

RUSH COUNTY COURTHOUSE
SIDEWALK & SITEWORK IMPROVEMENTS

SECTION 32 13 00 - SITE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cast-in-place concrete outside of the building for site improvements including, but not limited to, the following:
 - a. Curbing, gutters, walks and pavement.
 - b. Equipment pads, light pole bases, utility trench protection and bollard anchorage.
 - c. Retaining walls

1.2 QUALITY ASSURANCE

- A. Any work in public right-of-way or other areas subject to the jurisdiction of anybody shall be performed either to the requirements of that jurisdiction or to the requirements of this Specification, whichever is more stringent.

B. Qualifications of Workers:

1. Provide at least one person who shall always be present during the execution of this portion of the work.
2. This person should be thoroughly familiar with the type of materials being installed and the best methods for their installation.
3. This person shall direct all work performed under this Section.

- C. Manufacturer: manufacturer of ready-mixed concrete products complying with ASTM C94 requirements for production facilities and equipment.

D. Codes and Standards:

1. In addition to complying with all pertinent codes and regulations, comply with all pertinent requirements of the following American Concrete Institute Publications:
 - a. "Building Code Requirements for Reinforced Concrete" ACI 318-99.
 - b. "Recommended Practice for Cold Weather Concreting" ACI 306 R-88.
 - c. "Recommended Practice for Hot Weather Concreting" ACI 305 R-91.
 - d. "Recommended Practice for Evaluation of Strength Test Result for Concrete" ACI 214-77.
 - e. "Standard Practice for Selecting Proportions for Normal, Heavy Weight, and Mass Concrete" ACI 211.1-98.
2. Where provisions of pertinent codes and standards conflict with this Section, the more stringent provisions shall govern.

E. Testing and Inspection:

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1. All testing and inspection shall be performed by an independent Geotechnical Engineering Consultant ("Geotechnical Engineer").
2. The Geotechnical Engineer is responsible for all testing, sampling and inspection.
3. The Geotechnical Engineer is responsible for approving all materials, installation and procedures.
4. The Contractor is responsible for providing these services.
5. The Contractor is responsible for all coordination and scheduling with the Geotechnical Engineer.

1.3 SUBMITTALS

- A. Mix Designs.
- B. Testing and inspection reports.
- C. Chloride ion tests or total chloride tests (with generally accepted method to relate total chloride to chloride ion) to show compliance with maximum ion concentrations.
- D. Detectable Warning Surface Paver.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Concrete:
 1. Cement: ASTM C150, Type I or III.
 2. Fine aggregate: ASTM C33.
 3. Coarse aggregate: ASTM C33.
 - a. Crushed stone shall be used for exterior concrete, unless otherwise noted.
 - b. Maximum aggregate size is 3/4 of the minimum clear spacing (per code) between reinforcing bars or between bars and forms.
 4. Water: Clean, fresh, potable.
 5. Air-entraining admixture: ASTM C260.
 6. Fly ash: ASTM C618.
 7. Fiber mesh:
 - a. Fiber mesh shall be polypropylene fibrillated, and mix shall contain a minimum of 1.5 lbs. of fiber per cubic yard of concrete, unless otherwise prescribed by manufacturer and approved by Architect/Engineer.
 - b. Fiber shall be mixed at batch plant; field mixing is not acceptable.
 8. Sealer/curing compound:
 - a. ASTM C309, Type I, clear.
 - b. Compatible with texture of surfaces.
- B. Mix Design:
 1. Strength: 4000 psi, ready mixed in accordance with ASTM C94.

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2. Slump: 4" +/- 1".
3. Minimum cement content: 517 pounds per cubic yard (adjust for air entrainment)
4. Fly ash shall not replace more than 20% of the cement.
5. Maximum water/cement ratio: 0.40.
6. Air entrainment: 6%. The percentage of air content shall be determined in accordance with the admixture manufacturer's recommendations based on aggregate size and moderate level of exposure.
7. White concrete must have a 3-year aged minimum SR value of 0.28, or initial SR value of at least 33.

