

TRANSNET PIPELINES

CIVIL TECHNICAL DOCUMENT

STRUCTURAL STEEL SPECIFICATION FOR WALKWAYS, PLATFORMS, CAT LADDERS AND STAIRWAYS

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DOCUMENTATION SIGN-OFF SHEET

I, the undersigned hereby approve this procedure.

ROLE	CAPACITY/ FUNCTION	Name	SIGNATURE	DATE
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TABLE OF CONTENTS

1. PURPOSE	6
2. APPLICABILITY	6
3. REFERENCE DOCUMENTS	6
4. APPLICABLE TECHNICAL SPECIFICATIONS.....	6
5. DESIGN REQUIREMENTS.....	7
5.1 Design.....	7
5.2 Steel sections.....	8
5.3 Cat Ladders.....	10
5.4 Fabrication and Erection.....	10
6. HOT DIPPED GALVANIZING	11
6.1 Galvanizing	11
6.2 Repairing of damaged coatings	12
7. ANNEXURE A	13

ABBREVIATIONS

TPL	Transnet Pipelines
SANS	South African National Standards
PFC	Parallel Flange Channels
MPa	Mega Pascal

DEFINITIONS

Walkways	Designated paths for personnel to access and inspect fuel storage tanks, pipelines, and equipment.
Platforms	Elevated surfaces providing access to equipment, valves and piping.
Stairways	Permanent or temporary stairways providing access to elevated areas.
Cat Ladders	Vertical or near-vertical ladders providing access to elevated areas.
Rises	Vertical distance between two consecutive risers.
Goings	Horizontal distance between two consecutive risers.
Treads	Horizontal surface of a step.
Stringers	Structural members supporting the treads and risers.
Landers	Intermediate platforms between flights of stairs.
Flight	Series of consecutive steps.
Handrail	Railings providing support and balance.
Steps	Combination of a riser and a tread.

1. PURPOSE

The purpose of this document is to provide the minimum requirements that shall be complied with for the design, manufacture, erection and supply of walkways, platforms and stairways for Transnet Pipelines facilities.

2. APPLICABILITY

This specification is applicable to all TPL facilities and sets out requirements for the design, construction and installation of walkways, platforms, cat ladders and stairways which are intended to provide means of safe access and safe working at places normally used for operations, maintenance, and inspections.

3. REFERENCE DOCUMENTS

The following Standardized Specification for Civil Engineering Construction are applicable to this document.

4. APPLICABLE TECHNICAL SPECIFICATIONS

NO	DOCUMENT TITLE	DOCUMENT NUMBER
1	South African Steel Construction Handbook	Steel Construction Handbook (Red Book)
2	Structural Steelwork	SANS 2001-CS1:2017
3	The structural use of steel	SANS 10162 PART 1
4	The general procedures and loadings to be adopted in the design of buildings	SANS 10160
5	Construction and management requirements for works contracts Part 3: Structural steelwork	SANS 1921-3:2018
6	Typical Details: Walkways, Stairways, Platforms and Cat Ladders	PL 107253, Sheet 1, 2 & 3

Document Number: PL 892

Page 6 | 13

Standard Title: Structural Steel Specification for Walkways, Platforms, Cat Ladders and Stairways

5. DESIGN REQUIREMENTS

5.1 Design

- 5.1.1 The walkways, platforms and stairway shall be designed and constructed to the requirements as laid down in this specification and related documentation.
- 5.1.2 The walkways, platforms and stairways shall be designed to withstand 5 kN/m².
- 5.1.3 The design of a walkway, platform and stairways shall be governed by the following factors:
- Ease of access,
 - Frequency of use, and
 - Standard of safety requirements.
- 5.1.4 Design of walkways for use between tanks to include all calculations and certification documentation signed by a registered engineer.
- 5.1.5 This specification to be read in conjunction with drawing number PL 107253, sheet 1 and 2.
- 5.1.6 A satisfactory slope must be provided. For general and regular use, the slope shall not exceed 38°, See PL 107253, sheet 1 and 2.
- 5.1.7 Width of a stairway, measured as the clear distance between stringers and handrails, shall not be less than:
- 750 mm for occasional access purposes,
 - 1000 mm for regular two-way traffic, and
 - 1100 mm for emergency escape route.
- 5.1.8 The clear headroom, measured along the vertical pitch line, shall not be less than 2100 mm. Where walkways, platforms and stairways are erected at a height that enable a person to walk underneath, but do not comply with the stipulated clearance height as mentioned above, clear warning signs shall be erected by the contractor.
- 5.1.9 Clearance required is 300 mm between existing structures and new walkways, platforms, and stairways.
- 5.1.10 The rise of any step should be:
- 175 mm for use by general public,
 - 190 mm for normal industrial use, and

