

Master Specification

Part RD-PV-S2

Plant Mixed Stabilised Pavement

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RD-PV-S2 Plant Mixed Stabilised Pavement

1 General

- a) This Master Specification Part sets out the requirements for the construction of plant mixed stabilised pavement, using stabilising binders such as lime, polymers, cement or fly ash, including:
- i) the documentation requirements, as set out in section 2;
 - ii) the requirements for materials and documentation, as set out in section 3;
 - iii) the mixing requirements, as set out in section 4;
 - iv) the transportation requirements, as set out in section 5;
 - v) the delivery requirements, as set out in section 6;
 - vi) the placing requirements, as set out in section 7;
 - vii) the requirements for joints, as set out in section 8;
 - viii) the curing requirements, as set out in section 9;
 - ix) the finish requirements, as set out in section 10;
 - x) the traffic restriction requirements, as set out in section 11;
 - xi) the sampling and testing requirements, as set out in section 12;
 - xii) the test procedures, as set out in section 13; and
 - xiii) the verification requirements and records, as set out in section 14.
- b) This Master Specification Part does not apply to bituminous binders (refer to RD-BP-S1 “Supply of Bituminous Material”).
- c) The construction of plant mixed stabilised pavements must comply with the Reference Documents, including:
- i) AS 1289 Methods of testing soils for engineering purposes;
 - ii) AS 3972 General purpose and blended cements;
 - iii) Department Test Procedure TP164 Determination of the Dry Density/Moisture Content Relation of a Soil - 3 Point Method (available from: https://dit.sa.gov.au/standards/test_procedures);
 - iv) Department Test Procedure TP166 Assignment of Maximum Dry Density and Optimum Moisture Content Values (available from: https://dit.sa.gov.au/standards/test_procedures);
 - v) Department Test Procedure TP226 Sampling of Soil, Aggregates and Rocks (available from: https://dit.sa.gov.au/standards/test_procedures); and
 - vi) Department Test Procedure TP320 Compaction Control Test - Dry Density Ratio, Moisture Variation and Moisture Ratio (available from: https://dit.sa.gov.au/standards/test_procedures).

2 Documentation

2.1 Construction Documentation

In addition to the requirements of PC-CN3 “Construction Management”, the Construction Documentation must include the information required by section 3.2.

2.2 Quality Management Records

In addition to the requirements of PC-QA1 “Quality Management Requirements” or PC-QA2 “Quality Management Requirements for Major Projects” (as applicable), the Quality Management Records must include:

- a) calculations of the average percentage of stabilising binder added to the plant mixed pavement material mixed and placed, as required by section 4.2c);
- b) sample and test records, as required by section 12;
- c) initial assigned value of maximum dry density as required by section 12.1;
- d) updated value of maximum dry density as required by section 12.2a)ii);
- e) moisture content test results as required by section 12.3;
- f) compaction test results required by section 12.4a)ii);
- g) the testing results required by section 13b); and
- h) the verification requirements and records as required by section 14.

3 Materials and documentation

3.1 Materials

- a) The Contractor must ensure that cement used in the construction of plant mixed stabilised pavements is:
 - i) in accordance with AS 3972 General purpose and blended cements; and
 - ii) Type GB.
- b) The Contractor must ensure that a retarder is used with cement binders.

3.2 Documentation

The Contractor must ensure that the following is submitted as part of the Construction Documentation:

- a) details of the type of mixing plant proposed including:
 - i) type;
 - ii) proposed location;
 - iii) output capacity;
 - iv) method of controlling binder content;
 - v) method of controlling moisture content; and
 - vi) methods to ensure uniformity;
- b) details of the retarder to be used with cement binder;
- c) procedures for calibration of plant (including frequency);
- d) procedure for verifying binder content, including evidence of reliability of the procedure;
- e) procedures for material handling, including loading of mixer and control of segregation during loading and mixing; and
- f) detailed procedures for pavement construction.

4 Mixing

4.1 Plant

The Contractor must ensure that the following plant mixing requirements are satisfied:

- a) the quarry material, binder, retarder and water must be mixed at a central mixing plant of the pugmill type;
- b) the mixing plant contemplated by section 4.1a):
 - i) may be either a batch or continuous type;
 - ii) must be fitted with a measuring device to allow accurate measurement of the amount of retarder being added to the mix. The mass of charge in a batch mixer or the rate of feed to a continuous type mixer must not exceed that which will permit complete mixing of all material; and
 - iii) must be operated in accordance with the manufacturer's recommendations;
- c) the mixing of material must be continued until the quarry material, binder, retarder and water are evenly distributed through the mass and a uniform mixture of unchanging appearance is obtained; and
- d) sufficient mixing capacity must be provided to produce enough mixture to permit placing up to 200 t of mixture on the road bed per hour and capable of providing measurements of the binder incorporated in the mix for each 200 t produced to within 0.3% of the dry mass of the material being stabilised.

4.2 Process control requirements

The Contractor must ensure that the following process control requirements are satisfied:

- a) production of each nominated mix must be such that the minimum proportion of stabilising binder incorporated is within the specified tolerances;
- b) the Contractor must implement a testing regime to demonstrate that the binder content complies with section 14;
- c) at the end of each day's production, the average percentage of stabilising binder added to the plant mixed pavement material must be calculated and submitted as part of the Quality Management Records; and
- d) for the purposes of section 4.2c), the average percentage of stabilising binder added to the plant mixed material must be calculated as a percentage of the dry mass of the material being bound (to 0.05%) from the total amount of binder used that day (determined from delivery dockets, silo dippings, and other appropriate methods) and the total quantity of material mixed and placed in the Works that day (determined by appropriate measurement).

5 Transportation

The Contractor must ensure that transportation of the materials the subject of this Master Specification Part complies with the following requirements:

- a) during transportation to the site, the load is completely covered with a tarpaulin or similar heavy cover to protect the material against the effect of sun and rain; and
- b) the cover required by section 5a) is not removed until the load is about to be tipped.

6 Delivery

The Contractor must ensure that delivery of the materials the subject of this Master Specification Part complies with the following requirements:

- a) the rate of delivery must be sufficient to enable all spreading, shaping and compaction to be carried out within 2.75 hours of the material being stabilised;
- b) the rate of delivery and placing must also be sufficient to enable the first (or initial) compaction testing to be undertaken within 1.5 hours of the material being stabilised. This is to enable additional rolling of the material if the compaction standard has not been achieved; and
- c) stabilised material must not be delivered when the shade air temperature exceeds 35°C and material must not be placed if the mix temperature at the site exceeds 27°C.

7 Placing

The Contractor must ensure that the placing of materials the subject of this Master Specification Part complies with the following requirements:

- a) the pavement must be placed in the configuration and with binder content and any additional information regarding the mix design specified in Contract Documents. Binder content is expressed as a percentage of the dry aggregate mass (i.e. excluding compaction water);
- b) the spreading and shaping of the stabilised materials must be undertaken by either a paving machine or grader;
- c) if a paving machine is used pursuant to section 7b), it must be:
 - i) capable of laying and compacting pavement to a width of 12 m in a single pass;
 - ii) equipped with sensing devices for level control capable of working from a pre-set string line;
 - iii) fitted with a vibrating screed and tampers which impart an initial compactive effort to the pavement layer of up to 90% for the parent material; and
 - iv) capable of placing up to 200 t/h of material;
- d) the minimum subbase layer thickness must be 100 mm;
- e) where placed in 2 layers:
 - i) the upper layer of the stabilised course must not be less than one half of the specified thickness of the stabilised course; and
 - ii) the upper layer must be placed as soon as practicable after the first layer and on the same day;
- f) individual layers must be of uniform thickness;
- g) each layer must be fully compacted and the surface kept damp prior to placing the next layer; and
- h) for the purposes of this Master Specification Part, a Work Lot must not exceed 1 days' work.

8 Joints

The Contractor must ensure that the following requirements regarding construction jointing relevant to the materials the subject of this Master Specification Part are satisfied:

- a) the Works must be planned to minimise the number of joints;
- b) all joints, whether single or double layer, must be near vertical and must be continuous through the full depth of the stabilised material;
- c) at the end of each days' work and where spreading operations have been halted for any reason for a period exceeding 3 hours, the Contractor must provide construction joints at each discontinuity in the operation;
- d) joints must be cut within 1 hour of completion of compaction;

- e) joints must be made either transverse or parallel to the direction of the stabilising run;
- f) joints must be formed by cutting back into the compacted stabilised material to the extent necessary to form a near vertical face;
- g) any loose trimmed material must not be incorporated into the pavement; and
- h) joints must be kept moist prior to commencement of the next stabilising run.

