TRANSPORT FOR NSW (TfNSW)

QA SPECIFICATION M921

MEASUREMENT OF LONGITUDINAL LINEMARKING BY MOBILE RETROREFLECTOMETER

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REVISION REGISTER

Ed/Rev Number	Clause Number	Description of Revision	Authorised By	Date
Ed 1/Rev 0		First issue.	GM, IC	28.07.10
Ed 1/Rev 1		Specification reference number changed from R421 to M921.	MCQ	22.11.18
Ed 1/Rev 2	1.2.2	Deleted.	MCQ	30.08.19
	1.2.7	"Database Format" changed to "Report Data File Format".		
	3.1	Data collection requirements updated.		
	4.1	Survey data to be submitted electronically instead of via DVD/CD.		
	Annex A	A1 – nominal reporting interval changed from "25 m" to "1 m".		
		A2 – deleted.		
		A3 – Reference to Guide Notes removed.		
	Annex B	Pay Item P1 – "25 m" intervals changed to "1 m" intervals.		
	Annex L	Retitled and updated.		
Ed 1/Rev 3	Global	References to "Roads and Maritime Services" or "RMS" changed to "Transport for NSW" or "TfNSW" respectively.	DCS	22.06.20

GUIDE NOTES
(Not Part of Contract Document)

ANNEXURE M921/A3 – SCHEDULE OF WORK

Tender documenter should insert details of roads to be surveyed in Annexure M921/A3.

An example is given on the following page:

EXAMPLE OF A SCHEDULE OF WORK:

Road	Link	Dirn	Lane	Roadname	Start_Desc	End_Desc	Lane Length	CC	Cwy Ver	Link Length	Lane Function
10	150	P	1	Pacific Hwy, Crows Nest	Alexander St, Crows Nest	Falcon St (MR 164), Crows Nest	0.152	B	2	0.152	Through Lane
10	150	P	2	Pacific Hwy, Crows Nest	Alexander St, Crows Nest	Falcon St (MR 164), Crows Nest	0.152	B	2	0.152	Through Lane
10	150	C	1	Pacific Hwy, Crows Nest	Alexander St, Crows Nest	Falcon St (MR 164), Crows Nest	0.152	C	2	0.152	Through Lane
10	150	C	2	Pacific Hwy, Crows Nest	Alexander St, Crows Nest	Falcon St (MR 164), Crows Nest	0.152	C	2	0.152	Through Lane
10	150	C	3	Pacific Hwy, Crows Nest	Alexander St, Crows Nest	Falcon St (MR 164), Crows Nest	0.1	C	2	0.152	Bus Lane

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FOREWORD

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REVISIONS TO PREVIOUS VERSION

This document has been revised from Specification TfNSW M921 Edition 1 Revision 2.

All revisions to the previous version (other than minor editorial and project specific changes) are indicated by a vertical line in the margin as shown here, except when it is a new edition and the text has been extensively rewritten.

PROJECT SPECIFIC CHANGES

Any project specific changes are indicated in the following manner:

(a) Text which is additional to the base document and which is included in the Specification is shown in bold italics e.g. ***Additional Text***.

(b) Text which has been deleted from the base document and which is not included in the Specification is shown struck out e.g. ~~Deleted Text~~.

TfNSW QA SPECIFICATION M921

MEASUREMENT OF LONGITUDINAL LINEMARKING BY MOBILE RETROREFLECTOMETER

1 GENERAL

1.1 SCOPE

The work to be executed under this Specification consists of the collection of data on dry night retroreflectivity of longitudinal line markings across a network of surfaced roads using a vehicle mounted with Mobile Retroreflectometer, including:

(a) detection and measurement of dry night retroreflectivity by capture and analysis of light reflected from the stripes;

(b) analysis in real time of the dry night retroreflectivity data;

(c) analysis and provision of the processed data in the specified formats and Intervals.

1.2 STRUCTURE OF THE SPECIFICATION

This Specification includes a series of annexures that detail additional requirements.

1.2.1 Project Specific Requirements

The requirements for the survey work on the road network are stated in Annexure M921/A1.

A Schedule of Work detailing the roads to be surveyed is included in Annexure M921/A3.

