

katherine hogan architects

ADDENDUM 01

Date: 23 January 2024

Project: **Johnston County Public Schools – Security Fencing for Two Schools**
Johnston County Public Schools
2320 US 70 Business East
Smithfield, NC 27577

To: ALL PRIME BIDDERS OF RECORD

This Addendum forms a part of the Contract Documents and modifies the original Project Manual and Construction Documents dated January 16th, 2024. Please acknowledge receipt of this Addendum in the space provided in the Bid Form. Failure to do so may subject the Bidder to disqualification.

ATTACHMENT A:

1. Specification changes.

ATTACHMENT B:

1. Drawing set changes.

Items: CHANGES TO THE PROJECT MANUAL:

1. New Section 033000 – “Cast-in-Place Concrete”
2. New Section 321313 – “Concrete Paving”

CHANGES TO THE PROJECT DRAWINGS:

1. Modified “A-02.01 - SECTIONS” Wilsons Mills ES
2. Modified “A-01.00 – ENLARGED PLANS + ELEVATIONS” Micro ES
3. Modified “A-01.01 – SECTIONS” Micro ES

ANSWERS TO QUESTIONS AND REQUESTS TO DATE:

Q1. Are both elementary schools using the same style of fence for the main privacy portions? If so, what are the color specifics for each?

A. Yes. Micro ES – Yellow and Wilsons Mills ES - Green

raleigh

553-c pylon drive
raleigh, north carolina
27606, usa
p 919.793.5063

Q2. Referring to the specifications, the closest design that I can find that matches your renderings is Ideal Aluminum's aluminum privacy panels. Did you use a specific design reference for the fence?

A. Ideal Aluminum is acceptable. We are looking for an 8' tall and close to 100% opacity solution.

Q3. What color is the chain link going to be? Will it have privacy slats?

A. Black vinyl. No privacy slats.

Q4. Are the gates supposed to match the fence style? Or are they a specific door/gate that we need to order? I am already aware of the panic hardware and locking mechanisms.

A. Base Bid is a manufacturer supplied door and clad to match the fence material. The Alternate is a locally sourced custom fence panel to match the gate/door panel.

Q5. Are all posts supposed to be 4' O.C?

A. No. Depending on the manufacturer the spacing can be up to 8' maximum. At the curved sections the manufacturer may decrease the spacing between columns.

Q6. Does the chain link require a middle rail?

A. Yes, we would prefer a middle rail.

Q7. Will there need to be any reinforcement in the CIP benches?

A. Yes. Please see revised Sheet A-02.01 for Wilsons Mills ES and Sheet A-01.01 for Micro ES, issued with this addendum.

Q8. There is a concrete slab shown under the benches in the detail, I understand in the straight portion of Wilsons Mills it is on existing, but it looks like the bench in the radius at WMEs and the bench at MES are both on existing grass. Will there need to be any kind of base under this? Or if we are to pour a pad under them, can you provide the details on those pads?

A. Yes. Please see revised Sheet A-02.01 for Wilsons Mills ES and Sheet A-01.01 for Micro ES, and additional specification sections issued with this addendum.

Q9. The fence that runs where Doors 2 & 3 are at on the Wilsons Mills school, those posts are calling for a footing per the details. Being that is existing concrete, do we need to plan to core down and repour those, or would we be able to demo a strip of concrete wide enough to get those footers in and replace the concrete strip to match existing? We would need details on that concrete if so.

A. Demo a strip wide enough to get the footers in and replace the concrete to match is acceptable. Please see revised drawing sheets and specification sections issued with this addendum.

Q10. There is a door scheduled for Wilsons Mills but not for Micro, are those to be the same? Also, are these standard hollow metal exterior doors hung in a 4x4 extruded frame by the fence company?

A. Please see sheet A 01.00

Base Bid is a manufacturer supplied door and clad to match the fence material. The Alternate is a locally sourced custom fence panel to match the gate/door panel.

Q11. Section 7.4 of the General Conditions: "Performance Bond and Labor and Material Payment Bond" calls for a P&P bond for the project. It is our understanding that the project did not require a bond. Can you please clarify if a bond is required for the project?

A. The project does not require a bid bond.

Q12. Please confirm that the bid breakdown for bid and alternates is not due till after the bid is submitted and awarded to the lowest GC as stated in the bid form.

A. Correct

Q13. Is there a specification section for the concrete benches? What is the concrete strength? Any reinforcing?

A. Please see revised Sheet A-02.01 for Wilsons Mills ES and Sheet A-01.01 for Micro ES, and additional specification sections issued with this addendum.

Q14. There are no specifications for the fence doors? There is no hardware specification, hardware schedule, etc.?

A. Please see the door schedule provided on the drawings. Base Bid is a manufacturer supplied door and clad to match the fence material. The Alternate is a locally sourced custom fence panel to match the gate/door panel.

Q15. If the Alternate is accepted, then the July completion date may not be achievable. The bends and folds must be done in a custom shop and then sent back to the factory to be pre-finished.

A. We are open to alternatives to achieve the intent of the custom fence panel and meet the timeframe. The school system would like the project to be completed prior to the commencement of the 24-25 school year.

END OF ADDENDUM NUMBER ONE



01/23/2024

SECTION 033000 - 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:

- 1. Cast-in-place concrete, including concrete materials, mixture design, placement procedures, and finishes.

- B. Related Requirements:

- 1. Section 031000 "Concrete Forming and Accessories" for form-facing materials, form liners, insulating concrete forms, and waterstops.
 - 2. Section 032000 "Concrete Reinforcing" for steel reinforcing bars and welded-wire reinforcement.
 - 3. Section 033300 "Architectural Concrete" for general building applications of specially finished formed concrete.
 - 4. Section 312000 "Earth Moving" for drainage fill under slabs-on-ground.
 - 5. Section 321313 "Concrete Paving" for concrete pavement and walks.
 - 6. Section 321316 "Decorative Concrete Paving" for decorative concrete pavement and walks.

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.

- B. Water/Cement Ratio (w/cm): The ratio by weight of water to cementitious materials.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference:

- 1. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:

- a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixtures.
 - c. Ready-mix concrete manufacturer.
 - d. Concrete Subcontractor.
2. Review the following:
- a. Special inspection and testing and inspecting agency procedures for field quality control.
 - b. Construction joints, control joints, isolation joints, and joint-filler strips.
 - c. Semirigid joint fillers.
 - d. Vapor-retarder installation.
 - e. Anchor rod and anchorage device installation tolerances.
 - f. Cold and hot weather concreting procedures.
 - g. Concrete finishes and finishing.
 - h. Curing procedures.
 - i. Forms and form-removal limitations.
 - j. Methods for achieving specified slab flatness and levelness.
 - k. Slab flatness and levelness measurements.
 - l. Concrete repair procedures.
 - m. Concrete protection.
 - n. Initial curing and field curing of field test cylinders (ASTM C31/C31M.)
 - o. Protection of field cured field test cylinders.

1.5 ACTION SUBMITTALS

A. Product Data: For each of the following.

1. Portland cement.
2. Fly ash.
3. Slag cement.
4. Blended hydraulic cement.
5. Silica fume.
6. Performance-based hydraulic cement
7. Aggregates.
8. Admixtures:
 - a. Include limitations of use, including restrictions on cementitious materials, supplementary cementitious materials, air entrainment, aggregates, temperature at time of concrete placement, relative humidity at time of concrete placement, curing conditions, and use of other admixtures.
9. Vapor retarders.
10. Floor and slab treatments.
11. Liquid floor treatments.
12. Curing materials.

- a. Include documentation from color pigment manufacturer, indicating that proposed methods of curing are recommended by color pigment manufacturer.
 13. Joint fillers.
 14. Repair materials.
- B. Design Mixtures: For each concrete mixture, include the following:
1. Mixture identification.
 2. Minimum 28-day compressive strength.
 3. Durability exposure class.
 4. Maximum w/cm.
 5. Calculated equilibrium unit weight, for lightweight concrete.
 6. Slump limit.
 7. Air content.
 8. Nominal maximum aggregate size.
 9. Indicate amounts of mixing water to be withheld for later addition at Project site if permitted.
- C. Shop Drawings:
1. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
 - a. Location of construction joints is subject to approval of the Architect.
- D. Concrete Schedule: For each location of each Class of concrete indicated in "Concrete Mixtures" Article, including the following:
1. Concrete Class designation.
 2. Location within Project.
 3. Exposure Class designation.
 4. Formed Surface Finish designation and final finish.
 5. Final finish for floors.
 6. Curing process.
 7. Floor treatment if any.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For the following:
1. Installer: Include copies of applicable ACI certificates.
 2. Ready-mixed concrete manufacturer.
 3. Testing agency: Include copies of applicable ACI certificates.
- B. Material Certificates: For each of the following, signed by manufacturers:
1. Cementitious materials.

2. Admixtures.
3. Curing compounds.
4. Floor and slab treatments.
5. Bonding agents.
6. Adhesives.
7. Vapor retarders.
8. Semirigid joint filler.
9. Joint-filler strips.
10. Repair materials.

C. Material Test Reports: For the following, from a qualified testing agency:

1. Portland cement.
2. Fly ash.
3. Slag cement.
4. Blended hydraulic cement.
5. Silica fume.
6. Performance-based hydraulic cement.
7. Aggregates.
8. Admixtures:

- a. Permeability-Reducing Admixture: Include independent test reports, indicating compliance with specified requirements, including dosage rate used in test.

D. Floor surface flatness and levelness measurements report, indicating compliance with specified tolerances.

E. Research Reports:

1. For concrete admixtures in accordance with ICC's Acceptance Criteria AC198.
2. For sheet vapor retarder/termite barrier, showing compliance with ICC AC380.

F. Preconstruction Test Reports: For each mix design.

G. Field quality-control reports.

H. Minutes of preinstallation conference.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs Project personnel qualified as an ACI-certified Flatwork Technician and Finisher and a supervisor who is a certified ACI Flatwork Concrete Finisher/Technician or an ACI Concrete Flatwork Technician.

1. Post-Installed Concrete Anchors Installers: ACI-certified Adhesive Anchor Installer.

- B. Ready-Mixed Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.
 - 1. Manufacturer certified in accordance with NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- C. Laboratory Testing Agency Qualifications: A testing agency qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated and employing an ACI-certified Concrete Quality Control Technical Manager.
 - 1. Personnel performing laboratory tests shall be an 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.
- D. Field Quality Control Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, and qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.
 - 1. Personnel conducting field tests shall be qualified as an ACI Concrete Field Testing Technician, Grade 1, in accordance with ACI CPP 610.1 or an equivalent certification program.

1.8 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on each concrete mixture.
 - 1. Include the following information in each test report:
 - a. Slump.
 - b. Air content.
 - c. Water-Cement ratio.
 - d. Seven-day compressive strength.
 - e. 28-day compressive strength.
 - f. Standard deviation.
 - g. ACI required compressive strength
 - h. Unit weight.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Comply with ASTM C94/C94M and ACI 301.

1.10 FIELD CONDITIONS

- A. Cold-Weather Placement: Comply with ACI 301 and ACI 306.1 and as follows.

1. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
2. 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.
3. Do not use frozen materials or materials containing ice or snow.
4. Do not place concrete in contact with surfaces less than 35 deg F, other than reinforcing steel.
5. 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 ACI 305.1, and as follows:

1. Maintain concrete temperature at time of discharge to not exceed 95 deg F.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

1.11 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to furnish replacement sheet vapor retarder/termite barrier material and accessories for sheet vapor retarder/ termite barrier and accessories that do not comply with requirements or that fail to resist penetration by termites within specified warranty period.

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

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

A. ACI Publications: Comply with ACI 301 unless modified by requirements in the Contract Documents.

2.2 CONCRETE MATERIALS

A. Source Limitations:

1. Obtain all concrete mixtures from a single ready-mixed concrete manufacturer for entire Project.
2. Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant.
3. Obtain aggregate from single source.
4. Obtain each type of admixture from single source from single manufacturer.

B. Cementitious Materials:

1. Portland Cement: ASTM C150/C150M, Type I/II
 2. Fly Ash: ASTM C618, Class F.
 3. Slag Cement: ASTM C989/C989M, Grade 100 or 120.
 4. Blended Hydraulic Cement: ASTM C595/C595M, Type IS, portland blast-furnace slag cement.
 5. Silica Fume: ASTM C1240 amorphous silica.
- C. Normal-Weight Aggregates: ASTM C33/C33M, class 3M coarse aggregate or better, graded. Provide aggregates from a single source.
1. Maximum Coarse-Aggregate Size: 3/4 inch nominal.
 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- D. Air-Entraining Admixture: ASTM C260/C260M.
- E. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride in steel-reinforced concrete
1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
 2. Retarding Admixture: ASTM C494/C494M, Type B.
 3. Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type D.
 4. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
 5. High-Range, Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type G.
 6. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II.
 7. Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete and complying with ASTM C494/C494M, Type C.
 8. Non-Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, non-set-accelerating, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete.
 9. Permeability-Reducing Admixture: ASTM C494/C494M, Type S, hydrophilic, permeability-reducing crystalline admixture, capable of reducing water absorption of concrete exposed to hydrostatic pressure (PRAH).
 - a. Permeability: No leakage when tested in accordance with U.S. Army Corps of Engineers CRC C48 at a hydraulic pressure of 200 psi for 14 days.
- F. Water and Water Used to Make Ice: ASTM C94/C94M, potable

2.3 VAPOR RETARDERS

- A. Sheet Vapor Retarder, Class A: ASTM E1745, Class A; not less than 15 mils thick with a maximum perm rating of .01. Include manufacturer's recommended adhesive or pressure-sensitive tape.

2.4 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- C. Moisture-Retaining Cover: ASTM C171, polyethylene film burlap-polyethylene sheet.
 - 1. Color:
 - a. Ambient Temperature Below 50 deg F: Black.
 - b. Ambient Temperature between 50 deg F and 85 deg F: Any color.
 - c. Ambient Temperature Above 85 deg F: White.
- D. Curing Paper: Eight-foot- wide paper, consisting of two layers of fibered kraft paper laminated with double coating of asphalt.
- E. Water: Potable or complying with ASTM C1602/C1602M.
- F. Clear, Waterborne, Membrane-Forming, Dissipating Curing Compound: ASTM C309, Type 1, Class B.
- G. Clear, Waterborne, Membrane-Forming, Nondissipating Curing Compound: ASTM C309, Type 1, Class B, certified by curing compound manufacturer to not interfere with bonding of floor covering.
- H. Clear, Waterborne, Membrane-Forming, Curing Compound: ASTM C309, Type 1, Class B, 18 to 25 percent solids, nondissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.
- I. Clear, Solvent-Borne, Membrane-Forming, Curing and Sealing Compound: ASTM C1315, Type 1, Class A.
- J. Clear, Waterborne, Membrane-Forming, Curing and Sealing Compound: ASTM C1315, Type 1, Class A.

2.5 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D1751, asphalt-saturated cellulosic fiber

- B. Bonding Agent: ASTM C1059/C1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.

2.6 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 C150/C150M portland cement or hydraulic or blended hydraulic cement, as defined in ASTM C219.
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 in accordance with ASTM C109/C109M.

- 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 C150/C150M portland cement or hydraulic or blended hydraulic cement, as defined in ASTM C219.
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 in accordance with ASTM C109/C109M.

2.7 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, in accordance with ACI 301.

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

- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash or Other Pozzolans: 25 percent by mass.
2. Slag Cement: 50 percent by mass.
3. Silica Fume: 10 percent by mass.

4. Total of Fly Ash or Other Pozzolans, Slag Cement, and Silica Fume: 50 percent by mass, with fly ash or pozzolans not exceeding 25 percent by mass and silica fume not exceeding 10 percent by mass.
5. Total of Fly Ash or Other Pozzolans and Silica Fume: 35 percent by mass with fly ash or pozzolans not exceeding 25 percent by mass and silica fume not exceeding 10 percent by mass.

C. Admixtures: Use admixtures in accordance with manufacturer's written instructions.

1. Use high-range water-reducing admixture in concrete, as required, for placement and workability.
2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete and concrete with a w/cm below 0.50.
4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.
5. Use permeability-reducing admixture in concrete mixtures where indicated.

2.8 CONCRETE MIXTURES

A. Class A: Normal-weight concrete used for footings.

1. Minimum Compressive Strength: As indicated at 28 days.
2. Maximum w/cm: 0.50.
3. Slump Limit: 4 inches, plus or minus 1 inch or 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture.

B. Class B: Normal-weight concrete used for interior slabs-on-ground.

1. Minimum Compressive Strength: As indicated at 28 days.
2. Maximum w/cm: 0.50.
3. Slump Limit: 4 inches, plus or minus 1 inch or 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture.
4. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.

2.9 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C94/C94M, and furnish batch ticket information.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete in accordance with ASTM C94/C94M. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than five minutes after ingredients are in mixer, before any part of batch is released.

2. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd..
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:

1. Before placing concrete, verify that installation of concrete forms, accessories, and reinforcement, and embedded items is complete and that required inspections have been performed.
2. Do not proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide reasonable auxiliary services to accommodate field testing and inspections, acceptable to testing agency, including the following:

1. Daily access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Secure space for storage, initial curing, and field curing of test samples, including source of water and continuous electrical power at Project site during site curing period for test samples.
4. Security and protection for test samples and for testing and inspection equipment at Project site.

3.3 INSTALLATION OF EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining Work that is attached to or supported by cast-in-place concrete.

1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of ANSI/AISC 303.
3. 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.

3.4 INSTALLATION OF VAPOR RETARDER

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder in accordance with ASTM E1643 and manufacturer's written instructions.
 - 1. Install vapor retarder with longest dimension parallel with direction of concrete pour.
 - 2. Face laps away from exposed direction of concrete pour.
 - 3. Lap vapor retarder over footings and grade beams not less than 6 inches, sealing vapor retarder to concrete.
 - 4. Lap joints 6 inches and seal with manufacturer's recommended tape.
 - 5. Terminate vapor retarder at the top of floor slabs, grade beams, and pile caps, sealing entire perimeter to floor slabs, grade beams, foundation walls, or pile caps.
 - 6. Seal penetrations in accordance with vapor retarder manufacturer's instructions.
 - 7. Protect vapor retarder during placement of reinforcement and concrete.
 - a. Repair damaged areas by patching with vapor retarder material, overlapping damages area by 6 inches on all sides, and sealing to vapor retarder.
- B. Bituminous Vapor Retarders: Place, protect, and repair bituminous vapor retarder in accordance with manufacturer's written instructions.

3.5 JOINTS

- A. Construct joints true to line, with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Coordinate with floor slab pattern and concrete placement sequence.
 - 1. Install so strength and appearance of concrete are not impaired, at locations indicated on Drawings or as approved by Architect.
 - 2. Place joints perpendicular to main reinforcement.
 - a. Continue reinforcement across construction joints unless otherwise indicated.
 - b. Do not continue reinforcement through sides of strip placements of floors and slabs.
 - 3. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
 - 4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 - 5. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
 - 6. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Control Joints in Slabs-on-Ground: Form weakened-plane control joints, sectioning concrete into areas as indicated. Construct control joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Grooved Joints: Form control joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of control joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
 2. Sawed Joints: Form control 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 and before concrete develops random cracks.
- D. Isolation Joints in Slabs-on-Ground: 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. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated on Drawings.
 2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface, where joint sealants, specified in Section 079200 "Joint Sealants," are indicated.
 3. 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:
1. Install dowel bars and support assemblies at joints where indicated on Drawings.
 2. Lubricate or asphalt coat one-half of dowel bar length to prevent concrete bonding to one side of joint.

3.6 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, embedded items, and vapor retarder is complete and that required inspections are completed.
1. Immediately prior to concrete placement, inspect vapor retarder for damage and deficient installation, and repair defective areas.
 2. Provide continuous inspection of vapor retarder during concrete placement and make necessary repairs to damaged areas as Work progresses.
- B. Notify Architect and testing and inspection agencies 24 hours prior to commencement of concrete placement.
- C. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect in writing, but not to exceed the amount indicated on the concrete delivery ticket.
1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

- D. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301, but not to exceed the amount indicated on the concrete delivery ticket.
 - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- E. 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.
 - 1. If a section cannot be placed continuously, provide construction joints as indicated.
 - 2. Deposit concrete to avoid segregation.
 - 3. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
 - 4. Consolidate placed concrete with mechanical vibrating equipment in accordance with ACI 301.
 - a. Do not use vibrators to transport concrete inside forms.
 - b. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer.
 - c. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity.
 - d. 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.
- F. 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. Do not place concrete floors and slabs in a checkerboard sequence.
 - 2. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 - 3. Maintain reinforcement in position on chairs during concrete placement.
 - 4. Screed slab surfaces with a straightedge and strike off to correct elevations.
 - 5. Level concrete, cut high areas, and fill low areas.
 - 6. Slope surfaces uniformly to drains where required.
 - 7. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface.
 - 8. Do not further disturb slab surfaces before starting finishing operations.

3.7 FINISHING SLABS

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

1. When bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operation of specific float apparatus, consolidate concrete surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats.
2. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture and complies with ACI 117 tolerances for conventional concrete.
3. Apply float finish to surfaces to receive trowel finish.

C. Trowel Finish:

1. After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel.
2. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance.
3. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
4. Do not add water to concrete surface.
5. Do not apply hard-troweled finish to concrete, which has a total air content greater than 3 percent.
6. 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.
7. Finish surfaces to the following tolerances, in accordance with ASTM E1155, for a randomly trafficked floor surface:
 - a. Slabs on Ground:
 - 1) Specified overall values of flatness, F_F 35; and of levelness, F_L 25; with minimum local values of flatness, F_F 24; and of levelness, F_L 17.

D. Trowel and Fine-Broom Finish: Apply a first trowel finish to 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 perpendicular to main traffic route.

1. Coordinate required final finish with Architect before application.
2. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

E. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and locations indicated on Drawings.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.
2. Coordinate required final finish with Architect before application.

3.8 INSTALLATION OF MISCELLANEOUS CONCRETE ITEMS

A. Filling In:

1. Fill in holes and openings left in concrete structures after Work of other trades is in place unless otherwise indicated.
2. Mix, place, and cure concrete, as specified, to blend with in-place construction.
3. Provide other miscellaneous concrete filling indicated or required to complete the Work.

3.9 CONCRETE CURING

- A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
1. Comply with ACI 301 and ACI 306.1 for cold weather protection during curing.
 2. Comply with ACI 301 and ACI 305.1 for hot-weather protection during curing.
 3. Maintain moisture loss no more than 0.2 lb/sq. ft. x h before and during finishing operations.
- B. Curing Formed Surfaces: Comply with ACI 308.1 as follows:
1. Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces.
 2. Cure concrete containing color pigments in accordance with color pigment manufacturer's instructions.
 3. If forms remain during curing period, moist cure after loosening forms.
 4. If removing forms before end of curing period, continue curing for remainder of curing period, as follows:
 - a. Continuous Fogging: Maintain standing water on concrete surface until final setting of concrete.
 - b. Continuous Sprinkling: Maintain concrete surface continuously wet.
 - c. Absorptive Cover: Pre-dampen absorptive material before application; apply additional water to absorptive material to maintain concrete surface continuously wet.
 - d. Water-Retention Sheeting Materials: Cover exposed concrete surfaces with sheeting material, taping, or lapping seams.
 - e. Membrane-Forming Curing Compound: Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.
 - 1) Recoat areas subject to heavy rainfall within three hours after initial application.
 - 2) Maintain continuity of coating and repair damage during curing period.
- C. Curing Unformed Surfaces: Comply with ACI 308.1 as follows:
1. Begin curing immediately after finishing concrete.
 2. Interior Concrete Floors:
 - a. Floors to Receive Floor Coverings Specified in Other Sections: Contractor has option of the following:

- 1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
 - a) Lap edges and ends of absorptive cover not less than 12-inches.
 - b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
 - 2) Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive.
 - a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
 - b) Cure for not less than seven days.
 - 3) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:
 - a) Water.
 - b) Continuous water-fog spray.
- b. Floors to Receive Penetrating Liquid Floor Treatments: Contractor has option of the following:
- 1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
 - a) Lap edges and ends of absorptive cover not less than 12 inches.
 - b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
 - 2) Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive.
 - a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
 - b) Cure for not less than seven days.
 - 3) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:

- a) Water.
 - b) Continuous water-fog spray.
- c. Floors to Receive Polished Finish: Contractor has option of the following:
- 1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
 - a) Lap edges and ends of absorptive cover not less than 12 inches.
 - b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
 - 2) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:
 - a) Water.
 - b) Continuous water-fog spray.
- d. Floors to Receive Chemical Stain:
- 1) As soon as concrete has sufficient set to permit application without marring concrete surface, install curing paper over entire area of floor.
 - 2) Install curing paper square to building lines, without wrinkles, and in a single length without end joints.
 - 3) Butt sides of curing paper tight; do not overlap sides of curing paper.
 - 4) Leave curing paper in place for duration of curing period, but not less than 28 days.
- e. Floors to Receive Urethane Flooring:
- 1) As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
 - 2) Rewet absorptive cover, and cover immediately with polyethylene moisture-retaining cover with edges lapped 6 inches and sealed in place.
 - 3) Secure polyethylene moisture-retaining cover in place to prohibit air from circulating under polyethylene moisture-retaining cover.
 - 4) Leave absorptive cover and polyethylene moisture-retaining cover in place for duration of curing period, but not less than 28 days.
- f. Floors to Receive Curing Compound:
- 1) Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.
 - 2) Recoat areas subjected to heavy rainfall within three hours after initial application.
 - 3) Maintain continuity of coating, and repair damage during curing period.

- 4) Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project.

g. Floors to Receive Curing and Sealing Compound:

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

3.10 TOLERANCES

- A. Conform to ACI 117.

3.11 SPECIAL INSPECTIONS

- A. Special Inspections: Owner will engage a special inspector to perform field tests and inspections and prepare testing and inspection reports. Special Inspections shall be in accordance with Section 1705.3 of the Building Code, refer to Schedule of Special Inspections for detailed requirements.

1. Special Inspector shall be responsible for providing curing container for composite samples on Site and verifying that field-cured composite samples are cured in accordance with ASTM C31/C31M.
2. Special Inspector shall immediately report to Architect, Contractor, and concrete manufacturer any failure of Work to comply with Contract Documents.
3. Special Inspector shall report results of tests and inspections, in writing, to Owner, Architect, Contractor, and concrete manufacturer within 48 hours of inspections and tests.
 - a. Test reports shall include reporting requirements of ASTM C31/C31M, ASTM C39/C39M, and ACI 301, including the following as applicable to each test and inspection:
 - 1) Project name.
 - 2) Name of testing agency.
 - 3) Names and certification numbers of field and laboratory technicians performing inspections and testing.
 - 4) Name of concrete manufacturer.
 - 5) Date and time of inspection, sampling, and field testing.
 - 6) Date and time of concrete placement.
 - 7) Location in Work of concrete represented by samples.

- 8) Date and time sample was obtained.
 - 9) Truck and batch ticket numbers.
 - 10) Design compressive strength at 28 days.
 - 11) Concrete mixture designation, proportions, and materials.
 - 12) Field test results.
 - 13) Information on storage and curing of samples before testing, including curing method and maximum and minimum temperatures during initial curing period.
 - 14) Type of fracture and compressive break strengths at seven days and 28 days.
- B. Batch Tickets: For each load delivered, submit three copies of batch delivery ticket to testing agency, indicating quantity, mix identification, admixtures, design strength, aggregate size, design air content, design slump at time of batching, and amount of water that can be added at Project site.
- C. Inspections:
1. Headed bolts and studs.
 2. Verification of use of required design mixture.
 3. Concrete placement, including conveying and depositing.
 4. Curing procedures and maintenance of curing temperature.
 5. Verification of concrete strength before removal of shores and forms from beams and slabs.
 6. Batch Plant Inspections: On a random basis, as determined by Architect.
- D. Concrete Tests: Testing of composite samples of fresh concrete obtained in accordance with ASTM C 172/C 172M shall be performed in accordance with 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.
 - a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 2. Slump: ASTM C143/C143M:
 - a. One test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 - b. Perform additional tests when concrete consistency appears to change.
 3. Slump Flow: ASTM C1611/C1611M:
 - a. One test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 - b. Perform additional tests when concrete consistency appears to change.

4. Air Content: ASTM C231/C231M pressure method, for normal-weight concrete; ASTM C173/C173M volumetric method, for structural lightweight concrete.
 - a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
5. Concrete Temperature: ASTM C1064/C1064M:
 - a. One test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample.
6. Unit Weight: ASTM C567/C567M fresh unit weight of structural lightweight concrete.
 - a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
7. Compression Test Specimens: ASTM C31/C31M:
 - a. Cast and laboratory cure six 4-inch by 8-inch standard cylinder specimens for each composite sample.
 - b. Cast, initial cure, and field cure two sets of three 4-inch by 8-inch standard cylinder specimens for each composite sample.
8. Compressive-Strength Tests: ASTM C39/C39M.
 - a. Test one set of two laboratory-cured specimens at seven days and one set of three specimens at 28 days. Maintain one specimen in reserve for later testing if required.
 - b. Test one set of three field-cured specimens at seven days and one set of three specimens at 28 days.
 - c. 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.
9. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
10. 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 if specified compressive strength is 5000 psi, or no compressive strength test value is less than 10 percent of specified compressive strength if specified compressive strength is greater than 5000 psi.
11. 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.
12. Additional Tests:

- a. 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.
 - b. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42/C42M or by other methods as directed by Architect.
 - 1) Acceptance criteria for concrete strength shall be in accordance with ACI 301 section 1.6.6.3.
13. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
14. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.
- E. Measure slab flatness and levelness in accordance with ASTM E1155 within 48 hours of completion of floor finishing and promptly report test results to Architect.

3.12 PROTECTION

- A. Protect concrete surfaces as follows:
- 1. Protect from petroleum stains.
 - 2. Diaper hydraulic equipment used over concrete surfaces.
 - 3. Prohibit vehicles from interior concrete slabs.
 - 4. Prohibit use of pipe-cutting machinery over concrete surfaces.
 - 5. Prohibit placement of steel items on concrete surfaces.
 - 6. Prohibit use of acids or acidic detergents over concrete surfaces.
 - 7. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.
 - 8. Protect concrete surfaces scheduled to receive surface hardener or polished concrete finish using Floor Slab Protective Covering.

END OF SECTION 033000

SECTION 321313 - CONCRETE PAVING

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. This Section includes exterior portland cement concrete paving for the following:
 - 1. Curbs and gutters, pavement, walkways, service court, dumpster pads.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 31 Section "Earth Moving" for subgrade preparation, grading and subbase course.
 - 2. Division 03 Section "Cast-in-Place Concrete" for general building applications of concrete.
 - 3. Division 07 Section "Sealants and Caulking" for joint fillers and sealants within concrete paving and at joints with adjacent construction.