C. Other Requirements:

1. Proportions of materials for concrete shall be established in accordance with Section 5.2 of ACI 318 (Latest edition).
2. Follow ACI 211 and ACI 301 to determine the water-cement ratios.
3. Concrete shall not exceed maximum chloride ion content for corrosion protection as defined in ACI 318 Table 4.4.1.
4. Do not use calcium chloride or admixtures containing soluble chlorides.
5. Do not use re-tempered concrete or concrete that has been contaminated by foreign materials.
6. All exterior concrete shall be air entrained.
7. Unless otherwise indicated, all reinforcing for concrete pavement shall be epoxy coated.

D. Isolation Joints: Unless specified otherwise on Drawings, use the following:

1. Cork isolation joints with sealant:
 - a. Joint material: AASHTO M213; 1/2 inch thick.
 - b. Joint sealer: AASHTO M173; polyurethane with color matching adjacent concrete
 - c. Application: Use cork isolation joints with sealant for isolation joints for sidewalks, drop-offs, decorative concrete pavement areas, areas adjacent to buildings, structures, and columns.
2. Asphalt saturated cellulosic fiber:
 - a. Joint material: AASHTO M213; 1/2 inch thick.
 - b. Do not place sealant on asphalt saturated cellulosic fiber isolation joints.
 - c. Application: Use this type of isolation joint for items such as curbs and walks, which are in areas not adjacent to buildings, structures and columns, etc. Do not use in areas of colored concrete.
3. Contact Architect/Engineer if further direction is needed for proper application in specific areas.

E. Detectable Warning Surface:

1. Concrete pavers:
 - a. Size: 12" x 12" x 2" thick excluding the dome height.
 - b. Pavers shall be resistant to road salts and common road pollutants.
 - c. Paver units should be suitable for traffic loads.
 - d. Truncated dome elements shall comply with current ADA requirements
2. Cast iron plates: Detectable warning surface paver:

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- a. Shall be manufactured from gray iron in accordance with AASHTO M105, Class 30A.
- b. The tops of the domes and the space between domes shall have a non-slip textured surface.
- c. The minimum thickness of the casting shall be 0.30 inches excluding the dome height.
- d. Plates shall be resistant to road salts and common road pollutants.
- e. Plates shall be suitable for traffic loads.

2.2 STEEL REINFORCING

A. Reinforcing Bars:

1. Reinforcing bars and dowels: ASTM A615, Grade 60.
2. Reinforcing to be welded: ASTM A615, Grade 40.
3. Epoxy coated bars and dowels: ASTM A884, Grade 60.

B. Welded Wire Fabric:

1. ASTM A185 6"x6" xW1.4xW1.4, unless otherwise indicated.
2. Provide in flat sheets, not rolled form.

C. Other Embedded Items: Provide standard manufactured products as approved by the Architect/Engineer.

D. Bar Supports:

1. Conform to the requirements of the "Manual of Standard Practice", published by the Concrete Reinforcing Steel Institute.
2. Accessories shall be plastic protected Class "C" for all concrete exposed in the finished structure, except as specified below.
3. Accessories shall be Class "A", bright basic, for unexposed concrete.
4. Utilize Call "E," stainless steel bar supports, for exterior concrete to be finished by sand blasting.
5. Do not use continuous highchairs. Use individual highchairs laced with bottom cross bars plus #5 support bars. (Minimum of 2 rows of support for all reinforcing).
6. Supports must be capable of supporting construction loads without failing. Contractor to furnish additional supports at no cost to the Owner if in the Architect/Engineer estimation the supports are not adequate.

2.3 FORMWORK

A. Form Lumber:

1. All form lumber in contact with exposed concrete shall be new or of sufficient quality to ensure an unblemished texture.
2. All form lumber shall be plywood, board lumber, hardwood or other material of grade or quality to best suit each particular usage.

B. Fiber Forms:

1. Fiber forms may be utilized to construct round columns/piers.
2. Seamless forms must be used for concrete exposed in the finished structure.
3. Standard seamed tubes are permissible for non-exposed concrete.

