

Section 300—General Specifications for Base and Subbase Courses

300.1 General Description

This Specification applies to all base and subbase courses, except asphaltic concrete. Additional requirements for each type of base and subbase are described in the appropriate Sections for specific base and subbase type construction.

300.1.01 Definitions

General Provisions 101 through 150.

300.1.02 Related References

A. Standard Specifications

[Section 106—Control of Materials](#)

[Section 107—Legal Regulations and Responsibility to the Public](#)

[Section 109—Measurement and Payment](#)

[Section 150—Traffic Control](#)

[Section 152—Field Laboratory Building](#)

[Section 160—Reclamation of Material Pits and Waste Areas](#)

[Section 205—Roadway Excavation](#)

[Section 206—Borrow Excavation](#)

[Section 209—Subgrade Construction](#)

[Section 301—Soil-Cement Construction](#)

[Section 302—Sand-Bituminous Stabilized Base Course](#)

[Section 310—Graded Aggregate Construction](#)

[Section 316—Cement Stabilized Graded Aggregate Construction](#)

[Section 412—Bituminous Prime](#)

[Section 831—Admixtures](#)

B. Referenced Documents

Form OMR-TM-141 Daily Truck Weights

Form 474 Tally Sheet

300.1.03 Submittals

General Provisions 101 through 150.

300.2 Materials

Find the Specifications for materials to be used and the references for them under the appropriate Section for each base and subbase type construction.

Ensure that each material meets the requirements for the type specified. Incorporate only materials that meet the Engineer's approval.

Admixtures meeting the requirements of [Subsection 831.2.03](#) and approved for use in stabilized bases or subbases shall be governed by the requirements as outlined in Laboratory Standard Operating Procedure No. 5, Quality Control of Portland Cement and Blended Hydraulic Cements and Quality Control of Fly Ash and Granulated Blast-Furnace Slag.

A. Selecting Local Materials at the Source

The Engineer has the authority to classify materials at the source and require the materials to be excavated in the proper sequence so that each kind will reach its destination at the best location for that material in the finished work. The Engineer has the authority to reject any unsuitable materials.

B. Sources of Local Materials Outside the Right-of-Way

Follow the provisions of [Subsection 106.10, "Local Material Sources"](#) to obtain materials from local sources outside the right-of-way.

300.2.01 Delivery, Storage, and Handling

A. Storing at Central Mix Plants

Store material at a plant site with enough space for separate stockpiles, bins, or stalls for each size of aggregate. Keep aggregates separated until delivery to the plant feeders for proportioning. Keep the storage yard neat and the stockpiles, bins, and stalls accessible for obtaining samples.

300.3 Construction Requirements

300.3.01 Personnel

Supply all personnel and equipment necessary for obtaining samples from base plants and delivering them to the plant laboratory.

300.3.02 Equipment

Ensure that all equipment for constructing base and subbase courses is of an approved design and in satisfactory condition before construction begins. The equipment required for each type of base or subbase will be determined according to the construction method used.

A. Central Mix Plants

The central mixing plant will not be approved for proportioning, batching, or mixing unless a field laboratory meeting the requirements of [Section 152](#) is available for the exclusive use of the Engineer or Inspector.

Design, coordinate, and operate plants so that the mixture is produced within the specified tolerances. The requirements are as follows.

1. Scales

Before any mixture is delivered to the Project, check all scales with standard weights for accuracy and for agreement with each other.

If weight proportioning is used, provide accurate scales so all ingredients of the mixture can be weighed separately. Use scales that are accurate to within 0.5 percent of the measured load. Support scales with rigid supports so that vibration from the plant does not interfere with accurate readings.

a. Weight Box and Hopper Scales

Use springless dial scales of a standard make and design for weight boxes and hopper. Inspect and seal scales when the Engineer determines it necessary to assure accuracy. Ensure that at least ten 50 lb. (25 kg) weights are available for testing the scales.

b. Motor Truck Scales

With each plant, include a motor truck scale with a platform large enough to accommodate the entire length of any vehicle used. Ensure that the scale is certified according to [Section](#)

109 and is large enough to weigh the largest anticipated load. Do not measure weights greater than the rated capacity of the scales.

Ensure that the weights of the aggregate batches in the truck before delivery to the Project are within two percent of the sum of the weights of the batch ingredients.

Complete Forms OMR-TM-141 (Daily Truck Weights) and Form 474 (Tally Sheet) for each day's production and submit them to the Engineer.

2. Mixer

Equip each central mix plant with an approved mixer.

