, REX AND WIRING BY ACCESS CONTROL VENDOR.

GROUP NO. 28

5	EA	HW HINGE	3CB1HW 4.5 X 4.5	652	IVE
1	EA	ELECTRIC HW HINGE	3CB1HW 4.5 X 4.5 TW8	652	IVE
1	SET	AUTO FLUSH BOLT	FB31P	630	IVE
1	EA	DUST PROOF STRIKE	DP1	626	IVE
1	EA	EU STOREROOM LOCK	T881P QUA	626	FAL
1	EA	COORDINATOR	COR X FL	628	IVE
2	EA	SURFACE CLOSER	SC71 REG	689	FAL
2	EA	FLOOR STOP	FS444	626	IVE
1	EA	GASKETING	188S-BK	S-BK	ZER
1	EA	ASTRAGAL	44SP OR BY HM DOOR MFR.	SP	ZER

READER, POWER SUPPLY, CONTACTS, REX AND WIRING BY ACCESS CONTROL VENDOR.

GROUP NO. 29

6	EA	HINGE	3CB1 4.5 X 4.5	652	IVE
1	SET	AUTO FLUSH BOLT	FB31P	630	IVE
1	EA	DUST PROOF STRIKE	DP1	626	IVE
1	EA	STOREROOM LOCK	T581P6 QUA	626	FAL
1	EA	COORDINATOR	COR X FL	628	IVE
2	EA	MOUNTING BRACKET	MB	689	IVE
2	EA	SURFACE CLOSER	SC81 HDPA FC	689	FAL
2	EA	FLOOR STOP	FS18S	BLK	IVE
1	EA	GASKETING	188S-BK	S-BK	ZER
1	EA	ASTRAGAL	44SP OR BY HM DOOR MFR.	SP	ZER

GROUP NO. 30

6	EA	HW HINGE	3CB1HW 4.5 X 4.5	652	IVE
1	SET	AUTO FLUSH BOLT	FB31P	630	IVE
1	EA	DUST PROOF STRIKE	DP1	626	IVE
1	EA	STOREROOM LOCK	T581P6 QUA 23981152	626	FAL
1	EA	COORDINATOR	COR X FL	628	IVE
2	EA	MOUNTING BRACKET	MB	689	IVE
2	EA	SURFACE CLOSER	SC71 DS	689	FAL
1	EA	GASKETING	188S-BK	S-BK	ZER
1	EA	ASTRAGAL	44SP OR BY HM DOOR MFR.	SP	ZER

GROUP NO. 31

6	EA	HINGE	3CB1 4.5 X 4.5	652	IVE
1	SET	CONST LATCHING BOLT	FB51P	630	IVE
1	EA	DUST PROOF STRIKE	DP1	626	IVE
1	EA	STOREROOM LOCK	T581P6 QUA	626	FAL
2	EA	OH STOP	450S	630	GLY
1	EA	GASKETING	188S-BK	S-BK	ZER

GROUP NO. 32

2	EA	SURFACE CLOSER	4000T	689	LCN
2	EA	FIRE/LIFE WALL MAG	SEM7840	689	LCN
	EA		BALANCE OF HARDWARE BY INTEGRATED DOOR ASSEMBLY MFR.		

MAGNETIC HOLDER TIED TO FIRE ALARM SYSTEM

GROUP NO. 33

HARDWARE BY ROLL UP DOOR MFR.

GROUP NO. 34

HARDWARE BY ACCESS PANEL MFR

GROUP NO. 35

HARDWARE BY SLIDING DOOR MFR

GROUP NO. 36

3	EA	HINGE	3CB1 4.5 X 4	652	IVE
1	EA	ENTRANCE LOCK	CS210PD NEP PLY	626	SCH
1	EA	SURFACE CLOSER	SC61 REG OR PA AS REQ	689	FAL
1	EA	DOOR STOP	060	652	IVE
1	EA	GASKETING	188S-BK	S-BK	ZER
1	EA	DOOR SWEEP	111A	A	ZER
1	EA	THRESHOLD	PER DETAIL		
1	EA	DOOR VIEWER	U698	626	IVE

USE 2 DOOR VIEWERS @ ACCESSIBLE UNITS

GROUP NO. 37

3	EA	HINGE	3PB1 3.5 X 3.5	652	IVE
1	EA	PRIVACY LOCK	F40 JAZ	626	SCH
1	EA	DOOR STOP	060	652	IVE

GROUP NO. 38

3	EA	HINGE	3PB1 3.5 X 3.5	652	IVE
1	EA	PASSAGE SET	F10 JAZ	626	SCH
1	EA	DOOR STOP	060 OR 73	652	IVE

GROUP NO. 39

6	EA	HINGE	3PB1 3.5 X 3.5	652	IVE
2	EA	ROLLER LATCH	RL36	630	IVE
2	EA	SINGLE DUMMY TRIM	F170 JAZ	626	SCH
2	EA	DOOR STOP	060	652	IVE

GROUP NO. 40

1	SET	BI PASS TRACK AND HDWR	2-PANEL / DOUBLE TRACK CLOSET DOOR	AL	SDC
1	EA	FLUSH PULL	FLUSH DBL INDENT HANDLE	626	IVE

GROUP NO. 41

1	SET	BARN DOOR TRACK AND HDWR	2-PANEL / DOUBLE TRACK BARN DOOR	AL	SDC
1	EA	BARN DOOR LOCK	FLUSH DBL INDENT HANDLE W LOCK & SAFETY HOLE	626	ACC

GROUP NO. 42

3	EA	HINGE	3CB1 4.5 X 4.5 NRP	630	IVE
1	EA	PASSAGE SET	F10 JAZ	626	SCH
1	EA	ONE-SIDED DEADBOLT	B80	626	SCH
1	EA	OH STOP	450S	630	GLY
1	EA	DOOR SWEEP	111A	A	ZER
1	EA	THRESHOLD	PER DETAIL		
1	EA		WEATHERSTRIP BY DOOR/FRAME MANUFACTURER		

END OF SECTION

SECTION 08 8000
GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Insulating glass units.

B. Glazing units.

C. Glazing compounds and accessories.

1.02 RELATED REQUIREMENTS

A. Section 07 4243 - Composite Wall Panels: Spandrel panels in glazed aluminum framing systems.

B. Section 07 9200 - Joint Sealants: Sealants for other than glazing purposes.

C. Section 08 1113 - Hollow Metal Doors and Frames: Glazed lites in doors and borrowed lites.

D. Section 08 1416 - Flush Wood Doors: Glazed lites in doors.

E. Section 08 4313 - Aluminum-Framed Storefronts: Glazing furnished as part of storefront assembly.

F. Section 08 4413 - Glazed Aluminum Curtain Walls: Glazing furnished as part of wall assembly.

G. Section 08 5313 - Vinyl Windows: Glazing furnished by window manufacturer.

1.03 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; current edition.

B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings, Safety Performance Specifications and Methods of Test; 2010.

C. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2011).

D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2014.

E. ASTM C1036 - Standard Specification for Flat Glass; 2011.

F. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.

G. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass; 2014.

H. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2013.

I. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass; 2015.

J. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2012a.

K. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2010.

L. GANA (SM) - GANA Sealant Manual; 2008.

M. ITS (DIR) - Directory of Listed Products; current edition.

N. NFRC 100 - Procedure for Determining Fenestration Product U-factors; 2014.

O. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence; 2014.

P. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems; 2014.

Q. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by each of the affected installers.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data on Insulating Glass Unit and Glazing Unit Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.

C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements. Identify available colors.

D. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Insulating Glass Units: One of each glass size and each glass type.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.

C. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

1.07 FIELD CONDITIONS

A. Do not install glazing when ambient temperature is less than 40 degrees F.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Insulating Glass Units: Provide a five (5) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including replacement of failed units.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Float Glass Manufacturers:
   1. Cardinal Glass Industries; _____: www.cardinalcorp.com.
   2. Pilkington North America Inc; _____: www.pilkington.com/na.
   3. PPG Industries, Inc; _____: www.ppgideascapes.com.

B. Laminated Glass Manufacturers:
   1. Cardinal Glass Industries: www.cardinalcorp.com.
   2. Viracon, Architectural Glass segment of Apogee Enterprises, Inc: www.viracon.com.
   3. Substitutions: Refer to Section 01 6000 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES

A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
   1. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
   2. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.

3. Glass thicknesses listed are minimum.

B. Vapor Retarder and Air Barrier Seals: Provide completed assemblies that maintain continuity of building enclosure vapor retarder and air barrier.
   1. In conjunction with vapor retarder and joint sealer materials described in other sections.

C. Thermal and Optical Performance: Provide glass products with performance properties as indicated. Performance properties are in accordance with manufacturer's published data as determined with the following procedures and/or test methods:
   1. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
   2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
   3. Solar Optical Properties: Comply with NFRC 300 test method.

2.03 GLASS MATERIALS

A. Float Glass: Provide float glass based glazing unless noted otherwise.
   1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality-Q3.
   2. Heat-Strengthened and Fully Tempered Types: ASTM C1048, Kind HS and FT.
   3. Tinted Type: ASTM C1036, Class 2 - Tinted, Quality-Q3, color and performance characteristics as indicated.
   4. Thicknesses: As indicated; provide greater thickness as required for exterior glazing wind load design.

B. Laminated Glass: Tempered glass laminated in accordance with ASTM C1172.
   1. Laminated Safety Glass: Complies with ANSI Z97.1 and 16 CFR 1201 test requirements for Category II.

2.04 INSULATING GLASS UNITS

A. Manufacturers:
   1. Any of the manufacturers specified for float glass.
   2. Fabricator certified by glass manufacturer for type of glass, coating, and treatment involved and capable of providing specified warranty.
   3. Cardinal Glass Industries: www.cardinalcorp.com.
   4. Pilkington North America Inc: www.pilkington.com/na.
   5. PPG Industries, Inc: www.ppgideascapes.com.
   6. Substitutions: Refer to Section 01 6000 - Product Requirements.

B. Insulating Glass Units: Types as indicated.
   1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
   2. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
   3. Spacer Color: Black.
   4. Edge Seal:
   5. Color: Black.
   6. Purge interpane space with dry air, hermetically sealed.

C. Type IG-1 - Insulating Glass Units: Vision glass, double glazed.
   1. Applications: Exterior glazing unless otherwise indicated.
   2. Space between lites filled with air.
   3. Outboard Lite: Annealed float glass, 1/4 inch thick, minimum.
      a. Tint: Clear.
      b. Coating: Low-E (passive type), on #2 surface.
   4. Inboard Lite: Annealed float glass, 1/4 inch thick, minimum.
      a. Tint: Clear.
   5. Total Thickness: 1 inch.

D. Type IG-3 - Insulating Glass Units: Spandrel glazing.

1. Applications: Exterior spandrel glazing unless otherwise indicated.
2. Space between lites filled with air.
3. Outboard Lite: Annealed float glass, 1/4 inch thick, minimum.
    a. Tint: Clear.
    b. Coating: Same as on vision units, on #2 surface.
4. Inboard Lite: Heat-strengthened float glass, 1/4 inch thick.
    a. Tint: Clear.
    b. Opacifier: Ceramic frit, on #4 surface.
    c. Opacifier Color: As selected by Architect.
5. Total Thickness: 1 inch.
6. Thermal Transmittance (U-Value), Summer - Center of Glass: _____, nominal.

E. Type IG-2 - Insulating Glass Units: Safety glazing.
1. Applications:
    a. Glazed sidelights and panels next to doors.
    b. Other locations required by applicable federal, state, and local codes and regulations.
    c. Other locations indicated on drawings.
2. Space between lites filled with argon.
3. Glass Type: Same as Type IG-1 except use fully tempered float glass for both outboard and inboard lites.
4. Total Thickness: 1 inch.

2.05 GLAZING UNITS

A. Type G-1 - Monolithic Vision Glazing:
1. Applications: As scheduled.
2. Glass Type: Annealed float glass.
3. Tint: Clear.
4. Thickness: 1/4 inch, nominal.

B. Type G-2 - Monolithic Safety Vision Glazing: (Denoted "T" on the Drawings)
1. Applications: As scheduled.
2. Glass Type: Fully tempered float glass.
3. Tint: Clear.
4. Thickness: 1/4 inch, nominal.

C. Type G-3 - Fire-Resistance-Rated Glazing: Type, thickness, and configuration of glazing that contains flame, smoke, and blocks radiant heat, as required to achieve indicated fire-rating period exceeding 45 minutes.
1. Applications:
    a. Glazing in fire-rated door assembly.
    b. Glazing in sidelites, borrowed lites, and other glazed openings in fire-rated wall assemblies.
2. Provide products listed by ITS (DIR) or UL (DIR) and approved by authorities having jurisdiction.
3. Safety Glazing Certification: 16 CFR 1201 Category II.
4. Fire-Rating Period: 45 minutes.

D. Type G-3 - Guardrail Glazing: Laminated glass, 2-Ply.
1. Applications: Glazed guardrail assemblies as indicated on drawings.
2. Tint: Clear.
3. Thickness: 1/2 inch.
4. Outer Lite: Tempered glass.
5. Interlayer: Polyvinyl butyral (PVB), thickness as required to meet performance criteria.
6. Inside Lite: Tempered glass.

2.06 GLAZING COMPOUNDS

A. Type GC-1 - Polysulfide Sealant: Two component; chemical curing, non-sagging type; ASTM C920, Type M, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 15 to 25; color as selected.

B. Type GC-2 - Silicone Sealant: Single component; neutral curing; capable of water immersion without loss of properties; non-bleeding, non-staining; ASTM C920, Type S, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 15 to 25; _____ color.

C. Manufacturers:
   1. Dow Corning Corporation; _____: www.dowcorning.com/construction.
   2. Pecora Corporation; _____: www.pecora.com.
   3. BASF Corporation; _____: www.basf.com/us/en.html.

2.07 ACCESSORIES

A. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot of glazing or minimum 4 inch x width of glazing rabbet space minus 1/16 inch x height to suit glazing method and pane weight and area.

B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Minimum 3 inch long x one half the height of the glazing stop x thickness to suit application, self adhesive on one face.

C. Glazing Tape, Back Bedding Mastic Type: Preformed, butyl-based, 100 percent solids compound with integral resilient spacer rod applicable to application indicated; 5 to 30 cured Shore A durometer hardness; coiled on release paper; black color.

D. Glazing Tape: Closed cell polyvinyl chloride (PVC) foam, coiled on release paper over adhesive on two sides, maximum water absorption by volume of 2 percent, designed for compression of 25 percent to effect an air barrier and vapor retarder seal; ____x____ inch size.

E. Glazing Splines: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black.

PART 3 EXECUTION

3.01 VERIFICATION OF CONDITIONS

A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.

B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.

3.02 PREPARATION

A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.03 INSTALLATION, GENERAL

A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.

B. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.

C. Prevent glass from contact with any contaminating substances that may be the result of construction operations such as, and not limited to the following; weld splatter, fire-safing, plastering, mortar droppings, etc.

3.04 INSTALLATION - DRY GLAZING METHOD (GASKET GLAZING)

A. Application - Exterior and/or Interior Glazed: Set glazing infills from either the exterior or the interior of the building.

B. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.

C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.

D. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

3.05 INSTALLATION - PRESSURE GLAZED SYSTEMS

A. Application - Exterior Glazed: Set glazing infills from the exterior of the building.

B. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.

C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.

D. Install pressure plates without displacing glazing gasket; exert pressure for full continuous contact.

E. Install cover plate.

3.06 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Glass and Glazing product manufacturers to provide field surveillance of the installation of their products.

C. Monitor and report installation procedures and unacceptable conditions.

3.07 CLEANING

A. See Section 01 7419 - Construction Waste Management and Disposal, for additional requirements.

B. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.

C. Remove non-permanent labels immediately after glazing installation is complete.

D. Clean glass and adjacent surfaces after sealants are fully cured.

E. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.08 PROTECTION

A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.

B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

END OF SECTION

SECTION 08 9100
LOUVERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Louvers, frames, and accessories.

1.02 RELATED REQUIREMENTS

A. Section 07 9200 - Joint Sealants: Sealing joints between frames and adjacent construction.

B. Section 08 4413 - Glazed Aluminum Curtain Walls: Prepared openings for louvers.

C. Section 10 8200 - Louvered Architectural Screens: Decorative louvers.

1.03 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2012.

B. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels; 2013.

C. AMCA 511 - Certified Ratings Program for Air Control Devices; 2010.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data describing design characteristics, maximum recommended air velocity, design free area, materials and finishes.

C. Test Reports: Independent agency reports showing compliance with specified performance criteria.

1.05 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide twenty year manufacturer warranty against distortion, metal degradation, and failure of connections.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Louvers:
   1. Airolite Company, LLC: www.airolite.com.
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 FRAMED LOUVERS

A. Louvers: Factory fabricated and assembled, complete with frame, mullions, and accessories; AMCA Certified in accordance with AMCA 511.
   1. Drainable Blades: Continuous rain stop at front or rear of blade aligned with vertical gutter recessed into both jambs of frame.
   2. Screens: Provide insect screens at intake louvers and bird screens at exhaust louvers.

B. Stationary Louvers: Horizontal blade, extruded aluminum construction, with intermediate mullions matching frame.
   1. Free Area: as indicated on the drawings, minimum.
   2. Blades: Straight.
   3. Frame: 6 inches deep, channel profile; , with continuous recessed caulking channel each side.
   4. Aluminum Thickness: Frame 12 gage, 0.0808 inch minimum; blades 12 gage, 0.0808 inch minimum.
   5. Aluminum Finish: Class II natural anodized; finish welded units after fabrication.

2.03 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

B. Insect Screen: 18 x 16 size aluminum mesh.

2.04 FINISHES

A. Superior Performing Organic Coatings: AAMA 2605 multiple coat, thermally cured polyvinylidene fluoride system.
   1. Manufacturers:
      a. PPG Metal Coatings; Duranar: www.ppgideascapes.com.
      b. Arkema; Kynar 500: www.kynar500.com
      c. Substitutions: See Section 01 6000 - Product Requirements.
   2. Polyvinylidene fluoride (PVDF) multi-coat thermoplastic fluoropolymer coating system, including minimum 70 percent PVDF color topcoat and minimum total dry film thickness of 0.9 mil; color and gloss as indicated on drawings.

B. Color: As indicated on drawings.

2.05 ACCESSORIES

A. Screens: Frame of same material as louver, with reinforced corners; removable, screw attached; installed on inside face of louver frame.

B. Insect Screen: 18 x 16 size aluminum mesh.

C. Fasteners and Anchors: Stainless steel.

D. Flashings: Of same material as louver frame, formed to required shape, single length in one piece per location.

E. Sealant for Setting Sills and Sill Flashing: Non-curing butyl type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that prepared openings and flashings are ready to receive this work and opening dimensions are as indicated on shop drawings.

3.02 INSTALLATION

A. Install louver assembly in accordance with manufacturer's instructions.

B. Install louvers level and plumb.

C. Install flashings and align louver assembly to ensure moisture shed from flashings and diversion of moisture to exterior.

D. Secure louver frames in openings with exposed fasteners.

3.03 CLEANING

A. Strip protective finish coverings.

B. Clean surfaces and components.

END OF SECTION

SECTION 09 0561

COMMON WORK RESULTS FOR FLOORING PREPARATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. This section applies to all floors identified in the contract documents as to receive the following types of floor coverings:
   1. Resilient tile and sheet.
   2. Broadloom carpet.
   3. Thin-set ceramic tile and stone tile.

B. Preparation of new concrete floor slabs for installation of floor coverings.

C. Testing of concrete floor slabs for moisture and alkalinity (pH).

D. Remediation of concrete floor slabs due to unsatisfactory moisture or alkalinity (pH) conditions.
   1. Contractor shall perform all specified remediation of concrete floor slabs. If such remediation is indicated by testing agency's report and is due to a condition not under Contractor's control or could not have been predicted by examination prior to entering into the contract, a contract modification will be issued.

1.02 RELATED REQUIREMENTS

A. Section 01 4000 - Quality Requirements: Additional requirements relating to testing agencies and testing.

B. Section 03 3000 - Cast-in-Place Concrete: Moisture emission reducing curing and sealing compound for slabs to receive adhered flooring, to prevent moisture content-related flooring failures; to remain in place, not to be removed.

C. Section 03 3000 - Cast-in-Place Concrete: Concrete admixture for slabs to receive adhered flooring, to prevent moisture content-related flooring failures.

D. Section 03 3000 - Cast-in-Place Concrete: Limitations on curing requirements for new concrete floor slabs.

1.03 REFERENCES

A. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens); 2013.

B. ASTM C472 - Standard Test Methods for Physical Testing of Gypsum, Gypsum Plasters and Gypsum Concrete; 1999 (Reapproved 2014).

C. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2011.

D. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2011.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate scheduling of cleaning and testing, so that preliminary cleaning has been completed for at least 24 hours prior to testing.

1.05 SUBMITTALS

A. Floor Covering and Adhesive Manufacturers' Product Literature: For each specific combination of substrate, floor covering, and adhesive to be used; showing:
   1. Moisture and alkalinity (pH) limits and test methods.
   2. Manufacturer's required bond/compatibility test procedure.

B. Testing Agency's Report:
   1. Description of areas tested; include floor plans and photographs if helpful.
   2. Summary of conditions encountered.
   3. Moisture and alkalinity (pH) test reports.
   4. Copies of specified test methods.

5. Recommendations for remediation of unsatisfactory surfaces.
6. Submit report directly to Owner.
7. Submit report not more than two business days after conclusion of testing.

C. Adhesive Bond and Compatibility Test Report.

1.06 QUALITY ASSURANCE

A. Moisture and alkalinity (pH) testing shall be performed by an independent testing agency employed and paid by Contractor.

B. Testing Agency Qualifications: Independent testing agency experienced in the types of testing specified.
1. Submit evidence of experience consisting of at least 3 test reports of the type required, with project Owner's project contact information.

C. Contractor's Responsibility Relating to Independent Agency Testing:
1. Provide access for and cooperate with testing agency.
2. Confirm date of start of testing at least 10 days prior to actual start.
3. Allow at least 4 business days on site for testing agency activities.
4. Achieve and maintain specified ambient conditions.
5. Notify Architect when specified ambient conditions have been achieved and when testing will start.

1.07 FIELD CONDITIONS

A. Maintain ambient temperature in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 65 degrees F or more than 85 degrees F.

B. Maintain relative humidity in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 40 percent and not more than 60 percent.

PART 2 PRODUCTS

2.01 MATERIALS

A. Patching Compound: Floor covering manufacturer's recommended product, suitable for conditions, and compatible with adhesive and floor covering. In the absence of any recommendation from flooring manufacturer, provide a product with the following characteristics:
1. Cementitious moisture-, mildew-, and alkali-resistant compound, compatible with floor, floor covering, and floor covering adhesive, and capable of being feathered to nothing at edges.
2. Latex or polyvinyl acetate additions are permitted; gypsum content is prohibited.
3. Compressive Strength: 3000 psi, minimum, after 28 days, when tested in accordance with ASTM C109/C109M or ASTM C472, whichever is appropriate.

B. Alternate Flooring Adhesive: Floor covering manufacturer's recommended product, suitable for the moisture and pH conditions present; low-VOC. In the absence of any recommendation from flooring manufacturer, provide a product recommended by adhesive manufacturer as suitable for substrate and floor covering and for conditions present.

C. Remedial Floor Coating: Single- or multi-layer coating or coating/overlay combination intended by its manufacturer to resist water vapor transmission to degree sufficient to meet flooring manufacturer's emission limits, resistant to the level of alkalinity (pH) found, and suitable for adhesion of flooring without further treatment.
1. Thickness: 1/8 inch, maximum.
2. If testing agency recommends any particular products, use one of those.
3. Products:
   a. ARDEX Engineered Cements; ARDEX MC ULTRA with ARDEX FEATHERFINISH: www.ardexamericas.com.
   b. Floor Seal Technology, Inc; MES 100 with Floor Seal FloorCem SLU: www.floorseal.com.

c. Koster American Corporation; Koster VAP I 2000 with Koster SL Premium overlay: www.kosterusa.com.
d. ProSpec, an Oldcastle brand; Moisture Guard Max: www.prospec.com.
e. Sika Corporation; Sikafloor Moisture Tolerance Epoxy Primer and Sikafloor Self-Leveling Moisture Tolerant Resurfacer: www.sikafloorusa.com.
f. Substitutions: See Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 CONCRETE SLAB PREPARATION

A. Perform following operations in the order indicated:
1. Preliminary cleaning.
2. Moisture vapor emission tests; 3 tests in the first 1000 square feet and one test in each additional 1000 square feet, unless otherwise indicated or required by flooring manufacturer.
3. Internal relative humidity tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
4. Alkalinity (pH) tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
5. Specified remediation, if required.
6. Patching, smoothing, and leveling, as required.
7. Other preparation specified.
8. Adhesive bond and compatibility test.
9. Protection.

B. Remediations:
1. Active Water Leaks or Continuing Moisture Migration to Surface of Slab: Correct this condition before doing any other remediation; re-test after correction.
2. Excessive Moisture Emission or Relative Humidity: If an adhesive that is resistant to the level of moisture present is available and acceptable to flooring manufacturer, use that adhesive for installation of the flooring; if not, apply remedial floor coating over entire suspect floor area.
3. Excessive Alkalinity (pH): If remedial floor coating is necessary to address excessive moisture, no additional remediation is required; if not, if an adhesive that is resistant to the level present is available and acceptable to the flooring manufacturer, use that adhesive for installation of the flooring; otherwise, apply a skim coat of specified patching compound over entire suspect floor area.

3.02 PRELIMINARY CLEANING

A. Clean floors of dust, solvents, paint, wax, oil, grease, asphalt, residual adhesive, adhesive removers, film-forming curing compounds, sealing compounds, alkaline salts, excessive laitance, mold, mildew, and other materials that might prevent adhesive bond.

B. Do not use solvents or other chemicals for cleaning.

3.03 MOISTURE VAPOR EMISSION TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.

C. Test in accordance with ASTM F1869 and as follows.

D. Plastic sheet test and mat bond test may not be substituted for the specified ASTM test method, as those methods do not quantify the moisture content sufficiently.

E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if test values exceed 3 pounds per 1000 square feet per 24 hours.

F. Report: Report the information required by the test method.

3.04 ALKALINITY TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. The following procedure is the equivalent of that described in ASTM F710, repeated here for the Contractor's convenience.

C. Use a wide range alkalinity (pH) test paper, its associated chart, and distilled or deionized water.

D. Place several drops of water on a clean surface of concrete, forming a puddle approximately 1 inch in diameter. Allow the puddle to set for approximately 60 seconds, then dip the alkalinity (pH) test paper into the water, remove it, and compare immediately to chart to determine alkalinity (pH) reading.

E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if alkalinity (pH) test value is over 10.

3.05 PREPARATION

A. See individual floor covering section(s) for additional requirements.

B. Comply with requirements and recommendations of floor covering manufacturer.

C. Fill and smooth surface cracks, grooves, depressions, control joints and other non-moving joints, and other irregularities with patching compound.

D. Do not fill expansion joints, isolation joints, or other moving joints.

3.06 ADHESIVE BOND AND COMPATIBILITY TESTING

A. Comply with requirements and recommendations of floor covering manufacturer.

3.07 APPLICATION OF REMEDIAL FLOOR COATING

A. Comply with requirements and recommendations of coating manufacturer.

3.08 PROTECTION

A. Cover prepared floors with building paper or other durable covering.

END OF SECTION

SECTION 09 2116
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Performance criteria for gypsum board assemblies.

B. Metal stud wall framing.

C. Metal channel ceiling framing.

D. Gypsum sheathing.

E. Gypsum wallboard.

F. Joint treatment and accessories.

G. Textured finish system.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Building framing and sheathing.

B. Section 06 1000 - Rough Carpentry: Wood blocking product and execution requirements.

C. Section 07 2100 - Thermal Insulation: Acoustic insulation.

D. Section 07 8400 - Firestopping: Top-of-wall assemblies at fire rated walls.

E. Section 07 9200 - Joint Sealants: Sealing acoustical gaps in construction other than gypsum board or plaster work.

F. Section 09 2216 - Non-Structural Metal Framing.

G. Section 09 2400 - Portland Cement Plastering.

H. Section 09 3000 - Tiling: Tile backing board.

1.03 REFERENCE STANDARDS

A. AISI S100-12 - North American Specification for the Design of Cold-Formed Steel Structural Members; American Iron and Steel Institute; 2012.

B. AISI SG02-1 - North American Specification for the Design of Cold-Formed Steel Structural Members; American Iron and Steel Institute; 2001 with 2004 supplement. (replaced SG-971)

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.

D. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

E. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2015.

F. ASTM C514 - Standard Specification for Nails for the Application of Gypsum Board; 2004 (Reapproved 2014).

G. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members; 2014.

H. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2015.

I. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2013.

J. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness; 2015.

K. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2014.

L. ASTM C1047 - Standard Specification for Accessories For Gypsum Wallboard and Gypsum Veneer Base; 2014a.

M. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2013.

N. ASTM C1280 - Standard Specification for Application of Gypsum Sheathing Board; 2013.

O. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2014.

P. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2012.

Q. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009.

R. ASTM E413 - Classification for Rating Sound Insulation; 2010.

S. GA-216 - Application and Finishing of Gypsum Board; 2013.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on metal framing, gypsum board, accessories, and joint finishing system.

C. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

A. Provide completed assemblies complying with ASTM C840 and GA-216.

B. Interior Partitions, Indicated as Acoustic: Provide completed assemblies with the following characteristics:
   1. Acoustic Attenuation: STC rating as scheduled on the drawings calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

C. Shaft Walls at Elevator Shafts: Provide completed assemblies with the following characteristics:
   1. Air Pressure Within Shaft: Intermittent loads of 5 lbf/sq ft with maximum mid-span deflection of L/240.
   2. Acoustic Attenuation: STC of 35-39 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

D. Fire Rated Assemblies: Provide completed assemblies as scheduled on the drawings

2.02 METAL FRAMING MATERIALS

A. Non-Loadbearing Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/120 at 5 psf.
   1. Studs: "C" shaped with flat or formed webs with knurled faces.
   2. Runners: U shaped, sized to match studs.
   3. Ceiling Channels: C-shaped.
   4. Furring: Hat-shaped sections, minimum depth of 7/8 inch.
   5. Resilient Furring Channels: 2 5/8 inches x 1/2 inch depth, for attachment to substrate through one leg only.
      a. Products:
         1) Clark Dietrich RC Deluxe Resilient Channel (RCSD).

B. Shaft Wall Studs and Accessories: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 and specified performance requirements.
   1. Products:
      a. Phillips Manufacturing Co: www.phillipsmfg.com.
      b. Substitutions: See Section 01 6000 - Product Requirements.

C. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.

D. Partition Head to Structure Connections: Provide mechanical anchorage devices that accommodate deflection using slotted holes, screws and anti-friction bushings, preventing rotation of studs while maintaining structural performance of partition.
   1. Structural Performance: Maintain lateral load resistance and vertical movement capacity required by applicable code, when evaluated in accordance with AISI S100-12.
   2. Material: ASTM A653/A653M steel sheet, SS Grade 50/340, with G60/Z180 hot dipped galvanized coating.

2.03 BOARD MATERIALS

A. Manufacturers - Gypsum-Based Board:
   1. Georgia-Pacific Gypsum; ____: www.gpgypsum.com.
   2. National Gypsum Company; ____: www.nationalgypsum.com.
   3. USG Corporation; ____: www.usg.com.
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
   1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
   2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
      a. Mold-resistant board is required whenever board is being installed before the building is enclosed and conditioned.
      b. Mold resistant board is required _____.
   3. At Assemblies Indicated with Fire-Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
   4. Thickness:
      a. Vertical Surfaces: 5/8 inch.
      b. Ceilings: 5/8 inch.
      c. Multi-Layer Assemblies: Thicknesses as indicated on drawings.
   5. Paper-Faced Products:
      a. Georgia-Pacific Gypsum; ToughRock.
      b. National Gypsum Company; Gold Bond Brand Gypsum Wallboard.
      c. USG Corporation; Sheetrock Brand Gypsum Panels.
      d. Substitutions: See Section 01 6000 - Product Requirements.
   6. Mold Resistant Paper Faced Products:
      a. Georgia-Pacific Gypsum; ToughRock Mold-Guard.
      b. National Gypsum Company; Gold Bond Brand XP Gypsum Board.
      c. USG Corporation; Sheetrock Brand Mold Tough Gypsum Panels.
      d. Substitutions: See Section 01 6000 - Product Requirements.

C. Backing Board For Non-Wet Areas: Water-resistant gypsum backing board as defined in ASTM C1396/C1396M; sizes to minimum joints in place; ends square cut.
   1. Application: Vertical surfaces behind thinset tile, except in wet areas.
   2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
   3. At Assemblies Indicated with Fire-Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
   4. Type: Regular and Type X, in locations indicated.
   5. Type X Thickness: 5/8 inch.
   6. Edges: Tapered.
   7. Products:
      a. Georgia-Pacific Gypsum; DensShield Tile Backer.
      b. National Gypsum Company; Gold Bond Brand XP Gypsum Board.
      c. USG Corporation; Sheetrock Brand Mold Tough Gypsum Panels.
      d. Substitutions: See Section 01 6000 - Product Requirements.

D. Exterior Sheathing Board: Sizes to minimize joints in place; ends square cut.
   1. Application: Exterior sheathing, unless otherwise indicated.
   2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.

3. Glass Mat Faced Sheathing: Glass mat faced gypsum substrate as defined in ASTM C1177/C1177M.
4. At Assemblies Indicated with Fire-Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
5. Core Type: Regular and Type X, as indicated.
6. Type X Thickness: 5/8 inch.
7. Regular Board Thickness: 1/2 inch.
8. Edges: Square.
9. Glass Mat Faced Products:
    a. CertainTeed Corporation; GlasRoc Brand.
    b. Georgia-Pacific Gypsum; DensGlass Sheathing.
    c. National Gypsum Company; Gold Bond eXP Sheathing.
    d. Substitutions: See Section 01 6000 - Product Requirements.

E. Shaftwall and Coreboard: Type X; 1 inch thick by 24 inches wide, beveled long edges, ends square cut.
1. Paper Faced Type: Gypsum shaftliner board or gypsum coreboard as defined ASTM C1396/C1396M; water-resistant faces.
2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
3. Products:
    a. Georgia-Pacific Gypsum; DensGlass Shaftliner (mold-resistant).
    b. National Gypsum Company; Gold Bond Brand 1" Fire-Shield Shaftliner XP (mold-resistant).
    c. USG Corporation; Sheetrock Gypsum Liner Panels--Enhanced (mold-resistant).
    d. Substitutions: See Section 01 6000 - Product Requirements.

2.04 ACCESSORIES

A. Acoustic Insulation: ASTM C665; preformed glass fiber, friction fit type, unfaced. Thickness: _____ inch.

B. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.

C. Acoustic Sealant: As specified in Section 07 9005.

D. Water-Resistive Barrier: _____.

E. Finishing Accessories: ASTM C1047, galvanized steel or rolled zinc, unless noted otherwise.
1. Types: As detailed or required for finished appearance.

F. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
1. Tape: 2 inch wide, coated glass fiber tape for joints and corners, except as otherwise indicated.
2. Tape: 2 inch wide, creased paper tape for joints and corners, except as otherwise indicated.
3. Ready-mixed vinyl-based joint compound.

G. Textured Finish Materials: Latex-based compound; plain.

H. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inch in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion resistant.

I. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch in Thickness: ASTM C954; steel drill screws, corrosion resistant.

J. Anchorage to Substrate: Tie wire, nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.

K. Exterior Soffit Vents: One piece, perforated, ASTM B221 6063 T5 alloy aluminum, with edge suitable for direct application to gypsum board and manufactured especially for soffit application. Provide continuous vent.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

3.02 SHAFT WALL INSTALLATION

A. Shaft Wall Framing: Install in accordance with manufacturer's installation instructions.
   1. Install studs at spacing required to meet performance requirements.

B. Shaft Wall Liner: Cut panels to accurate dimension and install sequentially between special friction studs.

3.03 FRAMING INSTALLATION

A. Metal Framing: Install in accordance with ASTM C754 and manufacturer's instructions.

B. Suspended Ceilings and Soffits: Space framing and furring members as indicated.

C. Studs: Space studs at 16 inches on center.
   1. Extend partition framing to structure in all locations.
   2. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.
   3. Partitions Terminating at Structure: Attach top runner to structure, maintain clearance between top of studs and structure, and connect studs to track using specified mechanical devices in accordance with manufacturer's instructions; verify free movement of top of stud connections; do not leave studs unattached to track.

D. Standard Wall Furring: Install at concrete and masonry walls scheduled to receive gypsum board, not more than 4 inches from floor and ceiling lines and abutting walls. Secure in place on alternate channel flanges at maximum 24 inches on center.

E. Acoustic Furring: Install resilient channels at maximum 24 inches on center. Locate joints over framing members.

F. Blocking: Install wood blocking for support of:
   1. Wall mounted cabinets.
   2. Plumbing fixtures.
   3. Toilet accessories.

3.04 ACOUSTIC ACCESSORIES INSTALLATION

A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.

B. Acoustic Sealant: Install in accordance with manufacturer's instructions.
   1. Place continuous bead at perimeter of each layer of gypsum board.
   2. Seal around all penetrations by conduit, pipe, ducts, and rough-in boxes, except where firestopping is provided.

3.05 BOARD INSTALLATION

A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

B. Single-Layer Non-Rated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.
   1. Exception: Tapered edges to receive joint treatment at right angles to framing.

C. Fire-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.

D. Exposed Gypsum Board in Interior Wet Areas: Seal joints, cut edges, and holes with water-resistant sealant.

E. Exterior Sheathing: Comply with ASTM C1280. Install sheathing vertically, with edges butted tight and ends occurring over firm bearing.
   1. Seal joints, cut edges, and holes with water-resistant sealant.

2. Paper-Faced Sheathing: Immediately after installation, protect from weather by application of water-resistive barrier.

F. Cementitious Backing Board: Install over steel framing members where indicated, in accordance with ANSI A108.11 and manufacturer's instructions.

G. Installation on Wood Framing: For rated assemblies, comply with requirements of listing authority. For non-rated assemblies, install as follows:
   1. Single-Layer Applications: Screw attachment.
   2. Double-Layer Application: Install base layer using screws. Install face layer using screws.

3.06 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.

B. Corner Beads: Install at external corners, using longest practical lengths.

C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

D. Exterior Soffit Vents: Install according to manufacturer's written instructions and in locations shown on the drawings. Provide vent area shown on drawings.

3.07 JOINT TREATMENT

A. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
   1. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
   2. Level 3: Walls to receive textured wall finish.
   3. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
   4. Level 1: Fire rated wall areas above finished ceilings, whether or not accessible in the completed construction.

B. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
   1. Feather coats of joint compound so that camber is maximum 1/32 inch.
   2. Taping, filling, and sanding is not required at surfaces behind adhesive applied ceramic tile and fixed cabinetry.
   3. Taping, filling and sanding is not required at base layer of double layer applications.

3.08 TEXTURE FINISH

A. Apply finish texture coating by means of spraying apparatus in accordance with manufacturer's instructions and to match approved sample.

3.09 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

END OF SECTION

SECTION 09 2236.23

METAL LATH

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal lath for cement and gypsum plaster.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Sheathing on exterior walls.

B. Section 07 2500 - Weather Barriers: Weather barrier under exterior plaster and stucco.

C. Section 09 2400 - Portland Cement Plastering.

D. Section 09 2116 - Gypsum Board Assemblies: Sheathing on exterior walls.

E. Section 09 2116 - Gypsum Board Assemblies: Water-resistive barrier under exterior plaster and stucco.

1.03 REFERENCE STANDARDS

A. ASTM C847 - Standard Specification for Metal Lath; 2014a.

B. ASTM C933 - Standard Specification for Welded Wire Lath; 2014.

C. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness; 2015.

D. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2014.

E. ASTM C1063 - Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster; 2015a.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on furring and lathing components, structural characteristics, material limitations, and finish.

C. Job Site Mock-Up
   1. A 10 foot long by 8 foot tall mock-up wall describing full range of typical detail conditions including metal lath, control joint, expansion joint, corner, edge terminations.

PART 2 PRODUCTS

2.01 MANUFACTURERS

2.02 FRAMING AND LATH ASSEMBLIES

A. Provide completed assemblies with the following characteristics:
   1. Maximum Deflection of Vertical Assemblies: 1:360 under lateral point load of 100 lbs.
   2. Maximum Deflection of Horizontal Assemblies: 1:240 deflection under dead loads and wind uplift.

2.03 LATH

A. Diamond Mesh Metal Lath for horizontal applications: ASTM C847, galvanized; self-furring.
   1. Weight: To suit application and as specified in ASTM C841 or ASTM C1063 for framing spacing.
   2. Weight: 2.5 lb/sq yd.
   3. Backed with treated paper.

B. Welded Wire Lath for Vertical Applications: ASTM C933; galvanized; with 2 inch square openings, paper or felt backing, of weight to suit application, comply with deflection criteria, and as specified in ASTM C841 for framing spacing.

C. Beads, Screeds, Joint Accessories, and Other Trim: Depth governed by plaster thickness, and maximum possible lengths.
   1. Material: Formed sheet steel with rust inhibitive primer, expanded metal flanges.
   2. Casing Beads: Square edges.
   3. Corner Beads: Radiused corners.
   4. Base Screeds: Bevelled edges.
   5. Expansion Joints: Two-piece sliding type with reveal, 2 inch wide flanges.
   6. Control Joints: Accordion profile with protective tape, 2 inch flanges.

2.04 ACCESSORIES

A. Anchorage: Tie wire, nails, and other metal supports, of type and size to suit application; to rigidly secure materials in place, galvanized.

B. Fasteners: Self-piercing tapping screws; ASTM C1002 or ASTM C954.

C. Tie Wire: Annealed galvanized steel.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that substrates are ready to receive work and conditions are suitable for application.

C. For exterior plaster and stucco on stud walls, verify that water-resistive barrier has been installed over sheathing substrate completely and correctly.

D. Do not begin until unacceptable conditions have been corrected.

E. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 INSTALLATION - GENERAL

A. Install metal lath and furring for Portland cement plaster in accordance with ASTM C1063.

3.03 CONTROL AND EXPANSION JOINT INSTALLATION

A. Locate joints as indicated on drawings.

B. Install control and expansion joints.

3.04 LATH INSTALLATION

A. Apply lath taut, with long dimension perpendicular to supports.

B. Lap ends minimum 1 inch. Secure end laps with tie wire where they occur between supports.

C. Continuously reinforce internal angles with corner mesh, except where the metal lath returns 3 inches from corner to form the angle reinforcement; fasten at perimeter edges only.

D. Place corner bead at external wall corners; fasten at outer edges of lath only.

E. Place base screeds at termination of plaster areas; secure rigidly in place.

F. Place 4 inch wide strips of lath centered over junctions of dissimilar backing materials, and secure rigidly in place.

G. Place lath vertically above each top corner and each side of door frames to 6 inches above ceiling line.

H. Place casing beads at terminations of plaster finish. Butt and align ends. Secure rigidly in place.

I. Place additional strip mesh diagonally at corners of lathed openings. Secure rigidly in place.

3.05 TOLERANCES

A. Maximum Variation from True Lines and Levels: 1/8 inch in 10 feet.

END OF SECTION

SECTION 09 2400
PORTLAND CEMENT PLASTERING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Portland cement plaster for installation over metal lath, masonry, and solid surfaces.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Wood stud framing for plaster.

B. Section 09 2236.23 - Metal Lath: Metal furring and lathing for plaster.

1.03 REFERENCE STANDARDS

A. ASTM C926 - Standard Specification for Application of Portland Cement-Based Plaster; 2015b.

B. PCA EB049 - Portland Cement Plaster/Stucco Manual; 2003.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittals procedures.

B. Product Data: Provide data on plaster materials, characteristics and limitations of products specified.

PART 2 PRODUCTS

2.01 PORTLAND CEMENT PLASTER ASSEMBLIES

A. Exterior Stucco: Portland cement plaster system, made of finish, brown, and scratch coat and reinforcing mesh.
   1. Provide weather resistive barrier and air barrier as part of the systemand as specified in Section 07 2500 Weather Barriers.

2.02 PLASTER MATERIALS

A. Portland Cement, Aggregates, and Other Materials: In accordance with ASTM C926.

B. Premixed Base Coat: Mixture of cement, aggregate, and proprietary admixtures for scratch and brown coats, installed in accordance with ASTM C926.
   1. Manufacturers:
      a. The QUIKRETE Companies; QUIKRETE® Base Coat Stucco Pump Grade: www.quikrete.com.

C. Premixed Base Coat: Quikrete Base Coat Stucco type; No. 1139-80 manufactured by Quickcrete.

D. Premixed Finish Coat: Quikrete Finish Coat Stucco type; No. 1202 color; Gray manufactured by Quikrete.

2.03 METAL LATH

A. Metal Lath and Accessories: As specified in Section 09 2236.23.

B. Beads, Screeds, and Joint Accessories: As specified in Section 09 2236.23.

2.04 PLASTER MIXES

A. Over Solid Bases: Two-coat application, mixed and proportioned in accordance with manufacturer's instructions.

B. Over Metal Lath: Three-coat application, mixed and proportioned in accordance with manufacturer's instructions.

C. Premixed Plaster Materials: Mix in accordance with manufacturer's instructions.

D. Mix only as much plaster as can be used prior to initial set.

E. Mix materials dry, to uniform color and consistency, before adding water.

F. Protect mixtures from freezing, frost, contamination, and excessive evaporation.

G. Do not retemper mixes after initial set has occurred.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify the suitability of existing conditions before starting work.

B. Masonry: Verify joints are cut flush and surface is ready to receive work of this section. Verify no bituminous or water repellent coatings exist on masonry surface.

C. Metal Lath and Accessories: Verify lath is flat, secured to substrate, and joint and surface perimeter accessories are in place.

3.02 PREPARATION

A. Dampen masonry surfaces to reduce excessive suction.

3.03 PLASTERING

A. Apply premixed plaster in accordance with manufacturer's instructions.

B. Apply plaster in accordance with ASTM C926.

C. Two-Coat Application:
   1. Apply first coat to nominal thickness of 3/8 inch.
   2. Apply finish coat to nominal thickness of 1/8 inch.

D. Three-Coat Application Over Metal Lath:
   1. Apply first coat to a nominal thickness of 3/8 inch.
   2. Apply second coat to a nominal thickness of 3/8 inch.
   3. Apply finish coat to a nominal thickness of 1/8 inch.

E. Moist cure base coats.

F. Apply second coat immediately following initial set of first coat.

G. After curing, dampen previous coat prior to applying finish coat.

H. Finish Texture: Float to a consistent and smooth finish.

I. Avoid excessive working of surface. Delay troweling as long as possible to avoid drawing excess fines to surface.

J. Moist cure finish coat for minimum period of 48 hours.

3.04 TOLERANCES

A. Maximum Variation from True Flatness: 1/8 inch in 10 feet.

END OF SECTION

SECTION 09 3000

TILING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Tile for floor applications.

B. Tile for wall applications.

C. Cementitious backer board as tile substrate.

D. Ceramic accessories.

E. Ceramic trim.

1.02 RELATED REQUIREMENTS

A. Section 07 9005 - Joint Sealers.

B. Section 09 2116 - Gypsum Board Assemblies: Tile backer board.

1.03 REFERENCE STANDARDS

A. ANSI A108/A118/A136.1 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium); 2013.1.

B. ANSI A108.1a - American National Standard Specifications for Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar; 2014.

C. ANSI A108.1b - American National Standard Specifications for Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex-Portland Cement Mortar; 1999 (Reaffirmed 2010).

D. ANSI A108.1c - Specifications for Contractors Option: Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar or Installation of Ceramic Tile on a Cured Portland Cement Mortar Bed with Dry-Set or Latex-Portland Cement; 1999 (Reaffirmed 2010).

E. ANSI A108.4 - American National Standard Specifications for Installation of Ceramic Tile with Organic Adhesives or Water Cleanable Tile-Setting Epoxy Adhesive; 2009 (Revised).

F. ANSI A108.5 - American National Standard Specifications for Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar; 1999 (Reaffirmed 2010).

G. ANSI A108.6 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy; 1999 (Reaffirmed 2010).

H. ANSI A108.8 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant Furan Resin Mortar and Grout; 1999 (Reaffirmed 2010).

I. ANSI A108.9 - American National Standard Specifications for Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout; 1999 (Reaffirmed 2010).

J. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework; 1999 (Reaffirmed 2010).

K. ANSI A108.11 - American National Standard for Interior Installation of Cementitious Backer Units; 2010 (Revised).

L. ANSI A108.12 - American National Standard for Installation of Ceramic Tile with EGP (Exterior glue plywood) Latex-Portland Cement Mortar; 1999 (Reaffirmed 2010).

M. ANSI A108.13 - American National Standard for Installation of Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone; 2005 (Reaffirmed 2010).

N. ANSI A118.4 - American National Standard Specifications for Modified Dry-Set Cement Mortar; 2012 (Revised).

O. ANSI A118.6 - American National Standard Specifications for Standard Cement Grouts for Tile Installation; 2010 (Revised).

P. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units; 1999 (Reaffirmed 2010).

Q. ANSI A118.15 - American National Standard Specifications for Improved Modified Dry-Set Cement Mortar; 2012.

R. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation; 2015.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.

C. Samples: Mount tile and apply grout on two plywood panels, minimum 18 by 18 inches in size illustrating pattern, color variations, and grout joint size variations.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.06 FIELD CONDITIONS

A. Do not install solvent-based products in an unventilated environment.

1.07 EXTRA MATERIALS

A. Furnish extra tile materials from the same production run as the materials applied and in the quantities described below. Package with protective covering for storage and identify with labels describing contents. Deliver extra materials to Owner.

B. Furnish Owner with an additional five percent of each tile material and color.

C. Furnish Owner with an additional five percent of each grout.

D. Furnish Owner with an additional five percent of cement mortar bond coat.

PART 2 PRODUCTS

2.01 TILE

2.02 TRIM AND ACCESSORIES

A. Ceramic Accessories: Glazed finish, same color and finish as adjacent field tile; same manufacturer as tile.

B. Ceramic Trim: Matching bullnose and cove base ceramic shapes in sizes coordinated with field tile.
   1. Applications:
      a. Open Edges: Bullnose.
      b. Inside Corners: Jointed.
      c. Floor to Wall Joints: Cove base.
   2. Manufacturers: Same as for tile.

2.03 SETTING MATERIALS

A. Manufacturers:
   1. LATICRETE International, Inc: www.laticrete.com.
   2. Substitutions: See Section 01 6000 - Product Requirements.

B. Provide setting materials made by the same manufacturer as grout.

C. Latex-Portland Cement Mortar Bond Coat: ANSI A118.4 or ANSI A118.15.
   1. Applications: Use this type of bond coat where indicated and where no other type of bond coat is indicated.
   2. Products:
      a. LATICRETE International, Inc; LATICRETE 254 Platinum: www.laticrete.com.
      b. Substitutions: See Section 01 6000 - Product Requirements.

2.04 GROUTS

A. Manufacturers:

B. Standard Grout: ANSI A118.6 standard cement grout.
   1. Applications: Use this type of grout where indicated and where no other type of grout is indicated.
   2. Use sanded grout for joints 1/8 inch wide and larger; use unsanded grout for joints less than 1/8 inch wide.
   3. Color(s): As selected by Architect from manufacturer's full line.
   4. Products:
      a. LATICRETE International, Inc; LATICRETE 1500 Sanded Grout: www.laticrete.com.
      b. Substitutions: See Section 01 6000 - Product Requirements.

C. Tile Sealant: Gunnable, silicone, siliconized acrylic, or urethane sealant; moisture and mildew resistant type.
   1. Applications: Between tile and plumbing fixtures.
   2. Color(s): As selected by Architect from manufacturer's full line.
   3. Products:
      a. LATICRETE International, Inc; LATICRETE Latasil: www.laticrete.com.
      b. Substitutions: See Section 01 6000 - Product Requirements.

D. Grout Sealer: Liquid-applied, moisture and stain protection for existing or new Portland cement grout.
   1. Composition: Water-based colorless silicone.
   2. Products:
      a. Merkrete, by Parex USA, Inc; Merkrete Grout Sealer: www.merkrete.com.
      b. Substitutions: See Section 01 6000 - Product Requirements.

2.05 ACCESSORY MATERIALS

A. Backer Board: Cementitious type complying with ANSI A118.9; high density, glass fiber reinforced, 1/2 inch thick; 2 inch wide coated glass fiber tape for joints and corners.

B. Mesh Tape: 2 inch wide self-adhesive fiberglass mesh tape.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive tile.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile.

C. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Protect surrounding work from damage.

B. Vacuum clean surfaces and damp clean.

C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

D. Install backer board in accordance with ANSI A108.11 and board manufacturer's instructions. Tape joints and corners, cover with skim coat of setting material to a feather edge.

3.03 INSTALLATION - GENERAL

A. Install tile and grout in accordance with applicable requirements of ANSI A108.1a through ANSI A108.13, manufacturer's instructions, and TCNA (HB) recommendations.

B. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.

C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.

D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.

E. Form internal angles square and external angles bullnosed.

F. Install ceramic accessories rigidly in prepared openings.

G. Sound tile after setting. Replace hollow sounding units.

H. Keep control and expansion joints free of mortar, grout, and adhesive.

I. Prior to grouting, allow installation to completely cure; minimum of 48 hours.

J. Grout tile joints unless otherwise indicated. Use standard grout unless otherwise indicated.

K. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.

L. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.

3.04 INSTALLATION - FLOORS - THIN-SET METHODS

A. Over interior concrete substrates, install in accordance with TCNA (HB) Method F113, dry-set or latex-Portland cement bond coat, with standard grout, unless otherwise indicated.

3.05 INSTALLATION - WALL TILE

A. Over gypsum wallboard on wood or metal studs install in accordance with TCNA (HB) Method W243, thin-set with dry-set or latex-Portland cement bond coat, unless otherwise indicated.

3.06 CLEANING

A. Clean tile and grout surfaces.

3.07 PROTECTION

A. Do not permit traffic over finished floor surface for 4 days after installation.

END OF SECTION

SECTION 09 5100

ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Suspended metal grid ceiling system.

B. Acoustical units.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Placement of special anchors or inserts for suspension system.

B. Section 07 2100 - Thermal Insulation: Acoustical insulation.

C. Section 28 3100 - Fire Detection and Alarm: Fire alarm components in ceiling system.

D. Section 21 1300 - Fire Suppression Sprinklers: Sprinkler heads in ceiling system.

E. Section 23 3700 - Air Outlets and Inlets: Air diffusion devices in ceiling.

F. Section 26 5100 - Interior Lighting: Light fixtures in ceiling system.

1.03 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM):

1. ASTM A 1008 Standard Specification for Steel, Sheet, Cold Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
2. ASTM A 641 Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
3. ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
4. ASTM C 423 Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
5. ASTM C 635 Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
6. ASTM C 636 Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.
7. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials.
8. ASTM E 1414 Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum.
9. ASTM E 1111 Standard Test Method for Measuring the Interzone Attenuation of Ceilings Systems.
10. ASTM E 1264 Classification for Acoustical Ceiling Products.
11. ASTM E 1477 Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers.
12. ASTM D 3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
13. ASTM E 119 Standard Test Methods for Fire Tests of Building Construction and Material.

B. ASHRAE Standard 62.1-2004, "Ventilation for Acceptable Indoor Air Quality"

C. International Code Council-Evaluation Services - AC 156 Acceptance Criteria for Seismic Qualification Testing of Non-structural Components

D. International Code Council-Evaluation Services - Evaluation Report, ESR-1308, Fire- and Nonfire-Resistance-Rated Suspended Ceiling Framing Systems

E. ASCE 7 Standard - American Society of Civil Engineers, Minimum Design Loads for Buildings and Other Structures

F. CISCA Seismic Zones 3 & 4 - Ceilings and Interior Systems Construction Association Guidelines for Seismic Restraint for Direct Hung Suspended Ceiling Assemblies

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 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on suspension system components and acoustical units.

C. Manufacturer's Installation Instructions: Indicate special procedures.

1.06 QUALITY ASSURANCE

A. Single-Source Responsibility: Provide acoustical panel units and grid components by a single manufacturer.

B. Fire Performance Characteristics: Identify acoustical ceiling components with appropriate markings of applicable testing and inspecting organization.
   1. Surface Burning Characteristics: As follows, tested per ASTM E 84 and complying with ASTM E 1264 for Class A products.
      a. Flame Spread: 25 or less
      b. Smoke Developed: 50 or less

C. Fire Resistance Ratings: As indicated by reference to design designations in UL Fire Resistance Directory, for types of assemblies in which acoustical ceilings function as a fire protective membrane and tested per ASTM E 119.
   1. Protect lighting fixtures and air ducts to comply with requirements indicated for rated assembly.

D. Seismic Performance: Provide acoustical ceiling system that has been evaluated by an independent party and found to be compliant with the 2003 International Building Code, Seismic Category D, E, and F.
   1. Tested per International Code Council - Evaluation Services - AC 156 Acceptance Criteria for Seismic Qualification Testing of Non-structural Components as evidenced by International Code Council Evaluation Report, ESR-1308.

E. Handle acoustical ceiling units carefully to avoid chipping edges or damaged units in any way.

1.07 EXTRA MATERIALS

A. Furnish extra materials from the same production run as the materials applied and in the quantities described below. Package with protective covering for storage and identify with labels describing contents. Deliver extra materials to Owner.

B. Furnish Owner with an additional five percent of each acoustical panel type used.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acoustic Tiles/Panels:
   1. Armstrong World Industries, Inc: www.armstrong.com.
   2. Substitutions: See Section 01 6000 - Product Requirements.

B. Suspension Systems:
   1. Armstrong World Industries, Inc: www.armstrong.com.

2.02 ACOUSTICAL UNITS

A. Manufacturers:
   1. Armstrong World Industries, Inc; Product DUNE: www.armstrong.com.
   2. Substitutions: See Section 01 6000 - Product Requirements.

B. Acoustical Panels Type ACT-1:
   1. Surface Texture: Fine

2. Composition: Mineral Fiber
3. Color: White
4. Size: 24in X 24in X 5/8in, 24in X 48in X 5/8in as shownon drawings
5. Edge Profile: Square Lay-In for interface with Prelude XL Fire Guard 15/16" Exposed Tee.
6. Noise Reduction Coefficient (NRC): ASTM C 423; Classified with UL label on product carton, 0.50.
7. Ceiling Attenuation Class (CAC): ASTM C 1414; Classified with UL label on product carton, 35
8. Emissions Testing: Section 01350 Protocol, < 13.5 ppb of formaldehyde when used under typical conditions required by ASHRAE Standard 62.1-2004, "Ventilation for Acceptable Indoor Air Quality"
9. Flame Spread: ASTM E 1264; Fire Resistive
10. Light Reflectance (LR): ASTM E 1477; White Panel: Light Reflectance: 0.83.
11. Dimensional Stability: HumiGuard Plus - Temperature is between 32°F (0° C) and 120°F (49° C). It is not necessary for the area to be enclosed or for HVAC systems to be functioning. All wet work (plastering, concrete, etc) must be complete and dry.
12. Antimicrobial Protection: BioBlock Plus - Resistance against the growth of mold/mildew and gram positive and gram negative odor and stain causing bacteria.
13. Acceptable Product: Dune Square Lay-In and Tegular, 1850 as manufactured by Armstrong World Industries.

2.03 SUSPENSION SYSTEM(S)

A. Manufacturers:
   1. Armstrong World Industries, Inc: www.armstrong.com.
   2. Substitutions: See Section 01 6000 - Product Requirements.

B. 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.
   1. Components: Main beams and cross tees In accordance with the International Building Code, Section 1621 for Category D, E and F as described in ESR-1308.
      a. Structural Classification: ASTM C 635, Heavy Duty.
      b. Color: White and match the actual color of the selected ceiling tile, unless noted otherwise.
      c. Represented Systems: Prelude XL Fire Guard 15/16" Exposed Tee System as manufactured by Armstrong World Industries.
   2. Attachment Devices: In accordance with the International Building Code, Section 1621 for Category D, E, and F.
   3. Wire for Hangers and Ties: In accordance with the International Building Code, Section 1621.
   4. Wall Moldings: In accordance with the International Building Code, Section 1621 for Category D, E. and F or method as described in ESR-1308.
      a. Nominal 7/8 inch x 7/8 inch hemmed, pre-finished angle molding (7800) (7802) (7803) (780036) (HD7801)

2.04 ACCESSORIES

A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.
   1. BERC2 - 2 inch Beam End Retaining Clip, 0.034 inch thick, hot-dipped galvanized cold-rolled steel per ASTM A568 - used to join main beam or cross tee to wall molding.
   2. SJCG - Seismic Joint Clip, 5 inches x 1-1/2 inch, hot-dipped galvanized cold-rolled steel per ASTM A568. The two piece unit is designed to accommodate a seismic separation joint. The clip is compatible with 15/16 inch and 9/16 inch grid systems including Prelude, Suprafine, and Silhouette The SJCG is not suitable for use with Vector panel installations.
   3. SJMR15 - Seismic Joint Clip - Main Beam, 1 inch x 4 inches, commercial quality cold rolled hot dipped galvanized steel per ASTM A568, chemically cleansed.

B. Perimeter Moldings: Same material and finish as grid.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that layout of hangers will not interfere with other work.

3.02 INSTALLATION - SUSPENSION SYSTEM

A. Locate system on room axis according to reflected plan.

B. Install after major above-ceiling work is complete. Coordinate the location of hangers with other work.

C. 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.

D. Install suspension system and panels in accordance with the International Building Code, Section 1621, except as noted in Section 4.4.3.1 of ESR-1308, and with the authorities having jurisdiction.

E. ESR-1308, Section 4.4.3.1, Alternate Seismic Design Category D,E and F Installation:

F. Under this installation, the runners must be rated heavy-duty and have a minimum simple span uniform load of 16.35 pounds per lineal foot (238 N/m); maximum ceiling weight permitted is 4.0 pounds per square foot (19.5 kg/m2).
   1. The BERC-2 clip is used to secure the main runners and cross runners on two adjacent walls to the structure and the two opposite walls to the perimeter trim, as detailed below. A nominal 7/8-inch (22 mm) wall molding is used in lieu of the 2-inch (51 mm) perimeter supporting closure angle required by Section 9.6.2.6.2.2 (b) of ASCE-7 for Seismic Design Categories D, E and F. Except for the use of the BERC-2 clip and the 7/8-inch (22 mm) wall molding and elimination of spreader bars, installation of the ceiling system must be as prescribed by the applicable code.
   2. The BERC-2 clip is attached to the wall molding by sliding the locking lances over the hem of the vertical leg of the wall molding. Clips installed on the walls where the runners are fixed are attached to the runner by a sheet metal screw through the horizontal slot in the clip into the web of the runner.
   3. Alternate #2: If acceptable to architect, fixed attachment may be accomplished by pop-riveting the runner to the wall molding.
   4. Clips installed on the walls where the runners are not fixed to the runner allow the terminal runner end to move 3/4 inch (19.1 mm) in both directions. BERC-2 clips installed in this manner are an acceptable means of preventing runners from spreading in lieu of spacer bars required in CISCA 3-4, which is referenced in ASCE 7, Section 9.6.2.6.2.2, which is referenced in IBC Section 1621.

G. The SJCG Seismic Separation Joint Clip is to be installed per the manufacturer's instructions, CS-3815.

H. The SJMR15 Seismic Joint Clip Main Beam is to be installed per the manufacturer's instructions, CS-3955.

I. The presence of a hanger wire within 3 inches of an expansion relief joint as called for in ASTM C636 shall be required in addition to the requirements of the International Building Code, Section 1621.2.5 and with the authorities having jurisdiction.
   1. Only applies when using Prelude XL Fire Guard 15/16; Prelude Plus XL Fire Guard 15/16 and Suprafine XL Fire Guard 9/16 Exposed Tee Systems.

J. For reveal edge panels: Cut and reveal or rabbet edges of ceiling panels at border areas and vertical surfaces.

K. Install acoustical panels in coordination with suspended system, with edges resting on flanges of main runner and cross tees. Cut and fit panels neatly against abutting surfaces. Support edges by wall moldings.

3.03 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Fit border trim neatly against abutting surfaces.

D. Install units after above-ceiling work is complete.

E. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.

F. Cutting Acoustical Units:
   1. Make field cut edges of same profile as factory edges.

G. Lay acoustical insulation for a distance of 48 inches either side of acoustical partitions as indicated.

3.04 TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

END OF SECTION

SECTION 09 6500
RESILIENT FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Resilient tile and plank flooring.

B. Resilient base.

C. Installation accessories.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors.

B. Section 09 0561 - Common Work Results for Flooring Preparation: Independent agency testing of concrete slabs, removal of existing floor coverings, cleaning, and preparation.

1.03 REFERENCE STANDARDS

A. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2011.

B. ASTM F1066 - Standard Specification for Vinyl Composition Floor Tile; 2004 (Reapproved 2014).

C. ASTM F1303 - Standard Specification for Sheet Vinyl Floor Covering with Backing; 2004 (Reapproved 2014).

D. ASTM F1344 - Standard Specification for Rubber Floor Tile; 2015.

E. ASTM F1700 - Standard Specification for Solid Vinyl Tile; 2013a.

F. ASTM F1861 - Standard Specification for Resilient Wall Base; 2008 (Reapproved 2012).

G. BAAQMD 8-51 - Bay Area Air Quality Management District Regulation 8, Rule 51, Adhesive and Sealant Products; www.baaqmd.gov; 2002.

H. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168; current edition; www.aqmd.gov.

1.04 EXTRA MATERIALS

A. Furnish extra flooring materials from the same production run as the materials applied and in the quantities described below. Package with protective covering for storage and identify with labels describing contents. Deliver extra materials to Owner.

B. Furnish Owner with an additional two boxes of each resilient flooring material and color.

C. Furnish Owner with an additional one roll/box of each resilient base material and color.

D. Furnish Owner with an additional five gallons of flooring adhesive.

PART 2 PRODUCTS

2.01 TILE FLOORING

A. Vinyl Composition Tile: Homogeneous, with color extending throughout thickness.
   1. Minimum Requirements: Comply with ASTM F1066, of Class corresponding to type specified.
   2. Thickness: 0.125 inch.
   3. Pattern: As indicated on Drawings.
   4. Manufacturer: As indicated on Drawings

B. Vinyl Plank (Leasing): Solid vinyl with color and pattern throughout thickness:
   1. Manufacturers:
      a. As indicated on Drawings.
   2. Minimum Requirements: Comply with ASTM F1700, of Class corresponding to type specified.

3. Pattern: As indicated in Drawings.
4. Manufacturers:
    a. As indicated in Drawings

2.02 RESILIENT BASE

A. Resilient Base: ASTM F1861, Type TS rubber, vulcanized thermoset; top set Style B, Cove.
    1. Height: 4 inch.
    2. Thickness: 0.125 inch thick.
    3. Finish: Satin.
    4. Length: Roll.
    5. Color: Color as selected from manufacturer's standards.
    6. Accessories: Premolded external corners and internal corners.
    7. Manufacturers:
        a. Johnsonite, a Tarkett Company: www.johnsonite.com.
        b. Substitutions: See Section 01 6000 - Product Requirements.

2.03 ACCESSORIES

A. Primers, Adhesives, and Seam Sealer: Waterproof; types recommended by flooring manufacturer.
    1. Provide only products having lower volatile organic compound (VOC) content than required by the more stringent of the South Coast Air Quality Management District Rule No.1168 and the Bay Area Air Quality Management District Regulation 8, Rule 51.

B. Moldings, Transition and Edge Strips: Same material as flooring.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.

C. Cementitious Sub-floor Surfaces: Verify that substrates are dry enough and ready for resilient flooring installation by testing for moisture and pH.
    1. Test in accordance with Section 09 0561.
    2. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

3.02 PREPARATION

A. Prepare floor substrates for installation of flooring in accordance with Section 09 0561.

3.03 INSTALLATION

A. Starting installation constitutes acceptance of sub-floor conditions.

B. Install in accordance with manufacturer's written instructions.

C. Spread only enough adhesive to permit installation of materials before initial set.

D. Fit joints and butt seams tightly.

E. Set flooring in place, press with heavy roller to attain full adhesion.

F. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.

G. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.

H. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

3.04 TILE FLOORING

A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.

3.05 RESILIENT BASE

A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.

B. Install base on solid backing. Bond tightly to wall and floor surfaces.

3.06 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean in accordance with manufacturer's written instructions.

3.07 PROTECTION

A. Prohibit traffic on resilient flooring for 48 hours after installation.

END OF SECTION

SECTION 09 6800
CARPETING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Carpet, direct-glued.

B. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 09 0561 - Common Work Results for Flooring Preparation: Independent agency testing of concrete slabs, removal of existing floor coverings, cleaning, and preparation.

1.03 REFERENCE STANDARDS

A. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2011.

B. CRI 104 - Standard for Installation of Commercial Carpet; 2015.

C. CRI (CIS) - Carpet Installation Standard; Carpet and Rug Institute; 2009.

D. CRI (GLA) - Green Label Testing Program - Approved Adhesive Products; Carpet and Rug Institute; Current Edition.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.

C. Samples: Submit two samples 12 by 12 inch in size illustrating color and pattern for each carpet and cushion material specified.

D. Manufacturer's Installation Instructions: Indicate special procedures.

E. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

1.05 EXTRA MATERIALS FOR OWNER

A. Provide additional carpet in the amount of 5 percent for every type and color used. Label packages with all relevant information, and deliver to Owner.

B. Furnish Owner with an additional five gallons of carpet adhesive.

1.06 FIELD CONDITIONS

A. Store materials in area of installation for minimum period of 24 hours prior to installation.

B. Maintain minimum 70 degrees F ambient temperature 24 hours prior to, during and 24 hours after installation.

C. Ventilate installation area during installation and for 72 hours after installation.

PART 2 PRODUCTS

2.01 CARPET

A. Carpet Residential: As indicated in Finish Schedule and Plans.

2.02 ACCESSORIES

A. Sub-Floor Filler: Type recommended by carpet manufacturer.

B. Moldings and Edge Strips: Embossed aluminum, color as selected.

C. Adhesives - General: Compatible with materials being adhered; maximum VOC content of 50 g/L; CRI Green Label certified; in lieu of labeled product, independent test report showing compliance is acceptable.

D. Seam Adhesive: Recommended by manufacturer.

E. Contact Adhesive: Compatible with carpet material; releasable type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive carpet.

B. Cementitious Sub-floor Surfaces: Verify that substrates are dry enough and ready for flooring installation by testing for moisture and alkalinity (pH).
   1. Test in accordance with ASTM F710.
   2. Obtain instructions if test results are not within limits recommended by flooring material manufacturer and adhesive materials manufacturer.

C. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

B. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.

C. Clean substrate.

3.03 INSTALLATION - GENERAL

A. Starting installation constitutes acceptance of sub-floor conditions.

B. Install carpet and cushion in accordance with manufacturer's instructions and CRI 104 (Commercial).

C. Verify carpet match before cutting to ensure minimal variation between dye lots.

D. Lay out carpet and locate seams in accordance with shop drawings.
   1. Locate seams in area of least traffic, out of areas of pivoting traffic, and parallel to main traffic.
   2. Do not locate seams perpendicular through door openings.
   3. Align run of pile in same direction as anticipated traffic and in same direction on adjacent pieces.
   4. Locate change of color or pattern between rooms under door centerline.
   5. Provide monolithic color, pattern, and texture match within any one area.

E. Install carpet tight and flat on subfloor, well fastened at edges, with a uniform appearance.

3.04 DIRECT-GLUED CARPET

A. Double cut carpet seams, with accurate pattern match. Make cuts straight, true, and unfrayed. Apply seam adhesive to cut edges of woven carpet immediately.

B. Apply contact adhesive to floor uniformly at rate recommended by manufacturer. After sufficient open time, press carpet into adhesive.

C. Apply seam adhesive to the base of the edge glued down. Lay adjoining piece with seam straight, not overlapped or peaked, and free of gaps.

D. Roll with appropriate roller for complete contact of adhesive to carpet backing.

E. Trim carpet neatly at walls and around interruptions.

F. Complete installation of edge strips, concealing exposed edges. Bind cut edges where not concealed by edge strips.

3.05 CLEANING

A. Remove excess adhesive from floor and wall surfaces without damage.

B. Clean and vacuum carpet surfaces.

END OF SECTION

SECTION 09 6813
TILE CARPETING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Carpet tile, fully adhered.

1.02 RELATED REQUIREMENTS

A. Section 01 7419 - Construction Waste Management and Disposal: Reclamation/Recycling of new carpet tile scrap and removed carpet tile.

B. Section 03 3000 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors.

C. Section 09 0561 - Common Work Results for Flooring Preparation: Independent agency testing of concrete slabs, removal of existing floor coverings, cleaning, and preparation.

1.03 REFERENCE STANDARDS

A. ASTM D2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials; 2006 (Reapproved 2011).

B. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2011.

C. CRI (CIS) - Carpet Installation Standard; Carpet and Rug Institute; 2009.

D. CRI (GLA) - Green Label Testing Program - Approved Adhesive Products; Carpet and Rug Institute; Current Edition.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate layout of joints.

C. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.

D. Samples: Submit two carpet tiles illustrating color and pattern design for each carpet color selected.

1.05 EXTRA MATERIALS FOR OWNER

A. See Section 01 6000 - Product Requirements, for additional provisions.

B. Extra Carpet Tiles: Quantity equal to 5 percent of total installed of each color and pattern installed.

C. Furnish Owner with an additional five gallons of carpet tile adhesive.

1.06 FIELD CONDITIONS

A. Store materials in area of installation for minimum period of 24 hours prior to installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Mohawk; Product Zip It.

2.02 ACCESSORIES

A. Sub-Floor Filler: White premix latex; type recommended by flooring material manufacturer.

B. Edge Strips: Rubber, color as selected by Architect.

C. Adhesives: Acceptable to carpet tile manufacturer, compatible with materials being adhered; maximum VOC of 50 g/L; CRI Green Label certified; in lieu of labeled product, independent test report showing compliance is acceptable.

PART 3 EXECUTION

3.01 EXAMINATION

A. Cementitious Sub-floor Surfaces: Verify that substrates are dry enough and ready for flooring installation by testing for moisture and pH.
   1. Test in accordance with Section 09 0561.
   2. Obtain instructions if test results are not within limits recommended by flooring material manufacturer and adhesive materials manufacturer.

3.02 PREPARATION

A. Prepare floor substrates for installation of flooring in accordance with Section 09 0561.

3.03 INSTALLATION

A. Starting installation constitutes acceptance of sub-floor conditions.

B. Install carpet tile in accordance with manufacturer's instructions.

C. Blend carpet from different cartons to ensure minimal variation in color match.

D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.

E. Lay carpet tile in square pattern, with pile direction parallel to next unit, set parallel to building lines.

F. Fully adhere carpet tile to substrate.

G. Trim carpet tile neatly at walls and around interruptions.

H. Complete installation of edge strips, concealing exposed edges.

3.04 CLEANING

A. Remove excess adhesive without damage, from floor, base, and wall surfaces.

B. Clean and vacuum carpet surfaces.

END OF SECTION

SECTION 09 9000

PAINTS AND COATINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Interior paint and coatings systems, including surface preparation.

B. Interior high-performance paint and coatings systems including surface preparation.

C. Exterior paint and coatings systems including surface preparation.

1.02 RELATED SECTIONS

A. Section 03 30 00 - Cast-in-Place Concrete.

B. Section 04 20 00 - Unit Masonry.

C. Section 05 12 00 - Structural Steel Framing.

D. Section 05 50 00 - Metal Fabrications.

E. Section 06 20 00 - Finish Carpentry.

F. Section 06 40 00 - Architectural Woodwork.

G. Section 07 19 00 - Water Repellents.

H. Section 07 8120 - Intumescent Fire Resistant Materials.

I. Section 08 11 13 - Hollow Metal Doors and Frames.

J. Section 09 21 16 - Gypsum Board Assemblies.

K. Section 09 24 00 - Portland Cement Plastering.

L. Section 23 05 00 - Common Work Results for HVAC.

M. Section 26 05 00 - Common Work Results for Electrical.

1.03 REFERENCES

A. Steel Structures Painting Council (SSPC):
   1. SSPC-SP 1 - Solvent Cleaning.
   2. SSPC-SP 2 - Hand Tool Cleaning.
   3. SSPC-SP 3 - Power Tool Cleaning.
   4. SSPC-SP5/NACE No. 1, White Metal Blast Cleaning.
   5. SSPC-SP6/NACE No. 3, Commercial Blast Cleaning.
   6. SSPC-SP7/NACE No. 4, Brush-Off Blast Cleaning.
   7. SSPC-SP10/NACE No. 2, Near-White Blast Cleaning.
   8. SSPC-SP11, Power Tool Cleaning to Bare Metal.
   9. SSPC-SP12/NACE No. 5, Surface Preparation and Cleaning of Metals by Waterjetting Prior to Recoating.
   10. SSPC-SP 13 / NACE No. 6 Surface Preparation for Concrete.

B. Material Safety Data Sheets / Environmental Data Sheets: Per manufacturer's MSDS/EDS for specific VOCs (calculated per 40 CFR 59.406). VOCs may vary by base and sheen.

C. Green Seal, Inc.:
   1. GS-11 Standard for Paints and Coatings.(1st Edition, May 20,1993)
   2. GC-03 - Environmental Criteria for Anti-Corrosive Paints.

1.04 SUBMITTALS

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

B. Product Data: For each paint system indicated, including.
   1. Product characteristics.
   2. Surface preparation instructions and recommendations.
   3. Primer requirements and finish specification.
   4. Storage and handling requirements and recommendations.

5. Application methods.
6. Cautions for storage, handling and installation.

C. Verification Samples: For each finish product specified, submit samples that represent actual product, color, and sheen.

D. Only submit complying products based on project requirements. One must also comply with the regulations regarding VOCs. To ensure compliance with district regulations and other rules, businesses that perform coating activities should contact the local district in each area where the coating will be used.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.

B. Paint exposed surfaces. If a color of finish, or a surface is not specifically mentioned, Architect will select from standard products, colors and sheens available.

C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels unless indicated.

D. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
1. Finish surfaces for verification of products, colors and sheens.
2. Finish area designated by Architect.
3. Provide samples that designate primer and finish coats.
4. Do not proceed with remaining work until the Architect approves the mock-up.

E. Coating Maintenance Manual: Upon conclusion of the project, the Contractor or paint manufacturer/supplier shall furnish a coating maintenance manual, such as Sherwin-Williams “Custodian Project Color and Product Information” report or equal. Manual shall include an Area Summary with finish schedule, Area Detail designating where each product/color/finish was used, product data pages, Material Safety Data Sheets, care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver manufacturer's unopened containers to the work site. Packaging shall bear the manufacturer's name, label, and the following list of information.
1. Product name, and type (description).
2. Application and use instructions.
3. Surface preparation.
4. VOC content.
5. Environmental handling.
6. Batch date.
7. Color number.

B. Storage: Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

C. Store materials in an area that is within the acceptable temperature range, per manufacturer's instructions. Protect from freezing.

D. Handling: Maintain a clean, dry storage area, to prevent contamination or damage to the coatings.

1.07 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 absolute limits.

1.08 EXTRA MATERIALS

A. Furnish extra paint materials from the same production run as the materials applied and in the quantities described below. Package with protective covering for storage and identify with labels describing contents. Deliver extra materials to Owner.

B. Furnish Owner with an additional five gallons of each material and color.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturer: Standard of quality established by The Sherwin Williams Co.
   1. Alternate acceptable manufacturers: Benjamin Moore & PPG

B. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

2.02 APPLICATIONS/SCOPE

A. Interior Paints and Coatings:
   1. Concrete: Poured, precast, cast-in-place, cement board, plaster.
   2. Concrete: Floors (Non-Vehicular).
   3. Masonry: Concrete masonry units, including split-face, scored, and smooth block.
   4. Metal: Aluminum, galvanized steel.
   5. Metal: Structural steel, joists, trusses, beams, partitions and similar items.
   6. Wood: Walls, ceilings, doors, trim and similar items.
   7. Wood: Floors (non-vehicular), painted.
   8. Drywall: Drywall board, Gypsum board.

B. Interior High Performance Paints and Coatings:
   1. Concrete: Poured, precast, cast-in-place, cement board.
   2. Concrete: Ceilings.
   3. Masonry: CMU - concrete, split face, scored, smooth, stucco.
   4. Non-Ferrous Metal: Galvanized steel and aluminum.
   5. Metal Ferrous: Ceilings, structural steel, joists, trusses, beams, and similar items including dryfall coatings.
   6. Wood: Walls, ceilings, doors, trim, cabinet work, and similar items.
   7. Drywall: Drywall board, Gypsum board
   8. Plaster: Walls, ceilings.

C. Exterior Paints and Coatings:
   1. Concrete: Cementitious siding, flexboard, transite, and shingles (non-roof).
   2. Masonry: Concrete masonry units, cinder or concrete block.
   3. Metal: Aluminum, galvanized steel.
   4. Metal: Miscellaneous iron, ornamental iron, ferrous metal.
   5. Wood: Floors(non-vehicular), and platforms.
   6. Wood: Siding, trim, shutters, sash, and miscellaneous hardboard.
   7. Drywall: Gypsum board, and exterior drywall.

2.03 PAINT MATERLALS - GENERAL

A. Paints and Coatings.
   1. Unless otherwise indicated, provide factory-mixed coatings. When required, mix coatings to correct consistency in accordance with manufacturer's instructions before application. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.
   2. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color. Or follow manufactures product instructions for optimal color conformance.

B. Primers: Where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.

C. Coating Application Accessories: Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials required, per manufacturer's specifications.

D. Color: Refer to Finish Schedule for paint colors, and as selected.

2.04 INTERIOR PAINT SYSTEMS

A. MASONRY: CMU. Residential Trash Room Walls
   1. Epoxy System (Water Base):
      a. Semi-Gloss Finish:
         1) 1st Coat: S-W Loxon Block Surfacer, A24W200 (50-100 sq ft/gal).
         2) 2nd Coat: S-W Waterbased Catalyzed Epoxy, B70W211/ B60V25.
         3) 3rd Coat: S-W Waterbased Catalyzed Epoxy, B70W211/ B60V25 (6.0 mils wet, 2.5 mils dry per coat).

B. METAL: Hollow Metal Doors/Press Metal Door Frames
   1. Latex Systems:
      a. Gloss Finish:
         1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series (5.0 mils wet, 2.0 mils dry).
         2) 2nd Coat: S-W Pro Industrial Gloss Acrylic Coating, B66-600 Series.
         3) 3rd Coat: S-W Pro Industrial Gloss Acrylic Coating, B66-600 Series (6.0 mils wet, 2.5 mils dry per coat).

C. WOOD - (Doors, Trim) Residential Units
   1. Latex Systems:
      a. Semi - Gloss Finish:
         1) 1st Coat: S-W Premium Wall and Wood Primer, B28W8111 (4 mils wet, 1.8 mils dry).
         2) 2nd Coat: S-W ProClassic Waterborne Acrylic Semi-Gloss, B31 Series.
         3) 3rd Coat: S-W ProClassic Waterborne Acrylic Semi-Gloss, B31 Series (4 mils wet, 1.3 mils dry per coat).

D. DRYWALL - Walls, Ceilings: Residential Units, Lobbies, Mail Room, Leasing Office, Fitness Room
   1. Latex Systems:
      a. Semi-Gloss Finish Restroom Walls:
         1) 1st Coat: S-W ProMar200 Zero VOC Interior Latex Primer, B28W2600 (4 mils wet, 1.5 mils dry).
         2) 2nd Coat: S-W ProMar 200 Zero VOC Latex Semi-Gloss, B31-2600 Series.
         3) 3rd Coat: S-W ProMar 200 Zero VOC Latex Semi-Gloss, B31-2600 Series (4 mils wet, 1.6 mils dry per coat).
      b. Eg-Shel / Satin Finish Walls & Ceilings, Corridors, Trash Room Ceilings, Restroom Ceilings:
         1) 1st Coat: S-W ProMar 200 Zero VOC Interior Latex Primer, B28W2600 (4 mils wet, 1.5 mils dry).
         2) 2nd Coat: S-W ProMar 200 Zero VOC Latex Eg-Shel, B20-2600 Series.
         3) 3rd Coat: S-W ProMar 200 Zero VOC Latex Eg-Shel, B20-2600 Series (4 mils wet, 1.7 mils dry per coat).

E. CONCRETE: Concrete Floors, Residential Trash Rooms,
   1. Epoxy System Water-Based:
      a. Floor Finish:
         1) 1st Coat: S-W Armorseal 8100 B70 Series.
         2) 2nd Coat: S-W Armorseal 8100 B70 Series.

2.05 EXTERIOR PAINT SYSTEMS

A. CONCRETE, PLASTER: Parking Garage, Walls, Planters, Columns & Ceilings.
   1. Latex Systems:

a. Flat Finish:
1) 1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300 (8 mils wet, 3.2 mils dry).
2) 2nd Coat: S-W A-100 Exterior Latex Flat, A6 Series.
3) 3rd Coat: S-W A-100 Exterior Latex Flat, A6 Series (4 mils wet, 1.2 mils dry per coat).

B. MASONRY (CMU Walls)- Parking Garage .
1. Latex Systems:
a. Flat Finish:
1) 1st Coat: S-W PrepRite Block Filler, B25W25 (75-125 sq ft/gal).
2) 2nd Coat: S-W A-100 Exterior Latex Flat, A6 Series.
3) 3rd Coat: S-W A-100 Exterior Latex Flat, A6 Series (4 mils wet, 1.2 mils dry per coat).

C. CONCRETE: Parking Garage Concrete Floors Traffic Striping.
1. Acrylic System Water-Based:
a. Floor Striping:
1) 1 Coat S-W ProPark Waterborne Traffic Marking Paint

D. METAL: Steel Post, Gates, Railings & Trellises, Bar Grating
1. Latex Systems:
a. Semi-Gloss Finish:
1) 1st Coat: S-W Pro Industrial Universal Metal Primer B66-310.
2) 2nd Coat: S-W Pro Industrial Acrylic B66 Series
3) 3rd Coat: S-W Pro Industrial Acrylic B66 Series (4 mils wet, 1.5 mils dry per coat).