1.2.2 (Not Used)

1.2.3 Measurement and Payment

The method of measurement and payment must comply with Annexure M921/B.

1.2.4 Schedules of HOLD POINTS, WITNESS POINTS and Identified Records

The schedules in Annexure M921/C list the **HOLD POINTS** and **WITNESS POINTS** that must be observed. Refer to Specification TfNSW Q for the definitions of **HOLD POINTS** and **WITNESS POINTS**.

The records listed in Annexure M921/C are **Identified Records** for the purposes of TfNSW Q Annexure Q/E.

1.2.5 Technical Requirements

Technical requirements are specified in Annexure M921/E.

1.2.6 Validation Method

The method for validating each mobile retroreflectometer and driver combination is specified in Annexure M921/F.

1.2.7 Report Data File Format

Report Data File format is specified in Annexure M921/L.

1.2.8 Referenced Documents

Unless specified otherwise, the applicable issue of a referenced document, other than a TfNSW Specification, must be the issue current at the date one week before the closing date for tenders, or where no issue is current at that date, the most recent issue.

Standards, specifications and test methods are referred to in abbreviated form (e.g. AS 2350). For convenience, the full titles are given in Annexure M921/M.

1.3 PLANNING DOCUMENTS

Ensure that all the requirements in the Specification are incorporated into the PROJECT QUALITY PLAN and that the PROJECT QUALITY PLAN is implemented. The Inspection and Test Plan must nominate the proposed testing frequency to verify conformity of the item.

1.4 DEFINITIONS AND ACRONYMS

The terms "you" and "your" mean "the Contractor" and "the Contractor's" respectively. "TfNSW" is the Transport for NSW.

The following definitions and acronyms apply to this Specification:

Counter Direction	The opposite direction of travel to the "Prescribed" direction (refer to TfNSW Guide "RAMS – Lane Numbering")
Event	Instance encountered during the survey that may affect the data being collected and make it untypical of the road Interval
Mobile Retroreflectometer	Vehicle specially equipped with retroreflectivity test equipment
Interval	The distance that data is to be aggregated and reported in the database
Line Types	Refer to Specification TfNSW R145 Appendices 1, 2, 3 and 5
Longitudinal Marking	All lines that are generally parallel to the traffic flow, such as centre, lane, edge, turn, continuity and transition lines and outline markings
Prescribed Direction	The direction of travel that TfNSW defines, by convention, as the standard direction for each of its roads (refer to TfNSW Guide "RAMS – Lane Numbering")

Road Occupancy Licence	Allows the proponent to use a specified road space at approved times, provided certain conditions are met. The licence applies to the occupation of the "road space" only and does not imply permission or approval for the actual (physical) works being undertaken
Stripe	That part of longitudinal pavement marking comprising pavement marking material
Transverse Marking	All lines that are marked at right angles to the general traffic flow, such as "Stop/Give Way" lines and pedestrian crosswalk lines
RIAA	Roadmarking Industry Association of Australia
ROADLOC	The name given to the Linear Referencing System used by the TfNSW (refer to RAMS – Linear Referencing)
WGS84	World Geodetic System 1984

2 EQUIPMENT

2.1 GENERAL

Measurement and data recording of the retroreflectivity must be made using a Mobile Retroreflectometer mounted on a vehicle that travels at normal road speed. The retroreflectometer must comply with the requirements of Clause 2.2.

All measuring equipment must be calibrated and maintained in good working order.

Provide traffic control devices mounted on the vehicle (e.g. signposting, lights) and any other items required for the Work in accordance with the requirements of the Contract.

2.2 RETROREFLECTOMETER

Mobile Retroreflectometer must be in accordance with AS 4049.4 Appendix K, except where:

(a) Only geometry K3.1(c) is specified;

(b) K3.2 and K3.3 are not required;

(c) Procedure K4.1 Method 1 - Dry testing is used.

The Retroreflectometer must be able to:

(i) determine the dry retroreflectivity of stripes on all sealed pavement surface types (i.e. bituminous seal, asphalt or concrete);

(ii) measure the coefficient of retroreflected luminance as millicandella/square metre/lux ($mcd/m^2/lux$);

(iii) be configured for 30 m geometry in accordance with AS 4049.4 Appendix K3.1(c);

(iv) survey at road speeds of up to 80 km/hr with adequate sampling rate to ensure complete coverage;

(v) process data in real time and store data during the survey;

(vi) be positioned to collect linemarking on either side of the traffic lane;

(vii) filter out the effects from raised pavement markers and the unmarked pavement surface.

