SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

B. Related Sections:

1. Division 01 Section "Product Requirements" for administrative procedures for handling requests for substitutions made after Contract award.

1.3 MINOR CHANGES IN THE WORK

A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710, "Architect's Supplemental Instructions."

1.4 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
2. Within time specified in Proposal Request or 20 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.

    a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
    b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
    c. Include costs of labor and supervision directly attributable to the change.
    d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and

finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

e. Quotation Form: Use CSI Form 13.6B "Proposal Worksheet Summary" and 13.6C "Proposal Worksheet Detail"

B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to [Architect].

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Division 01 Section "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
7. Proposal Request Form: Use CSI Form 13.6A "Change Order Request (Proposal)" with attachments CSI Form 13.6B "Proposal Worksheet Summary" and 13.6C "Proposal Worksheet Detail".

1.5 ADMINISTRATIVE CHANGE ORDERS

A. Allowance Adjustment: Refer to Division 01 Section "Allowances" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect actual costs of allowances.

B. Unit Price Adjustment: Refer to Division 01 Section "Unit Prices" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect measured scope of unit price work.

1.6 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on County provided document.

1.7 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G71. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.

1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012600

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.

B. Related Sections:

1. Division 31 Section "Earth Moving" for drainage fill under slabs-on-grade.

1.2 SUBMITTALS

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

B. Design Mixtures: For each concrete mixture.

C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement.

D. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork.

E. Welding certificates.

F. Material certificates.

G. Material test reports.

H. Floor surface flatness and levelness measurements.

1.3 QUALITY ASSURANCE

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

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

B. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M, "Structural Welding Code - Reinforcing Steel."

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

1. ACI 301, "Specifications for Structural Concrete,"
2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

E. Concrete Testing Service: County shall engage the service of a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

F. Preinstallation Conference: Conduct conference at Project Site.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

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

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

2.2 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 60 percent.

B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 deformed or

1. Galvanized Reinforcing Bars: ASTM A 767/A 767M, Class II zinc coated after fabrication and bending.
2. Epoxy-Coated Reinforcing Bars: ASTM A 775/A 775M, epoxy coated, with less than 2 percent damaged coating in each 12-inch bar length.

C. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from as-drawn steel wire into flat sheets.

D. Deformed-Steel Welded Wire Reinforcement: ASTM A 497/A 497M, flat sheet.

E. Galvanized-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from galvanized-steel wire into flat sheets.

F. Epoxy-Coated Welded Wire Reinforcement: ASTM A 884/A 884M, Class A coated, Type 1, deformed steel.

G. 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.

2.3 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 I or Type II.

B. Normal-Weight Aggregates: ASTM C 33, graded.

1. Maximum Coarse-Aggregate Size: 1-1/2 inches nominal (Footings).
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Water: ASTM C 94/C 94M and potable.

2.4 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260.

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

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.5 WATERSTOPS

A. Flexible Rubber Waterstops: CE CRD-C 513, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.

B. Chemically Resistant Flexible Waterstops: Thermoplastic elastomer rubber waterstops for embedding in concrete to prevent passage of fluids through joints; resistant to oils, solvents, and chemicals. Factory fabricate corners, intersections, and directional changes.

C. Flexible PVC Waterstops: CE CRD-C 572, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.

D. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 inch.

E. Self-Expanding Rubber Strip Waterstops: Manufactured rectangular or trapezoidal strip, bentonite-free hydrophilic polymer modified chloroprene rubber, for adhesive bonding to concrete, 3/8 by 3/4 inch.

2.6 VAPOR RETARDERS

A. Sheet Vapor Retarder: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape.

B. Sheet Vapor Retarder: Polyethylene sheet, ASTM D 4397, not less than 10 mils thick.

2.7 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

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

D. Water: Potable.

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

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

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

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

2.8 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 175, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.

2.9 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 less than 40 percent.

C. Admixtures: Use admixtures according to manufacturer's written instructions. Mix Design shall be submitted to Architect and Engineer.

D. Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 3000 psi at 28 days.
2. Maximum Water-Cementitious Materials Ratio: 0.55 for all slabs, walls and columns and 0.60 or less for all foundations.
3. Slump Limit: 5 inches at point of placement
4. Air Content: 5.5 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size.

2.10 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.11 CONCRETE MIXING

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

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

PART 3 - EXECUTION

3.1 FORMWORK

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

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

3.2 EMBEDDED ITEMS

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

3.3 VAPOR RETARDERS

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.

1. Lap joints 6 inches and seal with manufacturer's recommended tape.

3.4 STEEL REINFORCEMENT

A. 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.

3.5 JOINTS

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

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

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. 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 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.

E. Waterstops: Install in construction joints and at other joints indicated according to manufacturer's written instructions.

3.6 CONCRETE PLACEMENT

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

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

C. Cold-Weather Placement: Comply with ACI 306.1.

D. Hot-Weather Placement: Comply with ACI 301.

3.7 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

C. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.

3.8 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 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 Curing: Keep surfaces continuously moist for not less than seven days.
2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, 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.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

    a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer.

4. 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.

3.9 CONCRETE SURFACE REPAIRS

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

3.10 FIELD QUALITY CONTROL

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

END OF SECTION 033000

SECTION 051200 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Structural steel.
2. Grout.

B. Related Sections:
1. Division 05 Section "Metal Stairs."

1.3 DEFINITIONS

A. Structural Steel: Elements of structural-steel frame, as classified by AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

B. Seismic-Load-Resisting System: Elements of structural-steel frame designated as "SLRS" or along grid lines designated as "SLRS" on Drawings, including columns, beams, and braces and their connections.

C. Protected Zone: Structural members or portions of structural members indicated as "Protected Zone" on Drawings. Connections of structural and nonstructural elements to protected zones are limited.

D. Demand Critical Welds: Those welds, the failure of which would result in significant degradation of the strength and stiffness of the Seismic-Load-Resisting System and which are indicated as "Demand Critical" or "Seismic Critical" on Drawings.

1.4 PERFORMANCE REQUIREMENTS

A. Connections: Provide details of simple shear connections required by the Contract Documents to be selected or completed by structural-steel fabricator to withstand ASD service loads indicated and comply with other information and restrictions indicated.

1. Select and complete connections using schematic details indicated.

1.5 SUBMITTALS

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

B. Shop Drawings: Show fabrication of structural-steel components.

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
2. Include embedment drawings.
3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.
5. Identify members and connections of the seismic-load-resisting system.
6. Indicate locations and dimensions of protected zones.
7. Identify demand critical welds.

C. Welding certificates. Refer to title sheet and structural drawings.

D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

E. Mill test reports for structural steel, including chemical and physical properties.

F. Product Test Reports: For the following:

1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
2. Direct-tension indicators.
3. Tension-control, high-strength bolt-nut-washer assemblies.
4. Shear stud connectors.
5. Shop primers.
6. Nonshrink grout.

G. Source quality-control reports.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD.

B. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category ACSE.

C. Shop-Painting Applicators: Qualified according to AISC's Sophisticated Paint Endorsement P1, P2, P3 or SSPC-QP 3, "Standard Procedure for Evaluating Qualifications of Shop Painting Applicators."

D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1. Welders and welding operators performing work on bottom-flange, demand-critical welds shall pass the supplemental welder qualification testing, as required by AWS D1.8. FCAW-S and FCAW-G shall be considered separate processes for welding personnel qualification.

E. Comply with applicable provisions of the following specifications and documents:

1. AISC 303.
2. AISC 341 and AISC 341s1.
3. AISC 360.
4. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

F. Preinstallation Conference: Conduct conference at Project site.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.

1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.

1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
2. Clean and relubricate bolts and nuts that become dry or rusty before use.
3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

1.8 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

2.1 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 25 percent.

B. 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 the following:

1. W-Shapes: 60 percent.
2. Channels, Angles, M, S-Shapes: 60 percent.
3. Plate and Bar: 25 percent.
4. Cold-Formed Hollow Structural Sections: 25 percent.
5. Steel Pipe: 25 percent.
6. All Other Steel Materials: 25percent.

C. W-Shapes: ASTM A 992/A 992M.

D. Channels, Angles-Shapes: ASTM A 36/A 36M.

E. Plate and Bar: ASTM A 36/A 36M.

F. Corrosion-Resisting Structural-Steel Shapes, Plates, and Bars: ASTM A 588/A 588M, Grade 50 (345).

G. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B, structural tubing.

H. Corrosion-Resisting Cold-Formed Hollow Structural Sections: ASTM A 847/A 847M, structural tubing.

I. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B.

1. Weight Class: as indicated on plans.
2. Finish: as indicated on plans.

J. Steel Castings: ASTM A 216/A 216M, Grade WCB with supplementary requirement S11.

K. Steel Forgings: ASTM A 668/A 668M.

L. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

A. High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, (ASTM A 563M, Class 8S) heavy-hex carbon-steel nuts; and ASTM F 436 (ASTM F 436M), Type 1, hardened carbon-steel washers; all with plain finish.

1. Direct-Tension Indicators: ASTM F 959, Type 325 (ASTM F 959M, Type 8.8), compressible-washer type with plain finish.

B. High-Strength Bolts, Nuts, and Washers: ASTM A 490 (ASTM A 490M), Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade DH, (ASTM A 563M, Class 10S) heavy-hex carbon-steel nuts; and ASTM F 436 (ASTM F 436M), Type 1, hardened carbon-steel washers with plain finish.

1. Direct-Tension Indicators: ASTM F 959, Type 490 (ASTM F 959M, Type 10.9), compressible-washer type with plain finish.

C. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.

D. Unheaded Anchor Rods: ASTM F 1554, Grade 36.

1. Configuration: as indicated on plans.
2. Nuts: ASTM A 563 (ASTM A 563M) heavy-hex carbon steel.
3. Plate Washers: ASTM A 36/A 36M carbon steel.
4. Washers: ASTM F 436 (ASTM F 436M), Type 1, hardened carbon steel.
5. Finish: Plain.

E. Headed Anchor Rods: ASTM F 1554, Grade 36 straight.

1. Nuts: ASTM A 563 (ASTM A 563M) hex carbon steel.
2. Plate Washers: ASTM A 36/A 36M carbon steel.
3. Washers: ASTM F 436 (ASTM F 436M), Type 1, hardened carbon steel.
4. Finish: Plain.

F. Threaded Rods: ASTM A 36/A 36M.

1. Nuts: ASTM A 563 (ASTM A 563M) hex carbon steel.
2. Washers: ASTM F 436 (ASTM F 436M), Type 1, hardened carbon steel.
3. Finish: Plain.

2.3 PRIMER

A. Primer: SSPC-Paint 25, Type II, zinc oxide, alkyd, linseed oil primer.

B. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.

2.4 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 and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.5 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC 360.

1. Camber structural-steel members where indicated.
2. Fabricate beams with rolling camber up.
3. Identify high-strength structural steel according to ASTM A 6/A 6M and maintain markings until structural steel has been erected.
4. Mark and match-mark materials for field assembly.
5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.

