REGULATIONS OF GEOMATICS

(WORK INSTRUCTIONS)

SURVEY DEPARTMENT

MINISTRY OF DEVELOPMENT

BRUNEI DARUSSALAM

GEOMATIC WORK INSTRUCTIONS

CONTENTS

PART 1 – PRELIMINARY

1 COMMENCEMENT

These Work Instructions are effective from 01 April 2011

Commencement

2 PURPOSE

The Survey Department hereby makes the following Geomatics Instructions for all Surveyors / Geomaticians. The objective of these instructions is to provide a high level of confidence and security in the survey system. Therefore a surveyor / geomatician , when undertaking a survey for a client, must respect the survey system of which the current survey will form part of, and be used by in the future by other surveyors / geomaticians and relied on by stakeholders.

Provide Confidence and Security

3 INTERPRETATION

Interpretation

3.1 **Cadastral Survey;** Title Survey as defined under The Licensed Land Surveyors Enactment 1979.

3.2 **R.S.O;** Abbreviation for Rectified Skew Orthomorphic projection used for mapping in Negara Brunei Darussalam.

3.3 **S.P. ;** Abbreviation for Survey Paper a document containing instructions issued for Surveys.

3.4 **Field Data;** A document for recording the field observations of a survey, issued by the Surveyor General (JUA).

3.5 **Accessory Unit**; A unit, whether or not part of a building, garden, garage, car parking space, storage space, swimming pool, laundry, stairway, passage etc. that is designed for use with any principal unit or any such purpose, that is shown on a strata plan as an accessory unit.

3.6 **Common Property**; A property that is not within a unit and not for the exclusive use of a unit installed or erected before the certification of the strata plan by the Commissioner and a structure erected by a strata corporation as part of the common property.

3.7 **Commissioner**; The Commissioner of Lands, being the officer appointed as the head of the Department of Lands and includes any person for the time being lawfully exercising his or her powers.

3.8 **Land**; Land includes land of any tenure, any building or parts thereof, the air space above the surface of the land and such of the subsoil as is occupied by any buildings and related structures, but excludes the right to all minerals and mineral products (including oil and gas).

3.9 **Licensed Land Surveyor**; Any person whose name has been placed on the Register and to whom a licence to practise has been issued by the Survey Board in accordance with the Licensed Land Surveyors Enactment

3.10 **Principal Unit**; A unit, that is designed for separate use or occupation, whether in conjunction with any accessory unit or not, as a place of residence or business or otherwise and that is shown on a strata plan as a Principal Unit.

3.11 **Strata Survey**; The subdivision of land so as to provide for the creation of units for certification of strata plan as defined under (Land Code (Strata)), 1999, Part II.

3.12 **Strata Plan**; The document that delineates the units and the common property of a Strata Title. Refer to section 9 of the (Land Code (Strata)) , 1999.

3.13 **Surveyor General (SG)**; The officer appointed as the head of the Survey Department and includes any person for the time being lawfully exercising his or her powers.

3.14 **Unit**; A Unit, in relation to any land, means a part of the land consisting of a space of any shape situated on, or above the surface of the land, or below the surface of the land to the extent that any buildings or related structures occupy the subsoil, or partly in one such situation and partly in another or others, all the dimensions of which are limited, and that is designed for separate ownership. Refer to section 9 under (Land Code (Strata)) , 1999.

4 QUALIFIED PERSONS

Qualified Persons

All Work covered by these Instructions shall be carried out personally or under the direct supervision of a Licensed Land Surveyor

5 BEST PRACTISE

Best Practise shall include but not be limited to the following.

5.1 Use proven and calibrated equipment, — Best Practise

5.2 Analyse acceptable error limits for each component of the survey,

5.3 Conform with defendable marking, measuring, recording and processing methods,

5.4 Confirm the origin of the survey,

5.5 Work from the whole to part,

5.6 Provide proof of a survey by redundant method.

6 DUTIES OF A SURVEYOR

6.1 All surveys shall be executed in accordance with the Licensed Land Surveyors Enactment; Brunei revised edition 1984 Chapter 100, Land Code (Strata)) , 1999 and Geomatic Instructions 2007, and any circular or instruction that may be issued from time to time by the Surveyor General. Any departure from these instructions must be agreed to, in writing, by the Surveyor General before being implemented. — Legal Compliance

6.2 Surveys shall be carried out with such equipment and by such methods as will readily attain the standards of accuracy prescribed by these Instructions; and it shall be the duty of every surveyor at all times to apply such checks and tests to his work as may be necessary to obtain those standards. — Reliability and Accuracy

6.3 Each surveyor shall search for all old survey marks (such as geodetic control marks, boundary marks or other approved marks) necessary to prove the accuracy of his survey, and having found those marks, shall connect his survey to them. Each surveyor shall supply to the Surveyor General all information obtained by him relating to the survey. — Search for Old Marks

6.4 Surveyors shall immediately report to the Surveyor General any disturbance or the likelihood of any disturbance to trigonometrical stations or other geodetic survey marks. — Report Disturbance to Marks

6.5 Surveyors discovering an apparent error in an existing approved survey — Report Errors

which materially effect its accuracy shall submit the Surveyor General with a full report and all available evidence. No attempt shall be made to rectify the error without detailed instructions from the Surveyor General.

7 PROJECTION

7.1 RSO Projection

Borneo RSO Projection Parameters

Name	Borneo Grid
Projection	Rectified Skew Orthomorphic
Spheroid	Everest
	'a = 6377298.556
	'f = 1/300.8017
Unit Measurement	meters
Origin	4^0 00' N
	115^0 00' E
Scale Factor at Origin	0.99984
False Northing	442 857.654 N
False Easting	590 476.872 E
Skew	53^0 18' 56.9543" E of the True North

Scale factor is almost constant along the initial line.

7.2 Transformation Parameters

7.2.1 GDBD2009 TO BT48 (Bursa-Wolf 7-Parameter)

GDBD2009 to BT48 Transformation Parameters

Parameter	Value	Standard Deviation
Dx	689.59370 m	± 11.31003 m
Dy	-623.84046 m	± 6.78722 m
Dz	65.93566 m	± 14.40584 m
Rx	-0.02331"	± 0.42256 "
Ry	1.17094"	± 0.27705 "
Rz	-0.80054"	± 0.37907 "
Scale	-5.88536 ppm	± 0.92598 ppm

7.2.2 GDBD2009 TO WGS84 (3-Parameter)

GDBD2009 to WGS84 Transformation Parameters

Parameter	Value	Standard Deviation
Dx	0.13513 m	± 0.07889 m
Dy	0.12670 m	± 0.07889 m
Dz	0.02497 m	± 0.07889 m

7.2.3 WGS84 TO BT48 (Bursa-Wolf 7-Parameter)

WGS84 to BT48 Transformation 7 Parameters

Parameter	Value	Standard Deviation
Dx	597.1257 m	-
Dy	-624.202 m	-
Dz	2.1991 m	-
Rx	-1.45741”	-
Ry	-0.84837”	-
Rz	1.79984”	-
Scale	-10.4358ppm	-

7.2.4 WGS84 TO BT48 (Molodensky-Badekas 10-Parameter)

WGS84 to BT48 Transformation 10 Parameters

Parameter	Value	Standard Deviation
Dx	678.3858 m	-
Dy	-665.3742 m	-
Dz	48.2161 m	-
Rx	1.6737”	-
Ry	1.5209”	-
Rz	2.8054”	-
Scale	6.9925 ppm	-
X_m	-2678448.9066 m	-
Y_m	5762777.7250 m	-
Z_m	543962.5028 m	-

7.3 Conversions

7.3.1 Area

Area Conversions

1 Acre	=	4046.842341	m2	=	0.404684	Ha
1 m2	=	10.76394785	ft2	=	24.71062414	Sq link
1 ft2	=	0.09290272	m2	=	2.295684	Sq link
1 Sq Link	=	0.04046842	m2	=	0.4356	ft2
1 Acre	=	43,560	ft2	=	100,000	Sq link

7.3.2 Distance

Distance Conversions

1	Link	=	0.20116765	Metre
1	Chain	=	20.116765	Metre
1	Foot	=	0.30479947	Metre
1	Metre	=	4.9709782	Link
1	Metre	=	0.04970978	Chain
1	Metre	=	3.28084561	Feet

7.3.3 Angle

Angle Conversions

1	Radian	=	57.29577951	Degrees
		=	3437.746771	Minutes
		=	206264.8063	Seconds

8 REFERENCE NUMBER OF JUA FILES

JUA Files reference number shall consists of:

8.1 Two digits of year of survey. The reference of the year of the survey done in 2008 is 08.

Year Number

8.2 After a slash, three-digit sequential number shall follow it. The first job issue for the particular year shall be numbered by 001.

Job Number

8.3 After a slash, it shall be followed by abbreviation of type of survey in Land Development Section, there are:

Type of Survey

Topographical	--- TS
Corridor	--- CO
Cadastral	--- CD
Precise Levelling	--- CS
Hydrographic	--- HY
GPS	--- GS
Miscellaneous	--- MC
Research work	--- PY
Etc….	

8.4 After a slash, it shall be followed by abbreviation of the district where the survey performs. The abbreviations of the districts are:

Brunei /Muara	---	BM	District
Tutong	---	TU	
Belait	---	KB	
Temburong	---	TE	

8.5 Example of JUA files rerence number:

Example

JUA08/001/TS/BM
JUA08/001/CS/KB

9 REVISIONS

Revisions

1st revision

2nd revision

3rd revision 2004

4th revision 2010

PART II – GEODETIC

10 TYPES OF SURVEYS

This Instruction is applicable to the following work

Types of surveys

10.1 Traversing

10.2 Levelling

10.3 Satellite Positioning

11 TRAVERSING

Types of traverse include Standard, First Class and Second Class Traverse. This Chapter deals with Standard & First Class Traverses only, as Second Class Traverses are covered in the Cadastral Survey Work Instruction.

Types of Traverses

11.1 Standard Traverses

11.1.1 General

11.1.1.1 Standard traverses shall be run between trigonometry stations or existing standard marks.

Origin

11.1.1.2 Proposed traverses shall be approved by the Surveyor General (SG). The Geodetic Section shall issue sequential station numbers, prefixed by the letter "A".

Approval by SG

11.1.1.3 The distance between marks shall be within the range of 500m to 2500m.

Distance between marks

11.1.1.4 Indirect or zigzag routes shall be avoided and the total length of traverses shall not exceed 20 km.

Traverse Configuration

11.1.1.5 All precise level benchmarks along the route shall be coordinated.

Coordinate Benchmarks

11.1.2 Origin and Closing Lines

11.1.2.1 Observing to a third mark shall test the reliability of the origin and closing lines.

Confirm Origin

11.1.2.2 Where the origin or closing lines are between existing

Origin Closure Criteria

standard marks at least one line shall be re-measured and the differences shall not exceed + (20 mm + 20 p.p.m).

11.1.3 Observations

11.1.3.1 A theodolite or total station reading to at least 1" of arc shall be used. Instrument Least Count

11.1.3.2 Generally forced centring targets shall be used. Forced Centring

11.1.3.3 Six sets of horizontal and two sets of vertical readings shall be observed at each station. The initial circle settings for each set shall be as follows:- Observation Sets

11.1.3.4

SET	FACE	CIRCLE SETTINGS
1	FL	0°
2	FR	270°
3	FL	30°
4	FR	300°
5	FL	60°
6	FR	330°

11.1.3.4

The residuals shall not exceed 3". Residuals

11.1.3.4

11.1.4 Bearing Closure

11.1.3.4

11.1.4.1 This shall not exceed 3.5 √n seconds for any traverse of n stations and in any case shall not exceed 10". Bearing Closure

11.1.3.4

11.1.4.2 Check bearings shall be observed at every tenth station. Check Bearings

11.1.3.4

11.1.5 Distance Measurement

11.1.3.4

11.1.5.1 Distances shall be measured with calibrated electromagnetic equipment or total station capable of accuracy of ± (15mm + 10 p.p.m). Instrument Precision

11.1.3.4

11.1.5.2 At least two separate and complete measurements shall be made from both ends of each traverse line and the difference in length between measurement shall not exceed + (10mm + 10 p.p.m). If this agreement is not reached then additional measurements shall be made. The computed differences of height between two stations, as observed from both ends, shall agree within an allowable error of $\pm$ 0.05 $\sqrt{k}$ metres, where k is the total length of the lines in kilometres.

11.1.6 Traverse Adjustment

11.1.6.1 The Survey Department of Geodetic Section shall carry out computation and adjustment. Adjustment by Survey Department

11.1.6.2 The field surveyor shall carry out preliminary closures to ensure that traverse closes are within 1:20 000. Closure Criteria

11.1.6.3 The computation of final co-ordinates shall be adjusted using Least Square Adjustment Method. Least Squares

11.2 First Class Traverses

11.2.1 General

11.2.1.1 First Class traverse shall be run between existing trigonometry stations, standards or first class marks. Origin

11.2.1.2 Proposed traverses shall be approved by the SG. First class traverse shall be numbered by the year of survey (first four digits) followed by the letter 'FC' (First Class) and the three digits sequential number. Approval by SG

Example : 2007FC001
2007FC550
2007FC999

11.2.1.3 The distance between First Class marks and standard marks shall be within the range of 100 m to 500 m. Distance between Marks

11.2.1.4 The maximum length of a traverse shall be 5 km. Maximum Length of line

11.2.1.5 All precise level benchmarks along the route shall be coordinated. Coordinate Benchmarks

11.2.2 Origin and Closing Lines

11.2.2.1 Observing to a third mark shall test the reliability of the origin and closing lines. Confirm Origin

11.2.2.2 Where the origin or closing lines is between standards or first class marks at least one line shall be re-measured and the difference shall not exceed ± (20 mm + 50 p.p.m). Origin Closure Criteria

11.2.3 Observations

11.2.3.1 A theodolite or total station reading to at least 1" of arc shall be used. Instrument Least Count

11.2.3.2 Generally forced centering targets shall be used. Forced Centring

11.2.3.3 Four sets of horizontal and one set of vertical readings shall be observed at each station. The initial circle settings for each set shall be as follows:- Observation Sets

SET	FACE	CIRCLE SETTINGS
1	FL	0°
2	FR	225°
3	FL	90°
4	FR	315°

The residuals shall not exceed 5". Residuals

11.2.4 Bearing Closures

11.2.4.1 This shall not exceed 8 √n seconds for any traverse of n station and in any case shall not exceed thirty seconds. Bearing Closure

11.2.4.2 Check bearings shall be observed at every fifteenth station. Check Bearings

11.2.5 Distance Measurement

11.2.5.1 Distance shall be measured with calibrated electromagnetic equipment or total station capable of any accuracy of ± (10 mm + 10 p.p.m). — Instrument Precision

11.2.5.2 The horizontal and vertical distances on instruments, which read these directly, need only be recorded. — Direct Reading of Distances

11.2.6 Traverse Adjustment

11.2.6.1 The Geodetic Section of Survey Department shall carry out computation and adjustment. — Adjustment by Geodetic Section

11.2.6.2 The field surveyor shall carry out preliminary closures to ensure that traverse closes are within 1:10 000. — Closure Criteria

11.2.6.3 The computation of final co-ordinates shall be adjusted with the least square adjustment method. — Least Squares

12 LEVELLING

12.1 General

12.1.1 Datum

The Geodetic Section of Survey Department shall establish and maintain the network of Geodetic Bench marks in terms of mean sea Level (Brunei Datum) for vertical control in the Negara Brunei Darussalam. — Level Datum

12.1.2 Benchmarks

Benchmarks shall be of the following types:

12.1.2.1 Fundamental Benchmarks placed at intervals of approximately 50 km or at major route junctions. They shall be carefully located on solid ground, preferably rock, where no local subsidence is likely. — Fundamental Benchmarks

12.1.2.2 Standard Benchmarks are located along main roads at approximately 1.5 km intervals but it may vary due to suitability of the area. — Standard Benchmarks

12.1.2.3 They should be located on stable ground and clear of — Stable ground

likely roadwork.

12.1.2.4 Intermediate benchmarks are located between standard benchmarks on suitable substantial structures such as bridge abutments or building foundations. Intermediate Benchmarks

12.1.2.5 Any establishment of Intermediate Marks shall be approved by Surveyor General. Approval by SG

12.1.3 Network Adjustment

The Geodetic Section of Survey Department will adjust precise and ordinary level networks and provide data (height) and Bench Mark location diagram on official lists. Adjustment by Geodetic Section

12.2 Precise Levelling

12.2.1 General Specification

12.2.1.1 Precise levelling shall begin and end on previously established bench marks. Origin

12.2.1.2 All lines are to be levelled independently in both forward and backward directions. Double Run Levelling

12.2.1.3 In order that the results of the control levelling may be as widely useful as possible, particularly in regard to mapping, the elevation of suitable points adjacent to the level line will be determined. These points, which are to be known as Intermediate Marks will normally be road intersections, decks of bridges, etc. Intermediate Marks

12.2.2 Observation Procedure

12.2.2.1 The backsights and foresights shall be approximately of the same length. The maximum length of sight shall not be more than 40 meter. Due to the slope of the ground or to shimmer the length of sight may often be shorter than this. Total distances of works is normally 1.5km but it may varies due to suitability of the area. Observation Length

12.2.2.2 Two backward and two foresight observations shall be taken. Differences between observations shall not exceed 0.04572 cm. The difference in length between backsight and corresponding foresight shall not exceed Observation tolerances

1.2 meter.

12.2.2.3 Acceptable precise levelling Invar stave shall be used. The stave is to be set always on a stave set up pin. These pins are different length for hard and soft ground and have rounded tops. A ring is attached to the pin to facilitate lifting and carrying. The stave shall be erected vertically by using plate bubble attached on the stave. Invar staves

12.2.2.4 Observation of new benchmarks shall only be taken at least after one month of their construction. If the work is stopped on other than permanent benchmark, at least two temporary Benchmarks are to be established. On resuming work the marks must be checked for disturbance or change of relative height. Observing new Benchmarks

12.2.2.5 Observation shall be recorded digitally. As a checking procedure, the digitally recorded observation shall be printed out and submitted to Survey Department Digital Recording

12.2.2.6 Read out from the instrument shall be set to five (5) decimal places. Least Count

12.2.2.7 The minimum stave reading shall not be less than 0.5 meter. Minimum Stave Reading

12.2.2.8 Clear diagrams shall be drawn digitally in a GDC01 form, sufficient offset or ties to permanent features nearest from benchmark for future location. It is essential that all record /data are made in the field note at the time of measurement Benchmark Diagrams

12.2.2.9 Digital photo of the station shall be included in the GDC01 form. Benchmark Photo

12.2.3 Misclosure;

12.2.3.1 Height closes within an allowable error of $\pm 3 \sqrt{k}$ mm where k is the distance in kilometre. Misclosure

12.3 Ordinary Levelling

12.3.1 General Specification

Ordinary levelling shall began and end on previously established benchmarks or existing height control marks. Every levelling job shall be arranged in such a way that it can be checked and the amount of error established. The methods are: — Origin of Levels

12.3.1.1 Levels from a known benchmark or height control mark and check back on the same point. The total of backsights shall equal the total of foresights, and then the total rises and falls and first and last reduced levels shall be the same. — Double Run Levelling

12.3.1.2 Level from a known benchmark or height control mark and finish on another benchmark or height control mark. The difference between the totals of backsights and foresights, between the totals of rises and falls, and between first and last reduced levels, shall be all be the same as the known difference between bench mark levels. — Single Run Levelling

12.3.2 For checking purposes, all observation shall be recorded in a field note produced by Survey Department. — Field Notes

12.3.3 Observation Procedure

12.3.3.1 The backsights and foresights shall be approximately of the same length. The maximum length of sight shall be 100 metre and the minimum length shall not less than 25 meter. Due to the slope of the ground or to shimmer the length of sight may often be shorter than this. Total distances of works shall not exceed 1.5km. — Observation Length

12.3.3.2 All observation shall be recorded digitally. As a checking procedure, the digitally recorded observation shall be printed out and submitted to Survey Department. — Digital Recording

12.3.3.3 Read out from the instrument shall be set to four (4) decimal places. — Least Count

12.3.3.4 The minimum stave reading shall not be less than 0.5 — Minimum Stave Reading

meter.

12.3.3.5 Clear diagrams shall be drawn digitally in a GDC01 form, sufficient offset or ties to permanent features nearest from any survey marks for future location. It is essential that all record /data are made in the field note at the time of measurement.

Benchmark Diagrams

12.3.3.6 Digital photo of the station shall be included in the GDC01 form.

Benchmark Photo

12.3.4 Misclosure

12.3.4.1 Height closes within an allowable error of $\pm$ 25 $\sqrt{k}$ mm where k is the distance in kilometre.

Misclosure

13 SATELLITE POSITIONING

Refer to

RICS Manual

"Guidelines for the use of GPS in Surveying and Mapping (RICS Guidance Note)"

Issued by The Royal Institute of Chartered Surveyors

Issued June 2003

PART III – CADASTRAL

14 TYPES OF SURVEYS

This instruction is applicable to all types of Surveys which relate to land titles including

Types of Surveys

14.1 Subdivision or Consolidation of Land

14.2 Redefinition Surveys

14.3 Strata Title Surveys

14.4 Gazette Plans

15 FIELD DATA

15.1 Field Notes

The following provision shall apply to field notes.

Original Field Notes

15.1.1 Original field notes shall be recorded in a Survey Department field book and/or approved digital format.

Property of Government

15.1.2 All field books/field data are the property of the Government of Brunei Darussalam and shall be retained as official records.

System of Recording

15.1.3 The system of recording field observations in the Field Book and /or approved digital format shall be the same as that adopted by the Survey Department.

Permanence and Clarity

15.1.4 Field data shall be neatly and clearly recorded in permanent black or blue black ink such a way that another surveyor or draughts person may draw a correct plan of the survey.

Record of all Observations and Features

15.1.5 The field data shall contain a record of all observations and measurements made by the surveyor and of the marks found or placed by the surveyor for the purposes of these Instructions. The field notes/data shall also show all location features made in accordance with good survey practice.

Amendment

15.1.6 No entry shall be altered, defaced or obliterated. Every amendment made by the surveyor shall be clearly written and erroneous entries shall be clearly crossed out, and initialled.

References

15.1.7 The first page of the field notes of each survey shall show the S.P.

number, description of the survey, particulars of the Lots, Kampong, Mukim, District, Standard Survey Sheet or such other reference as shall sufficiently identify the land surveyed, and the date of commencement and completion of the survey. The names or signatures of the surveyor, checker and the instrument used and its calibration shall also be stated.

15.1.8 Clear diagrams shall be drawn to make the measurements recorded in the field book readily interpretable, and shall show a North point and shall be clearly referenced with respect to other diagrams. Clear Diagrams

15.1.9 In diagrams, boundary lines shall be represented by solid lines, traverse lines and shooting lines and offsets shall be represented by interrupted lines. The boundaries of the under survey shall be edged in red. Line types

15.1.10 The words " Adopted Bearing " and " Bearing Closed " shall be entered both in the field book and the Survey Plan reference against the appropriate bearings on the observation pages and on the relevant diagrams. Annotation

15.1.11 All stations shall be numbered and no station number shall be used more than once in each survey. The abbreviations, symbols and conventional sign in accordance with approved draughting Instructions of the Survey Department (refer Section B) shall be used in the field notes and in the plans. Station Numbering, Abbreviations and symbols

15.1.12 Each field book shall contain not more than (1) one S.P. Except for the S.P.'s which Lots are adjacent to each other and the surveys are carried out on the same time by the same surveyor. One SP per Filed book

15.2 Digital Field Data

The following provision shall apply to digital field data.

15.2.1 Digital field data and printed output shall be supplied to the Surveyor General (SG). Digital Data

16 ORIGINS OF SURVEY

16.1 Origins of Coordinates and Bearings

The origin of coordinates and bearings shall be in terms of R.S.O. grid and in accordance with the following

16.1.1 Types of Origins

Types of Origins

16.1.1.1 Trigonometrical stations.

16.1.1.2 Standard or first class traverses.

16.1.1.3 Second class surveys approved by the Surveyor General (SG).

16.1.1.4 GPS stations approved by the Surveyor General (SG).

16.1.1.5 Any other surveys which the Surveyor General (SG) at his discretion, accepts as suitable.

Length of Origin Lines

16.1.2 Lines used for " Adopted Bearing " and " Bearing Closed " shall be not less than 50 metre long.

16.1.3 Alternative Origin

Stellar/Solar Observations

If it is impracticable to use the methods mentioned above, the origin of bearings may be obtained from at least two independent stellar and/or solar observation.

Reliability of Marks

16.1.4 The reliability of any two marks for the purposes of this Instruction shall be approved by testing their agreement with a third approved mark, subject to a permissible angular closing error of not more than 0.03 metre.

16.2 Methods of Survey

Subject to other provisions of this Instruction, the following methods of survey shall be acceptable.

Direct Traverse

16.2.1 By direct traverse, with no distance less than 30 metres unless field procedures ensure orientation remains within the precision specified in these Instructions or;

Triangulation

16.2.2 By well-conditioned connecting triangle; or

Resection

16.2.3 By resection from at least four favourably situated and reliable control survey stations.

17 BEARINGS

Observation Criteria

17.1 Surveyors undertaking title surveys shall make two independent angular observations in sexagesimal system with a theodolite or electronic theodolite (total stations).

Angular Closure

17.2 The permissible angular closing error for title surveys is fifteen seconds

(15”) of arc per station with a maximum accumulation of 2 minutes and 30 seconds of arc (2’ 30”).

17.3 For the purpose of computation and recording on plans the deduced bearings shall be rounded off as follows: - Rounding

Length of Line	Rounded off to the nearest
Up to 40 m.	0° 01'
> 40 m. - 200 m.	0° 00' 20"
Over 200 m.	0° 00' 10"

17.4 Deduced bearings are to be shown in the field books and on the diagrams. Deduced Bearings

18 CHECK BEARINGS

18.1 Check bearings shall be observed at intervals of not more than 20 stations or at station not more than 2000 m. apart by the traverse, whichever is least. Intervals for Check Bearings

18.2 Check bearings shall consist of:

18.2.1 Bearings observed to stations from any well-established points; Types of Check Bearings

18.2.2 Stellar or solar azimuths;

18.2.3 Any approved GPS Stations.

19 DISTANCES

19.1 All distances shall be expressed in metres to three (3) decimal places of a metre, (except on the diagram and plans where they shall be written to two (2) decimal places only). Decimal Places

19.2 Surveys shall ensure that all distances shown in field books are in terms of the official standard of length, Chain correction or calibration of other measuring equipment shall be recorded on the field book cover. Standard of Length

19.3 Electronic distance measuring equipment shall be calibrated against the Survey Department standards

19.3.1 Before being brought into use when new or after repair. EDM Calibration

19.3.2 Every twelve (12) months.

19.3.3 At the request of the Surveyor General (SG).

RSO Coordinates

19.4 The necessary corrections, for calibration, atmospheric conditions, sag, slope, height above sea level, and scale factor shall be applied where applicable, to the measured distances and the horizontal distance at sea level and grid distances shown in the field notes.

Exceptions to RSO Coordiunates

20 COMPUTATION AND CLOSURE

Traverse Closure Criteria

20.1 All traverses shall be computed and coordinated in terms of the origin of the Borneo Rectified Skew Orthomorphic Grid on traverse sheets.

20.2 If it is not practicable for the surveyor to express his survey in terms of the Borneo Rectified Skew Orthomorphic Grid, the Surveyor General (SG), at his discretion, may accept surveys with provisional, scaled or assumed coordinates.

Exceptions to Traverse Closure Criteria

Adjustment of Error

20.3 The closure of the traverse on to well established marks, or initial point of the survey after completing the traverse shall not below the limits of 1: 4000 or Q-factor 0.008. On short or minor circuits misclosures of not more than 0.03 m., shall be permitted.

Replacement of Missing or Disturbed Marks

20.4 Where the traverse circuit comprises in whole or in part traverse or boundary lines adopted from prior surveys, the closing limits prescribed above may be increased at the discretion of the Surveyor General (SG).

Hanging Traverse

20.5 The traverse closing error shall be eliminated by applying any approved systematic method to distribute the closing error and shall be shown on the traverse sheet.

20.6 Before any attempt is made to replace missing or disturbed marks, the relationship between the bearings and the distances adopted for the original survey and those adopted for the new survey, shall be determined to establish the most probable positions of the marks.

Calculation of Areas

Format of Calculations

20.7 A hanging or shooting traverse shall generally be avoided and not consist of more than one line. Independent measurements to check bearing and distance shall be recorded in the field books.

20.8 Bearings and distances of the boundaries which have not been traversed shall be calculated.

20.9 The areas of the lot and the access reserve are to be calculated, and shown in the diagram pages of the field book. The area of the surveyed lot shall be within the tolerance +-10% of the actual area. Area Calculation Criteria

20.10 The output of the results of the Survey Computation such as coordinates, shall be in the same format as that used by the Survey Department. Output Format

21 BOUNDARY MARKS

Refer to Part VIII

22 STRATA TITLE SURVEY

22.1 Field Work

22.1.1 Buildings

22.1.1.1 Where any of the parts of the buildings or the relationship of any building to the boundary is obscure, the correct relationship shall be shown on the plan by offsets derived from field measurements. In such cases, the surveyor's detailed field notes shall be lodged with the plan. Offsets to Boundary

22.1.1.2 If any part of a building encroaches over land not included in the land parcel of the original proprietor, necessary action should be taken to provide all the relevant details such as the ownership of the encroached land, the amount of encroachment etc., in order that the Commissioner may take an appropriate decision in terms of Section 15 of the Order. Encroachment

22.1.1.3 Perimeter of a building is the edge of the roof or the balcony and shall be shown as such in the field book. Perimeter of Building

22.1.1.4 All measurements shall be recorded to the nearest 0.01m. Accuracy of Measurements

22.1.1.5 The uses of the building/buildings shall be stated. Where applicable the name or the assigned number of the building shall be included. Uses of Buildings

22.1.2 Floor Levels

22.1.2.1 Measurements taken between every floor shall be recorded to the nearest 0.01 metre. — Accuracy of Measurements

22.1.2.2 The height of a unit shall be measured between the centre line of the floor to the centre line of the ceiling. — Vertical Boundary Definition

22.1.2.3 It is reasonable and adequate to take the difference in measurements between ground floor and upper floors using tape or any electronic survey distance-measuring device through any reasonable access such as stairs, fire exits etc. — Measurement of Vertical Distances

22.1.3 Principal and Accessory Units.

22.1.3.1 Every survey measurement shall be recorded to the nearest 0.01 metre. — Accuracy of Measurements

22.1.3.2 It is adequate to measure the floor dimensions (horizontal distance) from wall to wall. — Measurement of Horizontal Distances

22.1.3.3 Wall thickness shall be shown and drawn in the field notes as stipulated below.

22.1.3.3.1 In accordance with the Emergency (Land Code (Strata)) Order, 1999, Part III Section 13 (3a, 3b, 3c), a boundary is defined by reference to the centre lines of the wall, fence, floor or roof. — Boundary Definition

22.1.3.3.2 Wall with the same thickness shall be drawn and shown as a single line accompanied by the dimensions — Wall with Constant Thickness

22.1.3.3.3 Wall with different thickness shall be drawn and shown as a single line accompanied by horizontal distances and thickness — Wall with Varying Thickness

22.1.3.3.4 Wall with an irregular shape, whether it is part or not of the same boundary shall be drawn in detail in the field book showing the dimensions including thickness, boundary lines and horizontal distances, — Wall with Irregular Shape

22.1.3.4 Every accessory unit outside the building shall be surveyed in relation to the strata scheme — Survey of Accessory Units

22.1.3.5 For common property with access right or right of way (ROW), shall be described in the field book as to its uses. — Description of Common Property

22.1.3.6 The direction of North symbol shall be shown in every diagram. — North Point

22.2 Unit Boundaries.

22.2.1 Every unit shall be surveyed in detail. — Survey all Units

22.2.2 Boundary of each unit shall be based on the intended use as per design drawings approved by the Development Control Competent Authority (DCCA). — Boundaries in Accordance with Design Drawings

22.2.3 If it is not practicable to define the boundary between units based on the median of floor, wall, or ceiling, the adopted boundary shall be shown and described in the site plan and floor plan. — Adopted Boundary

22.3 Numbering of Buildings and Units.

22.3.1 Every building shall be numbered in a serial order prefixed by the alphabetical letter: 'U', Eg. U1, U2 etc. — Building Numbers

22.3.2 Every distinguishable block in a building shall be numbered in a serial order prefixed by the alphabetical letter: 'S', Eg. S1, S2 etc. — Block Numbers

22.3.3 Every floor above the ground surface shall be numbered in a serial order prefixed with the alphabetical letter: 'T' (for every floor), starting from the ground floor upwards. The ground floor shall be numbered T0. — Floor Numbers (Above Ground)

22.3.4 Every floor below the ground surface shall be numbered in a serial order prefixed with the alphabetical letter: 'B'. — Floor Numbers (Below Ground)

22.3.5 Every mezzanine floor shall be numbered 'M' and based on the location of the mezzanine in that particular building. Eg. M1 for the mezzanine in the first floor — Floor Numbers (Mezzanine)

22.3.6 For every unit, a unique serial number shall be used according to strata scheme in a systematic order beginning from the basement upward. The unit to be numbered in accordance to the strata scheme of the buildings. — Unique Numbers

22.3.7 All Accessory units shall be numbered ONCE ONLY based on the strata scheme. Every accessory unit shall be numbered beginning with the alphabet 'A'. The numbering scheme for the accessory units as stipulated below:

Accessory Unit Numbers

22.3.7.1 It begins from outside of the building.

22.3.7.2 Then follows inside of the building beginning from the bottom of the building.

22.4 Preparation of Strata Plan

22.4.1 Plan Size

Plan Size

The survey sheet shall be A2 size and prepared on media as approved by the Surveyor General (JUA).

22.4.2 Plan Sheets

Every Strata Plan shall consist of the following:-

Site Plan Contents

22.4.2.1 Site Plan showing title boundaries and boundary marks together with bearings and distances, building lines, abuttals etc. Where old boundary marks are not available they should be replaced following normal cadastral survey procedure.

Elevation Plan Contents

22.4.2.2 An elevation plan for a building showing each floor. This includes the basements and roof areas.

Floor Plan Contents

22.4.2.3 A floor plan showing the dimensions of each unit and any related common properties such as lifts, fire exits, parking lots etc.

Subdivision or Consolidation of Strata Plan

22.4.2.4 If the strata plan is intended for subdivision or consolidation of units, the new strata plan as well as the former strata plan shall be remarked in *red* as follows:

"Nota- Petak No…….. dalam Tingkat No……. dipecahkan/disatukan dalam Pelan Akui Strata No……"

22.4.3 Plan Numbering System.

The numbering system of the strata plans consists of eight digits, four alphabetical letters, and a hyphen as follows

22.4.3.1 The first two letters in front represent the strata plan (ST), — Strata Plan

22.4.3.2 The third, and the fourth letters from the left represent the location of the strata plan (District). — District

22.4.3.3 The next two digits indicate the year of issue of the strata plan. — Year

22.4.3.4 The three digits BEFORE the hyphen indicate the Strata Plan number for the year. — Number

22.4.3.5 The last three digits AFTER the hyphen indicate the serial number associated with the strata plan folio. — Folio

22.4.3.6 Each strata plan folio shall be identified by a unique number as given below.

Sample Numbering

STBM99123-001

STTU00123-002

STKB01001-089

STTE02003-100

22.4.4 Drafting – Line Guages.

Lines on unit plans shall be shown as follows: -

22.4.4.1 Lot boundaries by a solid line 0.5 mm thick. — Lot Boundaries

22.4.4.2 Unit boundaries by a solid line 0.7 mm thick. — Unit Boundaries

22.4.4.3 Other internal detail on unit plans by a solid line 0.25mm thick. — Internal Details

22.4.4.4 Rights of user and common property area boundaries on floor plans by a solid line ….mm thick. — ROW and Common Property

22.4.4.5 Areas to be excluded from licences or unit titles by a pecked or interrupted line 0.25 mm thick. — Excluded Areas

22.4.5 Schedule

In every folio of a Strata Plan, a schedule shall be included giving the following details:

22.4.5.1 Principal and Accessory Unit Description, Folio Schedule

22.4.5.2 Floor Number,

22.4.5.3 Area of a unit in square meters,

22.4.5.4 Running total of unit areas,

22.4.5.5 Height,

22.4.5.6 Unit Entitlement,

22.4.5.7 Strata Plan folio reference number,

22.4.6 Other information

Other information on the Strata Plan shall include the following: -

22.4.6.1 Strata Plan Number; Other Information

22.4.6.2 Area in square metres within unit limits;

22.4.6.3 Lot Number;

22.4.6.4 Field book Number;

22.4.6.5 Land Department Reference Number;

22.4.6.6 Town and Country Planning Department Reference Number;

22.4.6.7 References:-

22.4.6.7.1 R.S.O sheet Number;

22.4.6.7.2 Completion Date.

22.4.7 Accuracy of Strata Plan

The acceptable tolerance for the Strata Plan is 0.1 m between the approved building plan and the surveyed data. If the difference is greater than 0.1 m, the *surveyed value* is accepted; otherwise the building value will stand. Accuracy Criteria

22.4.8 Certification of Strata Plan

The certificate that the survey has been carried out according to the requirements of this Order shall be given on the Plan under the Certification

signature of the Licensed Land Surveyor (LLS). In addition, the Surveyor General or his authorised officer shall include a certificate of approval to the effect that:

22.4.8.1 The survey definition is incorporated in the plan,

22.4.8.2 For the purpose of this Order, the definition of all the units and common properties is shown on the Plan,

22.4.8.3 And it renders the plan, the property of the State.

22.4.9 Sample Strata Plan

Sample Strata Plan

The sample of Strata Plan is attached as Appendix B

22.4.10 Preparation of Strata Title Diagrams

Diagram as per Plan

22.4.10.1 A diagram drawn to scale showing the unit boundaries, as on the strata plan, unique number for each unit, and such available details where applicable. Line size and type shall be the same as those of the strata plan.

References

22.4.10.2 A heading giving Tanah Di kampong, Mukim, Daerah , Scale, R.S.O Sheet Number, Strata Plan number and the North Point.

One Diagram per Unit

22.4.10.3 Only one principal unit to be drawn on one strata title diagram of size A4.

Verification

22.4.10.4 Each diagram shall be signed and dated by the following persons at the relevant positions:

22.4.10.4.1 Draughtsman

22.4.10.4.2 Examiner

22.4.10.4.3 Surveyor General or his authorised officer.

22.4.11 Redraughting of Strata Title

Redraughting Criteria

Redraughting of a Strata Title may be done only when: -

22.4.11.1 The original has been gazetted and subsequently cancelled, lost or wholly or partially destroyed.

22.4.11.2 The original has been received for destruction.

22.4.11.3 The Land Department has given a written undertaking that the original will be destroyed.

PART IV - TOPOGRAPHICAL

23 GENERAL

23.1 Types of Surveys

Types of Surveys

This instruction applies to Ground Surveys undertaken to define the location and level of existing features. It does not apply to Photogrammetric or LIDAR surveys.

23.2 Areas to be Mapped

Areas to be Mapped

The areas to be mapped in accordance with the contract are described in the schedule to the Specification and are illustrated in the index map which accompanies it. All map sheets will be complete, except that where partial coverage only is required or possible, the areas to be mapped will be clearly defined in the Schedule to the Specification. Any special priority of execution will be stated in the Schedule to the Specification or in the letter of invitation to tender.

23.3 Scale of Mapping and Contour Interval

23.3.1 The scale(s) at which the required maps are to be plotted and/or fair drawn will be set out in the Schedule to the Specification. Scale

23.3.2 The Standard vertical interval between contours will be set out in the Schedule to the Specification. Variations in the contour interval, e.g. on steep slopes or above a particular altitude will be stated as will also the intervals at which contours should be emphasized. Contour Interval

23.3.3 The datum upon which all spot heights and contours are to be based shall be the BRUNEI State Datum. Vertical Datum

23.3.4 Where mapping of the same area is to be carried out at two different scales, this will normally be achieved by plotting at larger scale and reducing by photographic processes to the smaller scale. Any requirements for re-plotting or variations to the depiction of planimetric detail or contours will be set out in the Schedule to the Specification. Multiple Scales

23.4 Projection, Grid and Sheet Lines

23.4.1 The projection upon which the plotting shall be undertaken shall be the Borneo Rectified Skew Orhtomorphic Projection and the RSO Projection

grid shall be the Borneo Rectified Skew Orthomorphic Grid (metric), and the conversion for all non-metric dimensions derived from previous survey data shall be calculated as 20.11676502 metres being equivalent to one English Chain.

23.4.2 Where an approved cartographic specification is in existence, the depiction of grid lines and grid ticks will conform to that specification. In other cases, detailed instructions relating to the grid will be set out in the Schedule to the Specification. Grid Lines/Ticks

23.4.3 The sizes of map sheets, the sheets lines and sheet numbers will be specified in the Schedule to the Specification. Where the mapping forms part of an established series, the sheet lines and sheets numbers will conform to the appropriate cartographic specification. Exceptional cases where over-sized sheets or plotting beyond the neat-line of the map is envisaged, this will be laid down in the Schedule to the Specification. Size of Sheets

24 INFORMATION TO BE SUPPLIED BY SURVEYOR GENERAL

The contract may call for any or all of the following items to be supplied by the Surveyor General to the Contractor. The items which are to be supplied, and which may include others which are not listed below, will be set out in detail in the Schedule to the specification.

24.1 Index map showing the sheet line system and sheet numbers to be adopted. Index Map

24.2 Instructions as to the showing of the graticule and/or grid on the fair drawings or plots to be supplied, including grid co-ordinates of the sheet corners. Grid System

24.3 Details of any ground control stations which the Contractor may require to use as a framework for his own field surveys. These details may include co-ordinates, heights, descriptions and photo identifications, and available diagrams. Control Marks

24.4 List of symbols and conventional signs to be used on the plots or fair drawings. Symbols

24.5 Model sheet layout and Drawing Specification for the series. Sheet Layout

24.6 Names and related information which are required to be shown on the map. Annotation

24.7 Specimen copies of any sheets of the same series which have been Samples

published in order to illustrate style and method of presentation. Adjacent sheets, if published, or edge traces, for the purpose of sheet edge comparison.

24.8 Wording for imprints, copyright acknowledgment, sales note projection which is required to appear in the margin of the map. Marginal Information

25 FIELD WORK

25.1 Establishment of Survey Control.

25.1.1 The Surveyor will be free to plan the methods to be used and the programme or field observations, provided always that any scheme or method of observation shall conform to accepted standards of good survey practice. Where maximum standards of accuracy have to be achieved, these will be laid down in the Schedule to the Specification. Standards of Compliance

25.1.2 Unless excluded in the Specification, the Surveyor is required to submit a proposed scheme for approval by the Surveyor General before field observations are commenced. An up-dated diagram showing the observations actually made and control established must be submitted to the Surveyor General after completion of the field operations. Submit Proposed Scheme to SG

25.1.3 All topographical survey shall begin and end on previously established survey marks with existing height approved by Surveyor General (JUA). Origin of survey

25.1.4 The field survey requirements may call for placing and establishment of permanent ground marks. Details of the design of such marks and intervals at which they should be placed will be set out in the Schedule to the Specification. Notwithstanding this ground marks shall conform to the following Permanent Ground Marks

25.1.4.1 Marks shall be types approved by the Surveyor General Types of Marks

25.1.4.2 Proposed Marks shall be number by the letter J. After the slash the number consists of the year of survey (last two digits)and than slash followed by the three digits sequential number. For example JUA carried outin 2008 the marks shall be numbered as J08/001/001. Numbering of Marks

25.2 Survey Control Closure

Traverse Closure

25.2.1 Unless otherwise stated in the Schedule to Specifications the Traverse Closure shall conform to the requirements of Second Class Traverse

Height Closure

25.2.2 The computed differences of height between two stations, as observed from both ends, shall agree within an allowable error of * 0.05 *k metres, where k is the total length of the lines in kilometres.

25.3 Topographical Observations

Topographical Observations

Topographical observations shall be undertaken with equipment and method appropriate to the site conditions, mapping scale and other requirements detailed in the schedule to specifications and shall conform to the following

Spot Height Observations

25.3.1 All spot height shall be observed from established survey marks with existing height either by trignometrical heighting or ordinary levelling.

Intermediate Marks

25.3.2 In order that the results of the control levelling may be as widely useful as possible, particularly in regard to mapping the elevation of suitable adjacent to the level line will be determined. These points, which are to be known as 'Intermediate Marks' will normally be road intersections, decks of bridges, etc.

26 FIELD RECORDS

Submission of Field Data

All original field records, computations and resulting list of co-ordinates and heights must be submitted to the Surveyor General, who will retain all such records. In addition, the party leader will be required to keep a daily dairy of field operations and this must be submitted to the Surveyor General upon conclusion of the field work.

27 PLAN PREPARATION

27.1 Plotting Media

Plotting Media

For this map series, the originals will be prepared on transparent polyester base, in black and white.

27.2 Format and Numbering

27.2.1 Numbering

The numbering of sheets is derived from the 10km R.S.O. grid squares. Each such square is identified by the coordinates of its western and southern limiting grids.

27.2.1.1 As an example a square bounded by 540 000m E grid on the west and 510 000m N grid on the south will be numbered as 55 / 41. The first two digits, viz 55, in this example are 100km. grid values, one from East coordinate and the other from North coordinate and both in 100km. units. 100km Grids

27.2.1.2 The next two digits, viz 41, define the 10km. grid values, one from East coordinate and other from N coordinate and both in 10km. units. 10km Grids

27.2.1.3 This sheet is further divided into four quadrants, NE, NW, SE & SW each quadrant being a square of 5km. and is the area covered by a 1:10 000 scale sheet. In the above example the sheets numbers are 55/41 NE, 55/41 NW, 55/41 SE & 55/41 SW. 1:10,000 Numbering

27.2.1.4 Division of a 1:10 000 sheet into five segments east-west and ten segments north-south gives rectangular format of the 1:1 000 map series. E.g. 55 / 4010 N. 1:1,000 Numbering

The first two digits, viz 55, identify the southern and western corners of the 100km square. The next two digits viz 40, and the last two digits, viz. 10 identify the 1 Km. grids of the western and southern limits respectively. The sheet is further divided into North (N) and South (S). A sheet at 1 : 1 000 scale has a neat area dimension of 1000mm length and 500mm height.

27.2.2 In general, all Topographical Survey sheets should follow the sheet arrangement and numbering system described herein. Exceptions will, however be allowed in corridor Surveys and other types where the client requests special sheet arrangements. Exceptions

27.2.3 Where old Topographical Surveys exist, every effort should be made to use the existing sheets with blank areas to fill in the details. Suitable endorsements should be made to indicate the period of Survey, name of the Licensed Survey Company and the Contract Number for the area added in. Use of Existing Data

27.2.4 Only map information should be shown within the neat lines except, under special circumstances, it becomes necessary to include an Inset. Plotting within Neat Lines

27.3 Scale and Accuracy Requirements

27.3.1 The plan position of plotted detail will be such that no point of well defined detail contains a coordinate error of more than half a milimetre at final reproduction scale. For the purpose of checking the compliance with the Specification, the following criteria shall be taken: Horizontal Coordinates

27.3.2 The correct horizontal co-ordinate position of any well defined point of detail shall be its position as determined by theodolite traverse or triangulation from the nearest permanently marked Survey Department ground control point of First-Class order or above. Coordinates of Details

27.3.3 All elevations taken on the contours on any sheet shall be its elevation as determined by spirit levelling from the nearest Survey Department bench mark or such other height control point as may be specified in the Schedule to the Specification. Levels of Contours

27.3.4 Spot heights, other than those observed as control, shall be accurate to within one quarter of the contour interval. Accuracy of Spot Heights

27.3.5 Unless otherwise instructed by the Surveyor General, the Surveyor will be expected to match the positions of detail and contours at sheet edges with those appearing on existing published sheets. Agreement with Existing Data

27.3.6 Edge matching of all details should be carried out between adjoining sheets at both compilation and fair-drawing stages. Edge Mating

27.3.7 All sheets should be suitably referenced to each other and a control sheet should be provided showing the sheet arrangement in each project, together with the Survey Control. Sheet Layout

27.4 Style

27.4.1 Maps in this series will be comprehensive topographic editions showing elevations and contours, all natural and cultural features and sufficient number of suitable annotations. Comprehensive

27.4.2 All dimensions will be given in metric values. Metric

27.4.3 All information falling outside and inside the neat lines will eventually be in the Malay Language using the Roman Script. Malay

27.4.4 Hard copy of these maps will be available in monochrome only (i.e Black and White). Monochrome Hard Copy

27.5 Details to be Shown

27.5.1 General

27.5.1.1 The amount of man-made detail to be plotted shall include all that normally shown on maps at similar scale, and shall unless excluded in the Schedule to the Specification, include all buildings surveyed to roof line only, drains, ditches, culverts, bridges, roads, tracks, foot-paths, fences, walls, hedges, burial grounds, areas of cultivation, overground pipe lines, overhead electric and telegraphic transmission lines, masts, towers, and any other structure normally mapped at such a scale but shall, unless included in the Schedule to the Specification, exclude all underground pipe-lines, underground electric and telegraphic transmission lines, inspection chambers there to and septic tanks. Man Made Details

27.5.1.2 The amount of natural detail to be plotted shall include all rivers, streams, swamps, ponds and vegetation classification but shall exclude individual trees unless included in the Schedule to the Specification. Natural Details

27.5.1.3 Names, building reference numbers and other detail such as permanently marked ground control points and bench marks shall be shown on each sheet in accordance with information obtained during field survey. The Schedule to the Specification will stipulate whether this will be the responsibility of the Contractor or if this information will be supplied by the Surveyor General. References

27.5.2 Boundaries

27.5.2.1 Types of Boundaries

The following types of boundaries listed in their order of importance will be shown:-

a) International Boundaries

Types of Boundaries

b) District Boundaries

c) Mukim Boundaries

d) Village Boundaries

e) Municipal Boundaries

f) Boundaries of Forest Reserves

g) Fences, walls and hedges

h) Cadastral (including TOL) Boundaries

27.5.2.2 The location of an International Boundary on a sheet shall be by co-ordinate, if available. When coordinates are not available, it should be shown by reference to other available Departmental maps, in which case the Surveyor General's prior approval should be obtained.

Definition of International Boundary

27.5.2.3 The District, Mukim, Municipal and Village Boundaries shall be determined by reference to Departmental maps.

Definition of Mukim Boundaries

27.5.2.4 Boundaries of Forest reserves and their names should be determined from Survey or Forest Departmental maps.

Definition of Forest Reserves

27.5.2.5 When two or more of the above boundaries, in part of their course, follow the same alignment, only the more important one needs be shown.

Precedence

27.5.2.6 In cases where the alignment of the boundary coincides with other details, the following action will be taken:

27.5.2.6.1 Coincides with the centre of a road or street: The boundary symbol will be shown in position and broken where name of street, etc. must be annotated

Boundary on Centre of Road

27.5.2.6.2 Coincides with the side of the road, street or double line stream. The boundary will be positioned 0.5mm clear of the feature on the same side, using the full symbol.

Boundary on Side of Road

27.5.2.6.3 Coincides with the single line stream. When the boundary follows the same

Boundary on Stream

alignment as the single line stream it will be shown in sections 65mm long, extending from boundary intersections, sharp changes in directions or from the neatlines.

27.5.2.6.4 Boundary crosses open water: Full symbol will be used. Boundary in Open Water

27.5.2.6.5 Boundary coincides with map neat lines: Boundary will be shown in its correct position using full symbolization. The neat line will not be shown for that portion occupied by the boundary symbol. Boundary on Neat Lines

27.5.2.7 The names of Districts, Mukims and Villages will be given in such a way that the divisions created by the boundaries can be seen without difficulty. Placement of Names

27.5.2.8 Cadastral boundary marks will be shown if found on ground. The lot numbers will be given after verifying from Departmental records. Cadastral Boundaries

27.5.3 Roads and Paths

27.5.3.1 Types of Roads and Paths

a) The following types of roads and paths will be shown: Types of Roads and Paths

b) Major Roads (including dual carriageways)

c) Other Roads (sealed)

d) Other Roads (unsealed)

e) Footpaths and Elevated Walkways

f) Roads under construction

g) Light Railways

27.5.3.2 The road surface types will be annotated. Road surface

27.5.3.3 Where available, the names of roads and tracks or Simpang Numbers shall be given. Names of roads

27.5.3.4 The road symbol will be shown continuously in all Roads above

cases where the road or street is on the upper surface of bridges, viaducts, elevated roads, or overpasses. It will be omitted where the roads go under bridges and viaducts. Where a road or street goes through a tunnel or ends on each side of a double line river, the road casing will be omitted from the stretch of the tunnel or width of the river. and below bridges

27.5.3.5 Destination will be shown for major and other sealed roads where they continue into adjoining sheets. Destination of roads

27.5.3.6 Embankments and cuttings will normally be shown plotted to scale. The minimum size of the symbol will be 2mm wide on either side of a road or similar feature, and 20mm long. Symbols smaller than the stated minimum will be omitted. Size of Road Embankments

27.5.3.7 Kilometre Posts will be shown on roads when and where they are planted. They will be indicated by symbols accompanied by the Kilometre Post numbers. Km Posts

27.5.4 Buildings

27.5.4.1 Types of Buildings

The following types of buildings will be shown:- Types of Buildings

a) Public buildings (e.g. Museums, Government Offices, Schools, Hospitals etc.)

b) Places of worship (Mosques, Churches, Temples)

c) Other buildings

27.5.4.2 All public buildings will be annotated. Annotate Public Buildings

27.5.4.3 Places of worship will be annotated to show the religion to which they belong. Annotate Religious Buildings

27.5.4.4 Other building will be plotted to scale and shown with annotation where appropriate. In areas where the concentration of buildings is such that all individual buildings cannot be shown, the outline of the built-up area will be plotted to scale. Where available, the house numbers should be given. Size of Other Buildoings

27.5.4.5 Public Buildings

Public buildings will be annotated as follows:-

Annotation of Public Buildings

Type	Annotation	Abbreviated Annotation
Ministry	Kementerian	Kementerian.
Court (Judicial)	Mahkamah	Mh
Dept. Building	Bangunan Jabatan	Bgn.J.....
Office	Pejabat	PD
Police Station	Balai Polis	BP
Custom Station	Stesyen Kastam	SK
Bus Station	Stesyen Bas	SB
Fire Station	Stesyen Bomba	SBba
Museum	Muzium	Mzm
Hospital	Rumah Sakit	RS
Rest House	Rumah Perhentian	RP
School	Sekolah	Sek
Community Centre	Balai Raya	BR
Stadium	-	Sdm

27.5.4.6 Places of Worship

Places of worship will be annotated as follows

Annotation of Places of Worship

Type	Annotation	Abbreviated Annotation
Mosque	Masjid	Mjd
Church	Church	Chrch
Chapel	Gereja	Grj
Hindu Temple	Hindu Temple	T.Hdu
Buddhist Temple	Buddhist Temple	T.Bda
Chinese Temple	To'Kong Cina	T.Cna

27.5.4.7 Where possible the full annotation should be used. In cases where the full annotation would obliterate other important details the abbreviated annotation may be used. The annotation should be placed in the centre of the plotted position of the building or as close to it as possible.

Full Annotation where Possible

27.5.5 Vegetation and Swamp

27.5.5.1 Types of Vegetation and Swamp

The following types of vegetation and swamp will be shown by annotation with dotted outlines:-

a) Primary or Secondary Forest

Types of Vegetation

b) Mangrove

c) Nipah

d) Belukar

e) Sundry tree cultivations (fruit trees etc.)

f) Coconut

g) Rubber

h) Sundry non-tree cultivation (vegetable plots)

i) Pineapple

j) Grassland

k) Wet Padi

l) Swamp

Annotation of Mixed Vegetation

27.5.5.2 Where two or more types of vegetation or swamp occur in any one area the appropriate annotations may be mixed to show that is so.

27.5.6 Water Features

27.5.6.1 Types of Water Features

The following types of water features will be shown:-

Types of water Features

a) Rivers and streams

b) Canals, drains and ditches

c) Waterfalls

d) Rapids

e) Dams

f) Lakes, pools and reservoirs

g) Service reservoirs

h) Sand (coastal and inland)

i) Mud

j) Ferries (vehicular)

k) Piers, wharves and breakwaters

l) Shorelines

m) Marine Platforms

n) Springs

o) Current Directional Arrow

27.5.6.2 All water and river features should, where possible be drawn to scale. Scale of Water Features

27.5.6.3 The direction of flow of water in rivers and streams will be indicated by a Current Directional Arrow inside and close to the neat line in the case of single line streams and in the centre of the river close to the neat line in the case of double line rivers. Direction of Flow

27.5.6.4 Rapids in double line rivers should as far as possible be plotted showing the position of the rocks. Small rapids will be annotated and shown by two bars across the stream. Rapids Details

27.5.6.5 Only vehicular ferries will be shown. A ferry on a double line river will be marked by a single broken line joining the two ends of the road on the opposite banks and annotation "ferry". On single line rivers, only the annotation need be shown. Ferry details

27.5.6.6 Breakwaters will be shown plotted to scale. Features with plotted widths measuring less than 0.5 millimetre will be shown by single line. Breakwater Details

27.5.6.7 Piers, Docks or Wharves will be shown to scale and annotated as follows:- Annotation of Piers, Docks and Wharves

Type	Annotation	Abbreviated Annotation
Dock	Limbongan	-
Pier	Jeti	-
Wharf	Dermaga	-

27.5.6.8 Shoreline will be broken at sea walls, piers, docks or wharves. Indefinite shorelines will be indicated by a pecked line. Shoreline Details

27.5.7 Relief Features and Control Points

27.5.7.1 Types of Relief Features and Control Points

The following relief features and control points will be

shown:-

Types of relief Features and Control Points

a) Contours

b) Landslides

c) Quarries

d) Cliffs, precipices

e) Rock outcrops

f) Trigonometrical Stations

g) Standard (A) Control Marks

h) Second Class (B) and other Traverse Station

i) Bench Marks, if available

j) Spot heights (elevation) in metres

k) State Boundary Pillars

27.5.7.2 Contour intervals for maps will be 1m or as stated in the Schedule to Specification. The 5m contour and multiples thereof will be shown with a heavier line gauge. Contour lines will be omitted through cultural features such as buildings, roads, etc.

Contour Intervals

27.5.7.3 Sufficient contour values will be shown to enable map users to determine the value of any contour on the sheet. The contour values will be given in such a way that the top of the figure will always point towards the higher level. Contour values must be shown in a systematic way and not haphazardly located. They should not be placed where they destroy the legibility of intricate contour formations.

Contour Values

27.5.7.4 Spot heights should be given:-

Spot Height Requirements

a) at summits of isolated hills

b) along ridges

c) on saddles

d) at changes of slopes

27.5.7.5 In flat areas where contours are separated by more than 10cm on the map a sufficient number of spot

Intermediate Spot Heights

heights are required between the contours in such a way they give the maximum accuracy in determining the height of the ground. The spot heights will be given to the nearest first decimal place and the decimal point will also be its location on the map.

27.5.7.6 The landslide and rocks will be shown only when they exceed 5m in height. They will be labelled "Tanah Runtoh" (Landslide) or "Batu Runtoh" (Rockslide) as appropriate. Landslide Details

27.5.7.7 Wherever possible quarries will be plotted to scale and annotated with their names where appropriate. Quarry Details

27.5.7.8 Cliffs and precipices which exceed 5m vertically will be shown. The symbol may be indicated along the foreshore as well as inland. Cliff Details

27.5.7.9 The plotted positions of Trigonometrical Stations will be indicated by a dot in the centre of a triangle. For state boundary pillars, plotted positions will be indicated by a small, solid black triangle with circular white centre. Wherever possible height values and names will be included. Standard "A" and "B" stations will be indicated by a dot in the centre of a circle with its number beside it. All new and existing JUA stations will also be shown in the same manner. Control Mark Details

27.5.7.10 The positions of Benchmarks will be plotted if coordinates are available. If not they will be located in relation to other details. The number of the B.M. will be given beside its symbol, and its height will be given to the nearest first decimal. Bench Mark Details

27.5.8 Bridges and Culverts

27.5.8.1 Types of Bridges and Culverts

The following types of bridges and culverts will be shown

a) Permanent bridges (concrete, masonry or steel)
b) Wooden bridges
c) Foot bridges

Types of Bridges and Culverts

d) Culverts

27.5.8.2 Wooden bridges will be annotated "JK". Names of important bridges may be shown where these do not obscure more important details.

Annotation and Names of Bridges

27.5.8.3 Culverts will be shown by special symbol where the structure appears substantial. Otherwise, a small culvert will be shown by breaking the stream or canal line where it crosses under the road, street, etc. In cases where it would be pertinent to show the position of stream or canal under culverts, it may be done provided the broken lines are used for this purpose.

Culvert Symbols

27.5.8.4 The dimensions and types of all bridges and culverts should be given together with invert levels. They may be shown within a box with an arrow pointing to the bridge or culvert symbol.

Dimensions of Bridges and Culverts

27.5.9 Cultural Features, Utilities etc

27.5.9.1 Types of Cultural Features, Utilities etc

The following types of Cultural Features, Utilities etc will be shown:-

Types of Cultural Features, Utilities etc

a) Electricity Transmission Lines

b) Prominent walls and fences

c) Forts, ruins, and archaeological features

d) Rifle Ranges

e) Radio and Television masts and towers

f) Oil derrick or similar large, fixed mechanical devices

g) Tanks for water, oil, gas or other bulk fluids

h) Airfields and Landing Grounds

i) Sea Plane anchorages and Heliports

j) Cemeteries and crematoriums

k) Lighthouses and permanent beacons

l) Recreation grounds and Stadiums

m) Oil, Gas and Water Pipelines

n) Service Installations: lamposts, manholes, electrical posts, valves, post boxes, telephone boxes, transformers etc.

27.5.9.2 Ruins and archaeological features will be indicated by the outlines of the walls and annotated. Archaeological Details

27.5.9.3 Tanks will be shown by conventional signs or to scale and the tank contents annotated. Where the tanks are elevated (i.e not standing on the surface of the ground or partially covered by the ground) the annotation "berkaki" should be placed close to the symbol. Where possible individual tanks should be plotted separately but where this is not possible the area covered by the group of tanks will be shown. Tank Details

27.5.9.4 In general the most prominent walls and fences will be shown when they serve as boundaries in the area. Walls and Fences

27.5.9.5 Cemeteries will be annotated as follows: Cemetery Annotation

Type	Annotation	Abbreviated Annotation
Muslim Cemetery	Perkuboran Islam	Ku Isl
Chinese Cemetery	Perkuboran China	Ku Cna
Christian Cemetery	Perkuboran Keristian	Ku Ker
Other Religions	Ugama Lain	Ku Ug L

27.5.9.6 Any building within a cemetery or crematorium area will be shown to scale. Buildings in Cemetery

27.5.9.7 Wherever possible the full annotation will be used. Full Annotation

27.5.9.8 Airfields, landing sites, runways, taxi-ways, bays, dispersal areas and other details will be shown to scale. Airfields etc

27.5.10 Marginal Information

27.5.10.1 The general arrangement of the Marginal Information will be as follows:-

Sheet Number Top Right Corner and

Arrangement of Marginal Information

	Bottom Left Corner
Title of the Survey,	Top Left Corner and
Scale and Contract Number	Top centre
Company Name, Period of Survey, FB and LB Numbers, Scale, Contour Interval	Bottom Right Corner
Neat Lines	500 X 1000 mm all 4 sides
Grid Values	All 4 sides outside the neat lines
Special Symbols and Endorsements	Bottom Centre
North Line	Only where sheet is rotated. Close to the North East Corner of the Sheet.

Diagrammatic Guide

27.5.10.2 A diagramatic guide for the placement of above marginal information is appended.

Digitised Cadastral Data

27.5.10.3 If cadastral information has been fully digitised from R.S.O. Sheets, the following endorsement should be included on all relevant sheets:

"The cadastral boundaries shown on this sheet are approximate."

Copyright

27.5.10.4 The following endorsement should be given on all sheets:

"The prior approval of the Surveyor General, Brunei Darussalam, is necessary before this plan or portion thereof is copied"

27.6 Size of Features

True Size of Features

27.6.1 Many features on these maps will be depicted at their actual scale, but for others, generalisation is necessary, involving selection and simplification of material to eliminate unwanted details.

27.6.2 Minimum dimensions for details:-

Minimum Dimensions of Features

27.6.2.1 0.5m is considered as the minimum ground dimension of a detail which will be shown to its true plan scale. Those which are below this limit will be shown conventionally; important topographical features below 0.5m will be exaggerated in scale and shown at the minimum size. The under mentioned features however, will have increased minimum dimensions:

27.6.2.2 Gaps in cultivated or wooded areas: 1m

27.6.2.3 Pylons: 1m square at base.

27.6.2.4 Steps: 2m in length.

27.6.2.5 Driveways and approach roads: 5m in length.

27.6.2.6 Mud, marsh, sand and all types of vegetation: about 0.1 hectare.

27.6.3 Parallel details will be shown with following exaggerated plan clearance if their actual separation is less than the stated minimum:-

Exaggerated Clearances

27.6.3.1 Buildings, canal, minor roads etc: 0.5mm

27.6.3.2 Roads: 1.0m

Omission of Unimportant Data

27.6.4 In the process of generalisation the features which are either less than minimum dimensions noted herein or are of insufficient general importance, will be eliminated. However those details which are judged to be of value to the map user will be shown by conventional symbols if their overall dimensions fall below the minimum values stated above.

Symbol Tables

27.6.5 The Symbols and Line Tables give specifications for style, type sizes, symbols, dimensions and line widths for conventional signs at drafting scale.

27.7 Grid

RSO Projection

27.7.1 These maps will be drawn on the Rectifies Skew Orthomorphic (R.S.O) Projection.

Grid Crosses

27.7.2 The R.S.O. grids will be shown by crosses at 100m intervals in

the Northings and Eastings.

27.7.3 Full grid values will be given alongside the grids outside neat line. Grid Values

28 DELIVERABLES

The contract may call for the supply by the Surveyor of any or all of the following items. The items which are to be supplied, and which may include others which are not listed below, will be set out in detail in the Schedule to the Specification.

28.1 A draft sheet line scheme if the mapping is not part of a regular map series where the sheet lines are already defined. Proposed Sheet Series Layout

28.2 A draft sheet layout showing proposed arrangements of marginal information etc if the mapping is not part of a regular map series for which a standard sheet layout has been supplied by the Surveyor General. Proposed Sheet Format

28.3 All original plots together with three dyeline copies of the plots. Number of Copies

28.4 In the case of contracts where mapping of the same area at more than one scale is required, full details will be set out in the Schedule to the Specification of the requirements for enlargements or reductions of the original plots which are to be supplied. Mapping at Multiple Scales

28.5 Digital Data as follows

28.5.1 Autocad Drawing Format

28.5.2 Arc Info Format as follows

Digital Autocad Data

28.5.2.1 Feature codes as per Data Dictionary

28.5.2.2 Coverage Attribute Tables

28.5.2.3 Coverages created by “Clean and Build”

28.5.2.4 Parameter Boundaries

28.5.2.5 Colours and Patterns as prescribed

Digital Arc Info Data

28.6 Details of any additional ground control established by the Surveyor to control the mapping. (Clause 4.4). These details shall include:

28.6.1 A list of all control points use in the mapping giving grid co-ordinates (except for uncoordinated height points) and heights. Schedule of Control Points

28.6.2 Descriptions, including diagrams, of all planimetric control points and bench marks established by the Surveyor. Should there be a requirement for these descriptions to be entered on standard forms the Surveyor General would arrange for these forms to be supplied to the Surveyor.

Description of Control Points

28.6.3 All original records of field observations and computations in connection with the mapping control.

Original Field Records

28.6.4 A diagram for each contract area showing the approximate locations and reference numbers of all ground control used. This diagram shall indicate how individual planimetric control points were fixed.

Diagram of Control Points

On all these documents each control point will be identified by a unique number, allocated to it in accordance with a system to be approved by the Surveyor General, which will always be quoted whenever such point is mentioned in correspondence.

Numbering of Control Points

28.7 All records supplied by the Surveyor General to the Contractor shall be returned to the Surveyor General before completion of the contract.

Return of Data supplied by SG

PART V HYDROGRAPHICAL

29 TYPES OF SURVEYS

This Instruction relates to the following types of surveys

29.1 Foreshore construction in related to shore protection works, retaining walls and outfall/intake structures and land reclamation.

29.2 Residential and commercial properties / facilities/ structures located along the foreshore and internal rivers.

29.3 Soil investigation

29.4 Maritime navigation surveys are not included

30 FIELD WORK

Survey Limits

30.1 Soundings

30.1.1 A plan of operation shall be prepared before commencing to sound. The plan shall provide for the delineation of topography of the seabed in the most economical and expedient manner

MHWM

30.1.2 The line of sounding shall be run 5 mm apart on the sheet, for example, on scale of 1:12500; lines are run 62.5 metre apart on the ground.

30.2 Position Fixing

The position of a boat or vessel shall be fixed by means of two or more positions. The fix can be obtained in a variety ways and can be referred to terrestrial or celestial object.

30.3 Survey Limits

30.3.1 The survey limits shall extend to at least 25 metre beyond the perimeter of the required working limit or up to the adjacent sea-wall, wharf, coastline, etc.

Calibration of Equipment

30.3.2 Hydrographic survey must cover up to High Water Mark (Line) which is the Mean High High Water (MHHW) mark or Coastline where applicable. Low Water Mark or drying lines shall be shown in details symbolised in accordance with “Hydrographic Plan

drafting Specification".

30.4 Method and Execution of Survey

Conformance

The method and execution of survey shall conform to accepted standards of good survey practice. Where maximum standards of accuracy have to be achieved, these will be laid down in the Schedule to the Specification

30.5 Survey Equipment and Accuracy

30.5.1 Calibration

The LLS shall ensure that the survey equipment that are to be used shall be properly calibrated before they are used in any survey. The LLS shall maintain the calibration records and submit them Surveyor General or his representative for inspection.

Differential GPS

30.5.2 Echo Sounder

A dual frequency echo-sounder (viz. about 30 KHz and 210 KHz), providing depth accuracy of +/- 0.1 metre, shall be used for sounding surveys. The echo-sounder shall be calibrated daily by Bar Checks, up to the maximum depth of the survey area and on the working phase of the echo sounder, before and after sounding. The records of such Bar Checks shall be marked on the same echo roll used for the particular day's sounding and shall be subject to inspection by Surveyor General or his representative.

As per Specifications

Appropriate to topography

30.6 Horizontal Positioning System

Sounding Density

The horizontal positioning is to be controlled by Differential Global Positioning System (DGPS) or electronic positioning system such as Total Station providing an accuracy of +/- 1m or better. The DGPS shall be checked against a known coordinated position before and after survey each day.

30.7 Survey Scale

30.7.1 The survey scale shall be determined by the survey requirements which shall be set-out in the schedule to the specification.

30.7.2 The scale of the survey shall be large enough to allow sufficient lines to be plotted to indicate the configuration of the seabed.

30.8 Density of Soundings

Sounding lines shall be run at spacing of 3 x Average depth or 25m whichever is greater throughout the entire survey limits and at closer

intervals where seabed is irregular and high spots are detected. Cross-lines shall be run at intervals of not more than 10 times the line interval of the sounding lines.

30.9 Sounding Datum

BSD 88 Datum

The Sounding Datum to be used for the reduction of soundings shall be the Brunei State Datum 88 (BSD88) which is equivalent to the Mean Sea Level, MSL. This is normally referred to height of Bench Mark in the vicinity of the sounding area. This shall be specified on the plan and survey report.

Control Station Criteria

30.10 Control Stations

Control stations to be used shall be at least 2nd Class or better. All new control stations are to be connected to GDBD2009 stations. The Surveyor shall submit to Survey General a plan at the survey scale showing all the control stations used for the surveys and a list of their respective co-ordinates and station descriptions.

Tidal Correction Criteria

30.11 Tidal Corrections

Tidal readings for the reduction of soundings shall be taken based on tidal data obtained on the vicinity of the survey area. If RTK tide method using GPS or direct sounding reduction method using Total Station has been used, it shall be clearly mentioned in the methods of survey.

Data Processing Software

31 PLAN PREPARATION

31.1 Plotting

Plotting Scales

31.1.1 Depth and position data collected in the field shall be transferred to a Computer for automatic data processing and plan plotting. Hydrographic processing software shall be used for the purpose

Accurate Plotting

31.1.2 The plotting scale shall be at the scale that is normally used by Survey Department (1:500, 1:1000, 1:1250, 1:2500, 1:5000, and 1:10000).

Spacing between Soundings

31.1.3 Soundings shall be plotted accurately and shown in the appropriate format. All high spots detected on the echo trace between fixes shall be plotted unless proven to be false echo.

Main Sounding Lines

31.1.4 Soundings shall be plotted at intervals of not more than 10 -15 mm on plan along the entire sounding line.

Clarity of information

Main Soundings

31.1.5 Main sounding lines shall be plotted at intervals of not more than 5 mm on plan at survey scale??????.

Drafting Instructions???

31.1.6 All symbols, abbreviations and terms depicted on the plan shall be in accordance with the "Hydrographic plan drafting instruction"???. Depths shown on plans shall be clear, legible and free from over plotting. Any heights of isolated features shall be shown.

Cross sections

31.1.7 Where cross-sectional plans are to be drawn, the vertical and horizontal scales will be determined by requirements of the client or consultant.

Sea Bed Sampling

31.1.8 Results of seabed sampling for post dredging survey shall be plotted on a separate plan at the same survey scale.

31.2 Depth Contours

RSO Coordinates

Standard drying lines and depth contour will be set-out in the "Schedule to the Specification" and shall be drawn on all relevant survey plans. The contours depicting the approved dredging/or dumping depth shall also be drawn on the relevant survey plans where applicable.

Grid Interval

Grid Values

31.3 Survey Grid

31.3.1 The survey results shall be plotted in Geocentric RSO Coordinate grid in meters.

Field Data to be submitted

31.3.2 The grids will be shown by crosses at 100m intervals in Northings and Eastings.

31.3.3 Full grid values will be given alongside the grids outside neat line.

32 DELIVERABLES

32.1 Field Survey Records

The field records shall be maintained by the LLS for inspection at any time by Surveyor General or his representative. The following records must be duly certified and submitted to Survey General

32.1.1 Name of Surveyor;

32.1.2 Digital or hard copy of daily echo trace and bar-check records, date and time, fix numbers shall be annotated.

32.1.3 All Bathymetric and position data recorded digitally in real time. The raw data comprising date, time, x,y,z coordinates shall be

presented in ASCII format.

32.1.4 Digital record in ASCII format of daily tidal height measurement if applicable

32.1.5 Hard copy record of field equipment calibration;

32.1.6 Digital copy plots of the actual tracks travelled by the survey boat;

32.1.7 Digital and hard copy of sounding plots; and,

32.1.8 Any other relevant records.

32.2 Certification

LLS Certification

The LLS shall certify all plans, field records, reports, data sheet, equipment calibration records, sounding plots, etc before submitting them to the Surveyor general.

32.3 Survey Plans

The LLS shall submit :

32.3.1 One transparent polyester base, in black and white

32.3.2 two paper prints of the survey plans, not larger than AO size, to the Surveyor General .

Survey Report

32.4 Survey Report

CD of digital Data

The LLS shall submit a comprehensive survey report (2 copies) to Surveyor General giving details on Outline of Operation, Field Operation, Data Processing, Finding, List of Accompanying Documents, and any other relevant information of each survey carried out by the Surveyor.

32.5 Digital Data File

Calibrate prior to Survey

The LLS shall submit a set of all digital survey records mentioned herein, and store them in a 3.5" compact diskettes (CD) together with an index chart let showing the surveyed areas covered by each data file and the co-ordinates for those points defining the surveyed areas.

Calibration Method

33 CALIBRATION OF ECHO SOUNDER

33.1 A well-adjusted echo sounder shall be properly calibrated before the apparent depths recorded.

Calibrate during stable weather

33.2 For harbour and coastal surveys, the most convenient way of carry out calibration is by means of the bar check in which a bar is a sound reflecting piece of metal or other sound reflecting material, held horizontally under

Equal Intervals for bar Check

the echo sounding transducer. Normally an echo set shall be bar checked before and after a day's work.

Calibrate During Stable Conditions

33.2.1 Preferable this calibration is to be carried out during quiet weather, with no streams or currents to interfere with the correct reading of the actually vertical lead lines.

Calibration Procedure

33.2.2 By lowering the bar with an equal amount every time, the bar will gradually move away from the transducer while remaining horizontal. For every position of the bar its reflection on the echogram is noted. The positions of the bar are noted relative to the transducer so that all readings are corrected for depth of the transducer below the water line.

PART VI - MAPPING

34 GENERAL

34.1 GIS Mapping Section

GIS Mapping Section of Survey Department is responsible for providing updated, accurate and quality maps for national development as follows

GIS Mapping Section Responsibilities

34.1.1 To produce and facilitate continuous topographic maps at scale 1 : 10 000 and 1:50 000 that covers the whole of Brunei Darussalam.

34.1.2 To facilitate and updated maps of 1 : 1 000 and 1 : 2 500 continuously op developed area.

34.1.3 To create and manage digital topographical database.

34.1.4 Updating of topographical maps at medium scale and special projects that uses remote sensing technology.

34.1.5 To facilitate a systematic house numbering

34.2 Purpose

This Instruction provides details of the different data preparation guidelines and procedures the Cartography staff must observe for the successful publication of accurate and quality series of maps for the various clients of Survey Department

Purpose of Instruction

35 MAP PUBLICATION PROCESS

The following make up the major components of the map publication process

35.1 Data Sourcea

Cartography can use the following data sources for their map composition and design work:

Data Source

35.1.1 Photogrammetry Unit Access Warehouse (MDB)

35.1.2 Enterprise SDE Geodatabase.

35.1.3 Under no circumstance will Cartography unit make editing work on the said data sources. They are only allowed to change the layer representations but not the geometry nor its attributes.

35.2 Map Projection

35.2.1 The coordinate system used in GeoMedia V. 6, when querying

Geo Media RSO Projection

the feature class, is Rectified Skew Orthomorphic (RSO).

35.2.2 The coordinate system used in creating Grids in MicroStation for the map layout are the following:

35.2.2.1 Rectified Skew Orthomorphic (RSO) Projection. RSO Projection

35.2.2.2 Netherland East Indies (NEI) Pr Equatorial Zone Projection. NEI Projection

35.2.2.3 Geographic Timbalai 1948. GT 1948

35.3 Lithographic Process

35.3.1 For Cartographers, Geomedia Pro v6 is used for querying the data to organize into their respective layer names and categories. Proper categorizing of the spatial information is done using the Filter Attribute Table. Categorising Data

35.3.2 Exporting the MDB data to the design file (.dgn) is used after querying. It will then be converted back to its original CAD file format. Exporting Data

35.3.3 Based on the **CheckList** and existing data specifications, there should be 7 output files from the conversion process (7 categories):

Output Files

Boundary	- Bdy
Building	- Bld
Transportation	- Trn
Hydrography	- Hyd
Relief	- Rel
Miscellaneous	- Mis
Vegetation	- Veg

35.3.4 Check list is the Design File Compilation Table (Information Feature Table - IFT) which every table consists of 8 check lists:

Feature Table Check List

Boundary	- Bdy
Building	- Bld
Transportation	- Trn
Hydrography	- Hyd
Relief	- Rel
Miscellaneous	- Mis
Vegetation	- Veg
Legend	- Leg (As a Template)

35.3.5 Every CheckList has 60 Level List.

Conversion to Raster

35.3.6 To publish a map, the Cartographers have to convert the vector/CAD files (.dgn) into raster format (.rle).

Lithographic Specifications

35.3.7 Lithographic specifications are stored in specification table and path files. Each of the lithographic processes (Collage, Imageplot, and Photolab) requires a specification table file and a corresponding path file.

Map Information

35.3.8 The information placed varies for each map product and includes a map title, scale bar,, scale no., sheet no., edition no., RSO and NEI coordinates, geographical, legend, adjoining sheets, survey diagram, grid.

35.3.9 Map Publisher Limits and Constraints:

Map Publisher Limits

Parameter	Limit
Software display colors	24-bit full color (or 64K or more colors for editing continuous tone images)
Input design(.dgn) / drawing (.dwg) files	Unlimited
Levels / layers per design / drawing file	63
Number of input feature separates files (Intergraph Type 9 binary RLE files)	500
Specification Table entries	500
Path Files entries	500
Screens, total number in screen library	Unlimited
Screens, number referenced in a Specification table	127
Patterns, total number in pattern library	Unlimited
Patterns, number referenced in a Specification table	127
Negative / print inks (composites) per map	25

35.3.10 Before printing, the technician will check the digital map in the viewer of the Map Publisher. Once the map is satisfactory, a check plot shall be generated. The digital map will be checked by the senior officers of the Mapping Section for verification. Should there be corrections, the maplots shall be returned to operators for modification.

Checking of Digital Maps

35.3.11 The sheet normally represents an area as below:

Sheet Areas

1:1,000	-	10km X 5km
1:2,500	-	1km X 1km
1:10,000	-	5km X 5km
1:50,000	-	Various sizes
1:100,000	-	Various sizes
1:250,000	-	

35.4 Sheet Numbering

35.4.1 The numbering of sheets of this series is derived from the 10 km R.S.O. Each grid square is identified by the coordinates of its western and southern grid limits.

RSO 10km Grid

35.4.2 As an example, a square bounded by 540 000m E grid on the west 510 000 m N grid on the south will be numbered as 55/41. The first two digits, viz 55, in this example are 100 km grid values, one from East coordinate and the other from North coordinate and both in 100 km units.

100km Grid Reference

35.4.3 The next two digits, viz 41, define the 10 km grid values, one from east coordinate and other from north coordinate and both in 10 km units.

10km Grid Reference

35.4.4 The Edition Number will consist of a serial number and the year in which the map details were last edited. The serial number will be 1 for the first edition, 2 for the second and so on. eg. Edition 1-1985

Edition Number

35.4.5 This sheet is further divided into four quadrants, NE, NW, SE and SW, each quadrant being a square of 5 km and is the area covered by a 1: 10 000 scale sheet. In the above example the sheets numbers are: 55/41 NE, 55/41 NW, 55/41 SE and 55/41 SW.

Quadrant Reference

35.5 Map Accuracy

35.5.1 Well-defined points of detail should have an accuracy better than

a root mean square error (r.m.s.e.) of +/- 0.3 mm at Map Scale when compared with precise measurements using ground surveys. 90% of a representative sample of well-defined points shall be within 0.5 mm. Positional Accuracy

35.5.2 The spot heights in open areas should have an accuracy better than an r.m.s.e of +/- 1.25 m when compared with precise ground measurements. 90% of a representative sample of heights shall be within 2.0 m. Spot Height Accuracy

35.6 Map Contents

35.6.1 Maps in this series will be comprehensive topographic editions showing elevations and contours, all natural and cultural features, and sufficient number of suitable annotations. Comprehensive Data

35.6.2 All dimensions will be given in metric values. Metric

35.6.3 All information falling outside and inside the neat lines will eventually be in the Malay language using the Roman Script. Malay Language

35.6.4 The following colours will be used on these maps for the broad categories:

35.6.4.1 Water features – Cyan (process blue) Feature Colours

35.6.4.2 Contours, sand, roads - Magenta (red)

35.6.4.3 Vegetation – Green (varying combinations of yellow and process blue)

35.6.4.4 All other details – Black

35.6.4.5 Padi – Buff

35.6.5 Edge-matching of all details should be carried out between adjoining sheets at both compilation and fair drawing stages. Edge Matching

PART VII – MISCELLANEOUS SURVEYS

36 DIRECTION OF KIBLAT / ASTRONOMY

36.1 Survey Marks Available

Approved Survey Marks Second Class Traverse

36.1.1 Any approved survey marks can be used for the determination of kiblat direction.

36.1.2 The method of second class traverse shall be use (refer section 8 of this WI).

Recording Format

36.1.3 The recording of the observation shall be in the form that is prepared by the Geodetic Section (GDC 030).

36.2 Survey marks Not Available

Compass Theodolite

36.2.1 Where survey marks are not available, a suitable compass theodolite shall be use to determine the kiblat direction.

Magnetic Interference

36.2.2 The compass theodolite shall be set up within the area where disturbances which may effect the compass reading is minimum.

Recording Format

36.2.3 The recording of the observation shall be in the form that is prepared by the Geodetic Section (GDC 030).

PART VIII – SURVEY MARKS

37 STANDARD TRAVERSE MARKS

Standard Traverse Marks shall be as follows

37.1 Standard marks shall be constructed of galvanised pipes of length not less than 100 cm and internal diameter of not less than 25mm. — Type of Mark

37.2 The top of the pipe shall be secured below ground level by a concrete collar not less then 50 cm square and 15 cm thick. — Concrete Collar

37.3 The centre of the pipe shall be marked by a small non-ferrous nail set in concrete. The number shall be marked in the concrete collar. — Centre Marking

37.4 For ease of location, numbered reference stones shall be placed not less than 50 cm but not more than 100cms from the standard marks. — Reference Stones

38 FIRST CLASS TRAVERSE MARKS

First class traverse marks shall be:-

38.1 A galvanised pipe of length not less than 60cm and internal diameter of not less than 25 mm. — Type of Mark

38.2 The top of the pipe shall be secured below ground level by a concrete collar not less then 30 cm square and 10 cm thick. — Concrete Collar

38.3 The centre of the pipe shall be marked by a small shall non-ferrous or brass nail set in concrete. The number shall be marked in the concrete collar. — Centre Marking

38.4 A metal or plastic mark of a type approved by the JUA, securely set of grouted into rock or into a permanent structure. — Alternative Marks

38.5 Line marks shall be of permanent material, usually either an iron pipe or an iron spike, and shall usually be buried below ground level. — Line Marks

38.6 Pickets or other temporary marks shall not be used in any control survey. — Prohibited Marks

38.7 For ease of location numbered referred stones shall be placed not less than 50 cm but not more than 100cm from the first class marks. — Reference Stones

39 GPS MARKS

GPS fixed stations shall be as follows

39.1	Constructed of galvanised pipes not less than 60 cm.	Type of Mark
39.2	The top shall be secured below ground level, a concrete collar not less than 30 cm square and 30 cm thick.	Concrete Collar
39.3	The centre of the pipe shall be marked by brass nail set in the concrete. (See Photo 4 & Photo 5)	Centre Marking
39.4	The number shall be marked in the concrete collar.	Number Marked
39.5	Each survey station shall carry individual number. This will ensure that, where a station has been destroyed and subsequently replaced by a new station in approximately the same location, misidentification does not occur.	Unique Number
39.6	Any other marks approved by the JUA.	Alternative Marks

40 BENCH MARKS

Bench marks shall be constructed as follows:

40.1	Excavation of 600 x 600 x 1000 mm foundation.	Foundation Size
40.2	Galvanised pipe to be driven with minimum length of 2 metres and diameter between 100 mm (4 in) and 160 mm (6in).	GI Pipe
40.3	The top of the GI pipe shall be fitted with a 32mm (1¼ in) diameter copper pipe with maximum length of 300mm and fabricated to hold in position the bronze mark. This bronze mark will be provided by Survey Department.	Copper pipe and Bronze mark
40.4	The excavation area with the galvanised pipe to be filled and secured with concrete collar.	Concrete Collar
40.5	Above the ground level shall be concreted using the mould that will be provided by Survey Department.	Concrete above Ground
40.6	On the top of the concrete shall be stamped with words “JABATAN UKUR” and the number of the station that assigned by Survey Department. Survey Department will provide the stamp. The words and the number	Stamp on Concrete

shall be colour in red.

40.7 On the front side of the station a stainless steel plate shall be fabricated and installed with the words on the first line "HARTA BENDA KERAJAAN" and followed by on the second line with the words "SILA JAGA KESELAMATANNYA". The colour of this wording shall be in red. Steel Plaque

40.8 The finishing shall be plastered and colour with white using all weather paint. (See GDC01A). Painting

41 BOUNDARY MARKS

41.1 Types of Marks

Boundary marks shall be:

41.1.1 Cylindrical reinforced concrete marks, numbered and not less than 60 cm long with a diameter of not less than 8 cm and concreted on top of pvc pipe of not less than 60 cm long with diameter of not less than 25 cm and driven or set to finish not less than 5cm above ground level. Standard Boundary Mark

41.1.2 Where the presence of rock, stone, concrete or other permanent material or structure makes it impossible to use Standard Boundary Marks, the following shall be used: Marks in hard material

41.1.2.1 A metal rod or pipe or plastic of appropriate length of at least 1 cm internal diameter and driven or set to finish not more than 5 cm. above ground level. Rods and Pipes

41.1.2.2 Metal or plastic marks of a type approved by the Surveyor General (JUA), grouted if necessary into the base material to ensure stability. The height of mark above ground level shall be shown in the field notes. Metal or Plastic Marks

41.1.2.3 Any other marks approved by the Surveyor General (JUA). Other Approved marks

41.2 Placement of Marks

41.2.1 If a boundary corner or boundary line falls on a permanent structure or other obstacle in such a manner that it is not possible to use any of the marks prescribed in the Instruction. the exact position of the structure or obstacle shall be defined by survey. The relationship between the structure or obstacle and the Unable to Place Mark

boundary corner or boundary line shall be clearly shown on the plan of the survey.

41.2.2 If a boundary corner cannot be marked by reason of watercourse, structure, topography, vegetation, etc., line marks shall be placed along all boundaries as near as possible to the boundary corner. The relationship between such line marks and the boundary corner shall be clearly shown on the plan of the survey. — Line Marks

41.2.3 Details of physical features such as; fences, walls, hedges, etc., along boundary lines shall be noted and shown in the field notes and on the plan of the survey. — Locate Physical Features

41.2.4 Permanence and stability shall be the main considerations in the marking of any boundary, and where necessary, the length of any mark shall be increased accordingly. — Permanence and Stability

41.2.5 Boundaries shall be marked at every corner in accordance with the Instruction with other clauses of these Instructions. — Mark every Corner

41.2.6 Boundary lines shall be generally measured directly. — Direct Measurement

41.2.7 In urban surveys where the measurement of every boundary is not necessary, sufficient boundaries shall be measured to ensure the accuracy of computed boundaries. — Urban Areas

41.2.8 Boundary lines shall be cleared where necessary and distinctly marked at intervals generally not exceeding 300m. , which may be varied to suit the topography of the Country. Advantage shall be taken of the most prominent and favourable positions on the line for the markings so that marks are inter-visible. — Maximum Distance between Line Marks

41.2.9 In area where complete measurement of the boundary is not necessary, subject to the approval of the Surveyor General, lines shall be cut and line marks placed at least 100m apart so that the boundary may be readily ranged?????. — Ranging of Boundaries

41.2.10 Every survey mark defining an angle in a boundary shall be connected by traverse to a controlled traverse or witness mark. — Connection to Traverse Marks

41.2.11 No invisible survey mark shall be itself a witness mark. — Visible Witness Marks

41.2.12 Curved boundaries are not acceptable. — No Curved Boundaries

42 TRAVERSE AND WITNESS MARKS

42.1 Types of Marks

Traverse and witness marks shall be:-

42.1.1 Metal or plastic pipe not less than 1 cm. internal diameter and 50 cm long. — Metal or Plastic Pipes

42.1.2 Iron spike not less than 1 cm. diameter and 30 cm long. — Iron Spikes

42.1.3 A metal or plastic mark of a type approved by the Surveyor General (JUA), securely set or grouted into rock or into a permanent structure. — Marks in Hard Material

42.1.4 Other permanent and definite marks which are accepted by the Surveyor General. — Other approved Marks

42.1.5 Wooden pickets or other temporary marks are not to be used for traverse, on line or witness marks — Prohibited Marks

42.2 Placement of Marks

42.2.1 Care shall be taken when placing marks where there is a danger striking underground services. — Underground Utilities

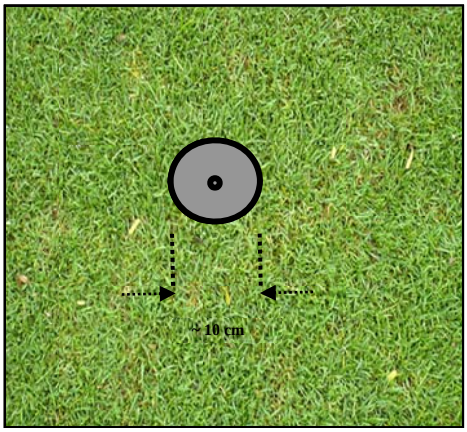
42.2.2 All traverse and witness marks shall be placed in positions that are as safe as possible from foreseeable disturbance and shall normally be driven or set not less than 20 cm. below ground level. Where there is any risk of disturbance or destruction by any development or works, or by vandalism, marks shall be driven or set as deep as necessary for reasonable preservation. The depth of all marks shall be shown in the field notes. Where necessary the length of marks shall be increased to ensure permanence and stability. — Safe from Disturbance

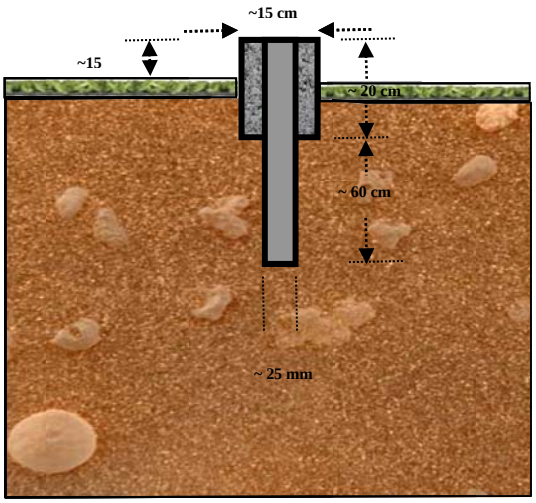
42.2.3 Traverse and witness marks shall be located and driven or set so that they cannot be mistaken for boundary marks. — Distinct from Boundary Marks

42.2.4 Traverse lines shall, where practicable, be located such that they will not be obstructed by future structures or development. — Intervisibility

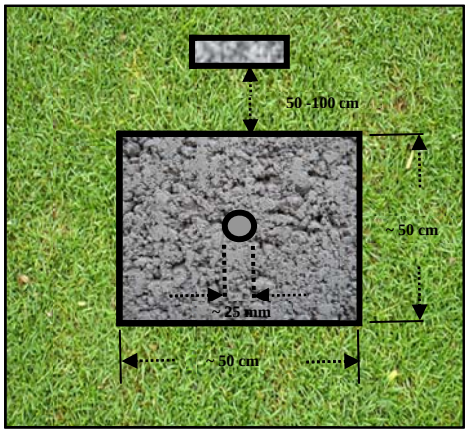
43 MARK DIMENSIONS

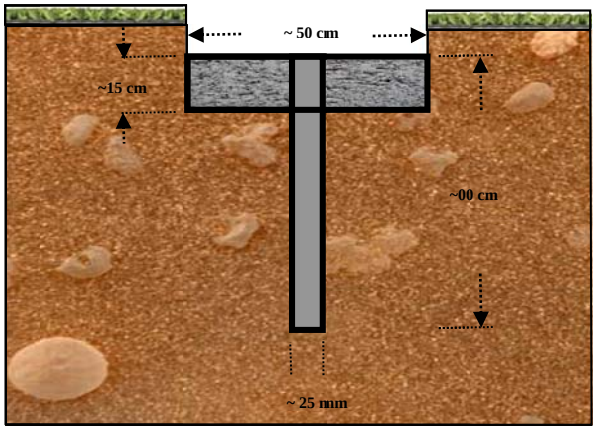
43.1 Standard Traverse Marks



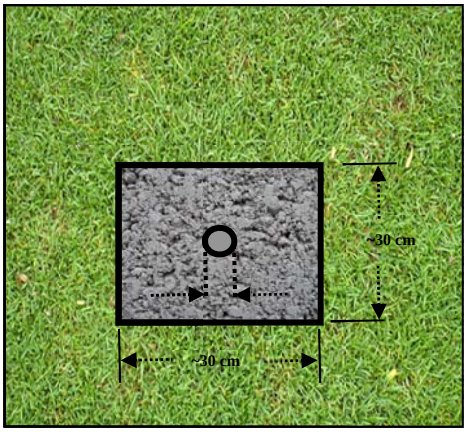


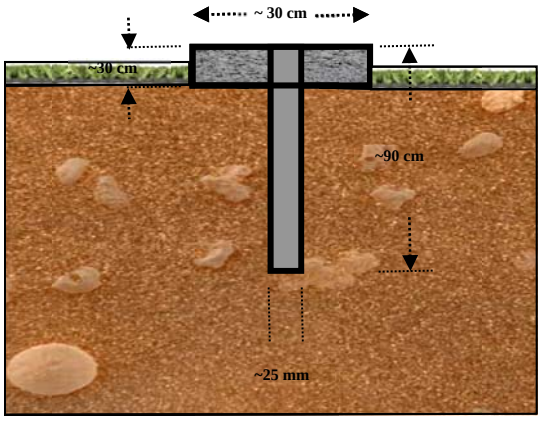
43.2 First Class Traverse Marks



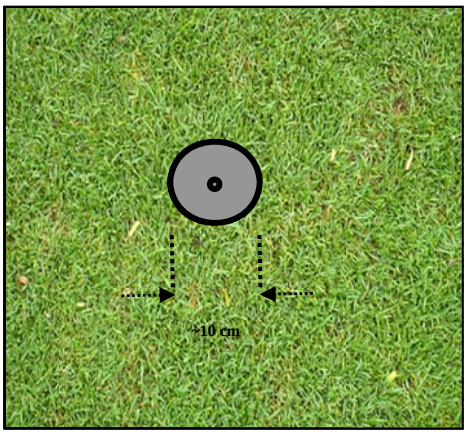


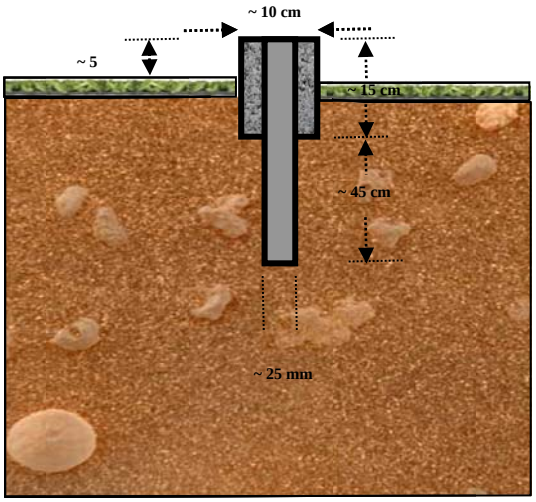
43.3 GPS Fixed Stations



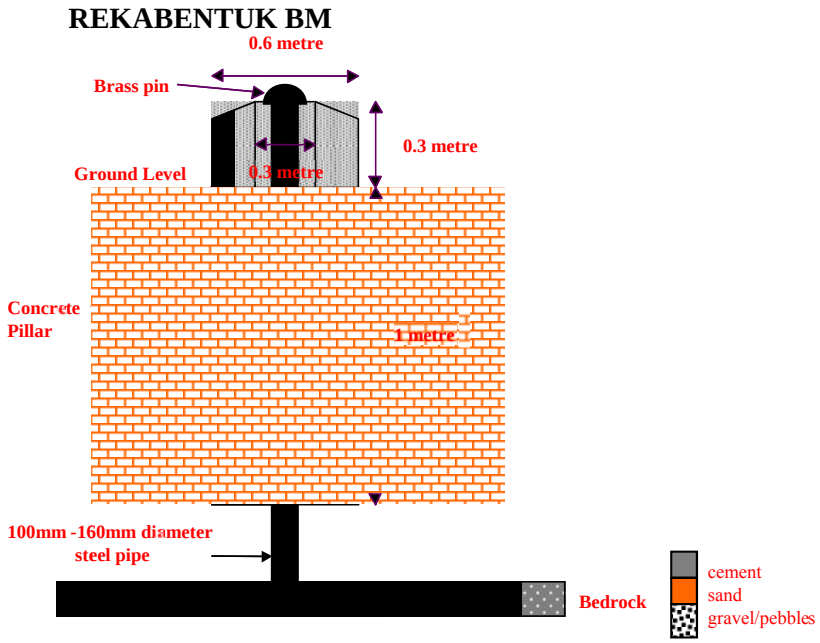


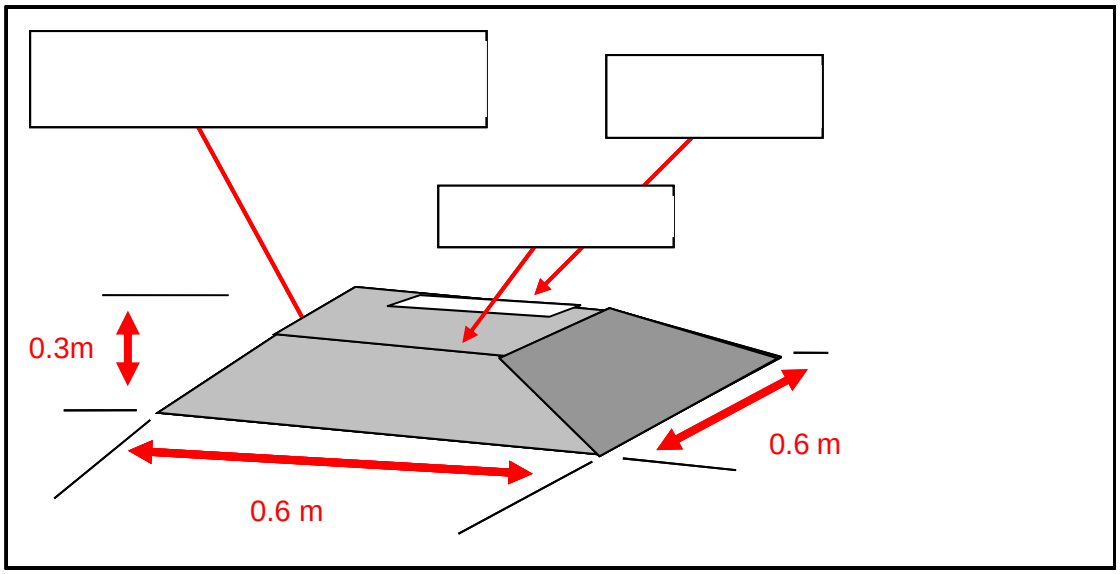
43.4 Boundary Marks





43.5 Bench Marks

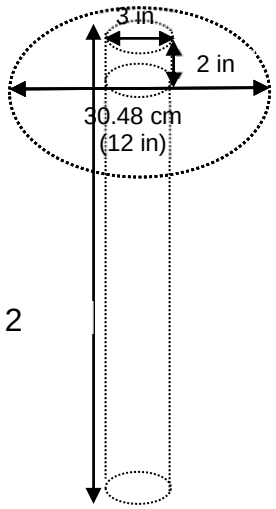




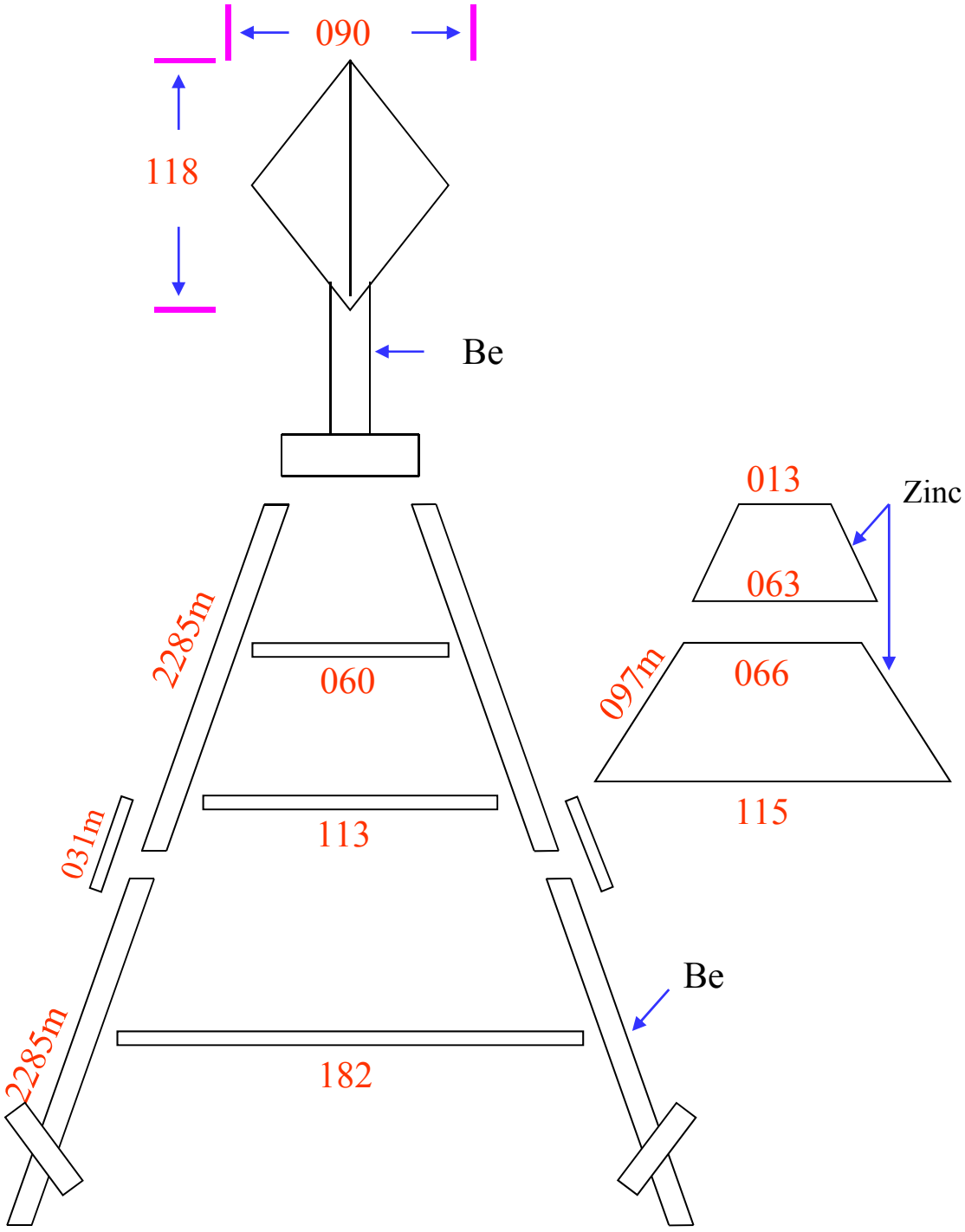
43.6 Other Marks

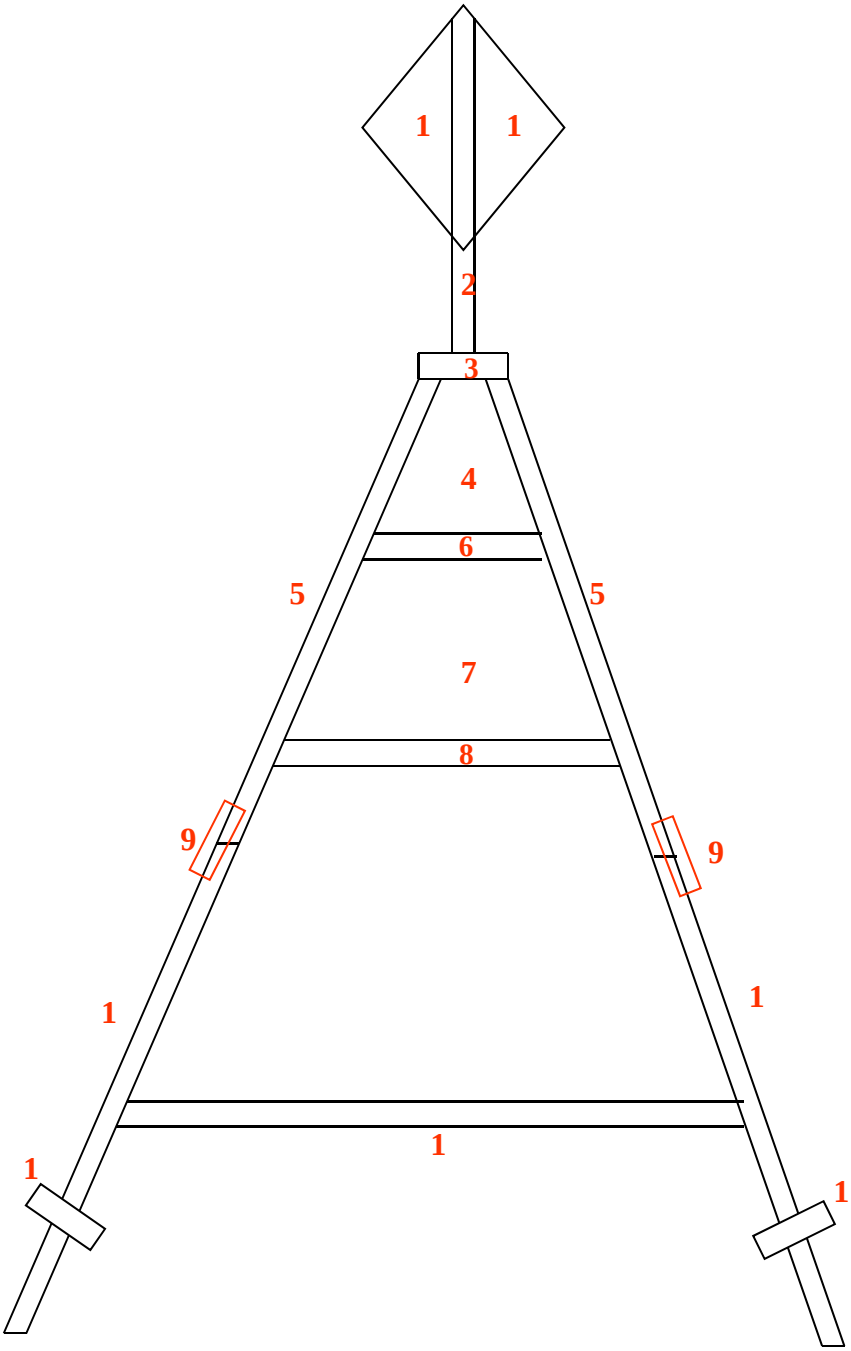
43.6.1 International Boundary Mark

BATU SEMPADAN ANTARABANGSA



43.6.2 Trig Station





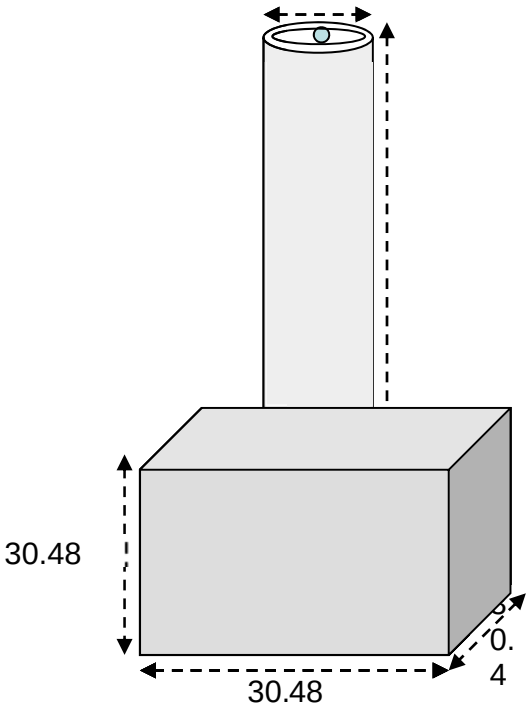
KEPALA BIRUP
BATANG KEPALA
MANGKUK
DINDING ATAS
KAKI ATAS
PALANG ATAS

DINDING BAWAH
PALANG TENGAH
PENYAMBONG KAKI
KAKI BAWAH
PALANG BAWAH
PALANG KAKI

BIRUP

Jumlah Ketinggian = 5.5897 M

PILLAR



PILLAR

44 MARK PHOTOGRAPHS

44.1 Standard Traverse Mark

44.2 First Class Traverse Mark

44.3 GPS Station

44.4 Bench Marks

44.5 Boundary Marks

44.5.1 Old Stone Peg (OSP)

44.5.2 Old Belian Peg (OBP)

44.5.3 Old Concrete Mark (OCM)

44.5.4 Old Concrete Mark (OCM) - Numbered

44.5.5 New Concrete Pipe (NCP)

44.5.6 Old Iron Pipe (OIP)

44.5.7 New Plastic Pipe (NPP)

44.5.8 Nail

44.5.9 Picket

PART IX – SUBDIVISION AND CONSOLIDATION

45 PLANNING GUIDELINES

Please refer to

PLANNING GUIDELINES FOR SUBDIVISION AND / OR CONSOLIDATION OF LAND.	Title of Guidelines
Published by:	
Department of Town and Country Planning	Publisher
Ministry of Development	
Negara Brunei Darussalam	
First Edition January 2004	Edition

PART X – SURVEY PLAN STANDARDS

46 STANDARD SURVEY SHEET

Survey data are compiled on Standard Survey Sheets of which there is a uniform Series of Cadastral Index throughout Negara Brunei Darussalam (refer Cadastral Index Map).

Cadastral Index

46.1 The numbering of Standard Survey Sheet is based on the metric RSO coordinates. It consists of Six digits. The first two digits represent the first digits of Easting and Northing coordinates followed by a slash. The next four digits represent the 2nd and 3rd of Easting and Northing coordinates.

Numbering System

E.g. 55/7439 E 574000
N 539000

46.2 The Standard Survey Sheet shall be produced on 48 X 62 cm size, paper at a scale of 1:2500. The margin lines are 1000 metres intervals of the Borneo R.S.O Grid, with lines at 100 m intervals.

Sheet Size

46.3 Coordinates shall be updated in Point Database.

Point Database

47 SURVEY PLANS

47.1 Plan Form.

All survey plans shall be produced on stable transparent draughting materials as approved by the Surveyor General (SG) with the sizes as follows.

Size and Prefix

SURVEY PLAN		SIZE	DISTRICT CODE/ABBREVIATION	
Gazette	GP	A2	Brunei Muara	BM
Certified	CP	A2	Tutong	TU
Misc	MP	A2	Belait	KB
TOL	TL	A2	Temburong	TE
Restricted Gazette	GT	A2		
Museum Gazette	GM	A2		

47.2 Numbering System

47.2.1 The numbering system of the plans consists of six digits and four Letters. The first two letters in front represents the type of the Survey plan and the last two letters represent the location of the plan (District). The first two digits in the middle indicating the year of the plan plotted and the last four digits indicating the total number of plans plotted in the year.

Numbering System

Example :

Examples

GP080001BM
CP080002TU
MP080012KB
TL080013TE
GT080014BM
GM080015BM

Unique Number

47.2.2 Each plan shall carry one unique number.

47.3 Scales

All plans shall be plotted at one of the following scales. Such scale is being chosen as best fit the plans form sizes laid down as follows :

Scales

Scale 1:100, 1:250, 1:500, 1:1000, 1:1250, 1:2500, 1:5000, 1:10000, 1:12500, 1:25000, 1:50000

Clarity

47.4 Bearing and Distances

Sexadecimal

47.4.1 All bearing and distances shall be written legibly against the lines to which they apply except where limitations on space prevent this, in which case inserts shall be used as prescribed herein

47.4.2 All bearings shall be quoted as whole circle bearings in the Sexagesimal (360°) system and all the distances in metres.

Decimal Places

47.5 Area

47.5.1 The area of any Lot and the access Reserves shall be written as close to the centre of the Lot as possible and shall be quoted to four decimal places in hectares only.

Decimal Places
Town Area

Example : 0.1234 ha.

47.5.2 For the town Lot the area shall be quoted 1/10th of square metres.

Inset Diagram

47.6 Inset

Inset

Where on any part of the plan, measurement or details would otherwise be illegible or difficult to interpret, a diagram on a larger scale or diagram not to scale shall be added as an insert or the information suitably tabulated.

47.7 Plotting

47.7.1 The plan shall be taken up such that the North is in the longer direction of the sheet. No deviations shall be permitted in this regards even in the inserts. The plotting shall be done by R.S.O coordinates. If R.S.O coordinates are not available, it shall be referred to Surveyor General (JUA) for further instruction. General format of the plan is given in the attached specimen.

Orientation

47.7.2 All information on the plan shall be produced. Coloured ink or washes will not be used for any purpose.

???

47.7.3 Line Widths

Standard line shall be used as follows: -

47.7.3.1 Boundary of Lot under Survey. 0.70 mm

Peripheral Boundaries

47.7.3.2 Peripheral Boundary of Land under Survey and Boundary of Lot(s) in insert. 0.50 mm

Traverse Lines

47.7.3.3 Traverse and shooting line by interrupted line 0.20 mm

Inserts

47.7.3.4 Non boundary Features and boundaries of new lots and unaffected Lots in insert e.g. roads, rivers etc. 0.25 mm

Margins

Geodetic

47.7.3.5 Plan margin & Insert Margin. 0.70 mm

47.7.3.6 Geodetic line 0.25 mm

Non-Scale

47.7.3.7 Non-Scale line shall be indicated by a single break of 5 mm

Other

47.7.3.8 Other line features, see Appendices

Grids

47.7.3.9 The R.S.O (Metric) grid coordinates shall be shown by cuts on the line orders of the plan at intervals not more than 10cm. All cuts shall be 2mmlong and

represent intervals of 100m, 50m or 10m as appropriate to the scale used.

47.7.4 Symbols

Standard symbols shall be used as follows:-

47.7.4.1 Boundary marks. New mark shall be shown as circle of 1.5mm diameter, the centre of the circle representing the mark. Found boundary mark shall be shown as solid circle. Found and replaced boundary mark shall be shown as a circle with the dot in the centre. " No Mark " shall be shown as a dot.

Control Marks

Trig Stations

47.7.4.2 Survey Geodetic Stations: Inner Circle 1.0mm diameter and outer circle of 2.0mm diameter.

47.7.4.3 Trigonometrical Stations: Triangles of 3.0 mm side lengths, the centre of the triangle representing the station.

Boundary Occupation

47.7.4.4 Buildings: The surveyed roof lines shall be drawn.

47.7.4.5 Hedges, Fences and Walls: By the normal conventional signs as shown in the Appendices.

Bearings

47.7.5 Text

Distances

47.7.5.1 All written information shall be permitted in such a way as will induce reading from left to right.

As per Field Book

47.7.5.2 All bearings shall be written above the line where possible.

47.7.5.3 All distances shall be written below the line where possible.

47.7.5.4 All bearings, distances and other information shall follow the data obtained from the field books.

Boundary Marks

47.7.6 Abreviations

Annotation

Standard abbreviation shall be used as follows:-

47.7.6.1 Boundary marks Refer to Part VIII

47.7.6.2 The front **O** or **N** can be omitted, if the symbol '●' or '○' which represents the Old mark and the New Mark respectively, is used. Annotation

47.7.6.3 Other Abbreviation

Calculated

47.7.6.3.1 Bearing and distances computed/ Calculated..... (c)

47.7.6.3.2 Deduced distance……...……..... (d) Deduced

47.7.6.3.3 Adopted Bearing ……....…. (Ad.Brg.) Adopted

47.7.6.3.4 Bearing Closed ……...…… (Brg.Closed) Closed

47.7.6.4 Other written information shall be of a size consistent with clarity and neat appearance. Clarity

47.8 Plan Information

47.8.1 For plans involving subdivision / consolidation surveys, an insert plan at the reduced scale (1:2500) shall be drawn where possible to indicate the parent lot(s) and the resulting changes. Occupation

47.8.2 In addition to boundaries and geodetic survey information, the following details shall be plotted: -

47.8.2.1 The roof lines of all buildings lying within or partly within the Lot (s) being surveyed. Water Features

47.8.2.2 All roads, tracks, footpaths, fences, hedges and bridges lying within, passing through or immediately adjacent to the Lot(s) being surveyed shall be suitably annotated. Road names junctions where known, are to be written on the plan. ROW

47.8.2.3 All rivers, streams, ditches, drains with direction of flow and names where appropriate.

47.8.2.4 Right of Way (ROW) given by Land Office shall be drawn.

47.9 Plan For Gazetting

For gazetting and distribution purpose copies of the original gazette plan are prepared with the boundary edged coloured green.

Certification

47.10 Signatures

The signatures of the draughtsperson, Checker, and Surveyor General and the date it is signed shall be shown on the plan. The signature of the Licensed Land Surveyor shall also be shown on the plan, if the job is undertaken by a private Licensed Land Surveyor.

48 PREPARATION OF TITLE DIAGRAMS (RGT):-

48.1 Extract from the District register requirements: -

Scale Diagram as per CP

EDR requirements are as follows

48.1.1 A diagram drawn to scale showing boundaries, numbered marks as on the certified plans, Lot number, area and such available topographical detail. Line and symbol type shall be the same as in the Certified Plan (CP) specification.

Certification

48.1.2 A heading giving North Point, Kampung, Mukim and the District's name, Survey Sheet numbers, the scale of the Diagram and Coordinates of the centre of the Lot.

Received

48.1.3 The signatures of the Draughting person, checker and Surveyor General and the date it is signed.

Guarantee

48.2 Redraughting of Title Diagrams

Redraughting of titles diagrams may be prepared only when: -

48.2.1 The original has been gazetted as cancelled or lost or wholly or partially destroyed.

Precautions

48.2.2 The original has been received for destruction.

48.2.3 The Land Office has given a written guarantee that the original will be destroyed.

49 RECORDS

49.1 Safe guarding

Location Tracking System

49.1.1 Adequate precautions must always be taken for the safeguarding of permanent records such as survey files (SP), field books, plans, survey sheets, calculations' volumes and digital storage .

Where possible a fireproof strong room (PMG/BMG) shall be provided.

49.1.2 The Surveyor General or the officer in charge of the records shall provide detail instructions / informations, so that any records issued and the responsibility for loss and damage can be traced and identified. All specified records must be returned to the Strong Room (PMG/BMG) as soon as possible.

Tracking

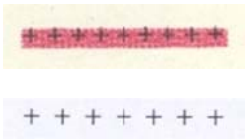
49.2 Prohibition

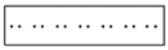
The removal of any record from the Survey Department is strictly prohibited and exception to this rule may be made only in compliance with an order of the Court. For that purpose, a certified copy of Court order is to be supplied.

Removal by Court Order

APPENDIX A – DESIGN FILE COMPILATION TABLES

1 BOUNDARIES

LEVEL	FEATURE	SCALES	SPECIFICATION	SYMBOL (agreed by Committee)
1.	INTERNATIONAL BOUNDARY	1:10,000(BR10)	Red band covering the symbols	
		1:50,000(BR50)	Red band covering the symbols	
		1:1,000(BR1)		
		1: 500(TOPO)	**1: 500(TOPO)**	
		1:2,500(RSO)		
		1:100,000(BR100)	Red band without symbols	
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
2.	DISTRICT BOUNDARY	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
3.	MUNICIPAL BOUNDARY	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
4.	MUKIM BOUNDARY	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		

LEVEL	FEATURE	SCALES	SPECIFICATION	SYMBOL (agree by Committee)
5.	VILLAGE BOUNDARY	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
6.	FOREST RESERVE BOUNDARY	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
7.	VILLAGE NAME	Black100 Font Style : Bold		**Pengkalan Gadong**
8.	MUKIM NAME	Black80 Font Style : Normal		KIANGGEH
9.	INTERNATIONAL NAME	Black100 Font Style : Normal		BRUNEI / SARAWAK
10.	DISTRICT NAME	Black100 Font Style : Normal		**BRUNEI-MUARA**
11.	FOREST RESERVE NAME	Black100 Font Style : Normal		**HUTAN SIMPAN LABU**

LEVEL	FEATURE	SCALES	SPECIFICATION	SYMBOL
12.	SEMPADAN PAJAKAN LOMBONG	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
13.	GARISAN TERABAS (MISC)	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
14.	SEMPADAN TANAH BERUKUR	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
15.	SEMPADAN TANAH TIDAK BERUKUR	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		

LEVEL	FEATURE	SCALES	SPECIFICATION	SYMBOL (agreed by Committee)
16.	SEMPADAN GAZ	1:10,000(BR10)		X – X – X – X - X
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
17.	TRAVERSE ADOPTED/CLOSED (MISC)	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
18.	TRIANGULASI TERABAS (MISC)	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
19.	SIMPANAN LALUAN	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		

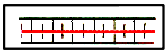
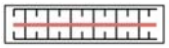
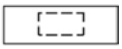
LEVEL	FEATURE	SCALES	SPECIFICATION	SYMBOL (agreed by Committee)
20.	TANAH KERAJAAN / STATE LAND	1:10,000(BR10)		S.L
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
21.	VEGETATION BOUNDARY	1:10,000(BR10)		.....
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		

2 ROADS AND PATHS

LEVEL	FEATURE	SCALES	SPECIFICATION	SYMBOL
1.	HIGHWAY	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)	Double Line same thickness	
		1: 500(TOPO)	Double Line same thickness	
		1:2,500(RSO)	Double Line same thickness	
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET(N/A)	Same Color,Same Pattern.	
2.	MAJOR ROAD	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)	Double Line same thickness	
		1: 500(TOPO)	Double Line same thickness	
		1:2,500(RSO)	Double Line same thickness	
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET(N/A)	Same Color,Same Pattern.	
3.	OTHER ROAD (SEALED)	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)	Double Line same thickness	
		1: 500(TOPO)	Double Line same thickness	
		1:2,500(RSO)	Double Line same thickness	
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET(N/A)	Same Color,Same Pattern.	
4.	OTHER ROAD (UNSEALED)	1:10,000(BR10)		
		1:50,000(BR50)	Red Dash	
		1:1,000(BR1)	Double Line same thickness	
		1: 500(TOPO)	Double Line same thickness	
		1:2,500(RSO)	Double Line same thickness	
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET(N/A)	Same Color,Same Pattern.	

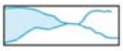
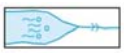
LEVEL	FEATURE	SCALES	SPECIFICATION	SYMBOL
5.	FOOTPATH	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)	Double Line same thickness	
		1: 500(TOPO)	Double Line same thickness	
		1:2,500(RSO)	Double Line same thickness	
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET(N/A)	Same Color,Same Pattern.	
6.	ROAD UNDER CONSTRUCTION	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
7.	KILOMETRE POST	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
8.	UNDERPASS, OVERPASS	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		

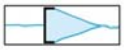
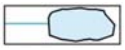
LEVEL	FEATURE	SCALES	SPECIFICATION	SYMBOL
9.	DUAL CARRIAGEWAY	1:10,000(BR10)		
		1:50,000(BR50)	Red with Black Outline	
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
10	GRAVEL(OVER 5 METERS) * Same as Unsealed Road *To Be confirm with Top Management	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
11	GRAVEL(UNDER 5 METERS) * Same as Unsealed Road *To Be confirm with Top Management	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
12	EARTH * Same as Unsealed Road *To Be confirm with Top Management	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		

LEVEL	FEATURE	SCALES	SPECIFICATION	SYMBOL
13.	ELEVATED WALKWAY	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
14.	EMBANKMENT	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
15.	CUTTING	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
16.	PARKING AREA	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		

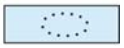
LEVEL	FEATURE	SCALES	SPECIFICATION	SYMBOL
17.	KILOMETRE POST TEXT *Black,100,Normal	1:10,000(BR10)		5
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
18.	ROAD NAME *Italic,100,Black	1:10,000(BR10)		JALAN GADONG
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		

3 WATER FEATURES

LEVEL	FEATURE	SCALES	SPECIFICATION	SYMBOL
1.	RIVER AREA	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
2.	DRAIN Earth Drain – Dash ,Cyan	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
3.	WATERFALL	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
4.	RAPIDS	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		

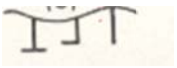
LEVEL	FEATURE	SCALES	SPECIFICATION	SYMBOL
5.	DAM	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
6.	LAKE	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
7.	RESERVOIR	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
8.	SAND AREA	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		

LEVEL	FEATURE	SCALES	SPECIFICATION	SYMBOL
9.	MUD AREA	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
10	FERRY	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
11.	JETTY	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
12.	SHORELINE: DEFINITE	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		

LEVEL	FEATURE	SCALES	SPECIFICATION	SYMBOL
13.	SHORELINE: INDIFINITE	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
14.	REEF	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
15.	SPRING	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
16.	CURRENT DIRECTIONAL	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		

LEVEL	FEATURE	SCALES	SPECIFICATION	SYMBOL
17.	RIVER TEXT	1:10,000(BR10)		SUNGAI BERAKAS
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
18.	RIVER (SINGLE)	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
19.	OTHER HYDRO TEXT (Island) Black,100,Normal	1:10,000(BR10)		PULAU BERAMBANG
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
20	SEA TEXT **Cyan,Italic	1:10,000(BR10)		LAUT CHINA SELATAN
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		

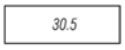
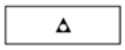
LEVEL	FEATURE	SCALES	SPECIFICATION	SYMBOL
21	OTHER HYDRO TEXT(Tasek) **Cyan,Italic,	1:10,000(BR10)		Tasek
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
22	NON-TIDAL	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
23	COASTAL SAND	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
24	INLAND SAND	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		

LEVEL	FEATURE	SCALES	SPECIFICATION	SYMBOL
25	WATER TANK	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
26	CANAL	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
27	HOT SPRING	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
28	PIER, WHARF, BREAKWATER	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		

4 RELIEF FEATURES AND CONTROL POINTS

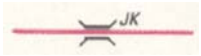
LEVEL	FEATURE	SCALES	SPECIFICATION	SYMBOLS
1.	CONTOUR LINE (MAJOR)	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
2.	CONTOUR LINE (MINOR)	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
3.	QUARRY	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
4.	CLIFF	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		

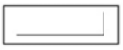
LEVEL	FEATURE	SCALES	SPECIFICATION	SYMBOLS
5.	ROCK OUTCROP	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
6.	TRIGONOMETRICAL STATION	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
7.	CONTROL MARK	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
8.	BENCH MARK • w/o arrow & text	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		

LEVEL	FEATURE	SCALES	SPECIFICATION	SYMBOLS
9.	SPOT HEIGHT	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
10.	BOUNDARY PILLAR	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
11.	TANDA LAMA PEKIT BULIAN / PAIP/PIN BESI / PAIP PLASTIK / PAKU	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		

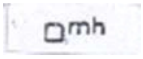
LEVEL	FEATURE	SCALES	SPECIFICATION	SYMBOLS
12.	TANDA BARU PEKIT BULIAN / PAIP/PIN BESI / PAIP PLASTIK / PAKU	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
13 .	TANDA SEMPADAN TANAH	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
14.	TANDA TERABAS	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
15.	TANDA UTARA	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		

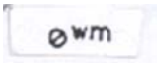
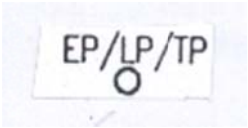
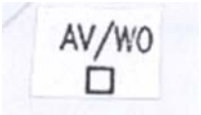
5 MISCELLANEOUS CULTURAL FEATURES

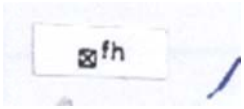
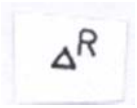
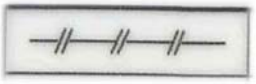
LEVEL	FEATURE	SCALES	SPECIFICATION	SYMBOL
1.	PERMANENT BRIDGE (concrete, masonry or steel)	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
2.	WOODEN BRIDGE *(WB)*	1:10,000(BR10)		• Ubah text 
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
3.	FOOTBRIDGE • w text – (FB)	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
4.	CULVERT	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		

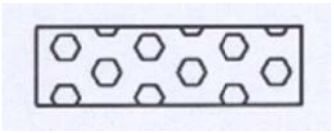
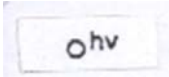
LEVEL	FEATURE	SCALES	SPECIFICATION	SYMBOL
5.	ELECTRICITY TRANSMISSION LINE	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
6.	PROMINENT WALL (FENCE)	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
7.	FORTRESS (KUBU PERTAHANAN)	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
8.	LANDMARK AREA (Airfield, Carpark,etc)	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		

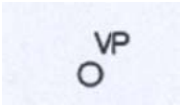
LEVEL	FEATURE	SCALES	SPECIFICATION	SYMBOL
9.	LANDMARK POINT (communications mast or tower, monument,etc)	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
10.	"DONKEY" or similar large, fixed, mechanical device	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
11	TANK	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
12.	TALIAN TALIPON	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		

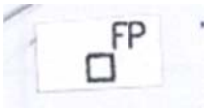
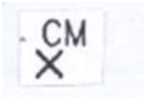
LEVEL	FEATURE	SCALES	SPECIFICATION	SYMBOL
13.	PADANG TERBANG	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
14.	DEREK MINYAK	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
15.	LAMP POST/SPOT LIGHT	1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
16.	MANHOLE	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		

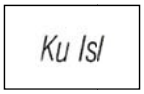
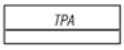
LEVEL	FEATURE	SCALES	SPECIFICATION	SYMBOL
17.	SEPTIK TANK / WATER TANK	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
18.	WATER METER	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
19.	LAMP POST/TEL. POST/ELE. POST	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
20.	AIR VALVE	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		

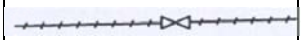
22.	FIRE HYDRANT	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
23.	ROAD REFLECTOR MARKER	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
24	GUARD RAIL/SAFETY BARRIER	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
25.	SUBSTATION	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		

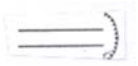
LEVEL	FEATURE	SCALES	SPECIFICATION	SYMBOL
27.	GABIAN WALL	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
28.	SIGNBOARD	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
29.	FLAG POLE	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
30.	HIGH VOLTAGE CABLE MARKER	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		

LEVEL	FEATURE	SCALES	SPECIFICATION	SYMBOL
31.	SEWERAGE VENTILATION POLE	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
32.	INVERT LEVEL	1:10,000(BR10)		(0.2)
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
33.	METAL GRATE ALONG FOOTPATH/ GRILL	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		

LEVEL	FEATURE	SCALES	SPECIFICATION	SYMBOL
34.	FEEDER PILLAR	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
35.	CABLE MARKER	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
36.	SUMP	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
37.	HELIPAD	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		

LEVEL	FEATURE	SCALES	SPECIFICATION	SYMBOL
38.	LIGHTHOUSE, PERMANENT BEACON	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
39.	CEMETERY TEXT	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
40.	PIPELINE *(TPA)* – TALIAN PAIP AIR	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		

LEVEL	FEATURE	SCALES	SPECIFICATION	SYMBOL
44.	COURT (Sport)	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
45.	SPORT TRACK	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
46	FENCE AND GATE	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
47	ARCHAELOGICAL FEATURES PARAMUKA KESAN PURBA	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		

LEVEL	FEATURE	SCALES	SPECIFICATION	SYMBOL
48	SHOOTING RANGE PADANG TEMBAK	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
49	WIRELESS MAST	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
50	STESEN PAM AIR	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		

6 BUILDINGS

LEVEL	FEATURE	SCALE	SPECIFICATION	SYMBOL
1.	PUBLIC BUILDING	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
2.	OTHER BUILDING	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		

7 TOWN AND RURAL AREA

LEVEL	FEATURE	SCALES	SPECIFICATION	SYMBOL
1	NUMBER OF BUILDING GENERALIZED	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
2	INDIVIDUAL BUILDING	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
3	MOSQUE	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		

LEVEL	FEATURE	SCALES	SPECIFICATION	SYMBOL
4	CHURCH	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
5	CHINESE TEMPLE	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
6	POLICE POST	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		

LEVEL	FEATURE	SCALES	SPECIFICATION	SYMBOL
7	SCHOOL	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
8	CLINIC	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
9	BALAI RAYA	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		

8 RUPAMUKA BUMI DAN TITEK KAWAL

LEVEL	FEATURE	SCALES	SPECIFICATION	SYMBOL
1	TANAH PERSENDIRIAN	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
2	LESEN TUMPANG SEMENTARA	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
3	TANAH WARTA	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
4	PANDUAN GERID	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		

9 VEGETATION

LEVEL	FEATURE	SCALES	SPECIFICATION	SYMBOL
1.	FOREST	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
2.	MANGROVE	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
3.	NIPAH	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		

LEVEL	FEATURE	SCALES	SPECIFICATION	SYMBOL
4.	BELUKAR	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
5.	SUNDRY TREE (fruit trees,etc)	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
6.	WET PADI	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		

LEVEL	FEATURE	SCALES	SPECIFICATION	SYMBOL
7.	SUNDRY NON TREE	1:10,000(BR10**0**)		
		1:50,000(BR50**0**)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
8.	GRASSLAND	1:10,000(BR10**0**)		
		1:50,000(BR50**0**)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
9.	SWAMP	1:10,000(BR10**0**)		
		1:50,000(BR50**0**)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
10.	COCONUT	1:10,000(BR10**0**)		
		1:50,000(BR50**0**)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		

LEVEL	FEATURE	SCALES	SPECIFICATION	SYMBOL
11.	RUBBER	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
12	PINEAPPLE	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
13	OPEN AREA	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		
14	PLAYING FIELD	1:10,000(BR10)		
		1:50,000(BR50)		
		1:1,000(BR1)		
		1: 500(TOPO)		
		1:2,500(RSO)		
		1:100,000(BR100)		
		1:250,000(BR250)		
		FIELD BOOK,OFFSET		

APPENDIX B – TOPOGRAPHICAL SYMBOLS AND LINES

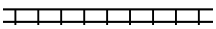
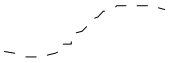
1 BOUNDARIES

ITEM	FEATURES	USE OF SYMBOL Refer to Pt. 1	GAUGE, ETC (MM)	SYMBOL, Manual Draft / Digitiser (if varying)
1.1	International Boundary	See 7.11 7.2 7.3	0.3 Line 20.0 Gap 5.0 Cross, arms 1.5 rach	
1.2	District Boundary	See 7.1.2 7.2 7.3 7.4	0.2 Line 15.0 Gap 6.0 Dots 0.4 diam	
1.3	Mukim Boundary	See 7.1.2 7.2 7.3 7.4	0.2 Line 12.0 Gap 4.5 Dots 0.4 diam	
1.4	Village Boundary	See 7.1.2 7.2 7.3	0.2 Line 12.0 Gap 3.0 Dots 0.4 diam	
1.5	Municipal Boundary	See 7.1.3 7.2 7.3	0.2 Line 10.0 Gap 2.0	
1.6	Forest Reserve Boundary	See 7.1.3 7.2 7.3	0.2 Line 12.0 / 2.0/2.0 Gap 1.0	

ITEM	FEATURES	USE OF SYMBOL Refer to Pt. 1	GAUGE, ETC (MM)	SYMBOL, Manual Draft / Digitiser (if varying)
1.7	Fence		0.1 Ticks 1.0 Gap 10.0	
1.8	Wall		0.1 Tick 1.0 Gap 10.0	
1.9	Hedge		0.1 Lines at 45 Apex 1.0 Gap 10.0	
1.10	Vegetation Limits		Dots 0.4 diam Gap 3.0	
1.11	Limits to Sand, Mudrock Outcrop		Dot 0.4 diam Gap 3.0	
1.12	Cadastral Boundaries including TOL boundaries		0.5 Line Dot 1mm diam	

2 ROADS AND PATHS

ITEM	FEATURES	USE OF SYMBOL Refer to Pt. 1	GAUGE, ETC (MM)	SYMBOL, Manual Draft/Digitiser (if varying)
2.1	Road or street (sealed) or other alignment		0.1	_____ _____..
2.2	Unsealed Roads		0.1 See 2.3 below	....
2.3	Secondary Alignment	Paved or aligned pathways, etc (eg. in parks)	0.1 Line 2.0 Gap 0.5	----------
2.4	Roads under construction	Where actual work is in progress	See 2.3 above	As for 2.2 and annotate "Under Construction"
2.5	Light Railways		0.2 Tick 1.0 each side Gap 15.0	
2.6	Embankment	See 8.5	0.1 Gap (Ticks) 3.0 Width to scale short ticks on high side 1.0 long	
2.7	Cutting	See 8.5	As for 2.6 above	
2.8	Kilometre Post Milestone or other Stone Pillar	See 8.6	0.2 Arm 2.0 each	

ITEM	FEATURES	USE OF SYMBOL Refer to Pt. 1	GAUGE, ETC (MM)	SYMBOL, Manual Draft/Digitiser (if varying)
2.9	Parking Area, Loading Bay	See 7.8 (this part)	See 7.8 (this part)	
2.10	Underpass, overpass	See 8.3	See 2.1 (this part)	No actual symbol, lines are deleted for traversed feature
2.11	Elevated Walkway	Interconnecting elevated paths, particularly in water villages	0.1 Gap between ticks 3.0	
2.12	Footpath			
2.13	Brigde	See 7.1		
2.14	Foot Bridge	See 7.3		
2.15	Culvert	See 7.4		

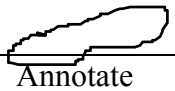
3 BUILDINGS

ITEM	FEATURES	USE OF SYMBOL Refer to Pt. 1	GAUGE, ETC (MM)	SYMBOL, Manual Draft/Digitiser (if varying)
3.1	Building	See 12, all items	0.2 Hachured	
3.2	Building Under construction		0.15 Hachured	
3.3	Group of buildings generalised		0.2 Hachured	

4 VEGETATION

ITEM	FEATURES	USE OF SYMBOL Refer to Pt. 1	GAUGE, ETC (MM)	SYMBOL, Manual Draft/Digitiser (if varying)
4.1	All classifications of vegetation and swamp		See 1.10	Vegetations limits plus appropriate annotation
4.2	Forest		0.5 Pecked line	Annotation
4.3	Mangrove		0.5 Pecked line	Annotation
4.4	Nipah		0.5 Pecked line	Annotation
4.5	Belukar		0.5 Pecked line	Annotation
4.6	Sundry Tree Cultivation		0.5 Pecked line	Annotation
4.7	Trees		0.15	Annotation

5 WATER FEATURES

ITEM	FEATURES	USE OF SYMBOL Refer to Pt. 1	GAUGE, ETC (MM)	SYMBOL, Manual Draft/Digitiser (if varying)
5.1	River and stream, definite Indefinite		0.5 Line 15.0 Gap 2.0	Annotate
5.2	Canal, Drain or Ditch		0.1	Annotate
5.3	Waterfall		0.2	Annotate at side of feature
5.4	Rapids			Annotate
5.5	Dam		Wall 0.2	Annotate
5.6	Lake, Pool or Reservoir		0.1	Annotate 
5.7	Service Reservoir or Swimming Pool		0.2	Annotate
5.8	Sand	See 5.1.1 (e)		See 1.11 this part
5.9	Mud	See 5.1.1 (e)		See 1.11 this part Annotate

ITEM	FEATURES	USE OF SYMBOL Refer to Pt. 1	GAUGE, ETC (MM)	SYMBOL, Manual Draft/Digitiser (if varying)
5.10	Vehicular Ferry	See 11.5	0.2 Line 1.0 Gap 1.0	Annotate
5.11	Jetty, Wharf Breakwater	See 11.6 11.7	0.1	Annotate
5.12	Shoreline : definite	See 11.7	0.1	
5.13	Shoreline : definite	See 11.7	0.5/0.7 Line 15.0 Gap 2.0	
5.14	Marine Platform (Oil Derrick)	Semi	Wall 0.2	Annotate
5.15	Reef	Rock or coral formation rising from the sea bed especially where a hazard to navigation exists	See 7.9 (this part)	Annotate
5.16	Spring		See 7.9 (this part)	Annotate
5.17	Current directional arrow	See 11.3 Tidal	0.2	See 1.11 this part

6 RELIEF FEATURES AND CONTROL POINTS

ITEM	FEATURES	USE OF SYMBOL Refer to Pt. 1	GAUGE, ETC (MM)	SYMBOL, Manual Draft/Digitiser (if varying)
6.1	Contours	See 11.2 11.3	Index 0.2 Intermediate 0.1	
6.2	Approximate contours	See 11.2		Covered by Legend Note
6.3	Landslide or Rockslide	See 12.5	0.1	
6.4	Quarry	See 12.6	0.2 Ticks 1.0 Gap 5.0	
6.5	Cliff Precipice	See 12.7	0.2 As for 2.7 (this part)	Annotate relative height
6.6	Rock Outcrop	See 5.1.1 (e)		See 1.11 (this part) Annotate

ITEM	FEATURES	USE OF SYMBOL Refer to Pt. 1	GAUGE, ETC (MM)	SYMBOL, Manual Draft/Digitiser (if varying)
6.7	Trigonometrical Station	See 11.8	0.2 Sides 5.0 dot 0.4 diam	
6.8	Traverse Station	See 12.8	0.2 Circle 3.0 diam Dot 0.4 diam	◯
6.9	Bench Mark	See 12.9	0.2 Circle 4.0	
6.10	Spot Height	See 12.4	Dot 0.4 diam	.
6.11	State Boundary Pillar	See 12.8	0.2 Circles 1.0, 1.5 diam Sides 3.5	
6.12	Embankment / Cutting			

7 MISCELLANEOUS CULURAL FEATURES

ITEM	FEATURES	USE OF SYMBOL Refer to Pt. 1	GAUGE, ETC (MM)	SYMBOL, Manual Draft/Digitiser (if varying)
7.1	Permanent Bridge (Concrete, masonry or steel)		0.2 Arms 45 Length 1.0	
7.2	Wooden Bridge	See 13.2	0.2 Arms 45 Length 1.0	Covered by Legend Note
7.3	Footbridge		0.2 Gap between ticks 3.0 Arms 45 Length 1.0	
7.4	Culvert	See 13.3	0.2	
7.5	Electricity Transmission Line < 66 kv		0.1 Circle 1.5 diam Gap at poles	
7.6	Electricity Transmission Line 66 kv		0.1 Square 2.0	
7.7	Fort Ruin or Archaelogical Feature		0.2	Annotate
7.8	Landmark Area (Rifle Range, Plaza, Carpark Playing Field, Cemetery etc ...)		0.2 circle Minimum 1.0 diam Otherwise to scale	
7.9	Landmark Structure or Point Feature (Communications mast or tower monument, etc ..)		0.2 Circle minimum 1.0 diam Otherwise to scale	

ITEM	FEATURES	USE OF SYMBOL Refer to Pt. 1	GAUGE, ETC (MM)	SYMBOL, Manual Draft/Digitiser (if varying)
7.25	Fire Hydrant		0.2 Side 1.0 Ticks 1.0	
7.26	Main Valve		0.2 Height 2.0	
7.27	Safety Valve		0.2 Circle 1.5 diam 0.5	
7.28	Lamp Post		0.1 Circle 1.0 diam 1.5	
7.29	Electric Post		0.2 Circle 1.5 diam 0.5	
7.30	Gabion Wall		0.2 Circle 1.0 diam 1 - 2	

APPENXIX C – AUTOCAD FEATURE CODING

LAYER	FEATURE	COLOUR
1 BUILDINGS		
Polygon Coverage Only	General Housing (Permanent)	(1)
	Temporary	(2)
	Carsheds	(3)
	Store	(25)
	Temporary Line to close building polygons	(255)
2 LAND USE		
Polygon Coverage Only	Secondary Jungle	(4)
	Ridge	(5)
	Grass/hedge	(6)
	Softground	(7)
	Temporary Line to close vegetation polygons	(255)
	Swamp	(23)
	Plantation	(8)
3 WATER UTILITIES		
Polygon Coverage Only	Air Valves (AV)	1 (text)
	Gate Valves (GV)	1 (text)
	Water Meters (WM)	1 (text)
	Fire Hydrant (FH)	1 (text) or (35) if polygon
	Sluice Valves (SV)	1 (text) or (36) if polygon
	Water Outlet (WO)	1 (text) or (37) if polygon
	Water Tank (WT)	1 (text)
	Water Pump (WP)	1 (text)
	Butterfly Valve (BF)	1 (text)
	Throttle Valve (THV)	1 (text)
	Water Tap (TAP)	1 (text)
4 SEWERAGE UTILITIES		
Arc and Polygon Coverages	Sewer Manholes	(33) a polygon
	Septic Tanks	(7)
5 TELECOM UTILITIES		
Point and Arc Covergaes	Telephone Poles	1 (text)
	Telecom Manhole	1 (text) or (31) if polygon
	Cable Manhole	1 (text) or (32) if polygon
	Satellite Dish (Dish)	1 (text)

LAYER	FEATURE	COLOUR
6 ELECTRICAL UTILITIES		
Point and Arc Coverages	Cable Marker	1 (text)
	Electrical Poles	1 (text)
	Lamp Posts	1 (text)
	Sub Station	(8)
	Electrical Cabinet	(34)
	Transmission Line	(1)
	Spot Light	1 (text)
	Pylon	(2)
7 RELIEF		
Point and Arc coverages	Contours	(9)
	Spot Heights	(10)
8 TERRAIN		
Arc coverages	Embankment (Top & Bottom)	(11)
9 ROADS		
Polygon and Arc coverages	Minor Roads	(12)
	Access Roads	(13)
	Rural Roads	(14)
	Foothpaths	(15)
	Temporary Line to close road polygons	(255)
	Gravel	(16)
	Track	(17)
	Conc. Rd	(18)
	Kerbs	(19)
	Highway	(20)
	Major Road	(21)
10 HYDROGRAPHY		
Arc and Polygon coverages	Watercourse	(16)
	Concrete Drain	(17)
	Earth Drain	(18)
	Pond	(20)
	Culvert	(21)
	Pipeline	(28)
	Sump	(40)
	Temporary Line to close hydrography polygons	(255)
	River	(29)

LAYER	FEATURE	COLOUR
11 MISCPOLY		
Polygon coverages	Bridge	(23)
	Sign (Large)	(38)
	General Polygon	(21)
	Concrete Lines	(24)
12 MISCLINE		
Arc Coverages	Fence	(24)
	Wall (Concrete,Retaining)	(26)
	Gate	(27)
	Grill	(25)
	Safety Barrier	(19)
	Gabion Wall	(30)
	General Lines	(21)
	Clothes lines	(28)
	Concrete lines	(22)
13 MISC POINT		
Point Coverages	Flag pole	1 (text)
	Sign (small)	1 (text)
	General Point (GP)	1 (text)
14 OIL GAS		
Point and Arc Coverages	Gas Meter (GM)	1 (text)
	Oil Pump (OP)	1 (text)