Transport Roads & Maritime Services

NSW GOVERNMENT

Test method T105

Preparation of samples for testing (Soils)

OCTOBER 2012

Revision Summary

Ed/Rev Number	Clause Number	Description of Revision	Authorisation	Date
		Reformatted and revision summary added. Table 1 revised	D. Dash	May 1999
		Date on Test Method revised to agree with date on Revision Summary	D. Dash	Feb 2001
Ed 2/Rev 0	All	New issue with major revisions. Collated preparation sections from separate Test Methods. Tabulated requirements for each test. Preparation processes defined in Appendix. Preparation of binder for laboratory samples included. Made consistent with Revised Test Methods.	G Donald	November 2007
Ed 2/Rev 1	Table 2/ T102, T105, T130&T131. A.7(c).	Clarification about curing, moisture content and altered sieve size T103.	D Hazell	Sept 2008
Ed 2/Rev 2	4.3(c), Table 2/ T111, T120, T144, T162, & T172. App A, C, D.	Consistent sample. Clarify mould requirements & T120 sample sizes. Updated T141 & T172 requ'ts. New T2162 & T2163 requ'ts. Table A.4 sieves added. New A.11, A.12. & A.13. New App C. App D Two definitions added and App renumbered.	D Hazell	Mar 2009
Ed 3/ Rev 0	All	Reformatted RMS template	J Friedrich	October 2012

Note that Roads and Maritime Services is hereafter referred to as 'RMS'.

The most recent revision to Test method T105 (other than minor editorial changes) are indicated by a vertical line in the margin as shown here.

Test method T105

Preparation of samples for testing (Soils)

1. Scope

This Test Method sets out the procedures to prepare soil samples for testing.

2. General

(a) This Test Method applies to:

(i) Soil, gravel, crushed rock or similar road construction materials

(ii) Aggregates used in road construction

(iii) Samples that may have been treated or tested by other methods

(iv) Materials to be blended in the laboratory with binders

(b) Table 2 presents each test method that has samples prepared using this Test Method. The table includes:

(i) The sample fraction, minimum mass of sample required and other information about the sample

(ii) The preparation of a sample for a test, which is subdivided into a number of processes. The processes numbered from A.1 to A.10 are described in Appendix A.

(c) Where portions are prepared for the determination of moisture contents, the process must be carried out as quickly as possible to limit moisture loss.

(d) Place the sample in a container and seal unless moisture loss or gain will not affect test results.

(e) The Processes (i.e. A.1 to A.13 in Appendix A) are also referred to by other Test Methods.

(f) The requirements for binders used in testing are presented in Appendix B.

(g) The terms and definitions are in Appendix D.

3. Apparatus

Table 1 presents the apparatus that corresponds with a process used to prepare samples:

(i) The processes are numbered from A.1 to A.10 as columns.

NOTE: Processes A.11 to A.13 involve calculations and do not require apparatus.

(ii) The piece of apparatus is listed at the start of each row.

(iii) The apparatus that is required to carry out the process is identified as follows:

- A ✓ in the column indicates each apparatus to carry out the process.
- 'Txxx' in the column indicates that the apparatus is only required to carry out the process for the nominated test(s).

Table 1 Apparatus Required for Preparation Processes

Process → / Apparatus ↓ (Refer to Appendix A)	4.2. Estimate the Mass of Samples for Testing	A.1 Crumbling	A.2.1 Air drying	A.2.2 Oven drying	A.3.1 Riffling	A.3.2 Cone and Quartering	A.4 Screening	A.6 Curing	A.9 Required mass of binder	A.10 Required mass of water to adjust moisture
(a) Balance of suitable capacity with a limit of performance no greater than 5 grams.	✓				✓	✓	✓		✓	✓
(b) Oven with good air circulation capable of maintaining a temperature ≤ 50°C and within a range of ± 5°C.				✓				T102		
(c) A thermostatically controlled oven with good air circulation, which is maintained at a temperature from 105°C to 110°C.				T107 T123						
(d) Heat proof dishes and containers of suitable size to hold samples and sub-samples as required.				✓				✓		
(e) Sieves as necessary conforming to AS 1152.	✓	✓			✓	✓	✓			
(f) Mixing and quartering tray and boards.	✓	✓				✓	✓	✓		
(g) Cone and quartering apparatus.						✓				
(h) Riffle box conforming to AS 1141.2 Figure 1.					✓					
(i) Mixing apparatus (mechanical and/or manual).								✓		
(j) Measuring cylinders								✓		
(k) Porcelain mortar with rubber pestle.		✓					✓			

Process → (Refer to Appendix A) / Apparatus ↓	4.2. Estimate the Mass of Samples for Testing	A.1 Crumbling	A.2.1 Air drying	A.2.2 Oven drying	A.3.1 Riffling	A.3.2 Cone and Quartering	A.4 Screening	A.6 Curing	A.9 Required mass of binder	A.10 Required mass of water to adjust moisture
(l) Porcelain mortar with porcelain pestle.							T102, T103			
(m) Scoops, brushes, trowels, shovels, etc.	✓	✓	✓	✓	✓	✓	✓	✓	✓	
(n) Dishes of suitable size.	✓	✓	✓	✓	✓	✓	✓	✓	✓	
(o) Sealable airtight containers.	T119						✓	✓	✓	
(p) Desiccator	Required for storage of dry samples before testing.									

4. Preparation

4.1. Preparation Requirements

(a) The requirements for preparing samples for each Test Method are presented in Table 2. The headings of the table are explained as follows:

(i) "Test Method" and "Title" are the tests covered by T105.

(ii) The "AS Sieve size" relates to the material requirement in the Test Method. The symbol "+" next to the AS Sieve means "Retained" on the nominated sieve and the symbol "-" means "Passing" the nominated sieve.

(iii) "Minimum Mass" is an estimate of the smallest amount of material required to perform the test. Some materials may require more than the stated "Minimum Mass" (e.g. steel slag).

(iv) "Statement" contains clarification or additional requirements.

(v) "Required preparation procedure" is a step-by-step procedure to prepare the sample (the processes numbered from A.1 to A.10 are described in Appendix A).

(vi) The tests are in each row of Table 2.

4.2. Estimate the Mass of Samples for Testing

(a) Locate the row in Table 2 that corresponds to the required Test Method.

(b) Determine the total mass of the sample to carry out all tests:

(i) List each test required and the number of each.

(ii) Record the mass required for each test as per Table 2.

NOTE: An initial sieve analysis on a small amount of the sample may help calculate the relative proportions.

(iii) Calculate the total mass of material required.

NOTE: The total is based on minimum masses so an allowance should be made for wastage, etc.

(c) If there is insufficient material to perform all tests reject the sample. A new sample must be obtained.

4.3. Preparation of Samples

(a) For each test required, find the required Test Method in Table 2.

(b) Prepare the sample for the test by carrying out the step-by-step procedure:

(i) The processes numbered from A.1 to A.10 are described in Appendix A.

(ii) Identify the apparatus according to Clause 0.

(iii) The number of samples is as calculated in Clause 0.

NOTE: Crumbling (A.1) may need to be carried out more than once during the preparation to break up aggregations of particles.

(c) Where more than one test is to be carried out on the same material, prepare the material for all the tests at the one time to ensure that consistent samples or sub-samples are tested (e.g. T111 and T117, T130 and T131).

Table 2 Summary of Preparation Requirements

Test Method	Title	AS Sieve Size	Minimum Mass	Statement
	Required preparation procedure			
T102	Pre-treatment of Road Construction Materials by Compaction	- 53 mm	6 kg	Where material is pre-treated for subsequent testing, refer to the test requirements for mass. Where both T102 and T103 are required on the same sample, carry out T103 first unless otherwise specified. Report the order of pre-treatment.
	(a) Screen the sample (A.4) through the 53 mm sieve. (b) Crush or break any oversize particles retained to the extent necessary to allow them to pass the 53 mm sieve. (c) Divide the sample (A.3) into the mass required. (d) Label the sample (A.7). (e) Cure the sample (A.6) except use an oven at a temperature of 45°C ± 5°C for at least 18 hours (i.e. accelerated curing). (f) Allow to cool. (g) Include the type and extent of pre-treatment in the data sheet.			
T103	Pre-treatment of Road Construction Materials by Artificial Weathering	- 53 mm	6 kg	Where material is pre-treated for subsequent testing, refer to the test requirements for mass. Where both T102 and T103 are required on the same sample, carry out T103 first unless otherwise specified. Report the order of pre-treatment.
	(a) Screen the sample (A.4) through the 53 mm sieve. (b) Crush or break any particles retained using a porcelain mortar and pestle to the extent necessary to allow them to pass the 53 mm sieve.			

Test Method	Title	AS Sieve Size	Minimum Mass	Statement
	Required preparation procedure			
	(c) Divide the sample (A.3) into the mass required. (d) Label the sample (A.7). (e) Include the type and extent of pre-treatment in the data sheet.			
T106	Coarse Particle Size Distribution in Road Construction Materials	Not screened prior to test	45 kg	Material of 50 to 75 mm nominal size.
			20 kg	Material of 37 to 50 mm nominal size.
			15 kg	Material of 26.5 to 37 mm nominal size.
			10 kg	Material of 19 to 26.5 mm nominal size.
			5 kg	Material of 13.2 to 19 mm nominal size.
			2.5 kg	Material of 9.5 to 13.2 mm nominal size.
			1 kg	Material of 6.7 to 9.5 mm nominal size.
			0.6 kg	Material of 4.75 to 6.7 mm nominal size.
			0.5 kg	Material of 2.36 to 4.75 mm nominal size.
			0.2 kg	Material of ≤ 2.36 mm nominal size.
		This test method may provide portions for other tests (e.g. T107, T108, T109 and T113). Additional material may be required to allow for this.		
	(a) Crumble the sample (A.1) to the extent required to pass the relevant sieve size. (b) Divide the sample (A.3) into the mass required. (c) Label the portion (A.7).			

<table>
<tr><th>Test Method</th><th>Title</th><th>AS Sieve Size</th><th>Minimum Mass</th><th>Statement</th></tr>
<tr><td></td><td colspan="4">Required preparation procedure</td></tr>
<tr><td>T107</td><td>Fine Particle Distribution in Road Materials</td><td>- 2.36 mm</td><td>150 g</td><td>Sample may be obtained from T106 if performed together.</td></tr>
<tr><td></td><td colspan="4">(a) Where a sample is not obtained from T106:
(i) Crumble the sample (A.1) to the extent required to pass the 19 mm sieve.
(ii) Screen the sample (A.4) through the 19 mm sieve.
(iii) Divide the portion (A.3) to provide sufficient material from the final screening.
(iv) Crumble the portion (A.1) to the extent required to pass the 2.36 mm sieve.
(v) Screen the portion (A.4) through the 2.36 mm sieve.
NOTE: Use guard sieves to prevent overloading the 2.36 mm sieve.
(b) Divide the portion (A.3) into the mass required.
(c) Label the portion (A.7).
(d) Dry to Constant Mass.
NOTE: Do not leave in the oven for more than 18 hours.
(e) Cool in a desiccator.</td></tr>
<tr><td>T108</td><td>Liquid Limit of Road Materials</td><td>- 425 μm</td><td>250 g</td><td>Sample may be obtained from T106 if performed together and the material has not been oven dried to constant mass.</td></tr>
<tr><td></td><td colspan="4">Ensure that some moisture is retained in the material during preparation.
NOTE: If the material is too dry, problems may occur when wetting up the sub-sample for testing.
(a) Where a sample is not obtained from T106:
(i) Crumble the sample (A.1) to the extent required to pass the 19 mm sieve.
(ii) Screen the sample (A.4) through the 19 mm sieve.
(iii) Divide the portion (A.3) to provide sufficient material from the final screening.
(iv) Crumble the portion (A.1) to the extent required to pass the 2.36 mm sieve.
(v) Screen the portion (A.4) through the 2.36 mm sieve.
NOTE: Use guard sieves to prevent overloading the sieve.
(b) Screen the portion (A.4) through the 425 μm sieve.
(c) Crumble the portion (A.1) retained on the 425 μm sieve using the rubber mortar and pestle. Re-screen on the 425 μm sieve and add to the portion that previously passed the 425 μm sieve.
(d) Divide the portion by riffling (A.3) into the mass required.
(e) Label the portion (A.7).</td></tr>
</table>

<table>
<tr><th>Test Method</th><th>Title</th><th>AS Sieve Size</th><th>Minimum Mass</th><th>Statement</th></tr>
<tr><td></td><td colspan="4">Required preparation procedure</td></tr>
<tr><td>T109</td><td>Plastic Limit and Plasticity Index of Road Construction Materials</td><td>- 425 μm</td><td>40 g</td><td>Sample may be obtained from T108 if performed together.</td></tr>
<tr><td></td><td colspan="4">(a) Where a sample is not obtained from T108:
(i) Crumble the sample (A.1) to the extent required to pass the 19 mm sieve.
(ii) Screen the sample (A.4) through the 19 mm sieve.
(iii) Divide the portion (A.3) to provide sufficient material from the final screening.
(iv) Crumble the portion (A.1) to the extent required to pass the 2.36 mm sieve.
(v) Screen the portion (A.4) through the 2.36 mm and 425 μm sieves.
NOTE: Use guard sieves to prevent overloading the sieves.
(vi) Crumble the portion (A.1) retained on the 425 μm sieve using the rubber mortar and pestle. Re-screen on the 425 μm sieve and add to the portion that previously passed the 425 μm sieve.
(b) Divide the portion by riffling (A.3) into the mass required.
(c) Label the portion (A.7).</td></tr>
<tr><td>T111</td><td rowspan="4">Dry Density/Moisture Relationship of Road Construction Materials</td><td rowspan="2">- 19 mm</td><td>10 kg</td><td>Where a one litre mould is used.</td></tr>
<tr><td></td><td>20 kg</td><td>Where a two litre mould is used.</td></tr>
<tr><td></td><td>- 37.5 mm</td><td>20 kg</td><td>Where a two litre mould is required.</td></tr>
<tr><td></td><td colspan="3">NOTE: A two litre mould is required where the sample has < 95% passing 19 mm sieve (i.e. more than 5% is retained on a 19.0 mm sieve). Otherwise a one or two litre mould can be used.</td></tr>
<tr><td></td><td colspan="4">(a) Crumble the sample (A.1) to the extent required to pass the 37.5 mm and/or 19 mm sieve as appropriate.
(b) Screen the sample (A.4) through the 37.5 mm and/or 19 mm sieve as appropriate to determine the size of mould to be used.
(c) Where the Relative Compaction of Road Construction Materials (T166) is to be determined and T119 has not been used, determine the proportion of oversize +37.5 mm (A.5).
(d) Divide the portion (A.3) to provide sufficient material from the final screening.
(e) Crumble the portion (A.1) to the extent required to pass the 2.36 mm sieve.
(f) Divide the portion (A.3) into at least 4 sub-samples.
(g) Label the sub-samples (A.7).
(h) Cure the sub-samples (A.6).</td></tr>
<tr><td>T112</td><td>Dry Density/Moisture Relationship of Road Construction Materials (Modified Compaction)</td><td></td><td></td><td>As for T111</td></tr>
<tr><td></td><td colspan="4">Requirements as for T111.</td></tr>
</table>

Test Method	Title	AS Sieve Size	Minimum Mass	Statement
	Required preparation procedure			
T113	Linear Shrinkage of Road Materials	- 2.36 mm	200 g	Sample may be obtained from T106 if performed together and the material has not been oven dried to constant mass.
	Ensure that some moisture is retained in the material during preparation. *NOTE: If the material is too dry, problems may occur when wetting up the sub-sample for testing.* (a) Where a sample is not obtained from T106: (i) Crumble the sample (A.1) to the extent required to pass the 19 mm sieve. (ii) Screen the sample (A.4) through the 19 mm sieve. (iii) Divide the portion (A.3) to provide sufficient material from the final screening. (iv) Crumble the portion (A.1) to the extent required to pass the 2.36 mm sieve. (v) Screen the portion (A.4) through the 2.36 mm sieve. *NOTE: Use guard sieves to prevent overloading the 2.36 mm sieve.* (b) Divide the portion by riffling (A.3) into the mass required. (c) Label the portion (A.7).			
T114	Maximum Dry Compressive Strength of Road Construction Materials	- 19 mm	4 kg	
	(a) Crumble the sample (A.1) to the extent required to pass the 19 mm sieve. (b) Screen the sample (A.4) through the 19 mm sieve. (c) Divide the portion (A.3) to provide sufficient material from the final screening. (d) Divide the portion (A.3) into 4 sub-samples of at least 1 kg. (e) Crumble the portion (A.1) to the extent required to pass the 4.75 mm sieve. (f) Screen (A.4) each sub-sample on the 4.75 mm sieve. (g) For each sub-sample, place the + 4.75 mm fraction and the - 4.75 mm fraction in separate containers. (h) Label all fractions (A.7).			
T116	Unconfined Compressive Strength of Remoulded Road Construction Materials	- 19 mm	7 kg	For duplicate UCS specimens plus a portion for moisture content determination. Additional material may be required to carry out T162.
	Time constraints may apply to this test. (a) Crumble the sample (A.1) to the extent required to pass the 19 mm sieve. (b) Screen the sample (A.4) through the 19 mm sieve and determine the proportion of oversize +19 mm sieve (A.5). (c) Divide the portion (A.3) to provide sufficient material from the final screening. (d) Crumble the portion (A.1)-to the extent required to pass the 2.36 mm sieve.			

