



AUSTRALIAN RAIL TRACK CORPORATION LTD

Discipline: Engineering (Signalling)

Category: Standard

Post Mounted Signals - Ladders

ESC-04-02

Applicability

ARTC Network Wide	✓	CRIA (NSW CRN)	✓
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Primary Source

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Document Status

Version	Date Reviewed	Prepared by	Reviewed by	Endorsed	Approved
1.2	13 August 2010	Standards	Stakeholders	Chief Operating Officer	Risk & Safety Committee 09/06/2009

Amendment Record

Version	Date Reviewed	Clause	Description of Amendment
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1.2	13 August 2010	All	Issued as final.

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1 General

1.1 Scope

Signal heads and equipment mounted on posts adjacent to railway tracks require access for maintenance activities. At the same time, unauthorised access needs to be restricted to minimise vandalism.

Appropriate means of access are required to the elevated positions in a safe manner. The introduction of LED Technology and the failure modes of signals have reduced significantly. Therefore it is now practical to have limited access to signal posts and heads.

Access to signals for maintenance purposes may be by one of the following methods:

- Temporary ladders
- Elevated platforms or cherry pickers
- Fixed ladders and platforms
- Pivoting Posts

AS 1657 "Fixed platforms, walkways, stairways and ladders – Design for construction & installation is applicable to new fixed installations. The case for fixed ladders & platforms should be considered against the alternative means of access.

Each installation should be assessed and judged on its merits and a recommendation made as to which of the above access methods is required accordingly.

1.2 Safety

Construction activities shall be undertaken at all times so as to ensure the safety of employees, not cause danger, delay, obstruction or stoppage to railway traffic and not interfere with the business of ARTC or its Operators.

All staff working on the installation must be appropriately accredited for work on or about Rail corridors in accordance with ARTC Network Operational and Safeworking requirements.

The Contractors shall prepare a "dial before you dig" plan of all services within the vicinity of the works before commencing any earth works.

Safe and convenient access of signalling equipment by other railway staff must be considered and arrangements put in place.

1.3 Occupational Health and Safety

All construction staff shall comply with the relevant safety legislation of the Occupational Health and Safety Act.

1.4 Competency

All staff working on the installation must be appropriately accredited as competent for work on the ARTC Network in accordance with the ARTC standards.

1.5 Drawings

The documentation and drawings to be used in the execution of the works shall be the approved construction drawings plus any other drawings referenced in the design or nominated in the specification for the work.

1.6 Definitions

In this document, the following definitions of terms shall apply:

Term or acronym	Description
ARTC	Australian Rail Track Corporation
Contractor	A person, company or authority nominated by ARTC to implement specific construction works.
Subcontractor	A person, company or authority hired by ARTC's Primary Contractor to perform a specific task as part of the overall project.
ARTC's Representative	A person, company or authority nominated by ARTC to make engineering determinations on ARTC's behalf.
Type Approved (Materials)	Equipment or materials that is approved by ARTC for application to the ARTC network in accordance any in use constraints.

1.7 Quality

The standard of materials and workmanship shall ensure that an asset will remain in service for a minimum of 25 years, during which it must remain fit for purpose in its physical and operational environment, in terms of safety, reliability, maintainability, durability, operability and supportability as set out in this Procedure and referenced documents.

All material and equipment shall be manufactured and assembled to provide a minimum service life of 25 years when maintained and/or overhauled at the manufacturer's recommended intervals.

1.8 Submissions for Approval

All installed equipment must be "type approved" for use on the ARTC Network.

Where alternatives or new equipment types are proposed to meet the design intent, approval for use shall be sought, in accordance with ARTC's PP-122 acceptance process for "New Equipment and Systems" approval.

1.9 Referenced Documents

The following documents are referenced in this standard:

1.9.1 Australian Standards

AS 1657 Fixed Platforms, walkways, stairways and ladders

1.9.2 ARTC Standards

ESC-07-01 Installation of Trackside Equipment

1.9.3 Drawings

- Figure 1: Ladder Attachment Bracket
- Figure 2: Ladder Bracket Construction Detail
- Figure 3: Ladder Slab Cross Section
- Figure 4: Plan View
- Figure 5: Signal Profile
- Figure 6: Restricted Ladder Access
- Figure 7: Ladder Security Chain

1.10 Access Conditions

When working in the vicinity of or adjacent to overhead electrified areas special access conditions shall apply. These requirements are available from the infrastructure manager upon request.

2 Assessing the Location Requirement

Fixed ladders are not required where there is acceptable access to the location and the terrain is considered suitable for walking while carrying a ladder.

Consideration of the following conditions will help in determining ladder requirements:

- Access to the signal location does not require the maintenance staff to cross multiple tracks.
- Access to the signal location does not require the maintenance staff to safely scale unstable embankments or ballast more than 1.0 m in height without proper access steps and guard rails.
- Access to the signal location requires the maintenance staff to safely descend into cuttings deeper than 1.0 m without proper access steps and guard rails or walkways.
- That the correct ladder brackets and foundations around the signal base have been installed correctly.
- That the frequency and type of rail traffic does not reduce the ability of the maintainer to safely utilise the portable ladder or increase the time required to safely access the signal head.
- The distance from the point nearest to the signal to which a vehicle carrying the portable ladder can be safely parked which provides unimpeded access to the signal. The maintainer should not be expected to carry the portable ladder more than 20m.
- The extent of work site protection requirements for portage and attachment of portable ladders is excessive.

These are provided as guide lines in determining locations for unfixed ladders. Locations which exceed the above requirements may be suitable. Similarly, locations which satisfy the above requirements may be unsuitable due to the individual or combinations of the conditions.

There is also the possibility, in suitable areas, that the use of an elevated platform could be considered for signal access. This consideration would be based on the terrain around the signal which should be flat and suitable for its use and have access roads to the site such that:

- Access from the boundary road is clear and unimpeded or there is a high rail take off point suitable for rail mounted vehicles of this type.
- Length of the access road is excessive, subject to road type and general weather conditions.
- The access road is an all weather track that is fit for purpose.

These requirements shall be assessed as part of the initial site survey during preliminary design. The assessment for each signal shall be included in the preliminary design report.

3 Installation Requirements

3.1 Fixed Ladders

Existing signals and searchlight signals fitted with incandescent lamps may retain the original fixed ladders when undergoing LED upgrades as it is not considered a retrospective requirement to upgrade.

However they should be fitted with Lanyard restraint points as shown in the drawings in section 8.

3.2 Unfixed Ladders

Signals considered suitable for installation without the need for fixed ladders should have provision of ladder brackets to support the top of the ladder at the positions necessary to access all installed signals safely, see Figure 1 & 2.

This bracket shall be retained by a single U bolt.

General arrangement detail drawing is shown in Figure 2

The ladder support brackets shall also include harness or fall arrestor anchor points.

The location around the signal base shall have a formed reinforced concrete slab 2000mm long x 750mm wide and 150mm deep containing recessed wells of a width suitable to prevent side slip of the ladder footing. The wells shall have 2 x 12mm conduits set into the base at a suitable angle from the bottom face to the side of the slab to permit drainage.

The base may need several ladder footing positions based on the number of lower signal brackets fitted. The positions of these will be relative to the table in section 7 as required. Alternative bases for ladder fastenings shall be submitted to the respective Maintenance Manger representative under the Engineering Wavier process.

Hot dip galvanised reinforcing bars shall protrude across the well providing additional fore and aft ladder security. The spacing of these bars shall be sufficient to accommodate the Bailey type ladders discussed in section 4.

The slab shall be positioned with its upper face slightly above the surrounding ground level at the rear of the signal, see Figure 3 & 4.

The position of the well within the slab must be such that the angle of the ladder, when fitted to any of the ladder brackets installed with the ladder footing in the recess, is maintained at a nominal 75 degrees or as defined in AS/NZS 1892.5

Refer to table in section 7 for examples.

Unimpeded access must be available to all fitted lamp cases without requiring the maintenance staff to adopt unsafe positions on the ladder. Cleaning of aspects will be via an extendable cleaning wand device that will allow maintenance from the front of the signal at ground level. Alternatively use a rotating head or an elevated platform for access.

The area immediately behind the signal should be kept clear of equipment and obstructions as far as is practical. In situations where this is not possible the ladder bracket may be angled away from the track provided sufficient clearance exists, to locate the ladder footing clear of these obstruction, see Figure 6.

If it is not possible to fulfil all of the above requirements then the installation shall be provided with an appropriate fixed ladder or other means of access.

4 Equipment

All temporary ladders shall conform to AS/NZS1892.5.

The figures in this document are based on using a Bailey FS20189 heavy duty glass fibre extension ladder or reinforced timber equivalent.

The useable range of this model Bailey ladder is between 4.50m & 7.57m and weighs 31.0 kg with a maximum loading of 130kg. All ladders should be fitted with a support chain at the top end suitable for securing the ladder to the top support bracket, see Figure 7.

Chains fitted to the portable ladders are for securing the top of the ladder from fore and aft movement only. They are not designed or intended to be used to 'hang' the ladder from the bracket. The ladder should be extended so that the base of the ladder is firmly contained within the purpose built footing at the base of the signal

As an example a 5m signal post has the top ladder bracket positioned at a height of 4.7m. With the ladder footing placed approx 1.2m from the centre line of the ladder bracket tang. This will give an included ladder angle of approximately 76 degrees.

Refer to table in section 7 for alternative post & bracket height calculations.

5 Harnesses & Fall Arrestors

Harnesses or fall arresting devices should be worn by staff working from signal ladders. These must be attached to the safety ring on the ladder support bracket once the staff member has scaled the ladder to the required working area.

Harnesses or fall arrestors shall be in accordance relevant Australian Standards.

The drawings M01-161 parts 1 to 4 on pages 15 & 16 show details of appropriate harness and fall arrestor anchorage fabrications which should be fitted to existing fixed ladder installations where appropriate.

New installations requiring fixed ladders shall conform to AS1657.

Where portable ladders are used, an anchor point shall be fitted to the ladder bracket on the side away from the running line so that in the event of a slip the victim will swing away from the danger zone to reduce the risk of being hit by passing traffic.

Anchor points should be designed to Australian Standards and be able to withstand a 15kN dynamic load restraint and also 21kN static load to allow for recovery.

Anchor points shall not be attached to signal lamp cases under any circumstances.

6 Signals with Front Access Only

There may be instances that lamp cases that have no rear access door have been installed. These mainly take the form of single lamp cases ie Marker lights, shunt signals and the like.

In circumstances of this nature if the fixture cannot be accessed safely and comfortably from ground level, the installation of a suitable ladder bracket on the front of the signal post shall be considered provided it does not adversely affect the visibility & sighting of the signal.

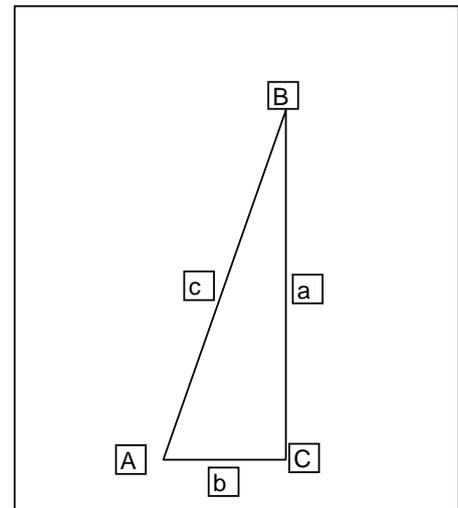
It should be taken into consideration that under normal installations, these aspects are located low on the signal post and as such the working height of the maintainer when accessing these signals may fall outside the requirements specified in any Australian Standard concerned with safe working heights. OH&S and Workcover documentation suggest that working up to a height of 2m without some form of fall arrestor is an acceptable risk.

This does not however assume that there is no fall hazard from working at heights less than 2m and due diligence is to be employed under these conditions.

7 Bracket Height Table

FIG 5 SIGNAL POST / LADDER CALCULATIONS TAN A = a/b
 Ladder angle should be between 70 and 75 degrees to the Horizontal - AS/NZ1657

	B POST HEIGHT	A BRACKET HEIGHT (a)	LADDER FOOTING (b)	LADDER ANGLE (A) DEGREES
Top of Post Mount				
	5.0	4.7	1.75	69.58
Ideal	5.0	4.7	1.50	72.30
	5.0	4.7	1.25	75.11
	5.5	5.2	1.75	71.41
Ideal	5.5	5.2	1.50	73.91
	5.5	5.2	1.25	76.49
	6.0	6.0	2.00	71.57
Ideal	6.0	6.0	1.75	73.75
	6.0	6.0	1.50	75.97
Top Signal Head at Front of post				
	5.0	4.3	1.50	70.77
Ideal	5.0	4.3	1.25	73.80
	5.0	4.3	1.00	76.91
	5.5	4.8	1.75	69.97
Ideal	5.5	4.8	1.50	72.65
	5.5	4.8	1.25	75.41
	6.0	5.3	1.70	72.22
Ideal	6.0	5.3	1.60	73.21
	6.0	5.3	1.50	74.20
Intermediate Signal Head at Front of post				
	5.0	2.0	0.70	70.72
Ideal	5.0	2.0	0.60	73.31
	5.0	2.0	0.50	75.97
	5.5	2.25	0.80	70.43
Ideal	5.5	2.25	0.70	72.72
	5.5	2.25	0.60	75.07
	6.0	2.5	0.90	70.21
Ideal	6.0	2.5	0.80	72.26
	6.0	2.5	0.70	74.36



8 Drawings

The bracket fixes to the rear of the signal post at required positions to allow maintenance access by portable ladder. This bracket should have provision for the attachment of fall arrestor equipment. See pages 15 & 16.

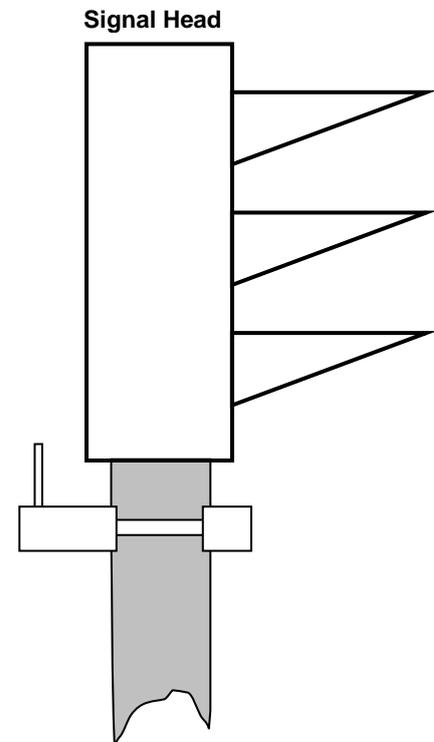
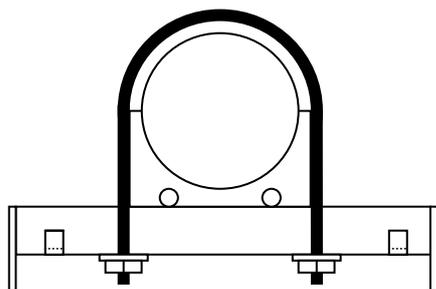
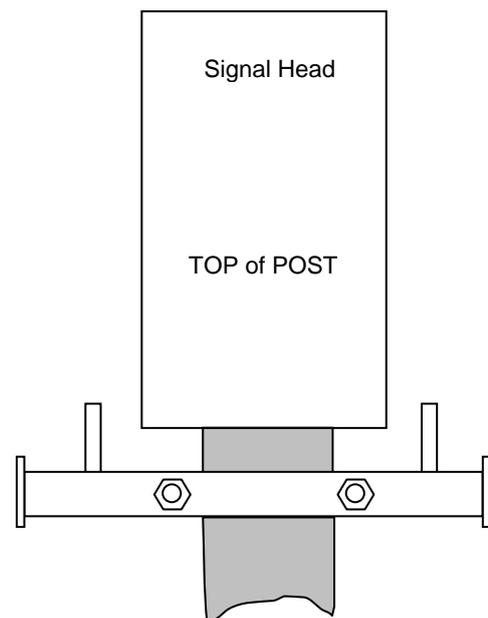


Figure 1 - Ladder Attachment Bracket.



Stand Alone Single U Bolt Fixing



Bracket Installation
Note: Ladder Support Tangs Uppermost

Figure 2 - Ladder Bracket Construction Detail

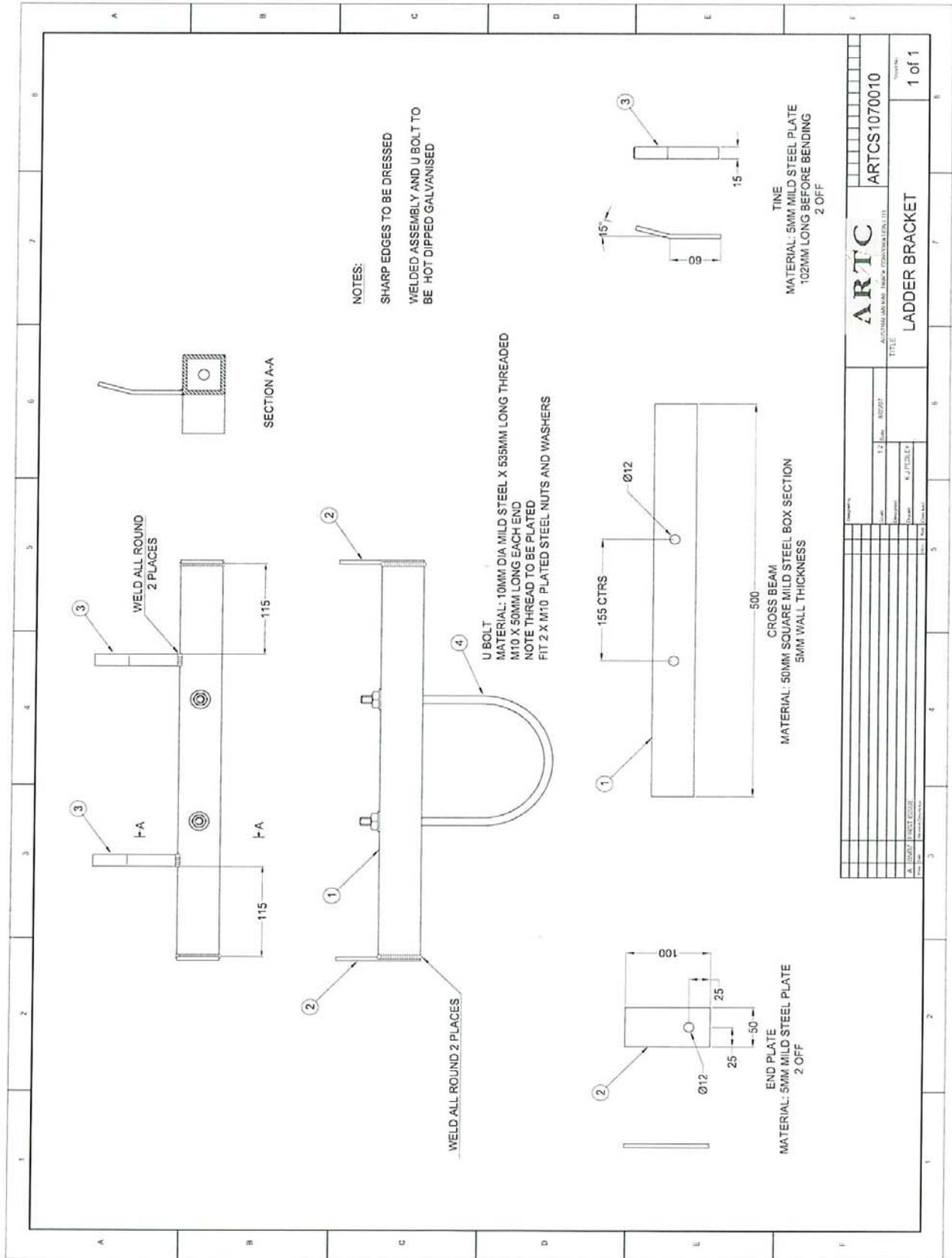


Figure 3 - Ladder Slab Cross Section

Concrete Ladder Footing cast in situ around signal base at or near ground level.

Note: reinforcing bar protruding into well to prevent ladder slippage fore and aft.

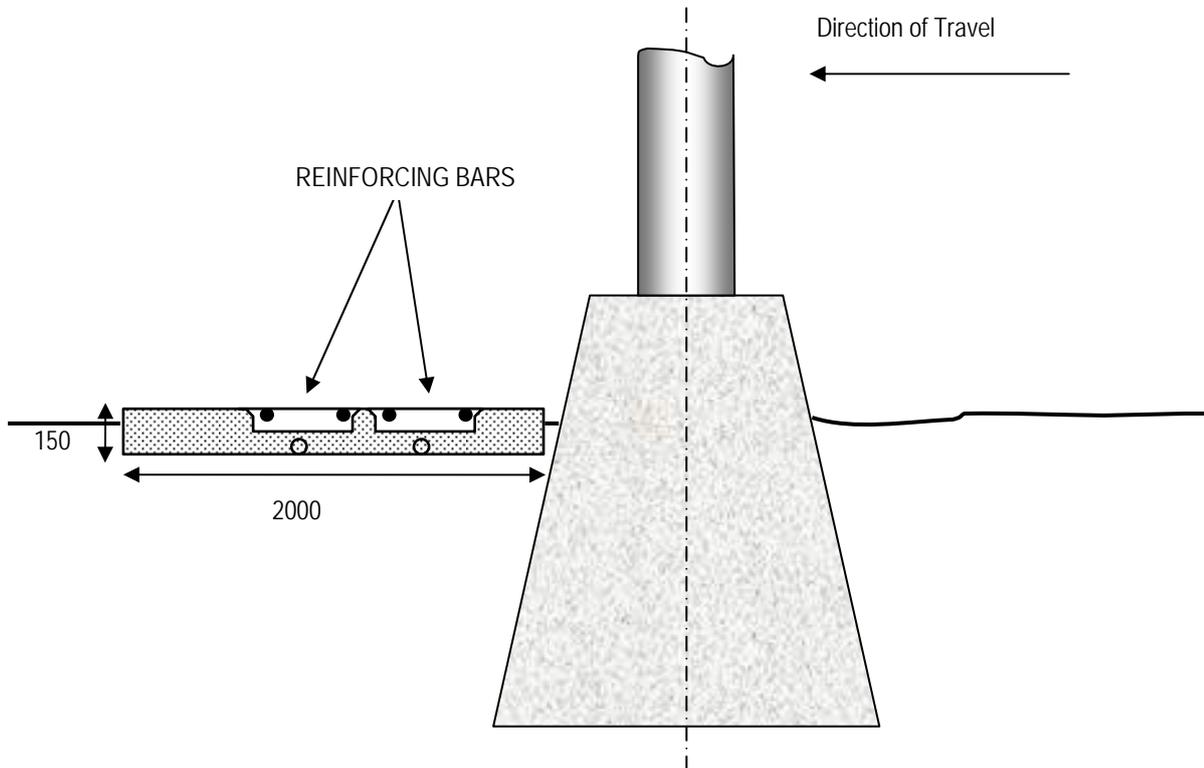


Figure 4 - Plan View

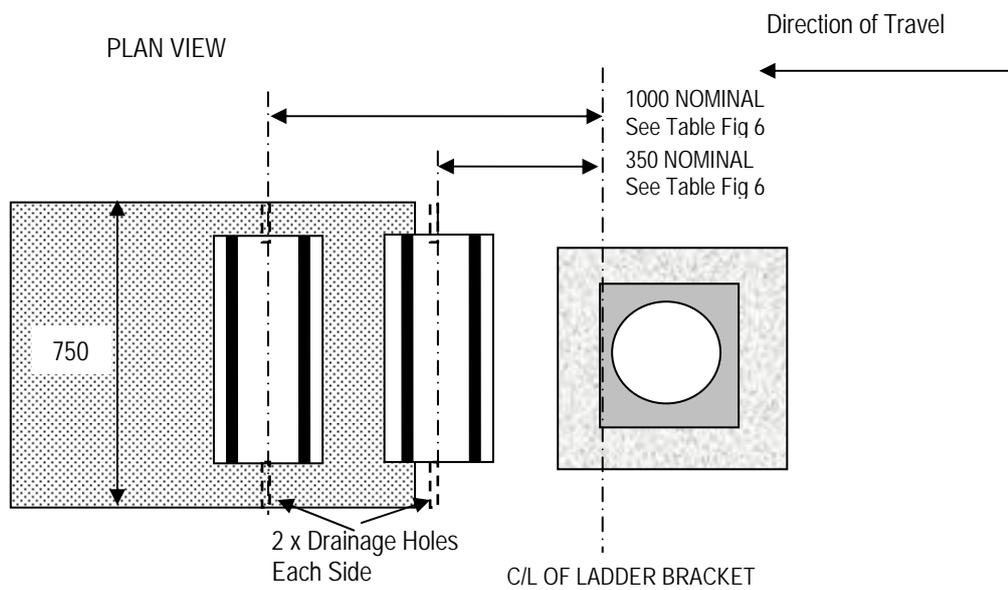


Figure 5 - Signal Profile

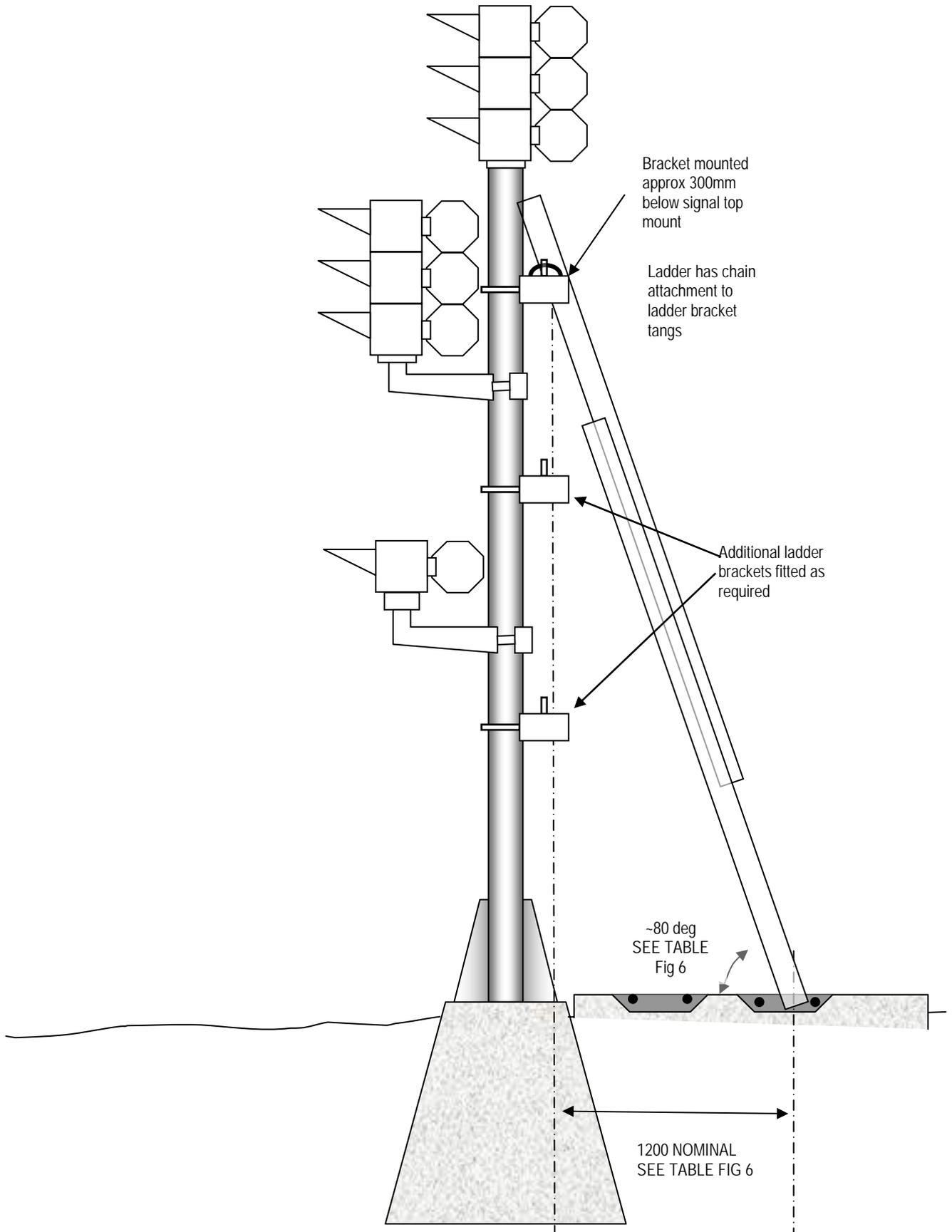


Figure 6 - Restricted Ladder Access

Brackets installed at angles to provide equipment clearance as required.

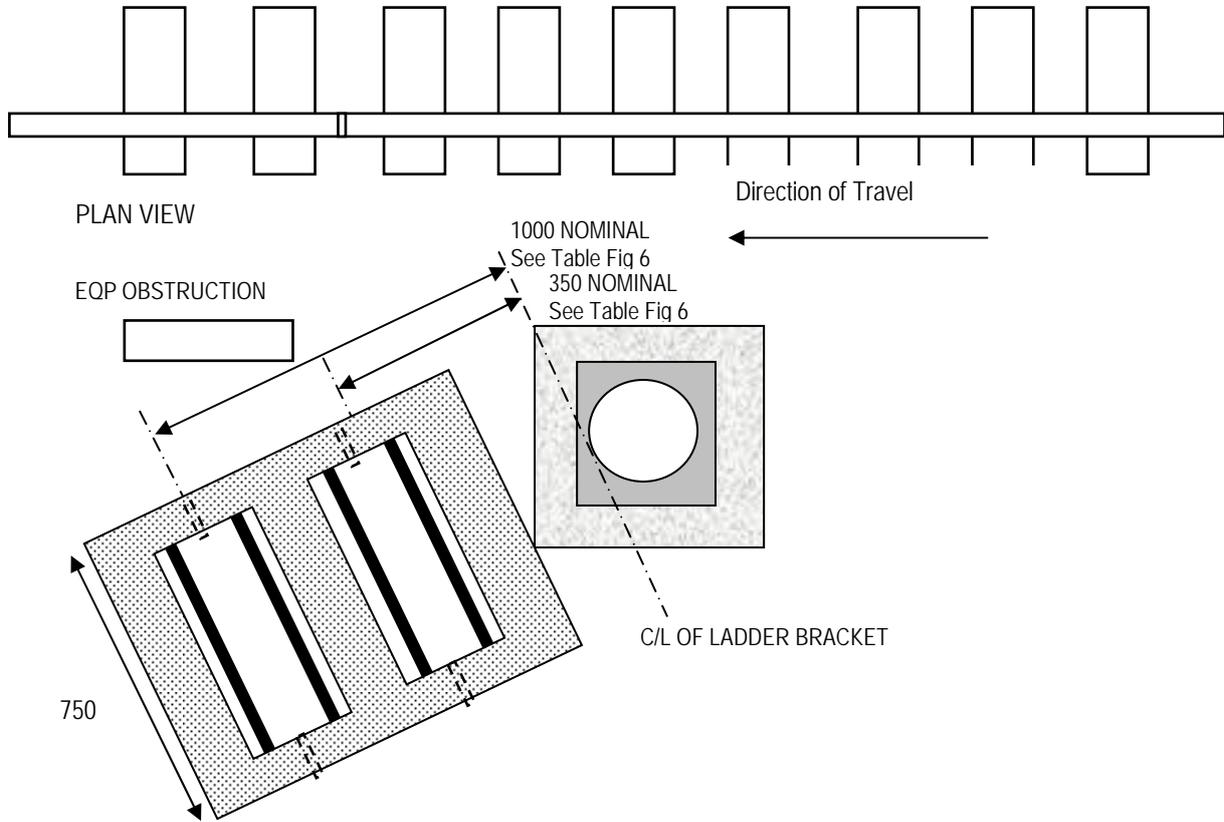
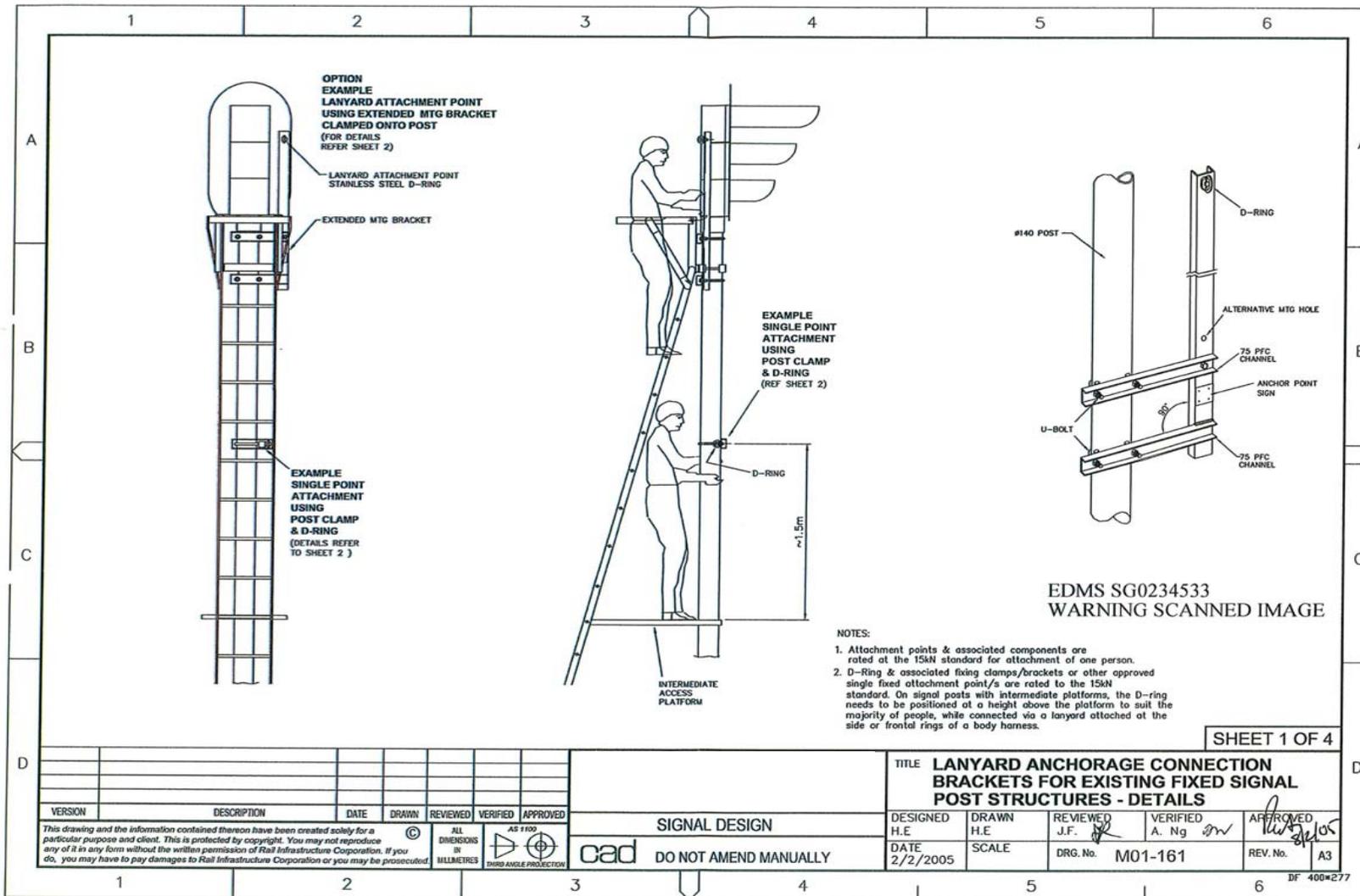
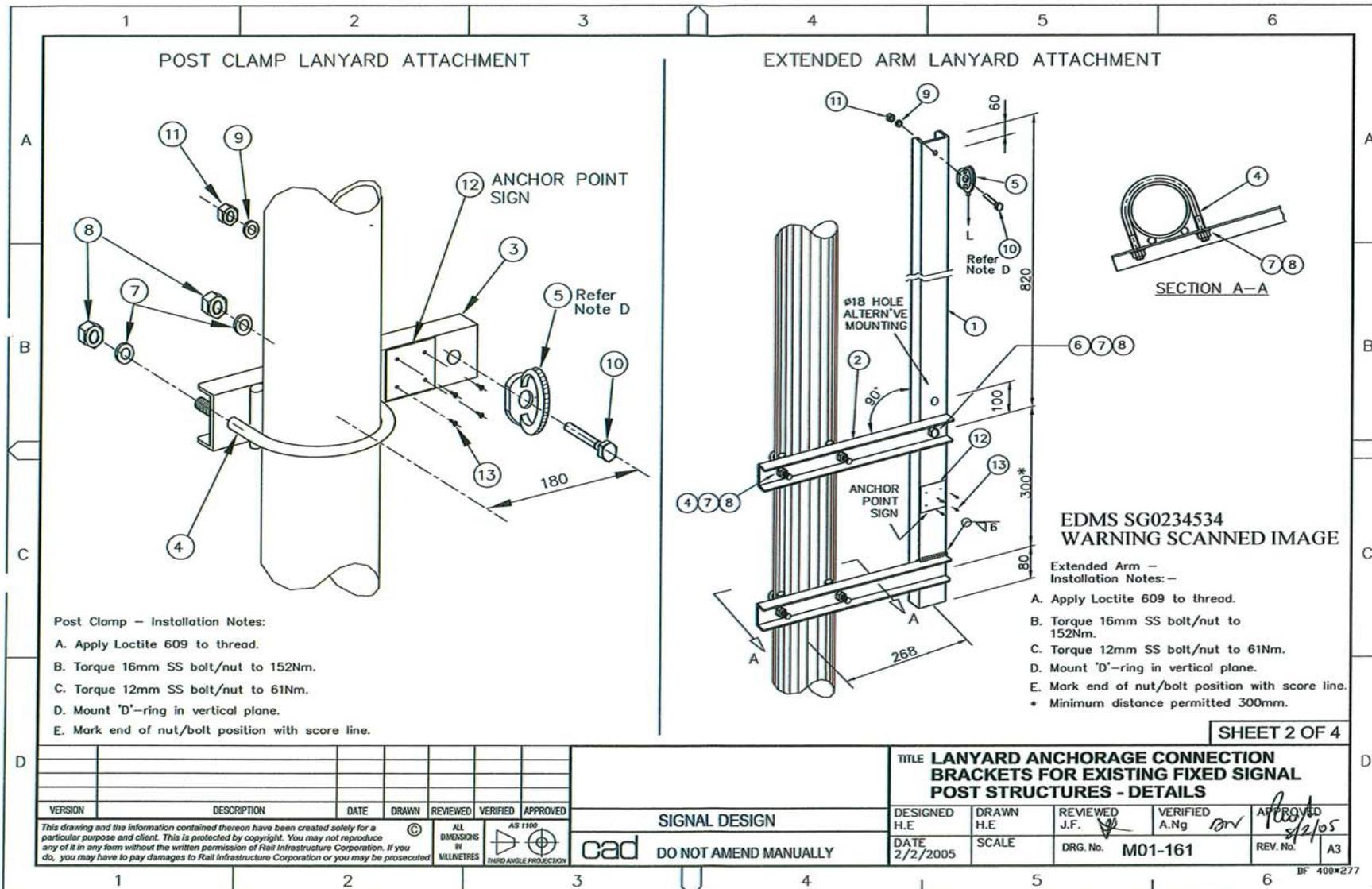


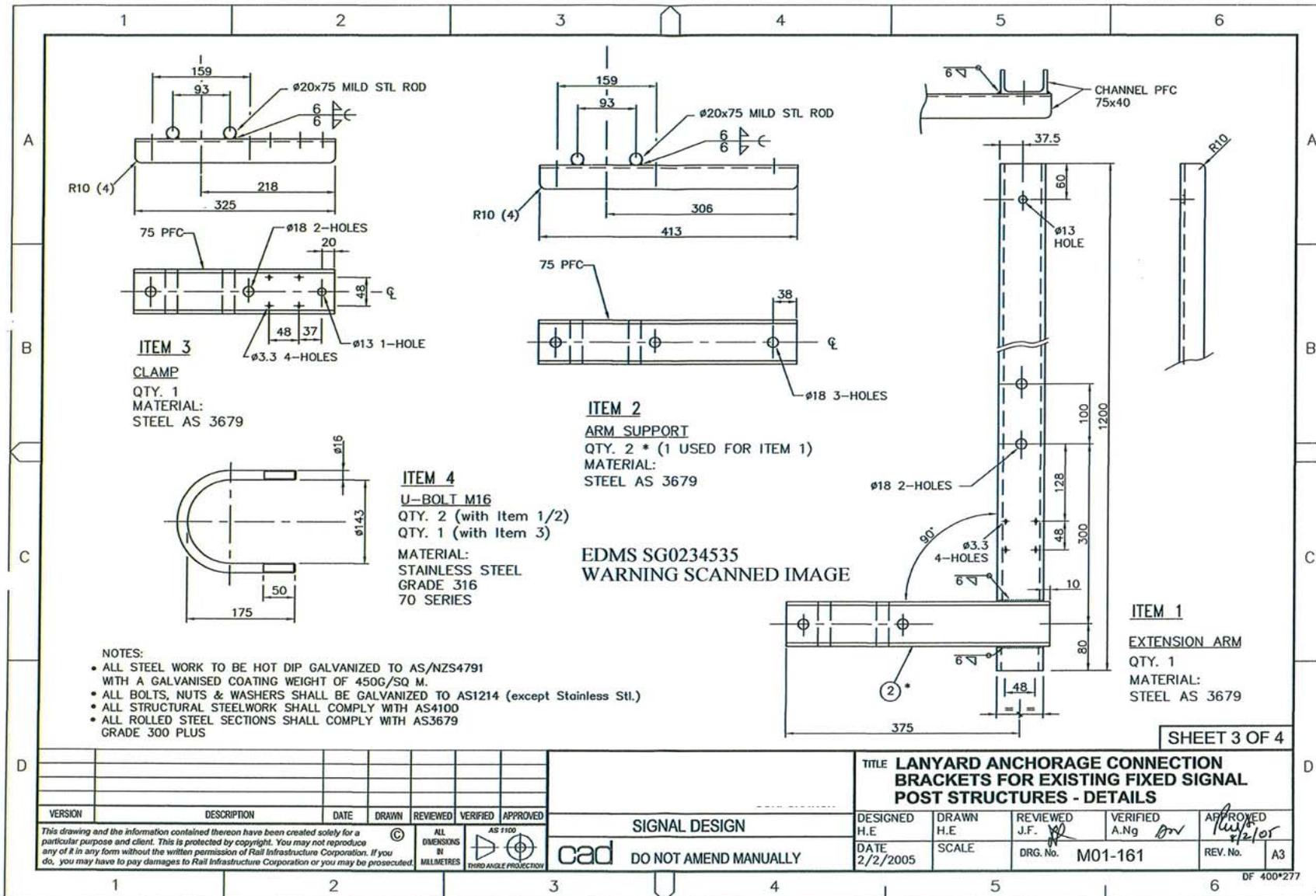
Figure 7 - Ladder Security Chain



9 Anchorage Arrangements - Lanyards







ITEM NO.	DESCRIPTION	MATERIAL	FINISH	EXTENDED ARM MTG. BRACKET QTY	SINGLE POINT ATTACHMENT QTY	DRAWING/SUPPLIER No.	STOCK CODE
1	EXTENSION ARM	STEEL	GALVANISED	1		M01-161 SHT 3	
2	ARM SUPPORT	STEEL	GALVANISED	2		M01-161 SHT 3	
3	POST CLAMP BRACKET	STEEL	GALVANISED		1	M01-161 SHT 3	
4	U-BOLT M16 STAINLESS STEEL GRADE 316 70 SERIES	STAINLESS STEEL	-	2	1	M01-161 SHT 3	
5	ANCHORING RING	STAINLESS STEEL	-	1	1	REFER NOTE **	
6	BOLT M16 x 40 STAINLESS STEEL GRADE 316 70 SERIES	STAINLESS STEEL	-	1		BLACKWOODS Part No.00027407	
7	M16 WASHER STAINLESS STEEL GRADE 316	STAINLESS STEEL	-	5	2	BLACKWOODS Part No.03756306	
8	M16 NYLOC NUT STAINLESS STEEL GRADE 316	STAINLESS STEEL	-	5	2	BLACKWOODS Part No.02736786	
9	M12 WASHER STAINLESS STEEL GRADE 316	STAINLESS STEEL	-	1	1	BLACKWOODS Part No.03756209	
10	BOLT M12 x 30 STAINLESS STEEL GRADE 316 70 SERIES	STAINLESS STEEL	-	1	1	BLACKWOODS Part No. 01068300	
11	M12 NYLOC NUT STAINLESS STEEL GRADE 316	STAINLESS STEEL	-	1	1	BLACKWOODS Part No. 02736664	
12	ANCHOR POINT LABEL	ALUMINIUM	-	1	1	TBA	
13	RIVET DOME HEAD ø3.2x9.5 ALUMINIUM	ALUMINIUM	-	4	4	BLACKWOODS Part No. 01152902	

**** NOTE :**
 MANUFACTURER
 LATCHWAYS D-RING Part No 85030
 DISTRIBUTOR:
 SFPA Part No. AM211
 Safety Fall Prevention Australia LTD
 3/3 Luca Rd Wyong North NSW 2259
 Phone 02 43533166

EDMS SG0234535
 WARNING SCANNED IMAGE

SHEET 4 OF 4

TITLE LANYARD ANCHORAGE CONNECTION BRACKETS FOR EXISTING FIXED SIGNAL POST STRUCTURES - DETAILS						DESIGNED H.E		DRAWN H.E		REVIEWED J.F.		VERIFIED A.Ng		APPROVED <i>[Signature]</i>	
DATE 2/2/2005						SCALE		DRG. No. M01-161		REV. No. 12/05		A3			

SIGNAL DESIGN **cad** DO NOT AMEND MANUALLY

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