E. METAL: Misc. Parking Garage: Pipework, Conduits, Ductwork, Louvers, Flashing, Gutters, Downspouts,
1. Latex Systems:
a. Semi-Gloss Finish:
1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series (5.0 mils wet, 2.0 mils dry).
2) 2nd Coat: S-W A-100 A8
3) 3rd Coat: S-W A-100 A8

PART 3

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared; notify Architect of unsatisfactory conditions before proceeding. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

B. Proceed with work only after conditions have been corrected and approved by all parties, otherwise application of coatings will be considered as an acceptance of surface conditions.

C. Previously Painted Surfaces: Verify that existing painted surfaces do not contain lead based paints, notify Architect immediately if lead based paints are encountered.

3.02 SURFACE PREPARATION

3.03 WARNING! REMOVAL OF OLD PAINT BY SANDING, SCRAPING OR OTHER MEANS MAY GENERATE DUST OR FUMES THAT CONTAIN LEAD. EXPOSURE TO LEAD DUST OR FUMES MAY CAUSE BRAIN DAMAGE OR OTHER ADVERSE HEALTH EFFECTS, ESPECIALLY IN CHILDREN OR PREGNANT WOMEN. CONTROLLING EXPOSURE TO LEAD OR OTHER HAZARDOUS SUBSTANCES REQUIRES THE USE OF PROPER PROTECTIVE EQUIPMENT, SUCH AS A PROPERLY FITTED RESPIRATOR (NIOSH APPROVED) AND PROPER CONTAINMENT AND CLEANUP. FOR MORE INFORMATION, CALL THE NATIONAL LEAD INFORMATION CENTER AT 1-800-424-LEAD (IN US) OR CONTACT YOUR LOCAL HEALTH AUTHORITY. REMOVAL MUST BE DONE IN ACCORDANCE WITH EPA RENOVATION, REPAIR AND PAINTING RULE AND ALL RELATED STATE AND LOCAL REGULATIONS. CARE SHOULD BE TAKEN TO FOLLOW ALL STATE AND LOCAL REGULATIONS WHICH MAY BE MORE STRICT THAN THOSE SET UNDER THE FEDERAL RRP RULE.

A. General: Surfaces shall be dry and in sound condition. Remove oil, dust, dirt, loose rust, peeling paint or other contamination to ensure good adhesion.
   1. Remove mildew before painting by washing with a solution of 1 part liquid household bleach and 3 parts of warm water. Apply the solution and scrub the mildewed area. Allow the solution to remain on the surface for 10 minutes. Rinse thoroughly with clean water and allow the surface to dry a minimum of 48 hours before painting. Wear protective glasses or goggles, waterproof gloves, and protective clothing. Quickly wash off any of the mixture that comes in contact with your skin. Do not add detergents or ammonia to the bleach/water solution.
   2. Remove items including but not limited to thermostats, electrical outlets, switch covers and similar items prior to painting. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.
   3. No exterior painting should be done immediately after a rain, during foggy weather, when rain is predicted, or when the temperature is below 50 degrees F (10 degrees C), unless products are designed specifically for these conditions. On large expanses of metal siding, the air, surface and material temperatures must be 50 degrees F (10 degrees F) or higher to use low temperature products.

B. Aluminum: Remove all oil, grease, dirt, oxide and other foreign material by cleaning per SSPC-SP1, Solvent Cleaning.

C. Block (Cinder and Concrete): Remove all loose mortar and foreign material. Surface must be free of laitance, concrete dust, dirt, form release agents, moisture curing membranes, loose cement, and hardeners. Concrete and mortar must be cured at least 30 days at 75 degrees F (24 degrees C). The pH of the surface should be between 6 and 9, unless the products are designed to be used in high pH environments. On tilt-up and poured-in-place concrete, commercial detergents and abrasive blasting may be necessary to prepare the surface. Fill bug holes, air pockets, and other voids with a cement patching compound.

D. Concrete, SSPC-SP13 or NACE 6: This standard gives requirements for surface preparation of concrete by mechanical, chemical, or thermal methods prior to the application of bonded protective coating or lining systems. The requirements of this standard are applicable to all types of cementitious surfaces including cast-in-place concrete floors and walls, precast slabs, masonry walls, and shotcrete surfaces. An acceptable prepared concrete surface should be free of contaminants, laitance, loosely adhering concrete, and dust, and should provide a sound, uniform substrate suitable for the application of protective coating or lining systems.

E. Cement Composition Siding/Panels: Remove all surface contamination by washing with an appropriate cleaner, rinse thoroughly and allow to dry. Existing peeled or checked paint should be scraped and sanded to a sound surface. Pressure clean, if needed, with a minimum of 2100 psi pressure to remove all dirt, dust, grease, oil, loose particles, laitance, foreign material, and peeling or defective coatings. Allow the surface to dry thoroughly. The pH of the surface should be between 6 and 9, unless the products are designed to be used in high pH environments.

F. Copper and Stainless Steel: Remove all oil, grease, dirt, oxide and other foreign material by cleaning per SSPC-SP 2, Hand Tool Cleaning.

G. Exterior Composition Board (Hardboard): Some composition boards may exude a waxy material that must be removed with a solvent prior to coating. Whether factory primed or unprimed, exterior composition board siding (hardboard) must be cleaned thoroughly and primed with an alkyd primer.

H. Drywall - Exterior: Must be clean and dry. All nail heads must be set and spackled. Joints must be taped and covered with a joint compound. Spackled nail heads and tape joints must be sanded smooth and all dust removed prior to painting. Exterior surfaces must be spackled with exterior grade compounds.

I. Drywall - Interior: Must be clean and dry. All nail heads must be set and spackled. Joints must be taped and covered with a joint compound. Spackled nail heads and tape joints must be sanded smooth and all dust removed prior to painting.

J. Galvanized Metal: Clean per SSPC-SP1 using detergent and water or a degreasing cleaner to remove greases and oils. Apply a test area, priming as required. Allow the coating to dry at least one week before testing. If adhesion is poor, Brush Blast per SSPC-SP7 is necessary to remove these treatments.

K. Plaster: Must be allowed to dry thoroughly for at least 30 days before painting, unless the products are designed to be used in high pH environments. Room must be ventilated while drying; in cold, damp weather, rooms must be heated. Damaged areas must be repaired with an appropriate patching material. Bare plaster must be cured and hard. Textured, soft, porous, or powdery plaster should be treated with a solution of 1 pint household vinegar to 1 gallon of water. Repeat until the surface is hard, rinse with clear water and allow to dry.

L. Steel: Structural, Plate, And Similar Items: Should be cleaned by one or more of the surface preparations described below. These methods are used throughout the world for describing methods for cleaning structural steel. Visual standards are available through the Society of Protective Coatings. A brief description of these standards together with numbers by which they can be specified follow.
    1. Solvent Cleaning, SSPC-SP1: Solvent cleaning is a method for removing all visible oil, grease, soil, drawing and cutting compounds, and other soluble contaminants. Solvent cleaning does not remove rust or mill scale. Change rags and cleaning solution frequently so that deposits of oil and grease are not spread over additional areas in the cleaning process. Be sure to allow adequate ventilation.
    2. Hand Tool Cleaning, SSPC-SP2: Hand Tool Cleaning removes all loose mill scale, loose rust, and other detrimental foreign matter. It is not intended that adherent mill scale, rust, and paint be removed by this process. Before hand tool cleaning, remove visible oil, grease, soluble welding residues, and salts by the methods outlined in SSPC-SP1.
    3. Power Tool Cleaning, SSPC-SP3: Power Tool Cleaning removes all loose mill scale, loose rust, and other detrimental foreign matter. It is not intended that adherent mill scale, rust, and paint be removed by this process. Before power tool cleaning, remove visible oil, grease, soluble welding residues, and salts by the methods outlined in SSPC-SP1.
    4. White Metal Blast Cleaning, SSPC-SP5 or NACE 1: A White Metal Blast Cleaned surface, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter. Before blast cleaning, visible deposits of oil or grease shall be removed by any of the methods specified in SSPC-SP1 or other agreed upon methods.
    5. Commercial Blast Cleaning, SSPC-SP6 or NACE 3: A Commercial Blast Cleaned surface, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter, except for staining. Staining shall be limited to no more than 33 percent of each square inch of surface area and may consist of light shadows, slight streaks, or minor discoloration caused by stains of rust, stains of mill scale, or stains of previously applied paint. Before blast cleaning, visible deposits of oil or grease shall be removed by any of the methods specified in SSPC-SP1 or other agreed upon methods.

6. Brush-Off Blast Cleaning, SSPC-SP7 or NACE 4: A Brush-Off Blast Cleaned surface, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, loose mill scale, loose rust, and loose paint. Tightly adherent mill scale, rust, and paint may remain on the surface. Before blast cleaning, visible deposits of oil or grease shall be removed by any of the methods specified in SSPC-SP 1 or other agreed upon methods.
7. Power Tool Cleaning to Bare Metal, SSPC-SP11: Metallic surfaces that are prepared according to this specification, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, mill scale, rust, paint, oxide corrosion products, and other foreign matter. Slight residues of rust and paint may be left in the lower portions of pits if the original surface is pitted. Prior to power tool surface preparation, remove visible deposits of oil or grease by any of the methods specified in SSPC-SP1, Solvent Cleaning, or other agreed upon methods.
8. Near-White Blast Cleaning, SSPC-SP10 or NACE 2: A Near White Blast Cleaned surface, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter, except for staining. Staining shall be limited to no more than 5 percent of each square inch of surface area and may consist of light shadows, slight streaks, or minor discoloration caused by stains of rust, stains of mill scale, or stains of previously applied paint. Before blast cleaning, visible deposits of oil or grease shall be removed by any of the methods specified in SSPC-SP1 or other agreed upon methods.
9. High- and Ultra-High Pressure Water Jetting for Steel and Other Hard Materials: SSPC-SP12 or NACE 5: This standard provides requirements for the use of high- and ultra-high pressure water jetting to achieve various degrees of surface cleanliness. This standard is limited in scope to the use of water only without the addition of solid particles in the stream.
10. Water Blasting, SSPC-SP12/NACE No. 5: Removal of oil grease dirt, loose rust, loose mill scale, and loose paint by water at pressures of 2,000 to 2,500 psi at a flow of 4 to 14 gallons per minute.

M. Vinyl Siding, Architectural Plastics, EIFS and Fiberglass: Clean vinyl siding thoroughly by scrubbing with a warm, soapy water solution. Rinse thoroughly. Do not paint vinyl siding with any color darker than the original color, unless the paint system features Sherwin-Williams VinylSafe technology. Painting with darker colors that are not Sherwin-Williams VinylSafe may cause siding to warp

N. Stucco: Must be clean and free of any loose stucco. If recommended procedures for applying stucco are followed, and normal drying conditions prevail, the surface may be painted in 30 days. The pH of the surface should be between 6 and 9, unless the products are designed to be used in high pH environments such as Loxon.

O. Wood: Must be clean and dry. Prime and paint as soon as possible. Knots and pitch streaks must be scraped, sanded, and spot primed before a full priming coat is applied. Patch all nail holes and imperfections with a wood filler or putty and sand smooth.

3.04 INSTALLATION

A. Apply all coatings and materials with the manufacturer's specifications in mind. Mix and thin coatings according to manufacturer's recommendations.

B. Do not apply to wet or damp surfaces. Wait at least 30 days before applying to new concrete or masonry. Or follow manufacturer's procedures to apply appropriate coatings prior to 30 days. Test new concrete for moisture content. Wait until wood is fully dry after rain or morning fog or dew.

C. Apply coatings using methods recommended by manufacturer.

D. Uniformly apply coatings without runs, drips, or sags, without brush marks, and with consistent sheen.

E. Apply coatings at spreading rate required to achieve the manufacturers recommended dry film thickness.

F. Regardless of number of coats specified, apply as many coats as necessary for complete hide, and uniform appearance.

G. Inspection: The coated surface must be inspected and approved by the Architect just prior to the application of each coat.

3.05 PROTECTION

A. Protect finished coatings from damage until completion of project.

B. Touch-up damaged coatings after substantial completion, following manufacturer's recommendation for touch up or repair of damaged coatings. Repair any defects that will hinder the performance of the coatings.

END OF SECTION

SECTION 10 1400

SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Room and door signs.

B. Interior directional and informational signs.

C. Emergency evacuation maps.

D. Building identification signs.

1.02 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.

B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

C. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2009.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.

C. Signage Schedule: Provide information sufficient to completely define each sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.

1. When room numbers to appear on signs differ from those on the drawings, include the drawing room number on schedule.
2. When content of signs is indicated to be determined later, request such information from Owner through Architect at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
3. Submit for approval by Owner through Architect prior to fabrication.

D. Samples: Submit two samples of each type of sign, of size similar to that required for project, illustrating sign style, font, and method of attachment.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Package signs as required to prevent damage before installation.

B. Package room and door signs in sequential order of installation, labeled by floor or building.

C. Store tape adhesive at normal room temperature.

1.05 FIELD CONDITIONS

A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.

B. Maintain this minimum temperature during and after installation of signs.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Flat Signs:

1. Cosco Industries (ADA signs); ADA Series 1: www.coscoarchitecturalsigns.com.
2. Substitutions: See Section 01 6000 - Product Requirements.

B. Dimensional Letter Signs:

1. Cosco Industries; Cast Aluminum: www.coscoarchitecturalsigns.com.
2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 SIGNAGE APPLICATIONS

A. Accessibility Compliance: Signs are required to comply with ADA Standards and ICC A117.1, unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.

B. Room and Door Signs: Provide a sign for every doorway, whether it has a door or not, not including corridors, lobbies, and similar open areas.
   1. Sign Type: Flat signs with engraved panel media as specified.
   2. Provide "tactile" signage, with letters raised minimum 1/32 inch and Grade II braille.
   3. Character Height: 1 inch.
   4. Sign Height: 2 inches, unless otherwise indicated.
   5. Office Doors: Identify with room numbers to be determined later, not the numbers shown on the drawings; in addition, provide "window" section for replaceable occupant name.
   6. Service Rooms: Identify with the room names and numbers shown on the drawings.
   7. Rest Rooms: Identify with pictograms, the names "MEN" and "WOMEN", room numbers to be determined later, and braille.

C. Interior Directional and Informational Signs:
   1. Sign Type: Same as room and door signs.
   2. Allow for 40 signs 4 inches high by 16 inches long.

D. Emergency Evacuation Maps:
   1. Allow for one map per elevator lobby.
   2. Map content to be provided by Owner.
   3. Use clear plastic panel silk-screened on reverse, in brushed aluminum frame, screw-mounted.

E. Building Identification Signs:
   1. Use individual metal letters.
   2. Mount on outside wall in location shown on drawings.

F. Other Dimensional Letter Signs: Wall-mounted.
   1. Exterior: Allow for total of 50 letters, 6 inches high, metal.
   2. Interior: Allow for total of 50 letters, 6 inches high, metal.

2.03 SIGN TYPES

A. Flat Signs: Signage media without frame.
   1. Edges: Square.
   2. Corners: Square.
   3. Wall Mounting of One-Sided Signs: Tape adhesive.

B. Color and Font: Unless otherwise indicated:
   1. Character Font: Helvetica, Arial, or other sans serif font.
   2. Character Case: Upper case only.
   3. Background Color: Clear.
   4. Character Color: Contrasting color.

2.04 TACTILE SIGNAGE MEDIA

A. Injection Molded Panels: One-piece acrylic plastic, with raised letters and braille.
   1. Total Thickness: 1/4 inch.

2.05 NON-TACTILE SIGNAGE MEDIA

A. Silk Screened Plastic Panels: Letters and graphics silk screened onto reverse side of plastic surface:
   1. Sign Color: Color as selected.
   2. Total Thickness: 1/4 inch.

2.06 ACCESSORIES

A. Concealed Screws: Stainless steel, galvanized steel, chrome plated, or other non-corroding metal.

B. Tape Adhesive: Double sided tape, permanent adhesive.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install neatly, with horizontal edges level.

C. Locate signs where indicated:
   1. Room and Door Signs: Locate on wall at latch side of door with centerline of sign at 60 inches above finished floor.
   2. If no location is indicated obtain Owner's instructions.

D. Protect from damage until Substantial Completion; repair or replace damaged items.

END OF SECTION

SECTION 10 2213
WIRE MESH PARTITIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wire mesh system for elevator hoistway partition and residential storage lockers. .

1.02 RELATED REQUIREMENTS

A. Section 05 5000 - Metal Fabrications.

B. Section 08 7100 - Door Hardware: Cylinders for locksets.

1.03 REFERENCE STANDARDS

A. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2013.

B. ASTM A510/A510M - Standard Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel; 2013.

C. ASTM A510M - Standard Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel (Metric); 2008.

D. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate plan and vertical dimensions, elevations, component details; head, jamb, and sill details; location of hardware. Provide component details, anchorage, and type and location of fasteners.

C. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.

PART 2 PRODUCTS

2.01 WIRE MESH PARTITIONS

A. Wire Mesh Partitions: Factory-fabricated modular assemblies of wall panels, doors, anchors, and accessories as required to provide a complete system and as indicated.
   1. Comply with applicable code for screen mesh opening size.

2.02 MATERIALS

A. Framing Members: ASTM A500/A500M, Grade B cold-formed steel tubing, square and rectangular shaped.

B. Woven Screen Wire: ASTM A510/A510M uncoated crimped steel wire; conforming to the following:
   1. Fill Wire Size: 10 gage, 0.1019 inch.
   2. Mesh Size: 2 by 2 inch.
   3. Mesh Weave Design: Plain weave, double crimp design.

2.03 FASTENERS

A. Bolts, Nuts and Washers: Hot dip galvanized.

B. Anchorage Devices: Provide power driven, powder actuated, and drilled expansion bolts.

C. Exposed Mechanical Fastenings: Flush countersunk screws or bolts, unobtrusively located, consistent with design of structure.

2.04 ACCESSORIES

A. Bracing: Formed sheet steel, thickness determined for conditions encountered, manufacturer's standard shapes, same finish as framing members.

B. Plates, Gussets, Clips: Formed sheet steel, thickness determined for conditions encountered, manufacturer's standard shapes, same finish as framing members.

C. Floor and Ceiling Pilaster Shoe: Manufacturer's standard.

D. Floor Base: Manufacturer's standard.

E. Shop and Touch-Up Primer:

1. Ferrous Surfaces: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

2.05 FABRICATION

A. Fit and assemble in largest practical sections for delivery to site, ready for installation.

B. Make exposed joints flush or tight.

C. Provide components required for anchorage to adjacent construction.

D. Fabricate door for hinged operation in dutch door configuration with shelf.

2.06 FINISHES

A. Shop Finished Surfaces: Black plastic coating.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install items plumb and level, accurately fitted, free from distortion or defects.

3.02 TOLERANCES

A. Maximum Variation From Plumb or Level: 1/4 inch.

B. Maximum Misalignment From True Position: 1/4 inch.

3.03 ADJUSTING

A. Adjust hinged doors to achieve free movement.

3.04 CLEANING

A. Remove temporary protection to prefinished surfaces.

END OF SECTION

SECTION 10 2800

TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Accessories for toilet rooms, showers, residential bathrooms, and utility rooms.

B. Grab bars.

1.02 RELATED REQUIREMENTS

A. Section 08 8300 - Mirrors: Other mirrors.

B. Section 09 3000 - Tiling: Ceramic washroom accessories.

1.03 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities; Final Rule; current edition; (ADA Standards for Accessible Design).

B. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2015.

C. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.

D. ASTM B456 - Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium; 2011.

E. ASTM C1036 - Standard Specification for Flat Glass; 2011.

F. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror; 2008 (Reapproved 2013).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with the placement of internal wall reinforcement to receive anchor attachments.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Toilet Accessories:
   1. ASI - American Specialties, Inc: www.americanspecialties.com.
   2. Bradley Corporation: www.bradleycorp.com.

2.02 MATERIALS

A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
   1. Grind welded joints smooth.
   2. Fabricate units made of metal sheet of seamless sheets, with flat surfaces.

B. Keys: Provide 2 keys for each accessory to Owner; master key lockable accessories.

C. Stainless Steel Sheet: ASTM A666, Type 304.

D. Stainless Steel Tubing: ASTM A269/A269M, Type 304 or 316.

E. Mirror Glass: Annealed float glass, ASTM C1036 Type I, Class 1, Quality Q2, with silvering, protective and physical characteristics complying with ASTM C1503.

F. Adhesive: Two component epoxy type, waterproof.

G. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.

2.03 FINISHES

A. Chrome/Nickel Plating: ASTM B456, SC 2, satin finish, unless otherwise noted.

2.04 TOILET ROOM ACCESSORIES

A. Toilet Paper Dispenser - Residential Units: Single roll, surface mounted bracket type, chrome-plated steel bracketsas noted on drawings.

B. Toilet Paper Dispenser: Double roll, semi-recessed, stainless steel unit with pivot hinge, tumbler lock.

C. Soap Dispenser - Public Restrooms Only: Liquid soap dispenser, wall-mounted, surface, with stainless steel cover and horizontal stainless steel tank and working parts; push type soap valve, check valve, and window gage refill indicator, tumbler lock.
   1. Minimum Capacity: 16 ounces.

D. Mirrors: Stainless steel framed, 1/4 inch thick annealed float glass; ASTM C1036.
   1. Size: As indicated on drawings.
   2. Backing: Full-mirror sized, minimum 0.03 inch galvanized steel sheet and nonabsorptive filler material.

E. Seat Cover Dispenser - Public Restrooms Only: Stainless steel, surface-mounted, reloading by hinged front panel.
   1. Minimum capacity: 250 seat covers.

F. Grab Bars: Stainless steel, nonslip grasping surface finish.
   1. Heavy Duty Grab Bars: Floor supports are acceptable if necessary to achieve load rating.
      a. Push/Pull Point Load: Minimum 1000 pound-force, minimum.
      b. Dimensions: 1-1/2 inch outside diameter, minimum 0.125 inch wall thickness, exposed flange mounting, 1-1/2 inch clearance between wall and inside of grab bar.
      c. Length and Configuration: As indicated on drawings.

2.05 SHOWER AND TUB ACCESSORIES

A. Shower Curtain Rod: Stainless steel tube, 1 inch outside diameter, 0.04 inch wall thickness, satin-finished, with 3 inch outside diameter, minimum 0.04 inch thick satin-finished stainless steel flanges, for installation with exposed fasteners.

B. Shower Curtain:
   1. Shower curtain hooks: Chrome-plated or stainless steel spring wire designed for snap closure.

C. Towel Bar: Stainless steel Type 304, 3/4 inch square tubular bar; rectangular brackets, concealed attachment, satin finish.
   1. Length: 24 inches.
   2. Length: Unless noted otherwise on the drawings.

2.06 RESIDENTIAL ACCESSORIES

2.07 UTILITY ROOM ACCESSORIES

A. Combination Utility Shelf/Mop and Broom Holder: 0.05 inch thick stainless steel, Type 304, with 1/2 inch returned edges, 0.06 inch steel wall brackets.
   1. Drying rod: Stainless steel, 1/4 inch diameter.
   2. Hooks: 2, 0.06 inch stainless steel rag hooks at shelf front.
   3. Mop/broom holders: 3 spring-loaded rubber cam holders at shelf front.
   4. Length: 36 inches.
   5. Length: Manufacturer's standard length for number of holders/hooks.

PART 3 EXECUTION

3.01 PREPARATION

A. Deliver inserts and rough-in frames to site for timely installation.

B. Provide templates and rough-in measurements as required.

3.02 INSTALLATION

A. Install accessories in accordance with manufacturers' instructions in locations indicated on the drawings.

B. Install plumb and level, securely and rigidly anchored to substrate.

C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.
   1. Grab Bars: As indicated on the drawings.

3.03 PROTECTION

A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION

SECTION 10 4400
FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire extinguishers.

B. Fire extinguisher cabinets.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Wood blocking product and execution requirements.

B. Section 09 9123 - Interior Painting: Field paint finish.

1.03 REFERENCE STANDARDS

A. NFPA 10 - Standard for Portable Fire Extinguishers; 2013.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide extinguisher operational features and color and finish.

C. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fire Extinguisher Cabinets and Accessories:
   1. Basis of design: Larsen's Manufacturing Co; ___: www.larsensmfg.com.

2.02 FIRE EXTINGUISHERS

A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.

B. Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gage.
   1. Stored Pressure Operated: Deep Drawn.
   2. Class: 2A-10B:C. Model MP5.
   3. Size: 5 pound.
   4. Finish: Baked polyester powder coat, red color.

2.03 FIRE EXTINGUISHER CABINETS

A. Metal: Formed galvanized steel sheet; 0.036 inch thick base metal.

B. Cabinet Configuration: Semi-recessed type.
   1. Size to accommodate accessories.

C. Door: 0.036 inch metal thickness, reinforced for flatness and rigidity with nylon catch. Hinge doors for 180 degree opening with two butt hinge.

D. Door Glazing: Float glass, clear, 1/8 inch thick, and set in resilient channel glazing gasket.

E. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.

F. Finish of Cabinet Exterior Trim and Door: No. 4 - Brushed stainless steel.

G. Finish of Cabinet Interior: White colored enamel.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install cabinets plumb and level in wall openings, 27 inches from finished floor to inside bottom of cabinet.

3.03 SCHEDULES

A. Corridors and Common Areas: Type 2A:10BC, pressurized, ___in recessed cabinet wall mounting, red color, as indicate in drawings.

B. Parking Garage: Type 2A:10BC, pressurized, bracket-mounted, red color, as indicated in drawings.

END OF SECTION

SECTION 10 5600

BICYCLE STORAGE ASSEMBLIES

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Enclosed Bicycle Lockers
      a. Free-Standing Bicycle Storage Units.
         1) Related Sections: Requirements that relate to this section are included but not limited to the section below.
            (a) Division 03 Section "Cast-in-Place Concrete" for concrete requirements.

B. ADMINISTRATIVE REQUIREMENTS
   1. Pre-installation Meetings:
      a. Pre-Installation Conferences: Contractor to conduct meetings at site with installer and all other trades involved prior to fabrication and start of Work. Familiarize
         1) installer with conditions at site and related Work.

C. ACTION SUBMITTALS
   1. Product Data: Describe the properties of items to be used in the Work. Include the following.
      a. Construction details, material descriptions, dimensions of individual components and
         1) profiles, and finishes for each type of storage unit.
      b. Shop Drawings: Show fabrication and installation of the Work. Include the following.
         1) Include plans, elevations, sections, details, and attachments to other Work.
      c. Samples:
         1) Verification: Furnish materials to be used with labels indicating colors, finish characteristics, and locations of the Work. Samples will be reviewed for color and appearance only. Furnish the following.
            (a) 12 inch (304.8 mm) square in range of finish selected.

D. INFORMATIONAL SUBMITTALS
   1. Sustainability Submittals:
      a. CalGreen:
         1) Documentation and verification data as specified in Division 01 Section “Sustainable Design Requirements” for the following measurements.
            (a) Recycled Content:
               (1) Comply with the requirements indicated in A5.405.4.
               (2) Regional Materials:
               (3) Comply with the requirements indicated in A5.405.1.
               (4) Enhanced Durability and Reduced Maintenance:
               (5) Comply with the requirements indicated in A5.406.1.
               (6) Adhesives, Sealants and Caulks:
               (7) Comply with the requirements indicated in 4.504.2.1.
               (8) Paints and Coatings:
               (9) Comply with the requirements indicated in 4.504.2.2.

E. CLOSEOUT SUBMITTALS
   1. Submit the following.
      a. Maintenance Data:
         1) Maintenance and Operating Manual: Assemble into binder.
            (a) Maintenance Practices: Manufacturer's recommended maintenance practices describing the materials, devices and procedures to be followed in cleaning and maintaining the Work.
            (b) Record documents.
            (c) Sustainable Design Closeout Documentation

F. QUALITY ASSURANCE

1. Regulatory Requirements: Comply with all applicable requirements of the laws, codes, ordinances and regulations authorities having jurisdiction. Obtain necessary approvals from all such authorities.
2. Qualifications:
    a. Contractor: Contractor is responsible for quality control of the Work.
    b. Manufacturer: A firm experienced in successfully producing work similar to that indicated for this Project, with a record of successful in-service performance, and with sufficient production capacity to produce required units without causing delay in the Work.
    c. Installer: An installer trained in the use of the materials and equipment to be employed in the Work.

G. DELIVERY, STORAGE, AND HANDLING
1. Deliver and Acceptance Requirements: Deliver materials in manufacturer's original packaging with label indicating pertinent information identifying the item.
    a. Do not deliver bicycle storage units until spaces to receive them are clean, dry, and ready for installation.
        1) Storage and Handling Requirements: Store materials in accordance with manufacturer's instructions in a protected dry location off ground. Do not open packaging nor remove labels until time of installation.
            (a) Protect bicycle storage units from damage during delivery, handling, storage, and installation.

PART 2 – PRODUCTS

2.01 MATERIALS – GENERAL

A. Single Source Responsibility:
1. Obtain work from a single manufacturer.
    a. Sustainable Requirements:
        1) Provide materials to comply with the requirements of Division 01 Section "Sustainability Requirements".

2.02 MATERIALS

A. Steel Tubing: Cold-formed steel tubing complying with ASTM A 500.

B. Steel Plates, Shapes, and Bars: ASTM A 36.
1. Fasteners: Zinc- or nickel-plated steel, slotless-type exposed bolt heads, and self- locking nuts or lock washers for nuts on moving parts.

2.03 FABRICATION

A. Free-Standing Bicycle Storage Units:
1. Material: Galvanized Steel.
2. Fabricate bicycle storage units square, rigid, and without warp, with metal faces flat and free of dents or distortion.
3. Make exposed metal edges free of sharp edges and burrs, and safe to touch.
4. Basis-of-Design Product:
    a. Subject to compliance with requirements, the design is based on the following manufacturer's product.
        1) Dero "Duplex Two-Tier Bike Rack"
    b. Comparable Product:
        1) Subject to compliance with requirements, the following manufacturer's product will be considered.
        2) Bike Security Racks Co., Inc.
        3) CycleSafe
        4) Palmer Group (bikeparking.com)
        5) Park-a-Bike
        6) Rudy Rack
        7) Saris Cycling Group.

2.04 FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes.

B. Ferrous Metals:
   1. Powder Coating:
      a. Prepare and treat metal to comply with resin manufacturer's written instructions
      b. Prepare uncoated ferrous-metal surfaces to comply with SSPC SP 6, "Commercial Blast Cleaning."
      c. Apply thermosetting polyester or acrylic urethane powder coating with cured-film thickness not less than 1.5 mils.
      d. Color: As selected by Architect from manufacturer's full line.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Examine and correct conditions of area to receive the Work prior to installation.
   1. Proceed with installation only after unsatisfactory conditions have been corrected.

B. INSTALLATION
   1. General: Install system in accordance with manufacturer's printed installation instructions, submittals, applicable industry standards, and governing regulatory requirements for the Work.
   2. Install storage units level, plumb, rigid, and flush according to manufacturer's written instructions.
      a. Anchor bicycle storage units to ceilings, walls and floors, as applicable. Uniformly space units in accordance with manufacturer's directions and securely fasten to substrates.

C. ADJUSTING
   1. Adjust bicycle storage units to operate easily without binding.
      a. Touch up marred finishes, or replace bicycle storage units that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.
         1) Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

D. CLEANING
   1. Clean bicycle storage units surfaces.
   2. Construction Waste Management:
      a. At the end of each work day, recycle or dispose of unused material, debris and containers in accordance with Division 01 Section "Construction Waste Management and Disposal."

E. PROTECTION
   1. Protect the Work so it will not deteriorate or be damaged. Remove protection at time of Substantial Completion.

END OF SECTION

SECTION 10 8200

LOUVERED ARCHITECTURAL SCREENS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Fixed, extruded-aluminum louvered screens.

B. See Division 5 Section "Structural Metal Framing" for structural framing supporting louver sections.

1.02 PERFORMANCE REQUIREMENTS

A. Design: Design louvers, including comprehensive engineering analysis by a qualified engineer, using structural performance requirements and design criteria indicated.

B. Structural Performance: Louvers shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver blade rattle or flutter, or permanent damage to fasteners and anchors.
   1. Wind Loads: Determine loads based on a uniform pressure of 30 lb./sq. ft., acting inward or outward.

1.03 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For equipment screens and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.

C. Samples: For each type of metal finish required.

D. Submittal: For louvers indicated to comply with structural performance requirements and design criteria indicated.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Aluminum Extrusions: ASTM B 221M, Alloy 6063-T5.

B. Aluminum Sheet: ASTM B 209M, Alloy 3003 with temper as required for forming.

C. Fasteners: Use types and sizes to suit unit installation conditions.
   1. For fastening aluminum, use 300 series stainless-steel fasteners.

2.02 FABRICATION, GENERAL

A. Join concealed frame members to each other and to fixed louver blades with fillet welds concealed from view welds, threaded fasteners, or both, as standard with louver manufacturer unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.03 EXTRUDED ALUMINUM SCREEN

A. Horizontal Blade Louvered Screen
   1. Basis-of-Design Product: Architectural Louvers Co. (Harray, LLC); Model V6JN4. Subject to compliance with requirements, provide the specified product or comparable product by one of the following:
      a. Manufacturers of equivalent products submitted and approved in accordance with Section 01 6000 - Product Substitution Procedures.
   2. Louver Blade Depth: 6 inches
   3. Blade Spacing: 4 inch centers
   4. Blade Profile: Narrow profile plain blade without center baffle.
   5. Blade Nominal Thickness: Not less than 0.080 inch.
   6. Framing Support Nominal Thickness: Not less than 0.125 inch

7. Louver Performance Requirements:
    a. Free Area: Not less than 11.3 sq. ft. for 48-inch- wide by 48-inch-high louver assembly.
    b. Horizontal Drag Coefficient: Not greater than 0.31 on a cross sectional profile, allowing for a 69% reduction in wind load imposed horizontally upon supporting structural framing.

2.04 ALUMINUM FINISHES

A. High-Performance Organic Finish: 3-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pre-treat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
    1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Locate and place equipment screens level, plumb, and at indicated alignment with adjacent work.

B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weather-tight connection.

C. Provide perimeter reveals and openings of uniform width to allow for thermal expansion, as indicated.

D. Repair damaged finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory and refinish entire unit or provide new units.

END OF SECTION

SECTION 11 8226
WASTE & RECYCLING COMPACTORS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Waste compactor, component fittings, and accessories.

B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

C. Related Sections

1. Section 149300 - Trash Chutes: Provision of trash chutes. Normally Closed Electrically-Interlocked 15”x15” Side Hinge Thru-Wall Intake Doors.
2. Section 416323 Bin Towing Vehicle Specification
3. Division 26 - Electrical: For electrical wiring and connections for waste compactor.

1.02 REFERENCES

A. ANSI - American National Standards Institute

1. Z245.1 - Safety Requirements for Refuse Collection and Compaction Equipment.

B. NEMA - National Electrical Manufacturers Association

C. NFP A - National Fire Protection Association

1. 70 - National Electrical Code.
2. 82 - Incinerators, Waste and Linen Handling Systems and Equipment

D. NSWMA - National Solid Waste Management Association

E. UL - Underwriters Laboratories Inc.

1.03 SUBMITTALS

A. Product Data: Submit product data for waste compactor specified, including installation instructions for each principal component. Provide shipping, installed, and operating weights.

1. Provide manufacturer’s performance data sheets that indicate the compactor’s NSWMA base size and normal and maximum system pressure, packing force, and force rating of waste compactor specified. Include certified test reports on operation.
2. Provide manufacturer’s color choices for color selection.

B. Shop Drawings: Submit plans, elevations, and details for work not fully shown by published product data; include rough in dimensions and service connection.

C. Wiring diagrams detailing wiring for power and control systems differentiating clearly between manufacturers installed wiring and field installed wiring.

D. Contract Closeout Submittals: Submit maintenance data for waste compactor including operating and maintenance instructions, parts list, parts inventory list, purchase source for operational and maintenance materials, emergency instructions, and similar information. Include name, address, and telephone number of the manufacturer’s nearest service representative.

1.04 QUALITY ASSURANCE

A. Qualifications

1. Manufacturer: Firm experienced in manufacturing waste compactors similar to those indicated for this Project and that have a record of successful in-service performance.
2. Installer: Engage an experienced installer who is an authorized representative of the waste compactor manufacturer for both the installation and maintenance of the type of equipment required for this Project.

3. Maintenance Proximity: Not more than 2 hours normal travel time from the installer's place of business to the Project Site.

B. Electrical Component Standard: Provide components that comply with NFPA 70 and are listed and labeled by UL.

C. Waste Compactor Standards: Comply with applicable requirements of ANSI Z245.1 and NFPA 82.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturers: Apollo Welding & Fabrication, Inc., "A500-R" or equal.

2.02 MATERIALS

A. The compactor body is fabricated from 1/4" steel plate. Compactor ram is constructed of 1/4" sides, top and bottom. The ram face is 1/4" steel plate, reinforced. Header bar is 5" x 5" x 1/2" steel angle. The integral hopper is made of steel plate with a 1/4" back plate to take the impact of falling refuse. The compactor floor is 1/4" thick steel. All steel surfaces shall be acid washed, prime and painted with auto grade enamel paint.

2.03 WASTE COMPACTOR

A. General: Provide manufacturer's standard packaged, prefabricated waste compactor, with selections as indicated to comply with requirements. Provide components that comply with manufacturer's published product literature, and as required for a complete functional system.

1. Compactor Type: horizontal compactor.
2. Chamber Opening: 30"x 30" opening sized to accommodate 30—inch or less diameter trash chute, as specified in Section 14 93 00.
3. Normal/Maximum Packing Force: 17,000 pounds @ 1200 psi/42,0100 pounds at 3,000 psi.
4. Operation: The operation shall be automatically controlled when the compaction chamber fills to the level where the photo sensor activates the compaction ram. The compactor ram shall continue to cycle until all refuse is cleared. Chamber capacity is 0.40 cubic yards with a cycle time is 26 seconds for a displacement per hour of 62 cubic yards. When the container is full, compactor will automatically shut down and activate the full indicator light.
5. Motor: 5 HP 3 Phase Tri-voltage motor (only 208V 3PH is available at this location)
6. Pump Size: 6.5 GPM pump.
7. Cylinders: Two - 3" Bore with 2" rod.
8. Hydraulic Tank: 12 gallons
9. Provide with container 80 percent and 100 percent full lights, multi-cycle mode.
10. Provide top loading hopper with safety interlocked access door on the right or the left and end feed transition chute connected to thru-wall intake door.
11. Provide automatic photo eye activation with time delay for chute deposits with safety interlock that disables automatic function when hopper side door is open.
12. Connect Chute intake doors and Thru-wall intake door normal closed electrical interlock system so compactor can not operate when any intake door is open.
13. Containers: Provide 2 – 2 cubic yard front load narrow containers compatible with local waste and recycling vendor collection equipment. The container(s) shall have a steel door covering the compactor opening, clevis or pintle tow hitch, 2 fixed and 2 swivel molded polyurethane on steel heavy duty casters mounted on a reinforced bottom with quick change caster pads, Overall dimensions: 80 ¼"L x 42 ½"Sides & Bottom: 12g Lids: 14g Lifting Pockets: 7g Caster pads: 10g Reinforcing channels: 10g Casters, Estimated shipping weight: 800 pounds.

2.04 FABRICATION

A. General: Fabricate waste compactor with manufacturer's standard joints and seams, with exposed edges smoothed and eased. Fabricate bins, hoppers, chutes, compaction chambers, unit bodies, and similar components of steel plate with welded joints. Reinforce with structural steel members

sized and spaced to withstand impacts and pressures of normal operations, and sufficient strength to prevent excessive long-term development of waves or valleys.

1. Fabricate with replaceable parts at points of normal wear.

B. Electrical Work: Provide materials, devices, and controls of type and quality recommended by NEMA for applications indicated. Refer to Division 26 Sections for power characteristics and service to equipment units, including disconnect switches.

PART 3 - EXECUTION 3.01 EXAMINATION

A. Prior to beginning installation, examine areas to receive waste compactors. Verify that critical dimensions are correct and that conditions are acceptable.

1. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. General: Install compactors according to manufacturer's instructions.

B. Set compactor securely and accurately in place; plumb, level and properly aligned. Anchor as required for secure operation.

C. Complete field assembly with joints as recommended by manufacturer. Grind welds smooth and restore finish. Comply with NEMA Standards for electrical work.

3.03 DEMONSTRATION

A. Startup Services: Provide the services of a factory authorized service representative to provide startup service and to demonstrate and train the Owner's personnel as specified below.

1. Test and adjust compactor controls and safety features. Replace damaged or malfunctioning controls and equipment. Make necessary adjustments for safe and proper operation of equipment.
2. Instruct the Owner's operational personnel in proper use and maintenance of waste compactors. Demonstrate capacity ratings, safety features, cleaning procedures, and proper methods for storage and handling of raw and processed waste materials.
3. Review data in "Operating and Maintenance Manual".
4. Schedule training with the Owner with at least 7 days' advance notice.

END OF SECTION

SECTION 12 3530
RESIDENTIAL CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Kitchen cabinets.

B. Vanity cabinets.

C. Casework hardware.

1.02 RELATED REQUIREMENTS

A. Section 12 3600 - Countertops.

1.03 REFERENCE STANDARDS

A. BHMA A156.9 - American National Standard for Cabinet Hardware; 2010.

B. KCMA A161.1 - Performance and Construction Standard for Kitchen and Vanity Cabinets; 2012.

C. KCMA (DIR) - Directory of Certified Cabinet Manufacturers; current edition, online.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide component dimensions and construction details.

C. Shop Drawings: Indicate casework locations, scale plans, elevations, clearances required, rough-in and anchor placement dimensions and tolerances.

1.05 QUALITY ASSURANCE

A. Products: Complying with KCMA A161.1.

B. Manufacturer: Company specializing in manufacturing the type of products specified in this section, with minimum five years of documented experience.

1.06 EXTRA MATERIALS

A. Furnish extra paint materials from the same production run as the materials applied and in the quantities described below. Package with protective covering for storage and identify with labels describing contents. Deliver extra materials to Owner.

B. Furnish Owner with additional items as follows:
   1. 1 box cabinet door pads
   2. 15 cabinet door handles
   3. 20 cabinet drawer guides
   4. 20 cabinet door hinges
   5. 3 cabinet doors of each size
   6. 3 cabinet drawers of each size

1.07 MOCK-UP

A. Provide full size mock-up of casework base unit.

B. Locate where directed.

C. Mock-up may remain as part of the Work.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Residential Casework:
   1. Lanz Cabinet Shop, Inc.; www.lanzcabinets.com
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 COMPONENTS

A. Cabinet Construction: Softwood lumber framing and particle board, tempered hardboard gables.

B. Countertops: As specified in Section 12 3600.

C. Door and Drawer Fronts: Wood veneer over particle board.

D. Bolts, Nuts, Washers and Screws: Of size and type to suit application.

E. Concealed Joint Fasteners: Threaded steel.

2.03 HARDWARE

A. Hardware: Manufacturer's standard.

B. Shelf Standards and Rests: Vertical steel standards with rubber button fitted steel rests.

C. Shelf Brackets: Vertical chrome steel standards with chrome steel arms.

D. Drawer and Door Pulls: Chrome wire pulls, 4 inches wide.

E. Catches: Magnetic.

F. Drawer Slides: Extension arms, steel construction.

G. Hinges: Offset pin.

2.04 FABRICATION

A. Shop assemble casework for delivery to site in units easily handled and to permit passage through building openings.

B. Fabricate corners and joints without gaps or inaccessible spaces or areas where dirt or moisture could accumulate.

C. Fabricate each unit to be rigid and not dependent on building structure for rigidity.

D. Provide cutouts for plumbing fixtures, appliances, and fixtures and fittings. Prime paint contact surfaces of cut edges.

E. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

2.05 FINISHES

A. As indicated on the drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of support framing.

3.02 INSTALLATION

A. Install casework, components and accessories in accordance with manufacturer's instructions.

B. Set casework items plumb and square, securely anchored to building structure.

C. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Use filler strips; not additional overlay trim for this purpose.

D. Close ends of units, back splashes, shelves and bases.

3.03 ADJUSTING

A. Adjust doors, drawers, hardware, fixtures, and other moving or operating parts to function smoothly.

3.04 CLEANING

A. Clean casework, countertops, shelves, and hardware.

3.05 PROTECTION

A. Do not permit finished casework to be exposed to continued construction activity.

END OF SECTION

SECTION 12 3600
COUNTERTOPS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Countertops for architectural cabinet work.

B. Countertops for manufactured casework.

1.02 RELATED REQUIREMENTS

A. Section 06 4100 - Architectural Wood Casework.

B. Section 12 3530 - Residential Casework.

1.03 REFERENCE STANDARDS

A. ISFA 2-01 - Classification and Standards for Solid Surfacing Material; 2013.

B. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Specimen warranty.

C. Selection Samples: For each finish product specified, color chips representing manufacturer's full range of available colors and patterns.

D. Test Reports: Chemical resistance testing, showing compliance with specified requirements.

E. Installation Instructions: Manufacturer's installation instructions and recommendations.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

PART 2 PRODUCTS

2.01 COUNTERTOPS

A. Quality Standard: See Section 06 4100.

B. Solid Surfacing Countertops: Solid surfacing sheet or plastic resin casting over continuous substrate.
   1. Flat Sheet Thickness: 5/8 inch, minimum.
   2. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
      a. Finish on Exposed Surfaces: Matte, gloss rating of 5 to 20.
   3. Back and End Splashes: Same sheet material, square top; minimum 4 inches high.

2.02 FABRICATION

A. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.
   1. Join lengths of tops using best method recommended by manufacturer.
   2. Fabricate to overhang fronts and ends of cabinets 1 inch except where top butts against cabinet or wall.
   3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.

B. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.
   1. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.
   2. Height: 4 inches, unless otherwise indicated.

C. Solid Surfacing: Fabricate tops up to 144 inches long in one piece; join pieces with adhesive sealant in accordance with manufacturer's recommendations and instructions.

PART 3 EXECUTION

3.01 INSTALLATION

A. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.

B. Seal joint between back/end splashes and vertical surfaces.

3.02 TOLERANCES

A. Variation From Horizontal: 1/8 inch in 10 feet, maximum.

B. Offset From Wall, Countertops: 1/8 inch maximum; 1/16 inch minimum.

C. Field Joints: 1/8 inch wide, maximum.

3.03 CLEANING

A. Clean countertops surfaces thoroughly.

3.04 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 14 2123

MRL TRACTION ELEVATORS

PART 1 GENERAL

1.01 SUMMARY

A. Section includes: Machine room-less electric traction passenger elevators as shown and specified. Elevator work includes:
   1. Gearless electric traction passenger elevators.
   2. Elevator car enclosures, hoistway entrances and signal equipment.
   3. Operation and control systems.
   4. Accessibility provisions for physically disabled persons.
   5. Equipment, machines, controls, systems and devices as required for safely operating the specified elevators at their rated speed and capacity.
   6. Materials and accessories as required to complete the elevator installation.

B. Related Sections:
   1. Division 3 Concrete: Installing inserts, sleeves and anchors in concrete.
   2. Division 4 Masonry: Installing inserts, sleeves and anchors in masonry.
   3. Division 5 Metals:
      a. Providing hoist beams, pit ladders, steel framing, auxiliary support steel and divider beams for supporting guide-rail brackets.
      b. Providing steel angle sill supports and grouting hoistway entrance sills and frames.
         1) Division 9 Finishes: Providing elevator car finish flooring and field painting unfinished and shop primed ferrous materials.
         2) Division 26, 27, and 28 Sections:
      c. Providing electrical service to elevators, including fused disconnect switches.
      d. Emergency power supply, transfer switch and auxiliary contacts.
      e. Heat and smoke sensing devices.
      f. Convenience outlets and illumination in machine room, hoistway and pit.
   4. Division 23 Heating, Ventilation and Air Conditioning
      a. Heating and ventilating hoistways and machine rooms.

C. Work Not Included: The following preparatory work is required in order to properly install the elevator equipment. The cost of this work is not included.
   1. A plumb and legal hoistway, properly framed and enclosed an including a pit of proper depth, and a pit ladder for each elevator. Drains, lights, access doors, waterproofing and hoistway ventilation, as required.
   2. Provide a suitable control closet with access and ventilation in accordance with all applicable codes and regulations. The control closet shall be maintained at a temperature between 32 F (0 C) and 104 F (40 C). To be measured at 6 feet (1830 mm) above the floor and 1 foot (305 mm) out from the front center of the car controller(s). Relative humidity is not to exceed 95% non-condensing. Local codes may require tighter temperature ranges, and higher ventilation levels, please check with your local code authority for the exact requirements in your area. If your control closet temperatures exceed these requirements, contact your local ThyssenKrupp Elevator sales representative for assistance.
      a. Hoistway must be maintained between 32ºF (0ºC) and 122ºF (50ºC) measured at the machine.
      b. Adequate supports to carry the loads of all equipment, including overhead machine and machine beams located in hoistway including supports for guide rail brackets.
      c. Complete 3 phase connections from the electric power mains to each controller, including necessary circuit breakers and fused mainline disconnect switches.
      d. Electric power of the same characteristics as the permanent supply without charge for the construction, testing and adjusting.
      e. Provide proper piping and conduit.
   3. Divider beams for rail bracket support as required.

a. Cutting of walls floor, etc. and removal of such obstructions as may be necessary for proper installation of the elevator.

4. Grouting of door sills, hoistway frames, and signal fixtures after installation of the elevator equipment.
5. All painting, except as otherwise specified.
6. Provide hoistway walls designed and constructed in accordance with the required fire rating (including those places where elevator fixture boxes, rail bracket fastings, and any other penetration into the hoistway walls).
    a. Temporary enclosures, barricades and other protection from open hoistways and elevator work area during the time the elevator is being installed to meet all permanent installation safety codes. A temporary work platform to be provided at the top landing across the hoistway; if required, it should conform to all code and safety requirements.
    b. Smoke detectorsensing devices and contacts wired to elevator control as required by local code. A means to automatically disconnect the main line power supply to the elevator prior to the application of water in the elevator controller room will be furnished by the electrical contractor. This means shall not be self resetting.
    c. All telephone wiring to controller room control panel, and installation of telephone instrument or other communication equipment in elevator cab with all connections to elevator in controller room.
    d. A standby power source, including necessary transfer switches and auxiliary contact, where elevator operation from an alternate power supply is required.
    e. Adequate storage facilities for elevator equipment prior to and during installation at ground level within 150 feet of hoistway.
    f. Setting of anchors and sleeves.

1.02 SUBMITTALS

A. Product data: When requested, the elevator contractor will provide standard cab, entrance and signal fixture data to describe product for approval.

B. Shop drawings:
    1. Show equipment arrangement in the control closet, corridor, pit and hoistway. Provide plans, elevations, sections and details of assembly, erection, anchorage, and equipment location.
    2. Indicate elevator system capacities, sizes, performances, safety features, finishes and other pertinent information.
    3. Show floors served, travel distances, maximum loads imposed on the building structure at points of support and all similar considerations of the elevator work.
    4. Indicate electrical power requirements and branch circuit protection device recommendations.

C. Powder Coat paint selection: Submit manufacturer’s standard selection charts for exposed finishes and materials.

D. Plastic laminate selection: Submit manufacturer’s standard selection charts for exposed finishes and materials.

E. Metal Finishes: Upon request, standard metal samples provided.

F. Operation and maintenance data. Include the following:
    1. Owners manuals and Wiring diagrams.
    2. Parts list, with recommended parts inventory.

1.03 QUALITY ASSURANCE

A. Manufacturer Qualifications: An approved manufacturer with minimum 15 years experience in manufacturing, installing, and servicing elevators of the type required for the project.
    1. The manufacturer of machines, controllers, signal fixtures, door operators cabs, entrances, and all other major parts of elevator operating equipment.

a. The major parts of the elevator equipment shall be manufactured by the installing company, and not be an assembled system.
2. The manufacturer shall have a documented, on-going quality assurance program.
3. ISO-9001:2000 Manufacturer Certified
4. ISO-14001:2004 Environmental Management System Certified

B. Installer Qualifications: The manufacturer or an authorized agent of the manufacturer with not less than 15 years of satisfactory experience installing elevators equal in character and performance to the project elevators.

C. Regulatory Requirements:
1. ASME A17.1 Safety Code for Elevators and Escalators, latest edition or as required by the local building code.
2. NFPA 70 National Electrical Code.
3. NFPA 80 Fire Doors and Windows.
4. Americans with Disabilities Act - Accessibility Guidelines (ADAAG)
5. Section 407 in ICC A117.1, when required by local authorities
6. CAN/CSA C22.1 Canadian Electrical Code
7. CAN/CSA B44 Safety Code for Elevators and Escalators.

D. Fire-rated entrance assemblies: Opening protective assemblies including frames, hardware, and operation shall comply with ASTM E2074, CAN4-S104 (ULC-S104), UL10(b), and NFPA Standard 80. Provide entrance assembly units bearing Class B or 1 1/2 hour label by a Nationally Recognized Testing Laboratory.
1. Inspection and testing:
a. Elevator Installer shall obtain and pay for all required inspections, tests, permits and fees for elevator installation.
2. Arrange for inspections and make required tests.
3. Deliver to the Owner upon completion and acceptance of elevator work.

1.04 DELIVERY, STORAGE AND HANDLING

A. Manufacturing will deliver elevator materials, components and equipment and the contractor is responsible to provide secure and safe storage on job site.

1.05 PROJECT CONDITIONS

A. Temporary Use:
1. Provide all necessary protection to prevent damage to each elevator used for construction purposes before Substantial Completion.
2. Provide temporary enclosures, coverings, guards, barriers and other devices required to protect the elevator car enclosures, hoistway entrances, signal fixtures and related materials, components and finishes from damage. Protective materials, methods and procedures shall be approved by the elevator manufacturer and paid for by the user.
3. Maintenance during use, including cleaning, lubricating and adjusting equipment and components for proper elevator operation shall be performed only by the elevator manufacturer. Cost for maintenance shall be paid by the user.
4. Elevators shall be free of damage or deterioration at time of Substantial Completion. Cost to repair damaged materials and finishes and replace worn or defective components to restore elevators to their original condition shall be paid by the user.
5. Contractor to sign elevator contractor standard temporary use contract form and agree to pay daily/monthly charge billed monthly.

1.06 WARRANTY

A. Warranty: Submit elevator manufacturer's standard written warranty agreeing to repair, restore or replace defects in elevator work materials and workmanship not due to ordinary wear and tear or improper use or care for 12 months after completion of installation or acceptance thereof by beneficial use, whichever is earlier.

1.07 MAINTENANCE

A. Furnish maintenance and call back service for a period of 3 months for each elevator after completion of installation or acceptance thereof by beneficial use, whichever is earlier, during normal working hours excluding callbacks.

B. Service shall consist of periodic examination of the equipment, adjustment, lubrication, cleaning, supplies and parts to keep the elevators in proper operation. Maintenance work, including emergency call back repair service, shall be performed by trained employees of the elevator contractor during regular working hours.
   1. Submit parts catalog and show evidence of local parts inventory with complete list of recommended spare parts. Parts shall be produced by manufacturer of original equipment.
   2. Manufacturer shall have a service office and full time service personnel within a 100 mile radius of the project site.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturer: Design based around ThyssenKrupp Elevator's Synergy Building-Supported Standard Series Machine Room-Less elevator.

2.02 MATERIALS, GENERAL

A. Colors, patterns, and finishes: As selected by the Architect: see interior design drawings.

B. Flooring by others.

2.03 HOISTWAY EQUIPMENT

A. Platform: Fabricated frame of formed or structural steel shapes, gusseted and rigidly welded with a wood sub-floor. Underside of the platform shall be fireproofed. The car platform shall be designed and fabricated to support one-piece loads weighing up to 25% of the rated capacity.

B. Sling: Steel stiles bolted or welded to a steel crosshead and bolstered with bracing members to remove strain from the car enclosure.

C. Deflector Sheaves: Optamid, Yellow Cast Polyamide material, pressed roller bearings, with removable steel shafts.

D. Guide Rails: Dry, non-lubricated steel, fastened to the building with steel brackets.

E. Guides: Roller guides, with a minimum of three tires, shall be mounted on top and bottom of the car and counterweight frame and be held in contact with the guide rail by adjustable devices.
   1. Buffers: Provide substantial buffers in the elevator pit. Mount buffers on continuous channels fastened to the elevator guide rail or securely anchored to the pit floor. Provide extensions if required by project conditions.
   2. Machine: The hoisting machine shall be a compact energy efficient permanent magnet Gearless traction type flat pancake style, consisting of PMAC motor, brake and driving sheave mounted on a rigid bedplate in the top of the hoistway. A solid, forged shaft shall serve as a support for the motor rotor assembly and for the removable drive sheave and brake system. It shall be supported by roller bearings mounted in the machine housing.
   3. Drive System:
      a. The drive system shall be of the Variable Voltage Variable Frequency (VVVF) Non Regenerative.
      b. The system shall be a vector controlled pulse-width modulated AC drive. The variable voltage variable frequency drive shall convert the AC power supply using a two step process to a variable voltage variable frequency power supply for use by the hoist motor.
      c. The speed control shall be by means of vector control providing direct torque and field excitation automatically provided by permanent magnet. A digital absolute velocity encoder shall be provided giving feedback to the controller on armature position and motor speed.

1) Motor/Machine:
(a) The motor shall be PMAC, totally enclosed, non-ventilated with class "F" insulation. The motor armature shall be dynamically balanced and supported by roller bearings of ample capacity. The armature and driving sheave shall be properly balanced for smooth, high-speed elevator performance. The PM pancake-shape machine shall be mounted horizontally in the top of the hoistway in a unitized formed steel structure on bearing plates furnished by the elevator installer. The unitized formed steel structure shall be securely fastened to the supports supplied by other trades.

4. Brake:
a. The brake shall be a spring applied electric brake; held open by an electro-magnet actuated by a digital brake controller and designed to make smooth, positive stops. The Brake shall be designed to automatically apply in the event of interruption of power supply from any cause. Operation and control of the brake shall be all digital. The setting and lifting of the brake shall be software based and all electronic. All adjustments and setup of the brake shall be made using a PC interface. No contactors or resistors shall be used in the actuation of the brake.

F. Ropes:
1. Provide Steel hoist cables of size and number to ensure proper wear qualities shall be used. Special wedge shackles shall be used.
a. Governor ropes shall be of iron construction.
1) Any special tools, devices, software or equipment required for monitoring the wear of any means of suspension other than standard elevator steel cables shall be included with the installation of the equipment and become the property of the owner at time of elevator completion. This includes special ongoing monitoring systems, special tools and instruction needed to monitor the suspension system.

G. Counterweight:
1. Counterbalance each elevator for smooth and economical operation by using iron or steel plate weights securely fastened in a steel counterweight frame. Counterweight shall equal the weight of the complete elevator car and approximately 50 percent of the specified capacity load.

H. Safety and Governor:
1. Car safety shall be mounted on the bottom members of the car frame and be operated by a centrifugal speed governor. The governor shall be designed to cut off power to the motor and apply the brake whenever the governor indicates the car has excessive speed. The governor shall function when the car over speeds.

I. Emergency Terminal Limits:
1. Place electric limit switches in the hoistway near the terminal landings. Limit switches shall be designed to cut off the electric current and stop the car if it runs beyond either terminal landing.

J. Automatic Self-Leveling:
1. Provide each elevator car with a self-leveling feature to automatically bring the car to the floor landings and correct for over travel or under travel. Self-leveling shall, within its zone, be automatic and independent of the operating device. The car shall be maintained approximately level with the landing irrespective of its load.

2.04 HOISTWAY ENTRANCES

A. Doors and Frames: Provide complete hollow metal type hoistway entrances at each hoistway opening bolteddown construction.
1. Manufacturer's standard entrance design consisting of hangers, doors, hanger supports, hanger covers, fascia plates, sight guards, and necessary hardware.
2. Main landing door & frame finish: Stainless steel panels, no. 4 brushed finish.
3. Typical door & frame finish: Stainless steel panels with no. 4 brushed finish.

B. Interlocks: Equip each hoistway entrance with an approved type interlock tested as required by code. Provide door restriction devices as required by code.

C. Door Hanger and Tracks: Provide sheave type two point suspension hangers and tracks for each hoistway horizontal sliding door.
   1. Sheaves: Polyurethane tires with ball bearings properly sealed to retain grease.
   2. Hangers: Provide an adjustable device beneath the track to limit the up-thrust of the doors during operation.
   3. Tracks: Drawn steel shapes, smooth surface and shaped to conform to the hanger sheaves.

D. Hoistway Sills: Extruded metal, with groove(s) in top surface. Provide mill finish on aluminum.

2.05 PASSENGER ELEVATOR CAR ENCLOSURE

A. Car Enclosure:
   1. See "Finish Material Legend - Amenity Spaces," Sheet ID 6.02.
      a. Doors: Horizontal sliding car doors reinforced with steel for panel rigidity. Hang doors on sheave type hangers with polyurethane tires that roll on a polished steel track and are guided at the bottom by non-metallic sliding guides.
      b. Cab Sills: Extruded sill, mill finish.
      c. Handrail: Provide 1.5" diameter cylindrical metal on side and rear walls on front opening cars and side walls only on front and rear opening cars. Handrails shall have a stainless steel, no. 4 brushed finish.
      d. Ventilation: Manufacturer’s standard exhaust fan, mounted on the car top.
      e. Car Top Inspection: Provide a car top inspection station with an “Auto-Inspection” switch, an "emergency stop" switch, and constant pressure "up and down" direction and safety buttons to make the normal operating devices inoperative. The station will give the inspector complete control of the elevator. The car top inspection station shall be mounted in the door operator assembly.

2.06 DOOR OPERATION

A. Door Operation: Provide a direct or alternating current motor driven heavy duty operator designed to operate the car and hoistway doors simultaneously. The door control system shall be digital closed loop and the closed loop circuit shall give constant feedback on the position and velocity of the elevator door. The motor torque shall be constantly adjusted to maintain the correct door speed based on its position and load. All adjustments and setup shall be through the computer based service tool. Door movements shall follow a field programmable speed pattern with smooth acceleration and deceleration at the ends of travel. The mechanical door operating mechanism shall be arranged for manual operation in event of power failure. Doors shall automatically open when the car arrives at the landing and automatically close after an adjustable time interval or when the car is dispatched to another landing. AC controlled units with oil checks, or other deviations are not acceptable.
   1. No Un-Necessary Door Operation: The car door shall open only if the car is stopping for a car or hall call, answering a car or hall call at the present position or selected as a dispatch car.
   2. Door Open Time Saver: If a car is stopping in response to a car call assignment only (no coincident hall call), the current door hold open time is changed to a shorter field programmable time when the electronic door protection device is activated.
   3. Double Door Operation: When a car stops at a landing with concurrent up and down hall calls, no car calls, and no other hall call assignments, the car door opens to answer the hall call in the direction of the car's current travel. If an onward car call is not registered before the door closes to within 6 inches of fully closed, the travel will reverse and the door will reopen to answer the other call.
   4. Nudging Operation: The doors shall remain open as long as the electronic detector senses the presence of a passenger or object in the door opening. If door closing is prevented for a field programmable time, a buzzer will sound. When the obstruction is removed, the door will begin to close at reduced speed. If the infra-red door protection

system detects a person or object while closing on nudging, the doors will stop and resume closing only after the obstruction has been removed.

5. Limited Door Reversal: If the doors are closing and the infra-red beam(s) is interrupted, the doors will reverse and reopen partially. After the obstruction is cleared, the doors will begin to close.
6. Door Open Watchdog: If the doors are opening, but do not fully open after a field adjustable time, the doors will recycle closed then attempt to open six times to try and correct the fault.
7. Door Close Watchdog: If the doors are closing, but do not fully close after a field adjustable time, the doors will recycle open then attempt to close six times to try and correct the fault.
8. Door Close Assist: When the doors have failed to fully close and are in the recycle mode, the door drive motor shall have increased torque applied to possibly overcome mechanical resistance or differential air pressure and allow the door to close.
9. Door Protection Device: Provide a door protection system using microprocessor controlled infra-red light beams. The beams shall project across the car opening detecting the presence of a passenger or object. If door movement is obstructed, the doors shall immediately reopen.

2.07 CAR OPERATING STATION

A. Car Operating Station, General: The main car control in each car shall contain the devices required for specific operation mounted in an integral swing return panel requiring no applied faceplate. Swing return shall have a brushed stainless steel finish. The main car operating panel shall be mounted in the return and comply with handicap requirements. Pushbuttons that illuminate using long lasting LED’s shall be included for each floor served, and emergency buttons and switches shall be provided per code. midmicroban Switches for car light and accessories shall be provided.

B. Emergency Communications System: Integral phone system provided.
   1. Auxiliary Operating Panel: Not Required
   2. Column Mounted Car Riding Lantern: A car riding lantern shall be installed in the elevator cab and located in the entrance. The lantern, when illuminated, will indicate the intended direction of travel. The lantern will illuminate and a signal will sound when the car arrives at a floor where it will stop. The lantern shall remain illuminated until the door(s) begin to close.
   3. Special Equipment: Not Applicable

2.08 CONTROL SYSTEMS

A. Controller: The elevator control system shall be microprocessor based and software oriented. The system shall operate in real time, continuously analyzing the car(s) changing position, condition, and work load. All controller and operational circuits including the brake control and drive system shall be digital. Control of the elevator shall be automatic in operation by means of push buttons in the car numbered to correspond to floors served, for registering car stops, and by "up-down" push buttons at each intermediate landing and "call" push buttons at terminal landings.

B. Momentary pressing of one or more buttons shall dispatch the car to the designated landings in the order in which the landings are reached by the car, irrespective of the sequence in which the buttons are pressed. Each landing call shall be canceled when answered.

C. When the car is traveling in the up direction, it shall stop at all floors for which car buttons or "up" hall buttons have been pressed. The car shall not stop at floors where "down" buttons have been pressed, unless the stop for that floor has been registered by a car button or unless the down call is at the highest floor for which any buttons have been pressed. Pressing the "up" button when the car is traveling in the down direction shall not intercept the travel unless the stop for that floor has been registered by a car button or unless the up call is the lowest for which any button has been pressed.

D. When the car has responded to its highest or lowest stop, and stops are registered for the opposite direction, its direction of travel shall reverse automatically and it shall then answer the calls registered for that direction. If both up and down calls are registered at an intermediate floor, only the call corresponding to the direction of car travel shall be canceled upon the stopping of the car at the landing.

E. A car that is stopping for the last hall call in the preference direction, and that hall call is for the opposite direction with no onward car calls, shall reverse preference when the selector position advances to the landing at which the car is committed to stop. A car that is stopping for the last hall call in the preference direction, and that hall call is for the same direction, shall hold its preference until the door is almost closed allowing time for a passenger to register an onward car call which will maintain the preference. If no car call is registered before the door is almost closed, the car will lose its preference and shall be available to accept calls in either direction.
   1. Operation: Selective Collective – ETA based. The system is optimized to get a car to the floor where a hall call has been registered, in the shortest time. The system receives input information from standard call pushbuttons located in the hall, car position and car load information from individual car Loadweighers.
      a. When group operation is required, the group supervisory operation shall be embedded within selected car controllers. No separate group controller shall be supplied. The microprocessor shall constantly scan the system for hall calls. When hall calls are registered, the control system shall immediately calculate the estimated time for arrival using such information as, number of floors to travel from the current position, the time it takes to travel one floor at top speed, calls assigned to a car, and car reversal time to respond to a call in the opposite direction of travel. When a car's status changes or additional hall calls are registered, the estimated time of arrival shall be recalculated and calls reassigned if necessary.
      b. Traffic Pattern: The microprocessor shall provide flexibility to meet well defined patterns of traffic, including up peak, down peak, and heavy interfloor demands, and adjust for indeterminate variations in these patterns which occur in buildings.
      c. Artificial Intelligence: Artificial Intelligence shall be an integral part of the group control system software. The enhanced artificial intelligence will optimize the interfloor traffic performance. Inputs for the artificial intelligence shall include accurate passenger load from an electronic loadweigher, probable car calls generated from each hall call, type of building and observed traffic patterns.
   2. Load Weighing Device: Provide a load weighing device on each car which, when the particular car is filled to an adjustable percentage of the capacity load, shall cause the car to bypass landing calls but not car calls. The passed landing calls shall remain registered for the next following car.
   3. The device shall be unaffected by the action of compensating chain or rope. The device shall detect a 50 pound (23 Kg.) load change under all conditions.
   4. The load sensor shall use a linear variable differential transformer to accurately measure the weight in the car. The information shall be transferred via a serial link to the elevator controller.

F. Anti-Nuisance Call Control: The microprocessor control system shall evaluate the number of people on the car and compare that value to the number of car calls registered. If the number of car calls exceeds the number of people by a field programmable value, the car calls shall be canceled after the first call has been answered.

G. Position Selector: The position selector shall be part of the microprocessor system. The car position in the hoistway shall be digitized through a primary position encoder. The microprocessor control system shall store the floor position and slow down points in memory.

H. Motion Control: The drive control system shall be dual-loop feedback system based primarily on car position. The velocity profile shall be calculated by the microprocessor control system producing extremely smooth and accurate stops. The velocity encoder shall permit continuous comparison of machine speed to velocity profile and to actual car speed. This accurate

position/velocity feedback shall permit a fast and accurate control of acceleration and retardation.`

I. Motor Pre-Torque: Current shall be applied to the elevator drive before the brake is released and the speed pattern is dictated to eliminate roll back and sling shot effects of unbalanced loads in the car. The electronic loadweigher shall determine the load on the car determining a pre-torque reference to send to the drive.

1. Emergency Power Operation: (Group 10-D4A) Upon loss of normal power, building-supplied standby power is available to the elevator on the same wires as the normal power.Once the loss of normal power has been detected and standby power is available, one elevator at a time from each group will be lowered to a pre-designated landing and will open the doors. After passengers have exited the elevator, the doors are closed and the car shuts down. The next available car in the group will then be selected to lower, allow passengers to exit, close the doors and shutdown. This process is repeated until all cars in the group have been lowered and parked. At this time, an elevator is automatically allowed to continue service using the building-supplied standby power.A manual selection switch is available to override the automatic selection and allow and car in the group to provide service to the building.When normal power is restored, the elevators automatically resume operation.
2. Destination Dispatch: Not Applicable
3. Automatic Light and Fan shut down: The control system shall evaluate the system activity and automatically turn off the cab lighting and ventilation fan during periods of inactivity. The settings shall be field programmable.
4. Special Operation: Not Applicable

2.09 HALL STATIONS

A. Hall Stations, General: Provide buttons with red-illuminating LED halos to indicate that a call has been registered at that floor for the indicated direction. Provide 1 set of pushbutton risers.
   1. Provide one pushbutton riser with faceplates having a brushed stainless steel finish.
      a. 1. Phase 1 firefighter's service key switch, with instructions, shall be incorporated into the hall station at the designated level.
      b. microbanmid

B. Floor Identification Pads: Provide door jamb pads at each floor. Jamb pads shall comply with Americans with Disabilities Act (ADA) requirements.

C. Hall Position Indicator: An electronic dot matrix position indicator shall be provided and mounted for optimum viewing. As the car travels, its position in the hoistway shall be indicated by the illumination of the alphanumeric character corresponding to the landing which the elevator is stopped or passing. When hall lanterns are provided, the position indicator shall be combined with the hall lanterns in the same faceplate. Faceplates shall match hall stations. Provide at main landing only.

D. Hall lanterns: Not Applicable

E. Special Equipment: Not Applicable

2.10 CONTROL CLOSET

A. A control closet shall be provided adjacent to the hoistway.
   1. The control closet for simplex cars shall be 5'-6" x 6'-4" x 7'-6" high minimum size. For two-car group operation, the control closet shall be 8'-0" x 5'-6" x 7'6" high minimum. The control closet must be within 150'-0" of machine.
   2. The control closet shall have a 3'-0" wide door minimum.
      a. A disconnect shall be provided for each elevator in the control closet by others.

PART 3 EXECUTION

3.01 EXAMINATION

A. Before starting elevator installation, inspect hoistway, hoistway openings, pits and machine rooms, as constructed, verify all critical dimensions, and examine supporting structures and all other conditions under which elevator work is to be installed. Do not proceed with elevator

installation until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.02 INSTALLATION

A. Install elevator systems components and coordinate installation of hoistway wall construction.
   1. Work shall be performed by competent elevator installation personnel in accordance with ASME A17.1, manufacturer's installation instructions and approved shop drawings.
   2. Comply with the National Electrical Code for electrical work required during installa-tion.

B. Perform work with competent, skilled workmen under the direct control and supervision of the elevator manufacturer's experienced foreman.

C. Supply in ample time for installation by other trades, inserts, anchors, bearing plates, brackets, supports, and bracing including all setting tem-plates and diagrams for placement.

D. Welded construction: Provide welded connections for installation of elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance, and replacement of worn parts. Comply with AWS standards for workmanship and for qualification of welding operators.

E. Coordination: Coordinate elevator work with the work of other trades, for proper time and sequence to avoid construction delays. Use benchmarks, lines, and levels designated by the Contractor, to ensure dimensional coor-dination of the work.

F. Install machinery, guides, controls, car and all equipment and accessories to provide a quiet, smoothly operating installation, free from side sway, oscilla-tion or vibration.

G. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with cars. Where possible, delay final adjustment of sills and doors until car is operable in shaft. Reduce clearances to minimum safe, workable dimensions at each landing.

H. Erect hoistway sills, headers, and frames before erection of rough walls and doors; erect fascia and toe guards after rough walls finished. Set sill units accurately aligned and slightly above finish floor at landings.

I. Lubricate operating parts of system, including ropes, as recommended by the manufacturer.

3.03 FIELD QUALITY CONTROL

A. Acceptance testing: Upon completion of the elevator installation and before permitting use of elevator, perform acceptance tests as required and rec-ommended by Code and governing regulations or agencies. Perform other tests, if any, as required by governing regulations or agencies.

B. Advise Owner, Contractor, Architect, and governing authorities in advance of dates and times tests are to be performed on the elevator.

3.04 ADJUSTING

A. Make necessary adjustments of operating devices and equipment to ensure elevator operates smoothly and accurately.

3.05 CLEANING

A. Before final acceptance, remove protection from finished surfaces and clean and polish surfaces in accordance with manufacturer's recommendations for type of material and finish provided. Stainless steel shall be cleaned with soap and water and dried with a non-abrasive surface; it shall not be cleaned with bleach-based cleansers.

B. At completion of elevator work, remove tools, equipment, and surplus mater-ials from site. Clean equipment rooms and hoistway. Remove trash and debris.

3.06 PROTECTION

A. At time of Substantial Completion of elevator work, or portion thereof, provide suitable protective coverings, barriers, devices, signs, or other such methods or procedures to protect elevator work from damage or deteriora-tion. Maintain protective measures throughout remainder of construction period.

3.07 DEMONSTRATION

A. Instruct Owner's personnel in proper use, operations, and daily maintenance of elevators. Review emergency provisions, including emergency access and proce-dures to be followed at time of failure in operation and other building emergen-cies. Train Owner's personnel in normal procedures to be followed in checking for sources of operational failures or malfunctions.

B. Make a final check of each elevator operation, with Owner's personnel pre-sent, immediately before date of substantial completion. Determine that control systems and operating devices are functioning properly.

3.08 ELEVATOR SCHEDULE

A. Elevator #1 and #2:
   1. Elevator Model: synergy Building-Supported Standard Series
   2. Elevator Type: Gearless Traction Machine Room-Less, Passenger
   3. Rated Capacity: 3500 lbs.
   4. Rated Speed: 350 ft/min.
   5. Operation System: TAC50
   6. Travel: 65'-0"
   7. Landings: 7 total
   8. Openings:
      a. Front: 7
      b. Rear: 0
         1) Clear Car Inside: 6' - 8" wide x 5' - 5" deep
   9. Cab Height: 7' - 10" nominal
   10. Hoistway Entrance Size: 3' - 6" wide x 7'-0" high
   11. Door Type: Single Speed
   12. Power Characteristics: 460 volts, 3 Phase, 60 Hz.
      a. Note: Isolation Transformer required for jobs with less than 480vac, 3 Phase building Power.
   13. Seismic Requirements: Zone 3+
   14. Hoistway Dimensions: 8' - 6" wide x 7' - 10" deep, each car.
   15. Pit Depth: 5' - 5"
   16. Button & Fixture Style: Signa4 Signal Fixtures mprotectfix
   17. Special Operations: None

B. Elevator #3:
   1. Elevator Model: synergy Building-Supported Standard Series
   2. Elevator Type: Gearless Traction Machine Room-Less, Passenger
   3. Rated Capacity: 4000 lbs.
   4. Rated Speed: 350 ft/min.
   5. Operation System: TAC50
   6. Travel: 74'-0"
   7. Landings: 8 total
   8. Openings:
      a. Front: 8
      b. Rear: 0
         1) Clear Car Inside: 7' - 8" wide x 5' - 5" deep
   9. Cab Height: 7' - 10" nominal
   10. Hoistway Entrance Size: 3' - 6" wide x 7'-0" high
   11. Door Type: Center-opening

12. Power Characteristics: 460 volts, 3 Phase, 60 Hz.
    a. Note: Isolation Transformer required for jobs with less than 480vac, 3 Phase building Power.
13. Seismic Requirements: Zone 3+
14. Hoistway Dimensions: 9' - 6" wide x 7' - 10" deep
15. Pit Depth: 5' - 5''
16. Button & Fixture Style: Signa4 Signal Fixtures mprotectfix
17. Special Operations: None

END OF SECTION

SECTION 14 9182
TRASH CHUTES

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes: Trash chutes

B. Description: Furnish and install where shown on plans a 30” diameter trash chute and thru-wall intakes with automatic opening low voltage electrically interlocking doors which includes the following features:

1. Building personnel can be notified if a specific intake door is not properly closed.
2. All doors can be locked from a master control panel.
3. All doors can be locked in the event of a life safety alarm.
4. Thru-wall door(s) accessing a compactor will be interlocked with the compactor so as prevent its operation when this door is open.
5. All door open automatically when opening button is pushed and the close automatically after an adjustable period of time

C. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

D. Related Sections

1. Section 11 82 26 - Facility Trash Compactors: Provision of waste compactors.
2. Division 22 - Plumbing: For water service hookups for fire sprinklers and sanitizing units.
3. Division 26 - Electrical: Provision of electrical service.

1.2 REFERENCES

A. ASTM - American Society for Testing and Materials.

1. A240 - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications

B. NFP A - National Fire Protection Association.

1. 13 - Standard for the Installation of Sprinkler Systems.
2. 82 - Standard on Incinerators, Waste and Linen Handling Systems and Equipment.

C. UL - Underwriters Laboratories Inc.

1.3 SUBMITTALS

A. Product Data: Submit product data for each type of chute required. Include standard details and installation instructions for each pre-engineered chute system. Indicate actual selections for sizes and other installation details.

B. Shop Drawings: Submit shop drawings for each type of chute required. Distinguish between factory fabrication and field-assembly work. Show required piping, wiring connections, and conduit runs for wiring. Include layout and installation details and other information not fully detailed in manufacturer’s standard product data and the following:

1. Sections and elevations at 1/4-inch per foot scale.
2. Typical landing plats at 1/2-inch per foot scale.
3. Chute fabrication and installation details, including roof flashing, at 1-1/2 inch per foot scale.

1.04 QUALITY ASSURANCE

C. Qualifications

1. Installer: Engage an experienced installer who has successfully completed installation of chutes similar in material, design, and extent to that indicated for this Project.

2. Fabricator: Provide chutes fabricated by a shop that employs skilled workers who have fabricated chutes similar to those required for this Project with a record of successful in-service performance.

D. Regulatory Requirements: Comply with applicable portions of NFPA Standard No. 82

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Acceptable manufacturers: Wilkinson-Hi-Rise, 2821 Evans St., Hollywood, FL 33020; Telephone: (800) 231-3888, Chute Source LLC Telephone: (330) 733-3996, Wilkinson of Canada Telephone: (866) 535-0558 or equal.

2.02 MATERIALS

B. Chute Metal: Hot-dip, zinc-coated, commercial-quality steel sheet, with G90 coating. Gauge: 0.062-inch thick (U.S. No. 16 gauge).

2.03 INTAKE DOORS

C. Chute Intake Door and Frame Units: Provide ASTM A240, Type 302/304 stainless steel, self-closing intake door units with positive latch and latch handle as shown on the drawings.

1. Locate units at heights indicated. UL Labeled Door Units: Provide B-labeled door units, 1-1/2 hour fire rated with 30-minute temperature rise of 250 degrees Fahrenheit. All doors to include stainless steel trim embossed with the words “RUBBISH” or “RECYCLING”.

2. Chute Door Type: 15” x 18” bottom-hinged with Automatic button opening pneumatic mechanism is designed to preclude the need to grasp, twist, or pinch the control mechanism in order to operate the intake door, slow self-closing with gaskets, positive latching, low voltage electrically interlocked normally closed intake doors with hydraulic closer and operation hardware are to be mounted in an independent compartment as not to reduce the chute throat or thru wall opening volume and with frame suitable for enclosing chase construction. Chute doors to be mounted in a chute section manufactured with a two sloped throat angle; incorporating a 30º and 60º (respectively) slope. Button is pushed to allow automatic opening of the intake door. Doors are provided with lockable “L” handles if pneumatic mechanism is not functioning. Doors are normally locked and can be disabled from the master control panel.

3. Finish: Satin finish.

D. Chute Discharge Door Units: Dual Door with slide guillotine manual door to allow closing the chute when emptying containers and fusible-link, fire-protection, self-closing steel discharge door unit of B label-type construction even though UL label may not be required.

1. Direct Vertical Discharge: Manual Guillotine 10-gauge galvaneal door and 16-gauge galvaneal inclined Type ‘A’ “B” label, horizontally rolling, shutter-type door unit with 165 degree F fusible link.

E. Thru-wall Door and Frame Units: Provide ASTM A240, Type 302/304 stainless steel, self-closing intake door units with positive latch and latch handle as shown on the drawings.

1. Locate units at heights indicated. UL Labeled Door Units: Provide B-labeled door units, 1-1/2 hour fire rated with 30-minute temperature rise of 250 degrees Fahrenheit. All doors to include stainless steel trim embossed with the words “RUBBISH” or “RECYCLING”.

2. Thru-wall Door Type: 15” x 15” side-hinged with automatic button opening pneumatic mechanism is designed to preclude the need to grasp, twist, or pinch the control mechanism in order to operate the intake door, slow self-closing with gaskets, positive latching, low voltage electrically interlocked normally closed intake doors with hydraulic closer and operation hardware are to be mounted as not to reduce the thru wall opening

volume and with frame suitable for the trash collection room wall. Thru-wall doors to be mounted in a compactor sleeve section. Button is pushed to allow automatic opening of the intake door. Doors are provided with lockable “L” handles if pneumatic mechanism is not functioning. Doors are normally locked and can be disabled from the master control panel.

3. Finish: Satin finish.

2.04 ACCESSORIES

F. Fire Sprinklers: Equip chute with sprinklers according to NFPA Standard No. 13, ready for piping connections. Provide access for head maintenance. Unless otherwise required by governing regulations, provide 1/2-inch NPS heads, 1 located in chute above highest intake door, and 1 located at intake door on alternate floors.

G. Flushing Spray Unit at Trash Chute: Provide 3/4-inch NPS spray head unit in chute above highest intake door, ready for hot water piping connection. Provide access for head and piping maintenance. Equip spray unit with disinfecting and sanitizing unit, including 1-gallon tank and adjustable proportioning valve with by-pass for manual control of sanitizing and flushing operation.

H. Isolator Pads & Sound Dampening: BRA-Red Mounts as manufactured by Mason Industries, or equal. Install in accordance with trash chute manufacturer’s recommendations using fasteners as manufactured by Hilti, Inc., or equal. Provide manufacturer’s factory applied premium sound dampening (V-Damp 3680 or equivalent) factory applied to the thickness of the metal on the outside of chute.

I. Master Control Panel: A manually actuated Switch shall be provided to disable all intake doors as required for purposes of system shut-down for service and other needs. Supply power will be 110VAC with a 24 VDC output to the chute intake doors interlocks on each floor.

J. Pneumatic Oil Less Air Compressor with Automatic Drain Valve. 2 HP, Tank Capacity 13 Gallons, Voltage @ 60 Hz 115 Volts, Current 20.0 AMPS to power the chute intake doors.

2.05 FABRICATION

K. General: Provide chute system of type, service, sizes, and shapes indicated. Fabricate chutes of metals and finishes indicated. Factory-assemble chutes with all-welded joints without spiral crimp seams, bolts, rivets, or clips on the interior. Include chute-support units, expansion joint materials at each floor and roof-termination vent unit with counter flashing. Locate integral intake chute throat sections where indicated to accommodate door units specified. Provide intake and discharge door units of type indicated. Provide the manufacturer’s standard fasteners and installation materials.

L. Roof-Termination Vent Units: Provide vent unit with roof-deck flange. Comply with full- diameter vent size requirements in accordance with NFPA 82 and manufacturer’s details. Provide nonferrous metal roof counter flashing compatible with chute metal.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General: Comply with the chute manufacturer’s instructions and recommendations. Assemble components with tight, non-leaking joints. Anchor securely to supporting structure with sufficient anchorages to withstand impact and wind-load stresses on vent units. Provide for thermal expansion movement of chute sections.

B. Install chutes plumb, without offsets or obstructions, for materials to free-fall within chutes. Install chute systems complete with doors and with safety, sanitizing, and fire-resistive components and accessories. Floor mounts shall be installed on isolator pads as detailed and as recommended by the trash chute manufacturer.

C. Coordination with Roofing: Supply roof vents to roofer for installation.

D. Intake and Discharge Doors: Install doors at heights and locations indicated. Provide anchors, wall-to-chute interfaces, self-closing operation, self-latching and similar installation features to comply with labeling and requirements for fire resistive door construction. Interface door units with throat sections of chutes in a manner to ensure safe, snag-proof, sanitary depositing of materials in chutes by users.