The Retroreflectometer must have been calibrated using a national traceable standard within 12 months prior to the commencement of work.

The PROJECT QUALITY PLAN must include the procedure for an operator to monitor the lines and data in real time to ensure that the equipment is correctly aligned and functioning.

2.3 LOCATION REFERENCING DEVICE

Use GPS equipment to capture the location of each data point as co-ordinates. Specify in the PROJECT QUALITY PLAN the coordinate system used by the GPS equipment (e.g. WGS84).

The GPS equipment must comply with the requirements specified in Table M921.1.

Table M921.1 – Minimum Equipment Requirements for GPS

Parameter	Requirements
Instrument Type	GPS (preferably Differential GPS)
Resolution	Data to be provided in decimal degrees either to double precision or with a minimum of 6 decimal places
Minimum Sampling Rate	1 Hz (preferably 4 Hz or better)
Operating Temperature Range	0°C - 40°C

Use the TfNSW terminology for Lane Code, as defined in the document “RAMS – Lane Numbering”, to describe the direction and lane of travel.

Your PROJECT QUALITY PLAN must include procedures for:

(a) Identification of both the longitudinal and transverse locations of the linemarking to enable test data to be traceable to the actual linemarking;

(b) Validation of the accuracy of the GPS data at any data point;

(c) Locating data point in areas where GPS coverage is unavailable or substandard;

(d) Analysis of GPS locations to verify direction and line identification entered by the operator;

(e) Systematic collection of all lines specified.

2.4 OPERATOR INTERFACE

The electronic data acquisition system of hardware and software must facilitate real time interaction with the operator to provide:

(a) Heading data;

(b) Events;

(c) Comments.

Use Event Codes listed in Annexure M921/E1 to identify each data record affected by the event. Events must be immediately recorded and their locations referenced while the survey is in progress.

3 DATA COLLECTION

3.1 GENERAL

Data Collection includes calibration, validation, survey of roads using the Mobile Retroreflectometer and Close-out (refer Clause 6).

Collect data for the following longitudinal linemarking, delineating the lanes of the roads nominated in the Schedule of Work (refer Annexure M921/A):

(a) Dividing Lines (e.g. Line Types: S1, S2, BB, BS, BS1, BB1, BB2, BB3; tested in both directions);

(b) Lane Lines (e.g. Line Types: L1, L2, L3, L4, L5, L6);

(c) Continuity Lines (e.g. Line Type: C1);

(d) Edge Lines (e.g. Line Types: E1, E2, E3, E4, E5, E6).

Unless otherwise directed by the Principal, data collection on a single carriageway (two lane two way road) necessitates only measurement of barrier or separation line (S1, BS, or BB or enhanced varieties) in one direction only. The measurement can be carried out in either the P (Prescribed) direction or C (Counter) direction, whichever is convenient. If it is safe to do so, carry out measurement also at the overtaking lane sections (i.e. stay in fast lane to measure barrier line).

For data collection on dual carriageways (divided), measure the lane line (L1) only on the slower lane in one direction only. Measurement on the other carriageway lane line is not required. The lane line can be measured in either the P direction or C direction, but not both.

Measurement at On or Off ramps is not required.

3.2 OPERATION OF MOBILE RETROREFLECTOMETER

Operate the Mobile Retroreflectometer in accordance with the manufacturer's instructions, with the linemarking consistently centred and the correct speed range maintained. Operate the equipment only in dry weather conditions and in the absence of spray from tyres.

Use only combinations of Mobile Retroreflectometer and driver complying with the requirements of the Validation Test (refer to Clause 3.7).

To comply with Work Health and Safety (WHS) requirements, include driver fatigue management and breaks at 2 hours intervals maximum.

3.3 "GREEN LIGHT" RUNS

In carrying out survey for the Principal, you are not accorded any special privileges in the use of the roadways. Obey all traffic laws during the survey.

In order to minimise stopping during the survey, you may propose periods of specific "green light" runs. Submit your proposal to the Principal at least 14 days prior to the proposed date of survey. You are not entitled to an extension of time or additional costs should your proposal be rejected by the Principal.

Where the Work requires testing of specially designated lanes (e.g. Bus Lanes, Transit Lanes), seek permission from the Principal in advance to carry out the test. Liaise with the TfNSW' Transport Operations Room during the survey.

3.4 CONTRACT PROGRAM

At least 7 days before the proposed commencement of survey, submit to the Principal your program showing the order in which survey of the road network under the Contract will be carried out.

The Contract Program must detail the roads to be surveyed by the date, the equipment and personnel involved, and when data will be available to the Principal. For surveys estimated to take 2 weeks or less to complete, the Contract Program does not need to specify survey dates.

The Contract Program must allow for:

(a) Meeting WHS and traffic management requirements;

(b) Time taken to process applications (such as for "Green light" runs);

(c) Conditions for the "green light" runs (refer to Clause 3.3);

(d) Limitations due to Tidal Flow configuration;

(e) Difficulty of work along kerbside lanes due to parked vehicles.

HOLD POINT

Process Held:	Commencement of survey.
Submission Details:	At least 7 days before the proposed commencement of survey, submit to the Principal the following: (a) Contract Program; (b) Annual calibration against a national traceable standard (e.g. RIAA primary reference plate).
Release of Hold Point:	The Principal will consider the submitted documents prior to authorising the release of the Hold Point.

3.5 PROGRESS REPORT

At the frequency specified in Annexure M921/A1, submit progress reports to the Principal that include:

(a) Progress against the Contract Program (e.g. a list of roads completed and current locations);

(b) Notification of any nonconformity identified during the implementation of the approved PROJECT QUALITY PLAN (refer to TfNSW Q);

(c) Progress with data processing;

(d) Other issues.

3.6 CALIBRATION

Include in the PROJECT QUALITY PLAN the following:

(a) A static calibration of the Mobile Retroreflectometer against:

(i) An RIAA or equivalent secondary reference plate at least at the beginning of each day;

(ii) A calibrated hand-held Retroreflectometer on an actual line at a distance in common with the Mobile Retroreflectometer at least every day.

(b) Daily check of the fixing and position of the Retroreflectometer unit.

Check the vehicle tyre pressures daily and maintain the suspension system to avoid excessive body movement.

3.7 VALIDATION

At the commencement of the survey, conduct a Validation Test to demonstrate conformity of the Mobile Retroreflectometer and driver and the PROJECT QUALITY PLAN. In addition, the Principal may require a Validation Test where:

(a) Nonconformity occurs in a Validation Test;

(b) In the PROJECT QUALITY PLAN, Mobile Retroreflectometer or driver is changed;

(c) Work does not comply with the Specification.

The Principal will nominate a length of road as the Validation Site that:

(i) Contains a sample of either dividing lines, edgelines or lane lines;

(ii) Has a length of 2.0 to 3.0 lane km.

WITNESS POINT

Process Witnessed: Validation Test.

Submission Details: At least 3 days notification of intention to test the Validation Site.

Test the Validation Site with each combination of Mobile Retroreflectometer and driver.

Supply all the data collected from the Validation Site in accordance with Annexure M921/L. Populate all fields with the actual data recorded.

The Principal will assess the repeat runs at the Validation Site for each Mobile Retroreflectometer and driver combination in accordance with the procedure in Annexure M921/F. Where the absolute percentage difference of the validation value of any run, when compared to the average of the 3 runs, does not meet the criterion in Table M921.2, the data collected by the Mobile Retroreflectometer and driver is nonconforming.

Until the nonconformity is rectified and Validation Test conforms, the Mobile Retroreflectometer and driver are deemed to be nonconforming.

Table M921.2 – Conformity Criterion

Criterion	Maximum Value
Absolute Percentage Difference (%)	≤ 7.5

The data submitted also forms the basis for assessing the Close-out in Clause 6.

Conforming results from the Validation Test may be used to report a site included in the Schedule of Work.

4 REPORTING

4.1 DATA REPORT

Data reporting includes processing of data following the survey, quality verification, flagging, calculations, storage of the data into the specified database format and supplying of data. The nominal reporting interval is specified in Annexure M921/A1, but is at the discretion of the Principal for each survey.