1.3 SUBMITTALS

- A. General: Submit the following according to the Conditions of the Contract and Division 01 Specification Sections.
- B. Product data for proprietary materials and items, including reinforcement and forming accessories, admixtures, joint systems, curing compounds, dry-shake finish materials, and others if requested by Architect.
- C. Design mixes for each class of concrete. Include percentage of recycled content (20% minimum). Include revised mix proportions when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.
- D. Scaled plan of proposed construction, expansion and control joint locations in concrete pavement and concrete sidewalk. Submittal of plans for joints in curb and gutter or longitudinal sidewalk 6-feet or less in width is not required.

1.4 QUALITY ASSURANCE

- A. Concrete Standards: Comply with provisions of the following standards, except where more stringent requirements are indicated.

1. American Concrete Institute (ACI) 301, "Specifications for Structural Concrete for Buildings."
 2. ACI 318, "Building Code Requirements for Reinforced Concrete."
 3. ACI 330R, "Guide for the Design and Construction of Concrete Parking Lots."
 4. Concrete Reinforcing Steel Institute (CRSI) "Manual of Standard Practice."
- B. Concrete Manufacturer Qualifications: Manufacturer of ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.
- C. Concrete Testing Service: Engage a qualified independent testing agency to perform materials evaluation tests and to design concrete mixes.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
 2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 FORMS

- A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.
1. Use flexible or curved forms for curves with a radius 100 feet or less.
- B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.3 STEEL REINFORCEMENT

- A. Plain-Steel Welded Wire Reinforcement: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.
- B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60; deformed.
- C. Steel Bar Mats: ASTM A 184/A 184M; with ASTM A 615/A 615M, Grade 60, deformed bars; assembled with clips.
- D. Plain Steel Wire: ASTM A 82, as drawn.

- E. Joint Dowel Bars: Plain steel bars, ASTM A 615/A 615M, Grade 60. Cut bars true to length with ends square and free of burrs. Electroplated zinc steel plates, ASTM A 108, ASTM B633 with corresponding pocket former.
- F. Tie Bars: ASTM A 615/A 615M, Grade 60, deformed.
- G. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete, and as follows:
 - 1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.

2.4 CONCRETE MATERIALS

- A. Cementitious Material: Use one of the following cementitious materials, of the same type, brand, and source throughout the Project:
 - 1. Portland Cement: ASTM C 150, portland cement, Type I, II, or III.
 - a. Fly Ash: ASTM C 618, Class F. Up to 30% by weight of required cement content, with 1.0-lbs Fly Ash per 1-lb of cement replaced.
 - b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120 with 1-lb slag per 1-lb of cement replaced.
- B. Normal-Weight Aggregates: ASTM C 33, Class 3S coarse aggregate, uniformly graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar pavement applications and service conditions using similar aggregates and cementitious materials.
 - 1. Maximum Coarse-Aggregate Size: 1-1/2 inches nominal.
 - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Water: ASTM C 94/C 94M, potable.
- D. Air-Entraining Admixture: ASTM C 260.
- E. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.
 - 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 - 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
 - 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 - 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
 - 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
 - 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.5 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry.
- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- C. Water: Potable.
- D. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.
- E. Clear Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

2.6 RELATED MATERIALS

- A. Expansion and Isolation Joint Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.
- B. Wheel Stops: Precast, air-entrained concrete; 2500-psi minimum compressive strength; approximately 6 inches high, 9 inches wide, and 84 inches long. Provide chamfered corners and drainage slots on underside and provide holes for dowel-anchoring to substrate.
 - 1. Dowels: Galvanized steel, diameter of $\frac{3}{4}$ inch, minimum length 10 inches.
- C. Bonding Agent: ASTM C 1059, Acrylic or styrene butadiene.
- D. Epoxy Adhesive: ASTM C 881, two-component material suitable for dry or damp surfaces. Provide material type, grade, and class to suit requirements.

2.7 CONCRETE MIXTURES

- A. Prepare design mixtures, proportioned according to ACI 301, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.
 - 1. Use a qualified independent testing agency for preparing and reporting proposed concrete mixture designs for the trial batch method.
- B. Proportion mixtures to provide normal-weight concrete with the following properties:
 - 1. Compressive Strength (28 Days): 4000 psi, 3500 psi, or 3000 psi as indicated on the drawings.
 - 2. Maximum Water-Cementitious Materials Ratio at Point of Placement: As specified by NCDOT Standard Specifications for class of concrete indicated.
 - 3. Slump Limit: Maximum 3.5 inches for non-vibrated, maximum 4 inches for vibrated.
- C. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows:

1. Air Content: 5-1/2 percent plus or minus 1.5 percent for 1-1/2-inch (38-mm) nominal maximum aggregate size.
 2. Air Content: 6 percent plus or minus 1.5 percent for 1-inch (25-mm) nominal maximum aggregate size.
 3. Air Content: 6 percent plus or minus 1.5 percent for 3/4-inch (19-mm) nominal maximum aggregate size.
- D. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.
1. Use admixtures in concrete, as required, for placement and workability.
 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
- E. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement according to ACI 301 requirements as follows:
1. Fly Ash: 30 percent.
 2. Ground Granulated Blast-Furnace Slag: 50 percent.
 3. Combined Fly Ash, and Ground Granulated Blast-Furnace Slag: 50 percent, with fly ash not exceeding 20 percent.
- F. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

2.8 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M and ASTM C 1116. Furnish batch certificates for each batch discharged and used in the Work.
1. When air temperature is between 85 deg F 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.
- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.
1. For concrete mixes of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
 2. For concrete mixes larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd.
 3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixing time, quantity, and amount of water added.

2.9 JOINT SEALANTS

- A. Type SL Silicone Sealant for Concrete and Asphalt: Single-component, low modulus, neutral-curing, self-leveling silicone sealant complying with ASTM D 5893 for Type SL.

- B. Round Backer Rod for Cold-Applied Sealants: ASTM D 5249, Type 1, of diameter and density required to control sealant depths and pavement bottom-side adhesion of sealant.

2.10 PAVEMENT MARKINGS

- A. Parking Lot Marking Paint: Latex, waterborne emulsion, lead and chromate free, ready mixed, complying with FS TT-P-1952, Type II, with drying time of less than 45 minutes and formulated for concrete surfaces.
 - 1. Color: As indicated on the drawings.
- B. Paved Play Pavement Marking Paint: Acrylic or latex, lead and chromate free, low VOC traffic marking paint formulated for concrete surfaces.
 - 1. Color: As indicated on the drawings.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

- A. Proof-roll prepared subbase surface to check for unstable areas and verify need for additional compaction. Do not begin paving work until such conditions have been corrected and are ready to receive paving. Ensure subgrade is graded for proper drainage. Repair as needed to avoid ponding on final pavement surfaces.
- B. Remove loose material from compacted subbase surface immediately before placing concrete.
- C. Herbicide Treatment: Apply chemical weed control agent in strict compliance with manufacturer's recommended dosages and application instructions. Apply to compacted, dry subbase.
- D. Place aggregate base courses as specified in Division 31 Section "Earth Moving".

3.2 EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for paving to required lines, grades, and elevations. Install forms to allow continuous progress of work and so that forms can remain in place at least 24 hours after concrete placement. Set forms to ensure positive drainage and compliance with ADA and Building Code requirements.
- B. Check completed formwork and screeds for grade and alignment to following tolerances:
 - 1. Top of Forms: Not more than 1/8 inch in 10 feet.
 - 2. Vertical Face on Longitudinal Axis: Not more than 1/4 inch in 10 feet.
- C. Clean forms after each use and coat with form release agent as required to ensure separation from concrete without damage.

