



VIHFA MIXED USE DEVELOPMENT

SPECIFICATIONS BOOK

Parcel #26A,102,103,104
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SECTION 01 10 00
SUMMARY

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Project Identification: VIHFA
- B. Project Summary: Mixed used steel frame building with apartments, offices and commercial space totaling approximately 18,500 sqft.
- C. Particular Project Requirements:
 - 1. Existing site conditions and restrictions: Empty lot with existing foundations.
 - 2. Requirements for sequencing, scheduling and completion date: (())
 - 3. Prior or concurrent work by Owner or others: N/A
 - 4. Separate contracts [awarded] [to be awarded] for (())
 - 5. Pre-purchased and pre-ordered items: (())
 - 6. Owner-purchased, Owner-installed items: (())
 - 7. Owner-purchased, Contractor-installed items: (())
 - 8. Owner's early or partial occupancy: (())
 - 9. Occupancy of adjacent facilities: (())
 - 10. Contractor's use of new and existing facilities: (())
 - 11. Scope of separate prime contracts: (())
- D. Permits and Fees: Apply for, obtain, and pay for permits, fees, and utility company back charges required to perform the work. Submit copies to Architect.
- E. Codes: Comply with applicable codes and regulations of authorities having jurisdiction. Submit copies of inspection reports, notices and similar communications to Architect.
- F. Dimensions: Verify dimensions indicated on drawings with field dimensions before fabrication or ordering of materials. Do not scale drawings.
- G. Existing Conditions: Notify Architect of existing conditions differing from those indicated on the drawings. Do not remove or alter structural components without prior written approval.
- H. Coordination:
 - 1. Coordinate the work of all trades.
 - 2. Prepare coordination drawings for areas above ceilings where close tolerances are required between building elements and mechanical and electrical work.
 - 3. Verify location of utilities and existing conditions.
- I. Installation Requirements, General:
 - 1. Inspect substrates and report unsatisfactory conditions in writing.
 - 2. Do not proceed until unsatisfactory conditions have been corrected.
 - 3. Take field measurements prior to fabrication where practical. Form to required shapes and sizes with true edges, lines and angles. Provide inserts and templates as needed for work of other trades.
 - 4. Install materials in exact accordance with manufacturer's instructions and approved

submittals.

5. Install materials in proper relation with adjacent construction and with proper appearance.
 6. Restore units damaged during installation. Replace units which cannot be restored at no additional expense to the Owner.
 7. Refer to additional installation requirements and tolerances specified under individual specification sections.
- J. Limit of Use: Limit use of work as indicated. Keep driveways and entrances clear.
- K. Existing Construction: Maintain existing building in a weathertight condition. Repair damage caused by construction operations. Protect building and its occupants.
- L. Definitions:
1. Provide: Furnish and install, complete with all necessary accessories, ready for intended use. Pay for all related costs.
 2. Approved: Acceptance of item submitted for approval. Not a limitation or release for compliance with the Contract Documents or regulatory requirements. Refer to limitations of 'Approved' in General and Supplementary Conditions.
 3. Match Existing: Match existing as acceptable to the Owner.
- M. Intent: Drawings and specifications are intended to provide the basis for proper completion of the work suitable for the intended use of the Owner. Anything not expressly set forth but which is reasonable implied or necessary for proper performance of the project shall be included.
- N. Writing Style: Specifications are written in the imperative mode. Except where specifically intended otherwise, the subject of all imperative statements is the Contractor. For example, 'Provide tile' means 'Contractor shall provide tile.'

PART 2 PRODUCTS - Not applicable to this Section

PART 3 EXECUTION - Not applicable to this Section

END OF SECTION

SECTION 01 20 00
PRICE AND PAYMENT PROCEDURES

PART 4 GENERAL

4.1 SECTION INCLUDES

- A. Price and Payment Procedures:
 - 1. Alternates.
 - 2. Allowances.
 - 3. Tenant Allowances.

4.2 ALTERNATES

- A. Total Price: Provide total price for each alternate in Bid Form. Include cost of modifications to other work to accommodate alternate. Include related costs such as overhead and profit.
- B. Acceptance of Alternates: Owner will determine which alternates are selected for inclusion in the Contract.
- C. Coordination of Alternates: Modify or adjust affected adjacent work as necessary to integrate work of the alternate into Project. Coordinate alternates with related work to ensure that work affected by each selected alternate is properly accomplished.
- D. List of Alternates:
 - 1. Exterior Chases:
 - a. Du-Rock on Treated plywood substrate, plastered and painted.
 - b. Acceptable alternate brands
 - 1) Equitone.
 - 2) Multi-Panels.
 - 3) American Fiber Cement Corporation.
 - 4) Nichiha.

4.3 ALLOWANCES - Not applicable to this Section

4.4 TENANT ALLOWANCES - Not applicable to this Section

PART 5 PRODUCTS - Not applicable to this Section

PART 6 EXECUTION - Not applicable to this Section

END OF SECTION

SECTION 01 30 00
ADMINISTRATIVE REQUIREMENTS

PART 7 GENERAL

7.1 SECTION INCLUDES

- A. Administration of Contract: Provide administrative requirements for the proper coordination and completion of work including the following:
 - 1. Supervisory personnel.
 - 2. Preconstruction conference.
 - 3. Project meetings, minimum of two per month; prepare and distribute minutes.
- B. Reports: Submit daily and special reports.
- C. Work Schedule: Submit progress schedule, updated monthly.
- D. Submittal Schedule: Prepare submittal schedule; coordinate with progress schedule.
- E. Schedule of Values: Submit schedule of values.
- F. Schedule of Tests: Submit schedule of required tests including payment and responsibility.
- G. Perform Surveys: Lay out the work and verifying locations during construction. Perform final site survey.
- H. Emergency Contacts: Submit and post a list of emergency telephone numbers and address for individuals to be contacted in case of emergency.
- I. Record Documents: Submit record drawings and specifications; to be maintained and annotated by Contractor as work progresses.

7.2 SUBMITTALS

- A. Types of Submittals: Provide types of submittals listed in individual sections and number of copies required below.
 - 1. Shop drawings reviewed and annotated by the Contractor - 4 copies.
 - 2. Product data - 4 copies.
 - 3. Samples - 2, plus extra samples as required to indicate range of color, finish, and texture to be expected.
 - 4. Inspection and test reports - 4 copies.
 - 5. Warranties - 4 copies.
 - 6. Survey data - 4 copies.
 - 7. Closeout submittals - 4 copies.
 - 8. Project photographs - 12 digital images each month submitted on CD. Submit cumulative CD at each subsequent submittal. Label each image with date.
- B. Submittal Procedures: Comply with project format for submittals. Comply with submittal procedures established by Architect including Architect's submittal and shop drawing stamp. Provide required resubmittals if original submittals are not approved. Provide distribution of approved copies including modifications after submittals have been approved.
- C. Samples and Shop Drawings: Samples and shop drawings shall be prepared specifically for this project. Shop drawings shall include dimensions and details, including adjacent construction and

related work. Note special coordination required. Note any deviations from requirements of the Contract Documents.

- D. Warranties: Provide warranties as specified; warranties shall not limit length of time for remedy of damages Owner may have by legal statute. Contractor, supplier or installer responsible for performance of warranty shall sign warranties.

END OF SECTION

SECTION 01 40 00
QUALITY REQUIREMENTS

PART 8 GENERAL

8.1 SECTION INCLUDES

- A. Quality Monitoring: Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality. Perform quality control procedures and inspections during installation.
- B. Standards: Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- C. Tolerances: Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate. Comply with manufacturers' tolerances.
- D. Reference Standards: For products or workmanship specified by association, trade, or other consensus standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- E. Manufacturer's Field Services: When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to perform the following as applicable, and to initiate instructions when necessary.
 - 1. Observe site conditions.
 - 2. Conditions of surfaces and installation.
 - 3. Quality of workmanship.
 - 4. Start-up of equipment.
 - 5. Test, adjust and balance of equipment.
- F. Mock-Ups: Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes. Accepted mock-ups shall be a comparison standard for the remaining Work.
- G. Removal of Mock-Ups: Where mock-up has been accepted by Architect and no longer needed, remove mock-up and clear area when directed to do so.

PART 9 PRODUCTS - Not applicable to this Section

PART 10 EXECUTION - Not applicable to this Section

END OF SECTION

SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS

PART 11 GENERAL

11.1 SECTION INCLUDES

- A. Temporary Services: Provide temporary services and utilities, including payment of utility costs including the following.
 - 1. Water (potable and non-potable).
 - 2. Lighting and power.
 - 3. Metering.
 - 4. Telephone.
 - 5. Toilet facilities.
 - 6. Materials storage.
- B. Construction Facilities: Provide construction facilities, including payment of utility costs including the following.
 - 1. Construction equipment.
 - 2. Dewatering and pumping.
 - 3. Enclosures.
 - 4. Heating.
 - 5. Lighting.
 - 6. Elevator.
 - 7. Access.
 - 8. Roads.
- C. Security and Protection: Provide security and protection requirements including the following.
 - 1. Fire extinguishers.
 - 2. Site enclosure fence, barricades, warning signs, and lights.
 - 3. Building enclosure and lock-up.
 - 4. Environmental protection.
 - 5. Pest control during and at the end of construction.
 - 6. Protection of floor openings and personnel barriers
- D. Personnel Support: Provide personnel support facilities including the following.
 - 1. Architect's field office with telephone, fax and data connection.
 - 2. Contractor's field office.
 - 3. Sanitary facilities.
 - 4. Drinking water.
 - 5. Project identification sign.
 - 6. Cleaning.

END OF SECTION

01 50 00

SECTION 01 60 00
PRODUCT REQUIREMENTS

PART 12 GENERAL

12.1 SECTION INCLUDES

- A. Manufacturers: Provide products from one manufacturer for each type or kind as applicable. Provide secondary materials as acceptable to manufacturers of primary materials.
- B. Product Selection: Provide products selected or equal approved by Architect. Products submitted for substitution shall be submitted with complete documentation and include construction costs of substitution including related work.
- C. Substitutions: Request for substitution must be in writing. Conditions for substitution include:
 - 1. An 'or equal' phrase in the specifications.
 - 2. Specified material cannot be coordinated with other work.
 - 3. Specified material is not acceptable to authorities having jurisdiction.
 - 4. Substantial advantage is offered to the Owner in terms of cost, time, or other valuable consideration.
- D. Substitution Requests: Substitutions shall be submitted prior to award of contract, unless otherwise acceptable. Approval of shop drawings, product data, or samples containing substitutions is not an approval of a substitution unless an item is clearly presented as a substitution at the time of submittal.

PART 13 PRODUCTS - Not applicable to this Section

PART 14 EXECUTION - Not applicable to this Section

END OF SECTION

SECTION 01 70 00
EXECUTION AND CLOSEOUT REQUIREMENTS

PART 15 GENERAL

15.1 SECTION INCLUDES

- A. Cutting and patching.
- B. Substantial Completion: The following are prerequisites to substantial completion. Provide the following.
 - 1. Punch list prepared by Contractor and subcontractors as applicable.
 - 2. Supporting documentation.
 - 3. Warranties.
 - 4. Certifications.
 - 5. Occupancy permit.
 - 6. Start-up and testing of building systems.
 - 7. Change-over of locks.
 - 8. Meter readings.
 - 9. Commissioning documentation.
- C. Final Acceptance: Provide the following prerequisites to final acceptance.
 - 1. Final payment request with supporting affidavits.
 - 2. Completed punch list.
- D. As-Built Drawings: Provide a marked-up set of drawings including changes, which occurred during construction.
- E. Project Closeout: Provide the following during project closeout.
 - 1. Submission of record documents.
 - 2. Submission of maintenance manuals.
 - 3. Training and turnover to Owner's personnel.
 - 4. Final cleaning and touch-up.
 - 5. Removal of temporary facilities.

PART 16 PRODUCTS - Not applicable to this Section

PART 17 EXECUTION

17.1 CUTTING AND PATCHING

- A. Cutting and Patching: Provide cutting and patching work to properly complete the work of the project, complying with project requirements for:
 - 1. Structural work.
 - 2. Mechanical/electrical systems.
 - 3. Visual requirements, including detailing and tolerances.
 - 4. Operational and safety limitations.
 - 5. Fire resistance ratings.
 - 6. Inspection, preparation, and performance.
 - 7. Cleaning.

- B. Means and Methods: Do not cut and patch in a manner that would result in a failure of the work to perform as intended, decrease energy performance, increase maintenance, decrease operational life, or decrease safety performance.
- C. Inspection: Inspect conditions prior to work to identify scope and type of work required. Protect adjacent work. Notify Owner of work requiring interruption to building services or Owner's operations.
- D. Performance of Operations: Perform work with workmen skilled in the trades involved. Prepare sample area of each type of work for approval.
- E. Cutting: Use cutting tools, not chopping tools. Make neat holes. Minimize damage to adjacent work. Inspect for concealed utilities and structure before cutting.
- F. Patching: Make patches, seams, and joints durable and inconspicuous. Comply with tolerances for new work.
- G. Cleaning: Clean work area and areas affected by cutting and patching operations.

END OF SECTION

SECTION 01 90 00
LIFE CYCLE ACTIVITIES

PART 18 GENERAL

18.1 SECTION INCLUDES

- A. Commissioning: Provide commissioning of building systems, subsystems and equipment including:
 - 1. HVAC components and equipment.
 - 2. Building automation systems.
 - 3. Lighting control systems.
- B. Commissioning Agent: The Owner will engage a commissioning agent to prepare a commissioning plan and report, and to perform functional tests and inspections of building systems.
- C. Cooperation: Cooperate with the Owner's commissioning agent, including attendance at commissioning meetings and activities, coordinating scheduling, access to the work and utility services for commissioning activities.
- D. Access: Provide access to project documentation, shop drawings, wiring diagrams, operations and maintenance manuals and similar items when requested by the Owner's commissioning agent.
- E. Remedial Work: Modify, adjust, balance, repair or replace systems, subsystems and equipment which does perform to code requirements or to requirements specified in the Contract Documents at no additional expense to the Owner. Pay for retesting and additional modifications until satisfactory results are obtained.

PART 19 PRODUCTS - Not applicable to this Section

PART 20 EXECUTION - Not applicable to this Section

END OF SECTION

SECTION 02 41 19
SELECTIVE DEMOLITION

PART 21 GENERAL

21.1 SECTION INCLUDES

- A. Selective Site Demolition:
 - 1. Demolition of designated site improvements including paving, curbing, site walls, and utility structures.
 - 2. Demolition of below-grade foundations and site improvements to depth to avoid conflict with new construction or site work.
 - 3. Removal of hollow items or items which could collapse.
 - 4. Salvage of designated items.
 - 5. Protection of site work and adjacent structures.
 - 6. Disconnection, capping, and removal of utilities.
 - 7. Pollution control during building demolition, including noise control.
 - 8. Removal and legal disposal of materials.
 - 9. Designated site improvements and adjacent construction.
 - 10. Interruption, capping or removal of utilities as applicable.
- B. Selective Building Demolition:
 - 1. Selective demolition of interior partitions, systems, and building components designated to be removed.
 - 2. Selective demolition of exterior facade, structures, and components designated to be removed.
 - 3. Protection of portions of building adjacent to or affected by selective demolition.
 - 4. Removal of abandoned utilities and wiring systems.
 - 5. Notification to Owner of schedule of shut-off of utilities which serve occupied spaces.
 - 6. Pollution control during selective demolition, including noise control.
 - 7. Removal and legal disposal of materials.
 - 8. Protection of designated site improvements and adjacent construction.
 - 9. Salvage of designated items.
 - 10. Interruption, capping or removal of utilities as applicable.
- C. Hazardous Materials:
 - 1. Not present.
 - 2. Removed under separate prior contract.
 - 3. Removed as a part of this contract.

21.2 SUBMITTALS

- A. Submit under provisions of Section 01 30 00 - Administrative Requirements.
- B. Schedule: Submit for approval selective demolition schedule, including schedule and methods for capping utilities to be abandoned and maintaining existing utility service.

21.3 QUALITY ASSURANCE

- A. Codes and Regulations: Comply with governing codes and regulations. Use experienced workers.

21.4 PRE-INSTALLATION MEETINGS

- A. Convene minimum two weeks prior to starting work of this section.

21.5 SEQUENCING

- A. Immediate areas of work will not be occupied during selective demolition. The public, including children, may occupy adjacent areas.
- B. No responsibility for buildings and structures to be demolished will be assumed by the Owner.
- C. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

PART 22 PRODUCTS - Not applicable to this Section.

PART 23 EXECUTION

23.1 SELECTIVE DEMOLITION

- A. Demolition Operations: Do not damage building elements and improvements indicated to remain. Items of salvage value, not included on schedule of salvage items to be returned to Owner, shall be removed from structure. Storage or sale of items at project site is prohibited.
- B. Utilities: Locate, identify, disconnect, and seal or cap off utilities in buildings to be demolished.
- C. Shoring and Bracing: Provide and maintain interior and exterior shoring and bracing.
- D. Occupied Spaces: Do not close or obstruct streets, walks, drives or other occupied or used spaces or facilities without the written permission of the Owner and the authorities having jurisdiction. Do not interrupt utilities serving occupied or used facilities without the written permission of the Owner and authorities having jurisdiction. If necessary, provide temporary utilities.
- E. Operations: Cease operations if public safety or remaining structures are endangered. Perform temporary corrective measures until operations can be continued properly.
- F. Security: Provide adequate protection against accidental trespassing. Secure project after work hours.
- G. Restoration: Restore finishes of patched areas.

END OF SECTION

SECTION 03 10 00
CONCRETE FORMWORK

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.
- B. Section 03 20 00 – Concrete Reinforcement and Embedded Assemblies
- C. Section 03 30 00 – Cast-in-Place Concrete

1.2 SUMMARY

- A. Section Includes:
 - 1. The furnishing and erecting formwork for cast-in-place structural concrete, with shoring, bracing, and anchorage.
 - 2. Form Accessories
 - 3. Form Stripping

1.3 REFERENCE STANDARDS

- A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.
- B. Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner.
- C. Remove and Reinstall: Detach items from existing construction, prepare for reuse, and reinstall where indicated.
- D. Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.4 QUALITY ASSURANCE

- A. Perform work in accordance with ACI 301, 318, and 347.
- B. The work of this section shall be performed by a company which specializes in the type of concrete framework work required for this Project, with a minimum of 10 years of documented successful experience and shall be performed by skilled workmen thoroughly experienced in the necessary crafts.
 - 1. Work shall be performed in compliance with Owner's insurance underwriters' requirements.
- C. Owner's Testing Laboratory Services: Required as specified in Bid Documents, and herein.

1.5 SUBMITTALS

- A. Submit the following according to Conditions of the Construction Contract and Division 1 Specification Sections.
- B. Shop Drawings: Sealed and signed by a Professional Engineer registered in the State of South Carolina. Review is for general conformance to member dimensional requirements and architectural applications and features only. Shop drawings shall clearly indicate but not be limited to:
 - 1. Size, type and quality of form materials including conditions at tops and ends of walls. (If wood is used, indicate species.)

2. Form construction indicating structural stability and jointing including special form joints or reveals required by Contract Documents.
 3. Location and pattern of form tie placement, and other items that affect the appearance of concrete that will remain exposed to view.
 4. Form finish clearly indicating proper locations and full coordination with concrete finishes required by Contract Documents.
- C. Product Data: Copies of manufacturers' product data and installation instructions for proprietary materials used in exposed concrete work, including form liners, release agents, manufactured form systems, ties, and accessories.
- D. Compatibility Certification: Contractor shall certify that form release agent used is compatible with subsequent architectural finish materials applied to concrete surfaces. Submit along with manufacturer's data.
- E. Installation Certificate: Contractor shall certify that formwork meets requirements of Contract Documents including allowable tolerances.
- F. Asbestos and PCB Certification: After completion of installation, but prior to Substantial Completion, Contractor shall certify in writing that products and materials installed, and processes used, do not contain asbestos or polychlorinated biphenyls (PCB), using format in General Conditions.

1.6 DELIVERY, HANDLING STORAGE

A. Comply with General Requirements:

1. Store forms and form materials clear of ground and protect from damage.

1.7 WARRANTY

- A. Comply with General Conditions, agreeing to repair or replace specified materials or Work that has failed within the warranty period. Failures include but are not limited to the following:
1. Discoloration of concrete scheduled to remain exposed to the view.
 2. Damage of concrete finishes caused by forms.
 3. Non-compliance with form finishes required for designated architectural finishes.
 4. Non-compatibility of form release agent with subsequent architectural finish materials applied to concrete surfaces.
 5. Excessive and/or noticeable bowing in placed concrete members caused by deflection of formwork during concrete placement.

PART 2 - PRODUCTS

2.1 UNAUTHORIZED MATERIALS

- A. Materials and products required for work of this section shall not contain asbestos, polychlorinated biphenyls (PCB) or other hazardous materials identified by the Owner.

2.2 ACCEPTABLE MANUFACTURERS

- A. Products of the manufacturers specified in this section establish the minimum functional, aesthetic and quality standards required for work of this section.
- B. Substitutions: Comply with General Conditions using form in Section 01 60 00/Product Requirements.

2.3 FORMWORK DESIGN

A. Design Requirements:

1. Forms shall be designed for fabrication and erection in accordance with Architect/Engineer's design requirements and recommendations of ACI 301, 318 and 347R. Design formwork for loads and lateral pressures outlined in ACI 347R Section 2.2, and wind loads as specified by controlling local building code. This includes loads imposed during construction, including weight of construction equipment, and temporary imbalance or discontinuity of building components.
2. Formwork shall meet construction safety regulations for locality in which this Project is located.
3. Forms shall be removable without impact, shock or damage to concrete surfaces, the structure and adjacent materials.
4. Forms shall be tight-fitting, designed and fabricated for required finishes and to withstand concrete weight and maintain tolerances as specified in ACI 117 for the following designations:
 - a. All surfaces are designated Class C.
5. Furnish forms in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings, using form materials with sufficient thickness to withstand pressure of newly-placed concrete without bow or deflection.
6. Butt Joints: Shall be solid and complete with backup material to prevent leakage of cement paste.
7. Design of Formwork and Shoring: Design of formwork, shoring and reshoring and its removal is the Contractor's responsibility.
 - a. Design formwork in a manner such that existing or new construction is not overloaded.
 - b. Do not remove shores or reshores earlier than recommended by ACI 301 and ACI 347R.

B. Form Finishes for Exposed Surfaces:

1. Type: Straight, smooth, free of cement paste leaks at butt-joints, surface imperfections and other irregularities detrimental to appearance of finished concrete, fully coordinated with requirements for required finish material.

C. Form exposed arises of columns, beams, ledges, balcony fascias to achieve true alignment and level soffit of spandrel beams and concrete edges. All such arises must be sharp, straight and true to line and level. Spandrel beams and concrete canopies and ledges must have adequate shoring to prevent any visible amount of sag and sufficient bracing to prevent any lateral movement during construction.

2.4 FORM MATERIALS

- A. General: Plywood, fiberglass, metal, metal-framed plywood faced, or other acceptable panel-type materials.
 1. Provide materials with sufficient strength to prevent warpage.
- B. Plywood: Douglas Fir or Southern Yellow Pine species; of grade suitable for intended use, sound undamaged sheets with clean true edges, minimum 5/8" thick, complying with U.S. Product Standard PS-1.
 1. Other Acceptable Sheet Materials: 14-gauge sheet steel or fibrous glass reinforced resin.
- D. Pan-Type Forms: Glass-fiber-reinforced plastic or formed steel, stiffened to support weight of placed concrete without deformation.

E. Fillets for Form Corners:

1. Types: Chamfer strips of wood, metal, PVC or rubber fabricated to produce smooth form lines and tight edge joints, 3/4" size, maximum possible lengths.
2. Required for all corners of beam and column forms.

F. Form Ties:

1. Type: Factory-fabricated galvanized metal, adjustable length, designed to prevent form deflection and to prevent spalling concrete upon removal.
2. Ties shall not leave metal closer than 1-1/2" to exposed surface.
3. When removed, ties shall not leave holes larger than 1" diameter in concrete surface.
4. Removable Ties: Use type with tapered cones, 1" outside diameter, for concrete walls which will remain exposed to view and scheduled for architectural finishes.
5. Snap-Off Ties: Use for concrete walls below grade and walls which will not remain exposed to view and are not scheduled for architectural finishes.
6. Wire Ties: Not acceptable.

G. Nails, Spikes, Lag Bolts, Thru-Bolts, Anchorages:

1. Type: Of size, strength and quality to meet the required quality of formwork.

H. Form Release Agent:

1. Type: Commercial formulation form release agent with a maximum of 350 g/L volatile organic compounds (VOC's) of non-emulsifiable type which will not bond with, stain, or adversely affect concrete surfaces, and be compatible with subsequent architectural finish materials applied to concrete surfaces.
2. For Steel Forms: Non-staining rust-preventative type.

- I. Reglets: Provide sheet metal reglets formed of same type and gauge as flashing metal, unless indicated otherwise on Drawings. Where resilient or elastomeric sheet flashing, or bituminous membranes are terminated in reglets, provide reglets of not less than 26-gauge galvanized sheet metal. Fill reglet or cover face opening to prevent intrusion of concrete or debris.

- J. Coordinate with materials as specified in Section 03 20 00/Concrete Reinforcement and Embedded Assemblies.

PART 3 - EXECUTION

3.1 FORMWORK

A. General:

1. Inspect areas to receive formwork.
 - a. Immediately report to Architect/Engineer in writing the conditions that will adversely affect the Work.
2. Construct forms to sizes, shapes, lines, and dimensions shown, and to obtain accurate alignment, location, grades, level and plumb work in finished structures.
3. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, drips, bevels, chamfers, blocking, screeds, bulkheads, anchorages and inserts and other features required in the Work.

4. Comply with shop drawings, ACI 301, 318, 347R and Contract Documents.
5. Maintain formwork and finished work construction tolerances complying with ACI 301 and 117.
6. Erect forms for easy removal without hammering or prying against concrete surfaces.
7. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces.
8. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only.
9. Kerf wood inserts for forming keyways, reglets, recesses, and the like, to prevent swelling and for easy removal.
10. Chamfer exposed corners and edges as indicated, using wood, metal, PVC or rubber chamfer strips fabricated to produce smooth lines and tight edge joints.
11. Design, erect, support, brace and maintain formwork and shoring to support loads until such loads can be safely supported by the concrete structure.
12. Uprturned beams, curbs and similar members in connection with slabs shall be formed so that they can be poured integrally with slabs.

B. Concrete Accessories and Embedded Items:

1. Install into forms concrete accessories, sleeves, inserts, anchor bolts, anchorage devices and other miscellaneous embedded items furnished by other trades or that are required for other work that is attached to or supported by cast-in-place concrete.
 - a. Use setting drawings, diagrams, instructions and directions provided by suppliers of items to be attached.
2. Install reglets to receive top edge of foundation sheet waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, relieving angles, and other conditions.
3. Forms for Slabs: Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and contours in finished surfaces.
 - a. Provide and secure units to support screed strips using strike-off templates or compacting-type screeds.
4. Coordinate with Section 03 20 00/Concrete Reinforcement and Embedded Assemblies.
5. Install straight, level, plumb and secure in place to prevent displacement by concrete placement.
6. Embeds: Set and secure embedded plates, bearing plates, and anchor bolts per approved setting drawings and in such a manner to prevent movement during placement of concrete.
7. Install waterstops at construction joints as indicated on the Contract Drawings in sizes to suit joint.

C. Temporary Openings:

1. Locate temporary openings in forms at inconspicuous locations.
2. For clean-outs and inspection before concrete placement, locate temporary openings where interior area of formwork is inaccessible.
3. For cleaning and inspections, locate openings at bottom of forms to allow flushing water to drain.
4. Securely brace temporary openings and set tightly in forms to prevent loss of concrete.

5. Close temporary openings with tight fitting panels, flush with inside face of forms, neatly fitted so that joints will not be noticeable on exposed concrete surfaces.

D. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades.

1. Determine size and location of openings, recesses, chases, offsets, openings, depressions, and curbs from trades providing such items.
2. Accurately place and securely support items built into forms.

E. Cleaning:

1. Thoroughly clean forms and adjacent surfaces to receive concrete.
2. Remove chips, wood, sawdust, dirt or other debris just before placing concrete.
3. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
4. Flush with water or use compressed air to remove remaining foreign matter.
5. Verify that water and debris can drain from forms through clean-out ports.

F. Form-Coatings:

1. Before placing reinforcing steel and miscellaneous embedded items, coat contact surfaces of forms with an approved non-residual, low-VOC form-coating compound in accordance with manufacturer's published instructions.
2. Do not allow release agent to accumulate in forms or come into contact with reinforcement or concrete against which fresh concrete will be placed.
3. Remove form-coating and residue from reinforcement or surfaces not requiring form coating.

G. Before Placing Concrete:

1. Inspect and check completed formwork, shoring and bracing to ensure that work is in accordance with formwork requirements of this section and Contract Documents, and that supports, fastenings, wedges, ties, and parts are secure.
 - a. Make necessary corrections or adjustment to form work to meet tolerance requirements.
2. Form joints in all exposed concrete surfaces shall be securely taped or sealed by other approved means to prevent leakage and loss of paste during placement of concrete.
3. Retighten forms and bracing before concrete placement to prevent mortar leaks and maintain proper alignment.
4. When formwork is complete and clean, notify Testing Laboratory 24 hours prior to placing concrete for inspection of forms.

H. During Concrete Placement:

1. Maintain a check on formwork to ensure that forms, shoring, ties and other parts of formwork have not been disturbed by concrete placement methods or equipment.

J. Surface Defects:

1. Install forms substantially free of surface defects.

3.2 REMOVING FORMS

- A. Do not remove forms, shores or bracing until concrete has gained sufficient strength to carry its own weight, and construction and design loads which are liable to be imposed upon it.
 - 1. Verify strength of concrete by compressive test results.
- B. General: Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50°F (10°C) for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form-removal operations, and providing curing and protection operations are maintained.
- C. Formwork supporting weight of concrete, such as beam soffits, joists, slabs, and other structural elements, may not be removed in less than 14 days or until concrete has attained at least 75% of design minimum compressive strength at 28 days or in accordance with the Structural Drawings.
 - 1. Provide backshores/reshores as required per ACI 347R. 2. Determine potential compressive strength of in-place concrete by testing field-cured specimens representative of concrete location or members.
- D. Form-facing material may be removed 4 days after placement only if shores and other vertical supports have been arranged to permit removal of form-facing material without loosening or disturbing shores and supports.
- E. Remove formwork progressively and in accordance with code requirements and using methods to prevent shock loads or unbalanced loads from being imposed on structure.
 - 1. Comply with ACI 347R.
- F. Loosen forms carefully.
 - 1. Do not wedge pry bars, hammers, or tools against concrete surfaces.
- G. Reshore structural members where required due to design requirements or construction requirements or construction conditions and as required to permit progressive construction.
 - 1. Coordinate with design requirements. 2. Reshore on same day shoring and forms are removed.

3.3 REUSING FORMS

- A. Before forms can be re-used, surfaces that will be in contact with freshly poured concrete must be thoroughly clean, damaged areas repaired, and projecting nails withdrawn.
- B. Clean and repair surfaces of forms to be reused in the Work.
 - 1. Split, frayed, delaminated or otherwise damaged form-facing material will not be acceptable for exposed surfaces.
 - 2. Apply new form coating compound as specified for new formwork.
- C. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints.
 - 1. Align and secure joints to avoid offsets.
- D. Forms for exposed concrete may be reused only if the surfaces have not absorbed moisture and have not splintered, warped, discolored, stained, rusted or peeled, subject to Architect's acceptance. The Architect reserves the right to require the Contractor to remove and reconstruct such formwork as will produce subsequent areas that are acceptable. Do not use "patched" forms for exposed concrete surfaces, except as acceptable to Architect.

3.4 FIELD QUALITY CONTROL

- A. General: The Owner's Testing Laboratory shall inspect concrete formwork as work progresses. Failure to detect any defective work or material shall not in any way prevent later rejection when such defect is discovered, nor shall it obligate Architect for final acceptance.
- B. Testing Laboratory shall provide qualified personnel at site to inspect formwork using the latest Drawings and approved shop drawings as follows:
 - 1. Prior to placement of reinforcement, inspect formwork for grade, quality of material, absence of foreign matter, and other imperfections that might affect suitability of concrete placement and tolerances stated herein.
 - 2. Inspect forms for location, configuration, compliance with specified tolerances, block outs, camber, shoring ties, seal of form joints and compliance with Contract Documents.
 - 3. Verify condition of bond surfaces, locations and sizes of all accessories, embedment items, and anchorage for prevention of displacement.
 - 4. Verify proper use/application of form release agents.
 - 5. Inspect form stripping for conformance with requirements of Section 03 30 00/Cast-in-Place Concrete.
- C. Submit inspection, observation, and/or test reports to the Architect/Engineer and provide an evaluation statement in each report stating whether or not concrete formwork conforms to the requirements of Specifications and Drawings. Specifically note deviations.
- D. Report deficiencies to Contractor immediately.

END OF SECTION

SECTION 03 15 00
CONCRETE ACCESSORIES

PART 24 GENERAL

1. SUMMARY

a. Related Documents:

- 1) Drawings and general provisions of the Subcontract apply to this Section.
- 2) Review these documents for coordination with additional requirements and information that apply to work under this Section.

b. Section Includes:

- 1) Anchors installed in hardened concrete, including but not limited to:
 - a) Expansion type anchors, including wedge-type, and shell type (drop-in) anchors.
 - b) Powder driven fasteners.
 - c) Epoxy anchors.
 - d) Inspection and testing of concrete anchors.

c. Related Sections:

- 1) Division 01 Section "General Requirements."
- 2) Division 01 Section "Special Procedures."
- 3) Division 23 Section "Supports and Anchors."
- 4) Section 07 16 16 "Coatings"

2. REFERENCES

a. General:

- 1) The following documents form part of the Specifications to the extent stated. Where differences exist between codes and standards, the one affording the greatest protection shall apply.
- 2) Unless otherwise noted, the referenced standard edition is the current one at the time of commencement of the Work.
- 3) Refer to Division 01 Section "General Requirements" for the list of applicable regulatory requirements.

b. International Code Council (ICC)

- 1) ICC Evaluation Reports.

3. SUBMITTALS

- a. Submit under provisions of Division 01 Section "General Requirements."
- b. Product Data: For each anchor type scheduled for use. Include active ICC Evaluation Report.

4. QUALITY ASSURANCE

- a. Each anchor proposed for use shall have a current ICC Evaluation report indicating allowable capacity in applicable concrete substrate materials.

5. PROJECT CONDITIONS

- a. Fill over deck is lightweight concrete.
- b. Cast-in-place normal weight concrete.

PART 25 PRODUCTS

1. CONCRETE ANCHORS

- a. Torque-Controlled Expansion Anchors: Kwik Bolt TZ, by Hilti (ICC ESR-1917), Strong-Bolt by Simpson (ICC ESR-1771) or approved equal.
- b. Shell-type (drop-in) Anchors: HDI by Hilti, Drop-in by Simpson, or approved equal.
- c. Powder Driven Fasteners: X-U fasteners as manufactured by Hilti, Inc.(ICC- ESR-2269), or approved equal.
- d. Epoxy Adhesive (Cartridge-Type): ICC approved, two component structural epoxy; prepackaged in cartridges for manually or pneumatically operated caulk gun and automatically mixed at nozzle. Subject to compliance with requirements provide one of the following:
 - HIT RE500-SD Adhesive Anchoring System, Hilti, Inc. (ICC ESR-2322).
 - HIT-HY 150 MAX-SD Adhesive Anchoring System, Hilti, Inc. (ICC ESR-3013).
 - SET-XP Adhesive Anchoring Systems, Simpson Strong-Tie Co. (ICC ESR-2508).

2. ANCHOR RESTRICTIONS

- a. Wedge-type Anchors: Acceptable for applications within the limitations of the applicable ICC report.
- b. Shell-type (drop-in) Anchors: Shall not be used in applications requiring resistance to forces due to wind or earthquake or tension forces due to gravity.
- c. Powder Driven Fasteners: Shall not be used in applications requiring resistance to forces due to wind or earthquake forces or tension forces due to gravity.
- d. Epoxy Anchors: Acceptable for applications within the limitations of the applicable ICC report and shall not be used to fasten overhead, wall mounted or fire resistive construction. Epoxy dowels shall not be used for substitution of lap splices.

PART 26 EXECUTION

1. EXAMINATION

- a. Examine areas to be drilled to verify conditions of access, interferences, and existing materials.
- b. Locate existing reinforcing steel, which might interfere with drilling, with a suitable metal detector.

2. INSTALLATION

- a. Holes for anchors and dowels shall be located to miss existing reinforcing steel wherever practical.
 - 1) Where reinforcement is encountered, and anchor cannot be shifted, install wedge type anchor with minimum 4 anchor diameter embedment above bottom of reinforcement.
- b. Hole diameter shall be as specified in the applicable ICC Report for the size and type of anchor or dowel to be installed. Hole depth shall be as necessary to obtain the embedment specified on the drawings.
 - 1) Torque controlled mechanical anchors installed in applications to resist tension due to gravity or seismic forces shall have an embedment equal to 8 anchor diameters, wherever practical.
- c. Holes shall be prepared as specified in the applicable ICC Report. At a minimum, holes shall be cleaned of all dust and debris prior to installation of anchors or dowels. Cleaning shall consist of removal of debris with oil free compressed air (90 psi (632 gr/cm²), minimum), brushing of the hole twice in a twisting motion with a nylon brush and removal of debris with oil free compressed air (90 psi (632 gr/cm²), minimum).

- d. Wedge-type anchors shall be installed to the minimum torque specified in the applicable ICC Report.

3. FIELD QUALITY CONTROL

- a. The Testing Laboratory will:
 - 1) Special Inspect installation of anchors in accordance with applicable ICC Evaluation Report, where special inspection is indicated on Contract Documents or where Subcontractor's design engineer has used ICC anchor capacities that require Special Inspection.
 - a) Subcontractor will reimburse Owner for cost of Special Inspection, where anchors are sized by Subcontractor's design engineer using ICC Special Inspection values.
 - 2) Develop and utilize an effective method of field marking anchor and dowel test locations and results.
- b. Test 25 percent of torque controlled mechanical anchors installed on a given day in tension using pullout procedure. Test to 80% of specified yield strength of the dowel or 200% of the ICC rated static capacity for 2500 psi concrete whichever is the lesser. Anchors specifically noted on the drawings as "No test required" do not require tension testing.
- c. Test 25 percent of reinforcing steel dowels and threaded rods installed with epoxy on a given day in tension using pullout procedure. Test to 80% of specified yield strength of the dowel or 150% of the ICC rated static capacity whichever is the lesser with special inspection. Dowels specifically noted on the drawings as "No test required" do not require tension testing.
- d. Pull test 25 percent of epoxy-type anchors installed on a given day in tension using pullout procedure. Test to 150 percent of the ICC rated capacity with special inspection.
- e. If the failure rate of anchors or dowels exceeds 10 percent, testing will be increased to 100 percent of that day's installation of similar anchors or dowels. Testing will be reduced to 25 percent of that day's installation when the failure rate is reduced to 10 percent or less.
- f. Failed anchors and dowels shall be replaced at no additional cost to the Owner and the Subcontractor shall reimburse the Owner for cost of additional testing.

END OF SECTION

SECTION 03 20 00
CONCRETE REINFORCING

PART 27 GENERAL

1. SUMMARY

a. Related Documents:

- 1) Drawings and general provisions of the Subcontract apply to this Section.
- 2) Review these documents for coordination with additional requirements and information that apply to work under this Section.

b. Section Includes: Concrete reinforcement and accessories.

c. Related Sections:

- 1) Division 01 Section "General Requirements."
- 2) Division 01 Section "Special Procedures."

2. REFERENCES

a. General:

- 1) The following documents form part of the Specifications to the extent stated. Where differences exist between codes and standards, the one affording the greatest protection shall apply.
- 2) Unless otherwise noted, the referenced standard edition is the current one at the time of commencement of the Work.
- 3) Refer to Division 01 Section "General Requirements" for the list of applicable regulatory requirements.

b. ACI – American Concrete Institute:

- 1) ACI 117 Tolerances for Concrete Construction
- 2) ACI 301 Specifications for Structural Concrete
- 3) ACI 315 Standard Practice for Detailing Reinforced Concrete Structures

c. ASTM International:

- 1) ASTM A185 / A185M Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete
- 2) ASTM A615 / A615M Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
- 3) ASTM A706 / A706M Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement
- 4) ASTM A970 / A970M Standard Specification for Headed Steel Bars for Concrete Reinforcement

d. CRSI - Manual of Standard Practice.

e. ICBO - Evaluation Reports.

3. SUBMITTALS

a. Submit under provisions of Division 01 Section "General Requirements."

b. Shop Drawings: Prepare placing drawings in accordance with ACI 315. Show size, shape and location of bars and wire fabric in structure. Show splice locations and lengths. Where details are not shown, conform to standards of practice indicated in ACI 315 and submit for approval.

- 1) Bill reinforcing bars for walls on elevations. Bill reinforcing bars for slabs on plans. Plans and elevations need not be true views. When more than one wall or slab are identical, only one such wall or slab is required. Take sections to clarify the arrangement of reinforcement. Identify, but do not bill bars on sections.
- 2) Unless the location of reinforcing is clear, give dimensions to some structural feature that will be readily distinguishable at time bars are placed.
- 3) Make placing drawings complete, including the location of support bars and chairs, without reference to the design drawings.

- c. Submit data required to evaluate proposed mechanical splices.
- d. Submit manufacturer's certified mill test reports on each heat of reinforcing steel delivered, showing physical and chemical analysis before placing reinforcement.

4. QUALITY ASSURANCE

- a. Codes and Standards: Comply with provisions of ACI 301 CRSI's "Manual of Standard Practice", except where more stringent requirements are shown or specified.
- b. Requirements of Regulatory Agencies: Proprietary products, including bar couplers, shall have an active ICBO Evaluation Report.
- c. Material Quality Assurance: Mill test reports including chemical analysis, tensile properties and bend test shall be examined for all reinforcing. Conform to one of the following:
- d. Maintain positive identification of reinforcing by heat number. Provide certified mill test reports to Testing Laboratory.
- e. Where positive identification cannot be made and procedures are not deemed adequate to ensure compliance, Testing Laboratory will randomly sample and make one tensile and one bend test from each 2-1/2 tons or fraction thereof of each size of reinforcement. Subcontractor will bear the cost of testing.

PART 28 PRODUCTS

1. REINFORCING MATERIALS

- a. Bar Reinforcement: ASTM A615, Grade 60, deformed billet bars.
 - 1) ASTM A706, where noted on Drawings.
 - 2) Recycled content shall be a minimum of 75 percent recycled post consumer steel.
- b. Headed Bar Reinforcement: ASTM A970.
- c. Spirals: ASTM A82.
- d. Welded Wire Fabric: ASTM A185.
- e. Threaded Bars: Grade 75, manufactured by DYWIDAY Systems International, Williams Form Engineering Corp. or equal substituted per Division 1.
- f. Smooth Dowels, ASTM A615, Grade 40 or 60, smooth; sawcut or grind one end to remove offsets; shop paint with iron oxide zinc chromate primer.
- g. Welded Deformed Bar Anchors: ASTM A-108 $f_y = 70,000$ psi, flux-filled deformed bar anchors welded to structural steel as shown; Nelson D2L, or equal substituted per Division 1.

- h. Mechanical Bar Couplers: Provide mechanical couplers with a current ICC evaluation report. Coupler shall develop 160% percent of specified minimum yield strength of spliced reinforcement. Subject to compliance with requirements provide one of the following, or approved equal:
- 1) Barteck, Dextra Inc.
 - 2) Lenton Taper Threaded Connection, Erico Inc.
 - 3) Bar Lock, Dayton Superior Inc.

2. ACCESSORIES

- a. Tie Wire: Minimum 16-gage black annealed wire.
- b. Bar Supports:
 - 1) At surfaces not exposed to view in completed structure: Precast concrete bar supports with two 16 ga. embedded wires or CRSI Class 2 wire supports.
 - 2) Supports placed against ground or on top of vapor barrier: Precast concrete blocks not less than 3 inches square (1935 mm²) with two 16 ga. embedded wires.
 - 3) At Architectural Concrete and surfaces exposed to weather: CRSI Class 2 stainless steel or CRSI Class 1 plastic protected.
 - 4) Where support is no closer to concrete surface than 1/2 inch (13 mm): CRSI Class 3 wire supports.

3. FABRICATION

- a. Fabricate reinforcement in accordance with ACI 315 where specific details are not shown.

PART 29 EXECUTION

1. PLACEMENT

- a. Surface Condition of Reinforcement: Before placing concrete, clean reinforcement of loose scale, dirt, grease and other substances which would impair bond with concrete.
- b. Place reinforcement in accordance with the Drawings and the CRSI Manual.
 - 1) Steel bars shall be of size and length indicated, accurately bent or formed to shapes detailed or scheduled by experienced shops by methods that will not injure the materials. Reinforcing bars shall be shop fabricated to lengths and bends shown on the drawings. Fabrication tolerance shall be in accordance with the requirements of ACI 315.
 - 2) Reinforcing bars shall be as long as possible with a minimum number of joints.
 - 3) Steel reinforcement shall not be bent or straightened in a manner that will injure the material or the embedding concrete. Bars with kinks or bends not shown on the Drawings shall not be used. Heating of reinforcement for bending will not be permitted.
 - 4) Reinforcement shall be tagged with suitable identification to facilitate sorting and placing.
- c. Place reinforcing bars accurately as to spacing and clearance and securely tied at intersections and supports with wire and in such a manner as will preclude displacement during pouring of concrete. Placing tolerances shall be in conformance with the requirements of ACI 117.
- d. Place and secure reinforcement to maintain the proper distance and clearance between parallel bars and from the forms. Provide vertical steel with metal spreaders to maintain steel properly centered in

the forms. Horizontal reinforcement shall be supported at proper height on concrete pads, chairs or transverse steel bars.

- e. After placing, maintain bars in a clean condition until completely embedded in concrete.
 - f. Bars shall not be spaced closer than 1-1/2 diameters of the largest of two adjacent bars, 1-1/2 times the maximum aggregate size, nor one inch, except at bar laps. Where reinforcement in members is placed in two layers, the clear distance between layers shall be not less than one inch (25 mm) or more than 1-1/2 inches (38 mm) unless otherwise noted on the drawings. The bars in the upper layer shall be placed directly above those in the bottom layer unless otherwise detailed.
 - g. Coverage of bars shall be as shown and scheduled. Conform to ACI 301 where not indicated.
 - h. Where obstruction prevents the intended placement of reinforcement, provide additional reinforcement as directed by the Owner around the obstruction.
 - i. Splice bars as indicated by lapping and securely wiring together. Splices at locations other than those indicated are subject to the approval of the Owner. Splices of reinforcement shall not be made at the point of maximum stress. Splices shall provide sufficient lap to transfer the stress between bars by bond and shear. Bars shall be spread the minimum distance specified. Stagger splices of adjacent bars where possible.
 - j. Reinforcing bars shall not have welded joints.
 - k. Mechanical Bar Couplers: Install in accordance with applicable ICC evaluation report. Maintain clearance and coverage at coupler. Stagger couplers wherever practical.
2. FIELD INSPECTION
- a. Testing Laboratory will:
 - 1) Review Quality Assurance procedures for maintaining identification of steel. Collect certificates of compliance and test reports for reinforcing steel.
 - 2) Special Inspect placement of reinforcement for conformance with the Contract Documents and as required by CBC Chapter 17.
 - 3) Special Inspect installation of mechanical couplers in accordance with requirements of applicable ICC evaluation report.
 - 4) Special Inspect shop and field welding as required by CBC Chapter 17

END OF SECTION

SECTION 03 30 00
CAST IN PLACE CONCRETE

PART 30 GENERAL

1. SUMMARY

a. Related Documents:

- 1) Drawings and general provisions of the Subcontract apply to this Section.
- 2) Review these documents for coordination with additional requirements and information that apply to work under this Section.

b. Section Includes:

- 1) Cast-in-place concrete.

c. Related Sections:

- 1) Section 031000 - Concrete Formwork
- 2) Section 031500 - Concrete Accessories
- 3) Section 032000 - Concrete Reinforcing
- 4) Section 033500 - Concrete Additives

2. REFERENCES

a. General:

- 1) The following documents form part of the Specifications to the extent stated. Where differences exist between codes and standards, the one affording the greatest protection shall apply.
- 2) Unless otherwise noted, the referenced standard edition is the current one at the time of commencement of the Work.
- 3) Refer to Division 01 Section "General Requirements" for the list of applicable regulatory requirements.

b. American Concrete Institute (ACI):

- 1) ACI 211.1 Proportioning Concrete Mixtures
- 2) ACI 301 Specifications for Structural Concrete
- 3) ACI 303.1 Specification for Cast-in-Place Architectural Concrete
- 4) ACI 305 Hot Weather Concreting
- 5) ACI 306 Specifications for Cold Weather Concreting
- 6) ACI 308 Specifications for Curing Concrete
- 7) ACI 309 Consolidation of Concrete
- 8) ACI 318 Building Code Requirements for Structural Concrete

c. American Society for Testing and Material (ASTM)

- 1) ASTM C31 Practice for Making and Curing Concrete Test Specimens in the Field
- 2) ASTM C33 Specification for Concrete Aggregates
- 3) ASTM C94 Specification for Ready Mix Concrete
- 4) ASTM C143 Test Method for Slump of Hydraulic Concrete
- 5) ASTM C150 Specification for Portland Cement

- 6) ASTM C156 Standard Test Method for Water Retention by Liquid Membrane Forming Curing Compounds for Concrete
- 7) ASTM C171 Specification for Sheet Materials for Curing Concrete
- 8) ASTM C172 Practice for Sampling Freshly Mixed Concrete
- 9) ASTM C260 Specifications for Air Entraining Admixtures for Concrete
- 10) ASTM C309 Specification for Liquid Membrane - Forming Compounds for Curing Concrete
- 11) ASTM C330 Specification for Lightweight Aggregates for Structural Concrete
- 12) ASTM C494 Specification for Chemical Admixtures for Concrete
- 13) ASTM C567 Test Method for Determining Density of Structural Lightweight Concrete
- 14) ASTM C618 Specification for Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
- 15) ASTM C881 Specification for Epoxy - Resin - Base Bonding Systems for Concrete
- 16) ASTM E1745 Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs

d. American Association of State Highway and Transportation Officials (AASHTO):

- 1) M182-60 - Burlap Cloth Made for Jute or Kelat

e. State of California - California Department of Transportation (CALTRANS):

- 1) CMM Materials Manual.
- 2) Standard Specifications.

f. American Institute of Steel Construction (AISC):

- 1) Code of Standard Practice for Steel Buildings and Bridges

3. SUBMITTALS

- a. Submit under provisions of Division 01 Section "General Requirements."
- b. Product Data: Provide data form proprietary materials, including admixtures curing materials, and finish materials.
- c. Submit Placement Shop Drawings, showing location of construction joints. Clearly indicate the construction joints in different locations that those shown in the Drawings.
- d. Samples: As requested by Testing Laboratory.
- e. Mix design for each concrete mix sealed by an engineer registered in California.
 - 1) Include compression test data used to establish mix proportions.
- f. Submit certification that the facilities of the ready-mix plant comply with the requirements of ASTM C94.
- g. Material Certificates.
 - 1) Cementitious materials, including supplemental cementitious material.
 - 2) Aggregates, including gradation and combined gradation.
 - 3) Admixtures. Where more than one admixture is proposed, include statement from admixture manufacturer indicating that admixtures proposed for use are compatible, such that desirable effects of each admixture will be realized.
- h. Submit ticket to Testing Laboratory for each batch of concrete delivered, bearing the following information. Refer to "Field Quality Control" Article of this Section.