- Should not exceed 200 mm.
- 5.1.11 Steps forming part of an emergency route shall have solid steel treads and risers. Where steps do not have solid risers, each tread shall overlap the next lower tread by not less than 25 mm.
- 5.1.12 The variation in the rises and goings of treads shall in any one flight of stairs shall not exceed 6 mm. The slope rises and goings should be preferably equal for all flights in a stairway.
- 5.1.13 Tread for all walkways, platforms, and stairways, excluding emergency route, shall be of the open grating type with embossed nosing and side plates welded to each side of the stair tread for bolting.

5.2 Steel sections

Reference: PL 107253 Sheet 1 and 2

- 5.2.1 All steelwork to be in accordance with SANS 2001-CS1:2017, SANS 1921-3:2004.
- 5.2.2 All steel to be grade S355JR except for cold formed and hollow sections which are to have a minimum yield stress of 200MPa.
- 5.2.3 The steel sections used for stair stringers to be PFC180x70 channel sections for spans up to 4000 mm unless shop drawings demonstrate that treads provide effective lateral support in which case 180 x 10mm thick flats can be used for spans up to a maximum of 3350 mm.
- 5.2.4 The steel section used for columns to be PFC 120x55 channel sections up to a maximum height of 3000 mm and a stairway / walkway width of not more than 1250 mm. Centre to centre distance between columns must not exceed 3000 mm for beams as defined in paragraph 5.2.5.
- 5.2.5 Steel sections used for beams (other than stringers) in landings and walkways to be PFC 120x55 channel sections up to a maximum span of 3000 mm.
- 5.2.6 Bracing must be provided for at least one bay in each direction using 60x60x5 angle sections up to a maximum length of 4250 mm, crossed and bolted with 1-M16 Grade 4.8 galvanised bolt.
- 5.2.7 For spans exceeding those specified on 5.2.4 to 5.2.6, a registered professional engineer shall determine the size of the steel sections.

- 5.2.8 Base plates to be a minimum of 10mm thick and anchored with at least 2-M20 Grade 8.8 galvanised bolts.
- 5.2.9 Stringers to have their ends terminated as per drawing PL 107253, sheet 1 and 2.
- 5.2.10 Landings shall be used between flights and in a change of direction. The vertical height of a stairway between floors or landings shall not exceed 3000 mm.
- 5.2.11 Landings to be at least 900 mm long and as wide as the stairway.
- 5.2.12 Landings to have kick plates made of angle or flat that rise at least 100 mm above finished floor level.
- 5.2.13 See PL 107253, sheet 1 and 2 for typical landing detail.
- 5.2.14 All walkways, platforms and stairways shall have handrails fitted on both sides. Handrail to comprise of knee rail and designed to withstand the greater of a concentrated force of 1,0 kN applied over a length of 100 mm acting in any direction or a distributed horizontal force of 0,5 kN/m.
- 5.2.15 Top of handrails to be a minimum of 1000 mm above platform floor level.
- 5.2.16 Handrail joints to be located close to the standards, see maximum recommended distance in the drawing number PL 107253, sheet 1. Railing shall be prevented from rotating or moving longitudinally.
- 5.2.17 Tubular hand and knee rails should be made from steel tube with a wall thickness of not less than 2.5 mm. Joints should be butted using tubular steel ferrules that may be pinned, screwed or spigoted, and they should be located at points of minimum stress. Railing should be prevented from rotating or moving longitudinally.
- 5.2.18 The size of tube generally used is 33.5 mm or 34.0 mm outside diameter by 2.5 mm or 2.65 mm wall thickness.
- 5.2.19 Instead of utilizing proprietary handrail standards as referred to in 5.2.17, handrailing systems may consist of hot-rolled angle or channel standards, with tubular handrails and angle or flat bar knee rails as indicated in PL 107253 Sheet 2. Top rail should be 25 mm diameter bar with mid rail of 50x6 mm flat bar and post bar member of 70x70x6 mm angle iron.
- 5.2.20 Spacing between standards not to exceed 1800 mm.
- 5.2.21 A stair shall not contain more than 15 treads or less than two.