C. Bolt Holes: Cut, drill punch standard bolt holes perpendicular to metal surfaces.

D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

E. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

F. Steel Wall-Opening Framing: Select true and straight members for fabricating steel wall-opening framing to be attached to structural steel. Straighten as required to provide uniform, square, and true members in completed wall framing.

G. Welded Door Frames: Build up welded door frames attached to structural steel. Weld exposed joints continuously and grind smooth. Plug-weld fixed steel bar stops to frames. Secure removable stops to frames with countersunk machine screws, uniformly spaced not more than 10 inches (250 mm) o.c. unless otherwise indicated.

H. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel framing members.

1. Cut, drill, or punch holes perpendicular to steel surfaces.
2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.6 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: Snug tightened.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

2.7 SHOP PRIMING

A. Shop prime steel surfaces except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches (50 mm).
2. Surfaces to be field welded.
3. Surfaces to be high-strength bolted with slip-critical connections.
4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
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."
3. SSPC-SP 7/NACE No. 4, "Brush-Off Blast Cleaning."
4. SSPC-SP 11, "Power Tool Cleaning to Bare Metal."
5. SSPC-SP 14/NACE No. 8, "Industrial Blast Cleaning."
6. SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
7. SSPC-SP 10/NACE No. 2, "Near-White Blast Cleaning."
8. SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning."
9. SSPC-SP 8, "Pickling."

C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils (0.038 mm). Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

D. Painting: Prepare steel and apply a one-coat, nonasphaltic primer complying with SSPC-PS Guide 7.00, "Painting System Guide 7.00: Guide for Selecting One-Coat Shop Painting Systems," to provide a dry film thickness of not less than 1.5 mils (0.038 mm).

2.8 SOURCE QUALITY CONTROL

A. Testing Agency: Owner will engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports.

1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

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

C. 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."

D. Welded Connections: In addition to visual inspection, shop-welded connections will be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

1. Liquid Penetrant Inspection: ASTM E 165.
2. 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.
3. Ultrasonic Inspection: ASTM E 164.
4. Radiographic Inspection: ASTM E 94.

E. In addition to visual inspection, shop-welded shear connectors will be tested and inspected according to requirements in AWS D1.1/D1.1M for stud welding and as follows:

1. Bend tests will be performed if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
2. Tests will be conducted on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1/D1.1M.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify, with steel Erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.

1. Prepare a certified survey of bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.

1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

3.3 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.

B. Base Bearing and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

1. Set plates for structural members on wedges, shims, or setting nuts as required.
2. Weld plate washers to top of baseplate.
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 plate before packing with grout.
4. Promptly pack grout solidly between bearing surfaces and 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.

C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure.
2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

E. Splice members only where indicated.

F. Do not use thermal cutting during erection.

G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

H. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

3.4 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
3. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.

3.5 PREFABRICATED BUILDING COLUMNS

A. Install prefabricated building columns to comply with AISC 360, manufacturer's written recommendations, and requirements of testing and inspecting agency that apply to the fire-resistance rating indicated.

3.6 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: 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/D1.1M.

1. In addition to visual inspection, field welds will be tested and inspected according to AWS D1.1/D1.1M 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. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:

1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.

2. Conduct tests on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1/D1.1M.

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

3.7 REPAIRS AND PROTECTION

A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780.

B. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

C. Touchup Painting: Cleaning and touchup painting are specified in Division 09 painting Sections.

END OF SECTION 051200

SECTION 054000 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Interior non-load-bearing wall framing.

1.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated.

   1. Deflection Limits: Design framing systems to withstand **design loads** without deflections greater than the following:
      a. Interior Non-Load-Bearing Framing: Horizontal deflection of **1/240** of the wall height.

1.3 SUBMITTALS

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

B. Shop Drawings: Show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners.

1.4 QUALITY ASSURANCE

A. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements.

B. Welding: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code--Sheet Steel."

C. Fire-Test-Response Characteristics: Where indicated, provide cold-formed metal framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

D. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."

PART 2 - PRODUCTS

2.1 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 **25** percent.

2.2 INTERIOR NON-LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
1. Flange Width: **1-5/8 inches**

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and same minimum base-metal thickness as steel studs.

C. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal and lateral loads.

D. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.

2.3 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members, unless otherwise indicated.

B. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.

C. Anchor Bolts: ASTM F 1554

D. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

E. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.

F. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.

1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

2.4 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: **ASTM A 780.**

B. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

C. Shims: Load bearing, high-density multimonomer plastic, nonleaching.

D. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch (6.4 mm) thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

PART 3 - EXECUTION

3.1 PREPARATION

A. Install load bearing shims or grout between the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations to ensure a uniform bearing surface on supporting concrete or masonry construction.

B. Install sealer gaskets to isolate the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations.

3.2 INSTALLATION, GENERAL

A. Install cold-formed metal framing according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions" and to manufacturer's written instructions unless more stringent requirements are indicated.

B. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened.

C. Install framing members in one-piece lengths.

D. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

E. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.

F. Install insulation, specified in Division 07 Section "Thermal Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

G. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.

H. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:

1. Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.3 INTERIOR NON-LOAD-BEARING WALL INSTALLATION

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.

B. Fasten both flanges of studs to **top and** bottom track, unless otherwise indicated. Space studs as follows:

1. Stud Spacing: **16 inches**

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.

1. Install single deflection tracks and anchor to building structure.
2. Install double deflection tracks and anchor outer track to building structure.

E. Install horizontal bridging in wall studs, spaced in rows indicated on Shop Drawings but not more than 48 inches (1220 mm) apart. Fasten at each stud intersection.

1. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
3. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable curtain-wall-framing system.

3.4 FIELD QUALITY CONTROL

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

B. Field and shop welds will be subject to testing and inspecting.

C. Testing agency will report test results promptly and in writing to Contractor and Architect.

D. Remove and replace work where test results indicate that it does not comply with specified requirements.

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

3.5 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 054000

SECTION 075423 - THERMOPLASTIC POLYOLEFIN (TPO) ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Adhered TPO membrane roofing system.
2. Mechanically fastened TPO membrane roofing system.

1.2 PERFORMANCE REQUIREMENTS

A. Energy Performance: Provide roofing system with initial Solar Reflectance Index not less than 78 when calculated according to ASTM E 1980, based on testing identical products by a qualified testing agency.

B. Energy Performance: Provide roofing system that is listed on the DOE's ENERGY STAR "Roof Products Qualified Product List" for low-slope roof products.

C. Energy Performance: Provide roofing system with initial solar reflectance not less than 0.70 and emissivity not less than 0.75 when tested according to CRRC-1.

1.3 SUBMITTALS

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

B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work.

C. Samples for Verification: For the following products:

1. Sheet roofing, of color specified.
2. 10 lb of aggregate ballast in gradation and color indicated.
3. Roof paver, full sized, in each color and texture required.

D. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.

1. Submit evidence of compliance with performance requirements.

E. Research/evaluation reports.

F. Field quality-control reports.

G. Maintenance data.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by membrane roofing system manufacturer to install manufacturer's product.

B. Source Limitations: Obtain components including fasteners for membrane roofing system from same manufacturer as membrane roofing.

C. Exterior Fire-Test Exposure: ASTM E 108, Class A; for application and roof slopes indicated, as determined by testing identical membrane roofing materials by a qualified testing agency. Materials shall be identified with appropriate markings of applicable testing agency.

D. Preinstallation Roofing Conference: Conduct conference at Project site.

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard or customized form, without monetary limitation, in which manufacturer agrees to repair or replace components of membrane roofing system that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 TPO MEMBRANE ROOFING

A. Fabric-Reinforced Thermoplastic Polyolefin Sheet: ASTM D 6878, internally fabric or scrim reinforced, uniform, flexible TPO sheet.

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

a. Carlisle SynTec Incorporated.
b. Custom Seal Roofing.
c. Firestone Building Products Company.
d. GAF Materials Corporation.
e. GenFlex Roofing Systems.
f. Johns Manville.
g. Mule-Hide Products Co., Inc.
h. Stevens Roofing Systems; Division of JPS Elastomerics.
i. Versico Incorporated.

2. Thickness: 60 mils nominal.

2.2 AUXILIARY MEMBRANE ROOFING MATERIALS

A. General: Auxiliary membrane roofing materials recommended by roofing system manufacturer for intended use, and compatible with membrane roofing.

1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.
2. Adhesives and sealants that are not on the exterior side of weather barrier shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

a. Plastic Foam Adhesives: 50 g/L.
b. Gypsum Board and Panel Adhesives: 50 g/L.
c. Multipurpose Construction Adhesives: 70 g/L.
d. Fiberglass Adhesives: 80 g/L.
e. Contact Adhesive: 80 g/L.
f. Other Adhesives: 250 g/L.
g. Single-Ply Roof Membrane Sealants: 450 g/L.
h. Nonmembrane Roof Sealants: 300 g/L.
i. Sealant Primers for Nonporous Substrates: 250 g/L.
j. Sealant Primers for Porous Substrates: 775 g/L.

B. Sheet Flashing: Manufacturer's standard unreinforced thermoplastic polyolefin sheet flashing, 55 mils thick, minimum, of same color as sheet membrane.

C. Bonding Adhesive: Manufacturer's standard.

D. Slip Sheet: Manufacturer's standard, of thickness required for application.

E. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch thick; with anchors.

F. Metal Battens: Manufacturer's standard, aluminum-zinc-alloy-coated or zinc-coated steel sheet, approximately 1 inch wide by 0.05 inch thick, prepunched.

G. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening membrane to substrate, and acceptable to membrane roofing system manufacturer.

H. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

2.3 WALKWAYS

A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway pads, approximately 3/16 inch thick, and acceptable to membrane roofing system manufacturer.

3.1 SUBSTRATE BOARD

A. Install substrate board with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt substrate boards together.

1. Fasten substrate board to top flanges of steel deck to resist uplift pressure at corners, perimeter, and field of roof according to membrane roofing system manufacturers' written instructions.

3.2 INSULATION INSTALLATION

A. Coordinate installing membrane roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.

B. Comply with membrane roofing system and insulation manufacturer's written instructions for installing roof insulation.

C. Install tapered insulation under area of roofing to conform to slopes indicated.

D. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inches or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.

E. Adhered Insulation: Install each layer of insulation and adhere to substrate as follows:

1. Prime surface of concrete deck with asphalt primer at rate of 3/4 gal./100 sq. ft. and allow primer to dry.
2. Set each layer of insulation in a solid mopping of hot roofing asphalt, applied within plus or minus 25 deg F of equiviscous temperature.
3. Set each layer of insulation in adhesive, firmly pressing and maintaining insulation in place.

F. Mechanically Fastened Insulation: Install each layer of insulation and secure to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.

