

SECTION 02751 (32 1313) - CONCRETE PAVING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Preparation and placement of Portland cement concrete parking areas.
 - 2. Preparation and placement of Portland cement concrete roads and entrances.
 - 3. Aggregate base below slab.

- B. Related Requirements:
 - 1. Section 01330 - Submittal Procedures:
 - 2. Section 01458 - Testing Laboratory Services. Procedures for inspection, testing, and documentation by Owner furnished testing laboratory.
 - 3. Section 02300 - Earthwork: Excavation, backfill, compaction for subgrades.
 - 4. Section 02765 - Pavement Markings.
 - 5. Section 03310 - Structural Concrete and Exterior Concrete Slabs: Truckwell slab, compactor and compressor equipment pads, drive-thru pharmacy driveway, and Automotive Center apron.

1.2 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only.

- B. American Concrete Institute (ACI):
 - 1. ACI 117 - Tolerances for Concrete Construction and Materials and Commentary.
 - 2. ACI 301 - Structural Concrete.
 - 3. ACI 305.1- Hot Weather Concreting.
 - 4. ACI 306.1- Cold Weather Concreting.
 - 5. ACI 308.1 - Curing Concrete.
 - 6. ACI 318 - Building Code Requirements for Reinforced Concrete and Commentary.

- C. American Society for Testing and Materials (ASTM):
 - 1. ASTM A 36 - Structural Steel.
 - 2. ASTM A185 - Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.
 - 3. ASTM A615 - Deformed and Plain Billet-Steel for Concrete Reinforcement.
 - 4. ASTM C31 - Making and Curing Concrete Test Specimens in the Field.
 - 5. ASTM C33 - Concrete Aggregates.
 - 6. ASTM C 39 - Comprehensive Strength of Cylindrical Concrete Specimens.
 - 7. ASTM C42 - Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
 - 8. ASTM C94 - Ready-Mixed Concrete.
 - 9. ASTM C138 - Unit Weight, Yield, and Air Content (Gravimetric) of Concrete.
 - 10. ASTM C143 - Slump of Hydraulic Cement Concrete.
 - 11. ASTM C150 - Portland Cement.
 - 12. ASTM C172 - Sampling Freshly Mixed Concrete.
 - 13. ASTM C231 - Air-Content of Freshly Mixed Concrete by the Pressure Method.
 - 14. ASTM C260 - Air-Entraining Admixtures for Concrete.
 - 15. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete.
 - 16. ASTM C403 - Time of Setting of Concrete Mixtures by Penetration Resistance
 - 17. ASTM C618 - Fly Ash and Raw or Calcined Natural Pozzolan for use as a Mineral Admixture in Portland Cement Concrete.
 - 18. ASTM C920 - Elastomeric Joint Sealants.
 - 19. ASTM C989 - Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars.
 - 20. ASTM C1064 - Temperature of Freshly Mixed Portland Concrete Cement.
 - 21. ASTM C1218 - Water-Soluble Chloride in Mortar and Concrete.
 - 22. ASTM C1602 - Mixing Water used in the Production of Hydraulic Cement Concrete.

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23. ASTM D98 - Calcium Chloride
24. ASTM D 698 - Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 5.5 lb (2.49 Kg) Hammer and 12-in (305 mm) Drop.
25. ASTM D994 - Preformed Expansion Joint Filler for Concrete (Bituminous).
26. ASTM D1241 - Materials for Soil-Aggregate Subbase, Base and Surface Courses
27. ASTM D1751 - Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
28. ASTM D1752: Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
29. ASTM D2628 - Preformed Polychloroprene Elastomeric Joint Seals for Concrete Pavements.
30. ASTM D3575: Standard Test Methods for Flexible Cellular Materials Made From Olefin Polymers.

D. Federal Specifications (FS):

1. FS HH-F-341 - Fillers, Expansion Joint: Bituminous (Asphalt & Tar)

E. International Code Council, Inc.:

1. International Building Code (IBC).

F. State Highway Department Standard Specifications.

G. National Ready-Mixed Concrete Association:

1. NRMCA Inspection Standards

1.3 SUBMITTALS

- A. Submittal Procedures: Unless otherwise specified herein, submit in accordance with procedures specified in Section 01330.
- B. Obtain CEC approval for Mix Design and Pavement Joint and Placement Plan prior to commencement of work.
- C. Submit submittal items required within this section in a single submittal. Do not submit submittals of this section together with submittals in section 03310 or any other section. Identify submittals explicitly in accordance with Procedures paragraphs in Section 01330.
- D. Sieve Analysis for Aggregate Base: Submit current sieve analysis report, sampled and tested within the last 60 days of submittal date, for aggregate base and choker material.
- E. Concrete Batch Plant Certifications: Submit name and address of the concrete supplier's batch plant and plant certification(s) by National Ready-Mix Concrete Association and/or State Department of Transportation.
- F. Mix Design: Fill out and submit attached Concrete Mix Design Submittal Form. Submit three copies of each proposed mix design in accordance with ACI 301, Sections 3.9 "Proportioning on the basis of previous field experience or trial mixture", or 3.10 "Proportioning based on empirical data". Submit separate mix design for concrete to be placed by pumping in addition to the mix design for concrete to be placed directly from the truck chute. Submit mix design to the Civil Engineering Consultant of Record, the Wal-Mart Construction Testing Laboratory, and the Wal-Mart Assigned Concrete Sub-Consultant. Include all applicable information shown on the Mix Design Submittal Form including the following:
 1. Proportions of cementitious materials, fine and coarse aggregate, and water.
 2. Water-cementitious material ratio, 28-day compressive design strength, slump, and air content.
 3. Type of cement, fly ash, slag and aggregate.
 4. Individual aggregate gradations.
 5. Type and dosage of admixtures.
 6. Special requirements for pumping.
 7. Range of ambient temperature and humidity for which design is valid.
 8. Special characteristics of mix which require precautions in mixing, placing, or finishing techniques to achieve finished product specified.
 9. Materials and methods for curing concrete.

