

## CHAPTER 10

### MATERIALS OF CONSTRUCTION

#### 10.0 GENERAL

- 10.0.1 QUALITY. It is the intent of these Specifications to secure new, first class materials. Only materials conforming to these specification requirements may be used. The source of supply of all materials shall be subject to the approval of the **City** Engineer. Such approval may be rescinded at anytime should the source of supply fail to produce materials of satisfactory quality or quantity.
- 10.0.2 SAMPLES and TESTS. All materials required for use on construction of the work shall be subject to sampling and testing by the City. The samples required by the City shall be furnished free of all charges by the Contractor. All tests will be made by and at the expense of the City, unless noted otherwise on the plans or in the Special Provisions. The Engineer reserves the right to have any load of material delivered to a truck scale in order to check the weight of the load. No claim for less or delay will be allowed on this account.
- 10.0.3 DELIVERY TICKETS. The Engineer shall be furnished copies of delivery tickets of materials delivered to the job unless otherwise specifically allowed. Where the contract unit prices necessitate payment for materials on a volume or weight basis, the City will pay only for the materials for which delivery tickets have been provided on the job site at the time of delivery.

#### 10.1 CONCRETE REINFORCEMENT

- 10.1.1 GENERAL REQUIREMENTS. Steel bars for concrete reinforcement shall conform to the Specifications for Billet-Steel Bars for Concrete Reinforcement, A.S.T.M. Designation A-15.
- 10.1.2 GRADE and QUALITY. All concrete reinforcing bars and **rebar** bars shall be structural grade steel. The bars shall be free of excess rust, oil or other harmful coatings.
- 10.1.3 TYPES and SIZES. Tie bars for curb and gutter construction and for all construction joints in pavements, bases and alleys shall be **No. 4** (1/2 inch) round deformed bars 18".

Tie bars abutting to the existing curb and gutter shall be composed of 2 epoxy-coated rebar, 12" long No. 4 (1/2 inch.) See Figure 8.

## 10.2 EXPANSION JOINT MATERIAL

10.2.1 GENERAL REQUIREMENTS. Expansion joint filler shall conform to the requirements for "Bituminous Fiber Type" expansion joint material. A.A.S.H.T.O. Designation M-213.

10.2.2 TYPES and SIZES. One inch expansion joint material shall be used in all curb and gutter, concrete pavement, and concrete alley construction. The material shall be cut to the required cross section and furnish full and complete separation of concrete from either side of the joint.

One-half inch material shall be used in sidewalk and driveway construction, and shall be installed so as to provide full expansion relief.

## 10.3 CORRUGATED METAL CULVERT PIPE

10.3.1 GENERAL REQUIREMENTS. Corrugated metal culvert pipe shall conform to the requirements of the "Specifications for Corrugated Metal Culvert Pipe", A.A.S.H.T.O. Designation M-36. Bolted metal bands of the same materials as the pipe shall be used in making field joints.

10.3.2 TYPES and SIZES. The culvert pipe to be furnished shall be of the size and shape as shown on the plans or as provided for in the contract bid items.

## 10.4 DOUBLE WALL CORRUGATED POLYETHYLENE PIPE

10.4.1 GENERAL REQUIREMENTS. Double wall corrugated polyethylene pipe shall conform to the requirements of the "Specifications for Corrugated Metal Culvert Pipe", A.A.S.H.T.O. Designation M-294. ADS, N-12 or equal hinged split couplings manufactured with the pipe shall be used in making field joints.

10.4.2 TYPES and SIZES. The pipe to be furnished shall be of a size up to 24 inches in diameter as indicated on the plans or as provided for in the contract bid items.

## 10.5 TOPSOIL

10.5.1 GENERAL REQUIREMENTS. Top soil shall consist of the natural loam, sandy loam, silt loam, silty clay loam or clay loam humus bearing soils adapted to the sustenance of plant life, and such topsoil shall be neither excessively acid nor excessively alkaline. The topsoil shall be a finely divided material free from lumps or balls of clay and containing no rocks, pebbles or other foreign substances.

## 10.6 CURING AGENT FOR CONCRETE

10.6.1 GENERAL REQUIREMENTS. The spray coating material used to provide the impervious coating required for curing concrete shall, when tested in accordance with the method prescribed in A.S.T.M. Designation C-156, provide a film which will retain within the specimen at the end of 72 hours at least 85 percent of the water used in the concrete mix. It shall be applied to the pavement at a rate sufficient to affect the required water retention and shall form a continuous, coherent, water-impermeable film without breaks or pin holes.