9 Curing

The Contractor must ensure that the materials the subject of this Master Specification Part comply with the following curing requirements:

- a) the surface of compacted stabilised layers must be kept continuously moist by watering with suitable spraying equipment for a minimum period of 7 days; and
- b) for the purpose of this section 9 and section 11, the time period will commence at the completion of compaction of the Work Lot being stabilised.

10 Finish

- a) The Contractor must ensure that the surface of the pavement layers are uniformly tight and free of loose uncompacted material, segregated or 'bony' material or soft, over wet areas and free of roller indentations.
- b) The Contractor must ensure that the surface of the subbase layer has a well graded aggregate texture.

11 Traffic restrictions

The Contractor must ensure that the Contractor complies with the following traffic restriction requirements as relevant to the materials the subject of this Master Specification Part:

- a) subject to section 11b), the Contractor must not permit any vehicular traffic or construction equipment on stabilised areas for a period of 7 days from the completion of the compaction of the section being stabilised;
- b) section 11a) does not apply to vehicles and plant required for curing purposes, provided such vehicles are only single axle units not exceeding 8 t per axle;
- c) after the 7 day period contemplated by section 11a), the Contractor must ensure that the only traffic permitted on stabilised areas is construction equipment used for construction of subsequent pavement layers and backfilling of kerb and gutter until the final pavement layers are placed;
- d) the Contractor must not use any section of stabilised pavement as a construction or haul track;
- e) where heavy commercial vehicle access over the stabilised area is required (and such vehicles exceed the limits set out in section 11b), the Contractor must place a 200 mm thick layer of PM2/20Q class 2 pavement material over the area to be trafficked; and
- f) equipment and vehicles required for kerb laying purposes will be permitted on stabilised areas after a period of 3 days from the completion of compaction of the stabilised section.

12 Sampling and testing

12.1 Determination of initial MDD

During production of the raw feed material, the Contractor must ensure that bulk samples are taken and test results provided in the Quality Management Records for the determination of the initial assigned value of MDD in accordance with the requirements of:

- a) Department Test Procedure TP166 Assignment of Maximum Dry Density and Optimum Moisture Content Values; and
- b) AS 1289.5.4.1 Methods of testing soils for engineering purposes, Method 5.4.1: Soil compaction and density tests - Compaction control test - Dry density ratio, moisture variation and moisture ratio.

12.2 Determination of subsequent MDD values

- a) In addition to the initial bulk sampling required by section 12.1, the Contractor must take additional bulk samples from subsequent Work Lots and:
 - i) the value of MDD updated in accordance with TP166 Assignment of Maximum Dry Density and Optimum Moisture Content Values; and
 - ii) the updated MDD value must be the assigned value for that Work Lot and provided in the Quality Management Records.
- b) Subject to section 12.2c), the Contractor must ensure that:
 - i) traceability is applied to each Work Lot; and
 - ii) the assigned value of MDD for the Work Lot is used when determining the dry density ratio in accordance with Department Test Procedure TP320 Compaction Control Test - Dry Density Ratio, Moisture Variation and Moisture Ratio.
- c) As an alternative to the process set out in section 12.2b), conforming Work Lots of raw feed may be combined on Site to form a composite stockpile subject to the following:
 - i) for each day of production, 5 sample increments of raw feed must be obtained at approximately equal intervals during the days' production;
 - ii) the 5 sample increments must be combined to form a bulk sample and an MDD determined; and
 - iii) the MDD determined in accordance with section 12.2c)ii) must be used to:
 - A. update the assigned value; and
 - B. determine the final compaction results for acceptance and verification.
- d) For control testing during the placement of each layer, the Contractor must ensure that the assigned MDD for the material placed on the previous day is used.

12.3 Moisture content control

- a) The Contractor must ensure that samples are taken in conjunction with each binder content determination required by section 4.2b). Moisture content test results must be submitted as part of the Quality Management Records.
- b) If AS 1289.2.1.4 Methods of testing soils for engineering purposes Soil moisture content tests - Determination of the moisture content of a soil - Microwave-oven drying method (subsidiary method) is utilised, the Contractor must ensure that:
 - i) calibration is conducted in accordance with:
 - A. AS 1289.2.2.1 Methods of testing soils for engineering purposes, Method 2.2.1: Soil moisture content tests - Determination of the total suction of a soil - Standard method; and
 - B. AS 1289.2.3.1 Methods of testing soils for engineering purposes, Method 2.3.1: Soil moisture content tests - Establishment of correlation - Subsidiary method and the standard method; and
 - ii) calibration checks are carried out at the frequencies required by the relevant test procedure in Table RD-PV-S2 13-1.