3.3 PLACING REINFORCEMENT

- A. General: Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars" for placing and supporting reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.
- C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.
- D. Install welded wire fabric in lengths as long as practicable at mid depth of concrete. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

3.4 JOINTS

- A. General: Construct contraction, construction, and isolation joints true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to the centerline, unless indicated otherwise.
 - 1. When joining existing paving, place transverse joints to align with previously placed joints, unless indicated otherwise.
- B. Contraction (Control) Joints: Provide weakened-plane contraction joints, sectioning concrete into areas as indicated below unless shown otherwise on Drawings. Construct contraction joints for a depth equal to at least 1/3 of the concrete thickness, as follows:
 - 1. Tooled Joints: Form contraction joints in fresh concrete by grooving and finishing each edge of joint with a radiused jointer tool.
 - 2. Sawn Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into hardened concrete when cutting action will not tear, abrade, or otherwise damage surface and before development of random contraction cracks.
 - 3. Inserts: Form contraction joints by inserting premolded plastic, hardboard, or fiberboard strips into fresh concrete until top surface of strip is flush with paving surface. Radius each joint edge with a jointer tool. Carefully remove strips or caps of two-piece assemblies after concrete has hardened. Clean groove of loose debris.
 - 4. Spacing:
 - a. Pavement (greater than 4-in thick slabs): Locate contraction joints at 10-ft max. intervals, each way in concrete pavement.
 - b. Sidewalk & Patios (4-in thick slabs): Locate contraction joints at 5-ft max. intervals, each way in concrete sidewalks/patios unless shown otherwise. Locate contraction joints in sidewalks less than 8-ft in width at 5-ft intervals across the walk. Locate contraction joints in sidewalks of 8-ft and greater width at 5-ft intervals across the walk and equally section the walk lengthwise with joints at 5-ft. max. intervals (example: an 8-ft wide walk shall have contraction joints at 5-ft. spacing across the walk and one joint dividing the walk lengthwise into two, equal 4-ft sections.)
 - c. Curbs or Curb & Gutter: Locate contraction joints at 10-ft max. intervals in concrete curbs or concrete curb and gutter.

- C. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than 1/2 hour, unless paving terminates at isolation joints.
1. Continue reinforcement across construction joints unless indicated otherwise. Do not continue reinforcement through sides of strip paving unless indicated.
 2. Provide tie bars at sides of paving strips where indicated.
 3. Use bonding agent on existing concrete surfaces that will be joined with fresh concrete.
- D. Isolation (expansion) Joints: Form isolation joints of preformed joint filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.
1. General spacing: Locate additional expansion joints at the following intervals unless indicated otherwise on the drawings.
 - a. Pavement (greater than 4-in thick slabs): None in addition to located specified above.
 - b. Sidewalks (4-in thick slabs): 30-ft each way.
 - c. Curbs or Curb & Gutter: 90-ft spacing.
 2. Extend joint fillers full width and depth of joint 1/2 inch below finished surface where joint sealant is indicated. Place top of joint filler flush with finished concrete surface when no joint sealant is required.
 3. Furnish joint fillers in one-piece lengths for full width being placed wherever possible. Where more than one length is required, lace or clip joint filler sections together.
 4. Protect top edge of joint filler during concrete placement with a metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.
- E. Dowel Joints: Install dowel sleeves and dowels or dowel bar and support assemblies at joints where indicated
1. Use dowel sleeves or lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.
 2. Diamond Dowel System is acceptable in lieu of round dowels. Contractor to provide submittal information to Engineer for review/approval. Install per manufacturer recommendations.

3.5 CONCRETE PLACEMENT

- A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast in. Notify other trades to permit installation of their work. Ensure forms are set to ensure water will not pond on final surface.
- B. Remove snow, ice, or frost from base surface and reinforcing before placing concrete. Do not place concrete on surfaces that are frozen.

- C. Moisten base to provide a uniform dampened condition at the time concrete is placed. Do not place concrete around manholes or other structures until they are at the required finish elevation and alignment.
- D. Comply with requirements and with ACI 304R for measuring, mixing, transporting, and placing concrete.
- E. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
- F. Form and pour concrete pavement with thickened edges along all edges that could be subject to vehicle wheel loads, do not abut a building or wall, or are not doweled to the adjacent pavement or structure.
- G. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- H. Consolidate concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures to consolidate concrete complying with ACI 309R.
 - 1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand-spreading and consolidation. Consolidate with care to prevent dislocating reinforcing, dowels, and joint devices.
- I. Screed paved surfaces with a straightedge and strike off. Use bull floats or darbies to form a smooth surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces prior to beginning finishing operations.
- J. Place concrete in two operations; strike off initial pour for entire width of placement and to the required depth below finish surface. Lay welded wire fabric or fabricated bar mats immediately in final position. Place top layer of concrete, strike off, and screed.
 - 1. Remove and replace portions of bottom layer of concrete that have been placed more than 15 minutes without being covered by top layer or use bonding agent if acceptable to Architect.
- K. Curbs and Gutters: When automatic machine placement is used for curb and gutter placement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not acceptable, remove and replace with formed concrete.
 - 1. Spill Gutters: Form and install curb and gutter with gutter pans that spill at ¼" per foot slope away from the curb in the following locations. Do not install curb and gutter that will pond water.

- a. Outside of the Public Right of Way: Provide spill gutter where curb and gutter is located adjacent to pavement surfaces that slope away from curb.
 - b. Within the Public Right of Way: Slope gutter per NCDOT Standard Drawing 846.01.
- L. Cold-Weather Placement: Comply with provisions of ACI 306R 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 air temperature has fallen to or is expected to fall below 40 deg F (4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
 - 2. Do not use frozen materials or materials containing ice or snow.
 - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise accepted in mix designs.
- M. Hot-Weather Placement: Place concrete complying with ACI 305R and as specified when hot weather conditions exist.
- 1. Cool ingredients before mixing to maintain concrete temperature at time of placement to below 90 deg F (32 deg C). Mixing water may be chilled 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. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedding in concrete.
 - 3. Fog spray forms, reinforcing steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.6 CONCRETE FINISHING

- A. Float Finish: Begin floating when bleed water sheen has disappeared and the concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand-floating if area is small or inaccessible to power units. Finish surfaces to true planes within a tolerance of 1/4 inch in 10 feet as determined by a 10-foot-long straightedge placed anywhere on the surface in any direction. Cut down high spots and fill low spots to ensure positive drainage and eliminate ponding. Refloat surface immediately to a uniform granular texture.
- 1. Medium-to-Fine-Textured Broom Finish: Draw a soft bristle broom across all site concrete sidewalk and pavement surfaces perpendicular to line of traffic to provide a uniform fine line texture finish.
 - 2. Very Fine Textured Broom Finish: Draw a very fine soft bristle broom across all concrete Play Area and Basketball Court surfaces perpendicular to direction of play to provide a uniform fine line texture finish for concrete.

- B. Final Tooling: Tool edges of paving, gutters, curbs, and joints formed in fresh concrete with a jointing tool to a radius of ¼-inch unless indicated otherwise on the drawings. Repeat tooling of edges and joints after applying surface finishes. Eliminate tool marks on concrete surfaces.
- C. Step Tread Grooves: Tool three (3) parallel grooves along entire top front edge of new concrete stair treads.

3.7 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with the recommendations of ACI 306R for cold weather protection and ACI 305R for hot weather protection during curing.
- B. Evaporation Control: In hot, dry, and windy weather, protect concrete from rapid moisture loss before and during finishing operations with an evaporation-control material. Apply according to manufacturer's instructions after screeding and bull floating, but before floating.
- C. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- D. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than 7 days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with a 12-inch lap over adjacent absorptive covers.
 - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's directions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.8 MARKINGS

- A. Cleaning: Remove all oil, dust, grease, dirt, loose rust, and other foreign material to ensure adequate adhesion.
- B. Surface Preparation: Surfaces shall be cured, clean, dry and sound. Remove all peeling paint from existing surfaces. Concrete surfaces shall cure minimum 30 days. Concrete sealers or

efflorescence of new concrete should be removed by extended weathering, etching or abrasive blasting.