E. Sanitizer Unit: Install sanitizer unit where indicated, cutting and patching chute wall only to extent necessary for installation; maintain fire-resistive construction.

3.02 TESTING

F. Test chute system components after installation. Operate doors and locks to demonstrate that hardware is adjusted and electrical wiring is connected correctly.

G. Operate sanitizing equipment through 1 complete cycle of use and cleanup, and demonstrate replenishment of chemicals or cleaning fluids in unit containers.

3.2 DEMONSTRATION

A. Demonstrate use of chute and safety features to the Owner's personnel

END OF SECTION

SECTION 22 00 00

PLUMBING

PART 1 GENERAL

1.01 DESCRIPTION

A. Furnish labor, material and coordination services required for installation of a complete and satisfactorily operating plumbing systems indicated herein. Lack of specific mention of any work necessary shall not lessen Contractor's responsibility or entail any increase in contract price.

B. The Contractor shall include in this price all items of work reasonably inferred by these specifications and drawings and required for compliance with applicable codes to provide such fully functioning facility with all its systems complete. If the Contractor is in doubt as to the intent of any portion of these specifications and drawings or suspects necessary information is omitted, then the Contractor shall notify the Architect in writing in sufficient time for the Architect's clarification's or corrections by addendum.

C. Included: Systems complete with equipment, piping, insulation, controls and related appurtenances. In addition to items specifically indicated, provide miscellaneous items required to result in complete and operable systems. Work to be included under the contract shall include, but not necessarily be limited to the following:

1. Waste, vent and storm drainage piping throughout the building.
2. Domestic hot and cold water systems.
3. Water heaters, circulating pumps and controls.
4. Plumbing fixtures and fittings.
5. Standpipe drains for fire sprinkler system drain down.
6. Floor drains, roof drains and overflow roof drains and piping.
7. Condensate drain piping system for all HVAC units.
8. Natural gas piping, fittings and connections to building gas meter.
9. Coordination with local utility company requirements.
10. Acoustical isolation and firestopping of piping.
11. Rough-in, installation and connection of dishwashers and garbage disposals.
12. Insulation of the domestic hot water supply and return lines, cold water piping and roof drainage piping as required by the specifications.
13. Subcontractor to furnish cleanouts within five (5) feet of all building exterior walls, and connect to sitework water, storm drain and sewer laterals.
14. Shock absorbers at all hot water and cold water connections to equipment equipped with automatic (solenoid) valves.
15. Lead or GSM flashings at roof & wall penetrations.
16. Licenses, permits and fees.
17. Testing and adjustment.
18. Guarantee and warranty.

1.02 INCORPORATED DOCUMENTS

A. The general provisions of the Contract, including General and Supplementary Conditions and Division 1, General Requirements, apply to the work specified in this Section.

1.03 SPECIFICATIONS AND DRAWINGS

A. Provide materials and labor indicated in either specifications or consultant drawings.

B. Drawings are generally diagrammatic except where indicated otherwise. Make adjustments that may be necessary or requested in order to resolve space problems, reserve headroom, and avoid architectural openings, structural members and work of other trades.

C. If any part of specifications or drawings appears unclear or contradictory, apply to Architect for his interpretation and decision as early as possible, including during bidding period.

1.04 CODES AND STANDARDS

A. Provide work in strict accordance with Federal, State, County and City laws, codes, rules and regulations, as well as those of other regulatory agencies having jurisdiction.

B. Provide work in accordance with appropriate standards, codes and recommendations, including those of the following:

1. City of Oakland Municipal Codes.
2. California Administrative Code (CAC).
3. Uniform Building Code (UBC).
4. Uniform Plumbing Code (UPC).
5. National Fire Protection Association (NFPA).
6. Underwriters' Laboratories, Inc. (UL).

1.05 LICENSES, PERMITS AND FEES

A. Refer to General Conditions.

1.06 REVIEW OF CONSTRUCTION

A. Work may be reviewed at any time by representatives of Architect.

B. Maintain on the job a set of specifications and drawings for use by Architect's representative.

1.07 SCHEDULE OF WORK

A. Arrange work to conform to schedule of construction established or required to comply with contract documents. In scheduling, anticipate means of installing equipment through available openings in structure.

1.08 SHOP DRAWINGS

A. Refer to Administrative Requirement.

1.09 SUBMITTALS

A. Refer to Administrative Requirements.

B. In addition to Architect's General Requirements, it shall be the responsibility of the subcontractor to demonstrate, by the use of manufacturer's data, shop drawings, and written descriptions, that equipment proposed will fit within the design's structural, dimensional, electrical, and any other performance parameters.

1.10 OPERATING AND MAINTENANCE INSTRUCTIONS

A. Instruct Owner's operating personnel in all respects of system operation and 3maintenance as soon as possible after systems are in operation.

B. Service manuals:

1. Provide to owner two (2) sets, each permanently bound and tabbed for easy reference, of service manuals incorporating all installed equipment for each division of work.
2. Instructions for routine maintenance, including part numbers and quantities of replacement parts, filters, and other consumables.
3. Names, addresses and phone numbers of contractors and subcontractors shall be included on a front page in each manual, and shall also be posted in equipment rooms in locations directed by the Architect.

1.11 PROJECT RECORD DOCUMENTS

A. Refer to Administrative Requirements.

B. In addition to changes made during course of work, clearly indicate by dimensions from column lines, exact location, type, and function of any concealed valves, dampers, and controllers.

1.12 ELECTRICAL REQUIREMENTS

A. Electrical work in this Division shall conform to requirements of Electrical Division.
B. Starters: All starters shall be furnished by this Division, installed and connect complete under Electrical Division.
C. Disconnects: Except for disconnects factory mounted on plumbing equipment, or in combination starters, motor disconnects are in Electrical Division.
D. Power Wiring: All power wiring 120 volt and above is in Electrical Division.
E. Control Wiring: Provide control wiring for starter holding coils, relays and controls. All control and interlock wiring shall be furnished, installed and connect complete by Mechanical Division unless otherwise noted.
F. Furnish, install and connect complete, controllers, relays, transformers, switches, etc., required by work of this Division.

1.13 RELATED WORK

A. Section 23 00 00, HVAC SYSTEMS.

B. DIVISION 02 -Sitework drawings and specifications.

C. DIVISION 26 -Electrical.

1.14 GUARANTEE

A. Subcontractor shall supply a written guarantee dated for one (1) year from the date of final acceptance by the Owner or notice of completion, whichever occurs later. The guarantee shall state that all work executed under this section is free from defects of materials and workmanship and shall further guarantee that Subcontractor shall at Subcontractor's own expense, repair and replace all such defective work, and all other work damaged thereby, which becomes defective during the term of the guarantee.

B. Refer to General Conditions for further requirements, as apply.

C. Provide extended guarantees where called for herein or on drawings.

D. This guarantee also applies to services including Instructions, Adjusting, Testing, Noise, Balancing, etc.

1.15 WARRANTY

A. This contractor shall provide as a part of his contract a written warranty for a period of one (1) year from the date of the notice of completion. This Warranty shall provide for all repairs at no cost to the Owner when such repairs are due to faulty workmanship or materials supplied under this contract. Contractor shall also deliver to the Architect all brochures, operating instructions, parts lists and warranty certificates from the manufacturers of the equipment installed on this project.

PART 2 PRODUCTS

2.01 MATERIALS

A. Materials and equipment shall be new, shall be current models of manufacturers, and shall bear complete identification by manufacturer.

B. Materials and equipment shall be guaranteed by manufacturer to equal or exceed specified, submitted and published pressure ratings, capacities, etc.

2.02 PIPING AND FITTINGS

A. Pressure piping systems:

1. WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING:

    a. Copper Tubing: ASTM B88, Type K, hard drawn. Fittings; ANSI/ASME B16.29, wrought copper. Joints: ANSI/ASTM B32, 95/5 (tin/antimony) solder, Grade 95TA.

2. WATER PIPING, ABOVE GRADE:

    a. Copper Tubing: ASTM B88, Type L, hard drawn. Fittings: ANSI/ASME B16.23, cast brass, or ANSI/ASME B16.29, wrought copper. Joints: ANSI/ASTM B32, 95/5 (tin/antimony) solder, Grade 95TA.

    b. CPVC pipe, ASTM D1784 & D2846, socket weld fittings with solvent cement per ASTM F493.

3. NATURAL GAS PIPING, BURIED WITHIN 5 FEET OF BUILDING: Not Used.

4. NATURAL GAS PIPING, ABOVE GRADE: Steel Pipe: ASTM A53 or A120, Schedule 40 black, Fittings: ANSI/ASME B16.3, malleable iron, or ASTM A234, forged steel welding type. Joints: Screwed for pipe two inches and under; ANSI/AWS D1.1, welded, for pipe over two inches. Galvanized pipe with ANSI/AWWA C105 polyethylene jacket or double layer, half- lapped 10 mil polyethylene tape at exterior conditions.

B. Drainage piping systems:

1. SANITARY SEWER & STORM DRAIN PIPING BELOW GRADE:

   a. Cast Iron Pipe: CISPI 301, hubless, service weight. Fittings: Cast iron. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies.

   b. Polyvinyl Chloride (PVC): Pipe: ASTM D2729. Fittings: Solvent Welded Socket Type: Use solvent cement, ASTM D2564;

2. SANITARY SEWER & STORM DRAIN PIPING, ABOVE GRADE:

   a. Cast Iron Pipe: CISPI 301, hubless, service weight. Fittings: Cast iron. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies.

   b. Copper Pipe: ASTM B306, DWV. Fittings: ANSI/ASME B16.3, cast bronze, or ANSI/ASME B16.29, wrought copper. Joints: ANSI/ASTM B32, solder, Grade 50B.

   c. Polyvinyl Chloride (PVC): Pipe: ASTM D2729. Fittings: Solvent Welded Socket Type: Use solvent cement, ASTM D2564; Threaded Type: Use tape or lubricant specifically intended for use with PVC plastic pipe.

3. CONDENSATE DRAIN PIPING:

   a. Type M copper tubing.

C. Pipe Threads: ANSI B2.1

D. Fittings and Flanges: Standard products as manufactured by CRANE, STOCKHAM, or MUELLER, or the respective manufacturer of piping as herein before specified. E. Unions:

1. For steel piping 2" and smaller: GRINNELL Fig. 554, or CRANE, 250 lb. ground joint.

2. Steel piping larger than 2": Welding flanges as herein before specified.

3. Copper piping: MUELLER No. WC-407, or CHASE.

F. Di-Electric Isolation: Make di-electric connections in all domestic water systems where ferrous and non-ferrous materials are joined. Di-electric connections shall consist of threaded brass pipe, minimum 6 inches long, installed between ferrous and non-ferrous piping.

2.03 DRAINAGE AND PIPING SPECIALTIES

A. Items shall be as manufactured by ZURN, JOSAM, or JAY R. SMITH.

B. Refer to drawings for sizes, locations, and other information.

C. CLEANOUTS

1. Exterior Surfaced Areas: Round cast nickel bronze access frame and non-skid cover.

2. Interior Finished Floor Areas: Galvanized cast iron, two piece body with double drainage flange, weep holes, reversible clamping collar, and adjustable nickel-bronze top, round with scoriated cover.

3. Interior Finished Wall Areas: Line type with lacquered cast iron body and round epoxy coated gasketted cover, and round stainless steel access cover secured with machine screw.

D. FLOOR DRAINS

1. Coated cast iron two piece body with reversible clamping collar, and round, adjustable nickel-bronze strainer; provide trap primer where required by code.

E. AREA DRAINS

1. Coated cast iron two piece body with reversible clamping collar, and square, adjustable nickel-bronze strainer.

2.04 VALVES

A. NIBCO except as otherwise noted ; or JENKINS, STOCKHAM, RED-WHITE.

B. Asbestos packing is prohibited.

C. Shut-off:

1. Cold, Hot and Recirculating Hot Water:

   a. Two inches and smaller: Ball, Fed. Spec. WW-V-35, Type II, Class A, Style 3, with solder end connections.

   b. Larger than two inches: Butterfly, iron body, aluminum bronze disc, 416 stainless steel stem, EPDM seat, wafer design, lever operator to six inch size, gear operated and crank for eight inches and above, 200 pound water oil gas (WOG), Fed. Spec WW-V-1967.

2. Fuel Gas:

   a. Two inches and smaller: Semi-steel body, eccentric plug valve, with bronze plug, screwed, 175 pound WOG. Butterfly valve, threaded, Fed. Spec. WW-V-1967, Type B.

   b. Larger than two inches: Semi-steel body eccentric plug valve, with bronze plug, flanged, 175 pound WOG.

D. Balancing:

1. Hot Water Recirculating, two inches and smaller: Combination type, calibrated, bronze with bronze disc, equipped with readout valves with integral check valve, indexing position pointer and calibrated name plate, internal EPDM seals and factory molded insulating enclosures.

E. Check: Stainless steel body and trim, spring type, 125 pound WSP.

F. Hose Bibbs: Wall-mounted, chrome plated with integral vacuum breaker, loose key, and locking shield. NIBCO Series VB-LS or equivalent CHICAGO FAUCET. Provide dedicated shut-off valve in building at all hose bibbs.

G. Relief Valves: Bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuated, capacities ASME certified and labeled.

2.05 PIPING SPECIALTIES

A. Thermometers: WEKSLER "Adjust-Angle," TRERICE, PHILADELPHIA, or WEISS, red- reading tube, cast aluminum case and separate sockets including cap and chain. 7" scale.

B. Thermometer Wells: Of same manufacturer as, and suitable for thermometers provided; with cap and chain.

C. Pressure Gauges:

1. In water lines: WEKSLER, TRERICE, WEISS or MARSH Standard Gauge Model J8454, 3-1/2" dial, plain case, 1/4" bottom connection, recalibrator bushed movement, 0 to 200 psig range.

2. Compound gauges in water lines: MARSH Standard Guide Model J8418, 3-1/2" dial, plain case, 1/4" bottom connection, recalibrator bushed movement, 30" Hg, 150 psig range.

D. Test Plug: PETERSON ENGINEERING COMPANY, "Pete's Plug" No. 110 with brass body and NORDEL valve core, suitable for 1000 psig and 275 degrees Fahrenheit. Locate where required for balancing and where indicated on drawings. Coordinate with balancing firm.

E. Strainers:

1. C.M. BAILEY No. 100A in steel piping and C.M. BAILEY No. 100B in copper tubing.

2. Bottom shouldered with gasket, brass plug and removable screen.

3. 2" and smaller: 250#, threaded, 20 mesh monel screen.

4. 2-1/2" to 4": 125#, flanged, 3/64" perforated brass screen.

F. Flashings: Flashings for piping, where same penetrates roof and where required, shall be made of 4 lb. lead sheet, not less than 6" in all directions of pipe, to which a seamless riser of same material and not less than 12" in height shall be attached. Furnish and install 4 lb. lead seamless counterflashing on each flashed vent pipe.

2.06 BACKFLOW PREVENTERS

A. Provide a backflow prevention device at any point in the plumbing system where the potable water supply comes in contact with a potential source of contamination. Device shall be certified by the American Society of Sanitary Engineers. See drawings for sizes and locations.

B. FEBCO #825Y or approved equal assembly of two spring loaded “Y” pattern check valves and one differential relief valve. Bronze body. 175 psi max working pressure, 32 – 140 degrees F temperature range.

2.07 BACKWATER VALVE

A. Flap type, hinged or pivoted, with revolving disc. Cast iron body with cleanout of sufficient size to permit removal of interior parts. Hinge, pivot, disc and seat shall be nonferrous metal. Normal position of disc shall be slightly open. Extend the cleanout to the finished floor and fit with threaded countersunk plug. Provide clamping device wherever the cleanout extends through the membrane waterproofing.

2.08 WATER PRESSURE REDUCING VALVES

A. Direct-acting valves (2” size and smaller) – WILKINS model 600 – ASTM 584 cast bronze body, with integral bypass check valve and strainer with separate access port. Adjust pressure setpoint as called for on drawings.

2.09 HANGERS AND SUPPORTS

A. General: SUPERSTRUT, except as otherwise noted, UNISTRUT, or FEE & MASON. Properly support material, equipment, and apparatus. Hangers and supports shall have minimum safety factor of five, based on ultimate tensile or compressive strength, as applicable of material used. Turnbuckles shall have capacity of not less than attached rod. Use proper manufactured supports throughout. Do not use makeshift materials such as wire, tape, wood blocks, etc., in lieu of proper supports. Comply with applicable requirements of ANSI B31.1 for piping. Do not cut or weld to any structural steel without permission of Architect. Do not support weight of piping from mechanical equipment; i.e., pump flanges, coil connections, etc.

B. Horizontal piping: Series C-711 hangers.

C. Individual grouped piping: Horizontal channel with Series 702 straps. D. Risers: Series C-720 as indicated on the drawings.

E. Pipe: Not fewer than two supports per section.

F. Insulation saddles: 20 gauge galvanized sheet metal; formed as a half cylinder, to protect insulation at supports of insulated pipe. Saddle length not less than three times insulation outside diameter; 12" minimum length.

G. Dielectrical isolators: Provide Series 715 or 716 isolators between uninsulated copper water piping and hangers.

H. Suspended horizontal piping shall be supported with hangers spaced at maximum distances as per CPC code. Spacing shall be decreased as necessary to prevent sagging and vibration. Install additional hangers at branch connections and not over 12" from each change in direction. On straight runs of pipe, hangers shall be spaced not over 5 feet apart for cast iron piping near hubs at each section, with separate hanger for each branch over 3 feet long. Each suspended length of "no-hub" piping shall be supported with two hangers to insure no sags in installation. Minimum of three hangers shall be used for single "Y" fittings and four hangers shall be used for double "Y" fittings.

2.10 ESCUTCHEONS

A. GRINNELL as specified, or BESTON-CORBIN; Fig. 2 for copper tubing; Fig. 13 for steel pipe; polished chrome plated.

B. Provide at exposed piping penetrations of walls, floors and ceilings. "Exposed" means finished rooms, including storage, janitor and mechanical rooms.

C. Where piping is insulated, escutcheons shall fit insulation outside diameter.

2.11 ACCESS PANELS

A. Architectural access panels are provided in another section of the Specifications.

2.12 PIPE INSULATION

A. Domestic hot water piping shall be insulated with OWENS-CORNING, or approved equal, fiberglass insulation with self-sealing all-service jacket. Insulation shall be continuous through supports, and shall be protected at supports with galvanized pipe shields.

B. Insulate all domestic water piping per Title 4 energy code requirements.

C. Provide insulation under handicapped lavs and kitchen sinks for P-traps and hot water piping with flexible vinyl as manufactured by SKAL-GARD or HANDI LAV GUARD.

D. Insulate elbows with flexible fiberglass blanket and secure polyvinyl chloride tape. Insulate other fittings and appurtenances with premolded or mitered sections of pipe insulation.

2.13 CONNECTIONS TO FIXTURES AND EQUIPMENT

A. General: Provide complete fixture assembly, including all trim and appurtenances for proper operation and neat, finished appearance. Procure all rough-in data from manufacturer, and rough-in and connect to fixtures as required.

B. Submissions: Include brochure complete with description of all trim. C. Trim:

1. All exposed trim, including tubing, traps and waste pieces, shall be polished chrome.

2. Provide separate speedway control stops for each fixture water connection; polished chrome plated.

3. "P" Traps: Adjustable, 1-1/4 inch inlet, 1-1/2 inch outlet, for lavatories, 1-1/2 inch by 1-1/2 inch for sinks except as noted.

4. Gasket floor mounted fixtures and grout with non-hardening Tile-fix.

2.14 FIXTURES

A. Refer to schedule on drawings for fixture requirements and selection.

B. Plumbing fixtures shall be high quality fixtures as manufactured by KOHLER, STERLING, MOEN, DELTA.

2.15 GAS-FIRED WATER HEATER PACKAGE

A. System of gas-fired direct heating domestic water boilers, circulating pumps, controls, piping and valving, storage tank shall be Teledyne Laars , Raypak, AO Smith or equal. The installation shall include seismic support bracing for all equipment and be made in compliance with all state and local codes and ordinances.

B. Minimum of two gas-fired high efficiency type water tube ASME boilers, with copper finned tube heat exchanger, one inch OD, 13 gage steel boiler tubes and copper tube heat exchanger with bronze heads, steel jacket with glass fiber insulation.

C. Boilers with gas burner, thermometer and pressure gauges, immersion thermostats for operating and high limit protection, 100 percent safety shut-off electric gas valve with transformer, electronic safety pilot and pilot burner, gas pressure regulator, manual gas shut-off, low water cut off, ASME rated temperature and pressure relief valve, expansion tank, draft invertor

D. Controls shall include Heat Timer sequencer water heater controller matching water temperature to demand and shall include sensors, thermometers and accessories. In addition to modulating set point temperature based on hot water demand, controller shall be set to automatically switch leading and lagging firing sequence on a first on / first off basis. Water heaters initial start up shall be by manufacturers representative.

E. Provide three-way self-contained thermostatic valve, full line size, bronze body set at 120 degrees F.

D. Burners shall be modulating, down-fired, power venting, with electronic temperature controls, and direct spark ignition.

E. Accessories shall include temperature & pressure relief valve, powered non-sacrificial anode, and condensate neutralizer.

F. Units shall have a five-year factory warranty.

2.16 CIRCULATOR PUMPS

A. Taco, Grundfos, Bell and Gossett or equal. Casing: Bronze, rated for 125 psig working pressure. Impeller: Bronze. Shaft: Alloy steel with integral thrust collar and two oil lubricated bronze sleeve bearings. Seal: Carbon rotating against a stationary ceramic seat. Drive: Flexible coupling.

2.17 DOMESTIC HOT WATER STORAGE TANKS

A. Tank shall be factory insulated to R-16 foamite with enameled coated steel jacket. The tank shall be supplied with an adjustable angle thermometer with brass well, aquastat controller with copper well and an AGA/CGA certified temperature and pressure relief valve. Di-electric insulators must be installed on all water connections to the tank.

2.18 DOMESTIC WATER SUB-METER

A. Client shall engage water sub-meter company to provide sub-meter meter equipment, electronic meter reading equipment and design service. Contractor shall install domestic water sub-meters as provided by the water sub-meter company

2.19 PRESSURE BOOSTER PUMP

A. Furnish and install Triplex VFD (variable frequency drive) Pressure Booster Pumping System as manufactured by Patterson, Armstrong, Bell & Gossett, Flowtherm or equal. The system shall be fully assembled piped, wired, tested and mounted on steel frame. System shall include bronze fitted pumps, shut-off valves, pressure reducing check valves on pump discharge, thermal protection, pressure gauges and open drip-proof motors. Controls shall include UL listed Nema 1 cabinet with motor starters, transformers, HOA switches and controls.

B. System: Packaged with three pumps, factory assembled, tested, and adjusted; shipped to site as integral unit; consisting of pumps, valves, and galvanized piping, with control panel assembled on fabricated steel base with structural steel framework.

C. Controls and Instruments: Locate in NEMA 250 Type 1 general purpose enclosure with main disconnect interlocked with door, fused circuit for each motor, magnetic starters with three overloads, control circuit transformer with fuse protection, selector switch for each pump, low limit pressure switch, low pressure alarm light, running lights, current sensing devices, minimum run timers, manual alternation, and suction and discharge pressure gages.

D. Lead Pump: Operate continuously with lag pumps operating on system demand. Should lead pump fail to operate, next pump in sequence shall start automatically.

E. Time Delay Relay: Prevent lag pumps short cycling on fluctuating demands.

F. Thermal Bleed Circuit with Solenoid Valve: Prevent overheating during low demand.

G. Low Pressure Control: Stop pump operation if incoming water pressure drops to atmospheric.

H. Pump Switch: Permit manual or automatic operation.

PART 3 EXECUTION

3.01 GENERAL

A. All workmanship shall be of highest quality, by persons especially skilled at assigned tasks, and shall result in a neat and clean installation.

B. Install materials and equipment in compliance with manufacturer's directions and governing codes.

C. Verify that conditions are satisfactory for the installation of materials and equipment. Notify Architect if conditions are not satisfactory and do not commence work until conditions have been corrected.

D. Equipment: Accurately set and level with supports neatly placed and properly fastened. Properly fasten equipment in place with bolts to prevent movement in earthquake.

E. Electrical:

1. Refer to Electrical Section of specifications.

3.02 EXCAVATING AND BACKFILLING

A. General: Trench bottoms shall be cut to suit required grades of piping. Grading shall be done as may be necessary to prevent surface water from flowing into trenches or other excavations, and any water accumulating therein shall be removed by pumping or by other approved methods. Under no circumstances lay pipe or install appurtenances in water; keep excavations free from water until work has been inspected. Presence of ground water in soil or necessity of sheeting or bracing of excavations shall not constitute a condition for which any increase may be made in contract price.

B. Trench Excavations: Trenches shall be of necessary width for proper laying of pipe. Banks of pipe trenches shall be as nearly vertical as practicable. Care shall be taken not to over excavate. Bottom of trench shall be accurately graded to provide uniform bearing and support for each section of pipe on sand bed at every point along its entire length, except for portions of pipe sections where it is necessary to excavate for bell holes and for proper sealing of pipe joints, and as hereinafter specified. Bell holes and depressions for joints shall be dug after trench bottom has been graded, and, in order that pipe rests on prepared bottom for as near its full length as practicable, bell holes and depressions shall be made only of such length, depth and width as required for properly making the particular type of joint. Stones shall be removed as necessary to avoid point bearing. Trenches shall be dug upgrade. Minimum trench width shall be 18". Except as hereinafter specified for wet or otherwise stable material, overdepths shall be backfilled as and with materials specified for backfilling the lower portion of trenches. Whenever wet or unstable material that is incapable of properly supporting pipe, as determined by Architect, is encountered at bottom of trench, such material shall be removed to depth required and trench backfilled to proper grade with suitable approved material. Special requirements relating to specific utilities are as follows:

1. Sanitary Sewer and Storm Drainage Piping: Width of trench at and below top of pipe shall be such that clear space between barrel of pipe and trench wall shall not exceed 8" on either side of pipe. Width of trench above that level shall be as wide as necessary for sheeting and bracing and proper performance of work. Bottom quadrant of pipe shall rest firmly on sand bed for as near the full length of barrel as proper joining operations will permit. Piping shall be bedded on 4" thick layer of clean, washed sand.

2. Excavation for Appurtenances: Excavation for sumps and similar structures shall be sufficient to leave at least 12" in the clear between outer surfaces and embankment, or timber that may be used to hold and protect banks. Any overdepth excavation below such appurtenance that has not been directed by Architect will be considered unauthorized and shall be refilled with sand, gravel or concrete, as directed, and at no cost to Owner.

C. Backfilling:

1. Trenches shall not be backfilled until required pressure tests are performed and locations of pipes are recorded. Sheeting shall not be removed until excavations are substantially backfilled. Where, in opinion of Architect, damage is likely to result from withdrawing sheeting, the sheeting shall be left in place.

2. Lower Portion of Trench: Immediately after making joints, trench shall be backfilled to spring line of pipe with sand. Sand backfill shall be carefully packed under haunches of pipe, and brought up simultaneously on both sides of pipe so as to prevent any displacement of pipe from its true alignment. Backfill material for sanitary sewer, storm sewer, and water piping shall be clean, washed sand which shall be deposited until there is a cover of not less than one foot over pipe under building and 6" over pipe outside of building.

3. Balance of backfill shall be excavated earth, free of organic matter, dampened and tamped in 6" layers, to a 90% compaction in accordance with ASTM D1557-58T; 95% compaction for trenches below paved areas. Note: Jetting or flooding shall not be permitted.

D. After backfill is completed, remove unused excavated materials from site. Installation shall prevent settlement and shall be satisfactory to Architect.

3.03 VIBRATION AND SEISMIC CONTROL

A. Piping:

1. No electrical conduit, fixture, ceiling suspension wires or other elements of the building construction may attach to or abut against piping systems.

2. Contain rough-in of piping within stud wall cavities no less than 1/4-inch from the plane of the studs.

B. Vibration Isolation Installation

1. Install vibration isolation equipment in full accordance with the manufacturer's instructions.

3.04 WATERPROOF CONSTRUCTION

A. Maintain waterproof integrity of penetrations of materials intended to be waterproof. Provide flashings at exterior wall and roof penetrations.

3.05 PROTECTION OF MATERIALS

A. Completely cover motors and other moving machinery and plumbing fixtures to protect from dirt and water during construction.

B. Perform work in manner precluding unnecessary fire hazard.

3.06 GENERAL INSTALLATION - PIPING SYSTEMS

A. Work into complete, integrated arrangement with like elements to make work neat appearing, finished.

B. Run concealed, except as directed otherwise; where exposed, parallel with walls or structural elements unless so indicated on Drawings or approved by Architect; vertical runs plumb; horizontal runs level, parallel with structure or uniformly pitched as appropriate.

C. Install with adequate passageways free from obstructions, as high as practicable to maintain adequate head room, as required. Notify Architect before installation whenever head room of less than 8-feet 0-inches will result. Coordinate with work of other Divisions to achieve proper head room as specified in this Division.

D. Clearance: Do not obstruct spaces required by Code in front of electrical equipment, access doors, etc.

E. Install piping to best suit field conditions and cooperate with other trades. Except for large scale details, piping is diagrammatically indicated and shall be generally installed as shown. Do not scale drawings for exact location of piping.

3.07 INSTALLATION OF PIPING

A. Definition of "Piping": The term "piping" as used in specifications, means all pipe, fittings, nipples, valves, unions, etc., as may be required for a complete, functional system.

B. Securely fasten all piping in the building to the building construction.

C. Piping in any partitions, through plates, studs, etc., shall have sufficient clearance from structure to allow for expansion, contraction of piping. No bare piping shall touch wood, concrete, metal, etc., at any time.

D. Wherever changes in size of pipes occur, make changes with reducing fittings. Bushings not permitted on pressure piping.

3.08 PIPING JOINTS

A. Perform pipe cutting and end preparation to result in clean ends with full inside diameter.

B. Mechanical Grooved Joints:

1. Cut or roll grooved. Grooves in accordance with latest manufacturer's published recommendations. All components of the mechanical grooved piping system in accordance with the manufacturer's latest specification for temperature pressure and suitability.
2. Provide manufacturer instruction manuals and assist the contractor in training assembly personnel. Submit notification of instruction.

C. Soldered and Brazed Joints:

1. Use Silfos or Silvaloy 15 silver solder (brazing) with 15-percent silver, 80-percent copper and 5-percent phosphorous for copper water pipe 2-inches and larger, all underground or underfloor piping.
2. Use lead free solder for other copper pipe.
3. Clean surfaces to be jointed, of oil, grease, rust and oxides.
4. Cut copper tubing with copper tube cutters.

D. Steel Pipe:

1. Only American Standard pipe threads shall be used for IPS threaded work.
2. Unless otherwise indicated, welding shall be permitted on 2-1/2-inch and larger black steel pipe lines.

E. Copper Tubing:

1. Branches may be cut into 2-inch and larger type L or K copper tubing using Bonney "Brazolets". T-Drill tee pulled joints acceptable where permitted by local code.
2. When erecting plated, polished or soft metal tubing, friction wrenches shall be used exclusively.

F. Copper to Steel Connections:

1. Make all copper pipe connections to ferrous piping with dielectric couplings or isolation flanges.
2. Make buried copper or brass piping connections to steel or cast iron piping with dielectric isolation flanges, field wrapped with two layers of "Scotchwrap" or equal, applied according to manufacturer's instructions. Each layer of wrapping shall have 1/2-inch overlap. Extend wrapping 5 feet minimum in all directions from connection. Cover taped piping with 15-pound tar of asphalt saturated felt jacket taped in place, to provide protections during backfill.

3.09 FITTINGS

A. Provide standard, manufactured fittings in all cases. Field fabricated fittings are prohibited.

B. Make branch take-offs with reducing tees or with line size tees and reducers.

3.10 HANGERS AND SUPPORTS INSTALLATION

A. General: Properly support all material, equipment, and apparatus. Minimum safety factor of five (5), based on ultimate tensile or compressive strength, as applicable, of material used.

B. Use proper manufactured supports throughout. Do not use makeshift materials such as wire, tape, wood blocks, etc.

C. Trapeze suspension (trapeze hangers may be used for parallel lines if pipes pitch same direction): Size channel assembly in accordance with manufacturer's published load ratings. Deflections not to exceed 1/360 of a span (refer to Superstrut load tables).

D. Do not weld to any structural steel without permission of Architect.

E. Supports from wall shall be steel brackets, hooks, clamps attached to wall with anchor bolts.

F. Install riser clamps at each floor.

G. Adjust each hanger to carry its proper share of load.

H. Install additional supports and/or braces if, during test or normal operation, piping should sway, crawl or vibrate.

I. Comply with California Building Code and Stanford Seismic Criteria.

3.11 INSULATION INSTALLATION

A. Install materials in accordance with manufacturer's instructions.

B. On exposed piping, locate insulation and cover seams in least visible locations.

C. For insulated pipes conveying fluids above ambient temperature:

1. Provide standard jackets, with or without vapor barrier, factory applied or field applied.
2. Insulate fittings, joints, and valves with insulation and PVC fitting covers of like material and thickness as adjoining pipe.
3. Finish with glass cloth and adhesive.
4. PVC fitting covers shall be used at all joints and fittings.
5. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations.

D. Finish insulation at supports, protrusions, and interruptions.

E. For pipe exposed in mechanical equipment rooms or in finished spaces below 10 feet above finished floor, finish with aluminum jacket.

F. For exposed piping at all lavatories and kitchen sinks, apply premolded foam sections selected and sized to fit components, including both hot and cold water supplies, and wastes. Trim and adjust as needed for neat, smooth fit. Secure with adjustable, self-locking nylon ties. Locate tie strip locks out of view and trim excess within 1/8” of all locks.

G. Pipe Insulation at Penetrations of Fire Barriers : Wrap pipe with Firestop pipe insulation, seal jacket seam and seal end joints to adjacent sections of insulation. Seal opening between insulation and pipe sleeve with UL listed firestopping material.

3.12 FIXTURE AND TRIM INSTALLATION

A. General:

1. Fixture layout shall conform to dimensions as shown on architectural plans.

2. Flat Rim Sink Trim: When applicable, all flat rim sink units shall be installed with "Hudee" or approved equal stainless steel trim.

3. Stops: All fixtures shall be provided with stops. All stops not integral with flush valves or faucets shall be located as inconspicuously as possible below the fixture.

3.13 SOUND CONTROL

A. All drainage piping and copper water piping systems shall be isolated with minimum 1/2" thick felt or equal from any structural members, wall sections or other materials that could transmit sound to the occupied areas. Hubbard “Hold-rite”, TSP “Acousti-Plumb”, Lasco felt pipe wrap, Stoneman "Trisolators or equal.

1. Pipes 1" and smaller shall be hung and/or secured with Hubbard “Holdrite” acoustical pipe clamps or equal.

2. Pipes larger than 1" shall be isloated and/or secured with Hubbard “Holdrite”, Lasco felt pipe wrap or equal..

B. Piping shall be kept a minimum of 1/8" clear from all framing, structure and gypsum board throughout the building. Firestop / caulk annular openings as required by local building codes.

1. Conform to restrictions on cutting framing members as shown on structural Drawings.
2. Openings in gypsum board walls shall be patched and sealed airtight with fire-resistant caulking.
3. Piping concealed in walls and furred spaces shall be securely anchored to prevent noise under vibration or pressure change conditions.
4. Incidental contact of the water supply or drainage piping system with other building elements should be avoided. Where contact is unavoidable, use felt of 3/8" thickness at the points of contact.

3.14 SEISMIC RESTRAINTS

A. Tolco manufacturer or equal. Seismic restraints shall be constructed in accordance with the requirements of Section 2312 of the Uniform Building Code. Seismic restraints must be installed and adjusted so that the equipment and piping vibration isolation is not degraded by the restraints.

3.15 RESTORATION OF DAMAGE

A. Repair or replace, as directed by Architect, materials and parts of premises which become damaged as result of installation of work of this Division.

B. Remove replaced parts from premises.

3.16 CLEANING

A. See Clean-Up Section.

B. Clean and sterilize piping before connecting equipment.

C. Clean equipment and materials. Remove foreign materials including dirt, grease, splashed paint and plaster, etc. Restore to original condition any finish damaged.

D. Clean, by flushing, interior of water piping. Upon completion of flushing, completely drain systems at low points; remove, clean and replace strainer baskets and refill systems. Provide means of isolating and draining systems separately from existing building systems.

E. Domestic Water Systems:

1. After above specified flushing, draining and refilling, sterilize domestic water systems in accordance with requirement of public health agency having jurisdiction, if applicable. Otherwise use procedure specified below.

2. Sterilize domestic water systems with 4% chlorine solution injected into system to concentration of 50 parts per million and allow to stand for 24 hours. After this period, purge throughout entire structure at outlets, by actual operation, for period not less than five minutes per outlet. Operate flush valves twice.

3. After completing sterilization and flush-out, test to ensure that levels of chlorine, and cultures/bacteria are acceptable per local health department standards. Certify to the Architect, in writing, that specified sterilization has been performed and that test results are acceptable to the health department.

3.17 TESTING

A. Provide test specified hereinafter and as otherwise required. Provide test equipment including test pumps, gauges, instruments and other equipment required. Pressure gauges used shall be graduated in increments not greater than five psi and shall have range of approximately twice test pressure. Gauges and instruments shall have been recently calibrated.

B. Where testing is specified, or otherwise necessary, completed installation shall comply with requirements hereinafter specified. Provide replacement materials and additional labor as may be required to accomplish this compliance.

C. Piping:

1. Remove from systems, during testing, equipment which would be damaged by test pressure. Replace removed equipment after testing. Systems may be tested in sections as work progresses. However, any previously tested portion shall become part of any later test of composite system. Correct leaks by remaking joints with new material; makeshift remedies will not be permitted. Test time will be accrued only while full test pressure is on system.

2. Do testing before backfilling or concealing.

3. Perform tests in accordance with following schedule. Unless indicated otherwise, "Tolerance" shall be no pressure drop, except that due to temperature change, in 24-hour period.

TEST SYSTEM	MEDIUM	PRESSURE	TOLERANCE
Domestic Water	"	150 psig	---
Soil & Waste	"	Top/Vent	No Leaks 2 Hr
Vents	"	Top/Vent	No Leaks 2 Hr
Natural Gas	Air	50 psig	---

D. Valves: Test valve bonnets for tightness. Test operate valves from closed-to-open-to-closed position while valve is under test pressure. Test automatic valves, including solenoid valves, expansion valves, water regulating valves, pressure reducing valves, pressure relief valves for proper operation at settings indicated. Test relief valves, safety relief valves, safety valves and temperature and pressure relief valves three times.

E. Piping Specialties: Test thermometers, pressure gauges and water meters for accurate indication; automatic water feeders, air vents, and vacuum breakers for proper performance.

F. Hangers and Supports: With systems in normal operation, test hangers, supports and rods to insure they are plumb and supporting proper share of load. Additionally support, as required, systems and equipment that sway, crawl, or vibrate.

G. Temperature Control: Test control functions to assure that systems are controlling as required, and that controls are adjusted to maintain proper temperatures.

H. Other Materials and Equipment: Test equipment for proper rotation. Test other materials and equipment as specified, as recommended by equipment manufacturer.

3.18 IDENTIFICATION OF PIPING

A. All exposed piping is to be identified with Brady Perma-Code or approved equal self-sticking pipe markers that indicate pipe working fluid and directions of flow, all on A.S.A. color background.

3.19 OPERATION DURING CONSTRUCTION

A. Operate any portion of installation for Owner's convenience if so required by Architect. Such operation does not constitute acceptance of work as complete. Cost of utilities, such as gas and electrical power will be borne by Owner if operation is requested by Owner.

3.20 STARTUP SERVICE

A. Prior to startup, be assured that systems are ready, including checking the following: proper equipment rotation, proper wiring, auxiliary connections, lubrication, venting controls and installed and properly set relief and safety valves. Start and operate all systems including temperature controls.

B. Provide manufacturer’s representative technician startup at the following equipment:

1. Domestic water heating systems.

2. Domestic water pressure booster pump systems.

3.21 ADJUSTING

A. Adjust equipment and system components as indicated on drawings or as otherwise required to result in intended system operation. Thereafter, as a result of system operation or as directed by Architect, make readjustments as necessary to refine performance and to effect complete system "tune-up."

3.22 GUARANTEE

A. Contractor shall supply a written guarantee dated for one (1) year from the date of final acceptance by the Owner or notice of completion, whichever occurs later. The guarantee shall state that all work executed under this section is free from defects of materials and workmanship and shall further guarantee that he shall at his own expense, repair and replace all such defective work, and all other work damaged thereby, which becomes defective during the term of the guarantee.

B. Refer to general Administrative Requirements for further requirements.

END OF SECTION

SECTION 23 00 00

HEATING, VENTILATION AND AIR CONDITIONING

PART 1 - GENERAL

1.1 REFERENCE

A. The General Conditions in Division 1, Supplementary Conditions, Information to Bidders, the Architectural Specifications and Structural Specifications and drawings, and all supplements issued thereto are a part of these specifications and the accompanying drawings and are binding upon all drawings as applicable.

B. Failure to examine and to be familiar with the Contract documents shall not relieve any contractor of responsibility or be used as a basis for additional compensation due to the omission of architectural or structural details from the mechanical drawings or specifications. If not included herewith, all pertinent documents are available at the Architect's office.

1.2 WORK INCLUDED

A. Residential/ Common Areas:
   1. Complete forced air supply, return, and exhaust systems, including all ductwork, registers, diffusers, insulation, filters, and appurtenances thereto, as required, specified herein, and/or indicated on the mechanical plans.
   2. Split system heat pumps with rooftop mounted outdoor units for each residential dwelling unit.
   3. Mechanical ventilation for each residential dwelling unit.
   4. Bathroom exhaust system.
   5. Kitchen range hood exhaust system.
   6. Split system heat pumps with rooftop mounted outdoor units for common areas.
   7. Corridor ventilation.
   8. Fire dampers with access panels as indicated on drawings.
   9. Provide independent HVAC for elevator equipment rooms, electrical rooms and janitor rooms as indicated on the drawings

1.3 WORK NOT INCLUDED

A. Primary and secondary condensate drains.

1.4 DRAWINGS AND SPECIFICATIONS

A. The intent of the mechanical specifications and drawings is to provide documents for installations which will be complete in every respect and which will operate properly. Any apparatus, appliance, material, appurtenance, or labor, not mentioned in the specifications or not shown on the drawings, that may be necessary to complete the work in accordance with the purpose of these documents, shall be furnished.

B. Drawings are diagrammatic and cannot show every connection or every line of piping in its exact location. Details are subject to the requirements of ordinances, structural, and architectural conditions. Carefully investigate structural and finish conditions affecting the Work and furnish all fittings and accessories required to give satisfactory operation.

C. Where discrepancies exist between the drawings or between the drawings and specifications, or where there is a conflict in the specifications, the Contractor shall base the bid upon, and

furnish, the better quality or greater quantity of work or material called for, unless otherwise ordered in writing by the Owner.

D. The Contractor shall be responsible for properly using the information on the drawings and in the specifications. All dimensional information shall be obtained from the appropriate drawings for all new construction and by taking actual measurements at the site for existing facilities. In no case shall drawings be scaled for exact dimensions.

E. Visit the site, verify all existing items indicated on the drawings and in the specifications and become familiar with existing working conditions, hazards, grades, actual formations, soil conditions and local requirements. Contractors shall accept conditions as they exist and each bid shall reflect all costs occasioned by these conditions. The lack of specific information on drawings in respect to site conditions shall not relieve the Contractor of this responsibility nor be reason for any extra charges after the Contract is signed.

F. There shall be no deviations from the Contract Documents without written approval of the Architect. Secure a written interpretation from the Architect for any questionable item in the Contract Documents, prior to installation.

1.5 SHOP DRAWINGS & SUBMITTALS

A. Refer to General Conditions of the Contract.

B. Submittals under this section shall include the following items, as applicable:
   1. Heating, ventilating and air conditioning plan showing duct layout, piping, details of all equipment and equipment schedules.
   2. Cooling, heating and ventilating equipment.
   3. Grilles and registers.
   4. Insulation.

C. Submit shop drawings, catalog data and diagrams for approval in all cases where deviations for the Contract Documents are contemplated because of substitution equipment or job conditions. Also submit detailed shop drawings for all special or custom-built items or equipment.

D. The Contract Documents are based on specific equipment, accessories, processes and arrangements. Approval of submittals indicates only the acceptance of the manufacturer and quality and in no way relieves the Contractor for errors or omissions in the submittals or compliance with the intent of the Contract Documents.

1.6 DELIVERY, HOISTING, SCAFFOLDING, STORAGE

A. Refer to General Conditions.

1.7 INDUSTRY STANDARDS

A. The following industry standards shall apply, as applicable to the Work of this section, except where the requirements of the Contract Documents are more stringent.

1. CMC 2013 CMC
2. CBC 2013 CBC
3. AGA American Gas Association
4. AMCA Air moving & Conditioning Association
5. ANSI American National Standards Institute
6. ASME American Society of Mechanical Engineers
7. ASHRAE American Society of Heating, Refrigeration & Air Conditioning Engineers
8. ASTM American Society of Testing Material
9. AWWA American Water Works Association
10. GVI Gas Vent Institute
11. IEEE Institute of Electrical & Electronic engineers
12. IES Illuminating Engineering Society
13. NBFU National Board of Fire Underwriters
14. NEC National Electrical Code
15. NFPA National Fire Protection Association
16. OSHA Occupational Safety and Health Administration
17. UL Underwriter's Laboratories
18. SMACNA Sheet Metal and Air Conditioning Contractor's national Association.

1.8 CODES AND ORDINANCES

A. Perform the Work in strict accordance with the local, state and national codes and ordinances; and the regulations and requirements of other ruling authorities having jurisdiction. The requirements of the codes, ordinances, and regulations of the authorities shall not relieve the Contractor from the responsibility of the requirements of the Contract Documents where specific conditions call for a higher quality or greater quantity of work than the requirements of the authority.

1.9 FEES

A. Obtain and pay for all licenses required by all authorities having jurisdiction for work on the project.

1.10 GUARANTEE

A. All equipment, materials and labor shall be guaranteed against defects in material and installation for a period of one year from final acceptance by owner. The guarantee shall include lost refrigerant and oils which is a result of defective materials or faulty installation, without additional cost to the Owner. A five-year warranty shall be required for air conditioning compressors.

B. Properly register the guarantees of equipment to protect the warranty. Contractor's and manufacturer's guarantees executed by the Contractor shall be presented to the Owner prior to final acceptance inspection.

PART 2 - PRODUCTS

2.1 FAN COIL UNITS

A. Furnish direct-expansion fan coil units. Units shall be of the type and capacity scheduled on the drawings. Units shall be compatible for heat pump operation.

B. Unit enclosures shall be constructed of galvanized steel with factory applied baked enamel finish. Unit enclosures shall be fully insulated for noise reduction and to maximize efficiency. Units shall be equipped with the throwaway filter with an integral filter rack. Mechanical contractor to include one additional filter for Owner/General Contractor to change out when the unit is ready to turnover.

C. Fans shall be forward curved with double inlet, mounted on motor shaft, dynamically and statically balanced. The fan shall deliver the scheduled cfm. Provide with multi-speed motors, factory lubricated resilient mounting and internal overload protection. Fan-motor assemblies shall be removable for service.

D. Coils shall be constructed with aluminum plate fins bonded to nonferrous tubing with joints brazed. Manual air vents shall be provided on heating coils and refrigerant-metering devices shall be provided on cooling coils.

E. Units shall be equipped with primary and secondary condensate connections.

F. Cooling control kit shall contain a 40 VA control circuit transformer (24-volt), indoor fan relay, line voltage terminal block and a low voltage terminal strip. Cooling control kit shall contain a 40 VA control circuit transformer (24-volt), indoor fan relay, line voltage terminal block and a low voltage terminal strip.

G. Thermostats for units shall be low voltage type with manual switching for heating/off/cooling and fan control - on/automatic.

H. Access panels shall be factory furnished, see drawings for model/type.

2.2 HEAT PUMP AIR HANDLER (Common Areas)

A. Equipment shall be as manufactured by Carrier, or approved substitute.

B. Units shall be equipped with electric heating coil, primary/secondary drains, high efficiency cooling coil, insulated drain pan and control transformer. Units shall be compatible for electric heat/ DX cooling.

C. Blower shall be centrifugal type, statically and dynamically balanced. Motor shall have factory lubricated bearings and shall be multi-speed, direct drive.

D. Casing shall be hot galvanized steel.

2.3 AIR COOLED HEAT PUMPS

A. All heat pump units shall be assembled on a heavy-gauge integral steel base. Units will be weather proofed and include hermetic compressor, condenser coil, fans and motors, controls, and holding charge of refrigerant. Units to have removable panels which allow access to all controls and motor components.

B. Unit frame one-piece welded assembly of heavy-gauge zinc-coated steel. Exterior surfaces will be cleaned, phosphatized and finished with an air dry enamel finish.

C. Direct-drive hermetic reciprocating compressor with integral suction accumulator: two-point lubrication for each bearing and connecting rod; and well; suction gals cooled and have a voltage utilization range rubber-in-shear isolators. Motors will be suction gas cooled and have a voltage utilization range plus or minus 10 percent or nameplate voltage. Two winding thermostats embedded between the three motor windings will protect against excessive winding temperatures.

D. Condenser Fan and Motors: Direct drive fan, statically and dynamically balanced, with aluminum blades and zinc-plated steel hubs. Motor with permanently lubricated ball bearings, built-in current and thermal overload protection, and weather-tight slingers over bearings.

E. Condenser Coil: Air-cooled. Configurated aluminum fin secondary surfaces mechanically bonded to primary surface of 3/8 inch OD seamless copper tubing. Subcooling circuits(s) with liquid accumulator(s) standard. Factory testing at 450 psig air pressure. Vacuum dehydrated.

2.4 DUCTS, GRILLES & THERMOSTATS

A. Flexible ducts shall be a factory assembly consisting of a galvanized spring steel wire helix, a continuous inner liner wrapped with a nominal 1 in. thick by 1 lb./cu. ft. density glass fiber insulation. The assembly shall be enclosed in a class 1-fire resistive vapor barrier jacket factory sealed at each end. The flexible duct shall be listed by UL and shall conform to the 90-A class 1 requirements of the NFPA.

B. Interior ductwork shall be supported from the building structure. Ductwork shall be concealed, except in strictly mechanical or utility spaces.

C. Fiberglass duct board to be Owen-Corning or approved equal.

D. Air inlets and outlets to be Tru-Aire or approved equal.

E. Thermostat to be Honeywell model Vision Pro 8000 WiFi, digital night set back thermostat.

F. Furnish and install UL listed fire dampers as shown on mechanical plans and as required in accordance with code requirements. Fire dampers to be manufactured by Pottorff series CFD or approved equal.

2.5 VENTILATING SYSTEMS

A. Furnish and install all ventilating systems as shown on the drawings, and as required for complete, properly operating systems, and in accordance with local codes and ordinances.
   1. Exhaust fans shall be as scheduled on the mechanical drawings.
   2. Exhaust ductwork shall be prime grade galvanized sheet metal or flexible aluminum where allowed by codes.
   3. Dryer vent assemblies shall be made of smooth aluminum or galvanized sheet metal construction, complete with end fittings. All joints in dryer vent duct shall be made without the use of screws; it shall be taped with Fasson or equal duct tape.

2.6 QUALITY ASSURANCE

A. Unless otherwise specified, all materials used on the project shall be new and of the quality specified. All like materials shall be of the same manufacturer and model unless otherwise specified.

B. All materials of a type for which the underwriter's Laboratories have established a standard shall be listed by the Underwriter's Laboratories and shall bear the UL label.

C. By submitting a bid on the Work, the Contractors set forth that they have the necessary technical training and ability to perform the Work in a satisfactory manner by skilled workers, properly licensed and experienced in their respective trades, up to the best standard of the trade, complete and in good working condition.

2.7 SUBSTITUTION OF EQUIPMENT

A. The design of mechanical systems are based on equipment of specified manufacturers and information published in their standard catalogs. Substitution equipment shall be complete with all components, trim arrangements and other accessories which are cataloged as standard equipment by the specified manufacturer, whether or not these items are specifically scheduled in the drawings or specifications. Any additional items that may be required by the substitute equipment manufacturer for proper operation of equipment within the intent of the Contract Documents shall also be furnished. Optional items shall be included as required by the Contract Documents. Approval of submittal data shall not relieve the Contractor from this requirement.

B. Coordinate the substitute item with the work of other trades in regards to electrical characteristics, motor starters, horsepower, space requirements, ingress and egress, and other such characteristics peculiar to the substitute equipment that will affect the work of other trades.

C. The noise level of substitute equipment shall not exceed the noise level of specified equipment.

D. Contractor shall bear all costs in connection with any changes required by the individual characteristics of the substitute equipment.

E. Should any substitute equipment prove unsatisfactory during installation or during the guarantee period, the Contractor shall replace the substitute equipment with the specified equipment upon direction of the Owner.

2.8 EQUIPMENT BASES AND FOUNDATIONS

A. Each piece of equipment shall be provided with an approved base and foundation, as required by the Contract Documents.

B. Condensing units, at the recreation/leasing building, shall be mounted on a four-inch concrete thick pad provided by the General Contractor.

2.9 ACCESS PANELS

A. A permanent access door or panel conforming to the interior surroundings and approved by the Architect shall be provided for each piece of equipment or device concealed under the floor, above ceiling, in walls or other inaccessible areas where access may be required for maintenance, inspection, or for emergency conditions. The access assembly shall be sized according to the intended use for the equipment or device served.

PART 3 - EXECUTION

3.1 MANUFACTURERS RECOMMENDATIONS

A. Delivery, storage, protection and installation of all equipment shall be in strict accordance with the manufacturer's recommendations.

B. All workmanship shall be performed by skilled mechanics using the best standard practices of the trade.

3.2 DUCT CONSTRUCTION

A. Construct in accordance with latest edition of the ASHRAE Guide and SMACNA Standards.

B. All ductwork shall be erected to the dimensions as indicated on the drawings.

C. Duct dimensions shown are net inside dimensions.

D. Flexible duct: Install flexible duct in fully extended condition, free from sags, kinks, sharp radius turns or offsets, supported at or near mid-length with two inch wide 28 gauge steel hanger collar attached to the structure with an approved duct hanger. Use only the minimum length required to make the connection.

E. All venting penetrating fire rated assemblies shall be sheet metal. General contractor to wrap the penetration openings with 5/8” type ‘x’ gypsum board.

3.3 REFRIGERANT PIPING

A. Refrigerant piping shall be brazed with silver solder complying with AWS A5.0. The inside of tubing and fitting shall be free of flux. Clean pipe brightly with emery cloth before brazing. Installation of the piping shall comply with ANSI B31.5.

B. Refrigeration suction line shall be insulated with a 3/8” thick rubber insulation manufactured by Armaflex, Rubatex, or equal.

C. Where piping and conduit penetrate fire rated assemblies, metal sleeve shall be provided and the space between the pipe or insulation and sleeve sealed with an approved firestop compound.

3.4 START-UP

A. Each unit shall be complete, checked and ready for operation. Subcontractor will provide complete instructions for the contractor on the proper operation of the system. All Aqua Therm forced air heating units shall be complete with fan, heating elements, casings, controls, filter and all required operation accessories, including furnishing and installation of the low voltage controls (5 wires) and connections to supply source.

B. Subcontractor shall:
   1. Provide 24-hour emergency service telephone number. Emergency service shall be made available to occupants on weekends and holidays.
   2. Check in with the project leasing office before starting repair or service work for special instructions, priorities and to obtain keys.
   3. Park in designated visitor parking spaces only.
   4. Resident Relations: Subcontractor's employees will conduct themselves in a manner that reflects optimum business courtesy and consideration. Formal communication relative to the Contract is to be handled by the Project Manager, as are resident complaints concerning work performed herein. Subcontractor's employees will at all times adhere to proper moral, ethical and legal code of conduct

3.5 INTERFERENCES

A. Furnish and install all necessary offsets and fittings in piping, ductwork, and other such items as required to install the Work as closely as possible to walls, ceilings, or structure in order to take up a minimum amount of space. Correct interferences with the work of other trades. Where space requirements conflict, the following order of precedence shall generally be observed:
   1. Structural members.
   2. Lighting fixtures.
   3. Air supply, return, and exhaust grilles.
   4. Vent piping.
   5. Refrigerant piping.
   6. Condensate piping.
   7. Supply and return ductwork.
   8. Exhaust ductwork.
   9. Fire protection piping.
   10. Domestic water piping.

3.6 CONSTRUCTION REQUIREMENTS

A. All piping, ductwork, conduit and other such items to be concealed shall be installed according to schedule to avoid the delay of the work of other grades and job progress. The Contractor is required to install work of other grades and job progress. The Contractor is required to install work with relation to finish lines established by the General Contractor and shall be entirely responsible for the correctness of the Work reference to finish, elevations, and fit.

B. All equipment and controls shall be located and arranged to provide for proper maintenance.

C. Contractor shall remove all surplus material and debris caused by his work.

D. All necessary cutting and patching of walls, floors, partitions and ceilings required for proper installation of work shall be by the Contractor providing the work and at his expense. This Work shall be performed neatly and in a manner acceptable by the Architect.

3.7 LOCATION OF OUTLETS

A. Contractor shall, in conjunction with the Architect, shall assist in the establishment of room centerlines and axes of rooms and walls. All switches, grilles, registers, diffusers, and other devices shall be referenced to those established date points and located to present symmetrical arrangements with those points and facilitate the proper arrangements of tiles, panels or similar surfaces with respect to the mechanical outlets. The final determination of the exact location of each outlet and the arrangements to be followed shall be acceptable to the Architect.

3.8 EQUIPMENT FURNISHED BY OTHERS

A. Install and connect equipment furnished by other trades or Owner where shown on drawings or specified. Coordinate with the supplier to have the equipment at the place of installation in accordance to schedule.

3.9 PAINTING

A. Nameplates on equipment shall not be painted. Cover and protect the nameplates during the painting operation.

END OF SECTION

SECTION 26 05 00
COMMON WORK RESULTS FOR ELECTRICAL

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Supporting Devices for Electrical Components.
2. Electricity-Metering Components.
3. Concrete Equipment Bases.
4. Electrical Demolition.
5. Cutting and Patching For Electrical Construction.
6. Touchup Painting.

1.2 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.

1. Product Data: For electricity-metering equipment.
2. Shop Drawings: Dimensioned plans and sections or elevation layouts of electricity-metering equipment.
3. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.3 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.

C. All work to be in accordance with latest requirements of the N.E.C. and all other applicable codes and regulations of authorities having jurisdiction over the work.

1.4 COORDINATION

A. Coordinate chases, slots, inserts, sleeves, and openings with general construction work and arrange in building structure during progress of construction to facilitate the electrical installations that follow.

1. Set inserts and sleeves in poured-in-place concrete, masonry work, and other structural components as they are constructed.

B. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work.
Coordinate installing large equipment requiring positioning before closing in the building.

C. Coordinate electrical service connections to components furnished by utility companies.

1. Coordinate installation and connection of exterior underground and overhead utilities and services, including provision for electricity-metering components.
2. Comply with requirements of authorities having jurisdiction and of utility company providing electrical power and other services.

D. Coordinate location of access panels and doors for electrical items that are concealed by finished surfaces.

Access panels are to be supplied by the electrical contractor. See architectural spec section for model and manufacturing information. Provide shop drawings showing all locations and sizing.

E. Coordinate all work with Mechanical. Electrical Contractor shall provide all wiring and final connection to all line voltage thermostats. Low voltage thermostat provided and installed by Mechanical.

F. All electrical drawings are to be read in conjunction with the project specifications and all other related contract drawings.

G. The contractor shall examine the site and observe the conditions under which the work will be done or other circumstances which will affect the contemplated work. No allowance will be made subsequently in the connection for any error or negligence on the contractor's part.

H. The contractor shall verify exact location, size and extent of all existing utilities, obstructions and/or other conditions which may affect the proposed work under the project. The contractor shall take every precaution to prevent damage to existing work and shall repair any damage as a result of this work.

I. The contractor shall verify all door swings in the field and mount switches on knob side of doors or as approved by the engineer.

J. The contractor shall carefully examine all contract drawings/specifications and be responsible for the proper fittings of materials and equipment at each location as indicated without substantial alteration. The drawings are generally diagrammatic and because of the small scale of the drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. Furnishing such fittings that are required to meet such conditions shall be furnished and installed at no cost.

PART 2 PRODUCTS

2.1 SUPPORTING DEVICES

A. Material: Cold-formed steel, with corrosion-resistant coating acceptable to authorities having jurisdiction.

B. Metal Items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel.

C. Slotted-Steel Channel Supports: Flange edges turned toward web, and 9/16-inch diameter slotted holes at a maximum of 2 inches o.c., in webs.

1. Channel Thickness: Selected to suit structural loading.

2. Fittings and Accessories: Products of the same manufacturer as channel supports.

D. Raceway and Cable Supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring-steel clamps or click-type hangers.

E. Pipe Sleeves: ASTM A53, Type E, Grade A, Schedule 40, galvanized steel, plain ends.

F. Cable Supports for Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug for non-armored electrical cables in riser conduits. Plugs have number and size of conductor gripping holes as required to suit individual risers. Body constructed of malleable-iron casting with hot-dip galvanized finish.

G. Expansion Anchors: Carbon-steel wedge or sleeve type.

H. Toggle Bolts: All-steel springhead type.

2.2 EQUIPMENT FOR UTILITY COMPANY'S ELECTRICITY METERING

A. Current-Transformer Cabinets: Comply with requirements of electrical power utility company.

B. Meter Sockets: Comply with requirements of electrical power utility company.

C. Modular Meter Centers: Factory-coordinated assembly of a main meter center circuit-breaker unit with wireways, tenant meter socket modules, and tenant branch circuit breakers arranged in adjacent vertical sections, complete with interconnecting buses.

1. Housing: NEMA 250, Type 1 enclosure.

2.3 CONCRETE BASES

A. Concrete Forms and Reinforcement Materials: As specified by others.

2.4 TOUCHUP PAINT

A. For Equipment: Equipment manufacturer's paint selected to match installed equipment finish.

B. Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.

PART 3 EXECUTION

3.1 ELECTRICAL EQUIPMENT INSTALLATION

A. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide the maximum possible headroom.

B. Materials and Components: Install level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.

C. Equipment: Install to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.

D. Right of Way: Give to raceways and piping systems installed at a required slope.

E. Coordinate work with other trades and install conduit and boxes to clear embedded ducts, openings, etc. and all structural features.

F. Unless otherwise noted, mounting heights, as shown, are from finished floor to top of panelboard and to centerline of other equipment. Coordinate all mounting heights with contract drawings, local code requirements, and all A.D.A. requirements.

1. Toggle (snap) switch: 4’-0”.

2. Enclosed circuit breaker: 5’-0”

3. Disconnect (safety) switch: 5’-0”.

4. Motor starter: 5’-0”.

5. Panelboard: 6’-6”.

3.2 ELECTRICAL SUPPORTING DEVICE APPLICATION

A. Damp Locations, Storage Rooms and Outdoors: Hot-dip galvanized materials or nonmetallic, U-channel system components.

B. Dry Locations: Steel materials.

C. Support Clamps for PVC Raceways: Click-type clamp system.

D. Selection of Supports: Comply with manufacturer's written instructions.

E. Strength of Supports: Adequate to carry present and future loads, times a safety factor of at least four; minimum of 200-lb design load.

3.3 SUPPORT INSTALLATION

A. Install support devices to securely and permanently fasten and support electrical components.

B. Install individual and multiple raceway hangers and riser clamps to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger

assemblies and for securing hanger rods and conduits.

C. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.

D. Size supports for multiple raceway installations so capacity can be increased by a 25 percent minimum in the future.

E. Support individual horizontal raceways with separate, malleable-iron pipe hangers or clamps.

F. Install 1/4-inch- diameter or larger threaded steel hanger rods, unless otherwise indicated.

G. Spring-steel fasteners specifically designed for supporting single conduits or tubing may be used instead of malleable-iron hangers for 1-1/2-inch and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings and for fastening raceways to slotted channel and angle supports.

H. Arrange supports in vertical runs so the weight of raceways and enclosed conductors is carried entirely by raceway supports, with no weight load on raceway terminals.

I. Simultaneously install vertical conductor supports with conductors.

J. Separately support cast boxes that are threaded to raceways and used for fixture support. Support sheet- metal boxes directly from the building structure or by bar hangers. If bar hangers are used, attach bar to raceways on opposite sides of the box and support the raceway with an approved fastener not more than 24 inches from the box.

K. Install metal channel racks for mounting cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices unless components are mounted directly to structural elements of adequate strength.

L. Install sleeves for cable and raceway penetrations of concrete slabs and walls unless core-drilled holes are used. Install sleeves for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.

M. Securely fasten electrical items and their supports to the building structure, unless otherwise indicated.
Perform fastening according to the following unless other fastening methods are indicated:

1. Wood: Fasten with wood screws or screw-type nails.
2. Masonry: Toggle bolts on hollow masonry units and expansion bolts on solid masonry units.
3. New Concrete: Concrete inserts with machine screws and bolts.
4. Existing Concrete: Expansion bolts.
5. Steel: Welded threaded studs or spring-tension clamps on steel.
    a. Field Welding: Comply with AWS D1.1.
6. Welding to steel structure may be used only for threaded studs, not for conduits, pipe straps, or other items.
7. Light Steel: Sheet-metal screws.
8. Fasteners: Select so the load applied to each fastener does not exceed 25 percent of its proof-test load.

3.4 UTILITY COMPANY ELECTRICITY-METERING EQUIPMENT

A. Install equipment according to utility company's written requirements. Provide grounding and empty conduits as required by utility company.

3.5 FIRESTOPPING

A. Apply firestopping to cable and raceway penetrations of fire-rated floor and wall

assemblies to achieve fire- resistance rating of the assembly. Firestopping materials and installation requirements are specified in Division 7 “Firestopping."

3.6 CONCRETE BASES

A. Construct concrete bases not less than 4 inches larger, in both directions, than supported unit. Refer to shop drawings for equipment sizing. Follow supported equipment manufacturer's anchorage recommendations and setting templates for anchor-bolt and tie locations, unless otherwise indicated. Use 3000-psi 28-day compressive-strength concrete and reinforcement.

3.7 CUTTING AND PATCHING

A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces required to permit electrical installations. Perform cutting by skilled mechanics of trades involved.

B. Repair and refinish disturbed finish materials and other surfaces to match adjacent undisturbed surfaces.
Install new fireproofing where existing firestopping has been disturbed. Repair and refinish materials and other surfaces by skilled mechanics of trades involved.

3.8 FIELD QUALITY CONTROL

A. Inspect installed components for damage and faulty work, including the following:

1. Supporting devices for electrical components.
2. Electricity-metering components.
3. Concrete bases.
4. Electrical demolition.
5. Cutting and patching for electrical construction.
6. Touchup painting.

3.9 CLEANING AND PROTECTION

A. On completion of installation, including outlets, fittings, and devices, inspect exposed finish. Remove burrs, dirt, paint spots, and construction debris.

B. Protect equipment and installations and maintain conditions to ensure that coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 26 05 19

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600 V and less.

B. Related Documents:

1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.

1.3 QUALITY ASSURANCE

A. Listing and Labeling: Provide wires and cables specified in this Section that are listed and labeled.

1. The Terms "Listed" and "Labeled": As defined in NFPA 70, Article 100.

2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" as defined in OSHA Regulation 1910.7.

B. Comply with NFPA 70.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver wires and cables according to NEMA WC 26.

1.5 COORDINATION

A. Coordinate layout and installation of cables with other installations.

B. Revise locations and elevations from those indicated, as required to suit field conditions and as approved by Owner representative.

PART 2 PRODUCTS

2.1 BUILDING WIRES AND CABLES

A. UL-listed building wires and cables with conductor material, insulation type, cable construction, and rating as specified in Part 3 "Wire and Insulation Applications" Article.

B. Rubber Insulation Material: Comply with NEMA WC 70.

C. Thermoplastic Insulation Material: Comply with NEMA WC 70.

D. Cross-Linked Polyethylene Insulation Material: Comply with NEMA WC 70.

E. Ethylene Propylene Rubber Insulation Material: Comply with NEMA WC 70.

F. Conductor Material: Copper

1. Feeders 100 ampere or greater may be aluminum "Alcan Stabiloy #8000", or approved substitution by listed manufacturers.

G. Stranding: Solid conductor for No. 10 AWG and smaller; stranded conductor for larger than No. 10 AWG.

H. Multiconductor Cable: Metal-clad cable, Type MCI, Non-metallic sheathed cable, TypeNM.

2.2 CONNECTORS AND SPLICES

A. UL-listed, factory-fabricated wiring connectors of size, ampacity rating, material, type, and class for application and service indicated. Comply with Project's installation

requirements and as specified in Part 3 "Wire and Insulation Applications" Article.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine raceways and building finishes to receive wires and cables for compliance with requirements for installation tolerances and other conditions affecting performance of wires and cables. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 WIRE AND INSULATION APPLICATIONS

A. Service Entrance: Type RHW or THWN, in raceway.

B. Horizontal Feeders: Type THHN/THWN, in raceway, or type MC cable.

C. Vertical Feeders: Type THHN/THWW in raceway, or type MC cable.

D. Horizontal Branch Circuits: Type THHN/THWN, in raceway, type MC cable, type NM if allowed by local AHJ.

E. Vertical Branch Circuits: Type THNN/THWW in raceway, Type MC Cable or type NM if allowed by local AHJ.

F. Fire alarm Circuits: Power-limited, fire-protective, signaling circuit cable or Type THHN/THWN, in raceway

G. Class 1 Control Circuits: Type THHN/THWN, in raceway.

H. Class 2 Control Circuits: Power-limited tray cable, in cable tray or Power-limited tray cable, in cable tray, or Type THHN/THWN, in raceway.

3.3 INSTALLATION

A. Install wires and cables as indicated, according to manufacturer's written instructions and NECA's "Standard of Installation."

B. Pull Conductors: 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. Install exposed cables, parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

E. Seal around cables penetrating fire-rated elements according to Division 7 "Firestopping."

F. All non-sheathed cable shall not come in contact with or have enough slack to come in contact with CPVC piping.

3.4 CONNECTIONS

A. Conductor Splices: Keep to minimum.

B. Install splices and tapes that possess equivalent or better mechanical strength and insulation ratings than conductors being spliced.

C. Use splice and tap connectors compatible with conductor material.

D. Use oxide inhibitor in each splice and tap connector for aluminum conductors.

E. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches of slack.

F. Connect outlets and components to wiring and to ground as indicated and instructed by manufacturer.

G. 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.

3.5 FIELD QUALITY CONTROL

A. Testing: On installation of wires and cables and before electrical circuitry has been energized, demonstrate product capability and compliance with requirements.

1. Procedures: Perform each visual and mechanical inspection and electrical test stated in NETA ATS, Section 7.3.1. Certify compliance with test parameters.

B. Correct malfunctioning conductors and cables at Project site, where possible, and retest to demonstrate compliance; otherwise, remove and replace with new units and retest.

END OF SECTION

SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Grounding of Electrical Systems and Equipment.

a. Grounding requirements specified in this Section may be supplemented by special requirements of systems described in other Sections.

1.2 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.

1. Product Data: For the following:

a. Ground rods.

1.3 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.

1. Comply with UL 467.

B. Comply with NFPA 70; for overhead-line construction and medium-voltage underground construction, comply with IEEE C2.

C. Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system.

PART 2 PRODUCTS

2.1 GROUNDING CONDUCTORS

A. Material: Aluminum, copper-clad aluminum, and copper.

B. Equipment Grounding Conductors: Insulated with green-colored insulation.

C. Isolated Ground Conductors: Insulated with green-colored insulation with yellow stripe. On feeders with isolated ground, use colored tape, alternating bands of green and yellow tape to provide a minimum of three bands of green and two bands of yellow.

D. Grounding Electrode Conductors: Stranded cable.

E. Underground Conductors: Bare, tinned, stranded, unless otherwise indicated.

F. Bare Copper Conductors: Comply with the following:

1. Solid Conductors: ASTM B3.

2. Assembly of Stranded Conductors: ASTM B8.

3. Tinned Conductors: ASTM B33.

G. Copper Bonding Conductors: As follows:

1. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG copper conductor, 1/4 inch in diameter.

2. Bonding Conductor: No. 4 or No. 6 AWG, stranded copper conductor.

3. Bonding Jumper: Bare copper tape, braided bare copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

4. Tinned Bonding Jumper: Tinned-copper tape, braided copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

H. Ground Conductor and Conductor Protector for Wood Poles: As follows:

1. No. 4 AWG minimum, soft-drawn copper conductor.

2. Conductor Protector: Half-round PVC or wood molding. If wood, use pressure-treated fir, or cypress or cedar.

I. Grounding Bus: Bare, annealed copper bars of rectangular cross section, with insulators.

J. Equipment Ground Conductor (Green) shall be included with all circuit conductors. In addition, provide a neutral conductor where applicable.

2.2 CONNECTOR PRODUCTS

A. Comply with IEEE 837 and UL 467; listed for use for specific types, sizes, and combinations of conductors and connected items.

B. Bolted Connectors: Bolted-pressure-type connectors, or compression type.

C. Welded Connectors: Exothermic-welded type, in kit form, and selected per manufacturer's written instructions.

2.3 GROUNDING ELECTRODES

A. Ground Rods: copper-clad steel.

1. Size: 120” long by 3/4” in diameter.

PART 3 EXECUTION

3.1 APPLICATION

A. Use only copper conductors for both insulated and bare grounding conductors in direct contact with earth, concrete, masonry, crushed stone, and similar materials.

B. In raceways, use insulated equipment grounding conductors.

C. Exothermic-Welded Connections: Use for connections to structural steel and for underground connections, except those at test wells.

D. Equipment Grounding Conductor Terminations: Use bolted pressure clamps.

E. Ground Rod Clamps at Test Wells: Use bolted pressure clamps with at least two bolts.

F. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

1. Use insulated spacer; space 1 inch from wall and support from wall 6 inches above finished floor, unless otherwise indicated.

2. At doors, route the bus up to the top of the door frame, across the top of the doorway, and down to the specified height above the floor.

3.2 EQUIPMENT GROUNDING CONDUCTORS

A. Comply with NFPA 70, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated.

B. Install equipment grounding conductors in all feeders and circuits.

C. Air-Duct Equipment Circuits: Install an equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners and heaters. Bond conductor to each unit and to air duct.

D. Signal and Communication Systems: For telephone, alarm, voice and data, and other communication systems, provide No. 6 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.

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.

E. Metal Poles Supporting Outdoor Lighting Fixtures: Provide a grounding electrode in addition to installing a separate equipment grounding conductor with supply branch-circuit conductors.

3.3 INSTALLATION

A. Ground Rods: Install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes.

1. Drive ground rods until tops are 2 inches below finished floor or final grade, unless otherwise indicated.

2. Interconnect ground rods with grounding electrode conductors. Use exothermic welds, except at test wells and as otherwise indicated. Make connections without exposing steel or damaging copper coating.

B. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated.
Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

C. Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers and supports is not transmitted to rigidly mounted equipment. Use exothermic-welded connectors for outdoor locations, unless a disconnect-type connection is required; then, use a bolted clamp. Bond straps directly to the basic structure taking care not to penetrate any adjacent parts. Install straps only in locations accessible for maintenance.

D. Metal Water Service Pipe: Provide insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes by grounding clamp connectors. Where a dielectric main water fitting is installed, connect grounding conductor to street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.

E. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with grounding clamp connectors.

F. Bond each aboveground portion of gas piping system upstream from equipment shutoff valve.

G. Install one test well for each service at the ground rod electrically closest to the service entrance. Set top of well flush with finished grade or floor.

3.4 CONNECTIONS

A. General: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.

1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.

2. Make connections with clean, bare metal at points of contact.

3. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

B. Exothermic-Welded Connections: Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.

C. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.

D. Non-contact Metal Raceway Terminations: If metallic raceways terminate at metal

housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically non-continuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.

E. Connections at Test Wells: Use compression-type connectors on conductors and make bolted- and clamped- type connections between conductors and ground rods.

F. Tighten screws and bolts for grounding and bonding 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 .

G. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.

H. Moisture Protection: If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

3.5 UNDERGROUND DISTRIBUTION SYSTEM GROUNDING

A. Manholes and Handholes: Install a driven ground rod close to wall and set rod depth so 4 inches will extend above finished floor. If necessary, install ground rod before manhole is placed and provide a No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive tape or heat- shrunk insulating sleeve from 2 inches above to 6 inches below concrete. Seal floor opening with waterproof, nonshrink grout.

B. Connections to Manhole Components: Connect exposed-metal parts, such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields as recommended by manufacturer of splicing and termination kits.

C. Pad-Mounted Transformers and Switches: Install two ground rods and counterpoise circling pad. Ground pad-mounted equipment and non-current-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes. Use tinned-copper conductor not less than No. 2 AWG for counterpoise and for taps to equipment ground pad. Bury counterpoise not less than 18 inches below grade and 6 inches from the foundation.

3.6 FIELD QUALITY CONTROL

A. Testing: Perform the following field quality-control testing:

1. After installing grounding system but before permanent electrical circuitry has been energized, test for compliance with requirements.

2. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at ground test wells. Measure ground resistance not less than two full days after the last trace of precipitation, and without the soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests, by the fall-of-potential method according to IEEE 81.

3. Provide drawings locating each ground rod and ground rod assembly and other grounding electrodes, identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location.

a. Equipment Rated 500 kVA and Less: 10 ohms.

b. Equipment Rated 500 to 1000 kVA: 5 ohms.

c. Equipment Rated More Than 1000 kVA: 3 ohms.

d. Substations and Pad-Mounted Switching Equipment: 5 ohms.

e. Manhole Grounds: 10 ohms.

4. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Owner representative promptly and include recommendations to reduce ground resistance.

3.7 GRADING AND PLANTING

A. Restore surface features, including vegetation, at areas disturbed by Work of this Section. Reestablish original grades, unless otherwise indicated. If sod has been removed, replace it as soon as possible after backfilling is completed. Restore areas disturbed by trenching, storing of dirt, cable laying, and other activities to their original condition. Include application of topsoil, fertilizer, lime, seed, sod, sprig, and mulch. Maintain restored surfaces. Restore disturbed paving as indicated.

END OF SECTION

SECTION 26 05 33

RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Raceways include the following:

a. RMC.

b. PVC, Schedule 40 or 80.

c. EMT.

d. FMC.

e. LFMC.

f. LFNC.

g. RNC.

h. Wireways.

j. ENT

2. Boxes, enclosures, and cabinets include the following:

a. Device boxes.

b. Floor boxes.

c. Outlet boxes.

d. Pull and junction boxes.

e. Cabinets and hinged-cover

1.02 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. FMC: Flexible metal conduit.

C. IMC: Intermediate metal conduit.

D. LFMC: Liquidtight flexible metal conduit.

E. LFNC: Liquidtight flexible nonmetallic conduit.

F. RMC: Rigid metal conduit.

G. RNC: Rigid nonmetallic conduit.

H. ENT: Electrical non-metallic tubing.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.

1. Product Data: For wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

1.4 QUALITY ASSURANCE

A. Comply with NFPA 70 "National Electric Code".

B. Listing and Labeling: Provide raceways and boxes specified in this Section that are listed and labeled.

1. The Terms "Listed" and "Labeled": As defined in NFPA 70, "National Electric Code" Article 100.

2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" as defined in OSHA Regulation 1910.7.

3. Comply with NECA 111 “Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC) (ANSI)”

1.5 COORDINATION

A. Coordinate layout and installation of raceways and boxes with other construction elements to ensure adequate headroom, working clearance, and access.

PART 2 PRODUCTS

2.1 NONMETALLIC CONDUIT AND TUBING

A. RNC: NEMA TC 2, Schedule 40 or 80 PVC.

B. RNC Fittings: NEMA TC 3; match to conduit or conduit/tubing type and material.

C. LFNC: UL 1660.

D. ENT: UL 1653.

2.2 OUTLET AND DEVICE BOXES

A. Sheet Metal Boxes: NEMA OS 1.

B. Plastic Boxes.

2.3 FLOOR BOXES

A. Floor Boxes: Cast metal, fully adjustable, rectangular.

2.4 PULL AND JUNCTION BOXES

A. Small Sheet Metal Boxes: NEMA OS 1.

B. Cast-Metal Boxes: NEMA FB 1, cast aluminum with gasketed cover.

2.5 ENCLOSURES AND CABINETS

A. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous hinge cover and flush latch.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.

2. Nonmetallic Enclosures: Plastic, finished inside with radio-frequency-resistant paint.

B. Cabinets: NEMA 250, Type 1, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Include metal barriers to separate wiring of different systems and voltage, and include accessory feet where required for freestanding equipment.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine surfaces to receive raceways, boxes, enclosures, and cabinets for compliance with installation tolerances and other conditions affecting performance of raceway installation. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 WIRING METHODS

A. Outdoors: Use the following wiring methods:

1. Underground, Single Run: RNC.

2. Underground, Grouped: RNC.

3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC, or type MC cable.

4. Boxes and Enclosures: NEMA 250, Type 3R or Type 4. Outdoor rated receptacle boxes to be both metal cover flap type (in public use areas), and extruding plastic waterproof cover (in non-public use areas and deck patios).

B. Indoors: Use the following wiring methods:

1. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC; except in wet or damp locations, use LFMC, or type MC cable.

2. Garage: RMC, MC Cable, or EMT.

3. Boxes and Enclosures: NEMA 250, Type 1, except as follows:

a. Damp or Wet Locations: NEMA 250, Type 4, stainless steel, galvanized steel, or cast aluminum.

C. Underground or concrete encased:

1. Schedule 40 PVC.

2. ENT: Allowed in concrete where allowed by NEC.

3.3 INSTALLATION - GENERAL

A. Install raceways, boxes, enclosures, and cabinets as indicated, according to manufacturer's written instructions.

B. Do not install aluminum conduits embedded in or in contact with concrete.

C. Set floor boxes level and adjust to finished floor surface.

D. Install hinged-cover enclosures and cabinets plumb. Support at each corner.

E. Size all conduits supplying motors and associated control equipment to include equipment grounding conductor sized per NFPA 70 whether or not shown on the drawings or specified.

F. Unless otherwise noted, terminate all conduits stubbing up inside rooms or roof as follows:

1. Conduits for AC power: Stub up 6” above finished.

2. On PVC conduit for AC power and control cable, provide PVC to galvanized steel rigid conduit adaptor.

3. Plug or cap all conduits during construction or until permanent conductors are installed. Taped ends will not be allowed.

G. In exposed conduit runs longer than 300 feet, expansion fittings shall be installed. Where embedded conduit crosses a structural expansion joint, expansion and deflection fitting shall be installed.

H. Tighten set screws of threadless fittings with suitable tools.

I. Complete raceway installation before starting conductor installation.

3.4 INSTALLATION - RACEWAYS

A. Minimum Raceway Size: 1/2-inch trade size (DN21).

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. Install raceways level and square and at proper elevations. Provide adequate headroom.

D. Support raceways as specified in this section.

E. Use temporary closures to prevent foreign matter from entering raceways.

F. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portion of bends is not visible above the finished slab.

G. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and straight legs of offsets parallel, unless otherwise indicated.

H. Use raceway fittings compatible with raceways and suitable for use and location.

I. Run concealed raceways, with a minimum of bends, in the shortest practical distance considering the type of building construction and obstructions, unless otherwise indicated.

J. Raceways Embedded in Slabs: Install in middle third of slab thickness where practical, and leave at least 1- inch concrete cover.

1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.

2. Space raceways laterally to prevent voids in concrete.

3. Run conduit larger than 1-inch trade size (DN27) parallel to or at right angles to main reinforcement.
Where at right angles to reinforcement, place conduit close to slab support.

K. Install exposed raceways parallel to or at right angles to nearby surfaces or structural members, and follow the surface contours as much as practical.

1. Run parallel or banked raceways together, on common supports where practical.

2. Make bends in parallel or banked runs from same centerline to make bends parallel. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.

L. Join raceways with fittings designed and approved for the purpose and make joints tight.

1. Make raceway terminations tight. Use bonding bushings or wedges at connections subject to vibration.
Use bonding jumpers where joints cannot be made tight.

2. Use insulating bushings to protect conductors.

M. Terminations: Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against the box. Where terminations are not secure with 1 locknut, use 2 locknuts: 1 inside and 1 outside the box.

N. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into the hub so the end bears against the wire protection shoulder. Where chase nipples are used, align raceways so the coupling is square to the box and tighten the chase nipple so no threads are exposed.

O. Install pull wires in empty raceways. Use No. 14 AWG zinc-coated steel or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of the pull wire.

P. Telephone and Signal System Raceways, 2-Inch Trade Size (DN53) and Smaller: In addition to the above requirements, install raceways in maximum lengths of 150 feet and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements.

3.5 INSTALLATION - ACCESSORIES

A. Install raceway sealing fittings according to manufacturer's written instructions. Locate fittings at suitable, approved, and accessible locations and fill them with UL-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 the boundaries of refrigerated spaces.

2. Where otherwise required by NFPA 70.

B. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment.
Install with an adjustable top or coupling threaded inside for plugs set flush with the finished floor.

3.6 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure coatings, finishes, and cabinets are without damage or deterioration at the time of Substantial Completion.

1. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.7 CLEANING

A. On completion of installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish, including chips, scratches, and abrasions.

END OF SECTION

SECTION 26 05 48

VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes seismic restraints and other earthquake-damage-reduction measures for electrical components. It complements optional seismic construction requirements in the various electrical component Sections.

1.2 DEFINITIONS

A. IBC: International Building Code

B. Seismic Restraint: A fixed device (a seismic brace, an anchor bolt or stud, or a fastening assembly) used to prevent vertical or horizontal movement, or both vertical and horizontal movement, of an electrical system component during an earthquake.

C. Mobile Structural Element: A part of the building structure such as a slab, floor structure, roof structure, or wall that may move independent of other mobile structural elements during an earthquake.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.

1. Product Data:

a. Illustrate and indicate types, styles, materials, strength, fastening provisions, and finish for each type and size of seismic restraint component used.

b. Anchor Bolts and Studs: Tabulate types and sizes, complete with report numbers and rated strength in tension and shear as evaluated by an agency approved by authorities having jurisdiction.

2. Shop Drawings: For anchorage and bracing not defined by details and charts on Drawings. Indicate materials, and show designs and calculations signed and sealed by a professional engineer.

a. Design Analysis: To support selection and arrangement of seismic restraints. Include calculations of combined tensile and shear loads.

b. Details: Detail fabrication and arrangement. Detail attachment of restraints to both structural and restrained items. Show attachment locations, methods, and spacings, identifying components and listing their strengths. Indicate direction and value of forces transmitted to the structure during seismic events.

3. Preapproval and Evaluation Documentation: By California Office of Statewide Health Planning and Development (OSHPD), showing maximum ratings of restraints and the basis for approval (tests or calculations).

4. Coordination Drawings: Plans and sections drawn to scale and coordinating seismic bracing for electrical components with other systems and equipment, including other seismic restraints, in the vicinity.

5. Product Certificates: Signed by manufacturers of seismic restraints certifying that products furnished comply with requirements.

1.4 QUALITY ASSURANCE

A. Comply with seismic restraint requirements in California Building Code, unless requirements in this Section are more stringent.

1.5 PROJECT CONDITIONS

A. Project Seismic Hazard Exposure Group as Defined in IBC: II.

B. Acceleration Factor: 0.5G.

1.6 COORDINATION

A. Coordinate layout and installation of seismic bracing with building structural system and architectural features, and with mechanical, fire-protection, electrical, and other building features in the vicinity.

B. Coordinate concrete bases with building structural system.

PART 2 PRODUCTS

2.1 MATERIALS

A. Use the following materials for restraints:

1. Indoor Dry Locations: Steel, zinc plated.

2. Outdoors and Damp Locations: Galvanized steel.

2.2 ANCHORAGE AND STRUCTURAL ATTACHMENT COMPONENTS

A. Strength: Defined in reports by ICBO Evaluation Service or another agency acceptable to authorities having jurisdiction.

1. Structural Safety Factor: Strength in tension and shear of components used shall be at least two times the maximum seismic forces to which they will be subjected.

B. Concrete and Masonry Anchor Bolts and Studs: Steel-expansion wedge type.

C. Concrete Inserts: Steel-channel type.

D. Through Bolts: Structural type, hex head, high strength. Comply with ASTM A325.

E. Welding Lugs: Comply with MSS SP-69, Type 57.

F. Beam Clamps for Steel Beams and Joists: Double sided. Single-sided type is not acceptable.

G. Bushings for Floor-Mounted Equipment Anchors: Neoprene units designed for seismically rated rigid equipment mountings, and matched to the type and size of anchor bolts and studs used.

H. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for seismically rated rigid equipment mountings, and matched to the type and size of attachment devices used.

2.3 SEISMIC BRACING COMPONENTS

A. Slotted Steel Channel: 1-5/8-by-1-5/8-inch cross section, formed from 0.1046-inch thick steel, with 9/16-by- 7/8-inch slots at a maximum of 2 inches o.c. in webs, and flange edges turned toward web.

1. Materials for Channel: ASTM A 570, GR 33.

2. Materials for Fittings and Accessories: ASTM A575, ASTM A576, or ASTM A36.

3. Fittings and Accessories: Products of the same manufacturer as channels and designed for use with that product.

4. Finish: Baked, rust-inhibiting, acrylic-enamel paint applied after cleaning and phosphate treatment, unless otherwise indicated.

B. Channel-Type Bracing Assemblies: Slotted steel channel, with adjustable hinged steel brackets and bolts.

C. Cable-Type Bracing Assemblies: Zinc-coated, high-strength steel wire rope cable attached to steel thimbles, brackets, and bolts designed for cable service.

1. Arrange units for attachment to the braced component at one end and to the structure at the other end.

2. Wire Rope Cable: Comply with ASTM 603. Use 49- or 133-strand cable with a minimum strength of 2 times the calculated maximum seismic force to be resisted.

D. Hanger Rod Stiffeners: Slotted steel channels with internally bolted connections to hanger rod.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install seismic restraints according to applicable codes and regulations and as approved by authorities having jurisdiction, unless more stringent requirements are indicated.

3.2 ELECTRICAL EQUIPMENT ANCHORAGE

A. Anchor rigidly to a single mobile structural element or to a concrete base that is structurally tied to a single mobile structural element.

B. Anchor panelboards, motor-control centers, motor controls, switchboards, switchgear, transformers, unit substations, fused power-circuit devices, transfer switches, busways, battery racks, static uninterruptible power units, power conditioners, capacitor units, communication system components, and electronic signal processing, control, and distribution units as follows:

1. Size concrete bases so expansion anchors will be a minimum of 10 bolt diameters from the edge of the concrete base.

2. Concrete Bases for Floor-Mounted Equipment: Use female expansion anchors and install studs and nuts after equipment is positioned.

3. Bushings for Floor-Mounted Equipment Anchors: Install to allow for resilient media between anchor bolt or stud and mounting hole in concrete.

4. Anchor Bolt Bushing Assemblies for Wall-Mounted Equipment: Install to allow for resilient media where equipment or equipment-mounting channels are attached to wall.

5. Torque bolts and nuts on studs to values recommended by equipment manufacturer.

3.3 SEISMIC BRACING INSTALLATION

A. Install bracing according to spacings and strengths indicated by approved analysis.

B. Expansion and Contraction: Install to allow for thermal movement of braced components.

C. Cable Braces: Install with maximum cable slack recommended by manufacturer.

D. Attachment to Structure: If specific attachment is not indicated, anchor bracing to the structure at flanges of beams, upper truss chords of bar joists, or at concrete members.

3.4 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Make flexible connections in raceways, cables, wireways, cable trays, and busways where they cross expansion and seismic control joints, where adjacent sections or branches are supported by different structural elements, and where they terminate at electrical equipment anchored to a different mobile structural element from the one supporting them.

END OF SECTION

SECTION 26 05 53

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Electrical identification materials and devices required to comply with ANSI C2, NFPA 70, OSHA standards, and authorities having jurisdiction.

1.2 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.

1. Product Data: For each electrical identification product indicated.

1.3 QUALITY ASSURANCE

A. Comply with ANSI C2.

B. Comply with NFPA 70 "National Electric Code"

C. Comply with ANSI A13.1 and NFPA 70 for color-coding.

PART 2 PRODUCTS

2.1 RACEWAY AND CABLE LABELS

A. Comply with ANSI A13.1, Table 3, for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

1. Color: Black letters on orange field.

2. Legend: Indicates voltage

B. Pre-tensioned, Wraparound Plastic Sleeves: Flexible, preprinted, color-coded, acrylic band sized to suit the diameter of the line it identifies and arranged to stay in place by pretensioned gripping action when placed in position.

C. Colored Adhesive Tape: Self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

D. Underground-Line Warning Tape: Permanent, bright-colored, continuous-printed, vinyl tape.

1. Not less than 6 inches wide by 4 mils thick.

2. Compounded for permanent direct-burial service.

3. Embedded continuous metallic strip or core.

4. Printed legend indicating type of underground line.

E. Tape Markers: Vinyl or vinyl-cloth, self-adhesive, wraparound type with preprinted numbers and letters.

F. Aluminum, Wraparound Marker Bands: Bands cut from 0.014-inch thick aluminum sheet, with stamped or embossed legend, and fitted with slots or ears for permanently securing around wire or cable jacket or around groups of conductors.

G. Plasticized Card-Stock Tags: Vinyl cloth with preprinted and field-printed legends. Orange background, unless otherwise indicated, with eyelet for fastener.

H. Aluminum-Faced, Card-Stock Tags: Weather-resistant, 18-point minimum card stock faced on both sides with embossable aluminum sheet, 0.002 inch thick, laminated with moisture-resistant acrylic adhesive, punched for fasteners, and preprinted with legends to suit each application.

2.2 NAMEPLATES AND SIGNS

A. Safety Signs: Comply with 29 CFR, Chapter XVII, Part 1910.145.

B. Engraved Plastic Nameplates and Signs: Engraving stock, melamine plastic laminate, minimum 1/16 inch thick for signs up to 20 sq. in. and 1/8 inch thick for larger sizes.

1. Engraved legend with black letters on white face.

2. Punched or drilled for mechanical fasteners.

C. Baked-Enamel Signs for Interior Use: Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for the application. 1/4-inch grommets in corners for mounting.

D. Exterior, Metal-Backed, Butyrate Signs: Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch galvanized-steel backing; and with colors, legend, and size required for the application. 1/4-inch grommets in corners for mounting.

E. Fasteners for Nameplates and Signs: Self-tapping, stainless-steel screws or No. 10/32, stainless-steel machine screws with nuts and flat and lock washers.

2.3 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Cable Ties: Fungus-inert, self-extinguishing, one-piece, self-locking, Type 6/6 nylon cable ties.

1. Minimum Width: 3/16 inch.

2. Tensile Strength: 50 lb minimum.

3. Temperature Range: Minus 40 to plus 185 deg F.

4. Color: According to color-coding.

PART 3 EXECUTION

3.1 INSTALLATION

A. Identification Materials and Devices: Install at locations for most convenient viewing without interference with operation and maintenance of equipment.

B. Lettering, Colors, and Graphics: Coordinate names, abbreviations, colors, and other designations with corresponding designations in the Contract Documents or with those required by codes and standards. Use consistent designations throughout Project.

C. Sequence of Work: If identification is applied to surfaces that require finish, install identification after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before applying.

E. Color Banding Raceways and Exposed Cables: Band exposed and accessible raceways of the systems listed below:

1. Bands: Pre-tensioned, wraparound plastic sleeves; colored adhesive tape; or a combination of both.
Make each color band 2 inches wide, completely encircling conduit, and place adjacent bands of two- color markings in contact, side by side.

2. Band Locations: At changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

3. Apply the following colors to the systems listed below:

a. Fire Alarm System: Red.

b. Fire-Suppression Supervisory and Control System: Red and yellow.

c. Combined Fire Alarm and Security System: Red and blue.

d. Security System: Blue and yellow.

e. Mechanical and Electrical Supervisory System: Green and blue.

f. Telecommunication System: Green and yellow.

F. Caution Labels for Indoor Boxes and Enclosures for Power and Lighting: Install pressure-sensitive, self- adhesive labels identifying system voltage with black letters on orange background. Install on exterior of door or cover.

G. Circuit Identification Labels on Boxes: Install labels externally.

1. Exposed Boxes: Pressure-sensitive, self-adhesive plastic label on cover.

2. Concealed Boxes: Plasticized card-stock tags.

3. Labeling Legend: Permanent, waterproof listing of panel and circuit number or equivalent.

H. Paths of Underground Electrical Lines: During trench backfilling, for exterior underground power, control, signal, and communication lines, install continuous underground plastic line marker located directly above line at 6 to 8 inches below finished grade. Where width of multiple lines installed in a common trench or concrete envelope does not exceed 16 inches overall, use a single line marker. Install line marker for underground wiring, both direct-buried cables and cables in raceway.

I. Secondary Service, Feeder, and Branch-Circuit Conductors: Color-code throughout the secondary electrical system.

1. Color-code 208/120-V system as follows:

a. Phase A: Black.

b. Phase B: Red.

c. Phase C: Blue.

d. Neutral: White.

e. Ground: Green.

2. Factory apply color the entire length of conductors, except the following field-applied, color-coding methods may be used instead of factory-coded wire for sizes larger than No. 10 AWG:

a. Colored, pressure-sensitive plastic tape in half-lapped turns for a distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Use 1-inch wide tape in colors specified. Adjust tape bands to avoid obscuring cable identification markings.

b. Colored cable ties applied in groups of three ties of specified color to each wire at each terminal or splice point starting 3 inches from the terminal and spaced 3 inches apart. Apply with a special tool or pliers, tighten to a snug fit, and cut off excess length.

J. Power-Circuit Identification: Metal tags or aluminum, wraparound marker bands for cables, feeders, and power circuits in vaults, pull and junction boxes, manholes, and switchboard rooms.

1. Legend: 1/4-inch steel letter and number stamping or embossing with legend corresponding to indicated circuit designations.

2. Tag Fasteners: Nylon cable ties.

3. Band Fasteners: Integral ears.

K. Apply identification to conductors as follows:

1. Conductors to Be Extended in the Future: Indicate source and circuit numbers.

2. Multiple Power or Lighting Circuits in the Same Enclosure: Identify each conductor with source, voltage, circuit number, and phase. Use color-coding to identify circuits'

voltage and phase.

3. Multiple Control and Communication Circuits in the Same Enclosure: Identify each conductor by its system and circuit designation. Use a consistent system of tags, color-coding, or cable marking tape.

L. Apply warning, caution, and instruction signs as follows:

1. Warnings, Cautions, and Instructions: Install to ensure safe operation and maintenance of electrical systems and of items to which they connect. Install engraved plastic-laminated instruction signs with

   approved legend where instructions are needed for system or equipment operation. Install metal- backed butyrate signs for outdoor items.

2. Emergency Operation: Install engraved laminated signs with white legend on red background with minimum 3/8-inch high lettering for emergency instructions on power transfer, load shedding, and other emergency operations.

M. Equipment Identification Labels: Engraved plastic laminate. Install on each unit of equipment, including central or master unit of each system. This includes power, lighting, communication, signal, and alarm systems, unless units are specified with their own self-explanatory identification. Unless otherwise indicated, provide a single line of text with 1/2-inch high lettering on 1-1/2-inch high label; where two lines of text are required, use labels 2 inches high. Use white lettering on black field. Apply labels for each unit of the following categories of equipment using mechanical fasteners:

1. Panelboards, electrical cabinets, and enclosures.
2. Access doors and panels for concealed electrical items.
3. Electrical switchgear and switchboards.
4. Emergency system boxes and enclosures.
5. Disconnect switches.
6. Enclosed circuit breakers.
7. Motor starters.
8. Push-button stations.
9. Power transfer equipment.
10. Contactors.
11. Remote-controlled switches.
12. Dimmers.
13. Control devices.
14. Transformers.
15. Telephone switching equipment.
16. Fire alarm master station or control panel.
17. Security-monitoring master station or control panel.

END OF SECTION

SECTION 26 24 00

SWITCHBOARDS AND PANELBOARDS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Service And Distribution Switchboards Rated 600 V and Less.

2. Load Centers And Panelboards, Overcurrent Protective Devices, And Associated Auxiliary Equipment Rated 600 V and Less For The Following Types:

a. Lighting and Appliance Branch-Circuit Panelboards.

b. Distribution Panelboards.

1.2 DEFINITIONS

A. EMI: Electromagnetic interference.

B. GFCI: Ground-fault circuit interrupter.

C. RFI: Radio-frequency interference.

D. RMS: Root mean square.

E. SPDT: Single pole, double throw.

F. TVSS: Transient voltage surge suppressor.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.

1. Product Data:

a. For each type of switchboard, panelboard, overcurrent protective device, TVSS device, ground- fault protector, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

2. Shop Drawings: For each switchboard, panelboard and related equipment.

a. Dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings. Include the following:

1) Enclosure types and details for types other than NEMA 250, Type 1.

2) Bus configuration, current, and voltage ratings.

3) Short-circuit current rating of switchboards and overcurrent protective devices.

4) Descriptive documentation of optional barriers specified for electrical insulation and isolation.

5) Utility company's metering provisions with indication of approval by utility company.

6) UL listing for series rating of installed devices.

7) Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

b. Wiring Diagrams: Diagram power, signal, and control wiring and differentiate between manufacturer-installed and field-installed wiring.

3. Manufacturer Seismic Qualification Certification: Submit certification that

switchboards, overcurrent protective devices, accessories, and components will withstand seismic forces defined in Section 26 05 48 “Vibration and Seismic Controls for Electrical Work." Include the following:

a. Basis of Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

b. The term "withstand" means "the unit will remain in place without separation of internal and external parts during a seismic event and the unit will be fully operational after the event."

c. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

d. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

4. Manufacturer's field service report.

5. Updated mimic-bus diagram for switchboard reflecting field changes after final switchboard load connections have been made, for record.

6. Maintenance Data: For Switchboards, Panelboards and components to include in maintenance manuals specified in Division 01. In addition to requirements specified in Division 01 Section "Contract Closeout," include the following:

a. Routine maintenance requirements for switchboards and all installed components.

b. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.

c. Time-current curves, including selectable ranges for each type of overcurrent protective device.

1.4 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 NEMA PB 2 for switchboards.

C. Comply with NEMA PB1 for panelboards.

D. Comply with NFPA 70.

E. Product Selection for Restricted Space: Drawings indicate maximum dimensions for switchboards, including clearances between switchboards, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver in sections of lengths that can be moved past obstructions in delivery path.

B. Store indoors in clean dry space with uniform temperature to prevent condensation. Protect from exposure to dirt, fumes, water, corrosive substances, and physical damage.

C. Handle switchboards according to NEMA PB 2.1.

1.6 PROJECT CONDITIONS

A. Installation Pathway: Remove and replace access fencing, doors, lift-out panels, and structures to provide pathway for moving switchboards into place.

B. Environmental Limitations: Rate equipment for continuous operation under the following, unless otherwise indicated:

1. Ambient Temperature: Not exceeding 104 deg F.

2. Altitude: Not exceeding 6600 feet.

1.7 COORDINATION

A. Coordinate layout and installation of switchboards, panelboards, and components with other construction, including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3 "Cast-in-Place Concrete."

PART 2 PRODUCT

2.1 SWITCHBOARDS - MANUFACTURED UNITS

A. Front-Connected, Front-Accessible Switchboard Fixed, individually mounted main device, panel-mounted branches, and sections rear aligned.

B. Nominal System Voltage: See Plans.

C. Main-Bus Continuous: See Plans.

2.2 SWITCHBOARDS - FABRICATION AND FEATURES

A. Enclosure: Steel: NEMA 1.

B. Enclosure Finish for Indoor Units: Factory-applied finish in manufacturer's standard gray finish over a rust- inhibiting primer on treated metal surface.

C. Barriers: Between adjacent switchboard sections.

D. Utility Metering Compartment: Fabricated compartment and section complying with utility company's requirements. If separate vertical section is required for utility metering, match and align with basic switchboard.

E. Bus Transition and Incoming Pull Sections: Matched and aligned with basic switchboard.

F. Hinged Front Panels: Allow access to circuit-breaker, metering, accessory, and blank compartments.

G. Buses and Connections: Three phase, four wire, unless otherwise indicated. Include the following features:

1. Phase- and Neutral-Bus Material: Hard-drawn copper of 98 percent conductivity or tin-plated, high- strength, electrical-grade aluminum alloy.

   a. If bus is aluminum, use copper or tin-plated aluminum for circuit-breaker line connections.

   b. If bus is copper, use copper for feeder circuit-breaker line connections.

2. Ground Bus: 1/4-by-2-inch minimum size, drawn-temper copper of 98 percent conductivity, equipped with pressure connectors for feeder and branch-circuit ground conductors. For busway feeders, extend insulated equipment grounding cable to busway ground connection and support cable at intervals in vertical run.

3. Contact Surfaces of Buses: Silver plated for copper to copper and copper to aluminum connections, silver or tin plating for aluminum to aluminum connections.

4. Main Phase Buses, Neutral Buses, and Equipment Ground Buses: Uniform capacity for entire length of switchboard's main and distribution sections. Provide for future extensions from both ends.

5. Isolation Barrier Access Provisions: Permit checking of bus-bolt tightness.

6. Neutral Buses: 100 percent of the ampacity of the phase buses, unless otherwise indicated, equipped with pressure connectors for outgoing circuit neutral cables. Bus extensions for busway feeder neutral bus is braced.

H. Future Devices: Equip compartments with mounting brackets, supports, bus connections, and appurtenances at full rating of circuit-breaker compartment.

2.3 SWITCHBOARDS - CONTROL POWER

A. Control Circuits: 120 V, supplied through secondary disconnecting devices from control-power transformer.

B. Control-Power Fuses: Primary and secondary fuses for current-limiting and overload protection of transformer and fuses for protection of control circuits.

C. Control Wiring: Factory installed, with bundling, lacing, and protection included. Provide flexible conductors for No. 8 AWG and smaller, for conductors across hinges, and for conductors for interconnections between shipping units.

2.4 PANELBOARDS - FABRICATION AND FEATURES

A. Enclosures: Flush- and/or surface-mounted cabinets as indicated on drawings. NEMA PB 1, Type 1, to meet environmental conditions at installed location.

1. Outdoor Locations: NEMA 250, Type 3R.

2. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.

B. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.

C. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.

D. Finish: Manufacturer's standard enamel finish over corrosion-resistant treatment or primer coat.

E. Directory Card: With transparent protective cover, mounted inside metal frame, inside panelboard door.

F. Bus: Hard-drawn copper, 98 percent conductivity or tin-plated aluminum.

G. Main and Neutral Lugs: Mechanical type suitable for use with conductor material.

H. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment ground conductors; bonded to box.

I. Future Devices: Mounting brackets, bus connections, and necessary appurtenances required for future installation of devices.

J. Gutter Barrier: Arrange to isolate individual panel sections.

K. Feed-through Lugs: Mechanical type suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.

2.5 PANELBOARDS - SHORT-CIRCUIT RATING

A. Series rated to interrupt symmetrical short-circuit current available at terminals.

2.6 PANELBOARDS - LIGHTING AND APPLIANCE BRANCH-CIRCUITS

A. Branch Overcurrent Protective Devices: Plug-in circuit breakers, replaceable without disturbing adjacent units.

B. Doors: Front mounted with concealed hinges; secured with flush latch.

2.7 PANELBOARDS - DISTRIBUTION

A. Doors: Front mounted, except omit in fused-switch panelboards; secured with vault-type latch with tumbler lock.

B. Main Overcurrent Protective Devices: Circuit breaker.

C. Branch overcurrent protective devices shall be one of the following:

1. For Circuit-Breaker Frame Sizes 125 A and Smaller: Plug-in circuit breakers.

2. For Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

2.8 LOAD CENTERS

A. Overcurrent Protective Devices: Plug-in circuit breaker.

B. Conductor Connectors: Mechanical type for main, neutral, and ground lugs and buses.

2.9 SWITCHBOARD AND PANELBOARDS - OVERCURRENT PROTECTIVE DEVICES

A. Molded-Case Circuit Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit- breaker frame sizes 250 A and larger.

2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field- adjustable trip setting.

3. Electronic Trip Unit Circuit Breakers: RMS sensing; field-replaceable rating plug; with the following field- adjustable settings:

a. Instantaneous trip.

b. Long- and short-time pickup levels.

c. Long- and short-time time adjustments.

d. Ground-fault pickup level, time delay, and I^2t response.

4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.

5. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker; trip activation on fuse opening or on opening of fuse compartment door.

6. GFCI Circuit Breakers: Single- and two-pole configurations with 30-mA trip sensitivity.

7. AFCI Circuit Breakers: Single-pole configuration, 15-amp rated, 120/240vAC rated.

B. Molded-Case Circuit-Breaker Features and Accessories: Standard frame sizes, trip ratings, and number of poles.

1. Lugs: Mechanical style, suitable for number, size, trip ratings, and material of conductors.

2. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.

3. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.

4. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 75 percent of rated voltage.

5. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage with field-adjustable 0.1- to 0.6- second time delay.

2.10 ACCESSORY COMPONENTS AND FEATURES

A. Spare-Fuse Cabinet: Suitably identified, wall-mounted, lockable, compartmented steel box or cabinet.
Arrange for wall mounting.

2.11 IDENTIFICATION

A. Mimic Bus for Switchboard: Continuously integrated mimic bus factory applied to front of switchboard.
Arrange in single-line diagram format, using symbols and letter designations consistent with final mimic-bus diagram. Coordinate mimic-bus segments with devices in

switchboard sections to which applied. Produce a concise visual presentation of principal switchboard components and connections.

B. Presentation Media: Painted graphics in color contrasting with equipment factory-finished background to represent bus and components, complete with lettered designations.

PART 3 EXECUTION

3.1 PROTECTION

A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions.

3.2 EXAMINATION

A. Examine elements and surfaces to receive switchboards for compliance with installation tolerances and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION

A. Install switchboards and accessories according to NEMA PB 2.1.

B. Install panelboards and accessories according to NEMA PB 1.1

C. Support switchboards on concrete bases, 4-inch nominal thickness.

D. Comply with mounting and anchoring requirements specified in Section 26 05 48 "Seismic Controls for Electrical Work."

E. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from switchboard units and components.

F. Operating Instructions: Frame and mount the printed basic operating instructions for switchboards, including control and key interlocking sequences and emergency procedures. Fabricate frame of finished wood or metal and cover instructions with clear acrylic plastic. Mount on front of switchboards.

G. Mounting of Panelboards: Plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish.

H. Circuit Directory: Create a directory to indicate installed circuit loads after balancing panelboard loads.
Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

I. Install filler plates in unused spaces.

J. Wiring in Panelboard Gutters: Arrange conductors into groups and bundle and wrap with wire ties after completing load balancing.

3.4 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Section 26 05 53 "Identification for Electrical Systems".

B. Switchboard Nameplates: Label each switchboard compartment with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

C. Panelboard Nameplates: Label each panelboard with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

3.5 CONNECTIONS

A. Install equipment grounding connections for switchboards with ground continuity to main electrical ground bus.

B. 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.

3.6 FIELD QUALITY CONTROL

A. Prepare for acceptance tests as follows:

1. Test insulation resistance for each switchboard bus, component, connecting supply, feeder, and control circuit.

2. Test continuity of each circuit.

B. Testing: After installing switchboards and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.

1. Procedures: Perform each visual and mechanical inspection and electrical test indicated in NETA ATS, Sections 7.1, 7.5, 7.6, 7.9, 7.10, 7.11, and 7.14 as appropriate. Certify compliance with test parameters.

2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

3.7 ADJUSTING

A. Set field-adjustable switches and circuit-breaker trip ranges.

3.8 CLEANING

A. On completion of installation, inspect interior and exterior of switchboards. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

END OF SECTION

SECTION 26 28 16

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Individually Mounted Switches and Circuit Breakers Used for the following:

a. Service Disconnect Switches.

b. Feeder And Equipment Disconnect Switches.

c. Feeder Branch-Circuit Protection.

d. Motor Disconnect Switches.

1.2 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.

1. Product Data:

a. Descriptive data and time-current curves.

b. Let-through current curves for circuit breakers with current-limiting characteristics.

c. Coordination charts and tables and related data.

2. Wiring diagrams detailing wiring for power and control systems and differentiating between manufacturer-installed and field-installed wiring.

3. Field test reports indicating and interpreting test results.

4. Maintenance data for tripping devices to include in the operation and maintenance manual specified in Division 01.

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain disconnect switches and circuit breakers from one source and by a single manufacturer.

B. Comply with NFPA 70 for components and installation.

C. Listing and Labeling: Provide disconnect switches and circuit breakers specified in this Section that are listed and labeled.

1. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.

2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

PART 2 PRODUCTS

2.1 DISCONNECT SWITCHES

A. Enclosed, Non-fusible Switch: NEMA KS 1, Type HD, with lockable handle.

B. Enclosed, Fusible Switch, 800 A and Smaller: NEMA KS 1, Type HD, clips to accommodate specified fuses, enclosure consistent with environment where located, handle lockable with 2 padlocks, and interlocked with cover in CLOSED position.

C. Enclosure: NEMA KS 1, Type 1, unless otherwise specified or required to meet environmental conditions of installed location.

1. Outdoor Locations: Type 3R.

2.2 ENCLOSED CIRCUIT BREAKERS

A. Enclosed, Molded-Case Circuit Breaker: NEMA AB 1, with lockable handle.

B. Characteristics: Frame size, trip rating, number of poles, and auxiliary devices as indicated and interrupting rating to meet available fault current.

C. Application Listing: Appropriate for application, including switching fluorescent lighting loads or heating, air- conditioning, and refrigerating equipment.

D. Circuit Breakers, 200 A and Larger: Trip units interchangeable within frame size.

E. Circuit Breakers, 400 A and Larger: Field-adjustable, short-time and continuous-current settings.

F. Current-Limiting Trips: Where indicated, let-through ratings less than NEMA FU 1, Class RK-5.

G. Current Limiters: Where indicated, integral fuse listed for circuit breaker.

H. Lugs: Mechanical lugs and power-distribution connectors for number, size, and material of conductors indicated.

I. Shunt Trip: Where indicated.

J. Accessories: On drawings.

K. Enclosure: NEMA AB 1, Type 1, unless otherwise specified or required to meet environmental conditions of installed location.

1. Outdoor Locations: Type 3R.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install disconnect switches and circuit breakers in locations as indicated, according to manufacturer's written instructions.

B. Install disconnect switches and circuit breakers level and plumb.

C. Install wiring between disconnect switches, circuit breakers, control, and indication devices.

D. Connect disconnect switches and circuit breakers and components to wiring system and to ground as indicated and instructed by manufacturer.

1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

E. Identify each disconnect switch and circuit breaker according to requirements specified in Section 26 05 53 - "Electrical Identification."

3.2 FIELD QUALITY CONTROL

A. Testing: After installing disconnect switches and circuit breakers and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.

1. Procedures: Perform each visual and mechanical inspection and electrical test stated in NETA ATS, Section 7.5 for disconnect switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.

B. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, remove and replace with new units and retest.

3.3 ADJUSTING

A. Set field-adjustable disconnect switches and circuit-breaker trip ranges as indicated or as directed in coordination study report.

3.4 CLEANING

A. After completing system installation, including outlet fittings and devices, inspect

exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish including chips, scratches, and abrasions.

END OF SECTION

SECTION 26 29 13

ENCLOSED CONTROLLERS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. AC Motor-Control Devices Rated 600 V and Less that are Supplied As Enclosed Units.

a. Manual Motor Controllers

b. Magnetic Motor Controllers

c. Variable-Frequency Controllers

d. Enclosed Timer Switches

e. Enclosures

1.2 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.

1. Maintenance Data: For products to include in the maintenance manuals specified in Division 01.

2. Load-Current and Overload-Relay Heater List: Compile after motors have been installed and arrange to demonstrate that selection of heaters suits actual motor nameplate full-load currents.

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain similar motor-control devices through one source from a single manufacturer.

B. Comply with NFPA 70.

C. Listing and Labeling: Provide motor controllers specified in this Section that are listed and labeled.

1. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.

2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" as defined in OSHA Regulation 1910.7.

1.4 COORDINATION

A. Coordinate features of controllers and accessory devices with pilot devices and control circuits to which they connect.

B. Coordinate features, accessories, and functions of each motor controller with the ratings and characteristics of the supply circuit, the motor, the required control sequence, and the duty cycle of the motor and load.

PART 2 PRODUCTS

2.1 MANUAL MOTOR CONTROLLERS

A. Description: NEMA ICS 2, general purpose, Class A with toggle action and overload element.

2.2 MAGNETIC MOTOR CONTROLLERS

A. Description: NEMA ICS 2, Class A, full voltage, non-reversing, across the line, unless otherwise indicated.

B. Control Circuit: 120 V; obtained from integral control power transformer, unless otherwise

indicated. Include a control power transformer with adequate capacity to operate connected pilot, indicating and control devices, plus 100 percent spare capacity.

C. Combination Controller: Factory-assembled combination controller and disconnect switch with or without overcurrent protection as indicated.

1. Fusible Disconnecting Means: NEMA KS 1, heavy-duty, fusible switch with rejection-type fuse clips rated for fuses indicated. Select and size fuses to provide Type 2 protection according to IEC 947-4-1, as certified by a Nationally Recognized Testing Laboratory.

2. Non-fusible Disconnect: NEMA KS 1, heavy-duty, non-fusible switch.

3. Circuit-Breaker Disconnect: NEMA AB 1, motor-circuit protector with field-adjustable short-circuit trip coordinated with motor locked-rotor amperes.

D. Overload Relay: Ambient-compensated type with inverse-time-current characteristic. Provide with heaters or sensors in each phase matched to nameplate full-load current of specific motor to which they connect, and with appropriate adjustment for duty cycle.

2.3 VARIABLE-FREQUENCY CONTROLLERS

A. Description: NEMA ICS 2, variable-frequency controller, listed and labeled as a complete unit and arranged to provide variable speed of a standard NEMA MG 1, Design B, 3-phase, induction motor by adjusting output voltage and frequency.

B. Design and Rating: Match load type such as fans, blowers, and pumps; and type of connection used between motor and load such as direct or through a power-transmission connection.

C. Isolation Transformer: Match transformer voltage ratings and capacity to system and motor voltages; and controller, motor, drive, and load characteristics.

D. Output Rating: 3-phase, 6 to 66 Hz, with torque constant as speed changes.

E. Starting Torque: 100 percent of rated torque or as indicated.

F. Speed Regulation: Plus or minus one percent.

G. Ambient Temperature: 0 to 40 deg C.

H. Efficiency: 95 percent minimum at full load and 60 Hz.

I. Isolated control interface allows controller to follow 1 of the following over an 11:1 speed range:

1. Electrical Signal: 4 to 20 mA at 24 V.

J. Internal Adjustability: Include the following internal adjustment capabilities:

1. Minimum Speed: 5 to 25 percent of maximum rpm.

2. Maximum Speed: 80 to 100 percent of maximum rpm.

3. Acceleration: 2 to 22 seconds.

4. Deceleration: 2 to 22 seconds.

5. Current Limit: 50 to 110 percent of maximum rating.

K. Multiple-Motor Capability: Controller suitable for service to multiple motors and furnished with a separate overload relay and protection for each controlled motor. Shut off the controller and motors served by it when an overload relay is tripped.

L. Self-protection and reliability features include the following:

1. Snubber networks to protect against malfunction due to system voltage transients.

2. Motor Overload Relay: Adjustable and capable of NEMA 250, Class 10 performance.

3. Notch filter to prevent operation of the controller-motor-load combination at a

natural frequency of the combination.

4. Instantaneous overcurrent trip.
5. Loss of phase protection.
6. Reverse phase protection.
7. Under- and overvoltage trips.
8. Overtemperature trip.
9. Short-circuit protection.

M. Automatic Reset/Restart: Attempt 3 restarts after controller fault or on return of power after an interruption and before shutting down for manual reset or fault correction. Restarting during deceleration will not damage controller, motor, or load.

N. Status Lights: Door-mounted LED indicators to indicate the following conditions:

1. Power on.
2. Run.
3. Overvoltage.
4. Line fault.
5. Overcurrent.
6. External fault.

O. Panel-Mounted Operator Station: Start-stop and auto-manual selector switches with manual speed control potentiometer and elapsed time meter.

P. Indicating Devices: Meters or digital readout devices and selector switch, mounted flush in controller door and connected to indicate controller output current, voltage, and frequency.

Q. Integral disconnect.

R. Isolating Switch: Non-load-break switch arranged to isolate variable-frequency controller and permit safe troubleshooting and testing, both energized and de-energized, while motor is operating in bypass mode.

2.4 ENCLOSURES

A. Description: Flush or surface-mounted cabinets as indicated. NEMA 250, Type 1, unless otherwise indicated to meet environmental conditions at installed location.

1. Outdoor Locations: NEMA 250, Type 3R.
2. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.

2.5 ACCESSORIES

A. Devices are factory installed in controller enclosure, unless otherwise indicated.

B. Push-Button Stations, Pilot Lights, and Selector Switches: NEMA ICS 2, heavy-duty type.

C. Stop and Lockout Push-Button Station: Momentary-break push-button station with a factory-applied hasp arranged so a padlock can be used to lock push button in depressed position with control circuit open.

D. Control Relays: Auxiliary and adjustable time-delay relays.

E. Elapsed Time Meters: Heavy duty with digital readout in hours.

F. Phase-Failure and Undervoltage Relays: Solid-state sensing circuit with isolated output contacts for hard- wired connection. Provide adjustable undervoltage setting.

G. Impulse sparkover voltage coordinated with system circuit voltage.

H. Factory mounted with Nationally Recognized Testing Laboratory listed and labeled mounting device.

PART 3 EXECUTION

A. Select features of each motor controller to coordinate with ratings and characteristics of supply circuit and motor; required control sequence; duty cycle of motor, drive, and load; and configuration of pilot device and control circuit affecting controller functions.

B. Select horsepower rating of controllers to suit motor controlled.

C. Use fractional-horsepower manual controllers for single-phase motors, unless otherwise indicated.

D. Use manual controllers for 3-phase motors up to 7-1/2 hp not requiring automatic or remote control.

E. Push-Button Stations: In covers of magnetic controllers for manually started motors where indicated, start contact connected in parallel with sealing auxiliary contact for low-voltage protection.

F. Hand-Off-Automatic Selector Switches: In covers of manual and magnetic controllers of motors started and stopped by automatic controls or interlocks with other equipment.

3.2 INSTALLATION

A. Install independently mounted motor-control devices according to manufacturer's written instructions.

B. Location: Locate controllers within sight of motors controlled.

C. For control equipment at walls, bolt units to wall or mount on lightweight structural-steel channels bolted to wall. For controllers not at walls, provide freestanding racks conforming to Section 26 05 00 - "Common Work Results for Electrical."

D. Install freestanding equipment on concrete housekeeping bases conforming to Division 3 - "Cast-in-Place Concrete."

E. Motor-Controller Fuses: Install indicated fuses in each fusible switch.

3.3 IDENTIFICATION

A. Identify motor-control components and control wiring according to Section 26 05 53 "Electrical Identification."

3.4 CONTROL WIRING INSTALLATION

A. Install wiring between motor-control devices according to Section 26 05 19 “Low-Voltage Electrical Power Conductors and Cables."

B. Bundle, train, and support wiring in enclosures.

C. Connect hand-off-automatic switch and other automatic control devices where available.

1. Connect selector switches to bypass only the manual and automatic control devices that have no safety functions when switch is in the hand position.

2. Connect selector switches with motor-control circuit in both hand and automatic positions for safety-type control devices such as low- and high-pressure cutouts, high-temperature cutouts, and motor overload protectors.

3.5 CONNECTIONS

A. Tighten connectors, terminals, bus joints, and mountings. Tighten field-connected connectors and terminals, including screws and bolts, according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.6 FIELD QUALITY CONTROL

A. Testing: After installing motor controllers and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.

1. Procedures: Perform each visual and mechanical inspection and electrical test stated in NETA ATS, Sections 7.5, 7.6, and 7.16. Certify compliance with test

parameters.

2. Remove and replace malfunctioning units with new units, and retest.

3.7 CLEANING

A. Remove paint splatters and other spots, dirt, and debris. Touch up scratches and mars of finish to match original finish. Clean devices internally, using methods and materials recommended by manufacturer.

END OF SECTION

SECTION 26 51 00

INTERIOR LIGHTING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior Lighting Fixtures
2. Lamps
3. Ballasts
4. Exit Signs
5. Emergency Lighting Units
6. Accessories

1.2 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.

1. For each type of lighting fixture indicated, arranged in order of fixture designation. Include data on features, accessories, and the following:
   a. Dimensions of fixtures.
   b. Certified results of laboratory tests for fixtures and lamps for photometric performance.
   c. Emergency lighting unit battery and charger.
   d. Fluorescent and high-intensity-discharge ballasts.
   e. Types of lamps.
   f. Photometric data.
2. Dimming Ballast Compatibility Certificates: Signed by manufacturer of ballast certifying that ballasts are compatible with dimming systems and equipment with which they are used.
3. Maintenance Data: For lighting fixtures to include in maintenance manuals specified in Division 01.

1.3 QUALITY ASSURANCE

A. Fixtures, Emergency Lighting Units, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.

B. Comply with NFPA 70.

C. NFPA 101 Compliance: Comply with visibility and luminance requirements for exit signs.

D. Fluorescent Lamp Ballasts shall comply with the EPA Toxicity Characteristic Leaching Procedures for low mercury type lamps.

1.4 COORDINATION

A. Fixtures, Mounting Hardware, and Trim: Coordinate layout and installation of lighting fixtures with ceiling system and other construction.

PART 2 PRODUCTS

2.1 FIXTURES AND FIXTURE COMPONENTS, GENERAL

A. Metal Parts: Free from burrs, sharp corners, and edges.

B. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging.

C. Doors, Frames, and Other Internal Access: Smooth operating, free from light leakage under operating conditions, and arranged to permit re-lamping without use of tools. Arrange doors, frames, lenses, diffusers, and other pieces to prevent accidental falling during re-lamping and when secured in operating position.

D. Reflecting Surfaces: Minimum reflectance as follows, unless otherwise indicated:

1. White Surfaces: 85 percent.
2. Specular Surfaces: 83 percent.
3. Diffusing Specular Surfaces: 75 percent.
4. Laminated Silver Metallized Film: 90 percent.

E. Lenses, Diffusers, Covers, and Globes: 100 percent virgin acrylic plastic or annealed crystal glass, unless otherwise indicated.

1. Plastic: High resistance to yellowing and other changes due to aging, exposure to heat, and ultraviolet radiation.
2. Lens Thickness: 0.125 inch minimum, unless greater thickness is indicated.

2.2 FLUORESCENT LAMP BALLASTS

A. General Requirements: Unless otherwise indicated, features include the following:

1. Designed for type and quantity of lamps indicated at full light output.
2. Total Harmonic Distortion Rating: Less than 20 percent.
3. Sound Rating: A.

B. Electronic Ballasts for Linear Lamps: Unless otherwise indicated, features include the following, besides those in "General Requirements" Paragraph above:

1. Certified Ballast Manufacturer Certification: Indicated by label.
2. Encapsulation: Without voids in potting compound.
3. Parallel Lamp Circuits: Multiple lamp ballasts connected to maintain full light output on surviving lamps if one or more lamps fail.

C. Ballasts for Compact Lamps in Recessed Fixtures: Unless otherwise indicated, additional features include the following:

1. Type: Electronic fully encapsulated in potting compound.
2. Power Factor: 90 percent, minimum.
3. Operating Frequency: 20 kHz or higher.
4. Flicker: Less than 5 percent.
5. Lamp Current Crest Factor: Less than 1.7.
6. Transient Protection: Comply with IEEE C62.41 for Category A1 locations.

D. Ballasts for Dimmer-Controlled Fixtures: Comply with general and fixture-related requirements above for electronic ballasts.

1. Compatibility: Certified by manufacturer for use with specific dimming system indicated for use with each dimming ballast.

E. Ballasts for Low-Temperature Environments: As follows:

1. Temperatures 0 Deg F Above: Electronic or electromagnetic type rated for 0 deg F starting temperature.
2. Temperatures Minus 20 Deg F and Above: Electromagnetic type designed for use with high-output lamps.

2.3 HIGH-INTENSITY-DISCHARGE LAMP BALLASTS

A. General: Comply with ANSI C82.4. Unless otherwise indicated, features include the following:

1. Type: Constant wattage autotransformer or regulating high-power-factor type, unless otherwise indicated.

2. Operating Voltage: Match system voltage.

3. Minimum Starting Temperature: Minus 22 deg F for single lamp ballasts.

4. Normal Ambient Operating Temperature: 104 deg F

5. Open-circuit operation that will not reduce average life.

6. Auxiliary, Instant-on, Quartz System: Automatically switches quartz lamp on when fixture is initially energized and when momentary power outages occur. Automatically turns quartz lamp off when high- intensity-discharge lamp reaches approximately 60 percent light output.

2.4 EXIT SIGNS

A. General Requirements: Comply with UL 924 and the following:

1. Sign Colors and Lettering Size: Comply with authorities having jurisdiction.

B. Internally Lighted Signs: As follows:

1. Lamps for AC Operation: Light-emitting diodes, 70,000 hours minimum rated lamp life.

C. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.

1. Battery: Sealed, maintenance-free, nickel-cadmium type with special warranty.

2. Charger: Fully automatic, solid-state type with sealed transfer relay.

3. Operation: Relay automatically energizes lamp from unit when circuit voltage drops to 80 percent of nominal or below. When normal voltage is restored, relay disconnects lamps, and battery is automatically recharged and floated on charger.

2.5 EMERGENCY LIGHTING UNITS

A. General Requirements: Self-contained units. Comply with UL 924. Units include the following features:

1. Battery: Sealed, maintenance-free, lead-acid type with minimum 10-year nominal life and special warranty.

2. Charger: Fully automatic, solid-state type with sealed transfer relay.

3. Operation: Relay automatically turns lamp on when supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps, and battery is automatically recharged and floated on charger.

4. Integral Time-Delay Relay: Arranged to hold unit on for fixed interval after restoring power after an outage. Provides adequate time delay to permit high-intensity-discharge lamps to restrike and develop adequate output.

2.6 LAMPS

A. Fluorescent Color Temperature and Minimum Color-Rendering Index: 3500 K and 85 CRI, unless otherwise indicated.

B. Non-compact Fluorescent Lamp Life: Rated average is 20,000 hours at 3 hours per start when used on rapid- start circuits.

C. Metal-Halide Color Temperature and Minimum Color-Rendering Index: 3600 K and 70

CRI, unless otherwise indicated.

2.7 FIXTURE SUPPORT COMPONENTS

A. Comply with Section 26 "Basic Electrical Materials and Methods," for channel- and angle-iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fitting and ceiling canopy. Finish same as fixture.

C. Twin-Stem Hangers: Two, 1/2-inch steel tubes with single canopy arranged to mount a single fixture. Finish same as fixture.

D. Rod Hangers: 3/16-inch- minimum diameter, cadmium-plated, threaded steel rod.

E. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

F. Aircraft Cable Support: Use cable, anchorages, and intermediate supports recommended by fixture manufacturer.

2.8 FINISHES

A. Fixtures: Manufacturer's standard, unless otherwise indicated.

1. Paint Finish: Applied over corrosion-resistant treatment or primer, free of defects.

2. Metallic Finish: Corrosion resistant.

3. Colors as indicated in Luminaire Schedule on Plans.

PART 3 EXECUTION

3.1 INSTALLATION

A. Fixtures: Set level, plumb, and square with ceiling and walls, and secure according to manufacturer's written instructions and approved submittal materials. Install lamps in each fixture.

B. Support for Fixtures in or on Grid-Type Suspended Ceilings:

1. Recessed lighting fixtures shall be supported independently from the suspended ceiling system.
Number 8 gauge galvanized steel wire or approved type hangers from the overhead building structures shall be provided for fixture support.

C. Suspended Fixture Support: As follows:

1. Pendants and Rods: Where longer than 48 inches brace to limit swinging.

2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.

3. Continuous Rows: Suspend from cable installed according to fixture manufacturer's written instructions and details on Drawings.

3.2 CONNECTIONS

A. Ground Equipment.

1. 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.

3.3 FIELD QUALITY CONTROL

A. Inspect each installed fixture for damage. Replace damaged fixtures and components.

B. Advance Notice: Give dates and times for field tests.

C. Provide instruments to make and record test results.

D. Tests: As follows:

1. Verify normal operation of each fixture after installation.

2. Emergency Lighting: Interrupt electrical supply to demonstrate proper operation.

3. Verify normal transfer to battery source and retransfer to normal.

4. Report results in writing.

E. Malfunctioning Fixtures and Components: Replace or repair, then retest. Repeat procedure until units operate properly.

F. Corrosive Fixtures: Replace during warranty period.

3.4 CLEANING AND ADJUSTING

A. Clean fixtures internally and externally after installation. Use methods and materials recommended by manufacturer.

B. Adjust aimable fixtures to provide required light intensities.

END OF SECTION

SECTION 26 56 00

EXTERIOR LIGHTING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Exterior Lighting Units with Luminaires
2. Ballasts
3. Lamps
4. Luminaire Support Components
5. Accessories

1.2 DEFINITIONS

A. Lighting Unit: A luminaire or an assembly of luminaires complete with a common support, including pole, post, or other structure, and mounting and support accessories.

B. Luminaire (Light Fixture): A complete lighting device consisting of lamp(s) and ballast(s), when applicable, together with parts designed to distribute light, to position and protect lamps, and to connect lamps to power supply.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.

1. For each type of lighting unit indicated, arranged in order of lighting unit designation. Include data on features, accessories, finishes, and the following:
   a. Materials and dimensions of luminaires and poles.
   b. Certified results of laboratory tests for fixtures and lamps for photometric performance.
   c. High-intensity-discharge luminaire ballasts.
   d. Photometric data.
2. Shop Drawings: Anchor-bolt templates keyed to specific poles and certified by manufacturer.
3. Maintenance Data: For lighting units to include in maintenance manuals specified in Division 01.

1.4 QUALITY ASSURANCE

A. Luminaires and Accessories: Listed and labeled as defined in NFPA 70, Article 100, for their indicated use, location, and installation conditions by a testing agency acceptable to authorities having jurisdiction

B. Comply with ANSI C2.

C. Comply with NFPA 70

D. Comply with Section 132 (b) of the California Energy Code.

1.5 DELIVERY, STORAGE, AND HANDLING OF POLES

A. Package aluminum poles for shipping according to ASTM B 660.

B. Store poles on decay-resistant treated skids at least 12 inches above grade and vegetation. Support poles to prevent distortion and arrange to provide free air circulation.

C. Handle wood poles so they will not be damaged. Do not use pointed tools that can indent surface more than 1/4 inch deep. Do not apply tools to section of poles below

ground-line.

D. Retain factory-applied pole wrappings on fiberglass poles until just before pole installation. Handle poles with web fabric straps.

E. Retain factory-applied pole wrappings on metal poles until just before pole installation. For poles with nonmetallic finishes, handle with web fabric straps.

PART 2 PRODUCTS

2.1 LUMINAIRES

A. Comply with IESNA RP-8 for parameters of lateral light distribution patterns indicated for luminaires.

B. Metal Parts: Free from burrs, sharp corners, and edges.

C. Sheet Metal Components: Corrosion-resistant aluminum, unless otherwise indicated. Form and support to prevent warping and sagging.

D. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use.
Provide filter/breather for enclosed luminaires.

E. Doors, Frames, and Other Internal Access: Smooth operating, free from light leakage under operating conditions, and arranged to permit re-lamping without use of tools. Arrange doors, frames, lenses, diffusers, and other pieces to prevent accidental falling during re-lamping and when secured in operating position. Provide for door removal for cleaning or replacing lens. Arrange to disconnect ballast when door opens.

F. Exposed Hardware Material: Stainless steel.

G. Plastic Parts: High resistance to yellowing and other changes due to aging, exposure to heat, and ultraviolet radiation.

H. Reflecting Surfaces: Minimum reflectance as follows, unless otherwise indicated:

1. White Surfaces: 85 percent.

2. Specular Surfaces: 83 percent.

3. Diffusing Specular Surfaces: 75 percent.

I. Lenses and Refractors: Materials as indicated. Use heat- and aging-resistant, resilient gaskets to seal and cushion lens and refractor in luminaire doors.

J. Photoelectric Relays: As follows:

1. Contact Relays: Single throw, arranged to fail in the on position and factory set to turn light unit on at
1.5 to 3 fc and off at 4.5 to 10 fc with 15-second minimum time delay.

2. Relay Mounting: In luminaire housing.

K. High-Intensity-Discharge Ballasts: Comply with ANSI C82.4. Constant wattage autotransformer or regulating high-power-factor type, unless otherwise indicated.

1. Ballast Fuses:One in each ungrounded supply conductor. Voltage and current ratings as recommended by ballast manufacturer.

2. Single-Lamp Ballasts: Minimum starting temperature of minus 40 deg C.

3. Open-circuit operation will not reduce average life.

4. Noise: Uniformly quiet operation, with a noise rating of B or better.

L. Lamps: Comply with the standard of the ANSI C78 series that is applicable to each type of lamp. Provide luminaires with indicated lamps of designated type, characteristics, and wattage. Where a lamp is not indicated for a luminaire, provide medium wattage lamp recommended by manufacturer for luminaire.

1. Metal-Halide Color Temperature and Minimum Color-Rendering Index: 3600 K

and 70 CRI, unless otherwise indicated.

2.2 LUMINAIRE SUPPORT COMPONENTS

A. Description: Comply with AASHTO LTS-3 for pole or other support structures, brackets, arms, appurtenances, base, and anchorage and foundation.

B. Wind-Load Strength of Total Support Assembly: Adequate to carry support assembly plus luminaires at indicated heights above grade without failure, permanent deflection, or whipping in steady winds of 100 mph (160 km/h) with a gust factor of 1.3. Support assembly includes pole or other support structures, brackets, arms, appurtenances, base, and anchorage and foundation.

1. Strength Analysis: For each pole type and luminaire combination, multiply the actual equivalent projected area of luminaires and brackets by a factor of 1.1 to obtain the equivalent projected area to be used in pole selection strength analysis.

C. Finish: Match finish of pole/support structure for arm, bracket, and tenon mount materials.

D. Mountings, Fasteners, and Appurtenances: Corrosion-resistant items compatible with support components.

1. Materials: Will not cause galvanic action at contact points.

2. Mountings: Correctly position luminaire to provide indicated light distribution.

3. Anchor Bolts, Nuts, and Washers: Hot-dip galvanized after fabrication unless stainless-steel items are indicated.

4. Anchor-Bolt Template: Plywood or steel.

E. Pole/Support Structure Bases: Anchor type with hold-down or anchor bolts, leveling nuts, and bolt covers.

F. Steel Poles: Tubing complying with ASTM A 500, Grade B, carbon steel with a minimum yield of 46,000 psig (317 MPa); one-piece construction up to 40 feet in length with access handhole in pole wall.

1. Grounding Provisions for Metal Pole/Support Structure: Welded 1/2-inch threaded lug, accessible through handhole and listed for copper conductor connection.

2. Shafts: Square, straight.

G. Metal Pole Brackets: Match pole metal. Provide cantilever brackets without underbrace, in sizes and styles indicated, with straight tubular end section to accommodate luminaire.

H. Pole-Top Tenons: Fabricated to support luminaire or luminaires and brackets indicated, and securely fastened to pole top.

I. Concrete for Pole Foundations: Comply with Division 3 "Cast-in-Place Concrete."

1. Design Strength: 3000-psig, 28-day compressive strength.

2.3 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Steel: Grind welds and polish surfaces to a smooth, even finish.

1. Galvanized Finish: Hot-dip galvanize after fabrication to comply with ASTM A 123.

2. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, and other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or SSPC- SP 8, "Pickling."

3. Interior: Apply one coat of bituminous paint on interior of pole, or otherwise treat to prevent corrosion.

4. Polyurethane Enamel: Manufacturer's standard finish consisting of one or more coats

of primer and two finish coats of high-gloss, high-build polyurethane enamel.

a. Color: Refer to Luminaire Schedule.

PART 3 EXECUTION

3.1 INSTALLATION

A. Concrete Foundations: Construct according to Division 3 "Cast-in-Place Concrete."

1. Comply with details for reinforcement and for anchor bolts, nuts, and washers. Verify anchor-bolt templates by comparing with actual pole bases furnished.

2. Finish for Parts Exposed to View: Trowel and rub smooth. Comply with Division 3 - "Cast-in-Place Concrete" for exposed finish.

B. Embedded Poles: Set poles to indicated depth, but not less than one-sixth of pole length below finish grade.
Dig holes large enough to permit use of tampers the full depth of hole. Backfill in 6-inch layers and thoroughly tamp each layer so compaction of backfill is equal to or greater than that of undisturbed earth.

C. Install poles as follows:

1. Use web fabric slings (not chain or cable) to raise and set poles.

2. Mount pole to foundation with leveling nuts, and tighten top nuts to torque level recommended by pole manufacturer.

3. Secure poles level, plumb, and square.

4. Grout void between pole base and foundation. Use non-shrinking or expanding concrete grout firmly packed in entire void space.

5. Use a short piece of 1/2-inch diameter pipe to make a drain hole through grout. Arrange to drain condensation from interior of pole.

D. Luminaire Attachment: Fasten to indicated structural supports.

E. Luminaire Attachment with Adjustable Features or Aiming: Attach luminaires and supports to allow aiming for indicated light distribution.

F. Lamp luminaires with indicated lamps according to manufacturer's written instructions.

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ce malfunctioning lamps.

3.2 CONNECTIONS

A. Ground Equipment

1. 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. Ground metal poles/support structures according to Section 26 05 26 - "Grounding and Bonding for Electrical Systems."

1. Nonmetallic Poles: Ground metallic components of lighting units and foundations. Connect luminaires to grounding system with No. 6 AWG conductor.

3.3 FIELD QUALITY CONTROL

A. Inspect each installed unit for damage. Replace damaged units.

B. Provide instruments to make and record test results.

C. Tests and Observations: Verify normal operation of lighting units after installing luminaires and energizing circuits with normal power source, and as follows:

1. Measure light intensities at night if specific illumination performance is indicated. Use photometers with calibration referenced to NIST standards.

2. Check intensity and uniformity of illumination.

3. Check excessively noisy ballasts.

D. Malfunctioning Fixtures and Components: Replace or repair, then retest. Repeat procedure until units operate properly.

3.4 CLEANING AND ADJUSTING

A. Clean units after installation. Use methods and materials recommended by manufacturer.

B. Adjust amiable luminaires and luminaires with adjustable lamp position to provide required light distributions and intensities.

END OF SECTION

SECTION 26 60 00

LIGHTING ACCESSORIES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Time Switches
2. Photoelectric Relays
3. Occupancy Sensors
4. Multi-pole Lighting Relays and Contactors.
5. Hearing Impaired Door Annunciator

1.2 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.

1. Product Data:

a. Include dimensions and data on features, components, and ratings for lighting control devices.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, for their indicated use and installation conditions by a testing agency acceptable to authorities having jurisdiction.

B. Comply with NFPA 70.

1.4 COORDINATION

A. Coordinate features of devices specified in this Section with systems and components specified in other Sections to form an integrated system of compatible components. Match components and interconnections for optimum performance of specified functions. Include coordination with the following:

1. Section 26 24 00 - "Switchboards and Panelboards."

PART 2 PRODUCTS

2.1 GENERAL LIGHTING CONTROL DEVICE REQUIREMENTS

A. Line-Voltage Surge Protection: Include in all 120- and 277-V solid-state equipment. Comply with UL 1449 and with ANSI C62.41 for Category A locations.

2.2 TIME SWITCHES

A. Description: Solid-state programmable units with alphanumeric display complying with UL 917.

1. Astronomic dial.
2. Two contacts, rated 30 A at 277-V ac, unless otherwise indicated.
3. Two pilot-duty contacts, rated 2 A at 240-V ac, unless otherwise indicated.
4. Eight-day program uniquely programmable for each weekday and holidays.
5. Skip-day mode.

2.3 PHOTOELECTRIC RELAYS

A. Description: Solid state, with single-pole, double-throw dry contacts rated to operate connected relay or contactor coils or microprocessor input, and complying with UL 773A.

B. Light-Level Monitoring Range: 0 to 3500 fc with an adjustment for turn-on/turn-off levels.

C. Time Delay: Prevents false operation.

D. Outdoor Sealed Units: Weathertight housing, resistant to high temperatures and equipped with sun-glare shield and ice preventer.

2.4 MULTI-POLE CONTACTORS AND RELAYS

A. Description: Electrically operated and mechanically held, and complying with UL 508 and NEMA ICS 2.

1. Current Rating for Switching: UL listing or rating consistent with type of load served, including tungsten filament, inductive, and high-inrush ballast (ballasts with 15 percent or less total harmonic distortion of normal load current).

2. Control Coil Voltage: Match control power source.

PART 3
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3.1 INSTALLATION

A. Install equipment level and plumb and according to manufacturer's written instructions.

B. Mount lighting control devices according to manufacturer's written instructions and requirements in Section 26 05 00 - "Common Work Results for Electrical".

C. Mounting heights indicated are to bottom of unit for suspended devices and to center of unit for wall-mounting devices.

3.2 CONTROL WIRING INSTALLATION

A. Install wiring between sensing and control devices according to manufacturer's written instructions and as specified in Section 26 05 19 - "Low-Voltage Electrical Power Conductors and Cables" for low-voltage connections.

B. Wiring Method: Install all wiring in raceway as specified in Section 26 05 33 "Raceways and Boxes for Electrical Systems."

C. Bundle, train, and support wiring in enclosures.

D. Ground equipment.

E. Connections: 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.

3.3 IDENTIFICATION

A. Identify components and power and control wiring according to Section 26 05 53 - "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

A. Schedule visual and mechanical inspections and electrical tests with at least seven days' advance notice.

B. Inspect control components for defects and physical damage, testing laboratory labeling, and nameplate compliance with the Contract Documents.

C. Check tightness of electrical connections with torque wrench calibrated within previous six months. Use manufacturer's recommended torque values.

D. Verify settings of photoelectric devices with photometer calibrated within previous six months.

E. Electrical Tests: Use particular caution when testing devices containing solid-state

components. Perform the following according to manufacturer's written instructions:

1. Continuity tests of circuits.

2. Operational Tests: Set and operate devices to demonstrate their functions and capabilities in a methodical sequence that cues and reproduces actual operating functions.

    a. Include testing of devices under conditions that simulate actual operational conditions. Record control settings, operations, cues, and functional observations.

F. Correct deficiencies, make necessary adjustments, and retest. Verify that specified requirements are met.

G. Test Labeling: After satisfactory completion of tests and inspections, apply a label to tested components indicating test results, date, and responsible agency and representative.

H. Reports: Written reports of tests and observations. Record defective materials and workmanship and unsatisfactory test results. Record repairs and adjustments.

3.5 CLEANING

A. Cleaning: Clean equipment and devices internally and externally using methods and materials recommended by manufacturers, and repair damaged finishes.

END OF SECTION

SECTION 27 01 10

STRUCTURED CABLING AND ENCLOSURES

PART 1 – GENERAL

1.1 SUMMARY

A. Terminology
   1. Lennar Multifamily Communities shall be hereinafter referred to in this document as Owner and the respondent shall be referred to as Contractor. The term Owner includes direct employees and other appointed representatives of Lennar Multifamily Communities. These representatives may be requested by the Owner to represent the Owner in undertaking certain project tasks.

B. Location and Access to Project
   1. Project is located in Oakland, California.
   2. Any access using normal street and highway route to the facility is acceptable.
   3. Permission for access to this facility may be revoked for any and all persons who violate facility traffic regulations including speed limits, parking restrictions and directions of the responsible Architect or project personnel. All Contractor's personnel, operating forces, and delivery personnel shall be made aware of and shall comply at all times with the regulations and the direction of responsible Owner and project personnel.

C. Basic Definitions
   1. Definitions:
      a. "Days": As used in the specifications, the word "days" means calendar days.
      b. "Provide": As used in the plans and specifications, the word "provide" means to furnish, install, connect, program, test, commission and warranty the subject material or services.
   2. Specified Items – Substitutions
      a. "No Substitutes": The exact make and model number identified in the Specification shall be provided without exception. Where compatibility with existing systems is specified, and where a specific make or model number is not identified, the Contractor shall provide equipment which is compatible with, and equivalent to, existing equipment of the same description and type, and serving the same purpose.
      b. "Or Equal": An item may be substituted for the specified item provided that in every technical and aesthetic sense, the substituted item provides the same or better capability than the specified item, and is fully compatible with the new or existing systems specified. For expansion of existing systems, the item shall also be approved and fully supported by the existing system manufacturer. The Structured Cable Engineer shall be the sole authority to determine the equality of substituted products with specified items.
      c. "Aesthetic", or "Aesthetic Considerations": If aesthetic considerations are involved in either the "or equal" or "approved equal" category, this shall be a consideration in approving or disapproving the proposed substitute. If the proposed substitute is aesthetically unacceptable to the Architect, then the specified, or another technically equal item, shall be provided.
      d. "Beneficial Use": Each component of a system is not considered available for beneficial use until and unless all components and conditions have been fulfilled to make the system fully operational.

D. Description

1. General Description: This specification section covers general requirements for the furnishing, installation and testing of complete Low Voltage Structured Cabling per the requirements defined by the Owner.

E. Scope of Work
   1. Systems: Provide the following work complete per the contract schedule, and with acceptable engineering and installation practices as described herein.
      a. Main Point of Entry (MPOE) to Intermediate Distribution Frame (IDF) Equipment and Terminations:
         1) All cabling from the outside of the building to the MPOE, and from the MPOE to the IDF closets shall be provided and installed by the Service Providers.
         2) All termination equipment and termination work for the cabling in the MPOE shall be provided and installed by the Service Providers.
         3) All conduit from the MPOE to the IDF closets shall be provided and installed by the Electrical Contractor. All sleeves between floors and IDF closets shall be provided by the Electrical Contractor.
         4) All conduit from the MPOE to the Leasing Office, and Amenity Areas such as the Club Room, Fitness, etc. shall be provided by the Electrical Contractor.
      b. IDF Equipment and Terminations:
         1) The Low Voltage Structured Cabling Contractor shall provide and install the backbone cables from the MPOE to the IDF closets. The cables and microducts shall be provided to allow a minimum whip of 15' at the backboard area of the IDF closet. The Low Voltage Structured Cabling Contractor shall coil these cables in the IDF closets.
         2) All termination equipment and termination work for the backbone cables shall be provided and installed by Low Voltage Structured Cabling Contractor.
      c. Backbone cable from the IDF closets to each unit media enclosure:
         1) The cabling from the IDF closet to the unit media enclosure shall be:
            a) (1) ½" Microduct for future fiber installation
            b) (1) ½" Microduct for future fiber installation
            c) (1) ½" Microduct for future fiber installation

      d. Residential Unit Low Voltage Structured Cabling:
         1) All cabling shall be from outlets to the unit media cabinet.
         2) Outlets shall consist of one or two port face plates, and shall be mounted in locations as designated on the plans.
         3) Each phone or data outlet shall be wired with (1) Category 6 (CAT6) CMP cable.
         4) Each television outlet shall be wired with (1) RG6 Quad Shielded cable.
         5) Each CAT6 cable at the outlet end shall be terminated with an RJ45 insert. The CAT6 cable at the media cabinet end shall be terminated to an RJ45 connector and inserted into a media module RJ45 insert/port.
         6) Each RG6 cable at the outlet end shall be terminated to an RG6 F-Connector insert. The RG6 cable at the media cabinet end shall be terminated to an RG6 compressor connector.
      e. The Low Voltage Structured Cabling Contractor shall provide and install 25-pair copper Category 3 cable from the MPOE to IDF's for telephone connection for the Resident Services Office, Amenity Spaces, and Elevator Cab phones.
   2. Area of work includes the "19th & Harrison" project site.
   3. Services: Contractor shall provide the following services complete and as scheduled:
      a. Project Planning and Management
      b. Shop Engineering and Documentation
      c. Wiring and Installation Diagrams
      d. Submittals
      e. System Installation
      f. System Start-up and Commissioning
      g. Training
      h. Testing
      i. Warranty

F. Related Work
   1. General:
      a. Coordinate with the Architect on all aspects of aesthetic interface.
   2. Access Doors: The Structured Cabling Contractor shall coordinate with the Architect and General Contractor for the provision of access doors where needed to gain access to wiring, boxes, panels and enclosures in walls or ceilings.
   3. Conduit: All conduit shall be furnished by the electrical contractor.
   4. Conditions:
      a. The Structured Cabling Contractor shall coordinate with other disciplines on all existing construction, equipment and field devices.
      b. Equipment provided under this project shall be installed in a manner consistent with architectural, operational, service and maintenance considerations.
      c. Special Issues: Some new and renovated spaces contain equipment, devices and/or other special materials that may cause interference or disturbances with communication equipment devices, conduit, power or cables. The Structured Cabling Contractor shall take special care in coordinating with other trades on the location of these devices, their zone of influence and mitigating methods that may be required. Mitigating methods may include but not limited to: Shielded cable to avoid interference. No special precautions have been taken in these plans and specifications to account for these issues.
   5. Other Related Work
      a. Coordinate with other trades and the General Contractor on any related work not specifically mentioned above.
      b. Painting/Patching: Painting, patching and repair services to match existing or renovated conditions will be the responsibility of the Owner.

1.2 SUBMITTALS

A. General: Bid documents, including plans, details and specifications are generally considered conceptual in nature, and provide direction on products and project requirements. In most cases, the Contractor is given a choice of products and methods that may be incorporated into the system. These choices may affect the overall design, configuration and installation of the proposed system.

B. Contractor Responsibility: Prepare and submit shop drawings, rendered in the latest AutoCAD format, which show details of work to insure proper installation of the work using those materials and equipment specified or allowed under the approved plans and specifications. A complete Shop Drawing submittal package shall consist of Plans, Equipment Submittals and an Acceptance Testing Plan.

C. Completeness: The Equipment Submittals, Acceptance Testing Plan and the Shop Drawings should be submitted as a complete and contiguous package. Partial or unmarked submittals will not be accepted for review.

D. Scheduling: A schedule of shop drawing submissions shall be submitted for the Architect's review on a form acceptable to the Architect within ten (10) days after award of the Contract. The schedule of shop drawing submissions shall include a minimum, but not limited to the requirements stated herein.

E. Requirements: Provide the following information complete, and in the manner described herein:
   1. Shop Drawings: Shop Drawings shall be numbered consecutively and shall accurately and distinctly present the following information:
      a. Title Sheet
      b. Floor Plans: Showing devices, pull boxes, cabinets, conduits and conductors in their proposed locations.

c. Riser Diagram: Showing conduit relationships between devices shown on the Floor Plans. Show power sources. Show signal relationships of controls and devices within the system.
d. Custom Assembly Diagrams: For each custom assembly such as Structured Cabling Terminal Cabinets, receptacle assemblies, or door control panels, provide an assembly drawing illustrating the appearance of the assembled device. Include dimensions, assembly components, and functional attributes (momentary or alternate action switch, lens color, panel finish, etc.)
e. Component Connection Diagrams
    1) For each equipment component such as a computer, system controller, interface module or proximity reader, show the rear elevation of the device and all connectors/terminations as a pictorial.
    2) Show the wire designations on connectors.
    3) Show a schedule of the wire colors connected to the pins on each device connector.
f. Equipment Wiring Diagrams
    1) Show a pictorial illustration of each equipment enclosure and/or terminal cabinet.
    2) Show the device nomenclatures exactly as shown on the single line diagrams.
    3) Show the terminations including the wire numbers as shown on the single line diagrams.
    4) Show wire colors for each terminal.
    5) For each wire exiting the enclosure, show the destination of the wire by floor, room number and the drawing number of the panel where the wire terminates.
g. Working dimensions and erections dimensions
h. Arrangement and sectional views
i. Necessary details, including complete information for making connections between work under this Contract and work under other Contracts.
j. Stock or standard plans will not be accepted for review unless full identification and supplementary information is shown thereon in ink or typewritten form.
k. Each Drawing or page shall include:
    1) Project name, Project Number and descriptions.
    2) Submittal date and space for revision dates.
    3) Identification of equipment, product or material.
    4) Name of Subcontractor.
    5) Relation to adjacent structure of material.
    6) Physical dimensions clearly identified.
    7) Identification of deviations from the Contract Documents.
    8) Contractor's stamp, initialed or signed, dated and certifying to review of submittal, certification of field measurements and compliance with Contract.
    9) Location at which the equipment or materials are to be installed. Location shall mean both physical location and location relative to other connected or attached material.

2. Equipment Submittals
    a. Provide a parts list, including system type, model numbers, quantities, and specification sheet page reference for equipment, materials, components and devices.
    b. Provide Manufacturers Specification Sheet with descriptive information for equipment, materials, components and devices. Clearly delineate on each specification sheet which model numbers, options and configurations are being proposed.
    c. Include kinds of materials and finishes for all equipment.
3. Acceptance Testing Plan: Submit a written document detailing the test procedures to be followed by Contractor in evaluating and providing the installed System(s). Include the test forms to be used for each system and for each component of each system. Include all tests required by the equipment Manufacturer and by this Specification. Comply with the acceptance testing requirements required herein.
4. Training Plan
    a. Submit a training plan to be followed in training key employees in the operation and maintenance of the installed system at the project site. The proposed training program shall be designed to provide a level of basic competence with the system for selected personnel. These selected personnel shall then be expected to train other personnel as required, utilizing the training that they have been given and the body of training

documentation provided by the Contractor. This plan shall comply with the requirements stated in the "Training" section, of these Specifications, all stated hours of which shall be considered to be classroom hours.

b. Submit a curriculum to account for, and relate, each subject to tactual training time. All required hours shall be accounted for in this curriculum.
c. Expend between 0.5 and 2.0 hours of preparation time for each classroom hour of actual training, in order to develop appropriate training plans and other training materials.
d. The training plan shall cover the overall system, each individual system, each database management, normal operations, and failure modes with response procedures for each failure. Each procedural item must be applied to each equipment level.

F. The Architect will return unchecked any submittal which does not contain complete data on the work and full information on related matters.

G. Verification: The contractor shall check and acknowledge shop drawings, and shall place his signature on shop drawings submitted to the Architect. Contractor's signature shall constitute a representation that quantities, dimensions, field construction criteria, materials, catalog numbers, performance criteria and similar data have been verified and that, in his opinion, the submittal fully meets the requirements of the Contract Documents.

H. Timeliness: The Contractor shall schedule, prepare and submit shop drawings in accordance with a time-table that will allow his suppliers and manufacturers sufficient time to fabricate, manufacture, inspect test and deliver their respective products to the project site in a timely manner. The Contractor is solely responsible for delayed performance of their work.

I. Departure from Contract Requirements: If the shop drawings show departures from the Contract requirements, the Contractor shall make specific mention thereof in his letter of transmittal; otherwise review of such submittals shall not constitute review of the departure. Review of the plans shall constitute review of the specific subject matter for which the plans were submitted and not of any other structure, materials, equipment, or apparatus shown on the plans.

J. Contractor Responsibility: The review of shop drawings will be general and shall not relieve the Contractor of responsibility for the accuracy of such plans, nor for the proper fitting and construction of the work, nor for the furnishing of materials or work required by the Contract. No construction called for by shop drawings shall be initiated until such plans have been reviewed and approved.

K. Shop Drawing Submittal Review: The procedure in seeking review of the shop drawings shall be as follows:
1. The Contractor shall submit five (5) complete sets of shop drawings and other descriptive data with one copy of a letter of transmittal to the Architect for review thirty (30) working days after award of the contract. The letter of transmittal shall contain the project name, the Architect's Project Number, the name of the Contractor, the list of plans submitted including number and titles, requests for any review of departures from the contract requirements and any other pertinent information. Plans submitted for review shall be full sized plans, rolled and included with the equipment submittals.
2. Plans or descriptive data will be stamped "Reviewed", "Reviewed as Noted", "Reviewed as Noted, Resubmit" or "Rejected" and one copy with a Letter of Transmittal will be mailed to the Contractor at an address designated by the Contractor.
3. If a shop drawing or data is stamped "Reviewed" or "Reviewed as Noted", no additional submittal is required for that shop drawing.
4. If a shop drawing or data is stamped "Reviewed as Noted, Resubmit" or "Rejected", the Contractor shall make the necessary corrections and resubmit the documents as required above. The letter transmitting corrected documents shall indicate that the documents are a resubmittal.
5. If any corrections, other than those noted by the Architect, are made on a shop drawing prior to resubmittal, such changes should be pointed out by the Contractor upon resubmittal.

6. The Contractor shall revise and resubmit the shop drawing as required, until they are stamped either “Reviewed” or “Reviewed as Noted”.
7. After the Contractor’s submittal or resubmittal of shop drawings, the Architect shall be provided with fifteen (15) working days for review. Should the Architect require additional review time above and beyond the stated fifteen (15) working days, the Contractor may ask for a time extension and/or monetary compensation, if they can present valid, factual evidence that actual damages were incurred by the Contractor. The Architect shall determine the amount of the time extension and/or the monetary compensation to be awarded the Contractor.
8. The Architect will not issue a “Notice to Proceed” until all shop drawings are reviewed, unless otherwise approved by the Architect.

L. The Contractor shall be responsible for extra costs incurred by the Architect caused by the Contractor’s failure to comply with the procedure outlined above.

1.3 QUALITY ASSURANCE

A. General:
1. The approved Contractor shall be responsible for satisfactory operation of the system and its clarification.
2. Approval of the Architect is required of products or services of the proposed manufacturer, suppliers and installers, and will be based upon conformance to the specifications.

B. Manufacturer Qualifications:
1. Manufacturers of established reputation and experience who have produced similar equipment and who are able to refer to similar installations rendering satisfactory service shall furnish system components.
2. The manufacturer’s products shall have been in satisfactory operation on at least three similar installations for not less than three years. Contractor shall submit a list of similar installations.
3. Components including, but not limited to, face plates, 66-blocks, unit media enclosures, and modules shall have been tested and listed by Underwriters Laboratories, Inc., Factory Mutual Systems, or other approved independent testing laboratory.

C. Contractor Qualifications
1. Hold legally required California State Contractor’s licenses necessary to accomplish the installation and activation of the described system at the facilities indicated. Contractor shall submit copies of licenses to Architect prior to the start of work.
2. Hold legally required state registrations required meeting local requirements for submittal plans.
3. Is a permanent organization approved by the manufacturer(s), having facilities and employing manufacturer-trained personnel with technical qualifications and experience to prepare the installation, to install the required system and to provide periodic maintenance. The installer shall have been installing Structured Cabling systems for a period of not less than five years.
4. Maintain a parts inventory and employ trained personnel at a location within a 100 mile radius of the project.
5. Indicate complete and total compliance with the provisions of these Specifications by letter, signed by an officer of the corporation, or a principal if other Ownership currently exists. In addition the letter shall include a complete listing of exceptions, if any.

PART 2 – PRODUCTS

2.1 GENERAL

A. Product Acceptability: The products section contains lists of acceptable products. If product substitutions are proposed, they must be made based upon a comparison of equivalence to the product specified. Considerations may include but shall not be limited to functional, physical, aesthetic and/or interface aspects. The Architect/Owner shall be the sole judge of whether or not a submitted substitution is deemed to be "equivalent" to that specified.

2.2 MANUFACTURERS

A. Legrand or acceptable equal

2.3 EQUIPMENT, MATERIALS & FABRICATION

A. Backbone Cable from IDF Closet to Unit Media Enclosure
   1. (1) ½-inch Microduct
   2. (1) ½-inch Microduct
   3. (1) ½-inch Microduct

B. Media Enclosure and modules for Apartment Units:
   1. The media enclosure shall be a single enclosure installed in the unit closet per plans. The enclosure shall be 42" in height with hinged door, and manufactured by Legrand, model #EN4260/#EN4280.
      a. General Info:
         1) Color: Glossy White
         2) Finish: Protective Powder Coat
         3) Type: Hinged
      b. Listing Agencies/Third Party Information:
         1) cULus: Yes
         2) UL Listing No.:ANSI/UL 1863; ANSI/UL 985; ANSI/UL 1023; CAN/CSA-C22.2 No. 182.4-1990; ULC-S545; CSA-C22.2 No. 144.1 (2006) – (Communication Circuit Accessory) and (Security Equipment – Fire Alarm Equipment)
         3) Dimensions:42.1"H x 14.3"W x 3.7"D (106.93cm x 36.32cm x 9.4cm)
         4) Technical Information:

Humidity:	Max 93% non-condensing
Material:	20 Gage CRS
Minimum Depth Requirement:	3.7" (9.4cm)
Mounting:	Flush mount

   2. Within each enclosure, Legrand modules shall be installed to accommodate a minimum of 10 data or phone, and 8 TV inputs from the unit outlets. All modules shall be mounted in the media enclosure using the Legrand modular mounting system. All modules shall have RJ45 ports for phone and data cable connection.
      a. 10 x 8 Combo module: The Low Voltage Structured Cabling Contractor shall install Legrand model CO1110 in each media enclosure:
         1) General Information:

a)	Color:	Black
b)	Finish:	Smooth Semi-Gloss
c)	Mounting:	Enclosure
d)	Type:	Telecom / Video Module
e)	Cable Type:	Cat6, Coaxial
f)	Connection Type	F-Connector, RJ31X
g)	H" x L" x W"	5" x 3.1" x 6"
h)	Product Weight	1.53 lbs
i)	Certifications	UL UN SPSC 43222819

b. The Electrical Contractor shall provide and install a 110VAC duplex outlet at the bottom of each media cabinet.
c. The service panel shall be large enough to accommodate the Ethernet hub/ Cable Modem Router, switch (where applicable) and other advanced services or equipment that may be installed at a later date.

C. Unit outlet components:

1. Every data outlet in each unit MUST be networked through the cable modem/router/switch combination.
2. The Low Voltage Structured Cabling Contractor shall provide and install TV and Phone/Data jacks in locations shown on the plans. The specified components are manufactured by Legrand and are as follows:
   a. Category 6 RJ45 Keystone Insert, White – Model #AC346025
   b. Category 6 RJ45 Keystone Connector, White – Model #WP3476-WH
   c. F Connector Snap In Insert, White – Model #WP3481-WH
   d. Radial Taper Compression Tool – Model #AC1018
   e. RG6 Quad Compression F-Type Connector– Model #VDV812612
   f. Single Gang 2-Port Wall Plate, White – Model #WP3402-WH
   g. Single Gang 3-Port Wall Plate, White – Model #WP3403-WH

D. Patch Panel for Leasing and Amenity Areas:

1. The Low Voltage Structure Cabling Contractor shall provide a 48-port patch panel with wall mounting bracket in the Telecom closet of the Leasing Office and Amenity Areas. The Low Voltage Structured Cabling Contractor shall connect the structured cabling outlets in these areas to the patch panel, with cables to maintain the following distance limitation requirements:
   a. Maximum 150 feet for RG6 Cables
   b. Maximum 200 feet for RG11 Cables
   c. Maximum 300 feet for Category 6 Cables
2. The Low Voltage Structure Cabling Contractor shall terminate all outlet cables to the patch panel and label all cables with a P-Touch adhesive label system or comparable industry standard labeling system (system subject to owner approval).

E. 25-Pair Category 3 (CAT3) Cable:

1. The 25-pair Category 3 cable shall be part number DIW25 and manufactured by Belden, or acceptable equal.
   a. General Description:CAT3, 25-pair, U/UTP-Unshielded, Riser-CMR, Premise Backbone Cable, 24 AWG solid bare copper conductors, PVC insulation, Ripcord, PVC jacket.
   b. Usage (Overall):Premise Backbone Cable
   c. Total number of conductors:50
   d. Overall Nominal Diameter:0.380 in.
   e. Operating Temperature Range:-30°C to +60°C (-22°F to +140°F)

PART 3 – EXECUTION

3.1 INSTALLATION

A. Comply with manufacturer's instructions for installation of access doors.

3.2 INCLUSIONS:

A. All labor and materials for a complete installation.

B. All wire and cable to be run in conduit and open cable fashion and in accordance with National Electrical Code Standards.

3.3 EXCLUSIONS

A. Dedicated 110 VAC outlets for Communication panels by the electrician

B. All conduits and raceways

3.4 WARRANTY

A. All components used in the installation of the system(s) will be new. The warranty period is for one (1) year from the date of installation. The warranty provides repair or replacement of all parts and labor on all workmanship and materials supplied by the system installer/contractor and its subcontractors. Vandalism, theft, misuse, intentional damage, acts of God, etc. are not covered by the warranty.

3.5 TRAINING, MANUALS and DRAWINGS

A. The system installer shall provide a complete close out package including (1) set of reproducible vellum as-built drawings and (3) sets of as-built blueprints. Drawings shall include device locations, controller locations, junction box locations, conduit and wiring paths, support notes and relevant detail drawings.

END OF SECTION

SECTION 27 21 33

WIFI ACCESS POINT SYSTEM

PART 1 - GENERAL

1.01 **SUMMARY**

A. TERMINOLOGY

1. Lennar Multifamily Communities shall be hereinafter referred to in this document as Owner and the respondent shall be referred to as Contractor. The term Owner includes direct employees and other appointed representatives of Lennar Multifamily Communities. These representatives may be requested by the Owner to represent the Owner in undertaking certain project tasks.

B. LOCATION AND ACCESS TO PROJECT

1. Project is located in Oakland, California.
2. Any access using normal street and highway route to the facility is acceptable.
3. Permission for access to this facility may be revoked for any and all persons who violate facility traffic regulations including speed limits, parking restrictions and directions of the responsible Architect or project personnel. All Contractor's personnel, operating forces, and delivery personnel shall be made aware of and shall comply at all times with the regulations and the direction of responsible Owner and project personnel.

C. BASIC DEFINITIONS

1. Definitions:
   a. "Days": As used in the specifications, the word "days" means calendar days.
   b. "Provide": As used in the plans and specifications, the word "provide" means to furnish, install, connect, program, test, commission and warranty the subject material or services.

2. Specified Items – Substitutions
   a. "No Substitutes": The exact make and model number identified in the Specification shall be provided without exception. Where compatibility with existing systems is specified, and where a specific make or model number is not identified, the Contractor shall provide equipment which is compatible with, and equivalent to, existing equipment of the same description and type, and serving the same purpose.
   b. "Or Equal": An item may be substituted for the specified item provided that in every technical and aesthetic sense, the substituted item provides the same or better capability than the specified item, and is fully compatible with the new or existing systems specified. For expansion of existing systems, the item shall also be approved and fully supported by the existing system manufacturer.
   c. "Aesthetic", or "Aesthetic Considerations": If aesthetic considerations are involved in either the "or equal" or "approved equal" category, this shall be a consideration in approving or disapproving the proposed substitute. If the proposed substitute is aesthetically unacceptable to the Architect, then the specified, or another technically equal item, shall be provided.

3. "Beneficial Use": Each component of a system is not considered available for beneficial use until and unless all components and conditions have been fulfilled to make the system fully operational.

D. DESCRIPTION

1. General Description: This specification section covers general requirements for the furnishing, installation and testing of complete WIFI Access Point System to meet the requirements of the current State of California building and fire codes.

E. SCOPE OF WORK

1. Systems: Provide the following work complete per the contract schedule, and with acceptable engineering and installation practices as described herein.
   a. The WIFI Access Point (WAP) system shall be installed per plans:
      1) Outdoor antennas,
      2) Indoor antennas
      3) Zone Director for WAP
      4) Power supplies
      5) POE switches
      6) Equipment Rack
      7) Cat6 Cable
      8) Patch Cables

2. Area of work includes, but is not limited to "19th & Harrison" project site.
3. Services: Contractor shall provide the following services complete and as scheduled:
   a. Project Planning and Management
   b. Shop Engineering and Documentation
   c. Wiring and Installation Diagrams
   d. Submittals
   e. System Installation
   f. System Start-up and Commissioning
   g. Training
   h. Testing
   i. Warranty

4. System Functionality:
   a. Provide WIFI access point coverage in the management office and community amenity areas.
   b. System to include all wiring antennas, network switch, ups, and zone director to provide a complete system ready for connection to an internet service provider.

F. RELATED WORK

1. General:
   Coordinate with the Architect on all aspects of aesthetic interface.

2. The WIFI Contractor shall coordinate with the Architect and General Contractor for the provision of access doors where needed to gain access to wiring, boxes, panels and enclosures in walls or ceilings.
3. Conduit: All conduit shall be furnished by the electrical contractor.
4. 120 VAC Electrical Power: All power outlets shall be on a circuit dedicated to WIFI equipment only and will be provided and installed by the electrical contractor.
5. Conditions:
   a. The WIFI Access Point Contractor shall coordinate with other disciplines on all existing construction, equipment and field devices.
   b. Equipment provided under this project shall be installed in a manner consistent with architectural, operational, service and maintenance considerations.

c. Special Issues: Some new and renovated spaces contain equipment, devices and/or other special materials that may cause interference or disturbances with communication equipment devices, conduit, power or cables. The WIFI Contractor shall take special care in coordinating with other trades on the location of these devices, their zone of influence and mitigating methods that may be required. Mitigating methods may include but not limited to: Shielded cable to avoid interference. No special precautions have been taken in these plans and specifications to account for these issues.

6. Other Related Work
   a. Coordinate with other trades and the General Contractor on any related work not specifically mentioned above.
   b. Painting/Patching: Painting, patching and repair services to match existing or renovated conditions will be the responsibility of the Owner.

1.02 SUBMITTALS

A. General: Bid documents, including plans, details and specifications are generally considered conceptual in nature, and provide direction on products and project requirements. In most cases, the Contractor is given a choice of products and methods that may be incorporated into the system. These choices may affect the overall design, configuration and installation of the proposed system.

B. Contractor Responsibility: Prepare and submit shop drawings, rendered in the latest AutoCAD format, which show details of work to insure proper installation of the work using those materials and equipment specified or allowed under the approved plans and specifications. A complete Shop Drawing submittal package shall consist of Plans, Equipment Submittals and an Acceptance Testing Plan.

C. Completeness: The Equipment Submittals, Acceptance Testing Plan and the Shop Drawings should be submitted as a complete and contiguous package. Partial or unmarked submittals will not be accepted for review.

D. Scheduling: A schedule of shop drawing submissions shall be submitted for the Architect's review on a form acceptable to the Architect within ten (10) days after award of the Contract. The schedule of shop drawing submissions shall include a minimum, but not limited to the requirements stated herein.

E. Requirements: Provide the following information complete, and in the manner described herein:
   1. Shop Drawings: Shop Drawings shall be numbered consecutively and shall accurately and distinctly present the following information:
      a. Title Sheet
      b. Floor Plans: Showing devices, pull boxes, cabinets, conduits and conductors in their proposed locations.
      c. Riser Diagram: Showing conduit relationships between devices shown on the Floor Plans. Show power sources. Show signal relationships of controls and devices within the system.
      d. Custom Assembly Diagrams: For each custom assembly such as Security Terminal Cabinets, receptacle assemblies, or door control panels, provide an assembly drawing illustrating the appearance of the assembled device. Include dimensions, assembly components, and functional attributes (momentary or alternate action switch, lens color, panel finish, etc.)
      e. Component Connection Diagrams

1) Show the wire designations on connectors.

f. Equipment Wiring Diagrams
   1) Show a pictorial illustration of each equipment enclosure and/or terminal cabinet.
   2) Show the device nomenclatures exactly as shown on the single line diagrams.
   3) Show the terminations including the wire numbers as shown on the single line diagrams.
   4) Show wire colors for each terminal.
   5) For each wire exiting the enclosure, show the destination of the wire by floor, room number and the drawing number of the panel where the wire terminates.

g. Working dimensions and erections dimensions

h. Arrangement and sectional views

i. Necessary details, including complete information for making connections between work under this Contract and work under other Contracts.

j. Stock or standard plans will not be accepted for review unless full identification and supplementary information is shown thereon in ink or typewritten form.

k. Each Drawing or page shall include:
   1) Project name, Project Number and descriptions.
   2) Submittal date and space for revision dates.
   3) Identification of equipment, product or material.
   4) Name of Subcontractor.
   5) Relation to adjacent structure of material.
   6) Physical dimensions clearly identified.
   7) Identification of deviations from the Contract Documents.
   8) Contractor's stamp, initialed or signed, dated and certifying to review of submittal, certification of field measurements and compliance with Contract.
   9) Location at which the equipment or materials are to be installed. Location shall mean both physical location and location relative to other connected or attached material.

2. Equipment Submittals
   a. Provide a parts list, including system type, model numbers, quantities, and specification sheet page reference for equipment, materials, components and devices.
   b. Provide Manufacturers Specification Sheet with descriptive information for equipment, materials, components and devices. Clearly delineate on each specification sheet which model numbers, options and configurations are being proposed.
   c. Include kinds of materials and finishes for all equipment.
3. Acceptance Testing Plan: Submit a written document detailing the test procedures to be followed by Contractor in evaluating and providing the installed System(s). Include the test forms to be used for each system and for each component of each system. Include all tests required by the equipment Manufacturer and by this Specification. Comply with the acceptance testing requirements required herein.
4. Training Plan
   a. Submit a training plan to be followed in training key employees in the operation and maintenance of the installed system at the project site. The proposed training program shall be designed to provide a level of basic competence with the system for selected personnel. These selected personnel shall then be expected to train other personnel as required, utilizing the training that they have been given and the body of training documentation provided by the Contractor. This plan shall comply with the requirements stated in the

"Training" section, of these Specifications, all stated hours of which shall be considered to be classroom hours.

b. The training plan shall cover the overall system, each individual system, each database management, normal operations, and failure modes with response procedures for each failure. Each procedural item must be applied to each equipment level.

F. The Architect will return unchecked any submittal which does not contain complete data on the work and full information on related matters.

G. Verification: The contractor shall check and acknowledge shop drawings, and shall place his signature on shop drawings submitted to the Architect. Contractor's signature shall constitute a representation that quantities, dimensions, field construction criteria, materials, catalog numbers, performance criteria and similar data have been verified and that, in his opinion, the submittal fully meets the requirements of the Contract Documents.

H. Timeliness: The Contractor shall schedule, prepare and submit shop drawings in accordance with a time-table that will allow his suppliers and manufacturers sufficient time to fabricate, manufacture, inspect test and deliver their respective products to the project site in a timely manner. The Contractor is solely responsible for delayed performance of their work.

I. Departure from Contract Requirements: If the shop drawings show departures from the Contract requirements, the Contractor shall make specific mention thereof in his letter of transmittal; otherwise review of such submittals shall not constitute review of the departure. Review of the plans shall constitute review of the specific subject matter for which the plans were submitted and not of any other structure, materials, equipment, or apparatus shown on the plans.

J. Contractor Responsibility: The review of shop drawings will be general and shall not relieve the Contractor of responsibility for the accuracy of such plans, nor for the proper fitting and construction of the work, nor for the furnishing of materials or work required by the Contract. No construction called for by shop drawings shall be initiated until such plans have been reviewed and approved.

K. Shop Drawing Submittal Review: The procedure in seeking review of the shop drawings shall be as follows:

1. The Contractor shall submit five (5) complete sets of shop drawings and other descriptive data with one copy of a letter of transmittal to the Architect for review thirty (30) working days after award of the contract. The letter of transmittal shall contain the project name, the Architect's Project Number, the name of the Contractor, the list of plans submitted including number and titles, requests for any review of departures from the contract requirements and any other pertinent information. Plans submitted for review shall be full sized plans, rolled and included with the equipment submittals.
2. Plans or descriptive data will be stamped "Reviewed", "Reviewed as Noted", "Reviewed as Noted, Resubmit" or "Rejected" and one copy with a Letter of Transmittal will be mailed to the Contractor at an address designated by the Contractor.
3. If a shop drawing or data is stamped "Reviewed" or "Reviewed as Noted", no additional submittal is required for that shop drawing.
4. If a shop drawing or data is stamped "Reviewed as Noted, Resubmit" or "Rejected", the Contractor shall make the necessary corrections and resubmit the documents as required above. The letter transmitting corrected documents shall indicate that the documents are a resubmittal.

5. If any corrections, other than those noted by the Architect, are made on a shop drawing prior to resubmittal, such changes should be pointed out by the Contractor upon resubmittal.
6. The Contractor shall revise and resubmit the shop drawing as required, until they are stamped either “Reviewed” or “Reviewed as Noted”.
7. After the Contractor’s submittal or resubmittal of shop drawings, the Architect shall be provided with fifteen (15) working days for review. Should the Architect require additional review time above and beyond the stated fifteen (15) working days, the Contractor may ask for a time extension and/or monetary compensation, if they can present valid, factual evidence that actual damages were incurred by the Contractor. The Architect shall determine the amount of the time extension and/or the monetary compensation to be awarded the Contractor.
8. The Architect will not issue a “Notice to Proceed” until all shop drawings are reviewed, unless otherwise approved by the Architect.

L. The Contractor shall be responsible for extra costs incurred by the Architect caused by the Contractor’s failure to comply with the procedure outlined above.

1.03 QUALITY ASSURANCE

A. General:
1. The approved Contractor shall be responsible for satisfactory operation of the system and its clarification.
2. Approval of the Architect is required of products or services of the proposed manufacturer, suppliers and installers, and will be based upon conformance to the specifications.

B. Manufacturer Qualifications:
1. Manufacturers of established reputation and experience who have produced similar equipment and who are able to refer to similar installations rendering satisfactory service shall furnish system components.
2. The manufacturer’s products shall have been in satisfactory operation on at least three similar installations for not less than three years. Contractor shall submit a list of similar installations.
3. Components including, but not limited to, communication equipment, wiring, cable and power supplies shall have been tested and listed by Underwriters Laboratories, Inc., Factory Mutual Systems, or other approved independent testing laboratory.

C. Contractor Qualifications
1. Hold legally required California State Contractor’s licenses necessary to accomplish the installation and activation of the described system at the facilities indicated. Contractor shall submit copies of licenses to Architect prior to the start of work.
2. Hold legally required state registrations required meeting local requirements of the authorities having jurisdiction over this project.
3. Is a permanent organization, approved by the manufacturer(s), having facilities and employing manufacturer-trained personnel with technical qualifications and experience to prepare the installation, to install the required system and to provide periodic maintenance. The installer shall have been installing IP and analog camera systems for a period of not less than five years.
4. Hold manufacturer’s certifications for design, installation and service of the products to be installed.
5. Maintain a parts inventory and employ trained personnel at a location within a 100 mile radius of the project.

6. Indicate complete and total compliance with the provisions of these Specifications by letter, signed by an officer of the corporation, or a principal if other Ownership currently exists. In addition the letter shall include a complete listing of exceptions, if any.

PART 2 - PRODUCTS

2.01 GENERAL

A. Product Acceptability: The products section contains lists of acceptable products. If product substitutions are proposed, they must be made based upon a comparison of equivalence to the product specified. Considerations may include but shall not be limited to functional, physical, aesthetic and/or interface aspects. The Architect/Owner shall be the sole judge of whether or not a submitted substitution is deemed to be “equivalent” to that specified.

2.02 MANUFACTURERS

A. Ruckus Wireless or acceptable equal

2.03 EQUIPMENT, MATERIALS & FABRICATION

A. WIFI Access Point System:
1. Zone Director: 1200 Zone Director – Ruckus Wireless Part # 901-1205-UN00
2. Single add on licenses for Zone Director 1200 – Ruckus Wireless Part # 9090001ZD12
3. ZoneFlex Dual Band R300 Indoor Access Point - Ruckus Wireless Part # 901-R300-US02
4. ZoneFlex 802.11AC T300 Outdoor Access Point – Ruckus Wireless Part # 901-T300-US01
5. POE Network Switch
6. POE Injectors for Indoor Access Points -
7. 8 port Gig-E Non-POE w/ available GBIC Port –
8. Smart UPS-UPS 1000VA USB & Serial RM 1U 120V - APC Part # SUA1000RM1U
9. Wall Mount Rack-Middle Atlantic Part # EWR-8-22

B. Zone Director Specifications
1. POWER • External power adapter Input: 110 – 240V AC Output: 12V DC, 2A
2. PHYSICAL SIZE • Desktop: 25cm(L), 15.93cm(W), 3.164cm(H)
3. WEIGHT • 2.2 lbs (1 kilogram)
4. ETHERNET PORTS • 2 ports, auto MDX, auto-sensing 10/100/1000 Mbps, 1 Console RJ-45 Port
5. ENVIRONMENTAL CONDITIONS
   a. Operating Temperature: 32°F (0°C) – 104°F (40°C)
   b. Operating humidity: 20% – 90% non-condensing
6. HOTSPOT • WISPr
7. GUEST ACCESS • Supported
8. CAPTIVE PORTAL • Supported
9. MESH • Supported
10. VOICE • 802.11e/WMM U-APSD Tunneling to AP
11. IP • IPv4, IPv6, dual-stack
12. VLANs • 802.1Q (1 per BSSID), dynamic VLAN

13. REDUNDANCY • 1+1 with auto-synchronization
14. DCHP SERVER • Supported
15. CONFIGURATION • Web user interface, CLI, FlexMaster, SNMP v1, v2, v3
16. AAA • RADIUS (primary and backup)
17. AP PROVISIONING • L2 or L3 auto-discovery, Auto-software upgrade, Automatic channel and power optimization
18. CLIENT PROVISIONING • Zero-IT, Auto proxy configuration
19. WIRELESS PACKET CAPTURE Supported

PART 3 - EXECUTION

3.01 INSTALLATION

A. Comply with manufacturer's instructions for installation of the WIFI Access Point System.

B. Outdoor antennas as minimum shall be 5 Ghz and 2.4 Ghz concurrent dual band, dual ethernet ports POE in and POE out, IP-67 outdoor enclosure, -20C to 55C operating temperature, 19-Element smart antenna, two external antenna connectors for 5Ghz operation, including POE injector with its power adapter.

C. Indoor antennas as a minimum shall be 5 Ghz and 2.4 Ghz concurrent) mid-range 802.11N wireless access point, 14 element smart antenna, three ports (1GE+2FE).

3.02 INCLUSIONS:

A. All labor and materials for a complete installation.

B. All wire and cable to be run in conduit and open cable fashion and in accordance with National Electrical Code Standards.

3.03 EXCLUSIONS

A. Dedicated 120 VAC outlets for Communication panels by the electrician

B. All conduits and raceways

3.04 WARRANTY

A. All components used in the installation of the system(s) will be new. The warranty period is for one (1) year from the date of installation. The warranty provides repair or replacement of all parts and labor on all workmanship and materials supplied by the system installer/contractor and it's subcontractors. Vandalism, theft, misuse, intentional damage, acts of God, etc. are not covered by the warranty.

3.05 TRAINING, MANUALS and DRAWINGS

A. The system installer shall provide a complete close out package including (1) set of reproducible vellum as-built drawings and (3) sets of as-built blueprints. Drawings shall include device locations, controller locations, junction box locations, conduit and wiring paths, support notes and relevant detail drawings.

B. (3) Sets of installation and operating manuals for each product will be bound into book or binder format, with each section clearly labeled.

C. The system shall provide a minimum of 2 hours training on all system functions and programming. The training shall be conducted over the course of 2 sessions:
   1. System power-up and start-up.
   2. Property management staff.

END OF SECTION

SECTION 27 32 26

TWO WAY COMMUNICATION-RESCUE ASSISTANCE SYSTEM

PART 1 – GENERAL

1.1 SUMMARY

A. TERMINOLOGY
1. Lennar Multifamily Communities shall be hereinafter referred to in this document as Owner and the respondent shall be referred to as Contractor. The term Owner includes direct employees and other appointed representatives of Lennar Multifamily Communities. These representatives may be requested by the Owner to represent the Owner in undertaking certain project tasks.

B. LOCATION AND ACCESS TO PROJECT
1. Project is located in Oakland, California.
2. Any access using normal street and highway route to the facility is acceptable.
3. Permission for access to this facility may be revoked for any and all persons who violate facility traffic regulations including speed limits, parking restrictions and directions of the responsible Architect or project personnel. All Contractor's personnel, operating forces, and delivery personnel shall be made aware of and shall comply at all times with the regulations and the direction of responsible Owner and project personnel.

C. BASIC DEFINITIONS
1. Definitions:
   a. "Days": As used in the specifications, the word "days" means calendar days.
   b. "Provide": As used in the plans and specifications, the word "provide" means to furnish, install, connect, program, test, commission and warranty the subject material or services.
2. Specified Items – Substitutions
   a. "No Substitutes": The exact make and model number identified in the Specification shall be provided without exception. Where compatibility with existing systems is specified, and where a specific make or model number is not identified, the Contractor shall provide equipment which is compatible with, and equivalent to, existing equipment of the same description and type, and serving the same purpose.
   b. "Or Equal": An item may be substituted for the specified item provided that in every technical and aesthetic sense, the substituted item provides the same or better capability than the specified item, and is fully compatible with the new or existing systems specified. For expansion of existing systems, the item shall also be approved and fully supported by the existing system manufacturer. The Contractor shall be the sole authority to determine the equality of substituted products with specified items.
   c. "Aesthetic", or "Aesthetic Considerations": If aesthetic considerations are involved in either the "or equal" or "approved equal" category, this shall be a consideration in approving or disapproving the proposed substitute. If the proposed substitute is aesthetically unacceptable to the Architect, then the specified, or another technically equal item, shall be provided.
3. "Beneficial Use": Each component of a system is not considered available for beneficial use until and unless all components and conditions have been fulfilled to make the system fully operational.

D. DESCRIPTION

1. General Description: This specification section covers general requirements for the furnishing, installation and testing of complete low-voltage 2-Way Communication System to meet the requirements of the current State of California building and fire codes.

E. SCOPE OF WORK
   1. Systems: Provide the following work complete per the contract schedule, and with acceptable engineering and installation practices as described herein.
      a. The 2-Way Communication System shall be a hard-wired digital system consisting of the following components:
         1) Flush mount stainless steel communication station at each elevator lobby that is not on a floor with a direct path of exit discharge from the building.
         2) Annunciator for the two-way communications system shall be located in the fire alarm control room. Each communication station shall be independently identified on the control/annunciator. The control panel/annunciator shall be capable of both audible and visual indication when a call is received. The control panel/annunciator shall be capable of transmitting both voice communication and visual signals off premises to a remote 24/7 manned central station.
         3) Remote switch for network topography and connection of call stations to control panel/annunciator
         4) Back-box for control panel.
         5) Power supply for Annunciator
         6) 3 conductor, 18 gauge power cable (2 for 24 VDC and 1 for Earth Ground)
         7) 1 conductor, 22 gauge power cable (Annunciator to Call Station-Audio)
         8) 4 conductor, 22 gauge power cable (Annunciator to Call Station-Power-Switch-LED)
         9) Optional: 2 conductor, 22 gauge power cable (Annunciator to Voice Dialer or FACP-Monitoring)

   2. Area of work includes, but is not limited to "19th & Harrison" project site.
   3. Services: Contractor shall provide the following services complete and as scheduled:
      a. Project Planning and Management
      b. Shop Engineering and Documentation
      c. Wiring and Installation Diagrams
      d. Submittals
      e. System Installation
      f. System Start-up and Commissioning
      g. Training
      h. Testing
      i. Warranty
   4. System Design:
      a. 2-Way Communication System:
         1) The system for this project shall be a hardwired analog based system. Each communication station shall be home-run to the Annunciator.
         2) A voice dialer shall be installed as an integrated part of the central control. If the central control is not manned, then the voice dialer shall initiate a call to a manned, 24 hour central station.
      b. System Functionality:
         1) The 2-Way Communication System shall utilize both audio and visual methods to signal a call from a communication station to and from the remote annunciator.
         2) The central control/annunciator shall be flush mounted whenever possible.
         3) The control/annunciator shall identify each communication station and a light shall light when a call station is activated.
         4) Upon activation of a call station, a 2 way communication path shall be established between the call station and the central control panel.
         5) A light shall light on the call station when a call button is depressed.

F. RELATED WORK

1. General:
   a. Coordinate with the Architect on all aspects of aesthetic interface.
2. Finish Carpentry and Millwork
   a. The back-box for the Annunciator shall be flush mounted into the wall. The framer shall provide framing for the appropriate size opening for the back-box at a height and location designated on the system drawings or per field coordination.
3. Access Doors: The 2-Way Communication Contractor shall coordinate with the Architect and General Contractor for the provision of access doors where needed to gain access to wiring, boxes, panels and enclosures in walls or ceilings.
4. Conduit: All conduit shall be furnished by the electrical contractor.
5. 120 VAC Electrical Power: All power outlets shall be on a circuit dedicated to 2-Way communication equipment only and will be provided and installed by the electrical contractor.
6. Conditions:
   a. The 2-Way Communication Contractor shall coordinate with other disciplines on all existing construction, equipment and field devices.
   b. Equipment provided under this project shall be installed in a manner consistent with architectural, operational, service and maintenance considerations.
   c. Special Issues: Some new and renovated spaces contain equipment, devices and/or other special materials that may cause interference or disturbances with communication equipment devices, conduit, power or cables. The 2-Way Communication Contractor shall take special care in coordinating with other trades on the location of these devices, their zone of influence and mitigating methods that may be required. Mitigating methods may include but not limited to: Shielded cable to avoid interference. No special precautions have been taken in these plans and specifications to account for these issues.
7. Other Related Work
   a. Coordinate with other trades and the General Contractor on any related work not specifically mentioned above.
   b. Painting/Patching: Painting, patching and repair services to match existing or renovated conditions will be the responsibility of the Owner.

1.2 SUBMITTALS

A. General: Bid documents, including plans, details and specifications are generally considered conceptual in nature, and provide direction on products and project requirements. In most cases, the Contractor is given a choice of products and methods that may be incorporated into the system. These choices may affect the overall design, configuration and installation of the proposed system.

B. Contractor Responsibility: Prepare and submit shop drawings, rendered in the latest AutoCAD format, which show details of work to insure proper installation of the work using those materials and equipment specified or allowed under the approved plans and specifications. A complete Shop Drawing submittal package shall consist of Plans, Equipment Submittals and an Acceptance Testing Plan.

C. Completeness: The Equipment Submittals, Acceptance Testing Plan and the Shop Drawings should be submitted as a complete and contiguous package. Partial or unmarked submittals will not be accepted for review.

D. Scheduling: A schedule of shop drawing submissions shall be submitted for the Architect's review on a form acceptable to the Architect within ten (10) days after award of the Contract. The schedule of shop drawing submissions shall include a minimum, but not limited to the requirements stated herein.

E. Requirements: Provide the following information complete, and in the manner described herein:

1. Shop Drawings: Shop Drawings shall be numbered consecutively and shall accurately and distinctly present the following information:
    a. Title Sheet
    b. Floor Plans: Showing devices, pull boxes, cabinets, conduits and conductors in their proposed locations.
    c. Riser Diagram: Showing conduit relationships between devices shown on the Floor Plans. Show power sources. Show signal relationships of controls and devices within the system.
    d. Component Connection Diagrams
        1) Show the wire designations on connectors.
    e. Equipment Wiring Diagrams
        1) Show the device nomenclatures exactly as shown on the single line diagrams.
        2) Show the terminations including the wire numbers as shown on the single line diagrams.
        3) Show wire colors for each terminal.
        4) For each wire exiting the enclosure, show the destination of the wire by floor, room number and the drawing number of the panel where the wire terminates.
    f. Working dimensions and erections dimensions
    g. Arrangement and sectional views
    h. Necessary details, including complete information for making connections between work under this Contract and work under other Contracts.
    i. Stock or standard plans will not be accepted for review unless full identification and supplementary information is shown thereon in ink or typewritten form.
    j. Each Drawing or page shall include:
        1) Project name, Project Number and descriptions.
        2) Submittal date and space for revision dates.
        3) Identification of equipment, product or material.
        4) Name of Subcontractor.
        5) Relation to adjacent structure of material.
        6) Physical dimensions clearly identified.
        7) Identification of deviations from the Contract Documents.
        8) Contractor's stamp, initialed or signed, dated and certifying to review of submittal, certification of field measurements and compliance with Contract.
        9) Location at which the equipment or materials are to be installed. Location shall mean both physical location and location relative to other connected or attached material.
2. Equipment Submittals
    a. Provide a parts list, including system type, model numbers, quantities, and specification sheet page reference for equipment, materials, components and devices.
    b. Provide Manufacturers Specification Sheet with descriptive information for equipment, materials, components and devices. Clearly delineate on each specification sheet which model numbers, options and configurations are being proposed.
    c. Include kinds of materials and finishes for all equipment.
3. Acceptance Testing Plan: Submit a written document detailing the test procedures to be followed by Contractor in evaluating and providing the installed System(s). Include the test forms to be used for each system and for each component of each system. Include all tests required by the equipment Manufacturer and by this Specification. Comply with the acceptance testing requirements required herein.
4. Training Plan
    a. Submit a training plan to be followed in training key employees in the operation and maintenance of the installed system at the project site. The proposed training program shall be designed to provide a level of basic competence with the system for selected personnel. These selected personnel shall then be expected to train other personnel as required, utilizing the training that they have been given and the body of training documentation provided by the Contractor. This plan shall comply with the requirements stated in the "Training" section, of these Specifications, all stated hours of which shall be considered to be classroom hours.

b. The training plan shall cover the overall system, each individual system, each database management, normal operations, and failure modes with response procedures for each failure. Each procedural item must be applied to each equipment level.

F. The Architect will return unchecked any submittal which does not contain complete data on the work and full information on related matters.

G. Verification: The contractor shall check and acknowledge shop drawings, and shall place his signature on shop drawings submitted to the Architect. Contractor's signature shall constitute a representation that quantities, dimensions, field construction criteria, materials, catalog numbers, performance criteria and similar data have been verified and that, in his opinion, the submittal fully meets the requirements of the Contract Documents.

H. Timeliness: The Contractor shall schedule, prepare and submit shop drawings in accordance with a time-table that will allow his suppliers and manufacturers sufficient time to fabricate, manufacture, inspect test and deliver their respective products to the project site in a timely manner. The Contractor is solely responsible for delayed performance of their work.

I. Departure from Contract Requirements: If the shop drawings show departures from the Contract requirements, the Contractor shall make specific mention thereof in his letter of transmittal; otherwise review of such submittals shall not constitute review of the departure. Review of the plans shall constitute review of the specific subject matter for which the plans were submitted and not of any other structure, materials, equipment, or apparatus shown on the plans.

J. Contractor Responsibility: The review of shop drawings will be general and shall not relieve the Contractor of responsibility for the accuracy of such plans, nor for the proper fitting and construction of the work, nor for the furnishing of materials or work required by the Contract. No construction called for by shop drawings shall be initiated until such plans have been reviewed and approved.

K. Shop Drawing Submittal Review: The procedure in seeking review of the shop drawings shall be as follows:
   1. The 2-Way Communication Contractor shall submit five (5) complete sets of shop drawings and other descriptive data with one copy of a letter of transmittal to the Architect for review thirty (30) working days after award of the contract. The letter of transmittal shall contain the project name, the Architect's Project Number, the name of the Contractor, the list of plans submitted including number and titles, requests for any review of departures from the contract requirements and any other pertinent information. Plans submitted for review shall be full sized plans, rolled and included with the equipment submittals.
   2. Plans or descriptive data will be stamped "Reviewed", "Reviewed as Noted", "Reviewed as Noted, Resubmit" or "Rejected" and one copy with a Letter of Transmittal will be mailed to the Contractor at an address designated by the Contractor.
   3. If a shop drawing or data is stamped "Reviewed" or "Reviewed as Noted", no additional submittal is required for that shop drawing.
   4. If a shop drawing or data is stamped "Reviewed as Noted, Resubmit" or "Rejected", the 2-Way Communication Contractor shall make the necessary corrections and resubmit the documents as required above. The letter transmitting corrected documents shall indicate that the documents are a resubmittal.
   5. If any corrections, other than those noted by the Architect, are made on a shop drawing prior to resubmittal, such changes should be pointed out by the 2-Way Communication Contractor upon resubmittal.
   6. The 2-Way Communication Contractor shall revise and resubmit the shop drawing as required, until they are stamped either "Reviewed" or "Reviewed as Noted".
   7. After the 2-Way Communication Contractor's submittal or resubmittal of shop drawings, the Architect shall be provided with fifteen (15) working days for review. Should the Architect require additional review time above and beyond the stated fifteen (15) working days, the

Contractor may ask for a time extension and/or monetary compensation, if they can present valid, factual evidence that actual damages were incurred by the Contractor. The Architect shall determine the amount of the time extension and/or the monetary compensation to be awarded the Contractor.

8. The Architect will not issue a "Notice to Proceed" until all shop drawings are reviewed, unless otherwise approved by the Architect.

L. The Contractor shall be responsible for extra costs incurred by the Architect caused by the Contractor's failure to comply with the procedure outlined above.

1.3 QUALITY ASSURANCE

A. General:
   1. The approved Contractor shall be responsible for satisfactory operation of the system and its clarification.
   2. Approval of the Architect is required of products or services of the proposed manufacturer, suppliers and installers, and will be based upon conformance to the specifications.

B. Manufacturer Qualifications:
   1. Manufacturers of established reputation and experience who have produced similar equipment and who are able to refer to similar installations rendering satisfactory service shall furnish system components.
   2. The manufacturer's products shall have been in satisfactory operation on at least three similar installations for not less than three years. Contractor shall submit a list of similar installations.
   3. Components including, but not limited to, communication equipment, wiring, cable and power supplies shall have been tested and listed by Underwriters Laboratories, Inc., Factory Mutual Systems, or other approved independent testing laboratory.

C. Contractor Qualifications
   1. Hold legally required California State Contractor's licenses necessary to accomplish the installation and activation of the described system at the facilities indicated. Contractor shall submit copies of licenses to Architect prior to the start of work.
   2. Hold legally required state registrations required meeting local requirements of the authorities having jurisdiction over this project.
   3. A permanent organization, approved by the manufacturer(s), having facilities and employing manufacturer-trained personnel with technical qualifications and experience to prepare the installation, to install the required system and to provide periodic maintenance. The installer shall have been installing IP and analog camera systems for a period of not less than five years.
   4. Hold manufacturer's certifications for design, installation and service of the products to be installed.
   5. Maintain a parts inventory and employ trained personnel at a location within a 100 mile radius of the project.
   6. Indicate complete and total compliance with the provisions of these Specifications by letter, signed by an officer of the corporation, or a principal if other Ownership currently exists. In addition the letter shall include a complete listing of exceptions, if any.

PART 2 – PRODUCTS

2.1 GENERAL

A. Product Acceptability: The products section contains lists of acceptable products. If product substitutions are proposed, they must be made based upon a comparison of equivalence to the product specified. Considerations may include but shall not be limited to functional, physical, aesthetic and/or interface aspects. The Architect/Owner shall be the sole judge of whether or not a submitted substitution is deemed to be “equivalent” to that specified.

2.2 MANUFACTURERS

A. 2-Way Communication System: Cornell or acceptable equal

2.3 EQUIPMENT, MATERIALS & FABRICATION

A. 2-Way Communication System:
   1. Annunciator: Cornell 4800 Main Control Panel with BB48 Back-Box
   2. Cornell ES-4808 Expansion Switch
   3. Communication Station: Cornell 4800V with RACO Back-Box
   4. Power Supply: Cornell B-5243B
   5. CAT5e Cable
   6. 22/2 Stranded Shielded Cable
   7. 16/2 Stranded Shielded Cable
   8. Cornell SN-C48 Signage-Push for Help

PART 3 – EXECUTION

3.1 INSTALLATION

A. Comply with manufacturer's instructions for installation of the 2-Way Communication System.

3.2 INCLUSIONS:

A. All labor and materials for a complete installation.

B. All wire and cable to be run in conduit and open cable fashion and in accordance with National Electrical Code Standards.

3.3 EXCLUSIONS

A. Dedicated 120 VAC outlets for 2-Way Communication System Equipment by the electrician

B. All conduits and raceways

3.4 WARRANTY

A. All components used in the installation of the system(s) will be new. The warranty period is for one (1) year from the date of installation. The warranty provides repair or replacement of all parts and labor on all workmanship and materials supplied by the system installer/contractor and it's

subcontractors. Vandalism, theft, misuse, intentional damage, acts of God, etc. are not covered by the warranty.

3.5 TRAINING, MANUALS AND DRAWINGS

A. The system installer shall provide a complete close out package including (1) set of reproducible vellum as-built drawings and (3) sets of as-built blueprints. Drawings shall include device locations, controller locations, junction box locations, conduit and wiring paths, support notes and relevant detail drawings.

B. (3) Sets of installation and operating manuals for each product will be bound into book or binder format, with each section clearly labeled.

C. The system shall provide a minimum of 2 hours training on all system functions and programming. The training shall be conducted over the course of 2 sessions:
   1. System power-up and start-up.
   2. Property management staff.

END OF SECTION

SECTION 28 1310

ACCESS CONTROL

PART 1 - GENERAL

1.01 SUMMARY

A. Terminology
   1. Lennar Multifamily Communities shall be hereinafter referred to in this document as Owner and the respondent shall be referred to as Contractor. The term Owner includes direct employees and other appointed representatives of Lennar Multifamily Communities. These representatives may be requested by the Owner to represent the Owner in undertaking certain project tasks.

B. Location and Access To Project
   1. Project is located in Oakland, California.
   2. Any access using normal street and highway route to the facility is acceptable.
   3. Permission for access to this facility may be revoked for any and all persons who violate facility traffic regulations including speed limits, parking restrictions and directions of the responsible Architect or project personnel. All Contractor's personnel, operating forces, and delivery personnel shall be made aware of and shall comply at all times with the regulations and the direction of responsible Owner and project personnel.

C. Basic Definitions
   1. Definitions:
      a. "Days": As used in the specifications, the word "days" means calendar days.
      b. "Provide": As used in the plans and specifications, the word "provide" means to furnish, install, connect, program, test, commission and warranty the subject material or services.
   2. Specified Items – Substitutions
      a. "No Substitutes": The exact make and model number identified in the Specification shall be provided without exception. Where compatibility with existing systems is specified, and where a specific make or model number is not identified, the Contractor shall provide equipment which is compatible with, and equivalent to, existing equipment of the same description and type, and serving the same purpose.
      b. "Or Equal": An item may be substituted for the specified item provided that in every technical and aesthetic sense, the substituted item provides the same or better capability than the specified item, and is fully compatible with the new or existing systems specified. For expansion of existing systems, the item shall also be approved and fully supported by the existing system manufacturer. The Security Engineer shall be the sole authority to determine the equality of substituted products with specified items.
      c. "Aesthetic", or "Aesthetic Considerations": If aesthetic considerations are involved in either the "or equal" or "approved equal" category, this shall be a consideration in approving or disapproving the proposed substitute. If the proposed substitute is aesthetically unacceptable to the Architect, then the specified, or another technically equal item, shall be provided.
   3. "Beneficial Use": Each component of a system is not considered available for beneficial use until and unless all components and conditions have been fulfilled to make the system fully operational.

D. Description
   1. General Description: This specification section covers general requirements for the furnishing, installation and testing of complete low-voltage access control system.
   2. Furnish and install electronic access control hardware devices, mounting brackets, power supplies, switches, equipment cabinets, controls, consoles and other components of the systems as shown and specified.

E. Scope of Work
   1. Systems: Provide the following work complete per the contract schedule, and with acceptable engineering and installation practices as described herein.
      a. An Access Control System consisting of the following primary components:
         1) Stand-alone network for the Access Control System (to provide controller connectivity between buildings)
         2) Computer Based Electronic Access Control System
         3) Proximity Readers
            (a) The security contractor shall provide (2) key fobs per apartment unit, and (50) key fobs for property management and stock.
            (b) The total count of key fob readers shall be rounded up to the nearest (50) or (100) increment.
         4) Long Range RFID Readers for Gate Controllers
            (a) The security contractor shall provide (2) transponders per apartment unit, and (50) transponders for property management and stock.
            (b) The total count of the transponders shall be rounded up to the nearest (50) or (100) increment.
         5) Telephone Entry System
            (a) Cloud-based, hands-free, two-way color video intercom system with databased access time-stamped events and building management integration.
         6) Electrification of Locking Hardware
   2. Area of work includes the “19th & Harrison Street” project site.
   3. Services: Contractor shall provide the following services complete and as scheduled:
      a. Project Planning and Management
      b. Shop Engineering and Documentation
      c. Wiring and Installation Diagrams
      d. Submittals
      e. System Installation
      f. System Start-up and Commissioning
      g. Training
      h. Testing
      i. Warranty
   4. System Design:
      a. Stand-alone network for access control:
         1) The access control system for this building will be part of a larger Access Control System Network (ACSN). It is the responsibility of the security contractor to make sure data connection is in place at the ACSN controller.

            The Work Room (space 106) in the Leasing Office shall have an access control computer workstation which the Property

Management Staff will use to enroll a new resident of the building into the ACSN, assign access tokens for residents, staff, vendors, etc. (key fobs for the pedestrian doors/gates and transponders for the vehicle gates) and enter resident contact information into the telephone entry directory. This computer workstation shall include a minimum Raid Level 5 storage back-up system.

The Server Room (space 103) shall house the main access control panel for the facility.

The ACSN shall provide for connection from the system controllers to the reader interface modules via an internal RS485 data network to be shared only with devices on the ACSN.

b. System Functionality:
   1) The access control system is designed to control access into resident or “non-common” areas, and to provide residents and authorized staff access through electronically locked doors by using key fobs and access readers. Residents and other authorized persons can gain entry by using a special key fob and presenting it to an access reader.
   2) Telephone Entry
      (a) VIDEO CALL
         (1) Visitors and tenants interact via the property intercom entry panel.
      (b) MESSAGING
         (1) Visitors can leave detailed voice and text messages for tenants directly from the ButterflyMX platform.
      (c) RESIDENTIAL DIRECTORY
         (1) Navigate the entry panel touch screen with the ease of scrolling the contact directory as a smartphone.
   3) Each door or gate can be programmed to control entrance by specific time zones, days of the week, and by access level (who can and cannot enter a gate/door). An audit trail is also generated every time someone uses a key fob to gain entry. Even unauthorized attempts to use a key fob, (using a key fob that has been deprogrammed or that doesn’t have entry permission to a particular door) are recorded in the audit report.
   4) Only staff authorized by the Owner will be able to make programming changes and run activity reports. Access to the database will be password protected. The system will be scalable, fully capable of integration, and Microsoft Windows 7 compatible. The server software shall reside on the security equipment room of the building. This server shall communicate with the client workstations at all Management/Resident Services offices using a separate network connection or internet connection specifically for access control. The database shall be stored in the server.
   5) The access control system shall interface with the scheduling system for the co-working rooms. The scheduling system shall be provided by LJG with the iPADs being provided and installed by Digital Boy.

c. Control Panel: An intelligent system controller shall be installed in the as designated on the security drawings. The intelligent system controller shall communicate with both the computer workstation and

door interface modules to allow/deny access at each controlled door or gate. Communication shall be via the proprietary ACSN.

d. Door Interface Modules: Door interface modules shall be installed at various locations within the garage and building to allow the access control devices (such as long range proximity readers for the vehicle gates and proximity readers for the pedestrian gates/man doors) to interface with the access control panel.

e. Pedestrian Gates and Man Doors:
   1) Each access controlled pedestrian gate / man door shall receive a proximity reader that will connect to a door interface module. The proximity readers are designed to work with key fobs that will be issued to residents to allow them access into controlled spaces.
   2) Residents and staff shall be issued key fobs (proximity tokens) as an electronic key to gain access through pedestrian gates and man doors controlled by proximity readers. To access a controlled space, the resident or staff member shall present their key fob approximately 2 – 4 inches from the reader. The validity of the key fob is verified within seconds through the access control system. Upon verification of a valid key fob read, the system will send a command to unlock the gate / door and allow access into the controlled space.

f. Vehicle Gates:
   1) Long range RFID (radio frequency identification device) readers shall be installed near each vehicle gate. The readers shall connect to a reader interface module for access control communication and provide a control output for controlling the gate motor. During operation, the reader sends out a radio frequency wave to establish a zone of surveillance. When a powered and active vehicle tag enters this zone, it begins to broadcast its identity. The receiving circuits in the reader sense and decode this RF signal and then determine the identity of the tag.
   2) Each resident shall be issued an active vehicle tag that will be affixed by a self-adhesive component to the inside of their vehicle's windshield. These active vehicle tags are designed to work with the long range RFID readers at each vehicle gate. To gain entry into the resident parking spaces, the resident will drive up to the vehicle gate. After verification of a valid transmit, the system will grant access and provide the control commands to activate the gate motors to open the gate.
   3) The Access Control system shall be capable of interfacing with a Fee Parking Gate/Ticket system. The Access Control system shall provide a means by which a resident may enter the garage facility without a "for pay" ticket. The Fee Parking system may be installed at a later date and the Access Control system must be capable of interfacing with this system.

g. Telephone Entry System: The facility shall be secured by an access control system which provides telephone entry for visitors using code entry. The telephone entry system is designed to provide visitors with a scrolling directory of residents by name and code. Names will be displayed on a Liquid Crystal Display (LCD) back-lit screen. Visitors will use the * and # keys to advance forwards and backwards through the directory alphabetically. When a name is located it will have a code number listed next to the name. When a visitor enters the code on the

keypad, a two-way voice link is established so that the resident can identify the visitor and grant access. The resident will use their standard home telephone to speak with the guest and allow entry by pressing the "9" key.

h. Electrified Locking Hardware: Each controlled door or gate shall be locked using electrified locking hardware. Hardware sets shall be developed by the Door Hardware Contractor for each unique condition of the door or gate. Locking hardware shall be specified and provided by the Door Hardware Contractor in coordination with the Architect and the Security Contractor.

F. Related Work

1. General:
   a. Observe interface procedures to related work as described in Part 3, herein.
   b. Coordinate with the Architect on all aspects of aesthetic interface.
2. Finish Carpentry and Millwork
   a. The access control computer workstation shall be designated, furnished and installed by the Contractor and will be installed at a location identified on the system drawings or as designated by the project architect. The Contractor shall coordinate security equipment size, desk/console openings, fit and operational requirements. Coordinate all required millwork and upgrades with the Architect.
3. Access Doors: The Security Contractor shall coordinate with the Architect and General Contractor for the provision of access doors where needed to gain access to wiring, boxes, panels and enclosures in walls or ceilings.
4. Conditions:
   a. The Security Contractor shall coordinate with other disciplines on all existing construction, equipment and field devices.
   b. Equipment provided under this project shall be installed in a manner consistent with architectural, operational, service and maintenance considerations.
   c. Special Issues: Some new and renovated spaces contain equipment, devices and/or other special materials that may cause interference or disturbances with security equipment devices, conduit, power or cables. The Security Contractor shall take special care in coordinating with other trades on the location of these devices, their zone of influence and mitigating methods that may be required. Mitigating methods may include but not limited to: Fiber Optic cable to avoid interference. No special precautions have been taken in these plans and specifications to account for these issues.
5. Other Related Work
   a. Coordinate with other trades and the General Contractor on any related work not specifically mentioned above.
   b. Painting/Patching: Painting, patching and repair services to match existing or renovated conditions will be the responsibility of the Owner.

1.02 SUBMITTALS

A. General: Bid documents, including plans, details and specifications are generally considered conceptual in nature, and provide direction on products and project requirements. In most cases, the Contractor is given a choice of products and methods that may be incorporated into the system. These choices may affect the overall design, configuration and installation of the proposed system.

B. Contractor Responsibility: Prepare and submit shop drawings, rendered in the latest AutoCAD format, which show details of work to insure proper installation of

the work using those materials and equipment specified or allowed under the approved plans and specifications. A complete Shop Drawing submittal package shall consist of Plans, Equipment Submittals and an Acceptance Testing Plan.

C. Completeness: The Equipment Submittals, Acceptance Testing Plan and the Shop Drawings should be submitted as a complete and contiguous package. Partial or unmarked submittals will not be accepted for review.

D. Scheduling: A schedule of shop drawing submissions shall be submitted for the Architect's review on a form acceptable to the Architect within ten (10) days after award of the Contract. The schedule of shop drawing submissions shall include a minimum, but not limited to the requirements stated herein.

E. Requirements: Provide the following information complete, and in the manner described herein:
   1. Shop Drawings: Shop Drawings shall be numbered consecutively and shall accurately and distinctly present the following information:
      a. Title Sheet
      b. Floor Plans: Showing devices, pull boxes, cabinets, conduits and conductors in their proposed locations.
      c. Riser Diagram: Showing conduit relationships between devices shown on the Floor Plans. Show power sources. Show signal relationships of controls and devices within the system.
      d. Custom Assembly Diagrams: For each custom assembly such as Security Terminal Cabinets, receptacle assemblies, or door control panels, provide an assembly drawing illustrating the appearance of the assembled device. Include dimensions, assembly components, and functional attributes (momentary or alternate action switch, lens color, panel finish, etc.)
      e. Component Connection Diagrams
         1) For each equipment component such as a computer, system controller, interface module or proximity reader, show the rear elevation of the device and all connectors/terminations as a pictorial.
         2) Show the wire designations on connectors.
         3) Show a schedule of the wire colors connected to the pins on each device connector.
      f. Equipment Wiring Diagrams
         1) Show a pictorial illustration of each equipment enclosure and/or terminal cabinet.
         2) Show the device nomenclatures exactly as shown on the single line diagrams.
         3) Show the terminations including the wire numbers as shown on the single line diagrams.
         4) Show wire colors for each terminal.
         5) For each wire exiting the enclosure, show the destination of the wire by floor, room number and the drawing number of the panel where the wire terminates.
      g. Working dimensions and erections dimensions
      h. Arrangement and sectional views
      i. Necessary details, including complete information for making connections between work under this Contract and work under other Contracts.
      j. Stock or standard plans will not be accepted for review unless full identification and supplementary information is shown thereon in ink or typewritten form.

k. Each Drawing or page shall include:
    1) Project name, Project Number and descriptions.
    2) Submittal date and space for revision dates.
    3) Identification of equipment, product or material.
    4) Name of Subcontractor.
    5) Relation to adjacent structure of material.
    6) Physical dimensions clearly identified.
    7) Identification of deviations from the Contract Documents.
    8) Contractor's stamp, initialed or signed, dated and certifying to review of submittal, certification of field measurements and compliance with Contract.
    9) Location at which the equipment or materials are to be installed. Location shall mean both physical location and location relative to other connected or attached material.

2. Equipment Submittals
    a. Provide a parts list, including system type, model numbers, quantities, and specification sheet page reference for equipment, materials, components and devices.
    b. Provide Manufacturers Specification Sheet with descriptive information for equipment, materials, components and devices. Clearly delineate on each specification sheet which model numbers, options and configurations are being proposed.
    c. Include kinds of materials and finishes for all equipment.
3. Acceptance Testing Plan: Submit a written document detailing the test procedures to be followed by Contractor in evaluating and providing the installed System(s). Include the test forms to be used for each system and for each component of each system. Include all tests required by the equipment Manufacturer and by this Specification. Comply with the acceptance testing requirements required herein.
4. Training Plan
    a. Submit a training plan to be followed in training key employees in the operation and maintenance of the installed system at the project site. The proposed training program shall be designed to provide a level of basic competence with the system for selected personnel. These selected personnel shall then be expected to train other personnel as required, utilizing the training that they have been given and the body of training documentation provided by the Contractor. This plan shall comply with the requirements stated in the "Training" section, of these Specifications, all stated hours of which shall be considered to be classroom hours.
    b. Submit a curriculum to account for, and relate, each subject to tactual training time. All required hours shall be accounted for in this curriculum.
    c. Expend between 0.5 and 2.0 hours of preparation time for each classroom hour of actual training, in order to develop appropriate training plans and other training materials.
    d. The training plan shall cover the overall system, each individual system, each database management, normal operations, and failure modes with response procedures for each failure. Each procedural item must be applied to each equipment level.
    e. The Architect will return unchecked any submittal which does not contain complete data on the work and full information on related matters.

F. Verification: The contractor shall check and acknowledge shop drawings, and shall place his signature on shop drawings submitted to the Architect. Contractor's signature shall constitute a representation that quantities, dimensions, field construction criteria, materials, catalog numbers, performance criteria and similar data have been verified and that, in his opinion, the submittal fully meets the requirements of the Contract Documents.

G. Timeliness: The Contractor shall schedule, prepare and submit shop drawings in accordance with a time-table that will allow his suppliers and manufacturers sufficient time to fabricate, manufacture, inspect test and deliver their respective products to the project site in a timely manner. The Contractor is solely responsible for delayed performance of their work.

H. Departure from Contract Requirements: If the shop drawings show departures from the Contract requirements, the Contractor shall make specific mention thereof in his letter of transmittal; otherwise review of such submittals shall not constitute review of the departure. Review of the plans shall constitute review of the specific subject matter for which the plans were submitted and not of any other structure, materials, equipment, or apparatus shown on the plans.

I. Contractor Responsibility: The review of shop drawings will be general and shall not relieve the Contractor of responsibility for the accuracy of such plans, nor for the proper fitting and construction of the work, nor for the furnishing of materials or work required by the Contract. No construction called for by shop drawings shall be initiated until such plans have been reviewed and approved.

J. Shop Drawing Submittal Review: The procedure in seeking review of the shop drawings shall be as follows:
   1. The Contractor shall submit five (5) complete sets of shop drawings and other descriptive data with one copy of a letter of transmittal to the Architect for review thirty (30) working days after award of the contract. The letter of transmittal shall contain the project name, the Architect's Project Number, the name of the Contractor, the list of plans submitted including number and titles, requests for any review of departures from the contract requirements and any other pertinent information. Plans submitted for review shall be full sized plans, rolled and included with the equipment submittals.
   2. Plans or descriptive data will be stamped "Reviewed", "Reviewed as Noted", "Reviewed as Noted, Resubmit" or "Rejected" and one copy with a Letter of Transmittal will be mailed to the Contractor at an address designated by the Contractor.
   3. If a shop drawing or data is stamped "Reviewed" or "Reviewed as Noted", no additional submittal is required for that shop drawing.
   4. If a shop drawing or data is stamped "Reviewed as Noted, Resubmit" or "Rejected", the Contractor shall make the necessary corrections and resubmit the documents as required above. The letter transmitting corrected documents shall indicate that the documents are a resubmittal.
   5. If any corrections, other than those noted by the Architect, are made on a shop drawing prior to resubmittal, such changes should be pointed out by the Contractor upon resubmittal.
   6. The Contractor shall revise and resubmit the shop drawing as required, until they are stamped either "Reviewed" or "Reviewed as Noted".
   7. After the Contractor's submittal or resubmittal of shop drawings, the Architect shall be provided with fifteen (15) working days for review. Should the Architect require additional review time above and beyond the stated fifteen (15) working days, the Contractor may ask for a time extension and/or monetary compensation, if they can present valid, factual evidence that actual damages were incurred by the Contractor. The Architect shall

determine the amount of the time extension and/or the monetary compensation to be awarded the Contractor.

8. The Architect will not issue a “Notice to Proceed” until all shop drawings are reviewed, unless otherwise approved by the Architect.

K. The Contractor shall be responsible for extra costs incurred by the Architect caused by the Contractor’s failure to comply with the procedure outlined above.

1.03 QUALITY ASSURANCE

A. General:
   1. The approved Contractor shall be responsible for satisfactory operation of the system and its clarification.
   2. Approval of the Architect is required of products or services of the proposed manufacturer, suppliers and installers, and will be based upon conformance to the specifications.

B. Manufacturer Qualifications:
   1. Manufacturers of established reputation and experience who have produced similar equipment and who are able to refer to similar installations rendering satisfactory service shall furnish system components.
   2. The manufacturer’s products shall have been in satisfactory operation on at least three similar installations for not less than three years. Contractor shall submit a list of similar installations.
   3. Components including, but not limited to, card access controllers, cameras, intercoms, computers, and power supplies shall have been tested and listed by Underwriters Laboratories, Inc., Factory Mutual Systems, or other approved independent testing laboratory.

C. Contractor Qualifications
   1. Hold legally required California State Contractor’s licenses necessary to accomplish the installation and activation of the described system at the facilities indicated. Contractor shall submit copies of licenses to Architect prior to the start of work.
   2. Hold legally required state registrations required meeting local requirements for submittal plans.
   3. Is a permanent organization approved by the manufacturer(s), having facilities and employing manufacturer-trained personnel with technical qualifications and experience to prepare the installation, to install the required system and to provide periodic maintenance. The installer shall have been installing security systems for a period of not less than five years.
   4. Maintain a parts inventory and employ trained personnel at a location within a 100 mile radius of the project.
   5. Indicate complete and total compliance with the provisions of these Specifications by letter, signed by an officer of the corporation, or a principal if other Ownership currently exists. In addition the letter shall include a complete listing of exceptions, if any.

PART 2 - PRODUCTS

2.01 GENERAL

A. Product Acceptability: The products section contains lists of acceptable products. If product substitutions are proposed, they must be made based upon a comparison of equivalence to the product specified. Considerations may include but shall not be limited to functional, physical, aesthetic and/or interface aspects. The Architect shall be the sole judge of whether or not a submitted substitution is deemed to be “equivalent” to that specified.

2.02 MANUFACTURERS

A. System Software: RS2 Access-it SL8USB Universal Software for 8 SCPs w/ USB Key. No Substitutions.

B. Client Software: RS2 S-Client

C. System Hardware: Manufactured by Mercury, such as the RS2 MR50, MR52, MR16OUT and MR16IN Modules

D. Card / Key Fob Readers: HID, or accepted equal. Model 5365EGP00 for gates. Model 5395CG100 Thinline for doors. All Grey in color.

E. Telephone Entry System: Butterfly MX Alight GEN3 or accepted equal.

F. Long Range RFID Readers and Vehicle Tags: NEDAP, or accepted equal.

G. Request-to-Exit Sensor: Bosch DS161 (black or white - match color to environment).

H. Door Contact: GE Recessed 1078 series, white in color.

I. Lock Power Supplies: Honeywell or Altronix – provide one lock power supply channel per lock

J. Host Server and/or Client Workstations: Dell

2.03 EQUIPMENT, MATERIALS & FABRICATION

A. Access Control System:

1. System Server: Provide access control computer Host/Server as shown on the plans. The Security Contractor shall be responsible for insuring the acceptable performance of the system based on the Access Control manufacturer's hardware requirements and the performance criteria specified herein for the Access Control System.
    a. Host Workstation (System Server/Headend): The Host Workstation shall be located in the Security Equipment Room of the building and shall be configured with one monitor for both interactive graphics and text.
    b. The Host Workstation shall be a Dell PowerEdge Server or equivalent 100% compatible Intel Pentium Xeon E5520, 2.26 GHz or faster computer with the following attributes:
        1) 4 GB DDR3 Memory 1066 MHz
        2) SATA Optical Drive (DVD-ROM/CD-RW)
        3) Configuration: All SATA Hard drives
        4) 500 GB SATA 3.0 Gb/s Hard drive
        5) 10/100/1000 Ethernet Network Card
        6) 19" SVGA Monitor (Dell UltraSharp 1908FP)
        7) Integrated Video
        8) (1) serial port COM1
        9) (2) USB ports
        10) Windows Server 2008 SP2 (or above) Standard x64, Incl Hyper-V, Incl 5 CALs

B. Workstation: Provide access control computer workstation in the RSO office as shown on the plans. The Security Contractor shall be responsible for insuring the acceptable performance of the system based on the Access Control manufacturer's hardware requirements and the performance criteria specified herein for the Access Control System.

1. Workstation: The Workstation shall be located in the RSO office of the building and shall be configured with one monitor for both interactive graphics and text.
2. The Workstation shall be a Dell Optiplex 780 Desktop or equivalent 100% compatible Intel Core 2 Duo E7500 with VT, 2.93 GHz or faster computer with the following attributes:

a. 2 GB DDR3 Memory 1333 MHz
b. SATA Optical Drive (DVD-ROM/CD-RW)
c. Configuration: All SATA Hard drives
d. 500 GB SATA 3.0 Gb/s Hard drive
e. 10/100/1000 Ethernet Network Card
f. 19" SVGA Monitor (Dell UltraSharp 1908FP)
g. Integrated Video
h. Minimum (4) USB ports
i. Windows 7 or other multi-tasking operating system platform with graphical user interface as required by system software.

3. System Software: RS2 Access-it! Universal server software or an equivalent configured as described herein.
   a. Client – RS2 Access-it! Universal client software
   b. Custom/User – Software and programming as required to perform all interface and database functions described herein.
4. Intelligent System Controller: The combination intelligent system controller shall be an EP-1502 manufacturer by RS2, or equivalent.
   a. The Intelligent System Controller (ISC) shall serve as the predominant access control engine. The ISC shall provide power, performance and flexibility for the most demanding applications. Multiple combinations of Alarm Input Control Modules, Output Control Modules and card reader interface modules must be configurable.
   b. The ISC shall communicate upstream at a minimum of 38.4 Kbps via RS-232, RS-485 multi-dropped configurations, modem dial-up communications, or Ethernet TCP/IP networks using 10/100T Ethernet connectivity. The standard ISC can store 5,000 cardholders and 10,000 events, with expansion capabilities for up to 250,000 cardholders and 1 million events. The ISC can connect up to 64 readers or 31 I/O devices on a single Intelligent System Controller. Each Single Reader Interface (SRI), Dual Reader Interface (DRI), Input Control Module (ICM) and Output Relay Module (ORM) use one device address
      1) Host Communications - 38.4 Kbps direct wire (RS-232/485 multi-dropped), Ethernet TCP/IP, Dial-up
      2) 12 VAC or 12 VDC input power
      3) Supports up to 16 different formats (8 card formats and 8 asset formats)
      4) Enhanced anti-passback capabilities
      5) Flash memory for real-time program updates
      6) Lithium battery back-up
      7) Up to 32,000 access levels
      8) 255 Holidays with grouping
      9) 255 Time zones, each with 6 time intervals
      10) 1 MB onboard memory expandable to 4 MB (up to 175,000 cardholders)
      11) Up to 64 readers or 32 downstream devices
      12) Alarm masking
      13) Individual extended held open and strike times (ADA required)
      14) Up to 9-digit PIN codes
      15) Status LEDs for heartbeat, upstream and downstream communication
      16) Two dedicated inputs for Tamper and Power Failure Status
      17) Biometric Credential Based Device Support
5. Door Interface Modules:

a. Single Reader Interfaces –
   1) RS2 offers a MR-50 Single Reader Interface (SRI) module for business access control solutions. Access control card readers, keypads, or readers with keypads that use standard Wiegand Data1/Data0 or Clock/Data communications are supported. Lock, unlock, and facility code offline access modes are supported on all readers connected to the SRI. Each SRI supports up to eight different card formats as well as issue codes for both magnetic and Wiegand card formats.
   2) The SRI provides a vital link between the Intelligent System Controller (ISC) and the card reader attached to the interface. As many as 32 SRI modules can be multi-dropped using RS-485 2-wire communication up to 4000 feet per port away from the ISC. Each SRI module is individually addressed for increased reporting capabilities with RS2 Access-it! Universal Access Control software applications. The SRI includes two inputs that support normally open, normally closed, supervised, and non-supervised circuits. Two output relays support fail-safe or fail-secure operation.
   3) Features and functionality:
      (a) 12 VDC power supply
      (b) Reader communications (Clock/Data or Wiegand Data1/Data0) - more than 150 different readers approved for use
      (c) Two Form-C relay outputs (5 A Door Strike and 1 A Aux relays)
      (d) Up to 16 different card formats (8 card and 8 asset)
      (e) Issue code support
      (f) Door contact Open or Closed, Supervised or Non-supervised
      (g) REX push-button monitor - Supervised or Non-supervised
      (h) Strike Control output
      (i) Bicolor or two wire status LED support
      (j) Beeper control
      (k) Plastic mounting channel
      (l) Support for offline reader access mode
      (m) Elevator control, support for 64 floors
      (n) UL 294 listed and CE approved
b. Dual Reader Interfaces –
   1) RS2 offers a MR52 Dual Reader Interface (DRI) module for business access control solutions. Most access control card readers, keypads, or readers with keypads that use standard Wiegand Data1/Data0 or Clock/Data communications are supported. Lock, unlock, and facility code offline access modes are supported on all readers connected to the DRI. Each DRI supports up to eight different card formats as well as issue codes for both magnetic and Wiegand card formats.
   2) The DRI provides a vital link between the Intelligent System Controller (ISC) and the card reader attached to the interface. As many as 32 DRI modules can be multi-dropped using RS-485 2-wire or 4-wire communication up to 4000 feet per port away from the ISC. Each DRI module is individually addressed for increased reporting capabilities with RS2 Access-it! Universal standard software applications. The DRI includes eight inputs that support normally open, normally closed, supervised, and non-supervised

circuits. In addition, six output relays support fail-safe or fail-secure operation.

3) Features and functionality
   (a) 12 VAC or 12 VDC power supply
   (b) Reader communications (Clock/Data or Wiegand Data1/Data0) - more than 150 different readers approved for use
   (c) Downloadable firmware
   (d) Six Form-C 5 A at 30 VDC relay outputs
   (e) Up to 16 different formats (8 card and 8 asset)
   (f) Issue code support for Magnetic and Wiegand formats
   (g) Door contact supervision (Open/Closed)
   (h) REX push-button monitor
   (i) Strike Control output
   (j) Bi-color status LED support and 2-wire LED support
   (k) Beeper control
   (l) Dedicated tamper and power failure circuits
   (m) Support for offline reader access mode
   (n) Onboard jumpers for termination
   (o) Onboard jumpers for 5 VDC or 12 VDC reader support
   (p) DIP switch selectable addressing
   (q) UL 294 listed and CE approved

6. Access Control Readers: Provide Proximity (RFID) type card readers as shown on the drawings:
   a. Interior Proximity Reader:
      1) The card reader shall be a ThinLine II proximity card reader, Model Number 5395, and shall be manufactured by HID Corporation, or equivalent from other manufacturer offering the same specifications.
      2) The card reader shall read the encoded data from the access keyfob and transmit the data back to the host panel, giving an audible and visual indication of a properly read card.
      3) The card reader shall be no larger than 4.7" x 3.0" x .68" (11.9 X 7.6 X 1.7 cm).
      4) The card reader shall have a typical read range of up to 2" (5.1 cm) with the use of ProxKey® II Keyfob.
      5) The card reader shall be listed under UL 294 as an access control system unit accessory, and shall have the following certifications: Canada/UL 294, Canada/UL 1604 (Hazardous Location Model only) FCC, Canada Radio, EU and CB Scheme Electrical Safety, EU – R&TTE Directive, CE Mark, Australia C-Tick, New Zealand, Taiwan.
      6) The card reader shall have separate terminal control points for the green LED, the red LED, and the audible indicator.
      7) The card reader shall have a hold line that will buffer a card read until the panel has asserted that the information can be sent up line.
      8) The card reader shall have a card present line that will indicate that card data is ready to send for clock and data applications.
      9) The card reader shall have a re-present mode in which the card must be taken from the reader field before being read again. This feature is required to eliminate multiple reads from a single card presentation.

10) The card reader shall have a built in anti-passback (multiple read) delay of one second.
11) The card reader shall be fully weatherized, and shall have an operating temperature of -22 to 150 degrees Fahrenheit (-30 to 65 degrees Celsius), and an operating humidity of 5-95% non-condensing.
12) The card reader shall have a lifetime warranty.
13) The card reader shall be made from polycarbonate material, and shall be charcoal gray, beige, black or white.
14) The card reader shall transmit at a 125 kHz frequency.
15) The cable requirements of the card reader shall be a minimum five (5) conductor, 22 AWG, stranded cable with overall shield (for a Wiegand protocol interface). A six (6) conductor cable is required when controlling the red and green LED individually. A seven (7) conductor cable is required when both the red and green LED's are controlled by the Host. The card reader shall be provided with a 10 wire pigtail connector or a 9-position terminal strip.
16) The card reader shall have the following reader configuration options:
    (a) Reader beeps and flashes green on a card read, LED normally red, single line control of LED.
    (b) Reader flashes green on a card read, LED normally red, single line control of LED.
    (c) Reader beeps on a card read, LED normally red, single line control of LED.
    (d) Beeper and LED are controlled by host only, LED normally red, single line control of LED.
    (e) Reader beeps and flashes green on a card read, LED normally off, red and green LED's controlled individually.
    (f) Reader flashes green on a card read, LED normally off, red and green LED's controlled individually.
    (g) Reader beeps on a card read, LED normally off, red and green LED's controlled individually.
    (h) Beeper and LED are controlled by host only, LED normally off, red and green LED controlled individually.
17) The model 5395 card reader shall communicate in a Wiegand protocol interface, and be compatible with all standard access control systems.
18) The voltage requirements of the card reader shall be 5 to 16 VDC.
19) The current requirements of the card reader shall be:

Voltage	Current (DC)	
	Average	Peak
5 VDC	30 MA	110 MA
12 VDC	20 MA	115 MA

b. Mullion Mounting (applications with a minimum of mounting space) Proximity Reader:
    1) The card reader shall be a MiniProx proximity card reader, Model Number 5365, and shall be manufactured by HID Corporation, or equivalent from other manufacturer offering the same specifications.

2) The card reader shall read the encoded data from the access card and/or transponder and transmit the data back to the host panel, giving an audible and visual indication of a properly read card.
3) The card reader shall be no larger than 6.0" x 1.7" x 1.0" (15.2 X 4.3 X 2.5 cm).
4) The card reader shall have a typical read range of 4" to 5.5" (10 - 14 cm).
5) The card reader shall be a single unit with a two-piece housing, with an epoxy-potted enclosure and a snap-on cover, narrow enough to be mounted onto a 1.75" (4.45 cm) metal door frame or mullion.
6) The card reader shall be listed under UL 294 as an access control system unit accessory, and shall have the following certifications: Canada/UL 294, Canada/UL 1604 (Hazardous Location Model only) FCC, Canada Radio, EU and CB Scheme Electrical Safety, EU – R&TTE Directive, CE Mark, Australia C-Tick, New Zealand, Taiwan.
7) The card reader shall have separate terminal control points for the green LED, the red LED, and the audible indicator.
8) The card reader shall have a hold line that will buffer a card read until the panel has asserted that the information can be sent up line.
9) The card reader shall have a card present line that will indicate that card data is ready to send for clock and data applications.
10) The card reader shall have a re-present mode in which the card must be taken from the reader field before being read again. This feature is required to eliminate multiple reads from a single card presentation.
11) The card reader shall have a built in anti-passback (multiple read) delay of one second.
12) The card reader shall be fully weatherized, and shall have an operating temperature of -22 to 150 degrees Fahrenheit (-30 to 65 degrees Celsius), and an operating humidity of 5-95% non-condensing.
13) The card reader shall have a lifetime warranty.
14) The card reader shall be made from polycarbonate material, and shall be charcoal gray or beige.
15) The card reader shall transmit at a 125 kHz frequency.
16) The cable requirements of the card reader shall be a minimum five (5) conductor, 22 AWG, stranded cable with overall shield (for a Wiegand protocol interface). A six (6) conductor cable is required when controlling the red and green LED individually. A seven (7) conductor cable is required when both the red and green LED's are controlled by the Host. The card reader shall be provided with a 10 wire pigtail connector or a 9-position terminal strip.
17) The card reader shall have the following reader configuration options:
    (a) Reader beeps and flashes green on a card read, LED normally red, single line control of LED.
    (b) Reader flashes green on a card read, LED normally red, single line control of LED.
    (c) Reader beeps on a card read, LED normally red, single line control of LED.

(d) Beeper and LED are controlled by host only, LED normally red, single line control of LED.
(e) Reader beeps and flashes green on a card read, LED normally off, red and green LED's controlled individually.
(f) Reader flashes green on a card read, LED normally off, red and green LED's controlled individually.
(g) Reader beeps on a card read, LED normally off, red and green LED's controlled individually.
(h) Beeper and LED are controlled by host only, LED normally off, red and green LED controlled individually.

18) The model 5365 card reader shall communicate in a Wiegand protocol interface, and be compatible with all standard access control systems.
19) The voltage requirements of the card reader shall be 5 to 16 VDC.
20) The current requirements of the card reader shall be:

Voltage	Current (DC)	
	Average	Peak
5 VDC	30 mA	110 mA
12 VDC	20 mA	110 mA

7. Access Tokens:
   a. Access tokens shall be used with access readers to gain entry to access controlled portals. The access token shall be made of durable material and shall be in the form of a key fob suitable for placement on a key ring. Presentation to the access control reader at any angle within two (2) inches shall result in an accurate reading of the token.
      1) The access key fob shall be a ProxKey III proximity access control key fob, Model Number 1346, and shall be manufactured by HID Corporation.
      2) The proximity key fob shall have a lifetime warranty.
      3) The key fob shall have up to 84 programmable bits of Wiegand formatted information for universal compatibility with all HID' Wiegand reader applications.
      4) The key fob shall be "Passive" (non-battery operated) proximity technology.
      5) The proximity key fob shall have a permanent ink jet or laser engraved identification number printed onto it. The card numbering options shall be:
         (a) Sequential Matching - The internal identification numbers and the external ink jet numbers shall both be sequential and shall match (i.e. internal numbers 1-100, external ink jet numbers 1-100).
         (b) Sequential Non-Matching - the internal identification numbers and the external ink jet numbers will be sequential but they will not match (i.e. internal numbers 1-100, external ink jet numbers 200-300).
         (c) Random Non-Matching - the internal identification number shall be random numbers, the external ink jet numbers will be sequential, and the internal and external numbers will not match (i.e. internal numbers 2, 7, 13, 18, etc., external ink jet numbers 1-100).

(d) No External Key Fob Numbering - the internal identification numbers are either sequential or random, there are no external ink jet card numbers.

6) The proximity key fob shall be no larger than 1.90" x 0.90" X 0.345 “(4.83 X 2.29 X 0.88 cm).

7) The proximity key fob shall have an operating temperature of -50 to 160 degrees Fahrenheit (-45 to 70 degrees Celsius), and shall have an operating humidity of 5-95% non-condensing.

8) The read range of the proximity key fob shall be extremely consistent, and not affected by body shielding or variable environmental conditions.

9) The proximity key fob shall be offered with over 2E84 unique codes

(a) Provide eight hundred (400) access tokens compatible with the specified card readers. The tokens shall not carry any identification showing the location of the property unless otherwise specified herein.

8. Telephone Entry Panel –

a. manufacturers

1) Acceptable manufacturer

(a) Video Intercom: Runs Like Butter, LLC; 158 West 29th Street, New York, NY 10001. Primary Tel: 917-856-0509. Secondary Tel: 917-656-0144. Email: info@butterflymx.com. Web: http://www. http://butterflymx.com/.

(b) Substitutions: no substitutions accepted.

b. model

1) ButterflyMX model: ALIGHT GEN3

(a) Recessed or Surface-Mount configurations

(b) Dimensions: 367.6mm x 346.3mm x 70.5 mm (14.4724” x 13.634” x 2.775”)

(c) System Details

(1) Ethernet connectivity.

(2) Dry contact relay connection to access control system.

(3) Optional HDMI connection for video.

(4) Outdoor ready (waterproof/weatherproof enclosure – IP65)

(5) Automatic door unlock system

(6) Onboard sensor package

(7) Key-slot locking bracket allows for easy installation and removal in surface mount applications

(8) Designed for standard power socket or waterproof junction box installation

(9) Optional waterproof power/communications junction box

(d) Touchscreen specifications:

(1) Diagonal Length: 12.1”.

(2) Brightness: 1000 Nits

(3) Resolution: 1920x1080

(4) Contrast Ratio: 700:1

(5) Vandal Resistant, 3H hardness

(6) Capacitive Touch

(7) Waterproof

(8) Chemical Resistant/Anti-Glare coated

(e) Hardware Specifications and Features
(1) J1900 Baytrail-Board
(2) Wifi ready
(3) 4G LTE-module
(4) 4GB RAM
(5) 60GB Solid State Drive
(6) Logitech C930 CAM, external waterproof mic
(7) Two (2) RFID-modules included supporting Mifare, NFC, EM4100
(f) Wide Area Network Minimum Requirements: Ethernet 2/2 MBPs internet connection.
(g) Environmental Details:
(1) Temperature Range: -20° to +60° F.
(h) Electrical Details:
(1) Power Consumption: 40 W
(2) Power Requirements: NEMA 5–15R
110 VAC Input voltage.

9. Long Range Proximity Readers: Long Range Proximity Readers shall be NEDAP Transit Standard (part #9875220) or equivalent.
a. General Specifications
1) Read Range – up to 33 feet
2) Transmitting Frequency – 2.438 – 2.456 GHz frequency
3) Power Requirements – 6.5VDC at 1.0A to 15VDC at .4A.
4) Output Format – Wiegand™ 26 bit.
5) Operating Temperatures – 31° to 150°F (-35° to 65°C).

10. Vehicle Tags: The vehicle tags shall be NEDAP Window Button active windshield tag for vehicles (part number 9882656) or equivalent.
a. General Specifications
1) Dimensions: 2.5” (6.3 cm) wide, 1.6” (4.0 cm) high.
2) Technology: Active proximity – Lithium Battery
3) Battery Life: 3-5 years
4) Formats: Wiegand 26 bit format
5) Read Range: up to 33 feet.

11. Security Terminal Cabinet (STC): System controllers and field control boards serving a given area shall be installed inside Security Terminal Cabinets, RS2 Model NCL or equalivent. No controller or control module shall be mounted independently of the cabinet and its power supplies. Refer to the drawings and the following description for details on STC configuration.

12. Power Supplies
a. Power for Controller and Reader Interface Modules
b. Provide RS2 Model LIN-PS and T1656 Transformer
1) Features
(a) 12-24 VDC, 2.5Amp, linear power
(b) Battery Charger
(c) Power fail detection
(d) 6-32x38” zinc plated Philips machine screws and lock washers
(e) 16VAC, 56VA, open frame U.L. listed transformer
c. Power Supplies for Electrified Strikes and Locksets:
1) Provide Altronix AL600ULPD8CB Multi-Output Power Supply/Charger or approved equal.
(a) Input: 115VAC, 60Hz, 3.5Amp
(b) Output:

(1) 12VDC or 24VDC selectable output
(2) 6 Amp continuous supply current
(3) Eight (8) Class 2 Rated PTC protected power limited outputs
(4) Outputs are rated @ 2.5 Amp
(5) Filtered and electronically regulated output
(6) Short circuit and thermal overload protection

(c) Battery Backup:
(1) Built-in charger for sealed lead acid or gel type batteries
(2) Automatic switch over to stand-by battery when AC fails
(3) Maximum charge current 0.7 Amp

(d) Supervision:
(1) AC fail supervision (form “C” contacts)
(2) Low battery supervision (form “C” contacts)
(3) Battery presence supervision (form “C” contacts)

(e) Visual indicators:

(f) AC input and DC output LED indicators

(g) Electrical:
(1) Operating temperature: 0°C to 49°C ambient
(2) 36.85 or 73.70 BTU/Hr
(3) System AC input VA requirement: 218.5VA

(h) Mechanical:
(1) Enclosure Dimensions (H x W x D approx.):
(2) 13.5” (342.9mm) x 13” (330.2mm) x 3.25” (82.55mm)
(3) Accommodates two (2) 12VDC/7AH batteries
(4) Product weight (approx.): 7.4 lbs. (3.36 kg)
(5) Shipping weight (approx.): 8.4 lbs. (3.81 kg)

(i) Agency Approvals:
(1) UL 294 – UL Listed for Access Control System Units
(2) UL 1481 – UL Listed Standard for Safety for Fire Protective Signaling Systems

PART 3 - EXECUTION

3.01 INSTALLATION

A. Comply with manufacturer's instructions for installation of access doors.

B. INCLUSIONS:

C. All labor and materials for a complete installation.

D. All wire and cable to be run in conduit and open cable fashion and in accordance with National Electrical Code Standards.

3.02 EXCLUSIONS

A. Dedicated 110 VAC outlets for Access/Security panels by the electrician

B. Electrified sliding and overhead automobile gates by others

C. Door locking hardware by others

D. Parking gates arms by others

E. Parking exit and safety loops by others

3.03 WARRANTY

A. All components used in the installation of the system(s) will be new. The warranty period is for one (1) year from the date of installation. The warranty provides repair or replacement of all parts and labor on all workmanship and materials supplied by

the system installer/contractor and its subcontractors. Vandalism, theft, misuse, intentional damage, acts of God, etc. are not covered by the warranty.

3.04 TRAINING, MANUALS AND DRAWINGS

A. The system installer shall provide a complete close out package including (1) set of reproducible vellum as-built drawings and (3) sets of as-built drawings on bond paper, minimum architectural size “D”. Drawings shall include device locations, controller locations, junction box locations, conduit and wiring paths, support notes and relevant detail drawings.

B. (3) Sets of installation and operating manuals for each product will be bound into book or binder format, with each section clearly labeled as follows:
   1. Telephone Entry
   2. Access Control
   3. System Software

C. The system shall provide a minimum of 16 hours training on all system functions and programming. The training shall be conducted over the course of 3 sessions:
   1. System power-up and start-up.
   2. Property management staff.
   3. Follow-up training for property management staff and security personnel.

D. The system installer shall be responsible for programming the initial 25 key fobs and 25 vehicle tags into the system.

END OF SECTION

SECTION 28 1610

INTRUSION ALARM

PART 1 - GENERAL

1.01 SUMMARY

A. Terminology

1. Lennar Multifamily Communities shall be hereinafter referred to in this document as Owner and the respondent shall be referred to as Contractor. The term Owner includes direct employees and other appointed representatives of Lennar Multifamily Communities. These representatives may be requested by the Owner to represent the Owner in undertaking certain project tasks.

B. Location and Access to Project

1. Project is located in Oakland, California.
2. Any access using normal street and highway route to the facility is acceptable.
3. Permission for access to this facility may be revoked for any and all persons who violate facility traffic regulations including speed limits, parking restrictions and directions of the responsible Architect or project personnel. All Contractor's personnel, operating forces, and delivery personnel shall be made aware of and shall comply at all times with the regulations and the direction of responsible Owner and project personnel.

C. Basic Definitions

1. Definitions:
   a. "Days": As used in the specifications, the word "days" means calendar days.
   b. "Provide": As used in the plans and specifications, the word "provide" means to furnish, install, connect, program, test, commission and warranty the subject material or services.
2. Specified Items – Substitutions
   a. "No Substitutes": The exact make and model number identified in the Specification shall be provided without exception. Where compatibility with existing systems is specified, and where a specific make or model number is not identified, the Contractor shall provide equipment which is compatible with, and equivalent to, existing equipment of the same description and type, and serving the same purpose.
   b. "Or Equal": An item may be substituted for the specified item provided that in every technical and aesthetic sense, the substituted item provides the same or better capability than the specified item, and is fully compatible with the new or existing systems specified. For expansion of exiting systems, the item shall also be approved and fully supported by the existing system manufacturer. The Security Engineer shall be the sole authority to determine the equality of substituted products with specified items.
   c. "Aesthetic", or "Aesthetic Considerations": If aesthetic considerations are involved in either the "or equal" or "approved equal" category, this shall be a consideration in approving or disapproving the proposed substitute. If the proposed substitute is aesthetically unacceptable to the Architect, then the specified, or another technically equal item, shall be provided.

3. "Beneficial Use": Each component of a system is not considered available for beneficial use until and unless all components and conditions have been fulfilled to make the system fully operational.

D. Description
1. General Description: This specification section covers general requirements for the furnishing, installation and testing of complete low-voltage intrusion alarm system.
2. Furnish and install electronic access control hardware devices, mounting brackets, power supplies, switches, equipment cabinets, controls, consoles and other components of the systems as shown and specified.

E. Scope of Work
1. Systems: Provide the following work complete per the contract schedule, and with acceptable engineering and installation practices as described herein.
   a. An Intrusion Alarm System consisting of the following primary components:
      1) Stand-alone Intrusion Alarm Panels
      2) Arm/Disarm Keypads
      3) Audible Sirens
      4) Magnetic Door and Window Contacts
      5) Motion Sensors
2. Glass Break Detectors Area of work includes the "19th & Harrison" project site.
3. Services: Contractor shall provide the following services complete and as scheduled:
   a. Project Planning and Management
   b. Shop Engineering and Documentation
   c. Wiring and Installation Diagrams
   d. Submittals
   e. System Installation
   f. System Start-up and Commissioning
   g. Training
   h. Testing
   i. Warranty
4. System Design:
   a. Stand-alone intrusion alarm systems:
      1) The intrusion alarm system in the amenity spaces will consist of multiple areas connected to one control panel. Each area shall be partitioned on the control panel so it can individually be controlled as a sub-zone area.
      2) System Functionality:
         (a) The intrusion alarm system is designed detect an intruder that enters a secured area by triggering a sensor, detector and magnetic contact.
         (b) Residents and staff will arm the systems using keypad and a personal PIN code.
5. Control Panel: An electronic microprocessor based intrusion alarm panel (IAP)shall be installed in each apartment and in selected amenity spaces as identified on the security drawings.
6. Communication: Each IAP shall include a universal digital dialer for communication with a central station. A phone jack and phone line will be provided at the IAP by the low voltage telecommunications contractor.

Monitoring of the alarm panel shall be at the discretion of the alarm system owner/user.

7. Pedestrian Doors:
    a. Each pedestrian door in the amenity rooms will receive a magnetic door contact. Each front entry door in the apartment units will receive a magnetic door contact. Each operable door on the podium level "walk-up" apartments will receive a magnetic door contact.
    b. Doors which are controlled by the card access system shall receive a DPDT (double pull, double throw) magnetic contact. One side of the contacts shall be connected to the access control system and the other side of the contacts will be connected to the intrusion alarm system for that area.
8. Windows: Select windows, as shown on the security drawings, will receive a magnetic door contact.
9. Motion Sensors:
    a. Motion sensors will be installed in strategic areas of the amenity spaces per the security drawings.
    b. Glass Break Sensors:
    c. Amenity spaces such as the leasing office, RSO offices, club rooms, etc. will receive glass break detectors in individual offices with walk-up glass windows and/or selected areas as identified on the security drawings.
    d. Audible Siren:
    e. One siren shall be installed for each intrusion alarm control panel. Sub-areas in amenity spaces may also receive an additional siren. Consult the security drawings for siren locations.

F. Related Work
1. General:
    a. Observe interface procedures to related work as described in Part 3, herein.
    b. Coordinate with the Architect on all aspects of aesthetic interface.
2. Window Contact Placement
    a. The window contacts shall be installed in such a manner as to avoid penetrating the frame or track. Avoid any penetration that could lead to a water leak or void the manufacturer's warranty. Consult with the window installer as to location and mounting of contact prior to installation.
3. Conditions:
    a. The Security Contractor shall coordinate with other disciplines on all existing construction, equipment and field devices.
    b. Equipment provided under this project shall be installed in a manner consistent with architectural, operational, service and maintenance considerations.
    c. Special Issues: Some new and renovated spaces contain equipment, devices and/or other special materials that may cause interference or disturbances with security equipment devices, conduit, power or cables. The Security Contractor shall take special care in coordinating with other trades on the location of these devices, their zone of influence and mitigating methods that may be required. Mitigating methods may include but not limited to: Fiber Optic cable to avoid interference. No special precautions have been taken in these plans and specifications to account for these issues.

4. Other Related Work
    a. Coordinate with other trades and the General Contractor on any related work not specifically mentioned above.
    b. Painting/Patching: Painting, patching and repair services to match existing or renovated conditions will be the responsibility of the Owner.

1.02 SUBMITTALS

A. General: Bid documents, including plans, details and specifications are generally considered conceptual in nature, and provide direction on products and project requirements. In most cases, the Contractor is given a choice of products and methods that may be incorporated into the system. These choices may affect the overall design, configuration and installation of the proposed system.

B. Contractor Responsibility: Prepare and submit shop drawings, rendered in the latest AutoCAD format, which show details of work to insure proper installation of the work using those materials and equipment specified or allowed under the approved plans and specifications. A complete Shop Drawing submittal package shall consist of Plans, Equipment Submittals and an Acceptance Testing Plan.

C. Completeness: The Equipment Submittals, Acceptance Testing Plan and the Shop Drawings should be submitted as a complete and contiguous package. Partial or unmarked submittals will not be accepted for review.

D. Scheduling: A schedule of shop drawing submissions shall be submitted for the Architect's review on a form acceptable to the Architect within ten (10) days after award of the Contract. The schedule of shop drawing submissions shall include a minimum, but not limited to the requirements stated herein.

E. Requirements: Provide the following information complete, and in the manner described herein:
    1. Shop Drawings: Shop Drawings shall be numbered consecutively and shall accurately and distinctly present the following information:
        a. Title Sheet
        b. Floor Plans: Showing devices, pull boxes, cabinets, conduits and conductors in their proposed locations.
        c. Riser Diagram: Showing conduit relationships between devices shown on the Floor Plans. Show power sources. Show signal relationships of controls and devices within the system.
        d. Custom Assembly Diagrams: For each custom assembly such as Security Terminal Cabinets, receptacle assemblies, or door control panels, provide an assembly drawing illustrating the appearance of the assembled device. Include dimensions, assembly components, and functional attributes (momentary or alternate action switch, lens color, panel finish, etc.)
        e. Equipment Wiring Diagrams
            1) Show a pictorial illustration of each equipment enclosure and/or terminal cabinet.
            2) Show the device nomenclatures exactly as shown on the single line diagrams.
            3) Show the terminations including the wire numbers as shown on the single line diagrams.
            4) Show wire colors for each terminal.
            5) For each wire exiting the enclosure, show the destination of the wire by floor, room number and the drawing number of the panel where the wire terminates.
        f. Working dimensions and erections dimensions
        g. Arrangement and sectional views

h. Necessary details, including complete information for making connections between work under this Contract and work under other Contracts.
i. Stock or standard plans will not be accepted for review unless full identification and supplementary information is shown thereon in ink or typewritten form.
j. Each Drawing or page shall include:
1) Project name, Project Number and descriptions.
2) Submittal date and space for revision dates.
3) Identification of equipment, product or material.
4) Name of Subcontractor.
5) Relation to adjacent structure of material.
6) Physical dimensions clearly identified.
7) Identification of deviations from the Contract Documents.
8) Contractor's stamp, initialed or signed, dated and certifying to review of submittal, certification of field measurements and compliance with Contract.
9) Location at which the equipment or materials are to be installed. Location shall mean both physical location and location relative to other connected or attached material.

2. Equipment Submittals
a. Provide a parts list, including system type, model numbers, quantities, and specification sheet page reference for equipment, materials, components and devices.
b. Provide Manufacturers Specification Sheet with descriptive information for equipment, materials, components and devices. Clearly delineate on each specification sheet which model numbers, options and configurations are being proposed.
c. Include kinds of materials and finishes for all equipment.

3. Acceptance Testing Plan: Submit a written document detailing the test procedures to be followed by Contractor in evaluating and providing the installed System(s). Include the test forms to be used for each system and for each component of each system. Include all tests required by the equipment Manufacturer and by this Specification. Comply with the acceptance testing requirements required herein.

4. Training Plan
a. Submit a training plan to be followed in training key employees in the operation and maintenance of the installed system at the project site. The proposed training program shall be designed to provide a level of basic competence with the system for selected personnel. These selected personnel shall then be expected to train other personnel as required, utilizing the training that they have been given and the body of training documentation provided by the Contractor. This plan shall comply with the requirements stated in the "Training" section, of these Specifications, all stated hours of which shall be considered to be classroom hours.
b. Submit a curriculum to account for, and relate, each subject to tactual training time. All required hours shall be accounted for in this curriculum.
c. Expend between 0.5 and 2.0 hours of preparation time for each classroom hour of actual training, in order to develop appropriate training plans and other training materials.

d. The training plan shall cover the overall system, each individual system, each database management, normal operations, and failure modes with response procedures for each failure. Each procedural item must be applied to each equipment level.

F. The Architect will return unchecked any submittal which does not contain complete data on the work and full information on related matters.

G. Verification: The contractor shall check and acknowledge shop drawings, and shall place his signature on shop drawings submitted to the Architect. Contractor's signature shall constitute a representation that quantities, dimensions, field construction criteria, materials, catalog numbers, performance criteria and similar data have been verified and that, in his opinion, the submittal fully meets the requirements of the Contract Documents.

H. Timeliness: The Contractor shall schedule, prepare and submit shop drawings in accordance with a time-table that will allow his suppliers and manufacturers sufficient time to fabricate, manufacture, inspect test and deliver their respective products to the project site in a timely manner. The Contractor is solely responsible for delayed performance of their work.

I. Departure from Contract Requirements: If the shop drawings show departures from the Contract requirements, the Contractor shall make specific mention thereof in his letter of transmittal; otherwise review of such submittals shall not constitute review of the departure. Review of the plans shall constitute review of the specific subject matter for which the plans were submitted and not of any other structure, materials, equipment, or apparatus shown on the plans.

J. Contractor Responsibility: The review of shop drawings will be general and shall not relieve the Contractor of responsibility for the accuracy of such plans, nor for the proper fitting and construction of the work, nor for the furnishing of materials or work required by the Contract. No construction called for by shop drawings shall be initiated until such plans have been reviewed and approved.

K. Shop Drawing Submittal Review: The procedure in seeking review of the shop drawings shall be as follows:

1. The Contractor shall submit five (5) complete sets of shop drawings and other descriptive data with one copy of a letter of transmittal to the Architect for review thirty (30) working days after award of the contract. The letter of transmittal shall contain the project name, the Architect's Project Number, the name of the Contractor, the list of plans submitted including number and titles, requests for any review of departures from the contract requirements and any other pertinent information. Plans submitted for review shall be full sized plans, rolled and included with the equipment submittals.
2. Plans or descriptive data will be stamped "Reviewed", "Reviewed as Noted", "Reviewed as Noted, Resubmit" or "Rejected" and one copy with a Letter of Transmittal will be mailed to the Contractor at an address designated by the Contractor.
3. If a shop drawing or data is stamped "Reviewed" or "Reviewed as Noted", no additional submittal is required for that shop drawing.
4. If a shop drawing or data is stamped "Reviewed as Noted, Resubmit" or "Rejected", the Contractor shall make the necessary corrections and resubmit the documents as required above. The letter transmitting corrected documents shall indicate that the documents are a resubmittal.
5. If any corrections, other than those noted by the Architect, are made on a shop drawing prior to resubmittal, such changes should be pointed out by the Contractor upon resubmittal.
6. The Contractor shall revise and resubmit the shop drawing as required, until they are stamped either "Reviewed" or "Reviewed as Noted".

7. After the Contractor's submittal or resubmittal of shop drawings, the Architect shall be provided with fifteen (15) working days for review. Should the Architect require additional review time above and beyond the stated fifteen (15) working days, the Contractor may ask for a time extension and/or monetary compensation, if they can present valid, factual evidence that actual damages were incurred by the Contractor. The Architect shall determine the amount of the time extension and/or the monetary compensation to be awarded the Contractor.
8. The Architect will not issue a "Notice to Proceed" until all shop drawings are reviewed, unless otherwise approved by the Architect.

L. The Contractor shall be responsible for extra costs incurred by the Architect caused by the Contractor's failure to comply with the procedure outlined above.

1.03 QUALITY ASSURANCE

A. General:
1. The approved Contractor shall be responsible for satisfactory operation of the system and its clarification.
2. Approval of the Architect is required of products or services of the proposed manufacturer, suppliers and installers, and will be based upon conformance to the specifications.

B. Manufacturer Qualifications:
1. Manufacturers of established reputation and experience who have produced similar equipment and who are able to refer to similar installations rendering satisfactory service shall furnish system components.
2. The manufacturer's products shall have been in satisfactory operation on at least three similar installations for not less than three years. Contractor shall submit a list of similar installations.
3. Components including, but not limited to, card access controllers, cameras, intercoms, computers, and power supplies shall have been tested and listed by Underwriters Laboratories, Inc., Factory Mutual Systems, or other approved independent testing laboratory.

C. Contractor Qualifications
1. Hold legally required California State Contractor's licenses necessary to accomplish the installation and activation of the described system at the facilities indicated. Contractor shall submit copies of licenses to Architect prior to the start of work.
2. Hold legally required state registrations required meeting local requirements for submittal plans.
3. Is a permanent organization approved by the manufacturer(s), having facilities and employing manufacturer-trained personnel with technical qualifications and experience to prepare the installation, to install the required system and to provide periodic maintenance. The installer shall have been installing security systems for a period of not less than five years.
4. Maintain a parts inventory and employ trained personnel at a location within a 100 mile radius of the project.
5. Indicate complete and total compliance with the provisions of these Specifications by letter, signed by an officer of the corporation, or a principal if other Ownership currently exists. In addition the letter shall include a complete listing of exceptions, if any.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturer: Bosch Security Systems, Inc.; 130 Perinton Parkway; Fairport, NY 14450. ASD. Toll Free Tel: 800-289-0096. Tel: 585-223-4060. Email: request info (presales.support@us.bosch.com). Web: www.boschsecurity.us.
B. Substitutions: Not permitted.
C. Requests for substitutions will be considered in accordance with provisions of section 01600.
D. Magnetic Contacts: GE/Sentrol 1078 series and Honeywell 2-951WG or accepted equal.
E. Motion Sensor: Bosch DS934 or accepted equal
F. Glass Break Sensor: Honeywell FG1625 or accepted equal
G. Equipment Tamper: Sentrol 1005 or accepted equal

2.02 GENERAL DESCRIPTION

A. Control Panel and Features:
1. The DACS control panel shall be Bosch Security Systems, Inc. model B5512 comprising a fully integrated intrusion and residential fire control system. The control panel shall support the following:
a. The DACS system is capable of being utilized as a combination Intrusion and residential Fire system per code. Fully integrated intrusion and fire functions allow users to interface with 1 system instead of 2
b. Optional Telephone Line Module, programmable for signaling and supervision.
c. Integrated Conettix IP based communication provides high-speed, secure alarm transport and control.
d. 4 programmable areas with perimeter and interior partitioning.
e. 8 on-board, hardwired points with expansion capability for a total of 48 using a combination of wired or wireless points.
f. Compatibility with ATM style LCD or 2-line LCD style Alarm Command Centers.
g. Local or remote programming, test, and diagnostic capability via a computer running the Remote Programming Software (RPS).
h. The system shall include an integrated USB port for local programming and diagnostics using a computer running Remote Programming Software (RPS) and a standard male USB2.0 to male USB 2.0 cable with no additional hardware modules required.
i. The system shall support the use of an Apple iOS device for control. Functions to include arming, disarming and control of outputs. This application shall connect directly to the DACS using internet, wifi or cellular communications and shall not require a third party server of network operations center (noc).
j. The DACS shall support up to four (4) custom functions allowing the installer to combine up to 6 commands into one command. These custom functions shall be operated by keypad command, point activation, keyfob button, or programmable schedule
k. The DACS shall support up to 32 keypad shortcuts which allow the installer to define which commands are available at each keypad.
l. The system shall offer multiple language support that can be assigned per keypad. Languages supported must include English, Latin American Spanish, and/or Canadian French.
m. The DACS shall support flash firmware upgrades of systems firmware for the control panel and peripherals, allowing for future updates.

n. Integrated real time clock, calendar, test timer and programmable scheduling capability for relay control and automatic execution of system functions based on a time / event.
o. Provide 0.8 amps of power for standby operation and 1.3 amps of alarm power, both rated at 12 VDC.
p. 1 configurable form 'C' wet or dry-contact relay output and 2 Auxiliary wet-contact solid state outputs with expansion capability for up to an additional 40 dry-contact relay outputs.
q. Integrated battery charger with reverse hook up protection, battery supervision and battery deep discharge protection.
r. Supervision of peripheral devices and communications interface(s).

B. Point Functionality and Expansion:
1. Each point in the system shall be programmable to provide the following type of response in the system:
a. Always on (24 hour response).
b. On when the system is Master Armed.
c. Only on when the system is Perimeter Armed.
d. Displays / Does Not Display at the ACC when the point is activated.
e. Provides / Does Not Provide entry warning tone.
f. Sounds / Does Not Sound audible alarm indication.
g. The Point is bypassable / not bypassable.
h. Alarm Verification with programmable verification time.
i. Relay activation by Point.
j. Provides / Does Not Provide "watch point" capability.
k. Provides Swinger Bypass.
l. Defers Bypass Report.
m. Can return to the system after being force armed and then restoring.
n. Can return to the system after being bypassed and then restoring.
o. Keyswitch arming (maintained or momentary)
p. Activate by Custom Function
q. Activate following an output
r. Gas Alarm
2. The DACS shall be capable of supporting "group zoning." Group zoning refers to the combining of points into a separately identifiable and separately annunciated (programmable text) areas.
3. The DACS shall be capable of allowing variable point response times via programming. Point response times shall be programmable over a range of 300 milliseconds to 4.5 seconds.
4. The DACS shall have the capability to expand up to 48 separately identifiable points, of which 8 are on-board and 40 are off-board wired or wireless points.
a. The 8 on-board points shall be able to accommodate powered class B functionality using a powered loop interface module.
b. Point Expansion Modules (Wired and Wireless) shall be able to be located remote to the main panel to a maximum distance of 1000 feet.
5. The DACS shall have the capability to expand up to 28 separately identifiable points, of which 8 are on-board and 20 are off-board addressable points connected to multiplexed backbone trunks via wired modules and/or wireless receivers.
a. The 8 on-board points shall be able to accommodate powered class B functionality using a powered loop interface module.
b. Point Expansion Modules (Wired and Wireless) shall be able to be located remote to the main panel to a maximum distance of 1000 feet.

C. Areas/Accounts:

1. The DACS shall be capable of assigning 1 to 2 account identifiers to the areas depending on the distribution of areas per account.
2. All of the areas must be capable of Master (All) and/or Perimeter (Part) arming (excluding predefined Interior protection).
3. The DACS shall be capable of logically grouping 1 or more points into an area, or conversely, dividing 2 or more points into two or more areas.
4. Any area shall be configurable to allow arming by specific users when a programmable number of devices are faulted or bypassed.
5. Areas shall be independently controlled by their corresponding ACC.
6. Area(s) shall accommodate assignment of independent account numbers to define annunciation, control, and reporting functions.
7. The DACS shall be capable of linking multiple areas to a shared area which may be automatically controlled (hallway or lobby).
8. The DACS shall accommodate conditional area arming dependant on the state of other areas (master or associate). Any area can be configured for perimeter and interior arming, not requiring a separate area for this function.

D. Scheduling: The DACS shall support scheduling capabilities with the following characteristics:
1. Arm / Disarm specific area(s) based on open/close windows.
2. Bypass / Unbypass point(s).
3. Activate / Deactivate relay(s).
4. Send test reports.
5. Up to 4 programmable holiday schedules of 366 days each (includes leap year). Based on the holiday settings, different time windows for open/close and other system functions can be executed.
6. Automatic adjustment of system clock for daylight savings time.

E. Alarm Command Centers:
1. The DACS shall accommodate connection with up to 8 ACCs, each capable of displaying custom English, Latin American Spanish or Canadian French text on a liquid crystal display.
2. The ACCs shall be able to display any system event in English, Latin American Spanish and/or Canadian French based upon programming of the ACC and user Passcode.

F. User Passcodes and Authority: Passcodes shall be programmable with authority levels to allow users to operate any or all areas.
1. Up to 32 different passcodes shall be accommodated.
2. Each passcode shall be 3 to 6 digits (variable) and be assigned a 32-character user name.
3. User access to System features and functions shall be configurable based on 14 individually programmable levels of authority assigned to the user passcode. Additionally, the system shall have the capability to assign to the user passcode, a different authority level in each of the areas. A service passcode can be assigned to the servicing agent allowing the agent limited access to system functions. User-programmable / activated functions include:
    a. Arming the system: All areas, specific area(s) only, perimeter instant, perimeter delayed, perimeter partial, watch mode, and arming the system with a duress passcode.
    b. Disarming the system: All areas, specific area(s) only and disarming with a duress passcode.
    c. Viewing system status: Faulted points, event memory, bypassed points, area status and point status.
    d. Implementation functions: Bypass a point, unbypass a point, reset sensors, silence bell, activating relays, initiating the remote

programming function locally to allow programming the system from a remote location.

e. Testing the system: Local Walk test, Service Walk test, Fire test, send report to remote DACR to check the telephone link, and programming the time and date for the next test report transmission.
f. Change system parameters: ACC display brightness, system time and date, and add/delete/change passcodes.
g. Extend the closing time of the system.
h. Transmitting special alerts and activating audible and visible signals.
i. Executing multiple commands / ACC keystrokes from a single Menu / Command List item. This function shall be able to have a 32 character (alphanumeric) title to identify it on the ACC display.
j. Editing of time / event based scheduling program from the ACC.

4. The DACS shall also provide a "service menu" to implement functions such as viewing and printing the system log, displaying the system firmware revision number, and defaulting (toggling) text displays between custom and default text displays for troubleshooting.
5. The DACS shall allow users to change their own user passcode from the Alarm Command Center (ACC). Managers shall be capable of changing the user passcodes and authority assignments by area of other users from the ACC.
6. The DACS shall incorporate a programmable "Passcode Follows Scope" feature to allow users to arm or disarm only the area they are entering with one simple command or control all areas from one ACC.

G. Communication: The DACS shall be capable of reporting system events and supervisory reports including alarm, trouble, missing modules, restorals, system status, AC failure, battery status to primary and secondary off-site DACR's. The following features shall be supported.

1. The DACS shall be capable of communicating via dial-up analog telephone lines, over a LAN/WAN/Internet using a wired network interface module, or over a cellular network using a CDMA Cellular interface module.
2. The Bosch Modem4 communications format shall be utilized for optimum system performance. The ModemIIIa² format provides the maximum data information to the receiver for alarms, troubles, restorals, bypasses, relay activation, opening/closings, and card access. The detailed information includes the point numbers with text, peripheral device numbers, user numbers with text, and area information. As an alternative format, Contact ID may be used when a non-Bosch receiver is used although it will include less detailed information like point or user text.
3. The DACS shall be capable of sending text (SMS) messages to compatible devices without requiring the=at these message are sent to a monitoring center
4. The DACS shall have the capability of communicating with up to 8 different DACRs using up to 4 different phone numbers, up to 24-digits in length and/or 4 URL/IP addresses over a network.
5. The DACS shall report to a Commercial Central Station that is using a Bosch D6600 Receiver/Gateway or a Bosch D6100i Receiver using Modem4 as a preferred format or Contact ID as an alternate format.
6. The DACR shall provide the transmission information sent from the DACS that includes alarms, troubles, restorals, bypasses, relay activation, opening/closings, and card access. When using the ModemIIIa² format the detailed information includes the point numbers with text, peripheral device numbers, user numbers with text, and area information.

7. The DACS reports shall be classified, by event, into eleven subcategories or "report groups." Each group represents similar types of events. Individual events within each group shall be selectively enabled or disabled for transmission. The eleven report groups shall be as follows:
    a. Fire Reports.
    b. Burglar Reports.
    c. User Reports.
    d. Test Reports.
    e. Diagnostic Reports.
    f. Relay Reports.
    g. Auto Function Reports.
    h. RPS Reports.
    i. Point Reports.
    j. User Change Reports.
    k. Access Reports.
8. The DACS shall be have the capability to verify the integrity of the remote communications path and switch to alternate paths when a communications failure occurs.
9. The DACS shall be capable of unattended mode of operation whereby programming and configuration updates are automatically transferred using the Remote Programming Software (RPS). These updates can initiate from either the control panel or the remote computer using RPS.

H. Network Communication: The DACS shall be capable of network communications over a LAN, WAN, Intranet, or the Internet. The system shall include supervision of the network communication utilizing configurable periodic heartbeats to the Digital Alarm Communications Receiver (DACR). The DACR shall provide notification of the loss of communications from a networked system after a programmable timeframe since the last communication. The notification options shall be programmable and include local annunciation or indication to automation software.
    1. The network interface module shall be capable of supporting Dynamic Host Communication Protocol (DHCP) to obtain an IP Address.
    2. The system shall support a method of authentication between the control panel and the receiver to ensure that the control panel has not been compromised or replaced.
    3. The network interface modules shall be capable of supporting encryption using a minimum of 128-bit AES Encryption (Rijndael) certified by NIST (National Institute of Standards and Technology).
    4. The network interface module shall support a 10/100BaseT connection to an Ethernet network.
    5. The control panel shall be capable of network communication with a programmable poll time to send periodic heartbeats to the receiver, programmable ACK Wait time, and programmable retry time. In the situation where a communication path is unsuccessful, the control panel shall be capable of attempting backup communication through an available communication method to the same receiver or a backup receiver.
        a. The control panel shall have the ability to automatically adjust the heartbeat rate of a backup path that is using cellular to the heartbeat rate of the primary path in case of a primary path failure. Upon restoral of the primary path, the heartbeat rate of the backup path shall automatically restore to the original rate. This allows a system utilizing cellular communications to keep the wireless charges low.
        b. The network communication between the control panel and the receiver shall use Modem4.

c. The control panel shall be capable of two-way communication using a wired network interface module with a 10/100BaseT on a LAN/WAN/Internet configuration or with a wireless GPRS module on the Internet.
d. The control panel shall be capable of configuring the destination of the receiver using a URL or static IP Address.
e. The control panel shall be capable of using DNS to lookup the IP Address of the receiver when programmed with a URL.
f. The control panel shall support UPnP for automated Port Forward configuration in the router where the control panel is installed.
g. The control panel shall support AutoIP to enable the RPS software to connect to the control panel locally using an IP Direct connection.
h. The control panel shall support configuration of the IP parameters from the keypad eliminating the need for a PC to configure the IP device.
i. The control panel shall support network diagnostics from a keypad to allow local testing of network connectivity. The diagnostics should include, Ethernet cable connected, gateway configuration ok, DNS lookup operational, and external network connectivity (such as the Internet) operational.
j. The system shall be capable of meeting DCID 6/9 and UL 2050 standards.

I. Event Log: The DACS shall maintain a log of events indicating time, day, month, year type of event, account number, area number, user ID, point text, user text and primary/secondary event route. The system shall allow the following characteristics:
1. The DACS shall be capable of storing up to 255 events
2. The DACS shall provide notification via a report to the DACR when the event log reaches a programmable “percent full capacity". This allows retrieval of stored events via RPS to prevent any loss of event history.
3. Group, signal type and area can route events to specific printers.
4. Each DACR shall be designated as a primary, backup, or duplicate destination for each report group. Assigning an event to multiple routing groups provides for duplicate destinations for the event. The transmission of grouped events allows the reporting of different types of information to different remote DACRs.

J. Testing, Diagnostic, and Programming Facilities: The DACS shall be capable of sending (manually or automatically) test and status reports to remote DACRs.
1. The DACS shall be capable of sending automatic tests daily, weekly or once every 28 days. Automatic test times shall be programmable to provide an offset of up to 24 hours from the current time.
2. Automatic test reports shall be programmable to be deferred by one test interval if any other report is transmitted in the current interval.
3. Automatic test reports and remote system access for diagnostics shall be supported via a remote central station computer with Remote Programming Software (RPS).
4. The DACS shall be programmable locally or remotely. Programming shall be accomplished via a command center or a computer with a remote programmer and diagnostic software package (RPS).
5. The DACS shall allow an on-site user to initiate remote programming while on-line with the servicing location. The remote programming device must provide a compare feature and allow for downloading either the stored program or the (un)modified program copied from the panel.

6. The DACS shall allow the local programming option to be disabled and must provide a method to program a panel while no one is on premises, when the panel shares a line with an answering machine.
7. The DACS shall accommodate IP Diagnostic to verify settings and operation of the network interface modules; Host name, MAC address, IPV4 address assignment. The IP Connection test shall include; Link test to verify physical cable integrity, Ping test to verify gateway response, ping test to verify address on the internet.
8. Wireless point diagnostics shall include signal strength and device states of registered wireless points in the system.
9. The number of system testing and programming sessions shall be restricted via the use of program locking features and passwords. Passcode protection in excess of sixteen million combinations is required.
10. New modules support enhanced diagnostics through RPS

K. Miscellaneous Features: Programmable alarm output timer, 4 programmable entry delay times, exit delay programmable by area, individually programmable point of protection text, point bypassing, key switch arming capability with LED outputs, and fire verification.

L. User-Programmable Features: The DACS shall provide a menu driven interface to provide a user-friendly command structure for programming / customizing the system to the operational criteria of the application. The DACS shall be capable of being operated via:
1. The Command Structure.
2. Menu / Command List.

2.03 SYSTEM INTERFACE REQUIREMENTS

A. Grounding: The Contractor shall properly earth ground the DACS to prevent electrostatic charges and other transient electrical surges from damaging the DACS panel.

B. Primary power: The Contractor shall provide a dedicated 120 VAC power circuit to the DACS system. This circuit shall be connected to the emergency power system. The 120 VAC is stepped down to power the DACS panel using a class two, plug-in transformer. This power circuit shall be properly rated to continuously power all points and functions indefinitely in full alarm condition.

C. Primary power supervision: When the primary power source fails, the system can be configured to report an "AC Fail" message to a commercial central station.
1. The message can also be programmed to "tag-along" with another message transmitted to the central station.
2. The system will always display a loss of primary power on the ACC and may be configured to provide additional audible warning.

D. Secondary power (standby battery): The Contractor shall provide adequate battery power as defined by the relevant application criteria, (UL 864 and UL 985 for alarm installations or NFPA 72 chapters for fire applications). Appropriate battery chargers shall be provided consistent with the battery back-up capacity. The most current accepted version of NFPA 72 and any applicable local codes or AHJ requirements must be met accordingly.

E. Secondary power supervision: When the secondary power source experiences a 85 percent depletion of its standby capacity, the system can be configured to report a "Low Battery" message to a commercial central station. The system will always display a low battery condition on the ACC and may be configured to provide additional audible warning.

F. Telephone interface: The control panel in the DACS shall be equipped with an optional phone line monitor and shall interface with the phone lines via RJ-31X jacks for supervision of the telephone line connection.

1. The telephone line interface shall conform with FCC rules (Title 47 C.F.R. part 68).

G. Ethernet Interface: The DACS shall include a integrated Ethernet interface module as the primary, or back-up means of communicating to a DACR.
   1. Built-in IP-based alarm transport, programming, and control
   2. The module shall accommodate 128, 256-bit AES encryption using CBC (Cipher Block Chaining) mode.
   3. 10BASE T or 100BASE T network connection
   4. Full-duplex and half-duplex support

H. Cellular interface: The DACS may use a cellular radio module as the primary, or backup, means of communicating to a DACR. Up to 4 IP Addresses shall be available for routing system events. The supervision time shall be programmable with a range of 5 to 65,535 seconds. This module shall accommodate 128-bit AES encryption.

I. Auxiliary function control interfaces: The DACS shall accommodate auxiliary functions such as activating bells, strobes, or lights and shall be accomplished using the optional application specific relay modules. These auxiliary interfaces shall be electrically isolated to avoid inter-system interferences or damage to the system.

J. Wiring: The contractor shall provide cables consistent with the manufacturer's recommendations. The following general guidelines shall be followed for wiring installation:
   1. Wiring shall be appropriately color-coded with permanent wire markers. Copper conductors shall be used.
   2. All signal cables provided under this contract shall be Class II, plenum-rated cable where required. Where subject to mechanical damage, wiring shall be enclosed in metal conduits or surface metallic raceway.
   3. Data wires shall not be enclosed in conduit or raceways containing AC power wires.
   4. Where EMI may interfere with the proper operation of the DACS circuits, twisted/shielded cable shall be used.

K. Environmental Conditions: The DACS shall be designed to meet the following environmental conditions:
   1. The system shall be designed for a storage temperature of -10° C to 70°C (14° F to 158°F).
   2. The system shall be designed for an operating temperature of 0° C to 50°C (32° F to 120°F).
   3. The system shall be designed for normal operation in an 85% relative humidity environment.
   4. The system shall meet or exceed the requirements of FCC rules Title 47 C.F.R. Part 15, Class B devices, and Part 68, IEC EMC directive

L. Magnetic Contact: - Sentrol 1078 for amenity spaces
   1. The contact contains a hermetically sealed magnetic reed switch. The reed shall be potted in the contact housing with a polyurethane based compound. Contact and magnet housing shall snap-lock into a 3/4" or 1" diameter hole. Housings shall be molded of flame retardant ABS plastic. Color of housings shall be off-white, grey or mahogany brown. The magnet shall be made of Alnico V. Rare Earth Magnet shall be made of neodymium iron boron. Snap-lock insulation bushing for tight fit and maximum gap in steel.
   2. Specifications:
      Form A: (R)1078, 1078W, (R)1078C, 1078CW, 1078C1
   3. Voltage 100 V AC/DC max.
      Current 0.5 A max.
      Power 7.5 W max.

M. Motion Sensor: Bosch DS934

1. The intrusion detector(s) shall operate on the Verified Intrusion principle using dual technology Passive Infrared (PIR) technology, and shall be listed by Underwriters Laboratories, Inc.

   Output and Enclosure: Each detector shall provide the detection, signal processing, alarm relay, and operating power circuitry in the same enclosure; and shall provide an alarm relay actuation upon the detection of an intruder moving into or through its protection pattern. The enclosure shall be ready for surface and/or corner mounting, and shall be capable of mounting to a compatible Wall or Ceiling Mounting Bracket without modification. Each detector shall feature a single piece electronics board whose circuitry is specifically designed for this detector alone. The board shall be mounted to a housing with the cover being secured with a screw. The case shall include easy wiring knockouts, and a wiring guide with wide wiring space.

N. Glass Break Detector: Honeywell FG1625

1. The coverage pattern of the detector can be easily adjusted to fit small or large rooms. Interference outside the range will not cause false alarms. The FG1625 detects in a full 360°-coverage pattern, with a maximum 25' (7.5m) radius from sensor to glass.
2. Input voltage: 9 to 16VDC (Typical 15mA, Maximum 25mA)
   Electrical configuration: Form A, Form C
   Field wiring size: 18 AWG
   Relay rating: 16V, 50mA max.
   Detection range: 3'-25' (0.9 m-7.6 m) x 360°
   Alarm response: 4 sec.
3. Minimum glass size: 12" x 24" (30.5 cm x 61 cm)
   Recommended glass thickness:
   a. Plate: 3/32"-1/4" (2.4 mm-6.4 mm)
   b. Tempered: 1/8"-1/4" (3.2 mm-6.4 mm)
   c. Wired: 1/4" (6.4 mm)
   d. Laminated: 1/8"-1/4" (3.2 mm-6.4 mm)
4. Operating temperature 32°-122°F (0°-50°C)
   Relative humidity 0-90% non-condensing

O. Interior Siren: Wave2F

1. The siren shall be flush mount for indoor use and shall provide a high decibel (dB) output.
   a. Tones: Steady and warble
   b. Operating Voltage: 6 – 14V DC
   c. S.P.L.: 120 dB at 12V DC
   d. Rated Power: 15 Watts
   e. Current Draw: 1 Amp at 12V DC
   f. Materials: High impact plastic
   g. Color: White

P. Equipment Tamper Switches – Sentrol Model 1005

1. Mini Magnapull magnetic pull-apart cords are used to protect valuable free-standing items, such as office equipment, video systems, art objects, and gun cabinets. Positive magnetic retention limits false alarms.
   a. Positive magnetic retention prevents false alarms
   b. Hermetically sealed; works in moist, dirty environments
   c. Durable high-impact plastic for trouble-free operation
   d. Mounting hardware included

e. Voltage: 100 V AC/DC max.
Current: 0.5 A max.
Power: 7.5 W max.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Comply with manufacturer's instructions for installation of access doors.

3.02 INCLUSIONS:

A. All labor and materials for a complete installation.
B. All wire and cable to be run in conduit and open cable fashion and in accordance with National Electrical Code Standards.

3.03 EXCLUSIONS

A. Dedicated 110 VAC outlets for Intrusion Alarm panels by the electrician
B. Phone jack and telephone line by telecommunications contractor
C. Conduits and raceways

3.04 WARRANTY

A. All components used in the installation of the system(s) will be new. The warranty period is for one (1) year from the date of installation. The warranty provides repair or replacement of all parts and labor on all workmanship and materials supplied by the system installer/contractor and its subcontractors. Vandalism, theft, misuse, intentional damage, acts of God, etc. are not covered by the warranty.

3.05 TRAINING, MANUALS AND DRAWINGS

A. The system installer shall provide a complete close out package including (1) set of reproducible vellum as-built drawings and (3) sets of as-built drawings on bond paper, minimum architectural size “D”. Drawings shall include device locations, controller locations, junction box locations, conduit and wiring paths, support notes and relevant detail drawings.
B. (3) Sets of installation and operating manuals for each product will be bound into book or binder format.
C. The system shall provide a minimum of 4 hours training on all system functions and programming. The training shall be conducted over the course of 2 sessions:
    1. System power-up and start-up.
    2. Property management staff.
    3. Follow-up training for property management staff and security personnel.

END OF SECTION

SECTION 28 2310

VIDEO SURVEILLANCE

PART 1 - GENERAL

1.01 SUMMARY

A. Terminology
   1. Lennar Multifamily Communities shall be hereinafter referred to in this document as Owner and the respondent shall be referred to as Contractor. The term Owner includes direct employees and other appointed representatives of Lennar Multifamily Communities. These representatives may be requested by the Owner to represent the Owner in undertaking certain project tasks.

B. Location and Access to Project
   1. Project is located in Oakland, California.
   2. Any access using normal street and highway route to the facility is acceptable.
   3. Permission for access to this facility may be revoked for any and all persons who violate facility traffic regulations including speed limits, parking restrictions and directions of the responsible Architect or project personnel. All Contractor's personnel, operating forces, and delivery personnel shall be made aware of and shall comply at all times with the regulations and the direction of responsible Owner and project personnel.

C. Basic Definitions
   1. Definitions:
      a. "Days": As used in the specifications, the word "days" means calendar days.
      b. "Provide": As used in the plans and specifications, the word "provide" means to furnish, install, connect, program, test, commission and warranty the subject material or services.
   2. Specified Items – Substitutions
      a. "No Substitutes": The exact make and model number identified in the Specification shall be provided without exception. Where compatibility with existing systems is specified, and where a specific make or model number is not identified, the Contractor shall provide equipment which is compatible with, and equivalent to, existing equipment of the same description and type, and serving the same purpose.
      b. "Or Equal": An item may be substituted for the specified item provided that in every technical and aesthetic sense, the substituted item provides the same or better capability than the specified item, and is fully compatible with the new or existing systems specified. For expansion of existing systems, the item shall also be approved and fully supported by the existing system manufacturer. The Security Engineer shall be the sole authority to determine the equality of substituted products with specified items.
      c. "Aesthetic", or "Aesthetic Considerations": If aesthetic considerations are involved in either the "or equal" or "approved equal" category, this shall be a consideration in approving or disapproving the proposed substitute. If the proposed substitute is aesthetically unacceptable to the Architect, then the specified, or another technically equal item, shall be provided.

3. "Beneficial Use": Each component of a system is not considered available for beneficial use until and unless all components and conditions have been fulfilled to make the system fully operational.

D. Description
   1. General Description: This specification section covers general requirements for the furnishing, installation and testing of complete low-voltage IP CCTV Camera system.
   2. Furnish and install an IP based video surveillance system including cameras, mounting brackets, power supplies, equipment cabinets, controls, consoles and other components of the systems as shown and specified.

E. Scope Of Work
   1. Systems: Provide the following work complete per the contract schedule, and with acceptable engineering and installation practices as described herein.
      a. The CCTV Camera System shall be consist of IP-based cameras and control recording equipment of the following primary components:
         1) Utilize the ACSN network to provide Ethernet connections capability for all IP based cameras
         2) Network video recorders and camera licenses
         3) Minimum digital storage media for 30 days at 10 frames per second, motion activated recording 50% of the time
         4) IP cameras – HD format
         5) Megapixel cameras, minimum 1.3 and 2 megapixels
         6) Camera mounts to adapt to all mounting configurations

   2. Area of work includes the "19th & Harrison" project site.
   3. Services: Contractor shall provide the following services complete and as scheduled:
      a. Project Planning and Management
      b. Shop Engineering and Documentation
      c. Wiring and Installation Diagrams
      d. Submittals
      e. System Installation
      f. System Start-up and Commissioning
      g. Training
      h. Testing
      i. Warranty

   4. System Design:
      a. Networked IP Camera System:
         1) The camera system for this project shall be an IP based video surveillance system. The system shall consist of IP cameras and Network Video Recorder (NVR).
         2) A proprietary video security network shall be established utilizing Cat5e and fiber optic cable. Network switches shall be installed where necessary and shall use this network for 10/100T Ethernet connectivity. The NVR shall be accessible from the client workstation.
         3) The workstation shall be located in the Work Room 106. Live video, recorded video and search features shall be accessible through this client workstation. The NVR shall be located in

Server Room 103. This system shall include a minimum RAID Level 5 HDD back-up system.

4) IP cameras shall be powered via Power-Over-Ethernet (POE) capable network switches.

b. System Functionality:

1) The CCTV surveillance system is designed to view certain areas of the building including vehicle parking entrances, elevator lobbies, pedestrian entrances, parking areas and amenity spaces such as clubrooms, business centers, and fitness rooms.

2) All cameras shall be recorded using the NVR's intelligent video motion capabilities so that only video is recorded when motion is in the area, thus saving hard drive storage space.

3) All cameras shall be fixed position dome cameras with verifocal lenses.

c. The NVR shall be provided with a secured connection to the internet by the Owner's IT Department for remote viewing capabilities.

d. Cameras in Amenity Spaces:

1) The purpose of cameras in these areas is to record the on-going activity in the rooms and store the video on the NVR for future event review.

2) It is not the intent of this system to provide live interactive viewing of video 24/7 by management or staff.

e. Cameras at Elevator Lobbies:

1) The purpose of the camera in each elevator lobby is to view the general lobby area, and direct access to the elevators.

f. Vehicle Entrances:

1) Megapixel cameras shall be installed at each vehicle entrance to the parking garage. There shall be (2) on the entrance side and (2) on the exit side of the gate. The intent of (2) of these cameras it so record the rear license plate of the vehicle entering and exiting the parking garage. The purpose of the other (2) cameras is to record the overall view of the car and capture an image of the driver if possible. The progressive scan features of the Megapixel camera shall allow property management to enlarge views to identify make and model of cars, identify persons on foot, identify drivers and capture license plates.

F. Related Work

1. General:

a. Observe interface procedures to related work as described in Part 3, herein.

b. Coordinate with the Architect on all aspects of aesthetic interface.

2. Finish Carpentry and Millwork

a. The NVR shall be designated, furnished and installed by the Contractor in the Security rack in the Server Room 103 as designated on the plans. The Contractor shall coordinate security equipment size, and provide an open frame floor mounted rack for all security equipment, including CCTV server, network switches, fiber connections, UPS devices and access control network equipment.

b. The Client Workstation shall be a tower PC based with a flat panel monitor, keyboard and mouse. The console or desk where the workstation will be mounted shall be designated, furnished, and installed by others. The Contractor shall coordinate security equipment size, and provide an open frame floor mounted rack for all security

equipment, including CCTV server, network switches, fiber connections, UPS devices and access control network equipment.

3. Access Doors: The Security Contractor shall coordinate with the Architect and General Contractor for the provision of access doors where needed to gain access to wiring, boxes, panels and enclosures in walls or ceilings.
4. Conduit: All conduit shall be furnished by the electrical contractor.
5. 120 VAC Electrical Power: All power outlets shall be on a circuit dedicated to security equipment only and will be provided and installed by the electrical contractor.
6. Conditions:
   a. The Security Contractor shall coordinate with other disciplines on all existing construction, equipment and field devices.
   b. Equipment provided under this project shall be installed in a manner consistent with architectural, operational, service and maintenance considerations.
   c. Special Issues: Some new and renovated spaces contain equipment, devices and/or other special materials that may cause interference or disturbances with security equipment devices, conduit, power or cables. The Security Contractor shall take special care in coordinating with other trades on the location of these devices, their zone of influence and mitigating methods that may be required. Mitigating methods may include but not limited to: Fiber Optic cable to avoid interference. No special precautions have been taken in these plans and specifications to account for these issues.
7. Other Related Work
   a. Coordinate with other trades and the General Contractor on any related work not specifically mentioned above.
   b. Painting/Patching: Painting, patching and repair services to match existing or renovated conditions shall be the responsibility of the Owner.

1.02 SUBMITTALS

A. General: Bid documents, including plans, details and specifications are generally considered conceptual in nature, and provide direction on products and project requirements. In most cases, the Contractor is given a choice of products and methods that may be incorporated into the system. These choices may affect the overall design, configuration and installation of the proposed system.

B. Contractor Responsibility: Prepare and submit shop drawings, rendered in the latest AutoCAD format, which show details of work to insure proper installation of the work using those materials and equipment specified or allowed under the approved plans and specifications. A complete Shop Drawing submittal package shall consist of Plans, Equipment Submittals and an Acceptance Testing Plan.

C. Completeness: The Equipment Submittals, Acceptance Testing Plan and the Shop Drawings should be submitted as a complete and contiguous package. Partial or unmarked submittals shall not be accepted for review.

D. Scheduling: A schedule of shop drawing submissions shall be submitted for the Architect's review on a form acceptable to the Architect within ten (10) days after award of the Contract. The schedule of shop drawing submissions shall include a minimum, but not limited to the requirements stated herein.

E. Requirements: Provide the following information complete, and in the manner described herein:
   1. Shop Drawings: Shop Drawings shall be numbered consecutively and shall accurately and distinctly present the following information:

a. Title Sheet
b. Floor Plans: Showing devices, pull boxes, cabinets, conduits and conductors in their proposed locations.
c. Riser Diagram: Showing conduit relationships between devices shown on the Floor Plans. Show power sources. Show signal relationships of controls and devices within the system.
d. Custom Assembly Diagrams: For each custom assembly such as Security Terminal Cabinets, receptacle assemblies, or door control panels, provide an assembly drawing illustrating the appearance of the assembled device. Include dimensions, assembly components, and functional attributes (momentary or alternate action switch, lens color, panel finish, etc.)
e. Component Connection Diagrams
    1) For each equipment component such as a computer, system controller, interface module or proximity reader, show the rear elevation of the device and all connectors/terminations as a pictorial.
    2) Show the wire designations on connectors.
    3) Show a schedule of the wire colors connected to the pins on each device connector.
f. Equipment Wiring Diagrams
    1) Show a pictorial illustration of each equipment enclosure and/or terminal cabinet.
    2) Show the device nomenclatures exactly as shown on the single line diagrams.
    3) Show the terminations including the wire numbers as shown on the single line diagrams.
    4) Show wire colors for each terminal.
    5) For each wire exiting the enclosure, show the destination of the wire by floor, room number and the drawing number of the panel where the wire terminates.
g. Working dimensions and erections dimensions
h. Arrangement and sectional views
i. Necessary details, including complete information for making connections between work under this Contract and work under other Contracts.
j. Stock or standard plans shall not be accepted for review unless full identification and supplementary information is shown thereon in ink or typewritten form.
k. Each Drawing or page shall include:
    1) Project name, Project Number and descriptions.
    2) Submittal date and space for revision dates.
    3) Identification of equipment, product or material.
    4) Name of Subcontractor.
    5) Relation to adjacent structure of material.
    6) Physical dimensions clearly identified.
    7) Identification of deviations from the Contract Documents.
    8) Contractor's stamp, initialed or signed, dated and certifying to review of submittal, certification of field measurements and compliance with Contract.
    9) Location at which the equipment or materials are to be installed. Location shall mean both physical location and location relative to other connected or attached material.

2. Equipment Submittals

a. Provide a parts list, including system type, model numbers, quantities, and specification sheet page reference for equipment, materials, components and devices.
b. Provide Manufacturers Specification Sheet with descriptive information for equipment, materials, components and devices. Clearly delineate on each specification sheet which model numbers, options and configurations are being proposed.
c. Include kinds of materials and finishes for all equipment.

3. Acceptance Testing Plan: Submit a written document detailing the test procedures to be followed by Contractor in evaluating and providing the installed System(s). Include the test forms to be used for each system and for each component of each system. Include all tests required by the equipment Manufacturer and by this Specification. Comply with the acceptance testing requirements required herein.
4. Training Plan
   a. Submit a training plan to be followed in training key employees in the operation and maintenance of the installed system at the project site. The proposed training program shall be designed to provide a level of basic competence with the system for selected personnel. These selected personnel shall then be expected to train other personnel as required, utilizing the training that they have been given and the body of training documentation provided by the Contractor. This plan shall comply with the requirements stated in the "Training" section, of these Specifications, all stated hours of which shall be considered to be classroom hours.
   b. Submit a curriculum to account for, and relate, each subject to tactual training time. All required hours shall be accounted for in this curriculum.
   c. Expend between 0.5 and 2.0 hours of preparation time for each classroom hour of actual training, in order to develop appropriate training plans and other training materials.
   d. The training plan shall cover the overall system, each individual system, each database management, normal operations, and failure modes with response procedures for each failure. Each procedural item must be applied to each equipment level.

F. The Architect shall return unchecked any submittal which does not contain complete data on the work and full information on related matters.
G. Verification: The contractor shall check and acknowledge shop drawings, and shall place his signature on shop drawings submitted to the Architect. Contractor's signature shall constitute a representation that quantities, dimensions, field construction criteria, materials, catalog numbers, performance criteria and similar data have been verified and that, in his opinion, the submittal fully meets the requirements of the Contract Documents.
H. Timeliness: The Contractor shall schedule, prepare and submit shop drawings in accordance with a time-table that shall allow his suppliers and manufacturers sufficient time to fabricate, manufacture, inspect test and deliver their respective products to the project site in a timely manner. The Contractor is solely responsible for delayed performance of their work.
I. Departure from Contract Requirements: If the shop drawings show departures from the Contract requirements, the Contractor shall make specific mention thereof in his letter of transmittal; otherwise review of such submittals shall not constitute review of the departure. Review of the plans shall constitute review of

the specific subject matter for which the plans were submitted and not of any other structure, materials, equipment, or apparatus shown on the plans.

J. Contractor Responsibility: The review of shop drawings shall be general and shall not relieve the Contractor of responsibility for the accuracy of such plans, nor for the proper fitting and construction of the work, nor for the furnishing of materials or work required by the Contract. No construction called for by shop drawings shall be initiated until such plans have been reviewed and approved.

K. Shop Drawing Submittal Review: The procedure in seeking review of the shop drawings shall be as follows:
   1. The Contractor shall submit five (5) complete sets of shop drawings and other descriptive data with one copy of a letter of transmittal to the Architect for review thirty (30) working days after award of the contract. The letter of transmittal shall contain the project name, the Architect's Project Number, the name of the Contractor, the list of plans submitted including number and titles, requests for any review of departures from the contract requirements and any other pertinent information. Plans submitted for review shall be full sized plans, rolled and included with the equipment submittals.
   2. Plans or descriptive data shall be stamped "Reviewed", "Reviewed as Noted", "Reviewed as Noted, Resubmit" or "Rejected" and one copy with a Letter of Transmittal shall be mailed to the Contractor at an address designated by the Contractor.
   3. If a shop drawing or data is stamped "Reviewed" or "Reviewed as Noted", no additional submittal is required for that shop drawing.
   4. If a shop drawing or data is stamped "Reviewed as Noted, Resubmit" or "Rejected", the Contractor shall make the necessary corrections and resubmit the documents as required above. The letter transmitting corrected documents shall indicate that the documents are a resubmittal.
   5. If any corrections, other than those noted by the Architect, are made on a shop drawing prior to resubmittal, such changes should be pointed out by the Contractor upon resubmittal.
   6. The Contractor shall revise and resubmit the shop drawing as required, until they are stamped either "Reviewed" or "Reviewed as Noted".
   7. After the Contractor's submittal or resubmittal of shop drawings, the Architect shall be provided with fifteen (15) working days for review. Should the Architect require additional review time above and beyond the stated fifteen (15) working days, the Contractor may ask for a time extension and/or monetary compensation, if they can present valid, factual evidence that actual damages were incurred by the Contractor. The Architect shall determine the amount of the time extension and/or the monetary compensation to be awarded the Contractor.
   8. The Architect shall not issue a "Notice to Proceed" until all shop drawings are reviewed, unless otherwise approved by the Architect.

L. The Contractor shall be responsible for extra costs incurred by the Architect caused by the Contractor's failure to comply with the procedure outlined above.

1.03 QUALITY ASSURANCE

A. General:
   1. The approved Contractor shall be responsible for satisfactory operation of the system and its clarification.
   2. Approval of the Architect is required of products or services of the proposed manufacturer, suppliers and installers, and shall be based upon conformance to the specifications.

B. Manufacturer Qualifications:

1. Manufacturers of established reputation and experience who have produced similar equipment and who are able to refer to similar installations rendering satisfactory service shall furnish system components.
2. The manufacturer's products shall have been in satisfactory operation on at least three similar installations for not less than three years. Contractor shall submit a list of similar installations.
3. Components including, but not limited to, card access controllers, cameras, intercoms, computers, and power supplies shall have been tested and listed by Underwriters Laboratories, Inc., Factory Mutual Systems, or other approved independent testing laboratory.

C. Contractor Qualifications
1. Hold legally required California State Contractor's licenses necessary to accomplish the installation and activation of the described system at the facilities indicated. Contractor shall submit copies of licenses to Architect prior to the start of work.
2. Hold legally required state registrations required meeting local requirements for submittal plans.
3. Is a permanent organization approved by the manufacturer(s), having facilities and employing manufacturer-trained personnel with technical qualifications and experience to prepare the installation, to install the required system and to provide periodic maintenance. The installer shall have been installing security systems for a period of not less than five years.
4. Maintain a parts inventory and employ trained personnel at a location within a 100 mile radius of the project.
5. Indicate complete and total compliance with the provisions of these Specifications by letter, signed by an officer of the corporation, or a principal if other Ownership currently exists. In addition the letter shall include a complete listing of exceptions, if any.

PART 2 - PRODUCTS

2.01 GENERAL

A. All equipment and materials used shall be standard components that are regularly manufactured and used in the manufacturer's system.
B. All systems and components shall have been thoroughly tested and proven in actual use.
C. All systems and components shall be provided with an explicit manufacturer warranty.

2.02 SRN-4000 64-CHANNEL NETWORK VIDEO RECORDER

A. The network video recorder (NVR) shall support up to 64 network cameras and shall be compatible with ONVIF compliant network cameras. The NVR will have the throughput of 400mbps for recording and 200mbps for network transmission
B. The NVR shall support H.264, MPEG4 and MJPEG Multiple codec.
C. The NVR shall support the iPolis mobile viewer for iPhone and Android phone
D. DISPLAY

1. N/W Camera		
	a. Inputs	Up to 64 network camera support
	b. Resolution	CIF ~ 5M
	c. Protocols	Samsung, ONVIF
2. LIVE		
	a. Local Display	HDMI / VGA
	b. Multi Screen Display	Local monitor : 1, 4, 9, 16, 1+5, 1+7, 1+12, Sequence, Web : 1, 4, 9, 16, 32, 64, Sequence

E. PERFORMANCE

1.	OS Embedded	Linux
2.	Recording	
	a. Compression	H.264, MPEG4, MJPEG
	b. Recording Bit Rate	Max. 400Mbps (2M 64camera real-time recording)
	c. Mode	Manual, Schedule (Continuous/Event), Event (Pre/Post)
	d. Event Trigger	Alarm input, Video loss, Camera event(Sensor, MD, Video Analytics), VA(Up to 4ch selectable, Advanced MD, Object classification(People, Car))
	e. Event Action	E-mail, PTZ preset, Alarm out, Buzzer, Monitor out
3.	Search & Playback	
	a. Search mode	Date/time(calendar), Event log list (all search included in Preview)
	b. Playback function	Fast Forward/Backward, Move one step up, Move one step down
	c. Playback bandwidth	25Mbps(16Ch simultaneously)
	d. Simultaneous Playback	16CH(Local monitor, CMS), 4CH(Web)
	e. Resolution	CIF ~ 5M
	f. Playback Function	Fast forward, backward, Move one step up/ down
4.	Network	
	a. Ethernet	RJ-45, Gigabit Ethernet x 4
	b. Transmission speed	Total Throughput Bandwidth Max: 700Mbps Transmission Bandwidth Max: 400Mbps
	c. Remote users	1 Search, 10 Live Unicast, 20 Live Multicast
	d. Protocol support	TCP/IP, UDP/IP, RTP(TCP), RTP(UDP), RTSP, NTP, HTTP, DHCP, PPPoE, SMTP, ICMP, IGMP, ARP, DNS, DDNS, UPnP, ONVIF, HTTPS, SNMP
	e. Viewer Software	Type: Webviewer, SmartViewer CMS support: Support SDK / CGI
	f. DDNS	Samsung Ipolis, DDNS
	g. IP	IPv4/v6
	h. Security	IP address Filtering, User access log, 802.1x authentication, Encryption
	i. Language	English, French, German, Italian, Spanish, Russian, Turkish, Polish, Dutch, Swedish, Czech, Portuguese, Danish, Rumanian, Serbian, Croatian, Hungarian, Greek, Norwegian, Finnish, Korean, Chinese, Japanese, Thai
	j. OS	Supported OS: Window XP (service pack 2 or above), Vista, 7, 8, Mac OS X (10.4.8 or above)
	k. Web Browser	MS IE 8.x, 9.x, Google Chrome, Mac Safari, Firefox 2.x, 3.x
	l. Smart Phone	Platform: Android, IOS Protocol Support: RTP, RTSP, HTTP,

		CGI Max. Remote Users : Live 10, Playback 1
5.	Storage	
a.	Built-in	2TB 1ea
b.	Internal HDD	12(Hot swap), Max 36TB
c.	External HDD	NAS(ISCSI) : vessRaid 1840i, Max. 192TB(JBOD)
d.	RAID	RAID-5/6
6.	Back up	File Back up(Via Web) : BU/Exe(GUI), JPG, AVI(Network), Function : Single channel play, Date-time/title display
7.	Sensor	Input / Output : 8 / 4 (NO/NC selectable)
8.	Alarm	input : 64CH(Network), compression : G.711, G.726 Audio Communication : 2-Way
F.	INTERFACE	
1.	Front	
a.	Indicator	LED status indicator : HDD action 12, RAID status 1, Alarm 1, Power 1, Record 1, Back up 1, Network 1
b.	Switch	PWR switch 1ea, Key-lock 1ea
2.	Alarm	
a.	Inputs	Terminal 8 inputs (Terminal block)
b.	Outputs	Terminal 4 outputs (Terminal block)
3.	Connections	
a.	Ethernet	RJ-45 ea.(GbE) w/ LINK/ACT LED
b.	Video	1 VGA, 1 HDMI
c.	USB	2ea(Front)
d.	Reset	Switch(1ea)
e.	Power cord	1ea AC inlet
f.	GENERAL	
4.	Electrical	
a.	Input Voltage/Current	100 ~ 240V AC ±10%, 50/60Hz, 3 ~ 1.5A(Dual SMPS)
b.	Power consumption	Max 187W(546BTU with 1TB 12 HDDs)
5.	Environmental	
a.	Operating Temperature	+0°C ~ +40°C (+32°F ~ +104°F)
b.	Operating Humidity	20% ~ 85% RH
6.	Mechanical	
a.	Dimensions(WxHxD)	436.0 x 132.0 x 450.0mm(17.17” x 5.2” x 17.72”)(3U)
b.	Weight(1 x Hard Disks)	Approx. 11.8Kg(14.77lb)
7.	Approvals	
a.	Safety	UL
b.	EMC	CE, FCC, KCC, CCC, Gost-R

2.03 PNF-9010R 12MEGAPIXEL NETWORK 360° 4K FISHEYE CAMERA

2.04 SNF-8010 5MEGAPIXEL NETWORK 360° FISHEYE CAMERA

A. The camera shall be of a dome type suitable for internal installation. The camera shall be ivory in appearance.
B. The cameras shall feature a 1.14mm lens, providing a 187 degree horizontal and vertical field of view.
C. The network camera shall feature up to 5 Mega Pixel resolution at 20fps.
D. ELECTRICAL SPECIFICATIONS

1.	Input Voltage / Current	12V DC ±10%, PoE (IEEE802.3af class3)
2.	Power Consumption	Max 10.2W(PoE, Class3), Max 7.8W(12V DC)

E. CAMERA

1.	Imaging Device	1/1.8” 6M PS CMOS(IMX178)
2.	Total Pixels (horizontal x vertical)	6megapixel / 5.2M (2560 x 2048)
3.	Scanning System	Progressive
4.	Min. Illumination	Color: 0.9Lux (1/30sec, F2.5, 50IRE), 0.015Lux (2sec, F2.5, 30IRE) B/W: 0.09Lux (1/30sec, F2.5, 50IRE), 0.0015Lux (2sec, F2.5, 30IRE)
5.	Video Out	CVBS : 1.0 Vpp / 75Ω composite

F. LENS

1.	Focal length	1.14mm fixed
2.	Max. Aperture ratio	F2.5
3.	Angular Field of View	H:187° / V : 187° / D : 187°
4.	Min Object Distance	0.3m ~ Infinity / Manual
5.	Focus control	Manual
6.	Lens Type	Fixed focal
7.	Mount Type	Board type (M12)

G. OPERATIONAL SPECIFICATION

1.	Camera Title	On, Off (displays up to 15 characters)
2.	Day and Night	True D&N
3.	Backlight Compensation	BLC
4.	Contrast Enhancement	SSDR(Samsung Super Dynamic Range)(Off/On)
5.	Digital Noise Reduction,	SSNRIII(2D+3D noise filter)(Off/On)
6.	Motion Detection	On, Off (4ea 4 points polygonal zones)
7.	Privacy Masking	On, Off (32ea zones with 4 points of polygonal)
8.	Gain Control	Off, Low, Medium, High,
9.	White Balance	ATW AWC, Manual, Indoor, Outdoor, Mercury
10.	Electronic Shutter Speed	2s~1/12,000s
11.	Digital Zoom	16x, Digital PTZ(Preset, Group)
12.	Flip / Mirror	On, Off
13.	Intelligent Video Analytics	Tampering, Virtual line, Enter / Exit / Disappear, Audio detection
14.	Alarm I/O	input 1ea / Output 1ea
15.	Alarm Triggers	Motion detection, Tampering, Audio detection, Alarm input, Network disconnection
16.	Alarm Events	File upload via FTP and E-Mail, Notification via E-Mail, TCP and HTTP Local storage (SD/SDHC/SDXC) recording at network disconnected & event (Alarm triggers), External output

H. NETWORK

1.	Ethernet	RJ-45 (10/100Base-T) : Female type
2.	Video Compression	H.264(MPEG-4 part 10/AVC), MJPEG
3.	Resolution	
	a. Fishyeye(Original)	<5.3M original> 2560 x 2048, 1920 x 1080, 1600 x 1200, 1280 x 1024, 1280 x 960, 1280 x 7201024 x 768, 800 x 600, 720 x 480, 640 x 480, 320 x 240
	b. Single rectangle	800 x 600, 640 x 480, 320 x 240
	c. Quad view	1600 x 1200, 1280 x 960, 1024 x 768, 800 x 600, 640 x 480, 320 x 240
	d. Double panorama	2048 x 1536, 1600 x 1200, 1280 x 960, 1024 x 768, 800 x 600, 640 x 480, 320 x 240
	e. Single panorama	2048 x 768, 1600 x 600, 1280 x 480, 1024 x 384, 800 x 300, 640 x 240, 320 x 120
4.	Max Frame rate(Raw)	<MJPEG>
	a. Source view	2560 x 2048, 1920 x 1080, 1600 x 1200, 1280 x 1024, 1280 x 960, 1280 x 720, 1024 x 768 : 15fps / 800 x 600, 720 x 480, 640 x 480, 320 x 240 : 20fps
	b. Single panorama view	800 x 600 : 15fps / 800 x 600 : 20fps
	c. Double panorama view	800 x 600 : 15fps / 800 x 600 : 20fps
	d. Quad view	800 x 600 : 15fps / 800 x 600 : 20fps,
	e. Single rectangle view	All: 20fps@Ground / Ceiling mode 800 x 600 : 15fps@Wall mode / 800 x 600 : 20fps@Wall mode
5.	Viewing Composition	
	a. Camera Side	360 view, Single panorama, Double panorama, Single panorama + 3 rectangle, 360 view + 3 rectangle, Quad view, Single rectangle, Single panorama + 2 rectangle, 360 view + 8 rectangle
	b. CMS side	360 view, Single panorama, Double panorama, Quad view, Single rectangle, 360 + 3 rectangle, Single panorama + 2 rectangle
6.	Video Quality Adjustment	
	a. H.264	Compression level, Target bitrate level control
	b. MJPEG	Quality level control
7.	Bitrate Control Method	
	a. H.264	VBR or CBR
	b. MJPEG	VBR
8.	Streaming Capability	Multiple streaming (Up to 3 profiles) *Multiple streaming (Up to 5 profiles), regardless of codec type
9.	Audio In	Max output level : 1 Vrms, Supply voltage : 2.5V DC(4mA), Input impedance : approx. 2K Ohm SNF-8010 : Selectable (Mic in / Line in)
10.	Audio Out	Line out (3.5mm stereo mini jack

11.	Audio Compression Format	G.711 u-law/G.726 selectable / G.726 (ADPCM) 8KHz, G.711 8KHz, G.726 : 16Kbps, 24Kbps, 32Kbps, 40Kbps / AAC (16Khz/48Khz) (Coming '14. Sep)
12.	Audio Communication	Bi-directional
13.	IP	IPv4, IPv6
14.	Network Protocol	TCP/IP, UDP/IP, RTP (UDP), RTP (TCP), RTCP, RTSP, NTP, HTTP, HTTPS, SSL, DHCP, PPPoE, FTP, SMTP, ICMP, IGMP, SNMPv1, v2c, v3 (MIB-2), ARP, DNS, DDNS, QoS, UPnP, Bonjour
15.	Security	HTTPS (SSL) login authentication, Digest login authentication, IP Address filtering, User access log, 802.1x authentication
16.	Streaming Method	Unicast, Multicast
17.	Max. User Access	15 users at Unicast
18.	Edge Storage	micro SD/SDHC/SDZC memory slot' Motion images recorded in the SDX/SDHC/SD memory card can be downloaded
19.	Application Programming Interface	ONVIF profile S, SUNAPI (Samsung protocol), SVNP 1.2
20.	Webpage Language	English, French, German, Spanish, Italian, Chinese, Korean, Russian, Japanese, Swedish, Danish, Portuguese, Turkish, Polish, Czech, Rumanian, Serbian, Dutch, Croatian, Hungarian, Greek, Finnish, Norwegian
21.	Web Viewer	
	a. Supported OS	Windows XP, Windows Vista, Windows 7, 8, MAC OS X 10.7
	b. Supported Browser	Microsoft Internet Explorer (Ver. 8 ~ 11), Mozilla Firefox (Ver. 9 ~ 19), Google Chrome (Ver. 15 ~ 25), Apple Safari (Ver. 6.0.2(Mac OS X 10.8, 10.7 only), 5.1.7) *Mac OS X only
22.	Central Management Software	SSM, Smart Viewer, iPOLiS mobile
I.	ENVIRONMENTAL SPECIFICATIONS	
1.	Operating Temperature	-10°C ~ +55°C (+14°F ~ +131°F)
2.	Operating Humidity	Less than 90% RH *Start up should be done at above - 10°C
3.	Storage Temperature	-30°C ~ +60°C (-22°F ~ +140°F)
4.	Storage Temperature	Less than 90% RH
5.	Standard Certification	UL, CE, FCC, RoHS, Gost, KC
J.	PHYSICAL SPECIFICATIONS	
1.	Dimension	Ø 145.9 x 49.6mm(Ø5.74" x1.95")
2.	Weight	750g(1.65lb)
3.	Color	Ivory
4.	Material	Aluminum
K.	CERTIFICATIONS	

1. UL listed
2. CE mark
3. FCC mark

L. WARRANTY
1. 3 years

2.05 SND 6083 2MEGAPIXEL FULL HD NETWORK DOME CAMERA

A. The camera shall be of a dome type suitable for interior installation. The camera shall be ivory in appearance with a plastic body.
B. The camera shall provide video compression dual codec (H.264 and MJPEG).
C. The network camera shall feature up to 2 Megapixel resolution in a 16:9 format.
D. The camera shall provide Defog and WDR.
E. The camera shall provide Audio, Face and Motion detection.
F. The camera shall provide memory slot for SD, SDHC and SDXC.
G. The camera shall provide Multi-crop streaming.
H. The camera shall support Bi-directional audio.
I. All operation and configuration menus shall be provided in English, French, German, Spanish, Italian, Chinese, Korean, Russian, Japanese, Swedish, Danish, Portuguese, Turkish, Polish, Czech, Rumanian, Serbian, Dutch, Croatian, Hungarian, Greek, Norwegian, and Finnish.
J. CAMERA

1.	Imaging Device	1/2.8" 2.38M CMOS
2.	Total Pixels	1,952(H) x 1,116(V)
3.	Effective Pixels	1,944(H) x 1,104(V)
4.	Scanning System	Progressive
5.	Min. Illumination	
	a. Color	0.1Lux (F1.2, 50IRE) 0.001Lux (2sec, 50IRE) 0.03Lux (F1.2, 30IRE)
	b. B/W	0.1Lux (F1.2, 50IRE) 0.03Lux (F1.2, 30IRE)
6.	S/N Ratio	50dB
7.	Video Output	CVBS : 1.0 Vpp / 75Ω composite, 720 x 480(N), 720 x 576(P), for installation DIP connector type

K. LENS TYPE

1.	Focal Length (Zoom Ratio)	3 ~ 8.5mm (2.8x) varifocal
2.	Max. Aperture Ratio	F1.2
3.	Angular Field of View	H : 106.18°(Wide) ~ 37.1°(Tele) V : 58.42°(Wide) ~ 20.94°(Tele)
4.	Min. Object Distance	0.5m (1.64ft)
5.	Lens Type	DC auto iris
6.	Mount Type	Board-in type
7.	Focus Control	Manual

L. PAN/TILT/ROTATE

1.	Pan Range	0° ~ 354°
2.	Tilt Range	0° ~ 67°
3.	Rotate Range	0° ~ 355°

M. OPERATION

1.	Camera Title	Off / On (Displayed up to 45 characters)
2.	Day & Night	Auto (Electrical) / Color / B/W / External / Schedule
3.	Backlight Compensation	Off / BLC
4.	Wide Dynamic Range	120dB

5.	Contrast Enhancement	SSDR (Samsung Super Dynamic Range) (Off / On)
6.	Digital Noise Reduction	SSNRIII (2D+3D noise filter) (Off / On)
7.	Digital Image Stabilization	Off / On
8.	Defog	Off / Auto / Manual
9.	Motion Detection	Off / On (4ea 4 points polygonal zones)
10.	Privacy Masking	Off / On (32 zones with 4 points of polygonal)
11.	Gain Control	Off / Low / Middle / High
12.	White Balance	ATW / AWC / Manual / Indoor / Outdoor
13.	Electronic Shutter Speed	Minimum / Maximum / Anti flicker (2 ~ 1/12,000sec)
14.	Flip / Mirror	Off / On
15.	Intelligent Video Analytics	Tampering, Virtual line, Enter / Exit, (Dis)Appear, Audio detection, Face detection
16.	Alarm I/O	Input 1ea / Output 1ea
17.	Alarm Triggers	Motion detection, Tampering, Audio detection, Face detection, Video analytics, Alarm input, Network disconnection
18.	Alarm Events	File upload via FTP and E-mail Notification via E-mail Local storage (SD/SDHC/SDXC) or NAS recording at Event (Alarm triggers) External output

N. NETWORK PROTOCOL

1.	Ethernet	RJ-45 (10/100BASE-T)
2.	Video Compression Format	H.264 (MPEG-4 part 10/AVC), MJPEG
3.	Resolution	1920 x 1080, 1280 x 1024, 1280 x 960, 1280 x 720, 1024 x 768, 800 x 600, 800 x 450, 640 x 480, 640 x 360, 320 x 240, 320 x 180
4.	Max. Framerate	
a.	H.264	Max. 60fps @ all resolutions
b.	MJPEG	Max. 30fps @ 800 x 600, 800 x 450, 640 x 480, 640 x 360, 320 x 240, 320 x 180 Max. 15fps @ 1920 x 1080, 1280 x 1024, 1280 x 960, 1280 x 720, 1024 x 768
5.	Video Quality Adjustment	
a.	H.264	Compression level, Target bitrate level control
b.	MJPEG	Quality level control
6.	Bitrate Control Method	
a.	H.264	CBR or VBR
b.	MJPEG	VBR
7.	Streaming Capability	Multiple streaming (Up to 10 profiles)
8.	Audio In	Selectable (Mic in / Line in), Built-in mic. Max output level : 1 Vrms Supply voltage : 2.5V DC (4mA), Input impedance : approx. 2K Ohm
9.	Audio Out	Line out (3.5mm stereo mini jack)

10.	Audio Compression Format	G.711 u-law/G.726 selectable, G.726 (ADPCM) 8KHz, G.711 8KHz G.726 : 16Kbps, 24Kbps, 32Kbps, 40Kbps
11.	Audio Communication	Bi-directional audio
12.	IP	IPv4, IPv6
13.	Protocol	TCP/IP, UDP/IP, RTP(UDP), RTP(TCP), RTCP,RTSP, NTP, HTTP, HTTPS, SSL, DHCP, PPPoE, FTP, SMTP, ICMP, IGMP, SNMPv1/v2c/v3(MIB-2), ARP, DNS, DDNS, QoS, PIM-SM, UPnP, Bonjour
14.	Security	HTTPS(SSL) login authentication Digest login authentication IP address filtering User access log 802.1x authentication
15.	Streaming Method	Unicast / Multicast
16.	Max. User Access	15 users at unicast mode
17.	Edge Storage	SD/SDHC/SDXC - motion Images recorded in the SD/SDHC/SDXC memory card can be downloaded. NAS (Network Attached Storage)
18.	Application Programming interface	ONVIF profile S & G, HTTP API (SUNAPI) 2.0 SVNP 1.2
19.	Webpage Language	English, French, German, Spanish, Italian, Chinese, Korean, Russian, Japanese, Swedish, Danish, Portuguese, Turkish, Polish, Czech, Rumanian, Serbian, Dutch, Croatian, Hungarian, Greek, Norwegian, Finnish
20.	Web Viewer	
	a. Supported OS	Windows XP / VISTA / 7 / 8 / 8.1, MAC OS X 10.7
	b. Supported Browser	Microsoft Internet Explorer (Ver. 11 ~ 8) Mozilla Firefox (Ver. 19 ~ 9) * Windows only Google Chrome (Ver. 25 ~ 15) * Windows only Apple Safari (Ver. 6.0.2(Mac OS X 10.8, 10.7 only), 5.1.7) * Mac OS X only
	c. Central Management Software	SmartViewer, SSM

O. ELECTRICAL

1.	Voltage	12V DC ±10%, PoE (IEEE802.3af, Class3)
2.	Consumption	Max. 8.09W (12V DC), Max. 8.94W (PoE, Class3)

P. ENVIRONMENTAL SPECIFICATIONS

1.	Operating Temperature / Humidity	-10°C ~ +55°C (+14°F ~ +131°F) / Less than 90% RH
2.	Storage Temperature / Humidity	-30°C ~ +60°C (-22°F ~ +140°F) / Less than 90% RH

Q. PHYSCIAL SPECIFICATIONS

1.	Dimension	Ø132.1 x 107.6mm (Ø5.2" x 4.24")
2.	Weight	485g (1.07 lb)
3.	Color/Material	Ivory / Plastic

R. CERTIFICATIONS
1. CE mark
2. FCC mark
3. UL mark

S. WARRANTY
1. 3 years, parts and labor.

2.06 SND L5083R 1.3 MEGAPIXEL NETWORK IR DOME CAMERA

A. The camera shall be of a dome type suitable for interior installation. The camera shall be ivory in appearance with a plastic body.

B. The camera shall provide video compression dual codec (H.264 and MJPEG).

C. The network camera shall feature up to 1.3 Mega Pixel resolution in a 16:9 format. 4:3 format shall also be available in smaller resolutions.

D. CAMERA

1.	Imaging Device	1/3" 1.37M CMOS
2.	Total Pixels	1,312(H) x 1,069(V)
3.	Effective Pixels	1,305(H) x 1,049(V)
4.	Scanning System	Progressive
5.	Min. Illumination	
	a. Color	0.04Lux (1/30sec, F1.4), 0.001Lux (2sec, F1.4)
	b. B/W	0Lux (IR LED on)

E. LENS TYPE

1.	Focal Length (Zoom Ratio)	2.8 ~ 12mm (4.3x) varifocal
2.	Max. Aperture Ratio	F1.4
3.	Angular Field of View	H: 88.2 ˚ (Wide)~28.6 ˚ (Tele) V: 69.4 ˚ (Wide)~23.0 ˚ (Tele) D:117.3 ˚ (Wide)~36.2 ˚ (Tele)
4.	Min. Object Distance	0.5m (1.64ft)
5.	Lens Type	DC auto iris
6.	Mount Type	Board type
7.	Focus Control	Manual

F. PAN/TILT/ROTATE

1.	Pan Range	0 ˚ ~ 350 ˚
2.	Tilt Range	0 ˚ ~ 67 ˚
3.	Rotate Range	0 ˚ ~ 355 ˚

G. OPERATION

1.	Camera Title	Off / On (Displayed up to 15 characters)
2.	Day & Night	True Day & Night
3.	Backlight Compensation	Off / BLC
4.	Contrast Enhancement	SSDR (Samsung Super Dynamic Range) (Off / On)
5.	Digital Noise Reduction	SSNR (Off / On)
6.	Motion Detection	Off / On (4ea rectangular zones)
7.	Privacy Masking	Off / On (6ea rectangular zones)
8.	Gain Control	Off / Low / Middle / High
9.	White Balance	ATW / AWC / Manual / Indoor / Outdoor
10.	LDC(Lens Distortion Correction)	Off / On (5 levels with min / max)
11.	Electronic Shutter Speed	Minimum / Maximum / Anti flicker
12.	Flip / Mirror	Flip / Mirror / Hallway view
13.	Intelligent Video Analytics	Motion detection with metadata, Tampering

14.	Alarm Triggers	Motion detection, Tampering detection, SD card error, NAS error
15.	Alarm Events	File upload via FTP and E-mail, Local storage recording at event, Notification via E-mail
16.	IR Viewable Length	15m (49.21ft)
H.	NETWORK PROTOCOL	
1.	Ethernet	RJ-45 (10/100BASE-T)
2.	Video Compression Format	H.264, MJPEG
3.	Resolution	1280 x 1024, 1280 x 960, 1280 x 720, 1024 x 768, 800 x 600, 720 x 576, 640 x 480, 320 x 240
4.	Max. Framerate	
a.	H.264	Max. 30fps at all resolutions
b.	MJPEG	Max. 1fps@1280 x 1024, 1280 x 960, 1280 x 720, 1024 x 768, Max. 15fps@other resolution
5.	Video Quality Adjustment	
a.	H.264	Target bitrate level control
b.	MJPEG	Quality level control
6.	Bitrate Control Method	
a.	H.264	CBR or VBR
b.	MJPEG	VBR
7.	Streaming Capability	Multiple streaming (Up to 3 profiles)
8.	Audio In	Built-in mic
9.	Audio Compression Format	G.711 u-law / G.726 selectable G.726 (ADPCM) 8KHz, G.711 8KHz G.726 : 16Kbps, 24Kbps, 32Kbps, 40Kbps
10.	Audio Communication	Uni-directional audio
11.	IP	IPv4, IPv6
12.	Protocol	TCP/IP, UDP/IP, RTP(UDP), RTP(TCP), RTCP, RTSP, NTP, HTTP, HTTPS, SSL, DHCP, PPPoE, FTP, SMTP, ICMP, IGMP, SNMPv1/v2c/v3(MIB-2), ARP, DNS, DDNS, QoS, PIM-SM, UPnP, Bonjour
13.	Security	HTTPS(SSL) login authentication Digest login authentication IP address filtering User access log 802.1x authentication
14.	Streaming Method	Unicast / Multicast
15.	Max. User Access	6 users at unicast mode
16.	Edge Storage	micro SD/SDHC max. 32G, NAS - Motion images recorded in the SD memory card can be downloaded - Manual recording at local PC
17.	Application Programming interface	ONVIF Profile S, G, SUNAPI (HTTP API)
18.	Webpage Language	English, French, German, Spanish, Italian, Chinese, Korean, Russian, Japanese, Swedish, Danish, Portuguese, Turkish, Polish, Czech,

		Rumanian, Serbian, Dutch, Croatian, Hungarian, Greek, Norwegian, Finnish
19.	Web Viewer	
a.	Supported OS	Windows XP / VISTA / 7 / 8 / 8.1, MAC OS X 10.7 ~ 10.10
b.	Supported Browser	Microsoft Internet Explorer (Ver. 8 ~ 11), Mozilla Firefox (Ver. 9 ~ 35), Google Chrome (Ver. 15 ~ 40), Apple Safari (Ver. 8.0.2(Mac OS X 10.10), 7.0.6(Mac OS X 10.9), 6.0.2 (Mac OS X 10.8, 10.7 only), 5.1.7) * Mac OS X only
20.	Central Management Software	SmartViewer
I.	ELECTRICAL	
1.	Voltage	PoE (IEEE802.3af, Class2)
2.	Consumption	Max. 5.4W
J.	ENVIRONMENTAL SPECIFICATIONS	
1.	Operating Temperature / Humidity	-10°C ~ +55°C (+14°F ~ +131°F) / Less than 90% RH
2.	Storage Temperature / Humidity	-30°C ~ +60°C (-22°F ~ +140°F) / Less than 90% RH
K.	PHYSCIAL SPECIFICATIONS	
1.	Dimension	Ø119.8 x 98.8mm (Ø4.72" x 3.89")
2.	Weight	290g (0.64 lb)
3.	Color/Material	Ivory / Plastic
L.	CERTIFICATIONS	
1.	CE mark	
2.	FCC mark	
M.	WARRANTY	
1.	3 years, parts and labor.	

2.07 SND L6083R 2 MEGAPIXEL NETWORK IR DOME CAMERA

A. The camera shall be of a DOME type suitable for interior installation. The camera shall be ivory in appearance with a plastic body.

B. The camera shall provide video compression dual codec (H.264 and MJPEG).

C. The network camera shall feature up to 2 Mega Pixel resolution in a 16:9 format. 4:3 format shall also be available in smaller resolutions.

D. The camera shall feature an Adaptive Infrared illumination system with IR LEDs giving a viewable distance of 15m (49.21ft) in complete darkness.

E.	CAMERA	
1.	Imaging Device	1/2.9" 2.19M CMOS
2.	Total Pixels	2,000(H) x 1,121(V)
3.	Effective Pixels	1,984(H) x 1,105(V)
4.	Scanning System	Progressive
5.	Min. Illumination	
a.	Color	0.95Lux (1/30sec, F1.4), 0.002Lux (2sec, F1.4)
b.	B/W	0Lux (IR LED on)
F.	LENS TYPE	
1.	Focal Length (Zoom Ratio)	2.8 ~ 12mm (4.3x) varifocal
2.	Max. Aperture Ratio	F1.4
3.	Angular Field of View	H: 103.8 ˚ ~ 32.4˚ / V: 53.7 ˚ ~ 18.4˚ / D: 121.9 ˚ ~ 37.1˚
4.	Min. Object Distance	0.5m (1.64ft)
5.	Lens Type	Fixed

6.	Mount Type	Board type
7.	Focus Control	Manual
G.	PAN/TILT/ROTATE	
1.	Pan Range	0 ˚ ~ 350 ˚
2.	Tilt Range	0 ˚ ~ 67 ˚
3.	Rotate Range	0 ˚ ~ 355 ˚
H.	OPERATION	
1.	Camera Title	Off / On (Displayed up to 15 characters)
2.	Day & Night	Electric Day & Night
3.	Backlight Compensation	Off / BLC
4.	Contrast Enhancement	SSDR (Samsung Super Dynamic Range) (Off / On)
5.	Digital Noise Reduction	SSNR (Off / On)
6.	Motion Detection	Off / On (4ea rectangular zones)
7.	Privacy Masking	Off / On (6ea rectangular zones)
8.	Gain Control	Off / Low / Middle / High
9.	White Balance	ATW / AWC / Manual / Indoor / Outdoor
10.	LDC(Lens Distortion Correction)	Off / On (5 levels with min / max)
11.	Electronic Shutter Speed	Minimum / Maximum / Anti flicker
12.	Flip / Mirror	Flip / Mirror / Hallway view
13.	Intelligent Video Analytics	Motion detection with metadata, Tampering
14.	Alarm Triggers	Motion detection, Tampering detection, SD card error, NAS error
15.	Alarm Events	File upload via FTP and E-mail Local storage recording at event Notification via E-mail
16.	IR Viewable Length	15m(49.21ft)
I.	NETWORK PROTOCOL	
1.	Ethernet	RJ-45 (10/100BASE-T)
2.	Video Compression Format	H.264, MJPEG
3.	Resolution	1920 x 1080, 1280 x 960, 1280 x 720, 1024 x 768, 800 x 600, 720 x 576, 640 x 480, 320 x 240
4.	Max. Framerate	
a.	H.264	Max. 30fps at all resolutions
b.	MJPEG	Max. 1fps@1920 x 1080, 1280 x 960, 1280 x 720, 1024 x 768 Max. 15fps@other resolution
5.	Video Quality Adjustment	
a.	H.264	Target bitrate level control
b.	MJPEG	Quality level control
6.	Bitrate Control Method	
a.	H.264	CBR or VBR
b.	MJPEG	VBR
7.	Streaming Capability	Multiple streaming (Up to 3 profiles)
8.	Audio In	Built-in mic
9.	Audio Compression Format	G.711 u-law / G.726 selectable G.726 (ADPCM) 8KHz, G.711 8KHz G.726 : 16Kbps, 24Kbps, 32Kbps, 40Kbps
10.	Audio Communication	Uni-directional audio
11.	IP	IPv4, IPv6

12.	Protocol	TCP/IP, UDP/IP, RTP(UDP), RTP(TCP), RTCP, RTSP, NTP, HTTP, HTTPS, SSL, DHCP, PPPoE, FTP, SMTP, ICMP, IGMP, SNMPv1/v2c/v3(MIB-2), ARP, DNS, DDNS, QoS, PIM-SM, UPnP, Bonjour
13.	Security	HTTPS(SSL) login authentication Digest login authentication IP address filtering User access log 802.1x authentication
14.	Streaming Method	Unicast / Multicast
15.	Max. User Access	6 users at unicast mode
16.	Edge Storage	micro SD/SDHC max. 32G, NAS - Motion images recorded in the SD memory card can be downloaded - Manual recording at local PC
17.	Application Programming interface	ONVIF Profile S, G, SUNAPI (HTTP API)
18.	Webpage Language	English, French, German, Spanish, Italian, Chinese, Korean, Russian, Japanese, Swedish, Danish, Portuguese, Turkish, Polish, Czech, Rumanian, Serbian, Dutch, Croatian, Hungarian, Greek, Norwegian, Finnish
19.	Web Viewer	
	a. Supported OS	Windows XP / VISTA / 7 / 8 / 8.1, MAC OS X 10.7 ~ 10.10
	b. Supported Browser	Microsoft Internet Explorer (Ver. 8 ~ 11), Mozilla Firefox (Ver. 9 ~ 35), Google Chrome (Ver. 15 ~ 40), Apple Safari (Ver. 8.0.2(Mac OS X 10.10), 7.0.6(Mac OS X 10.9), 6.0.2 (Mac OS X 10.8, 10.7 only), 5.1.7) * Mac OS X only
20.	Central Management Software	SmartViewer
J.	ELECTRICAL	
1.	Voltage	PoE (IEEE802.3af, Class2)
2.	Consumption	Max. 5.4W
K.	ENVIRONMENTAL SPECIFICATIONS	
1.	Operating Temperature / Humidity	-10°C ~ +55°C (+14°F ~ +131°F) / Less than 90% RH
2.	Storage Temperature / Humidity	-30°C ~ +60°C (-22°F ~ +140°F) / Less than 90% RH
L.	PHYSCIAL SPECIFICATIONS	
1.	Dimension	Ø119.8 x 98.8mm (Ø4.72" x 3.89")
2.	Weight	290g (0.64 lb)
3.	Color/Material	Ivory / Plastic
M.	CERTIFICATIONS	
1.	CE mark	
2.	FCC mark	
N.	WARRANTY	
1.	3 years, parts and labor.	

