Registration of asphalt mix designs

Technical directive

NORTHERN TERRITORY GOVERNMENT

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2.0	29/11/2019	Andrew Batson	Replace Code of Practice 106.1, additional performance testing requirements, deep lift asphalt requirements and additional requirements for information to be lodged.

Acronyms	Full form

Contents

1. Introduction

This guide note describes the process for registration of asphalt mix designs for use in works undertaken for the Department of Infrastructure, Planning and Logistics and other Government associated works. It replaces the document NTTN Code of Practice 106.1.

Registration in accordance with the procedures in this Guide note does not guarantee the handling and performance properties of this mix, this lies with the producer.

Production, delivery, placement and compaction of asphalt mixes shall comply with the relevant sections of the DIPL standard specification for roadworks and any project specific requirements.

Approval of a registered asphalt mix for use under the Contract does not relieve the Contractor from employing suitable manufacturing and handling techniques to ensure performance of the mix. The Contractor must also satisfy all contractual obligations in regards to rectification of defects.

If a registered mix has unsatisfactory handling or field performance, the Contractor or Superintendent may request the mix be de-registered. Re registration maybe considered when the manufacturer demonstrates through further testing or independent analysis that the design is suitable for use.

2. Registration

2.1. General

Applications to register an asphalt mix shall be submitted to The Department at least four weeks prior to the proposed date of commencement of supply and shall be accompanied by the information listed in Clause 2.2.

The registration of a mix design shall remain current for a period of 2 years subject to there being no changes to the source or grading of aggregate components or the source and nature of the binder.

Registration may be extended beyond 2 years with the agreement of the Department and the supplier, further testing will need to be conducted.

2.2. Information required

The following information shall be submitted for each mix design registration request:

a) Proportion of each component in the mix including details of supplier and source.
b) Grading of the total mix
c) NATA Laboratory test results for every component of the mix (grading, max densities etc.)
d) Volumetric, Stability and Flow graphs of all mix properties
e) Supplier and class of binder and certificate of compliance
f) Adhesion agent type and percentage
g) Source of added filler and certificate of compliance for added filler
h) Details of the type of additives, if any, and its proportion in the design mix
i) Details of any proposed asphalt recycling including sieve analysis (after extraction of binder) and binder content of RAP
j) Test reports for all laboratory tests carried out to achieve the mix design requirements

k) Test information from production trial and modification of laboratory test data for identification as the "Job Mix"

l) DIPL excel sheet with all component and test result results

- All the test results shall be current at the time of submission of the mix design
- All components of the asphalt mix shall comply with the DIPL standard specification for roadworks.

2.3. Additional information required for Warm Mix Asphalt (WMA) registration

a) WMA technology and/or WMA additives information including the classification and nominated proportions of additives;

b) WMA technology manufacturer's established target rate for additives and the acceptable variation for production;

c) Documentation that demonstrates proven field performance of the WMA technology for at least 2 years. Trials undertaken through Austroads and other State Authorities will be accepted.

2.4. Additional information required for asphalt including Recycled Asphalt Pavement (RAP)

a) Detailed RAP stockpile management plan to show that the supplier meets Austroads and AAPA requirements for RAP stockpile management and use.

b) Total percentage or RAP to be used in mix design

2.5. Notifications of approval

Acceptance or rejection of applications for registration of asphalt mixes will be advised in writing. Additional information may be required by the Department to complete the registration process.

Registered mixes will be issued with an identifying code.

Sufficient quantities of all components shall be provided for independent verification and assessment of the submitted mix design upon request by the Department.

3. Mix design requirements

3.1. General

Mix design procedures and test methods shall follow the guidelines provided in Austroads Guide to Pavement Technology Part 4B – Asphalt. Volumetric properties may be determined using either Gyratory compaction (AS 2891.2.2) or Marshall Compaction (AS 2891.5) of laboratory prepared or plant mixed specimens.

All testing shall be undertaken in a laboratory, accredited by NATA for the relevant test methods.

Note: All mix designs shall have adhesion agents (concentrated) added to the bitumen

Note: Open Graded Asphalt and Stone Mastic Asphalt shall not to be used.

Table 1 - Traffic category and binder requirements for dense graded asphalt mix types

Traffic Category	Mix Type	Application	Binder Type
Light	1 & 2	Cycle paths and pedestrian traffic	Class 320 or S10E
Medium	2	Car parking light vehicles only	Class 320
Heavy	3	Car parking with heavy vehicles, buses	Class S10E
Heavy	3	Regional Urban Subdivisions and Regional Rural Asphalt	A20E
Heavy	5	All Urban Roads and Intersections and Industrial Estates	A15E
Heavy	4	Structural layers	A15E

Refer to "Technical Standard – Bituminous Surfacing Works Treatment and Selection[1]" for further guidance.

Urban areas are defined as follows:

- Darwin region urban area is nominated as North of Cox Peninsular Road (Stuart Highway), west of Trippe Road (Arnhem Highway) and Howard River Bridge on Gunn Point Road
- Katherine, Tennant Creek and Alice Springs urban areas are defined as the areas within the respective town boundaries.

3.2. Mix design levels for dense graded asphalt

All Heavy mix designs require all Level 1* and 2* testing

Medium mix designs require Level 1* and level 2B* Wheel tracking

Light mix designs require Level 1* testing only

*Refer Austroads Guide to Pavement Technology Part 4B

3.3. Grading and binder content

The proportions of aggregate and binder in the mix and grading of aggregates including any added filler, after mixing but before compaction, shall lie within the limits specified in Table 2 - Grading properties and Table 3 - Binder Contents for each size of and type of asphalt unless otherwise approved by the DIPL.

Note: Where A20E is used Mix Type 5 requirements apply.

[1] https://dipl.nt.gov.au/infrastructure/technical-standards-guidelines-and-specifications/road-surfacing-standards

Table 2 – Grading properties

Mix Type	1	2	3	4	5	6
Mix Size	7	10	14	20 (A15E)	14 (A15E)	10 (Car Park)
Sieve Size AS (mm)	Percentage passing sieve size (by mass)					
26.5	100	100	100	100	100	100
19.0				95–100		
13.2			85–100	75–90	85–100	
9.5		90–100	70–85	60–80	70–85	90–100
6.7	85–100	70–90	62–75	50–70	62–75	68–87
4.75	70–87	58–76	53–70	40–60	53–70	50–76
2.36	44–65	40–58	35–52	25–43	35–52	32–57
1.18	29–48	27–44	24–40	18–35	24–40	22–42
0.60	19–35	17–35	15–30	14–27	15–30	15–31
0.30	12–25	11–24	10 –24	9–21	10–24	10–23
0.15	8–16	7–16	7–16	6–15	7–16	6--14
0.075	5–8	4–7	4–7	3–7	4– 7	4–7
Total	100	100	100	100	100	100

The grading curve shall be smooth and shall not vary from the outer one third of the range between the specified limits for one sieve size to the opposite outer one third of the range between the specified limits for an adjacent sieve size.

Table 3 - Binder content

Mix Size (mm)	7	10	14	20 (A15E)	14 (A15E)	10 mm (Car Park)
Binder Content (%by mass)	5.0 – 7.0	4.5 – 6.5	4.6 – 6.5	4.3 - 6.0	4.6 – 6.5	5.0 – 6.5

3.4. Binder film index

Binder film index of all mix types shall be a minimum of 8.0 micron.

This should be obtained at a minimum of 0.3% below the nominated bitumen design target.

3.5. Volumetric test properties

3.5.1. Gyratory compaction

Table 4 - Compaction cycles and air voids for volumetric properties determined by gyratory compaction

Mix Type	1	2	3	4	5	6
Mix Size (mm)	7	10	14	20 (A15E)	14 (A15E)	10 mm (Car Park)
Compaction cycles	Design air voids in laboratory compacted mix (%)					
50	4.0	N/A	N/A	N/A	N/A	N/A
80	N/A	4.0	N/A	N/A	N/A	4.0
120	N/A	4.0	4.0	4.0	4.0	4.0
250	N/A	>2.5	>2.5	>2.5	>2.5	N/A
350	N/A	N/A	N/A	TBR	N/A	N/A

The design air voids values are approximate and may be adjusted to account for rounding of the binder content value to the nearest +1.0%.

3.5.2. Marshall compaction

Mixes designed using Marshall compaction shall comply with the requirements of Table 5.

Table 5 - Marshall Properties and air voids for mixes designed using Marshall Compaction

Mix Type	1	2	3	4	5	6
Size (mm)	7	10	14	20 (A15E)	14 (A15E)	10 (Car Park)
Design air	4.0	5.0	5.0	5.0	5.0	4.0
Stability (min)	6	10	12	14	14	10
Flow (mm)	2–4	2–4	2–4	2–4	2–4	2–4
Refusal	N/A	N/A	N/A	>2.5	>2.5	N/A

Shall be compacted to 5% air voids within a tolerance of 1% air voids

Note: for heavy mix design use 75 blows for Marshall Stability and Flow testing, for refusal use 125 blows (per side)

3.6. Wheel track test requirements

Table 6 - Maximum wheel tracking depth

Mix Type	1	2	3	4	5	6
Size (mm)	7	10	14	20 (A15E)	14 (A15E)	10 (Car Park)

Traffic category	Maximum tracking depth Austroads Methodology					
Light traffic	N/A	N/A	N/A	N/A	N/A	N/A
Medium traffic	N/A	N/A	N/A	N/A	N/A	N/A
Heavy traffic	N/A	<2	<2	<2	<2	TBR

Wheel tracking test specimens shall be compacted to 5% air voids within a tolerance of 1% air voids. Total rut depth is determined after 10,000 cycles.

3.7. Mechanical testing

Shall be carried out for all Type 4 and 5 mixes

Table 7 – Mechanical Requirements

Test	Method	Limits
Tensile Strength Ratio – (after Freeze Thaw) (Wet) Tensile Strength	AG:PT/T232	80% Minimum 600 kPa Minimum

3.8. Asphalt mixes containing reclaimed asphalt pavement

Up to 10% of RAP may be incorporated in the design of Type 5 mixes and 15 % in Type 4 mixes, subject to meeting the design requirements as described Section 3.

Mixes for maintenance Type 2 asphalts may contain up to 25% RAP.

A RAP management plan shall be in place

4. Deep lift asphalt design

4.1. General

Deep lift asphalt pavements are defined as asphalt pavement installation measuring 80 mm or more in thickness.

Deep lift asphalt materials should be used in areas of high traffic flow and in areas of limited ability to close pavement segments for extended periods.

4.2. Mix design and asphalt material requirements

Table 8 – Deep Lift Parameters

Property	Test Method	Mix Type 4 – A15E	Mix Type 5 – A15E / A20E
Air Voids (%) - 120 Cycles Gyratory Compaction	AS 2891.2.2 AS 2891.7.1 or 7.3 AS 2891.8 AS 2891.9.2	4%	4%

Air Voids (%) - 250 Cycles Gyratory Compaction	AS 2891.2.2 AS 2891.7.1 or 7.3 AS 2891.8 AS 2891.9.2	≥ 2.5%	≥ 2.5%
Air Voids (%) - 350 Cycles Gyratory Compaction	AS 2891.2.2 AS 2891.7.1 or 7.3 AS 2891.8 AS 2891.9.2	Report	N/A
VMA (%) at 120 Cycles Gyratory Compaction	AS 2891.7.1 or 7.3 AS 2891.8 AS 2891.9.2	≥ 14%	≥ 15%
Binder Film Index (µm) Measured at 0.3% below Optimum nominated Design target	AGPT/T237	> 8.0	> 8.0
Filler / Binder Ratio		≥ 0.8 and ≤ 1.2	≥ 0.8 and ≤ 1.2
Moisture Sensitivity – Average Tensile Strength Ratio (%) Freeze Thaw method	AGPT-T232-07	> 80%	> 80%
(Wet) Tensile Strength	AGPT-T232-07	600 kPa minimum	600 kPa minimum
Deformation Resistance of Asphalt Mixtures by the Wheel Tracking Test Rut Depth following 10,000 cycles	AGPT-T231-06	< 2.0 mm	< 2.0 mm

5. Production trial and job mix design

A production trial shall be undertaken on the laboratory design mix to determine the Job Mix Design for all Type 4 and 5 mixes.

The production trial shall be used to verify the proportion of components, binder content, grading and Marshall Properties of the asphalt mix meeting the mix design requirements specified in Section 3 and conforming to the tolerance on finished asphalt properties specified in the DIPL standard specification for roadworks. Adjustments to the blend composition as a result of production trial shall be designated the Job Mix.