A white pigmented material shall be used and it shall be of such nature as not to react deleteriously upon the concrete. It shall produce no darkening of the concrete but shall be of such nature or so treated that the coating will be distinctly visible for at least 4 hours after application.

10.6.2 APPLICATION. Immediately after finishing operations are completed, the surface of the concrete shall be uniformly covered with the curing compound applied as a fine spray.

## 10.7 ASPHALTS and ASPHALTIC ROAD OILS

10.7.1 GENERAL REQUIREMENTS. All asphalt and asphaltic road oils shall conform to the requirements of Section **450, 455, 460, 465** of the Wisconsin Department of Transportation Specifications.

## 10.8 ASPHALTIC CEMENT

10.8.1 GENERAL REQUIREMENTS. All asphaltic cement shall conform to the requirements of Section **450, 455, 460, 465** of the Wisconsin Department of Transportation specifications.

## 10.9 CRUSHED LIMESTONE-BASE COURSE

10.9.1 GENERAL REQUIREMENTS. All crushed limestone aggregates shall conform to Section **305** of the WDOT Specifications.

## 10.10 CRUSHED CONCRETE-BASE COURSE

10.10.1 Crushed concrete will be considered as an alternate for base course if it conforms to State of Wisconsin Department of Transportation Standard, Section 304

## 10.11 COVER BEDDING AND BACKFILL MATERIALS

10.11.1 COVER MATERIAL. Bedding material shall be used for cover material in sewer and water installation. Cover

material for water main shall be of the same material as the bedding.

10.11.2 BEDDING MATERIALS. Shall be in accordance with the following detailed requirements:

(a) Crushed Stone Chips. Crushed stone chips shall be made from crushing sound limestone. The material shall be hard, tough and durable. The crushing process shall produce material of which 85% to 100% of the particles shall have at least one machine fractured face. Crushed stone chips shall be used for bedding sanitary and storm sewers.

1. For sewer pipe 18 inches in diameter or less, crushed stone chips meeting the grading requirements of this Table shall be used:

GRADATION REQUIREMENTS FOR  
3/8 INCH CRUSHED STONE CHIPS

<u>Sieve Size</u>	<u>Percentage Passing</u>
	<u>By Weight</u>
1/2 Inch	100%
3/8 Inch	90 - 100
No. 8	0 - 15
No. 30	0 - 3

2. For pipe larger than 18 inches in diameter crushed stone chip bedding meeting the requirements of this Table may be used:

GRADATION REQUIREMENTS FOR  
3/4 INCH CRUSHED STONE CHIPS

<u>Sieve Size</u>	<u>Percentage Passing</u>
	<u>By Weight</u>
1 Inch	100%
3/4 Inch	90 - 100
3/8 Inch	20 - 55
No. 4	0 - 10
No. 8	0 - 5

(b) Traffic Bond (TB) 3/4". Shall be used for the bedding of water main. TB 3/4" will be acceptable if it meets the following gradation criteria:

<u>Sieve Size</u>	<u>Percentage Passing</u>
	<u>By Weight</u>
1 Inch	100%
3/4 Inch	95 - 100
3/8 Inch	50 - 90
No. 4	35 - 70
No. 10	15 - 55
No. 40	10 - 35
No. 200	5 - 15

10.11.3 **BACKFILL MATERIAL.** Shall be in accordance with the following detailed requirements:

- (a) **Traffic Bond (TB) 1 1/4".** Shall be used for the backfill of all utility installations, except those found in existing pavement or critical locations where Lean Concrete Mix backfill is required.

1 1/4" TB will be acceptable if it meets the following gradation:

<u>Sieve Size</u>	<u>Percentage Passing</u> <u>By Weight</u>
1 1/4 Inch	95 - 100%
3/4 Inch	70 - 93
3/8 Inch	42 - 80
No. 4	25 - 63
No. 10	16 - 48
No. 40	8 - 28
No. 200	2 - 12

- (b) **Lean Concrete Mix Backfill.** This backfill is to be used in existing pavement locations or locations where a fast set is required by the City Engineer or authorized City representative.

The specification for this concrete product can be found in Section 10.14.1 of these specifications and 8.43.9 of the standard specifications.

## 10.12 ASPHALTIC CONCRETE PAVEMENT

### 10.12.1 GENERAL REQUIREMENTS

All asphaltic concrete pavements shall conform to the requirements of the Wisconsin Department of Transportation Specifications. Asphaltic concrete pavements shall be **typically** type **LT1** or **MT per trucking areas** as shown on the pavement plans or as approved by the City Engineer.

