Section 2121. Granular Shoulders

2121.01 DESCRIPTION.

Prepare a shoulder area and furnish and place granular material as shown on the contract documents. This section may also apply to construction of paved shoulder fillets.

2121.02 MATERIALS.

A. For Type A and Type B shoulders, meet the following:

1. Crushed stone. Apply Article 4120.02.

2. Gravel/Limestone (if allowed in the contract documents). Apply Article 4120.02.

3. Crushed PCC or crushed composite HMA and PCC. Meet gradation No. 11 of the Aggregate Gradation Table in Section 4109 (Materials I.M. 209). Either salvaged or unclassified sources of material may be allowed. Other quality requirements of Section 4120 will not apply.

B. The Engineer may:

- Disallow short sections of material substitutions.
- Restrict the substitution to both sides of the pavement.

C. Use aggregate for paved shoulder fillets that meets the requirements of Article 4120.07.

D. RAP inspected according to Article 2303.02, C, may be used for Type A and B Granular Shoulders. When RAP is used for granular shoulders, process it so that 100% of the material passes the 1 1/2 inch (37.5 mm) sieve. When so processed, other gradation and quality requirements of Section 4120 will not apply.

E. Recycled crushed PCC, RAP, or crushed composite HMA and PCC may be uniformly blended with crushed stone. Limit recycled materials to total no more than:

- 30% of the shoulder aggregate for new construction, and
- 50% of the total for existing granular shoulders.

2121.03 CONSTRUCTION.

A. Equipment.
Use equipment that meets the requirements of Section 2001 and the following:

1. Trench Machine.
Use a motor grader or other approved machinery to excavate for subgrade preparation.

2. Proportioning and Mixing Equipment.

a. Type A Granular Shoulders.

1) Prewetting will not be required when the quantity of Type A granular shoulders designated for the contract is less than 2000 tons (2000 Mg).

2) Use proportioning equipment that accurately proportions each material.

a) Mixing and Prewetting More Than One Aggregate: Apply Article 2001.08, B.

b) Prewetting One Aggregate: Apply Article 2001.08, A.

c) Prewetting One Premixed Aggregate: Apply Article 2001.08, A.

3) A traveling mixer may be used on a road that is closed to through traffic if it meets all of the following conditions:

a) Proportions water to a single or premixed aggregate.

b) Mixes the material in a single pass operation.

c) Achieves mixing equivalent to that required from a stationary mixer.

4) Ensure mixing plants include a means of calibrating and adjusting the proportioning equipment. Make provisions for a periodic check.

b. Type B Granular Shoulders.
Proportioning, mixing, and prewetting equipment is not specified.

3. Equipment for Applying Water.
Apply Article 2001.09.

4. **Compaction Equipment.**
   a. Apply Article 2001.05, B and C, for compaction of granular shoulder material. Also apply Article 2001.05, D, when the road or adjacent lane is closed to public traffic. Vibratory rollers, described in Article 2001.05, F, may be substituted for compaction, provided equivalent compaction is obtained and demonstrated to the Engineer. This equipment may also be used for compaction of earth fill.
   b. When the thickness of a Type B shoulder is 3 inches (80 mm) or less and the width is not more than 3 feet (1 m), the coverages may be with loaded truck tires having a weight (mass) not less than 200 pounds per inch (3.5 kg/mm) of tire width. Finish roll the surface of both types with one complete coverage by a steel tired roller.

5. **Weighing Equipment.**
   Apply Article 2001.07.

B. Type A Granular Shoulders.

1. **Proportioning and Mixing.**
   When more than one aggregate is to be combined, mix the aggregates before delivery to the road. Except as permitted in Article 2121.03, A, 2, a, premix aggregate with sufficient water, acceptable to the Engineer, so that all particles are uniformly wetted.

2. **Surface Preparation.**
   a. Prepare the surface by one of the following methods:
      1) **Earth Shoulder Fill.**
         a) Construct a shoulder fill to an elevation below that of the pavement edge to allow for placement of granular shoulders as shown in the contract documents. Use select treatment materials of Article 2102.02, D, 1, if available and coordinated with the Engineer, or use suitable soils of Article 2102.02, D, 2. Do not use unsuitable soils of Article 2102.02, D, 3 or topsoil.
         b) Spread and compact according to Articles 2107.03, D and E.
         c) Shape, smooth, and finish the fill. Correct shoulder fill elevation deviations exceeding 0.05 foot (15 mm).
         d) When unpaved side roads, drives, or entrances extend through the shoulder area, excavate them or fill them with earth as necessary, and as directed by the Engineer, to provide a suitable approach.
         e.) Equivalent compaction with equipment specified in Article 2121.03, D, will be acceptable.
      2) **Trenching and Reshaping.**
         a) Remove the earth of the existing shoulder to the width and depth shown on the contract documents. Remove existing vegetation and deposit on the foreslope. Unless specified otherwise in the contract documents, remove excess excavated material from the project. Do not excavate for placement of shoulders at driveways and intersecting roads that have fillets or pavement of a higher type.
         b) Correct shoulder fill elevation deviations exceeding 0.05 foot (15 mm). If placing earth backfill material is necessary in preparing the subgrade, thoroughly compact the earth backfill material by tamping or rolling in layers not exceeding 3 inches (80 mm) in depth.
         c) For reshaping earth shoulders to the specified cross section adjacent to the granular shoulder, earth fill does not need to be rolled except for the 1 foot (0.3 m) adjacent to the granular shoulder.
   b. If earth fill is expected, it will be designated in the contract documents along with provisions for payment.