- G. Attachments to Concrete Mix Design: Submit the following as attachments to be included with the Concrete Mix Design:
1. Cementitious materials mill test reports for the following:
 - a. Portland cement
 - b. Fly ash
 - c. Slag
 2. Designation, type, quality, and source (natural or manufactured) of coarse and fine aggregate materials.
 3. Sieve Analysis Reports: Provide separate sieve analysis of percentages passing for coarse and fine aggregate. Show values for each sieve size shown on the mix design form. Do not leave any line blank. Sieve analysis sampling and testing for each aggregate source shall be conducted within 60 days of concrete submittal date.
 4. Aggregate Supplier Statement:
 - a. Stating if aggregate is possibly alkali-reactive based on tests or past service.
 - b. Stating if aggregate can possibly cause pop-outs, "D" cracking, or other disruptions due to moisture gain, freezing, or other mechanisms, based on tests or past service.
 5. Product data for the following concrete materials admixtures:
 - a. Water reducing
 - b. Set retarding
 - c. Set accelerating
 - d. Data indicating chloride ion content information for each admixture
 6. Concrete compressive strength data as required by ACI 318.
 7. Concrete supplier approval of mix design.
 8. Chloride-Ion Content: Measured water-soluble chloride-ion content (percent by weight of cementitious materials) in accordance with ASTM C1218.
 9. Time of Initial Setting: Initial setting time in accordance with ASTM C403.
- H. Product Data: Submit certified laboratory test data or manufacturer's certificates and data for the items listed below certifying that materials are in conformance requirements specified herein. Submit to the Civil Engineering Consultant of Record and the Construction Testing Laboratory for review and approval and within 7 calendar days after receipt of Notice-to-Proceed. In addition, for projects with all-concrete parking lots, submit to the Wal-Mart Assigned Concrete Sub-Consultant.
1. Portland cement concrete mix design(s)
 2. Type and source of Portland cement, fly ash, and slag
 3. Aggregate gradations
 4. Joint back-up material
 5. Soft preformed joint filler
 6. Pavement joint sealant
 7. Dowel bars
 8. Tie bars
 9. Reinforcing steel bars
 10. Welded wire fabric
 11. Air entraining admixtures
 12. Water-reducing, set-retarding, and set-accelerating admixtures (if used)
- I. Pavement Joint and Placement Plan: For projects with all-concrete parking lots, provide a placement plan identifying the items listed below. In addition to submission to CEC, submit to Wal-Mart Assigned Concrete Sub-Consultant.
1. Concrete truck access location.
 2. Extent of placements including width, length, slab placement area and volume.
 3. Locations of construction joints.
 4. Location of sawn contraction joints if different from those shown on the civil drawings.
- J. Pre-Slab Installation Meeting:
1. Provide record of notification of pre-slab meeting including company name, persons contacted, and date and method of contact.
 2. Provide meeting minutes to all participants and Wal-Mart Construction Manager including sign-in sheet.
- K. Delivery Tickets:
1. Copies of delivery tickets for each load of concrete delivered to site.

2. Indicate information required by ASTM C 94 on each ticket including additional information required for slabs.
3. Information on ticket shall include quantities of material batched including the amount of free water in the aggregate and the quantity of water that can be added at the site without exceeding the maximum water cementitious ratio of the approved mix design. Aggregate moisture corrections shall be based on ASTM definitions of aggregate moisture content and absorption.
4. Mix identification number on ticket shall match number on submitted and approved mix design.
5. Submit copies to Wal-Mart Testing Laboratory with each concrete delivery.

L. Installation Certification: Submit certification in writing that final placement is in accordance with specification requirements.

M. Statement of Approval of Concrete Supplier: Submit statement with information specified in Quality Assurance paragraph below.

1.4 TESTING

A. Wal-Mart Construction Testing Laboratory (CTL) will perform concrete testing and inspection specified in Part 3 and elsewhere in this section as specified at no cost to the Contractor in accordance with Section 01458 - Testing Laboratory Services.

B. CTL is neither authorized to change any specified requirement nor to approve any portion of the work.

C. Failure to detect defective material or Work will neither prevent rejection when defects are discovered later nor will it obligate Owner to make final acceptance.

D. Responsibilities and Duties of Contractor Relative to Owner Testing:

1. Notify Owner's agency in advance of concrete placement to allow sufficient time to prepare for required testing.
2. Assist Owner's agency in securing field specimens.
3. Provide and maintain for sole use of CTL, facilities for safe storage and proper curing of concrete test cylinders at project site as required by ASTM C31 and acceptable to Wal-Mart Testing Laboratory.