C. Form Release Agent:

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1. Standards:
 - a. The release agent shall be similar to Symons Manufacturing Company Magic Kote.
 - b. Grace Construction Products Formshield Chemical Release Agent.
- D. Bracing/Shoring/Studs:
 1. Such supports should be selected for the economy consistent with safety requirements and the quality required in the finished work. The Contractor is responsible for the design, illustration, safety and serviceability of all formworks.
- E. Other Materials: All other materials, not specifically described, but required for proper completion of concrete formwork, shall be selected by the Contractor subject to advance acceptance by the Architect/Engineer.

PART 3 - EXECUTION

3.1 GENERAL

- A. Job Conditions:
 1. Extreme temperature conditions:
 - a. When extreme hot or cold weather conditions occur, or are expected to occur, which might detrimentally affect concrete, employ handling and placing techniques to guard against such effects.
 - b. Comply with the recommendations of American Concrete Institute for hot and cold weather concreting. ACI Publications ACI 306 and ACI 305.
 2. Inclement weather: Unless adequate protection is provided, do not place exterior concrete during rain, sleet or snow.
- B. Preparation and Verification:
 1. Prior to all work of this Section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly begin.
 2. Verify all items to be embedded in concrete are in place.
 3. Verify concrete may be placed on the lines and elevations indicated on the Drawings, with all required clearances for reinforcement.
 4. Verify forms may be constructed in accordance with all pertinent codes and regulations, the referenced standards and the original design.
 5. Remove all dirt, oil, paint, loose rust and other foreign materials from the concrete reinforcement prior to placement.
 6. In the event of discrepancy, contact Architect/Engineer immediately and do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.
 7. Verify approval of mock-ups by Owner and Architect/Engineer before beginning work.
- C. Other: Unless otherwise indicated, all exterior concrete shall be placed on a compacted aggregate fill per the following:
 1. Minimum depth equal to the concrete thickness for pavement, walks and other slabs on grade.

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2. Minimum 6" depth of fill for curbing and other support bases.

3.2 FORMWORK

A. Protection:

1. Use all necessary and appropriate means to protect formwork materials before, during and after installation.
2. Protect the installed work and materials of all other trades.
3. In the event of damage, immediately make all repairs and replacements necessary at no additional cost to Owner or other trades.

B. General:

1. Forms shall have sufficient strength and be sufficiently tight to prevent leakage of mortar.
2. The design and engineering of the formwork shall be the responsibility of the Contractor.
3. Refer to this Section for construction joint requirements.
4. Tolerances: Construct all forms straight, true, plumb and square within the tolerances recommended by ACI 347.
5. Embedded items: Set all required steel frames, angles, grilles, bolts, reglets, inserts, pipe, conduit and other such items required to be anchored in the concrete before the concrete is placed.
6. Wetting: Keep forms sufficiently wetted to prevent joints opening before concrete is placed, except as recommended in ACI 306 R-78, "Recommended Practice for Cold Weather Concreting."

C. Layout:

1. Form all required cast-in-place concrete to the shapes, sizes, lines and dimensions indicated on the Drawings.
2. Exercise particular care in the layout of forms to ensure the proper finish structure, size and shape.
3. Make proper provisions for all openings, offsets, recesses, anchorage, blocking and other features of the Work as shown or required.
4. Carefully examine the Contract Documents and consult with other trades as required to ensure proper provisions for openings, reglets, chases, and other items in the forms.

D. Bracing and Shoring:

1. Properly brace and tie the forms together to maintain position and shape and to ensure safety to personnel.
2. Construct all bracing, supporting members, and centering of ample size and strength to safely carry, without excessive deflection, all dead and live loads to which they may be subjected.
3. Properly space the forms apart and securely tie them together, using metal spreader ties that give positive tying and accurate spreading.
4. All shoring shall extend to adequate foundations.
5. The Contractor is responsible for both the proper design and installation of all bracing and shoring, to properly ensure the safety and serviceability of the structure.

