



# Landgate Requirements for Placement of Geodetic Marks

## GSU-04 Version 5



Locate



Value



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# Document control

Landgate Requirements for Placement of Geodetic Marks Version 4 – April 2025

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## Document version history

Date	Author	Version	Revision Notes
April 2025	Survey	5.0	Changed title from “Placement of Standard Survey Marks (SSMs)” to “Placement of Geodetic Marks” Benchmark placement added Appendices added and rearranged
Sept 2023	Survey	4.0	Update to new style and refresh hyperlinks Appendix C added
	Survey	1.0	Initial

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# 1. Preface

The installation of Landgate Geodetic Marks is to be in accordance with ICSM [Standard for the Australian Control Network \(SP1 v2.2\)](#) and [Guideline for Installation and Documentation of Survey Control Marks \(SP1 v2.2\)](#). The Landgate requirements below shall prevail over the SP1 v2.2 guidelines where there is inconsistency between the two.

## 2. Site Requirements

The placement of Geodetic marks (SSMs & BMs) should be undertaken considering the following:

- Installed in a location that provides long term stability and durability of the mark and is least likely to be disturbed, damaged, destroyed or constitute a hazard to the public
- Clear sky view
- Limit potential multi-path and Radio Frequency Interference sources
- Ease of access and occupation
- Avoid or minimize vegetation clearing (present and future)
- Limit hazard to public safety.

Avoiding service corridors need to be considered when placing Geodetic marks. Geodetic marks should be located at a sufficient distance from any potential earth works to prevent future damage and/or disturbance to the mark.

## 3. Placement of Geodetic Marks

The Geodetic mark should consist of a Landgate provided monument or brass plaque set in concrete, constructed in accordance with the sketches shown in Appendix [A](#), [B](#) or [C](#). A hatch cover is required in developed or planned for development areas, or where the Geodetic mark may be at risk or pose a risk to public safety.

### 3.1. Standard Survey Marks (SSMs)

3.1.1. The Landgate provided unique mark identifier shall be stamped on the brass plaque See [Appendix A](#) or [Appendix B](#) construction drawings for different types of installation depending on ground conditions.

3.1.2. The SSM monument and hatch cover when installed, must not be connected allowing for the hatch to move independently of the mark.

3.1.3. A minimum of three (3) reference marks (RMs) shall be placed around the SSM preferably at 120° separation and at least 0.2m below the natural ground surface

approximately 3 to 5 metres away from the SSM. The RMs should be 13mm diameter mild steel rods of sufficient length to ensure stability (0.6m preferred) and surrounded by a 0.2m diameter concrete collar of at least 0.25m in depth (See [Appendix D](#)).

- 3.1.4. Use of a metal reinforced precast mark is preferred. If a precast mark not available, only good quality reinforced concrete of a minimum 20MPa should be used in the construction of the SSM.
- 3.1.5. Measure and record the height difference from the SSM monument to ground level and where a hatch cover has been installed, from the hatch cover to the SSM monument and ground level (see [Appendix A](#)).
- 3.1.6. A Landgate witness plate near the SSM is required and attached to a star iron picket or a suitable nearby fixture. The distance and bearing to the SSM are to be stamped onto the witness plate. **Where public safety may be compromised, the requirement for a witness plate can be waived.**
- 3.1.7. In urban environments where witness plates are not suitable, SSM lettering and a broad arrow pointing to the mark can be stencilled onto the kerb or roadway using yellow paint (see [Appendix F](#)).

