

DAKTRONICS QUOTE # 586954-1-2

Signs Ink
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1/Jul/2016
 Quote valid for: 7 days
 Terms: Payment With Order
 Subject to Credit Review
 FOB: DAKTRONICS
 Anticipated mfg time: 4-6 weeks

Reference: YORKTOWN HIGH SCHOOL - EMC Order Qte

Ship date shall be established at time of order acceptance

| Model | Description | Qty | Price |
|--|--|-----|-------|
| GS6-32X140-19.8-RGB-2V | Galaxy® Outdoor Electronic Message Center - GS6 Series - 19.8mm RGB; 2V Interconnect Cable Length is 20 Feet | 1 | |
| <i>Line Spacing:</i> | 19.8mm | | |
| <i>Matrix:</i> | 32 lines by 140 columns | | |
| <i>LED Color:</i> | RGB- 281 Trillion Colors | | |
| <i>Display Configuration:</i> | 2V - two one sided displays - same content | | |
| <i>Cabinet Design:</i> | Single Section per face | | |
| <i>Paint:</i> | Semi-Black All Around | | |
| <i>Active Area:</i> | 2' 1" H X 9' 2" W (Approx. Dimensions) | | |
| <i>Cabinet Dimensions:</i> | 2' 7" H X 9' 5" W X 0' 5" D (Approx. Dimensions) | | |
| <i>Max Power:</i> | 860 watts/display | | |
| | <i>Ventilation:</i> Front | | |
| | <i>Service Access:</i> Front Only | | |
| | <i>Signal Connections:</i> Quick Connects External to Display | | |
| | <i>Frames per Second:</i> 60 | | |
| | <i>Dimming:</i> Automatic, Scheduled, or Manual | | |
| | <i>Readable Viewing Angle:</i> 160 degrees horizontal x 90 degrees vertical | | |
| | <i>Optimal Viewing Angle:</i> 140 degrees Horizontal x 70 degrees Vertical | | |
| | <i>Weight:</i> Unpackaged 175 lbs per display; Packaged 280 lbs per display | | |
| | <i>Compliance Info:</i> UL,cUL,UL-Energy Verified,FCC | | |
| Galaxy® Wireless Ethernet Bridge Outdoor Communication Kit | Communication Method: Wireless Ethernet Bridge Radio Set Includes: 1 Server (Sending) and 1 Client (Receiving). *Wireless communication devices may be affected by site specific conditions. Daktronics makes no guarantees that the communication device is suitable for every location. | 1 | |
| Galaxy® External Temperature Sensor | External Temperature Sensor with 25 ft. Quick Connect Cable | 1 | |
| Venus® Control Suite - Prime Playlist Package, Cloud Based | Secure, web-based software that enables display management anytime, anywhere via internet connection. ADMINISTRATORS OF ACCOUNT REQUIRED AT TIME OF ORDER. Terms of Use: http://www.daktronics.com/TermsConditions/DD2688225 | 1 | |
| FREIGHT | Shipping to NY | 1 | |
| Services | | | |
| G5G5 - Parts Assurance | Five (5) Year Parts Only Warranty | 1 | |
| PURCHASER PROVIDES MAINTENANCE SERVICE | Purchaser will execute end user's display maintenance. Services include providing phone technical support, parts ordering, onsite labor and preventative maintenance. | 1 | |
| Installation Assurance Plus | Advanced onsite support of equipment installation. Adds 90 days onsite labor service to the Product Assurance and includes one web seminar for product user | 1 | |

Total Price Excluding Sales Tax:

Financing

Show customers how to preserve cash AND increase sales by financing their new Daktronics display. Call your Daktronics representative or click <http://www.daktronics.com/financing>

SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with fly ash.
- B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
 - a. Contractor's superintendent.
 - b. Concrete Subcontractor.
 - 2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, forms and form removal limitations, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, floor and slab flatness and levelness measurement, and concrete protection.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
 - 1. Indicate amounts of mixing water to be withheld for later addition at Project site.

- C. Steel Reinforcement Shop Drawings: Placing Drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, tie spacing, hoop spacing, and supports for concrete reinforcement.
 - 1. Submit both plans and coordinated elevations for all placement of reinforcement.
- D. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
 - 1. Location of construction joints is subject to approval of the Architect.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer manufacturer.
- B. Material Certificates: For each of the following, signed by manufacturers:
 - 1. Cementitious materials.
 - 2. Admixtures.
 - 3. Steel reinforcement and accessories.
 - 4. Curing compounds.
 - 5. Adhesives.
 - 6. Vapor retarders.
 - 7. Joint-filler strips.
 - 8. Repair materials.
- C. Material Test Reports: For the following, from a qualified testing agency:
 - 1. Aggregates: Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs on Project personnel with a minimum of 5 years of documented experience on work of similar scope, size, and complexity.
- B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
 - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- C. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
 - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
 - 2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency

laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician, Grade II.

1.8 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on concrete mixtures. Testing must be completed for the specific mix designs specified for this project and must be completed within 6 months of the concrete submittal.