E. Plywood Forms:

1. Assembly: Nail the plywood panels directly to studs and apply in a manner to minimize the number of joints.
2. Joints: Make all panel joints tight but joints with all edges true and square.

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F. Reuse of forms:

1. Reuse of forms shall in no way delay or change the schedule for placement of concrete from the schedule obtainable if all forms were new.
2. Reuse of forms shall in no way impart less structural stability to the forms, nor less acceptable appearance to finished concrete.

G. Cleaning:

1. Before concrete is placed the forms shall be cleaned of all debris, ice, snow, frost, and standing water.
2. Remove all loose earth materials from the surfaces of earth forms.

H. Removal of Forms:

1. Forms should be removed in such a manner to ensure complete safety of the structure.
2. Formwork for columns, walls, and other parts not supporting the weight of the concrete may be removed as soon as the concrete has hardened sufficiently to resist damage from removal operations with the following minimums:
 - a. Formwork for walls and columns shall remain in place a minimum of two (2) days during which the temperature of the air surrounding the concrete must be above 50° F.
 - b. This minimum time period represents a cumulative number of days or fractions thereof.
 - c. Such formwork for concrete placed during cold weather with surrounding air temperatures 50° F shall remain in place one day after the artificial heating and/or freeze protection is discontinued/removed.
3. Forms and false work:
 - a. Any supporting vertical loads shall remain in place until the members have acquired sufficient strength to safely support their weight and any superimposed loads.
 - b. Such forming shall remain in place until the concrete has attained its specified 28-day strength as indicated by the test cylinders unless re-shores are installed in sufficient quantities to transmit the loads to adequate foundations without stressing the particularly cured structure.
 - c. The requirements of ACI 305 and 306 must also be met before forms may be removed.
 - d. Removal of forms and false work is the responsibility of the Contractor, and the Contractor shall bear full responsibility for this operation.
 - e. Concrete damaged by too early removal of forms or false work shall be repaired or replaced as directed by the Architect/Engineer.
4. Concrete exposed by form removal during the curing period shall be cured by one of the methods specified in this Section.
5. Curing compounds are not permitted in certain locations. In these cases, curing is to be by an alternate method. Refer alternate methods in this Section.
6. In no case shall the superimposed load or relatively new concrete exceed 50 pounds per square foot unless proper shoring to suitable foundations is installed as required by the Architect/Engineer.
7. Use all necessary and appropriate means to protect workman, public, the installed work and materials of other trades, and the complete safety of the structure.
8. Cut nails and similar fasteners off flush and leave all surfaces smooth and clean.

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3.3 REINFORCEMENT

A. Protection:

1. Use all necessary and appropriate means necessary to protect concrete reinforcement before, during and after installation and to protect the installed work and materials of all other trades.
2. Store in a manner to prevent excessive rusting and fouling with dirt, grease, and other bond-breaking coatings.
3. In the event of damage, immediately make all repairs and replacements necessary at no additional cost to the Owner.

B. Placing:

1. Reinforcing bars:

- a. Positively secure reinforcing bar supports and tie or otherwise anchor bars to prevent displacement by construction loads or by the placing of concrete.
- b. Splice bars with a minimum lap of 40 bar diameters, unless otherwise indicated.
- c. Use mechanical splicers/couplers where quantity of reinforcement restricts placement of concrete if lapped splices are utilized.
- d. Splice bars only at locations indicated on the Contract Documents and shop drawings.
- e. Both shop and field bending shall be accomplished without heating the bars.
- f. Minor placing adjustments can be made to avoid interference with other reinforcement and/or embedded devices. The final arrangement, however, is subject to review and acceptance of the Architect/Engineer.
- g. Immediately notify the Architect/Engineer if reinforcing cannot be installed as shown on drawings. No cutting of reinforcing shall occur unless the Architect/Engineer has reviewed and approved such cuts.

