**SECTION 32 11 23.33**

**DENSE GRADED BASE**

**BASED ON DFD MASTER SPECIFICATION DATED 12/30/2022**

This section has been written to cover most (but not all) situations that you will encounter. Depending on the requirements of your specific project, you may have to add material, delete items, or modify what is currently written. The Division of Facilities Development expects changes and comments from you.

**PART 1 - GENERAL**

**SCOPE**

The work under this section consists of constructing a dense graded base using crushed stone or crushed gravel. The Contractor may also use crushed concrete, reclaimed asphaltic pavement, reprocessed material, or blended material. The work under this section shall provide a surface ready for constructing and supporting the Concrete or Asphalt Pavement.

PART 1 - GENERAL

Scope

Related Work

Reference Standards

Quality Assurance

Submittals

PART 2 - MATERIALS

Dense Graded Base

PART 3 - EXECUTION

Construction

Compaction

Cleanup

RELATED WORK

***(The designer must determine if this work will impact other related work or Contractors and should revise these specifications accordingly.)***

Applicable provisions of Division 1 govern work under this Section.

Related work specified elsewhere:

Section 03 30 00 – Cast In Place Concrete

Section 30 05 00 – Common Work Results For Exterior Work

Section 31 22 16.15 – Roadway Subgrade Preparation

Section 32 12 16.13 -- Hot Mix Asphalt Paving

Section 00 00 00 – (Section Title)

**REFERENCE STANDARDS**

American Society for Testing and Materials (ASTM):

D1557 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort

D6938 Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods

E329 Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection

***(Note to the designer: The A/E shall discuss the quality assurance procedures with the DFD Project Manager. The A/E shall determine the frequency of the required tests based on the project specifics. The below table provides an example of testing and test frequency. Adjust the frequency of the testing based on the scope of the project.)***

**QUALITY ASSURANCE**

The Contractor shall conduct sampling, testing, and analysis as required by this section and elsewhere in the Contract Documents either by retaining the services of an independent construction materials testing consultant or with internal certified testers. The materials testing personnel shall meet the requirements of ASTM E329.

The Contractor’s construction materials testing personnel shall complete material testing as outlined in Table 32 11 23.33-1.

***Table 32 11 23.33 -1***

|  |  |  |
| --- | --- | --- |
| Material | Test Required | Test/Sample Frequency |
| i.e. 1¼-inch Base Aggregate Dense | *ASTM D1557 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort*  | *1 test/500 CY placed* |
| i.e. 1¼-inch Base Aggregate Dense | *ASTM D6938 Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods* | *1 test/500 CY placed* |
|  |  |  |
|  |  |  |

**SUBMITTALS**

Provide copies of all material testing reports completed for the project within 48 hours of completing the individual tests. Along with each individual test result, provide a running spreadsheet of all individual test results.

**PART 2 - MATERIALS**

***(Note to the designer: The gradation of the dense graded base shall be specified for each specific use. i.e., under roadway sections, under curb & gutter, shoulders, etc.)***

**DENSE GRADED BASE**

Use dense graded base ***(\_\_ -inch).*** Provide aggregate conforming to WisDOT Section 301.2 of the SSHSC for crushed stone, crushed gravel, crushed concrete, reclaimed asphaltic pavement, reprocessed material or blended material. Material gradations shall conform to WisDOT Section 305.2.2 of the SSHSC unless specified elsewhere in the contract documents.

**PART 3 - EXECUTION**

**CONSTRUCTION**

**Preparing the Foundation**

Refer to Section 31 22 16.15 – Roadway Subgrade Preparation.

**Placing Dense Graded Base Aggregate**

Construct Dense Graded Base as specified in WisDOT Section 305.3 of the SSHSC. Compact each base layer, including shoulder foreslopes, with equipment specified in WisDOT Section 301.3.1 of the SSHSC.

Use standard compaction conforming to WisDOT Section 301.3.4.2 of the SSHSC, unless otherwise specified herein. Final shaping of shoulder foreslopes does not require compaction.

Construct the base to the width and section the drawings show. Shape, and compact the base surface to within 0.04 feet of the drawing elevation.

Ensure there is adequate moisture in the aggregate during placing, shaping, and compacting to prevent segregation and achieve adequate compaction. Moisture condition dense graded base as necessary to achieve required density as determined by ASTM D1557.

Excavation shall be reasonably free of water prior to placement of dense graded base. Do not place dense graded base on frozen surfaces or use frozen material.

Maintain the base until paving over it, or until the DFD Project Representative accepts the work, if paving is not part of the contract.

***(Note to the designer: If shouldering is not part of the project, remove the following section.)***

**Placing Dense Graded Base Shoulders**

If the roadway is closed to through traffic during construction, construct the aggregate shoulders before opening the road to traffic.

If the roadway remains open to through traffic during construction and a 2-inch or more drop-off at the pavement edge exists; eliminate the drop-off within 48 hours after completing the asphalt or concrete work. Unless the special provisions specify otherwise, provide aggregate shoulder material compacted to a 4:1 or flatter cross slope from the surface of the pavement edge.

Provide and maintain signing and other traffic protection and control devices, as specified in WisDOT Section 643 of the SSHSC, until completing shoulder construction to the required cross-section and flush with the asphaltic pavement or surfacing.

Construct aggregate shoulders to the elevations and typical sections the drawings show, except for minor modifications needed to conform to other work. Use equipment that does not damage or mar the pavement surface, curbs, or appurtenances.

Place aggregate directly on the shoulder area between the pavement edge and the outer shoulder limits. Recover uncontaminated material deposited outside the limits and place within the limits.

Do not deposit aggregate on the pavement during placement, unless the A/E specifically allows. Do not leave aggregate on the pavement overnight. After placing the shoulder aggregate, keep the pavement surface free of lose aggregate.

**COMPACTION**

**Compacting Dense Graded Base Aggregate**

If using a pneumatic roller, do not exceed a compacted thickness of 6 inches per layer. For the first layer placed over a loose sandy subgrade, the Contractor may, with A/E approval, increase the compacted layer thickness to 8 inches. If using a vibratory roller, do not exceed a compacted thickness of 8 inches per layer.

The material shall be compacted to meet the following:

 Test Method to determine maximum density and moisture ASTM D1557

 Relative compaction relative to the optimum 95%

 Moisture content relative to the optimum -2% to +2%

The compacted material shall be tested for in-place field density in accordance with this Section, Part I, Quality Assurance.

***(Note to the designer: If shouldering is not part of the project, remove the following section.)***

**Compacting Dense Graded Base Shoulders**

Spread and compact the aggregate in compacted layers of 6 inches or less to 95% of the modified maximum density prior to placing each subsequent layer.

After final compaction, shape the shoulders to remove all longitudinal ridges to ensure proper drainage.

**CLEANUP**

After the project is completed, thoroughly clean up all debris which may have accumulated during the placement of dense graded base and breaker run, if placed. All storm sewer manholes, inlets, and trench drains within the project area shall be inspected in the presence of the DFD Project Representation, the Owner Agency, and the A/E to confirm there is no accumulated debris. The Contractor shall ensure the manholes, inlets, and trench drains are free of water and debris prior to inspection by the parties noted above. Any accumulated debris in the manholes, inlets, and trench drains shall be removed and properly disposed of by the Contractor.

Replace or repair as required, all surfaces and/or landscape features damaged or disturbed under this item of work.

**END OF SECTION**