1.9 FIELD CONDITIONS

- A. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 - 1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
 - 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- B. Hot-Weather Placement: Comply with ACI 301 and as follows:
 - 1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 - 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

- A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
 - 1. ACI 301.
 - 2. ACI 117.

2.2 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
 - 1. Plywood, metal, or other approved panel materials.

2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - a. High-density overlay, Class 1 or better.
 - b. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
 - c. Structural 1, B-B or better; mill oiled and edge sealed.
 - d. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.
 3. Overlaid Finnish birch plywood.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.
- D. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.
- E. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.
1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- F. Form Ties: Factory-fabricated, removable or snap-off glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
1. Furnish units that leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
 2. Furnish ties that, when removed, leave a 1" deep cone-shaped depression in the wall surface to receive patching mortar. See section 3.14 for patching requirements.

2.3 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- B. Plain-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, plain, fabricated from as-drawn steel wire into flat sheets.

2.4 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place. Manufacture bar supports from steel wire or plastic according to CRSI's "Manual of Standard Practice" and as follows:

1. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2.5 CONCRETE MATERIALS

- A. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.
- B. Cementitious Materials:
 1. Portland Cement: ASTM C 150/C 150M, Type I Type II Type I/II, gray.
 2. Fly Ash: ASTM C 618, Class F.
- C. Normal-Weight Aggregates: ASTM C 33/C 33M, Class 3M Class 1N coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.
 1. Maximum Coarse-Aggregate Size: varies with mix design.
 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- D. Air-Entraining Admixture: ASTM C 260/C 260M.
- E. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 2. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
- F. Water: ASTM C 94/C 94M.

2.6 VAPOR RETARDERS

- A. Sheet Vapor Retarder: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape.
 1. Fortifiber Building Systems Group; Moistop Ultra 15.
 2. Raven Industries, Inc; Vapor Block 15.
 3. Stego Industries, LLC; Stego Wrap 15 mil Class A.

2.7 CURING MATERIALS

- A. Moisture curing blankets for use on concrete flatwork: Polyethylene sheet backed with absorptive fibrous cellulous or other synthetic material.
 - a. PNA Construction Technologies; Hydracure.
 - b. Raven Industries Inc.; Konkure.

- B. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating for use on concrete surfaces other than flatwork.

1. Products:

- a. Euclid Chemical Company (The); Kurez DR VOX.
- b. Kaufman Products, Inc.; Thinfilm 420.
- c. L&M Construction Chemicals, Inc.; L&M Cure R.
- d. Meadows, W. R., Inc.; 1100 Clear.

2.8 RELATED MATERIALS

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

2.9 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C 150/C 150M, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109/C 109M.

- B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.

1. Cement Binder: ASTM C 150/C 150M, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109/C 109M.

2.10 CONCRETE MIXTURES, GENERAL

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

1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

- B. Cementitious Materials: Use fly ash as needed to reduce the total amount of portland cement, which would otherwise be used, by 20 percent.
- C. Admixtures: Use admixtures according to manufacturer's written instructions.
 - 1. Use a water-reducing admixture in all concrete for improved placement and workability.
 - 2. Use high-range water-reducing or plasticizing admixture in concrete as required for pumped concrete.

2.11 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Footings, Foundation Walls, Piers, and Building Frame Members: Normal-weight concrete.
 - 1. Minimum Compressive Strength: 4000 psi at 28 days.
 - 2. Maximum W/C Ratio: 0.50.
 - 3. Slump Limit: 4 inches maximum
 - 4. Slump Limit: 6 inches maximum with a low dose of superplasticizer added at the batching plant.
 - 5. Slump Limit: 8 inches maximum with a full dose of superplasticizer added at the batching plant.
 - 6. Maximum Aggregate Size: 1-1/2-inch nominal.
 - 7. Air Content: 4.5 percent minimum, 8 percent maximum at point of delivery.
- B. Slabs-on-Grade: Normal-weight concrete.
 - 1. Minimum Compressive Strength: 4000 psi at 28 days.
 - 2. Maximum W/C Ratio: 0.50.
 - 3. Slump Limit: 4 inches maximum
 - 4. Slump Limit: 6 inches maximum with a low dose of superplasticizer added at the batching plant.
 - 5. Slump Limit: 8 inches maximum with a full dose of superplasticizer added at the batching plant.
 - 6. Maximum Aggregate Size: 3/4-inch nominal.
 - 7. Air Content: 5 percent minimum, 8 percent maximum at point of delivery.

2.12 FABRICATING REINFORCEMENT

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

2.13 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information at the site. Concrete arriving on the site without a computer generated batch ticket from the plant will be rejected.
 - 1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK INSTALLATION

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
 - 1. Class A, 1/8 inch for smooth-formed finished surfaces.
 - 2. Class C, 1/2 inch for rough-formed finished surfaces.
- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Construct forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces.
 - 1. Install keyways, reglets, recesses, and the like, for easy removal.
 - 2. Do not use rust-stained steel form-facing material.
- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Chamfer exterior corners and edges of permanently exposed concrete unless noted otherwise.
- I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEM INSTALLATION

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

1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.
2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
3. Install dovetail anchor slots in concrete structures as indicated.
4. All concrete reinforcement must be tied in place for inspection prior to concrete order for delivery.
5. All concrete reinforcement must be tied in place prior to concrete placement. "Wet-Sticking" of dowels and bars into plastic concrete is not allowed and is cause for rejection, removal, and replacement of the work.

