



Public Works Manual

Revised September 2015



Concrete & Asphalt

Where it must cross domestic it must cross above and with a 1' minimum separation.
Nonpotable water tape.

10.00 PORTLAND CEMENT CONCRETE

10.01 MATERIALS

- a Cement. Cement shall conform to ASTM C 150, C 175 or C 595. The cement supplier shall submit to the Town of Gypsum a certification that the cement used on the project conforms to the applicable specifications with complete mill analysis.

The following list illustrates the type of cement that shall be used for particular structures;

TYPE I--Slabs, pavement, sidewalks, driveways, curbs and gutters.

TYPE II--Pipeline encasements

TYPE I, or II--Vaults, cut-off walls

- b. Aggregate. Aggregate shall conform to ASTM C 33. Fine aggregate in the sieve size range of 3/8" to #100 shall comprise 34% to 39% by weight of the total aggregate and shall conform to AASHTO M-6. The coarse aggregate in the sieve size range 1-1/2" to #4 shall conform to AASHTO M-80
- c. Admixtures. Air entraining admixtures shall conform to ASTM C 260. Type A water reducing admixtures (normal setting) shall conform to ASTM C 494 and may be used when air temperature is between 40 and 80 degrees F. Type D water reducing admixtures (retarders) shall conform to ASTM C 494 and may be used when air temperature is over 80 degrees F. Type E water reducing admixtures (accelerating) shall conform to ASTM C 494. Fly-ash shall conform to ASTM C 618 and when fly-ash is used, the proportions of materials shall be determined in accordance with the American Concrete Institute (ACI) Standard 318-77 Section 4.2.
- d. Materials for curing concrete. These materials shall be liquid membrane curing compound (white) conforming to ASTM C 309, or sheet material conforming to ASTM C171.
- e. Joint filling compound. Where joints are required to be filled, material shall be hot poured rubber asphalt joint filling compound conforming to AASHTO-M-173 or Federal Specification SS-S-164 or SS-S-1401a.
- f. Water. If water quality is questionable, it shall be tested in accordance with AASHTO-T-26.
- g. Fibrous Reinforcing Material. Fibrous reinforcing materials shall be 100% virgin polypropylene, fibrillated fibers containing no reprocessed olefin materials and specifically manufactured for use as a concrete secondary reinforcement. Material shall conform to ASTM C-1116 Type III 4.1.3 and ASTM C-1116 Performance Level I outlined

in Section 21 Note 17. Fibrous Concrete reinforcement shall be as manufactured by Fibermesh Company, 4019 Industry Drive, Chattanooga, Tennessee, 37416 or approved equal. Fibrous reinforcement shall be added to concrete materials at the time concrete is batched. The amounts added and the methods of mixing shall be in accordance with the instructions and recommendations of the manufacturer.

10.02 PROPORTIONING

Cement:	470 pounds per cubic yard minimum
Air content:	5% to 8%
Coarse aggregate:	1-1/2 inch maximum, but not greater than one-fourth of the thickness of the slab or structure wall
Slump:	2 to 4 inch maximum for surface vibrated or 1 to 3 inch maximum for internally vibrated.

10.03 STRENGTH REQUIRED

All concrete shall have a specified compressive strength of 4000 psi at 28 days. Flow fill shall have a specified compressive strength of not less than 75 psi at 28 days and not greater than 300 psi at 28 days. Conformance to strength requirements shall be determined by ASTM C 94 Section 16.5.1.

The compressive strength of flow fill shall never exceed 700psi, as determined by ASTM C 94 Section 16.5.1, or it shall be removed.

10.04 APPLICABLE STANDARDS

- a. "Specifications for Structural Concrete for Buildings" ACI 301.
- b. "Building Code Requirements for Reinforced Concrete" ACI 318.
- c. "Standard Specification for Ready Mixed Concrete" ASTM C 94 or ACI 304.