1.5 QUALITY ASSURANCE

A. Concrete Truck Inspection:

1. Conform to ASTM C94, NRMCA, and Department of Transportation standards in state where project is located.
2. Perform inspections immediately before starting concreting operations.
3. Record acceptable truck numbers.
4. Record the identification numbers of those trucks found to be acceptable on the basis of inspections.
5. Do not bring on site for concreting operations, any truck whose identification numbers are not recorded as acceptable. Notify Wal-Mart Testing Lab if non-conforming trucks are used to deliver concrete for slabs and pavements.

B. Tolerances:

1. Conform to most stringent requirements of ACI 117 and ACI 301 except as specified herein.
2. Conform to ACI 117 thickness tolerances for slabs-on-ground.

C. Concrete Supplier Approval:

1. The concrete supplier shall be fully approved and acceptable by the concrete subcontractor as the producer of concrete for which the subcontractor is to place and finish. Prepare Statement of Approval of Concrete Supplier stating project name, name of concrete supplier, along with the statement of approval and the signatures of the Contractor and concrete pavement subcontractor.

D. Workmanship:

1. When directed by the Owner, remove and replace or repair concrete and related Work which does not conform to specified requirements including strength, tolerances and finishes.

2. Bear cost of corrections or delays to other work affected by, or resulting from, corrections to concrete Work.
 3. If results of compressive strength tests reveal deficiencies in concrete, meet requirements of ACI 318 and ACI 301.
 4. Establish and maintain required lines and elevations.
 5. Check surface areas at intervals necessary to eliminate ponding areas.
- E. Pre-installation Meeting: Convene a pre-installation meeting at the site at least two weeks prior to commencing work of this Section. Require attendance of parties directly affecting work of this Section, including, but not limited to, the Owner's representative, CTL's representative and inspector, Contractor, concrete sub-contractor and job foreman, concrete supplier, and base fine grading contractor.
1. Contact Wal-Mart Construction Manager Thirty days prior to pre-installation conference to confirm schedule.
 2. Record discussions of meeting and decisions and agreements (or disagreements) reached, and furnish copy of record to each party attending. Review foreseeable methods and procedures related to paving work, including the following:
 3. CTL's testing and inspection procedures.
 4. Concrete finishes and finishing.
 5. Cold- and hot-weather concreting procedures.
 6. Curing procedures.
 7. Concrete design mixture and examine procedures for ensuring quality of concrete materials.
 8. Proposed sources of concrete materials, including capabilities and location of plant that will manufacture concrete.
 9. Tour, inspect and discuss condition of subgrade, drainage structures, and other preparatory work.
 10. Requirements for protecting concrete work, including restriction of traffic during installation period and for remainder of construction period.
 11. Review and finalize construction schedule and verify availability of materials.
 12. Concrete paving requirements (drawings, specifications and other contract documents).
 13. Required submittals, both completed and yet to be completed.
 14. Weather and forecasted weather conditions, and procedures for coping with unfavorable conditions.
 15. Safety precautions relating to placement of concrete.
 16. Changes to the contract documents from recommendations or discussions at the Pre-Construction meeting shall be approved in writing by the Wal-Mart Construction Manager prior to implementation.

1.6 ENVIRONMENTAL REQUIREMENTS

- A. Concreting in Hot, Dry, or Windy Weather:
1. Employ precautions to avoid cracking when the concrete rate of evaporation exceeds 0.1 pounds per square foot per hour or when any combination of concrete materials and weather conditions are favorable for the formation of plastic shrinkage cracks.
 2. Maintain an accurate reading thermometer at the job site to check temperature of concrete.
 3. Reject concrete if more than one slump adjustment, as defined in ASTM C 94, is required.
 4. Do not place concrete when forms, subgrade, aggregate base, or reinforcing bars are more than 120 F or the temperature differential between the forms, aggregate base, or reinforcing bars and concrete will create conditions favorable for settlement cracks or thermal cracking.
- B. Concreting in Cold Weather:
1. Conform to ACI 306.1 when temperature and other environmental conditions are as noted therein.
 2. Subgrade shall be thawed to depth of 12 inches immediately before placing concrete.
 3. Measure and record concrete temperature during protection period in each placement at regular time intervals, but not less than 3 times per 24 hour period.
 4. Do not place slabs on subgrade or base that is more than 20°F cooler than concrete. Warm subgrade or base to decrease temperature differential to 20 F or less

1.7 PROJECT CONDITIONS

- A. Maintain access for vehicular and pedestrian traffic as required for other construction activities (and Wal-Mart customers at expansion projects). Utilize temporary striping, flagmen, barricades, warning signs, and warning lights as required.

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PART 2 - PRODUCTS

2.1 MATERIALS

A. Forms: Steel, wood, or other suitable material of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use straight forms, free of distortion and defects. Use flexible spring steel forms or laminated boards to form radius bends as required. Coat forms with nonstaining type of coating that will not discolor or deface surface of concrete.

B. Aggregate Base and Choker Materials:

1. Aggregate Base Material:

- a. Gradation: Conform to gradation shown on the Civil Drawings.
- b. Equivalent Gradation: Equivalent gradations may be used upon approval of the Civil Engineer of Record. Submit proposed equivalent gradation to the Architect for approval within 30 days after the award of contract. Equivalent gradation shall be one of the following.

1) Any state DOT approved road base material meeting the following gradation:

<u>Std. Sieve Size</u>	<u>% Passing</u>
No. 1-1/2	100
No. 4	15-55
No. 200	5-12

2) Material conforming to the General Requirements and of the Gradation "A", "C", or "D" requirements (with the modified allowance of 5% to 12% passing the No. 200 sieve) as defined by ASTM D1241

2. Aggregate Choker Material: Clean granular fill with less than 3% clay and/or friable particles. Use one of the following gradations:

- a. ASTM 448 No. 10 with 6% to 12% passing No. 200 sieve.
- b. Material meeting the following gradation:

<u>Std. Sieve Size</u>	<u>% Passing</u>
No. 4	85-100
No. 8	75-95
No. 16	55-75
No. 50	22-45
No. 100	10-30
No. 200	6-12

C. Reinforcement:

- 1. Welded Wire Mesh: Welded plain cold-drawn steel wire fabric, ASTM A185. Furnish in flat sheets.
- 2. Reinforcing Bars: Deformed steel bars, ASTM A615, Grade 60.
- 3. Joint Dowel Bars: ASTM A615, grade 40 minimum, smooth round plain steel bars, or ASTM A36, smooth round or square plain steel bars, cut bars true to length with ends square and free of burrs. Epoxy coat per State Highway Department Standard Specifications.

D. Cementitious Materials:

- 1. Portland Cement: ASTM C150, Type I, Use only one brand throughout project.
- 2. Fly Ash: ASTM C 618, Class C or F. Use only one type and source throughout project.
- 3. Slag: ASTM C989, Grade 100 or 120. Use only one type and source throughout project.

E. Pavement Joint Materials:

- 1. Joint Back-up Material: Polyethylene foam, 100% closed cell
- 2. Soft Preformed Joint Filler: Flexible closed-cell non-extruding synthetic foam expansion joint strips.
 - a. Ceramar Flexibe Foam Expansion Joint, by W.R. Meadows.
 - b. Deck-O-Foam Expansion Joint Filler, by W.R. Meadows
 - c. Expansion Joint Filler, by BASF Building Systems (Degussa) (Formerly Sonneborn Sonolastic).
- 3. Sealant:
 - a. Dow 888, by Dow Corning.
 - b. 301 NS by Pecora.

- c. Spectrum 800 or 900 by Tremco.
- F. Concrete Aggregate:
- 1. Conform to ASTM C33.
 - 2. Aggregate shall contain no coal or lignite in concrete that will not be covered by soil.
 - 3. Fine Aggregate:
 - a. Conform to fine aggregate grading requirements as defined in section 6.1 of ASTM C 33 unless approved by the Civil Engineer.
 - b. If manufactured sand is used, blend with minimum 25% natural sand unless otherwise approved by Civil Engineer.
 - 4. Coarse Aggregate:
 - a. Nominal maximum coarse aggregate size shall be 1 inch for slabs \leq 5-1/2 inch thick.
 - b. The nominal maximum size of an aggregate is the smallest sieve size through which the major portion of the aggregate must pass, with a minimal amount retained on the maximum sieve size. Maximum 4% shall be retained on the nominal maximum size sieve.
 - 5. Adjust proportions of combined coarse, intermediate, and fine aggregates to provide the following particle size distribution characteristics, unless otherwise approved:
 - a. Coarseness Factor of 60 to 75%.
 - 1) The Coarseness Factor (CF) is the percent of combined aggregate retained on the #8 sieve that is also retained on the 3/8" sieve.
 - 2) The Coarseness Factor is calculated as follows:
 $CF = \text{Aggregate retained on } 3/8'' \text{ sieve} / \text{Aggregate retained on } \#8 \text{ sieve.}$
 - b. Adjusted Workability Factor
 - 1) The Workability Factor (WF) is the percent of combined aggregate that passes the #8 sieve.
 - 2) The Adjusted Workability Factor (Adj-WF) is calculated as follows:
 $\text{Adj-WF} = WF + [(\text{Cementitious Material} - 564 \text{ lbs}) / 37.6]$
 - 3) The range of accepted Adj-WF for a given CF is as follows:
 $\text{Adj-WF} = [(11.25 - .15 \text{ CF}) + 33] \pm 2.5$
 - 4) Combined percent retained on any given sieve size shall not exceed 24%.
 - 6. Gradation requirement of ASTM C33 may be waived in order to meet ranges specified.
- G. Water: ASTM C 1602.
- H. Air Entrainment: ASTM C260.
- 1. Air-Mix or AEA-92, by Euclid.
 - 2. MB-VR MB-AE 90, or Micro-Air, BASF.
 - 3. Daravair or Darex Series, by W.R. Grace.
 - 4. Equivalent approved products.
- I. Evaporation Retardant: Water-based polymer, sprayable.
- 1. Euco-Bar, by Euclid
 - 2. Confilm, by BASF Admixtures (Master Builders)
 - 3. Aquafilm, by Dayton Superior.
- J. Liquid Membrane Curing and Sealing Compound: ASTM C 1315, Type I, Class A or B, 25% minimum solids content, clear non-yellowing with no styrene-butadiene.
- 1. Water Based, VOC less than 350 g/l:
 - a. Super Aqua Cure, by Euclid Chemical Corp.
 - b. Kure 1315 by BASF.
 - 2. Solvent Based (For use below 40F)
 - a. Super Rez-Seal, by Euclid Chemical Corp.
 - b. Kure-N-Seal 30 by BASF.