- 1) Mix identification.
- 2) Weights of cementitious materials, aggregates, water and admixtures, and aggregate size.

i. Submit test reports from the independent testing agency for review.

4. QUALITY ASSURANCE

- a. Quality assurance and inspection shall be in accordance with Division 01 Section "Special Provisions".
- b. Standards: Comply with provisions of ACI 301, except where more stringent requirements are indicated. Evaluation and acceptance of concrete structures will be in accordance with ACI 301.
- c. Concrete Mix Design: Testing Laboratory shall, under direction of its California registered Civil Engineer, design concrete mixes. Each mix shall bear the signature, seal and registration expiration date of the engineer directing the design work. For mixes containing greater than twenty five percent fly ash, the Testing Laboratory shall produce calculations and test batches in accordance with the recommendations of ACI 211.1 to determine the minimum water content and to confirm workability, curing time and compressive strength.
- d. Certificates of Compliance: Acceptability of the following materials will be based upon documentation furnished by the manufacturer identifying each batch of material and certifying compliance with the requirements specified:
 - 1) Portland cement.
 - 2) Fly ash.
 - 3) Chemical admixtures.
- e. Certified Laboratory Test Reports: Before delivery of materials submit certified copies of the reports of the tests required in referenced standards or otherwise specified here. The testing shall have been performed by an independent laboratory approved within one year of submittal of test reports for approval. Test reports on a previously tested material shall be accompanied by notarized certificates from the manufacturer certifying that the previously tested material is of the same type, quality, manufacture and make as that proposed for use in the Project. Certified test reports are required for the following:
 - 1) Portland Cement.
 - 2) Aggregates.
 - 3) Admixtures.
- f. Survey anchor bolts for placement and alignment prior to casting concrete.

PART 31 PRODUCTS

1. CONCRETE MATERIALS

- a. Cementitious materials and aggregates for exposed concrete shall be from same source throughout the work.
- b. Cementitious Material: An intimate blend of Portland cement and supplemental cementitious material. Cementitious material shall include [15 percent minimum to a maximum of 25 percent] [50% percent minimum to a maximum of 60 percent] fly ash or ground blast furnace slag by weight unless the strength is specified to be achieved in 7 or 14 days. Cementitious material shall comply with ACI 318 Chapter 4 requirements for exposure class S1.
- c. Supplemental Cementitious Materials:

- 1) Fly Ash: ASTM C618, Class F with the following Modified ASTM requirements:
 - a) Loss of Ignition (L.O.I.): maximum 1 percent.
 - b) Sulfur Trioxide (SO₃) shall not exceed 3 percent by weight.
 - c) Water requirement maximum: 100 percent control.
 - 1) $R = (\text{CaO} - 5 \text{ percent}) / (\text{Fe}_2\text{O}_3)$, where R (sulfate resistance) is 0.75 maximum and CaO/Fe₂O₃ is the percentage from fly ash oxide analysis.
- 2) Ground Blast Furnace Slag: ASTM C989.]
- d. Aggregate for Standard Weight Concrete: ASTM C33, except as modified herein.
 - 1) Coarse Aggregates: Cleanness Value of not less than 75 when tested as per CMM-Test Method No. California 227.
 - 2) Coarse Aggregate for Shrinkage Controlled Concrete: Lonestar or Hanson Clayton, or Sechelt, B.C. (as supplied by Hanson).
 - 3) Fine Aggregates: Sand Equivalent of not less than 75 when tested per CMM-Test Method No. California 217.
- e. Aggregate for Lightweight Concrete: ASTM C330. Lightweight aggregate shall be vacuum saturated expanded shale or clay produced by rotary kiln.
- f. Water: Mixing water shall be clean, potable and free from deleterious material.
- g. Admixtures:
 - 1) **XYPEX**
Is required for all building retaining walls, exterior corridors, decks and roofs.
 - 2) **Refer to Section 033500 for details.**
2. ACCESSORIES
 - a. Curing Compounds: ASTM C309, Type I, clear or translucent without dye and which will not discolor concrete or affect bonding of other finishes applied thereover, and which restricts loss of water to not more than 0.500 grams per square centimeter of surface when tested per ASTM C156, "Test Method for Water Retention by Concrete Curing Materials."
 - b. Slab Curing Membrane: Membrane conforming to ASTM C171, non-staining.
 - c. Rock Base: Clean, hard and durable gravel or crushed rock conforming to the requirements of CalTrans Standard Specifications Section 68 for Class 1, Type A permeable material.
 - d. Vapor Barrier: ASTM D2103, "Polyethylene Film and Sheeting."
 - e. Sand Cover: Uniformly graded, clean sand free from excessive fines, organic materials or other deleterious substances.
 - f. Form Tie Cone Hole Plugs: Burke Co., Grey, Recessed, Jumbo Cone, "Snaplug", or equal (no known equal) with waterproof adhesive.
 - g. Filter drains such as behind concrete walls: Type A drain rock conforming to Division 31 Section "Backfilling" or prefabricated drain manufactured with polyethylene stranded or molded core and a geotextile fabric bonded to one side. Filter drains shall be manufactured by Mirafi, Exxon or equal approved by the Architect-Engineer.
 - h. Embedded Reglets and Dovetail Anchor Slots: 18 gauge galvanized steel.

i. Bonding Agent: Burke Acrylic Bondcrete, Thorobond or equal.

3. CONCRETE MIXES

a. Schedule of Concrete Classes:

Mix ID/Use	Aggregate Size	Slump	Min. Strength	Other Req'ts
Mix A Foundations	Size 57 (1 inch) (25 mm)	4 to 6 inches (100 to 150 mm)	4000 psi (27.6 MPa)	
Mix B Walls, Columns, Suspended Slabs & Beams	Size 57 (1 inch) (25 mm)	4 to 6 inches (100 to 150 mm)	4000 psi (27.6 MPa)	Req't E.1, Req't E.2
Mix C Floor Slabs on Grade, Miscellaneous Concrete	Size 57 (1 inch) (25 mm)	3 to 5 inches (75 to 125 mm)	4000 psi (27.6 MPa)	Req't E.1, Req't E.2
Mix D Lightweight Concrete Fill on Metal Decking	1/2 inch (13 mm) by #4 lightweight	3 to 5 inches (75 to 125 mm)	4000 psi (27.6 MPa)	Req'ts E.2 and E.3
Mix E Miscellaneous concrete for curbs, pads, etc.	Size 57 (1 inch) (25 mm)	3 to 5 inches (75 to 125 mm)	3500 psi (24.1 MPa)	
Lean Concrete	Size 57 (1 inch) (25 mm)	3 to 5 inches (75 to 125 mm)	1500 psi (10.3 MPa)	

- b. Aggregate: Coarse aggregate size number in accordance with ASTM C33 for normal-weight aggregate. Coarse aggregate size in accordance with ASTM C330 for lightweight aggregates.
- c. Slump: Minimum-maximum slump at point of placement in inches when tested in accordance with ASTM C143.
- d. Strength: Minimum compressive strength in psi after 14 days, tested in accordance with ASTM C39.
- e. Other Requirements (apply only where indicated in Schedule of Concrete Mixes)
- 1) Shrinkage Controlled Concrete: Use special coarse aggregates specified. Select materials and proportion mix to achieve shrinkage less than 0.040 percent (ASTM C157 modified).
 - 2) Water to Cementitious Material Ratio: Mixes "B","C" and "D" shall have a water-to-cementitious-material ratio not exceeding 0.45 by weight. Weight of water shall include all free moisture, including liquid admixtures. Mixes shall contain specified high range water reducing admixture at mid-range dosage as required to achieve specified slump.
 - 3) Lightweight Concrete: Equilibrium weight (at 100 days air dry) of 113 pcf plus or minus 3 pcf, ASTM C567. Mix shall contain 4 percent, plus or minus 1 percent, entrained air by volume at point of placement.
- f. Proposed mixes shall produce concrete to strengths specified with adequate workability and proper consistency to permit concrete to be worked into forms and around reinforcement without excessive segregation or bleeding.

- g. Mix design shall be subject to review and the Testing Laboratory. Submit mixes in a timely manner to allow for review and adjustment, if necessary.
- h. Add air entraining agent to normal weight concrete mix for work exposed to exterior.
- i. Concrete mixes used for liquid nitrogen tank foundations shall comply with ACI 318 Chapter 4 requirements for exposure class F1.
- j. For any concrete mix that uses greater than 45% total cementitious material the maximum water-cement ratio shall not exceed 0.38.

PART 32 EXECUTION

1. EXAMINATION

- a. Verify site conditions under provisions of Division 01 Section "General Provisions".
- b. Verify requirements for concrete cover over reinforcement.
- c. Verify that anchor bolts, embedded plates, reinforcement, sleeves and other items to be cast into concrete are accurately placed, positioned securely, and will not cause hardship in placing concrete.

2. FORMWORK ERECTION

- a. Verify lines, levels, and measurement before proceeding with formwork.
- b. Hand trim sides and bottom of earth forms; remove loose dirt.
- c. Align form joints.
- d. Do not apply form release agent to concrete surfaces which receive [special finishes] [or] [applied coatings] that may be affected by agent.
 - 1) Coordinate work of other sections in forming and setting openings, slots, recesses, chases, sleeves, bolts, anchors, and other inserts.

3. REINFORCEMENT AND EMBEDDED ITEMS

- a. Place, support, and secure reinforcement and embedded items against displacement.
- b. Installation tolerances for anchor bolts for structural steel columns shall comply with the AISC Code of Standard Practice for Steel Buildings and Bridges requirements for tolerances.
- c. Only items that are dimensionally located on the drawings may be embedded in concrete regardless of the trade responsible for placing them.

4. PLACING CONCRETE

- a. Notify the Architect at least 48 hours prior to commencement of concreting operations. No concrete shall be placed until all subgrade, formwork, reinforcing steel, embedded items and surfaces against which concrete is to be placed have been accepted by the Architect. The rate of delivery, haul time, missing time and hopper capacity shall be such that all mixed concrete delivered shall be placed in forms within 90 minutes from the time of the introduction of cement and water into the mixer. No water shall be added after transit mixer leaves the batching plant without the approval of the Architect.
- b. Prepare previously placed concrete by cleaning **waterblasting** and applying bonding agent in accordance with manufacturer's instruction.
- c. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.

- d. Foundation surfaces against which concrete is to be placed must be free from standing water, mud and debris. Surfaces shall be clean and free from oil, objectionable coatings, and loose or unsound material.
- e. All surfaces of forms and embedded items shall be free of grout before placing concrete.
- f. Install joint fillers and water-stops in accordance with manufacturer's instructions. Install 1/2-inch (13 mm) thick joint filler to separate slabs on grade from vertical surfaces. Extend joint filler from bottom of slab to within 1/4-inch (6 mm) of finished slab surface.
- g. Locate construction joints where indicated on the Structural Drawings.
- h. When ambient temperature is expected to exceed 80 degrees F during placing or finishing operations, steps shall be taken in accordance with ACI 305, "Recommended Practices for Hot Weather Concreting", to reduce concrete temperature and water evaporation by proper attention to the ingredients, production methods, handling, placing, protection and curing. The Subcontractor shall submit a detailed hot weather concreting procedure to the A/E for approval at least two business days before concrete placement is planned. The Subcontractor's testing agency will produce trial batches in accordance with ACI 305. Slabs will be fog sprayed from the completion of screeding until curing is begun; the fog spray may be discontinued on sections during troweling.

5. CURING AND PROTECTION

- a. The requirements of this section may be modified only by the Structural Engineer of Record (SER) for the design. In those cases where the Structural Engineer of record is under subcontract to the Laboratory, approval by a Laboratory Structural Engineer is required prior to modification of the requirements of this section.
- b. Wheeling, working and walking on concrete shall be avoided for at least 24 hours after casting. Protect concrete from sun and rain. Do not permit concrete to become dry during curing period. Concrete shall not be subjected to any loads until concrete is completely cured, and until concrete has attained its 28-day strength and 14 days minimum.
- c. Protect concrete during and after curing from damage during subsequent building construction operations.
- d. Cover traffic areas with plywood or other suitable means for as long as necessary to protect concrete from damage.
- e. Specific curing requirements for slabs shall include the following: Immediately upon completion of finishing operation, the surface of slabs shall be sealed against moisture loss by the application of a curing blanket made of polyethylene bonded to burlap in accordance with the manufacturer's instructions. Alternatively, waterproof curing paper may be used with edges lapped and sealed with tape. The curing membrane shall be weighted down. Tears and rips in curing membrane shall be repaired immediately during curing period. Curing shall be maintained for [7] [14] [21] days.
- f. Specific curing requirements for walls, beams and columns shall include the following: Concrete in forms shall be kept moist until removal. Immediately upon removal of forms, an approved sprayed-on curing compound shall be applied to the concrete surfaces in strict compliance with the manufacturer's recommendations. Curing shall be maintained for [7] [14] days.
- g. For above grade concrete sections over three feet thick in all three orthogonal directions except lean concrete:

- 1) Ten days before placing concrete, the results of thermal test performed by the Subcontractor will be submitted to the Architect for approval. Thermal tests shall consist of a three-foot test cube of the design mix for the thick section instrumented with thermocouples by the Subcontractor's testing agency and monitored to determine whether the heat of hydration exceeds 150 deg F (66 deg C). If the temperature exceeds 150 deg F (66 deg C) , the mix design will be revised or standard aggregate cooling utilized and a second test cube cast and tested at no additional cost to the Owner and Architect.
- 2) The temperature gradient between the center and the surface of the section must not exceed 20 deg F (6.6 deg C) during the first ten days of the controlled curing period. Thermocouples shall be installed by the Subcontractor's testing agency in the center and six inches from the surface at twenty-foot intervals and at the corners. The thermocouples are to be monitored continuously by the Subcontractor's testing agency and, if the temperature gradient exceeds 20 deg (6.6 deg C), insulating blankets shall be placed over the surface. On surfaces with protruding reinforcing, such as the top of a wall, loose insulation will be used.

6. FIELD QUALITY CONTROL

- a. Inspection and Testing will be performed under provisions of Division 01.
- b. Testing Laboratory will:
 - 1) Collect and review tickets for each batch of concrete delivered. Annotate water or admixtures added subsequent to batching.
 - 2) Special Inspect concrete placement, as required by CBC Section [1701.5, Item 1], for conformance with the Contract Documents.
 - 3) Slump: ASTM C143; one test at point of placement at start of each day's pour; additional tests when concrete consistency appears to have changed.
 - 4) Compressive Strength: Test concrete for compressive strength in accordance with CBC Section [[1905.6]]and ASTM C39. Conform to testing frequency of CBC [1905.6.1]. Take 4 specimens per sample, test one at seven days, two at 28 days, and retain one specimen.
 - 5) Temperature: ASTM C1064; one test hourly. Take additional tests where warranted by weather conditions or delays in delivery.
 - 6) Air Content: ASTM C173; for mixes with more than 3 percent air, take one test hourly at point of placement.
- c. The Subcontractor will be responsible for all Testing Laboratory costs for investigating low-strength compressive test results in accordance with CBC Section 1905.6.5.

END OF SECTION

SECTION 03 35 00
CONCRETE ADDITIVES

PART 1 - GENERAL

1.01 Summary

A. Section Includes:

Furnishing of all labor, materials, services and equipment necessary for the supply and installation of crystalline waterproofing additive to concrete as indicated on the drawings and as specified herein.

B. Related Sections:

1. Section 031000 - Concrete Formwork
2. Section 032000 - Concrete Reinforcing
3. Section 033000 – Cast in Place Concrete

1.02 References

A. Applicable Standards: The following standards are referenced herein.

1. American Society for Testing and Materials (ASTM)
2. Army Corps of Engineers (CRD)
3. American Concrete Institute (ACI)
4. American National Standards Institute (ANSI)
5. NSF International
6. European Standards (EN)
7. Drinking Water Inspectorate (DWI)

1.03 System Description

A. Crystalline Waterproofing Additive: Concrete waterproofing and protection system shall be of the crystalline type that chemically controls and permanently fixes a non-soluble crystalline structure within the pores and capillary tracts of the concrete. This crystalline system causes the concrete to become sealed against the penetration of liquids from any direction, and protects the concrete from deterioration due to harsh environmental conditions. The system is used for above or below-grade walls and slabs, including liquid retaining structures and where enhanced chemical resistance is required.

1.04 System Performance Requirements

A. Testing Requirements: Crystalline waterproofing system shall have been tested in accordance with the following standards and conditions, and the testing results shall meet or exceed the performance requirements as specified herein.

B. Independent Laboratory: Testing shall have been performed by an accredited independent laboratory meeting the requirements of ASTM E 329 or other applicable international standard for certification of testing laboratories. Testing laboratory shall have obtained all control and treated concrete samples.

- C. Crystalline Formation: Crystallizing capability of waterproofing system shall be evidenced by independent SEM (Scanning Electron Microscope) photographs showing crystalline formations within the concrete matrix.
- D. Permeability 1: Independent testing shall be performed according to a U.S. Army Corps of Engineers CRD-C48 (Mod.) "Permeability of Concrete". Concrete samples shall be pressure tested to 150 psi (350 foot head of water) or 1.05 MPa (106 m head of water). After 5 days the untreated samples shall leak and the treated samples shall exhibit no measurable leakage.
- E. Permeability 2: Independent testing shall be performed according to EN 12390-8. Treated samples shall be exposed to water with a pressure of 0.5 MPa for 72 hours. Treated samples must exhibit a reduction in permeability coefficient of at least 80% when compared to control concrete. Control samples must have a depth of penetration of at least 50 mm.
- F. Sulfuric Acid Resistance: Independent testing shall be performed to determine "Sulfuric Acid Resistance of Concrete Specimens". Treated concrete samples dosed at 3% shall be tested against untreated control samples. All samples shall be immersed in 7% sulfuric acid and weighed daily until a control sample reaches a mass loss of 50%. On final weighing the percentage mass loss of the treated samples shall be significantly lower than the control samples.
- G. Sulfate Resistance: Independent testing shall be performed to determine "Sulfate Resistance of Concrete Specimens" treated with integral crystalline admixture. Treated and untreated samples shall be immersed in a concentrated sulfate solution for at least 4 months. On final weighing the percentage mass loss of the treated samples shall be significantly lower than the control samples.
- H. Compressive Strength: Concrete samples containing the crystalline waterproofing additive shall be tested against an untreated control sample of the same mix. At 28 days, the treated samples shall exhibit equal or increased compressive strength over the control sample.
- I. Potable Water Approval: Waterproof material shall have a current, valid approval certificate from NSF (NSF 61), DWI, or other recognized certification agency.

1.05 Submittals

- A. General: Submit listed submittals in accordance with conditions of the Contract and with Division 1 Submittal Procedures Section.
- B. Product Data: Submit product data, including manufacturer's specifications, installation instructions, and general recommendations for waterproofing applications.
- C. Test Reports: Submit, for acceptance, complete test reports from approved independent testing laboratories certifying that waterproofing system conforms to performance characteristics and testing requirements specified herein.
- D. Manufacturer's Certification: Provide document signed by manufacturer or manufacturer's

representative certifying that the materials to be installed comply with the requirements of this specification.

1.06 Quality Assurance

- A. Manufacturer Qualifications: Manufacturer to be ISO 9001 registered, and to have no less than 10 years experience in manufacturing the crystalline waterproofing additive for the required work. Manufacturer must be capable of providing field service representation during construction phase. Manufacturers who cannot provide ongoing field support or who cannot provide the performance test data specified herein will not be considered for the project.
- B. Installer: Ready-mix supplier and/or installer of crystalline waterproofing additive shall be approved by the manufacturer or manufacturer's representative in writing.
- C. Pre-Installation Conference: Prior to installation of waterproofing system, conduct meeting with Architect/Engineer, owner's representative, concrete supplier, concrete placer and waterproofing manufacturer's representative to verify and review the following:
 - 1. Project requirements for waterproofing as set out in Contract Documents.
 - 2. Manufacturer's product data including mixing and installation instructions.
- D. Technical Consultation: The waterproofing manufacturer's representative shall provide technical consultation on waterproofing applications and shall provide on-site support as needed.

1.07 Delivery, Storage and Handling

- A. Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.
- B. Delivery: Deliver packaged waterproofing materials to project site in original undamaged containers, with manufacturer's labels and seals intact.
- C. Storage: Store waterproofing materials in dry, enclosed location, at a minimum temperature of 45°F (7°C).

1.08 Warranty

- A. Project Warranty: Refer to conditions of the Contract for project warranty provisions.
- B. Manufacturer's Warranty: Manufacturer shall provide standard product warranty executed by authorized company official.

PART 2 – PRODUCTS

2.01 Materials

- A. Acceptable Manufacturer:
 Xypex Chemical Corporation
 13731 Mayfield Place, Richmond, B.C., Canada V6V 2G9
 Tel: 800 961.4477 or 604 273.5265
 Fax: 604 270.0451
 E-mail: info@xypex.com

Website: www.xypex.com

Note: Acceptable manufacturers include all licensed manufacturing operations of Xypex Chemical Corporation.

B. Proprietary Products: Xypex crystalline waterproofing materials as follows:

1. Xypex Admix C-500 / C-500 NF
2. Xypex Admix C-1000 / C-1000 NF
3. Xypex Admix C-2000 / C-2000 NF

C. Substitutions: No substitutions permitted.

D. Source Quality: Obtain all proprietary crystalline waterproofing products from a single manufacturer.

2.02 Dosage

A. General: Xypex Admix must be added to concrete mix at time of batching.

B. Dosage Rate: Under normal conditions, the crystalline waterproofing powder shall be added to the concrete mix at the following rates:

- Xypex Admix C-500
2% - 3% by weight of cement content
- Xypex Admix C-1000
2% - 3% by weight of cement content
- Xypex Admix C-2000
2% by weight of cement content

For Xypex Admix NF Series dosages are 1% - 1.5% by weight of cement content.

Note: For enhanced chemical protection or for meeting specific project requirements or where the concrete mix design contains higher than 25% type F fly ash content or includes a portland cement/slag cement/type C fly ash blend, consult with manufacturer or its authorized representative to determine appropriate dosage rates.

PART 3 – EXECUTION

3.01 Manufacturer's Instructions

A. Compliance: Comply with manufacturer's product data regarding installation, including technical bulletins, product catalogue, installation instructions and product packaging labels.

3.02 Project Conditions

A. Crack Control: All reinforcement shall be in accordance with applicable standards. Concrete elements shall be designed and constructed to minimize and control cracking.

B. Setting Time and Strength: Some delay of set may occur when using Xypex Admix products. The amount of set delay will depend upon the concrete mix design, the particular Admix product used, dosage rate of the Admix, temperature of the concrete and climatic conditions. Concrete containing a Xypex Admix

product may develop higher ultimate strengths than plain concrete. Conduct trial mixes under project conditions to determine setting time and strength of the concrete. Consult with manufacturer or manufacturer's representative regarding concrete mix design, project conditions and proper dosage rate.

- C. Weather Conditions: For mixing, transporting and placing concrete under conditions of high temperature or low temperature, follow concrete practices such as those referred to in ACI 305R (Hot Weather Concreting) and ACI 306R (Cold Weather Concreting) or other applicable standards.

3.03 Application

A. General:

Xypex Admix is added to the concrete at the time of batching. It is important to obtain a homogeneous mixture of Xypex Admix with the concrete. Do not add dry Admix powder directly to wet mixed concrete as this could cause clumping and thorough dispersion may not occur.

B. Concrete Batching & Mixing:

Procedures for addition of Xypex Admix will vary according to type of batch plant operation and equipment.

1. Addition to Coarse Aggregate Belt:

Add Xypex Admix powder directly to the coarse aggregate conveyor belt manually or through computer controlled mass batching system. Account for worker health and safety issues relating to moving belts and wind-blown dust.

2. Addition to Ready Mixed Truck at Plant:

Add Xypex Admix in bulk powder or soluble bag form to the drum of the ready-mix truck immediately prior to driving the truck under the batch plant. Then add the balance of the materials or the premixed concrete in accordance with standard concrete batching practices. Take measures to ensure that soluble bags are dispersed properly.

Such measures can include:

- a) adding the bags as far forward in the drum as possible,
- b) adding a small amount of batch water along with the bags, and
- c) spinning the drum prior to adding remaining components.

Avoid delays in adding other components and utilize high speed mixing to ensure homogeneity of mix. Where there may be insufficient water for thorough dispersion of the bulk powder, mix the Admix powder with water to form a slurry and add to the truck mixer drum prior to batching. Account for added water in the mix design and slump.

3. Addition to Central Mixer:

Load the Xypex Admix in bulk powder form or in soluble bags along with the other components. Mix in accordance with standard batching practices to ensure thorough dispersion and a homogeneous mixture. Account for worker safety issues when accessing the equipment.

4. Precast Batch Plant - Pan Type Mixer:

Add Xypex Admix to the rock and sand, then mix thoroughly for 2 - 3 minutes before adding the cement and water. The total concrete mass shall be blended using standard practices.

Note 1: While it is preferable to install the Xypex Admix at the batch plant; when necessary, a slurry mixture containing the Admix can be added on site to the ready mix truck. To create a slurry, mix 5 parts Admix powder to 3 parts water by volume (i.e. a water to powder ratio of 0.67 by mass).

Following addition to the drum, mix concrete for a minimum of 5 minutes on high speed or until thoroughly dispersed. Account for added water in the mix design and slump.

Note 2: Consult with local Xypex Technical Services Representative concerning additional procedures for addition and mixing.

C. Construction and Cold Joints:

In addition to specified waterstops apply one coat of Xypex Concentrate slurry at a rate of 2 lb./sq. yd. (1 kg/m²) to joint surfaces between concrete pours. Moisten surfaces prior to slurry application. Apply slurry and keep moist for 12 hours then allow slurry to set or dry. Where joint surfaces are not accessible prior to pouring new concrete, contact Xypex Technical Services Representative for assistance.

Note: Inclusion, type and position of waterstops are at the discretion of the designer. Expanding waterstops may be placed on Xypex after it has dried or before Xypex slurry application. Xypex slurry may only be applied over waterstop if approved by waterstop manufacturer.

D. Sealing Strips: Where hydrostatic conditions exist, sealing strips shall also be applied at construction joints by filling grooves that are created along the joints. Dimensions of the grooves shall be 1 inch (25 mm) wide and 1.5 inches (37 mm) deep. If grooves are not been pre-formed then chip grooves to those dimensions. Fill the grooves as follows:

1. Apply slurry coat of Xypex Concentrate to slot in accordance with manufacturer's instructions or recommendations.
2. While slurry coat is still tacky, fill slot with Xypex Concentrate Dry-Pac.
3. Compact tightly using pneumatic packer or hammer and block.
4. Wet Dry-Pac surface lightly with water, then apply a slurry coat of Xypex Concentrate at a coverage rate of 1.5 - 2 lb./sq.yd. (0.8 - 1 kg/m²) over sealing strip and extending to 6" (150 mm) on either side.

Note: For further information, see Xypex Schematic Drawings for standard construction joint details.

E. Form Tie Holes: Form tie holes shall be waterproofed in accordance with manufacturer's technical literature including relevant Method Statements. Procedures are generally as follows:

1. Prepare the tie hole to create a straight sided void with a profile of at least ICRI CSP-3. For through element ties holes such as those created by taper ties the prepared void is to be at least 5" (125 mm) deep. For cone ties the void is to be to the bottom of the cone.
2. Clean and profile the area to a 6 inch (150 mm) diameter around the tie hole to an ICRI CSP-3 profile.
3. For through-element tie holes create a solid plug of material at the bottom of the profiled hole using Xypex Patch'n Plug leaving at least 4" (100 mm) of empty tie hole from the top of the plug to the surface of the concrete element.
4. Apply a coat of Xypex Concentrate slurry at a rate of 1.5 lb./sq. yd. (0.8 kg/m²) to the inside of the tie hole and to a 12" (300 mm) diameter area around the hole.

5. Fill and compact the tie hole with Xypex Concentrate Dry-Pac.
6. Wet Dry-Pac surface lightly with water, then apply a slurry coat of Xypex Concentrate at a coverage rate of 1.5 - 2 lb./sq. yd. (0.8 - 1 kg/m²) over the repaired area to a 12" (300 mm) diameter area around the filled void.

F. Repair of Defects: Concrete defects shall be repaired in accordance with manufacturer's technical literature including relevant Method Statements. Procedures are generally as follows:

1. Cracks and Faulty Construction Joints:

- a. Chip out cracks, faulty construction joints and other defects to a depth of 1.5 inches (37 mm) and a width of one inch (25 mm). A "V" shaped slot is not acceptable. The slot may be saw cut instead of chipped but ensure that the slot is dovetailed or otherwise shaped such that there will be mechanical interlock of materials placed into the slot at a later stage.
- b. Clean slot of debris and dust. Soak area with water and remove excess surface water. Apply a slurry coat of Xypex Concentrate at the rate of 1.5 lb./sq. yd. (0.8 kg/m²) to the slot.
- c. While slurry coat is still tacky, fill cavity with Dry-Pac. Compress tightly into cavity using pneumatic packer or block and hammer.
- d. Wet Dry-Pac surface lightly with water, then apply a slurry coat of Xypex Concentrate at a coverage rate of 1.5 - 2 lb./sq.yd. (0.8 - 1 kg/m²) over the repaired area to 6" (150 mm) on either side of slot.

2. Rock Pockets, Honeycombing or other defective concrete: All areas of poor concrete consolidation (honeycomb or rock pockets) shall be repaired.

Note: Where there is active water-flow see Method Statements or contact Xypex Technical Services Representative for assistance.

3.04 Placing

A. Concrete Placement: Concrete placement shall be in accordance with "309R: Guide for Consolidation of Concrete" or other applicable standard. Special attention is to be given to consolidation at joints, penetrations and other potential leakage locations.

3.05 Curing

- A. General: Concrete containing Xypex Admix shall be moist cured in accordance with ACI 308, "Standard Practice for Curing Concrete" or other applicable standard.
- B. Curing Compounds: Curing compounds may be used in the event that project requirements or conditions prevent moist curing. Curing compounds shall comply with ASTM C-309 or other applicable standard.

3.06 Protection

A. Protection: Protect installed product and finished surfaces from damage during construction.

3.07 Field Quality Control

A. Examination for Defects: Do not conceal Xypex treated concrete before it has been observed by Architect/Engineer, waterproofing manufacturer's representative or other designated entities. Concrete shall be examined for structural defects such as honeycombing, rock pockets, tie holes, faulty

construction joints, cold joints and cracks larger than 1/64" (0.4 mm). Such defects to be repaired in accordance with manufacturer's repair procedures as noted above.

B. Testing for Tanks and Foundation Works

1. Testing: Fill tanks or, for foundation works, shut off dewatering system as soon as practical so that the structure shall be exposed to it's normal service conditions. Examine for leaks.

2. Monitoring:

a. Actively leaking cracks and joints shall be left to self-heal for as long as practical. Depending on job site and ambient conditions crack healing can be expected to take several days to weeks.

b. Any crack or joints that do not heal in the allowable time frame shall be repaired.

c. Moving cracks shall be repaired using polyurethane injection or other appropriate method.

3. Repair: Use Xypex repair procedures to seal any static crack or joint that does not self-heal. See Method Statements or contact Xypex Technical Services Representative for appropriate repair procedures.

Note: Lower temperatures will extend the times for crystalline development.

3.08 Interaction with Other Materials

A. Backfilling: Normal backfilling procedures may be used after concrete has been cured.

B. Paint, Epoxy, Grout, Cement Parge Coat, Plaster or Stucco: Xypex Admix treatment of concrete does not adversely affect the bond of subsequently applied materials. Follow surface preparation and other relevant directions of the coating or parge material manufacturer.

C. Responsibility to Ensure Compatibility: Xypex Admix products are compatible with most admixtures used in the production of quality concrete. However, Xypex Chemical Corporation makes no representations or warranties regarding such compatibility of Xypex Admix products with other additives or admixtures. It shall be the responsibility of the concrete contractor to take whatever measures are necessary, including testing, to ensure compatibility of the Xypex Admix with other additives or admixtures being used in the concrete mix, and it shall be the responsibility of the installer of the surface-applied material that is to be applied over the Xypex treated concrete to take whatever measures are necessary, including testing, to ensure acceptance by or adhesion to the Xypex treated concrete.

END OF SECTION 03 35 00

SECTION 03 61 00
NON-SHRINK STRUCTURAL GROUT

PART 33 GENERAL

33.1 SECTION INCLUDES

- A. Non-shrink, high precision, extended flow, cement based grouting material.

33.2 RELATED SECTIONS

- A. Section 03 30 00 - Cast-in-Place Concrete.
- B. Section 05 12 10 – Structural Cast Steel Components.

33.3 REFERENCES

- A. American Society of Testing Materials (ASTM):
 - 1. ASTM C 1090 Test Method for Measuring Changes in Height of Cylindrical Specimens from Hydraulic Cement Grout
 - 2. ASTM C 1107 Standard Specification for Packaged Hydraulic-Cement Grout
- B. Corps of Engineers (COE):
 - 1. COE CRD C 621 Standard Specification for Packaged Hydraulic-Cement Grout

33.4 SUBMITTALS

- A. Submit under provisions of Section 01 30 00 - Administrative Requirements.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.

33.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Minimum 5 year experience manufacturing similar products.
- B. Installer Qualifications: Minimum 2 year experience installing similar products.
- C. System Performance Requirements:
 - 1. Passes ASTM C 1107, Grade B or Grade C, when tested at temperature placement minimums and maximums of 45 to 100 degree F.
 - 2. Grout shall be tested at maximum water (fluid consistency) allowed by the manufacturer and remain fluid at temperature range minimums and maximums for 60 minutes after slight agitation.
 - 3. Minimum 28 day compressive strength at the above fluid consistency shall be 9,000 psi.
 - 4. Bleed water appearing on the top of the grout surface after one hour at temperature minimum and maximums: No collectable water.

33.6 PRE-INSTALLATION MEETINGS

- A. Convene minimum two weeks prior to starting work of this section.

33.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver Materials to project in Manufacturer's original, unopened packaging, with labels clearly identifying product name, Manufacturer, and expiration date.
- B. Store grout in a cool, dry place, out of the sun.

33.8 PROJECT CONDITIONS:

- A. Follow Manufacturer's instructions. Refer to ACI 305 "Hot Weather Concreting" and ACI 306 " Cold Weather Concreting".

PART 34 PRODUCTS

34.1 MANUFACTURERS

- A. Acceptable Manufacturer: L&M Construction Chemicals, which is located at: 1 LATICRETE Park N.; Bethany, CT 06524-3423; Toll Free Tel: 800-362-3331; Tel: 402-453-6600; Email:[request info \(info@lmcc.com\)](mailto:info@lmcc.com); Web:www.laticrete.com/lmcc
- B. Substitutions: Not permitted.
- C. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

34.2 MATERIALS

- A. Column Base Plate Grouting: DURAGROUT, non-shrink, non-metallic and cement based grout.

PART 35 EXECUTION

35.1 EXAMINATION

- A. Verify by examination that all concrete substrate and plate surfaces are acceptable for grout.
- B. Do not begin installation until substrates have been properly prepared.
- C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

35.2 PREPARATION

- A. Mechanically remove all unsound concrete to the limits indicated on the drawings. Remove cement paste and laitance to expose sound aggregate.
- B. Clean surfaces of dirt, dust and debris. Clean rust from base plates and other metal surfaces to be grouted to obtain satisfactory adhesion.
- C. Maintain substrate in a saturated condition for 24 hours prior to grouting. Surface shall be saturated, surface dry (SSD) at time of grout installation.
- D. Formwork to be liquid tight, and per Manufacturer's recommendations.

35.3 MIXING

- A. Comply with Manufacturer's recommendations for mixing procedures.

35.4 INSTALLATION

- A. Place grout mixture into prepared areas from one side to the other, rapidly and continuously, to reduce air entrapment. Avoid placing grout from opposite sides.
- B. Protect foundation and baseplate from excessive heat, cold or wind.
- C. Cut back or form exposed shoulders when grout reaches initial set.

35.5 CURING

- A. Wet cure exposed shoulders for 72 hours, followed by one coat of membrane curing compound.

35.6 CLEAN UP

- A. Clean site of unused grout, waste, debris, and effluent in accordance with environmental regulations.

END OF SECTION

03 61 00

SECTION 04 10 00
MASONRY MORTAR

PART 36 GENERAL

36.1 SECTION INCLUDES

- A. Preblended masonry mortars of the following types:
 - 1. Portland cement, lime and sand mortar.

36.2 RELATED SECTIONS

- A. Section 04200 - Unit Masonry: Masonry units and installation requirements.
- B. Section 04220 - Concrete Unit Masonry: Masonry units and installation requirements.
- C. Section 07900 - Joint Sealants: Control joint and sealant requirements.

36.3 REFERENCES

- A. American Concrete Institute (ACI), American Society of Civil Engineers (ASCE), The Masonry Society (TMS) Masonry Joint Standards Committee:
 - 1. ACI 530.1 / ASCE 6 / TMS 602 - Specification for Masonry Structures.
- B. ASTM International (ASTM):
 - 1. ASTM C91 - Standard Specification for Masonry Cement
 - 2. ASTM C144- Standard Specification for Aggregate for Masonry Mortar
 - 3. ASTM C150- Standard Specification for Portland Cement.
 - 4. ASTM C207- Standard Specification for Hydrated Lime for Masonry Purposes.
 - 5. ASTM C270 - Standard Specification for Mortar for Unit Masonry.
 - 6. ASTM C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Masonry.
 - 7. ASTM C897 - Standard Specification for Aggregate for Job-Mixed Portland Cement Based Plasters.
 - 8. ASTM C979 - Standard Specifications for Pigments for Integrally Colored Concrete.
 - 9. ASTM C1072 - Standard Test Methods for Measurement of Masonry Flexural Bond Strength.
 - 10. ASTM C1384- Standard Specification for Admixtures for Masonry Mortars.
 - 11. ASTM E514 - Standard Test Method for Water Penetration and Leakage through Masonry.
- C. National Concrete Masonry Association (NCMA):
 - 1. NCMA TEK 08-2A - Removal of Stains from Concrete Masonry.
 - 2. NCMA TEK 08-4A - Cleaning Concrete Masonry.

36.4 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Mixing and preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- C. Test Reports:
 - 1. Submit certified test reports showing that the cementitious components of the mortar mix

comply with the specified requirements.

2. Submit certified test report showing that the mortar complies with the specified requirements.
3. Submit certified test reports prepared by qualified independent laboratory indicating compliance with performance requirements for mortar admixtures.

36.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Firm specializing in manufacture of masonry materials with minimum 10 years' experience.
- B. Installer Qualifications: Minimum 2 year experience installing similar products.
- C. Quality Assurance Testing: Test Reports prepared by a qualified independent laboratory indicating compliance with the following performance requirements.
 1. Mortar Test (Property Specification): For each mix provided, according to ASTM C780. Test mortar for mortar air content and compressive strength.
 2. Testing Standard: Mortar samples tested in accordance with ASTM C780.
- D. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship. Construct sample masonry panel to verify compatibility of materials and effects of materials and construction procedures on final appearance of masonry work. Incorporate range of masonry units, mortar textures and colors to be used.
 1. Finish areas designated by Architect.
 2. Construct panel using jobsite materials.
 3. Prepare more than one sample batch of mortar, especially when coloring pigments are added to the mortar, to establish acceptable visual and performance characteristics.
 4. Clean one half of panel and apply coatings, if any, and joint sealants.
 5. Refinish mock-up area as required to produce acceptable work. Construct additional samples as necessary to obtain Architect approval.
 6. Do not proceed with remaining work until workmanship is approved by Architect.
 7. Retain approved sample panel during construction as standard for judging completed masonry work.
 8. Acceptance of sample panel does not constitute approval of deviations from materials contained in sample panel, unless such deviations are specifically approved by the Architect in writing.

36.6 PRE-INSTALLATION MEETINGS

- A. Pre-Installation Meeting: At least three weeks prior to commencing work conduct a meeting at the project site to discuss contract requirements and job conditions; require the attendance of masonry installer, installers of related materials; notify Architect in advance of meeting. Include the following agenda items:
 1. Interface of flashing, waterproofing, joints, and air barrier work with masonry installation.
 2. Construction details in accordance with ACI 530.1 / ASCE 6 / TMS 602 - Specification for Masonry Structures.
 3. Mortar handling and tooling techniques.

36.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver mortar mix to site in sealed bags. Identify each bag with material name and type.
- B. Handle materials to avoid damage.
- C. Store the masonry mortar under cover to prevent materials from becoming wet before use.

36.8 PROJECT CONDITIONS

- A. Maintain environmental conditions and protect work during and after installation to comply with referenced standards and manufacturer's published recommendations.
- B. Proceed with work after all surfaces and conditions comply with requirements indicated in referenced masonry installation standard and manufacturer's published instructions.

36.9 SEQUENCING

- A. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

PART 37 PRODUCTS

37.1 MANUFACTURERS

- A. Acceptable Manufacturer: As specified by the Architect.
- B. Requests for substitutions will be considered in accordance with provisions of Section 01600.

37.2 PREBLENDED MORTARS

- A. Portland Cement, Lime and Sand Mortars:

37.3 ACCESSORY MATERIALS

- A. Water: Clean and free from deleterious acids, alkaline, and organic matter.
- B. Sand: Mason's sand, ASTM C144 Standard Specification for Aggregate for Masonry Mortar.
- C. Hydrated Lime: ASTM C207 Standard Specification for Hydrated Lime for Masonry Purposes.

37.4 MIXING

- A. Mixing Procedure: Add Portland cement to sand, water and lime in mortar mixer and mix for 3 to 5 minutes.

PART 38 EXECUTION

38.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

38.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

38.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

38.4 MORTAR BEDDING AND JOINTING

- A. Lay hollow masonry units as follows:
 - 1. Bed face shells in mortar and make head joints of depth equal to bed joints.

2. Bed webs in mortar in all courses of piers, columns, and pilasters.
 3. Bed webs in mortar in grouted masonry, including starting course on footings.
 4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.
 5. Fully bed units and fill cells with mortar at anchors and ties as needed to fully embed anchors and ties in mortar.
- B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

38.5 FIELD QUALITY CONTROL

- A. Contractor shall arrange and pay for field testing by an acceptable testing agency.
- B. Field Testing: In accordance with ASTM C780 with following exception: Verify compressive strength by obtaining minimum 20 pound (9 kg) uniform sample of dry blend, prepare mix as specified, and test in accordance with applicable portions of ASTM C270.

38.6 CLEANING

- A. In-Progress Cleaning: Promptly remove excess wet mortar as work progresses by dry brushing.
- B. Final Cleaning: Clean masonry work once mortar is set and cured.
1. Test cleaning methods on one-half of sample panel prior to cleaning masonry work.
 2. Remove dirt or stains from masonry walls exposed in the finished work in accordance with the manufacturer's recommendations and NCMA TEK 08-02A.
 3. Do not clean using strong acids, overaggressive sandblasting, or high-pressure cleaning methods.
 4. Clean in accordance with manufacturer's recommendation and NCMA TEK 08-04A.
 5. Comply with environmental laws and restrictions of authorities having jurisdiction.

38.7 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 04 22 00
CONCRETE UNIT MASONRY

PART 39 GENERAL

1. SUMMARY

a. Related Documents:

- 1) Drawings and general provisions of the Subcontract apply to this Section.
- 2) Review these documents for coordination with additional requirements and information that apply to work under this Section.

b. Section Includes:

- 1) Concrete Masonry units.
- 2) Reinforcement, anchorages, embedments and accessories.

c. Related Sections:

- 1) Division 01 Section "General Requirements."
- 2) Division 01 Section "Special Procedures."
- 3) Division 04 Section "Masonry Mortar".
- 4) Division 05 Section "Structural Steel Framing".
- 5) Division 05 Section "Cold Formed Metal Framing".
- 6) Division 07 Section "Metal Roofing Panels".

2. REFERENCES

a. General:

- 1) The following documents form part of the Specifications to the extent stated. Where differences exist between codes and standards, the one affording the greatest protection shall apply.
- 2) Unless otherwise noted, the referenced standard edition is the current one at the time of commencement of the Work.
- 3) Refer to Division 01 Section "General Requirements" for the list of applicable regulatory requirements.

b. ACI – American Concrete Institute:

- 1) ACI 315 Details and Detailing of Concrete Reinforcement

c. ASTM International:

- 1 ASTM A615 / A615M Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
- 2 ASTM C 90 Standard Specification for Loadbearing Concrete Masonry Units

d. AWS D12.1 Reinforcing Steel Welding Code

3. SUBMITTALS

a. Submit under provisions of Division 01 Section "General Requirements."

b. Submit Shop Drawings for reinforcement, anchorages and embedments. Indicate bar sizes, spacings, locations, and quantities of reinforcing steel bending and cutting schedules, supporting and spacing.

- c. Submit Manufacturer's certified mill test reports on each heat of reinforcing steel to be used in the work before placement.
 - d. Submit two 12 inch (300 mm) long samples of expansion and control joint materials.
 - e. Submit manufacturer's certificates.
4. ENVIRONMENTAL REQUIREMENTS
- a. Maintain materials and surrounding air temperature to at least 50 deg F(10 deg C) prior to, during, and 48 hours after completion of masonry work.

PART 40 PRODUCTS

1. CONCRETE MASONRY UNITS
- a. Hollow Load Bearing Units: conforming to UBC Standard 21-4, Grade N¹; light weight, plain smooth face in the manufacturer's standard color. Strength of units shall be as indicated on the Drawings.
 - b. Masonry Units: Modular sized to 8x8x16 and 8x12x16 inch as shown on the Drawings; provide special units for 90° corners, open ended, double open ended, bond beams and lintels. The use of LCC blocks is not permitted.
2. REINFORCEMENT AND ANCHORAGES
- a. Single Wythe Joint Reinforcement: Truss and Seismic Comb type, galvanized steel construction; as manufactured by Dur-o-wall, or equal.
 - b. Reinforcing Steel: Type specified and grade as specified in Division 03 Section "Concrete Reinforcing".
3. ACCESSORIES
- a. Control Joints: Preformed neoprene or polyvinyl chloride material.
 - b. Nailing Strips: Western softwood, preservative treated, sized to masonry joints.
4. LINTELS
- a. Constructed from concrete masonry lintel blocks.

PART 41 EXECUTION

1. PREPARATION
- a. Verify items provided by other sections of work are properly sized and located.
 - b. Establish lines, levels, and coursing. Protect from disturbance.
 - c. Provide temporary bracing during erection of masonry work. Maintain in place until building structure provides permanent bracing.
2. COURSING
- a. Place masonry to lines and levels indicated.
 - b. Maintain masonry courses to uniform width. Vertical and horizontal mortar joints shall be installed between blocks, shall be equal and of uniform thickness. Exposed joints shall be tooled to a slightly concave profile; unexposed surfaces may be struck smooth. Walls and parapet surfaces which will receive membrane sheet flashing and counter-flashing; and shall be constructed to permit the installation of base flashing materials as specified in Division 07 Section "Thermoplastic Membrane Roofing".

- c. Lay concrete masonry units in running bond. Course one block unit and one mortar joint to equal eight (8") inches. Alternate open ended and double open-ended blocks in each course. Bond beams shall consist of alternately placed open ended and double open-ended bond beam block.

3. PLACING AND BONDING

- a. Lay masonry in full bed of mortar, properly jointed with other work. Buttering corners of joints, and deep or excessive furrowing of mortar joints are not permitted.
- b. Fully bond intersections, and external and internal corners.
- c. Do not shift or tap masonry units after mortar has taken initial set. Where adjustment must be made, remove the mortar and replace.
- d. Remove excess mortar.
- e. Perform jobsite cutting with proper tools to provide straight unchipped edges. Take care to prevent breaking masonry unit corners or edges.

4. REINFORCEMENT AND ANCHORAGES

- a. Install horizontal joint reinforcement 16 inches on center and seismic comb reinforcement where indicated on the drawings.
- b. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend at least 16 inches on each side of opening.
- c. Place joint reinforcement continuous in first and second joint below top of walls.
- d. Lap joint reinforcement ends at least 6 inches (150 mm). Extend at least 16 inches (400 mm) on each side of opening.
- e. Reinforce joint corners and intersections with strap anchors 16 inches (400 mm) on center.

5. REINFORCING STEEL

- a. Place reinforcement in accordance with ACI 315.
- b. Locate reinforcing splices at points of minimum stress. Splice locations shall be as shown on the Shop Drawings unless alternative locations of splices are approved by the Engineer-of-Record.
- c. Where welding is approved by the Architect, weld reinforcement in accordance with AWS D12.1.
- d. Place reinforcing bars supported and secured against displacement. Maintain position within 1/2-inch (13 mm) of true dimension.
- e. Verify that reinforcement is clean, free of scale, dirt, or other foreign coatings that would reduce bond to grout.

6. TOLERANCES

- a. Alignment of Pilasters: Maximum 1/4-inch (7 mm) from true line.
- b. Variation from Unit to Adjacent Unit: 1/32-inch (1 mm) maximum.
- c. Variation from Plane of Wall: 1/4-inch (7mm) in 10 feet and 1/2-inch (13 mm) in 20 feet (6 m) or more.
- d. Variation from Plumb: 1/4-inch (7mm) per story noncumulative; 1/2-inch (13 mm) in two stories or more.
- e. Variation from Level Coursing: 1/8-inch (3 mm) in 3 feet; 1/4-inch (7 mm) in 10 feet (3 m); 1/2-inch (13mm) maximum.
- f. Variation of Joint Thickness: 1/8-inch (3 mm) in 3 feet.
- g. Maximum Variation from Cross Sectional Thickness of Walls: +/- 1/4-inch (7 mm).

7. MASONRY FLASHINGS
 - a. Lap end joints at least 6 inches and seal watertight.
8. LINTELS
 - a. Construct lintels using grout fill and reinforcing specified. Place reinforcing bars as shown on the drawings.]
 - b. Install reinforced unit masonry lintels over openings. Construct lintels using grout fill and reinforcing. Maintain at least 8-inch bearing on each side of opening.
 - c. Use reinforcing bars of one-piece lengths only.
 - d. Place and consolidate grout fill without disturbing reinforcing.
 - e. Allow lintels constructed in place to reach strength before removing temporary supports.
9. GROUTED COMPONENTS
 - a. Reinforce masonry units as shown on the drawings.
 - b. Lap splices at least 24 bar diameters.
 - c. Place and consolidate grout fill without disturbing reinforcing.
 - d. Solid grout concrete masonry units in accordance to Building Code.
10. CONTROL JOINTS
 - a. Do not continue horizontal joint reinforcing across control joints.
 - b. Form control joint by use of sheet building paper bond breaker one side fitted to hollow contour of block unit end. Fill created core with grout fill. Rake joint at exposed faces for rod and sealant.
 - c. Install resilient control joint in continuous lengths. Heat solvent weld butt and corner joints in accordance with manufacturer's instructions.
 - d. Size joint in accordance with Division 07 Section "Joint Sealants" for sealant performance.
11. BUILT-IN WORK
 - a. As work progresses, build-in [metal door frames,] [fabricated metal frames,] [window frames,] [wood nailing strips,] [anchor bolts,] [plates,] and other items to be built in the work supplied by other sections.
 - b. Build-in items plumb and level.
 - c. C.Bed anchors of metal door [and glazed] frames in mortar joints. Fill frame voids solid with mortar. [Fill masonry cores with grout at least [12 inches (300 mm)] <Insert option Here> from framed openings.]
 - d. Do not build-in organic materials subject to deterioration.
12. CUTTING AND FITTING
 - a. A. Cut and fit for chases, pipes, conduits, sleeves and grounds where applicable. Cooperate with other sections of work to provide correct size, shape, and location.
 - b. Obtain approval from the Architect prior to cutting or fitting areas not indicated or where appearance or strength of masonry work may be impaired.
13. CLEANING
 - a. Remove excess mortar and smears.
 - b. Replace defective mortar. Match adjacent work.