10.05 REINFORCEMENT STEEL

All reinforcement steel bars shall conform to ASTM A 615, ASTM A 616 or ASTM A 617, Grade 60.

10.06 MIXING AND HAULING

All ready-mixed concrete shall meet the requirements of either ASTM C 94 or AASHTO-M-157. The maximum elapsed time from time water is added to the mix until the concrete is in place shall not exceed 1.5 hours when concrete is transported in revolving-drum truck bodies.

10.07 FORMING

The subgrade or sub base under the forms shall be compacted and cut to grade so that the forms when set will be at the required elevation. Forms shall be of such configuration as to produce the structure or pavement shown on the plans. They shall be of such strength and so secured as to resist the pressure of the concrete when placed and the impact and vibration of

any equipment that they support, without springing or settlement. The method of connection between form sections shall be such that the joints shall not move in any direction. The maximum deviation of any final structure surface shall not exceed 1/4 inch in 10 feet. Forms shall be capable of being removed without causing damage to the structure or pavement. Flexible or curved forms of proper radius shall be used for pavement curves of 100 feet radius or less. When concrete is to be placed against rock, the rock surface shall be scaled and cleaned with a high-pressure hose to remove all loose material. All forms shall be cleaned to remove all mortar, grout or other foreign material from the surfaces and oiled prior to each use. Form oil shall be light colored paraffin oil, or other non-staining material. For exposed surfaces not in contact with earth backfill, acceptable chemical release agents are Protex Industries "Pro-Cote", Symons Corp., "Magic Kote", L & M "Debond" or equal. Form ties shall be commercially manufactured permanently embedded type with removable ends for all exposed surfaces. The permanently imbedded portion of the tie shall terminate not less than one inch from the face of the concrete. Chamfer strips shall be placed in forms to bevel salient edges and concrete corners of exposed surfaces, except for the top edges of walls and slabs, which are to be tooled. Unless otherwise noted on the Drawings, bevels shall be 3/4 inch wide. Forms shall remain in place a minimum of 12 hours after concrete is placed. The edge of previously placed concrete gutter section may be used as grade for a road pavement.

10.08 PLACING

The concrete shall be deposited in the structure forms or on the pavement grade in such a manner as to require as little rehandling as possible. All reasonable care shall be taken to prevent any segregation of the concrete materials.

10.09 VIBRATING

The concrete shall be thoroughly consolidated throughout by means of vibrators inserted in the concrete. Vibrators shall not be permitted to come in contact a joint assembly or the subgrade. Vibrators shall not be used to drag the concrete into place and shall not be operated longer than 10 seconds in one place.

10.10 JOB CONDITIONS

Concrete shall not be placed during rain, snow or sleet unless protection is provided to prevent precipitation from entering the concrete mix.

- a. Cold Weather Concreting. The work shall conform to the specifications of ACI 306, "Recommended Practice for Cold Weather Concreting". The Temperature of concrete when placed shall not be less than that shown in the following table.

Minimum concrete temp. (°F) in sections with least dimensions:

Air Temp. (°F)	Under 12 inches	12 inches & over
30 to 45	60	50
0 to 30	65	55
Below 0	70	60

Temperature of concrete when placed shall not exceed 85 °F.

Prior to placing concrete, all ice, snow, surface and subsurface frost shall be removed from surfaces to be in contact with new concrete and said surfaces shall be at least 35 degrees F but less than 90 degrees F. Concrete shall be protected from freezing during the specified curing period. Heated enclosures shall provide adequate protection of corners, edges and thin sections. Heating units shall not heat or dry concrete, or during the first 24 hours, expose the concrete to exhaust gasses containing carbon dioxide.

