

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 the specification requirements may be used. The source of supply of all materials shall be subject to the approval of the 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 Such approval may be rescinded at anytime should the source of supply fail to produce materials of satisfactory quality or quantity.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 Standard 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 dowel 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 1/2 inch round deformed bars 36 inches long and bent at right angles at the center.

Dowel bars shall be 1 inch round smooth bars 18 inches long.

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.O. Designation M-59.

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 "Standard 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 "Standard 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 401 of the State Specifications.

10.8 ASPHALTIC CEMENT

10.8.1 GENERAL REQUIREMENTS. All asphaltic cement shall conform to the requirements of Section 401 of the State of Wisconsin Standard Specifications for highway and structure construction.

10.9 CRUSHED LIMESTONE-BASE COURSE

10.9.1 GENERAL REQUIREMENTS. All crushed limestone aggregates shall conform to Section 304 of the State 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 GRAVEL

10.11.1 CRUSHED ROAD GRAVEL

- a. Will not be accepted for street base course. See 10.9 above.

10.11.2 GRANULAR BACKFILL

- a. Granular backfill for backfill shall consist of bank-run gravel having durable particles ranging in size from fine to coarse in uniform combination.

- b. Gradation

<u>Sieve Size</u>	<u>Percentage Passing by Weight</u>
3 inch (Square Opening)	100
2 inch (Square Opening)	95 - 100
No. 4 (Square Opening)	35 - 60
No. 200 (Square Opening)	5 - 15

10.12 COVER SAND and STONE CHIPS

- 10.12.1 GENERAL REQUIREMENTS. The cover material shall consist of clean, strong, durable, dust-free particles of inert materials from natural deposits. It shall conform to A.S.T.M. Designation C33-49 and all subsequent revisions thereof.

- 10.12.2 GRADATION. Cover sand, cover grit and crushed stone chips shall conform to the following gradations:

- a. Cover Sand

<u>Sieve Size</u>	<u>Percentage Passing By Weight</u>
1 inch	100
3/4 inch	95 - 100
1/2 inch	65 - 100
3/8 inch	55 - 80
No. 4	40 - 65
No. 10	25 - 50
No. 40	10 - 30
No. 200	3 - 12

- b. The aggregates for the surface course shall be crushed and conform to the following gradations:

<u>Sieve Size</u>	<u>Percentage Passing By Weight</u>
3/8 inch	95 - 100
No. 4	70 - 85
No. 10	45 - 65
No. 40	15 - 38
No. 80	5 - 20
No. 200	5 - 10

The maximum allowable loss in abrasion for all aggregates when tested by the standard Los Angeles Abrasion Test shall be 32%

The aggregates for a bituminous concrete pavement shall be natural sand blended with crushed limestone in such proportion, within the limitations of the above master ranges of gradations, as to provide a workability of the bituminous mixtures satisfactory to the Engineer. The fine and coarse sand shall contain not more than 5% of material by weight, passing the No. 200 sieve.

10.13 ASPHALTIC CONCRETE PAVEMENT

10.13.1 GENERAL REQUIREMENTS

All asphaltic concrete pavements shall conform to the requirements of Section 407 of the Wisconsin State Specifications. Asphaltic concrete pavements shall be type E1 or E3 as shown on the pavement plans or as approved by the City Engineer.

10.14 PORTLAND CEMENT CONCRETE

10.14.1 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.

10.14.2 PORTLAND CEMENT. The Portland cement used in all concrete mixes shall conform to Section 501 of the State 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.

10.14.3 AGGREGATES. The aggregates used in concrete shall conform to the requirements of Section 501 of the State 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

10.14.4 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.

10.14.5 MIXING and TRANSPORTING OF CONCRETE. Concrete shall be mixed and transported to the job site as required in Section 501 of the State 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.

10.14.6 CONCRETE PLANT.

- a. The Contractor shall, at his own expense, provide telephone service at the site of the concrete plant, and provide a means of communication from the construction site to the concrete plant that is acceptable to the Engineer.
- b. The Engineer reserves the right to demand that the concrete plant shall conform to the requirements set forth in "Certification of Ready Mixed Concrete Production Facilities", National Ready Mixed Concrete Association, Nov., 1965.

10.14.7 CONCRETING 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. When concreting curing 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.