- c. Clean soiled surfaces with a nonacidic solution that will not harm masonry or adjacent materials. Consult masonry manufacturer for acceptable cleaners.
 - d. Use nonmetallic tools in cleaning operations.
14. PROTECTION
- a. Protect finished installation under provisions of Division 01 Section "General Requirements".
 - b. Maintain protective boards at exposed external corners which may be damaged by construction activities.
 - c. Provide protection without damaging completed work.
 - d. At day's end, cover unfinished walls to prevent moisture infiltration.

END OF SECTION

SECTION 05 12 00
STRUCTURAL STEEL FRAMING

PART 42 GENERAL

1. SUMMARY

- a. Section Includes:
- 1) Structural steel shapes, plates, and bars.
 - 2) Structural pipe.
 - 3) Bolts, nuts, and washers.

2. RELATED REQUIREMENTS

- a. Composite Steel Deck: Section 05 36 00, COMPOSITE METAL DECKING.

3. APPLICABLE PUBLICATIONS

- a. Comply with references to extent specified in this section.
- b. American Institute of Steel Construction (AISC):
- 1) AISC Manual - Steel Construction Manual, 14th Ed.
 - 2) 303-10 - Code of Structural Steel Buildings and Bridges.
 - 3) 360-10: Specification for Structural Steel Buildings.
- c. The American Society of Mechanical Engineers (ASME):
- 1) B18.22.1-09 - Washers: Helical Spring-Lock, Tooth Lock, and Plain Washers.
- d. American Welding Society (AWS):
- 1) D1.1/D1.1M-15 - Structural Welding Code - Steel.
- e. ASTM International (ASTM):
- 1) A6/A6M-14 - General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling.
 - 2) A36/A36M-14 - Carbon Structural Steel.
 - 3) A53/A53M-12 - Pipe, Steel, Black and Hot-Dip, Zinc-Coated, Welded and Seamless.
 - 4) A123/A123M-15 - Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - 5) A242/A242M-13 - High-Strength Low-Alloy Structural Steel.
 - 6) A283/A283M-13 - Low and Intermediate Tensile Strength Carbon Steel Plates.
 - 7) A307-14 - Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength.
 - 8) A325-14 - Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
 - 9) A490-14a - Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength.
 - 10) A500/A500M-13 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing and Rounds and Shapes.
 - 11) A501/A501M-14 - Hot-Formed Welded and Seamless Carbon Steel Structural Tubing and Rounds and Shapes.
 - 12) A572/A572M-15 - High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
 - 13) A992/A992M-15 - Structural Shapes.
 - 14) F2329/F2329M-15 - Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy steel Bolts, Screws, washers, Nuts, and Special Threaded Fasteners.

- f. Master Painters Institute (MPI):
 - 1) No. 18 - Primer, Zinc Rich, Organic..
- g. Occupational Safety and Health Administration (OSHA):
 - 1) 29 CFR 1926.752(e) - Guidelines For Establishing The Components Of A Site-Specific Erection Plan.
 - 2) 29 CFR 1926-2001 - Safety Standards for Steel Erection.
- h. Research Council on Structural Connections (RCSC) of The Engineering Foundation:
 - 1) Specification for Structural Joints Using ASTM A325 or A490 Bolts.
- 4. SUBMITTALS
 - a. Submittal Drawings:
 - 1) Show size, configuration, and fabrication and installation details.
 - b. Test Reports: Certify products comply with specifications.
 - 1) Welders' qualifying tests.
 - c. Certificates: Certify each product complies with specifications.
 - 1) Structural steel.
 - 2) Steel connections.
 - 3) Welding materials.
 - 4) Shop coat primer paint.
 - d. Qualifications: Substantiate qualifications comply with specifications.
 - 1) Fabricator // with project experience list //.
 - 2) Installer // with project experience list //.
 - 3) Welders and welding procedures.
 - e. Design Drawings and Calculations: Signed and sealed by Engineer.
 - 1) Connection calculations.
 - f. Record Surveys: Signed and sealed by responsible surveyor or engineer.
- 5. QUALITY ASSURANCE
 - a. Fabricator Qualifications: AISC Quality Certification participant designated as AISC Certified Plant, Category STD.
 - 1) Regularly fabricates specified products.
 - 2) Fabricated specified products with satisfactory service on five similar installations for minimum five years.
 - b. Installer Qualifications: AISC Quality Certification Program participant designated as AISC-Certified Erector, Category ACSE.
 - 1) Regularly installs specified products.
 - 2) Installed specified products with satisfactory service on five similar installations for minimum five years.
 - c. Before commencement of Work, ensure steel erector provides written notification required by OSHA 29 CFR 1926.752(e). Submit a copy of the notification to Contracting Officer's Representative.
 - d. Welders and Welding Procedures Qualifications: AWS D1.1/D1.1M.

6. WARRANTY

- a. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

PART 43 PRODUCTS

1. SYSTEM PERFORMANCE

- a. Delegated Design: Prepare submittal documents including design calculations and drawings signed and sealed by registered design professional, licensed in state where project is located.
- b. Design structural steel framing connections complying with specified performance:
 - 1) Load Capacity: // Resist loads indicated on drawings // Resist full capacity of supported framing member //. Account for connection and member loads and eccentricities.
 - a) Request additional design criteria when necessary to complete connection design.
 - 2) Configuration: Design and detail all connections for each member size, steel grade and connection type to resist the loads and reactions indicated on the drawings or specified herein. Use details consistent with details shown on drawings, supplementing where necessary. The details shown on drawings are conceptual and do not indicate the required weld sizes or number of bolts unless specifically noted. Use rational engineering design and standard practice in detailing, accounting for all loads and eccentricities in both the connection and the members. Promptly notify the Structural Engineer of any location where the connection design criteria is not clearly indicated. The design of all connections is subject to the review and acceptance of the Structural Engineer. Submit structural calculations prepared and sealed by a qualified engineer registered in the state where the project is located. Submit calculations for review before preparation of detail drawings.

2. MATERIALS

- a. As specified in drawings by Structural Engineer.

3. FABRICATION

- a. Fabricate structural steel according to Chapter M, AISC 360.
- b. Shop and Field Connections:
 - 1) Weld connections according to AWS D1.1/D1.1M. Welds shall be made only by welders and welding operators who have been previously qualified by tests as prescribed in AWS D1.1 to perform type of work required.
 - 2) High-Strength Bolts: High-strength bolts tightened to a bolt tension minimum 70 percent of their minimum tensile strength. Tightening done with properly calibrated wrenches, by turn-of-nut method or by use of direct tension indicators (bolts or washers). Tighten bolts in connections identified as slip-critical using Direct Tension Indicators. Twist-off torque bolts are not an acceptable alternate fastener for slip critical connections.

4. FINISHES

- a. As specified by the Structural Engineer
- b. Shop Priming:
 - 1) Prime paint structural steel according to AISC 303, Section 6.

- a) Interstitial Space Structural Steel: Prime paint, unless indicated to receive sprayed on fireproofing.
 - c. Shop Finish Painting: Apply primer and finish paint as specified in Section 09 91 00, PAINTING.
 - d. Do not paint:
 - 1) Surfaces within 50 mm (2 inches) of field welded joints.
 - 2) Surfaces indicated to be encased in concrete.
 - 3) Surfaces receiving sprayed on fireproofing.
 - 4) Beam top flanges receiving shear connector studs applied.
 - e. Structural Steel Galvanizing for exterior applications if applicable: ASTM A123/A123M, hot dipped, after fabrication. Touch-up after erection: Clean and wire brush any abraded and other spots worn through zinc coating, including threaded portions of bolts and welds and touch-up with galvanizing repair paint.
 - 1) Galvanize structural steel framing installed at exterior locations.
 - f. Bolts, Nuts, and Washers Galvanizing: ASTM F2329, hot-dipped.
5. ACCESSORIES
- a. General: Shop paint steel according to AISC 303, Section 6.
 - b. Finish Paint System: Primer and finish as specified in Section 09 91 00, PAINTING.
 - c. Galvanizing Repair Paint: MPI No. 18.

PART 44 EXECUTION

1. ERECTION
- a. Erect structural steel according to AISC 303 and AISC 360.
 - b. Set structural steel accurately at locations and elevations indicated on drawings.
 - c. Maintain erection tolerances of structural steel within AISC 303 requirements.
 - 1) Pour Stop Elevation Tolerance: 6 mm (1/4 inch), maximum, before concrete placement.
 - d. Weld and bolt connections as specified for shop connections.
2. FIELD PAINTING
- a. After welding, clean and prime weld areas to match adjacent finish.
 - b. Touch-up primer damaged by construction operations.
 - c. Apply galvanizing repair paint to galvanized coatings damaged by construction operations.
 - d. Finish Painting: As specified in Section 09 91 00, PAINTING.
3. FIELD QUALITY CONTROL
- a. Record Survey:
 - 1) Engage registered land surveyor or registered civil engineer as specified in Section 01 00 00, GENERAL REQUIREMENTS to perform survey.
 - 2) Measure and record structural steel framing plumbness, level, and alignment after completing bolting and welding and before installation of work supported by structural steel.
 - 3) Identify deviations from allowable tolerances specified in AISC Manual.

END OF SECTION

SECTION 05 36 00
COMPOSITE METAL DECKING

PART 1 – GENERAL

1.1 DESCRIPTION:

- A. This section specifies material and services required for installation of composite steel decking including // shear connector studs and // miscellaneous closures required to prepare deck for concrete placement as shown and specified.

1.2 RELATED WORK:

- A. Materials testing and inspection during construction: Section 01 45 29, TESTING LABORATORY SERVICES.

1.3 DESIGN REQUIREMENTS:

- A. Design steel decking in accordance with AISI S-100, except as otherwise shown or specified.

1.4 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings: Shop and erection drawings showing decking unit layout, connections to supporting members, and information necessary to complete the installation as shown and specified, including supplementary framing, cant strips, cut openings, special jointing or other accessories.
 - 1. Show welding, side lap, closure, deck reinforcing and closure reinforcing details.
 - 2. Show openings required for work of other trades, including openings not shown on structural drawings.
 - 3. Indicate where temporary shoring is required to satisfy design criteria.
- C. Manufacturer's Literature and Data: Showing steel decking section properties and specifying required structural characteristics.
- D. Manufacturer's written recommendations for:
 - 1. Shape of decking section.
 - 2. Cleaning of steel decking prior to concrete placement.
- E. Test Report - Establishing structural characteristics of composite concrete and steel decking system.
- F. Test Report - Stud base qualification.
- G. Welding power setting recommendation by shear stud manufacturer.
- H. Shear Stud Layouts: Submit drawings showing the quantity, pattern, spacing and configuration of shear studs for each beam and girder.
- I. Certification: For each type and gauge of metal deck supporting concrete slab or fill, submit certification of specified fire ratings. Certify that units supplied are UL listed as a "Steel Floor and Form Unit".
- J. Manufacturers Certificates for deck units attesting compliance with specified requirements.
- K. Submit manufacturer's catalog data for Welding Equipment and Welding Rods and Accessories intended use.
- L. Power Actuated Tool Operator Certificates.
- M. Welders qualifications.

1.5 QUALITY ASSURANCE:

- A. Wind Storm Resistance: Provide roof construction assembly capable of withstanding an uplift as specified by the structural engineer when tested in accordance with the uplift pressure test described in the FM DS 1-28 or as described in the UL 580.//
- B. Deck Units: Provide deck units and accessory products from a manufacturer engaged in the manufacture of steel decking for more than three (3) years. Submit manufacturer's certificates attesting that the decking material complies with the specified requirements.
- C. Certification of Powder-Actuated Tool Operator: Manufacturer's certificate attesting that the operators are authorized to use the low velocity powder-actuated tool.
- D. Qualifications for Welding Work: Submit qualified welder qualifications in accordance with AWS D1.1/D1.1M or under an approved qualification test.

1.6 APPLICABLE PUBLICATIONS:

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only. Refer to the latest edition of referenced Standards and codes.
- B. American Iron and Steel Institute (AISI):
 - S-100-12.....North American Specification for the Design of Cold-Formed Steel Structural Members
- C. ASTM International (ASTM):
 - A36/A36M-14Carbon Structural Steel
 - A108-13.....Steel Bars, Carbon, Cold Finished, Standard Quality
 - A653/A653M-13Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanized) by the Hot-Dip Process
- D. American Institute of Steel Construction (AISC):
 - 1. Specification for Structural Steel Buildings – Allowable Stress Design and Plastic Design (Latest Edition)
 - 2. Load and Resistance Factor Design Specification for Structural Steel Buildings (Latest Edition)
- E. American Welding Society (AWS):
 - D1.1/D1.1M-11Structural Welding Code - Steel
 - D1.3/D1.3M-05(R2008).....Structural Welding Code - Sheet Steel
- F. FM Global (FM):
 - APP Guide.....Approval Guide
 - DS 1-28-2012.....Design Wind Loads
- H. Underwriters Laboratories (UL):
 - Bld Mat Dir(Annually)Building Materials Directory

PART 2 - PRODUCTS

2.1 MATERIALS:

- A. Steel Decking and Flashings: ASTM A653/A653M, Structural Quality
- B. Galvanizing: ASTM A653/A653M, G90. Thickness not less than indicated on drawings.

- C. Shear connector studs: ASTM A108, Grades 1015-1020, yield 350 Mpa (50,000 psi) minimum, tensile strength - 400 Mpa (60,000 psi) minimum, reduction of area 50 percent minimum.
 1. Provide studs of uniform diameter, with heads concentric and on same axis to shaft.
 2. Provide studs, after welding, free from substance or defect which would interfere with its function as a shear connector.
 3. Do not paint or galvanize studs.
 4. Provide size of studs as shown on drawings.
 5. Provide studs manufactured by a company normally engaged in the manufacturer of shear studs, and can furnish equipment suitable for weld-through installation of shear studs.
- D. Galvanizing Repair Paint: Mil. Spec. MIL-P-21035B.
- E. Miscellaneous Steel Shapes: ASTM A36/A36M.
- F. Welding Electrode: E60XX minimum.
- G. Sheet Metal Accessories: ASTM A653/A653M, galvanized, unless noted otherwise. Provide accessories of every kind required to complete the installation of metal decking in the system shown. Finish sheet metal items to match deck including, but not limited to, the following items:
 1. Metal Cover Plates: For end-abutting deck units, to close gaps at changes in deck direction, columns, walls and openings. Same quality as deck units but not less than 1.3 mm (18 gauge) sheet steel.
 2. Continuous sheet metal edging: at openings and concrete slab edges. Same quality as deck units but not less than 1.3 mm (18 gauge) steel. Side and end closures supporting concrete and their attachment to supporting steel to be designed by the manufacturer to safely support the wet weight of concrete and construction loads. The deflection of cantilever closures to be limited to a total of 3 mm (1/8 inch) maximum.
 3. Metal Closure Strips: For openings between decking and other construction, of not less than 1.3 mm (18 gauge) sheet steel of the same quality as the deck units. Form to the configuration required to provide tight-fitting closures at open ends of flutes and sides of decking.
 4. Seat angles for deck: Where a beam does not frame into a column.

2.2 REQUIREMENTS:

- A. Steel decking depth, gage, and section properties to be as shown on contract documents. Provide edges of deck with vertical interlocking male and female lip providing for a positive mechanical connection.
- B. Fabricate deck units with integral embossments to provide mechanical bond with concrete slab. Deck units combined with concrete slab to be capable of supporting total design loads.
- C. Provide integral system with single point of attachment for light duty hanger devices for flexibility for attaching hangers for support of acoustical, lathing, plumbing, heating, air conditioning electrical and similar items.
 1. Provide a minimum spacing pattern of 305 mm (12 inches) on centers longitudinally and 24 inches on centers transversely.
 2. Provide suspension system capable of safely supporting a maximum allowable load of 100 pounds concentrated at one hanger attachment point.
 3. System may consist of fold-down type hanger tabs or a lip hanger.

PART 3 - EXECUTION

3.1 ERECTION:

- A. Do not start installation of metal decking until corresponding steel framework has been plumbed, aligned and completed, and until temporary shoring, where required, has been installed.
 - 1. Remove oil, dirt, paint, ice, water and rust from steel surfaces to which metal decking will be welded.
- B. Coordinate and cooperate with structural steel erector in locating decking bundles to prevent overloading of structural members.
- C. Do not use floor deck units for storage or working platforms until permanently secured.
 - 1. Do not overload deck units once placed.
 - 2. Replace deck units that become damaged after erection and prior to casting concrete at no additional cost to the Government.
- D. Erect steel deck in accordance with manufacturer's printed instructions.
- E. Ship steel deck units in standard widths and fabricated to proper length.
- F. Provide steel decking in sufficient lengths to extend over 3 or more spans, except where structural steel layout does not permit.
- G. Place steel decking units on supporting steel framework and adjust to final position before being permanently fastened.
 - 1. Bring each unit to proper bearing on supporting beams.
 - 2. Place deck units in straight alignment for entire length of run of flutes and with close registration of flutes of one unit with those of abutting unit.
 - 3. Maximum space between ends of abutting units is 13 mm (1/2 inch). If space exceeds 13 mm (1/2 inch), install closure plates.
- H. Ceiling hanger loops, if provided, must be flattened or removed to obtain bearing of units on structural steel.
- I. Fastening Deck Units:
 - 1. Fasten floor deck units to steel supporting members by not less than 16 mm (5/8 inch) diameter puddle welds or elongated welds of equal strength, spaced not more than 305 mm (12 inches) on center with a minimum of two welds per unit at each support. Where two units abut, fasten each unit individually to the supporting steel framework.
 - 2. Tack weld or use self-tapping No. 8 or larger machine screws at 914 mm (3 feet) on center for fastening end closures. Only use welds to attach longitudinal end closures.
 - 3. Weld side laps of adjacent floor deck units that span more than 1524 mm (5 feet). Fasten at midspan or 914 mm (3 feet) on center, whichever is smaller.
- J. Weld in conformance to AWS D1.3/D1.3M and done by qualified experienced welding mechanics.
- K. Clean and touch-up area and welds scarred during erection, and repair with zinc rich galvanizing repair paint.
 - 1. Paint touch-up is not required for welds or scars that are to be in direct contact with concrete.
- L. Provide metal concrete stops at edges of deck.

M. Cutting and Fitting:

1. Fabricate metal deck units to proper length prior to shipping.
2. Field cutting by the metal deck erector is restricted to bevel cuts, notching to fit around columns and similar items, and cutting openings that are located and dimensioned on the structural drawings.
3. Other penetrations shown on the approved metal deck shop drawings but not shown on the structural drawings are to be located, cut and reinforced.
4. Make cuts and penetrations neat and trim using a metal saw, drill or punchout device; cutting with torches is prohibited.
5. Do not make cuts in the metal deck that are not shown on the approved metal deck drawings.
6. If an additional opening not shown on the approved shop drawings is required, submit a sketch, to scale, locating the required new opening and other openings and supports in the immediate area. Do not cut the opening until the sketch has been reviewed and accepted by the Architect. Provide additional reinforcing or framing required for the opening at no additional cost to the Government.
7. Reinforcement at Openings: Provide additional metal reinforcement and closure pieces as required for strength, continuity of decking and support of other work shown.

N. Install shear connector studs through previously installed metal deck in conformance to AWS D1.1/D1.1M, Section 7.

Exception: Install studs with automatically timed welding equipment and as specified below:

1. Do not place welded wire reinforcing or other materials and equipment which will interfere with stud installation on steel deck until shear connector studs are installed.
2. Clean steel deck sheets free of oil, rust, dirt, and paint. Release water in deck's valley so that it does not become entrapped between deck and beam. Clean and dry surface to which stud is to be welded.
3. Rest metal deck tightly upon top flange of structural member with bottom of deck rib in full contact with top of beam flange.
4. Weld studs only through a single thickness of deck. Place decking so that a butt joint is obtained. Place studs directly over beam web, where one row of studs are required.
5. Provide ferrules specially developed for the weld-through technique, and appropriate for size of studs installed. Remove ferrules after welding.
6. Submit report of successful test program for stud base qualification as required by AWS D1.1/D1.1M, Appendix K.

3.2 CLEANING:

- A. Clean deck in accordance with manufacturer's recommendation before concrete placement.

END OF SECTION

SECTION 05 40 00
COLD-FORMED METAL FRAMING

PART 45 GENERAL

45.1 SECTION INCLUDES

- A. Cold-formed metal framing for walls.
- B. Cold-formed metal framing for floors.
- C. Bridging, bracing, clips and other accessories.

45.2 RELATED SECTIONS

- A. Section 06 05 73 – Preservative Treated Wood
- B. Section 06 16 00 - Sheathing.
- C. Section 07 21 00 – Thermal Insulation.
- D. Section 09 21 16 - Gypsum Board Assemblies.

45.3 REFERENCES

- A. ASTM International (ASTM):
 - 1. ASTM A 653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 2. ASTM A 780 - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
 - 3. ASTM A 1003 - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members.
 - 4. ASTM B 633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
 - 5. ASTM C 954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 inch to 0.112 inch in thickness.
 - 6. ASTM C 955 - Standard Specification for Cold-Formed Steel Structural Framing Members.
 - 7. ASTM C 1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories.
 - 8. ASTM C 1513 - Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections.
- B. AISI S100 - North American Specification for the Design of Cold-Formed Steel Structural Members.
- C. AISI S240 - North American Standard for Cold-Formed Steel Structural Framing.
- D. AWS D.1.3 - Structural Welding Code - Sheet Steel.

45.4 DESIGN REQUIREMENTS

- A. Design steel in accordance with American Iron and Steel Institute Publication "Specification for the Design of Cold-Formed Steel Structural Members", except as otherwise shown or specified.
- B. Design loads: As indicated on the Structural Drawings.
- C. Design framing systems to withstand design loads without deflections greater than the following:
- D. Exterior Walls: Lateral deflection of: L/360.
- E. Design framing systems to provide for movement of framing members without damage or

overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change (range) of 67 degrees C (120 degrees F).

1. Design framing system to accommodate deflection of primary building structure and construction tolerances.
- F. Design exterior non-load-bearing curtain wall framing to accommodate lateral deflection without regard to contribution of sheathing materials.

45.5 SUBMITTALS

- A. Submit under provisions of Section 01 30 00 - Administrative Requirements.
- B. Product Data: Submit manufacturer's product literature, data sheets and installation recommendations for specified products.
- C. Manufacturer certification of product compliance with codes and standards.
- D. Structural Calculations: Submit structural calculations prepared by manufacturer for approval. Submittal shall be sealed by a professional engineer registered in the state of the project.
 1. Description of design criteria.
 2. Engineering analysis depicting stress and deflection (stiffness) requirements for each framing application.
 3. Selection of framing components, accessories and welded connection requirements.
 4. Verification of attachments to structure and adjacent framing components.
 5. Engineer shall have a minimum of 5 years experience with projects of similar scope.
- E. Shop Drawings:
 1. Submit shop drawings prepared by the cold-formed metal framing manufacturer showing plans, sections, elevations, layouts, profiles and product component locations, including anchorage, bracing, fasteners, accessories and finishes.
 2. Show connection details with screw types and locations, weld lengths and locations, and other fastener requirements.
 3. Where prefabricated or pre-finished panels are to be provided, provided drawings depicting panel configurations, dimensions and locations.
 4. Shop Drawings shall be signed and sealed by a registered PE (professional cold-formed specialty engineer) registered in the state of the project.

45.6 QUALITY ASSURANCE

- A. Contractor shall provide effective, full time quality control over all fabrication and erection complying with the pertinent codes and regulations of government agencies having jurisdiction.
- B. Installer Qualifications: Installer experienced in performing work of this section who has specialized in installation of work similar to that required for this project.
- C. Pre-installation Meetings: Conduct pre-installation meeting to verify project requirements, substrate conditions, and manufacturer's installation instructions.
- D. Manufacturer Qualifications: Member in good standing of the Steel Framing Industry Association (SFIA).

1. Products to be certified under an independent third party inspection program administered by an agency accredited by IAS to ICC-ES AC98 IAS Accreditation Criteria for Inspection Agencies.

- E. Welding Standards: Comply with applicable provisions AWS D1.1 "Structural Welding Code - Steel" and AWS D1.3 "Structural Welding Code-Sheet Steel."
- F. Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedure."

45.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- B. Protect and store materials protected from exposure to rain, snow or other harmful weather conditions. Products to be handled per AISI S202 "Code of Standard Practice for Cold-Formed Steel Structural Framing."

45.8 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 46 PRODUCTS

46.1 MANUFACTURERS

- A. Acceptable Manufacturer, Metal Framing: ClarkDietrich Building Systems, 9050 Centre Pointe Dr. Suite 400, West Chester, OH 45069. Tel: (513) 870-1100. Fax: (513) 870-1300. E-mail: info@clarkdietrich.com Web: www.clarkdietrich.com.
 1. ClarkDietrich Building Systems; 4601 North Point Boulevard, Baltimore, MD 21219. Tel: (410) 477-4000.
 2. ClarkDietrich Building Systems; 4200 Cedar Blvd., Baytown, TX 77520. Tel: (281) 383-1617.
 3. ClarkDietrich Building Systems; 780 James P. Casey Road, Bristol, CT 06010. Tel: (866) 921-0023.
 4. ClarkDietrich Building Systems; 6510 General Drive, Riverside, CA 92509. Tel: (951) 360-3500.
 5. ClarkDietrich Building Systems; 1685 Tide Court, Woodland, CA 95776. Tel: (530) 668-1987.
 6. ClarkDietrich Building Systems; 501 Steward Road, Suite 100, Rochelle, IL 61068. Tel: (800) 659-0745.
 7. ClarkDietrich Building Systems; 91-300 Hanua Street, Kapolei, HI 96707. Tel: (808) 682-5747.
 8. ClarkDietrich Building Systems; 330 Greenwood Place, McDonough, GA 30253. Tel: (678) 304-5500.
 9. ClarkDietrich Building Systems; 10340 Denton Drive, Dallas, TX 75220. Tel: (214) 350-1716.
 10. ClarkDietrich Building Systems; 38020 Pulp Drive, Dade City, FL 33523. Tel: (352) 518-4400.
- B. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

46.2 COMPONENTS

A. **Structural Studs: Cold-formed galvanized steel as specified by the Structural Engineer.**

46.3 MATERIALS

- A. Cold-Formed Steel Sheet: Complying with ASTM A 1003/A 1003M; unless indicated otherwise.
1. Where required: CP90 coating weight minimum G90, complying with ASTM C 955.

46.4 FABRICATION

- A. General: Framing components may be pre-assembled into panels prior to erecting.
- B. Fabricate panels square, with components attached in a manner so as to prevent racking or distortion.
- C. Cut all framing components squarely for attachment to perpendicular members, or as required for an angular fit against abutting members. Hold members positively in place until properly fastened.
- D. Provide insulation as specified elsewhere in all double jamb studs and double header members, which will not be accessible to the insulation contractor.
- E. Axially Loaded Studs:
1. Install studs to have full bearing against inside track web (1/8 inches (3.2 mm) maximum gap) prior to stud and track attachment.
 2. Splices in axially loaded studs are not permitted.
- F. Fasteners: Fasten components using self-tapping screws or welding.
- G. Welding: Welding is permitted on 18 gauge or heavier material only.
1. Specify welding configuration and size on the Structural Calculation submittal.
 2. Qualify welding operators in accordance with Section 6.0 of AWS D.1.3.
 3. Touch up all welds with zinc-rich paint in compliance with ASTM A 780.

PART 47 EXECUTION

47.1 EXAMINATION

- A. Prior to installation, inspect previous work of all other trades. Verify that all work is complete and accurate to the point where this installation may properly proceed in strict accordance with framing shop drawings.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

47.2 ERECTION

- A. General Erection Requirements:
1. Install cold-formed framing in accordance with requirements of ASTM C 1007.
 2. Weld in compliance with AWS D.1.3.
 3. Install in compliance with applicable sections of the AISI S240 "North American Standard for Cold-Formed Steel Structural Framing."
- B. Wall Systems:
1. Erect framing and panels plumb, level and square in strict accordance with approved shop drawings.
 2. Handle and lift prefabricated panels in a manner so as not to cause distortion in any member.

3. Anchor runner track securely to the supporting structure as shown on the erection drawings. Install concrete anchors only after full compressive strength has been achieved. Provide a sill sealer or gasket barrier between all concrete and steel connections.
4. Butt all track joints. Securely anchor abutting pieces of track to a common structural element, or butt-weld or splice them together.
5. Align and plumb studs, and securely attach to the flanges or webs of both upper and lower tracks except when vertical movement is specified.
6. Install jack studs or cripples below window sills, above window and door heads, at freestanding stair rails and elsewhere to furnish support, securely attached to supporting members.
7. Attach wall stud bridging in a manner to prevent stud rotation. Space bridging rows according to manufacturer's recommendations.
8. Frame wall openings to include headers and supporting studs as shown in the drawings.
9. Provide temporary bracing until erection is completed.
10. Provide stud walls at locations indicated on plans as "shear walls" for frame stability and lateral load resistance.
11. Where indicated in the drawings, provide for structural vertical movement using a vertical slide clip or other means in accordance with manufacturer's recommendations.

C. Steel Joists:

1. Locate joists directly over bearing studs within 3/4 inch (19 mm) or provide a suitable load distribution member at the top track.
2. Provide web stiffeners at reaction points where indicated in drawings.
3. Provide joist bridging as shown in drawings.
4. Provide end blocking where joist ends are not otherwise restrained from rotation.

47.3 FIELD QUALITY CONTROL

- A. Inspection: Periodic special inspections are required by local code authorities.
1. Owner will hire and pay inspection agency.
 2. Submit schedule showing when the following activities will be performed and resubmit schedule when timing changes.
 3. Notify inspection agency not less than 3 days before the start of any of the following activities.
 4. Inspections are required during welding operations, screw attachment, bolting, anchoring and other fastening of components within the force resisting structural system, including struts, braces, and hold-downs.

47.4 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 05 52 00
METAL RAILINGS

PART 1 GENERAL

1. SUMMARY

- a. Work Results:
 - 1) Provide exterior aluminum guardrail and handrail systems.
- b. Principal Products:
 - 1) Aluminum handrail.
 - 2) Aluminum guardrail.
 - 3) Aluminum baluster.
 - 4) Aluminum post.

2. ADMINISTRATIVE REQUIREMENTS

- a. Coordination: Coordinate Work of this Section with Work of Section 066300 "Plastic Railings."
- b. Preinstallation Conference: Conduct conference at Project Site.
 - 1) Meet with Owner, Architect, Installer, railing system manufacturer's representative, framing Installer, and installers whose work interfaces with or affects railing system.
 - 2) Review methods and procedures related to railing system installation, including manufacturer's written instructions.
 - 3) Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 4) Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
 - 5) Review structural loading limitations.
 - 6) Review railing system connection details and condition of other construction that affects railing system.
 - 7) Review temporary protection requirements for railing system during and after installation.

3. ACTION SUBMITTALS

- a. Product Data: Of Manufacturer's product lines for railings assembled from standard components.
 - 1) Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
 - 2) Include rated capacities, furnished specialties, and accessories.
- b. Shop Drawings:
 - 1) Include plans, elevations, sections, and attachment details.
 - 2) Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
- c. Samples: For each exposed product and for each color specified.
 - 1) Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters.

- 2) Fittings and brackets.
- 3) Assembled Samples of railing systems, made from full-size components, including top rail, post, handrail, and infill. Show method of finishing members at intersections. Samples need not be full height.
- d. Delegated-Design Submittal: For handrail and guardrail systems, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- 4. INFORMATIONAL SUBMITTALS
 - a. Qualification Data: For manufacturer and Installer.
 - b. Product Test Reports: For each product, for tests performed by manufacturer.
 - c. Sample Warranty: For manufacturer's warranty.
 - d. Welding Certificates.
- 5. CLOSEOUT SUBMITTALS
 - a. Cleaning Instructions.
- 6. QUALITY ASSURANCE
 - a. Manufacturer Qualifications: A railings system manufacturer who is a member in good standing with PCI and AAMA.
 - b. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects.
 - 1) Build mockup of typical of each railing system specified as shown on Drawings.
 - 2) Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3) Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- 7. DELIVERY, STORAGE, AND HANDLING
 - a. Delivery and Acceptance Requirements: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
 - b. Storage and Handling Requirements:
 - 1) Store and handle materials in accordance with manufacturer's instructions.
 - 2) Keep materials in manufacturer's original, unopened containers and packaging until installation.
 - 3) Store materials in clean, dry area.
 - 4) Keep materials dry.
 - 5) Protect materials and finish during storage, handling, and installation to prevent damage.
- 8. WARRANTY
 - a. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of handrail and guardrail system that fail in materials or workmanship within specified warranty period.
 - 1) Warranty does not include the failures caused by the following:
 - a) Damage caused by faulty installation, or from improper application.

- b) Damage attributable to fire, violent storms, earthquake or other Acts of God, accidents, vandalism, or other casualties, impact of objects, or exposure to atmospheric pollutants or conditions other than natural weather processes.
- c) Any materials not supplied by railing system manufacturer.
- d) Cost of installation or removal, freight, labor and similar costs.
- e) Any incidental or consequential damages.
- f) Installations where the atmosphere is influenced by bodies of salt water (or other contaminant conditions) must adhere to the railing system manufacturer's cleaning and maintenance guidelines.

2) Warranty Period: **30-year** Limited Warranty from date of Substantial Completion.

PART 48 PRODUCTS

1. MANUFACTURERS, ALUMINUM RAILING SYSTEMS

- a. Products: Subject to compliance with requirements, provide the following
 - 1) Digger Specialties, Inc.; Westbury® Aluminum Railing, Tuscany Series, **Style C10**.
- b. Basis-of-Design Product (Submit for Architect's approval): Subject to compliance with requirements, provide **Digger Specialties, Inc.; Westbury® Aluminum Railing, Tuscany Series Style C10** or comparable product by one of the following:
 - 1) Laurence, C. R. Co., Inc.
 - 2) Key-Link Fencing & Railing, Inc.
 - 3) Trex Company, Inc.
- c. Source Limitations: Obtain metal railing systems from single source from single manufacturer.

2. ALUMINUM HANDRAILS AND GUARDRAILS

- a. Railing System Description: **Digger Specialties, Inc.; Westbury® Aluminum Railing, Tuscany Series Style C10**, 2 rail system with square posts, square balusters, and a decorative top rail.
- b. Railing System Configuration:
 - 1) Guardrail Height: 36 inches (915 mm).
 - 2) Handrail Height: 36 inches (915 mm)
 - 3) Decorative Top Rail: 1.75 inches (45 mm) wide by 1.375 inches (35 mm) high.
 - 4) Posts: Square, aluminum post with welded base plate.
 - a) Plain Type: 2 inches (50 mm) square heavy duty, plain posts.
 - 5) Balusters, Square: 0.75 inch (20 mm) by 0.75 inch (20 mm).
 - 6) Baluster Spacing: 4.625 inches (117 mm) on center.
 - 1) Exception: Provide balusters spaced at 4.375 inches (110 mm) on center at stairs.
 - 7) Bottom Rail: 1.75 inches (45 mm) wide by 1.25 inches (32 mm) high.

3. PERFORMANCE REQUIREMENTS

- a. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design railings, including attachment to building construction.
- b. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

- 1) Handrails and Top Rails of Guards:
 - a) Uniform load of 50 lbf/ ft. (0.73 kN/m) applied in any direction.
 - b) Concentrated load of 200 lbf (0.89 kN) applied in any direction.
 - c) Uniform and concentrated loads need not be assumed to act concurrently.
 - 2) Infill of Guards:
 - a) Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).
 - b) Infill load and other loads need not be assumed to act concurrently.
 - c. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
 - 1) Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C, material surfaces)
 - d. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1) Flame-Spread Index: 35 or less.
 - 2) Smoke-Developed Index: 450 or less.
 - e. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1.
4. ALUMINUM
- a. Aluminum, General: Provide alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of alloy and temper designated below for each aluminum form required.
 - b. Provide aluminum of the following alloys, according to ASTM B 221 (ASTM B 221M), as required to meeting performance requirements:
 - 1) Posts: 6005-T5.
 - 2) Balusters: 6063-T6.
 - 3) Railings: 6005-T5
 - 4) Plates: 6061-T6 or 6063-T6.
5. ACCESSORIES
- a. General: Provide manufacture's standard accessories as required for complete railing system as indicated on the drawings and as required to comply with performance requirements.
 - b. Caps: Square, aluminum cap trim, size to correspond to specified posts.
 - 1) Type: Plain, low pyramidal (flat) cap.
 - 2) Approximate Dimensions: 2.25 inches (55 mm) wide by 1.00 inch (25 mm) high.
 - c. Base Trim Sleeve: Aluminum base trim, size to correspond to specified posts, of pattern indicated on the Drawings.
6. FASTENERS
- a. General: Type 316 stainless-steel fasteners.
 - 1) Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

- b. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.
- c. Fasteners for Interconnecting Railing Components:
 - 1) Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless exposed fasteners are unavoidable or are the standard fastening method for railings indicated.
 - 2) Provide **tamper-resistant** flat-head machine screws for exposed fasteners unless otherwise indicated.
- d. Post-Installed Anchors: **Torque-controlled Stainless Steel expansion anchors** capable of sustaining, without failure, a load equal to 6 times the load imposed when installed in unit masonry and 4 times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.

7. MISCELLANEOUS MATERIALS

- a. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.
- b. Non-shrink, Nonmetallic Grout: Factory-packaged, non-staining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
 - 1) Water-Resistant Product: At exterior locations provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.
- c. Reinforcing: Aluminum extrusions and plates as required to comply with performance requirements.
- d. Shims: Stainless steel, ASTM A 666, Type 316.

8. FABRICATION

- a. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage.
- b. Cut, drill, and punch aluminum cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- c. Fabricate connections that are exposed to weather in a manner that excludes water. Provide weep holes where water may accumulate.
- d. Form Changes in Direction as Follows:
 - 1) By bending to manufacturer's standard radius.
 - 2) Do not use prefabricated elbow insert fittings.
- e. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch (6 mm) or less.
- f. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.

- 1) At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.
- g. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work.
 - 1) Fabricate anchorage devices capable of withstanding loads imposed by railings as required to comply with Performance Requirements.
- h. Coordinate anchorage devices with supporting structure.
- i. For railing posts set in concrete, provide stainless-steel sleeves not less than 6 inches (150 mm) long with inside dimensions not less than 1/2 inch (13 mm) greater than outside dimensions of post, with metal plate forming bottom closure.
- j. ALUMINUM FINISHES
- k. Powder-Coat Finish: AAMA 2604 except with a minimum dry film thickness of 1.5 mils (0.04 mm). Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
 - 1) Color and Gloss: White Gloss
- l. White Gloss: As selected by Architect from full range of industry colors.

PART 49 EXECUTION

- 1. EXAMINATION
 - a. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements are clearly marked for Installer. Locate reinforcements and mark locations if not already done.
 - b. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 - c. Prepare written report, endorsed by Installer, listing conditions detrimental to performance.
 - d. Proceed with installation only after unsatisfactory conditions have been corrected.
- 2. INSTALLATION, GENERAL
 - a. Fit exposed connections together to form tight, hairline joints.
 - b. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
 - 1) Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 - 2) Set posts plumb within a tolerance of .
 - 3) Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed .
 - c. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1) Coat, with a heavy coat of bituminous paint, concealed surfaces of aluminum that are in contact with grout, concrete, masonry, wood, or dissimilar metals.

d. Adjust railings before anchoring to ensure matching alignment at abutting joints.

e. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3. RAILING CONNECTIONS

a. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of railings.

b. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.

c. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending **2 inches (50 mm)** beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within **6 inches (150 mm)** of post.

4. ANCHORING POSTS

a. Anchor posts to metal surfaces with flanges, angle type, or floor type as required by conditions, using fittings designed and engineered for this purpose.

5. ATTACHING RAILINGS

a. Anchor railing ends at walls with round flanges anchored to wall construction connected to railing ends using nonwelded connections.

b. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces and connected to railing ends using nonwelded connections.

c. Attach railings to wall with wall brackets, except where end flanges are used.

d. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

e. Maximum Spacing: 8 feet (2400 mm).

f. Secure wall brackets and railing end flanges to building construction as follows:

g. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.

h. For hollow masonry anchorage, use toggle bolts.

i. For steel-framed partitions, use self-tapping screws fastened to steel framing or to concealed steel reinforcements.

j. ERECTION TOLERANCES

k. Set posts plumb within a tolerance of 1/16 inch in 3 feet (2 mm in 1 m).

l. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet (5 mm in 3 m).

m. ADJUSTING AND CLEANING

n. Clean railing system by washing thoroughly with clean water and soap and rinsing with clean water.

6. PROTECTION

- a. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

END OF SECTION

SECTION 06 00 00
CONSTRUCTION ADHESIVES

PART 50 GENERAL

50.1 SECTION INCLUDES

- A. Construction adhesives.
- B. Panel adhesives.

50.2 RELATED SECTIONS

- A. Section 07 92 00 - Joint Sealants.

50.3 REFERENCES

- A. American Plywood Association AFG-01 - Performance Specifications for Adhesives Used for Field-Gluing Plywood to Wood Framing.
- B. ASTM International (ASTM):
 - 1. ASTM C 557 - Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing.
 - 2. ASTM D 1779 - Standard Specification for Adhesive for Acoustical Materials.
 - 3. ASTM D 3498 - Standard Specification for Adhesives for Field-Gluing Plywood to Lumber Framing for Floor Systems.
 - 4. ASTM E 72 - Standard Test Methods of Conducting Strength Tests of Panels for Building Construction.
- C. GreenSeal GS-36 Specifications - Standard for Adhesives For Commercial Use.
- D. USGBC - Leadership in Energy and Environmental Design (LEED):
- E. South Coast Air Quality Management District (SCAQMD) Rule #1168 - Adhesive and Sealant Applications.
- F. GREENGUARD and GREENGUARD Gold (UL Environment)

50.4 SUBMITTALS

- A. Submit under provisions of Section 01 30 00 - Administrative Requirements.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- C. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square representing actual product, color, and patterns.

50.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Minimum 5 year experience manufacturing similar products.
- B. Installer Qualifications: Minimum 2 year experience installing similar products.
- C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
 - 1. Finish areas designated by Architect.
 - 2. Do not proceed with remaining work until workmanship is approved by Architect.

3. Refinish mock-up area as required to produce acceptable work.

50.6 PRE-INSTALLATION MEETINGS

- A. Convene minimum two weeks prior to starting work of this section.

50.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store products in manufacturer's unopened packaging bearing the brand name and manufacturer's identification until ready for installation.
- B. Handling: Handle materials to avoid damage.

50.8 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

50.9 SEQUENCING

- A. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

PART 51 PRODUCTS

51.1 MANUFACTURERS

- A. Acceptable Manufacturer: Liquid Nails Brand, which is located at: 400 Bertha Lamme Dr.; Cranberry Township, PA 16066; Toll Free Tel: 800-634-0015; Email: request info (liquidnails@ppg.com); Web: www.liquidnails.com
- B. Web: <http://www.liquidnails.com>.
- C. Substitutions: Not permitted.
- D. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

51.2 CONSTRUCTION ADHESIVES

- A. Heavy Duty Adhesive (Latex Based):
 1. Product: LN-907 Extreme Heavy Duty as manufactured by Liquid Nails Brand.
 - a. Product Type: Waterborne Latex.
 - b. Class: ASTM C 557. Passes APA AFG-01.
 - c. VOC (actual): 1 %. Maximum 18 g/L.
 - d. Solids by Weight: 59 % minimum.
 - e. Flash Point: > 205 degrees F (96 degrees C).
 - f. Color: White.
 - g. Paintability: Paintable with oil or latex.

PART 52 EXECUTION

52.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

52.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

52.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions and approved submittals.

52.4 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 06 05 73
PRESERVATIVE TREATED WOOD

PART 53 GENERAL

53.1 SECTION INCLUDES

- A. Preservative treatment of interior lumber and plywood.
- B. Preservative treatment of exterior lumber and plywood.

53.2 RELATED SECTIONS

- A. Section 05 40 00 – Cold-Formed Metal Framing.
- B. Section 06 10 00 - Rough Carpentry.
- C. Section 06 16 00 – Sheathing.
- D. Section 07 25 00 – Weather Barriers.

53.3 REFERENCES

- A. American Wood-Protection Association (AWPA):
 - 1. AWPA E12 - Standard Method of Determining the Corrosion of Metal in contact with wood.
 - 2. AWPA U1 - Use Category System: User Specifications for Treated Wood.

53.4 SUBMITTALS

- A. Submit under provisions of Section 01 30 00 - Administrative Requirements.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- C. Preservative Treatment Certification: Treating plant's certification of compliance with specified requirements.

53.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Minimum 5 year experience with manufacturing process of similar products.

53.6 PRE-INSTALLATION MEETINGS

- A. Convene minimum two weeks prior to starting work of this section.

53.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store products in manufacturer's unopened packaging bearing the brand name and manufacturer's identification until ready for installation.
- B. Handling: Handle materials to avoid damage.

53.8 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

53.9 SEQUENCING

- A. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

53.10 WARRANTY

- A. Manufacturer shall warrant product and process in approved applications for the following terms:
 1. Lifetime Warranty for Above Ground general uses.
 2. Lifetime Warranty for Ground Contact and Fresh Water general uses.

PART 54 PRODUCTS

54.1 MANUFACTURERS

- A. Acceptable Manufacturer: Submit for Architect's approval
- B. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

54.2 WOOD PRESERVATIVE

- A. Method: Micronized copper pressure treated wood process.
- B. Process: (Listed ICC-ES Report number ICC ESR-2240)
 1. MicroPro preserved wood meets all applicable major model building codes for:
 - a. Above ground.
 - b. Ground contact.
 - c. Fresh water immersion.
 - d. Salt water splash zone.
 - e. Severe critical structural applications in ground contact.
 2. Third-Party Certification:
 - a. Certified under SCS's Environmentally Preferable Product (EPP) program based on Life-Cycle Assessment.

54.3 FASTENERS

- A. Nails, Fasteners and Fittings:
 1. Hot-dipped galvanized or stainless steel fasteners and fittings are acceptable for use with MicroPro treated wood.
 2. Use in direct contact with aluminum.
- B. For interior or exterior applications, use fasteners and hardware that are in compliance with the manufacturer's recommendations and the building codes for their intended use.
- C. Stainless Steel: Stainless steel fasteners and connectors for use with treated wood in severe exterior applications such as swimming pools, salt water exposure, etc. - Type 304 and 316 grades shall be used.

54.4 INTERIOR WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Preservative Treatment by Pressure Process: AWPA U1
 1. Use Category UC2.
 2. Kiln dry lumber and plywood after treatment to a maximum moisture content of 19 and 18 percent, respectively.
 3. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
 4. For exposed items indicated to receive transparent finish, do not use chemical formulations

that contain colorants or that bleed through or otherwise adversely affect finishes.

5. Do not use material that is warped or does not comply with requirements for untreated material.
6. Mark lumber with treatment-quality mark of an inspection agency approved by the American Lumber Standard Committee's Board of Review.
 - a. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece or omit marking and provide certificates of treatment compliance issued by inspection agency.
7. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.
 - a. For exposed plywood indicated to receive a stained or natural finish, mark back of each piece.
8. Application: Where indicated.

54.5 EXTERIOR WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Preservative Treatment by Pressure Process: AWPA U1:
 1. Use Category UC3a.
 2. Use chemical formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants in solution to distinguish treated material from untreated material.
 3. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
 4. Do not use material that is warped or does not comply with requirements for untreated material.
 5. Mark lumber with treatment-quality mark of an inspection agency approved by the American Lumber Standard Committee's Board of Review.
 - a. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece or omit marking and provide certificates of treatment compliance issued by inspection agency.
 6. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.
 - a. For exposed plywood indicated to receive a stained or natural finish, mark back of each piece.
 7. Application: Where indicated.

PART 55 EXECUTION

55.1 INSTALLATION

- A. Preservative Treated Wood:
 1. Compliance: Comply with manufacturer's product data, including product technical bulletins, product catalog installation instructions and product carton instructions for installation.

END OF SECTION

06 05 73

SECTION 06 10 00
ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

- A. Related Documents:
 - 1. Drawings and general provisions of the Subcontract apply to this Section.
 - 2. Review these documents for coordination with additional requirements and information that apply to work under this Section.
- B. Section Includes: Execution and completion of Rough Carpentry in accordance with the Specifications and Drawings including but not limited to;
 - 1. Dimensional lumber.
 - 2. Wall, floor, and roof sheathing.
 - 3. Cellulose honeycomb wall, floor and roof panels.
- C. Related Sections:
 - 1. Division 01 Section "General Requirements."
 - 2. Division 01 Section "Special Procedures."
 - 3. Division 01 Section "Construction Waste Management".
 - 4. Section 07 21 00 Thermal Insulation

1.2 REFERENCES

- A. General:
 - 1. The following documents form part of the Specifications to the extent stated. Where differences exist between codes and standards, the one affording the greatest protection shall apply.
 - 2. Unless otherwise noted, the referenced standard edition is the current one at the time of commencement of the Work.
 - 3. Refer to Division 01 Section "General Requirements" for the list of applicable regulatory requirements.
- B. ASTM International.
- C. American Wood Preservers Association (AWPA).
- D. National Fire Protection Association (NFPA).

1.3 SUBMITTALS

- A. Submit under provisions of Divisions 01 Section "General Requirements" and "Special Procedures."
- B. Certificate: Provide certificate from each manufacturer stating that material is first quality, meets or exceeds the properties of specified materials as specified herein, and is suitable for intended use on this Project. Where recycled lumber materials are used for structural applications or where otherwise noted, include lumber certification and quality grading.

1.4 QUALITY ASSURANCE

- A. Inspection: Prior to work of this Section, carefully inspect the installed work of other trades and verify that such work is completed to the point where this installation may properly commence.

- B. Discrepancies: In the event of discrepancy, immediately notify the Project Manager. Do not proceed with installation in areas of discrepancy until such discrepancies have been fully resolved.
- C. Lumber may be rejected by the Project Manager, whether or not it has been installed, for excessive warp, twist, bow, crook, mildew, fungus, or mold, as well as for improper cutting and fitting.

1.5 delivery, storage, and handling

- A. Materials shall be properly packed and handled while in transit so as to arrive at the job site in undamaged condition. Manufactured materials shall be delivered in suitable containers plainly marked with brand and manufacturer's name.
- B. Storage arrangements shall be subject to Project Manager's approval and shall afford every access for inspection and identification of each item. Lumber shall be piled off the ground, on skids, in a manner which prevents twisting or warping and affords proper ventilation, drainage and protection from termites and decay, rain and excessive sun. Plywood shall be protected from dampness. Material shall be protected from the elements and from damage or deterioration.
- C. Damaged or deteriorated materials or assemblies shall not be used in the work and shall be replaced at no extra cost to the Owner.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Material shall conform to these specifications and to the applicable current editions of the Standard Specifications of ASTM and CBC.
- B. Lumber Grading:
 - 1. Plywood: U.S. Product Standard PS1 (latest edition), grade stamped and edge branded to DFPA Standards of the APA - The Engineered Wood Association.
- C. Lumber Size and Patterns: Surface four sides, dress sizes to UBC Chapter 23; work to sizes shown. Sizing and surfacing shall be as required and approved for the particular location. Framing shall be sized and where exposed shall be surfaced.
- D. Dimensional lumber 2 inches (50 mm) or less in thickness shall have an average moisture content of 19 percent or less but no portion of a shipment shall be over 25 percent. Air dried lumber is desired but, if necessary, lumber may be kiln dried, however, the drying process must be slow and regulated to cause only an amount of checking comparable with air-dried stock. Wood thicker than 2-1/2 inches (63 mm) shall be well seasoned stock, moisture content not to exceed 18 percent.
- E. Sills and equipment curbs which rest on concrete shall be foundation grade Redwood or preservative pressure treated Douglas Fir.
- F. All interior wood and plywood used for blocking and built into roofing, or otherwise shown shall receive fire retardant pressure treatment in accordance with paragraph 2.5.B. Exterior stair framing and decking, and wood exposed to the exterior, or otherwise shown, shall receive the preservative type pressure treatment in accordance with paragraph 2.5.A.