Submit the first data report within 14 days of data collection from the field and subsequent data reports at a consistent rate thereafter within 28 days of data collection. Survey data must be in accordance with Annexure M921/L.

Comply with the following:

(a) Data to be reported at the nominated distance interval;

(b) The conformity of the data collected and processed during the survey to be assessed against the PROJECT QUALITY PLAN;

(c) Data to be flagged in accordance with Clause 5.2.

At completion of survey, submit to the Principal a complete set of survey data in accordance with Annexure M921/L, via secure electronic file transfer.

Retain all numeric and text data arising from the survey and the means of reprocessing the data for a period of 5 years from the completion date of each survey.

4.2 PROCESSING DATA

Process the data in the data report to provide the retroreflectivity data specified in Annexure M921/L. Use conforming data only to determine and report the data items.

Where an Interval has more than one type of Event Code, report the worst case Event Code for the Interval (e.g. an Event code that makes the nonconforming data taking precedence over others). Include the relative importance of Event Codes in the PROJECT QUALITY PLAN. Where the capability to report multiple Event Codes exists, then report all applicable Event Codes.

Exclude data which is a duplicate of the test results for longitudinal lines, except for dividing lines where testing in both directions is required.

In addition, the following applies where multiple lanes in the same direction of traffic are also part of the survey:

(a) Any sections of linemarking which have not been tested must be recorded as “Missing Data”;

(b) Data from an adjacent lane must not be used as a substitute to replace “Missing Data”.

5 CONFORMITY

5.1 GENERAL

Use statistical analysis generally to assess conformity over all the Work.

The Lot that is referred to in TfNSW Q corresponds to the data from a continuous run that has been collected.

Data is nonconforming where it is determined from < 95% of the total possible samples for the Interval. Report such nonconforming data (i.e. data reported as -99) as "Missing Data".

When requested by the Principal, provide the survey data from the specified sections to enable auditing of the (survey) results against a calibrated hand-held Retroreflectometer. The corresponding average Mobile Retroreflectometer readings for the linemarking over 100 m must be within ± 15% of a sample of 20 handheld Retroreflectometer readings.

5.2 DATA FLAGS

All data that is processed into the required Interval must be flagged in the data file by the Data Flags shown in Table M921.3. Nonconforming data includes, but is not necessarily limited to, the following:

(a) Data collected not complying with the requirements of the Specification, including:

  (i) Outside speed constraints;

  (ii) With the road surface being too wet;

  (iii) With linemarking out of range;

(b) Data collected through a lane with roadworks;

(c) Data collected by a nonconforming Mobile Retroreflectometer and/or driver.

Table M921.3 – Data Flags for Processed Data

Type	Data Flag	Extent	Examples
Conforming data	A	Each Interval	
Nonconforming data	Z	Each Interval	Roadworks Linemarking out of range

5.3 NONCONFORMITY REPORT

Submit a Nonconformity Report in accordance with TfNSW Q for all nonconforming data. The minimum details to be included in the report are as follows:

(a) Details of Nonconformity;

(b) Date;

(c) Road Name/Number;

(d) Horizontal Coordinates of the Location Reference;

(e) Direction and Lane affected;

(f) Reasons of Nonconformity;

(g) Proposed rectification;

(h) Corrective action.

5.4 DISPOSITION OF NONCONFORMITIES

The minimum extent of network reported that may be accepted by the Principal is specified in Annexure M921/A1. The Principal may accept rectification of data by reprocessing the data where you can demonstrate that the PROJECT QUALITY PLAN has not been followed in processing the data.

Nonconformities in the data items may be accepted by the Principal if the length that contains nonconforming data is excluded from payment.

6 CLOSE-OUT

Notify the Principal of the date of completion of the required field work (i.e. the collection completion date).

Within 28 days of the collection completion date, conduct Close-out by retesting the Validation Site (refer to Clause 3.7) for 3 consecutive runs with each Mobile Retroreflectometer and driver combination which has been used for the survey.

WITNESS POINT

Process Witnessed:	Close-out.
Submission Details:	At least 3 days' notification of intention to Close-out and test the Validation Site.