- C. Application Conditions: 50° min., 90° maximum (air, surface, and materials) at least 5° above dew point. Relative humidity 85% maximum.
- D. Tinting: Mix colors per manufacturer's specification. Only mix like paints (do not mix latex with acrylic or interior paints with exterior paints) to achieve required colors.
- E. Apply play area markings at manufacturer's recommended rates to provide minimum 15 mils dry thickness. Special care shall be given to laps and edges of stencils to prevent excessive film thickness.
- F. Apply traffic paint with mechanical equipment to produce uniform straight edges. Apply at manufacturer's recommended rates to provide minimum 12 to 15 mils dry thickness.

3.9 FIELD QUALITY CONTROL TESTING

- A. The Owner shall employ an independent testing and inspection agency to sample materials, perform tests, and submit test reports during concrete placement in accordance with Division 01 Section "Quality Control" and as follows:
 - 1. When total quantity of a given class of concrete is less than 50 cu. yd., Architect may waive strength testing if adequate evidence of satisfactory strength is provided.
 - 2. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.
- B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
 - 1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.
 - 2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
 - 3. Air Content: ASTM C 231, pressure method; 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; one test hourly when air temperature is 40 deg F and below and when it is 80 deg F and above, and one test for each composite sample.
 - 5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
 - 6. Compressive-Strength Tests: ASTM C 39/C 39M; test one specimen at seven days and two specimens at 28 days.
 - a. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at 28 days.

- C. Strength of each concrete mixture will be satisfactory if 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.
- D. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within one week 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.
- E. 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.
- F. 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.
- G. Concrete paving will be considered defective if it does not pass tests and inspections.
- H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.10 REPAIRS AND PROTECTION

- A. Remove and replace concrete paving that is broken, damaged, or defective, or does not meet the requirements of this Section.
- B. Drill test cores where directed by Architect when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to paving with epoxy adhesive.
- C. Protect concrete from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.
- D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep concrete paving not more than 2 days prior to date scheduled for Substantial Completion inspections.
- E. Remove and replace concrete paving or curb and gutter that ponds water.

END OF SECTION 321313



SHEET ISSUE

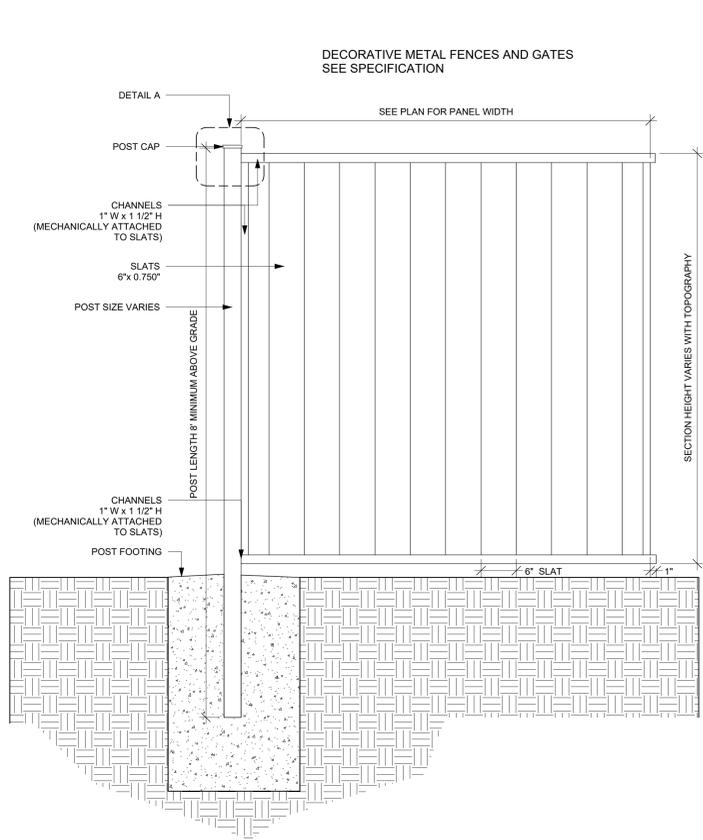
NO.	DESCRIPTION	DATE
1	SCHEMATIC DESIGN	7/28/23
2	DESIGN DEVELOPMENT	9/15/23
3	FOR PERMIT	11/21/23
4	BID DOCUMENTS	1/16/24
5	ADDENDUM #1	1/23/24

PROJECT NO. 12302e

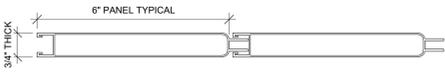
SHEET TITLE
SECTIONS

SHEET NUMBER

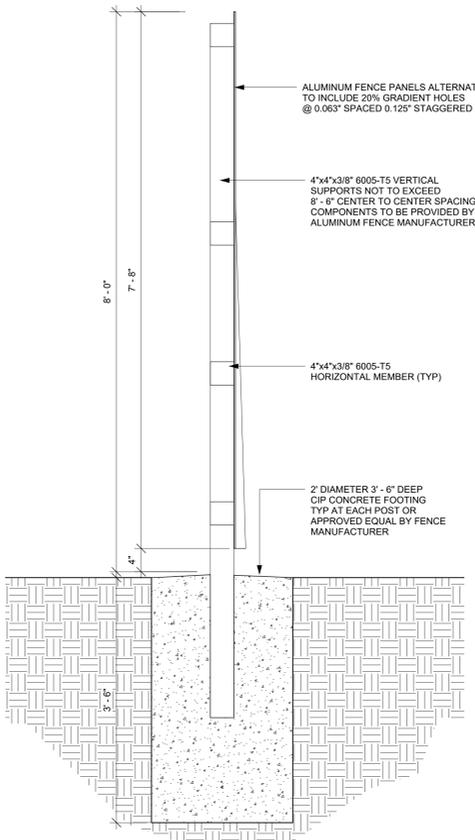
A-02.01



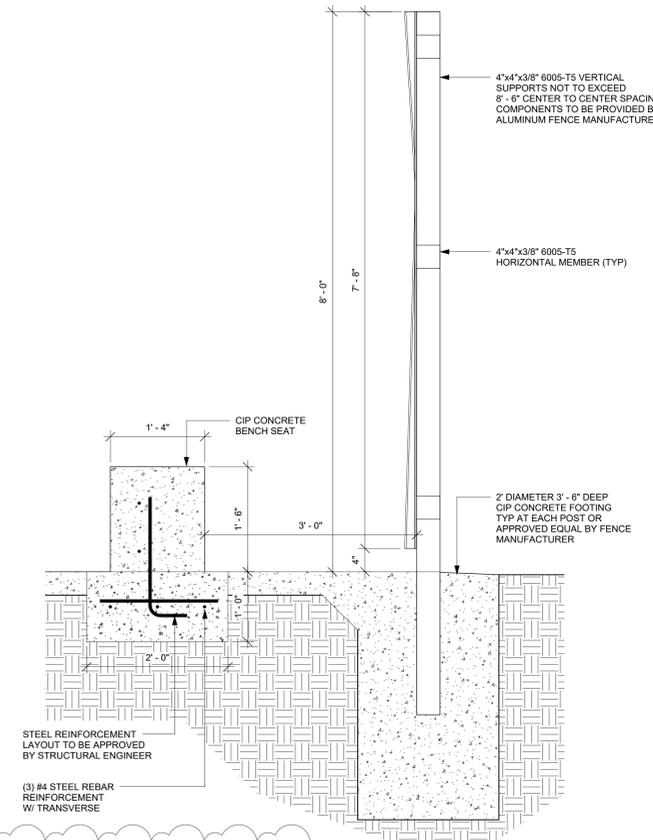
6 BASE - MANUFACTURED FENCE DETAIL A
1" = 1'-0"