2.2 Wall, floor and roof Sheathing

- A. Plywood: See Paragraph 2.1 D.

2.3 LUMBER FASTENINGS (except for preservative pressure treated lumber fastenings)

- A. Fasteners: Refer to Architectural and Structural drawings.

2.4 PRESSURE TREATMENT

- A. Where called for on the drawings or specified herein, exposed lumber to receive preservative-type pressure treatment shall have a minimum moisture content of 19 percent after pressure treatment and shall be pressure treated using Ammoniacal copper quaternary compound (ACQ). Preservative shall penetrate a minimum of 3/8-inch (9.5 mm) deep into wood. Materials shall be compatible with stain coatings when specified in Division 09 Section "Painting". Fasteners and connectors used with preservative pressure treated lumber shall be G185 hot dip galvanized, Type 304 stainless steel or Type 316 stainless steel.
 1. Dimensioned Lumber Posts: AWPA C-2, retention of 0.4 lbs/c.f. per quality standard for LP-22 for in-ground contact.
 2. Dimensioned Lumber (all other): AWPA C-2, retention of 0.25 lbs/c.f. per quality standard LP-2 for above ground use.
 3. Pre-treated lumber shall be preserved with ACQ Preserve®, Chemical Specialties Inc.
 4. Field treatment shall be Boracol® or Impel® Rods, Chemical Specialties Inc. applied in accordance with the manufacturer's instructions.
- B. All interior wood and plywood used for blocking and built into roofing, or otherwise shown, shall receive fire retardant pressure treatment in accordance with American Wood Preservers Association (AWPA). Treat wood with Kopper's "Non-Com", or Baxter fire retardant treatment, or equal, and provide UL label. Plywood shall have flame spread rating after treatment of 25 or less.
- C. Subcontractor shall furnish to the Project Manager, upon delivery of the members to the job, a certificate certifying that the material has been pressure treated as specified.

PART 3 - EXECUTION

3.1 WORKMANSHIP

- A. General: Rough carpentry shall produce joints true, tight, and well nailed with members assembled in accordance with the Drawings and with pertinent codes and regulations.
- B. Selection of lumber pieces: Carefully select members. Select individual pieces so that knots and obvious defects will not interfere with placing bolts or proper nailing or making proper connections.

3.2 WOOD PRESERVATIVE

- A. All exterior framing and wood trims coming in contact with concrete or masonry, whether or not Redwood, and not specified or otherwise shown to be pressure treated shall be treated with ACQ Preserve®. Preservatives shall be compatible with stain coatings when specified in Division 09 Section "Painting".

3.3 SITE-APPLIED WOOD TREATMENT

- A. Brush apply two coats of preservative treatment on site cut ends and site cut wood in contact with other wood surfaces.
- B. Apply preservative treatment in accordance with manufacturer's instructions.
- C. Allow preservative to cure prior to erecting members.

3.4 INSTALLATION - LUMBER AND DECKING

- A. Secure decking perpendicular to framing members with ends staggered over firm bearing where possible.
- B. Maintain deck joints of 1/16 inch (1.6 mm).
- C. Surface Flatness: +/- 1/4-inch (6 mm) in 10 feet (3 m) maximum.

3.5 FRAMING

- A. Install framing in strict accordance with the requirements of CBC Chapter 23 unless more stringent requirements are specified herein or shown on the Drawings.
- B. Optimum Value Engineering: Where indicated on drawings or, with prior approval by the Project Manager, the following framing techniques may be employed. Nothing in this Section shall supercede requirements of CBC Chapter 23 as modified by Division 01 Section "Lateral Force Procedures ", or other requirements in the Drawings or Specifications.
 - 1. Wall studs spaced at 24 inches (600 mm) on center (Verify with Project Manager and ensure that wall finish materials can meet spans)
 - 2. On non-bearing walls, or where upper level framing aligns with lower floor, a single continuous top plate may be used.
 - 3. Built up headers may be used in lieu of solid lumber.
 - 4. Frame corners with two studs and framing clips.
 - 5. Use blocking for attachments in lieu of continuous stud.
 - 6. Delete headers at non-load bearing walls.
 - 7. Layout framing to take advantage of sheathing or siding dimensions.

3.6 CLEANUP

- A. At the end of each shift and upon completion of the work, remove debris, rubbish and surplus materials from the site which resulted from work under this section. Do not leave wood, shavings, sawdust, etc. on the ground or buried in fill. Take positive measures to ensure that saw dust and wood shavings do not enter the storm drainage system.

3.7 waste management

- A. Conform with Division 01 Section "Construction Waste Management."
- B. Separate wood waste in accordance with the Waste Management Plan.
- C. Separate stained, painted and treated lumber from clean lumber and place in designated area for hazardous materials.
- D. Separate and store separately in a clean and dry location the following categories for salvage or re-use on site:
 - 1. Sheet materials larger than 2 square feet (1.19 m).
 - 2. Framing members larger than 16 inches (400 mm).
 - 3. Multiple offcuts of sizes larger than 12 inches (300 mm).
- E. The following categories may be re-used in the manufacture of particle board or MDF.
 - 1. Composite wood, (for example, plywood, OSB, LVL, I-Joist, parallel strand, MDF, particleboard).
 - 2. Clean dimensional lumber.

- F. Set aside damaged wood for acceptable alternative uses, for example use as bracing, blocking, cripples, or ties.
- G. Do not burn in an open fire, wood stove, fireplace or other non-industrial incinerator lumber that is less than a year old or wood treated with creosote, pentachlorophenol, CCA, ACA, or other pressure treatment.
- H. Separate the following categories for disposal and place in designated areas for hazardous materials: treated, stained, painted, or contaminated wood.
- I. Sequence work to minimize use of temporary HVAC to dry out building and control humidity.

END OF SECTION

SECTION 06 16 00
SHEATHING

PART 56 GENERAL

1. RELATED DOCUMENTS
2. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
3. SUMMARY
 - a. This Section includes the following:
 - 1) Wall sheathing.
 - 2) Building wrap.
 - 3) Sheathing joint-and-penetration treatment.
 - 4) Flexible flashing at openings in sheathing.
 - b. Related Sections include the following:
 - 1) Section 06 10 00 – Rough Carpentry
 - 2) Section 09 21 16 – Gypsum Board Assemblies
4. SUBMITTALS
 - a. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
 - 1) Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.
 - 2) For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
 - 3) Include copies of warranties from chemical treatment manufacturers for each type of treatment.
 - 4) For building wrap, include data on air-/moisture-infiltration protection based on testing according to referenced standards.
 - b. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:
 - 1) Preservative-treated plywood.
 - 2) Fire-retardant-treated plywood.
 - 3) Foam-plastic sheathing.
 - 4) Building wrap.
5. QUALITY ASSURANCE
 - a. Fire-Test-Response Characteristics: For assemblies with fire-resistance ratings, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1) Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory.
 - 2) Plywood.

6. DELIVERY, STORAGE, AND HANDLING

- a. Stack plywood and other panels flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 57 PRODUCTS

1. WOOD PANEL PRODUCTS, GENERAL

- a. Plywood: DOC PS 1.
- b. Thickness: As specified in Architectural detail drawings. Generally: 5/8". As needed to comply with requirements specified, but not less than thickness indicated.
- c. Factory mark panels to indicate compliance with applicable standard.

2. PRESERVATIVE-TREATED PLYWOOD

- a. Preservative Treatment by Pressure Process: AWWPA C9.
- 1) Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
- b. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.

1) Application: Fasten to exterior of metal framing as specified in drawings. Cover Plywood with Cement Board (Section 09 29 00) followed by Tyvek Homewrap weather barrier (Section 07 25 00) as specified in drawings.

2) Fastening: #12 Screws @6" O/C at Sheet Edges and 12" O/C elsewhere to track and studs.

3. WALL SHEATHING

- a. EXTERIOR SHEATHING: Plywood Wall Sheathing

- 1) Span Rating: Not less than **20/0**.
- 2) Nominal Thickness: [**5/8 inch (13 mm)**].
- 3) **Fastening: #12 Screws @6" O/C at Sheet Edges and 12" O/C elsewhere to track and studs.**

- b. INTERIOR SHEATHING

Paper-Surfaced Gypsum Wall Sheathing:

ASTM C 79/C 79M, gypsum sheathing; with **water-resistant-treated core and with water-repellent paper bonded to core's face**, back, and long edges.

- 1) Manufacturers: Subject to compliance with requirements, provide products by one of the following:
LaFarge North America Inc.
- a) American Gypsum
- b) G-P Gypsum Corporation.
- 2) United States Gypsum Co. and Thickness: Regular, 1/2 inch (13 mm) for Interior. 5/8 for Exterior.
- 3) Edge and End Configuration: Taper
- 4) Size: 48 by 96 inches (1219 by 2438 mm) for vertical.

- c. INTERIOR AND EXTERIOR SHEATHING WHERE SPECIFIED

Cementitious Backer Panel: Durock Cement Board

- 1) Basis of Design: Subject to compliance with project requirements, the design is based on the following: USG Corporation, LLC, "USG Durock Cement Board".
- 2) Classification: Cementitious Backer Units: ANSI A118.9, ASTM A108.11 and ASTM C 1325 provide with manufacturer's standard edges.
 - a) Thickness: **5/8 inch (12.7 mm)**
 - b) Board Length: **8 feet (2438 mm)**.
 - c) Board Width: **48 inches (1219 mm)**.
 - d) Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
- 3) Minimum bending radius: **6 feet (1830 mm)**.
- 4) Fastener Requirements: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and application.
 - a) Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: DUROCK Brand Steel or USG Sheathing SF steel drill screws [1-1/4 inch] [1-5/8 inch] [2-1/4 inch] with corrosion-resistant coating.
 - b) Wood Screws: DUROCK Brand Wood or USG Sheathing WF screws [1-1/4 inch] [1-5/8 inch] [2-1/4 inch] with corrosion-resistant coating.
- 5) Installation Requirements:
 - a) For steel framing less than 0.0329 inch thick, attach sheathing to comply with ASTM C 1002.
 - b) For steel framing from 0.033 to 0.112 inch thick, attach sheathing to comply with ASTM C 954.
- 6) Plaster Finish

4. FASTENERS

- a. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
 - 1) For wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
- b. Wood Screws: ASME B18.6.1.
- c. Screws for Fastening Wood Structural Panels to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.
 - 1) For wall sheathing panels, use: #12 Screws @6" O/C at Sheet Edges and 12" O/C elsewhere to track and studs. Provide screws with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.
- d. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing board to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.
 - 1) For steel framing less than **0.0329 inch (0.835 mm)** thick, attach sheathing to comply with ASTM C 1002.

- 2) For steel framing from **0.033 to 0.112 inch (0.84 to 2.84 mm)** thick, attach sheathing to comply with ASTM C 954.
- e. Screws for Fastening Oriented-Strand-Board-Surfaced, Polyisocyanurate-Foam Sheathing to Metal Roof Deck: Steel drill screws, in type and length recommended by sheathing manufacturer for thickness of sheathing board to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117. Provide washers or plates if recommended by sheathing manufacturer.
- 5. SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS
 - a. Sheathing Tape: Pressure-sensitive plastic tape recommended by sheathing manufacturer for sealing joints and penetrations in sheathing.
- 6. MISCELLANEOUS MATERIALS
 - a. Adhesives for Field Gluing Panels to Framing: Formulation that is approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.
 - 1) Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 2) Products: Subject to compliance with requirements, provide one of the following:
 - a) Carlisle Coatings & Waterproofing; CCW-705-TWF Thru-Wall Flashing.
 - b) Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; **[Vycor Plus Self-Adhered Flashing] [Vycor V40 Weather Barrier Strips]**.
 - c) MFM Building Products Corp.; Window Wrap.
 - d) Polyguard Products, Inc.; Polyguard 300.
 - e) Protecto Wrap Company; **[BT-20 XL] [PS-45]**.
 - b. Primer for Flexible Flashing: Product recommended by manufacturer of flexible flashing for substrate.

PART 58 EXECUTION

- 1. INSTALLATION, GENERAL
 - a. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
 - b. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction, unless otherwise indicated.
 - c. Securely attach to substrate by fastening as indicated, complying with the following:
 - 1) NES NER-272 for power-driven fasteners.
 - 2) Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."
 - d. Coordinate wall sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
 - e. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
 - f. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

2. WOOD STRUCTURAL PANEL INSTALLATION

- a. General: Comply with applicable recommendations in APA Form No. E30K, "APA Design/Construction Guide: Residential & Commercial," for types of structural-use panels and applications indicated.
 - 1) Comply with "Code Plus" installation provisions in guide referenced in paragraph above.
- b. Fastening Methods: Fasten panels as indicated below:
 - 1) Wall Sheathing:
 - a) Screw to cold-formed metal framing according to engineered specifications.
 - b) Space panels **1/8 inch (3 mm)** apart at edges and ends.

3. GYPSUM SHEATHING INSTALLATION

- a. Comply with GA-253 and with manufacturer's written instructions.
 - 1) Fasten gypsum sheathing to cold-formed metal framing with screws.
 - 2) Install boards with a **3/8-inch (9.5-mm)** gap where non-load-bearing construction abuts structural elements.
- b. Apply fasteners so heads bear tightly against face of sheathing boards but do not cut into facing.
- c. Vertical Installation: Install board vertical edges centered over studs. Abut ends and edges of each board with those of adjacent boards. Attach boards at perimeter and within field of board to each stud.
 - 1) Space fasteners approximately **8 inches (200 mm)** o.c. and set back a minimum of **3/8 inch (9.5 mm)** from edges and ends of boards.
 - 2) For sheathing under stucco cladding, boards may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.

4. SHEATHING JOINT-AND-PENETRATION TREATMENT

- a. Seal sheathing joints according to sheathing manufacturer's written instructions.
 - 1) Apply elastomeric sealant to joints and fasteners and trowel flat. Apply sufficient quantity of sealant to completely cover joints and fasteners after troweling. Seal other penetrations and openings.
 - 2) Apply sheathing tape to joints between foam-plastic sheathing panels and at items penetrating sheathing. Apply at upstanding flashing to overlap both flashing and sheathing.

5. FLEXIBLE FLASHING INSTALLATION

- a. Apply flexible flashing where indicated to comply with manufacturers written instructions.
 - 1) Prime substrates as recommended by flashing manufacturer.
 - 2) Lap seams and junctures with other materials at least **4 inches (100 mm)**, except that at flashing flanges of other construction, laps need not exceed flange width.
 - 3) Lap flashing over weather-resistant building paper at bottom and sides of openings.
 - 4) Lap weather-resistant building paper over flashing at heads of openings.
 - 5) After flashing has been applied, roll surfaces with a hard rubber or metal roller to ensure that flashing is completely adhered to substrates.

6. PROTECTION

- a. Paper-Surfaced Gypsum Sheathing: Protect sheathing by covering exposed exterior surface of sheathing with weather-resistant sheathing paper securely fastened to framing. Apply covering immediately after sheathing is installed.

END OF SECTION

SECTION 06 60 00
CELLULAR PVC FABRICATIONS

PART 59 GENERAL

59.1 SECTION INCLUDES

- A. Cellular PVC fabrications including the following:
 - 1. Trim.

59.2 RELATED SECTIONS

- A. Section 06 10 00 - Rough Carpentry.
- B. Section 06 20 00 - Finish Carpentry.

59.3 REFERENCES

- A. ASTM International (ASTM): ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

59.4 SUBMITTALS

- A. Submit under provisions of Section 01 30 00 - Administrative Requirements.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- C. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square representing actual product, color, and patterns.

59.5 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with requirements of authorities having jurisdiction and applicable codes at the location of the project.
- B. Manufacturer Qualifications: Minimum 5 years experience manufacturing similar products.
- C. Installer Qualifications: Minimum 2 years experience installing similar products.

59.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store products in manufacturer's unopened packaging bearing the brand name and manufacturer's identification until ready for installation.
- B. Comply with manufacturer's recommendations. Handle materials to avoid damage.

59.7 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

59.8 WARRANTY

- A. Provide manufacturer's standard limited warranty for products, stating that components will be free from defects in material that occur as a direct result of the manufacturing process, occur under normal use and service, occur during the warranty period and result in blistering, peeling, flaking, cracking, splitting, cupping, rotting or structural defects from termites or fungal decay.

PART 60 PRODUCTS

60.1 MANUFACTURERS

- A. Acceptable Manufacturer: Submit for Architect's Approval
- B. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

60.2 TRIM

- A. Fire Performance Characteristics: Provide products complying with the following:
 - 1. Flame Spread Index: Less than 25, ASTM E 84.
- B. PVC Trim: Material shall have the following characteristics:
 - 1. Material: Solid Cellular PVC.
 - 2. Style: Flat
 - 3. Trim Size, 4/4 Thickness:
 - a. 1 x 4 x 12 feet nominal, 3/4 inches x 3-1/2 inches by 12 feet actual dimension. As specified by Architectural detail drawings for sliding doors to balcony.

60.3 ACCESSORIES

- A. Adhesives: PVC cement.
- B. Sealants: Tremco, Inc., Dymonic FC.
See Section 07 01 91 for specifications.

PART 61 EXECUTION

61.1 EXAMINATION

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

61.2 INSTALLATION

- A. General: Install products in accordance with manufacturer's instructions, approved submittals, and in proper relationship with adjacent construction.
 - 1. Use manufacturer's recommended fasteners, not more than 2 inches from ends.
 - 2. Glue joints to eliminate joint separation.
 - 3. Allow for expansion and contraction at ends of the runs.

61.3 CLEANING AND PROTECTION

- A. Protect from damage during construction operations. Promptly repair any damaged surfaces. Remove and replace work which cannot be satisfactorily repaired.
- B. Clean products, prior to Substantial Completion, using materials recommended by the manufacturer to remove stains, dirt and debris prior to final acceptance.

END OF SECTION

SECTION 07 01 50
ELASTOMERIC WATERPOOFING SYSTEM
VULKEM 450

PART 62 GENERAL

62.1 SECTION INCLUDES

- A. Elastomeric Roof Coating System for Concrete Roof Surfaces.

62.2 RELATED SECTIONS

- A. Section 03 30 00 - Cast-in-Place Concrete

62.3 REFERENCES

- A. ASTM D 1644 - Standard Test Methods for Nonvolatile Content of Varnishes.
- B. ASTM D 1653 - Standard Test Methods for Water Vapor Transmission of Organic Coating Films
- C. ASTM D 2370 - Standard Test Method for Tensile Properties of Organic Coatings.
- D. ASTM D 2369 - Standard Test Method for Volatile Content of Coatings
- E. ASTM D 6083 - Standard Specification for Liquid Applied Acrylic Coating used in Roofing

62.4 DESIGN / PERFORMANCE REQUIREMENTS

- A. System assembly shall be listed on the CRRC website coolroofs.org showing that the initial solar reflectance, thermal emittance, and SRI values comply with LEED requirements, local building code requirements, and any specific project requirements.

62.5 SUBMITTALS

- A. Submit under provisions of Section 01 30 00 - Administrative Requirements.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Product Literature.
 - 2. Preparation instructions and recommendations.
 - 3. Storage and handling requirements and recommendations.
 - 4. Installation methods.
 - 5. Safety Data Sheets (SDS) for all components.
- C. Shop Drawings: Plans and details of liquid-applied coating system.
- D. Manufacturer's Certificates: Certify products meet or exceed specified requirements.
- E. Field Quality Control: Submit the following.
 - 1. Inspection and testing reports
 - 2. Completed Coating Inspection Report
- F. Closeout Submittals: Submit coating manufacturer and applicator's warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

62.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing commercially available fibered liquid roof coatings with a minimum of 10 years documented experience with applications in the United States.
- B. Installer Qualifications: Company specializing in performing the work of this section with a minimum of 3 years documented experience and approved by system manufacturer for warranted installation.

- C. Installer's Field Supervision: Maintain a full-time Supervisor/Foreman on job site during all phases of roofing work while coating work is in progress
- D. Manufacturer's Field Service: Coating manufacturer shall provide the services of a competent field representative to provide an on-site prior to issuance of Warranty.

62.7 PRE-INSTALLATION CONFERENCE

- A. Convene a pre-installation conference approximately two weeks before scheduled commencement of coating system installation and associated work.
- B. Objectives include:
 1. Review foreseeable methods and procedures related to roofing coating work, including set up and mobilization areas for stored material and work area.
 2. Tour representative areas of roofing coating substrates, inspect and discuss condition of substrate, penetrations and other preparatory work.
 3. Review structural loading limitations of deck and inspect deck for loss of flatness and for required attachment.
 4. Review roofing coating system requirements, Drawings, Specifications and other Contract Documents.
 5. Review and finalize schedule related to roofing coating work and verify availability of materials, installer's personnel, equipment and facilities needed to make progress and avoid delays.
 6. Review required inspection, testing, certifying procedures.
 7. Review weather and forecasted weather conditions and procedures for coping with unfavorable conditions, including possibility of temporary roofing.
 8. Record conference including decisions and agreements reached. Furnish a copy of records to each party attending.

62.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store products in manufacturer's unopened packaging with labels intact until ready for installation.
- B. Store materials off the ground or on pallets, under cover and in a cool, dry location, out of direct sunlight, in accordance with manufacturer's recommendations.
- C. Store and maintain materials above freezing.
- D. Place pallets as not to overload any single area of the roof.
- E. Follow manufacturer's directions for protection of materials prior to and during installation.
- F. Maintain copies of all current MSDS for all components on site. Provide personnel with appropriate safety data information and training as it relates to the specific chemical compounds to be utilized.

62.9 SEQUENCING

- A. Apply coating in a timely manner in conjunction with work of other trades. Coordinate with other trades to avoid traffic over or against completed coating surfaces.

62.10 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits

recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

- B. Do not apply coating system during or with the threat of inclement weather.
 - 1. Do not begin work if rain is expected within 24 hours of application.
 - 2. Do not apply if weather does not permit complete cure prior to rain, fog, or temperatures falling below 50 degrees F.
 - 3. All surfaces to be coated must not pond water. Water that evaporates within 48 hours is not considered ponding.
 - 4. All surfaces shall be clean, dry and structurally sound.
- C. Owner will occupy the premises during the entire project. Cooperate with Owner during the construction operations to promote continued use of the facility. Coordinate scheduling with the Owner in order to relocate or protect vehicles, building occupants and building contents from damage during the construction operations.
- D. Ensure that substrate materials are dry and free of contaminants. Do not commence with the application unless substrate conditions are suitable.

62.11 WARRANTY

- A. Tremco warrants its Vulkem Coatings to be free of defects in materials but makes no warranty as to appearance or color.
- B. Since methods of application and on-site conditions are beyond our control and can affect performance, Tremco makes no other warranty, expressed or implied, including warranties of MERCHANTABILITY and FITNESS FOR A PARTICULAR PURPOSE, with respect to Vulkem Coatings.
- C. Tremco's sole obligation shall be, at its option, to replace, or refund the purchase of the quantity of Vulkem Coating proved to be defective and Tremco shall not be liable for any loss or damage.

62.12 MANUFACTURERS

- A. Acceptable Manufacturer: The Cade Corporation, which is located at: 100 Lewis Street San Jose, California 95112. ASD.; Toll Free Tel: 408-292-3435; Fax: 408-293-8506; Email: [request info \(info@cadeco.com\)](mailto:requestinfo@cadeco.com); Web: <http://www.cadeco.com/>
- B. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

62.13 PRODUCT, GENERAL

- A. Materials shall be products of a single manufacturer or items standard with manufacturer of coating system. Provide secondary materials that are produced or are specifically recommended by manufacturer of coating system to ensure compatibility.
- B. Be sure to read Safety Data Sheets for all appropriate safety precautions with these products.

62.14 ELASTOMERIC WATERPROOFING SYSTEM MATERIALS

- A. VULKEM 450
 - 1. Physical Properties:

- a. Specific Gravity (ASTM D 1475): 1.32
- b. Weight per gallon (approx.): 11 lbs.
- c. Weight (ASTM D 1353): 83 percent
- d. Viscosity, CPS (Brookfield #4 Spindle @20 rpm) 20,000
- e. Dry Time (ASTM D 1640): Tack free-24 hrs. Rubbery cure 48 hrs
- f. Flash Point (ASTM D 1310): 101°F (38°C)
- g. Hardness, Shore A (ASTM D 2240): 37
- h. Tensile Strength (ASTM D 412): 320 psi (2.2MPa)
- i. Elongation (ASTM D 412): 450%
- j. Adhesion in Peel (ASTM D 903): 29 lb./in. (129N)
- k. MVT (ASTM E 96, B): 1.58 m.p.
- l. Weather Resistance (ASTM D 822) N.A.
- m. Salt Spray (ASTM B 117) N.A.
- n. Abrasion Resistance (ASTM C 501) 20 Rev., CS 17 wheel 1,000 gm. wt.: N.A.
- o. Tear Resistance (ASTM D 1004): 200 pli (889N)

PART 63 EXECUTION

63.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared and conditions are suitable to proceed with the Work of this specification.
 - 1. Substrates shall be inspected and repaired as needed to provide a proper surface to receive coating system.
 - 2. Roof surface must be clean, dry, free of ponding water, and structurally sound.
 - 3. Any discharge of fumes or possible contaminants must be noted. Contact manufacturer to determine if fumes or matter being exhausted will interfere with adhesion.
 - 4. Inspect the roof surface for cracks, blisters, chalking, crazing, and shrinking.
 - 5. Inspect flashing details including penetrations, curbs, expansion and transition joints, wall terminations, and drain details.
 - 6. Inspect and probe all field seams and patches.
 - 7. Inspect and determine if substrate, insulation or deck is deteriorated and should be replaced.
 - 8. Inspect for insulation fastener and/or plates backing out.
 - 9. Identify incompatible or unsatisfactory substrates, if any.

63.2 PREPARATION

- A. Concrete Roof Surface Preparation: Surfaces to be prepared as a substrate for the roof repair system as follows:
 - 1. Repair spalled concrete and allow to fully cure. Concrete shall be water cured and in place for at least 14 days, preferably 28 days.
 - 2. Concrete finish shall be a light steel trowel followed by a fine hair broom, or equivalent finish.
 - 3. New or existing slabs must be dry, clean, sound and free of all
 - 4. contaminants which may interfere with adhesion or proper curing.

5. Where ponding water conditions exist, corrective measures must be taken to eliminate water build-up prior to coating.
6. Repair all cracks exceeding 1/16-inch-wide with RG-110 Flashing Compound at a rate of 60 lineal ft./gallon (50 sq.ft./gallon) and feather out the edges. To repair larger cracks and protrusions, use UT-40 Universal Tape.
7. Chemical and/or mechanical surface preparation may be required.

63.3 ROOF COATING APPLICATION

A. General Applications Methods

1. Vulkem 450 Basecoat Method

- a. The Vulkem 450 basecoat is applied at the rate of 25 square feet per gallon (.61 m²/L) yielding approximately 60 wet mils (1.5mm) thickness.
- b. The coating is squeegee applied, followed by back rolling to evenly distribute the material.
- c. Vulkem 450 can be recoated after 24-hour cure at 75°F (23.9°C), 50% R.
- d. Tile to be installed over Vulkem 450. Refer to Section 09 30 00, and Section 09 31 00.

63.4 CLEANING

- A. Clean-Up: Site cleanup, including both interior and exterior building areas that have been affected by construction, shall be restored to preconstruction condition.
- B. Coating materials, components and accessories shall be removed from Site and taken to a legal dumping area authorized to receive such materials.

63.5 PROTECTION

- A. Protect building components with tarps or other suitable materials, from soil, stains, or spills at all hoisting points and areas of application.
- B. Any such damage shall be repaired at Contractor's expense to Owner's satisfaction or be restored to original condition.
- C. Provide barricades, retaining ropes, safety elements and any appropriate signage required.
- D. Eliminate construction traffic on newly placed coating systems. Do not store construction materials on unprotected coating surfaces.
- E. Use with adequate ventilation.

END OF SECTION

SECTION 07 21 00
THERMAL INSULATION

PART 64 GENERAL

64.1 SECTION INCLUDES

- A. Water Repellent, Semi-Rigid Board Insulation for Cavity Walls.

64.2 RELATED SECTIONS

- A. Section 05 40 00 - Cold-Formed Metal Framing.
- B. Section 06 10 00 - Rough Carpentry

64.3 REFERENCES

- A. ASTM C 165 - Standard Test Method for Measuring Compressive Properties of Thermal Insulations.
- B. ASTM C 167 - Standard Test Method for Thickness and Density of Blanket or Batt Thermal Insulations.
- C. ASTM C209 - [Standard Test Methods for Cellulosic Fiber Insulating Board.
- D. ASTM C 303 - Standard Test Method for Dimensions and Density of Preformed Block and Board-Type Thermal Insulation.
- E. ASTM C 356 - Standard Test Method for Linear Shrinkage of Preformed High-Temperature Thermal Insulation Subjected to Soaking Heat.
- F. ASTM C 411 - Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation
- G. ASTM C 423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
- H. ASTM C 518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
- I. ASTM C 553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
- J. ASTM C 612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
- K. ASTM C 665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
- L. ASTM C 795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.
- M. ASTM C 1104/C 1104M - Standard Test Method for Determining the Water Vapor Sorption of Unfaced Mineral Fiber Insulation.
- N. ASTM C 1338 - Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings.
- O. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- P. ASTM E 90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
- Q. ASTM E 96/E96M - Standard Test Methods for Water Vapor Transmission of Materials.
- R. ASTM E 136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750

degrees C.

- S. ASTM E 413 - Classification for Rating Sound Insulation.
- T. ASTM E 814 - Standard Test Method for Fire Tests of Penetration Firestop Systems.
- U. ASTM E 1050 - Standard Test Method for Impedance and Absorption of Acoustical Materials Using a Tube, Two Microphones and a Digital Frequency Analysis System.
- V. FM 4473 - Specification Test Standard for Impact Resistance Testing of Rigid Roofing Materials by Impacting with Freezer Ice Balls.
- W. UL 181 - Factory-Made Air Ducts and Connectors.
- X. UL Fire Resistance Directory U654, Fire Resistance Ratings, 1 Hour Assembly - Interior Surface.
- Y. UL Fire Resistance Directory, Fire Resistance Ratings, 1 Hour Assembly - Interior and Exterior Surfaces.
- Z. ULC Fire Resistance Directory W605 - Fire Resistance Ratings, 1 Hour Assembly - Interior Surface.
- AA. ULC Fire Resistance Directory W606 - Fire Resistance Ratings, 2 Hour Assembly - Interior Surface.
- BB. ULC Fire Resistance Directory W610 - Fire Resistance Ratings, 1 Hour Assembly - Interior and Exterior Surfaces.
- CC. ULC Fire Resistance Directory W611 - Fire Resistance Ratings, 2 Hour Assembly - Interior and Exterior Surfaces.

64.4 SUBMITTALS

- A. Submit under provisions of Section 01 30 00 - Administrative Requirements.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
 - 4. MSDS report.
- C. Verification Samples: For each product specified, two samples, minimum size 12 inches (300 mm) square, representing actual products specified.
- D. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

64.5 QUALITY ASSURANCE

- A. Installer Qualifications: Documented experience of 5 years minimum with work similar to work of this Section.
- B. Pre-installation Meeting: Convene pre-installation meeting after Award of Contract and [one week] before starting work of this Section to verify project requirements, substrate conditions and coordination with other building sub-trades, and to review manufacturer's written installation instructions.
 - 1. Comply with Section 01 31 13 - Project Coordination Project Meetings and co-ordinate with other similar pre-installation meetings.
 - 2. Notify attendees 2 weeks prior to meeting and ensure meeting attendees include as minimum:
 - a. Owner;
 - b. Consultant;

- c. Board Insulation Installation Subcontractor;
 - d. Manufacturer's Technical Representative.
3. Ensure meeting agenda includes review of methods and procedures related to insulation installation including co-ordination with related work.
 4. Record meeting proceedings including corrective measures and other actions required to ensure successful completion of work and distribute to each attendee within 1 week of meeting.

64.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials and accessories in insulation manufacture's original packaging with identification labels intact and in sizes to suit project.
- B. Store products in manufacturer's unopened packaging until ready for installation.
- C. Ensure insulation materials are not exposed to moisture during delivery or storage.

64.7 SEQUENCING

- A. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

64.8 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 65 PRODUCTS

65.1 MANUFACTURERS

- A. Acceptable Manufacturer: ROCKWOOL; 8024 Esquesing Line, Milton, Ontario, L9T 6W3. Phone: 905-878-8474, Toll Free: 1-800-265-6878. E-mail: contactus@rockwool.com, URL: <http://www.ROCKWOOL.com>
- B. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

65.2 DESCRIPTION

- A. Non-combustible, lightweight, semi-rigid mineral wool batt insulation to ASTM C655, Type 1.

65.3 PERFORMANCE CRITERIA

- A. Batt Insulation for exterior stud walls: To ASTM C665, Type 1.
 1. Fire performance:
 - a. Non-combustibility: To ASTM E136.
 - b. Surface Burning Characteristics: To ASTM E84.
 - 1) Flame spread: 0.
 - 2) Smoke developed: 0.
 2. Thermal resistance: To ASTM C518.
 3. Density: 2 lb/ft³ to ASTM C167.

4. Recycled content: 16% minimum.

65.4 MATERIALS

A. **Ceiling Insulation :**

Non-combustible, lightweight, semi-rigid mineral wool batt insulation to ASTM C665, Type 1.

1. Size: 24.25 x 48 inches.
2. Thickness: 6 inches.
3. R value/1 inch at 75 °F: 4.0 h ft² °F/Btu.
4. Acceptable Material: **ROCKWOOL COMFORTBATT® R24.**

B. **Wall Insulation :**

Non-combustible, lightweight, semi-rigid mineral wool batt insulation to ASTM C665, Type 1.

1. Size: 15.25 x 47 inches.
2. Thickness: 3.5 inches.
3. R value/1 inch at 75 °F: 4.0 h ft² °F/Btu.
4. Acceptable Material: **ROCKWOOL COMFORTBATT® R15.**

65.6 SOURCE QUALITY CONTROL

- A. Ensure insulation components and accessories are supplied or approved in writing by single manufacturer.

65.2 ACCESSORIES

- A. Mechanical fasteners in accordance with insulation manufacturer's written recommendations.
- B. Insulation Clips: in accordance with manufacturer's written recommendations.
- C. Adhesive: All purpose construction adhesive in accordance with insulation manufacturer's written recommendations.
- D. Foundation Sealing Compound: Bitumen sealing compound in accordance with Section 07 90 00 - Joint Protection.

PART 66 EXECUTION

66.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. Ensure surfaces are free of snow, ice, frost, grease and other deleterious materials.
- C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

66.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

66.3 EXAMINATION

- A. Verification of Conditions:

1. Visually inspect substrate in presence of Architect.
 2. Ensure surfaces are free of snow, ice, frost, grease and other deleterious materials.
 3. Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Architect.
- B. Start of insulation installation indicates installer's acceptance of substrate installation conditions.

66.4 INSTALLATION

- A. Install insulation in accordance with manufacturer's written recommendations
1. Product: ROCKWOOL COMFORTBATT for Steel Studs. View 65.4 for specification.
 2. Install insulation to maintain continuity of thermal protection to building elements and spaces.
 3. Do not compress insulation to fit into spaces.
 4. Fit insulation closely around electrical boxes, pipes, ducts, frames and other objects in or passing through insulation.
 5. Keep insulation minimum 3 inches (75 mm) from heat emitting devices such as recessed light fixtures, and minimum 2 inches (50 mm) and vents.
 6. Install Exterior Cavity Wall insulation board in accordance with insulation manufacturer's written recommendations.
 7. Do not enclose insulation until before inspection and receipt of Architect's written approval.

66.5 FIELD QUALITY CONTROL

- A. Field Inspection: Coordinate field inspection in accordance with Section 01 45 16.13 - Contractor Quality Control Quality Control.
1. Provide manufacturer's field services consisting of product use recommendations and periodic site visits for product installation review in accordance with manufacturer's instructions.
 2. Report any inconsistencies from manufacturer's recommendations immediately to the Architect and Contractor.
 3. Submit reports to Architect and Contractor within 3 days of visit.

66.6 CLEANING

- A. Progress Cleaning: Perform cleanup as work progresses [in accordance with Section 01 74 16 - Site Maintenance.
1. Leave work area clean at end of each day.
- B. Final Cleaning: Upon completion, remove surplus materials, rubbish, tools, and equipment.

66.7 PROTECTION

- A. Protect installed products until completion of project.
- B. Repair damage to adjacent materials caused by insulation installation.

END OF SECTION

SECTION 07 25 00
WEATHER BARRIERS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Weather barrier membrane: DuPont™ Tyvek® HomeWrap®
- B. Seam Tape: DuPont™ Tyvek® Tape
- C. Flashing: DuPont™ FlexWrap™, DuPont™ FlexWrap™ NF, DuPont™ StraightFlash™, DuPont™ StraightFlash™ VF, and/or DuPont™ Thru-Wall Flashing
- D. Fasteners: DuPont™ Tyvek® Wrap Caps

1.2 REFERENCES

- A. ASTM International
 - 1. ASTM C920; Standard Specification for Elastomeric Joint Sealants
 - 2. ASTM C1193; Standard Guide for Use of Joint Sealants
 - 3. ASTM D882; Test Method for Tensile Properties of Thin Plastic Sheeting
 - 4. ASTM D1117; Standard Guide for Evaluating Non-woven Fabrics
 - 5. ASTM E84; Test Method for Surface Burning Characteristics of Building Materials
 - 6. ASTM E96; Test Method for Water Vapor Transmission of Materials
 - 7. ASTM E1677; Specification for Air Retarder Material or System for Framed Building Walls
 - 8. ASTM E2178; Test Method for Air Permeance of Building Materials
- B. AATCC – American Association of Textile Chemists and Colorists
 - 1. Test Method 127 Water Resistance: Hydrostatic Pressure Test
- C. TAPPI
 - 1. Test Method T-410; Grams of Paper and Paperboard (Weight per Unit Area)
 - 2. Test Method T-460; Air Resistance (Gurley Hill Method)

1.3 SUBMITTALS

- A. Refer to Section 01 33 00 Submittal Procedures.
- B. Product Data: Submit manufacturer current technical literature for each component.
- C. Samples: Weather Barrier membrane, minimum 8-1/2 inches by 11 inch.
- D. Quality Assurance Submittals
 - 1. Manufacturer Instructions: Provide manufacturer's written installation instructions.

1.4 QUALITY ASSURANCE

- A. Qualifications
 - 1. Installation shall be in accordance with manufacturer's installation guidelines and recommendations.
 - 2. Source Limitations: Provide weather barrier and accessory materials produced by single manufacturer.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Refer to Section [01 60 00 Product Requirements] [insert section number and title].
- B. Deliver weather barrier materials and components in manufacturer's original, unopened, undamaged containers with identification labels intact.
- C. Store weather barrier materials as recommended by system manufacturer.

1.6 SCHEDULING

- A. Review requirements for sequencing of installation of weather barrier assembly with installation of windows, doors, louvers and flashings to provide a weather-tight barrier assembly.

PART 2 – PRODUCTS

2.1 MANUFACTURER

- a. DuPont; 4417 Lancaster Pike, Chestnut Run Plaza 728, Wilmington, DE 19805; 1-800-44-TYVEK (8-9835); <http://www.construction.tyvek.com>

2.2 MATERIALS

- A. Basis of Design: spunbonded polyolefin, non-woven, non-perforated, weather barrier is based upon DuPont™ Tyvek® HomeWrap® and related assembly components.
- B. Performance Characteristics:
 1. Air Penetration: <.004 cfm/ft² at 1.57 psf, when tested in accordance with ASTM E2178. Type I per ASTM E1677.
 2. Water Vapor Transmission: 56 perms, when tested in accordance with ASTM E96-05, Method A.
 3. Water Penetration Resistance: 250 cm when tested in accordance with AATCC Test Method 127.
 4. Basis Weight: 1.8 oz/yd², when tested in accordance with TAPPI Test Method T-410.
 5. Air Resistance: 1200 seconds, when tested in accordance with TAPPI Test Method T-460.
 6. Tensile Strength: 30/30 lbs/in., when tested in accordance with ASTM D882.
 7. Tear Resistance: 8/6 lbs, when tested in accordance with ASTM D1117.
 8. Surface Burning Characteristics: Class A, when tested in accordance with ASTM E84. Flame Spread: 15, Smoke Developed: 15

2.3 ACCESSORIES

- A. Seam Tape 2 inch wide, DuPont™ Tyvek® Tape as distributed by DuPont Building Innovations.
- B. Fasteners:
 1. (Specifier Note: Steel Frame Construction) DuPont™ Tyvek® Wrap Cap Screws, as distributed by DuPont: 1-5/8 inch rust resistant screw with 2-inch diameter plastic cap or manufacturer approved 1-1/4" or 2" metal gasketed washer.
- C. Sealants
 1. Provide sealants that comply with ASTM C 920, elastomeric polymer sealant to maintain watertight conditions.

2. Approved Products:
 - a. DuPont™ Residential Sealant

D. Adhesive:

1. Provide adhesive recommended by weather barrier manufacturer.
2. Approved Products:
 - a. Liquid Nails® LN-109
 - b. Denso Butyl Liquid
 - c. 3M High Strength 90
 - d. SIA 655

E. Primer:

1. Provide flashing manufacturer recommended primer to assist in adhesion between substrate and flashing.
2. Approved Products:
 - a. 3M High Strength 90
 - b. Denso Butyl Spray
 - c. SIA 655
 - d. Permagrip 105
 - e. ITW TACC Sta' Put SPH

F. Flashing

1. DuPont™ FlexWrap™, as distributed by DuPont: flexible membrane flashing materials for window openings and penetrations.

AND/OR

2. DuPont™ FlexWrap™ NF, as distributed by DuPont: flexible membrane flashing materials for window openings and penetrations.

AND/OR

3. Preformed Inside and Outside Corners and End Dams as distributed by DuPont: Preformed three-dimensional shapes to complete the flashing system used in conjunction with DuPont™ Thru-Wall Flashing.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify substrate and surface conditions are in accordance with weather barrier manufacturer recommended tolerances prior to installation of weather barrier and accessories.

3.2 INSTALLATION – WEATHER BARRIER

- A. Install weather barrier over exterior face of exterior wall substrate in accordance with manufacturer recommendations.
- B. Start weather barrier installation at a building corner, leaving 6-12 inches of weather barrier extended beyond corner to overlap.

- C. Install weather barrier in a horizontal manner starting at the lower portion of the wall surface. Maintain weather barrier plumb and level.
- D. Extend bottom roll edge over sill plate interface 2" to 3" minimum. Seal weather barrier with sealant or tape. Shingle weather barrier over back edge of thru-wall flashings and seal weather barrier with sealant or tape. Ensure weeps are not blocked.
- E. Subsequent layers shall overlap lower layers a minimum of 6 inches horizontally in a shingling manner.
- F. Window and Door Openings: Extend weather barrier completely over openings.
- G. Weather Barrier Attachment:
 - 1. Attach weather barrier to studs through exterior sheathing. Secure using weather barrier manufacturer recommended fasteners, spaced 12 -18 inches vertically on center along stud line, and 24 inch on center, maximum horizontally.
- H. Apply 4 inch by 7 inch piece of DuPont™ StraightFlash™ or weather barrier manufacturer approved alternate to weather barrier membrane prior to the installation cladding anchors.

3.3 SEAMING

- A. Seal seams of weather barrier with seam tape at all vertical and horizontal overlapping seams.
- B. Seal any tears or cuts as recommended by weather barrier manufacturer.

3.4 OPENING PREPARATION (for use with flanged windows)

- A. Cut weather barrier in an "I-cut" pattern. A modified I-cut is also acceptable.
 - 1. Cut weather barrier horizontally along the bottom and top of the window opening.
 - 2. From the top center of the window opening, cut weather barrier vertically down to the sill
 - 3. Fold side and bottom weather barrier flaps into window opening and fasten.
- B. Cut a head flap at 45-degree angle in the weather barrier membrane at window head to expose 8 inches of sheathing. Temporarily secure weather barrier membrane flap away from sheathing with tape.

3.5 FLASHING

- A. Cut 7-inch wide DuPont™ FlexWrap™ or DuPont™ FlexWrap™ NF a minimum of 12 inches longer than width of sill rough opening. Apply primer as recommended by the manufacturer.
- B. Cover horizontal sill by aligning DuPont™ FlexWrap™ or DuPont™ FlexWrap™ NF edge with inside edge of sill. Adhere to rough opening across sill and up jambs a minimum of 6 inches. Secure flashing tightly into corners by working in along the sill before adhering up the jambs.
- C. Fan DuPont™ FlexWrap™ or DuPont™ FlexWrap™ NF at bottom corners onto face of wall. Firmly press in place. Mechanically fasten fanned edges. Mechanical fastening is not required for DuPont™ FlexWrap™ NF.
- D. On exterior, apply continuous bead of sealant to wall or backside of window mounting flange across jambs and head. Do not apply sealant across sill.
- E. Install window according to manufacturer's instructions.
- F. Apply 4-inch wide strips of DuPont™ StraightFlash™ at jambs overlapping entire mounting flange. Extend jamb flashing 1-inch above top of rough opening and below bottom edge of sill flashing.

- G. Apply 4-inch wide strip of DuPont™ StraightFlash™ as head flashing overlapping the mounting flange. Head flashing should extend beyond outside edges of both jamb flashings.
- H. Position weather barrier head flap across head flashing. Adhere using 4-inch wide DuPont™ StraightFlash™ over the 45-degree seams.
- I. Tape head flap in accordance with manufacturer recommendations.
- J. On interior, install backer rod in joint between frame of window and flashed rough framing. Apply sealant around entire window to create air seal. Apply sealant in accordance with sealant manufacturer's instructions and ASTM C1193.

3.8 THRU-WALL FLASHING INSTALLATION

- A. Apply primer per manufacturer's written instructions.
- B. Install preformed corners and end dams bedded in sealant in appropriate locations along wall.
- C. Starting at a corner, remove release sheet and apply membrane to primed surfaces in lengths of 8 to 10 feet.
- D. Extend membrane through wall and leave ¼ inch minimum exposed to form drip edge.
- E. Roll flashing into place. Ensure continuous and direct contact with substrate.
- F. Lap ends and overlap preformed corners 4 inches minimum. Seal all laps with sealant.
- G. Trim exterior edge of membrane 1-inch and secure metal drip edge per manufacturer's written instructions.
- H. Terminate membrane on vertical wall.
- I. Apply sealant bead at each termination.

3.9 THRU-WALL FLASHING / WEATHER BARRIER INTERFACE AT BASE OF WALL

- A. Overlap thru-wall flashing with weather barrier by 6-inches.
- B. Mechanically fasten bottom of weather barrier through top of thru-wall flashing.
- C. Seal vertical and horizontal seams with tape or sealing membrane.

3.10 THRU-WALL FLASHING / WEATHER BARRIER INTERFACE AT SHELF ANGLE

- A. Seal weather barrier to bottom of shelf angle with sealing membrane.
- B. Apply thru-wall flashing to top of shelf angle. Overlap thru-wall flashing with weather barrier by 6-inches.
- C. Seal bottom of weather barrier to thru-wall flashing with tape or sealing membrane.

3.11 THRU-WALL FLASHING / WEATHER BARRIER INTERFACE AT WINDOW HEAD

- A. Cut flap in weather barrier at window head.
- B. Prime exposed sheathing.
- C. Install lintel as required. Verify end dams extend 4 inches minimum beyond opening.
- D. Install end dams bedded in sealant.
- E. Adhere 2 inches minimum thru-wall flashing to wall sheathing. Overlap lintel with thru-wall flashing and extend ¼ inch minimum beyond outside edge of lintel to form drip edge.
- F. Apply sealant along thru-wall flashing edges.
- G. Fold weather barrier flap back into place and tape bottom edge to thru-wall flashing.
- H. Tape diagonal cuts of weather barrier.
- I. Secure weather barrier flap with fasteners.

3.12 PROTECTION

- A. Protect installed weather barrier from damage.

END OF SECTION

SECTION 07 41 13
METAL ROOF PANELS

PART 67 GENERAL

1. SECTION INCLUDES
 - a. Exposed fastener metal roof panels, with related metal trim and accessories.
2. RELATED REQUIREMENTS
 - a. Section 05 12 10 - Structural Cast Steel Components
 - b. Section 05 40 00 - Cold-Formed Metal Framing
 - c. Section 07 84 46 – Fire-Resistive Joint Systems
 - d. Section 07 92 00 – Joint Sealants
3. REFERENCES
 - a. American Architectural Manufacturer's Association (AAMA): www.aamanet.org:
 - 1) AAMA 621 - Voluntary Specifications for High Performance Organic Coatings on Coil Coated Architectural Hot Dipped Galvanized (HDG) & Zinc-Aluminum Coated Steel Substrates.
 - 2) AAMA 809.2 - Voluntary Specification Non-Drying Sealants.
 - b. American Society of Civil Engineers (ASCE): www.asce.org/codes-standards:
 - 1) ASCE 7 - Minimum Design Loads for Buildings and Other Structures.
 - c. ASTM International (ASTM): www.astm.org:
 - 1) ASTM A 653 - Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 2) ASTM A 755 - Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products.
 - 3) ASTM A 792/A 792M - Standard Specification for Steel Sheet, 55 % Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
 - 4) ASTM C 645 - Specification for Nonstructural Steel Framing Members.
 - 5) ASTM C 754 - Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
 - 6) ASTM C 920 - Specification for Elastomeric Joint Sealants.
 - 7) ASTM D 1003 - Standard Test Method for Haze and Luminous Transmittance of Transparent Plastics.
 - 8) ASTM D 2244 - Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.
 - 9) ASTM D 4214 - Test Methods for Evaluating Degree of Chalking of Exterior Paint Films.
 - 10) ASTM E 1646 - Standard Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference.
 - 11) ASTM E 1680 - Standard Test Method for Rate of Air Leakage Through Exterior Metal Roof Panel Systems.
 - 12) ASTM E 1980 - Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces.

- d. FM Global (FM): www.fmglobal.com:
 - 1) ANSI/FM 4471 - Approval Standard for Class 1 Panel Roofs.
- e. International Accreditation Service (IAS):
 - 1) IAS AC 472 - Accreditation Criteria for Inspection Programs for Manufacturers of Metal Building Systems, Part B.
- f. Underwriters Laboratories, Inc. (UL): www.ul.com:
 - 1) UL 580 - Tests for Uplift Resistance of Roof Assemblies
- 4. ADMINISTRATIVE REQUIREMENTS
 - a. Preinstallation Meeting: Prior to erection of framing, conduct preinstallation meeting at site attended by Owner, Architect, manufacturer's technical representative, inspection agency and related trade contractors.
 - 1) Coordinate building framing in relation to metal panel system.
 - 2) Coordinate openings and penetrations of metal panel system.
 - 3) Coordinate work of Division 07 Sections "Roof Specialties" and "Roof Accessories" and openings and penetrations and manufacturer's accessories with installation of metal panels.
- 5. QUALITY ASSURANCE
 - a. Manufacturer/Source: Provide metal roof panel assembly and accessories from a single manufacturer providing fixed-base roll forming, and accredited under IAS AC 472 Part B.
 - b. Manufacturer Qualifications: Approved manufacturer listed in this Section with minimum five years experience in manufacture of similar products in successful use in similar applications.
 - 1) Approval of Comparable Products: Submit the following in accordance with project substitution requirements, within time allowed for substitution review:
 - a) Product data, including certified independent test data indicating compliance with requirements.
 - b) Samples of each component.
 - c) Sample submittal from similar project.
 - d) Project references: Minimum of five installations not less than five years old, with Owner and Architect contact information.
 - e) Sample warranty.
 - f) IAS AC 472 certificate.
 - 2) Substitutions following award of contract are not allowed except as stipulated in Division 01 General Requirements.
 - 3) Approved manufacturers must meet separate requirements of Submittals Article.
 - c. Installer Qualifications: Experienced Installer with minimum of five years experience with successfully completed projects of a similar nature and scope.
 - 1) Installer's Field Supervisor: Experienced mechanic, able to communicate with Owner, Architect, and installers, supervising work on site whenever work is underway.
 - d. Buy American Compliance: Materials provided under work of this Section shall comply with the following requirements:

- 1) Buy American Act of 1933 BAA-41 U.S.C §§ 10a – 10d.
- 2) Buy American provisions of Section 1605 of the American Recovery and Reinvestment Act of 2009 (ARRA).

