



THE HONG KONG INSTITUTE OF SURVEYORS

**Guidance Notes
for Land Boundary Survey**

2002

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Boundary Survey Advisory Committee

Land Surveying Division

2002

1. Objectives

- 1.1 These Guidance Notes are intended to deal with the survey principles and requirements for carrying out Land Boundary Surveys in the Hong Kong Special Administrative Region by the Professional Land Surveyors who are members of the Land Surveying Division of the Hong Kong Institute of Surveyors.
- 1.2 It is hoped that these Guidance Notes may serve the following general purposes:-
 - 1.2.1 As a self-reminding document for the Professional Land Surveyor,
 - 1.2.2 As a pledge of one's performance by an individual Professional Land Surveyor to his/her clients, and
 - 1.2.3 As a ready reference for allied professionals to realize the quality of service and the survey standard expected of a Professional Land Surveyor.

2. Roles of the Professional Land Surveyor

- 2.1 The primary role of the Professional Land Surveyor in Land Boundary Survey is to enable people to enjoy secured land ownership and settlement in respect of land boundary aspect.
- 2.2 In daily practice, his/her role is to advise the client the dimension, area, location and other relevant geoinformatic data of the land lot under survey. He/she can also define and demarcate on ground the boundary lines and other related alignments.

3. Ethics of boundary service

- 3.1 In carrying out, directing or supervising a land boundary survey, the Professional Land Surveyor must always bear in mind the responsibility of being a member of the Institute, the duty of care towards his/her clients and the liability as a consequence of any improper boundary determination.
- 3.2 In defining a land lot boundary, the Professional Land Surveyor should take every care to avoid inducing unnecessary boundary conflicts as part of his/her primary role.
- 3.3 A Professional Land Surveyor must release his/her boundary data and control data as far as possible to the other Professional Land Surveyors for the purpose

of achieving the above role.

- 3.4 The Professional Land Surveyor should act faithfully for his/her client in a Land Boundary Survey but, at the same time, must remain unbiased in the service even to the extent that the boundary definition may not be favorable to the client.

4. Operational requirement

4.1 Survey Approach

A Professional Land Surveyor should plan and design a survey method, conduct the field measurements and collect the data for the determination of the land boundary. The survey principle "*from the whole to part*" should always be applied and a self-checking methodology must be adopted. All fixes of boundary points should be checked independently.

4.2 Search of Information

At the beginning of a land boundary survey, a Professional Land Surveyor should obtain and collect all requisite information for determining the boundaries. These include, but not limited to, boundary plans, survey controls, grant conditions, lease plans, lease covenants, assignment plans, old survey sheets, old photographs, documentary evidences etc. of the subject land parcel and the adjoining land parcels, from the land owners, the District Survey Office, District Land Registry, the Government Record Office and other relevant Government offices. When a Professional Land Surveyor is involved in land boundary survey for land resumption or surrender, he/she may have to obtain road alignment data or planning layout data from the relevant Government departments.

4.3 Survey Equipment

- 4.3.1 A Professional Land Surveyor should select an appropriate survey instrument the precision of which meets the accuracy requirement for the land boundary survey.
- 4.3.2 Whatever types of survey instrument the Professional Land Surveyor selects and uses in a land boundary survey, he/she should be aware of the specifications and operational characteristics of the instrument and should apply any precautions and corrections in field measurements.

4.4 Calibration of Survey Instrument

All survey instruments should be checked, adjusted and calibrated regularly, or immediately following repair. For distance measuring instruments such as steel tape and Electronic Measuring Device, they should be checked and calibrated at suitable intervals or immediately after service.

4.5 Field Measurement Records

4.5.1 Field measurement records refer to original data collected via field observations and measurements, hand-written notes, diagrams, sketches and printout from electronic data capturing devices which stores the field observations and measurements. All these observations, measurements and notes should be neatly and clearly recorded using permanent ink on a proper field book or media made of long lasting material.

4.5.2 Field measurement records of each survey must contain all relevant items including, amongst others but not limited to, the title of the survey, location, date of survey, instrument used, the name and the signature of the Professional Land Surveyor. Printouts from an electronic data storage device should bear the name and signature of the surveyor and should contain equivalent information as stated above. A Professional Land Surveyor is responsible for all surveys carried out by a survey technician under his/her supervision.

4.6 Origin of Survey

4.6.1 The origin of co-ordinates and bearings should be obtained from:-

4.6.1.1 The Hong Kong Control Survey System which is currently based on the Hong Kong (1980) Geodetic Datum in the first place, or

4.6.1.2 Failing the above, any survey which the Professional Land Surveyor accepts with reasons as suitable for the purposes of land boundary surveys.

4.6.2 The reliability of the survey stations used for an origin of bearings should be checked and proved by testing their agreement with at least one other survey station.

4.6.3 The limits of error and the allowable tolerances stated in Appendix 2 should be used when proving origins and obtaining agreements with old survey work in the field.

4.7 Survey Control

4.7.1 All survey control points should originate from the control points provided by the Survey and Mapping Office of Lands Department or traverse survey stations established in previously land boundary surveys as shown on survey record plans. In the latter case, the reliability of any two of the survey stations, which should be used for an origin, should be proved by testing their agreement with at least a third survey station.

4.7.2 The Professional Land Surveyor should not accept an unclosed traverse.

4.7.3 In cases where a Global Positioning System is used in a control survey, the Professional Land Surveyor should observe the field techniques and procedures as laid down in the manufacturer's operational manuals in order to obtain the required precision and accuracy.

4.7.4 When a traverse longer than 1.5 km is run, control bearings should be observed reciprocally between traverse survey stations and other control survey stations, at such station intervals as will adequately control the orientation of the traverse lines. The number of traverse survey stations between control bearings should be kept as small as possible.

4.7.5 Traverse misclosures should be mathematically adjusted.

4.7.6 Survey control stations should be marked by survey marks of durable materials. Recommendations for different types of markers are in Appendix 3.

4.7.7 The accuracy requirement for control survey stations in a land boundary survey is in Appendix 2 for general reference.

4.8 Boundary Marking

4.8.1 When required, boundaries should be marked at every corner, and where necessary at points on the boundary lines if the corners are not intervisible.

4.8.2 Where a boundary mark cannot be placed because of an obstruction the boundary mark position should be offset for establishing its position in the future.

- 4.8.3 Boundary marks should be one of the survey marks as recommended in Appendix 3.
- 4.8.4 Every boundary mark should be placed by bearing and distance from a survey station and checked independently by radiation from another survey station. Where double radiation is impracticable other checking methods will be used to verify the accuracy intended. The same requirements apply when fixing the position of old marks, occupations and other elements essential to land boundary definitions.
- 4.8.5 The setting out distance from a survey station to a boundary point should be as short as possible depending on the type of instrument used. They must be checked independently and recorded accordingly.
- 4.8.6 Curved boundaries should be marked at both end points and at least one other point on the curve. In addition, curves should be marked at intervals not exceeding 15 metres, measured along the chord.

4.9 Permanent Survey Marks

- 4.9.1 At least two permanent survey marks (PSMs) should be established for every land boundary survey in accordance with the recommendations in Appendix 3. Where there are existing PSMs from previous land boundary surveys in the vicinity, they may be accepted as PSMs after verification.
- 4.9.2 All PSMs should be fixed by double radiation. They should be described with sketches in the field notes and shown on the survey record plan as to the type of survey mark and its position and height above ground level.
- 4.9.3 The co-ordinates of all permanent survey marks placed or used in the course of a land boundary survey will be recorded on the survey record plan.

4.10 Report on Land Boundary Definition

- 4.10.1 When required, a Professional Land Surveyor should prepare and sign a report on the land boundary survey. The report should contain information such as evidence found and the rationale of how the boundaries of the land parcel are established.

- 4.10.2 Evidence should include information from all relevant records, ground occupation and investigation, interviews and any other form of data that will support the position and dimensions of the lot under survey.

4.11 Survey Record Plans

- 4.11.1 When required, the Professional Land Surveyor should prepare and sign a Survey Record Plan for each job so as to summarize and show all key survey measurements, control traverses and boundary data on a plan for easy reference without resorting to the details of the computation.
- 4.11.2 The Survey Record Plan should include information such as boundary data of the subject lot, survey evidence, survey marks, survey control information, significant measurements ties to occupation and related physical features (e.g. party wall). Alignment data from Government sources and boundary data of adjoining lots should be quoted if they are relevant to the determination of the subject lot boundary.
- 4.11.3 A recommended draughting specification for Survey Record Plan is in Appendix 4 for general reference.

4.12 Land Boundary Plans

- 4.12.1 Under normal circumstance, a Survey Record Plan or modified Survey Record Plan may suffice for meeting the requirements of the client and it is not always necessary to prepare separately a Land Boundary Plan showing the lot boundary data and the essential survey data for the use of the client or his representative.

5. Remarks

- 5.1 Although every care has been taken in preparing these Notes, the Hong Kong Institute of Surveyors can accept no responsibility for any interpretation of them in relation to any Ordinances or related regulations. Any definition contained in the Notes can in no way override the definition which may have to be adopted for the purpose of land boundary survey under any Ordinance. If any doubt arises members should alert their clients with a view to seeking legal advice.

- 5.2 If members, or others who refer to these Notes, wish to comment on the Notes in any way, they may do so by writing to

The Hong Kong Institute of Surveyors,
Suite 801, 8/F., Jardine House,
Connaught Place,
Central,
Hong Kong.

- 5.3 Notwithstanding, the details of these Guidance Notes, it should be noted that submissions to Authorities may entail specified requirements.

6. Reference

- 6.1 Code of Practice under the Land Survey Ordinance
- 6.2 Boundary Survey Regulation 1998 prepared by the Survey and Mapping Office, Lands Department

7. Acknowledgements

- 7.1 Thanks to the Survey and Mapping Office, Lands Department for her kind permission to use information from the Code of Practice under the Land Survey Ordinance.

Appendix 1

Definition

<i>Adopted data</i>	data means the traverse or land boundary information accepted from previous survey.
<i>Boundary mark</i>	means a survey mark which demarcates a parcel of land.
<i>Boundary stone</i>	means a boundary mark made from white granite, or concrete slab established by the Survey and Mapping Office of Lands Department to demarcate a parcel of land.
<i>Calibration</i>	means the process of checking of a distance measuring equipment against a standard baseline established by the Survey and Mapping Office of Lands Department for corrections to be made to measured lines.
<i>Control survey station</i>	means a survey station emplaced and mathematically fixed under the Hong Kong Control Survey System.
<i>Grid lines</i>	means lines drawn on a map or plan in the form of rectangular grid under the Hong Kong Control Survey System.
<i>Hong Kong Control Survey System</i>	means the current network of survey stations, emplaced and mathematically fixed, based on the "Hong Kong (1980) Geodetic Datum" by the Survey and Mapping Office of Lands Department.
<i>Hong Kong (1980) Geodetic Datum</i>	means the control survey system established and adopted by the Survey and Mapping Office, Lands Department since 1980.
<i>Permanent survey mark</i>	means a survey mark established by a land boundary survey for future use and reference.
<i>Picket box</i>	means a control survey station enclosed by a cast iron box.
<i>Survey mark</i>	means a mark defining a surveyed position.
<i>Survey station</i>	means a survey mark over which survey observations are made.
<i>Traverse</i>	means a series of lines between survey stations established by angular and linear measurements starting and closing onto control or old traverse survey stations.
<i>Urban survey mark</i>	means a control survey station made of metal in a mushroom like shape.

Appendix 2

Recommended Survey Accuracy for Land Boundary Surveys

1. Accuracy Requirement and Allowable Tolerance

1.1 Angular Observation:

Precision of theodolite should be 20 seconds or better.

- At least one arc of angular observations on both face left and face right of the theodolite.
- The maximum angular misclosure is $(30\sqrt{n})$ seconds where n is the number of stations occupied and observed from.

1.2 Linear Measurement:

A steel tape or Electronic Distance Meter (EDM) should be used for distance measurements.

- The linear misclosure should not exceed $(10 + \frac{2s}{15})$ mm. where s is the traverse length in metre.

2. Allowable tolerance in survey measurement

When a bearing, a distance or an area is re-measured or re-calculated for verification, re-establishment or whatever reasons, discrepancies are acceptable when they are within the listed tolerances below. The original will then be adopted. If the discrepancies fall outside these tolerances the new values must be conclusively checked for correctness. If confirmed, the original values must be considered as superseded by the new values with reasons clearly recorded. The tolerances are:-

2.1 Survey tolerances - **Bearing** measurements:

<u>Distance</u>	<u>Tolerance</u>
under 15 m	$\pm 2' 00''$
15 m - 150 m	$\pm 1' 00''$
Over 150 m	$\pm 0' 30''$

2.2 Survey tolerances - **Distance** measurements:

Linear tolerance = $\pm(0.015 + 0.0001 \times \text{distance in metres})$ metre

2.3 Survey tolerances - **Area** calculations:

Area tolerance = $\pm 0.1 \%$

3. Areas should be rounded off to the nearest unit as follows:

<u>Area of Lot</u>	<u>Expressed in</u>	<u>Rounded off to nearest</u>
Under 2000 m²	sq. metre (m²)	0.1 m²
2000 m² and above	sq. metre (m²)	1 m²

However, areas already committed may be exempted from this rule, in which case the tolerance in paragraph 2.3 will apply.