- 5.2.22 Kick plates to be fixed against platform frames and not to the flooring. Minimum height of kick plates to be 100 mm above finished floor level and a 10 mm clearance between the lower edge and the floor.
- 5.2.23 Flooring/grating to be open grating, non-slip and secured by a minimum of two securing clips/hooks per section. Rectagrid RS40 30 x 4,5 by Mentis or similar.
- 5.2.24 All bags of bolt shall have a certificate indicating compliance with SANS 1700:5 and a reference to the bag label.
- 5.2.25 Edge distances and bolt spacing for connections to be in accordance with SANS 2001-CS1 unless otherwise noted.

5.3 Cat Ladders

Reference: PL 107253 Sheet 3

- 5.3.1 Ladders with a height of more than 5 metres must be fitted with safety cages consisting of hoops at a uniform spacing of not more than 1000 mm and three or more vertical straps. Cages must extend from not more than 2 500 mm above the lower level to at least 900 mm above the upper level served by the ladder.
- 5.3.2 The back of the cage may not be more than 700 mm from the plane of the rungs.
- 5.3.3 Cages should be attached to support their own weight and that of user.
- 5.3.4 The connection of the straps to the hoops and the hoops to the stringers is typically by means of welding. Where bolts are used these should be countersunk or otherwise recessed so as not to cause obstruction within the cage.
- 5.3.5 Rungs may be made from round bar with a diameter of not less than 20 mm. The pitch should be between 250 mm and 300 mm. The first rung should be between 150 mm to 300 mm from the ground level. Rungs may be attached directly to the stringer inner faces by welding, or the stringers may be drilled to receive the rungs, the rung ends being set in from the outer faces and welded.

5.4 Fabrication and Erection

- 5.4.1 The walkways, platforms, and stairways shall be fabricated to ensure easy assembly. Modular designed concept to be used.

- 5.4.2 The walkways, platforms and stairways shall be furnished complete with bolts, nuts, hooks, and grating.
- 5.4.3 The walkways, platforms and stairways shall be erected on site and foundations provided to compensate for the gradient that might exist at floor level.
- 5.4.4 Provision shall be made during manufacturing to anchor walkways, platforms, and stairways.
- 5.4.5 Contractor shall establish the relationship of the walkways, platforms, and stairways to existing structures.
- 5.4.6 Walkways and platforms must be of a self-supported and braced construction. No attachment to any existing structures allowed. Exceptions are buildings and walkways between tanks.
- 5.4.7 Positioning/design of walkways, platforms, and stairways to be such so as not to impede maintenance. Where there is no feasible alternative, provision shall be made for removable sections to accommodate maintenance.
- 5.4.8 Cut-outs may be provided in the flooring/grating where equipment is an obstruction. Then only shall the kick plate be secured on to the flooring around the cut-out.

6. HOT DIPPED GALVANIZING

6.1 Galvanizing

- 6.1.1 Steelwork described as “hot dipped galvanised” shall be galvanised after manufacturing and before delivering to site, by means of the hot dipped process, complying with the minimum requirements of SABS ISO 1461 – 1999 latest amendment.
- 6.1.2 Structural steel members shall be given an 85-micron thick galvanised coating, or such other thickness as may be specified in accordance with SABS ISO 1461 (Table 1).
- 6.1.3 Before galvanising, all damaged surfaces shall be thoroughly cleaned and if welding has been carried out, all slag shall be removed, preferably with a chisel hammer.
- 6.1.4 All surfaces of the metalwork shall be thoroughly cleaned of all scale and rust by shot blasting in accordance with SABS 064 or by pickling, and then fluxed ready for galvanising.

- 6.1.5 The zinc coating shall be even and continuous over all surfaces, free of bare spots, dull or rough patches, blisters, or other imperfections. The zinc coating shall show no signs of peeling and shall be uniform in thickness.
- 6.1.6 All bolts, nuts, screws, and other threaded components shall be hot dip galvanised to SABS ISO 1461.

6.2 Repairing of damaged coatings

- 6.2.1 Plant Repairs: Should any black spot or uncoated areas greater than 5mm² (individual) or 25mm² (collective) per m² or per m run be present after galvanising, the coating shall be repaired. This is to be carried out using abrasive blasting followed by zinc metal spray. The zinc metal spray shall be applied at least 25% thicker than that specified and shall overlap the damaged area by 20-25 mm. The finished coating shall be wire brushed to remove any excess metal spray.
- 6.2.2 Site Repairs: Zinc metal spray as set out above or with a zinc rich paint provided it has at least 90% zinc in the dry film, by mass. The paint should be a zinc rich epoxy in conformance with SABS 926.

7. ANNEXURE A

Title	Document Number
Typical Details: Walkways, Stairways & Platforms	PL 107253, Sheet 1
Typical Details: Walkways, Stairways & Platforms	PL 107253, Sheet 2
Typical Details: Cat Ladders	PL 107253, Sheet 3

CLEARANCE LINE

CH

KICK FLAT

WW

WALKWAYS

WALKWAYS SHOULD BE FITTED WITH KICK PLATES MADE FROM ANGLES OR FLAT THAT RISE AT LEAST 100mm ABOVE FINISHED FLOOR LEVEL. ALL EDGES ON KICKPLATES TO BE ROUNDED.

WALKWAYS MUST BE PROTECTED BOTH SIDES BY HANDRAILING.

GRATING FIXED TO SUPPORTING STEEL WORK ACCORDING TO MANUFACTURES SPECIFICATIONS.

WW = 600mm OCCASIONAL USE (EXCEPTIONAL)
= 750mm MIN. FOR NORMAL USE
= 1000mm FOR REGULAR TWO-WAY TRAFFIC
= 1100mm FOR EMERGENCY ESCAPE ROUTE.

CH = 2100mm MIN. HEAD ROOM (CLEARANCE HEIGHT)

-/B GRATING SHALL BE Banded ON ALL SIDES PRIOR TO GALVANIZING

SLOPES AND PROPORTIONS FOR LADDERS, STEP LADDERS, STAIRWAYS AND RAMPS

90° 80° 75° 65° 50° 45° 42° 38°

LADDERS

STEP LADDERS

CRITICAL ANGLES NON-PERMISSIBLE

VERY STEEP STAIRS AVOID IF POSSIBLE

STEP STAIRS NOT RECOMMENDED

ACCESS STAIRS

GENERAL PURPOSE STAIRS & FIRE ESCAPES

PUBLIC BUILDINGS

AVOID UNDESIRABLE RANGE

1:8 7.1°

1:10 5.7°

RAMPS

FORKLIFTS AND ELECTRIC TRUCKS

RECOMMENDATIONS FOR STAIRWAYS

'R'x'G'=48000-55000

'G' (GOING) 270mm IDEAL SITUATION
'G' NOT LESS THAN 250mm

'R' (RISE)175mm FOR USE BY GENERAL PUBLIC
'R' 190mm IDEAL SITUATION
'R' NOT TO EXCEED 200mm

THE VARIATION IN 'R'(RISE) IN ONE FLIGHT OF STAIRS IS NOT TO EXCEED 6mm.

GENERAL

THE DESIGN OF A STAIRWAY SHOULD BE GOVERNED BY SUCH FACTORS AS EASE OF ACCESS, FREQUENCY OF USE, STANDARD OF SAFETY REQUIRED AS WELL AS A SUITABLE PROPORTION BETWEEN RISE AND GOING.

WIDTH
THE WIDTH OF A STAIRWAY IS THE CLEAR DISTANCE MEASURED BETWEEN STRINGERS:

a) 750mm FOR STAIRWAYS USED FOR OCCASIONAL ACCESS TO PLANT PLATFORMS ETC.
b) 1000mm FOR MAIN STAIRWAYS USED FOR CONSTANT REGULAR TWO-WAY TRAFFIC
c) 1100mm FOR STAIRWAYS USED FOR EMERGENCY ESCAPE ROUTE

SLOPE
THE RECOMMENDED STAIRWAY SLOPES ARE:

a) 38° FOR MAIN STAIRWAYS USED FOR CONSTANT TWO-WAY TRAFFIC
b) UP TO 42° FOR STAIRWAYS USED FOR OCCASIONAL ACCESS
c) SLOPES BETWEEN 42° AND 50° ARE NOT RECOMMENDED FOR NORMAL USE, AND SHOULD BE ADOPTED ONLY IN EXCEPTIONAL CASES.

LAYOUT OF TYPICAL STAIRWAYS

H = 3m (MAX)
W = 900mm (MIN)
1.1m FOR ESCAPE STAIRS
CH = 2.1m (MIN) HEADROOM (CLEARANCE HEIGHT)

(A) STAIRWAY WITH SRAIGHT LANDING

TREADS SHOULD HAVE A NON-SLIP SURFACE THAT WILL RETAIN ITS EFFECTIVENESS DURING CONSTANT AND PROLONGED USE.
TREADS FOR STEEL STAIRS ARE TO BE MADE FROM RAISED PATTERN PLATE OR OPEN GRATING.
GRATING-TYPE TREADS ARE NOT SUITABLE FOR USE BY WOMEN WEARING SMALL HEELS, (E.G. OFFICE FIRE-ESCAPE STAIRWAYS)

TREADS SHOULD HAVE NON-SLIP SIGHTING EDGES OR NOSES AT LEAST 25mm WIDE WITH A RAISED PATTERN NO HIGHER THAN 3mm. SIGHTING EDGES ARE ESSENTIAL FOR TREADS MADE FROM GRATING.
NOSING EDGES SHOULD HAVE SHARP CORNERS GROUND OFF TO A RADIUS NOT EXCEEDING 5mm.

(B) STAIRWAY WITH 180° LANDING

W = 900mm MIN. OR 1100mm FOR ESCAPE STAIRS

TYPICAL HANDRAIL LAYOUT

NO JOINTS BETWEEN CORNER STANDARDS

HANDRAILS TO BE SECURED TO ALL CORNER AND END STANDARDS

JOINTS SHOWN THUS

NO JOINTS BEFORE STANDARD

PLAN

EITHER B OR C NOT TO EXCEED 300mm
B + C = 1000mm MAX.
D = 300 mm MAX.
E = 350 mm MAX.
R = 75 mm MIN.

PLAN: TYPICAL WALKWAY

ELEVATION A-A: TYPICAL BRACING

STAIRWAY STRINGER BASE DETAIL

DETAIL AT TOP OF STAIRWAY

DETAIL OF 180° LANDING

DETAIL OF STRAIGHT LANDING

STRINGER

THE STEEL SECTIONS MOST COMMONLY USED FOR STAIR STRINGERS ARE 180x70mm CHANNELS AND 180x10mm FLATS.
FOR LARGER SPANS THE SECTIONS SHOULD BE DETERMINED BY STRUCTURAL REQUIREMENTS

LANDINGS

LANDINGS SHOULD BE FITTED WITH KICK PLATES MADE FROM ANGLES OR FLATS THAT RISE AT LEAST 100mm ABOVE FINISHED FLOOR LEVEL.

LANDINGS AND WALKWAYS MUST BE PROTECTED BOTH SIDES BY HANDRAILING.

GRATING FIXED TO SUPPORTING STEEL WORKS ACCORDING TO MANUFACTURERS SPECIFICATIONS.