6. ACTION SUBMITTALS

- a. Product Data: Manufacturer's data sheets for specified products.
- b. Shop Drawings: Show layouts of metal panels. Include details of each condition of installation, panel profiles, and attachment to building. Provide details at a minimum scale 1-1/2-inch per foot of edge conditions, joints, fastener and sealant placement, flashings, openings, penetrations, roof accessories, lightning arresting equipment, and special details. Make distinctions between factory and field assembled work.
 - 1) Indicate points of supporting structure that must coordinate with metal panel system installation.
 - 2) Include data indicating compliance with performance requirements.
 - 3) Include structural data indicating compliance with requirements of authorities having jurisdiction.
- c. Samples for Initial Selection: For each exposed product specified including sealants. Provide representative color charts of manufacturer's full range of colors.
- d. Samples for Verification: Provide 12-inch- (305 mm-) long section of each metal panel profile. Provide color chip verifying color selection.

7. INFORMATIONAL SUBMITTALS

- a. Product Test Reports: Indicating compliance of products with requirements, witnessed by a professional engineer.
- b. Qualification Information: For Installer firm and Installer's field supervisor.
- c. IAS Accreditation Certificate: Indicating that manufacturer is accredited under provisions of IAS AC 472.
- d. Buy American Certification: Manufacturers' letters of compliance acceptable to authorities having jurisdiction, indicating that products comply with requirements.
- e. Manufacturer's Warranty: Sample copy of manufacturer's standard warranty.

8. CLOSEOUT SUBMITTALS

- a. Maintenance data.
- b. Manufacturer's Warranty: Executed copy of manufacturer's standard warranty.

9. DELIVERY, STORAGE, AND HANDLING

- a. Protect products of metal panel system during shipping, handling, and storage to prevent staining, denting, deterioration of components or other damage. Protect panels and trim bundles during shipping.
 - 1) Deliver, unload, store, and erect metal panel system and accessory items without misshaping panels or exposing panels to surface damage from weather or construction operations.
 - 2) Store in accordance with Manufacturer's written instructions. Provide wood collars for stacking and handling in the field.

10. COORDINATION

- a. Coordinate sizes, profiles, and locations of roof curbs and other roof-mounted equipment and roof penetrations based upon sizes of actual selected equipment.

11. WARRANTY

- a. Special Manufacturer's Warranty: On manufacturer's standard form, in which manufacturer agrees to repair or replace metal panel assemblies that fail within one year from date of Substantial Completion.
- b. Special Panel Finish Warranty: On Manufacturer's standard form, in which Manufacturer agrees to repair or replace metal panels that evidence deterioration of factory-applied finish within 25 years from date of Substantial Completion, including:
 - 1) **Fluoropolymer Two-Coat System:**
 - a) Color fading in excess of 5 Hunter units per ASTM D 2244.
 - b) Chalking in excess of No. 8 rating per ASTM D 4214.
 - c) Failure of adhesion, peeling, checking, or cracking.

PART 68 PRODUCTS

1. MANUFACTURER

- a. Basis of Design Manufacturer: **MBCI Metal Roof and Wall Systems, Division of NCI Group, Inc.;** Houston TX. Tel: (877)713-6224; Email: info@mbsci.com; Web: www.mbsci.com.
 - 1) Provide basis of design product, or comparable product approved by Architect prior to bid.

2. PERFORMANCE REQUIREMENTS

- a. General: Provide metal roof panel system meeting performance requirements as determined by application of specified tests by a qualified testing facility on manufacturer's standard assemblies.
- b. Thermal Movements: Allow for thermal movements from variations in both ambient and internal temperatures. Accommodate movement of support structure caused by thermal expansion and contraction. Allow for deflection and design for thermal stresses caused by temperature differences from one side of the panel to the other.
 - 1) Wind Loads: Determine loads based on uniform pressure, importance factor, exposure category, and basic wind speed indicated on drawings.
 - 2) Deflection Limits: Refer to engineering documents.
 - 3) Seismic Performance: Comply with ASCE 7, Section 9, "Earthquake Loads."
- c. **Wind Uplift Resistance:** Refer to engineering documents.
- d. **FM Approvals Listing:** Comply with FM Approvals 4471 as part of a panel roofing system, and that are listed in FM Approvals' "RoofNav" for Class 1 construction. Identify materials with FM Approvals markings.
 - 1) Fire/Windstorm Classification: Refer to engineering documents.
 - 2) Hail Resistance Rating: 1-SH.
- e. **Air Infiltration:** ASTM E 1680: Maximum 0.006 cfm/sq. ft. (0.030 L/s per sq. m) at 6.24 lbf/sq. ft. (300 Pa) static-air-pressure difference.
- f. **Water Penetration:** ASTM E 1646: No uncontrolled water penetration at a static pressure of 20 lbf/sq. ft. (958 Pa).

3. METAL PANEL MATERIALS

- a. **Aluminum-Zinc Alloy-Coated Steel Sheet:** ASTM A 792/A 792M, structural quality, Grade 50, Coating Class AZ50 (Grade 340, Coating Class AZM150), prepainted by the coil-coating process per ASTM A 755/A 755M.

4. METAL ROOF PANELS

- a. **Large Tapered-Rib-Profile, Exposed Fastener Metal Roof Panels:** Structural metal roof panel consisting of formed metal sheet with trapezoidal major ribs with intermediate stiffening ribs symmetrically placed between major ribs, installed by lapping edges of adjacent panels.

- 1) Basis of Design: **MBCI, PBR Panel**, www.mbc.com/pbr.html.
- 2) Coverage Width: 36 inches (914 mm).
- 3) Major Rib Spacing: 12 inches (305 mm) on center.
- 4) Rib Height: 1-1/4 inch (31.8 mm).
- 5) Nominal Coated Thickness: 0.022 inch/26 gage (0.56 mm)
- 6) Panel Surface: Smooth
- 7) Exterior Finish: Modified silicone-polyester two-coat system
- 8) Color: Solar White

5. METAL ROOF PANEL ACCESSORIES

- a. General: Provide complete metal roof panel assembly incorporating ridge, eave, rake, valley, and parapet trims, copings, fascias, gutters and downspouts, and miscellaneous flashings, in [manufacturer's standard profiles] [profiles as indicated]. Provide required fasteners, closure strips, support plates, and sealants as indicated in manufacturer's written instructions.
- b. Flashing and Trim: Match material, thickness, and finish of metal panel face sheet.
- c. Panel Fasteners: Self-tapping screws and other acceptable fasteners recommended by roof panel manufacturer.
- 1) Exposed Fasteners: Long life fasteners with EPDM or neoprene gaskets, with heads matching color of metal panels by means of factory-applied coating.
- d. Joint Sealers: Manufacturer's standard or recommended liquid and preformed sealers and tapes, and as follows:
- 1) Tape Sealers: Manufacturer's standard non-curing butyl tape, AAMA 809.2.
 - 2) Concealed Joint Sealants: Non-curing butyl, AAMA 809.2.
 - 3) Exposed Joint Sealants: Urethane, single component, ASTM C 920.
- e. Steel Sheet Miscellaneous Framing Components:
ASTM C 645, with ASTM A 653/A 653M, G60 (Z180) hot-dip galvanized zinc coating.
- f. Roof Accessories:
Approved by metal roof panel manufacturer. Refer to Section 07 22 00 "Roof Accessories" for requirements for curbs, equipment supports, roof hatches, heat and smoke vents, ventilators, and preformed flashing sleeves.

6. FABRICATION

- a. General: Provide factory fabricated and finished metal panels and accessories meeting performance requirements, indicated profiles, and structural requirements.
- b. Panel Lengths: Form panels in continuous lengths for full length of detailed runs, except where otherwise indicated on approved shop drawings.
- c. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's written instructions, approved shop drawings, and project drawings. Form from materials matching metal panel substrate and finish.

7. FINISHES

- a. Finishes, General: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
- b. **Modified Silicone-Polyester Two-Coat System:** 0.20 – 0.25 mil primer with 0.7 – 0.8 mil color coat.
 - 1) Basis of Design: **MBCI, Signature 200.**
- c. Interior Finish: 0.5 mil total dry film thickness consisting of primer coat and wash coat of manufacturer's standard light-colored acrylic or polyester backer finish.

PART 69 EXECUTION

1. EXAMINATION

- a. Examine metal panel system substrate and supports with Installer present. Inspect for erection tolerances and other conditions that would adversely affect installation of metal panel installation.
 - 1) Inspect metal panel support substrate to determine if support components are installed as indicated on approved shop drawings. Confirm presence of acceptable supports at recommended spacing to match installation requirements of metal panels.
 - 2) Panel Support Tolerances: Confirm that panel supports are within tolerances acceptable to metal panel system manufacturer but not greater than the following:
 - a) 1/4 inch (6 mm) in 20 foot (6.1 m) in any direction.
 - b) 3/8 inch (9 mm) over any single roof plane.
- b. Correct out-of-tolerance work and other deficient conditions prior to proceeding with metal roof panel system installation.

2. PREPARATION

- a. Miscellaneous Supports:
 - Install sub-framing, girts, furring, and other miscellaneous panel support members according to ASTM C 754 and manufacturer's written instructions.
- b. Flashings: Install flashings to cover exposed underlayment per Section 07 62 00 "Sheet Metal Flashing and Trim."

3. METAL PANEL INSTALLATION

- a. Exposed Fastener Metal Roof Panels: Install weathertight metal panel system in accordance with manufacturer's written instructions, approved shop drawings, and project drawings. Install metal roof panels in orientation, sizes, and locations indicated, free of waves, warps, buckles, fastening stresses,

and distortions. Anchor panels and other components securely in place. Provide for thermal and structural movement.

- b. Panel Sealants: Install manufacturer's recommended tape sealant at panel sidelaps and endlaps.
- c. Panel Fastening: Attach panels to supports using screws, fasteners, and sealants recommended by manufacturer and indicated on approved shop drawings.
 - 1) Fasten metal panels to supports at each location indicated on approved shop drawings, with spacing and fasteners recommended by manufacturer.
 - 2) Provide weatherproof jacks for pipe and conduit penetrating metal panels of types recommended by manufacturer.
 - 3) Dissimilar Materials: Where elements of metal panel system will come into contact with dissimilar materials, treat faces and edges in contact with dissimilar materials as recommended by manufacturer.

4. ACCESSORY INSTALLATION

- a. General: Install metal panel trim, flashing, and accessories using recommended fasteners and joint sealers, with positive anchorage to building, and with weather tight mounting. Coordinate installation with flashings and other components.
 - 1) Install components required for a complete metal panel assembly, including trim, copings, flashings, sealants, closure strips, and similar items.
 - 2) Comply with details of assemblies utilized to establish compliance with performance requirements and manufacturer's written installation instructions.
 - 3) Set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently weather resistant.
- b. Joint Sealers: Install joint sealers where indicated and where required for weathertight performance of metal panel assemblies, in accordance with manufacturer's written instructions.
 - 1) Prepare joints and apply sealants per requirements of Division 07 Section "Joint Sealants."

5. FIELD QUALITY CONTROL

6. CLEANING AND PROTECTION

- a. Remove temporary protective films immediately in accordance with metal roof panel manufacturer's instructions. Clean finished surfaces as recommended by metal roof panel manufacturer.
- b. Replace damaged panels and accessories that cannot be repaired to the satisfaction of the Architect.

END OF SECTION

SECTION 07 44 56
FIBER REINFORCED CEMENTITIOUS PANELS

PART 70 GENERAL

70.1 SECTION INCLUDES

- A. Fiber reinforced cement panel siding system.
- B. Accessories required for complete installation.

70.2 RELATED SECTIONS

- A. Section 05 40 00 - Cold-Formed Metal Framing.
- B. Section 07 90 00 - Joint Protection.
- C. Section 09 20 00 - Plaster and Gypsum Board.

70.3 REFERENCES

- A. ASTM C 1186 - Standard Specification for Flat Non-Asbestos Fiber-Cement Sheets.

70.4 SYSTEM DESCRIPTION

- A. Performance Requirements:
 - 1. Design and size components to withstand live loads caused by pressure of wind acting normal to plane of wall as calculated in accordance with ANSI/ASCE 7, and as measured in accordance with ANSI/ASTM E 330.
 - 2. Deflection: Provide system capable of withstanding wind loading within the following limitations:
 - a. No permanent deformation is acceptable.
 - 3. Design system to accommodate, without damage to system, components or deterioration of seals; movement within system; movement between system and perimeter framing components; dynamic loading and release of loads; and deflection of structural support framing.
 - 4. Design to accommodate vertical inter-story movement and provide an allowance for the following tolerances:
 - a. Building floor slab live load differential deflection.
 - b. Structural creep.
 - c. Thermally induced expansion and contraction of framing members.
 - d. Fabrication and erection tolerances.
 - e. Design ultimate load capacity of anchor components to withstand 2.0 times "Design Wind Load" without failure.
 - 5. Maintain continuous air and vapor barrier throughout assembly.

70.5 SUBMITTALS

- A. Submit under provisions of Section 01 30 00 - Administrative Requirements.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods, including fastening patterns.
- C. Shop Drawings: Provide shop drawings and erection plans for review including the following:

1. Layout of furring, weather barrier, finished sheets and fastener pattern.
 2. Details at base and top of walls, corners, at window and door trim and at other openings and connections.
 3. Shop drawings prepared and stamped by a structural engineer licensed in the state where the project is located.
- D. Calculations: Provide wind load calculations, engineering calculations and substantiating data to validate wind resistance of roof system.
- E. Product certificates including Research//Evaluation report or Code Authority approval of the system use for intended application.
- F. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- G. Verification Samples: For each finish product specified, two samples, minimum size 3 inches by 6 inches (76 mm by 150 mm) square, representing actual product, color, and patterns.
- H. Manufacturer's Certificates: Certify materials and accessory component products meet or exceed specified requirements.
- I. Manufacturer's warranties. Executed by manufacturer and installer.

70.6 QUALITY ASSURANCE

- A. Installer Qualifications: Provide installer with not less than three years of experience with products similar to those specified.
- B. Mock-Up: Provide a mock-up of complete panel system including furring, insulation, weather barrier and panels for approval by Architect.
1. Finish areas designated by Architect.
 2. Mock-up shall be a minimum of 4 panels showing one vertical and one horizontal joint and complete installation system and fastener layout.
 3. Do not proceed with remaining work until workmanship and color are approved by Architect.
 4. Refinish mock-up area as required to produce acceptable work.
- C. Pre-Installation Conference:
1. Prior to any panel application, the Contractor shall convene a pre-installation conference.
 2. Coordinate conference scheduling with the Architect. Conference shall be attended by the Contractor, Architect, personnel directly responsible for the installation of panels, flashing and sheet metal work and other trades interfacing with the panel work.
 3. Provide a copy of meeting notes and action items to all attending parties. Note action items requiring resolution prior to start of roof work.
 4. Discuss specific expectations and responsibilities, construction procedures, specification requirements, application, environmental conditions, job and surface readiness, material storage, and protection.

70.7 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver cement panels to site until job is ready for their installation.
- B. Store products in manufacturer's unopened packaging until ready for installation.
- C. Store materials off the ground, flat and under cover in a dry place until erection.
- D. Store materials in such a way to accommodate easy inspection of the materials prior to installation.

70.8 WARRANTY

- A. Installed material shall have a manufacturer's 10 year warranty.

- B. Warranty includes the repair or replacement of siding that does not comply with requirements or that fails within specified warranty period. Failures include, but are not limited to, cracking, deforming or otherwise deteriorating beyond normal weathering.

PART 71 PRODUCTS

71.1 MANUFACTURERS

- A. Acceptable Manufacturer: Cement Board Fabricators, which is located at: 2148 S. 41st St.; Louisville, KY 40211; Toll Free Tel: 800-366-5378; Tel: 502-774-5757; Fax: 502-774-5754; Email:[request info \(info@cbf11.com\)](mailto:info@cbf11.com); Web:www.cementboardfabricators.com

71.2 MATERIALS

- A. Prefinished Cement Board Siding Panels: SILBONIT siding sheets, fiber reinforced, cement based product conforming to ASTM C 1186 and manufactured of cement sand, cellulose fibers and fillers.
 1. Panel Size:
 - a. 5/16 inch 4 feet by 8 feet. (8 mm by 1220 mm by 2440 mm).
 - b. 5/16 inch 4 feet by 10 feet. (8 mm by 1220 mm by 3050 mm).
 2. Colors:
 - a. Natural colors:
 - 1) Stone - Natural.
 3. Mechanical fasteners: External tamper proof screws, stainless steel, torx head fasteners.
 - a. Screws shall be length as required by the panel manufacturer for the furring material used.
 - b. Steel Screws: Size: #10 by 10 inch (25.4 mm).
 - c. Use painted screws to match panel finish.
 4. Continuous cushions of black EPDM rubber, 1-1/4 inch (32 mm) and 3-1/2 inch (95 mm) as required.

71.3 ACCESSORIES

- A. Trim: Aluminum and stainless steel trim shapes suitable for trim conditions.
- B. Sheet Metal Flashing: Minimum 26 gauge hot-dipped galvanized steel sheet, or stainless steel.
- C. Wood furring materials shall conform to the requirements specified in Section 06 10 00 - Rough Carpentry.
- D. Metal furring shall conform to the requirements of Section 09 20 00 - Plaster and Gypsum Board.

PART 72 EXECUTION

72.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. Ensure that framing is completed and that electrical rough-in, windows, doors, and flashing are in place before proceeding with work of this section.
- C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

72.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation. Repair as necessary any substrate conditions that would be detrimental to proper installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

- C. Ensure that all dust, dirt, fingerprints and all other foreign marks on the material are removed prior to installation of the panels.

72.3 INSTALLATION - GENERAL

- A. Install in accordance with manufacturer's instructions and the approved shop drawings.
- B. Panel Cutting:
 1. Cut panels using a high speed circular saw with a segmented diamond blade.
 2. Cut panels from the front side and protect the face from being damaged during cutting.
 3. For incidental cuts, cut panels from the front side using a jigsaw with a carbide tip blade.
 4. Provide adequate ventilation during cutting. Use of a dust extractor is recommended.
 5. Reseal fabricated edges per manufacturer's instructions.
- C. Drilling:
 1. Drilling of holes must be done from the front of the panel using a carbide tip drill bit.
 2. Holes are recommended to be done using a universal drill.
 3. Larger holes, or cut-outs on the panel, can be made by a jig saw with a carbide blade or a hole saw with a diamond blade.
- D. Prepare structural backing with studs, backer board, weather barrier and furring as required to meet the performance requirements specified. Install fiber reinforced panels over a properly prepared support system in accordance with the manufacturer's installation instructions and approved shop drawings.
- E. Install weather barrier over prepared substrate.
- F. Fiber reinforced cement panel siding shall be installed over an impervious weather barrier, on furring strips with black EPDM rubber strips, and with an air cavity behind the face panel to allow ventilation of the substrate.
- G. Panels shall be attached to furring using the attachment pattern and fasteners indicated in the manufacturer's installation instructions and approved shop drawings.
- H. Install black EPDM rubber strips to each furring member.
- I. Pre-drill holes in cement boards in pattern indicated in the manufacturers installation instructions and approved shop drawings. Holes shall be of size as specified by the panel manufacturer for the fasteners being used.
- J. Fasten fiber cement board to furring as per vendor's details with approved stainless steel fasteners.

72.4 PROTECTION

- A. Protect installed products until completion of project.
- B. Inspect walls for any damage. Replace panels that are damaged. Do not attempt to repair.
- C. Ensure all dirt, dust, fingerprints and all foreign marks are immediately removed from the face of the material to avoid from permanent damage.
- D. Replace damaged products before Substantial Completion.

END OF SECTION

SECTION 07 84 46
FIRE-RESISTIVE JOINT SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Joints in or between fire-resistance-rated constructions.

1.2 SUBMITTALS

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

1.3 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Fire-resistive joint systems shall comply with the following requirements:

1. Fire-resistive joint system tests are performed by UL.

PART 2 - PRODUCTS

2.1 FIRE-RESISTIVE JOINT SYSTEMS

- A. Where required, provide fire-resistive joint systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which fire-resistive joint systems are installed. Fire-resistive joint systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.
- B. Joints in or between Fire-Resistance-Rated Construction: Ratings determined per ASTM E 1966 or UL 2079:
1. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of construction they will join.
 2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Tremco, Inc.; Tremco Fire Protection Systems Group.
 - b. USG Corporation.
- C. Exposed Fire-Resistive Joint Systems: Provide products with flame-spread and smoke developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
- D. VOC Content: Provide fire-resistive joint systems that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
1. Architectural Sealants: 250 g/L.
 2. Sealant Primers for Nonporous Substrates: 250 g/L.
 3. Sealant Primers for Porous Substrates: 775 g/L.
- E. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials, that are needed to install fill materials and to maintain ratings required. Use only components specified by fire-resistive joint system manufacturer and approved by the qualified testing agency for systems indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of the Work.
- B. Install fire-resistive joint systems to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.
- C. Install forming materials and other accessories of types required to support fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
 - 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of fire-resistive joint system.
- D. Install fill materials for fire-resistive joint systems by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by joints and forming materials as required to achieve fire-resistance ratings indicated.
 - 2. Apply fill materials so they contact and adhere to substrates formed by joints.
 - 3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.2 FIRE-RESISTIVE JOINT SYSTEM SCHEDULE

- A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHBN.
- B. Head-of-Wall, Fire-Resistive Joint Systems:
 - 1. UL-Classified Systems: HW-S-0090.
- C. Bottom-of-Wall, Fire-Resistive Joint Systems:
 - 1. UL-Classified Systems: BW-S-0001.

END OF SECTION

SECTION 07 92 00
JOINT SEALANTS

PART 73 GENERAL

1. SUMMARY

a. Section Includes:

- 1) Urethane joint sealants.

2. RELATED REQUIREMENTS

- 1) Section 07 25 00 - Exterior Insulation and Finish Systems
- 2) Division 07 - Air Barriers
- 3) Section 07 84 46 - Fire-Resistive Joint Systems
- 4) Section 08 52 00

3. REFERENCES

a. References, General: Versions of the [following] [cited] standards current as of the date of issue of the project apply to the Work of this Section.

b. ASTM International (ASTM): www.astm.org:

- 1) ASTM C 510 - Standard Test Method for Staining and Color Change of Single- or Multicomponent Joint Sealants.
- 2) ASTM C 661 - Standard Test Method for Indentation Hardness of Elastomeric Type Sealants by Means of a Durometer.
- 3) ASTM C 719 - Standard Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants Under Cyclic Movement (Hockman Cycle).
- 4) ASTM C 794 - Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants
- 5) ASTM C 834 - Specification for Latex Sealants.
- 6) ASTM C 920 - Specification for Elastomeric Joint Sealants.
- 7) ASTM C 1087 - Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems.
- 8) ASTM C 1193 - Guide for Use of Joint Sealants.
- 9) ASTM C 1248 - Test Method for Staining of Porous Substrate by Joint Sealants.
- 10) ASTM C 1311 - Specification for Solvent Release Sealants.
- 11) ASTM C 1330 - Cylindrical Sealant Backing for Use with Cold Liquid Applied Sealants.
- 12) ASTM D 412 - Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension.
- 13) ASTM D 624 - Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.
- 14) ASTM D 2203 - Standard Test Method for Staining from Sealants.
- 15) ASTM D 2240 - Test Method for Rubber Property - Durometer Hardness.

4. ADMINISTRATIVE REQUIREMENTS

a. Coordination: Coordinate installation of joint sealants with cleaning of joint sealant substrates and other operations that may impact installation or finished joint sealant work.

b. Preinstallation Conference: Conduct conference at Project Site.

5. ACTION SUBMITTALS

- a. Product Data: For each type of joint sealant product specified, including:
 - 1) Preparation instructions and recommendations.
 - 2) Standard drawings illustrating manufacturer's recommended sealant joint profiles and dimensions applicable to Project.
- b. Joint Sealant Schedule: Indicate joint sealant location, joint sealant type, manufacturer and product name, and color, for each application. Utilize joint sealant designations included in this Section.
- c. Samples for Color Selection: For each joint sealant type.
- d. Samples for Verification: For each exterior joint sealant product, for each color selected.

6. INFORMATIONAL SUBMITTALS

- a. Qualification Data: For qualified applicator.
- b. Sealant, Waterproofing, and Restoration Institute (SWRI) Validation Certificate: For each sealant specified to be validated by SWRI's Sealant Validation Program.
- c. Warranty: Sample of unexecuted manufacturer and installer special warranties.
- d. Preconstruction Compatibility and Adhesion Test Reports: From manufacturer. Include written interpretation of reports and recommendations for primers and substrate preparation.
- e. Preconstruction field-adhesion test reports.
- f. Field quality control adhesion test reports.

7. QUALITY ASSURANCE

- a. Installer Qualifications: Company with minimum of three years experience specializing in work of this section, employing applicators trained for application of joint sealants required for this project, with record of successful completion of projects of similar scope, and approved by manufacturer.
- b. Single Source Responsibility: Provide exterior joint sealants by a single manufacturer responsible for testing of Project substrates to verify compatibility and adhesion of joint sealants.
- c. Preconstruction Manufacturer Laboratory Compatibility, Staining, and Adhesion Testing: Submit samples of each substrate or adjacent material that will be in contact with or affect joint sealants. Current manufacturer test data of products on matching substrates will be acceptable.
 - 1) Adhesion: Use ASTM C 719 and ASTM C 794 to determine requirements for joint preparation, including cleaning and priming.
 - 2) Compatibility: Use ASTM C 1087 to determine materials forming joints and adjacent materials do not adversely affect sealant materials and do not affect sealant color.
 - 3) Stain Testing: Use ASTM C 510, ASTM C 1248, or ASTM D 2203 to verify non-staining characteristics of proposed sealants on specified substrates.
 - 4) Pre-construction manufacturer laboratory testing is not required when sealant manufacturer can furnish data acceptable to Architect based on previous testing for materials matching those of the Work.
- d. Preconstruction Field-Adhesion Testing: Prior to installing joint sealants, field test adhesion to joint substrates using ASTM C 1193 Method A. Verify adhesion is adequate. Modify joint preparation recommendations for failed joints and re-test. Submit written test report.

- e. Mockups: Provide joint sealant application within mockups required in other sections identical to specified joint sealants and installation methods.
- 8. DELIVERY, STORAGE AND HANDLING
 - a. Accept materials on site in manufacturer's unopened original packaging.
 - b. Store primers and sealants in dry location with ambient temperature range of 60 to 80 deg. F (15 to 27deg. C).
- 9. ENVIRONMENTAL REQUIREMENTS
 - a. Do not install primers or sealants when atmospheric temperatures or joint surface temperatures are less than 40 deg. F (4 deg. C).
- 10. SCHEDULING
 - a. Schedule work so waterproofing, water repellents and preservative finishes are installed after sealants, unless sealant manufacturer approves otherwise in writing.
 - b. Ensure sealants are cured before covering with other materials.
- 11. WARRANTY
 - a. Special Manufacturer's Warranty: Manufacturer's standard form in which joint sealant manufacturer agrees to furnish joint sealants to repair or replace those that demonstrate deterioration or adhesive or cohesive failure under normal use within warranty period specified.
 - 1) Warranty Period for Silicone Sealants: Five years date of Substantial Completion.
 - b. Special Installer's Warranty: Original statement on Installer's letterhead in which Installer agrees to repair or replace joint sealants that demonstrate deterioration or failure within warranty period specified.
 - 1) Warranty Period: two years from date of Substantial Completion.

PART 74 PRODUCTS

- 1. MANUFACTURERS
 - a. Basis-of-Design Products: Provide joint sealant products manufactured by Tremco, Inc., Commercial Sealants and Waterproofing Division, An RPM Company, Beachwood OH; (866) 321-6357; email: techresources@tremcoinc.com; www.tremcosealants.com, or comparable products of other manufacturer approved by Architect in accordance with Instructions to Bidders and Division 01 General Requirements.
- 2. MATERIALS, GENERAL
- 3. URETHANE JOINT SEALANTS
 - a. Single-Component, Nonsag, Moisture-Cure, Polyurethane Hybrid Joint Sealant [**UJS#**__]: ASTM C 920, Type S, Grade NS, Class 35, Use NT; Greenguard certified.
 - 1) Basis of Design Product: **Tremco, Inc., Dymonic FC.**
 - 2) Extrusion Rate ASTM C1183: 93.1 mL/min
 - 3) Weight Loss ASTM C1246: Pass
 - 4) Tack Free Time ASTM C679: 3 to 4 hr
 - 5) Volatile Organic Compound (VOC) Content: 10 g/L maximum.
 - 6) Volatile Organic Emissions (VOE): Not greater than Greenguard Children & Schools Certification emissions levels.

7) Color: As selected by Architect from manufacturer's standard line of not less than 15 colors.

4. JOINT SEALANT ACCESSORIES

- a. Cylindrical Sealant Backing: ASTM C 1330, Type B non-absorbent, bi-cellular material with surface skin, or Type O open-cell polyurethane, as recommended by sealant manufacturer for application.
- b. Bond Breaker Tape: Polymer tape compatible with joint sealant and adjacent materials and recommended by sealant manufacturer.
- c. Joint Substrate Primers: Substrate primer recommended by sealant manufacturer for application.
- d. Cleaners: Chemical cleaners acceptable to joint sealant manufacturer.
- e. Masking tape: Non-staining, non-absorbent tape product compatible with joint sealants and adjacent joint surfaces.

PART 75 EXECUTION

1. EXAMINATION

- a. Examine joint profiles and surfaces to determine if work is ready to receive joint sealants. Verify joint dimensions are adequate for development of sealant movement capability. Verify joint surfaces are clean, dry, and adequately cured. Proceed with joint sealant work once conditions meet sealant manufacturer's written recommendations.

2. PREPARATION

- a. Joint Surface Cleaning: Clean joints prior to installing joint sealants using materials and methods recommended by sealant manufacturer. Comply with ASTM C 1193.
 - 1) Remove curing compounds, laitance, form-release agents, dust, and other contaminants.
 - 2) Clean nonporous and porous surfaces utilizing chemical cleaners acceptable to sealant manufacturer.
 - 3) Protect elements surrounding the Work of this section from damage or disfiguration. Apply masking tape to adjacent surfaces when required to prevent damage to finishes from sealant installation.

3. SEALANT APPLICATION

- a. Sealant and Primer Installation Standard: Comply with ASTM C 1193 and manufacturer's written instructions.
- b. Joint Backing: Select joint backing materials recommended by sealant manufacturer as compatible with sealant and adjacent materials. Install backing material at depth required to produce profile of joint sealant allowing optimal sealant movement.
 - 1) Install joint backing to maintain the following joint ratios:
 - a) Joints up to 1/2 inch (13 mm) wide: 1:1 width to depth ratio.
 - b) Joints greater than 1/2 inch (13 mm) wide: 2:1 width to depth ratio; maximum 1/2 inch (13 mm) joint depth.
 - 2) Install bond breaker tape over substrates when sealant backings are not used.
- c. Masking: Mask adjacent surfaces to prevent staining or damage by contact with sealant or primer.
- d. Joint Priming: Prime joint substrates when recommended by sealant manufacturer or when indicated by preconstruction testing or experience. Apply recommended primer using sealant manufacturer's recommended application techniques.

- e. Liquid Sealant Application: Install sealants using methods recommended by sealant manufacturer, in depths recommended for application. Apply in continuous operation from bottom to top of joint vertically and horizontally in a single direction. Apply using adequate pressure to fill and seal joint width.
 - 1) Tool sealants immediately with appropriately shaped tool to force sealants against joint backing and joint substrates, eliminating voids and ensuring full contact.
 - 2) Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
 - 3) Tool exposed joint surface concave using tooling agents approved by sealant manufacturer for application.
 - f. Cleaning: Remove excess sealant using materials and methods approved by sealant manufacturer that will not damage joint substrate materials.
 - 1) Remove masking tape immediately after tooling joint without disturbing seal.
 - 2) Remove excess sealant from surfaces while still uncured.
 - g. Installation of Acoustical Sealant: At sound-rated assemblies and elsewhere as indicated, seal construction at perimeters, behind control joints, and at openings and penetrations on both sides of assemblies with a continuous bead of acoustical sealant. Comply with ASTM C 919 and with manufacturer's written recommendations.
 - h. Installation of Preformed Seals: Install seals immediately after removing protective wrapping. Do not stretch or misshape material. Place seals to provide continuity at ends, turns, and intersections. Apply heat to sealant when recommended by sealant manufacturer's written instructions.
4. FIELD QUALITY CONTROL
- a. Field-Adhesion Testing: Perform adhesion tests in accordance with manufacturer's instructions and with ASTM C 1193, Method A.
 - 1) Perform [5] tests for the first [1000 feet (300 m)] of joint length for each kind of sealant and joint substrate, and one test for each [1000 feet (300 m)] of joint length thereafter or 1 test per each floor per building elevation, minimum.
 - 2) For sealant applied between dissimilar materials, test both sides of joint.
 - b. Remove sealants failing adhesion test, clean substrates, reapply sealants, and re-test. Test adjacent sealants to failed sealants.
 - c. Submit report of field adhesion testing to Architect indicating tests, locations, dates, results, and remedial actions taken.
5. EXTERIOR JOINT-SEALANT SCHEDULE
- a. Exterior construction joints in cast-in-place and tilt-up concrete.
 - 1) Joint Sealant: Single-component non-sag urethane sealant Dymonic FC.
 - 2) Joint-Sealant Color: As selected by Architect from manufacturer's standard colors
 - b. Exterior joints within exterior insulation finish systems (EIFS).
 - 1) Joint Sealant: Single-component non-sag urethane sealant Dymonic FC
 - 2) Joint-Sealant Color: As selected by Architect from manufacturer's standard colors
 - c. Exterior concealed watertight joints in cladding systems.
 - 1) Joint Sealant: Single-component non-sag urethane sealant Dymonic FC.

- d. Exterior joints between different materials listed above.
 - 1) Joint Sealant: Single-component non-sag urethane sealant Dymonic FC.
 - 2) Joint-Sealant Color: As selected by Architect from manufacturer's standard colors
 - e. Exterior perimeter joints at frames of doors, windows, storefront frames, curtain wall frames, and louvers.
 - 1) Joint Sealant: Single-component non-sag urethane sealant Dymonic FC
 - 2) Joint-Sealant Color: As selected by Architect from manufacturer's standard colors
 - f. Exterior joints within structural glazing, aluminum storefront framing, curtain walls, and window systems:
Refer to Division 08 Section "Glazing Sealants".
 - g. All other exterior non-traffic joints.
 - 1) Joint Sealant: Single-component non-sag urethane sealant Dymonic FC
 - 2) Joint-Sealant Color: As selected by Architect from manufacturer's standard colors
6. INTERIOR JOINT-SEALANT SCHEDULE
- a. Interior vertical movement joints in exterior concrete and unit masonry.
 - 1) Joint Sealant: Single-component non-sag urethane sealant Dymonic FC
 - 2) Joint-Sealant Color: As selected by Architect from manufacturer's standard colors
 - b. Interior perimeter joints of exterior aluminum frames.
 - 1) Joint Sealant: Single-component non-sag urethane sealant Dymonic FC
 - 2) Joint-Sealant Color: As selected by Architect from manufacturer's standard colors
 - c. Interior perimeter joints of interior frames.
 - 1) Joint Sealant: Single-component non-sag urethane sealant Dymonic FC
 - 2) Joint-Sealant Color: As selected by Architect from manufacturer's standard colors
 - d. Interior sanitary joints between plumbing fixtures, food preparation fixtures, and casework and adjacent walls, floors, and counters.
 - 1) Joint Sealant: Mildew-Resistant, Single-Component, nonsag, acid-curing silicone joint sealant.
 - 2) Joint-Sealant Color: As selected by Architect from manufacturer's full range; multiple colors required.
 - 3) Joint-Sealant Color: As selected by Architect from manufacturer's full range.
 - e. Interior non-moving joints between interior painted surfaces and adjacent materials.
 - 1) Joint Sealant: Siliconized acrylic latex, Dymonic 100
 - 2) Joint-Sealant Color: Paintable.
 - f. Interior concealed sealants at thresholds and sills.
 - 1) Joint Sealant: Butyl-rubber-based joint sealant.

END OF SECTION

SECTION 08 52 00
ALUMINUM WINDOWS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. HR-710 WinGuard aluminum outside mount horizontal roller window.

1.2 RELATED SECTIONS

- A. Section 07 25 00 – Weather Barrier
- B. Section 07 92 00 - Joint Sealants

1.3 REFERENCES

- A. AAMA - American Architectural Manufacturers Association
 - 1. AAMA 103.3-93 "Procedural Guide for Aluminum and Vinyl Prime Windows and Glass Doors, Insulating Storm Products for Windows and Glass Doors and Thermal Performance of Windows and Glass Doors"
 - 2. AAMA 1302.5-76, paragraph 3.1.1 Test A through 3.1.3 Test G "Voluntary Specifications for Forced-Entry Resistant Aluminum Prime Windows"
- B. ANSI - American National Standards Institute
 - 1. ANSI/AAMA/NWWDA 101/I.S.2-97 "Voluntary Specification for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors"
- C. ASTM - American Society for Testing and Materials
 - 1. ASTM C 1036-91 "Standard Specification for Flat Glass"
 - 2. ASTM E 283-96 "Standard Test Method for Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors"
 - 3. ASTM E 330-96 "Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference"
 - 4. ASTM E 331-96 "Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference"
 - 5. ASTM E 547-96 "Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Cyclic Static Air Pressure Differential"
 - 6. ASTM F 588-85 "Standard Test Methods for Resistance of Window Assemblies to Forced Entry Excluding Glazing"

1.4 SYSTEM DESCRIPTION

- A. Configuration: outside mount flange construction aluminum horizontal roller, fixed-vent (OX) or vent-fixed (XO) or vent-fixed-vent (XOX) configuration only.
- B. Frame: 2.784" frame depth.
- C. Glazing: Laminated, Low E , 5/16".

D. Performance Requirements

1. Air Infiltration: 0.3 (ft³)/min/(ft²) maximum when tested per ASTM E 283 at a 1.57 psf static air pressure difference.
3. Water Resistance: no water leakage when tested per ASTM E 547 at a static air pressure difference of 15% of the positive design pressure.
4. Uniform Load Structural: after testing per ASTM E 330 with a load equal to 150% of the positive design pressure, the unit must be operable, with a maximum permanent deformation in any member of 0.4% of the member's length.

1.5 SUBMITTALS

- A. Submit according to provisions of Section 01300.
- B. Product Data: provide manufacturer's standard details, specifications and catalog information, recommendations, and installation instructions.
- C. Shop Drawings: include unit elevations, details of all aluminum window sections, typical anchorage and installation details, type of glazing and window finish, and interface with other products
- D. Finish Samples: manufacturer's available colors.
- E. Unit Samples: if required by Architect, provide scaled-down size operating samples of each unit type, to demonstrate design and construction of the unit and hardware.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: minimum five (5) years documented experience in the manufacture of aluminum windows as required for this project.
- B. Installer Qualifications: workmen properly trained and skilled in the installation and handling of aluminum windows as required for this project.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store and handle windows and accessories in accordance with the manufacturer's instructions.
- B. Protect the products from damage due to the elements, construction traffic, or other hazards, from the time of arrival through the completion of the project.

1.8 WARRANTY

- A. Manufacturer's Warranty: Furnish manufacturer's Limited Lifetime Warranty on aluminum windows and doors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. PGT Industries, Inc. Series HS-710 WinGuard outside mount horizontal roller aluminum window.

2.2 MATERIALS

- A. Main frame members: extruded from 6063-T6 alloy, nominal 0.062" wall thickness.
- B. Sash members: extruded from 6063-T5 aluminum alloy, nominal 0.062" wall thickness.
- C. Hardware: Four brass rollers in two roller housings. Two steel and tin-lead-zinc alloy cam lever sash locks on the vent (one sash lock if window height is less than 42") locking behind a groove in the meeting rail. Stainless steel assembly screws.
- D. Weatherstripping: weatherstripped with compressed vinyl bulbs on jambs, and two fin seal weatherstrips on top and bottom of sash.
- E. Glazing attachment with silicone adhesive.
- F. Screens: tubular aluminum frame with fiberglass screen cloth, vinyl spline, two plastic screen pull tabs and two compression retention springs per screen.

2.3 ACCESSORIES

- A. Mullions: mull as specified by the manufacturer and associated mull clips.

2.4 FABRICATION

- A. Main frame and sash joints constructed with butt-fit, assembled with phillips pan head screws, and factory sealed with Parbond or Schnee Moorehead sealer.
- B. All hardware factory installed.
- C. Bug screens constructed and installed in unit prior to shipment.

2.5 FINISHES

Colors: Selected by Architect from the following:

1. Standard coating color charts. White
 3. Color Name and Number:
- A. AAMA 2603 finish: Pretreatment plus thermosetting polyester powder coating.
 - B. AAMA 2605 Duranar (or comparable) finish - pretreatment plus 2 coat, 50 and 70 percent Kynar base options.

- C. Clear Anodized Finish: NAAMM AA-C2241, 204R1 – class II – Minimum 0.4 mils, in natural aluminum color.
- D. ETERNA® Wood grain finish: Pretreatment plus base powder coat with preprinted film transfer with organic photosensitive pigments and cellulose resin thermoprint.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that openings provide an acceptable anchoring surface, being clean, level, plumb, and dimensionally within the manufacturer's tolerance of clearance spacing.
- B. Correct unacceptable openings as required prior to installation.

3.2 INSTALLATION

- A. Install windows and accessories in accordance with approved shop drawings and manufacturer's recommendations.
- B. Securely fasten frames, and set units level, plumb, and square with respect to the surrounding structure, without twist or bow.
- C. Place insulation materials around shim spaces as required to ensure continuity of the thermal barrier of the structure.
- D. Apply caulk all around between the aluminum frame and the structure, ensuring that a continuous airtight and watertight perimeter seal results. Leave exposed surfaces clean and free of caulk.

3.3 ADJUSTING AND CLEANING

- A. Ensure that units freely operate in a normal fashion, and that vents make proper contact with weatherstripping perimeter seal. Adjust frame, vent, or hardware as needed.
- B. Leave units thoroughly clean and free of dirt or other construction residue.

END OF SECTION

SECTION 09 21 16
GYPSUM BOARD ASSEMBLIES

PART 76 GENERAL

76.1 SECTION INCLUDES

- A. Non-structural metal framing.
- B. Gypsum board, gypsum shaftliner board and accessories.

76.2 RELATED SECTIONS

- A. Section 05 40 00 - Cold-Formed Metal Framing.
- B. Section 06 10 00 - Rough Carpentry.

76.3 REFERENCES

- A. ASTM International (ASTM):
 1. ASTM A 653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 2. ASTM A 780 - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
 3. ASTM B 633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
 4. ASTM C 475 - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
 5. ASTM C 578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
 6. ASTM C 645 - Standard Specification for Nonstructural Steel Framing Members.
 7. ASTM C 665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
 8. ASTM C 754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
 9. ASTM C 834 - Standard Specification for Latex Sealants.
 10. ASTM C 840 - Standard Specification for Application and Finishing of Gypsum Board.
 11. ASTM C 844 - Standard Specification for Application of Gypsum Base to receive Gypsum Veneer Plaster.
 12. ASTM C 847 - Standard Specification for Metal Lath.
 13. ASTM C 919 - Standard Practice for Use of Sealants in Acoustical Applications.
 14. ASTM C 1002 - Standard Specification for Steel Self Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
 15. ASTM C 1047 - Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
 16. ASTM C 1063 - Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster (Plaster and Stucco Accessories).
 17. ASTM C 1177 - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
 18. ASTM C 1178 - Standard Specification for Glass Mat Water Resistant Gypsum Backing Panel.

19. ASTM C 1278 - Standard Specification for Fiber Reinforced Gypsum Panel.
 20. ASTM C 1396 - Standard Specification for Gypsum Board.
 21. ASTM C 1513 - Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections.
 22. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
 23. ASTM E 90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
 24. ASTM E 119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
 25. ASTM E 413 - Classification for Rating Sound Insulation.
- B. AISI S100 - "North American Specification for the Design of Cold-Formed Steel Structural Members."
- C. AISI S240 - "North American Standard for Cold-Formed Steel Structural Framing."
- D. Gypsum Association (GA):
1. GA-214 - Recommended Levels of Gypsum Board Finish.
 2. GA-216 - Application and Finishing of Gypsum Panel Products.
 3. GA-238 - Guidelines for the Prevention of Mold Growth on Gypsum Board; Gypsum Association.
 4. GA - 600 - Fire Resistance Design Manual.
- E. Underwriters Laboratory (UL) - Fire Resistance Directory; Underwriters Laboratories Inc.; current edition.

76.4 DESIGN REQUIREMENTS

- A. Design steel in accordance with American Iron and Steel Institute Publication S100 "North American Specification for the Design of Cold-Formed Steel Structural Members", except as otherwise shown or specified.
- B. Design loads: As indicated on the Architectural Drawings. 5 PSF minimum design lateral load is required for interior walls by the building code. Shaftwall framing minimum design lateral load is typically 5 - 15 PSF.
- C. Design framing systems to withstand design loads without deflections greater than the following:
 1. Interior Non-Load Bearing Walls: Lateral deflection of: $L/120$.
- D. Design framing system to accommodate deflection of primary building structure and construction tolerances.

76.5 SUBMITTALS

- A. Submit under provisions of Section 01 30 00 - Administrative Requirements.
- B. Product Data: Manufacturer's data sheets on each product specified, including:
 1. Preparation instructions and recommendations.
 2. Storage and handling requirements and recommendations.
 3. Installation methods.
 4. Manufacturer's certification of product compliance with codes and standards.
- C. Submit manufacturer's certification of product compliance with codes and standards along with product literature and data sheets for specified products. Electronic submittals generated via

ClarkDietrich website and submitted electronically are acceptable.

- D. Evaluation Reports: Submit evaluation reports certified under an independent third party inspection program administered by an agency accredited by IAS to ICC-ES AC98, IAS Accreditation Criteria for Inspection Agencies.

76.6 QUALITY ASSURANCE

- A. Installer Qualifications: Installer experienced in performing work of this section who has specialized in installation of work similar to that required for this project.
- B. Pre-installation Meetings: Conduct pre-installation meeting to verify project requirements, substrate conditions, and manufacturer's installation instructions.
- C. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-structural steel framing, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by, and displaying a classification label, from an independent testing agency acceptable to authority having jurisdiction.
 - 1. Construct fire-resistance-rated partitions in compliance with tested assembly requirements indicated on the Drawings.
 - 2. Rated assemblies to be substantiated from applicable testing using the proposed products, by Contractor.
- D. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.
- E. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
 - 1. Finish areas designated by Architect.
 - 2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
 - 3. Refinish mock-up area as required to produce acceptable work.

76.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect and store products in manufacturer's unopened packaging until ready for installation per requirements of AISI S202 "Code of Standard Practice for Cold-Formed Structural Framing".
- B. Notify manufacturer of damaged materials received prior to installing.
- C. Deliver and store gypsum board in accordance with GA-238.

76.8 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended ASTM C 840 and by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

PART 77 PRODUCTS

77.1 MANUFACTURERS

- A. Acceptable Manufacturer, Metal Framing: ClarkDietrich Building Systems, 9050 Centre Pointe Dr. Suite 400, West Chester, OH 45069. Tel: (513) 870-1100. Fax: (513) 870-1300. E-mail:

info@clarkdietrich.com Web: www.clarkdietrich.com.

1. ClarkDietrich Building Systems; 4601 North Point Boulevard, Baltimore, MD 21219. Tel: (410) 477-4000.
 2. ClarkDietrich Building Systems; 4200 Cedar Blvd., Baytown, TX 77520. Tel: (281) 383-1617.
 3. ClarkDietrich Building Systems; 780 James P. Casey Road, Bristol, CT 06010. Tel: (866) 921-0023.
 4. ClarkDietrich Building Systems; 6510 General Drive, Riverside, CA 92509. Tel: (951) 360-3500.
 5. ClarkDietrich Building Systems; 1685 Tide Court, Woodland, CA 95776. Tel: (530) 668-1987.
 6. ClarkDietrich Building Systems; 501 Steward Road, Suite 100, Rochelle, IL 61068. Tel: (800) 659-0745.
 7. ClarkDietrich Building Systems; 91-300 Hanua Street, Kapolei, HI 96707. Tel: (808) 682-5747.
 8. ClarkDietrich Building Systems; 330 Greenwood Place, McDonough, GA 30253. Tel: (678) 304-5500.
 9. ClarkDietrich Building Systems; 10340 Denton Drive, Dallas, TX 75220. Tel: (214) 350-1716.
 10. ClarkDietrich Building Systems; 38020 Pulp Drive, Dade City, FL 33523. Tel: (352) 518-4400.
 11. ClarkDietrich Building Systems; 1985 N. River Road NE, Warren, OH 44483. Tel: (330) 372-5564.
 12. ClarkDietrich Building Systems; 1455 Ridge Road, Vienna, OH 44473. Tel: (330) 372-4014.
- B. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

77.2 METAL FRAMING COMPONENTS

- A. Recycled Content of Steel Products: Post-consumer recycled content plus one-half of pre-consumer recycled content not less than 25 percent.
- B. Framing Members, General: Comply with ASTM C 645 for conditions indicated.
 1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
 2. Protective Coating: Comply with ASTM C 645; ASTM A 653/A 653M G40 (Z120), Coating with equivalent corrosion resistance of ASTM A 653/A 653M, G40 (Z120) or DiamondPlus coating; roll-formed from steel meeting mechanical and chemical requirements of ASTM A 1003 with a zinc-based coating. A40 galvanized products are not acceptable.
 - a. Coatings shall demonstrate equivalent corrosion resistance with an evaluation report acceptable to the authority having jurisdiction.
- C. Steel Studs and Runners: ASTM C 645.
 1. Non-Structural Studs: Cold-formed galvanized steel C-studs, ClarkDietrich ProSTUD drywall studs as per ASTM C 645 for conditions matching existing material:
 2. Designation and size as indicated on the drawings.
- D. Slotted Deflection Track: Cold-formed galvanized steel; ClarkDietrich Building Systems MaxTrak or

BlazeFrame.