## 3.2. Bench Marks (BMs)

- 3.2.1. The Landgate provided unique mark identifier shall be stamped on the brass plaque see [Appendix A](#) or [Appendix B](#) construction drawings for installation type, unless a Deep-Seated Mark is installed in place where this requirement is waved (see [Appendix C](#)).
- 3.2.2. The BM monument and hatch cover when installed, must not be connected allowing for the hatch to move independently of the mark.
- 3.2.3. A minimum of two (2) reference marks (RMs) shall be placed online with the BM with one (1) on either side and at least 0.2m below the natural surface approximately 10 to 15 metres away from the BM. The RMs should be 13mm diameter mild steel rods of sufficient length to ensure stability (0.6m preferred) and surrounded by a 0.2m diameter concrete collar of at least 0.25m in depth (See [Appendix D](#)).
- 3.2.4. Use of a metal reinforced precast mark is preferred. If a precast mark not available, only good quality reinforced concrete of a minimum 20MPa should be used in the construction of the BM.
- 3.2.5. Measure and record the height difference from the BM monument to ground level and where a hatch cover has been installed, from the hatch cover to the BM monument and ground level (see [Appendix A](#)).

- 3.2.6. A Landgate witness plate near the BM is required and attached to a star iron picket or a suitable nearby fixture. The distance and bearing to the BM are to be stamped onto the witness plate. ***Where public safety may be compromised, the requirement for a witness plate can be waived.***
- 3.2.7. In urban environments where witness plates are not suitable, BM lettering and a broad arrow pointing to the mark can be stencilled onto the kerb or roadway using yellow paint (see [Appendix F](#)).

## 4. Reference Marks

The RMs should be 13mm diameter mild steel rods of sufficient length to ensure stability (0.6m preferred) and surrounded by a 0.2m diameter concrete collar of at least 0.25m in depth (See [Appendix D](#)). If the placement of subsurface marks is impractical, alternative types of RMs (200mm where possible bridge nails in bitumen, masonry nails in concrete etc) may be used. These alternative marks should be placed with regards to the long-term stability and positioned in a manner that the SSM stability can be verified from these reference marks. Alternative RMs must also be capable of unambiguous height measurement with a staff. *RMs placed in fence posts, power poles, kerbs, brick paving or cracks in concrete are not considered to be suitable RMs.* Masonry nails, if used, should be of the hammer interference fit anchor type installed into a drill hole (for example Ramset Shuredrive™). Concrete nails should only be used in medium hardness materials that allows the nail to be driven in without distortion.

### 4.1. Standard Survey Marks (SSMs)

- 4.1.1. All distances between the SSM and RMs, and between RMs must be measured and recorded to three (3) decimal places.
- 4.1.2. Bearings from the new SSM to each RM are to be recorded to at least 10 seconds of arc. The bearings should be oriented to true azimuth by observing an angle from an adjacent known point within the geodetic network. If a known suitable SSM or Landgate co-ordinated mark is not available, true azimuth should be established by observing to a distant reference mark (DRM) utilising GNSS (static / rapid static baseline or RTK / VRS techniques can be used). The DRM should be of sufficient distance away from the primary mark to ensure reliable azimuth determination. Where possible a distance should be measured to the DRM and recorded.
- 4.1.3. Differences greater than 5mm between measured and calculated distances are not acceptable.
- 4.1.4. The difference in height between RMs and SSM must be accurately measured using a spirit level (digital or optical). The method of observation should eliminate errors caused by the staff foot being incorrectly placed on the mark. The method used must ensure

redundancy of measurements. Total stations can be used for RM levelling however the survey method must be detailed in the report and the instrument height, reflector height and collimation errors are reduced (2 face measurement) so that the height differences obtained achieve accuracies expected of a level instrument. **Only a high precision prism (2mm or better at steep vertical angles) installed on as short as possible pole, and braced, should be used. Standard length prism poles and/or 360° prisms (standard or mini) are not acceptable.**

4.1.5. Measure and provide the height difference from the RMs to ground level.

4.1.6. RMs are numbered consecutively clockwise with number 1 being assigned to the first RM as viewed clockwise from north. The same numbering system is applied when additional new RMs are installed on existing marks.

4.1.7. The use of GNSS (including RTK and VRS) is not acceptable for the measurement of RMs. However, they can be used as a check.

