

## SECTION 321313 - CONCRETE PAVING

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Concrete paving for:
  - a. Concrete parking areas and roads.
  - b. Concrete sidewalks.
  - c. Concrete curbs and gutters.

##### B. Related Requirements:

1. Section 321123 - Aggregate Base Courses.
2. Section 321216 - Asphalt Paving.

#### 1.2 PRICE AND PAYMENT PROCEDURES

##### A. Concrete Paving:

1. Basis of Measurement: By square yard.
2. Basis of Payment: Includes forms, reinforcing, concrete, accessories, placing, finishing, and curing.

#### 1.3 REFERENCE STANDARDS

##### A. American Concrete Institute:

1. ACI 304 - Guide for Measuring, Mixing, Transporting, and Placing Concrete.

##### B. ASTM International:

1. ASTM A775/A775M - S Standard Specification for Epoxy-Coated Steel Reinforcing Bars.
2. ASTM A934/A934M - Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars.
3. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
4. ASTM C33 - Standard Specification for Concrete Aggregates.
5. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
6. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.
7. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic Cement Concrete.
8. ASTM C150 - Standard Specification for Portland Cement.

9. ASTM C172 - Standard Practice for Sampling Freshly Mixed Concrete.
10. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
11. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
12. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete.
13. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
14. ASTM C1017/C1017M - Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
15. ASTM C1064/C1064M - Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete.
16. ASTM C1116 - Standard Specification for Fiber-Reinforced Concrete and Shotcrete.
17. ASTM D6690 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.

#### 1.4 SUBMITTALS

##### A. Product Data:

1. Submit data on concrete materials, joint filler, admixtures, curing compounds.

##### B. Design Data:

1. Submit concrete mix design for each concrete strength. Submit separate mix designs when admixtures are required for the following:
  - a. Hot and cold weather concrete work.
2. Identify mix ingredients and proportions, including admixtures.
3. Identify chloride content of admixtures and whether or not chloride was added during manufacture.

##### C. Source Quality Control Submittals: Indicate results of tests and inspections.

#### 1.5 QUALITY ASSURANCE

##### A. Obtain cementitious materials from same source throughout.

##### B. Perform Work according to City of Casper Standard Specifications for Public Works Construction and Infrastructure Improvements.

#### 1.6 QUALIFICATIONS

##### A. Installer: Company specializing in performing work of this section with minimum 3 years' experience.

## 1.7 AMBIENT CONDITIONS

- A. Do not place concrete when base surface temperature is less than 35 degrees F, or surface is wet or frozen.

## PART 2 - PRODUCTS

### 2.1 AGGREGATE BASE COURSE

- A. Aggregate Base Course: As specified in Section 321123.

### 2.2 CONCRETE PAVING

- A. Performance / Design Criteria:

- 1. Paving: Pavement section as specified in the drawings.

- B. Form Materials:

- 1. Wood or Steel form material, profiled to suit conditions.
- 2. Joint Filler: ASTM D1751; ¼ inch thick.

- C. Reinforcement:

- 1. Deformed Reinforcing: Steel: ASTM A615/A615M, #4, 60 ksi yield grade, deformed billet bars epoxy coated finish.
- 2. Synthetic Macro-fiber: Synthetic macro-fibers engineered and designed for use in concrete, complying with ASTM C1116/C1116M, Type III, **1 to 2-1/4 inches** long.
  - a. Manufacturers:
    - 1) ABC Polymer Industries.
    - 2) Euclid Chemical Company (The); an RPM company.
    - 3) GCP Applied Technologies Inc.
    - 4) Propex Operating Company, LLC.
    - 5) Sika Corporation.

- D. Concrete Materials:

- 1. Cement: ASTM C150 Type II modified, low C<sub>3</sub>A-; gray color.
- 2. Fine and Coarse Aggregates: In accordance with City of Casper Standard Specifications for Public Works Construction and Infrastructure Improvements.
- 3. Concrete Reinforcing Fibers: ASTM C1116, high strength industrial-grade fibers specifically engineered for secondary reinforcement of concrete.
- 4. Water: In accordance with City of Casper Standard Specifications for Public Works Construction and Infrastructure Improvements.
- 5. Air Entrainment: In accordance with City of Casper Standard Specifications for Public Works Construction and Infrastructure Improvements.
- 6. Chemical Admixture: In accordance with City of Casper Standard Specifications for Public Works Construction and Infrastructure Improvements.