- b. Hot Weather Concreting. The work shall conform to specifications of ACI 305, "Recommended Practice for Hot Weather Concreting". Temperature of concrete when placed shall not exceed 85 F. Forms and reinforcing steel shall be cooled to a maximum of 90 F with water spray prior to placing concrete. Concrete shall not be placed when the actual or anticipated evaporation rate equals or exceeds 0.20 pounds per square foot per hour, as determined by Figure 2.1.4 of ACI 305. Approved set retarding and water reducing admixtures may be used when ambient air temperature is 90 F or above to offset the accelerating effects of high temperature.

10.11 TESTING

Concrete shall be sampled and tested as follows:

- a. Slump tests--performed at any time that concrete being placed appears to contain excessive moisture and at each time that cylinders are prepared for strength tests. The following Table illustrates the maximum allowable slump for various types of construction.

TYPE OF CONSTRUCTION	MAXIMUM SLUMP (INCHES)
EXTRUDED CURB, CURB & GUTTER CAST-IN-PLACE MANHOLE BASE	2
CONCRETE PAVEMENT NOT INTEGRAL WITH CURB, SIDEHILL SURFACE DRAINAGE STRUCTURES	3
CURB, INTEGRAL CURB & PAVEMENT, GUTTER, SIDEWALK, GUTTER, APRONS, PIPE BEDDING & ANCHORS BRIDGES, BUILDING FOOTERS, FOUNDATIONS & RETAINING WALLS CAST-IN-PLACE PILES CHANNELS AND BOX CULVERTS WALLS AND DECKS	4
PIPE COLLARS & PIPE ENCASEMENT FENCE AND GUARD RAIL POST FOUNDATIONS FLOW FILL (TRENCH BACKFILL SLURRY)	5

- b. Strength tests--prepare four (4) each 6" x 12" cylinders for each test sample. A sample shall be taken for each 50 cubic yards up to 100 cubic yards and for each 100 yards there after. Flow fill concrete shall be sampled at each truckload. The four cylinders from the sample shall be broken as follows: one cylinder shall be broken at 7 days and two cylinders shall be broken at 28 days. The remaining cylinder shall be retained to break

later if necessary, or may be broken at 28 days for confirmation of the other cylinder breaks.

11.00 HOT BITUMINOUS PAVEMENT TESTING

11.01 SCOPE

The work shall consist of constructing one or more courses of bituminous pavement on a prepared base in accordance with these specifications, and in reasonably close conformity with the lines, grades, thicknesses and typical cross-sections shown on the plans or established.

11.02 REFERENCE SPECIFICATIONS

The Standard Specifications of the Colorado Department of Highways (current edition) are herein included by reference and the section and subsection numbers listed herein refer to that document.

11.03 MATERIALS

The materials shall conform to the requirements of subsections 401.02 through 401.06. A tack coat of emulsified asphalt Grade CSS-1H conforming to the requirements of section 702 shall be applied to all existing paved surfaces including edges and joints at all stations where a bituminous overlay or edge addition is required. Additionally, a tack coat shall be applied to the face of any concrete, curb, gutter or sidewalk to which it will abut.

A job mix formula shall be established and submitted to the Town of Gypsum for approval. The job mix shall be based on Grade C or C Modified mixes and conforms to the requirements of sections 702 and 703. Asphalt shall be grade AC-10.

11.04 CONSTRUCTION

The placement of hot bituminous pavement shall not commence until reports have been submitted by the Geotechnical Engineer to the Town of Gypsum, which state and illustrate that the subgrade preparation and the base course aggregate installation meet specifications. The construction requirements shall be as prescribed in subsections 401.07 through 401.20. The tack coat shall be installed in conformance with the requirements of section 407. After the bituminous mixture has been spread, struck off, and surface irregularities adjusted, it shall be thoroughly and uniformly compacted by rolling. Rolling shall be continued until all roller marks are eliminated and a density of 92% to 96% of the maximum theoretical density according to AASHTO T 209 is achieved.

12.00 TRAFFIC REGULATION

12.01 SCOPE

Whenever construction activities are on, adjacent to a traffic way, or in any way impact traffic, these specifications shall apply.