**The aggregates for a bituminous concrete pavement shall be blended with crushed limestone in such proportion, gradations, as to provide a workability of the bituminous mixtures satisfactory to the Engineer.**

## 10.13 PORTLAND CEMENT CONCRETE

10.13.1 **WATER.** The water used in mixing concrete shall be clean and free from injurious amounts of acids, salt, oil or other substances harmful to the concrete.

10.13.2 **PORTLAND CEMENT.** The Portland cement used in all concrete mixes shall conform to Section 501 of the WDOT Specifications with the following revisions:

- a. High-Early-Strength Portland cement shall be used only with the written consent of the Engineer.
- b. Air-entrained concrete shall be produced by the use of Air-entrained Portland cement. Air-entraining agents shall not be used as additives at the mixer, unless specifically allowed in writing by the City Engineer.

10.13.3 AGGREGATES. The aggregates used in concrete shall conform to the requirements of Section 501 of the WDOT Specifications with the following revisions:

- a. Gradation of Fine Aggregates

<u>Sieve Size</u>	<u>Percentage Passing By Weight</u>
3/8 inch	100
No. 4	95 - 100
No. 16	45 - 80
No. 50	7 - 30
No. 100	0 - 6

- b. Gradation of Coarse Aggregates

1. Size No. 1

1 inch	100
3/4 inch	90 - 100
3/8 inch	20 - 55
No. 4	0 - 5
No. 8	0 - 3

Size No. 2

2 inch	100
1-1/2 inch	90 - 100
1 inch	20 - 55
3/4 inch	0 - 15
1/2 inch	0 - 5

10.14 MIX DESIGN

- a. Concrete for the various intended uses shall conform to the following requirements:

Use of Concrete	Type of Cement	Cement Content In Sacks Per Cu. Yd.	Designed Compressive Strength	Water Max. Gal. Per Sack	Air Content
Street & Alley Pavements	Type 1A	6.0	3600 p.s.i.	5.5	3-7%
Curb & Gutter Walks, etc.	Type 1A	6.0	3500 p.s.i.	6.0	3-7%

The exact quantities of materials used in a specific concrete mix shall be designed by the Engineer.

- b. The consistency of the freshly mixed concrete shall be such that when measured by means of a 4 x 8 x 12 inch slump cone, the slump shall not exceed three (3) inches.

**10.14.1 LEAN CONCRETE MIX BACKFILL.**

Lean concrete mix backfill shall conform to the requirements of Section 8.43.9 with the addition of a minimum of 1 bag of cement per cubic yard.

The material shall be mixed with water to inundate the aggregate sufficient to provide an approximate 3" slump. The mix shall be deposited in the trench directly from a concrete transit mix truck.

10.14.2 MIXING and TRANSPORTING OF CONCRETE. Concrete shall be mixed and transported to the job site as required in Section 501 of the WDOT Specifications except that the "non-agitating" type of truck body shall not be used. All concrete shall be "Ready-Mixed" unless otherwise specifically allowed in writing by the Engineer. All concrete shall be deposited on the job site within one hour from the time that the mixing water is added. Loads of concrete rejected by the Inspector at the work site for any reason shall not be retempered or adjusted by additional ingredients and used in the work, without specific approval of the Engineer.

**10.14.3 CONCRETE PLACEMENT DURING COLD WEATHER.**

- a. Concrete shall not be placed on frozen subgrade or when the air temperature is less than 35° F. The Engineer at his discretion may order the concrete work to cease irrespective of air temperature if

it is anticipated that the temperature will drop below freezing.

The Contractor shall remove and replace at his expense any concrete damaged by frost or freezing irrespective of the fact that the Contractor may have had the approval of the Engineer to pour said concrete.

- b. **For concrete pours** during cold weather, the water and the aggregates in the concrete mixture may be heated. When specifically allowed by the Engineer, the Contractor may use magnesium-free calcium chloride as an admixture in the concrete. The maximum quantity to be used shall not exceed one (1) percent of the cement content of the mix.
- c. When the air temperature is expected to drop below freezing, the Contractor shall cover the surface of the concrete with straw or hay to a sufficient depth to prevent freezing, and such protection shall be furnished for at least five (5) days after the concrete has been poured. Any concrete less than five (5) days old shall be covered when directed by the Engineer.

Other methods of protection from freezing may be used when allowed by the Engineer.