The word "**about**" has been used to describe the area of a land parcel both in the legal document and in the plan attached thereto. It is entirely at the discretion of the Professional Land Surveyor to use the word "**about**" in qualifying the area in a land boundary survey.

Appendix 3

Recommended Survey Specification For Survey Marks and Permanent Survey Marks

The following types of survey marks are recommended to be used for land boundary survey nowadays.

1. **Iron tube** will consist of, a galvanised iron pipe at least 350 mm long, and 20 mm in diameter, driven vertically into the ground.
2. **Lead plug** will consist of a hole drilled or punched into hard surface filled with lead and centred with a tack. The hole should be at least 8 mm in diameter and at least 15 mm deep.
3. **Iron spike** will be at least 100 mm in length and 12 mm in diameter, driven into the ground to finish either flush with the ground surface or beneath it.
4. **Survey nail** will be at least 5 mm in diameter with a minimum length of 50 mm and will have a head of at least 10 mm in diameter.
5. **Wooden peg** will be made from hardwood and can be of two sizes:
 - 25 mm square and 150 mm long, or
 - 70 mm square and 400 mm long.

The position of the boundary corner will be marked on the top of the peg by a small metal tack.

6. **Cut mark** will consist of a hole 5 mm in diameter and at least 10 mm deep, drilled into hard surface. It will be surrounded by a triangle shaped groove with equal sides 100 mm long and at least 2 mm deep.

For General Information

In the grant of land or lease survey, the Government uses survey marks of other materials, e.g. boundary stone, to demarcate the boundary. The types of the boundary marks are:

1. **Boundary post** - made of cement concrete reinforced with four 6 mm steel rods 1.7 m long adequately secured iron wire and sunk 850 mm in the ground and well rammed.
2. **Boundary stones** - used to demarcate the boundary corners of a parcel of land. Broadly speaking, there are 4 different types of boundary stones to suit various boundary corner features for emplacement:-
 - (a) **Type 1 boundary stone** - made of sound white granite, 300 mm square on top and not less than 900 mm long. They will be fine punched on the top and on all four sides for at least 300 mm from the top. Lot reference numbers, 75 mm high and at least 5 mm deep, will be cut into the stone and painted black. This type of stone will be used in open ground and will be sunk 600 mm into the ground.
 - (b) **Type 2 boundary stone** - made of white granite, 150 mm square and not less than 600 mm long. They will be fine punched on the top and on one side for at least 300 mm from the top. Lot reference numbers, 50 mm high and at least 5 mm deep, will be cut into the stone and painted black. The type of stone will be used in open ground (mainly in the New Territories) and will be sunk at least 300 mm into the ground.
 - (c) **Type 3 boundary stone** - made of sound white granite, 300 mm square and not exceeding 120 mm long. They will be fine punched on properly squared face and one side. This type of stone is for use in the angles of walls or buildings or for fixing flush in pavements. Lot reference numbers, 75 mm high and at least 5 mm deep, will be cut into the stone and painted black.
 - (d) **Type 4 boundary stone** - made of white granite, 300 mm x 150 mm x 120 mm. They will be fine punched on one properly squared face and on one side. The type of stone will be used in the angles of walls or buildings or for fixing flush in the pavement (mainly in the New Territories). Lot reference numbers, 50 mm high and at least 5 mm deep, will be cut into the stone and painted black.

Appendix 4

Recommended Draughting Specification for Survey Record Plans

1. Plan form

- 1.1 All survey record plans should be fair drawn in black ink, on the specified survey record plan form in a standard transparent format, suitable size.
- 1.2 A survey record plan should be drawn on one plan form unless a reduction in scale will adversely affect the quality of the plan. Should two or more plan forms be required each sheet should be boldly labelled 'sheet of sheets' and clear joining lines will be shown between sheets.

2. Scale

All survey record plans should be produced at a preferred metric scale e.g. 1:2000; 1:1000; 1:500; 1:200; 1:100 or 1:50, that will suitably and clearly illustrate the full details of the survey. Where necessary intricate and cluttered detail should be clarified by an enlarged and/or, distorted diagram.

3. Grid lines

- 3.1 Plans should normally be plotted on a grid parallel to the sides of the plan form, north uppermost. However when the orientation of the survey dictates otherwise the grid may be tilted, but never be more than 90° from the normal north pointing.
- 3.2 The position of the grid lines should be indicated by intersecting cuts at the plan border and at least two meridians and two perpendiculars, suitably spaced, should be shown. The co-ordinate value of each grid line should be shown.

4. Plan drawing and detail

- 4.1 All survey record plans should be drawn, either by computer plotter, by hand, or by a combination of both.
- 4.2 The plans should clearly show all traverses run, information adopted from previous surveys used for the boundary definition. Boundary and traverse lines adopted should be annotated as such on the face of the plan. If possible traverse bearings and distances should be shown on the face of the plan but may also be tabulated, with co-ordinates of the radiated points in the margin of the plan.
- 4.3 All survey marks used should be described on the face of the plan by type

and number. In the case of old marks found or adopted, a reference to the adopted survey record plan should be included, either beside the mark, or if all the old marks originate from the same survey, in the margin. Details of the ground placement of all marks except those placed flush in concrete roads and footpaths and those adopted should be shown. e.g. IS3 (road edge of channel); OIT7 (buried 0.10m).

- 4.4 New traverse survey marks should be numbered consecutively, commencing from Arabic numeral 1. Boundary marks should be labelled alphabetically in consecutive order in a clockwise direction from the most northerly north-west corner, if Z is reached then the sequence should be continued by prefixing A to the alphabet, then B, and so on. e.g. Z, AA, AB, etc. The letters I and O should not be used.
- 4.5 The legal description of the subject lot or parcel and its abutments as well as all relevant road and street names should be shown on the face of the plan.
- 4.6 Areas of all land parcels should be shown on the face of the plan.
- 4.7 Lines which have been observed but not measured should be annotated 'obs. only'.
- 4.8 A north point should be shown on all survey record plans.
- 4.9 Survey record plans used for reference should be shown on the face of the plan.

5. Symbols and abbreviations

The following symbols are recommended to be used to indicate the type of survey mark placed or found:-

	<u>New/Adopted</u>	<u>Old mark found</u>
(a) Boundary stone	□	■
(b) Control survey station	⊙	⊗
(c) Permanent survey mark	△	▲
(d) All other survey marks	○	●

The following abbreviations are commonly adopted and used when referring to specific survey marks:-

- (a) Boundary stone - BS
- (b) Survey nail - Nail
- (c) Cut mark - CM
- (d) Iron spike - IS
- (e) Iron tube - IT
- (f) Lead plug - LP
- (g) Wooden peg - Peg

- (h) Permanent survey mark - PSM
- (i) Picket box (over any mark) - PB
- (j) Urban survey mark - USM
- (k) Concrete pillar - CP

Additionally all existing survey marks found, with the exception of boundary stones, will be prefixed with an O, for old e.g. OIT.

Other abbreviations are:-

- (a) Adopted - adpt
- (b) Boundary - bdy
- (c) Building - bldg
- (d) Calculated - calc
- (e) Concrete - conc
- (f) Observed - obs

6. Line work and lettering

For clarity and presentation, it is recommended to use the following line gauge for the line work on survey record plans:-

<u>Line</u>	<u>Recommended Gauge</u>
(a) Measured and, or, observed lines; and origins of bearings	0.25 mm
(b) Adopted or calculated lines and grid lines	0.25 mm
(c) Boundary lines, subject lot or parcel	0.7 mm
(d) Boundary lines, other than (c) above, sheet joining lines	0.5 mm
(e) Road/street alignments	0.5 mm
(f) Fences (fence on boundary annotate only)	0.25 mm
(g) Building or structures (Describe fully – add approximate age)	0.25 mm
(h) North point symbol	0.5 mm

Specifications for lettering and figure work are:

<u>Item</u>	<u>Recommended Height</u>	<u>Recommended Gauge</u>
(a) Descriptions and areas of subject parcels, road names, plan titles, sheet numbers and sheet joining line labels	7 mm	0.7 mm
(b) Descriptions of abutments, etc., diagram titles, specific usage names or descriptions, standard data in bottom panels and SRP reference	5 mm	0.5 mm
(c) All other lettering and figure work	2.5 mm	0.25 mm