2.2 CONCRETE MIX

- A. Design mix shall produce normal weight concrete consisting of Portland cement, supplementary cementitious materials, aggregates, admixtures, and water to produce specified requirements.

- B. Geographical Weather Exposure Classification: Reference IBC Figure 1904.2.2. Uncertainty of classification due to a project location near a border of a classification shall be referred to Wal-Mart Construction Manager for clarification.
- C. Compressive Strength at 28 days, unless otherwise indicated on the Drawings:
 - 1. Negligible exposure classification: 3,500 psi with a maximum water-cementitious ratio of 0.53.
 - 2. Moderate exposure classification: 4,000 psi with a maximum water-cementitious ratio of 0.48.
 - 3. Severe exposure classification: 4,500 psi with a maximum water-cementitious ratio of 0.45.
- D. Slump Range: 2"-4" for hand placed concrete, 1-1/4" to 3" for machine placed (slipform) concrete.
- E. Air Entrainment as shown below:

Nominal Maximum Size Aggregate (Inch)	Average Air Content (%)		
	Negligible	Moderate	Severe
3/8	4.5	6.0	7.5
1/2	4.0	5.5	7.0
3/4	3.5	5.0	6.0
1	3.0	4.5	6.0
1-1/2	2.5	4.5	5.5

- F. Supplementary Cementitious Materials (SCM):
 - 1. Concrete mix shall contain SCM at the amounts specified unless other amounts are approved by the Civil Engineer. Either fly ash or ground granulated blast furnace slag (GGBFS) may be used for the SCM but shall not be used together to form a ternary mix. Use of fly ash or GGBFS in the concrete mix is mandatory.
 - 2. Fly Ash: Substitute fly ash for Portland cement at 15% of the total cementitious content.
 - a. If used to mitigate potential aggregate reactivity, only Type F fly ash may be used and shall have the following maximum properties: 1.5% available alkali and 8.0% CaO. When a maximum of 25% replacement is used, up to 10.0% CaO is permitted.
 - 3. Ground Granulated Blast Furnace Slag (GGBFS): Substitute GGBFS for Portland cement at 20% of the total cementitious content.
 - a. If required to mitigate potential sulfate exposure or aggregate reactivity, up to 50% substitution of Portland cement is allowed.
 - 4. Maintain air-entrainment at specified levels.
- G. Calcium Chloride:
 - 1. Calcium chloride (Type L) may be used in solution form as part of the mixing water to accelerate concrete setting and early-strength development.
 - 2. Amount of calcium chloride added shall not be more than necessary to produce the desired results and shall not exceed 2% by weight of cement.
 - 3. The dosage range for the calcium chloride for the entire project shall not vary by more than 1%. Range is defined as the difference between the maximum and minimum dosages of calcium chloride for the entire project.
 - 4. Calcium chloride shall not be used in the following applications unless approved by the Civil Engineer:
 - a. concrete containing embedded dissimilar metals or aluminum
 - b. slabs supported on permanent galvanized steel forms
 - c. concrete exposed to deicing chemicals
 - d. prestressed or post-tension concrete
 - e. concrete containing aggregates with potentially deleterious reactivity and concrete exposed to soil
 - f. concrete exposed to soil or water containing sulfates.
 - 5. Use calcium chloride in accordance with manufacturer's recommendation.
 - 6. Chloride-ion Concentration: Maximum water-soluble chloride-ion concentrations in hardened concrete at ages from 28 to 42 days contributed from the ingredients including water, aggregates, cementitious materials, and admixtures shall not exceed the following limits unless approved by the Civil Engineer:

Type of Member	Maximum water-soluble chloride ion (Cl-) content in concrete (percent by weight of cement)
Prestressed concrete	0.06
Reinforced concrete exposed to chloride in service	0.15
Reinforced concrete that will be dry or protected from moisture in service	1.00
Other reinforced concrete construction	0.30
7. When using calcium chloride or other admixtures containing chlorides, measure water-soluble chloride-ion content (percent by weight of cement) per ASTM C 1218. Sample shall be from concrete representing the submitted mix design and maximum chloride dosage anticipated for the project.	

2.3 MIXING

- A. Mix concrete and deliver in accordance with ASTM C 94.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Proofroll prepared base material surface to check for unstable areas in accordance with Section 02300 including documentation and re-proof rolling as required. Paving work shall begin only after unsuitable areas have been corrected and are ready to receive paving.
- B. Remove loose material from compacted base material surface to produce firm, smooth surface immediately before placing concrete.