1. Fasten insulation to resist uplift pressure at corners, perimeter, and field of roof.

G. Mechanically Fastened and Adhered Insulation: Install each layer of insulation and secure first layer of insulation to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.

1. Fasten first layer of insulation to resist uplift pressure at corners, perimeter, and field of roof.
2. Set each subsequent layer of insulation in a solid mopping of hot roofing asphalt, applied within plus or minus 25 deg F of equiviscous temperature.

3. Set each subsequent layer of insulation in adhesive, firmly pressing and maintaining insulation in place.

H. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches in each direction. Loosely butt cover boards together and fasten to roof deck.

1. Fasten cover boards to resist uplift pressure at corners, perimeter, and field of roof.

3.3 ADHERED MEMBRANE ROOFING INSTALLATION

A. Adhere membrane roofing over area to receive roofing and install according to membrane roofing system manufacturer's written instructions.

B. Accurately align membrane roofing and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

C. Bonding Adhesive: Apply to substrate and underside of membrane roofing at rate required by manufacturer and allow to partially dry before installing membrane roofing. Do not apply to splice area of membrane roofing.

D. In addition to adhering, mechanically fasten membrane roofing securely at terminations, penetrations, and perimeter of roofing.

E. Apply membrane roofing with side laps shingled with slope of roof deck where possible.

F. Seams: Clean seam areas, overlap membrane roofing, and hot-air weld side and end laps of membrane roofing and sheet flashings according to manufacturer's written instructions to ensure a watertight seam installation.

1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of sheet membrane.
2. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
3. Repair tears, voids, and lapped seams in roofing that does not comply with requirements.

3.4 MECHANICALLY FASTENED MEMBRANE ROOFING INSTALLATION

A. Mechanically fasten membrane roofing over area to receive roofing and install according to roofing system manufacturer's written instructions.

B. Accurately align membrane roofing and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

C. Mechanically fasten or adhere membrane roofing securely at terminations, penetrations, and perimeter of roofing.

D. Apply membrane roofing with side laps shingled with slope of roof deck where possible.

E. In-Seam Attachment: Secure one edge of TPO sheet using fastening plates or metal battens centered within membrane seam and mechanically fasten TPO sheet to roof deck.

F. Seams: Clean seam areas, overlap membrane roofing, and hot-air weld side and end laps of membrane roofing and sheet flashings according to manufacturer's written instructions to ensure a watertight seam installation.

1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of sheet membrane.
2. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
3. Repair tears, voids, and lapped seams in roofing that does not comply with requirements.

3.5 BASE FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.

B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.

E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.6 WALKWAY INSTALLATION

A. Flexible Walkways: Install walkway products in locations indicated. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

B. Roof-Paver Walkways: Install walkway roof pavers according to manufacturer's written instructions in locations indicated, to form walkways. Leave 3 inches of space between adjacent roof pavers.

3.7 FIELD QUALITY CONTROL

A. Testing Agency: County to engage a qualified testing agency to perform tests and inspections.

B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.

C. Repair or remove and replace components of membrane roofing system where inspections indicate that they do not comply with specified requirements.

SECTION 08710

DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Door Hardware, including electric hardware.
2. Storefront and entrance door hardware.
3. Digital keypad access control devices.
4. Key cabinets.

B. Related Sections:

1. Section 06200 - Finish Carpentry: Finish Hardware Installation
2. Section 07900 - Joint Sealers – exterior thresholds
3. Section 08100 - Metal Doors and Frames
4. Section 08240 - Integrated Security Systems
5. Section 08300 - Special Doors
6. Section 08400 - Entrances and Storefronts
7. Section 08900 - Glazed Curtain Walls
8. Section 10650 - Operable Partitions
9. Section 16200 - Electrical Power
10. Section 16722 - Fire/Life-Safety System
11. Section 16724 - Security Access Systems

C. Specific Omissions: Hardware for the following is specified or indicated elsewhere.

1. Windows.
2. Cabinets, including open wall shelving and locks.
3. Signs, except where scheduled.
4. Toilet accessories, including grab bars.
5. Installation.
6. Rough hardware.
7. Conduit, junction boxes & wiring.

8. Folding partitions, except cylinders where detailed.
9. Sliding aluminum doors, except cylinders where detailed.
10. Access doors and panels, except cylinders where detailed.
11. Corner Guards.
12. Wrought Iron railing gates and supports.

1.2 REFERENCES:

Use date of standard in effect as of Bid date.

A. American National Standards Institute – ANSI 156.18 – Materials and Finishes.
B. BHMA – Builders Hardware Manufacturers Association
C. DHI – Door and Hardware Institute
D. NFPA – National Fire Protection Association
   1. NFPA 80 – Fire Doors and Windows
   2. NFPA 105 – Smoke and Draft Control Door Assemblies
   3. NFPA 252 – Fire Tests of Door Assemblies
E. UL – Underwriters Laboratories
   1. UL10C – Positive Pressure Fire Tests of Door Assemblies.
   2. UL 305 – Panic Hardware
F. WHI – Warnock Hersey Incorporated
G. 2010 State of California Building Code
H. Local applicable codes
I. SDI – Steel Door Institute
J. WI – Woodwork Institute
K. AWI – Architectural Woodwork Institute
L. NAAMM – National Association of Architectural Metal Manufacturers

1.3 SUBMITTALS & SUBSTITUTIONS

A. SUBMITTALS: Submit six copies of schedule per Section 01330. Only submittals printed one sided will be accepted and reviewed. Organize vertically formatted schedule 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. Type, style, function, size, quantity and finish of hardware items.

2. Use BHMA Finish codes per ANSI A156.18.
3. Name, part number and manufacturer of each item.
4. Fastenings and other pertinent information.
5. Description of door location using space names and numbers as published in the drawings.
6. Explanation of abbreviations, symbols, and codes contained in schedule.
7. Mounting locations for hardware.
8. Door and frame sizes, handing, materials, fire-rating and degrees of swing.
9. List of manufacturers used and their nearest representative with address and phone number.
10. Catalog cuts.
11. Wiring Diagrams.
12. Manufacturer's technical data and installation instructions for electronic hardware.

B.

C. Bid and submit manufacturer's updated/improved item if scheduled item is discontinued.

D. Deviations: Highlight, encircle or otherwise identify deviations from "Schedule of Finish Hardware" on submittal with notations clearly designating those portions as deviating from this section.

E. If discrepancy between drawings and scheduled material in this section, bid the more expensive of the two choices, note the discrepancy in the submittal and request direction from Architect for resolution.

F. Substitutions per Division 1. Include product data and indicate benefit to the Project. Furnish operating samples on request.

G. Items listed with no substitute manufacturers have been requested by Owner to meet existing standard.

H. Furnish as-built/as-installed schedule with closeout documents, including keying schedule, wiring diagrams, manufacturers' installation, adjustment and maintenance information, and supplier's final inspection report.

1.4 QUALITY ASSURANCE:

A. Qualifications:

1. Hardware supplier: direct factory contract supplier who employs a certified architectural hardware consultant (AHC), available at reasonable times during course of work for project hardware consultation to Owner, Architect and Contractor.

    a) Responsible for detailing, scheduling and ordering of finish hardware. Detailing implies that the submitted schedule of hardware is correct and complete for the intended function and performance of the openings.

B. Hardware: Free of defects, blemishes and excessive play. Obtain each kind of hardware (latch and locksets, exit devices, hinges and closers) from one manufacturer.

C. Exit Doors: Operable from inside with single motion without the use of a key or special knowledge or effort.

D. Fire-Rated Openings: NFPA 80 compliant. Hardware UL10C / California State Fire Marshal Standard 12-7-4 (positive pressure) compliant for given type/size opening and degree of label. Provide proper latching hardware, non-flaming door closers, approved-bearing hinges, and resilient seals. Coordinate with wood door section for required intumescent seals. Furnish openings complete.

1. Note: scheduled resilient seals may exceed selected door manufacturer's requirements.

2. See 2.6.E for added information regarding resilient and intumescent seals.

E. Furnish hardware items required to complete the work in accordance with specified performance level and design intent, complying with manufacturers' instructions.

1.5 DELIVERY, STORAGE AND HANDLING:

A. Delivery: coordinate delivery to appropriate locations (shop or field).

1. Permanent keys and cores: secured delivery direct to Owner's representative.

B. Acceptance at Site: Items individually packaged in manufacturers' original containers, complete with proper fasteners and related pieces. Clearly mark packages to indicate contents, locations in hardware schedule and door numbers.

C. Storage: Provide securely locked storage area for hardware, protect from moisture, sunlight, paint, chemicals, dust, excessive heat and cold, etc.

1.6 PROJECT CONDITIONS AND COORDINATION:

A. Where exact types of hardware specified are not adaptable to finished shape or size of members requiring hardware, provide suitable types having as nearly as practical the same operation and quality as type specified, subject to Architect's approval.

B. Coordination: Coordinate hardware with other work. Furnish hardware items of proper design for use on doors and frames of the thickness, profile, swing, security and similar requirements indicated, as necessary for proper installation and function, regardless of omissions or conflicts in the information on the Contract Documents. Furnish related trades with the following information:

1. Location of embedded and attached items to concrete.
2. Location of wall-mounted hardware, including wall stops.
3. Location of finish floor materials and floor-mounted hardware.
4. Locations for conduit and raceways as needed for electrical, electronic and electro-pneumatic hardware items. Fire/life-safety system interfacing. Point-to-point wiring diagrams plus riser diagrams to related trades.
5. Manufacturer templates to door and frame fabricators.

C. Check Shop Drawings for doors and entrances to confirm that adequate provisions will be made for proper hardware installation. Do not order hardware until the submittal has been reviewed by the frame and door suppliers for compatibility with their products.

1.7 WARRANTY:

A. Part of respective manufacturers' regular terms of sale. Provide manufacturers' written warranties:

1.	Locksets:	Three years
2.	Extra Heavy Duty Cylindrical Lock:	Seven Years
3.	Exit Devices:	Three years mechanical One year electrical
4.	Closers:	Ten years mechanical Two years electrical
5.	Hinges:	One year
6.	Other Hardware	Two years

1.8 COMMISSIONING:

A. Conduct these tests prior to request for certificate of substantial completion:

1. With installer present, test door hardware operation with climate control system and stairwell pressurization system both at rest and while in full operation.
2. With installer, access control contractor and electrical contractor present, test electrical, electronic and electro-pneumatic hardware systems for satisfactory operation.
3. With installer and electrical contractor present, test hardware interfaced with fire/life-safety system for proper operation and release.

PART 2 PRODUCTS

2.1 MANUFACTURERS:

A. Listed acceptable alternate manufacturers: submit for review products with equivalent function and features of scheduled products.

ITEM:	MANUFACTURER:	ACCEPTABLE SUB:
Hinges	(IVE) Ives	Bommer
Continuous Hinges	(IVE) Ives	Zero
Key System	(SCH) Schlage	
Locks	(SCH) Schlage	
Exit Devices	(VON) Von Duprin	
Closers	(LCN) LCN	
Auto Flush Bolts	(IVE) Ives	DCI
Coordinators	(IVE) Ives	DCI
Silencers	(IVE) Ives	Hiawatha
Push & Pull Plates	(IVE) Ives	Hiawatha
Kickplates	(IVE) Ives	Hiawatha
Stops & Holders	(IVE) Ives	Hiawatha
Overhead Stops	(GLY) Glynn-Johnson	None available
Thresholds	(NGP) NGP	Zero
Seals & Bottoms	(NGP) NGP	Zero
Key Cabinets	(LUN) Lund	TelKee
Aluminum Door Locks	(ADA) Adams Rite	None
Signs	SBH) Specialized Builders Hardware	

2.2 HINGING METHODS:

A. Drawings typically depict doors at 90 degrees, doors will actually swing to maximum allowable. Use wide-throw conventional or continuous hinges as needed up to 8 inches in width to allow door to stand parallel to wall for true 180-degree opening. Advise architect if 8-inch width is insufficient.

B. Conform to manufacturer's published hinge selection standard for door dimensions, weight and frequency, and to hinge selection as scheduled. Where manufacturer's standard exceeds the scheduled product, furnish the heavier of the two choices, notify Architect of deviation from scheduled hardware.

C. Conventional Hinges: Steel or stainless steel pins and concealed bearings. Hinge open widths minimum, but of sufficient throw to permit maximum door swing.

1. Outswinging exterior doors: non-ferrous with non-removable (NRP) pins and security studs.

2. Non-ferrous material exteriors and at doors subject to corrosive atmospheric conditions.

D. Continuous Hinges:

1. Geared-type aluminum.

a) Use wide-throw units where needed for maximum degree of swing, advise architect if commonly available hinges are insufficient.

2.3 LOCKSETS, LATCHSETS, DEADBOLTS:

A. Mortise Locksets and Latchsets: as scheduled.

1. Chassis: cold-rolled steel, handing field-changeable without disassembly.

2. Latchbolts: 3/4 inch throw stainless steel anti-friction type.

3. Lever Trim: through-bolted, accessible design, cast lever or solid extruded bar type levers as scheduled. Filled hollow tube design unacceptable.

a) Spindles: security design independent breakaway. Breakage of outside lever does not allow access to inside lever's hubworks to gain wrongful entry.

4. Furnish solid cylinder collars with wave springs. Wall of collar to cover rim of mortise cylinder.

5. Thumbturns: accessible design not requiring pinching or twisting motions to operate.

6. Deadbolts: stainless steel 1-inch throw.

7. Electric operation: Manufacturer-installed continuous duty solenoid.

8. Strikes: 16 gage curved steel, bronze or brass with 1 inch deep box construction, lips of sufficient length to clear trim and protect clothing.

9. Scheduled Lock Series and Design: Schlage L series, 17A design.

10. Certifications:

    a) ANSI A156.13, 1994, Grade 1 Operational, Grade 1 Security.

    b) ANSI/ASTM F476-84 Grade 31 UL Listed.

B. Access Control Locks: as scheduled.

1. Schlage Electronics AD-200 MS MTK 8B series

2.4 EXIT DEVICES / PANIC HARDWARE

A. General features:

1. Independent lab-tested 1,000,000 cycles.

2. Push-through push-pad design. No exposed push-pad fasteners, no exposed cavities when operated. Return stroke fluid dampeners and rubber bottoming dampeners, plus anti-rattle devices.

3. 0.75-inch throw deadlocking latchbolts.

4. End caps: impact-resistant, flush-mounted. No raised edges or lips to catch carts or other equipment.

5. No exposed screws to show through glass doors.

6. Non-handed basic device design with center case interchangeable with all functions, no extra parts required to effect change of function.

7. Releasable in normal operation with 15-lb. maximum operating force per California State Fire Marshal Standard 12-10-3, and with 32 lb. maximum pressure under 250-lb. load to the door.

8. Exterior doors scheduled with XP-series devices: Static load force resistance of at least 2000 pounds.

9. Where devices span over door lite frame and the face of the selected lite manufacturer’s frame is raised from the face of the door, furnish panic hardware manufacturer’s fitted shims or glass-bead kits at no additional cost to the project.

10. Comply with CBC Section 1003.3.1.9.

B. Specific features:

1. Non-Fire Rated Devices: cylinder dogging.
2. Lever Trim: breakaway type, forged brass or bronze escutcheon min .130" thickness, compression spring drive, match lockset lever design.
3. Rod and latch guards with sloped full-width kickplates for doors fitted with surface vertical rod devices with bottom latches.
4. Fire-Labeled Devices: UL label indicating "Fire Exit Hardware". Vertical rod devices less bottom rod (LBR) unless otherwise scheduled.
5. Removable Mullions: Removable with single turn of building key. Securely reinstalled without need for key. Furnish storage brackets for securely stowing the mullion away from the door when removed.

2.5 CLOSERS

A. Surface Closers: [4041]

1. Full rack-and-pinion type cylinder with removable non-ferrous cover and cast iron body. Double heat-treated pinion shaft, single piece forged piston, chrome-silicon steel spring.
2. ISO 2000 certified. Units stamped with date-of-manufacture code.
3. Independent lab-tested 10,000,000 cycles.
4. Non-sized, non-handed, and adjustable. Place closer inside building, stairs, and rooms.
5. Plates, brackets and special templating when needed for interface with particular header, door and wall conditions and neighboring hardware.
6. Adjustable to open with not more than 5.0lbs pressure to open at exterior doors and 5.0lbs at interior doors. As allowed per California Building Code, Section 1133B.2.5, local authority may increase the allowable pressure for fire doors to achieve positive latching, but not to exceed 15lbs.
7. Separate adjusting valves for closing speed, latching speed and backcheck, fourth valve for delayed action where scheduled.
8. Extra-duty arms (EDA) at exterior doors scheduled with parallel arm units.
9. Exterior door closers: tested to 100 hours of ASTM B117 salt spray test, furnish data on request.
10. Exterior doors: seasonal adjustments not required for temperatures from 120 degrees F to -30 degrees F, furnish checking fluid data on request.

11. Non-flaming fluid, will not fuel door or floor covering fires.

12. Pressure Relief Valves (PRV) not permitted.

2.6 OTHER HARDWARE

A. Automatic Flush Bolts: Low operating force design.

B. Overhead Stops: Non-plastic mechanisms and finished metal end caps. Field-changeable hold-open, friction and stop-only functions.

C. Kick Plates: Four beveled edges, .050 inches minimum thickness, height and width as scheduled. Sheet-metal screws of bronze or stainless steel to match other hardware.

D. Door Stops: Provide stops to protect walls, casework or other hardware.

1. Unless otherwise noted in Hardware Sets, provide wall type with appropriate fasteners. Where wall type cannot be used, provide floor type. If neither can be used, provide overhead type.

2. Locate overhead stops for maximum possible opening. Consult with Owner for furniture locations. Minimum: 90deg stop / 95deg deadstop. Note degree of opening in submittal.

E. Seals: Finished to match adjacent frame color. Resilient seal material: polyurethane, polypropylene, nylon brush, silicone rubber or solid high-grade neoprene as scheduled. Do not furnish vinyl seal material. UL label applied to seals on rated doors. Substitute products: certify that the products equal or exceed specified material’s thickness and durability.

1. Proposed substitutions: submit for approval.

2. Solid neoprene: MIL Spec. R6855-CL III, Grade 40.

3. Non-corroding fasteners at in-swinging exterior doors.

4. Sound control openings: Use components tested as a system using nationally accepted standards by independent laboratories. Ensure that the door leafs have the necessary sealed-in-place STC ratings. Fasten applied seals over bead of sealant.

5. Fire-rated Doors, Resilient Seals: UL10C / UBC Standard 7-2 compliant. Coordinate with selected door manufacturers' and selected frame manufacturers' requirements. Where rigid housed resilient seals are scheduled in this section and the selected door manufacturer only requires an adhesive-mounted resilient seal, furnish rigid housed seal at minimum, or both the rigid housed seal plus the adhesive applied seal. Adhesive applied seals alone are deemed insufficient for this project where rigid housed seals are scheduled.

6. Fire-rated Doors, Intumescent Seals: Furnished by selected door manufacturer. Furnish fire-labeled opening assembly complete and in full compliance with UL10C / UBC Standard 7-2. Where required, intumescent seals vary in requirement by door type and door manufacture -- careful coordination required

F. Automatic door bottoms: low operating force units. Doors with automatic door bottoms plus head and jamb seals cannot require more than two pounds operating force to open when closer is disconnected.

G. Thresholds: As scheduled and per details. Comply with CBC Section 1133B.2.4.1. Substitute products: certify that the products equal or exceed specified material's thickness. Proposed substitutions: submit for approval.

1. Exteriors: Seal perimeter to exclude water and vermin. Use sealant complying with requirements in Division 7 "Thermal and Moisture Protection". Non-ferrous 1/4inch fasteners and lead expansion shield anchors, or Red-Head #SFS-1420 (or approved equivalent) Flat Head Sleeve Anchors (SS/FHSL).

2. Fire-rated openings, 90min or less duration: use thresholds to interrupt floor covering material under the door where that material has a critical radiant flux value less than 0.22 watts per square centimeter, per NFPA 253. Use threshold unit as scheduled. If none scheduled, request direction from Architect.

3. Fire-rated openings, 3hour duration: Thresholds, where scheduled, to extend full jamb depth.

4. Acoustic openings: Set units in full bed of Division-7-compliant, leave no air space between threshold and substrate.

5. Plastic plugs with wood or sheet metal screws are not an acceptable substitute for specified fastening methods.

6. Fasteners: Generally, exposed screws to be Phillips or Robertson drive. Pinned TORX drive at high security areas. Flat head sleeve anchors (FHSL) may be slotted drive. Sheet metal and wood screws: full-thread. Sleeve nuts: full length to prevent door compression.

H. Exposed Through-Bolts: Do not use SNB, grommet nuts, sleeve nuts or other such clamping type fasteners, intent is for minimal exposed hardware. Coordinate with wood doors; ensure provision of proper blocking to support wood screws for mounting panic hardware and door closers. Coordinate with metal doors and frames; ensure provision of proper reinforcement to support machine screws for mounting panic hardware and door closers.

I. Silencers: Interior hollow metal frames, 3 for single doors, 4 for pairs of doors. Omit where adhesive mounted seal occurs. Leave no unfilled/uncovered pre-punched silencer holes.

2.7 FINISH:

A. Generally BHMA 613 Oxidized and Oil Rubbed Bronze and Ingersoll Rand Aged Bronze 643E.

1. Areas using BHMA 626 to have push-plates, pulls and protection plates of BHMA 630, Satin Stainless Steel, unless otherwise noted.

B. Door closers: factory powder coated to match other hardware, unless otherwise noted.

2.8 KEYING REQUIREMENTS:

A. Key System: Schlage Classic keyway “111111” bitted

1. Owner will furnish and install primus cores.

2. Furnish 10 construction keys.

3. Furnish 2 construction control keys.

4. Key Cylinders: furnish 6-pin solid brass construction.

B. Cylinders/cores: keyed at factory of lock manufacturer where permanent records are maintained. Locksets and cylinders same manufacturer.

PART 3 - EXECUTION

3.1 ACCEPTABLE INSTALLERS:

A. Can read and understand manufacturers’ templates, suppliers’ hardware schedules and printed installation instructions. Can readily distinguish drywall screws from manufacturers’ furnished fasteners. Available to meet with manufacturers’ representatives and related trades to discuss installation of hardware.

3.2 PREPARATION:

A. Ensure that walls and frames are square and plumb before hardware installation. Make corrections before commencing hardware installation.

B. Locate hardware per SDI-100 and applicable building, fire, life-safety, accessibility, and security codes.

1. Notify Architect of code conflicts before ordering material.

2. Locate levers, key cylinders, t-turn pieces, touchbars and other operable portions of latching hardware between 30 inches to 44 inches above the finished floor, per CBC Section 1133B.2.5.1.

3. Where new hardware is to be installed near existing doors/hardware scheduled to remain, match locations of existing hardware.

C. Overhead stops: before installing, determine proposed locations of furniture items, fixtures, and other items to be protected by the overhead stop's action.

3.3 INSTALLATION

A. Install hardware per manufacturer’s instructions and recommendations. Do not install surface-mounted items until finishes have been completed on substrate. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate for proper installation and operation. Remove and reinstall or replace work deemed defective by Architect.

1. Gaskets: install jamb-applied gaskets before closers, overhead stops, rim strikes, etc; fasten hardware over and through these seals. Install sweeps across bottoms of doors before astragals, cope sweeps around bottom pivots, trim astragals to tops of sweeps.

2. When hardware is to be attached to existing metal surface and insufficient reinforcement exists, use RivNuts, NutSerts or similar anchoring device for screws.

3. Use manufacturers' fasteners furnished with hardware items, or submit Request for Substitution with Architect.

4. Replace fasteners damaged by power-driven tools.

B. Locate floor stops no more that 4 inches from walls and not within paths of travel. See paragraph 2.2 regarding hinge widths, door should be well clear of point of wall reveal. Point of door contact no closer to the hinge edge than half the door width. Where situation is questionable or difficult, contact Architect for direction.

C. Core concrete for exterior door stop anchors. Set anchors in approved non-shrink grout.

D. Locate overhead stops for minimum 90 degrees and maximum allowable degree of swing.

E. Drill pilot holes for fasteners in wood doors and/or frames. Centerpunch hole locations before using self-drilling type screws to prevent skating. Replace screws that are not centered in their holes.

F. Lubricate and adjust existing hardware scheduled to remain. Carefully remove and give to Owner items not scheduled for reuse.

3.4. ADJUSTING

A. Adjust and check for proper operation and function. Replace units, which cannot be adjusted to operate freely and smoothly.

1. Hardware damaged by improper installation or adjustment methods: repair or replace to Owner's satisfaction.

2. Adjust doors to fully latch with no more than 1 pound of pressure.

3. Adjust delayed-action closers on fire-rated doors to fully close from fully-opened position in no more than 10 seconds.

4. Adjust door closers per 1.9 this section.

B. Inspection: Use hardware supplier's consultant or consultant's agent. Include supplier's report with closeout documents.

C. Final inspection: Installer to provide letter to Owner that upon completion installer has visited the Project and has accomplished the following:

1. Re-adjust hardware.

2. Evaluate maintenance procedures and recommend changes or additions, and instruct Owner's personnel.

3. Identify items that have deteriorated or failed.

4. Submit written report identifying problems

3.5 DEMONSTRATION:

A. Demonstrate mechanical hardware and electrical, electronic and pneumatic hardware systems, including adjustment and maintenance procedures.

3.6 PROTECTION/CLEANING:

A. Cover installed hardware, protect from paint, cleaning agents, weathering, carts/barrows, etc. Remove covering materials and clean hardware just prior to substantial completion.

B. Clean adjacent wall, frame and door surfaces soiled from installation/reinstallation process.

3.7 SCHEDULE OF FINISH HARDWARE

A. See door schedule in drawings for hardware set assignments.

B. No hardware shall be ordered until Finished Hardware has been reviewed and approved by Architect's hardware consultant.

C. Miscellaneous Material.

SPECWORKS # 128650

HW SET: 01R
DOOR NUMBER:
001

EACH TO HAVE:

1	EA	PANIC HARDWARE	QEL3549A-EO	626	VON
1	EA	PANIC HARDWARE	QEL3549A-L-NL-17	626	VON
1	EA	RIM CYLINDER	20-057	613	SCH
1	EA	PRIMUS CORE ONLY	20-740 (OWNER FURNISHED AND INSTALLED)	606	SCH
1	EA	POWER SUPPLY	PS902		SCE
1	EA	POWER SUPPLY	PS902 2RS	GRY	VON
1	EA	CONTROLLER	CT5000		SCE
1	EA	READER	MTK15 READER WITH KEYPAD WALL MOUNT		SCE
1	EA	MEMO	BALANCE BY AUTO DOOR SUPPLIER		

VERIFY TYPE AND QUANTITY OF HARDWARE WITH THE AUTO DOOR SUPPLIER. USE MA490P SERIES MAGNETIC LOCKS IN LIEW OD QEL PANICS IF REQUIRED BY DOOR MANUFACTURER'S BREAK-A-WAY SYSTEM.

HW SET: 02R
DOOR NUMBER:
011

EACH TO HAVE:

1	EA	CONTINUOUS HINGE	224HD	313	IVE
1	EA	PANIC HARDWARE	XP98L 996L 643E	SPL	VON
1	EA	RIM CYLINDER	20-057	613	SCH
1	EA	PRIMUS CORE ONLY	20-740 (OWNER FURNISHED AND INSTALLED)	606	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH	695	LCN
1	SET	SEALS	9700E	DKB	NGP
1	EA	DOOR SWEEP	C627D	DKB	NGP
1	EA	THRESHOLD	513 1/4"-20 COMBO ANCHOR OR AS DETAILED	DKB	NGP
1		MEMO	MOUNT SEALS BEFORE INSTALLING CLOSER		

HW SET: 03
DOOR NUMBER:
017 018

EACH TO HAVE:

6	EA	HINGE	3CB1SH 4.5 X 4.5 NRP	600	IVE
1	EA	MULLION	KR9954	313	VON
1	EA	FIRE EXIT HARDWARE	22EO-F	313	VON
1	EA	FIRE EXIT HARDWARE	22NL-F	313	VON
1	EA	RIM CYLINDER	20-057	613	SCH
1	EA	MORTISE CYLINDER	20-061	613	SCH
2	EA	PRIMUS CORE ONLY	20-740 (OWNER FURNISHED AND INSTALLED)	606	SCH
1	EA	MULLION SEAL	5100S OPENING HEIGHT	BLK	NGP
2	EA	SURFACE CLOSER	4040XP SCUSH	695	LCN
1	SET	SEALS	9700E	DKB	NGP
2	EA	DOOR SWEEP	C627D	DKB	NGP
1	EA	THRESHOLD	513 1/4"-20 COMBO ANCHOR OR AS DETAILED	DKB	NGP
1		MEMO	MOUNT SEALS BEFORE INSTALLING CLOSER		

HW SET: 04
DOOR NUMBER:
004

EACH TO HAVE:

3	EA	HINGE	3CB1 4.5 X 4.5	641	IVE
1	EA	STOREROOM LOCK	L9080R 17A 643E	SPL	SCH
1	EA	PRIMUS CORE ONLY	20-740 (OWNER FURNISHED AND INSTALLED)	606	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH	695	LCN
1	SET	SEALS	5050B	BRN	NGP
1	SET	SEALS	9700E	DKB	NGP
1	EA	DOOR BOTTOM	220NDKB	DKB	NGP
1	EA	THRESHOLD	411 1/4"-20 COMBO ANCHOR OR AS DETAILED	DKB	NGP
1		MEMO	MOUNT SEALS BEFORE INSTALLING CLOSER		

USE TWO JAMB SEALS

HW SET: 05R
DOOR NUMBER:
036

EACH TO HAVE:

3	EA	HINGE	3CB1 4.5 X 4.5 NRP	641	IVE
2	EA	PRIMUS CORE ONLY	20-740 (OWNER FURNISHED AND INSTALLED)	606	SCH
1	EA	CORE ONLY	23-030	626	SCH
1	EA	ELECTRONIC LOCK	AD-200-MS-70-MTK-SPA-JD-8B 643E	SPL	SCE
1	EA	SURFACE CLOSER	4040XP EDA	695	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	613	IVE
1	EA	WALL STOP	WS406/WS407 CONVEX /CONCAVE AS REQUIRED	613	IVE
1	SET	SEALS	5050B	BRN	NGP
1	EA	DOOR BOTTOM	320N	DKB	NGP
1	EA	THRESHOLD	411 1/4"-20 COMBO ANCHOR OR AS DETAILED	DKB	NGP

HW SET: 06
DOOR NUMBER:
024

EACH TO HAVE:

1	EA	HINGE	3CB1 4.5 X 4.5 NRP	641	IVE
1	EA	FIRE EXIT HARDWARE	XP98EO-F 98ALK 643E	SPL	VON
1	EA	ELECTRONIC EXIT TRIM	AD-200-993R-70-MTK-SPA-JD-8B 643E	SPL	SCE
1	EA	MORTISE CYLINDER	20-061	613	SCH
2	EA	PRIMUS CORE ONLY	20-740 (OWNER FURNISHED AND INSTALLED)	606	SCH
1	EA	WALL STOP	WS406/WS407 CONVEX /CONCAVE AS REQUIRED	613	IVE
1	SET	SEALS	5050B	BRN	NGP
1	EA	DOOR BOTTOM	320N	DKB	NGP
1	EA	DOOR SWEEP	C607DKB	DKB	NGP
1	EA	THRESHOLD	513 1/4"-20 COMBO ANCHOR OR AS DETAILED	DKB	NGP

HW SET: 06A
DOOR NUMBER:
006

EACH TO HAVE:

1	EA	HINGE	3CB1 4.5 X 4.5 NRP	641	IVE
1	EA	FIRE EXIT HARDWARE	XP98EO-F 98ALK 643E	SPL	VON
1	EA	ELECTRONIC EXIT TRIM	AD-200-993R-70-MTK-SPA-JD-8B 643E	SPL	SCE
1	EA	MORTISE CYLINDER	20-061	613	SCH
2	EA	PRIMUS CORE ONLY	20-740 (OWNER FURNISHED AND INSTALLED)	606	SCH
1	EA	CORE ONLY	23-030	626	SCH
1	EA	WALL STOP	WS406/WS407 CONVEX /CONCAVE AS REQUIRED	613	IVE
1	SET	SEALS	5050B	BRN	NGP
1	EA	DOOR BOTTOM	320N	DKB	NGP
1	EA	DOOR SWEEP	C607DKB	DKB	NGP
1	EA	THRESHOLD	513 1/4"-20 COMBO ANCHOR OR AS DETAILED	DKB	NGP

USE RX SWITCH FOR ALK SO THAT OUTSIDE OPERATION OF THE AD TRIM WILL NOT ALARM EXIT DEVICE.