1. Designation and size as indicated on the drawings.
- E. U Channel: Cold-formed galvanized steel; ClarkDietrich Building Systems U-Channel:
1. Designation and size as indicated on the drawings.
- F. H Studs and C-Runner: Cold-formed galvanized steel; ClarkDietrich Building Systems H-Studs and C-Runner:
1. Designation and size as indicated on the drawings.
- G. Metal Trims: Cold-formed galvanized steel.
1. Designation and size as indicated on the drawings.
- H. Drywall Corner Bead: Cold-formed galvanized steel sheet.
1. Designation and size as indicated on the drawings.
- I. Flat Strap and Backing Plate: Sheet for blocking and bracing in length and width indicated; ClarkDietrich Building Systems; Backing Plate.
1. Designation and size as indicated on the drawings.
- J. Channel Bridging and Bracing: Pre-notched steel bar, 7/8 inch by 7/8 inch by 50 inches (22.2 mm by 22.2 mm by 1270 mm), 0.0329-inch (0.84-mm) minimum base-steel thickness.
1. Subject to compliance with requirements, provide ClarkDietrich Building Systems; Spazzer 9200 Bridging and Spacing Bar.
- K. Channel Bridging: 0.0538 inch (1.37 mm) base-steel thickness, with minimum 1/2-inch-(12.7 mm) wide flanges.
1. Subject to compliance with requirements, provide ClarkDietrich Building Systems; Cold-Formed U-Channel.
 2. Designation and size as indicated on the drawings.
- L. Resilient Furring Channels: 1/2-inch (12.7 mm) deep, steel sheet members designed to reduce sound transmissions:
1. Designation and size as indicated on the drawings.
- M. Radius Framing: Steel sheet runner for non-load-bearing curves, bends, variable radii and arches using expandable ribbon technology.
1. Size: As indicated on Drawings.
- N. Framing Component Accessories: Provide the following accessories as required for a complete system.
1. EasyClip Clip Angle.
 2. Angles.
 3. Backing Strip.
- O. Drywall Penetration Barrier Mesh: Supply and install Barrier Mesh steel expanded metal panels as a penetration barrier behind gypsum wallboard walls and/or ceilings, where noted on the drawings.
1. Designation and size as indicated on the drawings.
- P. Fasteners:
1. Designation and size as indicated on the drawings.

- Q. Touch-Up Paint: Complying with ASTM A 780 - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings. Zinc rich, containing 95-percent metallic zinc.
- R. Non-Hardening, Flexible Sealant: Latex acrylic.
- S. Framing: Framing components may be preassembled into panels prior to erecting.
 - 1. Fabricate panels square, with components attached in a manner so as to prevent racking or distortion.
 - 2. Cut all framing components squarely for attachment to perpendicular members, or as required for an angular fit against abutting members. Hold members positively in place until properly fastened.
 - 3. Fasteners: Fasten components using self-tapping screws or welding.

77.3 GYPSUM BOARD AND ACCESSORIES

- A. Refer to Section 06 16 00 for gypsum materials and applications.
- B. Partitions Closures: Provide extruded aluminum adjustable partition closures at all junctures of partitions with other construction as indicated. Adjustable partition closures shall be spring-loaded assemblies filled with acoustical batt insulation and with finish to match curtain wall system.
 - 1. Manufacturer: Gordon Inc., "Mullion Mate."
- C. Partition End Caps: Provide extruded aluminum partition end caps at all partition termination end. Provide at locations of all adjustable partition closures and other locations indicated. Finish to match curtain wall system.
 - 1. Manufacturer: Gordon Inc., "Series 910 Special Shapes."
- D. Preformed Niches: Provide preformed recessed wall niches, ready to receive tile finish. Provide at showers and other locations indicated.
 - 1. Manufacturer: Noble Company "Pro Form."
- E. Trim Accessories: Provide manufacturer's standard plastic or metal trim accessories for gypsum board work, per ASTM C 1047. Provide with either knurled or perforated expanded flanges for nailing or stapling, and beaded for concealment of flanges, in joint compound. Provide corner beads, L-type edge trim-beads, U-type edge trim-beads, special L-kerf-type edge trim-beads, and one-piece control joint beads.
 - 1. Subject to compliance with requirements, provide drywall trims and accessories by Vinyl Corp.; a division of ClarkDietrich Building Systems or equivalent.
- F. Interior Trim Accessories: Provide corner beads, L-type edge trim-beads, U-type edge trim-beads, special L-kerf-type edge trim-beads, and one-piece control joint beads complying with the following requirements:
 - 1. Materials: Formed plastic or metal complying with one the following requirements:
 - a. Sheet Steel zinc coated by the hot-dip process.
 - b. Sheet Steel zinc coated by the hot-dip process or electrolytic process, or sheet steel coated with aluminum.
 - c. Rigid PVC or CPVC plastic.
 - 2. Subject to compliance with requirements, provide drywall trims and accessories by Vinyl

Corp.; a division of ClarkDietrich Building Systems.

- G. Accessories for Curved Surfaces: Cornerbead formed of metal, plastic, or metal combined with plastic, with either notched or flexible flanges that are bendable to curved radius.
 - 1. Subject to compliance with requirements, provide Vinyl Corp.; Archmaker Corner Bead.
- H. Exterior Surface Trim and Accessories: Cornerbead, edge trim, control joints formed from sheet steel zinc coated by the hot dip process per ASTM C 1047, or plastic conforming to ASTM C 1047 Section 4.3 plastic for accessories shall be manufactured from rigid PVC or ABS Plastic not less than 0.028 inch (0.7112 mm) and Section 4.3.1 PVC specification D 3678 Class II or III, in shapes indicated below by reference to ASTM C1047.
 - 1. Cornerbead on outside corners, unless otherwise indicated.
 - 2. Edge trim complying with shape LC-bead.
 - 3. One piece control joint formed with V-shaped slot and removable strip covering slot opening.
 - 4. Manufacturer: Vinyl Corp.; a division of ClarkDietrich Building Systems.
- I. Soffit Vents: Prefabricated extruded aluminum, with clear anodized finish or vinyl soffit vent.
 - 1. Manufacturer: Vinyl Corp "No. CSJ50-200V"
- J. Laminating Adhesive: Special adhesive or joint compound specifically recommended for laminating gypsum boards.
- K. Spot Grout: ASTM C 475, setting-type joint compound for type recommended for spot grouting hollow metal door frames.
- L. Gypsum Board Screws: ASTM C 1513. Fastening gypsum board to steel members less than 0.033 inch thick. Fastening gypsum board to gypsum board.
- M. Steel Drill Screws: ASTM C 1513, for fastening gypsum board to steel members.
- N. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing), unfaced mineral fiber blanket insulation in thicknesses shown. Fibers manufactured from glass, slag wool, or rock wool.
- O. Thermal Insulation: Thickness and width to fill voids formed by Z-furring members. Unfaced mineral fiber blanket insulation, ASTM C 665, Type I (blankets without membrane facing), in thicknesses shown or extruded polystyrene, ASTM C 578, Type IV, rigid, cellular, polystyrene thermal insulation formed from polystyrene resin using an extrusion process.
- P. Isolation Strip at Exterior Walls: Asphalt-saturated organic felt, ASTM D 226, Type I (No. 15 asphalt felt), non-perforated or adhesive backed, closed cell vinyl foam strips that allow fastener penetration without foam displacement, in width to suit steel stud size.

77.4 JOINT TREATMENT AND ACCESSORIES

- A. Joint Treatment Materials: ASTM C 475; type recommended by manufacturer of sheet products and joint treatment materials for application indicated, unless indicated otherwise.
- B. Joint Tape:
 - 1. Interior Gypsum Board: Paper reinforcing tape.
 - 2. Mold and Mildew Resistant Backer Board: Glass mesh tape.
 - 3. Gypsum Base for Veneer Plaster: Paper reinforcing tape.

- C. Setting Type Joint Compound: Factory prepackaged, job mixed chemical-hardening powder products for bedding and filling, formulated for uses indicated.
 - 1. For taping and filling only.
 - 2. For prefilling gypsum board joints.
 - 3. For filling joints and treating fasteners of water-resistant gypsum backing board behind base for ceramic tile.
 - 4. For filling joints and treating fasteners of mold and mildew resistant backing board behind base for ceramic tile.
 - 5. For filling joints and treating fasteners of gypsum base for veneer plaster.
 - 6. For topping compound, use sandable formulation.
- D. Drying-Type Joint Compounds: Factory prepackaged vinyl-based products complying with the following requirements for formulation and intended use.
 - 1. Ready-Mix Formulation: Factory-mixed product.
 - 2. All-purpose compound formulated for use as both taping and topping compound; use for finish (third) coat only.
- E. Exterior Joint Compound: Special chemical-hardening-type for exterior application.
- F. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard non-sag, paintable, nonstaining latex sealant complying with ASTM C 834 and the following requirements.

PART 78 EXECUTION

78.1 EXAMINATION

- A. Prior to installation, inspect previous work of all other trades. Verify that all work is complete and accurate to the point where this installation may properly proceed in strict accordance with framing shop drawings.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

78.2 METAL FRAMING INSTALLATION

- A. Install cold-formed framing in accordance with requirements of ASTM C 754.
- B. Framing Installation:
 - 1. Erect framing and panels plumb, level and square in strict accordance with approved drawings.
 - 2. Handle and lift prefabricated panels in a manner to not cause distortion in any member.
 - 3. Anchor runner track securely to the supporting structure. Install concrete anchors only after full compressive strength has been achieved.
 - 4. Butt all track joints. Securely anchor abutting pieces of track to a common structural element, or splice them together.
 - 5. Align and plumb studs, and securely attach to the flanges or webs of both upper and lower tracks.
 - 6. Attach wall stud bridging when required in a manner to prevent stud rotation. Space bridging rows according to manufacturer's recommendations.

7. Provided temporary bracing until erection is completed.
8. Where indicated in the drawings, provide for structural vertical movement using means in accordance with manufacturer's recommendations.

C. Shaftwall Framing Installation:

1. Lay out as shown in construction drawings. Secure J-Tabbed Track at perimeter framing and plumb to ceiling, floor and sides. Attach with suitable fasteners, spaced not more than 24 inches (610 mm) o.c. Apply a bead of non-hardening, flexible sealant to the perimeter.
2. Preplan the stud layout 24 inches (610 mm) o.c. and adjust the spacing at either end so the end studs will not fall closer than 12 inches (305 mm) from the end.
3. Erect the first 1-inch (25.4 mm) shaft wall liner panel, cut 3/4 inch (19 mm) less than the total height of the framed section. Plumb the panel against the web of the J-Tabbed Track and bend out tabs in J-Tabbed Track to secure panels in place. If tabs are not used, screw the liner panel to the J-Tabbed Track.
4. Insert CT Shaftwall Stud, cut 3/4 inch (19 mm) less than the overall height, into the top and bottom J-Tabbed Tracks and fit tightly over the previously installed 1 inch (25.4 mm) panel. Allow equal clearance between top and bottom J-Tabbed Track.
5. Install the next 1-inch (25.4 mm) shaft wall liner panel inside the J-Tabbed Tracks and within the tabs of the CT Shaftwall stud.
6. Progressively install succeeding studs and panels as described above until the wall section is enclosed. The final panel section may be secured with tabs from the J-Tabbed Track at 12 inches (305 mm) o.c.
7. Where wall heights exceed the standard or available length of shaft wall liner panels, the gypsum panels may be cut and stacked with joints occurring within the top or bottom third points of the wall. Joints of adjacent panels should be alternately staggered to prevent a continuous horizontal joint. Any butt joints must be factory edge to factory edge with pieces pushed tightly together. Gypsum panels must engage a minimum of 2 tabs of the CT Shaftwall Stud.
8. CT Shaftwall Studs cannot be spliced. They must be installed full height, one piece. J-Tabbed Track when not attached of the structure shall not be spliced.
9. Do not attach J-Tabbed Track to the CT Shaftwall Studs.
10. For doors, ducts or other large penetrations or openings, install J-Tabbed Track as perimeter framing. Use 20 gauge, 0.0329 inches (0.83 mm) track with a 3 inches (76 mm) back leg for elevator doors and block cavity with 12 inches (305 mm) wide gypsum filler strips for doors exceeding 7-foot (2 m) height.

D. Drywall Penetration Barrier Mesh Installation:

1. Barrier Mesh sheets may be installed with diamond running in direction most suitable.
2. BM-Clips shall be installed to secure the mesh to the framing members.
3. Mesh joints occurring on framing members may either join staggered or butt together.
4. It is acceptable to overlap mesh joints to achieve tie-in.

5. BM sheets shall join, begin and terminate on a framing member.
6. BM sheets not joining on framing member shall be wire tied with 18GA steel tie wire.
7. Wire tying shall be no less frequent than the installation of Mesh Clips.

78.3 GYPSUM BOARD INSTALLATION

A. Gypsum Board:

1. Gypsum Board Application and Finishing Standards: Comply with ASTM C 840 and GA-216.
2. Locate exposed end-butt joints as far from center of walls and ceilings as possible, and stagger not less than 24 inches (610 mm) in alternate courses of board.
3. Install ceiling boards across framing in the manner which minimizes the number of end-butt joints, and which will avoid end joints in the central area of each ceiling. Stagger end joints a minimum of 24 inches (610 mm).
4. Install wall and partition boards vertically unless otherwise noted.
5. Install exposed gypsum board with face side out. Do not install imperfect, damaged, or damp boards. Butt boards together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) open space between boards.
6. Locate either edge or end joints over supports, except in horizontal applications or where intermediate supports or gypsum board back-blocking is provided behind end joints. Position boards so that like edges abut, tapered edges against tapered edges, and mill-cut or field-cut ends against mill-cut or field-cut ends. Do not place tapered edges against cut edges or ends. Stagger vertical joints over different studs on opposite sides of partitions.
7. Attach gypsum board to steel studs so that leading edge or end of each board is attached to open (unsupported) edge of stud flange first.
8. Attach gypsum board to supplementary framing and blocking provided for additional support at openings and cut-outs.
9. Form control joints and expansion joints at locations indicated on Drawings, and as recommended by Gypsum Association, with space between edges of boards prepared to receive trim accessories.
10. Cover both faces of steel stud partition framing with gypsum board in concealed spaces except in chase walls that are properly braced internally.
11. Fit gypsum board around ducts, pipes, and conduits.
12. Where partitions intersect open concrete coffers, cut gypsum board to fit profile of coffers and allow 1/4 to 1/2 inch (6 mm to 13 mm) wide joint for sealant.
13. Isolate perimeter of non-load bearing drywall partitions at structural abutments. Provide 1/4 to 1/2 inch (6 mm to 13 mm) space and trim edge with "U" bead edge trim. Seal joints with acoustical sealant. See also 07910.
14. Where sound-rated drywall construction is indicated on Drawings, seal construction at perimeters, control and expansion joints, openings, and penetrations with a continuous bead of acoustical sealant including a bead at both faces of partitions. Comply with ASTM C 919 and manufacturer's recommendations for location of edge trim, and close off sound-flanking

paths around or through construction, including sealing of partitions above acoustical ceilings.

15. Space fasteners in gypsum boards per referenced gypsum board application and finishing standard and manufacturer's recommendations.

B. Accessories:

1. Where feasible, use the same fasteners to anchor trim accessory flanges as required to fasten gypsum board to the supports. Otherwise, fasten flanges to comply with manufacturer's recommendations.
2. Install metal corner beads at external corners.
3. Install metal edge trim whenever edge of gypsum board would otherwise be exposed or semi-exposed, except where plastic trim is indicated on Drawings. Provide type with face flange to receive joint compound except where "U" bead (semi-finishing type) is indicated.
4. Install gypsum board reveals where indicated on Drawings.
5. Install control joints at locations indicated on Drawings, or if not indicated, at spacing and locations required by referenced gypsum board application and finish standard, and approved by Architect for visual effect.

C. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch (1.5 mm) in 10 feet (3048 mm) in any direction.

D. Joint Treatment: Comply with ASTM C 840, GA 214 and GA 216.

1. Level 1: Plenums, service corridors; above ceilings.
2. Level 2: Areas of water resistant gypsum backing board under tile; exposed areas where appearance is not critical.
3. Level 3: Areas to receive heavy or medium textured coatings; heavy-grade wall coverings.
4. Level 4: Areas to receive flat sheen paint finish; light textured coatings; lightweight wall coverings.
5. Level 5: Areas to receive gloss, semi-gloss sheen paints; critical lighting conditions.

78.4 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 09 24 00
PORTLAND CEMENT PLASTERING

PART 79 GENERAL

79.1 SECTION INCLUDES

- A. Interior Portland cement plasterwork and accessories.
- B. Exterior Portland cement plasterwork (stucco) and accessories.

79.2 RELATED SECTIONS

- A. Section 05 40 00 - Cold-Formed Metal Framing.
- B. Section 06 10 00 - Rough Carpentry.
- C. Section 06 16 00 - Sheathing.
- D. Section 09 21 16 – Gypsum Board Assemblies.

79.3 REFERENCES

- A. ASTM International (ASTM):
 1. ASTM A 641/A 641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
 2. ASTM A 653/A 653M - [HYPERLINK "http://www.astm.org/Standards/A653.htm"](http://www.astm.org/Standards/A653.htm)Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 3. ASTM B 69 - Standard Specification for Rolled Zinc.
 4. ASTM C 91 - Standard Specification for Masonry Cement.
 5. ASTM C 150 - Standard Specification for Portland Cement.
 6. ASTM C 206 - Standard Specification for Finishing Hydrated Lime.
 7. ASTM C 207 - Standard Specification for Hydrated Lime for Masonry Purposes.
 8. ASTM C 665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
 9. ASTM C 847 - Standard Specification for Metal Lath.
 10. ASTM C 897 - Standard Specification for Aggregate for Job-Mixed Portland Cement-Based Plasters.
 11. ASTM C 926 - Standard Specification for Application of Portland Cement-Based Plaster.
 12. ASTM C 932 - Standard Specification for Surface-Applied Bonding Compounds for Exterior Plastering.
 13. ASTM C 933 - Standard Specification for Welded Wire Lath.
 14. ASTM C 954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness.
 15. ASTM C 1002 - Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
 16. ASTM C 1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.

17. ASTM C 1063 - Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster.
18. ASTM C 1328 - Standard Specification for Plastic (Stucco) Cement.
19. ASTM D 1784 - Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds.
20. ASTM E 90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
21. ASTM E 119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
22. ASTM E 413 - Classification for Rating Sound Insulation.

79.4 SUBMITTALS

- A. Submit under provisions of Section 01 30 00 - Administrative Requirements.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 1. Preparation instructions and recommendations.
 2. Storage and handling requirements and recommendations.
 3. Installation methods.
- C. Shop Drawings: Show locations and installation of control and expansion joints including plans, elevations, sections, details of components, and attachments to other work, based on architectural drawings.
- D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- E. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.

79.5 QUALITY ASSURANCE

- A. Installer Qualifications: Experienced installer of lathing and plastering systems with familiarity with manufacturer's products scheduled for the Work.
- B. Fire-Resistance Ratings: Where indicated, provide Portland cement plaster assemblies identical to those of assemblies tested for fire resistance per ASTM E 119 by, and displaying a classification label from, a qualified independent testing agency acceptable to the authority having jurisdiction. Identify products with appropriate markings of applicable testing agency.
 1. Construct fire-resistance rated partitions in compliance with tested assembly requirements indicated on drawings.
 2. Rated assemblies shall be substantiated from applicable testing using proposed products, by Contractor.
 3. Both metal framing and wallboard manufacturers shall submit written confirmation that it accepts the other manufacturer's product as a suitable component in the assembly.

Acceptance is as follows:

 - a. If installation of both products is proper, no adverse effect will result in the performance of one manufacturer's product by the other's product.
 - b. Combining products can be substantiated by required assembly tests.

4. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.
- C. Sound-Transmission Characteristics: Where indicated, provide Portland cement plaster assemblies identical to those of assemblies tested for STC ratings per ASTM E 90 and classified according to ASTM E 413 by a qualified testing agency.
- D. Mockups: Before plastering, install mockups of at least 100 sf (9.3 sq. m) in surface area to demonstrate aesthetic effects and set quality standards for materials and execution.
 1. Install mockups for each type of finish indicated.
 2. For interior plasterwork, simulate finished lighting conditions for review of mockups.
 3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- E. Preinstallation Conference: Conduct conference at Project site.

79.6 DELIVERY, STORAGE, AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes.
- B. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling as required by AISI's "Code of Standard Practice".

79.7 PROJECT CONDITIONS

- A. Comply with ASTM C 926 requirements.
- B. Interior Plasterwork: Maintain room temperatures at greater than 40 degree F (4.4 degree C) for at least 48 hours before plaster application, and continuously during and after application.
 1. Avoid conditions that result in plaster drying out during curing period. Distribute heat evenly; prevent concentrated or uneven heat on plaster.
 2. Ventilate building spaces as required to remove water in excess of that required for hydrating plaster in a manner that prevents drafts of air from contacting surfaces during plaster application and until plaster is dry.
- C. Exterior Plasterwork:
 1. Apply and cure plaster to prevent plaster drying out during curing period. Use procedures required by climatic conditions, including moist curing, providing coverings, and providing barriers to deflect sunlight and wind.
 2. Apply plaster when ambient temperature is greater than 40 degree F (4.4 degree C).
 3. Protect plaster coats from freezing for not less than 48 hours after set of plaster coat has occurred.
- D. Factory-Prepared Finishes: Comply with manufacturer's written recommendations for environmental conditions for applying finishes.

PART 80 PRODUCTS

80.1 MANUFACTURERS

- A. Acceptable Manufacturer: Vinyl Corp., which is located at: 8000 N. W. 79th Pl.; Miami, FL 33166; Toll Free Tel: 800-648-4695; Tel: 305-477-6464; Fax: 305-477-4108; Email: [request info](#)

(sam.maldonado@vinylcorp.com); Web:www.vinylcorp.com

- B. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

80.2 MATERIALS

- A. Accessories for Gypsum Wallboard and Gypsum Veneer Base: ASTM C 1047.
- B. Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster: ASTM C 1063.
- C. Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds: ASTM D 1784.

80.3 METAL LATH

- A. Expanded-Metal Lath: ASTM C 847, cold-rolled carbon steel sheet, ASTM A 653/A 653M, G60 (Z180).
 - 1. Basis-of-Design Product: ClarkDietrich Building Systems.
- B. Wire Lath: ASTM C933, Class 1 Galvanized Coating complying with ASTM A 641.
 - 1. Basis-of-Design Product: Structa Wire Corp. products by ClarkDietrich Building Systems.

80.4 ACCESSORIES

- A. Plastic Accessories for Gypsum Wallboard and Gypsum Veneer Base: ASTM C 1047. Fabricated from plastic or plastic and paper in combination shall be manufactured from rigid PVC, ABS, PETG, high-impact polystyrene (HIPS), or polycarbonate (PC) plastic not less than 0.028 inch (0.7112 mm) and Section 4.3.1 PVC specification D 1784 Cell class 13244C.
 - 1. Basis-of-Design Product: Vinyl Corp.
 - 2. Corner Beads:
 - a. Vinyl Corp. "VLCB".
 - b. Vinyl Corp. "VBCB".
 - 3. Channel Reveals: PVC reveals conforming to ASTM C 1047.
 - a. Vinyl Corp. "DC-Series".
 - 4. Soffit Vents: Vinyl soffit vent.
 - a. Vinyl Corp. "DCV-Series".
 - 5. Control Joints:
 - a. Vinyl Corp. "CJV-Series".
- B. Plastic Accessories for Exterior Stucco: ASTM C 1063. Fabricated from plastic or plastic and paper in combination shall be manufactured from rigid PVC, ABS, PETG, high-impact polystyrene (HIPS), or polycarbonate (PC) plastic. Section 4.3.1 PVC specification D 1784 Cell class 13244C.
 - 1. Basis-of-Design Product: Vinyl Corp.
 - 2. Corner Beads:
 - a. Vinyl Corp. "#1 Series".
 - 3. Casing Beads:
 - a. Vinyl Corp. "66-Series".
 - 4. Control Joints:
 - a. Vinyl Corp. "15-Series".

5. Soffit Vents:
 - a. Vinyl Corp. "V-Series".
 - b. Vinyl Corp. "CS-V Series".
6. Channel Reveals:
 - a. Vinyl Corp. "CS Series".
7. Weep Screed:
 - a. Vinyl Corp. "WS- Series".
- C. Metal Accessories: Comply with ASTM A 653/A 653M, G60 (Z180).
 1. Basis-of-Design Product: ClarkDietrich Building Systems.
- D. Zinc Accessories for Portland Cement Base Plaster. ASTM B 69. Fabricated from Zinc Alloy (99 percent pure zinc).
 1. Basis-of-Design Product: ClarkDietrich Building Systems.

80.5 MISCELLANEOUS MATERIALS

- A. Water for Mixing: Potable and free of substances capable of affecting plaster set or of damaging plaster, lath, or accessories.
- B. Fiber for Base Coat: Alkaline-resistant glass or polypropylene fibers, 1/2 inch (13 mm) long, free of contaminants, manufactured for use in Portland cement plaster.
- C. Bonding Compound: ASTM C 932.
- D. Steel Drill Screws: For metal-to-metal fastening, ASTM C 1002 or ASTM C 954, as required by thickness of metal being fastened; with pan head that is suitable for application; in lengths required to achieve penetration through joined materials of no fewer than three exposed threads.
- E. Fasteners for Attaching Metal Lath to Substrates: Complying with ASTM C 1063.
- F. Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, not less than 0.0475-inch (1.21-mm) diameter, unless otherwise indicated.

80.6 PLASTER MATERIAL

- A. Portland Cement: ASTM C 150, Type I.
- B. Portland Cement: ASTM C 150, Type II.
- C. Lime: ASTM C 206, Type S; or ASTM C 207, Type S.
- D. Sand Aggregate: ASTM C 897.
 1. Color for Job-Mixed Finish Coats: In color matching Architect's sample.
- E. Perlite Aggregate: ASTM C 35.
- F. Ready-Mixed Finish-Coat Plaster: Mill-mixed Portland cement, aggregates, coloring agents, and proprietary ingredients.
- G. Acrylic-Based Finish Coatings: Factory-mixed acrylic-emulsion coating systems, formulated with colorfast mineral pigments and fine aggregates; for use over Portland cement plaster base coats. Include manufacturer's recommended primers and sealing topcoats for acrylic-based finishes.

80.7 PLASTER MIXES

As specified by Architect and as conditions apply.

- A. General: Comply with ASTM C 926 for applications indicated.

1. Fiber Content: Add fiber to base-coat mixes after ingredients have mixed at least two minutes. Comply with fiber manufacturer's written instructions for fiber quantities in mixes, but do not exceed 1 lb of fiber/cu. yd. (0.6 kg of fiber/cu. m) of cementitious materials.
- B. Base-Coat Mixes for Use over Metal Lath: Scratch and brown coats for three-coat plasterwork as follows:
 1. Portland Cement Mixes:
 - a. Scratch Coat:
 - 1) For cementitious material, mix 1 part Portland cement and 0 to 3/4 parts lime.
 - 2) For cementitious material, mix 1 part Portland cement and 3/4 to 1-1/2 parts lime.
 - 3) Use 2-1/2 to 4 parts aggregate per part of cementitious material.
 - b. Brown Coat:
 - 1) For cementitious material, mix 1 part Portland cement and 0 to 3/4 parts lime.
 - 2) For cementitious material, mix 1 part Portland cement and 3/4 to 1-1/2 parts lime.
 - 3) Use 3 to 5 parts aggregate per part of cementitious material, but not less than volume of aggregate used in scratch coat.
 2. Plastic Cement Mixes:
 - a. Scratch Coat: 1 part plastic cement and 2-1/2 to 4 parts aggregate.
 - b. Brown Coat: 1 part plastic cement and 3 to 5 parts aggregate, but not less than volume of aggregate used in scratch coat.
 3. Portland and Plastic Cement Mixes:
 - a. Scratch Coat: For cementitious material, mix 1 part plastic cement and 1 part Portland cement. Use 2-1/2 to 4 parts aggregate per part of cementitious material.
 - b. Brown Coat: For cementitious material, mix 1 part plastic cement and 1 part Portland cement. Use 3 to 5 parts aggregate per part of cementitious material, but not less than volume of aggregate used in scratch coat.
- C. Base-Coat Mixes: Single base coats for two-coat plasterwork as follows:
 1. Portland Cement Mix: For cementitious material, mix 1 part Portland cement and 0 to 3/4 part lime. Use 2-1/2 to 4 parts aggregate per part of cementitious material.
 2. Portland and Masonry Cement Mix: For cementitious material, mix 1 part Portland cement and 1 part masonry cement. Use 2-1/2 to 4 parts aggregate per part of cementitious material.
 3. Plastic Cement Mix: Use 1 part plastic cement and 2-1/2 to 4 parts aggregate.
- D. Base-Coat Mixes: Single base coats for two-coat plasterwork as follows:
 1. Portland Cement Mix: For cementitious material, mix 1 part Portland cement and 3/4 to 1-1/2 parts lime. Use 2-1/2 to 4 parts aggregate per part of cementitious material.
 2. Masonry Cement Mix: Use 1 part masonry cement and 2-1/2 to 4 parts aggregate.
 3. Plastic Cement Mix: Use 1 part plastic cement and 2-1/2 to 4 parts aggregate.
- E. Job-Mixed Finish-Coat Mixes:
 1. Portland Cement Mix: For cementitious materials, mix 1 part Portland cement and 3/4 to 1-1/2 parts lime. Use 1-1/2 to 3 parts aggregate per part of cementitious material.

2. Portland Cement Mix: For cementitious materials, mix 1 part Portland cement and 1-1/2 to 2 parts lime. Use 1-1/2 to 3 parts aggregate per part of cementitious material.
 3. Masonry Cement Mix: 1 part masonry cement and 1-1/2 to 3 parts aggregate.
 4. Portland and Masonry Cement Mix: For cementitious materials, mix 1 part Portland cement and 1 part masonry cement. Use 1-1/2 to 3 parts aggregate per part of cementitious material.
 5. Plastic Cement Mix: 1 part plastic cement and 1-1/2 to 3 parts aggregate.
- F. Factory-Prepared Finish-Coat Mixes: For ready-mixed finish-coat plasters and acrylic-based finish coatings, comply with manufacturer's written instructions.

PART 81 EXECUTION

81.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

81.2 PREPARATION

- A. Protect adjacent work from soiling, spattering, moisture deterioration, and other harmful effects caused by plastering.
- B. Prepare solid substrates for plaster that are smooth or that do not have the suction capability required to bond with plaster according to ASTM C 926.

81.3 INSTALLATION, GENERAL

- A. Fire-Resistance-Rated Assemblies: Install components according to requirements for design designations from listing organization and publication indicated on Drawings.

81.4 INSTALLING METAL LATH

- A. Expanded-Metal Lath: Install according to ASTM C 1063.
 1. Partition Framing and Vertical Furring: Install flat diamond-mesh lath.
 2. Partition Framing and Vertical Furring: Install flat rib lath.
 3. Partition Framing and Vertical Furring: Install welded-wire lath.
 4. Partition Framing and Vertical Furring: Install woven-wire lath.
 5. Flat-Ceiling and Horizontal Framing: Install flat diamond-mesh lath.
 6. Flat-Ceiling and Horizontal Framing: Install flat rib lath.
 7. Flat-Ceiling and Horizontal Framing: Install 3/8-inch (9.5-mm) rib lath.
 8. Flat-Ceiling and Horizontal Framing: Install welded-wire lath.
 9. Flat-Ceiling and Horizontal Framing: Install woven-wire lath.
 10. Curved-Ceiling Framing: Install flat diamond-mesh lath.
 11. Curved-Ceiling Framing: Install welded-wire lath.
 12. Curved-Ceiling Framing: Install flat woven-wire lath.
 13. On Solid Surfaces, Not Otherwise Furred: Install self-furring, diamond-mesh lath.
 14. On Solid Surfaces, Not Otherwise Furred: Install self-furring, welded-wire lath.
 15. On Solid Surfaces, Not Otherwise Furred: Install self-furring, woven-wire lath.

81.5 INSTALLING WELDED WIRE LATH

- A. Installation per ESR 2017 - Fastener type and spacing as per ASTM C 1063 except that fasteners may attach the lath to framing supports either at the furring crimps on the vertical cross wire, at the intersection of the longitudinal wire and cross wire or any point along the longitudinal wires.
 - 1. Product: Structa Wire Corp. Structalath by ClarkDietrich Building Systems.

81.6 INSTALLING ACCESSORIES

- A. Install according to ASTM C 1063 and at locations indicated on Drawings.
- B. Reinforcement for External Corners:
 - 1. Install lath-type, external-corner reinforcement at exterior locations.
 - 2. Install corner bead at interior corner locations.
 - 3. Install corner bead at exterior corner locations.
- C. Control Joints:
 - 1. Install control joints at locations indicated on Drawings.

81.7 PLASTER APPLICATION

- A. General: Comply with ASTM C 926.
 - 1. Do not deviate more than plus or minus 1/4 inch in 10 feet (6.4 mm in 3 m) from a true plane in finished plaster surfaces, as measured by a 10-foot (3-m) straightedge placed on surface.
 - 2. Finish plaster flush with metal frames and other built-in metal items or accessories that act as a plaster ground unless otherwise indicated. Where casing bead does not terminate plaster at metal frame cut base coat free from metal frame before plaster sets and groove finish coat at junctures with metal.
 - 3. Provide plaster surfaces that are ready to receive field-applied finishes indicated.
- B. Bonding Compound: Apply on unit masonry and concrete plaster bases.
- C. Walls; Base-Coat Mixes for Use over Metal Lath: Scratch and brown coats for three-coat plasterwork; 3/4-inch (19-mm) thickness.
 - 1. Portland cement mixes.
 - 2. Plastic cement mixes.
 - 3. Portland and plastic cement mixes.
- D. Ceilings; Base-Coat Mixes for Use over Metal Lath: Scratch and brown coats for three-coat plasterwork; 1/2 inch (13 mm) thick and 3/4 inch (19 mm) thick on concrete.
 - 1. Portland cement mixes.
 - 2. Masonry cement mixes.
 - 3. Portland and masonry cement mixes.
 - 4. Plastic cement mixes.
 - 5. Portland and plastic cement mixes.
- E. Walls; Base-Coat Mix: Scratch coat for two-coat plasterwork, 3/8 inch (10 mm) thick on concrete masonry and 1/4 inch (6 mm) thick on concrete.
 - 1. Portland cement mixes.
 - 2. Masonry cement mixes.

3. Portland and masonry cement mixes.
 4. Plastic cement mixes.
 5. Portland and plastic cement mixes.
- F. Ceilings; Base-Coat Mix: Scratch coat for two-coat plasterwork, 1/4 inch (6 mm) thick on concrete.
1. Portland cement mixes.
 2. Masonry cement mixes.
 3. Portland and masonry cement mixes.
 4. Plastic cement mixes.
 5. Portland and plastic cement mixes.
- G. Plaster Finish Coats:
1. Apply to provide finish to match existing sample.
- H. Acrylic-Based Finish Coatings: Apply coating system, including primers, finish coats, and sealing topcoats, according to manufacturer's written instructions.
- I. Concealed Exterior Plasterwork: Where plaster application will be used as a base for adhered finishes, omit finish coat.
- J. Concealed Interior Plasterwork:
1. Where plaster application will be concealed behind built-in cabinets, similar furnishings, and equipment, apply finish coat.
 2. Where plaster application will be concealed above suspended ceilings and in similar locations, finish coat may be omitted.

81.8 PLASTER REPAIRS

- A. Repair or replace work to eliminate cracks, dents, blisters, buckles, crazing and check cracking, dry outs, efflorescence, sweat outs, and similar defects and where bond to substrate has failed.

81.9 PROTECTION

- A. Remove temporary protection and enclosure of other work. Promptly remove plaster from door frames, windows, and other surfaces not indicated to be plastered. Repair floors, walls, and other surfaces stained, marred, or otherwise damaged during plastering.

END OF SECTION

SECTION 09 30 00

TILE

PART 82 GENERAL

82.1 SECTION INCLUDES

- A. Tile and Accessories:
 - 1. Description.
 - 2. Floor Tile Material.

82.2 RELATED SECTIONS

- A. Section 09 31 00 – TILE AND STONE SETTING MATERIALS AND ACCESSORIES.

82.3 REFERENCES

- A. American National Standards Institute (ANSI):
 - 1. ANSI A108/A118/A136.1 - Specifications for the Installation of Ceramic Tile.
 - 2. ANSI A137.1 - Specifications for Ceramic Tile.
- B. American International (ASTM):
 - 1. ASTM C 144 - Standard Specification for Aggregate for Masonry Mortar.
 - 2. ASTM C 150 - Standard Specification for Portland Cement.
 - 3. ASTM C 207 - Standard Specification for Hydrated Lime for Masonry Purposes.
 - 4. ASTM C 1028 - Standard Test Method for Determining the Static Coefficient of Friction or Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull-Meter Method.
 - 5. ASTM D 4397 - Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications.
- C. Tile Council of North America (TCNA): TCA Handbook for Ceramic Tile Installation, 2007.

82.4 PERFORMANCE REQUIREMENTS

- A. Static Coefficient of Friction: Tile on walkway surfaces shall meet or exceed the following values as determined by testing in conformance with ASTM C 1028.
 - 1. Level Surfaces: Minimum of 0.6 (Wet).
 - 2. Step Treads: Minimum of 0.6 (Wet).
 - 3. Ramp Surfaces: Minimum of 0.8 (Wet).

82.5 SUBMITTALS

- A. Submit under provisions of Section 01 30 00 - Administrative Requirements.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- C. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, ceramic accessories, and setting details.
- D. Selection Samples: For each finish product specified, two full-size samples of the actual product, range of available color, and patterns.

- E. Verification Samples: For tile 8 by 8 inches (203 by 203 mm) and smaller, mount actual units on minimum 12 by 12 inch (305 by 305 mm) plywood panels and grout with selected grout. For larger tile, submit two units of each type, and grout chart indicating selections.
- F. Manufacturer's Certificates: Certify products meet or exceed specified requirements. When applicable, submit a Master Grade Certificate signed by the manufacturer and the installer certifying that products meet or exceed the specified requirements of ANSI A137.1.
- G. Maintenance Data: Include recommended cleaning methods, cleaning materials, and maintenance coatings.

82.6 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing the work of this section with minimum two years experience.
- B. Single Source Responsibility: Obtain each type and color of tile from a single source. Obtain each type and color of mortar, adhesive and grout from the same source.
- C. General: Provide tile that complies with ANSI A137.1 where applicable for types, compositions and other characteristics indicated. Provide tile in the locations and of the types colors and pattern indicated on the Drawings.
 - 1. Factory Blending: For tile exhibiting color variations within the ranges selected under Submittal of samples, blend tile in the factory and package so tile taken from one package shows the same range of colors as those taken from other packages.
 - 2. Mounting: For factory mounted tile, provide back or edge mounted tile assemblies as standard with the manufacturer, unless otherwise specified.
 - 3. Factory Applied Temporary Protective Coatings: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by precoating with a continuous film of petroleum paraffin wax applied hot. Do not coat unexposed tile surfaces.

82.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store products in manufacturer's unopened packaging until ready for installation.
- B. Protect setting materials from freezing or overheating in accordance with manufacturer's instructions.
- C. Store tile and setting materials on elevated platforms, under cover and in a dry location and protect from contamination, dampness, freezing or overheating.

82.8 PROJECT CONDITIONS

- A. Do not install adhesives in an unventilated environment.
- B. Maintain ambient and substrate temperature of 50 degrees F (10 degrees C) during tiling and for a minimum of 7 days after completion.

82.9 EXTRA MATERIALS

- A. See Section 01600 - Product Requirements, for additional provisions.
- B. Deliver extra sets of hardware items for Owner's use in maintenance.
 - 1. Provide for Owner's use a minimum of 2 percent of the primary sizes and colors of tile specified, boxed and clearly labeled.

PART 83 PRODUCTS

83.1 MANUFACTURERS

- A. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

83.2 TILE

1. Non-Skid Tile for Exterior as specified by the Architect.
2. Porcelain Tile for Interior Public Bathrooms as specified by architectural drawings:
PARVATILE Porcelain Tile - Cool Gray
18" x 18", Glazed Slip Resistant, PEI - 4
Model - PEYTON
3. Porcelain Tile for Interior Apartments as specified by architectural drawings:
MARAZZI Porcelain Tile - Cool Gray Limestone
12" x 24", Glazed Slip Resistant, PEI - 3
Model – AUTHENTICA FOG

83.3 TILE SETTING MATERIALS

- A. Tile Setting Materials: Comply with ANSI A108/A118/A136.1 as applicable to the installation methods referenced in Part 3 of this Section.
- B. Patching and Leveling Compound: As recommended by tile manufacturer and compatible with both substrate and setting materials.

PART 84 EXECUTION

84.1 EXAMINATION

- A. Acceptability of Surfaces: Inspect surfaces to be tiled to ensure proper bonding can be achieved, and to verify that surfaces are free of curing membranes, oil, grease, wax and dust.
- B. Substrate Tolerances: Before tiling, inspect surfaces to be tiled to verify that the following tolerances are not exceeded. If tolerances are exceeded, provide specified leveling coat to achieve specified tolerances.
 1. Walls: 1/8 inch in 8 feet (3 mm in 2.4 m) for dry-set mortar, epoxy and organic adhesives.
 2. Floors: 1/8 inch in 10 feet (3 mm in 3 m) for dry-set mortar and epoxy; 1/16 inch in 3 feet (1.5 mm in 1 m) for organic adhesive.

84.2 PREPARATION

- A. Layout: Determine locations of control and expansion joints before starting tile work. Layout tile work to minimize cuts less than one-half tile in size.

84.3 INSTALLATION

- A. General: Comply with ANSI A108/A118/A136.1 and manufacturer's recommendations. Comply with applicable TCA Handbook for Tile Installation requirements as listed below.
- B. Floors, Exterior, Roof:
 1. TCA F104, thin-set, which is applied over leveling grout and a previously applied Vulkem 450 primer. (see product book for specifications, manufacturer's instructions and detail drawings for Vulkem application).
- C. Floors, Interior, Concrete Subfloor:

1. TCA F113, dry-set mortar.
2. TCA F113, latex-Portland cement mortar.

84.4 CLEANING AND PROTECTION

- A. Cleaning: Clean tile within time period recommended by manufacturer, using materials recommended by manufacturer.
- B. Protection: Prohibit foot and wheeled traffic from floors for a minimum of 3 days. Where traffic is unavoidable, provide large flat boards in walkways and wheelways for a minimum of 7 days after installation. Protect from construction dirt and debris with heavy-duty, non-staining construction paper, masked in place.

END OF SECTION

SECTION 09 31 00

TILE AND STONE SETTING MATERIALS AND ACCESSORIES

PART 85 GENERAL

85.1 SECTION INCLUDES

- A. Setting materials.
- B. Grout materials.

85.2 RELATED SECTIONS

- A. Section 09 30 00 - Tiling.
- B. 03 54 00 - Underlayment

85.3 REFERENCES

- A. ANSI A108 Series/A118 Series - American National Standards for Installation of Ceramic Tile.
- B. ANSI A136.1 - American National Standard for Organic Adhesives for Installation of Ceramic Tile.
- C. ASTM C 144 - Standard Specification for Aggregate for Masonry Mortar.
- D. ASTM C 150 - Standard Specification for Portland Cement.
- E. TCNA (HB) - Handbook for Ceramic Tile Installation; Tile Council of North America.
- F. ISO 13007 - International Standards Organization; classification for Grout and Adhesives.

85.4 SUBMITTALS

- A. Submit under provisions of Section 01 30 00 - Administrative Requirements.
- B. Product Data: Manufacturer's technical information for each product specified.
- C. Samples: Color charts for selection of grout.
- D. Installation Instructions: Manufacturer's printed instructions for each product.

85.5 QUALITY ASSURANCE

- A. Provide cleaners, sealing and maintenance products as well as tile grout, setting materials, additives, and factory-prepared dry-set mortars from the same manufacturer.

85.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Prevent damage or contamination to materials by water, freezing, foreign matter or other causes.
- B. Do not use frozen materials unless specifically allowed by manufacturer.
- C. Deliver and store materials on site at least 24 hours before work begins.
- D. Provide heated and dry storage facilities on site.

85.7 PROJECT CONDITIONS

- A. Maintain environmental conditions and protect work during and after installation to comply with referenced standards and manufacturer's printed recommendations.
- B. Vent temporary heaters to exterior to prevent damage to tilework from carbon dioxide build-up.
- C. Maintain temperatures at not less than 50 deg F (10 deg C) in tiled areas during installation and for 7 days after completion, unless higher temperatures are required by referenced installation standards or manufacturer's written instructions.

PART 86 PRODUCTS

86.1 MANUFACTURERS

- A. Acceptable Manufacturer: Laticrete Inc.,
One LATICRETE Park North Bethany, CT 06524-3423, USA
Tel. 1.800.243.4788, 1.203.393.0010
- B. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

86.2 SETTING MATERIALS

- A. Laticrete 254 Platinum
See product book for specifications and installation instructions.

86.3 GROUT MATERIALS.

- A. Grout:
 - 1. See product book for specifications and installation instructions.
 - 2. To be selected by the Architect from the manufacturer's available color options.

86.4 MIXES

- A. Proportion and mix materials in accordance with manufacturer's most current written instructions and applicable ANSI standards.

PART 87 EXECUTION

87.1 EXAMINATION

- A. Examine surfaces to receive tilework and conditions under which tile will be installed.
- B. Do not proceed with tilework until surfaces and conditions comply with requirements indicated in reference tile installation standard and manufacturer's printed instructions.

87.2 INSTALLATION

- A. Install tile in accordance with manufacturer's printed instructions and the applicable requirements of ANSI A108 Series for the materials being used to match existing tile as close as possible.
- B. Apply tile and grout cleaners, sealers and maintenance products in accordance with manufacturer's printed instructions and technical data sheets.

87.3 GROUTING

- A. Grout joints in accordance with manufacturer's instructions and ANSI A108.10.
- B. Remove standing water, dust, and foreign substances from joints to be grouted.
- C. Clean and dry tile surfaces.
- D. After grouting, remove all grout residue promptly.

87.4 PROTECTION

- A. Floors: Protect from all traffic for at least 72 hours after installation.
 - 1. Do not step on floor for at least 24 hours; if traffic is unavoidable after that, use plywood stepping boards.
 - 2. Protect from heavy traffic for at least 7 days after installation.
 - 3. When fast-setting materials are used to allow faster occupancy, comply with the manufacturer's recommendations.
- B. Walls: Protect from impact, vibration and heavy hammering on adjacent and opposite walls for at

least 14 days after installation, unless manufacturer's instructions allow a shorter period.

- C. Protect from food products and chemicals which can cause staining for at least 14 days.
- D. Protect from total water immersion for at least 21 days after installation.

END OF SECTION

SECTION 10 21 13
TOILET COMPARTMENTS

PART 88 GENERAL

88.1 SECTION INCLUDES

- A. Compact Laminate (CL/Solid Phenolic), Moisture Resistant Substrate: (Bobrick DuraLineSeries).
 - 1. Toilet partitions.
 - 2. Urinal privacy screens.
 - 3. Dressing compartments.
 - 4. Shower dividers.

88.2 RELATED SECTIONS

- A. Section 05 50 00 - Metal Fabrications.
- B. Section 06 10 00 - Rough Carpentry.
- C. Section 09 30 00 - Tiling.

88.3 SUBMITTALS

- A. Submit under provisions of Section 01 30 00 - Administrative Requirements.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- C. USA Certificate of Origin: Manufacturer shall supply with first submittal, an example of their Certificate of Origin declaring toilet compartments are wholly manufactured and assembled specifically in the United States, including city and state locations. A notarized Certificate of Origin shall be provided with closeout documents.
- D. Shop Drawings: Submit manufacturer's shop drawings for each product specified, including the following:
 - 1. Plans, elevations, details of construction and attachment to adjacent construction.
 - 2. Show anchorage locations and accessory items.
 - 3. Verify dimensions with field measurements prior to final production of toilet compartments.

88.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Minimum 10 year experience manufacturing similar products.
- B. Installer Qualifications: Minimum 2 year experience installing similar products.
- C. Single Source Requirements: To the greatest extent possible provide products from a single manufacturer.
- D. Accessibility Requirements: Comply with requirements applicable in the jurisdiction of the project, including but not limited to ADA and ICC/ANSI A117.1 requirements as applicable.

88.5 PRE-INSTALLATION MEETINGS

- A. Convene minimum two weeks prior to starting work of this section.

88.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store products in manufacturer's unopened packaging bearing the brand name and

manufacturer's identification until ready for installation.

- B. Handling: Handle materials to avoid damage.

88.7 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

88.8 SEQUENCING

- A. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

88.9 WARRANTY

- A. Manufacturer's Warranty for DuraLine Series: Manufacturer's standard 25 year limited warranty for panels, doors, and stiles against breakage, corrosion, delamination, and defects in factory workmanship. Manufacturer's standard 1 year guarantee against defects in material and workmanship for stainless steel door hardware and mounting brackets.

PART 89 PRODUCTS

89.1 MANUFACTURERS

- A. Acceptable Manufacturer: Bobrick Washroom Equipment, Inc., which is located at: 6901 Tujunga Ave.; North Hollywood, CA 91605-6213; Tel: 818-764-1000; Fax: 818-765-2700; Email:info@bobrick.com; Web:www.bobrick.com
- B. Basis of Design Products: Based on the quality and performance requirements of the project, specifications are based solely on the products of Bobrick Washroom Equipment, Inc. www.bobrick.com. Location of manufacturing shall be the United States.
- C. Substitutions: The Architect will consider products of comparable manufacturers as a substitution, pending the Contractor's submission of adequate documentation of the substitution in accordance with procedures in Division 1 of the Project Manual. Documentation shall include a list of five similar projects of equivalent size where products have been installed for a minimum of two years, and manufacturer's certification that products are fabricated in the United States.

89.2 COMPACT LAMINATE (SOLID PHENOLIC), MOISTURE RESISTANT SUBSTRATE (DuraLine Series)

- A. Compact Laminate (Solid Phenolic) Toilet Partitions: Bobrick DuraLine Series.
 1. Design Type::
 - a. Standard Height.
 - 1) Door/Panel Height: 58 inches (147 cm).
 - 2) Floor Clearance: 12 inches (30 cm).
 - b. Maximum Height.
 - 1) Door/Panel Height: 72 inches (183 cm).
 - 2) Floor Clearance: 4-5/16 inches (11 cm).
 - 3) Panels: Up to 72 inches (183 cm) wide, one piece. Splice or two panels joined by bracket not acceptable.
 2. Mounting Configuration:

- a. Floor-mounted.
 - 1) Stile Standard Height: 69 inches (175 cm); Maximum Height: 75-5/16 inches (194 cm).
- b. Floor-mounted, overhead-braced with satin finish, extruded anodized aluminum headrails, 0.065 inch (1.65 mm) thick with anti-grip profile.
 - 1) Stile Maximum Height: 83 inches (211 cm).
- c. Floor-to-ceiling.
 - 1) Stile Standard Height: As required, 10 feet 0 inches (305 cm) maximum.
- B. Compact Laminate (Solid Phenolic) Urinal Screens: Bobrick DuraLine Series.
 - 1. Mounting Configuration:
 - a. Wall-hung.
 - 1) Screen Height: 42 inches (107 cm) with 18 inches (46 cm) floor clearance.
- C. Materials: Solidly fused plastic laminate with matte-finish melamine surfaces; integrally bonded colored face sheets and black phenolic-resin core.
- D. Edges: Black; brown edges not acceptable.
- E. Color:
 - 1. Color: S-542 Limousine Grey.
- F. Fire Resistance:
 - 1. National Fire Protection Association/International Building Code Interior Wall and Ceiling Finish: Class B / Uniform Building Code: Class II.
 - a. Flame Spread Index (ASTM E 84): 30 for panels and stiles.
 - b. Smoke Developed Index (ASTM E 84): 55 for panels, 20 for stiles.
 - 2. National Fire Protection Association/International Building Code Interior Wall and Ceiling Finish: Class A / Uniform Building Code: Class I.
 - a. Flame Spread Index (ASTM E 84): 15-25 for panels, stiles and doors.
 - b. Smoke Developed Index (ASTM E 84): 25 - 105 for panels, 20-90 for stiles.
- G. Finished Thickness:
 - 1. Stiles and Doors: 3/4 inch (19 mm).
 - 2. Panels and Screens: 1/2 inch (13 mm).
- H. Stiles: Floor-anchored stiles furnished with expansion shields and threaded rods.
 - 1. Leveling Devices: 7 gauge, 3/16 inches (5 mm) thick, corrosion-resistant, chromate-treated, double zinc-plated steel angle leveling bar bolted to stile; furnished with 3/8 inch (10 mm) diameter threaded rods, hex nuts, lock washers, flat washers, spacer sleeves, expansion anchors, and shoe retainers.
 - 2. Stile Shoes: One-piece, 22 gauge (0.8 mm), 18-8, Type 304 stainless steel, 4 inch (102 mm) height; tops with 90 degree return to stile. One-piece shoe capable of adapting to 3/4 inch (19 mm) or 1 inch (25 mm) stile thickness and capable of being fastened (by clip) to stiles starting at wall line.
- I. Anchors: Expansion shields and threaded rods at floor connections as applicable. Threaded rods

secured to supports above ceiling as applicable. Supports above ceiling furnished and installed as Work of Section 05 50 00 - Metal Fabrications.