7. Fly Ash: In accordance with City of Casper Standard Specifications for Public Works Construction and Infrastructure Improvements.
8. Slag: In accordance with City of Casper Standard Specifications for Public Works Construction and Infrastructure Improvements.
9. Plasticizing: In accordance with City of Casper Standard Specifications for Public Works Construction and Infrastructure Improvements

## 2.3 MIXES

### A. Concrete Mix - By Performance Criteria:

1. Mix and deliver concrete according to City of Casper Standard Specifications for Public Works Construction and Infrastructure Improvements.
2. Provide concrete to the following criteria:
  - a. Compressive Strength: 4000 psi at 28 days.
  - b. Slump: 2 to 4 inches
  - c. Minimum Cement Content: 6 sacks/cu yd.
  - d. Water/Cement Ratio: 4.5 to 5.5 gallon per sack
  - e. Air Entrainment: 4.5 to 7.5 percent.

## 2.4 FINISHES

### A. Shop Finishing - Reinforcement:

1. Epoxy Coated Finish for Steel Bars: ASTM A775/A775M

## 2.5 ACCESSORIES

- A. Curing Compound: According to City of Casper Standard Specifications for Public Works Construction and Infrastructure Improvements.
- B. Joint Sealers: ASTM D6690, Type II; hot applied type.
- C. Epoxy Grout: Per Table 819.2-1 of the WYDOT Standard Specifications for Road and Bridge Construction.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify compacted granular base course is dry and ready to support paving and imposed loads.
  1. Remove soft base course and recompact as specified in Section 321123.00
- B. Verify gradients and elevations of base are correct.

### 3.2 PREPARATION

- A. Moisten substrate to minimize absorption of water from fresh concrete.
- B. Notify Engineer minimum 24 hours prior to commencement of concreting operations.

### 3.3 INSTALLATION

#### A. Base Course:

- 1. Aggregate Base Course: Install as specified in Section 321123.

#### B. Forms:

- 1. Place and secure forms and screeds to correct location, dimension, profile, and gradient.
- 2. Assemble formwork to permit easy stripping and dismantling without damaging concrete.

#### C. Reinforcement:

- 1. Place tie bar at mid-height of paving.
- 2. Provide tie bar at 18 inch spacing at connection to existing concrete by drilling into existing concrete. Epoxy grout tie bar into existing concrete.
- 3. Repair damaged epoxy coating to match shop finish.

#### D. Placing Concrete:

- 1. Place concrete according to City of Casper Standard Specifications for Public Works Construction and Infrastructure Improvements
- 2. Place concrete continuously over the full width of the panel and between predetermined construction joints.

#### E. Joints

- 1. Place contraction joints as indicated on drawings.
- 2. Provide keyed joints as indicated.
- 3. Seal joints as indicated on Drawings.
- 4. Contraction joints may be sawcut or tooled. Saw cut joints shall be installed as soon as possible without causing raveling of the joint.

#### F. Finishing:

- 1. Paving: Finish shall match the look of adjacent existing concrete pavement.
- 2. Place curing compound on exposed concrete surfaces immediately after finishing.

#### G. Curing and Protection

- 1. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
- 2. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

### 3.4 TOLERANCES

- A. Maximum Variation of Surface Flatness: 1/4 inch in 10 ft.

### 3.5 FIELD QUALITY CONTROL

- A. Owner to provide field testing of concrete.
- B. Inspect tie bar placement for size, spacing, location, support.
- C. Testing firm will take cylinders and perform slump and air entrainment tests according to ACI 301.
- D. Testing Frequency:
  - 1. Minimum of one test will be taken for each day that concrete is placed.
  - 2. One test will be taken for all concrete paving that falls within vehicle traffic areas.
  - 3. Additional tests may be taken at the discretion of the Engineer.
- E. Strength Test Samples:
  - 1. Sampling Procedures: ASTM C172.
  - 2. Cylinder Molding and Curing Procedures: ASTM C31/C31M, cylinder specimens, standard cured.
  - 3. Sample concrete and make one set of three cylinders for every day of concrete placement.
- F. Field Testing:
  - 1. Slump Test Method: ASTM C143/C143M.
  - 2. Air Content Test Method: ASTM C231.
  - 3. Temperature Test Method: ASTM C1064/C1064M.
  - 4. Measure slump and temperature for each compressive strength concrete sample.
  - 5. Measure air content in air entrained concrete for each compressive strength concrete sample.
- G. Cylinder Compressive Strength Testing:
  - 1. Test Method: ASTM C39/C39M.
  - 2. Test Acceptance: 4000 psi at 28 days.
  - 3. Test one cylinder at 7 days.
  - 4. Test one cylinder at 28 days.
  - 5. Retain one cylinder for testing when requested by Engineer.
  - 6. Dispose remaining cylinders when testing is not required.
- H. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

3.6 PROTECTION

- A. Immediately after placement, protect paving from premature drying, excessive hot or cold temperatures, and mechanical injury.
- B. Do not permit vehicular traffic over paving for 7 days minimum after finishing and until 75 percent design strength of concrete has been achieved.

END OF SECTION 321313