## 4.2. Bench Marks (BMs)

4.2.1. All distances between the BMs and RMs must be measured and recorded to a minimum of two (2) decimal places.

4.2.2. Bearings from the new BM to each RM are to have a minimum of a magnetic bearing and be recorded to at nearest 1° of arc.

4.2.3. The difference in height between RMs and BM must be accurately measured using a spirit level (digital or optical). The method of observation should eliminate errors caused by the staff foot being incorrectly placed on the mark. The method used must demonstrate redundancy of measurement. Total stations can be used for RM levelling however the survey method must be detailed in the report and the instrument height, reflector height and collimation errors are reduced (2 face measurement) so that the height differences obtained achieve accuracies expected of a level instrument. **Only a high precision prism (2mm or better at steep vertical angles) installed on as short as possible pole, and braced, should be used. Standard length prism poles and/or 360° prisms (standard or mini) are not acceptable.**

4.2.4. Measure and provide the height difference from the RMs to ground level.

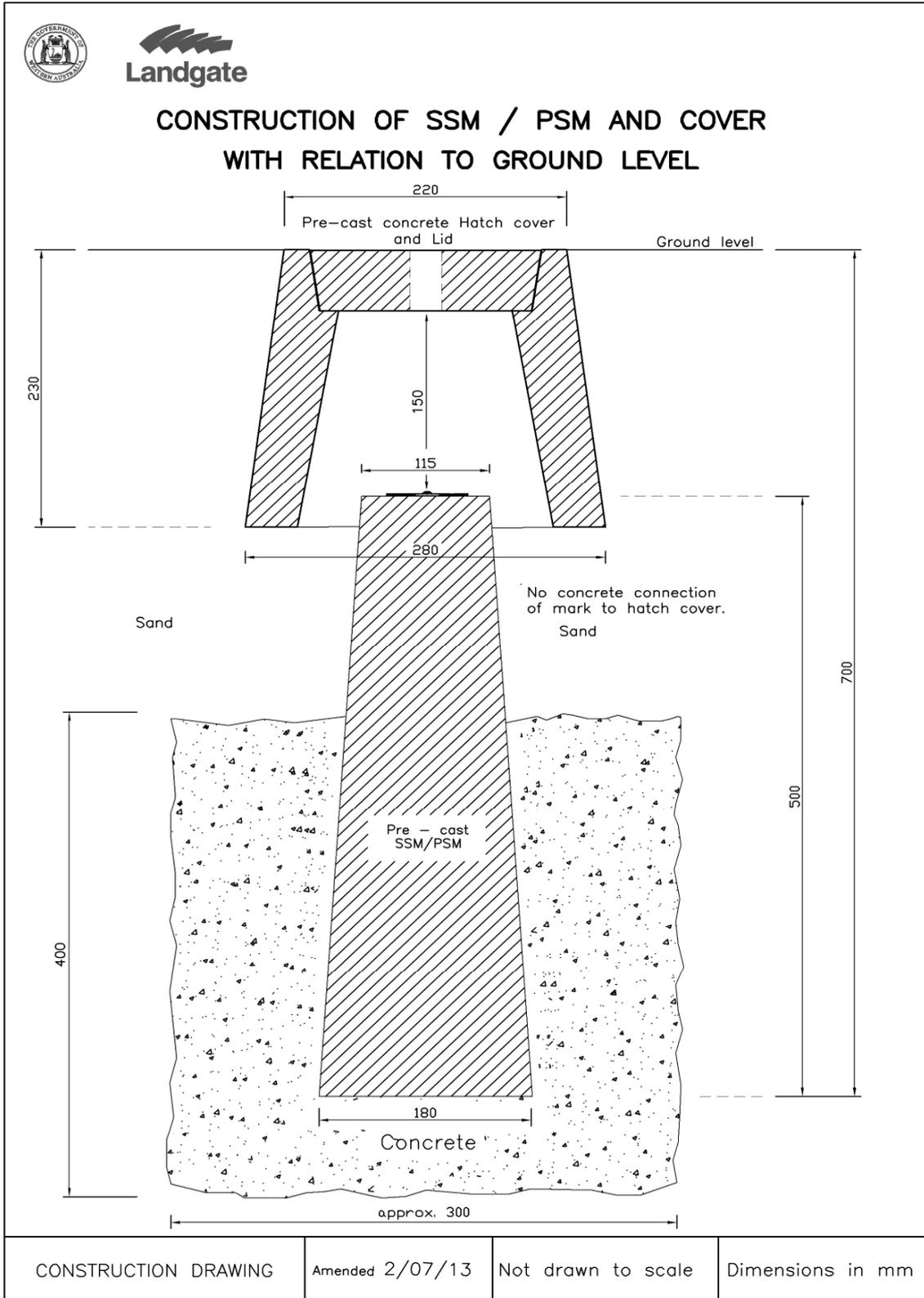
4.2.5. RMs are numbered consecutively clockwise with number 1 being assigned to the first RM as viewed clockwise from north. The same numbering system is applied when additional new RMs are installed on existing marks.

4.2.6. The use of GNSS (including RTK and VRS) is not acceptable for the measurement of RMs.

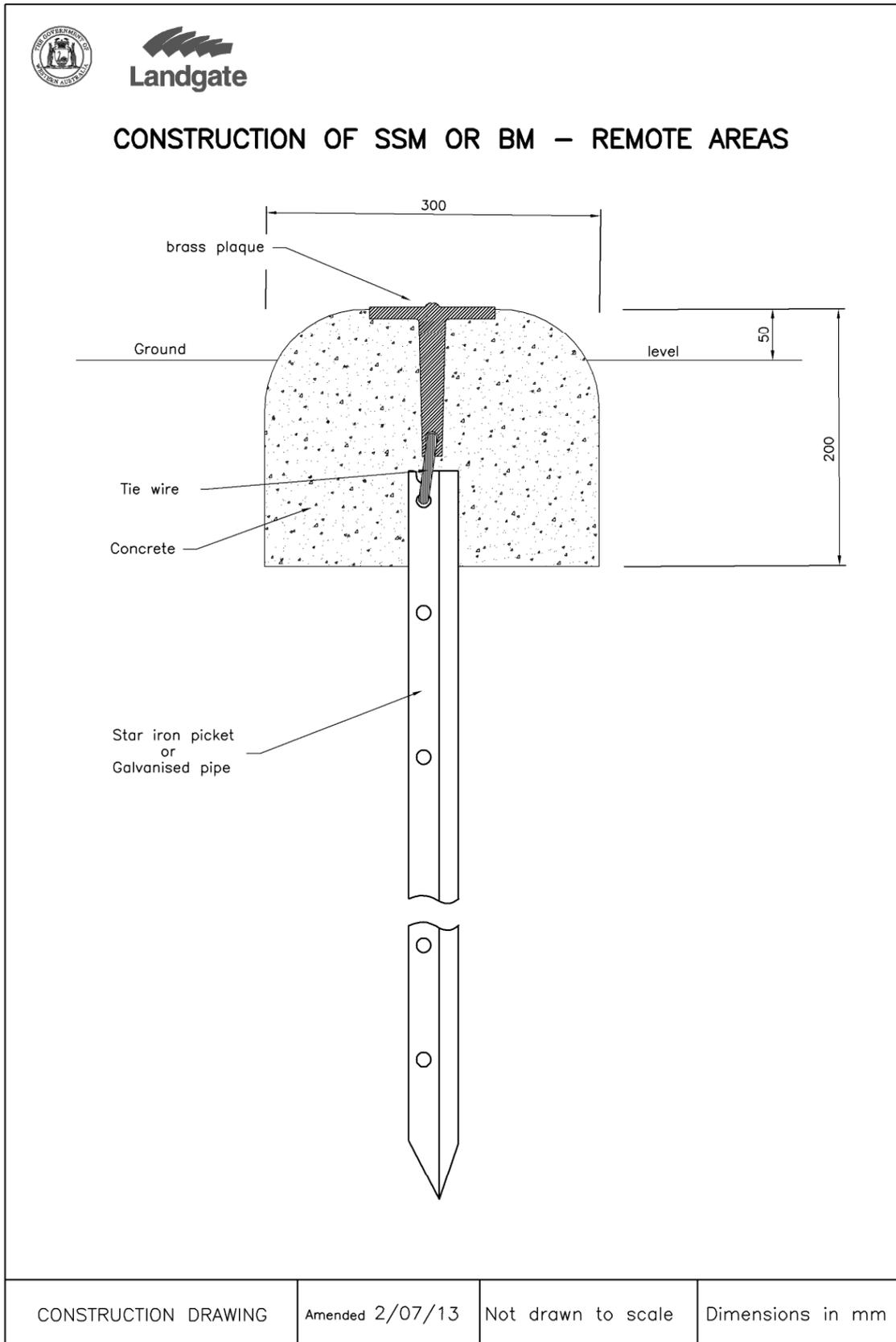
## 5. Station Summaries

- 5.1. A sketch with access information, a description of the Geodetic mark's location relevant to nearby features, and the physical characteristics (such as precast concrete with brass plaque or spike in concrete) of the Geodetic mark and RMs are to be provided. This should include sufficient access, recovery information and connections to any local features that will enable the Geodetic mark to be readily located. Refer to [Appendix E](#) for an example.
- 5.2. A station summary DWG file should be prepared using the supplied station summary template.
- 5.3. It is preferred that AutoCAD® is used when creating or amending station summaries and provided in DWG format.

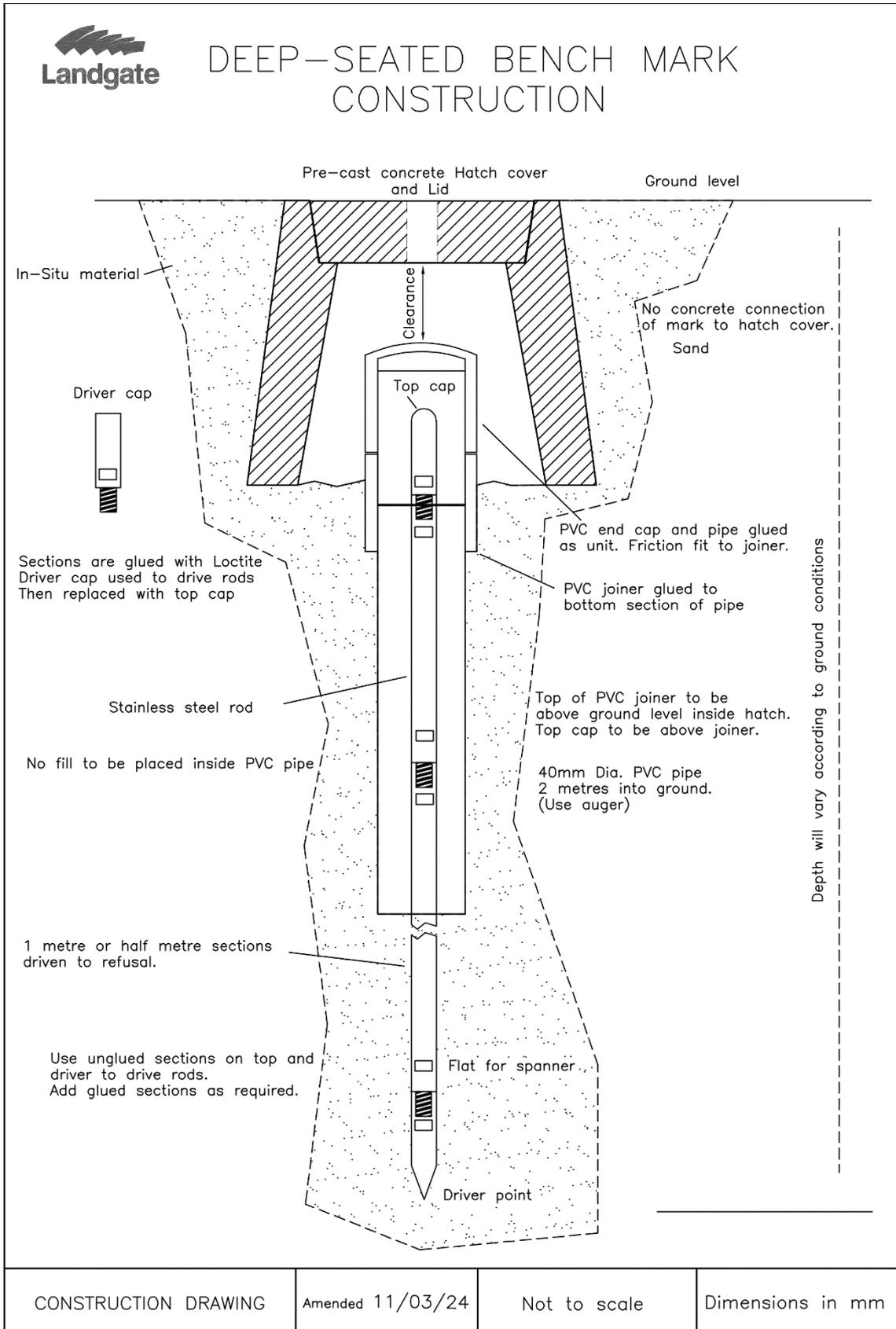
# 6. Appendix A - Installation of Precast Mark



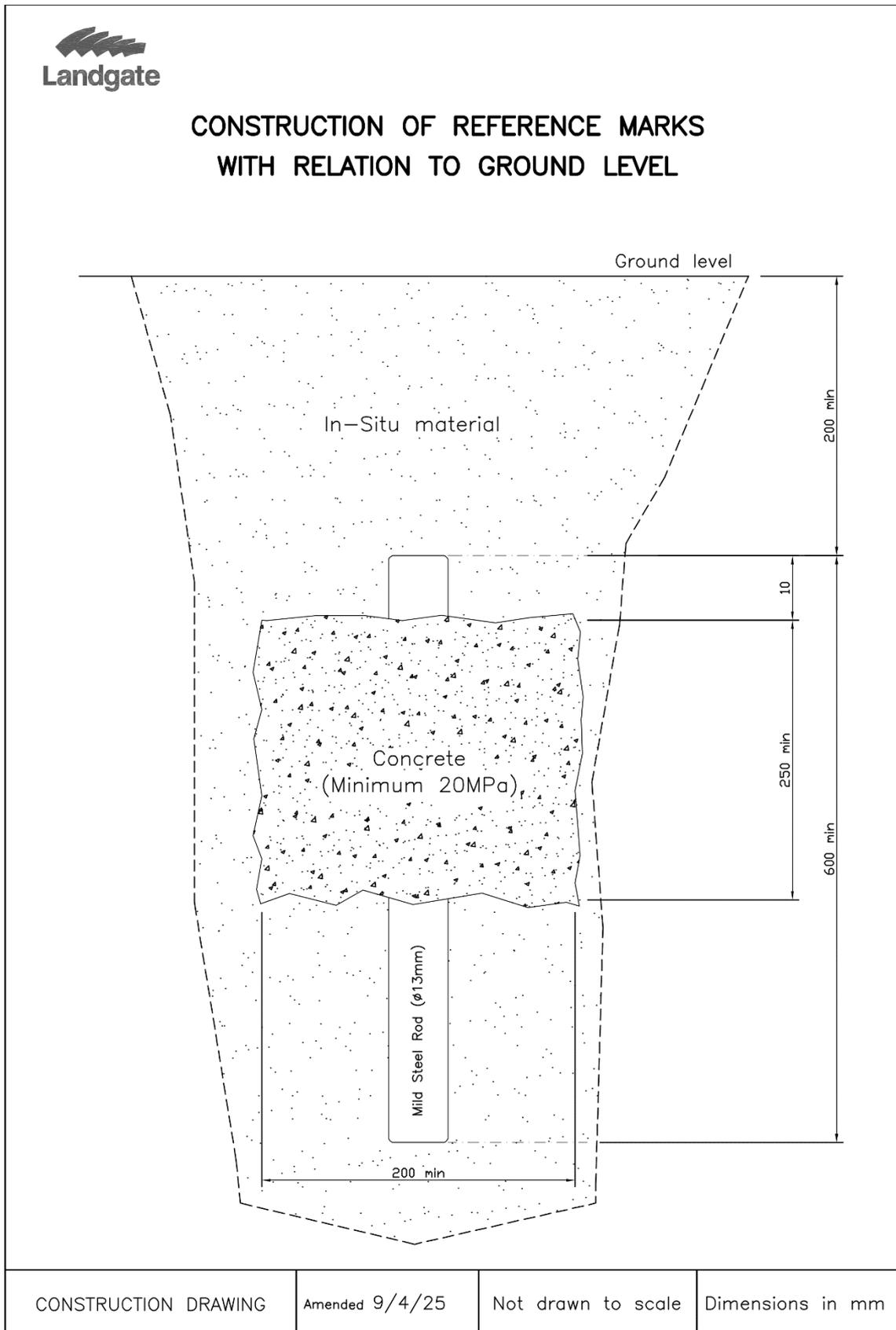
# 7. Appendix B - Installation of Brass Plaque



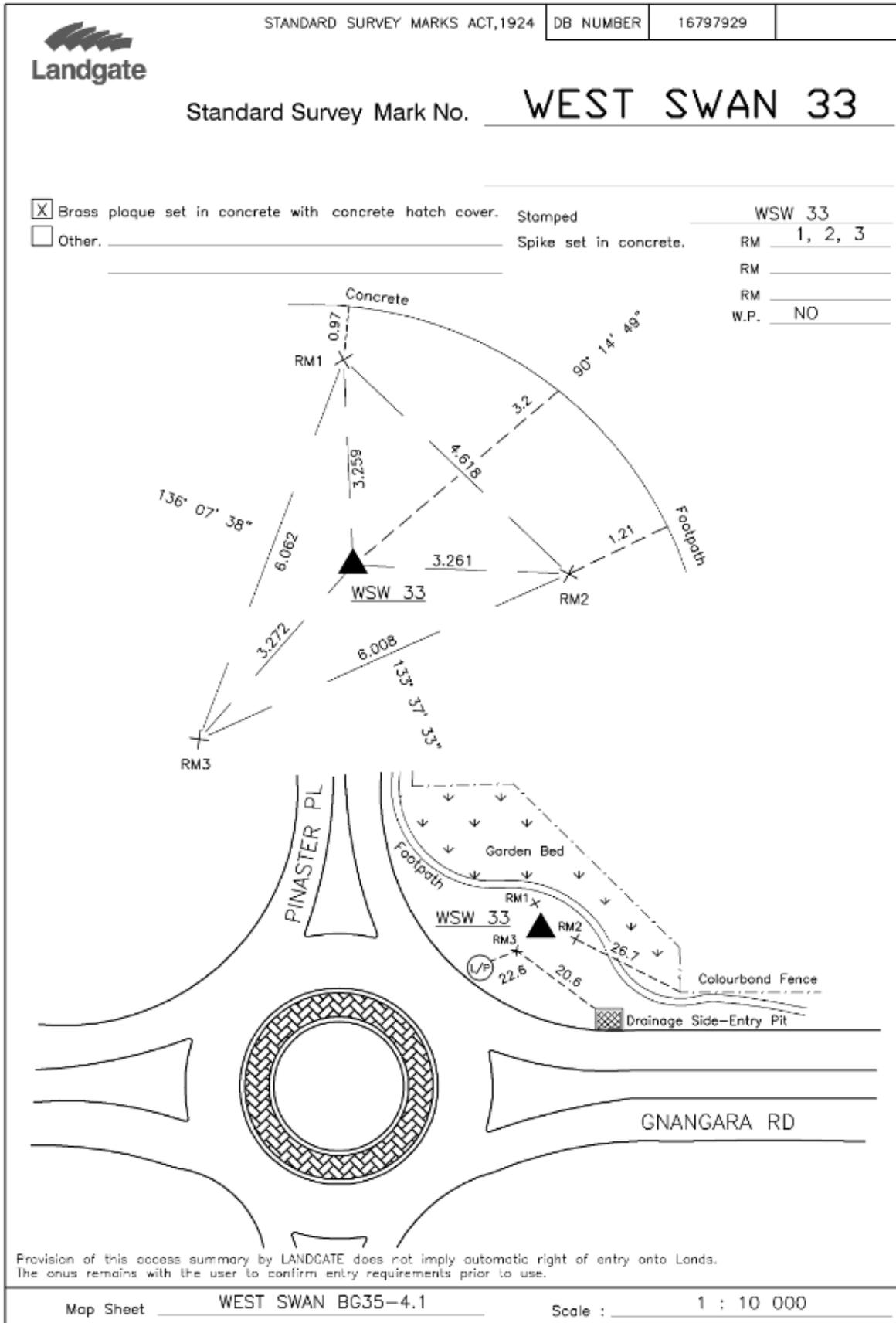
# 8. Appendix C - Installation of Deep-Seated Mark



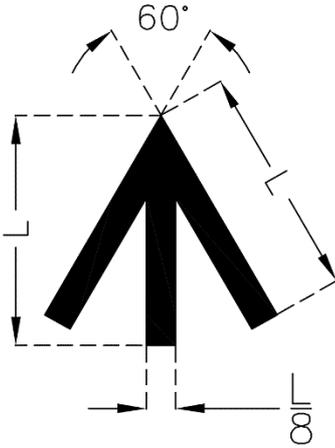
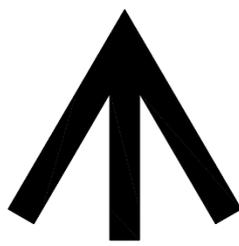
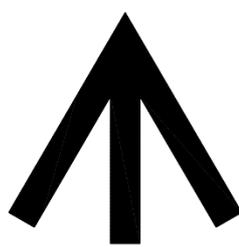
# 9. Appendix D - Installation of Reference Marks



# 10. Appendix E – Example of Station Summary



# 11. Appendix F – SSM/BM Stencil Template

	STANDARD SURVEY MARKS ACT, 1924	DB NUMBER	
Mark No. _____		SSM & BM	
<h2 style="margin: 0;">STENCIL TEMPLATE</h2>			
<input type="checkbox"/> Brass plaque set in concrete with concrete hatch cover.		Stamped _____	
<input type="checkbox"/> Other. _____		Spike set in concrete.	
		RM _____ RM _____ RM _____ W.P. _____	
		Stencils need to have a broad arrow not exceeding 0.1m in height "L". Text to be "Helvetica Bold" with a font size not exceeding 0.1m in height.	
		<h1 style="margin: 0;">SSM</h1>	
		<h1 style="margin: 0;">BM</h1>	
Provision of this access summary by LANDGATE does not imply automatic right of entry onto Lands. The onus remains with the user to confirm entry requirements prior to use.			
Map Sheet _____		Scale : _____ N.T.S	