3.2 AGGREGATE BASE PLACEMENT

- A. Unless otherwise specified on the Drawings, place aggregate base as specified herein.
- B. Aggregate Base:
1. Install aggregate base where shown on Drawings.
 2. Compact to final thickness shown in layers not exceeding 6 inches with minimum of 2 passes per layer with vibratory compactor.
 3. Compact fill to 98% of aggregate's Standard Proctor as determined by Method D of ASTM D698.
 4. Leave base up to 2 inches low until just prior to concrete placement.
- C. Aggregate Base Fine Grading:
1. Compact to final thickness shown with 2 passes minimum vibratory compactor to produce smooth, flat, dense surface.
 2. Do not allow excess moisture in or on base at time of placing concrete.
 3. Level off aggregate base top surface with a maximum 3/4" thick aggregate choker material to achieve the following:
 - a. To reduce surface friction and to meet specified fine grade tolerances specified below.
 - b. To level areas exposed to rain, traffic, or excavations for buried utilities.
 - c. At areas where aggregate base material does not have sufficient fine particles to produce a surface that is free of exposed aggregate or surface voids greater than 3/8" in size at time of slab installation.
 4. Wal-Mart Construction Testing Laboratory shall verify adequate fines at surface immediately prior to concrete slab placement.
 5. Provide dry, smooth, flat, dense surface
 6. Proof-roll 48 hrs maximum prior to concrete placement. Depression under a fully loaded ready mix truck shall not exceed 1/2 inch.
- D. Pavement Aggregate Base Fine Grade Tolerance: +0 inch, -3/4 inch with transition no greater than 3/4 inch vertically to 8 inches horizontally.

3.3 INSTALLATION

- A. Form Construction
 - 1. Set forms to required grades and lines, rigidly braced and secured.
 - 2. Install sufficient quantity of forms to allow continuance of work and so that forms remain in place minimum of 24 hours after concrete placement.
 - 3. Check completed formwork for grade and alignment to following tolerances:
 - a. Top of forms not more than 1/8-inch in 10'-0".
 - b. Vertical face on longitudinal axis, not more than 1/4-inch in 10'-0".
 - 4. Clean forms after each use and coat with form release agent as often as required to ensure separation from concrete without damage.

- B. Reinforcement: Fasten reinforcing bars or welded wire fabric (if required) accurately and securely in place with suitable supports and ties. Remove from reinforcement all dirt, oil, loose mill scale, rust, and other substances that will prevent proper bonding of the concrete to the reinforcement.

- C. Concrete Placement
 - 1. Mix and place concrete when the air temperature in the shade and away from artificial heat is a minimum of 35 degrees F and rising. Hot and cold weather concreting shall be in accordance with ACI 305.1 (hot weather) and 306.1 (cold weather).
 - 2. Do not place concrete until base material and forms have been checked for alignment and grade. Concrete shall not be placed around manholes or other structures until they are at required finish elevation and alignment.
 - 3. Place concrete using methods that prevent segregation of mix. Consolidate concrete along face of forms and adjacent to transverse joints with internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Consolidate with care to prevent dislocation of reinforcing, dowels, and joint devices.
 - 4. Deposit and spread concrete in continuous operation between transverse joints, as far as possible. If interrupted for more than 1/2 hour, place construction joint.

- D. Contraction and Construction Joints: Construct contraction and construction joints straight with face perpendicular to concrete surface. Construct transverse joints perpendicular to centerline, unless otherwise detailed.
 - 1. Contraction Joints: Provide joints at spacing of 12'-0" on centers, maximum each way. Construct control joints for depth equal to at least 1/4 of the concrete thickness, as follows:
 - a. Form tooled joints in fresh concrete by grooving top with recommended tool and finishing edge with jointer.
 - b. Sawed Contraction Joints:
 - 1) Use saws, blades, skid plates, and accessories by Soff-Cut International, Inc. or approved equal.
 - 2) Start cutting sawed joints as soon as concrete has hardened sufficiently to prevent raveling or dislodging of aggregates. This will typically be from 1 hour in hot weather to 4 hours in cold weather after completing finishing of slab in that joint location.
 - 3) Provide at least two "Soff-Cut" saws on site with blades capable of achieving the required depth of saw cut.
 - 4) Extend sawed joint to the slab boundaries and abutments, including columns, drains, and other penetrations in the path of a defined joint. Implement methods and timing of the saw cut beyond the limits of the Soff-Cut saw reach to provide a consistent depth of cut with minimal raveling of joint edges.
 - 2. Construction Joints: Place construction joints at end of placements and at locations where placement operations are stopped for period of more than 1/2 hour. Construct joints in accordance with details shown.

- E. Isolation and Fixed Object Joints: Construct joint at locations and in accordance with details shown.

- F. Pavement Joint Materials: Place joint fillers, back-up material, and sealants at locations shown and in accordance with manufacturer's instructions.
 - 1. Soft Preformed Joint Fillers: Extend preformed joint fillers full-width and depth of joint, and not less than 1/2-inch or more than 1-inch below finished surface. Furnish preformed joint fillers in 1-piece lengths for full width being placed, wherever possible. Where more than 1 length is required, lace or clip preformed joint filler sections together in a single plane.

3.4 CONCRETE FINISHING

02751-10

- A. After initial striking off and consolidating of concrete paving, smooth surface using either magnesium straight edge, wood, or magnesium channel float.
- B. Round edges of slabs and formed joints to 1/2-inch radius with edging tool. Eliminate tool marks on concrete surface.
- C. After completion of straightedge / floating and when excess moisture or surface sheen has disappeared, uniformly finish surface to provide a coarse, nonslip finish by scoring surface with stiff-bristled broom perpendicular to flow of traffic so as to produce regular corrugations not over 1/16 of an inch deep. Initial nonslip finishing shall be approved by the Wal-Mart Construction Manager.
- D. Do not remove forms for 24 hours after concrete has been placed. After form removal, clean ends of joints and point up minor honeycombed areas. Remove and replace areas or sections with major defects, as directed by Owner.