2. Embedded devices:

- a. Set hangers, anchor bolts, inserts, and other embedded devices accurately in place.
- b. Make sure all such devices are installed so that the work to be attached thereto will be properly received.
- c. Keep devices straight and true-to-line.

3. Welded wire fabric:

- a. Splice by lapping each section at least two meshes wide plus one wire with the adjacent section, but not less than 8".
- b. Extend fabric into all openings, doorways, and the like, unless otherwise indicated.

C. Final Cleaning:

1. Prior to placing concrete, remove all loose mill and rust scale, oil, mud, ice, and other foreign coatings which destroy and/or reduce bond between the reinforcement and concrete.
2. Use wire brushing and/or other suitable methods to complete cleaning operations.

3.4 CONCRETE PLACEMENT

A. Preparation:

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1. Remove all wood scraps, ice, snow, frost, standing water and debris from the area in which concrete will be placed.
2. Thoroughly wet the surface of excavations (except in freezing weather), coat forms with release agent and remove all standing water.

B. Method:

1. Convey concrete from mixer to place of final deposit by methods that will prevent separation and loss of materials.
2. For chuting, pumping and pneumatically conveying concrete, use only equipment of such size and design as to ensure a practically continuous flow of concrete at the delivery end without loss or separation of materials.
3. Deposit concrete as nearly as possible in its final position to avoid segregation due to re-handling and flowing.
4. Use screed poles or similar devices to ensure that all slabs are cast at the proper elevations and that specified tolerances are maintained.

C. Rate of Placement:

1. Place concrete at such a rate that concrete is always plastic and flows readily between reinforcement.
2. Once placing is started, carry it on as a continuous operation until the placement of the panel or section is complete.
3. Do not pour a greater area at one time than can be properly finished. This is particularly important during hot or dry weather.

D. Consolidation:

1. Thoroughly consolidate all concrete by mechanical vibration, hand, and other suitable means during placement, working it around all embedded fixtures and into corners of forms.
2. Do not over-consolidate when using mechanical vibration to cause separation of the aggregate.

3.5 JOINTS

- A. Unless otherwise shown on Drawings, joints shall meet the following minimum requirements. If questions or concerns exist, contact Architect/Engineer for direction.

B. Isolation Joints:

1. General:

- a. Tool concrete on both sides of joint (1/4" radius).
- b. Install joint material to full depth of concrete.
- c. See Part 2 Products for type of joint material to be used.
- d. Install sufficient smooth doweling reinforcing to prevent differential movement in curbing, walks and pavement.
- e. Do not dowl into such items as columns and exterior building walls/foundations, unless specified on drawings. Refer to structural drawings also.
- f. Unless otherwise indicated, install isolation joints per the following minimum requirements.

2. Curbing:

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- a. Provide each side of inlet castings.
 - b. Provide at all tangent points and changes in direction.
 3. Walks:
 - a. For walks 6 feet in width and less, provide at intervals not exceeding 25 feet.
 - b. For larger walks and plaza areas, provide at intervals not exceeding 20 feet in any direction.
 4. Pavement: Provide at intervals not exceeding 20 feet in any direction.
 5. Retaining walls: Provide at intervals not exceeding 40 feet per linear length of wall.
 6. Other:
 - a. Provide accessible ramps, buildings, columns, bollards, castings, drains and other locations as necessary to prevent excess cracking or displacement.
 - b. Contact Architect/Engineer if any areas of question or concern are encountered.
- C. Control Joints:
1. General:
 - a. Control joint depth shall be minimum $\frac{1}{4}$ of the slab thickness.
 - b. Continue one half of reinforcing through joint.
 - c. Install joints by tooling or saw cutting as described below, unless otherwise indicated.
 - d. Construction joints may be used where appropriate.
 2. Curbing: Saw cut at intervals not exceeding 10 feet.
 3. Walks: Tool joints at intervals not-to-exceed 5 feet in any direction.
 4. Pavement: Saw cut at intervals not exceeding 18x pavement thickness feet in any direction.
 5. Retaining walls: Provide at intervals not exceeding 20 feet per linear length of wall.
 6. Other:
 - a. Provide accessible ramps, columns, bollards, castings, drains and other locations as necessary to prevent excess cracking.
 - b. Contact Architect/Engineer if any areas of question or concern are encountered.
- D. Construction Joints:
1. Joints shall be made with properly constructed bulkheads and formed keyways.
 2. Extend reinforcing through construction joints, unless otherwise indicated.
 3. The Contractor shall consult with the Architect/Engineer before starting concrete work to establish a satisfactory placing schedule and to confirm joint locations.
 4. Retaining walls: Provide at intervals not exceeding 80 feet per linear length of wall.
- E. Tooled Joints and Scoring:
1. Make straight, clean and non-ragged.
 2. Tool or score concrete on both sides of joint ($\frac{1}{4}$ " radius).
 3. Provide windowpane joint finishes unless otherwise indicated.
- F. Bond Break: 15 per 100 square foot building paper.

