

301 Base, Subbase, and Subgrade Aggregate

301.1 Description

- (1) This section describes requirements common to sections [305](#) through [313](#) and [350](#). Exceptions and additional requirements are specified in those sections.

301.2 Materials

301.2.1 General

- (1) Provide coarse aggregates from a department-approved source as specified under [106.3.4.2](#).

301.2.2 Definitions

- (1) Interpret these terms, used throughout 300, as follows:

| | |
|--------------------------------|--|
| Aggregate | A composite mixture of hard, durable mineral materials that have been mechanically processed. |
| Breaker run | Aggregate resulting from the mechanical crushing of quarried stone or concrete not screened or processed after primary crushing. |
| Crushed gravel | Crushed angular particles of gravel retained on a No. 10 sieve. |
| Crushed stone | Crushed angular particles of quarried rock retained on a No. 10 sieve. |
| Fractured face | An angular, rough, or broken particle surface with sharp edges. |
| Gravel | Naturally occurring rounded particles of rock that will be retained on a No. 10 sieve. |
| Pit run | Unprocessed aggregate, with predominately 1 1/2-inch or larger sized particles, obtained from a gravel pit. |
| Natural material | Material that is excavated, mined, quarried, or originates from a pit or quarry; reclaimed asphalt or crushed concrete are not natural materials within 300. |
| Reclaimed asphalt | Crushed or processed asphaltic pavement or surfacing |
| Reprocessed material | Waste material for which a commercially demonstrated process uses the material as a raw material. |
| Sand | Granular material having at least 90 percent passing the No. 4 sieve and predominantly retained on the No. 200 sieve. |
| Select crushed material | Crushed and screened aggregate with particles predominately larger than 1 1/2 inches. |
| Virgin materials | Mineral materials in a native or raw form, not previously-used. |

301.2.3 Sampling and Testing

- (1) Department and contractor testing must conform to the following:

| | |
|---|--|
| Aggregate Sampling | WTM R90 |
| Mineral finer than No. 200 sieve | WTM T11 |
| Aggregate Gradation | WTM T27 |
| Extracted HMA gradation..... | WTM T30 |
| Aggregate moisture | WTM T255 |
| Liquid limit..... | WTM T89 |
| Plastic Limit and Plasticity Index..... | AASHTO T90 |
| LA Wear..... | WTM T96 |
| Sodium soundness | WTM T104 |
| Freeze/thaw | WTM T103 |
| Lightweight pieces | WTM T113 |
| Fracture | WTM D5821 |
| Standard/modified proctor | WTM T99 and WTM T180 |
| Sand cone | AASHTO T191 |
| Extraction of asphalt | AASHTO T164 or WTM D8159 |

- (2) Contact the engineer to collect sample aggregates proposed for the project. The engineer and contractor will jointly obtain the sample. The sampler must be HTCP certified to sample aggregates. Do not place base until the engineer tests and approves the material, except as allowed in [106.1](#).

301.2.4 Aggregate Requirements

301.2.4.1 General

- (1) Obtain material from department-approved sources as specified under [106.3.4.2](#) and furnish material substantially free of deleterious materials that include: shale, chert, phyllite or other altered rock formed from clay materials, soft or porous rock fragments, clay lumps, coal, and other non-durable or organic particles.

301.2.4.2 Aggregate Classifications

- (1) Provide aggregate conforming to one of the following classifications based on weight percentages.

Crushed stone or crushed gravel >= 85 percent virgin aggregates

Crushed concrete >= 90 percent crushed concrete that is substantially free of steel reinforcement and includes < 10 percent asphaltic pavement or surfacing, base, or a combination of asphaltic pavement, surfacing, and base, incorporated during the removal operation.

Reclaimed asphalt >= 75 percent asphaltic pavement or surfacing.

Reprocessed material Consists of crushed concrete, reclaimed asphalt, crushed stone, crushed gravel, or other construction materials that are thoroughly mixed and meet the following:

1. >= 80 percent is a combination of crushed concrete and reclaimed asphalt; where:
 - < 90 percent is crushed concrete, or else the material is classified as crushed concrete.
 - < 75 percent is reclaimed asphalt, or else the material is classified as reclaimed asphalt.
2. < 20 percent is crushed stone, crushed gravel, concrete block, brick, cinder, or slag particles; where:
 - < 10 percent of the final mixture is concrete block particles.
 - < 5 percent of the final mixture is brick, cinder, or slag particles.

Blended material Consists of a blend of crushed stone, crushed gravel, crushed concrete, reclaimed asphalt, or reprocessed material that are thoroughly mixed and meet the following:

1. Each individual component material, incorporated into the blend must meet the requirements of table 301-2 except for gradation. The final blend must conform to the specified gradation.
2. < 75 percent is reclaimed asphalt, or else the material is classified as reclaimed asphalt.
3. < 90 percent is crushed concrete, or else the material is classified as crushed concrete.
4. < 80 percent is a combination of crushed concrete and reclaimed asphalt, or else the material is classified as reprocessed material.
5. < 85 percent is virgin aggregate, or else the material is classified as crushed stone or crushed gravel.

301.2.4.3 Uses For Aggregate Classifications

- (1) The contractor may furnish the aggregate classifications, at the contractor's option, for the specified base types as allowed in table 301-1.

TABLE 301-1 USES FOR VARIOUS AGGREGATE BASE CLASSIFICATIONS

| BASE TYPE | CRUSHED STONE | CRUSHED GRAVEL | CRUSHED CONCRETE | RECLAIMED ASPHALT | REPROCESSED MATERIAL | BLENDED MATERIAL |
|------------------|---------------|----------------|------------------|-------------------|----------------------|--------------------|
| Dense 3/4-inch | Yes | Yes | Yes | No | Yes ^[1] | Yes ^[1] |
| Dense 1 1/4-inch | Yes | Yes | Yes | Yes | Yes | Yes |
| Dense 3-inch | Yes | Yes | Yes | No | Yes ^[2] | Yes ^[2] |
| Open-graded | Yes | Yes | No | No | No | No |

^[1] The contractor may provide reprocessed material or blended material as 3/4-inch base only if the material contains 50 percent or less reclaimed asphalt, by weight.

^[2] Ensure that material is substantially free of reclaimed asphalt.

301.2.4.4 By-Product Materials

- (1) The contractor may provide an aggregate with one of the following by-product materials mixed with crushed gravel, crushed concrete, or crushed stone up to the listed maximum percentage, by weight.

Glass 12%
 Foundry slag 7%
 Steel mill slag 75%
 Bottom ash 8%
 Pottery cull 7%

- (2) Furnish by-product materials substantially free of deleterious material.
 (3) Crush, screen, and combine materials to create a uniform mixture conforming to the predominant material specifications.
 (4) If the aggregate contains a by-product material, the department will test the final product for gradation, wear, soundness, liquid limit, plasticity, and fracture as required for the predominant material.
 (5) Do not use aggregate containing a by-product material in the top 3 inches of a temporary or permanent aggregate wearing surface.

301.2.4.5 Aggregate Base Physical Properties

- (1) Furnish aggregates conforming to the following:

TABLE 301-2 AGGREGATE BASE PHYSICAL PROPERTIES

| PROPERTY | CRUSHED STONE | CRUSHED GRAVEL | CRUSHED CONCRETE | RECLAIMED ASPHALT | REPROCESSED MATERIAL | BLENDED MATERIAL |
|--|--------------------|--------------------|---|---------------------------------|---|--|
| Gradation WTM T27 dense open-graded | 305.2.2.1 310.2 | 305.2.2.1 310.2 | 305.2.2.1 <u>not allowed</u> | 305.2.2.2 <u>not allowed</u> | 305.2.2.1 <u>not allowed</u> | 305.2.2.1 ^[1] <u>not allowed</u> |
| LA Wear WTM T96 loss by weight | <=50% | <=50% | note ^[2] | — | note ^[2] | note ^[3] |
| Sodium soundness WTM T104 loss by weight dense open-graded | <=18% <=12% | <=18% <=12% | — <u>not allowed</u> | — <u>not allowed</u> | — <u>not allowed</u> | note ^[3] <u>not allowed</u> |
| Freeze / thaw WTM T103 loss by weight dense open-graded | <=18% <=18% | <=18% <=18% | note ^[2] <u>not allowed</u> | — <u>not allowed</u> | note ^[2] <u>not allowed</u> | note ^[3] <u>not allowed</u> |
| Liquid limit WTM T89 | <=25 | <=25 | <=25 | — | — | note ^[3] |
| Plastic Limit & Plasticity Index WTM T90 | <=6 ^[4] | <=6 ^[4] | <=6 ^[4] | — | — | note ^[3] |
| Fracture WTM D5821 min one face by count dense open-graded | 58% 90% | 58% 90% | 58% <u>not allowed</u> | — <u>not allowed</u> | note ^[5] <u>not allowed</u> | note ^[3] <u>not allowed</u> |

^[1] The final aggregate blend must conform to the specified gradation.

^[2] No requirement for material taken from within the project limits. For material supplied from a source outside the project limits:

- LA wear maximum of 50 percent loss, by weight.
- Freeze thaw maximum of 42 percent loss, by weight.

^[3] Required as specified for the individual component materials defined in columns 2 - 6 of the table before blending.

^[4] For base placed between old and new pavements, use crushed stone, crushed gravel, or crushed concrete with a plasticity index of 3 or less.

^[5] ≥ 75 percent by count of non-asphalt coated particles.

301.3 Construction

301.3.1 Equipment

- (1) Use specialized pneumatic or vibratory compaction equipment or a combination of both types of machines. Do not use tamping rollers. Use pneumatic compaction equipment conforming to [207.3.6.2](#). The engineer may allow the contractor to compact the shoulder foreslopes with other equipment.

301.3.2 Preparing the Foundation

- (1) Prepare the subgrade, or resurface the previously placed base layer, as specified in [211.3.3](#) before placing base. Do not place base on foundations that are soft, spongy, or covered by ice or snow. Do not place base on frozen foundations unless the engineer approves otherwise. Water and rework or re-compact dry foundations as necessary to ensure proper compaction, or as the engineer directs.
- (2) Before placing material, identify areas of yielding subgrade and perform corrective work as specified in [205.3.13](#).

301.3.3 Stockpiling

- (1) If continuous compliance with material specifications is questionable, the engineer may require the contractor to supply material from a stockpile of previously tested material. Maintain a sufficiently large stockpile to preclude the use of material not previously approved.
- (2) Build and maintain stockpiles using methods that minimize segregation and prevent contamination. If the contract specifies location, place stockpiles where specified. Clear and prepare stockpile areas to facilitate the recovery of the maximum quantity of stockpiled material.

301.3.4 Constructing Base

301.3.4.1 General

- (1) Place aggregate in a way that minimizes hauling on the subgrade. Do not use vehicles or operations that damage the subgrade or in-place base. Deposit material in a way that minimizes segregation.
- (2) Construct the base to the width and section the plans show. Shape, and compact the base surface to within 0.04 feet of the plan elevation.
- (3) Ensure there is adequate moisture in the aggregate during placing, shaping, and compacting to prevent segregation and achieve adequate compaction.
- (4) Maintain the base until paving over it, or until the engineer accepts the work, if paving is not part of the contract. The contractor is not responsible for maintaining material placed on detours, unless the special provisions specify otherwise.

301.3.4.2 Standard Compaction

- (1) Compact the base until there is no appreciable displacement, either laterally or longitudinally, under the compaction equipment. Route hauling equipment uniformly over previously placed base. Compact each layer before placing a subsequent layer. If the material is too dry to readily attain the required compaction, add water as necessary to achieve compaction.

301.3.4.3 Special Compaction

- (1) If the contract requires special compaction, compact each layer to 95 percent of maximum density, or more, before placing the subsequent layer. The engineer will determine the maximum density according to [WTM T99](#) method C or D and in-place density according to [AASHTO T191](#).

301.3.5 Excavation Below Subgrade

- (1) The engineer may request EBS in areas of placed base or subbase. Restore the surface in EBS areas to the plan grade and cross-section or as the engineer directs.

301.3.6 Controlling Dust

- (1) Apply water or other engineer-approved dust control materials to control dust during construction and maintenance of the base and shoulders.

301.4 Measurement

- (1) For measurement by the ton, the department will determine weight based on contractor-provided tickets submitted daily. Submit tickets as specified in [109.1.4.2](#). For material with more than 7 percent

moisture, the department will reduce the ticket weight by the weight of water exceeding 7 percent. The department will determine moisture content as a percent of dry weight.

- (2) For measurement by the cubic yard, the department will determine the volume in the vehicle.
- (3) The department may convert the measurement between weight and volume as specified in [109.1](#).

301.5 Payment

- (1) Contractor testing for department-approved aggregate sources is incidental to the work.
- (2) The department will only pay for engineer-approved EBS to correct problems beyond the contractor's control. Work performed under [105.3](#) to correct unacceptable work is the contractor's responsibility. For EBS performed after placing subbase or base in the EBS area, and where the engineer approved that area for subsequent operations under [205.3.13](#), the department will pay for EBS as follows:
 - 1. Up to a maximum of \$25,000 per contract, the department will pay as follows:
 - 1.1 For excavation: 3 times the contract unit price for the Excavation Common bid item under the EBS Post Placing Subbase or EBS Post Placing Base administrative item.
 - 1.2 For backfill and restoration with the materials the engineer directs: 3 times the contract unit price for the bid items of each material used to fill the excavation and restore the subbase or base under the Restoration Post Completion (item) administrative item.
 - 1.3 For excavation, backfill, or restoration work without contract bid items: as extra work.
 - 2. After exceeding \$25,000 per contract, the department will pay for additional EBS in engineer-approved areas as determined under [109.4](#).
- (3) Payment also includes water for compaction and dust control except, if the contract contains the Water bid item, the department will pay separately for compaction and dust control water under [624.5](#).