3.5 CURING AND PROTECTION

- A. Protect and cure finished concrete paving using curing compound. Cure for a period not less than 7 days.
- B. Use solvent based curing compound when compound is applied below 40 F.

3.6 CLEANING AND ADJUSTING

- A. Sweep concrete pavement and wash free of stains, discolorations, dirt, and other foreign material just prior to final inspection.
- B. Protect concrete from damage until acceptance of work. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials.

3.7 FIELD QUALITY CONTROL

- A. Field quality control tests specified herein will be conducted by the Owner's Construction Testing Laboratory at no cost to the Contractor in accordance with Section 01458. The Contractor shall perform additional testing as considered necessary by the Contractor for assurance of quality control. Retesting required as a result of failed initial tests shall be at the Contractor's expense.
- B. Field testing, frequency, and methods may vary as determined by and between the Owner and the Owner's Testing Laboratory.
- C. Review the Contractor's proposed materials and mix design for conformance with specifications.
- D. Perform testing in accordance with ACI 301 and testing standards listed herein.
- E. Strength Tests:
 - 1. Secure composite samples in accordance with ASTM C172. Sample at regularly spaced intervals from middle portion of the batch. Sampling time shall not exceed 15 minutes.
 - 2. Mold and cure specimens in accordance with ASTM C31.
 - a. A minimum of four concrete test cylinders shall be taken for every 100 cubic yards or less of each class of concrete placed each day and not less than once for each 5000 square feet of paved area.
 - b. During the initial 24 hours (plus or minus 8 hours) after molding, the temperature immediately adjacent to the specimens shall be maintained in the range of 60 to 80 degrees F. Control loss of moisture from the specimens by shielding from the direct rays of the sun and from radiant heating devices.
 - c. Specimens transported prior to 48 hours after molding shall not be demolded, but shall continue initial curing at 60 to 80 degrees F until time for transporting.

- d. Specimens transported after 48 hours age shall be demolded in 24 hours (plus or minus 8 hours). Curing shall then be continued but in saturated limewater at 73.4 degrees (plus or minus 3 degrees F) until the time of transporting.
 - e. Wet cure cylinders under controlled temperature until testing.
 3. Test cylinders in accordance with ASTM C39.
 - a. Size of specimen test cylinder shall be 6" x 12" or 4" x 8".
 - b. Date test cylinders and number consecutively. Give each cylinder of each set an identifying letter (i.e. A, B, C, D). Prepare a sketch of the site plan for each test set identifying location of placed concrete.
 - c. Test one cylinder (A) at 7 days for information..
 - d. Test two cylinders (B and C) at 28 days and the average of the breaks shall constitute the compressive strength of the concrete sample.
 - e. Retain fourth cylinder (D) for further testing if needed, but do not retain cylinder more than 90 days.
 4. Evaluation and Acceptance:
 - a. Strength level of concrete will be considered satisfactory if the average of all sets of three consecutive strength tests equal or exceed specified strength and no individual strength test (average of two cylinders) results are below specified compressive strength by more than 500 psi.
 - b. Complete concrete work will not be accepted unless requirements of ACI 301, have been met, including dimensional tolerances, appearance, and strength of structure.
 - c. Where average strength of cylinders, as shown by tests is not satisfactory, Wal-Mart reserves the right to require Contractor to provide improved curing conditions of temperature and moisture to secure required strength. If average strength of laboratory control cylinders should fall so low as to cause portions of structure to be in question by Wal-Mart, follow core procedure set forth in ASTM C42. If results of core test indicate, in opinion of Wal-Mart, that strength of structure is inadequate, provide without additional cost to Wal-Mart, replacement, load testing, or strengthening as may be ordered by Wal-Mart. If core tests are so ordered and results of such tests disclose that strength of structure is as required, cost of test will be paid by Wal-Mart.
- F. Slump Test: Conduct slump test for each cylinder set taken in accordance with ASTM C143. Make additional slump tests for every other load from a stationary mixer or truck to test consistency. Sampling shall be in accordance with ASTM C172.
- G. Air Content: Conduct air content test for each cylinder set for concrete in accordance with ASTM C 231, ASTM C 173, or ASTM C 138. Indicate test method on report. Make test at same time as slump test.
1. Perform air content test for first and second truck for each class of concrete placed each day. If either test fails, perform air test on every truck until two consecutive air tests comply with the requirements of the project specifications.
- H. Unit Weight: ASTM C 138.
- I. Temperature Test: Conduct temperature test for each cylinder set taken in accordance with ASTM C1064. Test hourly when air temperature is 40 F and below or 80 F and above. Determine temperature of concrete sample and ambient air for each strength test.
- J. In addition to required information noted previously in this Section, record the following information on concrete compression reports:
1. Test cylinder number and letter.
 2. Specific foundations or structures covered by this test.
 3. Proportions of concrete mix or mix identification.
 4. Maximum size coarse aggregate.
 5. Specified compressive strength.
 6. Tested compressive strength.
 7. Slump, air-content.
 8. Concrete plastic unit weight.
 9. Concrete Temperature.
 10. Elapsed time from batching at plant to discharge from delivery truck at project.
 11. Date and time concrete was placed.
 12. Ambient temperature, wind speed, and relative humidity during concrete placement.
 13. Name of technician securing samples.

