STATE CONTROL SURVEY

SPECIFICATIONS FOR

PRIMARY CONTROL SURVEYS

Now Obsolete

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Produced by Department of Lands 1984
NEW SOUTH WALES

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SPECIFICATION
for
PRIMARY CONTROL SURVEYS

General Description of Contract

PART 1

1. Statement of Work

(a) The Consultant shall furnish all personnel, materials, instruments and necessary equipment except where expressly stated otherwise and provide all transportation necessary for the satisfactory performance of the contract. He shall execute and complete the assigned survey in an expeditious and professional manner. The survey shall be effected personally by a Registered Surveyor in the form specified to the satisfaction of the Surveyor General in accordance with this specification, other written advices and sound survey practice.

(b) The Surveyor General shall furnish to the Consultant a specific instruction, all necessary illustrative maps, field books, location diagrams, trigonometrical charts and schedule of stations to be occupied.

2. Accuracy

The survey is to establish State Control Survey marks to primary standards.

Maximum permissible deviation from standard is 3 millimetre for lines to 100 metre and other lines 5 millimetre + 7 p.p.m. (parts per million). Horizontal directions to accord with distance measuring accuracy.

Vertical angles are required for the determination of the provisional heights of occupied stations and to enable distance measures to be reduced to the datum plane.

Where field tests are made, the mean value will be adopted for comparison. A standard deviation of 5" for major verticals is expected.

The routines detailed in the specifications and appendices are designed to achieve the specified standards.

3. Instruments and Equipment

(i) The survey shall be effected with modern instruments of a type approved by the Surveyor General. Before commencing the survey, the Surveyor must notify the Surveyor Genera1of the equipment which will be used. In general terms, this consists of the make, model, year of manufacture and date of purchase of the undermentioned instruments.

(a) A single second reading Theodolite
(b) An electro-optical Distance Measuring Unit
(c) Reflecting Prisms and Targets
(d) An aspirated psychrometer

(e) An aneroid barometer
(f) Steel or invar tape or band.

(ii) Specifications for Instruments and Equipment

(a) Theodolite
A single second reading theodolite in good order and adjustment is required for major angles directions and vertical observations.

The instrument should be carefully levelled before any observations are made. Appendix 'A' is attached for guidance.

All Optical Plummets should be tested to ensure their accuracy.

(b) Distance Measurer and Reflectors

and

(c) Calibration of the Distance Measuring unit will be required. The instrument constant and reflector prism constant must be reported to the Surveyor General together with the supporting documents.

The instrument constant must be tested each week and testing data entered in the field book.

A method of obtaining instrument constant is detailed on the attached Appendix 'A'.

(d) Psychrometers

The aspirated type psychrometers, containing two thermometers reading in degrees Celsius, are required. Wet bulb temperature is not required and the two thermometers should be read as dry temperature.

(e) Aneroid Barometers

A reliable aneroid barometer, reading in millimetres or millibars should be used. The instrument should be tested and in correct adjustment. A certificate or statement of test is required.

(f) Steel or Invar tape or band

A certificate of test for each tape or band is required.

(iii) Units

All distances are to be recorded in International Metres and angles in the sexagesimal system.

(iv) Recommended Practices

In the event of any doubt, uncertainty or circumstances where departure from these instructions or specifications appear desirable, reference should be made to the Surveyor General or District Surveyor, Survey Control Branch, for clarification or consent.

4. Commencement and Progress

The Consultant is to commence the survey as soon as practicable after receipt of the instruction and continue the work in a methodical manner until it is completed. Departmental officers may visit the field party during survey operations.

The Surveyor General or the District Surveyor is to be informed of progress at fortnightly intervals or at the time of any interruption or delay in the work.

5. Submissions and Report

At conclusion of the survey the Consultant is to submit to the Surveyor General –

(i) A brief description of work effected each day during progress of survey.

(ii) All maps and information supplied with the Instruction.

(iii) A diagram of each occupied Control Survey Mark showing connections to local survey marks. If the diagram supplied with the instruction is suitable this need only be annotated and signed.

(iv) A station summary for each occupied station. This should take the form of a listing of observed horizontal directions, oriented to the back station and coupled with the measured distances. Directions along the main traverse and to intersected stations should be reduced to the nearest one-tenth of a second. Other short connections should be reduced to the nearest whole second. Distances should be indicated to the nearest millimetre.

(v) A listing of vertical angles and distances along the main traverse.

(vi) A listing of vertical angles observed to adjoining traverse stations, trigonometrical stations, intersected stations and connections from each occupied station. Station identification, heights of the signal and the instrument should be added.

Where the Departmental Field Book is used requirements (iv) and (vi) will be produced on a Computer Summary, by the Department of Lands.

PART II

FIELD WORK

6. Horizontal directions

(1) The direction of the main traverse lines, trigonometrical stations, spires or other objects to be fixed by intersection should be determined by double sector resolution.

(2) Directions to locally placed surveyor witness marks should be observed and recorded in relation to the major traverse direction.

(3) Where traverse lines are in excess of 700 metres, recommended circle settings for a 10' micrometer are:-

FL	0º	00’	20”	0º	10’	20”
	60º	15’	00”	60º	05’	00”
	120º	09’	40”	120º	19’	40”

(4) Where traverse lines are less than 700 metres recommended circle settings for a 10' micrometer Theodolite are:-

FL	0°	00’	20”	0º	10’	00”
	90°	10’	00”	90º	00’	20”

EXECUTION

(1) For lines longer than 700 metres, the main traverse angle should be determined by a minimum of 3 rounds using the back target as initial station and, separately, by three rounds of observations using the forward target as initial pointing.

(2) For lines less than 700 metres the main traverse angle should be determined by a minimum of two rounds using back target as initial station and, separately, by two rounds of observations using the forward target as initial pointing.

One round of observation is defined as:-

F.L. circle setting on initial station turn 360º clockwise, re-point to initial station and record. Then observe stations in turn in a clockwise direction to the concluding station. Reverse telescope and approach concluding station in an anti-clockwise direction. Point and record on all stations, terminating on the initial station.

The back station is to accord with the sense of the adopted direction of the traverse.

(3) A round of observation is generally sufficient for connections to witness and other marks within 50 metres of the station, whilst two rounds are generally sufficient for these marks in excess of 50 metres.

The consistency of observations should be examined and repeat measures made as necessary.

7. Vertical Angles

(1) Vertical angles along the main traverse and to trigonometrical and other stations should be observed by two pointings each face.

Each station should be adequately described. Also the height of the signal and instrument must be recorded.

(2) One reading on each face is adequate for vertical angles to local survey, witness marks and reference marks.

8. Taping

Short distances should be measured with a tape, comprising a fully or partly divided steel or invar tape, a short offset tape or long steel (or invar) band and reader. All tapes should be standardised and a certificate of standardisation supplied as required.

The sag component should be recorded. Required detail of the band or tape used must be noted in the field book. The terminals of the measurements notes should be clearly stated in the field notes e.g. instrument axis to top of tripod

All taped measures shall be recorded as read in field without mental interpretation.

The temperature of tape or band should be carefully assessed in field and each taped measure dimension should be independently verified. This satisfactory example of dual measurement is to measure slope and horizontal distance. Could be done by observing the slope distance and the horizontal distance.

9. Distance Measurement

All distance measured with electro-optical equipment are to be measured independently in both directions. Information about particularly adverse weather or other circumstances should be noted in the field book.

Ambient temperature and pressure should be resolved and noted at the time of measurement. An aspirated psychrometer and a reliable aneroid barometer should be used to determine temperature and pressure at each instrument standpoint.

Six determinations of each distance is required to each and details of the signal strength, battery voltage, ambient conditions and difficulty or ease of reading should be recorded. If signal strength is excessive, a veil should be placed over the transmitting lens.

10. Proving Position

The position of each radiated monument should be proved. Two methods of proving position are detailed in Appendix ‘B’.

11. Additional Marking

Where the line between two marks is obstructed, or the conditions imposed by the line as marked are such as to make observation of distance or direction impractical, an intermediate

mark of a durable nature should be placed as close to midway as possible. In all cases due regard should be made for stability and permanence.

Suitable marks, comprising brass triangles, numbered SSM or steel rod, will be provided as necessary.

The Surveyor General should be advised in the final report of placement and type of mark, reasons for placement, and sketch showing the location of the mark.

12. Field Notes

All survey records of the field work should be neatly written in ink or acceptable ball point pen, in the field books provided.

Only original notes will be accepted. Transcription of original notes or embellishment of notes is expressly forbidden.

A fieldbook diagram is required for each station occupied in the course of the survey. The diagram should illustrate features such as fences, kerbs, tracks and the like in addition to any witness or other survey marks. Offsets to these features should be measured with appropriate accuracy.

Each fieldbook diagram should be oriented to the North and magnetic bearings recorded unless Grid bearings are available.

13. Discarded Observations

Where two or more readings are discarded in a set of observations, the complete set should be re-observed and recorded separately.

APPENDIX 'A'

VERTICALITY OF THEODOLITE

The following procedures are designed to ensure that the vertical axis of an instrument is truly vertical.

(1) Level instrument in normal manner using circular bubble and plate level.

Align telescope parallel to 2 reference footscrews.

Achieve co-incidence of the vertical bubble by means of clip screw (index level setting screw).

Rotate telescope through 180 degrees.

Check and achieve co-incidence by movement of clip screw (half) and the reference footscrews (half).

Rotate telescope through 90 degrees and adjust co-incidence by means of the remaining footscrew.

The co-incidence bubble will then appear level in any pointing position of the telescope and vertical axis is truly vertical. If this procedure fails, then Theodolite is damaged or faulty.

(2) For instruments with automatic vertical index, level instrument in normal manner. Proceed as in (1) but lock telescope and read vertical component through reading microscope.

Rotate telescope through 180 degrees and read vertical component.

Set micrometer (or scale) at mean reading and adjust by the 2 footscrews.

Rotate telescope through 90 degrees and adjust by the remaining footscrew.

When the telescope is clamped in vertical, the vertical reading will remain constant in any position of the horizontal circle and the vertical circle in truly vertical.

CONSTANT FOR DISTANCE MEASURER AND REFLECTOR

A quick assessment of the instrument constant is effected using a steel tape of known length. Distances of approximately 20 and 25 metres are measured with the Distance Measurer and a tape and compared.

PSYCHROMETER READING

Both thermometer bulbs should be free of moisture. Air flow should be unrestricted and open to reflect the temperature of the air.

The air temperature should be determined at approximately two metres above ground level and in shaded conditions, i.e. bulb not in direct sunlight.

Temperatures should be recorded to 0.1 degree Celsius.

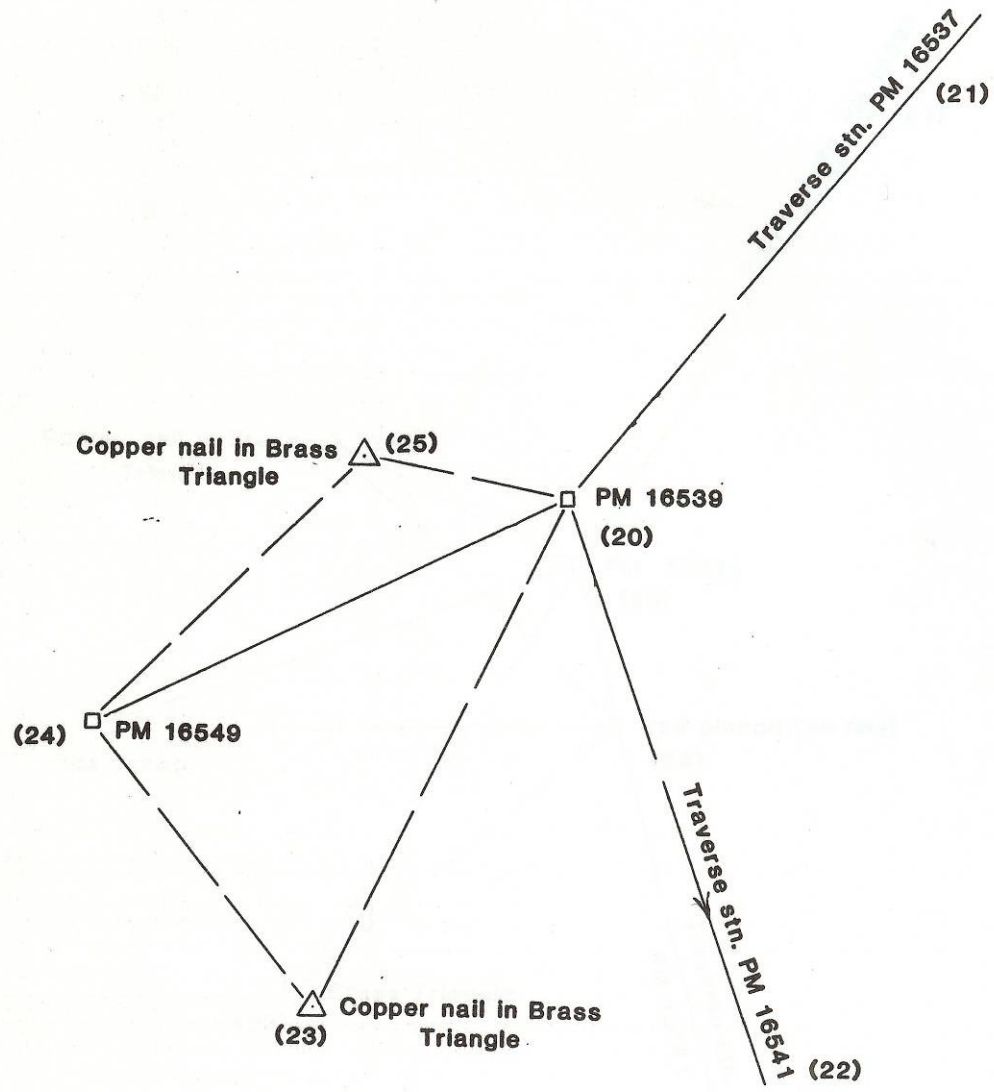
APPENDIX 'B'

METHOD 1

DIAGRAM

Showing connections to Subsidiary marks

Proof of Position



From occupied Station PM 16539 (20) measure directions (21), (22), (23), (24) and (25) on F.L. and reverse on F.R. Measure distances to (23), (24) & (26).

Change standpoint to say (24) measure directions (25), (20), (23), (21) or (22), If visible, then measure distances to (25), (20), (23).

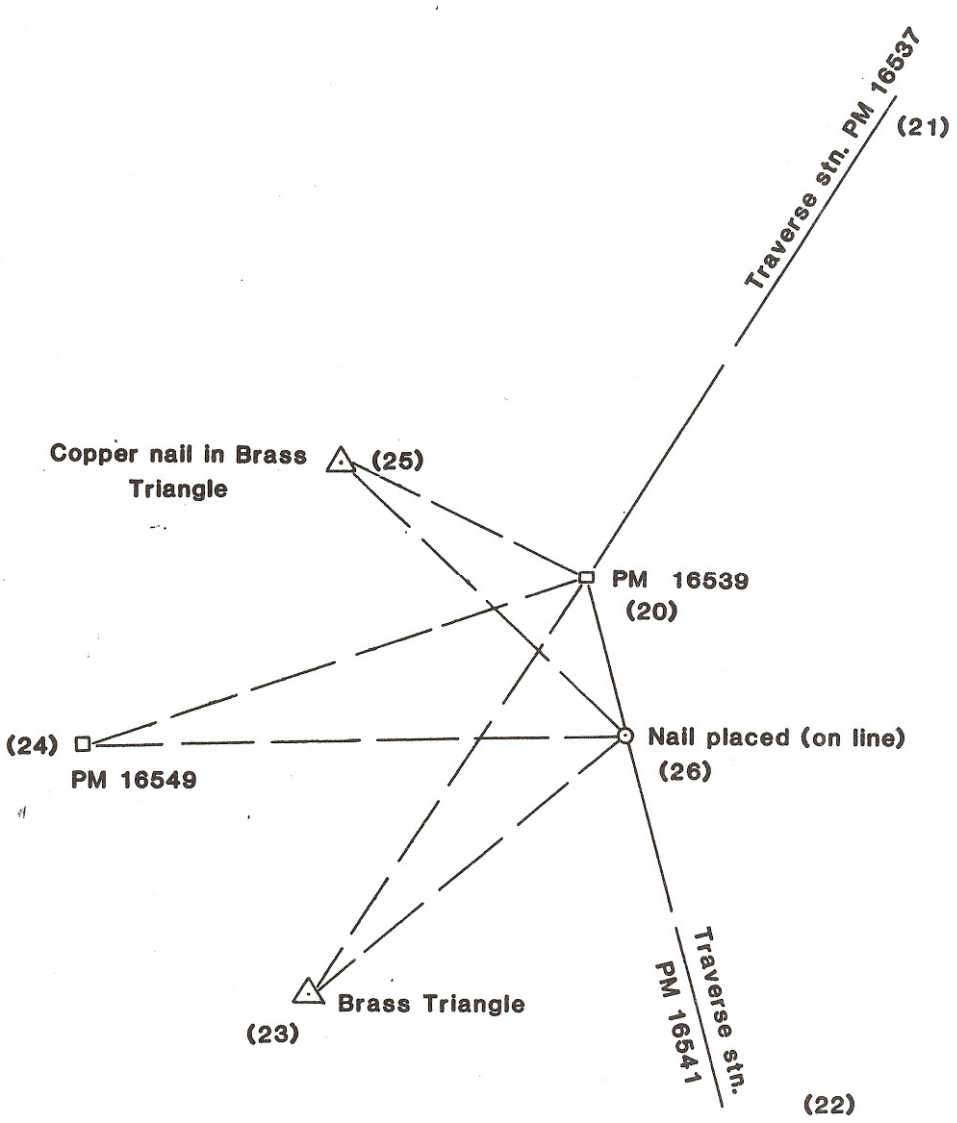
APPENDIX 'B'

METHOD 2

DIAGRAM

Showing connection to Subsidiary marks

"Proof of Position"



From occupied station PM 16539 (20) measure directions (21), (22), (23), (24), (25) and (26) on F.L. and reverse on F.R. Measure distances (23), (24), (25), & (26). Record directions (22) and (26) separately.

From a standpoint (26) on main traverse line (20) - (22) observe directions (22), (23), (24), (25) and (20) and measure distances to (23), (24), (25) and (20).

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