HW SET: 07
DOOR NUMBER:
003

EACH TO HAVE:

2	EA	MORTISE CYLINDER	20-062	613	SCH
2	EA	PRIMUS CORE ONLY	20-740 (OWNER FURNISHED AND INSTALLED)	606	SCH
1	EA	MEMO	BALANCE BY AUTO DOOR SUPPLIER		

VERIFY CYLINDER TYPE AND QUANTITY WITH DOOR MANUFACTURER.

HW SET: 08
DOOR NUMBER:
005

EACH TO HAVE:

3	EA	HINGE	3CB1 4.5 X 4.5	641	IVE
1	EA	CLASSROOM LOCK	L9071R 17A 643E	SPL	SCH
2	EA	PRIMUS CORE ONLY	20-740 (OWNER FURNISHED AND INSTALLED)	606	SCH
1	EA	WALL STOP	WS406/WS407 CONVEX /CONCAVE AS REQUIRED	613	IVE
1	SET	SEALS	5050B	BRN	NGP
1	EA	DOOR BOTTOM	320N	DKB	NGP
1	EA	THRESHOLD	411 1/4"-20 COMBO ANCHOR OR AS DETAILED	DKB	NGP

HW SET: 09
DOOR NUMBER:
051

EACH TO HAVE:

3	EA	HINGE	3CB1 4.5 X 4.5	641	IVE
1	EA	STOREROOM LOCK	L9080R 17A 643E	SPL	SCH
1	EA	PRIMUS CORE ONLY	20-740 (OWNER FURNISHED AND INSTALLED)	606	SCH
1	EA	SURFACE CLOSER	4041 DEL	695	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	613	IVE
1	SET	SEALS	5050B	BRN	NGP
1	EA	DOOR BOTTOM	320N	DKB	NGP
1	EA	THRESHOLD	411 1/4"-20 COMBO ANCHOR OR AS DETAILED	DKB	NGP

HW SET: 10
DOOR NUMBER:
021

EACH TO HAVE:

3	EA	HINGE	3CB1 4.5 X 4.5	641	IVE
1	EA	STOREROOM LOCK	L9080R 17A 643E	SPL	SCH
1	EA	PRIMUS CORE ONLY	20-740 (OWNER FURNISHED AND INSTALLED)	606	SCH
1	EA	KICK PLATE	8400 16" X 2" LDW	613	IVE
1	EA	WALL STOP	WS406/WS407 CONVEX /CONCAVE AS REQUIRED	613	IVE
1	SET	SEALS	5050B	BRN	NGP
1	EA	DOOR BOTTOM	320N	DKB	NGP
1	EA	THRESHOLD	411 1/4"-20 COMBO ANCHOR OR AS DETAILED	DKB	NGP

HW SET: 11R
DOOR NUMBER:
047

EACH TO HAVE:

3	EA	HINGE	3CB1 4.5 X 4.5	641	IVE
1	EA	CLASSROOM LOCK	L9070R 17A 643E	SPL	SCH
1	EA	PRIMUS CORE ONLY	20-740 (OWNER FURNISHED AND INSTALLED)	606	SCH
1	EA	SURFACE CLOSER	4041 DEL	695	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	613	IVE
1	EA	WALL STOP	WS406/WS407 CONVEX /CONCAVE AS REQUIRED	613	IVE
1	SET	SEALS	5050B	BRN	NGP
1	EA	DOOR BOTTOM	320N	DKB	NGP
1	EA	THRESHOLD	411 1/4"-20 COMBO ANCHOR OR AS DETAILED	DKB	NGP

HW SET: 11R1
DOOR NUMBER:
032

EACH TO HAVE:

3	EA	HINGE	3CB1 4.5 X 4.5	641	IVE
1	EA	CLASSROOM LOCK	L9070R 17A 643E	SPL	SCH
1	EA	PRIMUS CORE ONLY	20-740 (OWNER FURNISHED AND INSTALLED)	606	SCH
1	EA	KICK PLATE	8400 10" X 2" LDW	613	IVE
1	EA	WALL STOP	WS406/WS407 CONVEX /CONCAVE AS REQUIRED	613	IVE
1	SET	SEALS	5050B	BRN	NGP
1	EA	DOOR BOTTOM	320N	DKB	NGP
1	EA	THRESHOLD	411 1/4"-20 COMBO ANCHOR OR AS DETAILED	DKB	NGP

HW SET: 12
DOOR NUMBER:
035

EACH TO HAVE:

3	EA	HINGE	3CB1 4.5 X 4.5	641	IVE
1	EA	OFFICE LOCK	L9050R 17A L583-363 643E	SPL	SCH
1	EA	PRIMUS CORE ONLY	20-740 (OWNER FURNISHED AND INSTALLED)	606	SCH
1	EA	SURFACE CLOSER	4041 DEL	695	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	613	IVE
1	SET	SEALS	5050B	BRN	NGP
1	EA	DOOR BOTTOM	320N	DKB	NGP
1	EA	THRESHOLD	411 1/4"-20 COMBO ANCHOR OR AS DETAILED	DKB	NGP

HW SET: 12R
DOOR NUMBER:
031

EACH TO HAVE:

3	EA	HINGE	3CB1 4.5 X 4.5	641	IVE
1	EA	OFFICE LOCK	L9050R 17A L583-363 643E	SPL	SCH
1	EA	PRIMUS CORE ONLY	20-740 (OWNER FURNISHED AND INSTALLED)	606	SCH
1	EA	KICK PLATE	8400 10" X 2" LDW	613	IVE
1	SET	SEALS	5050B	BRN	NGP
1	EA	DOOR BOTTOM	320N	DKB	NGP
1	EA	THRESHOLD	411 1/4"-20 COMBO ANCHOR OR AS DETAILED	DKB	NGP

HW SET: 13
DOOR NUMBER:
009 010 015 016 028 029
030 045

EACH TO HAVE:

3	EA	HINGE	3CB1 4.5 X 4.5	641	IVE
1	EA	OFFICE LOCK	L9050R 17A L583-363 643E	SPL	SCH
1	EA	PRIMUS CORE ONLY	20-740 (OWNER FURNISHED AND INSTALLED)	606	SCH
1	EA	WALL STOP	WS406/WS407 CONVEX /CONCAVE AS REQUIRED	613	IVE
1	SET	SEALS	5050B	BRN	NGP
1	EA	DOOR BOTTOM	320N	DKB	NGP
1	EA	THRESHOLD	411 1/4"-20 COMBO ANCHOR OR AS DETAILED	DKB	NGP

HW SET: 13R
DOOR NUMBER:
019 020

EACH TO HAVE:

3	EA	HINGE	3CB1 4.5 X 4.5	641	IVE
1	EA	CLASSROOM LOCK	L9071R 17A 643E	SPL	SCH
2	EA	PRIMUS CORE ONLY	20-740 (OWNER FURNISHED AND INSTALLED)	606	SCH
1	EA	WALL STOP	WS406/WS407 CONVEX /CONCAVE AS REQUIRED	613	IVE
1	SET	SEALS	5050B	BRN	NGP
1	EA	DOOR BOTTOM	320N	DKB	NGP
1	EA	THRESHOLD	411 1/4"-20 COMBO ANCHOR OR AS DETAILED	DKB	NGP

HW SET: 13R1
DOOR NUMBER:
044 046

EACH TO HAVE:

3	EA	HINGE	3CB1 4.5 X 4.5	641	IVE
1	EA	PRIMUS CORE ONLY	20-740 (OWNER FURNISHED AND INSTALLED)	606	SCH
1	EA	CORE ONLY	23-030	626	SCH
1	EA	ELECTRONIC LOCK	AD-200-MS-70-MTK-SPA-JD-8B 643E	SPL	SCE
1	EA	WALL STOP	WS406/WS407 CONVEX /CONCAVE AS REQUIRED	613	IVE
1	SET	SEALS	5050B	BRN	NGP
1	EA	DOOR BOTTOM	320N	DKB	NGP
1	EA	THRESHOLD	411 1/4"-20 COMBO ANCHOR OR AS DETAILED	DKB	NGP

HW SET: 14
DOOR NUMBER:
013 022

EACH TO HAVE:

3	EA	HINGE	3CB1HW 4.5 X 4.5	641	IVE
1	EA	PUSH PLATE	8200 4" X 16"	613	IVE
1	EA	PULL PLATE	8302-8 4" X 16"	613	IVE
1	EA	SURFACE CLOSER	4041 DEL	695	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	613	IVE
1	EA	WALL STOP	WS406/WS407 CONVEX /CONCAVE AS REQUIRED	613	IVE
1	SET	SEALS	5050B	BRN	NGP
1	EA	DOOR BOTTOM	320N	DKB	NGP
1	EA	THRESHOLD	411 1/4"-20 COMBO ANCHOR OR AS DETAILED	DKB	NGP
1	EA	MEMO	SIGNAGE BY OTHERS		

HW SET: 14R
DOOR NUMBER:
048 050

EACH TO HAVE:

3	EA	HINGE	3CB1HW 4.5 X 4.5	641	IVE
1	EA	CLASSROOM LOCK	L9076R17A	626	SCH
1	EA	PRIMUS CORE ONLY	20-740 (OWNER FURNISHED AND INSTALLED)	606	SCH
1	EA	SURFACE CLOSER	4041 DEL	695	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	613	IVE
1	EA	WALL STOP	WS406/WS407 CONVEX /CONCAVE AS REQUIRED	613	IVE
1	SET	SEALS	5050B	BRN	NGP
1	EA	DOOR BOTTOM	320N	DKB	NGP
1	EA	THRESHOLD	411 1/4"-20 COMBO ANCHOR OR AS DETAILED	DKB	NGP
1	EA	MEMO	SIGNAGE BY OTHERS		

HW SET: 15
DOOR NUMBER:
014

EACH TO HAVE:

3	EA	HINGE	3CB1 4.5 X 4.5	641	IVE
1	EA	PRIVACY SET	L9040 17A L583-363 643E	SPL	SCH
1	EA	SURFACE CLOSER	4041 DEL	695	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	613	IVE
1	EA	WALL STOP	WS406/WS407 CONVEX /CONCAVE AS REQUIRED	613	IVE
1	SET	SEALS	5050B	BRN	NGP
1	EA	DOOR BOTTOM	320N	DKB	NGP
1	EA	THRESHOLD	411 1/4"-20 COMBO ANCHOR OR AS DETAILED	DKB	NGP

HW SET: 15R
DOOR NUMBER:
033 034

EACH TO HAVE:

3	EA	HINGE	3CB1 4.5 X 4.5	641	IVE
1	EA	PRIVACY SET	L9040 17A L583-363 643E	SPL	SCH
1	EA	KICK PLATE	8400 10" X 2" LDW	613	IVE
1	EA	WALL STOP	WS406/WS407 CONVEX /CONCAVE AS REQUIRED	613	IVE
1	SET	SEALS	5050B	BRN	NGP
1	EA	DOOR BOTTOM	320N	DKB	NGP
1	EA	THRESHOLD	411 1/4"-20 COMBO ANCHOR OR AS DETAILED	DKB	NGP

HW SET: 16R
DOOR NUMBER:
027 043

EACH TO HAVE:

3	EA	HINGE	3CB1 4.5 X 4.5 NRP	641	IVE
1	EA	PANIC HARDWARE	XP98EO 643E	SPL	VON
1	EA	ELECTRONIC EXIT TRIM	AD-200-993R-70-MTK-SPA-JD-8B 643E	SPL	SCE
1	EA	PRIMUS CORE ONLY	20-740 (OWNER FURNISHED AND INSTALLED)	606	SCH
1	EA	CORE ONLY	23-030	626	SCH
1	EA	WALL STOP	WS406/WS407 CONVEX /CONCAVE AS REQUIRED	613	IVE
1	SET	SEALS	5050B	BRN	NGP
1	EA	DOOR BOTTOM	320N	DKB	NGP
1	EA	DOOR SWEEP	C607DKB	DKB	NGP
1	EA	THRESHOLD	513 1/4"-20 COMBO ANCHOR OR AS DETAILED	DKB	NGP

HW SET: 17R
DOOR NUMBER:
012

EACH TO HAVE:

3	EA	HINGE	3CB1 4.5 X 4.5	641	IVE
1	EA	OFFICE LOCK	L9050R 17A L583-363 643E	SPL	SCH
1	EA	PRIMUS CORE ONLY	20-740 (OWNER FURNISHED AND INSTALLED)	606	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH	695	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	613	IVE
1	SET	SEALS	5050B	BRN	NGP
1	EA	DOOR BOTTOM	320N	DKB	NGP
1	EA	THRESHOLD	411 1/4"-20 COMBO ANCHOR OR AS DETAILED	DKB	NGP

HW SET: 18R
DOOR NUMBER:
026

EACH TO HAVE:

6	EA	HINGE	3CB1 4.5 X 4.5	641	IVE
1	SET	CONST LATCHING BOLT	FB52	613	IVE
1	EA	APT ENTRANCE LOCK	L9060R 17A 643E	SPL	SCH
2	EA	PRIMUS CORE ONLY	20-740 (OWNER FURNISHED AND INSTALLED)	606	SCH
1	EA	COORDINATOR	COR X FL	628	IVE
2	EA	MOUNTING BRKTS	MB1/MB2 AS REQUIRED	600	IVE
1	EA	ASTRAGAL	139SP	600	NGP
2	EA	SURFACE CLOSER	4040XP EDA	695	LCN
2	EA	DOME STOP	FS436/FS438 AS REQUIRED	613	IVE
1	SET	SEALS	5050B	BRN	NGP

MOUNT COORDINATOR BEFORE CLOSERS.

HW SET: 19
DOOR NUMBER:
037 038 039

EACH TO HAVE:

6	EA	HINGE	3CB1 4.5 X 4.5 NRP	641	IVE
1	SET	CONST LATCHING BOLT	FB51P	613	IVE
1	EA	DUST PROOF STRIKE	DP1/DP2	613	IVE
1	EA	CLASSROOM LOCK	L9070R 17A 643E	SPL	SCH
1	EA	PRIMUS CORE ONLY	20-740 (OWNER FURNISHED AND INSTALLED)	606	SCH
1	EA	ASTRAGAL	139SP	600	NGP
2	EA	OVERHEAD STOP	450S	613	GLY

HW SET: 20
DOOR NUMBER:
040

EACH TO HAVE:

6	EA	HINGE	3CB1 4.5 X 4.5 NRP	641	IVE
1	SET	CONST LATCHING BOLT	FB51P	613	IVE
1	EA	DUST PROOF STRIKE	DP1/DP2	613	IVE
1	EA	CLASSROOM LOCK	L9070R 17A 643E	SPL	SCH
1	EA	PRIMUS CORE ONLY	20-740 (OWNER FURNISHED AND INSTALLED)	606	SCH
1	EA	ASTRAGAL	139SP	600	NGP
2	EA	OVERHEAD STOP	450S	613	GLY

HW SET: 21
DOOR NUMBER:
049

EACH TO HAVE:

3	EA	HINGE	3CB1 4.5 X 4.5	641	IVE
1	EA	STOREROOM LOCK	L9080R 17A 643E	SPL	SCH
1	EA	PRIMUS CORE ONLY	20-740 (OWNER FURNISHED AND INSTALLED)	606	SCH
1	EA	WALL STOP	WS406/WS407 CONVEX /CONCAVE AS REQUIRED	613	IVE
1	SET	SEALS	5050B	BRN	NGP
1	EA	DOOR BOTTOM	320N	DKB	NGP
1	EA	THRESHOLD	411 1/4"-20 COMBO ANCHOR OR AS DETAILED	DKB	NGP

HW SET: 22
DOOR NUMBER:
042

EACH TO HAVE:

6	EA	HINGE	3CB1HW 4.5 X 4.5	641	IVE
2	EA	PANIC HARDWARE	9949L-LBL 996L 643E	SPL	VON
2	EA	RIM CYLINDER	20-057	613	SCH
2	EA	PRIMUS CORE ONLY	20-740 (OWNER FURNISHED AND INSTALLED)	606	SCH
1	SET	ASTRAGAL	9600DKB	DKB	NGP
2	EA	SURFACE CLOSER	4040XP EDA	695	LCN
2	EA	WALL STOP	WS406/WS407 CONVEX /CONCAVE AS REQUIRED	613	IVE
1	SET	SEALS	5050B	BRN	NGP
2	EA	DOOR BOTTOM	220NDKB	DKB	NGP
1	EA	THRESHOLD	411 1/4"-20 COMBO ANCHOR OR AS DETAILED	DKB	NGP

HW SET: 22R
DOOR NUMBER:
041

EACH TO HAVE:

6	EA	HINGE	3CB1HW 4.5 X 4.5	641	IVE
2	EA	PANIC HARDWARE	9949EO-LBL 643E	SPL	VON
2	EA	ELECTRONIC EXIT TRIM	AD-200-993R-70-MTK-SPA-JD-8B 643E	SPL	SCE
2	EA	PRIMUS CORE ONLY	20-740 (OWNER FURNISHED AND INSTALLED)	606	SCH
1	EA	CORE ONLY	23-030	626	SCH
1	SET	ASTRAGAL	9600DKB	DKB	NGP
2	EA	SURFACE CLOSER	4040XP EDA	695	LCN
2	EA	WALL STOP	WS406/WS407 CONVEX /CONCAVE AS REQUIRED	613	IVE
1	SET	SEALS	5050B	BRN	NGP
2	EA	DOOR BOTTOM	220NDKB	DKB	NGP
1	EA	THRESHOLD	411 1/4"-20 COMBO ANCHOR OR AS DETAILED	DKB	NGP

HW SET: 23
DOOR NUMBER:
002

EACH TO HAVE:

2	EA	MORTISE CYLINDER	20-061	613	SCH
2	EA	PRIMUS CORE ONLY	20-740 (OWNER FURNISHED AND INSTALLED)	606	SCH
1	EA	MEMO	BALANCE BY DOOR MFGR.		

VERIFY CYLINDER TYPE AND QUANTITY WITH DOOR MANUFACTURER.

HW SET: 24
DOOR NUMBER:
007 025

EACH TO HAVE:

1	EA	FIRE EXIT HARDWARE	98EO-F 643E	SPL	VON
1	EA	ELECTRONIC EXIT TRIM	AD-200-993R-70-MTK-SPA-JD-8B 643E	SPL	SCE
1	EA	PRIMUS CORE ONLY	20-740 (OWNER FURNISHED AND INSTALLED)	606	SCH
1	EA	CORE ONLY	23-030	626	SCH
1	EA	MEMO	BALANCE OF HARDWARE IS EXISTING		

MODIFY EXISTING DOOR AND FRAME FOR NEW HARDWARE. IF LABELED HAVE DOORS RECERTIFIED PER THE DOOR MANUFACTURER'S LABEL PROGRAM. PATCH AND MAKE NEW ANY EXISTING CUT OUTS NOT COVERED BY NEW HARDWARE.

HW SET: 25
DOOR NUMBER:
008 023 052

EACH TO HAVE:

1	EA	STOREROOM LOCK	L9080R 17A 643E	SPL	SCH
1	EA	PRIMUS CORE ONLY	20-740 (OWNER FURNISHED AND INSTALLED)	606	SCH

MODIFY EXISTING DOOR AND FRAME FOR NEW HARDWARE. IF LABELED HAVE DOORS RECERTIFIED PER THE DOOR MANUFACTURER'S LABEL PROGRAM. PATCH AND MAKE NEW ANY EXISTING CUT OUTS NOT COVERED BY NEW HARDWARE.

MISC ITEMS

50	EA	KEY BLANKS	35-053		SCH
75	EA	IBUTTON ON FOB	IBF-X (SPECIFY COLOR: BLU, GRY, GRN, RED, YEL)		SCE
20	EA	KEYFOB	IBWB-151 (OWNER FURNISHED)	BLK	SCE
50	EA	PROXIMITY CARD	SXF7410SCH		SCE

END OF SECTION

SECTION 237200 - AIR-TO-AIR ENERGY RECOVERY EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Heat wheels.
2. Packaged energy recovery units.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design vibration isolation and seismic-restraint details, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Seismic Performance: Air-to-air energy recovery equipment shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, furnished specialties, and accessories.

B. LEED Submittals:

1. Product Data for Credit EA 4: Documentation required by Credit EA 4 indicating that equipment and refrigerants comply.
2. Product Data for Prerequisite EQ 1: Documentation indicating that units comply with ASHRAE 62.1-2004, Section 5 - "Systems and Equipment."

C. Shop Drawings: For air-to-air energy recovery equipment. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

2. Wiring Diagrams: For power, signal, and control wiring.

D. Coordination Drawings: Plans, elevations, and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:

1. Suspended ceiling components.
2. Structural members to which equipment or suspension systems will be attached.

E. Seismic Qualification Certificates: For air-to-air energy recovery equipment, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

F. Field quality-control reports.

G. Operation and Maintenance Data: For air-to-air energy recovery equipment to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ARI Compliance:

1. Capacity ratings for air-to-air energy recovery equipment shall comply with ARI 1060, "Performance Rating of Air-to-Air Heat Exchangers for Energy Recovery Ventilation Equipment."
2. Capacity ratings for air coils shall comply with ARI 410, "Forced-Circulation Air-Cooling and Air-Heating Coils."

