AUSTROADS SPECIFICATION AG:AM/S001

SPECIFICATION FOR PAVEMENT ROUGHNESS MEASUREMENT WITH AN INERTIAL LASER PROFILOMETER

1 SCOPE

1.1 Scope of specification

This specification provides minimum equipment, calibration, validation and survey method requirements for the conduct of network level pavement roughness measurement using an inertial laser profilometer.

This specification does not address all occupational health and safety issues associated with its use. It is the responsibility of the Supplier to operate in accordance with appropriate legislation.

1.2 Scope of works

(a) The list of the roads to be surveyed is attached to this specification as Annex 1.

(b) The location referencing system to be used to report final data is documented in Annex 2.

(c) The format for reporting of final data is documented in Annex 3.

2 ROLES

Table 1 outlines the roles of different parties considered in this specification.

Table 1: Roles of different parties considered in this specification

Role	Description
Client	the organisation for whom the roughness data is being collected
Contract Supervisor	the representative of the Client organisation
Supplier	the operators of the Profilometer system and the suppliers of the resultant data

3 REFERENCED DOCUMENTS

Austroads Test Method AG:AM/T001. Pavement roughness measurement with an inertial laser profilometer. March 2007.

Austroads Test Method AG:AM/T002. Pavement roughness validation checks for an inertial laser profilometer (reference device method). March 2007.

Austroads Test Method AG:AM/T003. Pavement roughness validation checks for an inertial laser profilometer (loop method). March 2007.

Austroads Test Method AG:AM/T004. Pavement roughness repeatability and bias checks for an inertial laser profilometer. March 2007.

4 EQUIPMENT

4.1 Minimum equipment specification

The inertial laser profilometer equipment to be used shall meet the minimum requirements in Austroads Test Method AG:AM/T001.

4.2 Calibration

The profilometer must be calibrated in accordance with the calibration procedure contained in Austroads Test Method AG:AM/T001.

4.3 Validation

(a) Profilometer equipment must be validated in accordance with Austroads Test Method AG:AM/T001.

(b) At any stage during the collection of data the last successfully passed validation must be within the last 12 months.

(c) Separate validations must be undertaken for each vehicle, driver and operator used to collect data. Conducting separate validations for all possible combinations of vehicle, driver and operator is not necessary.

(d) In accordance with AG:AM/T001, two validation procedures are permissible (AG:AM/T002 and AG:AM/T003) and, unless specifically otherwise directed by the Client, successful completion of either method shall be deemed to represent a successful validation.

(e) Unless specifically otherwise directed by the Client, it is not required that the validation trials be conducted on roads within the Client's jurisdiction.

5 SURVEY

5.1 Survey roads

Refer to Annex 1 for a detailed list of the roads to be surveyed.

5.2 Location referencing

Data must be reported in accordance with the location referencing system documented in Annex 2.

5.3 Survey procedure

Survey works must be conducted in accordance with AG:AM/T001.

5.4 Commencement of survey

5.4.1 Validation

Survey works must not commence until it has been demonstrated to the satisfaction of the Contract Supervisor that the calibration and validation requirements have been met.

5.4.2 Initial process quality assessment

For work in excess of 3,000 lane-km of total survey length, an initial process quality assessment must be undertaken prior to the commencement of the full survey. This will provide assurance that the entire survey exercise (from data collection to handover of final data) meets the Client's requirements. It also allows the Client to conduct data quality checks against existing records. A minimum of 100 lane-km of the total survey network must be surveyed and the data processed and submitted to the Client in the required data formats.

5.5 Ongoing repeatability and bias

(a) Assessment of the repeatability of measurements and bias error is undertaken, in accordance with AG:AM/T004, as part of the validation process (see 4.3).

(b) Subsequent to the validation process, AG:AM/T004 must be repeated, and its acceptance limits re-passed, on an ongoing basis, at an interval of no greater than 30 days (unless otherwise agreed by the Client). It is not required that these ongoing checks be performed by each driver/operator/vehicle combination.

(c) AG:AM/T004 must be repeated, and its acceptance limits re-passed, following any changes to the survey equipment or host vehicle that could affect the measurements taken.

6 REPORTING

Data must be recorded in accordance with the minimum reporting requirements listed in Austroads Test Method AG:AM/T001, and be presented to the Client in accordance with the data reporting format documented in Annex 3.

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ANNEX 1 – LIST OF ROADS TO BE SURVEYED

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SPECIFICATION FOR PAVEMENT ROUGHNESS MEASUREMENT WITH AN INERTIAL LASER PROFILOMETER

ANNEX 1 – LIST OF ROADS TO BE SURVEYED

GUIDANCE

The Client must replace this page with either a detailed list of the roads to be surveyed, or a cross reference to such a list in another location within the contract documentation.

The minimum information that must be provided is as follows:

- names of road lengths to be tested
- lengths of roads
- test carriageways and lanes
- designated start and end points of each road
- identification fields used to uniquely identify the road lengths within the location reference system used by the Client (refer Annex 2).

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ANNEX 2 – LOCATION REFERENCING SYSTEM

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ANNEX 2 – LOCATION REFERENCING SYSTEM

GUIDANCE

The Client must replace this page with detailed documentation of the location referencing system to be used in the reporting of data, or a cross reference to such documentation within the contract documentation.

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ANNEX 3 – DATA FORMAT

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ANNEX 3 – DATA FORMAT

GUIDANCE

The Client must replace this page with detailed documentation of the data format(s) to be used in reporting the collected survey data, or a cross reference to such documentation within the contract documentation.

As a minimum the data format documentation must include the following:

- data file type to be used (e.g. ASCII text file, Microsoft Access database (including version), etc.)
- file header information
- for each data field:
  - name of field
  - description
  - data type
  - length/precision of field.

EXAMPLE FORMAT DOCUMENTATION

Data file definition

Data file type: Microsoft Access 2003 database
Data fields: The following data to be reported every 100 m

Database field description	Field name	Field format	
Primary key (unique) calculated as: (Road number * 10,000,000) + (Link * 1,000) + (CH_FR) + 'Survey number' + 'Direction' + 'Data flag'	PKEY	Text	20 characters
Road number	ROAN	Number	Integer
Link number	LINK	Number	Integer
Distance from start of link to start of the interval (km)	CH_FR	Number	Float (3 decimals)
Distance from start of link to end of the interval (km)	CH_TO	Number	Float (3 decimals)
Length of interval (km) calculated as CH_TO – CH_FR	LENGTH	Number	Float (3 decimals)
Carriageway code: A: Undivided road B & C: Divided road R – Z: Ramps	CC	Text	1 character
Carriageway version (denotes how many times the link on that carriageway has been altered): 1: original version 2: amended once 3: amended twice etc.	CWYV	Number	Integer
Lane code: direction surveyed: P: Prescribed C: Counter	DIRN	Text	1 characters
Lane code: through lane number (starting at median lane), e.g.: 1: median lane 2: middle lane 3: kerb lane	LCODE	Text	3 characters
Contract code defined by Client	CCODE	Text	5 characters
Supplier code defined by Client	SCODE	Text	5 characters
Survey vehicle registration number	REGO	Text	10 characters
Operator's identification (initials)	OPERATOR	Text	4 characters
Survey date	DATE	Date	dd/mm/yyyy
Survey time	TIME	Time	hh:mm:ss
Mean vehicle speed for interval (km/h)	SPEED	Number	Integer
Survey number for link (sequential from A to Z)	SNUM	Text	1 character
Data flag: A: Valid data L: Discrepancy in length Z: Invalid data (refer to following table)	DFLAG	Text	1 character
Event code (refer to following list)	ECODE	Text	1 character
Comments	COMM	Text	68 characters
IRI roughness value (outer quarter car)	IRI_O	Number	Float (2 decimals)
IRI roughness value (inner quarter car)	IRI_I	Number	Float (2 decimals)
IRI roughness value (average lane quarter car)	IRI_L	Number	Float (2 decimals)

Data flag

Survey data is marked as invalid, and must be flagged in the database, for occurrences of the following events:

- data is collected when the equipment is not complying with the quality plan
- data is collected during periods of rain
- the level of sensor signal 'drop out' exceeds 5% of the number of samples for each reporting interval
- when more than 50% of the data within the reporting interval is collected:
  - when the road surface is wet
  - outside the speed constraints of the equipment.

Event code

Event code	Description	Extent
Valid data		
B	Bridge abutment	Discrete event
X	Railway crossing	Discrete event
P	Partial stop (i.e. speed below specified limit for part of interval)	Discrete event
E	Extraordinary event	Also describe in the comments field
O	Change from the nominated lane	Each data item affected
Invalid data		
W	Road works (inc. sidetracks, roads under construction or repair, road opening, temporary cover, etc.)	Each data item affected
S	Speed or distance outside the limits identified in quality plan	Each data item affected
D	Sensor drop off exceeds specified limit	Each data item affected
U	Unsealed road	Each data item affected

AMENDMENT RECORD

Amendment No.	Sections amended	Action [1]	Date
1 (Initial release)	All (Michael Moffatt, ARRB)	New	26 March 2007

[1] Key:

Format	change in format
Substitution	old section removed and replaced with new section
New	insertion of new section
Removed	old section removed