HOLD POINT

Process Held:	Completion of the survey.
Submission Details:	Within 5 days of completing Close-out and testing Validation Site, submit all the data collected from the Validation Site in accordance with Annexure M921/L, clearly identifying each Mobile Retroreflectometer and driver combination. Submit also the Calibration of Retroreflectometer carried out on the day of testing of the Validation Site.
Release of Hold Point:	The Principal will consider the absolute percentage difference values from the Close-out survey and the Validation Site for each Mobile Retroreflectometer and driver combination prior to authorising the release of the Hold Point.

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Where the absolute percentage difference of the validation value of any run, when compared to the average of the 3 runs, does not meet the criterion in Table M921.2, the data collected by the Mobile Retroreflectometer and driver is nonconforming.

ANNEXURE M921/A – PROJECT SPECIFIC REQUIREMENTS AND INFORMATION

A1 REQUIREMENTS

Clause	Item Description	Requirement
1.2.1	Location of Work	TfNSW road network.
1.2.1	Schedule of Work detailing roads to be surveyed (refer Annexure M921/A3)	The Location References for the Start and End of each road section to be surveyed.
4.1	Frequency for progress report	Each 2 weeks
4.1	Nominal reporting interval	1 m
5.4	Retroreflectivity – Minimum extent of Road Network to be reported	95% of the total nominated linear kilometres

A2 (NOT USED)

A3 SCHEDULE OF WORKS:

Road	Link	Dirn	Lane	Roadname	Start_Desc	End_Desc	Lane Length	CC	Cwy Ver	Link Length	Lane Function

ANNEXURE M921/B – MEASUREMENT AND PAYMENT

Refer to Clause 1.2.3.

Payment will be made for all costs associated with completing the work detailed in this Specification in accordance with the following Pay Item.

Where no specific pay items are provided for a particular item of work, the costs associated with that item of work are deemed to be included in the rates and prices generally for the Work Under the Contract.

A lump sum price for this item will not be accepted.

Pay Item M921P1 - Retroreflectivity Data

This item covers all costs associated with collection, processing, storage and reporting of Retroreflectivity Data at 1 m intervals.

The unit of measurement is the linear kilometre of longitudinal linemarkings.

The length must be measured along the centrelines of the longitudinal linemarkings. Only conforming Retroreflectivity Data at 1 m intervals along the longitudinal linemarkings on the roads shown in the Schedule of Work will be measured for payment. The length includes any longitudinal spaces between the lines, as required by the line type, and the first of the 3 consecutive runs for Close-out.

Where the line type comprises multiple lines, only one line must be measured.

For Dividing Lines where both directions are tested, i.e. Line Types S1, S2, BB, BS, BS1, BB1, BB2, BB3, the length must be measured in both directions.

The length must exclude:

(a) Validation Site;

(b) Second and subsequent surveys for Close-out;

(c) Nonconforming or rejected data;

(d) Missing data;

(e) Duplication of data except for Dividing Lines;

(f) Parking Restriction Lines, Turn Lines and Bicycle Lines;

(g) Transverse Lines.

ANNEXURE M921/C – SCHEDULES OF HOLD POINTS, WITNESS POINTS AND IDENTIFIED RECORDS

Refer to Clause 1.2.4.

C1 SCHEDULE OF HOLD POINTS AND WITNESS POINTS

Clause	Type	Description
3.4	Hold	Submission of annual calibration against the RIAA primary reference plate, and Contract Program.
3.7	Witness	Validation Test.
6	Witness	Close-out and retesting Validation Site.
6	Hold	Submission of all data from Validation Site, clearly identifying each Mobile Retroreflectometer and driver combination and Calibration of Retroreflectometer completed on the day the Validation Site was tested.

C2 SCHEDULE OF IDENTIFIED RECORDS

The records listed below are Identified Records for the purposes of TfNSW Q Annexure Q/E.

Clause	Description of Identified Record
2.2	Calibration reports including: (a) Retroreflectometer; (b) Geometry alignment.
3.7	Test data of the Validation Site.
4.1	Data collected from the Mobile Retroreflectometer.
6	Test data at Close-out.

ANNEXURE M921/D – PLANNING DOCUMENTS

Refer to Clause 1.3.

The following documents are a summary of documents that must be included in the PROJECT QUALITY PLAN. The requirements of this Specification and others included in the Contract must be reviewed to determine additional documentation requirements.

Clause	Description
2.2	Procedure for an operator to monitor lines and data
2.3	Procedures for locations of data collected
3.4	Contract Program
3.6	Calibration of Mobile Retroreflectometer
4.2	Relative importance of Event Codes
Annexure M921/E	Method of and situations for recording specific Event Codes

ANNEXURE M921/E – TECHNICAL REQUIREMENTS

E1 EVENT CODES

Event Codes to record specific event during the survey must be recorded by the data acquisition system. The PROJECT QUALITY PLAN must define how and when the specific Event Codes in the following table are recorded.

Code	Event
1	Wet Road
2	Possible Damp Road
3	Thru Town
4	No Line
5	No Edge Line
6	Intersection
7	Turn Lane
8	Bridge
9	Roadworks
10	Other Event

ANNEXURE M921/F – VALIDATION METHOD

F1 PROCEDURE

To validate the measurements recorded by each mobile retroreflectometer, the specified Validation Site must be measured three (3) times by each mobile retroreflectometer and driver combination. The data collected on each run is then analysed to verify consistent performance.

F2 ANALYSIS

Take the results for each interval recorded along the Validation Site run and calculate the average retroreflectivity value for run. This average is designated as the Validation Value (**VV**) for the run. After calculating $\mathbf{VV_{Run1}}$, repeat this process for the second and third run, obtaining $\mathbf{VV_{Run2}}$ and $\mathbf{VV_{Run3}}$.

Calculate the average VV for the three runs using the formula

$$\mathbf{VV_{Ave}} = \frac{\mathbf{VV_{Run1} + VV_{Run2} + VV_{Run3}}}{3}$$

Calculate the Absolute Percentage Difference of the VV from the VV_{Ave} for each run

$$\textbf{Absolute Percentage Difference (\%)} = \frac{\mathbf{|\,(VV_{Run} - VV_{Ave})\,|} \times \mathbf{100}}{\mathbf{VV_{Ave}}}$$

Verify that the Absolute Percentage Difference calculated for each run is less than or equal to 7.5%.

ANNEXURES M921/G TO M921/K– (NOT USED)

ANNEXURE M921/L – REPORT DATA FILE FORMAT

Supply survey data to the Principal as a single text file with comma-separated values (csv file) and in a single table in Microsoft Access database format. Also supply the original, unaltered spreadsheet files to facilitate cross-checking.

The data parameters required are described in the following table.

FIELD NAME	DATABASE FIELD DESCRIPTION	FIELD FORMAT
Road	The Road Number of the road surveyed	Long Integer
Roadname	Name of road	String
Dirn	Direction "P" – Prescribed or "C" – Counter	String
Description	Text description of road and direction of travel	String
Driver	Name of the Driver of Mobile Retroreflectometer	String
Survey_Date	Date of Survey	String
Chain	Distance (in km) from starting at zero measured by distance transducer	Double
Speed	Speed of vehicle (km/hr)	Single
Dflag	Data Flags (inserted after data is processed)	String
Ecode	Event code flag	String
RL	Average Retroreflectivity for the interval	Single
Width	Width in centimetres, if available	Single
Daylight contrast	Daylight contrast value, if available	Single
Left_SD	Std Dev of Retroreflectivity for the interval	Single
Comment	Additional field for recording comments	String
Time	Local Time of survey	String
Long_GPS	Longitude Coordinate for reading	Double
Lat_GPS	Latitude Coordinate for reading	Double
Alt_GPS	Altitude Coordinate for reading	Double
Temp	Temperature in °C.	Single

Where ROADLOC is used, the following fields are required:

Link	Link Number corresponding to record	Integer
CC	Link Carriageway Code	Integer
Cway	Link Carriageway Version number	Integer

ANNEXURE M921/M – REFERENCED DOCUMENTS

Refer to Clause 1.2.8.

TfNSW Specifications

TfNSW Q	Quality Management System
TfNSW R145	Pavement Marking (Performance-Based)

TfNSW Guides *

RAMS – Linear Referencing

RAMS – Lane Numbering

* *Available upon request from the Principal*

Australian Standards

AS 4049.4	Paints and related materials – Pavement marking materials - High performance pavement marking systems