3. **Shoulder Construction.**
   a. Place granular shoulder material on the subgrade so no material is deposited on the adjacent pavement surface. Immediately remove material inadvertently spilled on the adjacent pavement using shovels and brooms.
   b. Spread and compact the granular shoulder material so the finished elevation and width conform to the specified cross section.
   c. Compact granular shoulder material with six complete coverages with a pneumatic tired roller or a steel vibratory roller, followed by at least one complete finish coverage with a steel tired roller. The Engineer may reduce the rolling when unstable subgrade is

encountered, and may require additional finish rolling if needed to ensure a satisfactory surface finish. Shape concurrently with compaction. The tolerance for width of the completed shoulder is ± 0.2 foot (60 mm).

d. Maintain the required moisture content in the granular shoulder material until it has been satisfactorily spread, compacted, and finished to the required dimensions.

e. The Engineer will check the shoulder cross slope with a template furnished and used by the Contractor. Shoulder cross slope is not to be less than specified or more than 1% greater than specified.

4. Limitations.

a. When traffic is maintained on adjacent pavement, construct shoulders on one side of the pavement at a time. Conduct operations resulting in a minimum inconvenience to traffic. Fill the portion of the shoulder excavated with granular material and compact prior to opening to traffic. The Engineer may modify this requirement for unusual and justifiable conditions.

b. When construction of the pavement is staged, stage construction of the shoulder as well, according to Article 2121.03, C, 4. Place, and moisten if necessary, granular material for temporary fillets and compact according to Article 2121.03, C, 3.

c. Bring granular shoulder material up to the pavement edge for the full width of the shoulder, at the design cross slope, prior to winter shutdown.

C. Type B Granular Shoulders.

1. Proportioning and Mixing.

Use an aggregate in a moist condition so that it will readily compact. Do not apply Article 2001.08.

2. Surface Preparation.

a. Minimum surface preparation work is anticipated. Existing shoulders damaged by the Contractor's operations shall be restored. Remove existing vegetation and deposit on the foreslope. Salvage bituminous edge rut material and existing aggregate from the fillet area and deposit on the outer shoulder area. The work shall assure a nearly vertical pavement edge.

b. If earth fill is expected, it will be designated in the contract documents along with provisions for payment.

3. Shoulder Construction.

a. Deposit, without dumping on the pavement, granular shoulder material directly on the shoulder for the width designated.

b. Thoroughly compact the moist aggregate with a minimum of four complete coverages of the entire exposed surface using a pneumatic tired roller or a steel vibratory roller. Follow this with at least one complete finish coverage using a steel tired roller. Moisten the aggregate if, in the opinion of the Engineer, it is so dry that it will not readily compact.

c. Shape the aggregate to produce a smooth surface flush with the pavement edge and tapered to meet the shoulders at the width shown in the contract documents.

4. Limitations.

a. When a drop-off is caused by the Contractor's operations and is adjacent to a lane open to public traffic, placement of granular shoulders shall be coordinated so they are brought up to the pavement operation before the adjacent lane is opened to traffic.

b. Use a fillet of granular material to temporarily correct a drop-off created by the resurfacing. If a fillet is placed, the minimum width of the fillet is to be 6 times the thickness of HMA resurfacing completed. Blade this material across the shoulder prior to placing the final layer of granular surfacing. The Engineer may modify this requirement for narrow shoulders and other justifiable conditions.

c. Bring granular shoulder material up to the pavement edge for the full width of the shoulder, at the design cross slope, prior to winter shutdown.

D. Paved Shoulder Fillet.

Place and compact aggregate for a fillet at the edge of a paved shoulder as provided in Article 1107.08.

2121.04 METHOD OF MEASUREMENT.

A. Measurement for Type A and Type B Granular Shoulders satisfactorily placed will be computed from the weights (mass) of individual truck loads, including moisture in the aggregate at time of delivery. Moisture added after delivery will not be measured for payment.

B. Trenching and Reshaping, in stations (meters), will be the quantity shown on the contract documents. The quantity of Trenching and Reshaping will be determined for each side of the pavement or base.

2121.05 BASIS OF PAYMENT.

A. Payment will be the contract unit price as follows:

1. Type A Granular Shoulders.

a. Per ton (megagrams) for the tons (megagrams) placed on the shoulder.

b. Payment is full compensation for the following:

- Furnishing materials, including aggregate and water.
- Furnishing equipment, tools, and labor to place the material in accordance with the contract documents.

c. The earth shoulder fill required in the shoulder area under the granular shoulder will be paid for separately.

d. When traffic has not been routed through the work during paving or base construction, but all or a portion of the work must be done under traffic as provided in Article 2121.03, B, 4, no payment will be made for additional flagging, barricading, decreased production, or other items directly related to this traffic.

2. Type B Granular Shoulders.

a. Per ton (megagram) for the tons (megagrams) placed on the shoulder.

b. Payment is full compensation for the following:

- Furnishing materials, including aggregate and water.
- Furnishing equipment, tools, and labor to place the material in accordance with the contract documents.
- The minimum surface preparation work described in Article 2121.03, C, 2.

c. The earth shoulder fill required in the shoulder area under the granular shoulder will be paid for separately.

d. Furnishing and placing the paved shoulder fillet adjacent to paved shoulders is incidental and will not be paid for separately.

3. Trenching and Reshaping

a. Trenching and reshaping will be paid for at the contract unit price for per station (meter). Payment is full compensation for trenching, reshaping, and removing excess excavated material from the project.

B. The contract will have a separate item for Granular Shoulders, Place Only, of the type specified in tons (Mg), when the Contracting Authority is providing the material or if the material is available from mandatory crushing on the contract. The cost of crushing should be included in the Contractor's price for granular shoulders if recycling is not required but the Contractor chooses to crush the pavement removal for granular shoulder material.