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3.6 FINISHING

- A. Unless otherwise indicated, provide a light-broom finish on all exterior slabs, walks and stairs.
- B. Provide a dry-rub finish for all exposed concrete walls, curbs or edge surfaces.

3.7 CURING

A. Formed Surfaces:

- 1. Cure formed surfaces by either of the following methods:
 - a. Leave forms in place until the cumulative number of days or fractions thereof, not necessarily consecutive, has totaled seven days during which the temperature of the air in contact with the concrete is 50°F or above.
 - b. Remove forms at an earlier time but apply curing compound to concrete surfaces.
 - c. Apply compound in accordance with manufacturer's recommendations.
- 2. If curing compound is not used and the forms are stripped prior to 7 days curing, the following methods are approved:
 - a. Ponding or continuous sprinkling.
 - b. Continuously wet mats.
 - c. Sand kept continuously wet.

3.8 PATCHING

- A. Patch existing concrete to receive new finish in a manner so that existing and patched surfaces are smooth and continuous and have a uniform appearance.

3.9 QUALITY ASSURANCE

A. Coordination:

- 1. A representative from the Geotechnical Engineer shall be present to always observe and perform tests. The site concrete work is in progress.
- 2. The contractor shall provide a minimum of 72 hours' notice to the Geotechnical Engineer before each operation requiring testing or inspection.

B. Inspection:

- 1. Immediately after forms and curing membranes have been removed, inspect all concrete surfaces and patch all pour joints, voids, rock pockets, form tie holds and other imperfections before the concrete is thoroughly dry.
- 2. If the defects are serious or affect the strength of the structure, or if patching does not satisfactorily restore the quality and appearance of the surface, the concrete shall be removed and replaced complete, at no additional cost to the Owner.

C. Testing: The Geotechnical Engineer shall perform the following:

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1. Compression tests:
 - a. Secure three standard cylinders from each pour of concrete, in accordance with ASTM C31, and cure under standard moisture and temperature conditions.
 - b. Test in accordance with ASTM C39.
 - c. Test one cylinder at 7 days and two cylinders at 28 days.
 - d. Submit duplicate test reports of results from testing to Architect/Engineer.
 - e. Take steps immediately to evaluate unsatisfactory test results.
 - f. In the event of unsatisfactory test results, an investigation as outlined in Section 5.6.5 of ACI 318-99 shall be employed.
2. Slump and air entrainment:
 - a. Perform slump tests in accordance with ASTM C143.
 - b. Determine the air content of concrete in accordance with ASTM standards.
 - c. Submit results of slump tests and air content on each compression test report.
3. Should additional testing be required because of unsatisfactory test results, the Contractor is responsible for the costs incurred for correcting any deficiencies and the cost of additional testing.

3.10 DETECTABLE WARNING SURFACE

- A. Shall be installed per manufacturer requirements.
- B. The contractor shall install the warranty system for a period of three years from the date of substantial completion.
- C. Contractor shall provide the owner with detectable warning surface units equal to 10% of the total units installed for future repairs.

END OF SECTION 32 13 00