If Portland cement is required, begin mixing immediately after the cement is added to the coarse aggregate and soil mortar. Continue mixing until a homogeneous and uniform mixture is produced.

If the equipment does not produce a homogeneous and uniform mixture that meets these Specifications, the Engineer will require the Contractor to make the changes necessary to accomplish this result.

Any adjustments made to the charge in a batch mixer or the rate of feed to a continuous mixer must ensure a complete mix of all of the material.

Correct dead areas in the mixer where the material does not move or is not sufficiently agitated, by reducing the volume of material or by making other adjustments.

3. Mixture Proportioning

Add Portland cement, bituminous materials, aggregates, or other ingredients in such a manner that they are uniformly distributed throughout the mixture during the mixing operation.

4. Water Proportioning

In all plants, proportion water by weight. Provide a means for the Engineer to verify the amount of water per batch or the rate of flow for continuous mixing.

Use spray bars to evenly distribute moisture throughout the mixture.

5. Sampling

Use sampling equipment approved by the Engineer to obtain samples before combining them with other ingredients or introducing them into the mixer.

Use sampling equipment to provide an accurate representation of the furnished material.

6. Additional Requirements for Continuous-Mixing Plants

a. Feeder System

Continuous mixing plants shall use a feeder system that accurately proportions aggregate from each bin by weight.

Equip each feeder with a device that can change the quantity of material being fed. Use a feeder with adjustments that can be securely fastened.

Ensure that the plant has an interlocking system of feeders and conveyors that can be synchronized to supply a continuous flow of aggregate, including a positive flow of dry and liquid additives for mixing.

Provide an electronic belt-weighing device to monitor the combined aggregates. Ensure that there are meters for maintaining the aggregates and additives at varying production rates.

Use an electronic control package capable of tracking which accepts a signal from the belt-weighing device and signals to continuously vary the dry and liquid additive feeder speed and maintain the feed rate.

Proportion dry additives with a gravimetric (depleting weight) system meeting the following requirements:

- The dry additive gravimetric (depleting weight) system includes an isolation vessel supported by load cells independent of the fines silo.
 - Use load cells in conjunction with an electronic scale package having remote digital display and the necessary controls. Continuously weigh the material being metered with a positive displacement feeder mounted on the discharge of the isolation vessel.
- b. Control System
- Use a control package that has a plant interlock shutdown capability. Plants must be able to shut down if actual flow rates differ from desired flow rates excessively. If the flow rate deviates excessively, an alarm shall sound at any of the aggregate, dry additive, or liquid additive metering devices.
- Provide a monitoring station to control the entire operation that shows continuous quantitative data on the production and proportioning of the mix ingredients.
- a. Portable Power Units
- Equip plants that use portable electric power generators with a frequency meter (graduated and accurate to one hertz) and a voltmeter (graduated and accurate to two volts), installed in the power circuit.
- b. Mixer
- Use a mixer equipped with enough paddles or blades to produce a uniform and homogeneous mixture. Replace paddle blades that show more than 25 percent wear in the face area. Use paddles that can be adjusted to angular positions on the shafts and that can be reversed to retard the flow of the mix. Keep the mixer level.
- c. Surge Hopper
- Equip the mixer with a surge hopper. Use a surge hopper that automatically discharges the mixture when it reaches a predetermined level.
7. Additional Requirements For Batch-Mixing Plants
- a. Weigh Box or Hopper
- Use weigh boxes and hoppers that are suspended on scales, large enough to hold a full batch without spilling or needing hand raking, and equipped with a device for accurately weighing each size of aggregate.
- Provide a convenient and accurate means of obtaining samples of aggregates from each bin before the material enters the mixing chamber. Equip each bin compartment with a bin level indicator that automatically stops weighing when a bin is empty.
- b. Mixer
- Include an approved, leak-proof batch mixer in the plant. Use a mixer fast enough or equipped with enough paddles or blades to produce a properly and uniformly mixed batch. Replace paddles and blades that show more than 25 percent wear in the face area.
- a. Weighing Cement
- Weigh cement on scales separate from the aggregate batching scales. Ensure that all scales meet the requirements of [Section 109](#).
- d. Proportioning Bituminous
- Introduce bituminous material into the mixer through spray bars and weigh it on scales separate from the aggregate batching scales.
- e. Control of Mixing Time
- Use a time-locking device that automatically limits mixing time. Do not mix materials less than 30 seconds.

B. In-Place Mixers

For in-place mixing operations, use mixers that meet the following requirements:

1. Multiple Pass Mixers

Use approved rotary-type multiple pass mixers with sufficient tines that mix cement, soil or soil-aggregate, and water uniformly for the full depth of the course.

2. Traveling Plant Mixers

Use approved traveling mixing plants to pick up the aggregate, soil, or other materials from the windrow or roadway. Use plants equipped with a bottom shell or pan that pick up and mix the material while it is separated from the foundation material during at least 50 percent of the mixing cycle.

Use plants that mix the material for the full depth of the section. Ensure that travelling plants move forward with successive increments the length and width of the roadbed so that the roadbed is compacted and finished in one operation. Ensure that none of the materials being mixed are lost or segregated.

Use plants mounted on wheels or crawler tracks wide enough so that they will not rut or damage the mixed surface when loaded to capacity.

Use plants with a pressurized metering device that introduces water during mixing.

Ensure that devices for proportioning water and materials to be mixed accurately measures the specified amounts while the machine is in motion.

For bituminous stabilization, use plants equipped with a metering device that accurately measures the bituminous material into the mixer within the tolerances specified in [Section 302.3.05.B](#). Ensure that the meter indicator dial has a scale with divisions indicating gallons (liters).

If mixing equipment does not produce a homogeneous and uniform mixture, make the changes necessary to produce this result, as required by the Engineer.

C. Mechanical Cement Spreader

When the material is to be mixed in-place, use an approved mechanical cement spreader to uniformly and accurately spread the cement. Do not use pneumatic tubes to transfer the cement from the tanker to the material to be stabilized.

D. Mixture Spreader

Use an approved mechanical spreader that meets the following requirements to uniformly spread the mixture:

- A height-adjustable strike-off plate to obtain the specified thickness of the finished base
- A self-propelled spreader with rollers to contact the truck tires and push the truck without skewing the spreader or truck
- A hopper large enough to prevent spilling or wasting the material

E. Static Rollers

Use static rollers that meet the following requirements. Use self-propelled static rollers on cement stabilized base.

1. Trench Roller

In this context, “roller” describes a wheel made of a flat metal surface; “wheel” describes a rubber wheel of the automotive type.

When base widening is specified, use at least one trench roller. Use a trench roller that has a guiding roller or wheel that operates in tandem with the compression roller on the area to be compacted or with the auxiliary wheel or roller.

Ensure that the trench roller is equipped with an auxiliary wheel or roller, mounted on a height-adjustable axle. The contact surface of the auxiliary wheel or roller must be adjustable to at least 10 in (250 mm) above and 2 in (50 mm) below the rolling plane of the compression roller. If this adjustment is not sufficient to compact the subgrade to the Plan elevation, adjust the contact surface the necessary amount.

If the steering roller or wheel operates in tandem with the auxiliary wheel or roller, it does not need to be height-adjustable.

Ensure that the auxiliary wheel or roller operates on the surface of the pavement adjacent to the area to be compacted, and at a distance from the edge of the pavement that no damage occurs. Keep the height adjustment of the auxiliary wheel or roller such that the compression roller will develop a smooth, compacted surface true to crown.

Use gas-propelled trench rollers equipped with reversing, smooth operating friction clutches. Ensure that friction clutches have smooth operating brakes of ample capacity. Use either hand-powered or power-operated steering devices.

The compression per inch (25 mm) width of compression roller shall not be less than 300 lbs (545 kg) and not greater than 365 lbs (660 kg). If necessary, use a hollow compression roller and secure the minimum weight with liquid ballast. The trench roller must compact a minimum width of at least 15 in (375 mm).

Fit rollers with adjustable spring scrapers that can scrape in both directions.

2. Steel-Wheel Rollers

Use three-wheel or tandem steel-wheel rollers. Use self-propelled rollers equipped with cleaning devices to prevent material from adhering to the wheels.

For base or subbase materials, use 3-wheel rollers on base or subbase materials that have a minimum weight of 10 tons (9 Mg) and a minimum compression of 325 pounds per inch (580 kg/100 mm) of width for the rear wheels.

Use steel wheel tandem rollers with a minimum weight of 10 tons (9 Mg) and a minimum compression of 225 pounds per inch (400 kg/100 mm) of width for the rear drum.

3. Pneumatic-Tire Rollers

Use pneumatic-tire rollers with a minimum contact pressure of 50 psi (345 kPa) per wheel.

Equip rollers to uniformly distribute the load between all wheels.

Use multiple axle, multiple wheel rollers with wheels staggered on the axles and spaces between each wheel to provide uniform compaction for the full compacting width of roller.

Ensure that the air pressure of any tire does not vary more than 5 psi (35 kPa) from the established pressure.