2.08 SNV-8081R 5MEGAPIXEL VANDAL-RESISTANT NETWORK IR DOME CAMERA

A. The camera shall feature up to 5M resolution with frame rate of 30 fps. At 2M resolution, it shall feature frame rate of 60 fps.
B. The minimum illumination shall be 0.15Lux at the aperture ratio of F1.3 in color mode. In black and white mode with IR LED on, it shall be 0Lux.
C. The camera shall feature motorized varifocal lens which varies between 3.93mm and 9.4mm.
D. The camera shall feature H.265, H.264 and MJPEG codec.
E. The camera shall feature Day & Night mode with a removable infrared cut filter (ICR) for precise color reproduction and the best possible low light performance.
F. The camera shall feature intelligent video and audio analytics such as tampering and audio detection.
G. The camera shall provide memory slots for SD/SDHC/SDXC and support recording to NAS and local PC.
H. The camera shall provide hallway view which rotates the scene to 90 or 270 degrees. The hallway view is particularly useful for corridors where vertical view is desired.
I. The camera shall feature LDC (Lens Distortion Correction) which corrects the distortions caused by lens of camera for true reproduction of objects.
J. The camera shall provide IP66 and IK10 ratings to prove strong protection against solid and liquid objects and impact.
K. CAMERA

1.	Imaging Device	1/1.8” 6M CMOS
2.	Total Pixels	3,096(H) x 2,094(V)
3.	Effective Pixels	2,616(H) x 1,976(V)
4.	Scanning System	Progressive
5.	Min. Illumination	
	a. Color	0.3Lux (1/30sec, F1.3, 50IRE) 0.005Lux (2sec, F1.3, 50IRE) 0.15Lux (1/30sec, F1.3, 30IRE) 0.003Lux (2sec, F1.3, 30IRE)
	b. B/W	0Lux (IR LED on)
6.	S / N Ratio	50dB
7.	Video Output	CVBS: 1.0 Vpp / 75Ω composite, 704 x 480(N), 704 x 576(P), for installation DIP connector type

L. LENS TYPE

1.	Focal Length (Zoom Ratio)	3.93 ~ 9.4mm (2.4x) motorized varifocal
2.	Max. Aperture Ratio	F1.3
3.	Angular Field of View	H: 93.4°(Wide) ~ 39.2°(Tele) V: 68.1°(Wide) ~ 29.3°(Tele)
4.	Min. Object Distance	0.5m (1.64ft)\
5.	Lens Type	DC auto iris, support P-Iris mode
6.	Mount Type	Board-in type
7.	Focus Control	Simple focus (Motorized V/F) Manual, Remote control via network (Manual, Simple focus)

M. PAN / TILT / ROTATE

1.	Pan / Tilt / Rotate Range	0° ~ 354° / 0° ~ 67° / 0° ~ 355°

N. OPERATION

1.	Viewable Length	30m (98.43ft), Smart IR
2.	Camera Title	Off / On (Displayed up to 15 characters)
3.	Day & Night	Auto (ICR) / Color / B/W / External / Schedule
4.	Backlight Compensation	Off / BLC / WDR

5.	Wide Dynamic Range	120dB
6.	Contrast Enhancement	SSDR (Samsung Super Dynamic Range) (Off / On)
7.	Digital Noise Reduction	SSNR (2D+3D noise filter) (Off / On)
8.	Motion Detection	Off / On (4ea, Rectangle)
9.	Privacy Masking	Off / On (6ea, Rectangle) - Color: Black / Blue / Red / Grey / White / Green
10.	Gain Control	Off / Low / Medium / High
11.	White Balance	ATW / AWC / Manual / Indoor / Outdoor (Include mecury & Sodium)
12.	LDC (Lens Distortion Correction)	Off / On (Level auto control)
13.	Electronic Shutter Speed	Minimum / Maximum / Anti flicker (2 ~ 1/12,000sec)
14.	Flip / Mirror	Off / On, Hallway : 90° /270°
15.	Intelligent Video Analytics	Tampering, Audio detection - with metadata
16.	Alarm I/O	Input 1ea / Output 1ea
17.	Alarm Triggers	Alarm input, Motion detection, Tampering, Audio detection, Network disconnect
18.	Alarm Events	File upload via FTP and E-mail, Notification via E-mail Local storage (SD/SDHC/SDXC) or NAS recording at event triggers, External output
19.	Pixel Counter	Support

O. NETWORK PROTOCOL

1.	Ethernet	RJ-45 (10/100BASE-T)
2.	Video Compression Format	H.265: Main, H.264 (MPEG-4 part 10/AVC): Main / Baseline / High, MJPEG
3.	Resolution	
	a. 5M Mode	2592 x 1944, 2592 x 1464, 1920 x 1080, 1600 x 1200, 1280 x 1024, 1280 x 960, 1280 x 720, 1024 x 768, 800 x 600, 720 x 576, 720 x 480, 640 x 480, 320 x 240
	b. 2M Mode	1920 x 1080, 1280 x 1024, 1280 x 960, 1280 x 720, 1024 x 768, 800 x 600, 720 x 576, 720 x 480, 640 x 480, 320 x 240
4.	Max. Frame rate	
	a. 5M Mode	H.265 / H.264 - 30fps in all resolutions MJPEG - 2592 x 1944 ~ 2592 x 1464: 2fps, 1920 x 1080 ~ 1600 x 1200: 4fps 1280 x 1024 ~ 1024 x 768: 5fps, 800 x 600 ~ 320 x 240: 15fps
	b. 2M Mode	H.265 / H.264 - 60fps in all resolutions MJPEG - 1920 x 1080: 4fps, 1280 x 1024 ~ 1024 x 768: 5fps, 800 x 600 ~ 240: 15fps
5.	Smart Codec	Manual mode (Area-based: 4ea)
6.	Video Quality Adjustment	
	a. H.264 / H.265	Compression level, Target bitrate level control

	b. MJPEG	Quality level control
7.	Bitrate Control Method	
	a. H.264 / H.265	CBR or VBR
	b. MJPEG	VBR
8.	Streaming Capability	Multiple streaming (Up to 3 profiles) - Total 3 stream at the same time (Including recording stream)
9.	Audio In	Selectable (Mic. in / Line in) Supply voltage: 2.5V DC (4mA) Input impedance: approx. 2K Ohm
10.	Audio Out	Line out (3.5mm stereo mini jack) Max output level: 1Vrms
11.	Audio Compression Format	G.711 u-law/G.726 selectable, G.726 (ADPCM): 8KHz, G.711: 8KHz, G.726: 16Kbps, 24Kbps, 32Kbps, 40Kbps
12.	Audio Communication	Bi-directional audio (2-way)
13.	IP	IPv4, IPv6
14.	Protocol	TCP/IP, UDP/IP, RTP(UDP), RTP(TCP), RTCP, RTSP, NTP, HTTP, HTTPS, SSL, DHCP, PPPoE, FTP, SMTP, ICMP, IGMP, SNMPv1/v2c/v3(MIB-2), ARP, DNS, DDNS, QoS, PIM-SM, UPnP, Bonjour
15.	Security	HTTPS(SSL) login authentication, Digest login authentication, IP address filtering, User access log, 802.1x authentication (EAP-TLS, EAP-LEAP)
16.	Streaming Method	Unicast, Multicast
17.	Max. User Access	10 users at Unicast mode
18.	Edge Storage	SD/SDHC/SDXC (128GB) - Motion images recorded in the SD/SDHC/SDXC memory card can be downloaded, Camera can detect automatically when the memory is connected, Memory status display (Normal / Error / Active / Formatting / Lock), NAS (Network Attached Storage), Local PC for instant recording
19.	Application Programming Interface	ONVIF profile S, SUNAPI (HTTP API), SVNP, Samsung Techwin Open Platform
20.	Webpage Language	English, French, German, Spanish, Italian, Chinese, Russian, Japanese, Swedish, Danish, Portuguese, Turkish, Polish, Czech, Rumanian, Serbian, Dutch, Croatian, Hungarian, Greek
21.	Web Viewer	
	a. Supported OS	Windows XP / VISTA / 7 / 8 / 8.1 or higher MAC OS X 10.7 ~ 10.10
	b. Supported Browser	Microsoft Internet Explorer (Ver. 8 ~ 11), Mozilla Firefox (Ver. 9 ~ 35), Google Chrome (Ver. 15 ~ 40), Apple Safari (Ver. 8.0.2 (Mac OS X

		10.10), 7.0.6 (Mac OS X 10.9), 6.0.2 (Mac OS X 10.8, 10.7 only), 5.1.7) * Mac OS X only
22.	Central Management Software	SmartViewer, SSM

P. ELECTRICAL

1.	Input Voltage / Current	24V AC ±10%, 12V DC ±10% PoE (IEEE802.3af, Class3)
2.	B. Consumption	Max. 12W/13.5W (24V AC, Heater off / on) Max. 10W/11.5W (12V DC, Heater off / on) Max. 11.5W/12.95W (PoE, Heater off / on)

Q. ENVIRONMENTAL SPECIFICATIONS

1.	Operating Temperature	-40°C ~ +55°C (40°F ~ 131°F) Startup should be done at above -35°C(-31°F)
2.	Operating Humidity	Less than 90% RH
3.	Storage Temperature	-30°C ~ +60°C (-22°F ~ +140°F)
4.	Storage Humidity	Less than 90% RH
5.	Ingress Protection	IP66
6.	Vandal Resistance	IK10

R. PHYSICAL SPECIFICATIONS

1.	Dimension (WxHxD)	Φ160.0 x 118.5mm (Φ6.3” x 4.67”)
2.	Weight	955g (2.11 lb.)
3.	Color	Ivory
4.	Material	Aluminum

S. CERTIFICATIONS

1. CE mark
2. FCC mark
3. UL mark

T. WARRANTY

1. 3 years, parts and labor.

2.09 SNV L6083R 2 MEGAPIXEL VANDAL-RESISTANT NETWORK IR DOME CAMERA

A. The camera shall be of a dome type suitable for external installation. The camera shall be ivory in appearance with a metal body.

B. The camera shall provide video compression dual codec (H.264 and MJPEG).

C. The vandal-resistant network camera shall feature up to 2 Mega Pixel resolution in a 16:9 format. 4:3 format shall also be available in smaller resolutions.

D. CAMERA

1.	Imaging Device	1/2.9" 2.19M CMOS
2.	Total Pixels	2,000(H) x 1,121(V)
3.	Effective Pixels	1,984(H) x 1,105(V)
4.	Scanning System	Progressive
5.	Min. Illumination	
	a. Color	0.095Lux (1/30sec, F1.4), 0.002Lux (2sec, F1.4)
	b. B/W	0Lux (IR LED on)

E. LENS TYPE

1.	Focal Length (Zoom Ratio)	2.8 ~ 12mm (4.3x) varifocal
2.	Max. Aperture Ratio	F1.4

3.	Angular Field of View	H: 103.8 ˚ (Wide)~32.4 ˚ (Tele) V: 53.7 ˚ (Wide)~18.4 ˚ (Tele) D:121.9 ˚ (Wide)~37.1 ˚ (Tele)
4.	Min. Object Distance	0.5m (1.64ft)
5.	Lens Type	DC auto iris
6.	Mount Type	Board type
7.	Focus Control	Manual
F.	PAN/TILT/ROTATE	
1.	Pan Range	0 ˚ ~ 350 ˚
2.	Tilt Range	0 ˚ ~ 67 ˚
3.	Rotate Range	0 ˚ ~ 355 ˚
G.	OPERATION	
1.	Camera Title	Off / On (Displayed up to 15 characters)
2.	Day & Night	True Day & Night
3.	Backlight Compensation	Off / BLC
4.	Contrast Enhancement	SSDR (Samsung Super Dynamic Range) (Off / On)
5.	Digital Noise Reduction	SSNR (Off / On)
6.	Motion Detection	Off / On (4ea rectangular zones)
7.	Privacy Masking	Off / On (6ea rectangular zones)
8.	Gain Control	Off / Low / Middle / High
9.	White Balance	ATW / AWC / Manual / Indoor / Outdoor
10.	LDC(Lens Distortion Correction)	Off / On (5 levels with min / max)
11.	Electronic Shutter Speed	Minimum / Maximum / Anti flicker
12.	Flip / Mirror	Flip / Mirror / Hallway view
13.	Intelligent Video Analytics	Motion detection with metadata, Tampering
14.	Alarm Triggers	Motion detection, Tampering detection, SD card error, NAS error
15.	Alarm Events	File upload via FTP and E-mail, Local storage recording at event, Notification via E-mail
16.	IR Viewable Length	20m (65.62ft)
H.	VANDAL-RESISTANT NETWORK PROTOCOL	
1.	Ethernet	RJ-45 (10/100BASE-T)
2.	Video Compression Format	H.264, MJPEG
3.	Resolution	1280 x 1024, 1280 x 960, 1280 x 720, 1024 x 768, 800 x 600, 720 x 576, 640 x 480, 320 x 240
4.	Max. Framerate	
a.	H.264	Max. 30fps at all resolutions
b.	MJPEG	Max. 1fps@1280 x 1024, 1280 x 960, 1280 x 720, 1024 x 768, Max. 15fps@other resolution
5.	Video Quality Adjustment	
a.	H.264	Target bitrate level control
b.	MJPEG	Quality level control
6.	Bitrate Control Method	
a.	H.264	CBR or VBR
b.	MJPEG	VBR
7.	Streaming Capability	Multiple streaming (Up to 3 profiles)
8.	Audio In	Line in
9.	Audio Compression Format	G.711 u-law / G.726 selectable G.726 (ADPCM) 8KHz, G.711 8KHz

		G.726 : 16Kbps, 24Kbps, 32Kbps, 40Kbps
10.	Audio Communication	Uni-directional audio
11.	IP	IPv4, IPv6
12.	Protocol	TCP/IP, UDP/IP, RTP(UDP), RTP(TCP), RTCP, RTSP, NTP, HTTP, HTTPS, SSL, DHCP, PPPoE, FTP, SMTP, ICMP, IGMP, SNMPv1/v2c/v3(MIB-2), ARP, DNS, DDNS, QoS, PIM-SM, UPnP, Bonjour
13.	Security	HTTPS(SSL) login authentication Digest login authentication IP address filtering User access log 802.1x authentication
14.	Streaming Method	Unicast / Multicast
15.	Max. User Access	6 users at unicast mode
16.	Edge Storage	micro SD/SDHC max. 32G, NAS - Motion images recorded in the SD memory card can be downloaded - Manual recording at local PC
17.	Application Programming interface	ONVIF Profile S, G, SUNAPI (HTTP API)
18.	Webpage Language	English, French, German, Spanish, Italian, Chinese, Korean, Russian, Japanese, Swedish, Danish, Portuguese, Turkish, Polish, Czech, Rumanian, Serbian, Dutch, Croatian, Hungarian, Greek, Norwegian, Finnish
19.	Web Viewer	
	a. Supported OS	Windows XP / VISTA / 7 / 8 / 8.1, MAC OS X 10.7 ~ 10.10
	b. Supported Browser	Microsoft Internet Explorer (Ver. 8 ~ 11), Mozilla Firefox (Ver. 9 ~ 35), Google Chrome (Ver. 15 ~ 40), Apple Safari (Ver. 8.0.2(Mac OS X 10.10), 7.0.6(Mac OS X 10.9), 6.0.2 (Mac OS X 10.8, 10.7 only), 5.1.7) * Mac OS X only
20.	Central Management Software	SmartViewer
I.	ELECTRICAL	
1.	Voltage	PoE (IEEE802.3af, Class2)
2.	Consumption	Max. 5.8W
J.	ENVIRONMENTAL SPECIFICATIONS	
1.	Operating Temperature / Humidity	-30°C ~ +55°C (-22°F ~ +131°F) / Less than 90% RH *Start up should be done at above -20°C (-4°F)
2.	Storage Temperature / Humidity	-30°C ~ +60°C (-22°F ~ +140°F) / Less than 90% RH
3.	Ingress Protection	IP66
4.	Vandal Resistance	IK10
K.	PHYSCIAL SPECIFICATIONS	
1.	Dimension	Ø137.0 x 106.1mm (Ø5.39" x 4.18")

2. Weight 670g (1.48 lb)
3. Color/Material Ivory / Metal

L. CERTIFICATIONS
1. CE mark
2. FCC mark

M. WARRANTY
1. 3 years, parts and labor.

2.10 NETWORK SWITCH –

A. 10-Port POE Network Switch - Shall be TrendNET TPE-1020WS 10-Port Gigabit Web Smart PoE+ Switch or equivalent. Switches shall be in a quantity sufficient to accommodate all cameras and other security equipment terminations. Switches shall communicate via Cat5e/Cat6 Ethernet cable or multimode fiber with the rest of the network switches for the security system. Switches shall be rack or cabinet mounted.
1. Port Configuration: 8 x PoE+ Gigabit ports, 2 x Gigabit Ethernet ports and 2 x shared SFP slots
2. Dimensions: 330 x 183 x 44.45 mm (13 x 7.2 x 1.75 in.) / Rack mountable 1U height.
3. Weight: 1.9 kg (4.1 lbs.)
4. Operating temperature: 0 – 45 °C (32 - 113 °F).
5. Operating Relative Humidity: Max 90% non-condensing.
6. Power Consumption: 92.3 Watts (Max).
7. POE Budget: Up to 30 Watts per port with a 75 Watts total power budget

B. 16-Port POE Network Switch - Shall be TrendNET TPE-1620WS 16-Port Gigabit Web Smart PoE+ Switch or equivalent. Switches shall be in a quantity sufficient to accommodate all cameras and other security equipment terminations. Switches shall communicate via Cat5e/Cat6 Ethernet cable or multimode fiber with the rest of the network switches for the security system. Switches shall be rack or cabinet mounted.
1. Port Configuration: 16 x PoE+ Gigabit ports, 2 shared SFP slots
2. Dimensions: 440 x 251 x 44.45 mm (17.3 x 9.9 x 1.75 in.) / Rack mountable 1U height.
3. Weight: 3.6 kg (7.9 lbs.)
4. Operating temperature: 0 – 45 °C (32 - 113 °F).
5. Operating Relative Humidity: Max 90% non-condensing.
6. Power Consumption: 198 Watts (Max).
7. POE Budget: Up to 30 W per port with a 185 W total power budget

C. 24-Port POE Network Switch – Shall be TrendNET TPE-2840WS 28-Port Gigabit Web Smart PoE+ Switch, or equivalent. Switches shall be in a quantity sufficient to accommodate all cameras and other security equipment terminations. Switches shall communicate via Cat5e/Cat6 Ethernet cable or multimode fiber with the rest of the network switches for the security system. Switches shall be rack or cabinet mounted.
1. Port Confirguration: 4 x Gigabit PoE+ ports, 20 x Gigabit PoE ports, 4 x SFP slots
2. Dimensions: 440 x 250 x 44.45 mm (17.3 x 9.8 x 1.75 in.) / Rack mountable 1U height.
3. Weight: 3.8 kg (8.38 lbs.)
4. Operating temperature: -5 – 50 °C (23 – 122 °F).
5. Operating Relative Humidity: Max. 90% non-condensing.
6. Power Consumption: 240.2 Watts (max.).
7. POE Budget: 185 Watts

D. Workstation: CCTV specific workstation

2.11 UNINTERRUPTIBLE POWER SUPPLY

A. The UPS shall be a Tripplite Model #SM1000RM1UTAA (TAA SmartPro® 120V 1kVA 800W Line-Interactive Sine Wave UPS, 1U, Network Card Options, USB, 6 Outlets, ENERGY STAR)

2.12 EQUIPMENT RACK

A. MANUFACTURER
   1. Middle Atlantic Products, Inc. Phone (973) 839-1011. Fax (973) 839-1976. Website middleatlantic.com. E-mail info@middleatlantic.com.

B. EQUIPMENT ENCLOSURES
   1. Equipment Enclosures: BGR Series Enclosure.
      a. Model: BGR-4538LRD
      b. Type: 19-inch gangable equipment rack.
      c. Compliance:
         1) EIA/TIA 310D.
      d. Seismic Certified: Seismic certified to 1997 UBC and 2007 & 2010 CBC Seismic Zone 4 or Seismic Design Category (SDC) “D” and 2006, 2009 & 2012 IBC, 2003 IBC, 2002 ASCE Standard 7, ASCE 7-05 (2005 Edition) & ASCE 7-10 (2010 Edition) and 2006 & 2009 NFPA 5000 Seismic Use Group III lateral force requirements for protecting 1,175 pounds of essential equipment in upper floor installations when used with optional BGR-Z4/BGR-ISO-Z4 seismic floor anchor brackets with Ip value of 1.5.
      e. UL Listed: US and Canada.
      f. Overall Dimensions:
         1) Height: 82.875 inches (2105 mm).
         2) Width: 23.0 inches (584 mm).
         3) Depth: 38.0 inches (965 mm).
      g. Useable Dimensions:
         1) Height: 45 rackspaces.
         2) Depth: 35.4 inches (899 mm).
      h. Construction: Fully welded.
      i. Weight Capacity: 3,000 pounds UL Listed, 12,000 pounds static.
      j. Finish of Structural Elements: Black textured powder coat.
      k. Rackrail:
         1) Two pairs of fully adjustable, 11-gauge steel rackrail with tapped 10-32 mounting holes in universal EIA spacing.
         2) Finish: Black e-coat.
         3) Rackspaces: Numbered.
      l. 12. Rear Door: Solid, keylocked, selectively vented with mounting provisions for 4-1/2” fans.
      m. Removable Rear Knockout Panel:
         1) 1/2-inch, 5/8-inch, 1-inch, and 1-1/4-inch electrical knockouts and ½” “D” UHF/VHF knockouts on 1-5/16-inch x 7-1/2-inch laser knockout plate installed in top and bottom.
      n. Grounding and Bonding Stud: 1/4-20 by 1-inch threaded, installed in top and base, allows installation to conform to NEC.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Comply with manufacturer's instructions for installation of access doors.

3.02 INCLUSIONS:

A. All labor and materials for a complete installation.

B. All wire and cable to be run in conduit and open cable fashion and in accordance with National Electrical Code Standards.

3.03 EXCLUSIONS

A. Dedicated 110 VAC outlets for Access/Security panels by the electrician
B. Conduits and raceways

3.04 WARRANTY

A. All components used in the installation of the system(s) shall be new. The warranty period is for one (1) year from the date of installation. The warranty provides repair or replacement of all parts and labor on all workmanship and materials supplied by the system installer/contractor and its subcontractors. Vandalism, theft, misuse, intentional damage, acts of God, etc. are not covered by the warranty.

3.05 TRAINING, MANUALS AND DRAWINGS

A. The system installer shall provide a complete close out package including (1) set of reproducible vellum as-built drawings and (3) sets of as-built drawings on bond paper, minimum architectural size “D”. Drawings shall include device locations, controller locations, junction box locations, conduit and wiring paths, support notes and relevant detail drawings.
B. (3) Sets of installation and operating manuals for each product shall be bound into book or binder format, with each section clearly labeled as follows:
    1. Cameras
    2. Switches and Power Supplies
    3. Servers and RAID Storage
    4. System Software
C. The system shall provide a minimum of 16 hours training on all system functions and programming. The training shall be conducted over the course of 3 sessions:
    1. System power-up and start-up.
D. Property management staff.
    1. Follow-up training for property management staff and security personnel.

END OF SECTION

An Addressable Life Safety System

1. Part 1 - General

1.1. Related documents

- Drawings and general provisions of the contract apply to this section.
- The work covered by this section is to be coordinated with related work as specified elsewhere in the specifications. Requirements of the following sections apply: <Spec Writer please edit as required>

Division 01 General Requirements

Division 07 Thermal and Moisture Protection, Section 078413 Penetration Firestopping

Division 08 Openings, Section 087100 Door Hardware
Division 14 Conveying Equipment, Section 14 28 16 Elevator Controls

Division 21 Fire Suppression, Section 21 13 00 Fire-Suppression Sprinkler Systems

Division 21 Fire Suppression, Section 21 22 00 Clean-Agent Fire-Extinguishing Systems

Division 21 Fire Suppression, Section 21 30 00 Fire pumps

Division 23 Heating Ventilating and Air Conditioning, Section 23 09 93 Sequence of Operations for HVAC Controls

Division 25 Integrated Automation, Section 25 98 00 Integrated Automation Control Sequences for Electronic Safety and Security Systems

Division 26 Electrical, Section 26 05 00 Common Work Results for Electrical

1.2. Summary

1.2.1. Related Work - Fire

A. The Contractor shall coordinate work in this Section with all related trades. Work and/or equipment provided in other Sections and related to the fire alarm system shall include, but not be limited to:

1. Sprinkler waterflow and supervisory switches shall be furnished and installed by the fire protection contractor, but wired and connected by the electrical contractor. Modification of existing sprinkler devices to accommodate monitoring by the new fire alarm system shall be the responsibility of the fire alarm system installing contractor.

2. Duct smoke detectors shall be furnished, wired and connected by the electrical contractor. The HVAC contractor shall furnish necessary duct opening to install the duct smoke detectors.

3. New air handling and smoke exhaust system fan control circuits and status contacts to be furnished by the HVAC control equipment.

4. Elevator recall control circuits to be provided by the elevator control equipment. Modifications to the existing elevator controls to accommodate ANSI A17.1 shunt trip activation shall be provided by the elevator controls contractor. Any shunt trip circuit breakers and related wiring required for ANSI A17.1 compliance shall be provided by the electrical contractor (see power riser for more details).

5. <Dry pipe/deluge sprinkler system release valve control circuits and supervision contacts shall be provided by the dry pipe/deluge sprinkler system control equipment.>

5. <Kitchen hood extinguishing systems status monitoring.>

6. <Fire pumps (manual, automatic and special service) status monitoring.
   a. Pump failure (fail to start) indication
   b. Pump running indication
   c. Phase reversal indication>

7. <Emergency generator status monitoring
   a. Running indication
   b. Fail to start indication>

9. <Existing IP network interface
   a. Coordinate with the owner's IT department for interconnection between the owner's existing TCP/IP network and the TCP/IP network equipment supplied under this contract.>

1.3. References

1.3.1. Codes-General

All work and materials shall conform to all applicable federal, state and local codes and regulations governing the installation. If there is a conflict between the referenced standards, federal, state or local codes, and this specification, it is the bidder's responsibility to immediately bring the conflict to the attention of the engineer for resolution. National standards shall prevail unless local codes are more stringent.

The bidder shall not attempt to resolve conflicts directly with the local authorities unless specifically authorized by the engineer.

1.3.2. Fire CodeiO

The equipment and installation shall comply with the provisions of the following codes and standards unless the authority having jurisdiction has adopted an earlier version:

National Fire Protection Association (NFPA)

NFPA 70 - 2011 *National Electric Code®*
NFPA 72 - 2010 *National Fire Alarm Code®*
NFPA 90A - 2012 *Installation of Air-Conditioning and Ventilating Systems*
NFPA 101- 2012 *Life Safety Code®*

Underwriter's Laboratories, Inc

UL 864 - Control Units for Fire Protective Signaling Systems.

UL 268 - Smoke Detectors for Fire Protective Signaling Systems.
UL 268A - Smoke Detectors for Duct Applications.
UL 217 - Single and Multiple Station Smoke Alarms
UL 521 - Heat Detectors for Fire Protective Signaling Systems.
UL 228 - Door Closers-Holders, With or Without Integral Smoke Detectors.
UL 464 - Audible Signaling Appliances.
UL 38 - Manually Actuated Signaling Boxes for Use with Fire-Protective Signaling Systems
UL 346 - Waterflow Indicators for Fire Protective Signaling Systems.
UL 1971 - Signaling Devices for the Hearing-Impaired.
UL 1635 - Digital Alarm Communicator System Units
UL-1638 - Signaling Appliances - Private Mode Emergency and General Utility Signaling

<Local codes/standards such as: CSFM (State of California), MEA (New York City), City of Chicago >

International Code Council
International Building Code
International Fire Code
International Mechanical Code

Federal Codes and Regulations
Americans with Disabilities Act (ADA)

Electrical Industries Association
EIA-232-D: Interface Between Data Terminal Equipment and Data Circuit-Terminating Equipment Employing Serial Binary Data Interchange
EIA-485: Electrical Characteristics of Generators and Receivers for Use in Balanced Digital Multipoint Systems

1.3.3. Definitions and Abbreviations

ACU: Autonomous Control Unit.
ADA: Americans with Disabilities Act.
AFF: Above Finished Floor.
AHJ: Authority Having Jurisdiction.
Approved: Unless otherwise stated, materials, equipment or submittals approved by the Authority or AHJ.
Circuit: Wire path from a group of devices or appliances to a control panel or transponder.
CCS: Central Control Station.
CPU: The central computer of a multiplex fire alarm or voice command control system.
ECS: Emergency Communication System.
FACP: Fire Alarm Control Panel.
FCC: Fire Command Center.
FM: FM Global (Factory Mutual)
FSCP: Firefighter's Smoke Control Panel.
HPSA: High Power Speaker Array.
HVAC: Heating Ventilating and Air Conditioning.
IDC: Initiating Device Circuit.
LCD: Liquid Crystal Display.
LED: Light Emitting Diode.
LOC: Local Operating Console.

MN: Mass Notification.
MNEC: Mass Notification Emergency Communications.
NAC: Notification Appliance Circuit.
NFPA: National Fire Protection Association.
NICET: National Institute for Certification in Engineering Technologies
NRTL: Nationally Recognized Testing Laboratory
PTR: Printer.
RCP: Remote Control Panel
SLC: Signaling Line Circuit.
Style 1: As defined by NFPA 72, Class B.
Style 4: As defined by NFPA 72, Class B.
Style 6: As defined by NFPA 72, Class A.
Style 7: As defined by NFPA 72, Class A.
Style B: As defined in NFPA 72, Class B.
Style D: As defined in NFPA 72, Class A.
Style Y: As defined in NFPA 72, Class B.
UL or ULI: Underwriters Laboratories, Inc.
UL Listed: Materials or equipment listed and included in the most recent edition of the UL Fire Protection Equipment Directory.
Zone: Combination of one or more circuits or devices in a defined building area, i.e. 3 speaker circuits on a floor combined to form a single zone.

1.4. System Description - Fire

1.4.1. General FireiO

The system supplied under this specification shall be a new UL Listed modular fire alarm panel that uses independently addressed fire detection devices, input/output control modules, and notification appliances.

The system shall be fully field programmable such that virtually any combination of system output functions may be correlated to any type of input event(s). Inputs may be combined using Boolean logic, be time dependent or under manual control, as defined by required system operation. All software operations are to be stored in a non-volatile programmable memory within the fire alarm control panels. There shall be no limit, other than maximum system capacity, as to the number of addressable devices which may be in alarm simultaneously.

Addressable smoke detector sensitivity settings for both pre-alarm and alarm activation shall be automatically individually configurable for both daytime and nighttime operation. Addressable smoke detectors shall be UL listed for automatic sensitivity testing.

Ease of maintenance shall be facilitated by the use of panel based and PC based system diagnostics.

1. The system shall automatically test smoke detector sensitivity, eliminating the need for manual sensitivity testing.
2. Ground fault detection and annunciation shall be by individual module address for supervised input and output devices.
3. System test operation shall be configurable by individual addressable devices, and not disable entire circuits.

4. The system shall be capable of generating a graphical map of connected all addressable devices to aide in circuit troubleshooting.
5. Placement supervision of addressable devices shall couple a device's location (not its address) to the programmed system response.

The system shall be designed, inspected, tested and approved to provide occupant notification audibility levels of 15 dBA over ambient conditions.

The system shall interface with other building systems as required by the fire codes.

The system shall transmit required signals to a central monitoring station.

System annunciators shall utilize configurable message routing and selective event messaging to direct event information only to the required system displays as required.

1.4.2. Fire Alarm Performance

1.4.2.1. General RequirementsiO

A. Comply with the provisions of NFPA 72 and the operational requirements of this specification.

B. The system shall identify all off normal conditions and log each condition into the system as an event.

1. The system shall automatically display on the control panel Liquid Crystal Display (LCD) the first (oldest) event of the highest priority. The event priority shall be alarm, supervisory, trouble, and monitor.
2. Labeled, color coded indicators shall be provided for each type of event: alarm - red, supervisory - yellow, trouble - yellow, monitor - yellow. When an unseen event exists for a given type, the indicator shall be lit.
3. For each event, the display shall include the number of active and disabled points, the type of event, the time the event occurred and up to a 40 character custom user description.
4. The user shall be able to review the event queue by using the scrolling keys (up-down).
5. New alarm, supervisory, or trouble events shall sound a distinct, silenceable audible signal at the control panel.
6. The LCD shall show the system time and the number of active and disabled points in the system.
7. **Specific input/output devices shall operate in accordance with the alarm, supervisory, trouble, monitor sections that follow and the input/output matrix.**

C. All critical systems, sub-systems and circuits shall be monitored for integrity. System faults shall be annunciated.

D. Strobes shall be synchronized on each floor.

E. Batteries shall be sized to support the system for 24 Hrs. of standby operation followed by 5 minutes of alarm operation at the end of the 24 Hour period.

F. Off premises reporting of the loss of AC mains power to any system component shall be automatically delayed for a period of time acceptable to the AHJ to reduce traffic at the central monitoring station due to wide-area power failures.

G. The system shall provide “one man” testing of the system. Both silent and audible modes shall be available. Zones not under test shall go directly into alarm if activated.

H. Event processing and display shall be prioritized as follows:
   1. Fire alarms
   2. Supervisory events
   3. Trouble events
   4. Monitor events

1.4.2.2. Alarm Operation

<The following representative tasks should be customized for each project. As an alternative to descriptive text, the use of a functional input/output matrix may provide additional detail.>

Upon the **alarm activation** of any area smoke detector, heat detector, manual pull station, sprinkler waterflow <duct smoke detector>, the following functions shall automatically occur:

The system shall remain in the alarm mode until all initiating devices are reset and the fire alarm panel is manually reset and restored to normal.
The internal audible device shall sound at the control panel or command center.
Display the alarm event on the graphical workstation.
The LCD display shall indicate all applicable information associated with the alarm condition including; zone, device type, device location and time/date.
All system activity/events shall be documented on the system printer and logged into system history.
Any remote or local annunciator LCD/LED's associated with the alarm zone shall be illuminated.

<Activate notification audible appliances on the fire floors (zones) immediately above and below (adjacent to) the fire floor (zone) <general alarm evacuation>.
Activate visual strobes notification appliances on the fire floors (zones) immediately above and below (adjacent to) the fire floor (zone) <general alarm evacuation>. The visual strobe shall continue to flash until the system has been reset. The visual strobe <shall> <shall not> not stop operating when the "Alarm Silence" is pressed.
Or

<Sound the ANSI 117-1 signal with synchronized audibles and synchronized strobes throughout the facility.>

Audible alarm signals shall be silenced from the fire alarm control panel by an alarm silence switch. Visual signals shall be programmable to flash until system reset or alarm silencing, as required.

The notification appliance dedicated to sprinkler system water flow alarm shall not be silenced while the sprinkler system is flowing at a rate of flow equal to a single head.

Transmit signal to the building automation system.
Transmit signal to the central monitoring station with point identification.
Activate automatic smoke control sequences.
Activate emergency lighting control.
Activate emergency shutoffs for gas and fuel supplies.
Activate emergency shutdown for the following equipment: <supply list of equipment to be shut down.>

All automatic events programmed to the alarm point shall be executed and the associated outputs activated.

1. Activation of elevator lobby or elevator equipment room smoke detectors shall initiate recall of the bank of elevators to the 1st floor and lockout the elevator controls. Activation of the first floor elevator lobby smoke detector shall recall shall be to an alternate floor, and lockout the elevator controls.
2. Activation of heat detectors in elevator shafts and machine rooms shall activate the elevator power shunt trip circuit breaker.

All stairwell/exit doors shall unlock throughout the building.
All self-closing fire/smoke doors held open shall be released.
Transmit alarm text messages to "alpha-numerical" display pagers.
Direct the closed circuit TV cameras to the alarm event and start video recording.

1.4.2.3. Supervisory Operation
<The following representative tasks should be customized for each project>

Upon **supervisory activation** of any sprinkler valve supervisory switch, waterflow <duct smoke detector>, <guest unit smoke detector>, <guest unit CO detector>, fire pump off-normal, clean agent fire suppression system trouble, elevator shunt trip supervision, the following functions shall automatically occur:
The internal supervisory event audible device shall sound at the control panel.
Display the event on the graphical workstation and display a pictorial image.
The LCD display shall indicate all applicable information associated with the supervisory condition including; zone, device type, device location and time/date.
All system activity/events shall be documented on the system printer and logged to system history.
Any remote or local annunciator LCD/LED's associated with the supervisory zone shall be illuminated.
Transmit signal to the central monitoring station with point identification.

<Activated Guest Unit smoke detectors shall be displayed individually at the fire alarm control unit and remote annunciator as a supervisory events. Activation of a Guest Unit smoke detector shall not sound the general fire alarm, but shall sound an audible alarm within the Guest Unit at all audible detector bases.>

<Activated Guest Unit CO detectors shall be displayed individually at the fire alarm control unit and remote annunciator as supervisory events. Activation of a Guest Unit CO detector shall not sound the general fire alarm, but shall sound an audible alarm within the Guest Unit at all audible detector bases.>

1.4.2.4. Trouble Operation
<The following representative tasks should be customized for each project>

Upon activation of a **trouble condition** or signal from any device or internal system integrity monitoring function on the system, the following functions shall automatically occur:

The internal panel audible device shall sound at the control panel.
Display the event on the graphical workstation and display a pictorial image.
The LCD keypad display shall indicate all applicable information associated with the trouble condition including; zone, device type, device location and time/date.

Trouble conditions that have been restored to normal shall be automatically removed from the trouble display queue and not require operator intervention. This feature shall be software

selectable and shall not prevent the logging of trouble events to the historical file.

All system activity/events shall be documented on the system printer and logged to system history.

Any remote or local annunciator LCD/LED's associated with the trouble zone shall be illuminated.

Transmit a trouble signal to the central monitoring station with point identification.

1.4.2.5. Monitor Operation

<The following representative tasks should be customized for each project>

Upon activation of any device connected to a **monitor circuit**, the following functions shall automatically occur:

<The internal panel audible device shall sound at the control panel. >
Display the event on the graphical workstation and display a pictorial image.
<The LCD display shall indicate all applicable information associated with the status condition including; zone, device type, device location and time/date.>
<All system activity/events shall be documented on the system printer and logged to system history.>
Any remote or local annunciator LCD/LED's associated with the monitor circuit shall be illuminated.

1.5. Submittals

1.5.1. Submittal General

A. The contractor shall not purchase any equipment for the specified system until the owner has approved the project submittals in their entirety and has returned them to the contractor.

B. Approved submittals allow the contractor to proceed with the installation and shall not be construed to mean that the contractor has satisfied the requirements of these specifications.

C. Each submittal shall include a detailed list of variations that the submittal may have from the requirements of the contract documents.

D. The contractor shall provide specific notation on each shop drawing, sample, data sheet, installation manual, etc. submitted for review and approval, of each variation.

E. Any conflicts in the contract documents and/or with Authority Having Jurisdiction (AHJ) requirements shall be submitted to the owner in writing 7 days prior to bid.

F. Submittals shall be approved by authorities having jurisdiction prior to submitting them to the Architect.

1.5.2. Submital Books

Submit for approval no less than three (3) copies of a submittal book to the consulting engineer for review and comment.

Submittal books shall meet the following requirements:

a. Cover sheet
c.. Product data sheets, as detailed elsewhere in this specification
d. Provide description of operation of the system (sequence of operation), similar to that provided in Part 2 of this section of the specifications. The description shall be specific to this project, and shall provide individual sequences for every type of alarm, supervisory, or trouble condition, which may occur as part of normal or off-normal system use.
e. B-size (black line) reduced shop drawings, as detailed elsewhere in this specification.
f. System calculations, as detailed elsewhere in this specification.
g. Installation instructions.
h. Provide samples of various items when requested.
i. Copies of all licenses, documents and certifications, as detailed elsewhere in this specification.

Additional copies may be required at no additional cost to the project.

1.5.3. Product Data

System components proposed in this specification shall be UL listed to operate together as a system. The supplier shall provide evidence, with his submittal, of listings of all proposed equipment and combinations of equipment.

For each product submitted provide the following information:

1. Manufacturer's catalog data, to include material description, agency approvals, operating characteristics, electrical characteristics, dimensions, mounting requirements and accessories.

   Product data sheets for system components shall be highlighted to indicate the specific products, features, or functions required to meet this specification.

   Alternate or as-equal products submitted under this contract shall provide a detailed line-by-line comparison of how the submitted product meets, exceeds, or does not comply with this specification.

2. Manufacturer's product installation sheets: A copy of the documentation that is required to be shipped with all listed products by UL.

1.5.4. Shop Drawings

Submit for approval three (3) sets of shop drawings to the consulting engineer for review and comment. Drawings shall be either D-size or E-size blue line drawings and of a sufficient resolution to be completely read. Drawing sets shall be bound. Additional copies may be required at no additional cost to the project.

Contained in the title block of each drawing shall be symbol legends with device counts, wire tag legends, circuit schedules for all addressable and notification appliance circuits, the project name/address, and a drawing description which corresponds to that indicated in the drawing index on the coversheet drawing. A section of each drawing title block shall be reserved for revision numbers and notes.

Shop drawings shall meet the following requirements:

1. Shop drawings shall be prepared by persons with the following qualifications:
    a. Trained and certified by the manufacturer of the submitted equipment in fire-alarm system design.
    b. NICET-certified fire-alarm technician, Level <II or III or IV> minimum or <INSERT STATE> registered Professional Engineer.
2. **Coversheet** with project name, address and drawing index.
3. **General notes** drawing with peripheral device backbox size information, part numbers, device mounting height information, and the names, addresses, point of contact, and telephone numbers of all contract project team members.
4. Provide device **floor plans** for all areas served by the fire alarm system. <Utilize the CAD Files provided by the consulting engineer in the preparation of the floor plans.> Floor plans shall indicate accurate locations for all control and peripheral devices. Drawings shall be NO LESS THAN 1/8-INCH SCALE. If individual floors need to be segmented to accommodate the 1/8" scale requirements, KEY PLANS and BREAK-LINES shall be provided on the plans in an orderly and professional manner.
    - All addressable devices shall be shown. Coordinate the device address with the same device shown on the riser diagram.
    - Identify all notification appliances with a circuit and item number. Coordinate the circuit and item number with the same device shown on the riser diagram.
    - Show all raceways, marked for size, conductor count with type and size, showing the percentage of allowable National Electric Code fill used.
    - Areas required to meet intelligibility requirements shall be clearly identified. Wide area mass notification system plot drawings shall identify all project areas that must meet intelligibility requirements as well as environmentally sensitive areas on or off of the project site where system output shall be minimized.
5. Device **riser diagram**, which individually depict all control panels, annunciators, addressable devices, and notification appliances. Shall include a specific, proposed device description above each addressable device. Shall include a specific, discrete device address that corresponds to addresses shown on the floor plans. Drawings shall provide wire specifications, and wire identification for all conductors depicted on the riser diagram. All circuits shall have identifiers that shall correspond with those required on the control panel and floor plan drawings. End-of-line resistors (and values) shall be depicted.
6. **Control panel drawing**(s) shall show internal component placement and all internal and field terminations. Provide details indicating where conduit connections shall be made to avoid conflicts with internally mounted batteries. For each additional fire alarm panel, a separate drawing which clearly indicated the panel designation, service and location of the control enclosure.
7. Provide typical **device wiring diagrams** that show all system components, and the respective field wiring. Wire type, gauge, and jacket shall be indicated. When an addressable module is used in multiple configurations for monitoring or controlling equipment, provide a drawing for each application. End-of-line resistors (and values)

shall be shown.

8. Provide a fire alarm system **function matrix** that illustrates alarm input/out events in association with initiation devices. Matrix summary shall include system supervisory and trouble output functions.

9. **System Calculations** as detailed elsewhere in this specification.

Upon receipt of approved drawings from the Authority Having Jurisdiction, the supplier shall immediately forward two sets of drawings to the owner. These drawings shall either be stamped approved or a copy of the letter stating approval shall be included.

1.5.5. Closeout

Two (2) copies of the following documents shall be delivered to the building owner's representative at the time of system acceptance.

Project specific operating and maintenance manuals covering the system as installed. The manuals shall contain a description of the system architecture, inputs, notification signaling, auxiliary functions, annunciation, sequence of operations, expansion capability, application considerations and limitations. A generic instruction and operation manual shall not be acceptable.

Technical literature (manufacturer's data sheets and installation manuals/instructions) for all parts of the system, including control panels, smoke detectors, batteries, manual stations, alarm notification appliances, power supplies, and remote alarm transmission means.

Software and Firmware Operational Documentation:

THE END-USER SHALL RETAIN COMPLETE RIGHTS AND OWNERSHIP TO ALL SITE-SPECIFIC SOFTWARE RUNNING IN THE SYSTEM. The fire alarm equipment supplier shall provide hard and soft copies of the software database to the end-user at the end of the warranty period. The database provided shall be useable by any authorized and certified distributor of the product line, and shall include all applicable passwords necessary for total and unrestricted use and modification of the database.

Drawings

Provide "As Built" drawings of record of all the shop drawings used in the installation of the system.

Refer to the Submittals - Shop Drawings section of this specification for drawing requirements.

Record of Completion

System supplier and contractor shall provide a certified test report to verify that the system and all components functioned properly and as intended.
A filled out Record of Completion similar to NFPA 72, 2007 edition figure 4.5.2.1 shall be provided.

Warranty

Provide copies of the warranty documentation as detailed in the Warranty section of this specification.

Service Organization

Provide the name, address and telephone of the authorized factory representative.

Training

Conduct the required training as detailed in the Startup and Commissioning - Training section of this specification.

1.6. Project Conditions

1.6.1. Responsibility

It shall be the contractor's responsibility to inspect the job site and become familiar with the conditions under which the work will be performed.

A pre-bid meeting will be held to familiarize the contractors with the project. Failure to attend the pre-bid meeting may be considered cause for rejection of the contractor's bid. The minutes of this meeting will be distributed to all attendees and shall constitute an addendum to these specifications.

All work, except for <INSERT>, may be conducted during normal working hours, 8:00 a.m. to 5:00 p.m., Monday through Friday.

1.7. Warranty

1.7.1. Installation Workmanship and Parts

The contractor shall warranty the installation and workmanship for one (1) year and all parts for thirty-six (36) months from date of final acceptance. A copy of the manufacturer's warranty shall be provided with closeout documentation and included with the operation and installation manuals. The full cost of maintenance, labor and materials required to correct any defect during the warranty period shall be included in the submittal bid.

During the warranty period, each year the contractor shall perform detector sensitivity testing and provide a report to the owner. If the system is UL Listed to perform automatic detector sensitivity testing without manual intervention, and if a detector falls outside of sensitivity window the system automatically indicates a devices trouble, then this requirement shall be waived. Documentation from UL shall be provided as proof of automatic sensitivity testing operation.

The system supplier shall maintain a service organization with adequate spare parts stock within 75 miles of the installation. Provide a telephone response to owner's questions within 4 hours and on-site assistance within 24 hours.

Permit the owner's fire alarm technicians to perform temporary bypasses and emergency repairs on the system without voiding the warranty.

1.8. Startup and Commissioning

1.8.1. Training

The system supplier shall schedule and present a minimum of eight (8) hours of formal site specific instruction for the building owner, detailing the proper operation and maintenance of the installed system.

The instruction shall be presented in an organized and professional manner by a person factory trained in the operation and maintenance of the equipment and who is also thoroughly familiar

with the installation.

The instruction shall cover the schedule of maintenance required by NFPA 72 and any additional maintenance recommended by the system manufacturer.

Copies of all training aids, presentations, etc. shall be left with the owner.

1.9. Maintenance

1.9.1. Spare Parts

The contractor shall furnish the following extra material that matches the products installed. Spares shall be packaged with protective covering for storage and identified with labels describing contents.

Automatic detection devices - Two (2) percent of the installed quantity of each type, no less than one piece.

Manual fire alarm stations - Two (2) percent of the installed quantity of each type, no less than one piece..

Glass rods or panels for break glass manual fire alarm stations (if used) - <Ten> percent of the installed quantity, but no less than two devices.

Audible and visible devices - One (1) percent of the installed quantity of each type, but no less than two (2) devices.

Keys - A minimum of three (3) sets of keys shall be provided and appropriately identified.

2. Part 2 - Products

2.1. Acceptable Manufacturers

A. The manufacturer of the system equipment shall be regularly involved in the design, manufacture, and distribution of the products specified in this document. These processes shall be monitored under a quality assurance program that meets ISO 9000/9001 requirements.

B. The catalog numbers used are those of Edwards, a UTC Climate | Controls | Security Company" or equal", and constitute the type and quality of equipment to be furnished. For a list of Edwards authorized fire alarm vendors, contact: edwardsmarketing@fs.utc.com.

C. If equipment of another manufacturer is to be submitted for approval as equal, the contractor shall, at the time of bid, list all exceptions taken to these specifications, all variances from these Specifications and all substitutions of operating capabilities or equipment called for in these specifications and forward said list to the engineer. Any such exceptions, variances or substitutions not listed at the time of bid and are subsequently identified in the submittal, shall be grounds for immediate disapproval without comment. Final determination of compliance with these specifications shall rest with the engineer, who, at his discretion, may require proof of performance.

D. Alternate product submissions shall provide proof of no less than three (3) factory

authorized and certified manufacturer's distributors within <50 miles> of the project job site. These distributors shall provide installation support, shall have a service organization capable of 24 hour emergency call service and SHALL HAVE BEEN CONTRACTED AND DELIVERED NO LESS THAN FIVE (5) SIMILIAR PROJECTS USING THE SUBMITTED PRODUCT OVER THE PAST YEAR. Alternate submissions without the required references shall be rejected.

E. Alternate product submissions based upon use of a product line considered proprietary in its distribution, design, application software, or ongoing maintenance and repair shall not acceptable. Proof of a product's non-proprietary nature shall be the burden of the contractor at the time of bid, and shall be in the form of written documentation. The determination of a product's compliance to this requirement shall be exclusively that of the engineer.

All products used shall be of a single manufacturer. All products shall be listed by the manufacturer for their intended purpose. Submission of notification appliances, auxiliary relays, or documentation from other than a single manufacturer shall not be acceptable and will be grounds for immediate disapproval without comment.

F. Approved Products: All panels and peripheral devices shall be of the standard product of single manufacturer and shall display the manufacturer's name of each component. The catalog numbers specified under this section are those of Edwards, a UTC Climate | Controls | Security Company, and shall constitute the type, product quality, material and desired operating features.

2.2. Fire Alarm Panel

2.2.1. General - FireiO500

Overview

All materials, equipment, accessories, devices and other facilities and appurtenances covered by these specifications or noted on the drawings shall be new, best suited for the intended use and shall conform to applicable and recognized standards for their use, and supplied by a single manufacturer. Should any equipment provided under this specification be supplied by a different manufacturer, that equipment shall be recognized compatible by BOTH manufacturers and listed as such as required by Underwriters' Laboratories.

The fire alarm control panel shall be a microprocessor based system designed specifically for fire and smoke detection < and extinguishing agent releasing>. The control panel shall be listed and approved for the application standard(s) as listed in the References section of this specification.

The control panel shall include all required hardware, software and site specific system programming to provide a complete and operational system. The control panel shall be designed such that interactions between any applications can be configured, and modified through the front panel or by using software provided by the manufacturer. The control panel operational priority shall assure that life safety takes precedence among the activities coordinated by the control panel.

The operating controls shall be located in a steel enclosure behind a locked door with viewing window. All control modules shall be labeled, and all zone locations shall be identified. All panel modules shall be placement supervised for and signal a trouble if damaged or removed.

System Features

Each control panel shall include the following capabilities:

Supervision of the system electronics, wiring, detection devices and software
Up to 500 analog/addressable input/output points
Support a dialer (DACT) connection to a central monitoring station.
An RS-232 serial communication port.
An internal audible signal with different patterns to distinguish between alarm, supervisory, trouble and monitor events
Provide four class B 24 VDC NACs. Provide two class A 24 VDC NACs.
Two user configurable switch-LEDs to support auxiliary functions
Log up to 1000 chronological events
A real-time clock for time stamps and timed event control
Electronic addressing of intelligent addressable devices
Provide an independent hardware watchdog to supervise software and CPU operation
"Dry" alarm, trouble and supervisory relay contacts.
Field wiring shall be rated for 12 to 18 AWG conductors.

User Oriented Features

Each control panel shall include the following user oriented features:

An LCD user interface control/display that shall annunciate and control system functions. Provide discreet system control switches for reset, alarm silence, ACK/panel silence, drill switch, remote disconnect and two user configurable switches. Provide a 10-Digit Keypad with # and Backspace switches, a menu switch and Four cursor scroll switches with Enter switch.

A "lamp test" feature shall verify operation of all visual indicators on the panel.
An authorized user shall have the ability to operate or modify system functions including system time, date, passwords, restart the system and clear control panel event history file.
An authorized user shall have the ability to disable/enable devices, inputs, outputs, and timers.
An authorized user shall have the ability to activate/restore outputs, and simulate detector smoke levels.
An authorized user shall have the ability to enter time and date, reconfigure the communications port for download programming, initiate programming and change passwords.

An authorized user shall have the ability to test the functions of the installed system, including silent and audible one-man walk tests. Devices not under test shall process all events normally.

Provide internal system diagnostics and maintenance user interface controls to display/report the power, communication, and general status of specific panel components, detectors, and modules.

SLC loop controller diagnostics shall identify common alarm, trouble, ground fault, Class A fault, and map faults. Map faults include wire changes, device type changes by location, device additions/deletions and conventional open, short, and ground conditions. Ground faults on the supervised circuit wiring of remote addressable modules shall be identified by device address.

An authorized user shall have the ability to generate a report history for alarm, supervisory, monitor, trouble, smoke verification, watchdog, and restore activity. correlation groups

System reports shall provide detailed description of the status of system parameters for corrective action or for preventative maintenance programs. Reports shall be displayed by the

operator interface or capable of being printed on a printer.

An authorized user shall have the ability to display/report the condition of addressable analog detectors. Reports shall include device address, device type, percent obscuration, and maintenance indication. The maintenance indication shall provide the user with a measure of contamination of a device upon which cleaning decisions can be made.

Programmability

The panel shall have the ability to auto program itself by identifying all connected devices, resulting in a general alarm fire system. It shall be possible to create or modify the panel's site-specific programming through the front panel controls.

A Windows®-based Configuration Utility (CU) shall available to create or modify the site-specific system programming. The utility shall facilitate programming of any input point to any output point. The utility shall allow customization of fundamental system operations using initiating events to start actions, timers, and logical sequences.

- Zoning of initiation devices.
- Initiation of events using OR, AND and counting functions.
- Prioritizing system events.
- Programmable activation of detector sounder bases by detector or in groups of bases.
- Detector sensitivity selection by time of day
- Support of two central monitoring stations.

The configuration utility shall time and date stamp all changes to the site-specific program, and shall facilitate program versioning and shall store all previous program version data. The utility shall provide a compare feature to identify the differences between different versions of the site-specific program.

The configuration utility shall be capable of generating reports which detail the configurations of all fire alarm panels, addressable devices and their configuration settings including generating electrical maps of the addressable device SLCs.

The configuration utility shall support the use of bar code readers to expedite electronic addressing and custom programming functions.

Please refer to the *General, System Description Section* for this project's site-specific system operating requirements.

The fire alarm control panel shall be an Edwards iO500 series.

2.2.2. Signaling Line Circuits

2.2.2.1. iO System

The signaling line circuit connecting panels to intelligent addressable devices including, detectors, monitor modules, control modules, isolation modules, intrusion detection modules and notification circuit modules shall be <Class A (style 6 or 7)>< Class B (style 4).> All signaling line circuits shall be supervised and power limited.

When the addressable devices on a signaling line circuit cover more than one designated fire/smoke compartment, a wire-to-wire short on the circuit shall not affect the operation of the addressable devices in other fire/smoke compartments.

Each SLC shall support <64 addressable devices (iO64)> < 125 addressable detector addresses and 125 module addresses (iO500).> The SLC shall support 100% of all addressable devices in alarm and provide support for a 100% compliment of detector isolator bases. Initial circuit loading shall not exceed 80% in order to allow for future system expansion.

T-taps (branching) shall be permitted on Class B circuits. Where possible, the devices installed at the end of each branch should be easily accessible for troubleshooting, e.g. a pull station at normal mounting height.

The addressable device SLC module shall be UL Listed for use with code compliant, electrically sound existing wiring.

Each intelligent addressable device shall transmit information about its location with respect to other devices on the circuit. This information shall be used to create an "As-Built" wiring diagram as well as provide enhanced supervision of a device's physical location. The device message and programmed system output function shall be associated with the device's location on the SLC circuit location and not a device address.

The SLC module shall allow replacement of "same type" devices without the need to address and reload the "location" parameters on replacement device.

The SLC/Panels shall notify the user when programmed devices are detected on the SLC circuit. The SLC/Panels shall notify the user when the wrong device type is installed at a location configured for a different device type on the SLC circuit.

The addressable device signaling line circuit module shall be an Edwards XAL-250.

2.2.3. Notification Appliance Circuits

2.2.3.1. Notification Appliance CircuitsiO

General

All notification circuits shall be supervised and power limited. Non-power limited circuits are not acceptable. All notification appliance circuits shall be <Class A (Style "Z")><Class B (Style "Y")>.

Initial circuit loading shall not exceed 80% in order to allow for future system expansion.

24 VDC Notification Appliance circuits

Notification appliance circuits shall have a minimum circuit output rating of 2amps @ 24 Vfwr

24Vfwr NACs shall be polarized and provide both strobe synchronization and a horn silence signals on a single pair of wires.

2.3. Remote Booster Power Supply

2.3.1. Remote Booster Power Supply

Install Remote NAC Power Supplies (boosters) at the locations shown on the drawings, as required, to minimize NAC voltage drops. Remote NAC power supplies shall be treated as peripheral NAC devices and shall not be considered fire alarm control units.

The NAC power supplies shall be fully enclosed in a surface mounted steel enclosure with hinged door and cylinder lock, and finished in red enamel. Door keys shall be the identical to FACP enclosure keys. The enclosure shall have factory installed mounting brackets for additional UL listed fire alarm equipment within its cabinet. Enclosures shall be sized to allow ample space for interconnection of all components and field wiring, and up to 10AH batteries. The enclosure shall have provisions for an optional tamper switch. All FACP addressable control modules required to initiate the required NAC power supply output functions shall be installed within the NAC power supply enclosure

Remote NAC power supply *input* circuits shall be configurable as Class B supervised inputs or for connection to any 6 to 45 VDC initiation source.

Remote booster power supplies shall provide four (4) synchronized Class B supervised or two (2) Class A, power limited, 24VDC filtered and regulated Notification Appliance Circuits (NACs). Each NAC output shall be configurable as a continuous 24Vdc auxiliary power output circuit. The booster power supply shall be capable of a total output of <6> 10 amps.

The power supply NACs shall be configurable to operate independently at any one of the following rates: continuous synchronized, or 3-3-3 temporal. It shall be possible to configure the NACs to follow the main FACP NAC or activate from intelligent addressable synchronized modules. All visible <audible> NACs within the facility shall be synchronized.

Upon failure of primary AC power, the remote power supply shall automatically switch over to secondary battery power without losing any system functions. It shall be possible to delay reporting of an AC power failure for up to 6 hours. All standby batteries shall be continuously monitored by the power supply. Low battery and disconnection of battery power supply conditions shall immediately annunciated as locally as battery trouble. All power supply trouble conditions (DC power failure, ground faults, low batteries, and IDC/NAC circuit faults) shall identify the specific remote power supply affected at the main FACP. All power supply trouble conditions except loss of AC power shall report immediately. Interconnecting NAC Booster power supplies in a manner which prevents identification of an individual power supply trouble shall not be considered as an equal.

The remote booster power supply shall be capable of recharging up to 24AH batteries to 70% capacity in 24 hours maximum. Batteries provided shall be sized to meet the same power supply performance requirements as the main FACP, as detailed elsewhere in this specification.

All AC power connections shall be to the building's designated dedicated emergency electrical power circuit. The power circuit disconnect means shall be clearly labeled FIRE ALARM CIRCUIT CONTROL and shall have a red marking. The location of the circuit disconnect shall be labeled permanently inside the each remote NAC power supply the disconnect serves.

The remote NAC power supplies shall be Edwards model BPS/APS series devices.

2.4. Annunciators

2.4.1. Remote Annunciator3XiO

Provide a UL864 listed remote annunciator at the location(s) shown on the drawings. The annunciators shall be semi-flush mounted <on a standard 4" square electrical box> < in key-locked metal enclosures>

The annunciator shall display the same text information on the 80 character back-lit LCD as the FACP to which it is connected.

The following common indicators shall be provided on the annunciator.

Annunciator Power, Fire Alarm, Supervisory, Ground Fault, Trouble, Controls Enabled and Ack/Silence LEDs; and an internal buzzer.

The following common controls shall be provided on the annunciator:

<Silence>, <Trouble Silence>, <Drill> <System Reset>, and Lamp Test push buttons. The common controls shall be enabled using a key switch.

The annunciators shall be capable of driving up to 24 pairs of LEDs for point annunciation.

The annunciator shall be powered by a battery backed up UL Listed 24 VDC power source.

The fire alarm remote annunciator shall be Edwards R-Series annunciator.

2.5. Peripheral Components

2.5.1. Addressable

2.5.1.1. Detectors

2.5.1.1.1. General

General Requirements for Intelligent Addressable Heat, Smoke and CO Detectors

Each detector shall contain an integral microprocessor which shall determine if the device is normal, in alarm, or has an internal trouble. The microprocessor's non-volatile memory shall permanently store the detector's serial number, device type and system address. It shall be possible to address each intelligent device without the use of switches. Devices requiring switches for addressing shall not be considered as equal. Memory shall automatically be updated with the hours of operation, last maintenance date, number of alarms and troubles, time of last alarm, and analog signal patterns for each sensing element just before the last alarm.

Each detector shall be capable of identifying up to 32 diagnostic codes. This information shall be available for system maintenance. The diagnostic code shall be stored at the detector.

Each addressable detector on the Signaling Line Circuit (SLC) shall transmit information regarding its location with respect to other intelligent devices on the signaling line circuit to the control panel, creating an "As-Built" circuit map. The circuit mapping function shall provide location supervision of all intelligent devices on the signaling line

circuit. An intelligent detector's programmed system response functions shall be associated with the detector's actual *location* on the signaling line circuit and *not with the detector's address*. After system commissioning, detectors improperly installed in the wrong location shall function according to the mapped programmed response for its *location* on the circuit, not its detector's address.

Two status LEDs shall be provided on each detector. A flashing green LED shall indicate normal operation; flashing RED shall indicate the alarm state. A steady RED and steady GREEN shall indicate alarm state when in the stand-alone mode. LEDs shall be visible from any direction.

The system shall allow for changing of detector types for service replacement purposes without the need to reprogram the system. The replacement detector type shall automatically continue to operate with the same programmed sensitivity levels and functions as the detector it replaced, without the need for reprogramming. System shall display an off-normal condition until the proper detector type is installed or a change in the device type profile has been made.

Detectors shall be rated for operation in the following environment unless specifically noted:

- Temperature: 32°F to 120°F (0°C to 49°C)
- Humidity: 0-93% RH, non-condensing

Detectors with addressing components in the base shall not be considered as equal.

The intelligent detectors shall be Edwards Signature Series devices.

Please refer to the *General, System Description Section* for site-specific detector operating requirements.

2.5.1.1.2. Photo-Heat

Provide analog/addressable combination photoelectric smoke-heat detectors at the locations shown on the drawings.

When mounted in a sounder base, the detector shall be capable of initiating a temporal 3-3-3 when smoke or heat is detected.

Each smoke-heat detector shall be individually programmable to operate at any one of five (5) sensitivity settings. The detector shall also store pre-alarm and alternate pre-alarm sensitivity settings. Pre alarm sensitivity values shall be configurable in 5% increments of the alarm and alternate alarm sensitivity settings respectively. The detector shall be able to differentiate between a long term drift above the pre alarm threshold and fast rise above the threshold. The detector shall monitor the sensitivity of the smoke sensor. If the sensitivity shifts outside the UL limits, a trouble signal shall be sent to the panel. It shall be possible to automatically change the sensitivity of individual intelligent addressable smoke detectors for day and night (alternate) periods.

Each detector shall utilize an environmental compensation algorithm that shall automatically adjust for background environmental conditions such as dust, temperature, and pressure. The detector shall provide a maintenance alert signal when 80% (dirty) of the available compensation range has been used. The detector shall provide a dirty fault signal when 100% or greater compensation has been used.

Three low mass thermistors shall act as fixed temperature 130 to 140 °F (54 to 60 °C) heat sensors, contributing along with the photo sensor to the fire alarm algorithm.

The Combination photoelectric smoke-heat detector shall be an Edwards SIGA-PHS.

2.5.1.1.3. Duct Smoke

Provide intelligent low profile photoelectric duct smoke detectors / remote test switches at the locations shown on the drawings.

The intelligent duct smoke detector shall operate in ducts having from 100ft/min to 4,000ft/min air velocity. The detector shall be suitable for operation over a temperature range of -20 to 158F° and offer a harsh environment gasket option. The detector shall utilize an air exhaust tube and an air sampling inlet tube that extends into the duct air stream up to ten (10) feet. Design of the detector shall permit sampling tube installation from either side of the detector and permit sampling tube installation in 45- degree increments to ensure proper alignment with duct airflow. Drilling templates and gaskets to facilitate locating and mounting the housing shall be provided.

The intelligent duct smoke detector shall obtain information from a photoelectric sensing element. The detector shall be able to differentiate between a long term drift above the pre alarm threshold and fast rise above the threshold. The detector shall monitor the sensitivity of the smoke sensor. If the sensitivity shifts outside the UL limits, a trouble signal shall be sent to the panel

Each detector shall utilize an environmental compensation algorithm that shall automatically adjust for background environmental conditions such as dust, temperature, and pressure. The detector shall provide a maintenance alert signal when 80% (dirty) of the available compensation range has been used. The detector shall provide a dirty fault signal when 100% or greater compensation has been used.

The intelligent duct smoke detector shall provide a form "C" auxiliary alarm relay rated at 2amps @ 30Vdc. The position of the relay contact shall be supervised by the control panel software. Operation of the relay shall be controlled either by its respective detector processor or under program control from the control panel as required by the application. Detector relays not capable of programmed operation independent of the detector's state shall not be considered as equal. The detector shall be equipped with a local magnet-activated test switch.

Each duct detector shall be installed and testing in accordance with manufacturer's instructions, including pressure differential and, velocity testing. Test results shall be submitted to the owner.

Remote test switches/LED indicators shall be provided below the detector on the ceiling to indicate location of the detector in non-mechanical areas, at locations indicated on the drawings.

The Intelligent Photoelectric Duct Smoke Detector shall be an Edwards model SIGA-SD.

The remote key operated test switch / LED shall be a Edwards model SD-TRK

2.5.1.1.4. Duct Mounting Plate

Where addressable smoke detectors are directly mounted on a low velocity ducts up to 3 ft (0.91m) high x 3 ft (0.91m) wide, provide factory mounting plate assemblies to facilitate

mounting the detectors. The mounting plate shall be code gauge steel with corrosion resistant red enamel finish. The detector mounting plate shall support an addressable detector along with a standard, relay or isolator detector mounting base.

The detector mounting plate shall be an Edwards SIGA-DMP.

2.5.1.1.5. Rate of Rise

Provide intelligent combination fixed temperature / rate-of-rise heat detectors at the locations shown on the drawings.

The detector shall continually monitor the temperature of the air in its surroundings to minimize thermal lag to the time required to process an alarm. The detector shall utilize a low mass thermistor heat sensor and operate at a nominal fixed temperature alarm point rating of 135°F and at a temperature rate-of-rise alarm point of 15°F per minute. The integral microprocessor shall determine if an alarm condition exists and initiate an alarm based on the analysis of thermistor data. Systems using central intelligence for alarm decisions shall not be considered as equal.

The heat detector shall be rated for ceiling installation at a minimum of 70 ft centers and also be suitable for wall mount applications.

The Intelligent combination fixed temperature / rate-of-rise heat detector shall an Edwards SIGA-HRS.

2.5.1.1.6. Standard Base

Provide standard detector bases suitable for mounting on either North American 1-gang, 3½ or 4 inch octagon box and 4 inch square box, European BESA or 1-gang box.

The bases shall utilize a twist-lock design and provide screw terminals for all field wiring connections.

The base shall contain no active electronics and support all Signature series detector types.

The base shall be capable of supporting a Remote Alarm LED Indicator. Provide remote LED alarm indicators where shown on the plans.

Removal of the respective detector shall not affect communications with other detectors.

The standard addressable detector base shall be an Edwards SIGA-SB or SB4.

The remote LED indicator shall be an Edwards SIGA-LED

2.5.1.2. Manual Stations

2.5.1.2.1. Single Action Two Stage

Provide addressable single action, two stage fire alarm stations at the locations shown on the drawings.

The manual station shall be suitable for mounting on North American 2 ½ (64mm) deep 1-gang boxes and 1 ½ (38mm) deep 4 square boxes with 1-gang covers. If indicated as surface mounted, provide manufacturer's surface back box.

The fire alarm station shall be of metal construction, shall be finished in red with silver "PULL IN CASE OF FIRE" lettering, shall show visible indication of operation and incorporate an internal toggle switch for first stage alarm and key switch for second stage alarm.

The manual pull station will have an addressable module integral to the unit.

Manual pull stations that initiated an alarm condition when opening the unit are not acceptable.

The addressable single action two stage manual fire alarm station shall be an Edwards SIGA-270P

2.5.1.2.2. Guards

Provide manual pull station guards at the locations shown on the drawings.

The guard shall consist of a factory-fabricated clear polycarbonate enclosure, hinged at the top. Lifting the cover shall provide access to the manual pull station and activate an integral battery powered audible horn intended to discourage false alarms.

The manual pull station guards shall Edwards STI-1000 Series.

2.5.1.3. Modules

2.5.1.3.1. General

Intelligent addressable multifunction modules shall be provided at the locations shown on the drawings to provide the specific system input and output functions described by the operation section and functional matrix found elsewhere in this specification.

The operation of multifunction modules shall be software configurable at the site to meet operational conditions, and may be changed at any time by download changes from the control panel. The intelligent multifunction modules shall utilize electronic addressing. Modules using rotary or DIP switches, memory chips and / or jumpers for addressing shall not be considered as equal.

Each intelligent multifunction module on the Signaling Line Circuit (SLC) shall transmit information regarding its location with respect to other intelligent devices on the signaling line circuit to the control panel, creating an "As-Built" circuit map. The circuit mapping function shall provide location supervision of all intelligent devices on the signaling line circuit. An intelligent device's programmed system response functions shall be associated with the device's actual *location* on the signaling line circuit and *not with the device's address*. After system commissioning, devices improperly installed in the wrong location shall function according to the mapped programmed response for its *location* on the circuit, not its device address.

All input /output status decisions shall be made by the microprocessor within the module. Communications with a control panel shall not be required in order for the module to identify off-normal input/output conditions. Modules with supervised input or output circuits shall be capable of identifying ground fault conditions down to the module address level.

Each module shall be equipped with two (2) diagnostic indicators; a green LED to confirm

communications and a red LED to display active status. LEDs shall be visible through the finished cover plate. The module shall be capable of storing a unique serial number and up to 24 diagnostic codes, hours of operation, number of alarms and troubles, and time of last alarm in its memory which can be retrieved for troubleshooting.

Modules shall be rated for operation in the following environment:

- Temperature: 32°F to 120°F (0°C to 49°C)
- Humidity: 0-93% RH, non-condensing

Where multiple modules are mounted in close proximity to each other, plug-in modular versions of the modules and motherboards shall be available to minimize field wiring and facilitate troubleshooting.

The addressable multifunction modules shall Edwards Signature Series devices.

Please refer to the *General, System Description Section* for site-specific module operating requirements.

2.5.1.3.2. One Input Monitor

Provide addressable single input multifunction modules at the locations shown on the drawings.

The module shall be suitable for mounting on North American 2½" (64mm) deep 1-gang boxes and 1½" (38mm) deep 4" square boxes with 1-gang covers.

Each module shall provide one (1) supervised Class B input circuit configurable as one of the following "personalities."

1. Normally-Open Alarm Latching (for alarm initiation applications)
2. Normally-Open Alarm Delayed Latching (for waterflow switch applications)
3. Normally-Open Active Non-Latching (for limit switch and monitor applications)
4. Normally-Open Active Latching (for tamper switch and supervisory applications)

Each module shall identify and report by device address, ground faults and opens associated with its initiating device circuit, to the control panel. Single function modules or without individual ground fault detection identification capability shall not be considered as equal.

The Intelligent Single Input Module shall be an Edwards SIGA-CT1.

2.5.1.3.3. Two Input Monitor

Provide addressable dual input multifunction modules at the locations shown on the drawings.

The module shall be suitable for mounting on North American 2½" (64mm) deep 1-gang boxes and 1½" (38mm) deep 4" square boxes with 1-gang covers.

Each module shall provide two (2) supervised Class B input circuit configurable as one of the following "personalities."

1. Normally-Open Alarm Latching (for alarm initiation applications)
2. Normally-Open Alarm Delayed Latching (for waterflow switch applications)
3. Normally-Open Active Non-Latching (for limit switch and monitor applications)
4. Normally-Open Active Latching (for tamper switch and supervisory applications)

Each module shall identify and report by device address, ground faults and opens associated with its initiating device circuits, to the control panel. Single function modules or without individual ground fault detection identification capability shall not be considered as equal.

The Addressable Dual Input Module shall be an Edwards SIGA-CT2.

2.5.1.3.5. Relay

Provide addressable control relay modules at the locations shown on the drawings.

The module shall be suitable for mounting on a North American 2 ½" (64mm) deep 1-gang box or 1 ½" (38mm) deep 4" square box with 1-gang covers.

The module shall provide one (1) form C dry relay contacts rated at 24Vdc @ 2 amps (pilot duty) to control external appliances or equipment. The position of the relay contact shall be confirmed by the system firmware. The relay coil shall be magnetically latched to reduce wiring and ensure 100% of the relays on the SLC can be energized at same time.

The addressable control relay module shall be an Edwards SIGA-CR or MCR.

2.5.1.3.6. Waterflow-Tamper

Provide addressable dual input waterflow / tamper modules at the locations shown on the drawings.

The module shall be suitable for mounting on North American 2½" (64mm) deep 1-gang boxes and 1½" (38mm) deep 4" square boxes with 1-gang covers.

Each module shall provide two (2) supervised Class B input circuit configured as:

1. Normally-Open Alarm Delayed Latching for waterflow switch applications.
2. Normally-Open Active Latching for tamper switch and supervisory applications.

Each module shall identify and report by device address, ground faults and opens associated with its initiating device circuits, to the control panel. Modules or without individual ground fault detection identification capability shall not be considered as equal.

The Addressable Dual Input Module shall an Edwards SIGA-WTM.

2.5.1.3.8. Universal Modules

Provide intelligent universal Class A/B multifunction modules at the locations shown on the drawings.

The module shall be suitable for mounting on North American 2½" (64mm) deep 2-gang boxes and 1½" (38mm) deep 4" square boxes with 2-gang covers.

Each universal module shall be configurable as one of the following "personalities."

1. Two (2) supervised Class B Normally-Open Alarm Latching. (for alarm initiation applications)
2. Two (2) supervised Class B Normally-Open Alarm Delayed Latching. (for waterflow switch applications)
3. Two (2) supervised Class B Normally-Open Active Non-Latching. (for limit switch and monitor applications)

4. Two (2) supervised Class B Normally-Open Active Latching. (for tamper switch and supervisory applications)
5. One (1) form "C" dry relay contact rated at 2 amps @ 24 Vdc. (for circuit control applications)
6. One (1) supervised Class A Normally-Open Alarm Latching. . (for alarm initiation applications)
7. One (1) supervised Class A Normally-Open Alarm Delayed Latching. . (for waterflow switch applications)
8. One (1) supervised Class A Normally-Open Active Non-Latching. (for limit switch and monitor applications)
9. One (1) supervised Class A Normally-Open Active Latching. . (for tamper switch and supervisory applications)
10. One (1) supervised Class A 2-wire Smoke Alarm Non-Verified. (for alarm initiation applications)
11. One (1) supervised Class B 2-wire Smoke Alarm Non-Verified. (for alarm initiation applications)
12. One (1) supervised Class A 2-wire Smoke Alarm Verified (for alarm initiation applications)
13. One (1) supervised Class B 2-wire Smoke Alarm Verified(for alarm initiation applications)
14. One (1) supervised Class A Signal Circuit, 24Vdc @ 2A.(for occupant notification applications)
15. One (1) supervised Class B Signal Circuit, 24Vdc @ 2A. .(for occupant notification applications)

Each module shall identify and report ground faults, opens and shorts associated with its supervised input / output circuits, by device address, to the control panel. Single function modules or without individual ground fault detection identification capability shall not be considered as equal.

The Universal Class A/B Module shall an Edwards SIGA-UM.

2.5.2. Notification Appliances

2.5.2.1. Low Profile

2.5.2.1.1. Horns
Provide low profile wall mounted horns at the locations shown on the drawings.

Low profile horns shall mount in a North American 1-gang box, and protrude less than 1" from the finished wall. The word FIRE shall be prominently displayed on the housing.

The horns shall provide an audible output of 85 dBA at 10 ft. when measured in reverberation room per UL-464, and have a selectable steady or synchronized temporal (3-3-3) output pattern.

Horn power, horn silencing, and strobe synchronization shall be accomplished over a single pair of wires. In and out screw terminals shall accommodate 18AWG to 12 AWG wiring and have captive hardware.

The horns shall be Edwards Genesis G1 Series.

2.5.2.1.2. Low Frequency Audible Signals

The low-profile wall-mounted low frequency audible/strobe shall be listed to UL 1971 and UL 464 and for fire protective signaling service. The low frequency audible/strobe shall serve as a primary-signaling notification appliance and comply with the Americans with Disabilities Act requirements for visible signaling appliances, flashing at 1Hz over the strobe lights entire operating voltage range. The strobe light shall have field-selectable candela settings including 15, 30, 75 and 110. The strobe light shall consist of a xenon flash tube.

The low frequency audible shall comply with UL 464, Section 24.3 for Low Frequency Audible Output. Appliances shall have an option to switch between a temporal three-pattern and a non-temporal (continuous) pattern at standard or low audible output levels. The low frequency audible on low frequency audible-only appliances shall be capable of operating on a coded notification appliance circuit.

The low frequency strobe shall operate between 32°F and 120°F and be listed to operate on filtered/regulated as well as full-wave rectified Edwards Genesis compatible notification appliance circuits.

Audiles, strobes and Audible/strobes shall all function on one pair of wires. Appliances that require separate wires for strobes and separate wires for audible are not acceptable.

All audible and visible signals on the same notification appliance circuit and in the same operating zone shall be fully synchronized to within 10 milliseconds.

The low frequency Audible strobe shall mount to a standard 4 × 4 × 1½-inch back box or appliance manufacturer provided surface-mount back box.

All notification appliances shall be 100 per cent compatible with Edwards Genesis communication and synchronization protocols. The low frequency Audible/strobe appliances shall be Edwards G4LF Series.

2.5.2.1.3. Strobes

Provide low profile wall mounted strobes at the locations shown on the drawings.

Low profile strobes shall mount in a North American 1-gang box, and protrude less than 1" from the finished wall. The word FIRE <ALERT> shall be prominently displayed on the housing.

The strobe output shall be switch selectable as required by its application from the following available settings: 15cd, 30cd, 75cd & 110cd. Selected strobe rating shall be visible when the strobe is in its installed position. Amber lens strobes shall be available with outputs of 12/24/60/88cd. Light shall be evenly distributed throughout the required volume using cavity and mask "FullLight" technology to prevent hot spots. Strobes using specular reflectors shall not be considered as equal.

When multiple strobes are installed within view of each other, their outputs shall be synchronized within ten (10) milliseconds of each other for an indefinite period without the need for separate synchronization modules.

Horn and strobe power, horn silencing, and strobe synchronization shall be accomplished over a single pair of wires. In and out screw terminals shall accommodate 18AWG to 12 AWG wiring and have captive hardware.

The strobes shall be Edwards Genesis G1 Series.

2.5.2.1.4. Horn-Strobes

Provide low profile wall mounted horn-strobes at the locations shown on the drawings.

Low profile horn-strobes shall mount in a North American 1-gang box, and protrude less than 1" from the finished wall. The word FIRE shall be prominently displayed on the housing. The word FIRE <ALERT> shall be prominently displayed on the housing.

The horn-strobe shall provide an audible output of 85 dBA at 10 ft. when measured in reverberation room per UL-464, and have a selectable steady or synchronized temporal (3-3-3) output pattern.

The strobe output shall be switch selectable as required by its application from the following available settings: 15cd, 30cd, 75cd & 110cd. Selected strobe rating shall be visible when the horn-strobe is in its installed position. Amber lens strobes shall be available with outputs of 12/24/60/88cd. Light shall be evenly distributed throughout the required volume using cavity and mask "FullLight" technology to prevent hot spots. Strobes using specular reflectors shall not be considered as equal.

When multiple strobes are installed within view of each other, their outputs shall be synchronized within ten (10) milliseconds of each other for an indefinite period without the need for separate synchronization modules.

Horn and strobe power, horn silencing, and strobe synchronization shall be accomplished over a single pair of wires. In and out screw terminals shall accommodate 18AWG to 12 AWG wiring and have captive hardware.

The horn-strobes shall be Edwards Genesis G1 Series.

2.5.2.1.5. Horn-Strobes-Weatherproof

Provide low profile weatherproof horn-strobes at the locations shown on the drawings.

The weatherproof horn-strobes shall mount in a North American 4" square 1 ½"deep electrical box for indoor applications and a factory supplied back box for weatherproof applications.

The horn-strobe shall be suitable for wall or ceiling mount and operate in temperatures from -40 to 151 degrees F. The word FIRE shall be prominently displayed on the housing.

The horn-strobe shall provide a user configurable high/low audible output of 89.7/85.4 dBA @ 10' for a steady output and an 84.2/81.7 4 dBA @ 10' for a temporal (3-3-3) output when measured in reverberation room per UL-464.

The strobe output shall be switch selectable as required by its application from the following available settings:

		Standard Candela Output Horn-Strobes				**High Candela Output Horn-Strobes**			
		Strobe Switch Position							
Listing	**Location**	**D**	**C**	**B**	**A**	**D**	**C**	**B**	**A**
UL 1971	Indoor	15 cd	29 cd	70 cd	87 cd	102 cd	123 cd	147 cd	161 cd
UL 1638	Outdoor (-35C)	6 cd	12 cd	28 cd	35 cd	41 cd	50 cd	60 cd	65 cd

Selected strobe rating shall be visible when the speaker-strobe is in its installed position

When multiple strobes are installed within view of each other, their outputs shall be synchronized within ten (10) milliseconds of each other for an indefinite period without the need for separate synchronization modules.

Horn and strobe power, horn silencing, and strobe synchronization shall be accomplished over a single pair of wires. In and out screw terminals shall accommodate 18AWG to 12 AWG wiring and have captive hardware.

The weatherproof horn-strobes shall be Edwards Genesis WG4 Series.

2.5.3. Accessories

2.5.3.1. Magnetic Door Holders

Provide <floor mounted> <wall mounted> fail safe electromagnetic door holders as shown on the drawings.

Holders shall provide approximately 25-lbf nominal holding force when energized. The units shall have an aluminized finish and contain no moving parts. The contact plate shall have an integral nylon swivel to absorb shock and adjust to any door angle.

Flush and semi-flush models shall be designed for concealed wiring applications and shall mount on standard 1-gang electrical box. Floor mounted electromagnet units shall consist of a floor plate, gaskets, and housing. Incoming conduit shall connect directly into floor plate. The housing and gaskets shall mount on the floor plate to form a weatherproof junction box Door holders shall be listed to UL-228.

All holders shall be normally be energized, and a release shall be accomplished by interrupting the circuit.

The electromagnetic door holders shall be Edwards 1500 series.

3. Part 3 – Execution

3.1. Installation

3.1.1. General

General

A. The entire system shall be installed in a skillful manner in accordance with approved manufacturer's installation manuals, shop drawings and wiring diagrams.

B. All work shall be performed in accordance with the requirements of NFPA 70 and NFPA 72.

C. Coordinate locations of all devices with all other divisions' drawings and specifications.

D. All fire alarm devices shall be accessible for periodic maintenance. Should a device location indicated on the contract drawings not meet this requirement, it shall be the responsibility of the installing contractor to bring it, in writing, to the attention of the Project Engineer.

E. Fasten equipment to structural members of building or metal supports attached to structure, or to concrete surfaces.

F. All systems and system components listed to UL864 Control Units for Fire Protective Signaling Systems maybe installed within a common conduit raceway system, in accordance with the manufacture's recommendations. System(s) or system components not listed to the UL864 standard shall utilize a separate conduit raceway system for each of the sub-systems.

G. No wiring except life safety system circuits and system power supply circuits shall be permitted in the control panel enclosures.

H. Any low-voltage copper wiring that leaves the protection of a building shall be provided with a compatible UL 497B listed transient protection devices where the circuit leaves the building and where it enters the next building.

I. Devices containing end-of-line resistors shall be appropriately labeled. Devices should be labeled such that removal of the device is not required to identify the EOL device.

J. Fiber Optic Cable
   1. Only glass filament cable permitted. Plastic filament fiber optic cables are not acceptable.
   2. ST connectors shall be used at all equipment terminations.

K. Concrete floors shall be X-rayed prior to core drilling on post tension slabs. Verify with engineer on type of slab prior to bid.

3.1.2. Electrical

Electrical

1.01 BOXES, ENCLOSURES AND WIRING DEVICES

A. Boxes shall be installed plumb and firmly in position.

B. Extension rings with blank covers shall be installed on junction boxes where required.

C. Junction boxes served by concealed conduit shall be flush mounted.

D. Fire alarm system junction box covers shall be painted red.

E. Wiring within cabinets, enclosures, boxes, junction boxes and fittings shall be installed in a neat and workmanlike manner, installed parallel with or at right angles to the sides and back of any box, enclosure or cabinet, and routed to allow access for maintenance. All conductors that are terminated, spliced, or otherwise interrupted in any enclosure, cabinet, mounting or junction box shall be connected to terminal blocks. Mark each terminal in accordance with the wiring diagrams of the system. Make all connections with approved pressure type terminal blocks, which are securely

mounted. All terminal block screws shall have pressure wire connectors of the self-lifting or box lug type. No more than two conductors shall be installed under one connection. Wire nuts, crimp splices and similar devices shall not be used.

1.02 CONDUCTORS

A. Each conductor shall be identified as shown on the drawings at terminal points. Permanent wire markers shall be located within 2 inches of the wire termination. Marker text shall be visible with protective doors or covers removed.

B. Maintain a consistent color code for fire alarm system conductor functions throughout the installation.

C. All wiring shall be installed in compliance with the National Electric Code, NFPA 70, and the equipment manufacturer's requirements.

Wiring for Signaling Line Circuit and Initiating Device Circuit field wiring shall be solid copper, No. 18 AWG twisted pair conductors at a minimum. Speaker circuits; 16 AWG twisted pair at a minimum. Telephone circuits shall be 18 AWG twisted-shielded pair at a minimum. 24VDC visual and audible Notification Appliance Circuits shall be solid copper No. 14 AWG size conductors at a minimum. The wiring sizes listed herein are minimum sizes. Use larger wire sizes when recommended by the manufacturer, based on system configuration and project specific calculations.

Where shielded wiring is used, the shield shall be grounded at only one point, which shall be in or adjacent to the FACP or other control equipment. Shields shall be continuous, treated as a third conductor, and insulated from ground except as noted.

T-taps (branches) are permitted in Style 4 SLC circuits with interconnections occurring on terminal strips.

Circuits to third-party systems (HVAC, Elevators, fire pumps, etc.) shall terminate in terminal cabinets within three (3) feet of the controllers for those systems.
AC power wiring shall be No. 12 AWG solid copper having insulation rated for 600 volts.

Crimp type spade lugs shall be used for terminations of stranded conductors to binder screws or stud type terminals.

D. All wiring shall be checked and tested to insure that there are no grounds, opens or shorts.

1.03 DEVICES

A. All devices and appliances shall be mounted to or in an approved electrical box.

1.04 Raceways

A. Conduits shall be sized according to the conductors contained therein. Cross sectional area percentage fill for system conduits shall not exceed 40%.

B. Install all conductors in rigid metal conduit or electro-metallic tubing, utilizing compression type fittings and couplings, with a minimum diameter 3/4". The use of flexible metal conduit not exceeding a six (6) foot length shall be permitted for initiating device circuits.

C. All fire alarm conduit systems shall be routed and installed to minimize the potential for physical, mechanical or fire damage, and shall not to interfere with existing building systems, facilities or equipment.

D. Run conduit or tubing concealed in finished areas unless specifically shown otherwise on the drawings. Conduit may be exposed in unfinished mechanical/electrical rooms, and basement levels.

E. All system conduits, junction boxes, pull boxes, terminal cabinets, electrical enclosures and device back box locations shall be readily accessible for inspection, testing, service and maintenance.

1.05 Open cable

A. Power Limited cable, when not installed in UL listed metal conduit or raceway, shall be mechanically protected by building construction features par NFPA 70, Article 760.
   1. Installation shall be in areas not subjected to mechanical injury.
   2. All circuits shall be supported by the building structure. Cable shall be attached by straps or bridal rings to the building structure at intervals not greater than 10 feet. The use of staples is prohibited. Fire alarm wiring shall not be bundled or strapped to existing conduit, pipe or wire in the facility.
   3. Where wiring is installed above drop ceilings, cable shall not be laid on ceiling tiles.
   4. Cable shall not be fastened in a manner that puts tension on the cable.