C. ASHRAE Compliance:

1. Applicable requirements in ASHRAE 62.1-2004, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."
2. Capacity ratings for air-to-air energy recovery equipment shall comply with ASHRAE 84, "Method of Testing Air-to-Air Heat Exchangers."

D. NRCA Compliance: Roof curbs for roof-mounted equipment shall be constructed according to recommendations of NRCA.

E. UL Compliance:

1. Packaged heat recovery ventilators shall comply with requirements in UL 1812, "Ducted Heat Recovery Ventilators"; or UL 1815, "Nonducted Heat Recovery Ventilators."
2. Electric coils shall comply with requirements in UL 1995, "Heating and Cooling Equipment."

1.6 COORDINATION

A. Coordinate layout and installation of air-to-air energy recovery equipment and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

B. Coordinate sizes and locations of concrete bases with actual equipment provided.

C. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of air-to-air energy recovery equipment that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Packaged Energy Recovery Units: Two years.
2. Warranty Period for Fixed-Plate Total Heat Exchangers: 10 years.

1.8 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Filters: One set(s) of each type of filter specified.
2. Fan Belts: One set(s) of belts for each belt-driven fan in energy recovery units.
3. Wheel Belts: One set(s) of belts for each heat wheel.

PART 2 - PRODUCTS

2.1 HEAT WHEELS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Advanced Thermal Technologies.
2. Airxchange Inc.
3. American Energy Exchange, Inc.
4. Loren Cook Company.
5. SEMCO Incorporated.
6. Trane; American Standard Companies, Inc.

B. Casing:

1. Steel with standard factory-painted finish.
2. Integral purge section limiting carryover of exhaust air to between 0.05 percent at 1.6-inch wg and 0.20 percent at 4-inch wg (0.05 percent at 400-Pa and 0.20 percent at 1000-Pa) differential pressure.
3. Casing seals on periphery of rotor and on duct divider and purge section.
4. Support vertical rotors on grease-lubricated ball bearings having extended grease fittings or permanently lubricated bearings. Support horizontal rotors on tapered roller bearing.

C. Rotor: Aluminum segmented wheel strengthened with radial spokes, with nontoxic, noncorrosive, silica-gel desiccant coating.

D. Rotor: Glass-fiber segmented wheel strengthened with radial spokes impregnated with nonmigrating, water-selective, molecular-sieve desiccant coating.

E. Drive: Fractional horsepower motor and gear reducer and self-adjusting multilink belt around outside of rotor.

1. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Division 23 Section "Common Motor Requirements for HVAC Equipment."
2. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

F. Controls:

1. Starting relay, factory mounted and wired, and manual motor starter for field wiring.
2. Variable frequency controller, factory mounted and wired, permitting input of field connected 4-20 mA or 1-10-V control signal.
3. Variable frequency controller, factory mounted and wired, with exhaust-air sensor to vary rotor speed and maintain exhaust temperature above freezing.
4. Variable frequency controller, factory mounted and wired, with exhaust- and outdoor-air sensors, automatic changeover thermostat and set-point adjuster, to vary rotor speed and maintain exhaust temperature above freezing and air differential temperature above set point. Rotor speed shall increase to maximum when exhaust-air temperature is less than outdoor-air temperature.
5. Pilot-Light Indicator: Display rotor rotation and speed.
6. Speed Settings: Adjustable settings for maximum and minimum rotor speed limits.

G. Extended-Surface, Disposable Panel Filters:

1. Comply with NFPA 90A.
2. Filter Holding Frames: Arranged for flat or angular orientation, with access doors on both sides of unit. Filters shall be removable from one side or lift out from access plenum.
3. Factory-fabricated, dry, extended-surface type.
4. Thickness: 2 inches (50 mm).
5. Minimum Arrestance: 90, according to ASHRAE 52.1.
6. Minimum Merv: 7, according to ASHRAE 52.2.

7. Media: Fibrous material formed into deep-V-shaped pleats and held by self-supporting wire grid.
8. Media-Grid Frame: Nonflammable cardboard.
9. Mounting Frames: Welded, galvanized steel with gaskets and fasteners, suitable for bolting together into built-up filter banks.

2.2 PACKAGED ENERGY RECOVERY UNITS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Advanced Thermal Technologies.
2. American Energy Exchange, Inc.
3. Applied Air; Mestek Technology, Inc.
4. Carnes.
5. Des Champs Technologies.
6. Engineered Air.
7. Fairchild Industrial Products Company.
8. Gaylord Industries, Inc.
9. Greenheck Fan Corporation.
10. Loren Cook Company.
11. Mitsubishi Electric & Electronics USA, Inc.; HVAC Advanced Products Division.
12. Mitsubishi Electric Sales Canada Inc.
13. RenewAire LLC.
14. SEMCO Incorporated.
15. Trane; American Standard Companies, Inc.
16. Venmar CES Inc.
17. Wing, L. J.; Mestek Technology, Inc.

B. Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.

C. Housing: Manufacturer's standard construction with corrosion-protection coating and exterior finish, gasketed and calked weathertight, hinged access doors with neoprene gaskets for inspection and access to internal parts, minimum 1-inch- (25-mm-) thick thermal insulation, knockouts for electrical and piping connections, exterior drain connection, and lifting lugs.

1. Inlet: Weatherproof hood, with damper for exhaust and supply.

   a. Exhaust: Gravity backdraft damper.
   b. Supply: Gravity backdraft damper.

2. Roof Curb: Refer to Division 07 Section "Roof Accessories" for roof curbs and equipment supports.

D. Heat Recovery Device: Heat wheel.

E. Supply and Exhaust Fans: Forward-curved, centrifugal fan with spring isolators and insulated flexible duct connections.

1. Motor and Drive: Belt driven with adjustable sheaves, motor mounted on adjustable base.
2. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Division 23 Section "Common Motor Requirements for HVAC Equipment."
3. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
4. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Division 26 Sections.

F. Extended-Surface, Disposable Panel Filters:

1. Comply with NFPA 90A.
2. Filter Holding Frames: Arranged for flat or angular orientation, with access doors on both sides of unit. Filters shall be removable from one side or lift out from access plenum.
3. Factory-fabricated, dry, extended-surface type.
4. Thickness: 2 inches (50 mm).
5. Minimum Arrestance: 90, according to ASHRAE 52.1.
6. Minimum Merv: 7, according to ASHRAE 52.2.
7. Media: Fibrous material formed into deep-V-shaped pleats and held by self-supporting wire grid.
8. Media-Grid Frame: Nonflammable cardboard.
9. Mounting Frames: Welded, galvanized steel with gaskets and fasteners, suitable for bolting together into built-up filter banks.

G. Piping and Wiring: Fabricate units with space within housing for piping and electrical conduits. Wire motors and controls so only external connections are required during installation.

1. Indoor Enclosure: NEMA 250, Type 12 enclosure contains relays, starters, and terminal strip.
2. Outdoor Enclosure: NEMA 250, Type 3R enclosure contains relays, starters, and terminal strip.
3. Include fused disconnect switches.

H. Accessories:

1. Roof Curb: Galvanized steel with gasketing, and factory-installed wood nailer; complying with NRCA standards; minimum height of 14 inches (350 mm).
2. Intake weather hood with 2-inch- (50-mm-) thick filters.
3. Louvered intake weather hood with 2-inch- (50-mm-) thick filters in V-bank configuration.
4. Exhaust weather hood with birdscreen.
5. Duct flanges.
6. Hinged access doors with quarter-turn latches.
7. Drain pans for condensate removal complying with ASHRAE 62.1-2004.
8. Weatherproofing for tilt-control system.

2.3 CONTROLS

A. Time Clock: Solid-state, programmable, microprocessor-based unit for mounting in outdoor NEMA 250, Type 3R enclosure with up to eight on/off cycles per day and battery backup protection of program settings against power failure to energize unit.

B. Motion (Occupancy) Sensor: Passive infrared sensor for wall mounting with adjustable time-off delay of up to 30 minutes to energize unit.

C. Carbon Monoxide Sensor: Adjustable control from 600 to 2000 ppm for wall or duct mounting with digital display and computer/building management system interface to energize unit.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine casing insulation materials and filter media before air-to-air energy recovery equipment installation. Reject insulation materials and filter media that are wet, moisture damaged, or mold damaged.

C. Examine roughing-in for electrical services to verify actual locations of connections before installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install heat wheels so supply and exhaust airstreams flow in opposite directions and rotation is away from exhaust side to purge section to supply side.

1. Install access doors in both supply and exhaust ducts, both upstream and downstream, for access to wheel surfaces, drive motor, and seals.
2. Install removable panels or access doors between supply and exhaust ducts on building side for bypass during startup.
3. Access doors and panels are specified in Division 23 Section "Air Duct Accessories."

B. Roof Curb: Install on roof structure or concrete base, level and secure, according to The NRCA "Roofing and Waterproofing Manual - Volume 4: Construction Details - Low-Slope Roofing," Illustration "Raised Curb Detail for Rooftop Air Handling Units and Ducts." Install air-to-air energy recovery equipment on curbs and coordinate roof penetrations and flashing with roof construction specified in Division 07 Section "Roof Accessories." Secure air-to-air energy recovery equipment to upper curb rail, and secure curb base to roof framing or concrete base with anchor bolts.

C. Unit Support: Install unit level on structural curbs. Coordinate wall penetrations and flashing with wall construction. Secure air-to-air energy recovery equipment to structural support with anchor bolts.

D. Install units with clearances for service and maintenance.

E. Install new filters at completion of equipment installation and before testing, adjusting, and balancing.

F. Pipe drains from units and drain pans to nearest floor drain; use ASTM B 88, Type L (ASTM B 88M, Type B), drawn-temper copper water tubing with soldered joints, same size as condensate drain connection.

1. Requirements for Low-Emitting Materials:

a. Use PVC solvent cement that has a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
b. Use adhesive primer that has a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

3.3 CONNECTIONS

A. Comply with requirements for piping specified in Division 23 Section "Hydronic Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to unit to allow service and maintenance.

C. Connect piping to units mounted on vibration isolators with flexible connectors.

D. Connect cooling condensate drain pans with air seal trap at connection to drain pan and install cleanouts at changes in pipe direction.

E. Comply with requirements for ductwork specified in Division 23 Section "Metal Ducts."

F. Electrical Connections: Comply with applicable requirements in Division 26 Sections.

1. Install electrical devices furnished with units but not factory mounted.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

B. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Tests and Inspections:

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
2. Adjust seals and purge.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
4. Set initial temperature and humidity set points.
5. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

D. Air-to-air energy recovery equipment will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.5 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain air-to-air energy recovery units.

END OF SECTION 237200