12.4 Compaction

- a) Unless otherwise stated in Contract Documents, the Contractor must ensure that stabilised granular pavement layers are:
 - i) compacted uniformly to the full depth over the full width to not less than 96% (modified); and
 - ii) tested at a frequency as specified in Table RD-PV-S2 12-1 (as a minimum), and the results provided as part of the Quality Management Records.
- b) The Contractor must ensure that the location of the testing required by section 12.4a)ii) is on a stratified random basis in accordance with AS 1289.1.4.2 Methods of testing soils for engineering purposes Sampling and preparation of soils - Selection of sampling or test sites - Stratified random number method.
- c) Acceptance must be based on discrete results. Where a result fails, the Contractor must ensure that the stratum represented by that result is the subject of a Non-Conformance.

Table RD-PV-S2 12-1 Testing frequency

Lot area (m ²)	Number of tests per layer
<300	2
301 - 600	3
601 - 900	4
901 - 1200	5
1201 - 1500	6
>1500	6 plus 1 test for each additional 300 m ² lot area or part thereof

12.5 Levels and position

The Contractor must ensure that:

- a) tolerances on the specified lateral position of stabilised pavement materials are ± 50 mm; and
- b) the finished level of stabilised pavement layers are in accordance with the Contract Documents

13 Test procedures

- a) The Contractor must use the test procedures set out in Table RD-PV-S2 13-1 to verify conformance with this Master Specification Part.
- b) The Contractor must submit test records for all tests undertaken pursuant to section 13a) as part of the Quality Management Records.

Table RD-PV-S2 13-1 Test procedures

Test	Test procedure
Site selection by stratified random technique	AS 1289.1.4.2 Methods of testing soils for engineering purposes Sampling and preparation of soils - Selection of sampling or test sites - Stratified random number method
Sampling of soil, aggregates and rocks	Department Test Procedure TP226 Sampling of Soil, Aggregates and Rocks
Preparation of samples	AS 1289.1.1 Methods of testing soils for engineering purposes Sampling and preparation of soils - Preparation of disturbed soil samples for testing

Test		Test procedure
Field density:	Nuclear method	AS 1289.5.8.1 Methods of testing soils for engineering purposes Soil compaction and density tests - Determination of field density and field moisture content of a soil using a nuclear surface moisture-Density gauge - Direct transmission mode
Moisture content:	Oven drying method	AS 1289.2.1.1 Methods of testing soils for engineering purposes Soil moisture content tests - Determination of the moisture content of a soil - Oven drying method (standard method)
Moisture content:	Microwave method	AS 1289.2.1.4 Methods of testing soils for engineering purposes Soil moisture content tests - Determination of the moisture content of a soil - Microwave-oven drying method (subsidiary method)
Maximum dry density:	Modified compaction	AS 1289.5.2.1 Methods of testing soils for engineering purposes, Method 5.2.1: Soil compaction and density tests - Determination of the dry density/moisture content relation of a soil using modified compactive effort
Maximum dry density:	3 point method	Department Test Procedure TP164 Determination of the Dry Density/Moisture Content Relation of a Soil - 3 Point Method ⁽¹⁾
Dry density ratio		Department Test Procedure TP320 Compaction Control Test - Dry Density Ratio, Moisture Variation and Moisture Ratio

Table Notes:

(1) The 3 point method may be used to provide MDD value in stabilised material.

14 Verification requirements and records

The Contractor must supply written verification as part of the Quality Management Records that the requirements listed in Table RD-PV-S2 14-1 have been complied with.

Table RD-PV-S2 14-1 Verification requirements

Subject	Property	Frequency	Acceptable limits
Mixed material properties	Binder content	One test per 150 t or part thereof	Within $\pm 0.5\%$ of that specified
Mixed material properties	Moisture content	One test per calibration curve	Report only
Pavement compaction	Dry density ratio	Refer section 12.4	Not less than 96%
Surface of pavement course	Levels	No more than 10 m apart longitudinally. As specified in PC-S11 "Site Surveys".	Refer section 12.5