Operate rollers between 3 mph (5 kph) and 8 mph (13 kph), unless otherwise directed by the Engineer.

4. Sheepsfoot Rollers

Use vibratory or static compaction sheepsfoot rollers of sufficient size and weight to obtain the desired compaction.

F. Vibratory Rollers

Use an approved vibratory roller designed to activate the frequency of vibration and the roller movement separately. Ensure that the weight and amplitude of the roller can compact the surface to Specifications with a minimum number of passes.

G. Bituminous Sampling Valve

Use bituminous transfer pumps that include a valve for sampling bituminous materials.

H. Fine Grading Machine

Specifications for the Fine Grading Machine are included in either a Special Provision or a Supplemental Specification in the Proposal or in the current Supplemental Specification book.

When using GPS technology during the construction of subgrade and subbase, the Engineer may approve the omission or inclusion of the fine grading machine.

300.3.03 Preparation

A. Alternate Methods

When alternate methods of construction are provided without restriction, the Contractor may select these alternate methods at will, provided the equipment and organization are suited to the method

selected. Before starting construction, discuss the proposed method with the Engineer. The method selected must:

- Spread base or subbase material uniformly without damaging the subgrade, subbase, or the material being placed
- Mix the materials until they are homogeneous
- Use the specified water and cement or bitumen content
- Compact throughout the depth of the course to the density specified
- Complete the work within the specified time limits

Organize the work and equipment so that spreading, compacting, and finishing the base or subbase is a continuous operation. Do not exceed minimum or maximum time limits where the detailed Specifications require them, except in unusual cases where permitted by the Engineer.

B. Preparing the Pit Site

Remove grass, weeds, roots, and other debris from local materials pits. Adhere to the requirements of [Subsection 107.23, "Environmental Considerations"](#) when performing this work. Include the cost in the prices bid for the pertinent Pay Items. This work is not considered as clearing and grubbing.

C. Preparing the Subgrade

If the subgrade does not meet the requirements of [Section 209](#) for surface, compaction, and stability, repair all defective portions until it meets the requirements of that Section. Remove unsuitable materials and replace with acceptable material, if necessary. Compact the subgrade as specified in [Section 209](#).

Have enough prepared subgrade meeting the requirements of [Section 209](#) for at least one day of base construction before beginning work.

D. Preparing the Subbase

If a subbase is required, prepare it according to the requirements for surface and compaction. Ensure that it is stable enough to support the equipment that will place the base material without rutting or pumping. Repair all defective portions and replace any unsuitable material with acceptable material, if the subbase does not meet the requirements of the Specifications.

300.3.04 Fabrication

General Provisions 101 through 150.

300.3.05 Construction

A. Draining and Leaving Materials Pits

Keep materials pits well drained while materials are being removed from them. After removing materials, leave pits in the condition required by [Section 106](#) and [Section 160](#).

B. Mining and Mixing in a Pit

Mine all local materials pits within the pit boundaries and grid depths established by the Engineer.

Mine all materials from top to bottom. Mix materials in the pit before hauling to the roadbed or plant.

Place materials in windrows or stockpiles with a dragline or backhoe. Blend the gradation and moisture strata from each pit to a uniform mixture.

When a rim ditch is required and its depth exceeds the specified grid depth of soil-cement material, include only the material above the grid depth as base material. Use this material for the windrow or stockpile of material to be used for soil-cement base unless the Engineer determines that below-the-grid material is satisfactory.

Only use ladder pans and scrapers for stockpiling and windrowing in pits that are less than 18 in (450 mm) deep.

After the preliminary mixing, prevent the coarse materials from segregating from the fine materials with loading equipment that continues to blend the material.

C. Placing Materials

1. Mixture Control

The Engineer will determine the proportions of the materials to be used in compounding the base or subbase. The Engineer will determine the analysis basis of the components.

Change the mix, if required by the Engineer, to ensure that the finished base meets the requirements of these Specifications.

2. Moisture Control

Control the moisture content according to the specified requirements for each type of base or subbase.

Add water uniformly, allow it to evaporate or aerate, and roll the materials as often as necessary, to control the moisture content within the limits specified.

3. Number of Courses

Because the maximum thickness of base or subbase materials to be mixed or spread in one course varies with the equipment used, it is subject to the Engineer's approval. Ensure that the thickness meets the requirements of [Subsection 300.3.05.C.5, "Compaction."](#)

4. Widening Work

Ensure that widening work conforms to [Section 150](#).

When widening in traffic areas, excavate an area that can be completed in the same day.

When widening pavement on which there is traffic on both sides, stagger operations to keep the widening trench open in one lane of traffic at a time.

5. Compaction

Compact the entire thickness of all bases and subbases to the specified maximum dry weight per cubic foot (meter), as determined by the method specified in the Section for each base or subbase.

If any base or subbase is more than 6 in (150 mm) thick, construct according to the following table for layer thickness:

Material	Layer Thickness
Topsoil, Sand-Clay, or Chert	Two equal layers, or one layer not to exceed 8 in (200 mm)
Graded Aggregate	Two equal layers, or one layer not to exceed 8 in (200 mm)
Cement Stabilized Graded Aggregate	Two equal layers, or one layer not to exceed 8 in (200 mm)
Cement Stabilized Soil Aggregate	Two equal layers, or one layer not to exceed 8 in (200 mm)
Sand Bituminous	Two equal layers, or one layer not to exceed 8 in (200 mm)
Soil-Cement	One layer not to exceed 8 in (200 mm)

D. Meeting Surface Requirements

Produce a smooth, uniform surface that complies with these Specifications.

Rebuild any areas that do not meet the requirements or remove or add material to the area until the Engineer approves of the Work.

300.3.06 Quality Acceptance

A. Monitoring Quality Control

Ensure that the mixture and the materials used meet the following quality controls:

- Before producing any mixture for the Project, calibrate the electronic sensors, devices, or settings for proportioning all mixture ingredients by scale weight. Calibrate in the presence of the Engineer, the proportioning of every ingredient for all rates of production.
- Maintain a dated, written record of the most recent calibration. Post the calibration at the base plant and make the record available for the Engineer's inspection at all times. Format records as graphs, tables, charts, or mechanically prepared data. If the material changes, the rate of production changes by more than +/- 20%, the plant is not producing base material for more than two weeks, or if a component affecting the ingredient proportions has been repaired, replaced, or adjusted, check and recalibrate the proportions.
- Verify the moisture of the mixture being produced. Perform checks on ingredient proportioning and verify truck weight as directed by the Engineer.

Provide quality control personnel and all necessary equipment to perform and document moisture tests. Perform moisture tests at a frequency of at least one test per hour of base plant production.

B. Repairing Defects

During construction: If materials that do not meet these Specifications are placed on the roadway at any time during construction, remove and replace them with acceptable materials as a part of the Pay Item for the base or subbase being constructed.

After construction: Promptly correct defects discovered in the surface finish, thickness, or compaction of the completed base or subbase before The Work is accepted.

- If the base, subbase, or shoulders are deficient in thickness and it is determined that the subgrade elevation is high, remove the materials, lower the subgrade, and reconstruct the course, according to these Specifications at no cost to the Department.
- If job conditions permit and the Engineer mandates, correct areas deficient in thickness by raising the elevation of the surface or adding material to the course.
- In other cases, the Engineer may determine that the defective portions must be entirely removed. Add, mix, spread, and compact new material according to the Specifications and at no cost to the Department.
- If a surface is less than 3 in (75 mm) deep, scarify the area to a depth of at least 3 in (75 mm), except in the case of stabilized bases or subbases. Mix and compact the new and old materials.
- Repair stabilized bases or subbases according to [Section 301](#), [Section 302](#), [Section 310](#), or [Section 316](#), whichever is applicable.

300.3.07 Contractor Warranty and Maintenance

General Provisions 101 through 150.

300.4 Measurement

Base and Subbase courses will be measured in accordance with the Specification Section for the item.

Bituminous prime will not be measured for separate payment.

300.4.01 Limits

General Provisions 101 through 150.

300.5 Payment

Base and Subbase courses will be paid for in accordance with the Specification Section for the item.

Include the cost of furnishing and applying bituminous prime in the Unit Price Bid for each individual Base Item according to the applicable provisions of [Section 412](#).

No separate payment will be made for adding water or for aerating or rolling for the purpose of adding water. Include the cost of controlling moisture content in the prices bid for the pertinent Pay Items.

Separate payment will be made only for clearing and grubbing listed in the Proposal or required in the Plans and designated a Pay Item by the Engineer.

No separate payment will be made for stripping excavation unless shown on the Plans and included in the Proposal as a Pay Item.

300.5.01 Adjustments

If the Contractor for the subbase or base is responsible for the subgrade under another Pay Item, no additional payment will be made for any repairs made to the subgrade, except as provided in [Section 209](#).

If another party (not the Contractor) is responsible for the subgrade, removing unsuitable materials will be paid for according to the Earthwork Item in the Contract.

Include compaction, scarification, and any other preparation necessary for the subgrade in the Unit Price Bid for the pertinent base course.