J. Hardware:

1. Compliance: Operating force of less than 5 lb (2.25 kg).
2. Emergency Access: Hinges, latch allow door to be lifted over keeper from outside compartment on inswing doors.
3. Materials: 18-8, Type 304, heavy-gauge stainless steel with satin finish.
4. Doorstops: Prevents inswinging doors from swinging out beyond stile; on outswing doors, doorstop prevents door from swinging in beyond stile.
5. Fastening: Hardware is secured to door and stile with pin-in-head Torx stainless steel machine screws. Hinges, latch and optional door stops secured to door with pin-in-head Torx stainless steel machine screws into factory-installed, threaded brass inserts. Fasteners for hinges, latch and optional door stops secured directly into core not acceptable.
 - a. Threaded Brass Inserts: Factory-installed; withstand direct pull force exceeding 1500 lb (680 kg) per insert.
6. Clothes Hooks: Projecting no more than 1-1/8 inch (29 mm) from face of door.
7. Door Latch: Track of door latch prevents inswing doors from swinging out beyond stile; on outswing doors, door keeper prevents door from swinging in beyond stile; 16 gauge (1.6 mm) sliding door latch, 14 gauge (2 mm) keeper.
8. Locking: Door locked from inside by sliding door latch into keeper.
9. Hinge Type:
 - a. Standard.
 - 1) Balanced, with field-adjustable cam to permit door to be fully closed or partially open when compartment is unoccupied.
10. Mounting Brackets:
 - a. Standard concealed.
 - 1) Mounting Brackets: Mounted inside compartment; exposed brackets on exterior of compartment not acceptable with the exception of outswing doors.

PART 90 PRODUCTS

90.1 PREPARATION

- A. Prepare substrates including but not limited to blocking and supports in walls and ceilings at points of attachment using methods recommended by the manufacturer for achieving the best result for the substrates under the project conditions.
 1. Inspect areas scheduled to receive compartments for correct dimensions, plumbness of walls, and soundness of surfaces that would affect installation of mounting brackets.
 2. Verify spacing of plumbing fixtures to assure compatibility with installation of compartments.
- B. If preparation is the responsibility of another installer, notify Architect in writing of deviations from manufacturer's recommended installation tolerances and conditions.
- C. Do not proceed with installation until substrates have been properly prepared with blocking and

supports in walls and ceilings at points of attachment and deviations from manufacturer's recommended tolerances are corrected. Commencement of installation constitutes acceptance of conditions.

90.2 INSTALLATION

- A. Install products in strict compliance with manufacturer's written instructions and recommendations, including the following:
 - 1. Verify blocking and supports in walls and ceilings has been installed properly at points of attachment.
 - 2. Verify location does not interfere with door swings or use of fixtures.
 - 3. Use fasteners and anchors suitable for substrate and project conditions
 - 4. Install units rigid, straight, plumb, and level.
 - 5. Conceal evidence of drilling, cutting, and fitting to room finish.
 - 6. Test for proper operation.

90.3 ADJUSTING, CLEANING AND PROTECTION

- A. Adjust hardware for proper operation after installation. Set hinge cam on in-swinging doors to hold doors open when unlatched. Set hinge cam on out-swinging doors to hold unlatched doors in closed position.
- B. Touch-up, repair or replace damaged products.
- C. Clean exposed surfaces of compartments, hardware, and fittings.

END OF SECTION

SECTION 12 36 00
COUNTERTOPS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies casework countertops with integral accessories.
- B. Integral accessories include:
 - 1. Sinks with traps and drains.
 - 4. Electrical Receptacles.

1.2 RELATED WORK

- A. Color and patterns of plastic laminate: SECTION 09 06 00, SCHEDULE FOR FINISHES.
- B. DIVISION 22, PLUMBING.
- C. DIVISION 26, ELECTRICAL.
- D. Equipment Reference Manual for SECTION 12 36 00, COUNTERTOPS.

1.3 SUBMITTALS

- A. Submit in accordance with SECTION 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings
 - 1. Show dimensions of section and method of assembly.
 - 2. Show details of construction at a scale of ½ inch to a foot.
- C. Samples:
 - 1. 150 mm (6 inch) square samples each top.
 - 2. Front edge, back splash, end splash and core with surface material and booking.

1.4 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only.
- B. American Hardboard Association (AHA):
 - A135.4-95.....Basic Hardboard
- C. Composite Panel Association (CPA):
 - A208.1-09.....Particleboard
- D. American Society of Mechanical Engineers (ASME):
 - A112.18.1-12.....Plumbing Supply Fittings
 - A112.1.2-12.....Air Gaps in Plumbing System
 - D256-10.....Pendulum Impact Resistance of Plastic
 - D570-98(R2005).....Water Absorption of Plastics
 - D638-10.....Tensile Properties of Plastics
 - D785-08.....Rockwell Hardness of Plastics and Electrical Insulating Materials
 - D790-10.....Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
 - D4690-99(2005).....Urea-Formaldehyde Resin Adhesives
- F. Federal Specifications (FS):

- A-A-1936Adhesive, Contact, Neoprene Rubber
- G. U.S. Department of Commerce, Product Standards (PS):
 PS 1-95.....Construction and Industrial Plywood
- H. National Electrical Manufacturers Association (NEMA):
 LD 3-05.....High Pressure Decorative Laminates

PART 2 - PRODUCTS

2.1 MATERIALS

A. Plastic Laminate: NEMA LD 3.

1. Concealed backing sheet Type BKL.
2. Decorative surfaces:
 - a. Flat components: Type GP-HGL.
 - b. Post forming: Type PF-HGP.
3. Chemical Resistant Surfaces
 - a. Flat components: Type GP-HGL.
 - b. Post forming: Type PF-HGP.
 - c. Resistance to reagents:
 - 1) Test with five 0.25 mil drops remaining on surface for 16 hours followed by washing off with tap water, then cleaned with liquid soap and water, dried with soft cotton cloth and then cleaned with naphtha.
 - 2) No change in color, surface texture, and original protectability remaining from test results of following reagents:

98% Acetic Acid	Butyl Alcohol	Acetone
90% Formic Acid--	Benzine	Chloroform
28% Ammonium Hydroxide	Xylene	Carbon Tetrachloride
Zinc Chloride (Sat.)	Toluene	Cresol
Sodium Carbonate (Sat.)	Gasoline	Ether
Calcium Hypochlorite (Sat.)	Kerosene	Cottonseed Oil
Sodium Chloride (Sat.)	Mineral Oil	40% Formaldehyde
Methyl Alcohol	Ethyl Acetate	Trichlorethylene
Ethyl Alcohol	Amyl Acetate	Monochlorobenzine
 - 3) Superficial effects only: Slight color change, spot, or residue only with original protectability remaining from test results of following reagents:

77% Sulfuric Acid	37% Hydrochloric Acid	85% Phenol
33% Sulfuric Acid	20% Nitric Acid	Furfural
85% Phosphoric Acid	30% Nitric Acid	Dioxane
- 4) Minimum height of impact resistance: 300 mm (12 inches).

B. Adhesive

1. For plastic laminate FS A-A-1936.
2. For wood products: ASTM D4690, un-extended urea resin or un-extended melamine resin, phenol resin, or resorcinol resin.
3. For Field Joints:
 - a. Epoxy type, resistant to chemicals as specified for plastic laminate laboratory surfaces.
 - b. Fungi resistant: ASTM G-21, rating of 0.

C. Fasteners:

1. Use studs, bolts, spacers, threaded rods with nuts or screws suitable for materials being joined with metal splice plates, channels or other supporting shape.

L. Laminar Flow Control Device

1. Smooth bright stainless steel or satin finish, chrome plated metal laminar flow device shall provide non-aeration, clear, coherent laminar flow that will not splash in basin. Device shall also have a flow control restrictor and have vandal resistant housing.
2. Flow Control Restrictor:
 - a. Capable of restricting flow of 7.5 to 8.5 Lpm (2.0 to 2.2 gpm) for sinks provided in paragraph 2.2D.
 - b. Compensates for pressure fluctuation maintaining flow rate specified above within 10 percent between 175 and 550 kPa (25 and 80 psi).
 - c. Operates by expansion and contraction, eliminates mineral/sediment building up with self clearing action, and is capable of easy manual cleaning.

2.2 SINKS

B. Stainless Steel:

1. ANSI/ASME A112.19.3, Type 304.
2. As specified in Product Book.
3. Self rim for plastic laminate or similar tops with concealed fasteners.
4. Ledge back or ledge sides with holes to receive required fixtures when mounted on countertop.
5. Apply fire resistant sound deadening material to underside.

2.3 TRAPS AND FITTINGS

A. Material as specified in DIVISION 22, PLUMBING.

C. For Stainless Steel Sinks:

1. Stainless steel P-traps and drain fittings; ASME A112.18.1
2. Flat strainer, except where cup strainer or overflow standpipe specified.
 - a. Provide cup strainer in cabinet type 1B.
 - b. Provide stainless steel overflow stand pipe to within 38 mm (1-1/2 inches) of sink rim.
3. Exposed surface chromium plated finish.

E. Air Gap Fittings: ASME A112.1.2.

2.4 WATER FAUCETS

- A. ASME A112.18.1.
 - 1. As specified in Product Book.

2.7 ELECTRICAL RECEPTACLES

- A. Hospital grade per electrical specifications.
- B. Curb Mounted Receptacles:
 - 1. NEMA 5-20R duplex in galvanized steel box.
 - 2. Chromium plated brass or steel face plate.
- C. Pedestal Mounted Receptacles:
 - 1. NEMA 5-20R duplex installed in double faces.
 - 2. Polished stainless steel or aluminum, or chromium plated brass pedestal.
- G. Indicating light assembly
 - 1. Mounted on the Control Unit Front.
 - 2. Red lens and high brightness neon glow type lamp with resistor suitably for 25,000 hours average life.
- H. Fuses and Circuit Breakers:
 - 1. Easily accessible from front of cabinet.
 - 2. Do not locate at back of storage or where articles can be stored in the front.
- I. Range and Control Units Concealed Surfaces:
 - 1. Made of materials suitable for the intended use.
 - 2. Low carbon steel galvanized or other suitable corrosion resistant finish.
 - 3. Provide a solid 1.5 mm (0.0598 inch) thick sheet steel barrier below the unit, located a minimum of nine inches below the unit top.

2.10 COUNTERTOPS

- A. Fabricate in largest sections practicable.
- B. Fabricate with joints flush on top surface.
- C. Fabricate countertops to overhang front of cabinets and end of assemblies 25 mm (one inch) except where against walls or cabinets.
- D. Provide 1 mm (0.039 inch) thick metal plate connectors or fastening devices (except epoxy resin tops).
- E. Join edges in a chemical resistant waterproof cement or epoxy cement, except weld metal tops.
- F. Fabricate with end splashes where against walls or cabinets.
- G. Splash Backs and End Splashes:
 - 1. Not less than 19 mm (3/4 inch) thick.
 - 2. Height 100 mm (4 inches) unless noted otherwise.
 - 3. Laboratories and pharmacy heights or where fixtures or outlets occur: Not less than 150 mm (6 inches) unless noted otherwise.
 - 4. Fabricate epoxy splash back in maximum lengths practical of the same material.

- H. Drill or cutout for sinks, and penetrations.
 - 1. Accurately cut for size of penetration.
 - 2. Cutout for VL 81 photographic enlarger cabinet.
 - a. Finish cutout to fit flush with vertical side of cabinet, allowing adjustable shelf to fit into cutout space of cabinet at counter top level. Finish cutout surface as an exposed edge.
 - b. Provide braces under enlarger space to support not less than 45 kg (100 pounds) centered on opening side along backsplash.
- I. Plastic Laminate Countertops:
 - 1. As specified in Product Book.
 - 1. Fabricate plastic laminate on five-ply plywood or particleboard core 19 mm (3/4 inch) thick with plastic laminate backing sheet.
 - 2. Front edge over cabinets not less than 38 mm (1-1/2 inches) thick except where plastic "T" insert is used, not less than 19 mm (3/4 inch) thick.
 - 3. Exposed Surface and edges of decorative laminated plastic or laboratory chemical resistant surface.
 - a. Use chemical resistant surface on tops 6A, 6B, and 6C.
 - b. Use decorative surface tops when noted plastic laminate, for tops 10A, 10B and 10C.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Before installing countertops verify that wall surfaces have been finished as specified and that mechanical and electrical service locations are as required.
- B. Secure countertops to supporting rails of cabinets with metal fastening devices, or screws through pierced slots in rails.
 - 1. Where type, size or spacing of fastenings is not shown or specified, submit shop drawings showing proposed fastenings and method of installation.
 - 2. Use round head bolts or screws.
 - 3. Use epoxy or silicone to fasten the epoxy resin countertops to the cabinets.
 - 4. Use wood or sheet metal screws for wood or plastic laminate tops; minimum penetration into top 16 mm (5/8 inch), screw size No 8, or 10.
- C. Sinks
 - 1. Install stainless steel sink in plastic laminate tops with epoxy compound to form watertight seal under shelf rim.
 - a. In laboratory and pharmacy fit stainless steel sink with overflow standpipe.
 - b. Install faucets and fittings on sink ledges with watertight seals where shown.
 - 2. Install molded resin sinks with epoxy compound to form watertight seal with underside of molded resin top.
 - a. Install sink with not less than two channel supports with threaded rods and nuts at each end, expansion bolted to molded resin top.
 - b. Design support for a twice the full sink weight.

- c. Install with overflow standpipes.
- 3. Install methyl methacrylic polymer sinks in manufacturers recommended adhesive sealer or epoxy compound to underside of methyl methacrylic polymer countertop.
 - a. Bolt or screw to countertop to prevent separation of bowl and fracture of adhesive sealant joint.
 - b. Install drain and traps to sink.
- D. Faucets, Fixtures, and Outlets:
 - 1. Seal opening between fixture and top.
 - 2. Secure to top with manufacturers standard fittings.

3.2 PROTECTION AND CLEANING

- A. Tightly cover and protect against dirt, water, and chemical or mechanical injury.
- B. Clean at completion of work.

END OF SECTION

SECTION 14 20 40
HYDRAULIC ELEVATORS

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section specifies hydraulic elevators.

- B. Work Required:
 - 1. The work required under this section consists of all labor, materials and services required for the complete installation (including operational verification) of all the equipment required for the elevator(s) as herein specified.
 - 2. All work shall be performed in a first class, safe and workmanlike manner.
 - 3. In all cases where a device or part of the equipment is herein referred to in the singular, it is intended that such reference shall apply to as many of such devices or parts as are required to make complete installation.

- C. Related work not specified herein: The following sections contain requirements that relate to this section and are performed by trades other than the elevator manufacturer/installer.
 - 1. Section 01 50 00 - Construction Facilities and Temporary Controls: protection of floor openings and personnel barriers; temporary power and lighting.
 - 2. Section 03 03 00 - Cast-In-Place Concrete: elevator pit, elevator motor and pump foundation, and grouting thresholds.
 - 3. Section 04 20 00 - Unit Masonry: masonry hoistway enclosure, building-in and grouting hoistway door frames, grouting thresholds.
 - 4. Section 05 50 00 - Metal Fabrications: pit ladder, divider beams, support for entrances and rails, hoisting beam at top of hoistway.
 - 5. Section 16 10 00 - Electrical:
 - a. Main disconnects for each elevator.
 - b. Electrical power for elevator installation and testing.
 - c. Disconnecting device to elevator equipment prior to activation of sprinkler system.
 - d. The installation of dedicated GFCI receptacles in the pit and overhead.
 - e. Lighting in controller area, machine area and pit.
 - f. Wiring for telephone service to controller.
 - 6. Section 16 72 00 - Fire Alarm Systems: fire and smoke detectors and interconnecting devices; fire alarm signal lines to contacts in the machine area.
 - 7. Section 16 74 00 - Telephone Systems: ADAAG-required emergency communications equipment.

- D. Applicable Codes: Comply with applicable building and elevator codes at the project site, including but not limited to the following:
1. ANSI A117.1, Buildings and Facilities, Providing Accessibility and Usability for Physically Handicapped People.
 2. ADAAG, Americans with Disabilities Act Accessibility Guidelines.
 3. ANSI/NFPA 70, National Electrical Code.
 4. ANSI/NFPA 80, Fire Doors and Windows.
 5. ASME/ANSI A17.7, Safety Code for Elevators and Escalators.
 6. ANSI/UL 10B, Fire Tests of Door Assemblies.
 7. CAN/CSA C22.1, Canadian Electrical Code.
 8. CAN/CSA-B44, Safety Code for Elevators and Escalators.
 9. EN 12016 (May 1998): "EMC Product Family Standards for lifts, escalators, and passenger conveyors Part 2 – immunity"
 10. Local Building Codes.
 11. All other local applicable codes.

1.02 SYSTEM DESCRIPTION

- A. Equipment Description: Holeless Hydraulic elevator with Machine-Room Less application
- B. Equipment Control: Elevonic® Control System.
- C. Quantity of Elevators: 1
- D. Elevator Stop Designations: 1,2,3
- E. Stops: 3
- F. Openings: 3 at Front, 0 at Rear.
- G. Travel: 24 ft 0 in 0
- H. Rated Capacity: 2100 lbs
- I. Rated Speed: 100 fpm
- J. Platform Size: 5' 9-1/2" wide x 4' 11-1/8" deep
- K. Clear Inside Dimensions: 5' 9 1/2" x 4' 4 1/8"
- L. Cab Height: 7' 9"
- M. Clear Cab Height: 7'-9" with 5/16" floor recess and Structural ceiling
- N. Entrance Type and Width: Entrance Type and Width: Single Slide; 3' 0"
- O. Entrance Height: 7' 0"
- P. Main Power Supply: 480 Volts, 3-Phase, 60Hz + or - 5% of normal, three-Phase, with a separate equipment grounding conductor.
- Q. Car Lighting Power Supply: 120 Volts, Single-phase, 15 Amp, 60 Hz.
- R. Machine and Controller Location: No machine-room required, tank and controller in hoistway pit.
- S. Signal Fixtures: Manufacturer's standard with stainless steel metal button targets (exc. CA).

- T. Controller Location: Inside hoistway, accessible by a door in the right side hoistway wall on the 1st or 2nd landing. (1st landing only if rear entrance)
- U. Stopping Accuracy: $\pm 1/4"$ (6.4 mm) under any loading condition or direction of travel.
- V. Operation: Simplex Collective Operation- Using a microprocessor-based controller, operation shall be automatic by means of the car and hall buttons. If all calls in the system have been answered, the car shall park at the last landing served.
- W. Operating Features – Standard
1. Full Collective Operation
 2. Anti-nuisance.
 3. Fan and Light Protection.
 4. Load Weighing Bypass.
 5. Independent Service.
 6. Full Collective Operation.
 7. Firefighters' Service Phase I and Phase II
 8. Top of Car Inspection.
- X. Operation Features – Optional
- 1. Zoned Access at Bottom Landing.**
 - 2. Automatic Standby Power Operation with Manual Override.**
- Y. Door Control Features:
1. Door control to open doors automatically when car arrives at a landing in response to a normal hall or car call.
 2. Elevator doors shall be provided with a reopening device that will stop and reopen the car door(s) and hoistway door(s) automatically should the door(s) become obstructed by an object or person.
Door protection shall consist of a two-dimensional, multi-beam array projecting across the car door opening.
 3. Door nudging operation to occur if doors are prevented from closing for an adjustable period of time.
- Z. Provide equipment according to seismic zone: Zone 4

1.03 SUBMITTALS

- A. Product Data: Submit manufacturer's product data for each system proposed for use. Include the following:
1. Signal and operating fixtures, operating panels and indicators.
 2. Cab design, dimensions and layout.
 3. Hoistway-door and frame details.
 4. Electrical characteristics and connection requirements.
 5. Expected heat dissipation of elevator equipment in hoistway (BTU).

6. Color selection chart for Cab and Entrances.
- B. Shop Drawings: Submit approval layout drawings. Include the following:
1. Car, guide rails, buffers and other components in hoistway.
 2. Maximum rail bracket spacing.
 3. Maximum loads imposed on guide rails requiring load transfer to building structure.
 4. Clearances and travel of car.
 5. Clear inside hoistway and pit dimensions.
 6. Location and sizes of access doors, hoistway entrances and frames.
- C. Operations and Maintenance Manuals: Provide manufacturer's standard operations and maintenance manual.

1.04 QUALITY ASSURANCE

- A. Manufacturer: Elevator manufacturer shall be ISO 9001 certified.
- B. Installer: Elevators shall be installed by the manufacturer.
- C. Permits, Inspections and Certificates: The Elevator Contractor shall obtain and pay for necessary Municipal or State Inspection and permit as required by the elevator inspection authority, and make such tests as are called for by the regulations or such authorities. These tests shall be made in the presence of such authorities or their authorized representatives.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Should the building or the site not be prepared to receive the elevator equipment at the agreed upon date, the General Contractor will be responsible to provide a proper and suitable storage area on or off the premises.
- Should the storage area be off-site and the equipment not yet delivered, then the elevator contractor, upon notification from the General Contractor, will divert the elevator equipment to the storage area. If the equipment has already been delivered to the site, then the General Contractor shall transport the elevator equipment to the storage area. The cost of elevator equipment taken to storage by either party, storage, and redeliver to the job site shall not be at the expense of the elevator contractor.

1.06 WARRANTY

- A. The elevator contractor's acceptance is conditional on the understanding that their warranty covers defective material and workmanship. The warranty period shall not extend longer than

one (1) year from the date of completion or acceptance thereof by beneficial use, whichever is earlier, of each elevator. The warranty excludes: ordinary wear and tear, improper use, vandalism, abuse, misuse, or neglect or any other causes beyond the control of the elevator contractor and this express warranty is in lieu of all other warranties, express or implied, including any warranty of merchantability or fitness for a particular purpose.

1.07 MAINTENANCE and SERVICE

- A. Maintenance service consisting of regular examinations and adjustments of the elevator equipment shall be provided by the elevator contractor for a period of 12 Months after the elevator has been turned over for the customer's use. This service shall not be subcontracted but shall be performed by the elevator contractor. All work shall be performed by competent employees during regular working hours of regular working days. This service shall not cover adjustments, repairs or replacement of parts due to negligence, misuse, abuse or accidents caused by persons other than the elevator contractor. Only genuine parts and supplies as used in the manufacture and installation of the original equipment shall be provided.
- B. The elevator control system must:
- 1) Provide in the controller the necessary devices to run the elevator on inspection operation.
 - 2) Provide on top of the car the necessary devices to run the elevator in inspection operation.
 - 3) Provide in the controller an emergency stop switch. This emergency stop switch when opened disconnects power from the brake and prevents the motor from running.
 - 4) **[Optional]** Provide the means from the controller to reset elevator earthquake operation.
- C. Provide system capabilities to enable a remote expert to create a live, interactive connection with the elevator system to enable the following functions:
1. Remotely diagnose elevator issues with a remote team of experts
 2. Remotely return an elevator to service
 3. Provide real-time status updates via email
 4. Remotely make changes to selected elevator functions including:
 - a. Control building traffic: Restrict floor access, remove car from group operation, shut down elevator, select up peak / down peak mode, activate independent service
 - b. Conserve energy: Activate cab light energy save mode, activate fan energy save mode, shut down car(s)
 - c. Improve passenger experience: Extend door open times, change parking floor, activate auto car full, activate anti-nuisance, advance door opening, door nudging, extend specific floor extended opening time, release trapped passengers

PART 2 - PRODUCTS

2.01 DESIGN AND SPECIFICATIONS

- A. Provide machine-roomless holeless hydraulic elevators from Otis Elevator Company. The control system and car design based on materials and systems manufactured by Otis Elevator Company. Specifically, the system shall consist of the following components:
1. The entire hydraulic system and the controller shall be located inside the hoistway. No extra machine room or control closet space is required.
 2. Sleep mode operation for LED ceiling lights and car fan.
 3. LED lighting standard in ceiling lights and elevator fixtures.
 4. Sleep mode operation for LED ceiling lights and car fan.
- B. Approved Installer: Otis Elevator

2.02 EQUIPMENT: MACHINE COMPONENTS

- A. The hydraulic system shall be of compact design suitable for operation under the required pressure. The power component shall be mounted in the hydraulic-fluid storage tank. The control valve shall control flow for up and down directions hydraulically and shall include an integral check valve. A control section including control solenoids shall direct the main valve and control: up and down starting, acceleration, transition from full speed to leveling speed, up and down stops, pressure relief and manual lowering. All of these functions shall be fully adjustable for maximum smoothness and to meet contract conditions. System to be provided with a low-pressure switch and a shut-off valve.
- The entire hydraulic system with hydraulic-fluid storage tank, power component and valves shall be located in the hoistway pit and be easily accessible for maintenance through an access door in the hoistway wall.
- B. A microprocessor-based controller shall be provided, including necessary starting switches together with all relays, switches, solid-state components and hardware required for operation, including door operation, as described herein. A three (3) phase overload device shall be provided to protect the motor against overloading.
- The controller shall be located together with the hydraulic system in the hoistway pit and be easily accessible for maintenance through the same access door that is also used for the hydraulic system.
- C. A manual lowering feature shall permit lowering the elevator at slow speed in the event of power failure or for adjusting purposes.

- D. Pressure Switch

2.03 EQUIPMENT: HOISTWAY COMPONENTS

- A. Plunger(s) and Cylinder(s): Each cylinder shall be constructed of steel pipe of sufficient thickness and suitable for the operating pressure. The top of each cylinder shall be equipped with a cylinder head with a drip ring to collect any oil seepage as well as an internal guide ring and self-adjusting packing. Each plunger shall be constructed of selected steel tubing or pipe of proper diameter machined true and smooth with a fine polished finish. Each plunger shall be provided with a stop ring electrically welded to it to prevent the plunger from leaving the cylinder. Each plunger and cylinder shall be installed plumb and shall operate freely with minimum friction.
- B. Car Guide Rails: Tee-section steel rails with brackets and fasteners.
- C. Polyurethane type buffers shall be used.
- C. Wiring: Wiring for hoistway electrical devices included in scope of the elevator system, hall panels, pit emergency stop switch, and the traveling cable for the elevator car.
- D. Hoistway Entrances
 1. Frames: Entrance frames shall be of bolted construction for complete one-piece unit assembly. All frames shall be securely fastened to fixing angles mounted in the hoistway and shall be of UL fire rated steel.
 2. Sills shall be extruded Aluminum.
 3. Doors: Entrance doors shall be of metal construction with vertical channel reinforcements.
 4. Entrance Finish: Satin Stainless Steel
 5. Entrance marking plates: Entrance jambs shall be marked with 4" x 4" (102 mm x 102 mm) plates having raised floor markings with Braille located adjacent to the floor marking. Marking plates shall be provided on both sides of the entrance.
 6. Sight Guards: Black sight guards will be furnished with all doors.

2.04 EQUIPMENT: CAR COMPONENTS

- A. Cab: Steel shell cab with satin stainless steel vertical removable panels. Brushed Steel Finish finished base plate located at top and bottom.
- B. Car Front Finish: Satin Stainless Steel

- C. Car Door Finish: Satin Stainless Steel
- D. Ceiling Type: Flush steel ceiling with 4 LED lights in a real white (EW0) finish.
- E. Emergency Car Lighting: An emergency power unit employing a 6-volt sealed rechargeable battery and totally static circuits shall be provided to illuminate the elevator car in the event of building power failure.
- F. Fan: A one-speed 120 VAC fan will be mounted to the structural ceiling to facilitate in-car air circulation, meeting A17.1 code requirements. The fan shall be rubber mounted to prevent the transmission of structural vibration and will include a baffle to diffuse audible noise. A switch shall be provided in the car-operating panel to control the fan.
- G. Handrail: Not Required
- H. Threshold: Extruded Aluminum
- I. Emergency Exit Contact: An electrical contact shall be provided on the car-top exit.
- J. Guides: Car roller type guides at the top and the bottom.
- K. Platform: Car platform shall be constructed of metal.
- L. Certificate frame: Provide a Certificate frame with a satin stainless-steel finish.
- M. The LED ceiling lights and the fan should automatically shut off when the system is not in use and be powered back up after a passenger calls the elevator and pushes a hall button.

2.05 EQUIPMENT: SIGNAL DEVICES AND FIXTURES

- A. Car Operating Panel: A standard car operating panel shall be provided which contains all push buttons, key switches, and message indicators for elevator operation. The car operating panel shall have a Satin Stainless Steel finish.

A car operating panel shall be furnished. It shall contain a bank of round stainless steel, mechanical LED illuminated buttons. Flush mounted to the panel and marked to correspond to the landings served. All buttons to have raised numerals and Braille markings with:

1/8" (3mm) satin stainless steel projecting button with blue or white LED illuminating halo.

The car operating panel shall be equipped with the following features:

1. Raised markings and Braille to the left hand side of each push-button.
2. Car Position Indicator at the top of and integral to the car operating panel.
3. Door open and door close buttons.
4. Inspection key-switch.
5. Elevator Data Plate marked with elevator capacity and car number.
6. Help Button: The help button shall initiate two-way communication between the car and a location inside the building, switching over to another location if the call is unanswered, where personnel are available who can take the appropriate action. Visual indicators are provided for call initiation and call acknowledgement.
7. Landing Passing Signal: A chime bell shall sound in the car to signal that the car is either stopping at or passing a floor served by the elevator.
8. In car stop switch (toggle or key unless local code prohibits use)
9. Firefighter's hat (standard USA)
10. Firefighter's Phase II Key-switch (standard USA)
11. Call Cancel Button (standard USA)

B. Car Position Indicator: A digital, LED car position indicator shall be integral to the car operating panel.

C. Hall Fixtures: Hall fixtures shall be provided with necessary push buttons and key switches for elevator operation. Integral Hall fixtures shall feature round stainless steel, mechanical buttons marked to correspond to the landings. Hall fixtures to be located in the entrance jamb. Therefore, separate wiring and installation of electrical boxes inside the wall for the hall buttons are not required. Buttons shall be in vertically mounted fixture. Fixture shall be Satin Stainless Steel.

Button Options: 1/8" (3mm) satin stainless steel projecting button with blue or white LED illuminating halo.

D. Car Lantern and Chime: A directional lantern visible from the corridor shall be provided in the car entrance. When the car stops and the doors are opening, the lantern shall indicate the direction in which the car is to travel and a chime will sound.

E. Access key-switch at lowest floor in entrance jamb.

3.01 PREPARATION

- A. Take field dimensions and examine conditions of substrates, supports, and other conditions under which this work is to be performed. Do not proceed with work until unsatisfactory conditions are corrected.

3.02 INSTALLATION

- A. Installation of all elevator components except as specifically provided for elsewhere by others.

3.03 DEMONSTRATION

- A. The elevator contractor shall make a final check of each elevator operation with the Owner or Owner's representative present prior to turning each elevator over for use. The elevator contractor shall determine that control systems and operating devices are functioning properly.

END OF SECTION

SECTION 22 05 11
COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The requirements of this Section shall apply to all sections of Division 22.
- B. Definitions:
 - 1. Exposed: Piping and equipment exposed to view in finished rooms.
- C. Abbreviations/Acronyms:
 - 1. ABS: Acrylonitrile Butadiene Styrene
 - 2. AC: Alternating Current
 - 4. AI: Analog Input
 - 16. CO: Carbon Monoxide
 - 36. FAR: Federal Acquisition Regulations
 - 51. kPa: Kilopascal
 - 78. PSIG: Pounds per Square Inch
 - 80. PVC: Polyvinyl Chloride
 - 83. RO: Reverse Osmosis
 - 96. THWN: Thermoplastic Heat & Water Resistant Nylon Coated Wire
 - 99. V: Volt

1.2 RELATED WORK

- A. Section 01 00 00, GENERAL REQUIREMENTS.
- B. Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- C. Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
- D. Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS.
- G. Section 03 30 00, CAST-IN-PLACE CONCRETE: Concrete and Grout.
- H. Section 05 31 00, STEEL DECKING: Building Components for Attachment of Hangers.
- I. Section 05 36 00, COMPOSITE METAL DECKING: Building Components for Attachment of Hangers.
- J. Section 05 50 00, METAL FABRICATIONS.
- K. Section 07 60 00, FLASHING AND SHEET METAL: Flashing for Wall and Roof Penetrations.
- L. Section 07 84 00, FIRESTOPPING.
- M. Section 07 92 00, JOINT SEALANTS.
- N. Section 09 91 00, PAINTING.
- O. Section 13 05 41, SEISMIC RESTRAINT REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS.//
- P. Section 22 05 12, GENERAL MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT.
- Q. Section 22 07 11, PLUMBING INSULATION.
- R. Section 22 08 00, COMMISSIONING OF PLUMBING SYSTEMS.//

- T. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.
- U. Section 26 05 19, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES.
- V. Section 26 29 11, MOTOR CONTROLLERS.

1.3 APPLICABLE PUBLICATIONS

- A. The publications listed below shall form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American Society of Mechanical Engineers (ASME):
 - ASME Boiler and Pressure Vessel Code -
 - BPVC Section IX-2013Welding, Brazing, and Fusing Qualifications
 - B31.1-2012Power Piping
- C. American Society for Testing and Materials (ASTM):
 - A36/A36M-2012Standard Specification for Carbon Structural Steel
 - A575-96(R2013)e1Standard Specification for Steel Bars, Carbon, Merchant Quality, M-Grades
 - E84-2013aStandard Test Method for Surface Burning Characteristics of Building Materials
 - E119-2012aStandard Test Methods for Fire Tests of Building Construction Materials
 - F1760-01(R2011)Standard Specification for Coextruded Poly(Vinyl Chloride) (PVC) Non-Pressure Plastic Pipe Having Reprocessed-Recycled Content
- D. International Code Council, (ICC):
 - IBC-2012International Building Code
 - IPC-2012International Plumbing Code
- E. Manufacturers Standardization Society (MSS) of the Valve and Fittings Industry, Inc:
 - SP-58-2009Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application and Installation
 - SP-69-2003Pipe Hangers and Supports - Selection and Application
- G. National Electrical Manufacturers Association (NEMA):
 - MG 1-2011Motors and Generators
- H. National Fire Protection Association (NFPA):
 - 51B-2014Standard for Fire Prevention During Welding, Cutting & Other Hot Work
 - 54-2012National Fuel Gas Code
 - 70-2014National Electrical Code (NEC)
- I. NSF International (NSF):
 - 5-2012Water Heaters, Hot Water Supply Boilers, and Heat Recovery Equipment
 - 14-2012Plastic Piping System Components and Related Materials
 - 61-2012Drinking Water System Components – Health Effects
 - 372-2011Drinking Water System Components – Lead Content

1.4 SUBMITTALS

- A. Submittals, including number of required copies, shall be submitted in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, and SAMPLES.
- B. Information and material submitted under this section shall be marked "SUBMITTED UNDER SECTION 22 05 11, COMMON WORK RESULTS FOR PLUMBING", with applicable paragraph identification.
- C. Contractor shall make all necessary field measurements and investigations to assure that the equipment and assemblies will meet contract requirements and will fit the space available.
- D. If equipment is submitted which differs in arrangement from that shown, provide drawings that show the rearrangement of all associated systems. Approval will be given only if all features of the equipment and associated systems, including accessibility, are equivalent to that required by the contract.
- E. Prior to submitting shop drawings for approval, contractor shall certify in writing that manufacturers of all major items of equipment have each reviewed drawings and specifications, and have jointly coordinated and properly integrated their equipment and controls to provide a complete and efficient installation.
- F. Installing Contractor shall provide lists of previous installations for selected items of equipment. Contact persons who will serve as references, with telephone numbers and e-mail addresses shall be submitted with the references.
- G. Manufacturer's Literature and Data: Manufacturer's literature shall be submitted under the pertinent section rather than under this section.
 - 1. Electric motor data and variable speed drive data shall be submitted with the driven equipment.
 - 2. Equipment and materials identification.
 - 3. Firestopping materials.
 - 4. Hangers, inserts, supports and bracing. Provide load calculations for variable spring and constant support hangers.
 - 5. Wall, floor, and ceiling plates.
- H. Submittals and shop drawings for interdependent items, containing applicable descriptive information, shall be furnished together and complete in a group. Coordinate and properly integrate materials and equipment in each group to provide a completely compatible and efficient installation. Final review and approvals will be made only by groups.
- I. Coordination Drawings: Complete consolidated and coordinated layout drawings shall be submitted for all new systems, and for existing systems that are in the same areas. The drawings shall include plan views, elevations and sections of all systems and shall be on a scale of not less than 1:32 (3/8 inch equal to one foot). Clearly identify and dimension the proposed locations of the principal items of equipment. The drawings shall clearly show the proposed location and adequate clearance for all equipment, controls, piping, pumps, valves and other items. All valves, trap primer valves, water hammer arrestors, strainers, and equipment requiring service shall be provided with an access door sized for the complete removal of plumbing device, component, or equipment. Equipment foundations shall not be installed until equipment or piping layout drawings have been approved. Detailed layout drawings shall be provided for all piping systems. In addition, details of the following shall be provided.

1. Mechanical equipment rooms.
 2. Interstitial space.
 3. Hangers, inserts, supports, and bracing.
 4. Pipe sleeves.
 5. Equipment penetrations of floors, walls, ceilings, or roofs.
- J. Maintenance Data and Operating Instructions:
1. Maintenance and operating manuals in accordance with Section 01 00 00, GENERAL REQUIREMENTS, Article, INSTRUCTIONS, for systems and equipment. Include complete list indicating all components of the systems with diagrams of the internal wiring for each item of equipment.
 2. Include listing of recommended replacement parts for keeping in stock supply, including sources of supply, for equipment shall be provided. The listing shall include belts for equipment: Belt manufacturer, model number, size and style, and distinguished whether of multiple belt sets.
- K. Completed System Readiness Checklist provided by the Commissioning Agent and completed by the contractor, signed by a qualified technician and dated on the date of completion, in accordance with the requirements of Section 22 08 00 COMMISSIONING OF PLUMBING SYSTEMS.
- L. Submit training plans, trainer qualifications and instructor qualifications in accordance with the requirements of Section 22 08 00 COMMISSIONING OF PLUMBING SYSTEMS.//

1.5 QUALITY ASSURANCE

- A. Products Criteria:
1. Standard Products: Material and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture, supply and servicing of the specified products for at least 5 years. However, digital electronics devices, software and systems such as controls, instruments, computer work station, shall be the current generation of technology and basic design that has a proven satisfactory service record of at least 5 years.
 2. Equipment Service: There shall be permanent service organizations, authorized and trained by manufacturers of the equipment supplied, located within 160 km (100 miles) of the project. These organizations shall come to the site and provide acceptable service to restore operations within four hours of receipt of notification by phone, e-mail or fax in event of an emergency, such as the shut-down of equipment; or within 24 hours in a non-emergency. Names, mail and e-mail addresses and phone numbers of service organizations providing service under these conditions for (as applicable to the project): pumps, compressors, water heaters, critical instrumentation, computer workstation and programming shall be submitted for project record and inserted into the operations and maintenance manual.
 3. All items furnished shall be free from defects that would adversely affect the performance, maintainability and appearance of individual components and overall assembly.
 4. The products and execution of work specified in Division 22 shall conform to the referenced codes and standards as required by the specifications. Local codes and amendments enforced by the local

code official shall be enforced, if required by local authorities such as the natural gas supplier. If the local codes are more stringent, then the local code shall apply. Any conflicts shall be brought to the attention of the Contracting Officers Representative (COR).

5. Multiple Units: When two or more units of materials or equipment of the same type or class are required, these units shall be products of one manufacturer.
 6. Assembled Units: Manufacturers of equipment assemblies, which use components made by others, assume complete responsibility for the final assembled product.
 7. Nameplates: Nameplate bearing manufacturer's name or identifiable trademark shall be securely affixed in a conspicuous place on equipment, or name or trademark cast integrally with equipment, stamped or otherwise permanently marked on each item of equipment.
 8. Asbestos products or equipment or materials containing asbestos shall not be used.
 9. Bio-Based Materials: For products designated by the USDA's Bio-Preferred Program, provide products that meet or exceed USDA recommendations for bio-based content, so long as products meet all performance requirements in this specifications section. For more information regarding the product categories covered by the Bio-Preferred Program, visit <http://www.biopreferred.gov>.
- B. Welding: Before any welding is performed, contractor shall submit a certificate certifying that welders comply with the following requirements:
1. Qualify welding processes and operators for piping according to ASME "Boiler and Pressure Vessel Code", Section IX, "Welding and Brazing Qualifications".
 2. Comply with provisions of ASME B31 series "Code for Pressure Piping".
 3. Certify that each welder and welding operator has passed American Welding Society (AWS) qualification tests for the welding processes involved, and that certification is current.
 4. All welds shall be stamped according to the provisions of the American Welding Society.
- C. Manufacturer's Recommendations: Where installation procedures or any part thereof are required to be in accordance with the recommendations of the manufacturer of the material being installed, printed copies of these recommendations shall be furnished to the COR prior to installation. Installation of the item will not be allowed to proceed until the recommendations are received. Failure to furnish these recommendations can be cause for rejection of the material.
- D. Execution (Installation, Construction) Quality:
1. All items shall be applied and installed in accordance with manufacturer's written instructions. Conflicts between the manufacturer's instructions and the contract documents shall be referred to the COR for resolution. Printed copies or electronic files of manufacturer's installation instructions shall be provided to the COR at least 10 working days prior to commencing installation of any item.
 2. All items that require access, such as for operating, cleaning, servicing, maintenance, and calibration, shall be easily and safely accessible by persons standing at floor level, or standing on permanent platforms, without the use of portable ladders. Examples of these items include but are not limited to: all types of valves, filters and strainers, transmitters, and control devices. Prior to commencing installation work, refer conflicts between this requirement and contract documents to COR for resolution.

3. Complete layout drawings shall be required by Paragraph, SUBMITTALS. Construction work shall not start on any system until the layout drawings have been approved by Architect.
 4. Installer Qualifications: Installer shall be licensed and shall provide evidence of the successful completion of at least five projects of equal or greater size and complexity. Provide tradesmen skilled in the appropriate trade.
 5. If an installation is unsatisfactory to the COR, the Contractor shall correct the installation at no additional cost or additional time to the Government.
- E. Guaranty: Warranty of Construction, FAR clause 52.246-21.
- F. Plumbing Systems: IPC, International Plumbing Code. Unless otherwise required herein, perform plumbing work in accordance with the latest version of the IPC. For IPC codes referenced in the contract documents, advisory provisions shall be considered mandatory, the word "should" shall be interpreted as "shall". Reference to the "code official" or "owner" shall be interpreted to mean the COR.
- G. Cleanliness of Piping and Equipment Systems:
1. Care shall be exercised in the storage and handling of equipment and piping material to be incorporated in the work. Debris arising from cutting, threading and welding of piping shall be removed.
 2. Piping systems shall be flushed, blown or pigged as necessary to deliver clean systems.
 3. The interior of all tanks shall be cleaned prior to delivery and beneficial use by the Government. All piping shall be tested in accordance with the specifications and the International Plumbing Code (IPC). All filters, strainers, fixture faucets shall be flushed of debris prior to final acceptance.
 4. Contractor shall be fully responsible for all costs, damage, and delay arising from failure to provide clean systems.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Protection of Equipment:
1. Equipment and material placed on the job site shall remain in the custody of the Contractor until phased acceptance, whether or not the Government has reimbursed the Contractor for the equipment and material. The Contractor is solely responsible for the protection of such equipment and material against any damage.
 2. Damaged equipment shall be replaced with an identical unit as determined and directed by the COR. Such replacement shall be at no additional cost or additional time to the Government.
 3. Interiors of new equipment and piping systems shall be protected against entry of foreign matter. Both inside and outside shall be cleaned before painting or placing equipment in operation.
 4. Existing equipment and piping being worked on by the Contractor shall be under the custody and responsibility of the Contractor and shall be protected as required for new work.

PART 2 - PRODUCTS

2.1 MATERIALS FOR VARIOUS SERVICES

- A. Non-pressure PVC pipe, Steel pipe.

- B. Plastic pipe, fittings and solvent cement shall meet NSF 14 and shall bear the NSF seal "NSF-PW". Polypropylene pipe and fittings shall comply with NSF 14 and NSF 61. Solder or flux containing lead shall not be used with copper pipe.
- C. Material or equipment containing a weighted average of greater than 0.25 percent lead shall not be used in any potable water system intended for human consumption and shall be certified in accordance with NSF 61 or NSF 372.
- D. In-line devices such as water meters, building valves, check valves, stops, valves, fittings, tanks and backflow preventers shall comply with NSF 61 and NSF 372.
- E. End point devices such as drinking fountains, lavatory faucets, kitchen and bar faucets, ice makers supply stops, and end-point control valves used to dispense drinking water must meet requirements of NSF 61 and NSF 372.

2.2 FACTORY-ASSEMBLED PRODUCTS

- A. Standardization of components shall be maximized to reduce spare part requirements.
- B. Manufacturers of equipment assemblies that include components made by others shall assume complete responsibility for final assembled unit.
 - 1. All components of an assembled unit need not be products of same manufacturer.
 - 2. Constituent parts that are alike shall be products of a single manufacturer.
 - 3. Components shall be compatible with each other and with the total assembly for intended service.
 - 4. Contractor shall guarantee performance of assemblies of components, and shall repair or replace elements of the assemblies as required to deliver specified performance of the complete assembly at no additional cost or time to the Government.
- C. Components of equipment shall bear manufacturer's name and trademark, model number, serial number and performance data on a name plate securely affixed in a conspicuous place, or cast integral with, stamped or otherwise permanently marked upon the components of the equipment.
- D. Major items of equipment, which serve the same function, shall be the same make and model.

2.3 COMPATIBILITY OF RELATED EQUIPMENT

- A. Equipment and materials installed shall be compatible in all respects with other items being furnished and with existing items so that the result will be a complete and fully operational system that conforms to contract requirements.

2.4 SAFETY GUARDS

- A. Pump shafts and couplings shall be fully guarded by a sheet steel guard, covering coupling and shaft but not bearings. Material shall be minimum 16-gage sheet steel; ends shall be braked and drilled and attached to pump base with minimum of four 8 mm (1/4 inch) bolts. Reinforce guard as necessary to prevent side play forcing guard onto couplings.
- B. All Equipment shall have moving parts protected from personal injury.

2.5 LIFTING ATTACHMENTS

- A. Equipment shall be provided with suitable lifting attachments to enable equipment to be lifted in its normal position. Lifting attachments shall withstand any handling conditions that might be encountered, without bending or distortion of shape, such as rapid lowering and braking of load.

2.6 ELECTRIC MOTORS, MOTOR CONTROL, CONTROL WIRING

- A. All material and equipment furnished and installation methods used shall conform to the requirements of Section 22 05 12, GENERAL MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT; Section 26 29 11, MOTOR CONTROLLERS; and, Section 26 05 19, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES. All electrical wiring, conduit, and devices necessary for the proper connection, protection and operation of the systems shall be provided. Premium efficient motors shall be provided. Unless otherwise specified for a particular application, electric motors shall have the following requirements.
- B. Special Requirements:
 - 1. Where motor power requirements of equipment furnished deviate from power shown on plans, provide electrical service designed under the requirements of NFPA 70 without additional cost or time to the Government.
 - 2. Assemblies of motors, starters, and controls and interlocks on factory assembled and wired devices shall be in accordance with the requirements of this specification.
 - 3. Wire and cable materials specified in the electrical division of the specifications shall be modified as follows:
 - a. Wiring material located where temperatures can exceed 71° C (160° F) shall be stranded copper with Teflon FEP insulation with jacket. This includes wiring on the boilers and water heaters.
 - b. Other wiring at boilers and water heaters, and to control panels, shall be NFPA 70 designation THWN.
 - c. Shielded conductors or wiring in separate conduits for all instrumentation and control systems shall be provided where recommended by manufacturer of equipment.
 - 4. Motor sizes shall be selected so that the motors do not operate into the service factor at maximum required loads on the driven equipment. Motors on pumps shall be sized for non-overloading at all points on the pump performance curves.
 - 5. Motors utilized with variable frequency drives shall be rated "inverter-ready" per NEMA Standard, MG1.
- C. Motor Efficiency and Power Factor: All motors, when specified as "high efficiency or Premium Efficiency" by the project specifications on driven equipment, shall conform to efficiency and power factor requirements in Section 22 05 12, GENERAL MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT, with no consideration of annual service hours. Motor manufacturers generally define these efficiency requirements as "NEMA premium efficient" and the requirements generally exceed those of the Energy

Policy Act (EPACT), revised 2005. Motors not specified as “high efficiency or premium efficient” shall comply with EPACT.

- D. Single-phase Motors: Capacitor-start type for hard starting applications. Motors for centrifugal pumps may be split phase or permanent split capacitor (PSC).
- E. Poly-phase Motors: NEMA Design B, Squirrel cage, induction type. Each two-speed motor shall have two separate windings. A time delay (20 seconds minimum) relay shall be provided for switching from high to low speed.
- F. Rating: Rating shall be continuous duty at 100 percent capacity in an ambient temperature of 40° C (104° F); minimum horsepower as shown on drawings; maximum horsepower in normal operation shall not exceed nameplate rating without service factor.
- G. Insulation Resistance: Not less than one-half meg-ohm between stator conductors and frame shall be measured at the time of final inspection.

2.7 VARIABLE SPEED MOTOR CONTROLLERS

- A. Refer to Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS and Section 26 29 11, MOTOR CONTROLLERS for specifications.
- B. The combination of controller and motor shall be provided by the respective pump manufacturer, and shall be rated for 100 percent output performance. Multiple units of the same class of equipment, i.e. pumps, shall be product of a single manufacturer.
- C. Motors shall be premium efficient type, “invertor duty”, and be approved by the motor controller manufacturer. The controller-motor combination shall be guaranteed to provide full motor nameplate horsepower in variable frequency operation. Both driving and driven motor sheaves shall be fixed pitch.
- D. Controller shall not add any current or voltage transients to the input AC power distribution system, Direct digital controls, sensitive medical equipment, etc., nor shall be affected from other devices on the AC power system.

2.8 EQUIPMENT AND MATERIALS IDENTIFICATION

- A. Interior (Indoor) Equipment: Engraved nameplates, with letters not less than 7 mm (3/16 inch) high of brass with black-filled letters, or rigid black plastic with white letters specified in Section 09 91 00, PAINTING shall be permanently fastened to the equipment. Unit components such as water heaters, tanks, coils, filters, etc. shall be identified.
- B. Exterior (Outdoor) Equipment: Brass nameplates, with engraved black filled letters, not less than 7 mm (3/16 inch) high riveted or bolted to the equipment.
- C. Control Items: All temperature, pressure, and controllers shall be labeled and the component’s function identified. Identify and label each item as they appear on the control diagrams.
- D. Valve Tags and Lists:
 - 1. Plumbing: All valves shall be provided with valve tags and listed on a valve list (Fixture stops not included).