Test Method	Title	AS Sieve Size	Minimum Mass	Statement
	Required preparation procedure			
	(e) Divide the portion (A.3) into 2 sub-samples. (f) Place each sub-sample in a container and seal. (g) Label each sub-sample (A.7). (h) Cure the portion (A.6).			
T117	California Bearing Ratio of Remoulded Specimens of Road Construction Materials	- 19 mm	7 kg	For CBR specimen plus a portion for moisture content determination. Additional material may be required to carry out T111.
	(a) Crumble the sample (A.1) to the extent required to pass the 19 mm sieve. (b) Screen the sample (A.4) through the 19 mm sieve and determine the proportion of oversize +19 mm sieve (A.5). (c) Divide the portion (A.3) to provide sufficient material from the final screening. (d) Crumble the portion (A.1) to the extent required to pass the 2.36 mm sieve. (e) Label the portion (A.7). (f) Cure the portion (A.6).			
T119	Field density of road construction materials (sand replacement method)			Where required, obtain sufficient material according to T119 to carry out other laboratory tests (e.g. moisture content, T162).
	Field test.			
T120	Moisture Content of Road Construction Materials (Standard Method)	Not screened prior to test	30 g	Where the sample has 80 to 100% passing 2.36 mm sieve except for T108, T109 and T144 where the specified sample size is used.
			300 g	Where the sample has 80 to 100% passing 19 mm sieve.
			3 kg	Where the sample has > 20% + 19 mm.
	Minimise the loss of moisture during preparation of the sample by quickly completing the processes and sealing samples as required. (a) Divide the sample (A.3) into the mass required. *NOTE: Drying in the test can be facilitated by breaking down the sample into smaller pieces.* (b) Place the sub-sample in container, seal and label (A.7).			
T121	Moisture Content of Road Construction Materials (Sand Bath or Hot Plate Method)			As for T120
	Requirements as for T120			

Test Method	Title	AS Sieve Size	Minimum Mass	Statement
	Required preparation procedure			
T123	pH value of a soil (Electrometric method)	- 2.36 mm	35 g	Sample may be obtained from T106 if performed together.
	(a) Where a sample is not obtained from T106: (i) Crumble the sample (A.1) to the extent required to pass the 19 mm sieve. (ii) Screen the sample (A.4) through the 19 mm sieve. (iii) Divide the portion (A.3) to provide sufficient material from the final screening. (iv) Crumble the portion (A.1) to the extent required to pass the 2.36 mm sieve. (v) Screen the portion (A.4) through the 2.36 mm sieve. *NOTE: Use guard sieves to prevent overloading the 2.36 mm sieve.* (b) Divide the portion (A.3) into the mass required. (c) Label the portion (A.7). (d) Dry to Constant Mass. *NOTE: Do not leave in the oven for more than 18 hours.* (e) Cool in a desiccator.			
T126	Assessment of Primer or Binder Absorption by Road Gravel	- 4.75 mm	10 kg	
	Refer to the Test Method.			
T127	Apparent Density of Fine Soil Particles	- 4.75 mm	1 kg	
	Refer to the Test Method.			
T128	Apparent Density of Soils Containing Coarse Particles	+ 4.75	5 kg	Usually sample is obtained in conjunction with T127.
	Refer to the Test Method.			
T129	Bulk Density and Water Absorption of the Fine Sand Fraction of Soils	- 2.36 mm	1 kg	Increase the mass where the sample has > 50% - 13.5 μm.
	Refer to the Test Method.			
T130	Dry Density/Moisture Relationship of Road Construction Materials (Blended in the Laboratory with Cementitious Binders)	- 19 mm	10 kg	Where the sample has ≥ 95 % passing the 19 mm sieve.
			20 kg	Where the sample has < 95 % passing the 19 mm sieve.
	(a) Crumble the sample (A.1) to the extent required to pass the 19 mm sieve. (b) Screen the sample (A.4) through the 19 mm sieve and determine the proportion of oversize +19 mm sieve (A.5). (c) Divide the portion (A.3) to provide sufficient material from the final screening.			

Test Method	Title	AS Sieve Size	Minimum Mass	Statement
	Required preparation procedure			
	(d) Crumble the portion (A.1) to the extent required to pass the 2.36 mm sieve. (e) Divide the portion (A.3) into at least 4 sub-samples. (f) Label the sub-samples (A.7). (g) Cure the sub-samples (A.6). (h) Prepare the binder (A.8). (i) Calculate the quantity of binder (A.9). (j) Measure out the quantity of binder, place in a sealed container and label (A.7). *NOTE: Do not blend the binder until directed in the Test Method.*			
T131	Unconfined Compressive Strength of Road Construction Materials (Blended in the Laboratory with Cementitious Binders)	- 19 mm	7 kg	Duplicate UCS specimens plus a portion for moisture content determination. Additional material may be required to carry out T130.
	(a) Crumble the sample (A.1) to the extent required to pass the 19 mm sieve. (b) Screen the sample (A.4) through the 19 mm sieve. (c) Divide the portion (A.3) to provide sufficient material from the final screening. (d) Crumble the portion (A.1) to the extent required to pass the 2.36 mm sieve. (e) Divide the portion (A.3) into 2 sub-samples. (f) Place each sub-sample in a container and seal. (g) Label each sub-sample (A.7). (h) Cure the sub-samples (A.6). (i) Prepare the binder (A.8). (j) Calculate the quantity of binder (A.9). (k) Measure out the quantity of binder, place in a sealed container and label (A.7). *NOTE: Do not blend the binder until directed in the Test Method*			
T132	California Bearing Ratio of Remoulded Specimens of Road Construction Materials (Blended in the Laboratory with Cementitious Binders)	- 19 mm	7 kg	For each binder content to be tested. Additional material may be required to carry out T130.
	Refer to the Test Method.			
T133	Durability of Road Materials Modified or Stabilised by the Addition of Cement	- 19 mm	5 kg	For each cement content to be tested.
	Refer to the Test Method.			

Test Method	Title	AS Sieve Size	Minimum Mass	Statement
	Required preparation procedure			
T134	Lime or Cement Content of Uncured Stabilised Soil (EDTA. Method)	- 4.75 mm	4 kg	Standard sample of material to be stabilised.
			3 kg	Stabilised sample at completion of mixing on-site.
	Refer to the Test Method.			
T137	Cement Content of Cement Stabilised Material (Heat of Neutralisation Method)	Not screened prior to test	40 kg	Sample of material to be stabilised.
			1.5 kg	Cement to be used.
	Refer to the Test Method.			
T143	Lime Content of Lime Stabilised Materials	Not screened prior to test	200 g	For each lime binder, stabilised material and unstabilised material to be tested.
	Refer to the Test Method.			
T144	Hydrated Lime for Road Construction Materials (Lime Demand Test)	- 2.36 mm	400 g	A larger sample may be required to produce the necessary quantity.
	(a) Divide the sample (A.3) to provide sufficient material from the final screening. (b) Crumble the sample (A.1) to the extent required to pass the 2.36 mm sieve as appropriate. (c) Determine the mass of the sample (M). (d) Screen the sample (A.4) through the 19.0 and 9.50 mm sieves to avoid overloading of sieves. (e) Screen the -9.5 mm portion (A.4) through the 2.36 mm sieve. (f) Determine the mass of the -2.36 mm portion prepared ($M_{-2.36}$). (g) Determine the Percentage passing the 2.36 mm sieve ($P_{-2.36}$) (%) $P_{-2.36} = \frac{M_{-2.36}}{M} \times 100\%$ (h) Place the portion passing the 2.36 mm sieve in a container and seal. (i) Label the portion passing the 2.36 mm sieve (A.7). (j) Prepare the hydrated lime (A.8), measure out at least 25 g of hydrated lime, place in a container, seal and label. *NOTE: Do not add the hydrated lime until directed in the Test Method.*			
T147	Working Time for Road Construction Materials (Blended in the Laboratory with Slow Setting Binders)	- 19 mm	55 kg	Where the sample has ≥95 % passing the 19 mm sieve.
			95 kg	Where the sample has < 95 % passing the 19 mm sieve
		NOTE: The mass is 4x the requirements for T130 to allow for 4 time intervals PLUS 2x the requirements for T131 to allow for 4 time intervals using 1×UCS specimen.		
	As required for T130 and T131 except that single specimens are required for T131.			

<table>
<tr><th>Test Method</th><th>Title</th><th>AS Sieve Size</th><th>Minimum Mass</th><th>Statement</th></tr>
<tr><td></td><td colspan="4">Required preparation procedure</td></tr>
<tr><td rowspan="3">T150</td><td rowspan="2">Dry Density/Moisture Relations of Road Construction Materials (Blended in the Laboratory with Bituminous Materials)</td><td rowspan="2">- 19 mm</td><td>10 kg</td><td>Where the sample has
≥ 95 % passing the 19 mm sieve.</td></tr>
<tr><td>20 kg</td><td>Where the sample has
< 95 % passing the 19 mm sieve.</td></tr>
<tr><td colspan="4">(a) Crumble the sample (A.1) to the extent required to pass the 19 mm sieve.
(b) Screen the sample (A.4) through the 19 mm sieve and determine the proportion of oversize +19 mm sieve (A.5).
(c) Divide the portion (A.3) to provide sufficient material from the final screening.
(d) Crumble the portion (A.1) to the extent required to pass the 2.36 mm sieve.
(e) Divide the portion (A.3) into at least 4 sub-samples.
(f) Label the sub-samples (A.7).
(g) Cure the sub-samples (A.6).
(h) Prepare the binder (A.8).
(i) Calculate the quantity of binder (A.9).
(j) Measure out the quantity of binder, place in a sealed container and label (A.7).
NOTE: Do not blend the binder until directed in the Test Method.</td></tr>
<tr><td rowspan="2">T151</td><td>Unconfined Compressive Strength of Road Construction Materials (Blended in the Laboratory with Bituminous Binders)</td><td>- 19 mm</td><td>7 kg</td><td>Duplicate UCS specimens plus a portion for moisture content determination.
Additional material may be required to carry out T150.</td></tr>
<tr><td colspan="4">(a) Crumble the sample (A.1) to the extent required to pass the 19 mm sieve.
(b) Screen the sample (A.4) through the 19 mm sieve.
(c) Divide the portion (A.3) to provide sufficient material from the final screening.
(d) Crumble the portion (A.1) to the extent required to pass the 2.36 mm sieve.
(e) Divide the portion (A.3) into 2 sub-samples.
(f) Place each sub-sample in a container and seal.
(g) Label each sub-sample (A.7).
(h) Cure the sub-samples (A.6).
(i) Prepare the binder (A.8).
NOTE: Do not blend the binder until directed in the Test Method</td></tr>
<tr><td rowspan="2">T153</td><td>The Half-Life and Expansion Ratio of Foamed Bitumen</td><td></td><td></td><td></td></tr>
<tr><td colspan="4">Under development.</td></tr>
</table>

Test Method	Title	AS Sieve Size	Minimum Mass	Statement
	Required preparation procedure			
T154	The Resilient Modulus of Remoulded Foamed Bitumen Specimen			
	Under development.			
T162	Compaction Control Test (Rapid Method)	- 19 mm	10 kg	Where a one litre mould is used.
			20 kg	Where a two litre mould is used.
		- 37.5 mm	20 kg	Where a two litre mould is required.
		NOTE: A two litre mould is required where the sample has < 95% passing 19 mm sieve (i.e. more than 5% is retained on a 19.0 mm sieve). Otherwise a one or two litre mould can be used. *Sample is usually prepared from material excavated when using T119 or T173.* *Sample for moisture content as described for T120.*		
	(a) Crumble the sample (A.1) to the extent required to pass the 37.5 mm and/or 19 mm sieve as appropriate. (b) Screen the sample (A.4) on the 37.5 mm and/or 19 mm sieve as appropriate to determine the size of mould to be used. (c) Where the Relative Compaction of Road Construction Materials (T166) is to be determined and T119 has not been used, determine the proportion of oversize +37.5 mm (A.5). (d) Where required, divide the sample (A.3) to obtain a portion for T120. (e) Divide the sample into at least 4 sub-samples (A.3). (f) Place each sub-sample in a container, seal and label (A.7).			
T164	Maximum Dry Density of Non-cohesive Materials (by Vibration)	- 37.5 mm	5 kg	Where the sample has any + 19 mm particles.
		- 37.5 mm	2.5 kg	All of the sample is all - 19 mm.
	Refer to AS 1289.5.5.1 for preparation.			
T167	Determination of the California Bearing Ratio of Remoulded Specimens of Road Materials (Design Method)	- 19 mm	30 kg	Less material is required if the design moisture is known. Additional material may be required to carry out T111.
	Refer to the Test Method.			
T170	Determination of the Soil Suction-Moisture Content Relationship for Soils	-2.36 mm	3.5 kg	For suction samples. Additional material may be required to carry out T111.
	Refer to the Test Method.			

Test Method	Title	AS Sieve Size	Minimum Mass	Statement
	Required preparation procedure			
T171	Modified Texas Triaxial Compression Test for Road Construction Materials	- 37.5 mm	40 kg	For each moisture content tested (i.e. 4×10 kg samples). Additional material may be required to carry out T111.
	(a) Crumble the sample (A.1) to the extent required to pass the 37.5 mm sieve. (b) Screen the sample on the 37.5 mm sieve (A.4). (c) Divide the portion into at least 4 sub-samples (A.3). (d) Determine the proportion of oversize +37.5 mm (A.5). (e) Label all sub-samples (A.7).			
T172	Determination of Capillary Rise and Absorption of Road Materials	- 19 mm	7 kg	Specimens prepared according to T116, T131 or other as appropriate.
	Refer to the Test Method.			
T173	Field Wet Density of Road Construction Materials (Nuclear Gauge in Direct Transmission Method)			Where required, obtain sufficient material according to T173 to carry out other laboratory tests (e.g. moisture content, T162).
	Refer to the Test Method.			
T180	Moisture Content of Road Construction Materials (Microwave Oven Method)			Requirements as for T120.
	Requirements as for T120			
T186	Erodibility of Stabilised Road Construction Materials	- 6.75 mm	12 kg	Two specimens of 6 kg each. Additional material may be required to carry out T120.
	(a) Crumble the sample (A.1) to the extent required to pass the 6.75 mm sieve. (b) Screen the sample (A.4) on the 6.75 mm sieve. (c) Divide the portion (A.3). (d) Label the portion (A.7). (e) Cure the portion (A.6). (f) Prepare the binder (A.8). (g) Calculate the quantity of binder (A.9). (h) Measure out the quantity of binder, place in a sealed container and label (A.7). *NOTE: Do not blend the binder until directed in the Test Method*			

Test Method	Title	AS Sieve Size	Minimum Mass	Statement
	Required preparation procedure			
T276	Constituents of Recycled Materials Used in Road Construction	Not screened prior to test	20 kg	Material of 50 to 150 mm nominal size.
			6 kg	Material of 20 to 50 mm nominal size.
			4 kg	Material of 10 to 20 mm nominal size.
			2 kg	Material of ≤ 10 mm nominal size.
	(a) Label the sample (A.7).			
T2105	Correlation of Moisture Content with Standard Method			
	The test is used in conjunction with T120 and either T121 or T180.			
T2162	Drying Shrinkage of Stabilised Road Construction Materials	- 19 mm	12 kg	Where the sample has ≥95 % passing the 19 mm sieve.
			18 kg	Where the sample has < 95 % passing the 19 mm sieve
			Additional material may be required to carry out T111, T130 or T150 as appropriate.	
	(a) Crumble the sample (A.1) to the extent required to pass the 19 mm sieve. (b) Screen the sample (A.4) through the 19 mm sieve. (c) Divide the portion (A.3) to provide sufficient material from the final screening. (d) Crumble the portion (A.1) to the extent required to pass the 2.36 mm sieve. (e) Divide the portion (A.3) into 3 sub-samples of at least 4 kg each. (f) Label the sub-samples (A.7). (g) For samples mixed in the laboratory with cementitious binder: (i) Prepare the binder (A.8). (ii) Calculate the quantity of binder (A.9). (iii) Measure out the quantity of binder, place in a sealed container and label (A.7). *NOTE: Do not blend the binder until directed in the Test Method*			

Test Method	Title	AS Sieve Size	Minimum Mass	Statement
	Required preparation procedure			
T2163	Flexural Test Specimens from Stabilised Road Construction Materials	- 19 mm	18 kg	Where the sample has ≥95 % passing the 19 mm sieve.
			27 kg	Where the sample has < 95 % passing the 19 mm sieve
			Additional material may be required to carry out T111, T130 or T150 as appropriate.	
	(a) Crumble the sample (A.1) to the extent required to pass the 19 mm sieve. (b) Screen the sample (A.4) through the 19 mm sieve. (c) Divide the portion (A.3) to provide sufficient material from the final screening. (d) Crumble the portion (A.1) to the extent required to pass the 2.36 mm sieve. (e) Divide the portion (A.3) into 2 sub-samples of at least 9 kg each. (f) Label the sub-samples (A.7). (g) For samples mixed in the laboratory with cementitious binder: (i) Prepare the binder (A.8). (ii) Calculate the quantity of binder (A.9). (iii) Measure out the quantity of binder, place in a sealed container and label (A.7). *NOTE: Do not blend the binder until directed in the Test Method*			

5. Reporting

Include the following in the data sheet:

(d) Reference to any pre-treatment (e.g. T102 and/or T103)

(e) Where binders are used:

(i) The type, source and date of manufacture of binder

(ii) Blended proportions and constituents

(f) All measurements (e.g. mass determinations, dimensions)

(g) All calculations

Appendix A - Processes

Process	Procedure
A.1 Crumbling	(h) Break down aggregations of soil particles so that only discrete particles and not aggregations are retained on the specified sieve size. The extent of break down is to enable aggregations to pass the size of sieve used in screening or aperture used in division. The following may need to be carried out to assist break down: *NOTE: Typically, a more thorough break down is required for material that is to be screened through finer apertures.* (i) Breaking down the aggregations by hand. (ii) Drying back the sample (A.2). (iii) Placing material into a mortar and using a rubber pestle to rub down aggregations of particles in such a way as to avoid crushing any discrete or sound particles. *NOTE: To distinguish between aggregations and discrete particles, place some material in water and bring to the boil. If the material breaks down, then further treatment may be required.*
A.2 Drying	Dry back the material by the procedure described in either Air Drying (A.2.1) or Oven Drying (A.2.2). The temperature and period of application must not disrupt or weaken particles to the extent that the property being measured changes (e.g. some fine grained sedimentary rocks such as mudstone).
A.2.1Air drying	(a) Spread the material on a smooth clean surface in an open space. *NOTE: Avoid contamination of the sample.* (b) Occasionally stir the material to assist evaporation and uniformity of drying. (c) Transfer material to a container and cover the sample when the particles are judged sufficiently dry to be crumbled.
A.2.2Oven drying	(d) Place material in a metal dish and place in an oven at a temperature not exceeding 50°C. *NOTE: Some samples will need to be stirred periodically to separate aggregation and promote even drying.* (e) Remove from the heat and cover the sample when the particles are judged sufficiently dry to be crumbled.
A.3 Division	Not required where the sample is already of the required mass. Divide the sample by the procedure described in Riffling (A.3.1) or Cone and Quartering (A.3.2). Unless otherwise specified, riffling is the preferred method of division. Where oversize is present and the material is prone to segregation, the entire sample may be screened down on the 37.5 mm or 19.0 mm sieve as required prior to division.
A.3.1Riffling	(a) Use a riffle box conforming to AS 1141.2 Figure 1. (b) Carry out riffling to provide sub-samples of sufficient quantity for the specified tests. *NOTE: It is preferable to carry out riffling on material sufficiently dry but not dusty, so that fine particles are not lost.*

Process	Procedure
A.3.2Cone and Quartering	(c) Cone and quarter the material and take diametrically opposite quarters. (d) Repeat the process until the sub-samples are of sufficient quantity for the specified tests.
A.4 Screening	(e) Screen the sample by hand or with a mechanical shaker using the specified sieves: (i) When sieving by hand, use a lateral and vertical motion of the sieve accompanied by a jarring action and with periodic stopping. (ii) When using mechanical sieving, estimate the minimum sieving time and set the timer to the estimated time. *NOTE: The estimate may be based on the elapsed time for previous samples. Generally 15 minutes sieving is required. Periodically stopping and starting the equipment after a pause may help the process.* *Nesting of sieves: several sieves, in order of size, may be fitted together and used.* (iii) Take care not to overload the sieve(s). Where the mass of material retained on any sieve at the completion of sieving exceeds the value in Table A.4, re-sieve the sample in two or more portions. *NOTE: Overloading of sieves may affect the accuracy of results and damage the sieves. Larger sieves or sieve sizes can be used.* (f) Break down any aggregation of material remaining on a screen by Crumbling (A.1) and re-screen the material. (g) Brush any adhering fine particles from the portion retained on sieves 19.0 mm or greater and return to the sieve. (h) Continue screening until the mass passing each sieve in one minute is less than 1% of the mass of material retained on that sieve.

Table A.4. Maximum Mass of Material to be Retained on Each Sieve at the Completion of Screening

AS Sieve	200 mm Diameter Sieve (g)	300 mm Diameter Sieve (g)	400 mm Diameter Sieve (g)
75.0 mm	1000	3000	6000
53.0 mm	1000	2750	5500
37.5 mm	1000	2200	5000
26.5 mm	800	1800	4000
19.0 mm	600	1200	3000
13.2 mm	400	900	2000
9.5 mm	250	600	1500
6.7 mm	225	500	1250
4.75 mm	200	400	1000
3.35 mm	180	350	800
2.36 mm	150	300	600
1.70 mm	125	250	500
1.18 mm	100	200	400
700 μm	90	170	-
600 μm	75	150	-
425 μm	60	120	-
300 μm	50	100	-
150 μm	35	-	-
75 μm	25	-	-

Process	Procedure
A.5 Proportion and density of oversize material	(a) Determine the mass of oversize material as a percentage of the total mass (%) (i.e. not passing the nominated sieve).
	$P_O = \frac{M_O}{M_4} \times 100\%$ Where: P_O = Proportion of oversize material (%). M_O = Mass of material (g) retained on the nominated sieve to the nearest 5 g. M_4 = Mass of sample (g) to the nearest 5 g.

Process	Procedure
	(b) Where required for T166, determine the volume of the oversize material (V_O) using displacement: (i) Wet the material to approximately saturated surface dry condition. (ii) Determine the mass of the material in air (*L)* in grams. (iii) Determine the mass of the material immersed in potable water (*K*) at not more than 25°C in grams. (c) Where required for T166, determine the field density of the oversize material (J_O). $J_O = \frac{M_O}{V_O}$ Where: J_O = Field density of the oversize material (t/m³). M_O = Mass of the oversize material (g). V_O = $L - K$ and is the volume of oversize material (mL). L = The mass in air of the saturated surface dry oversize material (g). K = The mass in water of the oversize material (g).
A.6 Curing	(d) Add sufficient water to produce a moisture content OMC-3% to OMC. Mix the material to ensure uniform distribution of moisture. (e) Place the moist sample in a container, seal and allow to cure. (f) Unless otherwise specified (e.g. as in Table 2/T102), cure the sample at room temperature (i.e. from 5 to 50°C) for a period of time that allows the moisture to become uniformly distributed through the sample. *NOTE: Inadequate curing will give misleading results.* *Sandy materials may be satisfactorily cured in one hour, but heavy clays may require several days or longer.*
A.7 Labelling	(g) Place all test samples/sub-samples/portions/fractions in dishes or containers with labels for identification with Laboratory Registration Number, Sample Number, Test Method Number, and size fraction as required. Seal container where required. *NOTE: Treat and protect samples at all times to prevent contamination which could alter the result of a subsequent test.* (h) All sample butts must be placed in containers and labelled indicating Laboratory Registration Number, Sample Number and whether or not any size fraction has been removed from it. Seal container where required.
A.8 Preparation of Binders	(i) The binder must comply with the relevant requirements in Appendix B. (j) The binder must not be used if more than three months from date of manufacture. *NOTE: The binder should be the same (type, source, manufacture, grading) as will be used in the field.*

Process	Procedure
A.9 Required mass of binder	(k) Determine the moisture content (w) of the sample according to T120. (l) Determine the wet mass of the sample (M_2) to the nearest 1 g. (m) Convert the wet mass of the sample to a dry mass using the following calculation: $M_3 = M_2 \times \frac{100}{(100 + w)}$ Where: M_3= Dry mass of sample (g). M_2= Wet mass of sample (g). w= Moisture content of sample (%). (n) Calculate the required mass of binder and additional water using the following calculation: $M_B = M_3 \times \frac{B}{100}$ M_B= Mass of dry binder to be added (to the nearest 1 g). M_3= Dry mass of sample (g). B= Specified binder proportion to be added (%). (o) Where a target moisture content (w_t) has been determined, calculate the required mass of water to be adjusted using the following calculation: *NOTE: The moisture content is the actual % and is not converted to a decimal.* $M_w = M_2 \frac{(w_t - w)}{(100 + w)} + M_B \times \frac{w_t}{100}$ Where: M_w= Mass of water to be adjusted (to the nearest 0.1 g) *NOTE: Also the volume of water in mL.* *If $w > w_t$, dry back the sample and repeat the process.* M_2= Wet mass of sample (g). w_t= Target moisture content (%). w= Moisture content of sample (%). M_B= Mass of dry binder to be added (to the nearest 1 g).
A.10 Required mass of water to adjust moisture content.	(p) Determine the moisture content (w) of the sample according to Test Method T120. If the moisture content (w) is more than the target moisture content (w_t), dry back the sample and repeat the process. (q) Determine the wet mass of the sample (M_2) to the nearest 1 g. (r) Calculate the required mass of water (M_w) to be adjusted using the following calculation: *NOTE The moisture content is the actual % and is not converted to a decimal.*

Process	Procedure
	$M_w = M_2 \frac{(w_t - w)}{(100 + w)}$ Where: M_w= Mass of water to be adjusted (to the nearest 0.1 g). *NOTE: Also the volume of water in mL.* M_2= Wet mass of sample (g). w_t= Target moisture content (%). w= Moisture content of sample (%).
A.11 Required mass of material to fill a mould.	Calculate the required mass (M_w) using the following calculation: $M_w = V_m \times \rho_d \left(\frac{100 + w_t}{100} \right)$ Where: M_w = Mass of moist sub-sample (g) V_m = Volume of the mould (mL) ρ_d = Maximum Dry Density (t/m³) from T111, T130 or T150 as appropriate. w_t = Target Moisture Content (%)
A.12 Required number of blows for compaction.	Calculate the required number of blows (B) from a drop rammer using the following calculation: (a) For standard compaction E = 596 kJ/m³ (b) For modified compaction E = 2703 kJ/m³ $B = \left(\frac{E}{M_P \times 9.8 \times h} \right) \times \frac{V_m}{n}$ Where: B = Number of blows per layer to the nearest whole number E = Energy input (kJ/m³) M_P = Drop mass of rammer (kg) h = Drop height of rammer (mm) V_m = Volume of the mould (mL) n = Number of equal layers compacted.

Process	Procedure
A.13 Air Voids Line	(c) Calculate the Air Voids Lines for the nominated air voids using the formula in Equation A.13.1 for moisture contents from 0% to 20%. *NOTE: 0% and 5% Air Voids are usually required.* (d) Plot the Air Voids Lines as moisture content Vs. wet or dry density as required. $\rho_v = \rho_m(100 - v)$ … … … … … … … … Equation A.13.1 Where: ρ_v = Theoretical density with % Air Voids (t/m³) ρ_m = Dry Density (ρ_d) or Wet Density (ρ_w) of material (t/m³) calculated as required using Equation A.13.2 or A.13.3. v = Air voids content in % on a dry or wet basis. (e) Calculate ρ_m based on Dry Density as follows: $\rho_d = \dfrac{1}{\left(\dfrac{1}{\rho_S} + \dfrac{w}{100}\right)}$ … … … … … … … … Equation A.13.2 Where: ρ_d = Dry Density of soil (t/m³) ρ_S = Density of soil particle (t/m³). = 2.67 t/m³ unless otherwise determined. *NOTE: Generally applicable to rocks and clays containing quartz and feldspars. Basaltic and artificial aggregates will require a separate determination.* w = Moisture Content as % of the mass of dry soil. (f) Calculate ρ_m based on Wet Density as follows: $\rho_w = \rho_d\left(\dfrac{100 + w}{100}\right)$ … … … … … … … … Equation A.13.3 Where: ρ_w = Wet Density of soil (t/m³) ρ_S = Particle density of soil (t/m³) w = Moisture Content as % of the mass of dry soil.

Appendix B –Requirements for Binders

B.1 Cementitious Binders

Binder	Type, unless otherwise specified	Material Specification	Requirements *(i)*
Cement	Type GB - General Purpose Blended Cement	3211 - Portland and Blended Cements	Must be stored in a sealed container, labelled with date of manufacture and protected from moisture until used.
Fly Ash	Fine or medium grade		
Ground Granulated Iron Blast Furnace Slag	Cementitious grade		
Lime and lime-pozzolan mixtures	Hydrated Lime	3054 - Hydrated Lime	(a) Quicklime must NOT be used in the laboratory. Replace quicklime for laboratory testing: 1.32% of hydrated lime is equivalent to 1% of quicklime. (b) Lime that shows signs of absorption of moisture or carbon dioxide (e.g. caked) must not be used. (c) Must be stored in a sealed container, labelled with date of manufacture and protected from moisture and carbon dioxide until used.

NOTE: (i) All binders must be no more than 3 months old from date of manufacture.

B.2 Bituminous Binders

Under development.

Appendix C –Preparation of Laboratory Samples

C.1 Prepared Using Cementitious Binders

Detailed within the relevant Test Method (e.g. T130, T131, T132, T147, T186).

C.2 Prepared Using Bituminous Binders

Under development.

Appendix D - Terms and Definitions

Term	Definition
CBR	California Bearing Ratio
Cohesive	The ability of a material to resist by means of internal forces of attraction the separation of its constituent particles.
Constant Mass	The stage in the drying process where the loss in mass of the material between successive drying periods is less than 0.1% (refer to T120, T121 or T180).
MDD	Maximum Dry Density
Non-cohesive	A soil in which the fine fraction is lacking, resulting in the loss of the cohesive bonds associated with this fraction (also known as cohesionless).
OMC	Optimum Moisture Content
Oversize	Particles that are retained on a specified sieve in the test (e.g. 37.5 mm, 19.0 mm). Ensure that material adhering to oversize particles is returned to the sample.
Sample	That which is submitted to the laboratory for testing as representative of the parent material. The following terms generally relate to parts of a sample.
Sub-sample	A quantity of material representative of a sample obtained by division (quartering or riffling).
Fraction	The material derived from a sample that is (i) retained on a specific sieve or (ii) passes a specific sieve, or (iii) is retained between two specific sieves.
Portion	The material derived from a sample after screening and/or division (by quartering or riffling) for a particular test.
Specimen	The product made using a test portion (e.g. compacted in a mould).
UCS	Unconfined Compressive Strength