3.3 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations, and curing and protection operations need to be maintained.
1. Leave formwork for beam soffits, joists, slabs, and other structural elements that support weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength. The Contractor is responsible for the scheduling, cost, and assuring acceptance of this testing.
 2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material is not acceptable for exposed surfaces. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 VAPOR-RETARDER INSTALLATION

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.
1. Lap joints 6 inches and seal with manufacturer's recommended tape and/or sealant system.
 2. Seal all edges and penetrations with manufacturer's recommended tape and/or sealant system.

3.5 STEEL REINFORCEMENT INSTALLATION

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars, secure with wire ties.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded-wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.6 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
 - 2. Space vertical joints in walls as indicated.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated on plans and the slab on grade details as follows:
 - 1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface. Joints should usually be cut with an early entry saw system, usually within 4 hours of finishing, but not later than 16 hours after finishing.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
 - 1. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface. Fill top of joints with one-part self-leveling gray urethane sealants, unless other sealants are indicated as specified in Section 079200 "Joint Sealants".
 - 2. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
- E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.7 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless all of the conditions below are met.
 - 1. Water must have been withheld at the batch plant from the approved mix design.
 - 2. The amount of water withheld at the batch plant must be clearly indicated on the computerized batch ticket delivered with the concrete.
 - 3. The amount of water added on site must not exceed the amount withheld at the batch plant.
 - 4. The mix design must not contain a superplasticizer.
 - 5. After the addition of water, the concrete must be mixed in the truck for a minimum of 5 minutes.
 - 6. Sampling of the concrete and the preparation of test cylinders must occur after the addition of water.
 - 7. If the slump is exceeded, the concrete will be rejected. If it is placed within the forms, it must be removed.
- C. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
 - 1. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
 - 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
 - 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
 - 4. Concrete placed with seams or planes of weakness after removal of the forms will be rejected and must be removed and replaced.
- D. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
 - 1. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 - 2. Maintain reinforcement in position on chairs during concrete placement.
 - 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 - 4. Slope surfaces uniformly to drains where required.
 - 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

3.8 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 - 1. Apply to concrete surfaces not exposed to public view.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 - 1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete.
- C. Rubbed Finish: Apply the following to smooth-formed-finished at the upper portions of exposed foundation walls and where indicated:
 - 1. Smooth-Rubbed Finish: Strip wall forms on the morning following wall placement. Moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
 - 2. If this process is not done on time and as specified, the concrete placement will be rejected. Grinding of the surface or parging coating with an overlay of material at a later date will not be accepted. The rejected walls will be removed and replaced.
- D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.
 - 1. Apply a steel trowel finish to the tops of all foundation walls. A floated finish is not acceptable.

3.9 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in one direction.
 - 1. Apply scratch finish to surfaces to receive concrete floor toppings or to receive mortar setting beds for bonded cementitious floor finishes.
- C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraighening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to surfaces to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.
- D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
1. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
 2. Finish and measure surface, so gap at any point between concrete surface and an unveled, freestanding, 10-ft.- long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/8 inch.
- E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thinset method. While concrete is still plastic, slightly scarify surface with a fine broom.
1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.
- F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.
1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.10 MISCELLANEOUS CONCRETE ITEM INSTALLATION

- A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations:
1. Coordinate sizes and locations of concrete bases with actual equipment provided.
 2. Minimum Compressive Strength: 4000 psi at 28 days.
 3. Install rods to connect concrete base to concrete floor and detailed.
 4. Prior to pouring concrete, place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 5. Cast anchor-bolt insert into bases. Install anchor bolts to elevations required for proper attachment to supported equipment.
- D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel finish concrete surfaces.

3.11 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for remainder of curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
 - 1. Moisture Curing of Interior Slabs: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Moisture curing blankets, water saturated, and kept continuously wet. Cover concrete surfaces and edges with manufacturer's recommended lap over adjacent absorptive covers.
 - d. Do not cure interior slabs with a curing compound.
 - 2. Curing Compound for Non-Interior Slabs: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.12 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
 - 1. Defer joint filling until concrete has aged at least one month. Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.

3.13 CONCRETE SURFACE REPAIRS

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

- B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
1. Immediately after form removal, no later than the same day, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete. Use a saw to cut around the perimeter of the repair area. Cut to the depth of the defect but limit the depth to 3/4 inch. Do not cut through any steel reinforcing. Make edges of cuts perpendicular to concrete surface. Chip away interior concrete to a uniform depth and or to the depth of the defect. Clean, dampen with water, and brush-coat holes and voids with a paste of Portland cement and water, scrubbing the paste into the abraded surface. Fill and compact with patching mortar before the Portland cement paste has dried. Blend the repair surface to match existing adjacent finishes.
 2. Fill all form-tie holes with patching mortar.
 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 2. After concrete has cured at least 14 days, correct high areas by grinding.
 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
 5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Do not cut reinforcement. Clean, dampen with water, and brush-coat holes and voids with a paste of Portland cement and water, scrubbing the paste into the abraded surface. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Perform the patch before the Portland cement paste has dried. Cure in same manner as adjacent concrete.
 7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Clean, dampen with water, and brush-coat holes and voids with a paste of Portland cement and water, scrubbing the paste into the abraded surface. Place

patching mortar before Portland cement paste has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

- E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

3.14 FIELD QUALITY CONTROL

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

- B. Inspections:

1. Steel reinforcement placement.
2. Headed bolts and studs.
3. Verification of use of required design mixture.
4. Concrete placement, including conveying and depositing.
5. Curing procedures and maintenance of curing temperature.

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

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
2. Slump: ASTM C 143/C 143M; one test at point of placement (end of the discharge chute or the end of the pump hose for pumped concrete. Test the slump for truck delivery to the site, and for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231/C 231M, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C 1064/C 1064M; Test hourly when air temperature is 40 deg F and below or 80 deg F and above. Test each truck delivery to the site. Test during each composite sample.
5. Unit Weight: ASTM C 567/C 567M, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
6. Compression Test Specimens: ASTM C 31/C 31M.
 - a. Cast and laboratory cure three sets of two standard cylinder specimens for each composite sample.
7. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days. Reserve the remaining set of two specimens and test at 56 days only if the 28-day strength is below the specified strength.

- a. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
 - b. Note that the contract requires that the compressive strength of all concrete be reached at 28-days. The additional specimens made for 56-day testing are for the Owner's information only and do not relieve the contractor of providing concrete meeting the 28-day strength specified.
8. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
 9. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
 10. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
 11. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
 12. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
 13. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.
- D. Measure floor and slab flatness and levelness according to ASTM E 1155 within 24 hours of finishing.

END OF SECTION 03 30 00

SECTION 04 20 00 – UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. The work performed under this Section includes the performance criteria, materials, production, and erection of unit masonry for the project and consists of the provision of all plant, materials, labor and equipment and the like necessary and/or required for the complete execution of all unit masonry as required by schedules, keynotes and drawings, as specified herein, and as may be required by conditions and authorities having jurisdiction including, but not limited to the following:

1. Concrete unit masonry.
2. Face brick.
3. Common (building) brick.
4. Mortar and grout.
5. Steel reinforcing bars.
6. Masonry joint reinforcement.
7. Ties and anchors.
8. Embedded flashing.
9. Miscellaneous masonry accessories.

1.3 SUBMITTALS

- A. Product data for each different masonry unit, accessory, and other manufactured product indicated.
- B. Shop drawings for reinforcing detailing fabrication, bending and placement of unit masonry reinforcing bars. Comply with ACI 315 "Details and Detailing of Concrete Reinforcing" showing bar schedules and arrangement of masonry reinforcement.
- C. Samples for verification purposes of the following:
 1. Full-size units for each different exposed masonry unit required showing full range of exposed color, texture and dimensions to be expected in complete construction.
 - a. Include size variation data verifying that actual ranges of sizes for brick falls within ASTM C 216 dimensions tolerances for brick where dimensioning is indicated.
 2. Pigmented and colored-aggregate mortar. Make samples using same sand and mortar ingredients to be used on project.
 3. Weep holes and vents.
 4. Accessories embedded in the masonry.
- D. Material certificates for the following signed by manufacturer and Contractor certifying that each material complies with requirements.

1. Each different cement product required for mortar and grout including name of manufacturer, brand, type and weight slips at time of delivery.
 2. Each material and grade indicated for reinforcing bars.
 3. Each type and size of joint reinforcement.
 4. Each type and size of anchors, ties and metal accessories.
- E. Material test reports from a qualified independent testing laboratory employed and paid by Contractor indicating and interpreting test results relative to compliance of the following proposed masonry materials with requirements indicated.
1. Mortar complying with property requirements of ASTM C270.
 2. Grout mixes. Include description of type and proportions of grout ingredients.
 3. Masonry units.
- F. Cold –weather construction procedures evidencing compliance with requirements specified in referenced unit masonry standard.
- G. Hot-weather construction procedures evidencing compliance with requirements specified in referenced unit masonry standard.
- H. Qualification data firms and persons specified in “Quality Assurance” Article to demonstrate their capabilities and experience. Include list of completed projects with project names, addresses, telephone numbers, names of Architects and Owners and other information specified.
- I. Results from tests and inspections performed by Owner’s representatives will be reported promptly and in writing to Architect and Contractor.

1.4 QUALITY ASSURANCE

- A. Unit Masonry Standard: Comply with ACI 530.1/ASCE 6 “Specifications for Masonry Structures”, except as otherwise indicated.
1. Revise ACI 530.1/ASCE 6 to exclude Sections 1.4 and 1.7; Parts 2.1.2, 3.1.2 and 4.1.2; and Articles 1.5.1.2, 1.5.1.3, 2.1.1.1, 2.1.1.2 and 2.3.3.9 and to modify Article 2.1.1.4 by deleting requirement for installing vent pipes and conduits built into masonry.
- B. Inspecting Laboratory Qualifications: To qualify for employment in performing tests and inspection specified in this Section, an independent testing laboratory must demonstrate to Architects satisfaction, based on evaluation of laboratory-submitted criteria conforming to ASTM C 1093, that it has the experience and capability to conduct satisfactorily the testing indicated without delaying the progress of work.
- C. Preconstruction Testing: Owner will employ and pay a qualified independent testing laboratory to perform the following preconstruction testing indicated as well as other inspecting and testing services required by referenced unit masonry standard or indicated herein for source and field quality control:
1. Brick masonry tests: For each different clay masonry unit type indicated, units will be tested per ASTM C67.
 2. Concrete Masonry Unit Tests: For each different concrete masonry unit type indicated, units will be tested for strength, absorption and moisture content per ASTM C140.

3. Mortar properties will be tested per property specification of ASTM C270.
 4. Grout compressive strength will be tested per ASTM C 1019.
- D. Single-Source Responsibility for Masonry Units: Obtain exposed units of uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from one manufacturer for each different product required for each continuous surface of visually related surfaces.
- E. Single-Source Responsibility for Mortar Materials: Obtain mortar ingredients of uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source and producer for each aggregate.
- F. Sample Panels: Build sample panels to verify selections made under sample submittals and to demonstrate aesthetic effects. Comply with requirements in Section 01 45 00 "Quality Requirements" for mockups. (NOT USED)
1. Build sample panels for each type of exposed unit masonry construction 48 inches (1200 mm) long by 48 inches (1200 mm) high by full thickness.
 2. Where masonry is to match existing, erect panels adjacent and parallel to existing surface.
 3. Clean one-half of exposed faces of panels with masonry cleaner indicated.
 4. Protect approved sample panels from the elements with weather-resistant membrane.
 5. Approval of sample panels is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Architect in writing.
 - a. Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels unless such deviations are specifically approved by Architect in writing.
- G. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution. (NOT USED)
1. Build mockup of typical wall area as shown on Drawings.
 2. Build mockups for each type of exposed unit masonry construction in sizes approximately 72 inches (1800 mm) long by 72 inches (1800 mm) high by full thickness, including face and backup wythes and accessories.
 - a. Include a sealant-filled joint at least 16 inches (400 mm) long in each exterior wall mockup.
 - b. Include lower corner of window opening framed with stone trim at upper corner of exterior wall mockup. Make opening approximately 12 inches (300 mm) wide by 16 inches (400 mm) high.
 - c. Include through-wall flashing installed for a 24-inch (600-mm) length in corner of exterior wall mockup approximately 16 inches (400 mm) down from top of mockup, with a 12-inch (300-mm) length of flashing left exposed to view (omit masonry above half of flashing).
 - d. Include sheathing, sheathing joint-and-penetration treatment, veneer anchors, flashing, cavity drainage material, and weep holes in exterior masonry-veneer wall mockup.

3. Where masonry is to match existing, erect mockups adjacent and parallel to existing surface.
 4. Clean one-half of exposed faces of mockups with masonry cleaner as indicated.
 5. Protect accepted mockups from the elements with weather-resistant membrane.
 6. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.
 - a. Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.
 - b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by Architect in writing
 7. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- H. Pre-Installation Conference: Conduct conference at Project site to comply with requirements in Section 01 31 00 "Project Management and Coordination."

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver masonry materials to project in undamaged condition.
- B. Do not ship any concrete masonry units before receiving written approval of strength tests from the Architect. Products shipped beforehand will be rejected.
- C. Store and handle masonry units off ground, under cover and in dry location to prevent their deterioration or damage due to moisture, temperature changes, contaminants, corrosion and other caused, If units become we, do not place until units are in air-dried condition.
- D. Store cementitious materials off ground, under cover and in dry locations.
- E. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- F. Store masonry accessories including metal items to prevent corrosion and accumulation of dirt and oil.

1.6 PROJECT CONDITIONS

- A. Protection of Masonry: During erection, cover tops of walls, projections and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls.

- C. Stain Prevention: Prevent grout, mortar and soil from staining the face of masonry to be left exposed. Remove immediately any grout, mortar and soil that come in contact with such masonry.
 - 1. Protect base walls from rain-slashed mud and mortar splatter by means of coverings spread on ground and over wall surface.
 - 2. Protect sills, ledgers and projections from mortar droppings.
 - 3. Protect surfaces of window and doorframes. As well as similar products with painted and integral finishes from mortar droppings.
- D. Cold-Weather Construction: comply with referenced unit masonry standard for cold-weather construction and the following:
 - 1. Do not lay masonry units that are wet or frozen.
 - 2. Remove masonry damaged by freezing conditions.
- E. Hot-Weather Construction: Comply with referenced unit masonry standard.

PART 2 - PRODUCTS

2.1 MATERIALS - GENERAL

- A. Comply with references unit masonry standard and other requirements specified in this Section applicable to each material indicated.
- B. Fire-Resistance Ratings: Where indicated, provide units that comply with requirements for fire-resistance ratings indicated as determined by testing according to ASTM E 119, by equivalent masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

2.2 CLAY MASONRY UNITS

- A. General: Comply with the following requirements applicable to each form of brick required.
 - 1. Provide special extruded shapes where indicated and as follows:
 - a. For applications requiring brick of form, color, texture and size on exposed surfaces that cannot be produced by sawing standard brick sizes.
 - b. For applications where stretcher units cannot accommodate special conditions including those at corners.
 - 2. Provide units without cores or frogs and with all exposed surfaces finished for ends of headers and similar applications that expose brick surfaces that otherwise would be concealed from view.
- B. Face Brick Standard: ASTM C216 and as follows:
 - 1. Grade and Unit Compressive Strength: Provide units of grade and minimum average net area compressive strength indicated below:
 - a. Grade SW.
 - b. 3000 psi.
 - 2. Type FBX.

3. Shape units during manufacture as indicated below:
 - a. Extruded.
 4. Application: Use where brick is exposed, unless otherwise indicated.
 5. Provide face brick of matching color, texture and size as existing adjacent brickwork.
 6. Color and Texture: Match existing.
 7. Subjects to compliance with requirements, provide product by one of the following:
 - a. Glen-Gery Corporation, Sommerville, NJ.
 - b. The Belden Brick, Canton, OH.
- C. Building (Common) Brick: ASTM C 62 and as follows:
1. Grade and Unit Compressive Strength: Provide units of grade and minimum average net area compressive strength indicated below:
 - a. Grade MW or Grade SW.
 - b. 3000 psi.
 2. Size: Provide bricks manufactured to the following actual dimensions within the tolerances specified in ASTM C 216:
 - a. Match existing
 3. Application: Use where brick is indicated for concealed locations.

2.3 CONCRETE MASONRY UNITS

- A. Comply with requirements of ASTM C 90, latest edition and as indicated below, applicable to each form of concrete masonry unit required, whether hollow units or solid units.
1. Size: Provide concrete masonry units complying with requirements indicated below for size that are manufactured to specified dimensions within tolerances as specified in ASTM C 90.
 - a. Concrete Masonry Units: Manufactured to specified dimensions of 3/8 inch less than nominal widths by nominal heights indicated on drawings.
 2. Moisture Content: Provide Type I, moisture-controlled units.
 3. Exposed Faces: Manufacturer's standard color and texture, unless otherwise indicated.
 4. Strength: See Table 3, ASTM C 90.
 5. Water Absorption: See Table 3, ASTM C 90.
 6. Weight: See General Notes.
- B. Shapes: Provide shapes indicated on Drawings and in this Section.
1. Provide special shapes for corners, jambs, sashes, movement joints, headers, bonding, and other special conditions, as can be reasonably inferred from floor plans and elevations.
 2. Provide square-edged units for outside corners, unless otherwise indicated.
 3. Provide bull-nose corners for interior locations, unless otherwise noted.
 4. Provide special shapes as required to maintain precise patterns of joints.
 5. Provide units with two or more finished faces as required to maintain consistent appearance on all exposed surfaces of masonry construction.

6. Provide polished surfaces for cut units.
 7. Provide factory formed lipped units for heads at windows and openings formed from solid CMU units. Refer to drawings for profiles required.
- C. Absorption: Maximum allowable water absorption shall be 10 pounds per cubic foot, average of five units. Units when delivered to site shall have moisture content not exceeding 8% by weight.
- D. Shrinkage: Drying shrinkage shall not exceed 0.25% average for five (5) specimens, when tested according to ASTM C-426.
- E. Integral Water Repellent: Provide units made with integral water repellent for exterior exposed units.
1. Integral Water Repellent: Liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive according to ASTM E 514, with test period extended to 24 hours, show no visible water or leaks on the back of test specimen. Available products include:
 - a. Grace Construction Products; Dry-Block.
- F. Mortar And Grout Materials
1. Water-Repellent Admixture: Dry Block Liquid water repellent admixture shall be added to the mortar while mixing.

2.4 MORTAR AND GROUT MIXES

- A. General: Do not add mixtures including air-entraining agents, accelerators, retarders, water repellent agents, antifreeze compounds or other admixtures unless otherwise indicated.
1. Do not use calcium chloride in mortar or grout.
- B. Mortar: Comply with ASTM C 270, Type S.
- C. Grout for Unit Masonry: Comply with ASTM C 476 and referenced unit masonry standard.
- D. High-Lift Grouting: Grouting of masonry walls built to full height (maximum 12'-0").

2.5 REINFORCING STEEL

- A. Shall conform to ASTM A615, Grade 60.

2.6 JOINT REINFORCEMENT

- A. General: Provide joint reinforcement complying with requirements of referenced unit masonry standard and this article, formed from the following:
1. Hot-dipped galvanized carbon steel wire, coating class as required by referenced unit masonry standard to application indicated.

- B. Description: Welded-wire units prefabricated with deformed continuous side rods and plain cross rods into straight lengths of not less than 10 feet, with prefabricated corner and tee units, and complying with requirements indicated below:
1. Wire Diameter for Side Rods: 0.1483 inch (9 gauge).
 2. Wire Diameter for Cross Rods: 0.1483 inch (9 gauge).
 3. For multi wythe masonry provide type as follows:
 - a. Ladder design with diagonal cross rods spaced not more than 16 inches o.c. and number of side rods as follows:
 - 1) Number of side Rods for Multi Wythe Concrete Masonry: One side rod for each face shell of hollow masonry units more than 4 inches in nominal width plus one side rod for each style of masonry 4 inches or less nominal width.
- C. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to, the following:
1. AA Wire Products Co.
 2. Dur-O-Wal, Inc.
 3. Heckmann Building Products, Inc.
 4. Hohmann & Barnard, Inc.

2.7 TIES AND ANCHORS, GENERAL

- A. Masonry Joint Reinforcement, General: ASTM A 951.
1. Interior Walls: Hot-dip galvanized, carbon steel.
 2. Exterior Walls: Stainless steel, 18-8, type 316.
 3. Wire Size for Side Rods: W2.8 or 0.188-inch (4.8-mm) diameter.
 4. Wire Size for Cross Rods: W2.8 or 0.188-inch (4.8-mm) diameter.
 5. Wire Size for Veneer Ties: W2.8 or 0.188-inch (4.8-mm) diameter.
 6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches (407 mm) o.c.
 7. Provide in lengths of not less than 10 feet (3 m) with prefabricated corner and tee units.
- B. Steel Plates and Bars: ASTM A 36, hot-dip galvanized to comply with ASTM A 123 or ASTM 153, Class B3, as applicable to size and form indicated.
- C. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to, the following:
1. Heckmann Building Products, Inc. – Basis of Design: Pos-i-Tie
 2. AA Wire Products Co.
 3. Dur-O-Wal, Inc.
 4. Hohmann & Barnard, Inc.

2.8 ADJUSTABLE ANCHORS FOR CONNECTING MASONRY TO STRUCTURAL FRAMEWORK

- A. General: Two-piece assemblies as described below allowing vertical or horizontal differential movement between wall and framework parallel to plane of wall, but resisting tension and compression forces perpendicular to it.

- B. For anchorage to steel framework provide manufacturer's standard anchors with crimped 1/4inch diameter wire anchor section for welding to steel and triangular-shaped wire tie section sized to extend within 1 inch of masonry face and as follows:

- 1. Wire Diameter: 0.1875 inch.

2.9 RIGID ANCHORS

- A. Provide straps of form and length indicated, fabricated from metal strips of following width and thickness:

- 1. 1/1/2 inches wide by 1/4inch thick.

2.10 ADJUSTABLE MASONRY VENEER ANCHORS

- A. General: Provide toe-piece assemblies allowing vertical or horizontal differential movement between wall and framework parallel to plane wall, but resisting tension and compression forces perpendicular to it; for attachment over sheathing to metal studs; and with the following structural performance characteristics.

- 1. Structural performance Characteristics: Capable of withstanding a 100lb/ft load in either tension or compression without deforming over, or developing play in excess of, 0.05inch.

- B. Screw-Attached Masonry Veneer Anchors: Unites consisting of wire tie section and metal anchor section complying with the following requirements:

- 1. Wire Tie Shape: Triangular.
 - 2. Wire Tie Length: As required to extend 2 inches into masonry wythe of veneer face.
 - 3. Anchor Section: Sheet metal plate, with screw holes top and bottom and with raised, rib-stiffened strap stamped into the center to provide slot between strap and plate for connection of wire tie; of overall indicated below:

- a. Size: Plate and Strap size: 1-1/4 inches wide for plate, 5/8 inch for strap by lengths indicated bellow; slot clearance formed between face of plate and back of strap at maximum rib projection: 1/32 inch plus diameter of wire tie.

- 1) Plate and Strap Lengths: 6 inches and 3-5/8 inch; with both sides of plate stiffened by ribs.

- C. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:

- 1. Screw-Attached Masonry Veneer Anchors:

- a. "D/A 213", Dur-O-Wal, Inc.

- b. "X Seal Anchor system", Hohmann & Barnard, Inc.

2.11 MISCELLANEOUS ANCHORS

- A. Unit Type Masonry Inserts in Concrete: Cast iron or malleable iron inserts of type and size indicated.

- B. Dovetail Slots: Furnish dovetail slots, with filler strips, of slot size indicated, fabricated from 0.0336 inch (22 gauge) sheet metal.
- C. Anchor Bolts: steel bolts complying with A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers; hot dip galvanized to comply with ASTM A 153, Class C; of diameter and length indicated and in the following configurations.
- D. Anchors for Tying New Brick Masonry to Existing Masonry: 1-1/2 inch x 14 gauge hot dipped galvanized corrugated box anchor with 1/4inch x 1 inch galvanized metal hit anchor as manufactured by Hilti.

2.12 EMBEDDED FLASHING MATERIALS

- A. Elastomeric Fabric Flashing: Fabricate to comply with requirements of Division 7 Section "Elastomeric Flashing" and below:
 - 1. 60 mil thick uncured neoprene.
- B. Sheet Metal Flashing (alternatively): Fabricate from the following metal complying with requirements specified in Division 7 Section "Sheet Metal Work and Flashing" and below:
 - 1. Stainless Steel: 24 gauge.
 - 2. Application: use where flashing is fully or partially concealed in masonry wall.
- C. At all wall opening, window sills, coping and parapet walls: Flashings should project a minimum of 1/2" from the face of masonry.

2.12 LIMESTONE FACADE PANEL REPAIR PRODUCTS (NOT USED)

- A. Single component, cement mineral based, custom colored, repair mortar: Jahn M90, as manufactured by Cathedral Stone Products, Inc.

2.13 MISCELLANEOUS MASONRY ACCESSORIES

- A. Bond Breaker Strips: Asphalt-saturated organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).
- B. Weep holes: Weep holes shall be screened to prevent clogging with backfill materials. Weep holes for masonry veneer are required at a maximum spacing of 2'-8" in the vertical joints at the base of the bottom course. Provide mesh filler in cavity at weep locations. Provide drip slots in the masonry at the window heads to minimize excessive water runoff or leeching.
 - 1. Provide the following: Round Plastic Tubing: Medium-density polyethylene, 3/8 inch outside diameter by 4 inches long.
- C. Seismic Masonry-Veneer Anchors: Units consisting of a metal anchor section and a connector section designed to engage a continuous wire embedded in the veneer mortar joint.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

- a. Hohmann & Barnard, Inc.; DW-10-X-Seismiclip, X Seal System.
2. Anchor Section: Gasketed sheet metal plate, 1-1/4 inches (32 mm) wide by 6 inches (152 mm) long, with screw holes top and bottom; top and bottom ends bent to form pronged legs to bridge insulation or sheathing and contact studs; and raised rib-stiffened strap, 5/8 inch (16 mm) wide by 6 inches (152 mm) long, stamped into center to provide a slot between strap and plate for inserting wire tie. Provide anchor manufacturer's standard, self-adhering, modified bituminous gaskets manufactured to fit behind anchor plate and extend beyond pronged legs.
3. Connector Section: Triangular wire tie and rigid PVC extrusion with snap-in grooves for inserting continuous wire. Size wire tie to extend at least halfway through veneer but with at least 5/8-inch (16-mm) cover on outside face.
4. Fabricate wire connector sections from 0.25-inch- (6.35-mm-) diameter, stainless-steel wire.

2.14 MASONRY CLEANERS

- A. Job-Mixed Detergent Solution: Solution of trisodium phosphate (1/2-cup dry measure) and laundry detergent (1/2cup dry measure) dissolved in one gallon of water.
- B. Proprietary Acidic Cleaner: Manufacturer's standard-strength, general-purpose cleaner designed for removing mortar/grout stains, efflorescence and other new construction stains from masonry surfaces; expressly approved for intended use by manufacturer of masonry units being cleaned.
 1. For masonry not subject to metallic oxidation stains, use formulation consisting of a concentrated blend of surface-acting acids, chelating and wetting agents.
 2. Available Products: Subject to compliance with requirements, a product that may be used to clean unit masonry surfaces includes, but is not limited to, the following:
 - a. "Sure Klean No. 6000 Detergent", ProSoCO, Inc.

2.15 SOURCE QUALITY CONTROL

- A. Brick Tests: For each type and grade of brick indicated, units will be tested by qualified independent testing laboratory per ASTM C 67 except 5 bricks will be selected at random for each 100,000 units or fraction thereof installed.
- B. Concrete Masonry Unit Tests: For each type, class and grade of concrete masonry unit indicated, units will be tested by qualified independent testing laboratory for strength, absorption and moisture content per ASTM C 140.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other specific conditions and other conditions affecting performance of unit masonry.

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of unit masonry.

B. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Comply with referenced unit masonry standard and other requirements indicated applicable to each type of installation included in Project.

B. Thickness: Build Composite walls and other masonry construction the full thickness shown.

C. Cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide continuous pattern and to fit adjoining construction. Use full size units without cutting where possible.

3.3 CONSTRUCTION TOLERANCES

A. Comply with construction tolerances of referenced unit masonry standard.

3.4 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint widths and for accurate locating of openings, movement-type joints, returns and offsets. Avoid the use of less-than-half-size units at corners, jambs and where possible at other locations.

B. Lay up walls to comply with specified construction tolerances, with courses accurately spaced and coordinated with other construction.

C. Bond Pattern for Exposed Masonry: Lay exposed masonry in the following bond pattern; do not use units with less than nominal 4 inch horizontal face dimensions at corners or jambs.

1. One-half running bond with vertical joint in each course centered on units in courses above and below.

D. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2 inches. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4 inch horizontal face dimensions at corners or jambs.

E. Stopping and Resuming Work: In each course, rack back $\frac{1}{2}$ unit length for one half running bond or $\frac{1}{3}$ unit length for one third running bond; do not tooth. Clean exposed surfaces of set masonry, wet clay masonry units lightly (if required), and remove loose masonry units and mortar prior to laying fresh masonry.

F. Built-In Work: As construction progresses, built-in items specified under this and other Sections of the Specifications. Fill in solidly with masonry around built-in items.

1. Fill space between hollow metal frames and masonry solidly with mortar, unless otherwise indicated.