7 BASE - MANUFACTURED FENCE PANEL PRIVACY SPECS
1" = 1'-0"



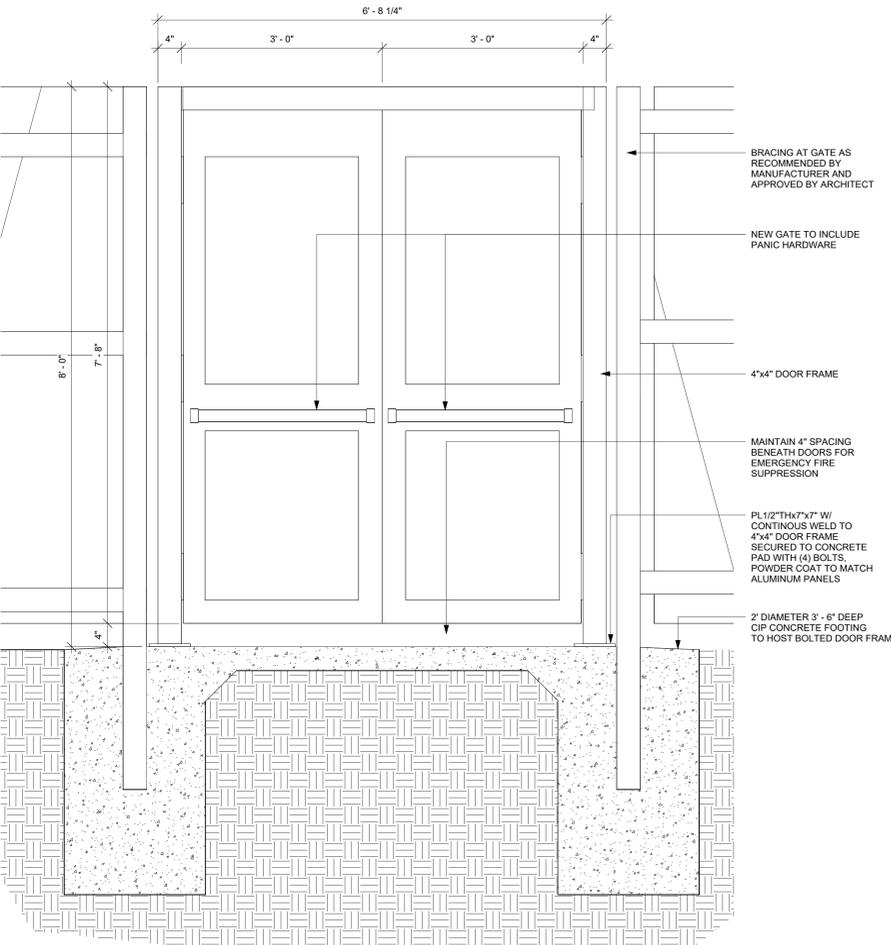
5 ALT 1 - TYPICAL SECTION @ POSTS
1" = 1'-0"



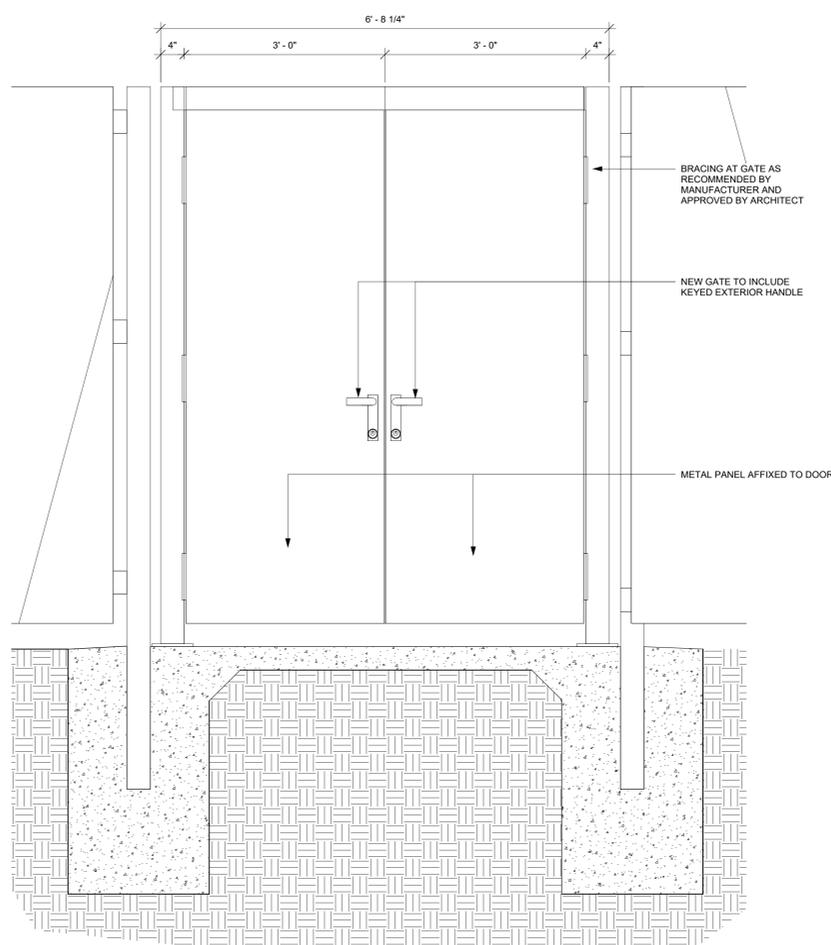
4a ALT 1 - SECTION @ POST
1" = 1'-0"

8 BASE - MANUFACTURED FENCE PANEL
1" = 1'-0"

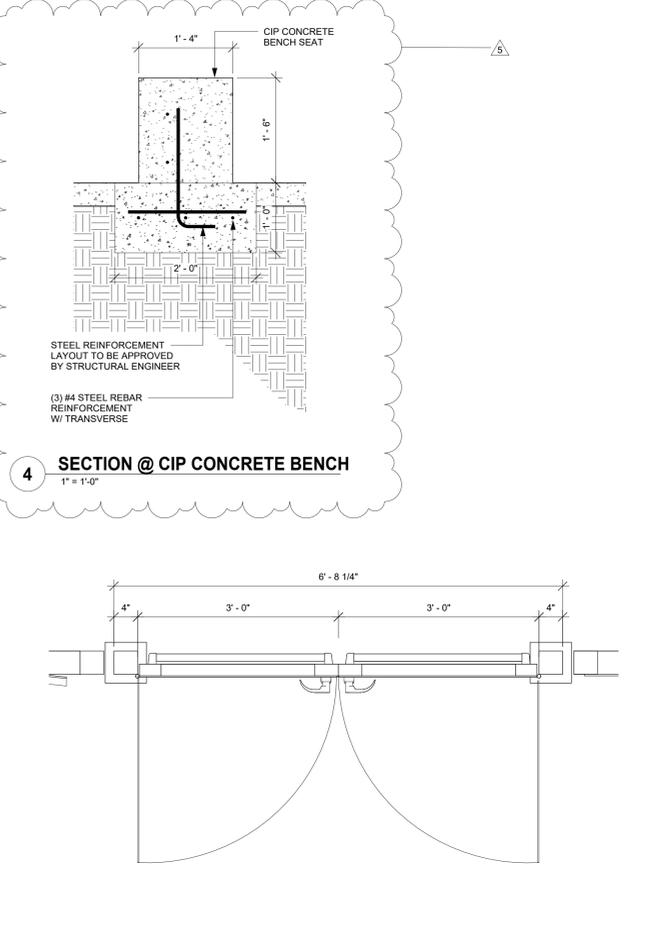
4a ALT 1 - SECTION @ POST
1" = 1'-0"



3 DOOR - INTERIOR ELEVATION
1" = 1'-0"



2 DOOR - EXTERIOR ELEVATION
1" = 1'-0"



4 SECTION @ CIP CONCRETE BENCH
1" = 1'-0"

1 DOOR PLAN
1" = 1'-0"