B. Power Limited Cable shall be FPLP, FPLR or FPL, or permitted substitute.

3.1.3. FA Components

FA Components

1.01 DEVICES

1. All devices and appliances shall be mounted to or in an approved electrical box.

2. All wall mounted *control equipment* shall comply with requirements defined by the International Building Code and Acceptance Criteria for Seismic Qualification by Shake-Table Testing of Nonstructural Components and Systems (AC-156) using a seismic component importance factor of 1.5.

A. Fire Alarm Control Panels

   a. Mount the enclosure with the top of the cabinet 72" above the finished floor or center the cabinet at 63", whichever is lower.
   b. Label the fire alarm panels with the room number, electrical panel number and circuit breaker number feeding them.
   c. Paint the handles of the dedicated circuit breakers feeding fire alarm panels red, and install handle locks.
   d. Within the panel, all non-power limited wiring must be properly separated from power limited circuits.
   e. Grounds shall comply with IEEE 1100. Install a ground wire from main service

ground to fire-alarm control unit.

C. Remote power supplies and auxiliary fire alarm panels
   a. Locate the panel or cabinet with the top of the panel 72" above the finished floor or center the panel at 63", whichever is lower.
   b. Do not locate these panels above ceilings or where inaccessible by a person standing on the finished floor of the space.
   c. Label the power supplies and auxiliary FACPs with the room number, electrical panel number and circuit breaker number feeding them.
   d. Paint the handles of the dedicated circuit breakers feeding fire alarm panels red, and install handle locks.
   e. Within the panel, all non-power limited wiring must be properly separated from power limited circuits.

D. Manual Pull Stations
   a. Mount stations so that their operating handles are between 42" and 48" above the finished floor.

F. Notification Appliances: Mount assemblies as follows:
   a. All wall mounted audio/visual devices shall be mounted so the entire lens is between 80" and 96" above the finished floor. Where low ceilings exist, devices shall be mounted within 6" of the ceiling.
   b. Each speaker's (horn) output shall be set to the wattage value indicated for its specific location as shown on the drawings.
   c. Each strobe's output shall be set to the candela value indicated for its specific location as shown on the drawings.
   d. Each speaker (horn)-strobe's outputs shall be set to the wattage/candela value indicated for its specific location as shown on the drawings.
   e. Where ceiling height exceeds 30 feet, appliances shall be suspended from the ceiling to a height of 30 feet maximum above the finished floor.
   f. Appliances installed outdoors shall be UL listed for outdoor use.

G. Smoke Detectors:
   b. Smoke and heat detector **heads** shall not be installed until after construction clean-up is completed. Detector **heads** installed prior to construction clean-up shall be cleaned by the manufacturer or replaced.
   c. Detectors located on the wall shall have the top of the detector at least 4" and not more than 12" below the ceiling.
   d. On smooth ceilings, detectors shall not be installed over 30 ft. apart in any direction.
   e. Install smoke detectors no closer than 3 ft. from air handling supply air diffusers or return air openings.
   f. Locate detectors no closer than 12" from any part of a lighting fixture.

H. Duct Smoke Detectors:
   a. Install sampling tubes so they extend the full width of ducts exceeding 36".
   b. Detectors shall be located to facilitate ease of maintenance.
   c. All penetrations near detectors located on/in return ducts shall be sealed to prevent air entry.

J. End-of-Line Resistors
   a. Devices containing end-of-line resistors shall be appropriately labeled.

K. Remote Status and Alarm Indicators:
   a. Install near each smoke detector and each sprinkler water-flow switch and valve-tamper switch that is not readily visible from normal viewing position.

O. Heat Detectors
   a. Heat detectors shall be installed in strict accordance with their UL listing and the requirements of NFPA 72.

b. Heat detectors installed in the elevator machinery room to meet ANSI A17.1 requirements for elevator power disconnect, shall be located adjacent to each sprinkler head. Coordinate temperature rating and location with sprinkler rating and location.

M. Addressable Control (relay) Modules
   a. Install the module less than 3 feet from the device controlled.
   b. Orient the device mounting for best maintenance access.
   c. Label all addressable control modules as to their function.
   d. Provide a dedicated 24VDC circuit to feed all auxiliary relays required for inductive loads (auxiliary relays, door holders). Circuits shall be supervised via an end-of-line relay and addressable input module. Auxiliary relays shall not derive their power from the starter or load being controlled.

SECTION 28 3320

DISTRIBUTED ANTENNA SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Terminology
   1. Lennar Multifamily Communities shall be hereinafter referred to in this document as Owner and the respondent shall be referred to as Contractor. The term Owner includes direct employees and other appointed representatives of Lennar Multifamily Communities. These representatives may be requested by the Owner to represent the Owner in undertaking certain project tasks.

B. Location and Access to Project
   1. Project is located in Oakland, California.
   2. Any access using normal street and highway route to the facility is acceptable.
   3. Permission for access to this facility may be revoked for any and all persons who violate facility traffic regulations including speed limits, parking restrictions and directions of the responsible Architect or project personnel. All Contractor's personnel, operating forces, and delivery personnel shall be made aware of and shall comply at all times with the regulations and the direction of responsible Owner and project personnel.

C. Basic Definitions
   1. Definitions:
      a. "Days": As used in the specifications, the word "days" means calendar days.
      b. "Provide": As used in the plans and specifications, the word "provide" means to furnish, install, connect, program, test, commission and warranty the subject material or services.
   2. Specified Items – Substitutions
      a. "No Substitutes": The exact make and model number identified in the Specification shall be provided without exception. Where compatibility with existing systems is specified, and where a specific make or model number is not identified, the Contractor shall provide equipment which is compatible with, and equivalent to, existing equipment of the same description and type, and serving the same purpose.
      b. "Or Equal": An item may be substituted for the specified item provided that in every technical and aesthetic sense, the substituted item provides the same or better capability than the specified item, and is fully compatible with the new or existing systems specified. For expansion of existing systems, the item shall also be approved and fully supported by the existing system manufacturer. The DAS Engineer shall be the sole authority to determine the equality of substituted products with specified items.
      c. "Aesthetic", or "Aesthetic Considerations": If aesthetic considerations are involved in either the "or equal" or "approved equal" category, this shall be a consideration in approving or disapproving the proposed substitute. If the proposed substitute is aesthetically unacceptable to the Architect, then the specified, or another technically equal item, shall be provided.

   3. "Beneficial Use": Each component of a system is not considered available for beneficial use until and unless all components and conditions have been fulfilled to make the system fully operational.

D. Description
   1. General Description: This specification section covers general requirements for the furnishing, installation and testing of complete Distributed Antenna System for Public

Safety Radio frequencies to meet the requirements of the current State of California building and fire codes.

E. Scope of Work
   1. Systems: Provide the following work complete per the contract schedule, and with acceptable engineering and installation practices as described herein.
      a. The Distributed Antenna System (DAS) shall be installed per plans:
         1) Roof antennas
         2) Indoor antennas
         3) Bi-directional amplifier
         4) Power supplies
         5) Couplers, splitters, combiners, etc.
         6) Equipment Rack
         7) ½" Coaxial Di-Electric Cable, Plenum rated
         8) Patch Cables
   2. Area of work includes the "19th & Harrison" project site.
   3. Services: Contractor shall provide the following services complete and as scheduled:
      a. Project Planning and Management
      b. Shop Engineering and Documentation
      c. Wiring and Installation Diagrams
      d. Submittals
      e. System Installation
      f. System Start-up and Commissioning
      g. Training
      h. Testing
      i. Warranty
   4. System Functionality:
      a. Provide DAS coverage of no less in the parking garage areas and other areas of the building as required to meet minimum signal strengths of -95db.
      b. System to include all wiring, antennas, bi-directional amplifier, remote units, couplers, splitters, connectors and other necessary materials to provide a complete system.

F. Related Work
   1. General:
      a. Coordinate with the Architect on all aspects of aesthetic interface.

   2. Frequencies:
      a. The Distributed Antenna System contractor shall be responsible for verifying the proper frequencies required by the Oakland Police Department and Fire Department for their Public Safety Radio communications channels.

   3. The DAS Contractor shall coordinate with the Architect and General Contractor for the provision of access doors where needed to gain access to wiring, boxes, panels and enclosures in walls or ceilings.
   4. Conduit: All conduit shall be furnished by the electrical contractor.
   5. 120 VAC Electrical Power: All power outlets shall be on a circuit dedicated to DAS equipment only and will be provided and installed by the electrical contractor.
   6. Conditions:
      a. The DAS Contractor shall coordinate with other disciplines on all existing construction, equipment and field devices.
      b. Equipment provided under this project shall be installed in a manner consistent with architectural, operational, service and maintenance considerations.
      c. Special Issues: Some new and renovated spaces contain equipment, devices and/or other special materials that may cause interference or disturbances with

communication equipment devices, conduit, power or cables. The DAS Contractor shall take special care in coordinating with other trades on the location of these devices, their zone of influence and mitigating methods that may be required. Mitigating methods may include but not limited to: Shielded cable to avoid interference. No special precautions have been taken in these plans and specifications to account for these issues.

7. Other Related Work:
   a. Coordinate with other trades and the General Contractor on any related work not specifically mentioned above.
   b. Painting/Patching: Painting, patching and repair services to match existing or renovated conditions will be the responsibility of the Owner.

1.2 **SUBMITTALS**

A. General: Bid documents, including plans, details and specifications are generally considered conceptual in nature, and provide direction on products and project requirements. In most cases, the Contractor is given a choice of products and methods that may be incorporated into the system. These choices may affect the overall design, configuration and installation of the proposed system.

B. Contractor Responsibility: Prepare and submit shop drawings, rendered in the latest AutoCAD format, which show details of work to insure proper installation of the work using those materials and equipment specified or allowed under the approved plans and specifications. A complete Shop Drawing submittal package shall consist of Plans, Equipment Submittals and an Acceptance Testing Plan.

C. Completeness: The Equipment Submittals, Acceptance Testing Plan and the Shop Drawings should be submitted as a complete and contiguous package. Partial or unmarked submittals will not be accepted for review.

D. Scheduling: A schedule of shop drawing submissions shall be submitted for the Architect's review on a form acceptable to the Architect within ten (10) days after award of the Contract. The schedule of shop drawing submissions shall include a minimum, but not limited to the requirements stated herein.

E. Requirements: Provide the following information complete, and in the manner described herein:
   1. Shop Drawings: Shop Drawings shall be numbered consecutively and shall accurately and distinctly present the following information:
      a. Title Sheet
      b. Floor Plans: Showing devices, pull boxes, cabinets, conduits and conductors in their proposed locations.
      c. Riser Diagram: Showing conduit relationships between devices shown on the Floor Plans. Show power sources. Show signal relationships of controls and devices within the system.
      d. Custom Assembly Diagrams: For each custom assembly such as Terminal Cabinets, receptacle assemblies, or door control panels, provide an assembly drawing illustrating the appearance of the assembled device. Include dimensions, assembly components, and functional attributes (momentary or alternate action switch, lens color, panel finish, etc.)
      e. Component Connection Diagrams
         1) Show the wire designations on connectors.
      f. Equipment Wiring Diagrams
         1) Show a pictorial illustration of each equipment enclosure and/or terminal cabinet.

2) Show the device nomenclatures exactly as shown on the single line diagrams.
3) Show the terminations including the wire numbers as shown on the single line diagrams.
4) Show wire colors for each terminal.
5) For each wire exiting the enclosure, show the destination of the wire by floor, room number and the drawing number of the panel where the wire terminates.

g. Working dimensions and erections dimensions
h. Arrangement and sectional views
i. Necessary details, including complete information for making connections between work under this Contract and work under other Contracts.
j. Stock or standard plans will not be accepted for review unless full identification and supplementary information is shown thereon in ink or typewritten form.
k. Each Drawing or page shall include:
1) Project name, Project Number and descriptions.
2) Submittal date and space for revision dates.
3) Identification of equipment, product or material.
4) Name of Subcontractor.
5) Relation to adjacent structure of material.
6) Physical dimensions clearly identified.
7) Identification of deviations from the Contract Documents.
8) Contractor's stamp, initialed or signed, dated and certifying to review of submittal, certification of field measurements and compliance with Contract.
9) Location at which the equipment or materials are to be installed. Location shall mean both physical location and location relative to other connected or attached material.

2. Equipment Submittals
a. Provide a parts list, including system type, model numbers, quantities, and specification sheet page reference for equipment, materials, components and devices.
b. Provide Manufacturers Specification Sheet with descriptive information for equipment, materials, components and devices. Clearly delineate on each specification sheet which model numbers, options and configurations are being proposed.
c. Include kinds of materials and finishes for all equipment.

3. Acceptance Testing Plan: Submit a written document detailing the test procedures to be followed by Contractor in evaluating and providing the installed System(s). Include the test forms to be used for each system and for each component of each system. Include all tests required by the equipment Manufacturer and by this Specification. Comply with the acceptance testing requirements required by the local jurisdiction, including a "sweep" test of the building using Anritsu testing equipment.
a. All testing shall conducted by a technician certified by the manufacturer for use of the testing equipment used.
b. The system shall be certified by an individual holding license for radio frequency system design and testing issued by the Federal Communications Commission (FCC).

4. Training Plan
a. Submit a training plan to be followed in training key employees in the operation and maintenance of the installed system at the project site. The proposed training program shall be designed to provide a level of basic competence with the system for selected personnel. These selected personnel shall then be expected to train other personnel as required, utilizing the training that they have been given and the body of training documentation provided by the Contractor. This plan shall comply with the requirements stated in the "Training" section, of these Specifications, all stated hours of which shall be considered to be classroom hours.

b. The training plan shall cover the overall system, each individual system, each database management, normal operations, and failure modes with response procedures for each failure. Each procedural item must be applied to each equipment level.

F. The Architect will return unchecked any submittal which does not contain complete data on the work and full information on related matters.

G. Verification: The contractor shall check and acknowledge shop drawings, and shall place his signature on shop drawings submitted to the Architect. Contractor's signature shall constitute a representation that quantities, dimensions, field construction criteria, materials, catalog numbers, performance criteria and similar data have been verified and that, in his opinion, the submittal fully meets the requirements of the Contract Documents.

H. Timeliness: The Contractor shall schedule, prepare and submit shop drawings in accordance with a time-table that will allow his suppliers and manufacturers sufficient time to fabricate, manufacture, inspect test and deliver their respective products to the project site in a timely manner. The Contractor is solely responsible for delayed performance of their work.

I. Departure from Contract Requirements: If the shop drawings show departures from the Contract requirements, the Contractor shall make specific mention thereof in his letter of transmittal; otherwise review of such submittals shall not constitute review of the departure. Review of the plans shall constitute review of the specific subject matter for which the plans were submitted and not of any other structure, materials, equipment, or apparatus shown on the plans.

J. Contractor Responsibility: The review of shop drawings will be general and shall not relieve the Contractor of responsibility for the accuracy of such plans, nor for the proper fitting and construction of the work, nor for the furnishing of materials or work required by the Contract. No construction called for by shop drawings shall be initiated until such plans have been reviewed and approved.

K. Shop Drawing Submittal Review: The procedure in seeking review of the shop drawings shall be as follows:

1. The Contractor shall submit five (5) complete sets of shop drawings and other descriptive data with one copy of a letter of transmittal to the Architect for review thirty (30) working days after award of the contract. The letter of transmittal shall contain the project name, the Architect's Project Number, the name of the Contractor, the list of plans submitted including number and titles, requests for any review of departures from the contract requirements and any other pertinent information. Plans submitted for review shall be full sized plans, rolled and included with the equipment submittals.
2. Plans or descriptive data will be stamped "Reviewed", "Reviewed as Noted", "Reviewed as Noted, Resubmit" or "Rejected" and one copy with a Letter of Transmittal will be mailed to the Contractor at an address designated by the Contractor.
3. If a shop drawing or data is stamped "Reviewed" or "Reviewed as Noted", no additional submittal is required for that shop drawing.
4. If a shop drawing or data is stamped "Reviewed as Noted, Resubmit" or "Rejected", the Contractor shall make the necessary corrections and resubmit the documents as required above. The letter transmitting corrected documents shall indicate that the documents are a resubmittal.
5. If any corrections, other than those noted by the Architect, are made on a shop drawing prior to resubmittal, such changes should be pointed out by the Contractor upon resubmittal.
6. The Contractor shall revise and resubmit the shop drawing as required, until they are stamped either "Reviewed" or "Reviewed as Noted".
7. After the Contractor's submittal or resubmittal of shop drawings, the Architect shall be provided with fifteen (15) working days for review. Should the Architect require additional

review time above and beyond the stated fifteen (15) working days, the Contractor may ask for a time extension and/or monetary compensation, if they can present valid, factual evidence that actual damages were incurred by the Contractor. The Architect shall determine the amount of the time extension and/or the monetary compensation to be awarded the Contractor.

8. The Architect will not issue a “Notice to Proceed” until all shop drawings are reviewed, unless otherwise approved by the Architect.

L. The Contractor shall be responsible for extra costs incurred by the Architect caused by the Contractor’s failure to comply with the procedure outlined above.

1.3 QUALITY ASSURANCE

A. General:
1. The approved Contractor shall be responsible for satisfactory operation of the system and its clarification.
2. Approval of the Architect is required of products or services of the proposed manufacturer, suppliers and installers, and will be based upon conformance to the specifications.

B. Manufacturer Qualifications:
1. Manufacturers of established reputation and experience who have produced similar equipment and who are able to refer to similar installations rendering satisfactory service shall furnish system components.
2. The manufacturer’s products shall have been in satisfactory operation on at least three similar installations for not less than three years. Contractor shall submit a list of similar installations.
3. Components including, but not limited to, card access controllers, cameras, intercoms, computers, and power supplies shall have been tested and listed by Underwriters Laboratories, Inc., Factory Mutual Systems, or other approved independent testing laboratory.

C. Contractor Qualifications
1. Hold legally required California State Contractor’s licenses necessary to accomplish the installation and activation of the described system at the facilities indicated. Contractor shall submit copies of licenses to Architect prior to the start of work.
2. Hold legally required state registrations required meeting local requirements of the authorities having jurisdiction over this project.
3. Is a permanent organization, approved by the manufacturer(s), having facilities and employing manufacturer-trained personnel with technical qualifications and experience to prepare the installation, to install the required system and to provide periodic maintenance. The installer shall have been installing IP and analog camera systems for a period of not less than five years.
4. Hold manufacturer’s certifications for design, installation and service of the products to be installed.
5. Maintain a parts inventory and employ trained personnel at a location within a 100 mile radius of the project.
6. Indicate complete and total compliance with the provisions of these Specifications by letter, signed by an officer of the corporation, or a principal if other Ownership currently exists. In addition the letter shall include a complete listing of exceptions, if any.
7. Hold legally required California State Contractor’s licenses necessary to accomplish the installation and activation of the described system at the facilities indicated. Contractor shall submit copies of licenses to Architect prior to the start of work.

PART 2 - PRODUCTS

2.1 GENERAL

A. Product Acceptability: The products section contains lists of acceptable products. If product substitutions are proposed, they must be made based upon a comparison of equivalence to the product specified. Considerations may include but shall not be limited to functional, physical, aesthetic and/or interface aspects. The Architect shall be the sole judge of whether or not a submitted substitution is deemed to be “equivalent” to that specified.

2.2 MANUFACTURERS

A. TXRX, Axell, G-Wave or acceptable equal

2.3 EQUIPMENT, MATERIALS & FABRICATION

A. Distributed Antenna System:
   1. Bi-directional Amplifier with Cabinet
   2. Triband Random Antennas
   3. Yagi Antenna
   4. ½” Braided Fire Retardant Foam Diel , 50 Ohm Coaxial Cable
   5. ½” Corrugated Aluminum Plenum Air Dielectric Cable
   6. Connector, Positive Stop, N-Male
   7. Coupler, N Female Connector
   8. Grounding Kit for ½” Coaxial Cable
   9. 100-512 MHz 750 Watt RMS N-Female Surge/N-Female (Equipment)
   10. 4-Way Power Splitter
   11. 30-512 Mhz 2-way Receiver
   12. VHF-UHF Hybrid Power Splitter
   13. 15 dB Hybrid Directional Coupler

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with manufacturer's instructions for installation of the Distributed Antenna System.

B. Roof antenna, 5dBd Yagi Antenna

C. Indoor antennas shall be Tri-band Radome VHF/UHF/, Unity Gain

3.2 INCLUSIONS:

A. All labor and materials for a complete installation.

B. All wire and cable to be run in conduit and open cable fashion and in accordance with National Electrical Code Standards.

3.3 EXCLUSIONS

A. Dedicated 110 VAC outlets by the EC

B. All EMT Conduits and Raceways by the EC

3.4 **WARRANTY**

A. All components used in the installation of the system(s) will be new. The warranty period is for one (1) year from the date of installation. The warranty provides repair or replacement of all parts and labor on all workmanship and materials supplied by the system installer/contractor and its subcontractors. Vandalism, theft, misuse, intentional damage, acts of God, etc. are not covered by the warranty.

3.5 **TRAINING, MANUALS and DRAWINGS**

A. The system installer shall provide a complete close out package including (1) set of reproducible vellum as-built drawings and (3) sets of as-built blueprints. Drawings shall include device locations, controller locations, junction box locations, conduit and wiring paths, support notes and relevant detail drawings.

B. (3) Sets of installation and operating manuals for each product will be bound into book or binder format, with each section clearly labeled.

C. The system shall provide a minimum of 2 hours training on all system functions and programming. The training shall be conducted over the course of 2 sessions:
   1. System power-up and start-up.
   2. Property management staff.

END OF SECTION

SECTION 32 8400

PLANTING IRRIGATION

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.

1.01 SUMMARY

1.02 SECTION INCLUDES:

A. Backfill
B. Pipes and fittings
C. Pipe sleeves
D. Valves
E. Remote control valves
F. Miscellaneous piping specialties
G. Sprinklers and bubblers
H. Quick couplers
I. Drip irrigation
J. Controllers and enclosure
K. Electrical conduit, wiring, and water proof wire connectors
L. Boxes for valves and wiring
M. Marking and identification products
N. Maintenance period
O. Irrigation audit
    1. DESCRIPTION OF WORK
        a. Furnish all labor, materials, supplies, equipment, tools, and transportation, and perform all operations in connection with and reasonably incidental to the complete installation of the irrigation system, and guarantee/ warranty.
        b. Connect electrical power supply and data lines to irrigation controller.
        c. Testing of the irrigation system to assure proper operation. Programming of controller and set-up and testing of sensors.
        d. All necessary parts that are required to complete, modify, repair, and restore either existing and/ or new irrigation system shall be furnished and installed. All new and existing systems shall meet industry standards and be in operating order at the completion of maintenance period.
        e. Maintain and repair irrigation system as needed during maintenance period.
        f. Related Sections:
            1) Division 01 - Section "Tree and Plant Protection"
            2) Division 03 - Section "Cast-in-Place Concrete"
            3) Division 31 - Section "Earth Moving"
            4) Division 32 - Section "Portland Cement Concrete Paving"
            5) Division 32 - Section "Planting"
    2. SUBMITTALS
        a. Materials list:
            1) Contractor shall submit to Landscape Architect complete list of all irrigation system materials and processes proposed to be furnished and installed as part

of contract. List shall be provided and approved by Landscape Architect before ordering irrigation system materials.

2) Submittals shall have the following information:
   (a) The catalog cut sheets shall identify product from the most recent manufacturer's catalog or from manufacturer's web-site.
   (b) The catalog cut sheets shall clearly indicate the manufacturer's name and item model number. The model number, specified options and specified size shall be clearly indicated on catalog cut sheets.
   (c) Submittal format requirements:
      (1) Title Sheet with job name, contractor's name, contractor address and telephone number, submittal date, and submittal number.
      (2) Submittals shall be provided as one complete package for the project
      (3) Submittal package shall be stapled or bound in such a way as to allow for disassembly for review processing. Submittal maybe sent as a single .pdf file and electronically transmitted.
      (4) Submittal package shall have all pages numbered in the lower right hand corner.
   (d) The Landscape Architect will allow no substitution without prior written acceptance.
   (e) The Landscape Architect will not review the submittal package unless provided in the format described above.

3. DELIVERY, STORAGE, AND HANDLING
   a. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.
   b. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.
4. PROJECT CONDITIONS
   a. Interruption of Existing Water Service: Do not interrupt water service to facilities occupied by Owner or others unless permitted under the following conditions and then, only after arranging to provide temporary water service according to requirements indicated:
      1) Notify Owner no fewer than 7 days in advance of proposed interruption of water service.
      2) Do not proceed with interruption of water service without Owner's written permission.
5. TESTS AND INSPECTIONS
   a. The Contractor is responsible for notifying the Landscape Architect for site visits to review work as follows. Provide Landscape Architect 48 hours minimum notice to schedule these visits.
      1) Pre-construction conference with general contractor, grading contractor, landscape contractor, and landscape architect.
      2) Staking
         (a) Set stakes to identify locations of proposed point of connection, backflow preventer, master valve and flow sensor assembly, controller, quick coupler, remote control valves, isolation valves, and mainline pipe.
      3) Mainline Pressure/ Leak Test: After installation of mainline pipe, valves, and remote control valves.
         (a) Perform test after welded plastic pipe joints have cured at least 24 hours, or longer if manufacturer of solvent cement requires.
         (b) Leak Test procedures:
            (1) Charge system slowly to avoid water hammer.
            (2) Bleed system to remove air from pipes.
            (3) Maintain pressure in mainline pipe for 24 hour duration

(4) Pressurize system to 125% of design pressure for one hour using hydraulic pump or other safe method.
(5) Visually inspect all parts of irrigation system while the system is pressurized.
(6) Repair any leaks found in mainline irrigation system.

4) Operational Test: After electrical circuitry has been energized, operate controllers and automatic control valves to confirm proper system operation.
(a) If operation test presents problems contractor shall contact a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

5) Coverage Test: After completion of irrigation system a coverage test shall be performed to determine uniform and complete coverage of landscape area.
(a) 24 hours before test, run irrigation system at least once in all landscape planters.
(b) Landscape Architect shall review and approve all planters before plant material, bark mulch, gravel, or decomposed granite is installed.

6) Test and adjust controller and irrigation equipment. Replace damaged and malfunctioning irrigation components and equipment.

7) Irrigation Audit: Irrigation system is designed in accordance with the Model Water Efficient Landscape Ordinance (MWELO). Landscape and irrigation installation shall meet or exceed the MWELO, and shall pass an irrigation water audit.

6. PROJECT WARRANTY
a. Contractor to furnish and install all work free of defects in materials and workmanship for period of 1-year from start of Maintenance Period per Div. 32- Section "Planting". Contractor to warranty all work furnished in accordance to the drawings and specifications. Ordinary wear and tear, neglect from maintenance, abuse, and vandalism are exempt from the contractor warranty. Repair and replacement of defective work and material will be done by the contractor at no cost to the owner. Repairs and replacement shall be conducted within 48 hours of notification to contractor.

PART 2 PRODUCTS

2.01 QUALITY ASSURANCE

A. Materials used in the system shall be new and free of flaws and defects of any type.

B. BACKFILL MATERIAL
1. Backfill shall be either screened on-site material or imported.
2. Backfill material shall be free of organic materials, large clods of earth or rocks larger than one (1) inch diameter, trash, construction debris, asphalt, or concrete.
3. Imported material shall be a clean loam soil.

C. PIPE AND FITTINGS
1. Comply with requirements in the drawing for applications of pipe and fitting materials, and for joining methods for specific services, service locations, and pipe sizes.
2. Use a dielectric union wherever a copper-based metal (copper, brass, bronze) is joined to an iron-based metal (iron, galvanized steel, stainless steel).
3. Assemblies calling for threaded pipe connections shall utilize PVC Schedule 80 nipples and PVC Schedule 80 threaded fittings.
4. Joint sealant: Use only Teflon-type tape pipe joint sealant on plastic threads. Use non-hardening, nontoxic pipe joint sealant formulated for use on water-carrying pipes on metal threaded connections.
5. PVC Pipe: ASTM D 1785, PVC 1120 compound, Class 315, schedule 40, schedule 80, with integral belled end.
a. PVC Socket Fittings: ASTM D 2466, Schedule 80.
b. PVC Threaded Fittings: ASTM D 2464, Schedule 80.

c. Use Schedule 40 and SCH 80, Type 1, PVC solvent weld fittings conforming to ASTM Standards D2466 and D1784. Use primer approved by the pipe manufacturer. Solvent cement to conform to ASTM Standard D2564.

6. PVC Threaded Nipples: PVC Schedule 80 nipples shall be extruded. PVC Schedule 80 nipples shall be made from NSF approved PVC compound conforming to ASTM D1784, Cell Classification 12454B.
7. Mainline detection tape:
   a. Manufacturer: TChristy. Model# TA.DT.2.BI. 5 mil (.005") thick tape with aluminum foil core and polyethylene backing, 2" width, and shall say "Caution Irrigation Line Buried Below".

D. IRRIGATION PIPE SLEEVE
1. Corrugated HDPE with dual wall construction for irrigation sleeves eight (8) inches and larger.
2. PVC schedule 40 for irrigation sleeves six (6) inches and smaller.

E. REMOTE CONTROL VALVES
1. Manufacturers: Refer to drawings for manufacturer, model, and size of remote control valves.
2. Remote control valve to be in normally closed position.
3. Remote control drip zone shall have forty psi pressure regulator and a filter cartridge with a minimum of 120 mesh. Size valve, pressure regulator and filter for drip zone flow rate.

F. QUICK COUPLERS
1. Manufacturers: Refer to drawings for manufacturer, model, and size of quick coupler.
2. Description: Factory-fabricated, bronze or brass, two-piece assembly. Include coupler water-seal valve; removable upper body with spring-loaded or weighted, locking rubber-covered cap; hose swivel with ASME B1.20.7, 3/4-11.5NH threads for garden hose on outlet; and operating key.

G. SPRINKLERS AND BUBBLERS
1. General Requirements: Designed for uniform coverage over entire spray area indicated at available water pressure.
2. Plastic, Pop-up Spray Sprinklers:
   a. Refer to drawings for manufacturer, model, and size of pop-up spray sprinklers and bubblers.

H. DRIP IRRIGATION SYSTEM
1. Manufacturers: Refer to drawings for manufacturer, model, and size of drip irrigation system and associated components.
2. Drip Tubes with Inline Emitters:
   a. Tubing: Flexible Polyethylene tubing.
   b. Emitter spacing: 12", 18", or 24" on center as specified on drawings.
   c. Emitters: Check valve and pressure compensation.
3. Fittings: Drip tubing fittings shall be per manufacturer's specifications.
4. Filter Units: Plastic housing, with corrosion-resistant internal parts; of size and capacity required for devices downstream from unit.
5. Air Relief Valves: Plastic housing, with corrosion-resistant internal parts.
6. Vacuum Relief Valves: Plastic housing, with corrosion-resistant internal parts.

I. IDENTIFICATION PRODUCTS
1. Remote control valve tags:
   a. Manufacturer: TChristy. Model# ID.STD.Y1. Plastic tag attached by nylon tie to valve, hot stamped lettering, tag color: yellow. Tag to identify valve based on drawings controller letter and valve numbering.
2. Backflow History Tag
   a. Manufacturer: TChristy. Model# ID.BFHT.1. Plastic tag attached directly and permanently to backflow.

J. AUTOMATIC IRRIGATION CONTROLLERS

1. Manufacturer: Refer to drawings for manufacturer and model of automatic irrigation controller.
2. ET Sensor Manufacturer: Refer to drawings for manufacturer and model of ET sensor.
3. Controller Enclosure:
    a. Refer to plans for manufacturer and model
4. Two Wire Cable
    a. Controller to decoder wire use 14 gauge solid copper insulated wire, twisted together, loose tube-high density polyethylene jacket. Paige Electric Co., model P7354D.
    b. Decoder to Solenoid wire use 14 gauge solid copper insulated wire, parallel wire held by webbing, in various color. Paige Electric Co., model ICD.
    c. Where spliced wires are required, splices shall be housed in a grey plastic electric pull box.
    d. Waterproof wire connector manufacturer: 3M Direct Bury Splice Kit. Model# DBR/Y-6.

K. CONDUIT
1. All conduit and fittings to be PVC schedule 40, color: grey.
2. Pull tape manufacturer: Fibertek, Inc. Model# WP1250.
    a. Electrical pull tape to be 1/2" woven polyester tape with a minimum of 1250 pounds tensile strength and less than 0.10 coefficient of friction.
    b. All pull tape to be continuous with out slicing or knots.
    c. Provide couplers or bushings on cut pipe end to prevent damage to wires.

L. GROUNDING
1. Earth grounding for irrigation equipment shall meet or exceed article 250 of National Electrical Code (NEC) and be UL listed.
2. Grounding rod shall be minimum copper clad 5/8" diameter by 10 feet long.
3. OR Grounding plate
4. Bare Copper Wire shall be minimum 6 gauge soft-annealed uncoated wire.
5. Grounding rod connection to be exothermic weld or clamp.
    a. Grounding rod clamp shall be brass and must securely attach grounding rod and wire.
6. Grounding to have a resistance of 25 ohms or less.
7. Back fill shall be highly conductive material. Where needed use electrical grounding backfill products like Powerfill by Loresco.

M. BOXES VALVES AND ELECTRICAL PULL
1. Electrical Pull Box:
    a. Manufacturer: Carson. Body model# 910-10 and lid model# 910-4B. Bolt down kit, T-cover lid, body and lid color: grey.
    b. Or equal
2. Remote Control Valve:
    a. Manufacturer: Rainbird. Body model# VD-STD-H. Bolt down kit, T-cover lid, body and lid color: green.
3. Quick coupler:
    a. Manufacturer: Rainbird. Body model# VB-10RND. Bolt down kit, T-cover lid, body color: black and lid color: green.
4. Isolation Valve:
    a. Manufacturer: Rainbird. Body model# VB-10RND. Bolt down kit, T-cover lid, body color: black and lid color: green.
5. Flush Valve:
    a. Manufacturer: Rainbird. Body model# VB-10RND. Bolt down kit, T-cover lid, body color: black and lid color: green.
6. Air/ Vacuum Relief Valve:
    a. Manufacturer: Rainbird. Body model# VB-7RND. T-cover lid, body color: black and lid color: green.
7. Subterranean Drip Emitter Box:

a. Manufacturer: Rainbird. Body model# SEB 7XB. T-cover lid, body color black and lid color: green.

8. Drain rock shall be 3/4" washed crushed rock.
9. Hardware cloth shall be galvanized 16 gauge 1/4" mesh.
10. Use valve box extension where needed to install boxes at proper height.

PART 3 EXECUTION

3.01 GENERAL

A. Irrigation system shall meet all federal, state, and local codes, regulations and ordinances.

B. Verify all underground utilities by contacting Common Ground Alliance (C.G.A.) at 811 a minimum of 2 working days before any excavation work begins on site.

C. If contractor finds utilities on site that are not shown on plans, contractor shall contact Landscape Architect. Found utilities that cross irrigation lines shall be shown on Record Drawings.

D. Verify water pressure and available flow prior to construction. Notify Landscape Architect if water pressure or flow will prevent the irrigation system from functioning properly.

E. EARTHWORK
1. Excavating, trenching, and backfilling are specified in Division 31 - Section "Earth Moving."
2. Install warning tape directly above pressure piping, 12" below finished grades and above irrigation pipe.

F. PREPARATION
1. Set stakes to identify locations of proposed point of connection, backflow preventer, master valve and flow sensor assembly, controller, quick coupler, remote control valves, isolation valves, and mainline pipe. Contact Landscape Architect within 48 hours for approval before excavation.

G. WATER, ELECTRICAL, & COMMUNICATION CONNECTIONS
1. Water Supply
   a. Contact the Owner a minimum of five (5) working days before beginning any work that will disrupt existing irrigation system.
2. Electrical Supply
   a. Contractor is responsible for coordination of electrical supply connection to controller enclosure.
   b. Electrical work shall be preformed by licensed electrical contractor. Material and workmanship for electrical service shall meet all federal, state, and local codes, regulations and ordinances.
3. Communication
   a. Contractor is responsible for coordination of data line connection to controller enclosure.

H. PIPING INSTALLATION
1. Install piping free of sags and bends. Lay piping on solid sub-base, uniformly sloped without humps or depressions.
2. Install groups of pipes parallel to each other and with a minimum of 4" of separation. Pipes shall not lie on top of another pipe.
3. Install fittings for changes in direction and branch connections.
4. Install PVC piping in dry weather when temperature is above 40 deg F. Allow joints to cure at least 24 hours at temperatures above 40 deg F before testing.
5. Install piping in sleeves under parking lots, roadways, and sidewalks.
6. Remove all rough edges and burrs from PVC pipe by reaming cut ends. All irrigation pipe cuts shall be square. Remove all debris from pipe before installing.
7. PVC pipe shall not lie on top of another pipe. All pipe should have 4" separation between pipes.
8. Cap all pipe ends during construction to prevent debris from entering pipe.
9. Snake pipe in trench one (1) foot per every one hundred (100) feet for thermal expansion.

10. Mainline changes in depth and direction shall be done with 45 degree fittings.

I. JOINT CONSTRUCTION
   1. Ream ends of pipes and tubes and remove burrs.
   2. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Join pipe fittings and valves as follows:
      a. Apply appropriate PTFE/ Teflon tape or thread compound to external pipe threads. Provide three wraps around male thread.
      b. Tighten joints to hand tight, plus one turn with a strap wrench
      c. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
   3. PVC Piping Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
      a. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
      b. PVC P Piping: Join schedule number, ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672
      c. Allow 30 minute cure time for handling and 24 hours of cure time before allowing water in the pipe..

J. CONDUIT
   1. Remove all rough edges or burrs from conduit pipe by reaming cut ends. All conduit cuts shall be square.
   2. Install coupler or bushing on cut pipe ends.
   3. All 2-wire cable shall be in PVC conduit.

K. SLEEVES
   1. Install sleeve in all locations where irrigation pipe and controller wire cross beneath pavement or other hardscape elements.
   2. Irrigation controller wire shall not share sleeve with 120 volt and higher voltage wire.
   3. Contractor shall coordinate the installation of sleeves with other trades.
   4. Sleeves shall have minimum of 25% void space. Contractor is responsible for sizing sleeve based on field conditions. Size sleeve based on conduit and irrigation pipe size.

L. BACKFILLING
   1. Backfill shall be of approved screen material.
   2. With the exception of center loading, irrigation trenches shall not be backfilled until completion and passing of tests.
   3. Trench should be cleaned of debris before backfilling.
   4. Backfill shall be compacted in 6" lifts using vibrating plate. Compaction of backfill shall be equal to adjacent undisturbed soil.
   5. Contractor shall correct any settling with more backfill and compaction.

M. REMOTE CONTROL VALVES
   1. Flush mainline before installing remote control valves
   2. Install valves in landscape planter. Do not install valves in roadways or paved areas.
   3. Group remote control valves and other valves whenever possible.
   4. Install per drawings and manufacturer's specifications.
   5. Install valve in valve box to provide proper operation and maintenance of valve.
   6. First downstream fitting past valve shall be located min. 18" from valve.

N. SPRINKLER INSTALLATION
   1. Install sprinklers after hydrostatic testing is completed.
   2. Flush lateral pipe before installing sprinklers.
   3. Set sprinklers perpendicular to finish grade.
   4. Install sprinklers at manufacturer's recommended heights.
   5. Locate part-circle sprinklers to maintain a minimum distance of 4 inches from walls and 2 inches from other boundaries unless otherwise indicated.

6. Adjust the radius and throw of each sprinkler for best performance. Minimum of 70% low quarter distribution uniformity (DULQ) of spray irrigation. Post-installation irrigation audit may be conducted to confirm (DULQ) of spray irrigation.
7. Install per drawings and manufacturer's specifications.

O. DRIP IRRIGATION
1. Flush lateral before installing drip tubing.
2. Install drip tubing on uniformly prepared bed. Drip tubing emitters should be offset to create a triangular spacing.
3. Install fitting for all 90 degree changes of direction in line.
4. Use 6" wire staples every three (3) feet to secure drip tubing.
5. Install air relief and vacuum relief valves in valve boxes, at highest point of landscape planter.
6. Install automatic flush and ball valves at drip exhaust header. Refer to drawings for location of flush valves.
7. The pressure at the end of the drip tubing should have a maximum of 20% drop in pressure from the beginning of the drip line.
8. Install per drawings and manufacturer's specifications.

P. AUTOMATIC IRRIGATION CONTROLLER
1. Equipment Wall Mounting: Install wall mounted controller on building wall shown on plans and coordinated with building owner representative.
   a. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   b. Install anchor bolts for proper attachment to supported equipment.
   c. Orient enclosure to provide access to controller.
2. Provide connection to electrical power supply and data line as required by controller.
3. All remote control valves, master valves, and flow sensors to be connected to controller.
4. Install all ET sensor, weather stations, and rain/ freeze sensor equipment. Contractor to program and fine tune controller to operate with sensor equipment during maintenance period. Fine tuning of schedule and ET sensor should be completed at the end of maintenance period.
5. Irrigation schedule shall not exceed water budget established for project. Water budget and irrigation schedule shown on plans.
6. Install per drawings and manufacturer's specifications.

Q. FIELD QUALITY CONTROL
1. Contractor to make adjustments to irrigation components to provide optimum performance of system. Adjust irrigation components to prevent excessive watering onto paved surfaces, windows, and building walls.
2. Adjust sprinklers and devices, except those intended to be mounted aboveground, so they will be flush with, or not more than 1/2" above, finish grade or compacted mulch.
3. Any irrigation product will be considered defective if it does not pass tests and inspections.
4. Improperly installed equipment shall be reinstalled or replaced to meet Construction Documents.

R. CLEANING
1. Flush dirt and debris from piping before installing sprinklers and other devices.
2. Upon completion of work, remove all site machinery, tools, construction material, and any rubbish.

S. MAINTENANCE
1. Provide maintenance as per Division 32 - Section "Planting"

T. RECORD DRAWINGS
1. Prior to Pre-Maintenance Review, obtain from the Owner’s Authorized Representative a reproducible copy of the Drawings. Using computer aided drafting, duplicate information contained on the Record Drawings maintained on site.
2. Label each sheet "Record Drawing".

3. Record pipe and wiring network alterations. Record work which is installed differently than shown on the construction drawings. Record accurate reference dimensions, measured from at least two permanent reference points, of each irrigation system valve, each backflow prevention device, each controller or control unit, each sleeve end, and other irrigation components enclosed within a valve box.

U. ITEMS FURNISHED TO OWNER
   1. The following items to be furnished to the Owner by the contractor at the completion of the project:
      a. Two (2) keys to the control and enclosure
      b. Two (2) quick coupler keys and hose swivels
      c. One (1) isolation valve opening key
      d. One (1) hand held remote control for controller, if specified.
      e. One (1) of each specialized tool used to adjust irrigation equipment
      f. All manuals for irrigation equipment
      g. One (1) copy of irrigation schedule
      h. One (1) copy of the approved irrigation submittal.

V. CONTROLLER CHARTS
   1. Prior to completion of the maintenance period, prepare a reduced copy of the as-built plans, with valve numbering/zones clearly highlighted at the reduced scale. The reduced plan shall be sized to fit flat within the controller, laminated in plastic, and placed in the controller.

3.02 IRRIGATION WATER AUDIT

A. An irrigation audit is required, per AB 1881. Irrigation audit shall be conducted by a certified landscape irrigation auditor.

B. IRRIGATION DESIGN

C. As designed, the irrigation system is compliant with AB1881. The installation and tuning of the irrigation system shall also meet the requirements for a compliant irrigation audit.

D. AUDIT ATTENDEES
   1. At a minimum the following people shall be in attendance at the time of the Irrigation Audit: A certified landscape irrigation auditor, an Owner's representative, a landscape contractor representative who is knowledgeable of the irrigation design and installation, and who has access to the irrigation controller, and tune or repair the irrigation system if necessary during the audit.

E. AUDIT PROCEDURE
   1. Audit may only be performed after the completion of irrigation and landscape irrigation. No other irrigation water may be in use at time of irrigation audit. A project with spray irrigation cannot be audited when winds exceed 5 mph.
   2. Inspection- Prior to start of audit, inspect and confirm installation meets design intent of irrigation drawings. Inspect irrigation controller installation and programmed schedule, and ET sensor.
   3. Measurement- Measure static and dynamic pressure at irrigation point of connection.
   4. Sample areas- Audit shall include a representative sample of each type of irrigation (spray, drip) on each type of hydrozone. Linking of irrigation stations is allowed.
   5. Spray irrigation- Auditing of spray irrigation valves shall measure:
      a. Pressure at first and last spray head
      b. Flow rate of station
      c. Distribution uniformity
   6. Drip irrigation- Auditing of drip irrigation valves shall measure:
      a. Pressure in dripline at supply and exhaust
      b. Flow rate of station.

END OF SECTION

SECTION 32 9000

PLANTING

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. Provide all labor, material, equipment and services necessary to provide all landscape planting, complete in place, as shown and specified.

B. Section Includes:
   1. Planting and landscape areas.
   2. Landscape fabric.
   3. Landscape edgings.
   4. Tree root barriers.
   5. Tree stabilization.
   6. Decomposed granite.
   7. Cobble/rock.
   8. Synthetic turf.

C. Subgrade Elevations
   1. Excavation filling and grading required to establish elevations is shown on drawings. Coordinate all work with grading contractor in order to arrive at rough grades that will allow tolerance for topsoil in planting areas, soil amendments and ornamental mulch as required in other sections of this specification. Contractor to assume tolerance of rough grades established at +/- .1 feet (1 tenth of a foot).

D. Related Sections:
   1. Division 01 Section "Tree and Plant Protection" for protection of existing trees and plant materials.
   2. Division 31 Section "Site Clearing" for topsoil stripping and stockpiling.
   3. Division 31 Section "Earth Moving" for excavation, filling and backfilling, and rough grading.
   4. Division 32 Section "Planting Irrigation" for irrigation.
   5. Division 33 Section "Subdrainage" for subsurface drainage.

1.03 SUBMITTALS

A. Informational submittals shall include but not be limited to the following:
   1. Pesticides and herbicides: Include product label and manufacturer's application instructions specific to this Project.
   2. Soil Fertility and Agricultural (Horticultural) Suitability Analysis.
      a. After completion of rough grading and prior to soil preparation, the Contractor shall obtain agronomic soils tests for planting areas. A minimum of two (2) samples of planting areas shall be required. Tests shall be performed by an approved agronomic soils testing laboratory and shall include a complete soil suitability analysis with written recommendations for soil amendment, fertilizer and chemical conditioner, application rates for soil preparation, and post-maintenance fertilizer program.
      b. The soils report recommendations shall take precedence over the minimum soil amendment and fertilizer application rates, as specified, when they exceed the specified minimums.
      c. The Soil Analysis report shall be submitted to the Landscape Architect in a timely manner to make necessary adjustments to the project documents.
      d. The Soil Analysis report shall be submitted to the Landscape Architect as part of the Certificate of Completion requirements. The Landscape Architect shall submit

documentation verifying implementation of the soil analysis report recommendation to the local agency with the Certificate of Completion.

e. Fertilizer: Chemical and percentage composition, and manufacturers or vendor's certified analysis.
f. Plant materials: Include botanical and common name, quantities, sizes, quality, and sources for all plant materials.
g. Seed mixtures for sod and hydroseed: Botanical and common name, percentage by weight, percentages of purity, germination and weed seed for each grass seed species.
h. Landscape fabric.
i. Landscape edgings (except concrete): Type, size, manufacturer, required stakes (if any).
j. Tree root barriers: Type, size, manufacturer.
k. Tree staking.
l. Decomposed granite.
m. Stabilizer for decomposed granite.
n. Synthetic turf: Type, manufacturer.
o. Submit other data substantiating that materials comply with specified requirements. Such certificates may be tags, labels, and/or manufacturers literature. All submittals shall be reviewed and accepted by Landscape Architect before contractor begins work.
p. Planting schedule: Submit proposed planting schedule at least two weeks prior to planting any materials, indicating dates for each type of landscape work during normal seasons for such work in areas of the site. Correlate with specified maintenance periods to provide maintenance from date of substantial completion. If dates need to be revised after acceptance of planting schedule, document reasons for delays and submit for acceptance.

B. Material submittals shall include but not be limited to the following:
1. Soil amendments: Type, size, composition, and manufacturers or vendor's certified analysis. 1-pint in sealed labeled plastic bag.
2. Mulch: 1-pint in sealed labeled plastic bag.
3. Landscape fabric: 8"x8" square
4. Cobble/Rock: Type and size. 1-pint, or as required to accommodate representative sample in sealed labeled plastic bag.
5. Synthetic turf: 8"x8" square, infill material if applicable.

1.04 SITE VISITS

A. The Contractor is responsible for notifying the Landscape Architect for site visits to review work as follows. Provide Landscape Architect 48 hours minimum notice to schedule these visits, unless otherwise indicated.
1. Pre-construction conference with general contractor, grading contractor, landscape contractor, and landscape architect, at project site. 7 days minimum notice. The purpose of this conference will include:
a. Review of Contractor's questions regarding project.
b. Review of administrative and inspection procedures that will occur during construction.
c. Review of Contractor's work schedule for project.
d. Tour, inspect, and discuss site conditions (if necessary).
e. Review of soil sampling.
f. Review of planting stock at nursery, or upon arrival on site.
g. Review of all landscape areas in preparation for planting.
1) All landscape areas have been cleaned of all construction debris, including gravel, concrete, concrete washout, cement plaster, paint, asphalt, etc.
2) Fine grading- allow for inclusion of all amendments, settling, etc.
3) Irrigation coverage.

4) Review of base preparation and edging for synthetic turf.

h. Review of plant material locations.
   1) The Landscape Architect may adjust locations of any plant materials prior to installation.

i. Punch list at substantial completion (prior to installation of bark mulch). 7 days minimum notice.

j. Final completion. Final review of entire project, including grading, irrigation, planting and completion of all punch list items (to begin Maintenance Period). 7 days minimum notice.

k. Final acceptance of project (at end of Maintenance Period). 7 days minimum notice.
   1) Final application shall have been made to all landscape areas with slow-release maintenance fertilizer.

1.05 QUALITY ASSURANCE

A. Subcontract: Subcontract landscape work to a single firm specializing in commercial landscape installation.

B. Soil-Testing Laboratory Qualifications: An independent laboratory or university laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.

C. Soil Analysis: For each unamended soil type, furnish soil analysis and a written report by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; sodium absorption ratio; deleterious material; pH; and mineral and plant-nutrient content of the soil.
   1. Testing methods and written recommendations shall comply with USDA's Handbook No. 60.
   2. The Landscape Architect shall oversee soil sampling, with depth, location, and number of samples to be taken. A minimum of two representative samples shall be taken from varied locations for each soil to be used or amended for planting purposes.
   3. Report suitability of tested soil for plant growth.
      a. Based on the test results, state recommendations for soil treatments and soil amendments to be incorporated. State recommendations in weight per 1000 sq. ft. or volume per cu. yd. for nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory planting soil suitable for healthy, viable plants.
      b. Report presence of problem salts, minerals, or heavy metals, including aluminum, arsenic, barium, cadmium, chromium, cobalt, lead, lithium, and vanadium. If such problem materials are present, provide additional recommendations for corrective action.

D. Source Quality Control:
   1. General: Comply with regulations applicable to shipping of landscape materials.
   2. Analysis and Standards: All materials shall be of standard, approved and first-grade quality and shall be in prime condition when installed and accepted. Any commercially processed or packaged material shall be delivered to the site in the original unopened container bearing the manufacturer’s guaranteed analysis. The Contractor shall supply the Landscape Architect with analytical data from an approved laboratory source illustrating compliance of bearing the manufacturer’s guaranteed analysis of all supplied materials.

E. Topsoil: Obtain topsoil only from naturally, well-drained sites where topsoil occurs in a depth of not less than 4"; do not obtain from bogs or marshes. The Landscape Architect reserves right to have topsoil tested and analyzed by an independent laboratory before delivery to site.

F. Trees, Shrubs and Plants: Provide trees, shrubs and plants of quantity, size, genus, species and variety shown and scheduled for landscape work and complying with recommendations and requirements of ANSI Z60.1-1980 "American Standard for Nursery Stock". Provide healthy, vigorous stock, grown in recognized nurseries in accordance with good horticultural practice and free of disease, insects, insect eggs, larvae and defects such as knots, sun-scald, injuries,

abrasions, overlapping surface roots, or disfigurement. Central leaders of all trees shall be intact, undamaged, with evenly spaced lateral branches.

G. The contractor is responsible for ordering and reserving plant materials immediately upon bid award to insure plant materials meet size and quality requirements as specified herein. Plant material of substandard size will be rejected.

H. Label at least one tree and one shrub of each variety in each grouping with a securely attached waterproof tag bearing legible designation of botanical and common name. Where formal arrangements and consecutive order of trees is shown, select stock for uniform height/spread, and label with number to assure symmetry in planting.

I. Stock review: The Landscape Architect will review all plant materials either at place of growth or at site before planting for compliance with requirements for genus, species, variety, size and quality. Landscape Architect retains right to further review trees and shrubs for size and condition of balls and root systems, insects, injuries and latent defects, and to reject unsatisfactory or defective material at any time during progress of the work. Remove rejected vegetation immediately from project site. Contractor shall request review of such stock by Landscape Architect by delivering notice in writing 48 hours in advance.

J. Synthetic Turf: Comply with Division 01 "Quality Assurance"
   1. Manufacturer Qualifications:
      a. Shall be experienced in the manufacture and installation of specified type of synthetic monofilament grass system for a minimum of three years, including the backing, backing coating and installation method.
      b. Installer: Company shall specialize in performing the work of this section. The contractor shall provide competent workers skilled in this specific type of synthetic turf installation, including gluing seams and proper installation of infill mixture.
      c. Contractor shall verify special conditions required for the installation of the system, and shall notify Landscape Architect of any discrepancies.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws, as applicable. Protect materials from deterioration during delivery, and while stored on site.

B. Sod: Deliver sod in time for planting within 24 hours of harvesting. Protect sod from breakage and drying.

C. Bulk Materials:
   1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
   2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
   3. Accompany each delivery of bulk fertilizers and soil amendments with appropriate certificates.

D. Trees and Shrubs: Do not prune prior to delivery. Do not bend or bind trees or shrubs in such manner as to damage bark, break branches or destroy natural shape. Provide protective covering during delivery, and provide protection on site from traffic, pedestrians, and deleterious effects of climate while planting operations are in progress. Dropped or damaged stock will not be accepted.

E. Deliver trees and shrubs after preparations for planting have been completed and plant immediately after approval of plant materials locations. If planting is delayed more than 6 hours after delivery, set trees and shrubs in shade, protect from weather and mechanical damage, and keep roots moist by covering with mulch, burlap or other acceptable means of retaining moisture. Do not remove container grown stock from containers until planting time.

F. Plant material shall not be stored on the jobsite for more than 48 hours before planting. Contractor shall schedule nursery deliveries in sub-groups as necessary to comply with this requirement. Plant materials that have been damaged in any way will be discarded and if installed, shall be replaced with undamaged materials at the Contractor's expense.

G. Synthetic Turf: Deliver and store components with labels intact and legible. Protect from damage during delivery, storage, handling and installation. Protect from damage by other trades. Inspect all delivered materials and products to ensure they are undamaged and in good condition. Comply with manufacturer's recommendations.

1.07 PROJECT CONDITIONS

A. Proceed with and complete landscape work as rapidly as portions of site become available, working within seasonal limitations for each kind of landscape work required.

B. Contractor shall verify locations of all existing utilities, whether shown on plans or not. The Contractor shall call 811 two (2) working days in advance of performing any excavation work.

C. After determining location of underground utilities, perform work in a manner which will avoid possible damage. Hand excavate, as required. Maintain grade stakes set by others until removal is mutually agreed upon by parties concerned.

D. Excavation: When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions, or obstructions, notify Landscape Architect before planting.

E. No landscape materials may be planted before an irrigation operation and coverage test is completed and approved by the Landscape Architect.

F. No landscape materials may be planted before finish grade is inspected and approved by the Landscape Architect.

G. Planting Time: Plant or install materials during normal planting seasons for each type of landscape work required.

H. Coordination with Lawns: Plant trees and shrubs after final grades are established, after irrigation system is operable, and prior to planting of lawns, unless otherwise acceptable to Landscape Architect. If planting of trees and shrubs occurs after lawn work, protect lawn areas and promptly repair damage to lawns resulting from planting operations.

I. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

1.08 SPECIAL PROJECT WARRANTY

A. Warranty all plant materials and other materials installed under the Contract for a period of one year (from beginning of maintenance period) against defects including death and unsatisfactory growth, or faulty performance, inferior materials and/or workmanship or improper maintenance resulting from neglect, abuse or damage by others, as determined by the Landscape Architect. Materials shall be replaced at the Contractor's expense.

B. Synthetic Turf: Contractor shall provide a warranty to Owner covering defects in materials and workmanship for a period of eight (8) years from the date of substantial completion. Turf manufacturer must verify that their representative has inspected the installation and that the work conforms to the manufacturer's requirements. The manufacturer's warranty shall include general wear, and damage caused from UV degradation. The warranty excludes vandalism.

C. Replacement: Any materials found to be dead, missing, or not in a satisfactory or healthy condition during the maintenance period shall be replaced immediately. The Landscape Architect shall be sole judge as to the condition of material. Material to be replaced within the guarantee period shall be replaced by the Contractor within five (5) days of written notification by the Landscape Architect. All replacement materials and installations shall comply to the Plans and Specifications. Any plant missing due to suspected theft shall be replaced by the Contractor. If the Contractor suspects that theft may be a problem, the Contractor shall provide written documentation to the Landscape Architect that security on this site needs to be

intensified. The Contractor may relieve himself of theft responsibility if after the security notice, with no result, a written notice to the Landscape Architect shall be given that plant material will not be replaced for theft or vandalism due to lack of site security being maintained. This procedure may take place only during the Landscape Maintenance Period.

1.09 MAINTENANCE SERVICE

A. General: Provide full maintenance by skilled employees of landscape Installer. Maintain as required in Part 3.

B. Continuously maintain entire project area during the progress of the work and during the ninety (90) calendar day maintenance period until final acceptance of the project by the Landscape Architect.

C. Maintenance period shall not start until Final Completion, when all elements of construction, planting and irrigation for the entire project are in accordance with Plans and Specifications. A prime requirement is that all turf grass and landscape areas shall be planted, and that all turf grass areas shall show an even, healthy stand of grass seedlings and which shall have been mown twice. If such criteria are met to the satisfaction of the Landscape Architect, a written notification shall be issued to the Owner establishing the effective beginning date of maintenance period.

D. Any day of improper maintenance, as determined by the Landscape Architect, shall not be credited as an acceptable maintenance period day. The maintenance period shall be extended on a daily basis if the work is not in accordance to the Plans and Specifications. Project shall not be segmented into maintenance areas or phases, unless authorization of the Landscape Architect is obtained.

E. Maintenance shall continue beyond the ninety (90) day maintenance period, as required, until final acceptance is given by the Landscape Architect.

F. Contractor shall provide protection to the project site during the maintenance period.

PART 2 PRODUCTS

2.01 GENERAL

A. The following organic amendments and fertilizers are to be used for bid price basis only. Specific amendments and fertilizers specification shall be made after rough grading operations are complete and soil samples are tested by the Contractor and approved by the Landscape Architect. The amounts listed in the Preparation section are considered minimum amounts for the project unless directed otherwise by the Landscape Architect.

2.02 ORGANIC SOIL AMENDMENTS

A. Organic amendment shall be nitrogen stabilized wood residual containing 0.56 to 0.84% N based on dry weight.

B. Particle Size:
   1. 95-100% passing 6.35 mm standard sieve
   2. 80-100% passing 2.33 mm standard sieve

C. Salinity: The saturation extract conductivity shall not exceed 3.5 milliohms/centimeter at 25 degrees centigrade as determined by the saturation extract method.

D. Iron content: Minimum 0.08% dilute acid soluble Fe on dry weight basis.

E. Ash: 0-6.0% (dry weight).

F. As available from:
   1. Redi-Grow Corporation
      8909 Elder Creek Road
      Sacramento, CA 95828
      (916) 381-6063
      (800) 654-4358
      OR

   OR

2. American Soil & Stone
   565A Jacoby Street
   San Rafael, CA 94901
   (415) 456-1381
   OR
3. L.H. Voss Materials, Inc.
   5965 Dougherty Rd
   Dublin, CA 94568
   (925) 560-9920

2.03 SOIL AMENDMENTS

A. Soil Sulfur: Agricultural grade sulfur containing a minimum of 99% sulfur (expressed as elemental).

B. Iron Sulfate: 20% Iron (expressed as metallic iron), derived from ferric and ferrous sulphate, 10% sulfur (expressed as elemental).

C. Calcium Carbonate: 95% lime as derived from oyster shells.

D. Gypsum: Agricultural grade product containing 98% minimum calcium sulphate.

2.04 FERTILIZERS

A. Retain 1 bag of each type fertilizer on-site for inspection by Landscape Architect prior to disposal.

B. Planting Fertilizer: Pelleted or granular form shall consist of the following percentages by weight and shall be mixed by commercial fertilizer supplier:
   1. 16% nitrogen, 6% phosphoric acid, 8% potash

C. Planting Tablets:
   1. Shall be slow-release type with potential acidity of not more than 5% by weight containing the following percentages of nutrients by weight:
   2. 16% nitrogen
      a. 6% phosphoric acid
      b. 8% potash
      c. 2.6% combined calcium
      d. 1.6% combined sulfur
      e. 0.35% iron (elemental) from ferrous sulfate
      f. Planting tablets shall be one of the following:
         1) 21 gram tablets as manufactured by Agriform
         2) Best Tabs 7 gram tablets as manufactured by GroPower
      g. Planting tablets shall be applied per manufacturer’s instructions.

D. Sulphate of Potash: 0-0-50.

E. Single Super phosphate: Commercial product containing 18-20% available Phosphoric Pentoxide, or equal.

F. Urea Formaldehyde: 38-0-0.

G. Slow-release maintenance landscape fertilizer shall be "GroPower Controlled Release Nitrogen 12-8-8" 6-8 month formulation:
   1. 12% nitrogen, 8% phosphoric acid, 8% potash

2.05 SOIL

A. Topsoil: Site to be rough graded to elevations shown on Civil Drawings. Top soil is required behind curb areas. Top soil is required in all planting areas to a minimum depth of 9”. Provide on-site, import, or non-processed topsoil in planting areas as needed to complete rough grading which is fertile, friable and natural. Topsoil shall be from agricultural sources, surface soil, reasonably free of subsoil, clay lumps, brush, weeds and other litter, and free of roots, stumps,

stones larger than 1" in any dimension, and other extraneous or toxic matter harmful to plant growth.

B. All topsoil to be used for planting, regardless of whether import or on-site in origin, shall be tested as described in this Section.

C. Import Topsoil: ASTM D 5268 topsoil, with pH range of 5.5 to 7.5, a minimum of 4 percent organic material content. Mix topsoil with the following soil amendments in the following quantities to produce planting soil:
   1. Coarse Sand:
      Particle Size Range: 0.5-2.0 mm
      Max. % weight: 15
      Min. % weight: 0
   2. Silt Plus Clay
      Particle Size Range: <0.05 mm
      Max. % weight: 50
      Min. % weight: 25
   3. Silt
      Particle Size Range: 002-0.05 mm
      Max. % weight: 30
      Min. % weight: 10
   4. Clay
      Particle Size Range: 0-.002 mm
      Max. % weight: 25
      Min. % weight: 10
   5. Gravel
      Particle Size Range: 2-13 mm
      Max. % weight: 15
      Min. % weight: 0
   6. Rock
      Particle Size Range: >1/2 inch
      Max. % weight: 10% by volume; None > 1 inch
      Min. % weight: 0
   7. Organic Matter
      Particle Size Range: n/a
      Max. % weight: 15
      Min. % weight: 0

D. Lightweight On-Structure Planting Soil
   1. Planting Soil: Rooflite Intensive
   2. As available from: Redi-Grow Corporation

2.06 MULCH

A. Mulch shall be walk-on shredded fir bark mulch.

B. Physical properties:

1. Percent Passing	Sieve Size
90-100	1” Dia.
80-100	½” Dia.

C. Chemistry:

Acid in reaction, max. pH 5.0

Maximum ash Chemistry: 7% based on dry weight.

Minimum moisture 35% at time of delivery based on fresh weight.

D. As available from:
   1. Redi-Grow Corporation
      8909 Elder Creek Road

Sacramento, CA 95828
OR

2. L.H. Voss Materials, Inc.
   5965 Dougherty Rd
   Dublin, CA 94568
   (925) 560-9920

2.07 HERBICIDES

A. General: Herbicide, registered and approved by EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for project conditions and application. Do not use restricted herbicides unless authorized in writing by authorities having jurisdiction.

B. Pre-Emergent Herbicide (Selective and Non-Selective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.

C. Post-Emergent Herbicide (Selective and Non-Selective): Effective for controlling weed growth that has already germinated.
   1. Roundup (Glyphosate)
   2. Approved Equal

2.08 PLANT MATERIAL

A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features shown Drawings and complying with ANSI Z60.1 and in accordance with California State Department of Agricultural regulations for nursery inspections, rules and ratings; and with healthy root systems. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.
   1. Trees with damaged, crooked, or multiple leaders; tight vertical branches where bark is squeezed between two branches or between branch and trunk ("included bark"); crossing trunks; cut-off limbs more than 3/4 inch in diameter; or with stem girdling roots will be rejected.
   2. Collected Stock: Do not use plants harvested from the wild, from native stands, from an established landscape planting, or not grown in a nursery unless otherwise indicated.
   3. Plants of a larger size may be used if acceptable to Landscape Architect, with a proportionate increase in size of roots or balls.

B. Labeling: Label at least one plant of each variety, size, and caliper with a securely attached, waterproof tag bearing legible designation of common name and full scientific name, including genus and species. Include nomenclature for hybrid, variety, or cultivar, if applicable for the plant as shown on Drawings.

C. If formal arrangements or consecutive order of plants is shown on Drawings, select stock for uniform height and spread, and number the labels to assure symmetry in planting.

D. The minimum acceptable planted height of 15 gallon trees is 6’-6”.

E. Provide single stem trees except where special forms are shown or listed.

2.09 LANDSCAPE FABRIC

A. Nonwoven Geotextile Filter Fabric: Polypropylene or polyester fabric, 3.5oz./sq. yd. minimum, composed of fibers formed into a stable network so that fibers retain their relative position. Fabric shall be inert to biological degradation and resist naturally-encountered chemicals, alkalis, and acids.

2.10 LANDSCAPE EDGINGS

A. Concrete edger: Standard gray concrete.

2.11 TREE STABILIZATION

A. Tree stakes
   1. Lodge Pole Stake

a. Sound new lodge pole pine 2" minimum diameter with minimum height (above ground) of 6'-0" for 5 gallon container and 8'-0" for 15 gallon container. Stakes shall have been treated with copper napthanate to a minimum wood depth of 1/16". All stakes shall be free of knots larger then 1/2" in diameter, holes and other defects.
b. Tree Straps: VIT "Cinch-tie" tree straps. Tree straps shall be attached to tree stake as shown in staking detail on the plans.

2.12 DECOMPOSED GRANITE

A. Decomposed granite with stabilizer soil additive.

2.13 COBBLE/ROCK

A. Hard, durable stone, washed free of loam, sand, clay, and other foreign substances, of following type, size range, and color:
1. Type: Limestone, crushed rock
a. Size Range: 1.5" - 3"
b. Color: blue, gray

2.14 SAND

A. Washed silica sand.

2.15 PLANTER DRAINAGE ROCK

A. Drainage rock to be 1/4" pea gravel and shall be clean, hard, durable, uniform in quality and free of any detrimental quantity of soft friable, thin, elongated, or laminated pieces, organic matter, oil, alkali, or other deleterious substance.

2.16 SYNTHETIC TURF

A. Turf:
1. Yarn: Polyethylene monofilament, memory fiber. Color: Primary Field/ Olive; Secondary Turf green/ dark tan. Construction: Knitted. Blade height: 1.75". Total Weight: 110 ounce. Backing: Primary: 18 pic reinforced tri-component; Secondary: 50 ounce polyurethane, with 4 ounce non-woven geotex laminate. Infil: 1/2 pound sand/ rubber mix.
2. Available manufacturers:
a. Forever Lawn Select EL by Dupont*
1) Available through Forever Lawn West
Phone: (866) 369-4727
www.foreverlawn.com
FieldTurf USA, Inc.
b. SynFescue 354 by SYNLawn
1) Available through SYNLawn Northern CA
Phone: (530)583-4548
www.gosynlawn.com/
c. Or Approved Equal
Asterisk (*) indicates manufacturer(s) used as Basis of Design

PART 3 EXECUTION

3.01 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.
1. Protect adjacent and adjoining areas from hydroseeding overspray.
2. Protect grade stakes set by others until directed to remove them.

B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

C. Soil Preparation
1. All planting areas shall have a minimum of nine inches of clean topsoil. Soil shall be cleared of all stones, stumps, debris, etc. larger than 1 inch in diameter, that are brought to the surface as a result of cultivation.

a. Cultivation shall be by rototilling or ripping equipment.
b. After approximate finished grades have been established, soil shall be conditioned and fertilized in the following manner:
    1) Amendments shall be uniformly spread and cultivated thoroughly by means of mechanical tiller into the top six inches of soil.
    2) The following organic soil amendments and fertilizer rates, and quantities are minimums and are to be used for bid basis only. Specific rates and quantities will be made after rough grading operations are complete and soil samples are tested by the Contractor and approved by the Landscape Architect.
    3) Application rates: (Per 1,000 square feet)
        (a) Organic amendment- six cubic yards for groundcover and shrub areas; three cubic yards for lawn areas.
        (b) Fertilizer- 15 lbs.
        (c) Gypsum- 200 lbs.
        (d) Soil sulphur- 20 lbs.
        (e) Iron- 2 lbs.
        (f) Calcium carbonate- 2 lbs.

D. Loosen subgrade of planting areas to a minimum depth of 9 inches. Remove stones larger than 1 inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them offsite.

E. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit finish grading to areas that will be planted within 24 hours.

F. Parking Lot Planters:
1. All aggregate base rock, and other non-organic materials shall be removed from all parking lot planter areas down to the level of native soil. Backfill planters to specified finish grade with native or approved topsoil, and amend as specified.

G. Final Grades:
1. The following areas shall be graded so that the final grades shall be established below adjacent paved areas, sidewalks, valve boxes, headers, clean outs, drains, manholes, etc. as follows:
    a. Shrub/groundcover areas: 2-1/2 inches.
    b. Sod areas: 1-1/2 inches.
    c. Surface drainage shall be away from all building foundations, 2% minimum.
    d. Legally dispose of excess or unacceptable soil from the site at no expense to the Owner.

H. Synthetic Turf: Sub-base leveling must be complete prior to installation of aggregate base. Sub-base must drain well. Compaction of aggregate base shall be 95%.

I. Before planting, obtain Landscape Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.02 PRE-PLANT WEED CONTROL

A. Irrigate all areas to be planted for 7 days to achieve weed germination.

B. Spray all weeds with a non-selective systemic contact herbicide, as recommended and applied by and approved licensed landscape pest control advisor and applicator. Leaved sprayed plants intact for at least fourteen days. Continue to irrigate during this period, after the initial 48 hours. Clear and remove these existing weeds by grubbing off all plant parts at least a 1/4 inch below the soil surface in the entire area to be planted.

C. Apply a second application of herbicide to remaining weeds.

D. Planting may begin 24 hours after the second application has been completed.

3.03 EXCAVATION FOR TREES AND SHRUBS

A. Lay out individual tree and shrub locations and areas for multiple plantings. Stake locations, outline areas, adjust locations when requested, and obtain Landscape Architect's acceptance of layout before excavating or planting. Make minor adjustments as required.

B. Planting Pits and Trenches: Excavate circular planting pits. Create a roughened edge along the inside walls of the planting pit. Trim perimeter of bottom leaving center area of bottom raised slightly to support root ball and assist in drainage away from center. Do not further disturb base. Ensure that root ball will sit on undisturbed base soil to prevent settling.
   1. Excavate approximately three times as wide as ball diameter.
   2. Do not excavate deeper than depth of the root ball, measured from the root flare to the bottom of the root ball.
   3. If area under the plant was initially dug too deep, add soil to raise it to the correct level and thoroughly tamp the added soil to prevent settling.

C. Subsoil and topsoil removed from excavations may be used as planting soil, provided they meet the requirements of planting soil noted above.

D. Obstructions: Notify Architect if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.

E. Drainage: Notify Architect if subsoil conditions evidence unexpected water seepage or retention in tree or shrub planting pits.

F. Fill excavations with water and allow to percolate away before positioning trees and shrubs.

3.04 PLANTING

A. Set plant plumb and in center of planting pit or trench with root flare 1-inch above adjacent finish grades shrubs, vines and groundcover; 2- inches at trees.
   1. Use planting soil for backfill.
   2. Carefully remove root ball from container without damaging root ball or plant.
   3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
   4. Place planting tablets in each planting pit when pit is approximately one-half filled; in amounts recommended in soil reports from soil-testing laboratory. Place tablets beside the root ball about 1 inch from root tips; do not place tablets in bottom of the hole.
   5. Continue backfilling process. Water again after placing and tamping final layer of soil.

B. When planting on slopes, set the plant so the root flare on the uphill side is flush with the surrounding soil on the slope; the edge of the root ball on the downhill side will be above the surrounding soil. Apply enough soil to cover the downhill side of the root ball.

C. After installation and before Substantial Completion, remove all nursery tags, tie tape, labels, wire, and other debris from plant material, planting areas, and project site.

3.05 TREE STABILIZATION

A. Staking
   1. Stake trees of 2- through 5-inch caliper. Use stake of required length to penetrate at least 18 inches below bottom of backfilled excavation. Set stake to avoid penetrating root balls or root masses.
   2. Support trees with strap-bar OR tree straps. Allow enough slack to avoid rigid restraint of tree.

3.06 PLANTING IN PLANTERS

A. Place a layer of drainage gravel at least 4 inches thick in bottom of planter. Cover bottom with filter fabric and wrap filter fabric 4 inches up on all sides. Fill planter with lightweight on-structure planting soil. Place soil in lightly compacted layers to an elevation of 1-1/2 inches below top of planter, allowing natural settlement.

B. Top dress all planters with 1-inch layer of Pea Gravel

3.07 LANDSCAPE FABRIC

A. Place fabric below cobble/rock mulch or as indicated on drawings. Overlap all seams 12" minimum and pin down every 36".

3.08 MULCHING

A. Mulch all planting areas (except turf) to depth of 3".
   1. Do not place mulch within 3 inches of trunks or stems.

3.09 EDGING INSTALLATION

A. Concrete Edging: End of concrete edging shall meet flush and at 90º angle to abutting material, unless shown otherwise on plans. Height of edging shall not vary more than 1/2" over finish grade.

3.10 SYNTHETIC TURF INSTALLATION

A. The Contractor shall strictly adhere to specified procedures. Any variance from these requirements shall be provided in writing and submitted to the Landscape Architect and/or Owner, verifying that the changes do not in any way affect the Warranty. Infill materials shall be approved by the manufacturer and installed in accordance with the manufacturer's standard procedures.

B. Carpet rolls shall be installed directly over the properly prepared aggregate base. Care shall be taken to avoid disturbing the base compaction and planarity.

C. Seams shall be flat, tight, and permanent with no separation or fraying.

D. Infill Materials
   1. Infill materials shall be applied in thin lifts. The turf shall be brushed as the mixture is applied. Infill material shall be installed to depth determined by the manufacturer.

E. Upon completion of installation, the finished area shall be inspected by the Contractor, Manufacturer's representative and Landscape Architect.

F. Recycling: Manufacturer must commit to a "take back" program once the useful life of the turf surface has lapsed. Upon removal of the turf surface, at least 75% must be recycled.

3.11 HERBICIDE APPLICATION

A. Apply herbicide and other chemical products and biological control agents in accordance with authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.

B. Pre-Emergent Herbicides (Selective and Non-Selective): Apply to tree, shrub, and ground-cover areas in accordance with manufacturer's written recommendations. Do not apply to seeded areas.
   1. Post-Emergent Herbicides (Selective and Non-Selective): Apply only as necessary to treat already-germinated weeds and in accordance with manufacturer's written recommendations.

3.12 SATISFACTORY TURF

A. Turf installations shall meet the following criteria as determined by Landscape Architect:
   1. Satisfactory Sodded Turf: At end of maintenance period, a healthy, well-rooted, even-colored, viable turf has been established, free of weeds, open joints, bare areas, and surface irregularities.

B. Use specified materials to reestablish turf that does not comply with requirements and continue maintenance until turf is satisfactory.

3.13 MAINTENANCE

A. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, adjusting and repairing tree-stabilization devices, resetting to proper grades or vertical position, and performing other operations as required to establish healthy, viable plantings. Spray or treat as required to keep trees and shrubs free of insects and disease.

B. Thoroughly water to insure vigorous and healthy growth until work is accepted. Water in a manner to prevent erosion due to application of excessive quantities of water.

C. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace mulch materials damaged or lost in areas of subsidence.

D. Weeding
   1. Keep plant basins and areas between plants free of weeds. Control weeds with pre-emergent herbicides. If weeds develop, use legally approved herbicides. Avoid frequent soil cultivation that destroys shallow roots. Weeding also shall be included in all paved areas including public or private sidewalks.
   2. Apply a final application of pre-emergent herbicide at the end of the Maintenance Period, just prior to final acceptance.
   3. Pruning
      a. Trees: Prune trees to select and develop permanent scaffold branches; to eliminate narrow V-shaped branch forks that lack strength; to reduce toppling and wind damage by thinning out crowns; to maintain a natural appearance and to balance crown with roots. All trees shall be maintained and pruned in accordance with the accepted practices of the International Society of Aboriculture (ISA). Prune only as directed by the Landscape Architect.
      b. Shrubs: Same objectives as for trees. Shrubs shall not be clipped into balled or boxed forms unless such is required by the landscape plans. All pruning cuts shall be made to lateral branches, buds or flush with the trunk. Stubbing and heading shall not be permitted.
      c. Only skilled workers shall perform pruning work in accordance with standard horticultural pruning practices. Remove from the project all pruned branches and material. Remove and replace any plant material excessively pruned or malformed resulting from improper pruning practices at no additional costs to the owner.

E. Staking: Stakes shall remain in place through the guarantee period and shall be inspected and adjusted to prevent rubbing that causes bark wounds. Remove nursery stakes from all trees just prior to end of Maintenance Period, unless otherwise noted.
   1. Apply treatments as required to keep plant materials, planted areas, and soils free of pests and pathogens or disease. Use integrated past management practices whenever possible to minimize the use of pesticides and reduce hazards. Treatments include physical controls such as hosing off foliage, mechanical controls such as traps, and biological control agents.

F. Fertilization: Fertilize all planting areas, just prior to end of maintenance period with slow release maintenance fertilizer at manufacturer's recommended rate.

G. IRRIGATION SYSTEM
   1. System Observation: The Contractor shall check all systems for proper operation. Lateral lines shall be flushed out after removing the last sprinkler head or two at each end of the lateral. All heads are to be adjusted as necessary for unimpeded head to head coverage.
   2. Controllers: Set and program automatic controllers for seasonal water requirements. Give the Owner's Representative instructions on how to turn off system in case of emergency.
   3. Repairs: Repair all damages to irrigation system at the Contractor's expense. Repairs shall be made within twenty-four (24) hours.

3.14 CLEANUP AND PROTECTION

A. Promptly remove soil and debris from paved and vertical surfaces. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
   1. Erect temporary fencing, barricades and/or warning signs as required protecting newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established. Treat, repair, or replace damaged plantings.
   2. Remove non-degradable erosion-control measures after grass establishment period.

3. During planting, keep adjacent paving and construction clean and work area in an orderly condition.
4. Trash: Remove trash weekly in all planted areas, pedestrian walkways and parking areas.

3.15 FINAL ACCEPTANCE

A. Work under this section will be accepted by the Landscape Architect upon satisfactory completion of all work (including maintenance). Upon final acceptance, and written notification, the Owner will assume responsibility for maintenance of the work.

END OF SECTION

SECTION 41 3300
ODOR CONTROL

Control of odors emitting from trash compactors, trash bins and trash chutes.

PART 1 GENERAL

1.1 RELATION TO DIVISION 1

A. Drawings and applicable provisions of the General Conditions, Supplementary General Conditions and General Requirements in Division 1 govern work under this section.

B. Where contradictions occur between this section and Division 1, the more stringent of the two shall apply. The engineer shall decide which is more stringent.

1.2 SCOPE

A. This section includes specifications for a Piian Mini Vaporizer System, a small scale Vaporizer type odor control system for control of odors emitting from garbage compactors, garbage dumpsters and or garbage chutes. Included are the following topics:

1. Piian Mini Vaporizer Unit
2. Piian Odor Neutralizer – the odor neutralizing solution sprayed from the Mini Vaporizer unit.

1.3 RELATED WORK BY OTHERS

A. Section 14100 – Electrical Power Distribution, provide 115 vAC 15 Amp receptacle at Mini VAPORIZER location.

1.4 SUBMITTALS

A. Refer to Division 1, General Conditions, and Submittals.

B. Include manufacturer cuts sheets, dimensions, capacities, options included, materials of construction, ratings, weights, motors, installation instructions, startup instructions, operating instructions and maintenance instructions.

1.5 QUALITY ASSURANCE

A. Manufacturer to have minimum 5 years experience producing products specified in the section and be able to provide adequate references of other buildings or sites implementing this type of odor control technology.

B. Installer to be approved by manufacturer and have minimum 5 years experience working with this type of equipment.

1.6 WARRANTY

A. Furnish manufacturers standard one-year warranty for equipment and extended warranty provisions for odor neutralizer consumption.

PART 2 PRODUCTS

2.1 GENERAL

B. System to operate with minimum dripping and not to cause wetting or other moisture related problems.

C. System to produce a uniform “VAPOR” of 5 Micron (mean) sized fluid droplets.

D. System to be industrial quality construction suitable for constant operation.

E. System to dispense Piian all natural odor neutralizer solution only.

F. Odor neutralizer solution to have independent laboratory test data, which confirms odor reduction, safety and toxicity properties.

G. Odor neutralizer solution to be non-hazardous, non-flammable, non-toxic, non-corrosive and water-soluble.

2.2 PIIAN MINI VAPORIZER SPRAY UNIT

A. Ultrasonic vaporizing nozzle and tube.
B. 115-vAC 1PH 60 Hz 1/3 HP air compressor motor.
C. One year between scheduled refills.
D. NEMA 4X electrical enclosure with clear Lexan lockout cover.
E. Custom designed electronic circuit control board with easy to use programming and operation buttons.
F. Automatic shut down upon freezing conditions.
G. Digital display timer independent set buttons for time off and time on.
H. Low tan alert and tank empty alarm.
I. 304L stainless steel chassis and cabinet construction with wall mount flanges.
J. 5-gallon container capacity lower cabinet.
K. Lockable cabinet door.

2.3 PIIAN ODOR NEUTRALIZER

A. All natural components and formulation.
B. Completely derived from essential oils and plant extracts.
C. All contents GRAS by FDA (generally recognized as safe).
D. Product is to destroy common odorous gases and compounds by absorbing and biodegrading action.
E. Product to have no added fragrance or masking properties.
F. Provide independent laboratory test data conforming destructive properties relating to common odorous gases and compounds.
G. Independent laboratory test data confirmation of safety and toxicity properties.
H. Product to be non-hazardous, non-toxic, non-flammable and non-volatile.
I. Product must be water-soluble.
J. Must not require special handling or packaging, spills capable of being flushed with water to drain.

PART 3 EXECUTION

3.1 INSTALLATION

A. Mini Vaporizer Unit to be mounted on a wall close to odor source, vapor outlet to be positioned to deliver odor neutralizer directly at odor source.
B. Installer to read installation instructions supplied with Mini Vaporizer Unit.
C. Mini Vaporizer System to be started up by installer and cycling function adjusted to provide suitable level of odor control.
D. Installer to brief building owner / operation on function and operation principles of Mini Vaporizer Unit.

END OF SECTION

SECTION 41 6323
TRASH BIN TOWING TUG

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The general provisions of the contract, including General and Supplementary Conditions and Division 1, General Requirements, apply to the work specified in this section.

1.02 DESCRIPTION

A. Furnish Waste Caddy Dumpster Mover as manufactured by DJ Products, Inc. as specified below.

1.03 SUBMITTALS

A. Catalog Cuts: Before the Waste Caddy is delivered to the job site, submit catalog cuts to the Architect in accordance with these specifications, showing all details of the product and all requirements for work by other trades

B. Product Data: Manufacturer's product specifications, standard details and recommendations for project conditions; indicate selected sizes and installation details specific to the project.

1.04 OPERATION AND MAINTENANCE DATA

A. Warranty Documents: Issued and executed by the manufacturer and distributor.

1.05 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer: Minimum five (5) years-documented experience producing products specified in this section.
2. Distributor: Approved by the Manufacture, and having a minimum of five (5) years experience.

1.06 RELATED WORK BY OTHERS SPECIFIED ELSEWHERE

A. The following work is excluded from the scope of work in this section 14 and is included in other divisions of the specifications for inclusion in the scope of work of others.

1. Welding or bolting bin hitch(s) to trash bin(s) or dumpster(s)

1.07 WARRANTY

A. Manufacturer's warranty: Furnish manufacturer's standard one (1) year warranty from date of temporary certificate of occupancy or similar, locally mandated permission to use the project common areas for their intended use. Warranty shall apply to defects in product workmanship and materials.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Acceptable manufacturers: DJ Products, Inc.

B. Substitutions: Not permitted.

C. Components & Features:

1. Tubular Steel Frame
2. 1500 lb. Differential/transaxle
3. Electronic Speed Controller
4. Neutral throttle braking.
5. Adjustable acceleration/braking
6. (3) 36 Volt 115 Amp batteries
7. Variable Speed Twist Grip
8. 0-3 mph forward/reverse
9. Non-marking tires.
10. Battery discharge indicator
11. Automatic Charger

PART 3 - EXECUTION

3.01 DEMONSTRATION

A. Arrange demonstration of system operation, conducted by manufacturer's representative, to Owner's maintenance personnel.

END OF SECTION