2. Valve tags: Engraved black filled numbers and letters not less than 15 mm (1/2 inch) high for number designation, and not less than 8 mm (1/4 inch) for service designation on 19 gage, 40 mm (1-1/2 inches) round brass disc, attached with brass "S" hook or brass chain.
3. Valve lists: Valve lists shall be created using a word processing program and printed on plastic coated cards. The plastic coated valve list card(s), sized 215 mm (8-1/2 inches) by 275 mm (11 inches) shall show valve tag number, valve function and area of control for each service or system. The valve list shall be in a punched 3-ring binder notebook. An additional copy of the valve list shall be mounted in picture frames for mounting to a wall. COR shall instruct contractor where frames shall be mounted.
4. A detailed plan for each floor of the building indicating the location and valve number for each valve shall be provided in the 3-ring binder notebook. Each valve location shall be identified with a color coded sticker or thumb tack in ceiling or access door.

2.9 FIRESTOPPING

- A. Section 07 84 00, FIRESTOPPING specifies an effective barrier against the spread of fire, smoke and gases where penetrations occur for piping. Refer to Section 22 07 11, PLUMBING INSULATION, for pipe insulation.

2.10 GALVANIZED REPAIR COMPOUND

- A. Mil. Spec. DOD-P-21035B, paint.

2.11 PIPE AND EQUIPMENT SUPPORTS AND RESTRAINTS

- A. In lieu of the paragraph which follows, suspended equipment support and restraints may be designed and installed in accordance with the International Building Code (IBC)// and Section 13 05 41, SEISMIC RESTRAINT REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS.// Submittals based on the International Building Code (IBC)// and Section 13 05 41, SEISMIC RESTRAINT REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS// requirements, or the following paragraphs of this Section shall be stamped and signed by a professional engineer registered in the state where the project is located. The Support system of suspended equipment over 227 kg (500 pounds) shall be submitted for approval of the COR in all cases. See the above specifications for lateral force design requirements.
- B. Type Numbers Specified: For materials, design, manufacture, selection, application, and installation refer to MSS SP-58. For selection and application refer to MSS SP-69. Refer to Section 05 50 00, METAL FABRICATIONS, for miscellaneous metal support materials and prime coat painting.
- C. For Attachment to Concrete Construction:
 1. Concrete insert: Type 18, MSS SP-58.
 2. Self-drilling expansion shields and machine bolt expansion anchors: Permitted in concrete not less than 100 mm (4 inches) thick when approved by the COR for each job condition.
 3. Power-driven fasteners: Permitted in existing concrete or masonry not less than 100 mm (4 inches) thick when approved by the COR for each job condition.

- D. For Attachment to Steel Construction: MSS SP-58.
1. Welded attachment: Type 22.
 2. Beam clamps: Types 20, 21, 28 or 29. Type 23 C-clamp may be used for individual copper tubing up to 23 mm (7/8 inch) outside diameter.
- E. Attachment to Metal Pan or Deck: As required for materials specified in // Section 05 31 00, STEEL DECKING. // Section 05 36 00, COMPOSITE METAL DECKING.//
- F. For Attachment to Wood Construction: Wood screws or lag bolts.
- G. Hanger Rods: Hot-rolled steel, ASTM A36/A36M or ASTM A575 for allowable load listed in MSS SP-58. For piping, provide adjustment means for controlling level or slope. Types 13 or 15 turn-buckles shall provide 40 mm (1-1/2 inches) minimum of adjustment and incorporate locknuts. All-thread rods are acceptable.
- H. Multiple (Trapeze) Hangers: Galvanized, cold formed, lipped steel channel horizontal member, not less than 43 mm by 43 mm (1-5/8 inches by 1-5/8 inches), 2.7 mm (No. 12 gage), designed to accept special spring held, hardened steel nuts.
1. Allowable hanger load: Manufacturers rating less 91kg (200 pounds).
 2. Guide individual pipes on the horizontal member of every other trapeze hanger with 8 mm (1/4 inch) U-bolt fabricated from steel rod. Provide Type 40 insulation shield, secured by two 15 mm (1/2 inch) galvanized steel bands, or insulated calcium silicate shield for insulated piping at each hanger.
- I. Pipe Hangers and Supports: (MSS SP-58), use hangers sized to encircle insulation on insulated piping. Refer to Section 22 07 11, PLUMBING INSULATION for insulation thickness. To protect insulation, provide Type 39 saddles for roller type supports or insulated calcium silicate shields. Provide Type 40 insulation shield or insulated calcium silicate shield at all other types of supports and hangers including those for insulated piping.
1. General Types (MSS SP-58):
 - a. Standard clevis hanger: Type 1; provide locknut.
 - b. Riser clamps: Type 8.
 - c. Wall brackets: Types 31, 32 or 33.
 - d. Roller supports: Type 41, 43, 44 and 46.
 - e. Saddle support: Type 36, 37 or 38.
 - f. Turnbuckle: Types 13 or 15.
 - g. U-bolt clamp: Type 24.
 - h. Copper Tube:
 - 1) Hangers, clamps and other support material in contact with tubing shall be painted with copper colored epoxy paint, copper-coated, plastic coated or taped with isolation tape to prevent electrolysis.
 - 2) For vertical runs use epoxy painted, copper-coated or plastic coated riser clamps.
 - 3) For supporting tube to strut: Provide epoxy painted pipe straps for copper tube or plastic inserted vibration isolation clamps.
 - 4) Insulated Lines: Provide pre-insulated calcium silicate shields sized for copper tube.

- i. Supports for plastic or glass piping: As recommended by the pipe manufacturer with black rubber tape extending one inch beyond steel support or clamp. //Spring Supports (Expansion and contraction of vertical piping):
 - 1) Movement up to 20 mm (3/4 inch): Type 51 or 52 variable spring unit with integral turn buckle and load indicator.
 - 2) Movement more than 20 mm (3/4 inch): Type 54 or 55 constant support unit with integral adjusting nut, turn buckle and travel position indicator. //
 - j. Spring hangers are required on all plumbing system pumps one horsepower and greater.
2. Plumbing Piping (Other Than General Types):
- a. Horizontal piping: Type 1, 5, 7, 9, and 10.
 - b. Chrome plated piping: Chrome plated supports.
 - c. Hangers and supports in pipe chase: Prefabricated system ABS self-extinguishing material, not subject to electrolytic action, to hold piping, prevent vibration and compensate for all static and operational conditions.
 - d. Blocking, stays and bracing: Angle iron or preformed metal channel shapes, 1.3 mm (18 gage) minimum.
- J. Pre-insulated Calcium Silicate Shields:
- 1. Provide 360 degree water resistant high density 965 kPa (140 psig) compressive strength calcium silicate shields encased in galvanized metal.
 - 2. Pre-insulated calcium silicate shields to be installed at the point of support during erection.
 - 3. Shield thickness shall match the pipe insulation.
 - 4. The type of shield is selected by the temperature of the pipe, the load it must carry, and the type of support it will be used with.
 - a. Shields for supporting cold water shall have insulation that extends a minimum of 25 mm (1 inch) past the sheet metal.
 - b. The insulated calcium silicate shield shall support the maximum allowable water filled span as indicated in MSS SP-69. To support the load, the shields shall have one or more of the following features: structural inserts 4138 kPa (600 psig) compressive strength, an extra bottom metal shield, or formed structural steel (ASTM A36/A36M) wear plates welded to the bottom sheet metal jacket.
 - 5. Shields may be used on steel clevis hanger type supports, trapeze hangers, roller supports or flat surfaces.
- K. Seismic Restraint of Piping: Refer to Section 13 05 41, SEISMIC RESTRAINT REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS.

2.12 PIPE PENETRATIONS

- A. Pipe penetration sleeves shall be installed for all pipe other than rectangular blocked out floor openings for risers in mechanical bays.
- B. Pipe penetration sleeve materials shall comply with all firestopping requirements for each penetration.

- C. To prevent accidental liquid spills from passing to a lower level, provide the following:
 - 1. For sleeves: Extend sleeve 25 mm (1 inch) above finished floor and provide sealant for watertight joint.
 - 2. For blocked out floor openings: Provide 40 mm (1-1/2 inch) angle set in silicone adhesive around opening.
 - 3. For drilled penetrations: Provide 40 mm (1-1/2 inch) angle ring or square set in silicone adhesive around penetration.
- D. Penetrations are not allowed through beams or ribs, but may be installed in concrete beam flanges, with structural engineer prior approval. Any deviation from these requirements must receive prior approval of the Architect.
- E. Sheet metal, plastic, or moisture resistant fiber sleeves shall be provided for pipe passing through floors, interior walls, and partitions, unless brass or steel pipe sleeves are specifically called for below.
- F. Cast iron or zinc coated pipe sleeves shall be provided for pipe passing through exterior walls below grade. The space between the sleeve and pipe shall be made watertight with a modular or link rubber seal. The link seal shall be applied at both ends of the sleeve.
- G. Galvanized steel or an alternate black iron pipe with asphalt coating sleeves shall be for pipe passing through concrete beam flanges, except where brass pipe sleeves are called for. A galvanized steel sleeve shall be provided for pipe passing through floor of mechanical rooms, laundry work rooms, and animal rooms above basement. Except in mechanical rooms, sleeves shall be connected with a floor plate.
- H. Brass Pipe Sleeves shall be provided for pipe passing through quarry tile, terrazzo or ceramic tile floors. The sleeve shall be connected with a floor plate.
- I. Sleeve clearance through floors, walls, partitions, and beam flanges shall be 25 mm (1 inch) greater in diameter than external diameter of pipe. Sleeve for pipe with insulation shall be large enough to accommodate the insulation plus 25 mm (1 inch) in diameter. Interior openings shall be caulked tight with firestopping material and sealant to prevent the spread of fire, smoke, water and gases.
- J. Sealant and Adhesives: Shall be as specified in Section 07 92 00, JOINT SEALANTS. Bio-based materials shall be utilized when possible.
- K. Pipe passing through roof shall be installed through a 4.9 kg per square meter copper flashing with an integral skirt or flange. Skirt or flange shall extend not less than 200 mm (8 inches) from the pipe and set in a solid coating of bituminous cement. Extend flashing a minimum of 250 mm (10 inches) up the pipe. Pipe passing through a waterproofing membrane shall be provided with a clamping flange. The annular space between the sleeve and pipe shall be sealed watertight.

2.13 TOOLS AND LUBRICANTS

- A. Furnish, and turn over to the Owner, special tools not readily available commercially, that are required for disassembly or adjustment of equipment and machinery furnished.
- B. Grease Guns with Attachments for Applicable Fittings: One for each type of grease required for each motor or other equipment.

- C. Tool Containers: metal, permanently identified for intended service and mounted, or located, where directed by the Owner.
- D. Lubricants: A minimum of 0.95 L (1 quart) of oil, and 0.45 kg (1 pound) of grease, of equipment manufacturer's recommended grade and type, in unopened containers and properly identified as to use for each different application. Bio-based materials shall be utilized when possible.

2.14 WALL, FLOOR AND CEILING PLATES

- A. Material and Type: Chrome plated brass or chrome plated steel, one piece or split type with concealed hinge, with set screw for fastening to pipe, or sleeve. Use plates that fit tight around pipes, cover openings around pipes and cover the entire pipe sleeve projection.
- B. Thickness: Not less than 2.4 mm (3/32 inch) for floor plates. For wall and ceiling plates, not less than 0.64 mm (0.025 inch) for up to 75 mm (3 inch) pipe, 0.89 mm (0.035 inch) for larger pipe.
- C. Locations: Use where pipe penetrates floors, walls and ceilings in exposed locations, in finished areas only. Wall plates shall be used where insulation ends on exposed water supply pipe drop from overhead. A watertight joint shall be provided in spaces where brass or steel pipe sleeves are specified.

2.15 ASBESTOS

- A. Materials containing asbestos are not permitted.

PART 3 - EXECUTION

3.1 ARRANGEMENT AND INSTALLATION OF EQUIPMENT AND PIPING

- A. Location of piping, sleeves, inserts, hangers, and equipment, access provisions shall be coordinated with the work of all trades. Piping, sleeves, inserts, hangers, and equipment shall be located clear of windows, doors, openings, light outlets, and other services and utilities. Equipment layout drawings shall be prepared to coordinate proper location and personnel access of all facilities. The drawings shall be submitted for review.
- B. Manufacturer's published recommendations shall be followed for installation methods not otherwise specified.
- C. Operating Personnel Access and Observation Provisions: All equipment and systems shall be arranged to provide clear view and easy access, without use of portable ladders, for maintenance, testing and operation of all devices including, but not limited to: all equipment items, valves, backflow preventers, filters, strainers, transmitters, sensors, meters and control devices. All gages and indicators shall be clearly visible by personnel standing on the floor or on permanent platforms. Maintenance and operating space and access provisions that are shown on the drawings shall not be changed nor reduced.
- D. Structural systems necessary for pipe and equipment support shall be coordinated to permit proper installation.
- E. Location of pipe sleeves, trenches and chases shall be accurately coordinated with equipment and piping locations.

F. Cutting Holes:

1. Holes shall be located to avoid interference with structural members such as beams or grade beams. Holes shall be laid out in advance and drilling done only after approval by the Architect. If the Contractor considers it necessary to drill through structural members, this matter shall be referred to the Structural Engineer for approval.
2. Waterproof membrane shall not be penetrated. Pipe floor penetration block outs shall be provided outside the extents of the waterproof membrane.
3. Holes through concrete and masonry shall be cut by rotary core drill. Pneumatic hammer, impact electric, and hand or manual hammer type drill will not be allowed, except as permitted where working area space is limited.

G. Minor Piping: Generally, small diameter pipe runs from drips and drains, water cooling, and other services are not shown but must be provided.

H. Protection and Cleaning:

1. Equipment and materials shall be carefully handled, properly stored, and adequately protected to prevent damage before and during installation, in accordance with the manufacturer's recommendations and as approved by the Owner. Damaged or defective items in the opinion of the Owner, shall be replaced at no additional cost or time to the Government.
2. Protect all finished parts of equipment, such as shafts and bearings where accessible, from rust prior to operation by means of protective grease coating and wrapping. Close pipe openings with caps or plugs during installation. Pipe openings, equipment, and plumbing fixtures shall be tightly covered against dirt or mechanical injury. At completion of all work thoroughly clean fixtures, exposed materials and equipment.

I. Concrete and Grout: Concrete and shrink compensating grout 25 MPa (3000 psig) minimum, specified in Section 03 30 00, CAST-IN-PLACE CONCRETE, shall be used for all pad or floor mounted equipment.

J. Gages, thermometers, valves and other devices shall be installed with due regard for ease in reading or operating and maintaining said devices. Thermometers and gages shall be located and positioned to be easily read by operator or staff standing on floor or walkway provided. Servicing shall not require dismantling adjacent equipment or pipe work.

K. Interconnection of Controls and Instruments: Electrical interconnection is generally not shown but shall be provided. This includes interconnections of sensors, transmitters, transducers, control devices, control and instrumentation panels, alarms, instruments and computer workstations. Comply with NFPA 70.

M. Work in Existing Building:

1. Perform as specified in Article, OPERATIONS AND STORAGE AREAS, Article, ALTERATIONS, and Article, RESTORATION of the Section 01 00 00, GENERAL REQUIREMENTS for relocation of existing equipment, alterations and restoration of existing building(s).
2. As specified in Section 01 00 00, GENERAL REQUIREMENTS, Article, OPERATIONS AND STORAGE AREAS, make alterations to existing service piping at times that will cause the least interfere with normal operation of the facility.

- N. Work in Animal Research Areas: Seal all pipe penetrations with silicone sealant to prevent entrance of insects.
- O. Work in bathrooms, restrooms, housekeeping closets: All pipe penetrations behind escutcheons shall be sealed with plumbers putty.
- P. Switchgear Drip Protection: Every effort shall be made to eliminate the installation of pipe above data equipment, and electrical and telephone switchgear. If this is not possible, encase pipe in a second pipe with a minimum of joints. Drain valve shall be provided in low point of casement pipe.
- Q. Inaccessible Equipment:
 - 1. Where the Government determines that the Contractor has installed equipment not conveniently accessible for operation and maintenance, equipment shall be removed and reinstalled or remedial action performed as directed at no additional cost or additional time to the Government.
 - 2. The term "conveniently accessible" is defined as capable of being reached without the use of ladders, or without climbing or crawling under or over obstacles such as electrical conduit, motors, fans, pumps, belt guards, transformers, high voltage lines, piping, and ductwork.

3.2 TEMPORARY PIPING AND EQUIPMENT

- A. Continuity of operation of existing facilities may require temporary installation or relocation of equipment and piping. Temporary equipment or pipe installation or relocation shall be provided to maintain continuity of operation of existing facilities.
- B. The Contractor shall provide all required facilities in accordance with the requirements of phased construction and maintenance of service. All piping and equipment shall be properly supported, sloped to drain, operate without excessive stress, and shall be insulated where injury can occur to personnel by contact with operating facilities. The requirements of paragraph 3.1 shall apply.
- C. Temporary facilities and piping shall be completely removed back to the nearest active distribution branch or main pipe line and any openings in structures sealed. Dead legs are not allowed in potable water systems. Necessary blind flanges and caps shall be provided to seal open piping remaining in service.

3.3 RIGGING

- A. Openings in building structures shall be planned to accommodate design scheme.
- B. Alternative methods of equipment delivery may be offered and will be considered by Government under specified restrictions of phasing and service requirements as well as structural integrity of the building.
- C. All openings in the building shall be closed when not required for rigging operations to maintain proper environment in the facility for Government operation and maintenance of service.
- D. Contractor shall provide all facilities required to deliver specified equipment and place on foundations. Attachments to structures for rigging purposes and support of equipment on structures shall be Contractor's full responsibility.
- E. Contractor shall check all clearances, weight limitations and shall provide a rigging plan designed by a Registered Professional Engineer. All modifications to structures, including reinforcement thereof, shall be at Contractor's cost, time and responsibility.

F. Rigging plan and methods shall be referred to the Architect for evaluation prior to actual work.

3.4 PIPE AND EQUIPMENT SUPPORTS

- A. Where hanger spacing does not correspond with joist or rib spacing, use structural steel channels secured directly to joist and rib structure that will correspond to the required hanger spacing, and then suspend the equipment and piping from the channels. Holes shall be drilled or burned in structural steel ONLY with the prior written approval of the structural engineer.
- B. The use of chain pipe supports, wire or strap hangers; wood for blocking, stays and bracing, or hangers suspended from piping above shall not be permitted. Rusty products shall be replaced.
- C. Hanger rods shall be used that are straight and vertical. Turnbuckles for vertical adjustments may be omitted where limited space prevents use. A minimum of 15 mm (1/2 inch) clearance between pipe or piping covering and adjacent work shall be provided.
- D. For horizontal and vertical plumbing pipe supports, refer to the International Plumbing Code (IPC) and these specifications.
- E. Overhead Supports:
 - 1. The basic structural system of the building is designed to sustain the loads imposed by equipment and piping to be supported overhead.
 - 2. Provide steel structural members, in addition to those shown, of adequate capability to support the imposed loads, located in accordance with the final approved layout of equipment and piping.
 - 3. Tubing and capillary systems shall be supported in channel troughs.
- F. Floor Supports:
 - 1. Provide concrete bases, concrete anchor blocks and pedestals, and structural steel systems for support of equipment and piping. Concrete bases and structural systems shall be anchored and doweled to resist forces under operating and seismic conditions (if applicable) without excessive displacement or structural failure.
 - 2. Bases and supports shall not be located and installed until equipment mounted thereon has been approved. Bases shall be sized to match equipment mounted thereon plus 50 mm (2 inch) excess on all edges. Structural drawings shall be reviewed for additional requirements. Bases shall be neatly finished and smoothed, shall have chamfered edges at the top, and shall be suitable for painting.
 - 3. All equipment shall be shimmed, leveled, firmly anchored, and grouted with epoxy grout. Anchor bolts shall be placed in sleeves, anchored to the bases. Fill the annular space between sleeves and bolts with a grout material to permit alignment and realignment.

3.5 LUBRICATION

- A. All equipment and devices requiring lubrication shall be lubricated prior to initial operation. All devices and equipment shall be field checked for proper lubrication.
- B. All devices and equipment shall be equipped with required lubrication fittings. A minimum of one liter (one quart) of oil and 0.45 kg (1 pound) of grease of manufacturer's recommended grade and type for each

different application shall be provided. All materials shall be delivered to COR in unopened containers that are properly identified as to application.

- C. A separate grease gun with attachments for applicable fittings shall be provided for each type of grease applied.
- D. All lubrication points shall be accessible without disassembling equipment, except to remove access plates.
- E. All lubrication points shall be extended to one side of the equipment.

3.6 PLUMBING SYSTEMS DEMOLITION

- A. Rigging access, other than indicated on the drawings, shall be provided after approval for structural integrity by the Architect. Such access shall be provided without additional cost or time to the Government. Where work is in an operating plant, approved protection from dust and debris shall be provided at all times for the safety of plant personnel and maintenance of plant operation and environment of the plant.
- B. In an operating plant, cleanliness and safety shall be maintained. The plant shall be kept in an operating condition. Government personnel will be carrying on their normal duties of operating, cleaning and maintaining equipment and plant operation. Work shall be confined to the immediate area concerned; maintain cleanliness and wet down demolished materials to eliminate dust. Dust and debris shall not be permitted to accumulate in the area to the detriment of plant operation. All flame cutting shall be performed to maintain the fire safety integrity of this plant. Adequate fire extinguishing facilities shall be available at all times. All work shall be performed in accordance with recognized fire protection standards including NFPA 51B.
- C. Unless specified otherwise, all piping, wiring, conduit, and other devices associated with the equipment not re-used in the new work shall be completely removed from Government property per Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT. This includes all concrete equipment pads, pipe, valves, fittings, insulation, and all hangers including the top connection and any fastenings to building structural systems. All openings shall be sealed after removal of equipment, pipes, ducts, and other penetrations in roof, walls, floors, in an approved manner and in accordance with plans and specifications where specifically covered. Structural integrity of the building system shall be maintained. Reference shall also be made to the drawings and specifications of the other disciplines in the project for additional facilities to be demolished or handled.
- D. All valves including gate, globe, ball, butterfly and check, all pressure gages and thermometers with wells shall remain Government property and shall be removed and delivered to owner and stored as directed. The Contractor shall remove all other material and equipment, devices and demolition debris under these plans and specifications. Such material shall be removed from Government property expeditiously and shall not be allowed to accumulate. Coordinate with the Owner.

3.7 CLEANING AND PAINTING

- A. Prior to final inspection and acceptance of the plant and facilities for beneficial use by the Government, the plant facilities, equipment and systems shall be thoroughly cleaned and painted. Refer to Section 09 91 00, PAINTING.
- B. In addition, the following special conditions apply:
 - 1. Cleaning shall be thorough. Solvents, cleaning materials and methods recommended by the manufacturers shall be used for the specific tasks. All rust shall be removed prior to painting and from surfaces to remain unpainted. Scratches, scuffs, and abrasions shall be repaired prior to applying prime and finish coats.
 - 2. The following Material and Equipment shall NOT be painted:
 - a. Motors, controllers, control switches, and safety switches.
 - b. Control and interlock devices.
 - c. Regulators.
 - d. Pressure reducing valves.
 - e. Control valves and thermostatic elements.
 - f. Lubrication devices and grease fittings.
 - g. Copper, brass, aluminum, stainless steel and bronze surfaces.
 - h. Valve stems and rotating shafts.
 - i. Pressure gages and thermometers.
 - j. Glass.
 - k. Name plates.
 - 3. Control and instrument panels shall be cleaned and damaged surfaces repaired. Touch-up painting shall be made with matching paint type and color obtained from manufacturer or computer matched.
 - 4. Pumps, motors, steel and cast iron bases, and coupling guards shall be cleaned, and shall be touched-up with the same paint type and color as utilized by the pump manufacturer.
 - 5. Temporary Facilities: Apply paint to surfaces that do not have existing finish coats per Section 09 91 00, Painting.
 - 6. The final result shall be a smooth, even-colored, even-textured factory finish on all items. The entire piece of equipment shall be repainted, if necessary, to achieve this. Lead based paints shall not be used.

3.8 IDENTIFICATION SIGNS

- A. Laminated plastic signs, with engraved lettering not less than 7 mm (3/16 inch) high, shall be provided that designates equipment function, for all equipment, switches, motor controllers, relays, meters, control devices, including automatic control valves. Nomenclature and identification symbols shall correspond to that used in maintenance manual, and in diagrams specified elsewhere. Attach by chain, adhesive, or screws.
- B. Factory Built Equipment: Metal plate, securely attached, with name and address of manufacturer, serial number, model number, size, and performance data shall be placed on factory built equipment.

- C. Pipe Identification: Refer to Section 09 91 00, PAINTING.

3.9 STARTUP AND TEMPORARY OPERATION

- A. Startup of equipment shall be performed as described in the equipment specifications. Vibration within specified tolerance shall be verified prior to extended operation. Temporary use of equipment is specified in Section 01 00 00, GENERAL REQUIREMENTS, Article, TEMPORARY USE OF MECHANICAL AND ELECTRICAL EQUIPMENT.

3.10 OPERATING AND PERFORMANCE TESTS

- A. Prior to the final inspection, all required tests shall be performed as specified in Section 01 00 00, GENERAL REQUIREMENTS, Article, TESTS and submit the test reports and records to the COR.
- B. Should evidence of malfunction in any tested system, or piece of equipment or component part thereof, occur during or as a result of tests, make proper corrections, repairs or replacements, and repeat tests at no additional cost to the Government.
- C. When completion of certain work or systems occurs at a time when final control settings and adjustments cannot be properly made to make performance tests, then conduct such performance tests and finalize control settings during the first actual seasonal use of the respective systems following completion of work. Rescheduling of these tests shall be requested in writing to COR for approval.
- D. Perform tests as required for commissioning provisions in accordance with Section 22 08 00, COMMISSIONING OF PLUMBING SYSTEMS and Section 01 91 00, GENERAL COMMISSIONING REQUIREMENTS

3.11 OPERATION AND MAINTENANCE MANUALS

- A. All new and temporary equipment and all elements of each assembly shall be included.
- B. Data sheet on each device listing model, size, capacity, pressure, speed, horsepower, impeller size, and other information shall be included.
- C. Manufacturer's installation, maintenance, repair, and operation instructions for each device shall be included. Assembly drawings and parts lists shall also be included. A summary of operating precautions and reasons for precautions shall be included in the Operations and Maintenance Manual.
- D. Lubrication instructions, type and quantity of lubricant shall be included.
- E. Schematic diagrams and wiring diagrams of all control systems corrected to include all field modifications shall be included.
- F. Set points of all interlock devices shall be listed.
- G. Trouble-shooting guide for the control system troubleshooting shall be inserted into the Operations and Maintenance Manual.
- H. The control system sequence of operation corrected with submittal review comments shall be inserted into the Operations and Maintenance Manual.
- I. Emergency procedures for shutdown and startup of equipment and systems.

END OF SECTION

22 05 11

SECTION 22 14 29
SUMP PUMPS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Sump pumps. See schedule on Drawings for pump capacity and head.
- B. A complete listing of all acronyms and abbreviations are included in Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING.

1.2 RELATED WORK

- A. Section 01 00 00, GENERAL REQUIREMENTS.
- B. Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- C. Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS.
- F. Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING.
- G. Section 22 05 12, GENERAL MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT.
- H. Section 22 05 23, GENERAL-DUTY VALVES FOR PLUMBING PIPING

1.3 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American National Standard Institute (ANSI)/Hydraulic Institute (HI):
 - 1.1-1.2-2014Rotodynamic Centrifugal Pumps for Nomenclature and Definitions
 - 1.3-2013Rotodynamic Centrifugal Pumps for Design and Application
 - 1.4-2014Rotodynamic Centrifugal Pumps for Manuals Describing Installation, Operation, and Maintenance
- C. ASTM International (ASTM):
 - A48/A48M-2003 (R2012)Standard Specification for Gray Iron Castings
 - A532/A532M-2010 (R2014)Standard Specification for Abrasion-Resistant Cast Irons
 - B584-2014Standard Specification for Copper Alloy Sand Castings for General Applications
- D. National Electrical Manufacturers Association (NEMA):
 - ICS 6-1993 (R2001, R2006)Industrial Control and Systems: Enclosures
 - 250-2014Enclosures for Electrical Equipment (1000 Volts Maximum)
- E. Underwriters' Laboratories, Inc. (UL):
 - 508-1999 (R2013)Standards for Industrial Control Equipment

1.4 SUBMITTALS

- A. Submittals, including number of required copies, shall be submitted in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

- B. Information and material submitted under this section shall be marked "SUBMITTED UNDER SECTION 22 14 29, SUMP PUMPS", with applicable paragraph identification.
- C. Manufacturer's Literature and Data including: Full item description and optional features and accessories. Include dimensions, weights, materials, applications, standard compliance, model numbers, size, and capacity.
 - 1. Pump:
 - a. As specified by the Engineer
 - 2. Electric Motor:
 - a. As specified by the Engineer
 - 3. Control panel.
 - 4. Sensors.
- D. Certified copies of all the factory and construction site test data sheets and reports.
- E. Complete operating and maintenance manuals including wiring diagrams, technical data sheets and information for ordering replacement parts:
 - 1. Include complete list which indicates all components of the system.
 - 2. Include complete diagrams of the internal wiring for each item of equipment.
 - 3. Diagrams shall have their terminals identified to facilitate installation, operation and maintenance, and troubleshooting.
- //F. Completed System Readiness Checklist provided by the CxA and completed by the contractor, signed by a qualified technician and dated on the date of completion, in accordance with the requirements of Section 22 08 00, COMMISSIONING OF PLUMBING SYSTEMS.//
- //G. Submit training plans and instructor qualifications in accordance with the requirements of Section 22 08 00, COMMISSIONING OF PLUMBING SYSTEMS.//

1.5 QUALITY ASSURANCE

- A. Bio-Based Materials: For products designated by the USDA's Bio-Preferred Program, provide products that meet or exceed USDA recommendations for bio-based content, so long as products meet all performance requirements in this specifications section. For more information regarding the product categories covered by the Bio-Preferred Program, visit <http://www.biopreferred.gov>.

1.6 AS-BUILT DOCUMENTATION

- A. Submit manufacturer's literature and data updated to include submittal review comments and any equipment substitutions.
- B. Submit operation and maintenance data updated to include submittal review comments, substitutions and construction revisions shall be // in electronic version on compact disc or DVD // inserted into a three ring binder. All aspects of system operation and maintenance procedures, including piping isometrics, wiring diagrams of all circuits, a written description of system design, control logic, and sequence of operation shall be included in the operation and maintenance manual. The operations and maintenance manual shall include troubleshooting techniques and procedures for emergency situations. Notes on all special

systems or devices such as damper and door closure interlocks shall be included. A List of recommended spare parts (manufacturer, model number, and quantity) shall be furnished. Information explaining any special knowledge or tools the owner will be required to employ shall be inserted into the As-Built documentation.

- B. Certification documentation shall be provided to the Architect 10 working days prior to submitting the request for final inspection. The documentation shall include all test results, the names of individuals performing work for the testing agency on this project, detailed procedures followed for all tests, and a certification that all results of tests were within limits specified.

PART 2 - PRODUCTS

2.1 SUMP PUMP

- A. Centrifugal, vertical, submersible pump and motor, designed for 140 degrees F maximum water service. Driver shall be electric motor. Support shall be rigid type. Provide perforated, suction strainer. Systems may include one, two, or more pumps with alternator as required by Contract Documents. Pump shall be capable of continuous duty cycle.
 - 1. Pump housings may be cast iron, bronze, aluminum or stainless steel. Cast iron and aluminum housings for submersible pumps shall be epoxy coated. Bio-based materials shall be utilized when possible.
- B. Impeller: Statically and dynamically balanced, keyed and secured to shaft.
- C. Shaft: Stainless steel or other approved corrosion-resisting metal.
- D. Bearings: As required to hold shaft alignment, anti-friction type for thrust permanently lubricated. Bio-based materials shall be utilized when possible.
- E. Seal: Mechanical.
- F. Motor: Maximum 40 degrees C (104 degrees F) ambient temperature rise above the maximum fluid temperature being pumped, drip-proof hermetically sealed, lifting eye, capacitor start type, voltage and phase as shown in schedule on Electrical drawings conforming to NEMA Type 1. Size the motor capacity to operate pump without overloading the motor at any point on the pump curve.
- G. Starting Switch: Manually-operated, tumbler type.
- H. Automatic Control and Level Alarm: Furnish a control panel in a NEMA 1 enclosure for indoors or in a NEMA 4X enclosure for outdoors. The controls shall be suitable for operation with the electrical characteristics listed on the Electrical drawings. The control panel shall have a level control system with switches to start and stop pumps automatically, and to activate a high water alarm. The level control system shall include sensors in the sump that detect the level of the liquid. The pump is also connected to a control which has the ability to prevent oil from being pumped. The same unit shall activate an alarm when oil is detected. The sensors may be float type switches, ultrasonic level sensors, or transducers. The high water alarm shall have a red beacon light at the control panel and a buzzer, horn, or bell. The alarm shall have a silencing switch. Provide auxiliary contacts for remote communication with, and alarm monitoring to, the BAS using a BACnet compatible open-protocol type interface to DDC Controls System.

1. The circuitry of the control panel shall include:
 - a. Power switch to turn on/off the automatic control mechanism
 - b. HOA switches to manually override automatic control mechanism
 - c. Run lights to indicate when pumps are powered up
 - d. Level status lights to indicate when water in sump has reached the predetermined on/off and alarm levels
 - e. Magnetic motor contactors
 - f. Disconnect/breaker for each pump
 - g. Automatic motor overload protection
 - h. Wiring terminal block
 - i. Dead front
 - j. Auxiliary contacts
 - k. Control circuit protection
 - l. Fused control step down transformer
2. Sensors that detect the level of water in the sump shall be so arranged as to allow the accumulation of enough volume of liquid below the normal on-level that the pump will run for a minimum cycle time as recommended by the pump manufacturer. Sensors shall be located to activate the alarm adequately before the water level rises to the inlet pipe.
3. Provide two separate power supplies to the control panel, one for the control/alarm circuitry and one for power to the pump motors. Each power supply is to be fed from its own breaker so that if a pump overload trips a breaker, the alarm system shall still function. Each power supply is to be wired in its own conduit.
4. Wiring from the sump to the control panel shall have separate conduits for the pump power and for the sensor switches. All conduits are to be sealed at the basin and at the control panel to prevent the intrusion of moisture and of flammable and/or corrosive gases.
- I. Sump: Furnish // cast iron // fiberglass // steel // polyethylene // basin with gas tight covers. Cover shall have 275 mm by 381 mm (11 inch by 15 inch) manhole with bolted cover, vent connection, openings for pumps and controls. Sump shall be sized to allow an adequate volume of water to accumulate for a minimum one minute cycle of pump operation.
- J. Provide a check and ball valve in the discharge of each pump.
- K. Removal/Disconnect System: In a system utilizing a submersible pump, where sump depth, pump size, or other conditions make removal of the pump unusually difficult or unsafe, a manufacturer's removal/disconnect system shall be provided. The system shall consist of a discharge fitting mounted on vertical guide rails attached to the sump or quick connect pipe fitting connection to piping. The pump shall be fitted with an adapter fitting that easily connects to/disconnects from the discharge fitting as the pump is raised from or lowered into the sump. The discharge piping shall connect to the discharge fitting so that it is disconnected without workers entering the pit. Where the sump depth is greater than five feet or other conditions exist to make the removal of the pump difficult or hazardous, the system shall include a rail guided quick disconnect apparatus to allow the pump to be pulled up out of the sump.

PART 3 – EXECUTION

3.1 STARTUP AND TESTING

- A. Pump installation to comply with ANSI/HI 1.4 for sump pumps.
- B. Leak Test: Charge piping system and test for leaks. Test until there are no leaks. Make tests as recommended by product manufacturer and listed standards and under actual or simulated operating conditions and prove full compliance with design and specified requirements. Tests of the various items of equipment shall be performed simultaneously with the system of which each item is an integral part.
- C. The tests shall include system capacity and all control and alarm functions.
- D. When any defects are detected, correct defects and repeat test.
- E. The engineer will observe startup and contractor testing of selected equipment. Coordinate the startup and contractor testing schedules with the Owner. Contractor shall provide a minimum of 10 working days prior to startup and testing.

END OF SECTION

SECTION 31 20 00
EARTHWORK

PART 91 GENERAL

91.1 SECTION INCLUDES

- A. Excavation, filling, compacting and grading operations both inside and outside building limits as required for below-grade improvements and to achieve grades and elevations indicated. Provide trenching and backfill for mechanical and electrical work and utilities.
- B. Subbase materials, drainage fill, common fill, and structural fill materials for slabs, pavements, and improvements.
- C. Suitable fill from off-site if on-site quantities are insufficient or unacceptable, and legal disposal of excess fill off-site.
- D. Rock excavation without blasting unless blasting is specifically authorized.

91.2 RELATED SECTIONS

- A. Section 32 90 00 - Planting.

91.3 SUBMITTALS

- A. Submit under provisions of Section 01 30 00 - Administrative Requirements.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- C. Test Reports: Submit for approval test reports, list of materials and gradations proposed for use.

91.4 QUALITY ASSURANCE

- A. Installer Qualifications: Minimum 2 year experience installing similar products.

91.5 PRE-INSTALLATION MEETINGS

- A. Convene minimum two weeks prior to starting work of this section.

91.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store products in manufacturer's unopened packaging bearing the brand name and manufacturer's identification until ready for installation.
- B. Handling: Handle materials to avoid damage.

91.7 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

91.8 SEQUENCING

- A. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

PART 92 PRODUCTS

92.1 MATERIALS

- A. Earthwork: For reference, earthwork to correspond to Architectural Drawings.

1. Subbase Material: Graded gravel or crushed stone.
2. Bedding Course: Graded crushed gravel and sand.
3. Borrow Soil: Off-site soil for fill or backfill.
4. Drainage Fill: ashed gravel or crushed stone.
5. Common Fill: Mineral soil free from unsuitable materials.
6. Structural Fill: Graded gravel.
7. Impervious Fill: Gravel and sand mixture.

PART 93 EXECUTION

93.1 PREPARATION

- A. Repair surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

93.2 INSTALLATION

- A. Excavation is unclassified and includes excavation to subgrade regardless of materials encountered. Repair excavations beyond elevations and dimensions indicated as follows:
 1. At Structure: Concrete or compacted structural fill.
 2. Elsewhere: Backfill and compact as directed.
- B. Maintain stability of excavations; coordinate shoring and bracing as required by authorities having jurisdiction. Prevent surface and subsurface water from accumulating in excavations. Stockpile satisfactory materials for reuse, allow for proper drainage and do not stockpile materials within drip line of trees to remain.
- C. Compact materials at the optimum moisture content as determined by ASTM D 1557 by aeration or wetting to the following percentages of maximum dry density:
 1. Structure, Pavement, Walkways: Subgrade and each fill layer to 95 percent of maximum dry density to suitable depth.
 2. Unpaved Areas: Top 6 inches of subgrade and each fill layer to 90 percent maximum dry density.
- D. Place acceptable materials in layers not more than 8 inches loose depth for materials compacted by heavy equipment and not more than 4 inches loose depth for materials compacted by hand equipment to subgrades indicated as follows:
 1. Structural Fill: Use under foundations, slabs on grade in layers as indicated.
 2. Drainage Fill: Use under designated building slabs, at foundation drainage and elsewhere as indicated.
 3. Common Fill: Use under unpaved areas.
 4. Subbase Material: Use under pavement, walks, steps, piping and conduit.
- E. Grading Tolerances Outside Building Lines:
 1. Lawns, unpaved areas, and walks, plus or minus 1 inch.
 2. Pavements, plus or minus 1/2 inch.
- F. Grading Tolerance for Fill Under Building Slabs: Plus or minus 1/2 inch measured with 10-foot straightedge.

- G. Protect newly graded areas from traffic and erosion. Recompact and regrade settled, disturbed and damaged areas as necessary to restore quality, appearance, and condition of work.
- H. Control erosion to prevent runoff into sewers or damage to sloped or surfaced areas.
- I. Control dust to prevent hazards to adjacent properties and vehicles. Immediately repair or remedy damage caused by dust including air filters in equipment and vehicles. Clean soiled surfaces.
- J. Dispose of waste and unsuitable materials off-site in a legal manner.

END OF SECTION

SECTION 32 17 23
PAVEMENT MARKINGS

PART 94 GENERAL

1. SUMMARY
 - a. Section Includes:
 - 1) Paint on pavement surfaces, in form of traffic lanes, parking bays, areas restricted to handicapped persons, crosswalks, and other detail pavement markings.
2. RELATED REQUIREMENTS
 - a. Paint Color: Section 09 06 00, SCHEDULE FOR FINISHES.
3. APPLICABLE PUBLICATIONS
 - a. Comply with references to extent specified in this section.
 - b. Federal Specifications (Fed. Spec.):
 - 1) TT-P-1952F - Paint, Traffic and Airfield Marking, Waterborne.
4. SUBMITTALS
 - a. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
 - b. Submittal Drawings:
 - 1) Show pavement marking configuration and dimensions.
 - 2) Show international symbol of accessibility at designated parking spaces.
 - c. Manufacturer's Literature and Data:
 - 1) Description of each product.
 - 2) Application instructions.
 - d. Samples:
 - 1) Paint: 200 mm (8 inches) square, each type and color.
 - e. Certificates: Certify products comply with specifications.
 - f. Qualifications: Substantiate qualifications comply with specifications.
 - 1) Installer with project experience list.
5. QUALITY ASSURANCE
 - a. Installer Qualifications:
 - 1) Regularly installs specified products.
 - 2) Installed specified products with satisfactory service on five similar installations for minimum five years.
 - a) Project Experience List: Provide contact names and addresses for completed projects.
6. DELIVERY
 - a. Deliver products in manufacturer's original sealed packaging.
 - b. Mark packaging, legibly. Indicate manufacturer's name or brand, type, color, production run number, and manufacture date.
 - c. Before installation, return or dispose of products within distorted, damaged, or opened packaging.
7. STORAGE AND HANDLING
 - a. Store products indoors in dry, weathertight conditioned facility.

- b. Protect products from damage during handling and construction operations.

8. FIELD CONDITIONS

- a. Environment:

- 1) Product Temperature: Minimum 13 degrees C (55 degrees F) for minimum 48 hours before installation.

- a) Surface to be painted and ambient temperature: Minimum 10 degrees C (50 degrees F) and maximum 35 degrees C (95 degrees F).

- b. Field Measurements: Verify field conditions affecting traffic marking installation. Show field measurements on Submittal Drawings.

9. WARRANTY

- a. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

PART 95 PRODUCTS

1. SYSTEM PERFORMANCE

- a. Design paint complying with specified performance:

- 1) Application: Fed. Spec. TT-P-1952.

2. PRODUCTS - GENERAL

- a. 72W-A087 White High Build Jet Dry Waterborne Traffic Safety Paint.

- b. See product book for details.

3. SANDBLASTING EQUIPMENT

- a. Air compressor, hoses, and nozzles of proper size and capacity as required for cleaning painted surfaces. Compressor to provide minimum 0.08 cu. m/s (150 cfm) of air at pressure of minimum 625 kPa (90 psi) at each nozzle used.

4. PAINT APPLICATOR

- a. Apply marking paint with approved mechanical equipment. Provide equipment with constant agitation of paint and travel at controlled speeds. Synchronize one or more paint "guns" to automatically begin and cut off paint flow in case of skip lines. Equipment to have manual control to apply continuous lines of varying length and marking widths as indicated on Drawings. Provide pneumatic spray guns for hand application of paint in areas where mobile paint applicator cannot be used. // Use separate piece of equipment when equipment does not have glass bead dispenser. Adjust and synchronize equipment with paint applicator to distribute reflective beads on paint lines uniformly within ten seconds without any waste. //

5. PAINT

- a. Paint: 72W-A087 White High Build Jet Dry Waterborne Traffic Safety Paint.

- 1) See product book for details.

PART 96 EXECUTION

1. PREPARATION

- a. Examine and verify substrate suitability for product installation.

- 1) Allow new pavement surfaces to cure for period of minimum 14 days before application of marking materials.
- b. Protect existing construction and completed work from damage.
- c. Clean substrates. Remove contaminants capable of affecting subsequently installed product's performance.
 - 1) Remove dust, dirt, and other granular surface deposits by sweeping, blowing with compressed air, rinsing with water, or combination of these methods.
 - 2) Completely remove rubber deposits, existing paint markings, and other coatings adhering to pavement with scrapers, wire brushings, sandblasting, mechanical abrasion, or approved chemicals as directed by Contracting Officer's Representative.
 - 3) As an option, comply with Fed. Spec. TT-P-1952 for removal of existing paint markings on asphalt pavement. Apply black paint in as many coats as necessary to completely obliterate existing markings.
 - 4) Scrub affected areas with several applications of trisodium phosphate solution or other approved detergent or degreaser, and rinse thoroughly after each application, where oil or grease are present on old pavements to be marked.
 - a) After cleaning, seal oil-soaked areas with cut shellac to prevent bleeding through new paint.
 - 5) Clean and dry surface before pavement marking. Do not begin any marking until Contracting Officer's Representative inspected surface and gives permission to proceed.

2. TEMPORARY PAVEMENT MARKING

- a. Apply Temporary Pavement Markings of colors, widths and lengths shown on drawings or directed by Contracting Officer's Representative. After temporary marking has served its purpose and when so ordered by Contracting Officer's Representative, remove temporary marking by carefully controlled sandblasting, approved grinding equipment, or other approved method to prevent damage on applied surface.
- b. As an option, provide approved preformed pressure sensitive, // reflective, // adhesive tape type of temporary pavement marking of required colors, widths and lengths in lieu of temporary painted // and reflective // marking. Continuous durability and effectiveness of such marking is required during period for which its use is required. Remove any unsatisfactory tape type marking and replace with painted // and reflective // markings.

3. INSTALLATION - GENERAL

- a. Install products according to manufacturer's instructions and approved submittal drawings.
 - 1) When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.

4. PAINT APPLICATION

- a. Apply uniformly painted pavement markings of required colors, length, and width with true, sharp edges and ends on properly cured, prepared, and dried surfaces.
- b. Comply with details as indicated on drawings and established control points.

- c. Apply paint at wet film thickness of 0.4 mm (0.015 inch). Apply paint in one coat. When directed by the Architect, apply additional coats at markings showing light spots. Comply with paint manufacturer's maximum drying time requirements to prevent undue softening of asphalt, and pick-up, displacement, or discoloration by tires of traffic.
- d. When deficiency in marking drying occurs, discontinue paint operations until cause of slow drying is determined and corrected.
- e. Remove and replace marking applied less than minimum material rates, deviates from true alignment, exceeds stipulated length and width tolerances, or shows light spots, // faulty distribution of beads, // smears, or other deficiencies or irregularities.
- f. Remove marking by carefully controlled sandblasting, approved grinding equipment, or other approved method to prevent damage on applied surface.

5. DETAIL PAVEMENT MARKING APPLICATION

- a. Apply Detail Pavement Markings, exclusive of actual traffic lane marking as follows:
 - 1) At exit and entrance islands and turnouts.
 - 2) On curbs.
 - 3) At crosswalks.
 - 4) At parking bays.
 - 5) Other locations as indicated on drawings.
- b. Apply International Handicapped Symbol at indicated parking spaces. Color as shown on drawings. Apply paint for symbol using suitable template approved by the Architect that will provide pavement marking with true, sharp edges and ends.
- c. Install detail pavement markings of colors, widths and lengths, and design pattern at locations indicated on drawings.

6. TOLERANCES

- a. Length and Width of Lines: Plus or minus 75 mm (3 inches) and plus or minus 3 mm (1/8 inch), respectively, in case of skip markings.
- b. Length of intervals exceeding line length tolerance are not acceptable.

7. CLEANING

- a. Remove excess paint before paint sets.

8. PROTECTION

- a. Protect pavement markings from traffic and construction operations.
 - 1) Protect newly painted markings from vehicular traffic until paint is dry and track free.
 - 2) Place warning signs at beginning of wet line, and at points well in advance of marking equipment for alerting approaching traffic from both directions.
 - 3) Place small flags or other similarly effective small objects near freshly applied markings at frequent intervals to reduce crossing by traffic.
- b. Repair damage.

END OF SECTION

SECTION 32 90 00
PLANTING

PART 97 GENERAL

97.1 SECTION INCLUDES

- A. Trees, shrubs, plants and groundcover.
- B. Topsoil and soil amendments.
- C. Initial maintenance of planting materials.
- D. Pruning and relocation of existing plant materials.

97.2 RELATED SECTIONS

- A. Section 31 20 00 - Earthwork.

97.3 SUBMITTALS

- A. Submit under provisions of Section 01 30 00 - Administrative Requirements.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- C. Maintenance Data: Submit maintenance data, including maintenance schedule.
- D. Notices: Submit 48-hour written notice prior to turnover to Owner for watering and maintenance.
- E. Warranty: Warrant trees and shrubs for a period of one year after date of Substantial Completion, against defects including death and unsatisfactory growth and except for defects resulting from neglect by Owner, abuse by others, or natural phenomena. Replace unsatisfactory plant material at end of warranty period at no additional expense to the Owner. One replacement is required.

97.4 QUALITY ASSURANCE

- A. Installer Qualifications: Minimum 2 year experience installing similar products.
- B. Balled and Burlapped Plants and Trees: Graded to American Standard for Nursery Stock, ANSI Z60.1.
- C. Testing: Laboratory testing for suitable soil amendments and fertilizer.

97.5 PRE-INSTALLATION MEETINGS

- A. Convene minimum two weeks prior to starting work of this section.

97.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store products as recommended by supplier until ready for installation.
- B. Handling: Handle materials to avoid damage.

97.7 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside supplier's recommended limits.

97.8 SEQUENCING

- A. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

PART 98 PRODUCTS

98.1 MANUFACTURERS

- A. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

98.2 MATERIALS

A. Plantings:

1. Plant Materials:

- 1) Chamadorea Palm
- 2) Dwarf Ixora
- 3) Dypsis Lutenscens
- 4) Monstera Deliciosa
- 5) Roystonea Regia

2. Plant Materials: Ground cover refer to landscaping dwgs..

3. Topsoil: From offsite.

4. Soil Amendments: Based on soil testing.

5. Accessories:

- a. Gravel: Water-worn gravel.
- b. Anti-Erosion Mulch: Seed-free salt hay or threshed straw.
- c. Anti-Dessicant: Emulsion type, film-forming.
- d. Plastic Sheet: Black polyethylene, 8 mils.
- e. Filtration Fabric: Water permeable fiberglass or polypropylene fabric.
- f. Wrapping: Tree-wrap tape.
- g. Stakes and Guys: New hardwood, treated softwood, or redwood.
- h. Metal Edging: Commercial steel edging.
- i. Wood Headers and Edging: All heart redwood or pressure treated southern yellow pine.

PART 99 EXECUTION

99.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

99.2 PREPARATION

- A. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

99.3 INSTALLATION

- A. Install materials in accordance with approved submittals. Install landscape work in proper relation with adjacent construction and with uniform appearance. Coordinate with work of other sections.
- B. Prepare topsoil by mixing fertilizer with loam. Apply fertilizer at a rate of 2 pounds of actual nitrogen per 1000 sq. ft. for plant beds and 2 pounds per inch of trunk for tree pits.
- C. Install soil mix to a depth of 18 inches in plant beds.

- D. Excavate as required for trees and shrubs.
- E. Install plant material and backfill with soil mix. Stake and guy trees. Water thoroughly. Allow for soil settlement.
- F. Provide maintenance and watering until turnover to Owner for maintenance and watering. Replace damaged materials and dead or unhealthy plants prior to turnover to Owner.

99.4 PROTECTION

- A. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION