



3525-SPECIFICATION FOR SOIL CEMENT BASE COURSE

3525 - 1 DESCRIPTION

- 1.01 The work shall consist of a layer of soil, mixed with portland cement, placed on a prepared surface at the locations and in conformity with the lines, grades, and dimensions shown on the plans or designated by the Engineer.
- 1.02 Soil cement base course shall be constructed from in-situ and/or imported aggregate and will be designated on the plans as one of the following:
- (a) In-situ soil cement base course. (Contractor may elect to use rotary-type or travel plant method of mixing).
 - (b) Imported soil cement base course. (Contractor may elect to use rotary-type, travel plant, or central plant method of mixing).
- 1.03 In sections 1, 2, and 3 of this specification the following definitions will apply:

In-situ base aggregate	- the existing subgrade soil before mixing with portland cement.
Imported base aggregate	- the aggregate from material deposits before mixing with portland cement.
Base mix	- the mix during and after mixing with portland cement, but before spreading.
Base Course	- the mix in place on the road during and after spreading and compacting.

3525 - 2 MATERIALS

- 2.01 The department will supply and pay for the portland cement. The Contractor shall be responsible for unloading cement at the storage silo(s) and/or mixing plant and shall arrange with the supplier regarding the time and quantity of cement shipments. The Contractor shall be responsible for demurrage charges caused by his delay in unloading cement.
- 2.02 The quality of the water used for soil cement base course shall be determined by Test 9815.
- 2.03 The aggregate shall be free from undesirable quantities of organic or other deleterious material.
- 2.04 The imported base aggregate shall comply with the following requirements:

Sieve Designation	Percent by Weight Passing Canadian Standard Square Mesh Sieves
	TYPE 60
63 mm 71 µm	100 5 - 30
Plasticity Index	0 - 10

3525 - 3 CONSTRUCTION

General

- 3.01 Overburden shall be removed from material deposits in accordance with the requirements for Removal of Overburden (Specification 2260).
- 3.02 If in-situ base aggregate is used, the subgrade shall be prepared in accordance with the requirements for Special Subgrade Preparation and Compaction (Specification 3005).
- 3.03 If imported base aggregate is used, the subgrade shall be prepared in accordance with the requirements for Subgrade Preparation and Compaction (Specification 3000).
- 3.04 The base aggregate and base mix shall be hauled in accordance with the requirements for Haul (Specification 2405).
- 3.05 Oversize material shall not be incorporated into the base course.
- 3.06 Construction of soil cement base mix or base course shall not be performed before May 15 or after October 1.
- 3.07 Cement or base mix shall not be spread if the subgrade or aggregate is frozen; nor if the air temperature is less than two degrees Celsius (2°C), nor if conditions indicate that the temperature may fall below two degrees Celsius (2°C) within twenty-four (24) hours, nor if there is imminent danger of rain.
- 3.08 Cement content will generally be in the range of five (5) to ten (10) percent by weight. The percentage of cement added shall not vary by more than eight-tenths (0.8) of one percent from the design percentage.
- 3.09 The percentage of water shall not vary by more than two (2) from the optimum moisture percentage. Moisture content will be determined at the start of the compaction operation.
- 3.10 Soil cement base course shall be constructed in a single lift, except that, if the specified thickness is greater than twenty centimetres (20 cm), the base course may be constructed in two (2) approximately equal lifts.
- 3.11 Soil cement base course construction shall be performed during daylight hours only.
- 3.12 Water shall be added in accordance with the requirements for Watering (Specification 2500).

- 3.13 Failures in the subgrade, sub-base course, or base course, which develop after depositing the base aggregate or mix on the road, shall be repaired at no direct expense to the department.
- 3.14 Failures in the subgrade, sub-base course, or base course, which develop after mixing has commenced on in-situ base aggregate, shall be repaired at no direct expense to the Department.

Storage of Cement

- 3.15 Cement shall be stored in suitable weatherproof building to protect the cement from dampness, except that cement in sacks may be stored on a raised platform and protected with a waterproof covering.

Mixing

3.16 Rotary-type or Travel Plant Method

- (a) Rotary-type or Travel Plant method will not be allowed unless permitted by the Special Provisions.
- (b) If imported base aggregate is used, the Contractor shall load the aggregate by pushing the material to a trap. The aggregate shall be screened over a sixty-three millimetre (63 mm) screen.
- (c) If mixing is done on the road, the base aggregate shall be thoroughly pulverized. After pulverization, one hundred (100) percent of the material shall pass a twenty-five millimetre (25 mm) sieve and not less than eighty (80) percent, by weight, shall pass a five millimetre (5.00 mm) sieve, exclusive of gravel or stone retained on these sieves. The pulverization test will be performed at the conclusion of mixing operations, and by the dry sieve analysis method.
- (d) Pre-wetting of the base aggregate will be permitted to aid pulverization and mixing.
- (e) If excess moisture exists in the base aggregate, it shall be aerated and dried, at no direct expense to the Department.
- (f) The specified quantity of cement shall be spread uniformly on the base aggregate. Cement shall not be spread if the wind velocity on the road surface is greater than twenty-five kilometres (25 km) per hour.
- (g) Mixing shall commence before additional water is added to the mix. Mixing shall be accomplished by use of a rotary-type mixer or a travel plant mixer.
- (h) Water hauling and pressure distributing equipment, that will assure the application of sufficient water on the section being constructed, shall be provided.
- (i) During mixing operations, the Contractor shall avoid cutting into the underlying course or contaminating the base mix with raw soil.

- (j) Base course that has not been compacted or base mix shall not remain undisturbed for more than thirty (30) minutes.
- (k) The base mix shall be manipulated until uniformity has been obtained.

3.17 Central Plant Method

- (a) The Contractor shall load the base aggregate by pushing the material to a trap. The aggregate shall be screened over a sixty-three millimetre (63 mm) screen.
- (b) Base aggregate shall be placed into a stockpile in accordance with the requirements for Stockpiling Aggregates (Specification 3600). After mixing operation commences, the Contractor shall always have sufficient aggregate in the stockpile such that the base aggregate has been in the stockpile for 24 hours, except during the final 24 hours of mixing to complete the base mix requirements.
- (c) Mixing operations shall be carried out in a stationary mixing plant.
- (d) The cement and aggregate shall be dry mixed until the cement is uniformly distributed throughout the aggregate.
- (e) If a continuous-type mixing plant is used, the aggregate, cement, and water feeds must be accurately controlled and co-ordinated. The cement feed must be of the vane type feeder. A separate hopper shall be positioned above this feeder such that the head of cement remains constant. The aggregate feed shall be of the belt type. The aggregate feed shall be interconnected such that both feeds can be stopped and started simultaneously. Calibration of the cement feed and aggregate feed shall be carried out prior to mixing operations. Mixing shall continue until a uniform intimate mix is obtained.
- (f) The base mix shall be hauled in trucks equipped with protective covers.

Spreading

- 3.18 The base mix from a central plant shall be placed on a moistened subgrade or sub-base course by a mechanical spreader capable of laying the material ready for compaction without further shaping.
- 3.19 If the mix is to be spread in separate lanes, not more than thirty (30) minutes shall elapse between the spreading of base mix in adjacent lanes, except that this time may be extended provided the longitudinal construction joint is trimmed to a straight, firm, vertical edge before placing additional material against the joint.
- 3.20 Each transverse construction joint shall be trimmed to a straight, firm, vertical edge before placing additional material against the joint.
- 3.21 The equipment used for final trimming shall have a wheel base of not less than four and one-half metres (4.5 m) and a straight edge blade having an effective length of not less than three metres (3 m).

Compacting

- 3.22 Compaction shall begin not later than forty-five (45) minutes after wet mixing. Final compaction shall be completed not later than two (2) hours after wet mixing.
- 3.23 The required grade and cross section shall be maintained during compaction. The finished surface shall be as free as possible from waves, depressions, roller marks and other unevenness.
- 3.24 The surface of the base course shall be kept moist until a prime coat is applied.
- 3.25 Compaction planes in the base course shall be eliminated. If necessary, the surface shall be lightly scarified to remove tire imprints, roller imprints, and compaction planes. The final surface shall be compacted with pneumatic tire rollers.
- 3.26 The base course shall be compacted to not less than ninety-seven (97) percent of the maximum density as determined by Test 9210.
- 3.27 The engineer will determine, from the test results, the section of base course to be considered for evaluation. The density of this section will be considered satisfactory when:
 - (a) Test results average at least ninety-seven (97) percent of maximum density, and
 - (b) All individual test results are greater than ninety-five (95) percent of maximum density.
- 3.28 If final compaction is not completed in the specified time, the Engineer may specify remedial action to be carried out on the base course. The remedial action shall be done at the Contractor's own expense except that the Department will supply and pay for any additional cement required.

Curing

- 3.29 Within two (2) hours following the final finishing operation, a prime coat shall be applied in accordance with the requirement for Bituminous Prime, Tack and Flush Coat (Specification 4000). The quantity of prime coat will generally be one-half to one litre per square metre (0.5 to 1.0 l/m²), as designated by the Engineer. The prime coat will generally be an RC type liquid asphalt.
- 3.30 If necessary, light local traffic and the Contractor's construction equipment, except the Contractor's hauling units, will be permitted on the base course during the seven (7) days subsequent to the placing of the prime coat. After seven (7) days, normal traffic may be permitted on the base course provided that damage to the work will not occur.
- 3.31 If a bituminous surface is specified, it shall not be placed on the soil-cement base course until seven (7) days after placing the prime coat.

- 3.32 If required, traffic crossings, consisting of material free from stones and of a depth not less than thirty centimetres (30 cm) shall be constructed over the base course at no direct expense to the Department. The width of the crossing shall be not less than three metres (3 m) for one-way traffic and six metres (6 m) for two-way traffic. The traffic crossing shall extend not less than one and one-fourth metres (1.25 m) beyond the edges of the base course.
- 3.33 The base course must be protected so that the surface temperature of the base course will be not less than two degrees Celsius (2°C) for a period of seven (7) days after construction.

3525 - 4 MEASUREMENT

- 4.01 Sections of base course designated as In-Situ Soil Cement Base Course will be measured in square metres. The finished, trimmed top surface of the base course, as staked, will be the basis of measurement.
- 4.02 Sections of base course designated as Imported Soil Cement Base Course will be measured in tonnes.
- 4.03 On any section of base course designated as In-Situ Soil Cement Base Course, the Contractor may elect to use imported base aggregate or base mix from a central plant. In such cases, the quantities of imported base aggregate or base mix to be used will be determined by the Engineer. Ninety-seven (97) percent of the maximum density of the base mix as determined by Test 9210 will be the basis for calculation of the quantities of base mix to be used.
- 4.04 On any section of base course designated as Imported Soil Cement Base Course, the Contractor may elect to use the rotary-type or travel plant method of mixing. In such cases, the base course quantity will be determined by adding the weights of base aggregate, cement, and water added through the mixing plant.

3525 - 5 PAYMENT

- 5.01 Payment for IN-SITU SOIL CEMENT BASE COURSE will be at the contract unit price per square metre. The unit price will be full compensation for handling, storing, hauling, and spreading the cement; scarifying; blading; pulverizing; mixing; spreading; compacting; shaping; and finishing the base course. The unit price will also be full compensation for adding binder, filler and blender sand.
- 5.02 Payment for IMPORTED SOIL CEMENT BASE COURSE will be at the contract unit price per tonne. The unit price will be full compensation for removing overburden; handling, storing, hauling, and adding the cement; excavating; screening; watering at the pugmill; mixing; loading; dumping; spreading; compacting; shaping; and finishing the base course. The unit price will also be full compensation for adding binder, filler, and blender sand at the central mixing plant.
- 5.03 Payment for HAULING IMPORTED SOIL CEMENT BASE COURSE will be at the contract unit price per tonne kilometre in accordance with the requirements for Haul (Specification 2405). Payment for hauling binder, filler, and blender sand will be in accordance with the requirements for Haul (Specification 2405).

- 5.04 Payment for IMPORTED SOIL CEMENT BASE COURSE IN PLACE will be at the contract unit price per tonne. The unit price will be full compensation for removing overburden; handling; storing, hauling, and adding the cement; excavating; screening, water at the pugmill; mixing; loading; hauling; dumping; spreading; compacting; shaping; and finishing the base course. The unit price will also be full compensation for adding binder, filler, and blender sand at the central mixing plant.
- 5.05 On sections designated as In-Situ Soil Cement Base Course, payment for special subgrade preparation and compaction will be in accordance with the requirements for Special Subgrade Preparation and Compaction (Specification 3005).
- 5.06 On Sections designated as Imported Soil Cement Base Course, payment for subgrade preparation and compaction will be in accordance with the requirements for Subgrade Preparation and Compaction (Specification 3000).
- 5.07 Payment for watering on the road will be in accordance with the requirements for Watering (Specification 2500).
- 5.08 Payment for hauling water to the central mixing plant will be in accordance with the requirements for Haul (Specification 2405).
- 5.09 Payment for prime coat will be in accordance with the requirements for Bituminous Prime, Tack and Flush Coat (Specification 4000).