14. Curing conditions for concrete strength test specimens (field and laboratory).
 15. Date strength specimens transported to laboratory.
 16. Age of strength specimens when tested.
 17. Type of fracture during test.
- K. At the start of each day's mixing, report any significant deviations from approved mix design including temperature, moisture and condition of aggregate.
- L. Review each delivery ticket of concrete. Report type of concrete delivered, amount of water added and time at which cement and aggregate were loaded into truck, and time at which concrete was discharged from truck
- M. In Place Pavement Testing: Randomly core pavement in low traffic volume areas at minimum rate of 1 core per 20,000 sq. ft of pavement, with minimum of 3 cores . Sample and test cores in accordance with ASTM C42. Core will be tested for thickness and quality of aggregate distribution. Core holes shall be patched by the Contractor immediately with Portland cement concrete and shall be finished to provide level surface as specified herein.
- N. Additional Tests: Additional in-place tests shall be conducted as directed by the Wal-Mart Construction Manager when specified concrete strengths and other characteristics have not been attained in the structures.

END OF SECTION

WAL-MART STORES

CONCRETE MIX DESIGN SUBMITTAL FORM
(Section 02751 – Concrete Pavement)

Date _____

DISCOUNT STORE SUPERCENTER NEIGHBORHOOD MARKET SAM'S CLUB

STORE INFORMATION

STORE # _____
 ADDRESS _____
 CITY, ST _____
 GENERAL CONTRACTOR _____
 COMPANY _____
 JOBSITE PHONE _____

A. CONCRETE INFORMATION

Supplier Mix Design #	_____
Design Strength (f'c)	_____ psi
Water / Cementitious Ratio	_____
Total Air Content	_____ %
Total Est. Volume of Concrete	_____ CY
Mix Developed From:	
<input type="checkbox"/> Trial Mix Test Data (<i>attach test data</i>)	
<input type="checkbox"/> Field Experience	
Density	
Wet	_____ pcf
Dry	_____ pcf
Slump	
_____ " (± 1")	WITHOUT WR Admixture
_____ " (± 1")	WITH WR Admixture

LEAVE BLANK FOR
 STAMP OF
 APPROVAL BY
 CONCRETE
 SUPPLIER AND
 ENGINEER OF
 RECORD

B. ADMIXTURE INFORMATION

	ASTM Designation	Product (Manufacturer/Brand)	Dosage (ounces)	
			oz / cy	oz / cwt
Water Reducing				
Accelerating				
Retarding				
Air-Entraining				

C. MIX DESIGN

Mix Proportions (per cubic yard)

	Identification (Type, size, source, etc.)	Weight (pounds)	Density (SSD)	Volume (cubic feet)	% Aggregate Absorption
Cement					
Fly Ash					
Slag					
Coarse Aggregate #1					
#2					
#3					
Fine Aggregate #1					
#2					
Water					
Air Content					
	TOTALS				

Coarse & Fine Aggregate Gradation Information

Sieve Size	% Passing Each Sieve (All Sieve Sizes must be entered)					Combined % Passing	Combined % Retained	
	Coarse Agg. # 1	Coarse Agg. # 2	Coarse Agg. # 3	Fine Agg. # 1	Fine Agg. # 2		Cumulative	Individual
1-1/2"								
1"								
3/4"								
1/2"								
3/8"								
# 4								
# 8								
# 16								
# 30								
# 50								
# 100								
# 200								
% of Vol								

Aggregate Ratios

Coarseness Factor =	$\frac{\text{Combined \% cumulative retained } 3/8'' \text{ sieve}}{\text{Combined \% cumulative retained } \#8 \text{ sieve}}$	=	
Workability Factor =	Combined % passing #8 sieve	=	
Adj-Workability Factor =	$WF + [(Cementitious \text{ Material} - 564) \div 37.6]$	=	
Allowable Adj-WF =	$Adj-WF = [(11.25 - .15 \text{ CF}) + 33] \pm 2.5$	=	Low High

D. ATTACHMENTS: Include the following with this Mix Design Report.

- Portland Cement mill test reports
- Fly ash mill test reports
- Slag mill test reports
- Designation, type, quality, and source (natural or manufactured) of coarse and fine aggregate materials
- Separate aggregate gradation reports including all required sieve sizes
 - All gradation sieve report tests dated within 60 days of this report
 - Report for each coarse and fine aggregate material in mix
- Statement if possible reactivity of aggregate, based on tests or past service
- Statement if possible aggregate pop-outs or their disruptions, based on tests or past service
- Product data for the following admixtures:
 - Chloride ion data and related calculations
 - Water reducing, set retarding, set accelerating, etc.
- Measured water-soluble chloride ion content in concrete (percent by weight of cement).
- Concrete compressive strength data used for standard deviation calculations

E. CONCRETE SUPPLIER INFORMATION

Company Name _____ **Tel. #** () _____

Address _____

City, ST Zip _____

Technical Contact _____ **Cell #** () _____

e-mail _____

Sales Contact _____ **Cell #** () _____

PRIMARY PLANT

SECONDARY PLANT

Plant Location: _____

Miles from Site: _____

Travel Time to Site: _____

NRMCA Certified: YES NO

YES NO

State DOT Certified: YES NO

YES NO

Batch Mixing Type: DRY CENTRAL MIX

DRY CENTRAL MIX

02751-17

Anytown, USA - 11110000

Revision Date: