

Part 1 General

1.1 SUMMARY

.1 Related Sections:

- .1 Section 32 12 16 – Asphalt Paving.

.2 Measurement Procedures:

- .1 Measure cement stabilized base in square metres of actual surface area as indicated.
- .2 Measure bituminous cement for stabilization in tonnes incorporated into work.
- .3 Measure emulsified asphalt in litres at 15 degrees C of undiluted emulsified asphalt applied.
- .4 Measure fluidised asphalt for stabilization in litres at 15 degrees C of unfluidised asphalt applied.
- .5 Measure granular corrections in tonnes of material incorporated into work.

1.2 REFERENCES

.1 American Association Of State Highway and Transportation Officials (AASHTO)

- .1 AASHTO M81-[92-UL(2004)], Standard Specification for Cutback Asphalt (Rapid - Curing Type), Single User Digital Publication.
- .2 AASHTO M82-[75 -UL(2004)], Standard Specification for Cutback Asphalt (Medium - Curing Type), Single User Digital Publication.
- .3 AASHTO M140-[03-UL(R2003)], Standard Specification for Emulsified Asphalt.
- .4 AASHTO M208-[01-UL(R2005)], Standard Specification for Cationic Emulsified Asphalt, Single User Digital Publication.

.2 American Society for Testing and Materials International (ASTM)

- .1 ASTM C88-[05], Standard Test Method for Soundness of Aggregates by Use of Sodium Sulphate or Magnesium Sulphate.
- .2 ASTM C117-[04], Standard Test Method for Material Finer Than 0.075 mm (No.200) Sieve in Mineral Aggregates by Washing.
- .3 ASTM C131-[06], Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
- .4 ASTM C136-[06], Standard Method for Sieve Analysis of Fine and Coarse Aggregates.
- .5 ASTM C171-[03], Standard Specification for Sheet Materials for Curing Concrete.
- .6 ASTM D558-[04], Standard Test Methods for Moisture-Density (Unit Weight) Relations of Soil-Cement Mixtures.
- .7 ASTM D559-[03], Standard Test Methods for Wetting-and-Drying Compacted Soil-Cement Mixtures.
- .8 ASTM D560-[03], Standard Test Methods for Freezing and Thawing Compacted Soil-Cement Mixtures.
- .9 ASTM D698-[00ae1], Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft³) (600kN-m/m³).
- .10 ASTM D977-[05], Standard Specification for Emulsified Asphalt.

- .11 ASTM D1557-[02e1], Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000ft-lbf/ft³) (2,700kN-m/m³).
- .12 ASTM D2027-[1997(R2004)], Cutback Asphalt (Medium-Curing Type).
- .13 ASTM D2028-[1997(R2004)], Cutback Asphalt (Rapid-Curing Type).
- .14 ASTM D4318-[05], Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-8.1-[88], Sieves, Testing, Woven Wire, Inch Series.
 - .2 CAN/CGSB-8.2-[M88], Sieves, Testing, Woven Wire, Metric.
- .4 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-A3000-[03(R2006)], Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
 - .1 CSA-A3001-[03], Cementitious Materials for Use in Concrete.
 - .2 CAN/CSA-A23.1-[04]/A23.2-[04], Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
- .5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).

1.3 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 **Product Data:**
 - .1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 **Samples:**
 - .1 Inform ministry Representative of proposed source of aggregates and provide access for sampling at least 2 weeks prior to beginning production.
 - .2 Test reports: submit at least 2 weeks prior to beginning work with copies of manufacturer's test data and certification that cement and asphalt delivered to job site meets requirements of this Section.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Waste Management and Disposal:
 - .1 Evacuate of site any rapping materials and transport them to an appropriate recycling plant.
 - .2 Place into designated containers any substance that complies with toxic or dangerous material.
 - .3 The unused granular materials shall be transported off the site to a quarry.
 - .4 Unused bituminous material shall be transport to an appropriate recycling plant.

1.5 AMBIENT CONDITIONS

- .1 Suspend operations when air temperature is less than 15 degrees C or when rain is forecast within 2 hours.

Part 2 Products

2.1 MATERIALS

- .1 Cement: to CAN/CSA-A3001, Type GU.
- .2 Anionic emulsified asphalt: to ASTM D977.
- .3 Cutback asphalt: to [ASTM D2027] [ASTM D2028].
- .4 Aggregate: in accordance with Section 31 05 17 - Aggregate Materials and following requirements:
 - .1 Crushed stone or gravel.
 - .2 Gradations to be within limits specified when tested to ASTM C136 and ASTM C117. Sieve sizes to CAN/CGSB-8.2.
 - .3 Table:

Sieve Designation	% Passing
100 mm	-
75 mm	-
50 mm	-
37.5 mm	-
25 mm	[100]
19 mm	-
12.5 mm	[75 - 100]
9.5 mm	-
4.75 mm	[55 - 95]
2.00 mm	-
0.425 mm	[10 - 30]
0.180 mm	-
0.075 mm	[0 - 10]

- .4 Liquid limit: ASTM D4318, maximum 25.
- .5 Plasticity index: ASTM D4318, maximum 6.
- .6 Los Angeles Degradation: ASTM C131, maximum % loss by mass: 45 %.
- .7 Soundness: ASTM C88, using Magnesium Sulphate. Maximum % loss by mass: coarse aggregate 12, fine aggregate 16.
- .5 Potable Water, clean, cool and free of excessive amounts of oil, acid, salt, alcalide, organic material or other substances that may alter the cure.
 - .1 Test water of questionable quality in accordance with CAN/CSA-A23.1/A23.2, as directed by Ministry Representative.

2.2 MIXES

- .1 Minimum cement content: 5 % by mass of dry aggregate.
- .2 Minimum compressive strength: 2.0 MPa at 7 days.
- .3 Proportion aggregates, cement and water to produce mix meeting following physical requirements or as directed by Ministry Representative:

- .1 Percentage of loss not to exceed 14 % when tested by wetting and drying test to ASTM D559.
- .2 Percentage of loss not to exceed 14 % when tested by freezing and thawing test to ASTM D560.
- .3 Test specimen for ASTM D559 and ASTM D560, to be prepared in accordance with method outlined in ASTM D558.
- .4 Mix design formula subject to approval of Ministry Representative.

2.3 CURING MATERIALS

- .1 Emulsified asphalt: to ASTM D977.
- .2 If required, polyethylene-coated burlap: white, opaque, 0.10 mm thick film, impregnated into surface of one side of burlap weighing 0.30 kilograms per square meter prior to coating.
 - .1 Water retention requirements in accordance with ASTM C171.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 SITE PREPARATION

- .1 Clean debris from area to be stabilized.
- .2 Inspect subbase for capability, to withstand without displacement compaction specified for aggregate-cement mixture.
- .3 Correct ruts, soft or yielding areas in subbase by removing or adding material or aerating or wetting materials as required.
- .4 Grade and shape area to be stabilized; conform to lines, grades, and cross sections prior to placing cement-treated course.
- .5 Surface: approved by Ministry Representative prior to base course placement.
- .6 Determine moisture-density relationship of existing soils in accordance with ASTM D1557.
- .7 Perform laboratory tests on existing materials prior to initial construction.
- .8 Maintain lines and grades as indicated.
 - .1 When stabilized course is part of pavement which is to meet fixed grade, construct transition long enough to minimize abrupt or noticeable grade changes.

3.3 SEQUENCE OF OPERATION

- .1 Mixed-in-place:
 - .1 Ensure no frozen materials are used in mixing.

- .2 Travelling mixing machine to have following features:
 - .1 Capable of picking up aggregate and cement off grade for dry mixing.
 - .2 Equipped with spray nozzle type of watering system.
 - .3 Capable of spreading mix in uniform layers.
- .3 Begin placement at crown or high side of one way design slope.
- .4 Add the corrective aggregates.
- .5 Spread base aggregate to required depth or place in windrow as required by type of mixing machine used.
- .6 Spread cement on aggregate by approved self-powered mechanical cement spreader at rate approved by Ministry Representative.
- .7 Pick up and mix dry cement and aggregate until homogeneous.
 - .1 Add water and remix until water is evenly distributed.
- .8 Spread and compact mix in uniform layer of 200 mm compacted thickness.
- .2 Joints:
 - .1 When placing mix against stabilized base less than 30 min in place, no special jointing required.
 - .2 When placing mix against stabilized base more than 30 min in place, prepare construction joint by cutting back existing material as necessary to expose uniform aligned full depth vertical face, composed of well compacted material.
 - .1 Cutting back is not necessary if form is used.
 - .3 Offset joints at least 250 mm from design joint locations of overlaying pavement.
 - .4 Compact new material against joints to ensure bond.
- .3 Compacting:
 - .1 Compaction equipment: capable of obtaining required material densities.
 - .2 Compact stabilized base to at least 97 % of maximum density, ASTM D558, (method B) except compactive effort to be in accordance with ASTM D1557 98 % of maximum density ASTM D698.
 - .3 Begin compaction immediately after spreading to complete surface finishing within 2 hour from start of mixing.
 - .4 Begin compaction with roller covering outer edge of material and proceed continuously back and forth across area until specified compaction is obtained.
 - .1 Space successive roller passes no more than 75% of width of rear roller wheel is on uncompact material.
 - .5 Operate compaction equipment forward and backward without turning around.
 - .6 Keep stabilized base surface moist during compaction operation.
 - .7 Complete final compaction using pneumatic tired rollers.
 - .8 Correct high areas by scarifying and removing material until surface is within specified tolerance.
 - .9 Dispose of excess material.
 - .1 Do not use excess material to fill depressions.
 - .10 Correct low areas by adding materials, scarifying, removing, and wasting at least 50 mm of compacted base before bringing to grade with new material.
 - .11 Compact corrected areas.
- .4 Curing:

- .1 Prior to application of curing membrane, clean surface of loose material and keep moist continuously by means of fine spray of water.
- .2 Apply curing membrane of emulsified asphalt within 2 hours following final finishing operations.
- .3 Apply [emulsified asphalt with pressure distributor truck at 1.35 L/m² or cutback asphalt with pressure distributor truck at 1.0 L/m².
- .4 Completely cover stabilized base surface with emulsified or cutback asphalt and use hand application methods to complete areas missed by distributor truck.

3.4 SITE TOLERANCES

- .1 Finish cement stabilized granular base to plus or minus 10 mm of design grade and cross section, but not uniformly high or low.

3.5 FINISHING

- .1 Moisten surface, after compaction and shape to required lines, grades and cross section.
- .2 Lightly scarify surface to eliminate imprints made by compacting or shaping equipment.
- .3 Compact surface to specified density with rubber tired rollers and smooth-wheel tandem rollers to provide smooth, dense, uniform surface free of surface checking, ridges or loose material and conforming to crown, grade and line indicated.
- .4 Complete finishing operations within 2 hours after completion of mixing operations.
- .5 In places not accessible to finishing and shaping equipment, compact mixture with mechanical tampers to density specified; shape and finish by hand methods.
- .6 Reprocess with additional cement that portion of compacted mix with density less than that specified or that has not properly hardened or that is improperly finished.
- .7 Place material along edges of stabilized course in quantity that will compact to thickness of course being constructed.
- .8 If constructed in two or more layers, place in quantity that will compact to thickness of each layer.
- .9 Allow in each operation whenever possible, minimum width of 300 mm of shoulder to be rolled and compacted simultaneously with each layer of stabilized course.
- .10 Where average measured thickness of stabilized course is more than 13 mm deficient in thickness conduct additional tests and correct deficiencies as directed by Ministry Representative.
 - .1 Correct excesses in thickness if so directed by Ministry Representative.
 - .2 Replace material removed for test holes or for deficient thickness reconstruction and compact with new soil-cement mixture.
 - .3 At end of each work day, form straight transverse construction joint by cutting back into completed work to form true vertical face free of loose or shattered material.
 - .4 Remove improperly compacted material along construction joints and replace with soil-cement that is mixed, moistened, and compacted.

3.6 CURING

- .1 Immediately after completion of finishing operations, but no later than end of each days stabilization work, protect surface against rapid drying for 24 hours.
- .2 Immediately after finishing, clean surface of loose and foreign matter.
- .3 Ensure that surface contains sufficient moisture, by applying water in fine spray to prevent penetration of bituminous material.
- .4 Using distributor, apply bituminous material at temperature between 18 and 26 degrees C and at rate between 0.90 and 1.13 litres per square metre.
- .5 Treat areas inaccessible to, or missed by distributor using manually operated hose attachment.

3.7 PROTECTION

- .1 Protect cement stabilized base from frost for 3 days after placement and 5 days for emulsified asphalt.
- .2 Keep vehicular traffic off cement stabilized base or emulsified asphalt, except essential construction traffic.
- .3 Maintain in acceptable condition until succeeding material is applied or until acceptance by Ministry Representative. If rutting occurs, restore to smooth compacted surface.

3.8 LOADING TESTS

- .1 At least 2 days after the stabilizing operation, the contractor shall at his own expenses, make a loading test in accordance with the following prescriptions. The typical truck shall be:
 - .1 10 wheel truck with 3 axles with a load of 27 250 kg.
 - .2 12 wheel truck with 4 axles with a load of 32 000 kg.
- .2 The chosen and fully loaded truck shall travel at least one time on each lane or parking at a speed of 5 to 10 km/h.
- .3 When deformations occur after a first pass a second pass is asked.
- .4 Where a deformation is noted again or amplifies, the contractor shall repair the pavement after approval of the Ministry representative.

3.9 CLEANING

- .1 Proceed in accordance with Section 01 74 11 - Cleaning.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION