



Specification for Geodetic Physical Maintenance and Geodetic Mark Inventory Service

National Geodetic Office

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1 Foreword

1.1 Purpose of Specification

Section 7(1)(b) of the Cadastral Survey Act 2002 makes it a function and duty of the Surveyor-General "to maintain a national survey control system". This function has been delegated to the Chief Geodesist of the National Geodetic Office in Land Information New Zealand.

This specification was developed by the National Geodetic Office for use by contracting organisations when providing geodetic survey and maintenance services to LINZ.

1.2 Brief History of Specification

This specification is a major revision of previous National Geodetic Office Specifications and supersedes:

- Geodetic Survey, version 2.5 published 12 May 2010
- Geodetic Physical Network, version 2.5 published 12 May 2010
- Geodetic Contract Deliverables, version 1.4 published 12 May 2010

1.3 Related Rules, Standards and Specifications

The following standards, guidelines and Rules should be consulted when interpreting this specification:

- Standard for tiers, classes and orders of LINZ data – LINZS25006 (21 September 2009)
- Standard for the New Zealand survey control system – LINZS25003 (21 September 2009)
- Guideline for the provision and maintenance of the New Zealand survey control system – LINZG25704 (21 September 2009)
- Rules for Cadastral Survey 2010 (24 May 2010)

INFORMATION - Related Documents

The above standards can be obtained from:
<http://www.linz.govt.nz/geodetic/standards-publications/standards/index.aspx>

1.4 Contact Information

Chief Geodesist
National Geodetic Office
Land Information New Zealand
PO Box 5501
Lambton Quay
Wellington 6145
Phone: 04 460 0110
Email: info@linz.govt.nz

2 Introduction

2.1 Scope of this Specification

This specification defines the requirements for the provision of physical maintenance and geodetic inventory services to LINZ by contracting organisations. The requirements for survey control services are specified in the Specifications for Order 5 Geodetic Survey.

2.2 Variations from this Specification.

- (a) Compliance with all aspects of this specification is expected.
- (b) It is recognised that on occasions a better outcome for the survey control system may be obtained through an alternative approach. If a Contractor believes this to be the case, a variation to these specifications must be sought.
- (c) All variations must be agreed to by LINZ prior to any work being carried out.

2.3 Obtaining Specialist Maintenance Items

If unable to be supplied by the Contractor, any LINZ-specific maintenance items (such as beacons, cast iron covers and identification plaques) may be purchased from the following supplier:

Mark Dunnett
Survey Services Hawkes Bay Ltd
PO Box 3028
Hawkes Bay Mail Centre
Napier 4142

Phone: 06 844 4354
Fax: 06 844 4346
Email: mark@surveyhb.co.nz

3 General Requirements

3.1 Site Access

- (a) The Contractor must obtain permission to enter private land from the landowner/occupier prior to accessing any privately owned site.
- (b) If, after reasonable attempts, the landowner/occupier is unable to be contacted prior to private land being accessed, the Contractor must leave their contact details at the property concerned so that the landowner/occupier is aware that the site has been accessed.
- (c) The Contractor must obtain permission from the landowner and occupier to install and/or maintain marks, the site and protection structures, before any work is commenced.
- (d) The Contractor must comply with all requests from the landowner/occupier regarding access and health and safety.

INFORMATION - Site Access

Details of the land owner/occupier may be available from the LINZ Geodetic Database (see <http://www.linz.govt.nz/gdb>)

Contractors are given access to private property for the purpose of these contracts at the grace of the landowner/occupier. The landowner/occupier is entitled to place restrictions on this access, such as: defining the route/method of access, preventing access during lambing, prohibiting scrub clearance or weed spraying, requesting gates to be closed.

If a Contractor is unable to access a mark due to landowner/occupier restrictions they should advise the National Geodetic Office as soon as possible.

3.2 Health and Safety

- (a) Contractors must be fully aware of, and at all times exercise their responsibilities and obligations under, the Health and Safety in Employment Act 1992.
- (b) Sites, marks, beacons and other protection structures must be left in a respectable and safe state.

3.3 Traffic Management

- (a) Contractors must abide by the New Zealand Transport Agency and relevant local authorities Code of Practice for Temporary Traffic Management when working on or near roads.
- (b) Contractors must supply copies of all approved traffic management plans with the deliverables for this contract.

INFORMATION - Traffic Management

The deliverable requirements for providing traffic management plans are specified in section **12.7**

4 Geodetic Marks

4.1 Geodetic Codes

- (a) Each mark shall be assigned a unique four-character geodetic code.
- (b) Geodetic codes shall be requested from the National Geodetic Office by the Contractor.
- (c) A mark shall retain its existing geodetic code unless:
 - (i) The mark has been modified in accordance with section 8.3.1, or
 - (ii) The height of the mark has been modified by more than 3 mm (section 8.3.2).

4.2 Mark Names

4.2.1 Names for Existing Marks

- (a) The existing name for a mark with a geodetic code shall be retained, except that:
 - (i) All letters of the name shall be shown in upper case, however,
 - (ii) Where a Survey District forms part of the name, the Survey District name shall be enclosed in brackets, shown in sentence case, and followed by "SD".
- (b) Where an existing non-boundary mark shown on an approved survey plan or approved Cadastral Survey Dataset (CSD) plan is upgraded:
 - (i) Its existing identification along with its plan number shall be used,
 - (ii) The use of "OLD" (as in OIT I) to prefix a mark name shall not be used, and
 - (iii) The latest name shown on a CSD plan shall be continued.
- (c) A single space character shall be inserted between each element of a name.

EXAMPLE - Existing Mark Names

An existing mark referred to as "Dingle Peak" should be changed to "DINGLE PEAK"

An existing mark referred to as "B MAROTIRI SD" should be changed to "B (Marotiri SD)"

An existing mark shown as "OIT IV DP 2532" on a CSD plan should be changed to "IT IV DP 2532"

An existing mark originally referred to as "IT III DP2398" but renamed to "SS 23 SO 2865" should continue to use the later name

- (d) Where a mark has an alternative name (eg a geographical location), that name shall be included in the contract deliverables.

4.2.2 Names for New Marks

- (a) New marks shall be given a unique name.
- (b) Mark names shall consist of the following components in this order:
 - (i) An abbreviation that describes the physical mark type (BP for bronze plaques, PIN for stainless steel pins),
 - (ii) A unique numeric identifier, and
 - (iii) The CSD type and number.

EXAMPLE - New Mark Names

A new bronze plaque mark shown on SO 354895 shall be named "BP 1 SO 354895"

A new stainless steel pin mark shown on SO 354897 shall be named "PIN 1 SO 354897"

4.2.3 Names for Modified Marks

- (a) Where a mark has been modified, in accordance with section **8.3.1** the modified mark shall be assigned a new name.
- (b) A modified mark name shall have "NO 2" appended to the original name for the mark
- (c) Where a "NO 2" mark has been modified, "NO 3" shall replace "NO 2" in the mark name.
- (d) Where an original mark name is prefixed by a number or letter the number or letter is to be removed in the modified mark name.

EXAMPLE - Modified Mark Names

Where "B (Marotiri SD)" has been modified, the new mark shall be named "B (Marotiri SD) NO 2"

Where "IT IV SO 1254 NO 2" has been lowered, the new mark shall be named "IT IV SO 1254 NO 3"

Where "MT JOHN" has been modified, the new mark shall be named "MT JOHN NO 2"

Where "2 HILL RD" has been modified, the new mark shall be named "HILL RD 3"

5 Control Survey

5.1 Autonomous Coordinates

Where the accuracy of a mark's coordinate is Order 10 - 12, the Contractor shall supply a new coordinate collected using a. handheld GPS receiver.

6 Field Requirements

6.1 Activities to be Completed on Site

The Contractor shall assess and verify the following for every geodetic mark visited, surveyed or maintained as part of the contract. This list is informational only, if it conflicts with other sections of this specification, the other sections take precedence.

6.1.1 Activities for Physical Maintenance

- (a) A before photo shall be taken in accordance with section **10.4.1**
- (b) Site Maintenance in accordance with section **7**
- (c) Mark Maintenance in accordance with section **8**
- (d) Protection Structure Maintenance in accordance with section **9**
- (e) Survey Control in accordance with section **5**
- (f) The following site details shall be recorded or checked for correctness for the Mark Details File in accordance with section **12.5**
 - (i) Mark type (MRKT)
 - (ii) Mark physical state (MPSC) in accordance with section **12.8.6**
 - (iii) Mark protection structures (MRKR, MRKR2) in accordance with section **12.8.7**
 - (iv) Beacon type recorded (MRKE) in accordance with section **12.8.8**
 - (v) Ground level relationship (GLREL) in accordance with section **8.6**
 - (vi) Beacon and pillar heights measurements (BCNHGT, BCNHGT2, BCNHGT3, BCNHGT4, BCNHGT5, BCNHGT6) in accordance with sections **9.3.2** or **9.7.2**
 - (vii) Beacon installation date record for new beacons (BDAT)
 - (viii) Beacon eccentricity (BECC) recorded and/or corrected in accordance with section **9.3.3**
 - (ix) Mark details/description (MRKD) in accordance with section **11.3**
 - (x) Mark location/access note (MLOC) in accordance with section **11.2**
 - (xi) Identification plaque, identification plate and information plate are attached correctly (PLQEXIST, PLTEXIST, INFOEXIST) in accordance with sections **8.1, 9.1** and **9.2**
 - (xii) Description of mark, beacon and protection structure maintenance completed (MPSM, MPSB, MPSP) in accordance with sections **8** and **9**
 - (xiii) Description of mark, beacon and protection structure maintenance recommended/required (MDMK, MDBE, MDPR) in accordance with sections **8** and **9**
 - (xiv) Landowner/occupier name, physical address and phone number (OWNER, PHNO, PADD) in accordance with section **11.5**

- (xv) Access restrictions (ARES) in accordance with section **3.1**
- (xvi) GNSS suitability (GNSSU) in accordance with section **11.6**
- (xvii) Cell phone coverage (CELL) in accordance with section **11.7**
- (g) Access diagrams in accordance with section **11.1**
- (h) Non-standard beacon diagram in accordance with section **11.8**
- (i) On completion of maintenance the mark and site photos shall be taken in accordance with section **10.4.2**

6.1.2 Activities for Inventory Service

- (a) Where a mark has been specified for full maintenance or requires maintenance for health and safety in accordance with section **3.2** all activities from section **6.1.1** shall apply, otherwise:
 - (b) A before photo shall be taken in accordance with section **10.4.1**
 - (c) Survey Control in accordance with section **5**
 - (d) The following site details shall be recorded or checked for correctness for the Mark Details File in accordance with section **12.5**
 - (i) Mark type (MRKT)
 - (ii) Mark physical state (MPSC) in accordance with section **12.8.6**
 - (iii) Mark protection structures (MRKR, MRKR2) in accordance with section **12.8.7**
 - (iv) Beacon type recorded (MRKE) in accordance with section **12.8.8**
 - (v) Ground level relationship (GLREL) in accordance with section **8.6**
 - (vi) Beacon and pillar heights measurements (BCNHGT, BCNHGT2, BCNHGT3, BCNHGT4, BCNHGT5, BCNHGT6) in accordance with sections **9.3.2** or **9.7.2**
 - (vii) Mark details/description (MRKD) in accordance with section **11.3**
 - (viii) Mark location/access note (MLOC) in accordance with section **11.2**
 - (ix) Description of mark, beacon and protection structure maintenance recommended/required (MDMK, MDBE, MDPR) in accordance with sections **8** and **9**
 - (x) Landowner/occupier name, physical address and phone number (OWNER, PHNO, PADD) section **11.5**
 - (xi) Access restrictions (ARES) in accordance with section **3.1**
 - (xii) GNSS suitability (GNSSU) in accordance with section **11.6**
 - (xiii) Cell phone coverage (CELL) in accordance with section **11.7**
- (e) Access diagrams in accordance with section **11.1**

6.2 Incomplete Maintenance

It is recognised that in some situations full maintenance of a Mark, Protection Structure and/or Site may not be completed.

- (a) This may be due to the required maintenance being:
 - (i) outside the scope of the contract
 - (ii) rejected by the Land Owner/Occupier, section **3.1**
 - (iii) rejected by LINZ
 - (iv) unsafe to complete, or
 - (v) agreed as not required by LINZ.

In this case:

- (b) The Mark, Protection Structure and Site shall be left in a tidy state, so that it does not pose a health and safety risk.
- (c) The reason for not completing this work shall be clearly stated in the Contract Report section **12.6**, and
- (d) Any recommended future maintenance shall be included in the Mark Details File in accordance with section **12.5** fields
 - (i) Mark maintenance required (MDMK)
 - (ii) Beacon maintenance required (MDBE) or
 - (iii) Protection maintenance required (MDPR)

7 Site Maintenance

7.1 Clear Vegetation

7.1.1 Land Owner Permission

Permission from the land owner/occupier must be obtained prior to any spraying or clearance of vegetation occurring, section **3.1**.

7.1.2 Clear Tall Plants

Tall plants, including trees, shall be cleared from the site so that it is clear of all obstructions that may restrict visibility both to and from the site.

7.1.3 Clear Scrub

- (a) All scrub-like vegetation which impedes access or usability of a proposed or existing site shall be cleared from within a one metre radius of the site and its protection structure.
- (b) Grass is not considered to be scrub unless it exceeds 1.0 metre in height before clearance.

GUIDELINE - Clear Scrub

The purpose of clearing scrub such as blackberry and gorse is to improve access to a mark and to enable observations to be made from it in the medium term.

In general, trimming grass does not provide improved access or mark usability after a month. Where grass requires trimming to enable other maintenance to occur (e.g. painting posts, beacons or marks) this is to be included in the unit rate for that maintenance item.

7.1.4 Spray Vegetation

Vegetation such as blackberry, gorse and grass not on farmland, shall be sprayed within a one metre radius of a mark and its protection structure so that re-growth is impeded.

7.2 Disposal of Unwanted Materials

- (a) Any beacon, protection structure, or parts thereof that have been replaced shall be removed from the site and disposed of in an environmentally friendly manner.
- (b) Debris such as cleared plants, vegetation and excavated material that cannot be left on or near site in a safe and tidy manner (eg in urban areas) shall be removed and disposed of in an environmentally friendly manner.

GUIDELINE –Disposal of Material in Urban Areas

In urban areas all unwanted materials shall be removed from the site. Any green waste should be composted or disposed of in terms with local by-laws.

8 Mark Maintenance

Maintenance of an existing mark shall be carried out when:

- (a) It is required to enable the survey to be carried out (for example, grouting a stainless steel pin into a 50mm tube), or
- (b) It is required to protect an at-risk mark (for example, where a mark is likely to be destroyed or buried), or
- (c) It is required to avert a Health and Safety hazard (for example, a protruding iron tube).

GUIDELINE - Mark Maintenance

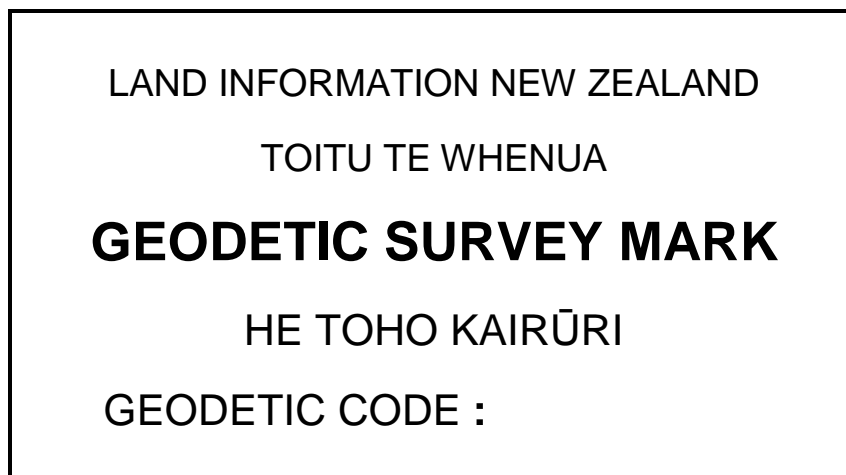
Whenever mark maintenance work is carried out, care shall be taken to ensure that the existing mark does not have its position altered either horizontally or vertically.

If a mark is damaged or destroyed or moved it shall become classified as a modified mark.

8.1 Identification Plaques

8.1.1 Identification Plaques

- (a) A bronze identification plaque shall be installed at all Order 4 and higher marks.
- (b) A plaque shall be engraved to clearly show the mark's four-character geodetic code.
- (c) A plaque shall be firmly secured (rendering it difficult to be removed) to a:
 - (i) Concrete collar around the mark, or
 - (ii) Stable rock, or
 - (iii) Permanent structure in close proximity (i.e. within 0.5m) of the mark.
- (d) A plaque shall have an outside base dimension of 112mm by 63mm.
- (e) A plaque shall be in the form of and contain the wording shown below:



8.1.2 Install an Identification Plaque

- (a) The Contractor shall supply and install an identification plaque in accordance with section **8.1.1**.
- (b) Identification plaques shall not be installed:
 - (i) For lower order marks (orders 5-12)
 - (ii) For marks that are flush in seal in urban areas and which have no protection structure (including a cast iron cover), or
 - (iii) On to removable features, such as a cast iron lid.

8.1.3 Non-Conforming LINZ plaques

- (a) Where a LINZ plaque not conforming to section **8.1.1** is already affixed to a mark, the non-conforming plaque shall be removed if
 - (i) The removal will not damage or disturb the mark
 - (ii) Information on the plaque is incorrect
- (b) Where additional information is provided by the non-conforming plaque it shall be retained and a conforming plaque shall be fixed beside the existing plaque in accordance with section **8.1.1**.

GUIDELINE – Non-Conforming Plaque

Additional information can include the mark name, for example SS 2

8.2 New Geodetic Marks

8.2.1 Order 5 Marks

- (a) A new Order 5 geodetic mark must consist of a bronze (mushroom) plaque that is:
 - (i) Installed flush in a solid structure, such as a concrete berm, kerb or footpath, and
 - (ii) Stamped with the geodetic code.
- (b) Where it is not practical to use a bronze plaque a new mark must be installed in accordance with section **8.2.2**

8.2.2 Other Geodetic Marks

- (a) A new geodetic mark must consist of a 12 or 22mm stainless steel pin grouted into solid rock or an existing substantial concrete structure (such as a culvert or bridge abutment), or
- (b) Where **(a)** is not practical, a 22mm stainless steel pin set in a stable concrete block must be used.
- (c) A concrete block must:
 - (i) Have minimum dimensions of 0.35m × 0.35m × 0.5m,
 - (ii) Be located at least 0.10m below ground level, and

- (iii) Be covered by a cast iron protective box in accordance with section **9.6.1**.
- (d) An identification plaque, stamped with the geodetic code, shall be located near the grouted mark or attached to the concrete block.

8.3 Modifications to Existing Marks

8.3.1 Mark Modifications

If during the course of maintenance the original position of the mark is altered either horizontally or vertically by more than 3mm:

- (a) The physical change between the original and modified mark shall be reported,
- (b) The modified mark shall be named in accordance with section **4.2.3**,
- (c) A new geodetic code shall be assigned for the modified mark in accordance with section **4.1**,
- (d) Details of both the original mark and the modified mark are to be included in the Mark Details File, section **12.5** and
- (e) The Mark Physical State for the original mark shall be recorded as DEST (destroyed) in the Mark Details File, section **12.5**.

8.3.2 Modify Height of an Existing Mark

- (a) Where the mark has a published normal-orthometric or ellipsoidal height and the height of the mark is changed by more than 3mm it shall be regarded as a modified mark.
- (b) The Contractor shall carry out all work described in section **8.3.1**.

GUIDELINE - Mark Height Modification

The height of a mark may need to be changed to mitigate a health and safety risk or to protect an at-risk mark

8.3.3 Upgrade an Existing Mark

Where an existing mark comprises a large diameter (greater than 25 mm) iron tube that is in good condition, the Contractor shall:

- (a) Insert a stainless steel pin inside the tube,
- (b) Secure the pin in place using cement or a suitable epoxy resin, and
- (c) Report any difference in the height of the tube and reference point of the pin in the Mark Details File, section **12.5**.

GUIDELINE - Upgrading an Existing Ground mark

The top of the pin should be the same level as the top of the tube.

If a 3D coordinate already exists for the mark and the pin is not level, it shall become classified as a modified mark and section **8.3.1** shall apply.

8.3.4 Stabilise an Existing Mark

If an existing mark can be moved horizontally or vertically by more than 3 mm (under normal conditions) then the Contractor shall stabilise the mark by:

- (a) Removing any nearby vegetation threatening the mark,
- (b) Compacting or replacing the ground around the mark with a more stable material, and
- (c) Installing a concrete collar around the mark.

GUIDELINE - When not to stabilise a mark

In some situations the site may be unstable (rather than just the mark), due to localised deformation or draining etc. In these cases, where the mark is able to move more than 3mm horizontally or vertically, any identification plates/plaques should be removed and the mark recorded as destroyed.

8.3.5 Preserve a Mark

When the top of a corroded iron pipe or tube is protruding above the ground and its height is not posing a health and safety risk, the Contractor shall preserve the tube by:

- (a) Placing a PVC pipe around the corroded tube, to a sufficient depth below ground level to ensure mark stability, and
- (b) Securing the corroded tube within the PVC pipe with concrete.

GUIDELINE - When not to Preserve a Mark

Some marks may be too corroded or pose a Health and Safety Risk by protruding above the ground, these marks should have their height reduced in accordance with Section **8.3.2**.

8.4 Offset an Existing mark

- (a) A mark may be offset when:
 - (i) An existing mark has been identified as going to be damaged or destroyed by construction, or
 - (ii) An existing mark is no longer in a suitable location to enable survey.
- (b) Sufficient new marks shall be installed, clear of any unstable ground, so that the original position of the mark can be known to within 3mm both horizontally and vertically.
- (c) The offsets shall be surveyed and submitted to LINZ on a Survey Information CSD
- (d) New marks shall be installed in accordance with section **8.1**.

8.5 Replace an Existing Mark

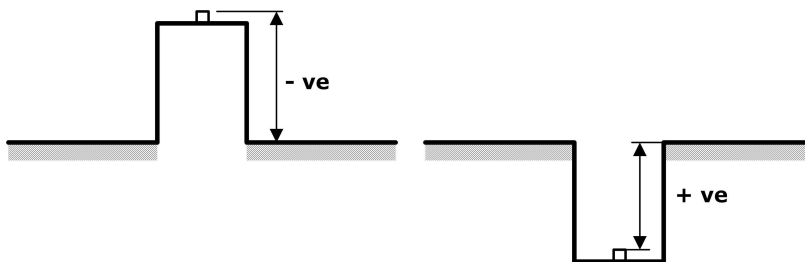
- (a) An existing mark may be replaced when it is at risk of being damaged or destroyed by construction.
- (b) The original mark shall be offset in accordance with section **8.4** and then removed.
- (c) Once the site is no longer endangered, a new mark shall be installed in accordance with section **8.1**.
- (d) The replacement mark shall be placed both horizontally and vertically within 3mm of the position of the original mark.

GUIDELINE - Replace an Existing Mark

If the replacement mark cannot be placed in the same position (i.e. within 3mm horizontally and vertically) of the original mark, it shall become classified as a modified mark and section **8.3.1** shall apply.

8.6 Measure Ground Level Relationship

All geodetic marks shall have the relationship from the top of the mark to the ground measured.



8.7 Destroyed or Not Found Marks

If a geodetic mark is found to be destroyed or it cannot be located within a reasonable time frame (e.g. 15 minutes), the Contractor shall:

- (a) Update the Mark Details File (section **12.5**) to:
 - (i) DEST (destroyed) or
 - (ii) NFND (not found), and
- (b) Provide details of the search undertaken to locate the mark in the Contract Report, section **12.6**

9 Protection Structure Maintenance

9.1 Identification Plates

9.1.1 Identification Plates

- (a) An aluminium identification plate shall be affixed to a:
 - (i) Beacon,
 - (ii) Marker post,
 - (iii) Post and rail enclosure, or
 - (iv) Pillar.
- (b) An identification plate shall conform to the following requirements:
 - (i) The geodetic code must be clearly engraved,
 - (ii) The distance to the mark (to one decimal place of a metre) must be clearly engraved,
 - (iii) Identification plates are only to be secured to LINZ property. They are not to be secured to nearby fences, walls, fence posts or power poles unless consent has been given by owner of such property.
 - (iv) The identification plate shall be prefabricated with outside dimensions of 100mm by 125,
 - (v) The identification plate shall be in the form and contain the wording shown below:



9.1.2 Install an Identification Plate

- (a) The Contractor shall supply and install an identification plate in accordance with section **9.1.1**, and
- (b) Damaged or existing identification plates that do not conform to section **9.1.1** shall be removed and replaced when maintenance is undertaken.

9.2 Information Plates

9.2.1 Information Plates

- (a) An aluminium information plate shall be affixed to a side panel of two and four metre beacons located at sites readily and frequently accessible to the general public.
- (b) An information plate shall conform to the following requirements:
 - (i) Be engraved to describe the purpose and usage of the beacon and its mark.
 - (ii) Be secured to the beacon on the side panel facing access.
 - (iii) Only to be secured to LINZ beacons and not to nearby fences, walls, fence posts or power poles.
 - (iv) Be prefabricated in the form shown below with outside dimensions of 150mm by 200mm.
 - (v) Be in the form and contain the wording shown below:

TRIG STATION

This 'Trig Beacon' identifies a geodetic survey mark, which forms the physical component of New Zealand's geodetic system. It is part of a network of 'Trig Stations' across New Zealand that serve as physical reference points.

Land Information New Zealand (LINZ) is responsible for determining and maintaining the accurate and complete measurements and location of New Zealand's physical features. New Zealand's geodetic system provides the underlying measurements used in producing topographic maps and hydrographic charts and is an essential tool in setting and identifying property boundaries.

New Zealand's geodetic system is used by:

- surveyors and land professionals
- government departments and local authorities
- utility providers such as power, gas and telecommunications companies
- emergency services
- trampers and hikers
- mariners

Further information on Land Information New Zealand and the Geodetic System can be found at www.linz.govt.nz. You can also find out about this Trig Beacon by entering its geodetic code into the geodetic section of the LINZ website.

New Zealand Government



9.2.2 Install an Information Plate

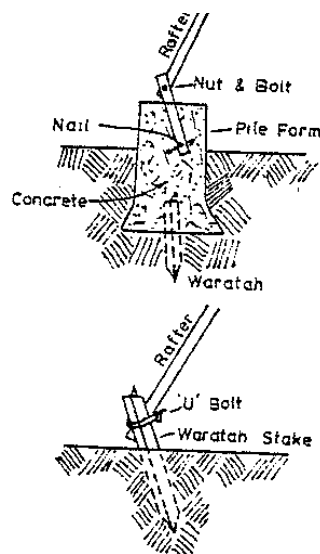
- (a) The Contractor shall supply and install an information plate in accordance with section **9.2.1**.
- (b) If an information plate installed in accordance with section **9.2.1** would not be easily readable then no information plate shall be installed.
- (c) Damaged or existing information plates that do not conform to section **9.2.1** shall be removed and replaced.

9.3 Beacons

9.3.1 Two Metre Beacon

- (a) Two metre beacons shall be installed:

- (i) To replace a damaged two or four metre beacon, or
 - (ii) At a non-beaconed site with the written permission of the National Geodetic Office.
- (b) Two metre beacons shall be constructed using the following materials:
- (i) All nuts, bolts, screws, washers, 'U' bolts, mast locking pins etc to be stainless steel,
 - (ii) Side panels, vane panels and vane braces to be 22 gauge galvanised iron sheet metal or stainless steel,
 - (iii) Mast braces to be 12 gauge galvanised iron sheet metal,
 - (iv) Mast and rafters to be 20 mm diameter galvanised iron pipes, and
 - (v) Alloy head to be cast aluminium with 28 mm internal diameter steel tubing insert.
- (c) Two metre beacons shall be painted in the following scheme:
- (i) Side panels and vane braces painted white, and
 - (ii) Vane panels painted black.
- (d) A locking pin, U-bolt or other securing bracket shall be fixed through the mast immediately above the head to prevent the mast rotating and to hold the mast clear of the ground mark.
- (e) The bottom of the mast shall sit at least 20 mm clear of the top of the ground mark to prevent damage to the ground mark.
- (f) The beacon shall be anchored by clamping the rafters to waratahs using a nut and bolt or a 'U' bolt.
- (g) Waratahs are to be driven firmly into the ground and if necessary secured by a concrete collar. Concrete must not be placed around rafters (see Figure below).

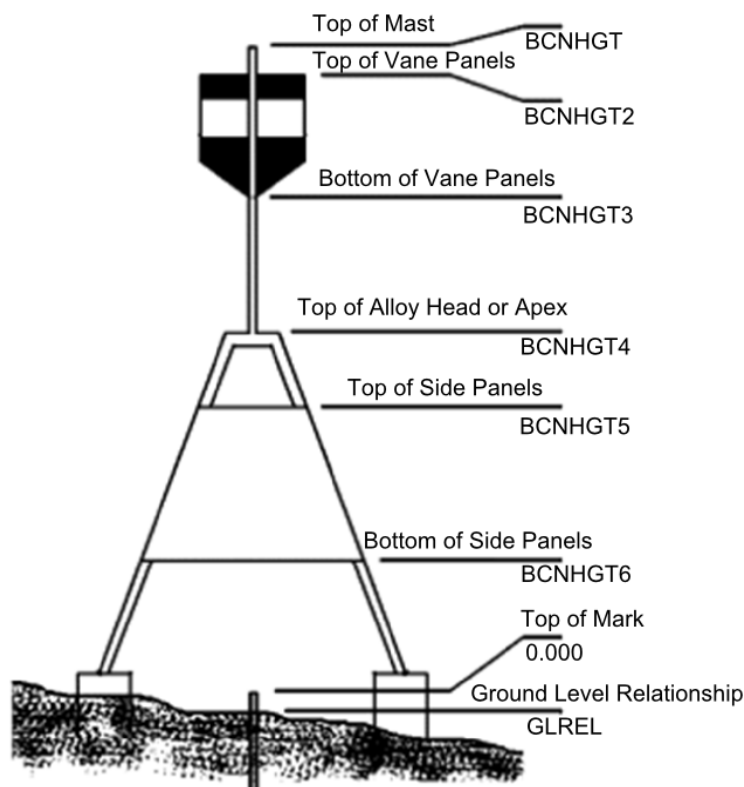


- (h) New beacons shall be installed so that that the top of the alloy head is 1.2 m – 1.4 m above ground level.
- (i) The centre of the mast shall be located vertically over the centre of the mark.

- (j) An identification plate shall be attached to the side panel of a two metre beacon facing the usual route of access in accordance with section **9.1**.
- (k) An information plate shall be attached in accordance with section **9.2**.

9.3.2 Beacon Measurements

- (a) Two and four metre beacons shall have the following relationships measured from the top of the mark to the:
 - (i) Top of mast,
 - (ii) Top of vanes (target boards),
 - (iii) Top of alloy head or apex,
 - (iv) Top of side boards (sight boards)
 - (v) Bottom of side panels



- (b) A non standard beacon shall
 - (i) Be measured, as far as possible, in accordance with **9.3.2**,
 - (ii) Have measurements taken from mark to observable features where **9.3.2** does not apply
 - (iii) Have measurements displayed on a non-standard beacon diagram in accordance with section **11.8**.

9.3.3 Beacon Eccentricity

- (a) Prior to commencing maintenance a beacon shall be checked for eccentricity in relation to the mark.

- (b) Any eccentricity greater than 10mm shall have the direction (north/east/south/west) and distance relative to the mark recorded in the Mark Details File, section **12.5**
- (c) Where an existing beacon has an eccentricity greater than 0.01m the beacon shall be centred over the mark.

GUIDELINE - Beacon Eccentricity

Any beacon eccentricity should be removed when a beacon is being maintained. It is important to record any existing eccentricity so that observations made to the beacon before it was maintained can be correctly reduced by surveyors.

Following all maintenance activities the Contractor should confirm that the beacon is still central to the mark.

9.3.4 Install a Two Metre Beacon

The Contractor shall supply and install a two metre beacon and identification plate in accordance with section 9.1.2.

9.3.5 Centre a Beacon

The Contractor shall re-centre a beacon over a mark in accordance with section **9.3.1(i)**.

9.3.6 Supply and Fit Mast Locking Pin

The Contractor shall supply and fit a mast locking pin in accordance with section **9.3.1 (d)**.

GUIDELINE - Mast Locking Pins

Locking pins are used to ensure that the beacon mast can be replaced to a consistent height above the ground mark, thereby maintaining the accuracy of the beacon height measurements.

The pins also protect the ground mark by ensuring that the mast does not rest directly on it, and prevent the mast from spinning and incurring damage to the beacon.

9.3.7 Modify a Four Metre Beacon

- (a) Wooden four metre beacons shall be modified so that they can be easily removed and accurately re-established over the ground mark by installing brackets at the base of the rafters.
- (b) Brackets and securing bolts or screws shall be made of galvanised steel or brass.
- (c) Beacon eccentricity shall be assessed, reported and corrected in accordance with section **9.3.2**.

GUIDELINE - Modifying Four Metre Beacons

Four metre beacons were designed to enable terrestrial surveying measurements to be made from under the erect beacon. To collect GNSS observations at marks monumented by four metre beacons it is necessary to first remove the beacon.

Metal brackets should be attached to each rafter to facilitate the efficient removal and replacement of wooden four metre beacons. An example of a modified rafter is shown in the picture below.



9.3.8 Repair a Beacon

Where a beacon does not comply with this specification the Contractor shall:

- (a) Supply all materials,
- (b) Restore a two beacon to its original state in accordance with section **9.3.1**, including:
 - (i) Painting in accordance with section **9.3.9**,
 - (ii) Installing an identification plate in accordance with section **9.1**, and
 - (iii) Installing an information plate in accordance with section **9.2**.
- (c) Restore a four metre, wooden or other non-standard beacon to its original state by
 - (i) Replacing or securing any damaged components of the beacon including damaged, corroded, rotted or missing rails, rafters, side panels, vane panels, hinges, and holding down devices,
 - (ii) Painting any damaged or replaced components in accordance with section **9.3.9**,
 - (iv) Installing an identification plate in accordance with section **9.1**, and
 - (iii) Installing an information plate in accordance with section **9.2**.
- (d) Beacon eccentricity shall be assessed, reported and corrected in accordance with section **9.3.2**.

- (e) Where a beacon is beyond repair a two metre beacon shall be installed in accordance with section **9.3.1**

9.3.9 Paint a Two Metre Beacon

The Contractor shall:

- (a) Clean all surfaces, by brushing down or scraping, prior to painting to remove all loose paint, moss, lichen etc,
- (b) Use non toxic paint,
- (c) Undercoat all metal structures with galvanised iron primer, and
- (d) Paint two metre metal or wooden beacons in the following scheme:
 - (i) Side panels and vane braces painted white, and
 - (ii) Vane panels painted black.

9.3.10 Paint a Three or Four Metre Beacon

The Contractor shall:

- (a) Clean all surfaces, by brushing down or scraping, prior to painting to remove all loose paint, moss, lichen etc,
- (b) Use non toxic paint,
- (c) Undercoat all metal structures with galvanised iron primer, and
- (d) Paint three or four metre beacons in the following scheme:
 - (i) Rafters, rails, mast, mast braces and top and bottom third of the vane panels painted black, and
 - (ii) Side panels and centre third of the vane panels painted white.

9.3.11 Paint a Cone Beacon

The Contractor shall:

- (a) Clean all surfaces, by brushing down or scraping, prior to painting to remove all loose paint, moss, lichen etc,
- (b) Use non toxic paint,
- (c) Undercoat all metal structures with galvanised iron primer, and
- (d) Paint cone beacons in the following scheme:
 - (i) Top and bottom third of cone painted black, and
 - (ii) Middle third of cone painted white.

9.3.12 Paint a Non-Standard Beacon

The Contractor shall:

- (a) Clean all surfaces, by brushing down or scraping, prior to painting to remove all loose paint, moss, lichen etc,
- (b) Use non toxic paint,

- (c) Undercoat all metal structures with galvanised iron primer,
- (d) Paint non-standard beacons, as far as possible, in accordance with sections **9.3.9** to **9.3.10**, and
- (e) Paint any remaining structure black if it is LINZ property, otherwise the structure shall not be maintained.

9.3.13 Repairs for Safety

- (a) This section only applies if repairs require additional maintenance subject to approval or maintenance not required as part of the contract.
- (b) Repairs shall be completed to ensure that the beacon no longer poses a health and safety hazard.
- (c) The Contractor shall supply the materials, remove, replace or secure any damaged or dangerous components of the beacon and/or protection structure including any or all of the following: rails, rafters, side panels, vane panels, hinges, and holding down devices.

9.4 Marker Post

9.4.1 Marker Post

A marker post shall:

- (a) Be constructed from a galvanised half round fence post with a minimum diameter of 125mm and approximately 1.8 m long.
- (b) Be placed no further than 5.0 m from the ground mark.
- (c) Have one third of the post's length buried. This will leave 1.2 m of post exposed above ground level
- (d) Be set in concrete to ensure stability if located in soft or sandy soil
- (e) Have the flat side of the post facing the mark
- (f) Be installed immediately against the fence line or as close as possible to it, where a mark is situated close to a fence
- (g) Not use existing posts unless they were explicitly placed for mark identification eg existing concrete bench mark posts.
- (h) Prior to painting all surfaces shall be cleaned (eg. by brushing down or scraping) to remove all loose paint, moss, lichen etc
- (i) Be painted using non toxic paints
- (j) Be painted in the following colour schemes:
 - (i) the top 0.3 m of exposed post painted black, and
 - (ii) the remaining exposed post painted white.
- (k) Have an identification plate that complies with section **9.1** located:
 - (i) On the flat side of post facing the ground mark and
 - (ii) On the area painted black

9.4.2 Install a Marker Post

The Contractor shall supply and install a marker post with identification plate in accordance with section **9.4.1**,

9.4.3 Maintain a Marker Post

An existing marker post shall be:

- (a) Restored to its original state in accordance with section **9.4.1**,
- (b) Straightened and secured taking care to ensure that the identification plate remains undamaged, and
- (c) Re-positioned to face the mark in accordance with section **9.4.1 (e)** unless:
 - (i) The mark is likely to remain clearly visible and/or,
 - (ii) The relationship of the marker post to the mark is obvious from the access or finder diagram.

9.5 Post and Rail Enclosure

Where a mark or beacon is threatened by cattle or is required by the local authority a post and rail enclosure may be installed with approval from the National Geodetic Office.

9.5.1 Post and Rail Enclosure

A post and rail enclosure shall:

- (a) Be constructed from the following materials:
 - (i) Three or four wooden tanalised fence posts (eg half rounds) approximately 1.8 m long (post),
 - (ii) Tanalised half-round fence posts or lengths of tanalised 100mm x 50mm (rails).
- (b) Have posts at an equidistant from the ground mark, where this distance shall be between 1.8m and 2.2 m
- (c) Have at least one third of the post's length buried, leaving 1.2 m of post exposed above ground level.
- (d) Have posts in soft sandy soil, set in concrete to ensure stability.
- (e) Have the rails secured to the top of the posts using screwed in metal straps or galvanized bolts
- (f) Have rails that are generally level
- (g) Be cleaned (eg. by brushing down or scraping) prior to painting to remove all loose paint, moss, lichen etc
- (h) Be painted using non-toxic paint in the following colour scheme:
 - (i) Rails and tops of posts at rail level are to be painted white, and
 - (ii) Remainder of the posts exposed above ground level are to be painted black.

- (i) Have an identification plate in accordance with section **9.1** located on the outside of the enclosure closest to usual access.

9.5.2 Install a Post and Rail Enclosure

The Contractor shall supply and install a post and rail enclosure with identification plate in accordance with section **9.5.1**.

9.5.3 Maintain an Existing Post and Rail Enclosure

The Contractor shall:

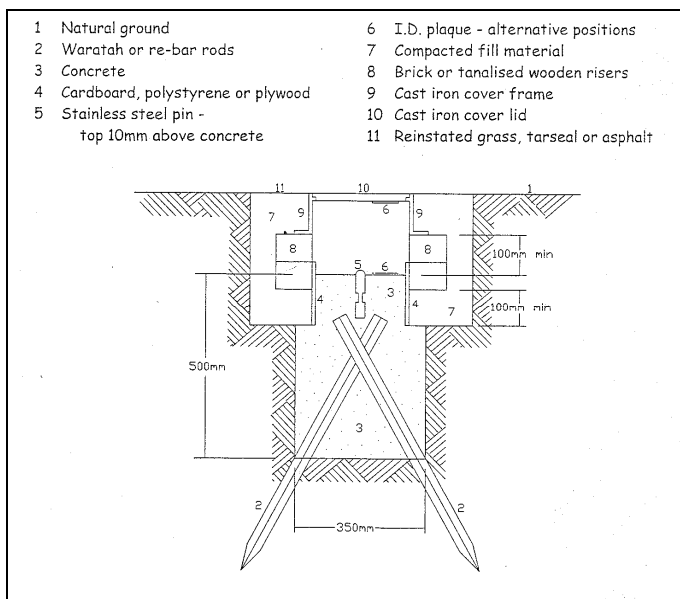
- (a) Restore an existing post and rail enclosure to original state in accordance with section **9.5.1**, and
- (b) Supply and replace any damaged or missing parts, taking care to ensure that the identification plate remains undamaged.

9.6 Covers

9.6.1 Cast Iron Covers and Boxes

Cast iron covers and boxes shall:

- (a) Be a LINZ approved standard cover and box,
- (b) Be suitable for use in vehicular trafficked areas,
- (c) Be placed in a way so that they are safe, stable and durable,
- (d) Be placed so they are flush with the surrounding surface,
- (e) Have original surface that was disturbed reinstated to a standard and finish at least equivalent to what the existing surface was like before it was disturbed,
- (f) Have the base of the box isolated from the concrete base by a material such as plywood, or polystyrene spacers, and
- (g) Installed in accordance with the diagram below:



9.6.2 Install a Cast Iron Cover and Box

The Contractor shall:

- (a) Supply and install a cover and box in accordance with section **9.6.1**, and
- (b) Restore the surface surrounding the box to a standard at least equivalent to the state before the cover was installed.

9.6.3 Raise or Lower Cast Iron Cover and Box

Where an existing cover and box is no longer level with the surrounding surface, the Contractor shall:

- (a) Raise or lower the existing cover and box in accordance with section **9.6.1** by replacing or adjusting any brick, wood or polystyrene raisers,
- (b) Restore the surface surrounding the box to a standard at least equivalent to the state before the cover was installed, and
- (c) Dispose of all waste from the site.

9.6.4 Replace a Cast Iron Cover and Box

Where an existing cover and box is broken or a new lid can not be obtained to fit an existing box the Contractor shall:

- (a) Remove and dispose of the existing box and cover,
- (b) Supply and install a cover and box in accordance with section **9.6.1**,
- (c) Restore the surface surrounding the box to a standard at least equivalent to the state before the cover was installed, and
- (d) Dispose of all waste from the site.

9.6.5 Replace a Cast Iron Cover

Where a cast iron cover is missing or broken, the Contractor shall:

- (a) Remove and dispose of the broken cover, and
- (b) Supply and install a replacement cover in the existing box in accordance with section **9.6.1**.

GUIDELINE - Non Standard Covers and Lids

Covers and lids may vary from area to area and may not always fit the LINZ standard cover and box. If a non-standard cover can not be obtained then both the box and cover may need to be replaced.

9.6.6 Replace a Concrete Cover

Where a concrete cover is missing or broken, the Contractor shall:

- (a) Remove and dispose of the broken cover, and
- (b) Supply and install a replacement cover in accordance with sections **9.6.1 (c) to (e)**.

9.7 Pillars

9.7.1 Pillars

- (a) Pillars are considered to be structures over 1 metre high that can be observed to.
- (b) A pillar shall be painted with the following colour scheme:
 - (i) The top and bottom third of a pillar shall be painted white, and
 - (ii) The central third shall be painted black.
- (c) Have an identification plate that complies with section **9.1** located within the area painted black on the side of the pillar facing the usual direction of access.

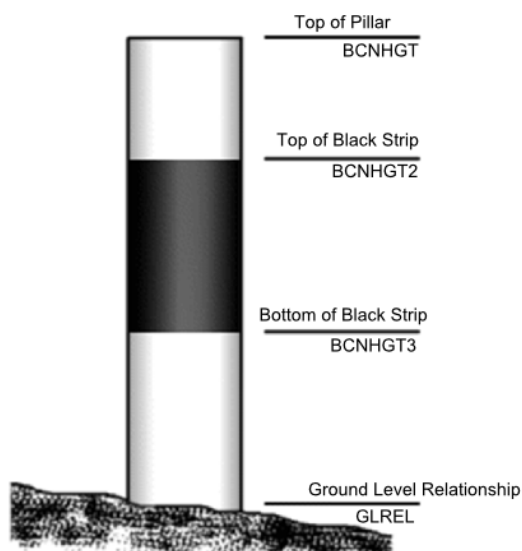
9.7.2 Pillar Height Measurements

Heights shall be measured and recorded from the top of the mark to each of the following:

- (a) Top of pillar,
- (b) Top of black strip, and
- (c) Bottom of black strip.

GUIDELINE - Pillar Height Measurements

Pillars are regarded as beacons in the contract deliverables. As such 'beacon height' measurements will always be negative because the mark is above the ground.



9.7.3 Paint a Pillar

The Contractor shall:

- (a) Clean all surfaces prior to painting, by brushing or scraping, to remove all loose paint, moss, lichen etc, and

- (b) Paint the entire exposed pillar in accordance with section **9.7.1** with non-toxic paint.

9.8 Bench Mark Blocks

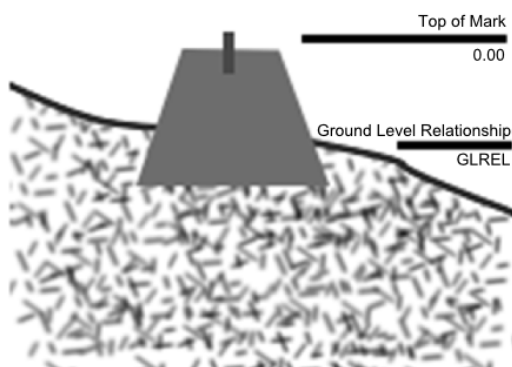
9.8.1 Bench Marks

- (a) Bench mark blocks are considered to be a mark with a concrete block protruding between 0.10 and 1.0 metres above the ground.
- (b) A bench mark block shall be painted white.

9.8.2 Paint a Bench Mark

The Contractor shall:

- (a) Clean all surfaces prior to painting, by brushing or scraping, to remove all loose paint, moss, lichen etc, and
- (b) Paint the entire exposed bench mark block white with non-toxic paint.



10 Photographs

10.1 Photographs Required

- (a) The following photographs must be provided for each mark:
 - (i) Mark photograph that clearly shows the mark. Mark type should be obvious,
 - (ii) Site photograph that clearly shows the mark in relation to its immediate surroundings, including any protection structures, and
 - (iii) Extended site photograph that shows a wider view of the site, its surroundings, and other features which may help to locate the mark in the future.
- (b) Photographs must be taken after all maintenance has been completed at the site.

GUIDELINE - Photographs

The mark type should be obvious in the mark photograph.

If the mark has a cast iron or concrete lid, this should be visible in at least one of the photos.

The extended site photograph should:

- (i) Be taken from more than 20m away from the mark,
- (ii) Contain enough information to convey the suitability of the mark for terrestrial or GNSS observations, and
- (iii) Place an item (such as a road cone) over the mark to identify its location where it is not obvious.

This information will be used for locating the mark in the future. Therefore photographs following any maintenance are required.

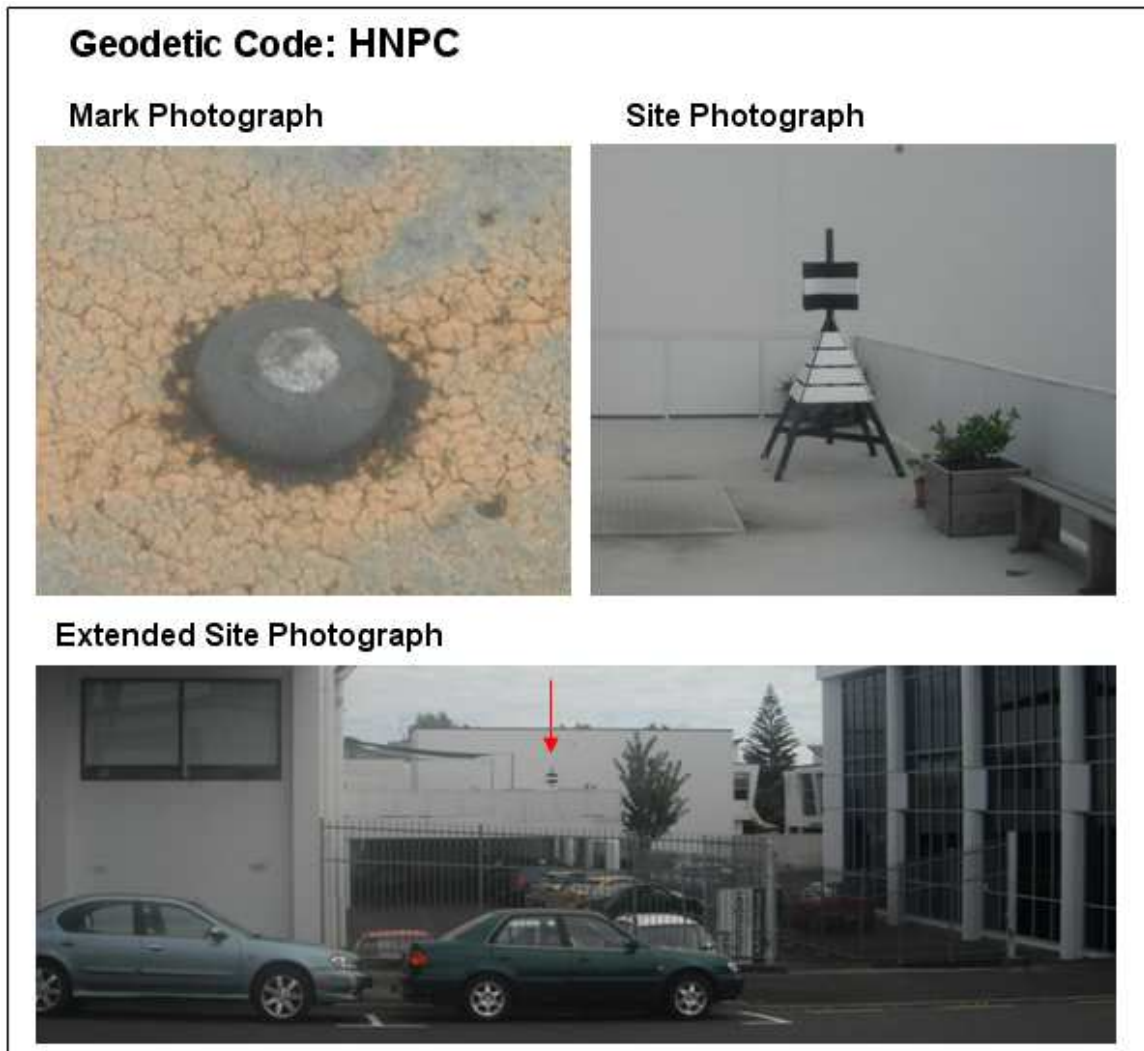
10.2 Photographs Characteristics

All photographs must:

- (a) Not include members of the public, or anything else that could compromise an individual's privacy, bearing in mind that these photographs will be made available over the internet in a public database,
- (b) Be vertically aligned for ease of viewing (ie, ground at the bottom of the photograph, sky at the top), and
- (c) Not be digitally altered, except to:
 - (i) Overcome privacy issues, or
 - (ii) Identify the location of the mark if it is not obvious in the photo.

10.3 Mark and Site Image

- (a) The photographs required by section **10.1** must be provided as a single mark and site image that shows the:
 - (i) Geodetic code of the mark,
 - (ii) Mark photograph,
 - (iii) Site photograph, and
 - (iv) Extended site photograph.
- (c) The mark and site image shall be provided in accordance with section **12.9**.
- (b) Each photograph must be labelled appropriately, (ie Mark Photograph, Site Photograph, or Extended Site Photograph).
- (c) The mark and site image must adhere to the following template:



10.4 Maintenance Photographs

- (a) The following photographs must be supplied if physical maintenance is carried out at a mark, protection structure or site:
 - (i) Before photographs, and
 - (ii) After photographs.
- (b) Sufficient 'before' and 'after' mark and site photographs shall be supplied to provide evidence of maintenance work completed.
- (d) Maintenance photographs shall be provided in accordance with section **12.9**.
- (c) 'After' photographs are not required if the mark and site image required in section **10.3** clearly shows all maintenance completed.

10.4.1 Before photos

Before photographs must:

- (a) Be taken prior to commencement of any maintenance work, and
- (b) Clearly show the nature of the maintenance work required.

10.4.2 After photos

After photographs must:

- (a) Be taken upon completion of all maintenance work, and
- (b) Clearly show the maintenance work carried out and/or any additional maintenance required.

GUIDELINE - Maintenance Photographs

"Before" and "after" photos are used to verify the need for maintenance to be undertaken and to show that it has been satisfactorily completed.

It is important for the supplied images to contain sufficient detail to enable this assessment to be completed.

11 Mark and Site Information

11.1 Access and Finder Diagrams

- (a) An access or finder diagram must be provided for every mark included in the Mark Details File section **12.5**, irrespective of whether it was maintained or not.
- (b) The following types of diagram shall be provided:
 - (i) Access diagrams shall be provided for all trigs and marks with complex access instructions, or
 - (ii) Finder Diagrams shall be provided in all other cases.
- (c) An existing mark diagram may be used as an access or finder diagram if:
 - (i) The content is still applicable and correct, and
 - (ii) It complies with the requirements of this section and is supplied in accordance with section **12.9**.
- (d) Access diagrams shall provide enough information to ensure that anyone locating the mark will travel via the safest, most direct route or the route preferred by the landowner/occupier.
- (e) Finder diagrams shall include street names and ties to at least three nearby physical objects to allow the mark to be located in a timely manner
- (f) All diagrams must:
 - (i) Be drawn at a scale appropriate to show features useful in accessing the mark,
 - (ii) Have a north arrow and be aligned so that the north arrow points up the page,
 - (iii) Show all topographical features and names useful in accessing the mark, including the geodetic code of the mark,
 - (iv) Show the measured relationship of physical features with respect to the ground mark, which would allow the mark to be located within a timely manner,
 - (v) Show the relationship of any marker post with respect to the ground mark, and
 - (vi) Diagrams must be square in shape and contain detail that is clearly visible when the image is displayed at 8cm x 8 cm

11.2 Access Description

A text description of the information provided on the Access/Finder Diagram, shall be included in the Mark Details File (MLOC – Mark Location) section 12.5. As a minimum the description will include:

- (a) Location of the mark, in respect to
 - (i) topographical or

- (ii) nearby permanent features
- (b) Directions to the mark, from the nearest road

11.3 Mark Description

A text description of the ground mark, as found, shall be included in the Mark Details File (MRKD – Mark Details) section 12.5.

GUIDELINE – Mark description

There is no need to include information in this section which is detailed elsewhere in the Mark Details File. Except where a mark has been destroyed, this should be reported in the MRKD field.

For a wooden Beacon state if it can or can not be easily removed.

For existing geodetic marks the mark description from the geodetic database (including the information on scanned mark diagrams) shall be used and edited/updated with new information if required. The original information should not be lost unless it is incorrect.

11.4 Plan References

At least one survey plan relevant to the mark shall be listed in the Mark Details File (PLRF – Plan References) section **12.5**.

GUIDELINE – Plan Reference

For existing marks the plan references from the geodetic database (including those listed on scanned mark diagrams) shall be used.

It is not necessary to research all plans that have used the mark

In the case where there are no relevant survey plans this field shall be left blank.

11.5 Owner Occupier information

After gaining permission to access a site, section 3.1, the name of the contact person (OWNER), their phone number (PHNO) and their Physical address (ARES) shall be collected and recorded in the Mark Details File section **12.5**.

GUIDELINE – Owner/Occupier Information

As a minimum, only the name of the contact person permitted to access and occupy the mark (OWNER) must be supplied.

If the mark is in the road reserve state: 'Road Reserve'

11.6 GNSS Suitability

Each site shall be accessed for its suitability for making observations using GNSS techniques. This information shall be recorded in the Mark Details File (GNSSU – GNSS Suitability), section 12.5. The site shall be accessed as either:

(a) Good

- (i) Have at least 70% clear sky visibility above 15 degrees from the horizon in all directions,
- (ii) Be at least 5 metres clear of obstacles such as fences and buildings that may cause multipath, and
- (iii) Be at least 20 metres clear of sources of radio interference such as radio transmitters, cell-phone transmitters and high-tension power lines.

(b) Poor

- (i) Have less than 70% clear sky visibility above 15 degrees from the horizon in all directions, or
- (ii) Be less than 5 metres clear of obstacles such as fences and buildings that may cause multipath, or
- (iii) Be between 20 - 10 metres clear of sources of radio interference such as radio transmitters, cell-phone transmitters and high-tension power lines.

(c) Unsuitable

- (i) Have less than 40% clear sky visibility above 15 degrees from the horizon in all directions, or
- (ii) Be less than 5 metres clear of multiple obstacles such as fences and buildings that may cause multipath, or
- (iii) Be less than 10 metres clear of sources of radio interference such as radio transmitters, cell-phone transmitters and high-tension power lines.

11.7 Cell Phone Coverage

Each site shall be accessed for its cell phone coverage, for at least one provider. This information shall be recorded in the Mark Details File (CELL – Cell phone Coverage), section **12.5**. The site shall be accessed in terms of the table in section **12.8.11**,

11.8 Non-Standard Beacon Diagrams

- (a) A Non-Standard Beacon Diagram shall be provided for every mark included in the 'Mark Details File' that has a beacon type (MRKE) that is not "4M", "2M", "PL" or "NB".
- (b) An existing non-standard beacon diagram may be used if:
 - (i) The content is still applicable and correct, and
 - (ii) It complies with the requirements of this section and is supplied in accordance with section **12.9**.
- (c) Non-Standard Beacon Diagrams must:

- (i) Clearly depict the appearance and prominent parts of the beacon,
 - (ii) Show the height, in decimal metres, of each prominent beacon part above (+ve) or below (-ve) the top of the mark, and
 - (iii) Show the height of the ground (in decimal metres) above (+ve) or below (-ve) the top of the mark.
- (d) Diagrams must be square in shape and contain detail that is clearly visible when the image is displayed at 8cm x 8 cm.

12 Contract Deliverables

12.1 General

- (a) All information relating to geodetic contracts shall be provided to the National Geodetic Office in digital form only.
- (b) Information shall be provided:
 - (i) Physically on a CD, DVD or flash drive, or
 - (ii) By LINZ downloading directly from the Contractor's FTP site, or
 - (iii) By the Contractor uploading to the LINZ FTP site.
- (c) Individual files which are being resubmitted may be delivered by email.

12.2 Invoices

- (a) A hard copy invoice for full or progress payment of work completed shall be provided to the National Geodetic Office.
- (b) Digital copies of all provided invoices shall be supplied in accordance with section **12.9**.

12.3 Maintenance Summary Report

- (a) A digital Maintenance Summary Report shall be provided for every invoice submitted.
- (b) The contractor shall use the template provided by the National Geodetic Office in compliance with section **12.9**

INFORMATION – Maintenance Summary Report

The Maintenance Summary Report is used to check the work charged for and the work completed against the before and after photos provided.

12.4 Mark Data File

- (a) A Mark Data File shall be supplied for marks that have been upgraded in accordance with section 5.1.
- (b) The following fields shall be provided for each mark included in the Mark Data File:

Field Name	Contents	Format
CODE	Geodetic Code	4 character geodetic code
MRKS	Mark Status	See section 12.8.1
MRKT	Mark Type	See section 12.8.3
EXMK	Existing Mark	See section 12.8.2
DISTRICT	Land District	See section 12.8.4

CROD	Coordinate Order	See section 12.8.5
ORDV1	NZGD2000 Latitude	Decimal degrees to 8 decimal places (+ve North, -ve South)
ORDV2	NZGD2000 Longitude	Decimal degrees to 8 decimal places (+ve East, -ve West)
ORDV3	NZGD2000 Ellipsoidal Height (if available)	Metres to 3 decimal places, blank if unknown
NAME	Mark Name	See section 4.2
ALTN	Alternative Mark Name	See section 4.2
COMM	Optional Comments	Text, for information only. These comments will not be loaded in to the Geodetic Database or Landonline

(c) The Mark Data File shall

(i) Be supplied in comma delimited format (CSV),

Contain the following header line:

CODE,MRKS,MRKT,EXMK,DISTRICT,CROD,ORDV1,ORDV2,ORDV3,NAME,ALTN,COMM

(i) Contain information about one data file per line, and

(ii) Be named in accordance with section **12.9**.

GUIDELINE - Mark Data File

The Mark Data file is used to update low order co-ordinates in landonline for those without observational/vector data.

An example Mark Data File (listing one mark) is:

```
CODE,MRKS,MRKT,EXMK,DISTRICT,CROD,ORDV1,ORDV2,ORDV3,NAME,ALTN,COMM
AG1F,COMM,PIN,Y,DN,2k6,-45.89797972,170.37251667,0.000,W 8/180,MOWD 96,
Autonomous Coordinate
```

12.5 Mark Details File

(a) A report shall be supplied that provides updated information about all geodetic marks visited, maintained and searched for by the Contractor.

(b) The following fields shall be provided for each mark

Field Name	Contents	Format
CODE	Geodetic Code	4 character geodetic code
NAME	Mark Name	See section 4.2
EXMK	Existing Mark	See section 12.8.2
MRKT	Mark Type	See section 12.8.2
MPSC	Mark Physical State	See section 12.8.6
PLRF	Plan references	See section 11.4 , blank if none found
EDAT	Date mark originally established	YYYY.MM.DD

MRKR	Most prominent mark protection	See section 12.8.7
MRKR2	Secondary mark protection	See section 12.8.7 , blank if none present
MRKE	Beacon type	See section 12.8.8
GLREL	Ground level relationship	Metres to 2 decimal places, see section 8.6
BCNHGT	Height measurement for beacons and pillars	See section 9.3.2 and 9.7.2 , blank if not required to be measured
BCNHGT2	Height measurement for beacons and pillars	See section 9.3.2 and 9.7.2 , blank if not required to be measured
BCNHGT3	Height measurement for beacons and pillars	See section 9.3.2 and 9.7.2 , blank if not required to be measured
BCNHGT4	Height measurement for beacons and pillars	See section 9.3.2 and 9.7.2 , blank if not required to be measured
BCNHGT5	Height measurement for beacons and pillars	See section 9.3.2 and 9.7.2 , blank if not required to be measured
BCNHGT6	Height measurement for beacons and pillars	See section 9.3.2 and 9.7.2 , blank if not required to be measured
BDAT	Date Beacon Erected	YYYY.MM.DD, blank if not known
BECC	Beacon Eccentricity	See section 9.3.3 , blank if not required to be measured
MRKD	Description of ground mark	Text, see section 11.3
MLOC	Description of site and Location	Text, see section 11.2
PLQEXIST	ID plaque existence	See section 12.8.9
PLTEXIST	ID plate existence	See section 12.8.9
INFOEXIST	Information plate existence	See section 12.8.9
MDAT	Date of most recent maintenance or site inspection	YYYY.MM.DD
MPSM	Description of mark maintenance completed	Text, state "None" if no work completed
MPSB	Description of beacon maintenance completed	Text, state "None" if no work completed
MPSP	Description of protection maintenance completed	Text, state "None" if no work completed
MDMK	Description of mark maintenance required	Text, state "None" if no work

		required, see section 6.2
MDBE	Description of beacon maintenance required	Text, state "None" if no work required, see section 6.2
MDPR	Description of protection maintenance required	Text, state "None" if no work required, see section 6.2
OWNR	Name of contact person to permit access to and occupation of mark, or "Road Reserve" if in road reserve	Text, see section 11.5
PHNO	Phone number of OWRN	(0X) XXX XXXX, blank if OWRN is road reserve, see section 11.5
PADD	Physical address of OWRN, where they can be contacted	Text, blank if OWRN is road reserve, see section 11.5
ARES	Restrictions to accessing mark	Text, state if no access restrictions, see section 3.1
GNSSU	GNSS Suitability	See sections 11.6 and 12.8.10
CELL	Telecom cell phone network coverage	See sections 11.7 and Error! Reference source not found.
ADAT	Date that owner/occupier information and access data was verified	YYYY.MM.DD
COMM	Optional comments	Text, for information only. These comments will not be loaded in to the Geodetic Database or Landonline

(c) The Mark Details File shall

(i) Be supplied in comma delimited format (CSV),

(ii) Contain the following header line:

CODE,NAME,EXMK,MRKT,MPSC,PLRF,EDAT,MRKR,MRKR2,MRKE,GLREL,BCNHGT,BCNHGT2,BCNHGT3,BCNHGT4,BCNHGT5,BCNHGT6,BDAT,BECC,MRKD,MLOC,PLQEXIST,PLTEXTIST,MDAT,MPSM,MPSB,MPSP,MDMK,MDBE,MDPR,OWNR,PHNO,PADD,ARES,GNSSU,CELL,ADAT,COMM

(iii) Contain information about one mark per line, and

(iv) Be named in accordance with section **12.9**.

GUIDELINE - Mark Details File

The Mark Details file contains mark information that a Contractor has collected or verified. It is used to update Landonline and the geodetic database with the latest information about geodetic marks.

It is important to ensure data formats are maintained in CSV files, particularly the specified number of characters (eg Year.Month.Day: YYYY.MM.DD).

No information regarding PositionZ or CORS sites not visited by the contractor should be included in the Mark Details File or the Mark Details File.

12.6 Contract Report

The Contract Report shall be arranged in the following order and contain a discussion on each of the listed points:

(a) Personnel

A list of the staff involved and their role in this contract

(b) Summary

- (i) Final number of marks maintained/visited
- (ii) Marks specified in contract but not maintained/visited
- (iii) Details of Contract Variations
- (iv) Details of approved non-compliance with specification, second visit approvals or clarifications
- (v) Certification of Compliance with Specifications in accordance with section **12.6.1**

(c) Resources Used

INFORMATION – Resources Used

A list at a high level of equipment, paints types/brands etc...

(d) Maintenance Completed

- (i) Details of each mark maintained/visited
- (ii) Details of major maintenance on marks/structures that have been maintained within the last 5 years

INFORMATION – Details of Major Maintenance

Marks and protection structures may have different maintenance requirements due to their environments. This section will help decide whether marks shall be visited more regularly or whether different material should be used.

Example1: Metal beacons in coastal environments are more prone to rust and collapse much quicker than metal beacons in less harsh environments. This information will be used to assess whether stainless steel beacons should be installed.

Example2: Protection structures and/or beacons in public places can be subject to graffiti.

(e) Issues and Problems Encountered

- (i) Details of any difficulties experienced and how these were managed.
- (i) Specify any inconsistencies found in the specification
- (ii) Specify any recommendations for the specification

(f) Recommendations for future Maintenance

GUIDELINE - Contract Report

The Contract Report may be presented in the Contractor's corporate style. However, the above headings need to be used to enable a consistent review by the National Geodetic Office. This report structure also helps to ensure that all required points are discussed by the Contractor and thereby reduce the likelihood of re-work. Where there is no information applicable to a heading, this should be clearly stated. Additional headings may be added by the Contractor, if required.

12.6.1 Certification of Compliance with Specifications

The following declaration, signed by the Contractor, shall be included in the Contract Report:

All maintenance undertaken as part of this Contract fully complies with the Specification for Geodetic Physical Maintenance and Geodetic Mark Inventory Service.

Signed: _____

Name: _____

Contractor

12.7 Approved Traffic Management Plans

All Traffic Management Plans should be approved by the relevant local authority or their delegate. Approved copies of these plans should be supplied in the form specified in section **12.9**

12.8 Field Codes

12.8.1 Mark Status

The following MRKS codes shall be used to indicate the status of a mark:

MRKS Code	Description
PEND	Mark is not currently in the geodetic database
COMM	Mark exists in the geodetic database

12.8.2 Existing Mark

The following EXMK codes shall be used to indicate the status of a mark:

MRKS Code	Description
N	Mark is not currently in the geodetic database
Y	Mark exists in the geodetic database

12.8.3 Mark Type

The following MRKT codes shall be used to indicate the type of mark:

MRKS Code	Description
IS	Iron Spike Iron Rod

IT	Iron Tube Iron Pipe
LP	Lead Plug
NAIL	Nail
PIN	Stainless Steel Pin Bronze Plaque
OTHR	Any other mark type, including forced centring
UNMK	Unmarked
UNKN	Not Specified

12.8.4 Land District

The following MRKT codes shall be used to indicate the land district a mark is located in:

DISTRICT Code	Description
AA	Antarctica
CH	Canterbury
CI	Chatham Islands
GS	Gisborne
NA	Hawkes Bay
BM	Marlborough
NN	Nelson
AK	North Auckland
OI	Offshore Islands
DN	Otago
HN	South Auckland
IN	Southland
NP	Taranaki
WN	Wellington
HK	Westland

12.8.5 Coordinate Order

The following CROD codes shall be used to indicate the existing Order of mark:

CROD Code	Description
2k0	Order 0
2k1	Order 1
2k2	Order 2
2k3	Order 3
2k4	Order 4

2k5	Order 5
2k6	Order 6 or lower

12.8.6 Mark Physical State

The following MPSC codes shall be used to indicate the physical state of a mark:

MPSC Code	Description
DEST	Destroyed
DMGD	Damaged
NFND	Not Found
RELB	Reliable
THRT	Threatened
NSPE	Not Specified

12.8.7 Mark Protection Type

The following MRKR and MRKR2 codes shall be used to indicate the mark protection structure:

MRKR/MRKR2 Code	Description
2MBE	2m Beacon
4MBE	3m or 4m Beacon
CICV	Cast Iron Cover
COVR	Wooden or Concrete Cover and Box
MKPT	Marker Post
PREN	Post and Rail Enclosure
NOPR	No Protection
NSPE	Not Specified
NSTD	Non Standard Beacon

12.8.8 Beacon Type

The following MRKE codes shall be used to indicate the beacon type:

MRKE Code	Description
AA	Cairn
CN	Chimney
LH	Lighthouse
MR	Marine Beacon
MS	Mast
NB	Not Beacons
ND	Unknown
PL	Pillar
TO	Tower

TT	Transmission Tower
2M	2m Beacon
4M	3m or 4m Beacon
NS	Non Standard Beacon

12.8.9 ID Plate, Plaque and Information Plate

- (a) The following PLQEXIST, PLTEXIST and INFOEXIST codes shall be used to indicate the presence of ID plaques, ID plates and Information plates:

PLQEXIST, PLTEXIST, INFOEXIST Code	Description
E	ID plaque, ID plate or information plate exists
Y	ID plaque, ID plate or information plate installed
N	ID Plaque or ID Plate non-existent and not installed

- (b) Where an ID plaque or ID plate does not exist and a replacement has not been installed, this shall be explained in the COMM field of the Mark Details File (section 12.5).

12.8.10 GNSS Suitability

The following GNSSU codes shall be used to indicate the GNSS suitability of a mark:

GNSSU Code	Description
GD	Good
PR	Poor
US	Unsuitable

12.8.11 Cell Phone Coverage

- (a) The CELL field shall be used to indicate cell phone coverage for at least one provider at a mark
- (b) The following coverage status's shall be used

Status	Description
Good	Strong signal
Poor	Weak but reliable signal
No Coverage	No signal or unreliable signal
Not Tested	Network signal not tested

- (c) The cell phone coverage reported in the following format:

Provider: status, Provider: status, Provider: status

GUIDELINE – Cell Phone Coverage

Cell phone coverage is a text field, the format above is to ensure consistency between contractors. 027, 027 and 022 are not to be used as numbers can now be

transferred between providers.

Example: Telecom: Good, Vodafone: Good, 2Degrees: Not Tested

12.9 File Names

(a) Contract deliverable files shall use the following naming conventions:

File Type	File Name Format	File Format
Before Photo	CODEYYpbV.jpg	JPG
After Photo	CODEYYpV.jpg	JPG
Mark and Site Image	CODEYYpV.jpg	JPG
Access Diagram	CODEYYad.png	PNG
Finder Diagram	CODEYYad.png	PNG
Non-standard Beacon Diagram	CODEYYbd.png	PNG
Mark Data File	BBEEEEEm.csv	CSV
Mark Details File	YYNNNNmV.csv	CSV
Maintenance Summary Report	YYNNNNmV.xls	XLS
Contract Report	YYNNNNs.doc YYNNNNs.pdf	DOC PDFS
Progress Payment Invoice	BBNNNNiV.pdf	PDF
Final Invoice	BBINVOICE.pdf	PDF
Approved Traffic Management Plans	BBEEEEEE.pdf	PDF

(b) Files shall be provided in the following formats:

Format	Document Type	Details
JPG	JPEG Image	Resolution: 200 dpi Colour: True Colour
TIF	TIFF Image	Resolution: 200 dpi Colour: Black and white Compression: CCITT Group 4 (2d)
PNG	PNG Image	Resolution: 200 dpi Colour: Black and white
DOC	Microsoft Word Document	
XLS	Microsoft Excel Spreadsheet	
CSV	Comma delimited text file	
PDF	PDF Document	Searchable text is not compulsory
PDFS	PDF Document	Text within document is searchable

12.10 Abbreviations

(a) Upper case characters in file names and in record formats represent:

Abbreviation	Description	Example
CODE	Geodetic Code	HNPC
YY	Year of information (last two digits)	11
YYYY.MM.DD	Date of information	2011.04.15
V	Sequential file number	1
NNNNNNN	Schedule code	2006102
NNNN	Last 4 digits of cell code	0201
FFF	Sequential file number, assigned by Contractor	001
EEEE	Unique number within deliverables, assigned by Contractor	1234
EEEEEE	Unique number within deliverables, assigned by Contractor	12345

- (b) Where a Contractor has not been assigned an ID, the abbreviation **XX** shall be used in deliverable file names.

12.11 Summary of Required Files (Information Only)

The following table summarises the files that are to be provided with the contract deliverables. The table is informational only, if it conflicts with other sections of this specification, the other sections take precedence.

It is the responsibility of the Contractor to ensure that all necessary files are correctly provided to fulfil their contractual obligations to LINZ.

Deliverable	Format	Reference	Comment
Contract Report	DOC PDFS	Section 12.6	Report
Maintenance Summary Report	XLS	Section 12.3	Record of maintenance completed
Final Invoice	PDF	Section 12.2	Final digital invoice
Progress Payment Invoice	PDF	Section 12.2	Digital progress payment invoice(s)
Mark Details File	CSV	Section 12.5	Details of all marks maintained/visited
Before Photo	JPG	Section 10.4	Photo of mark, site, and protection structure before maintenance
Mark and Site Image	JPG	Section 10.3	Template showing mark, site and extended photos
Access Diagram	PNG	Section 11.1	Diagram conveying mark location
Non-standard Beacon diagram	PNG	Section 11.8	Diagram of a non-standard beacon showing recorded heights
Mark Data File	CSV	Section 12.4	List of all marks that have had autonomous coordinates collected
Approved traffic management plans	PDF	Section 12.7	Final approved traffic management plans