A1	APPROVAL				REFERENCES		REVISIONS			TRANSNET pipelines TYPICAL DETAILS WALKWAYS, STAIRWAYS & PLATFORMS	PROJECT NAME	
	DISCIPLINE	NAME	SIGN	DATE	DWG NUMBER	DESCRIPTION	REV	BY	DATE	DESCRIPTION	CHK	APP
	ELECTRICAL										TXT	TXT
	MECHANICAL	Thershni Pillay		8/11/2024								
	MC&I											
	PROCESS											
	CIVIL	Makhado Mulaudzi		11/11/2024								
	FIRE											
											DRAWING No.	
											PL 107253 SHEET 1	
											SCALE	
											N.T.S.	
											REV	
											0	

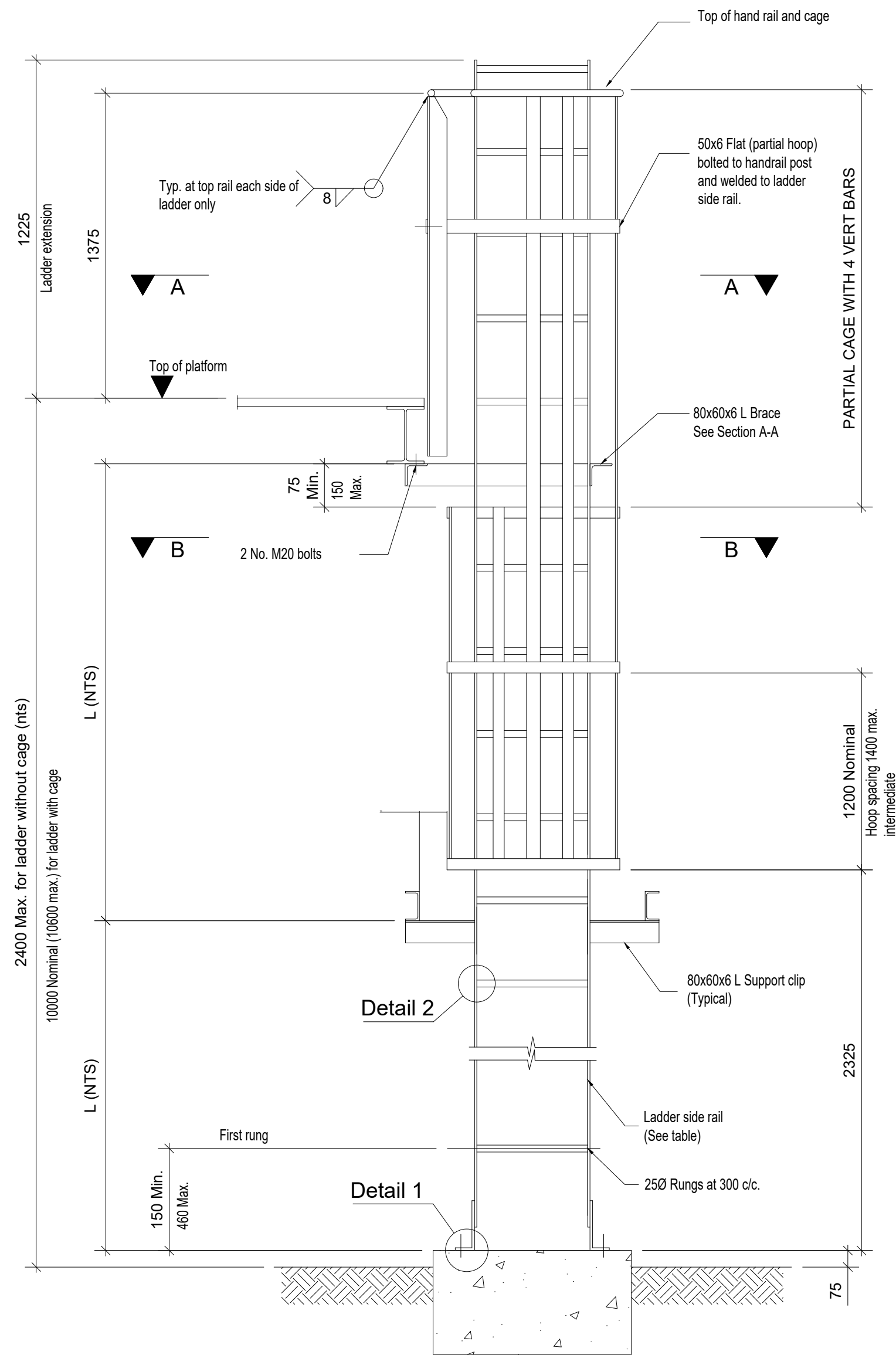


TRANSPET
pipelines

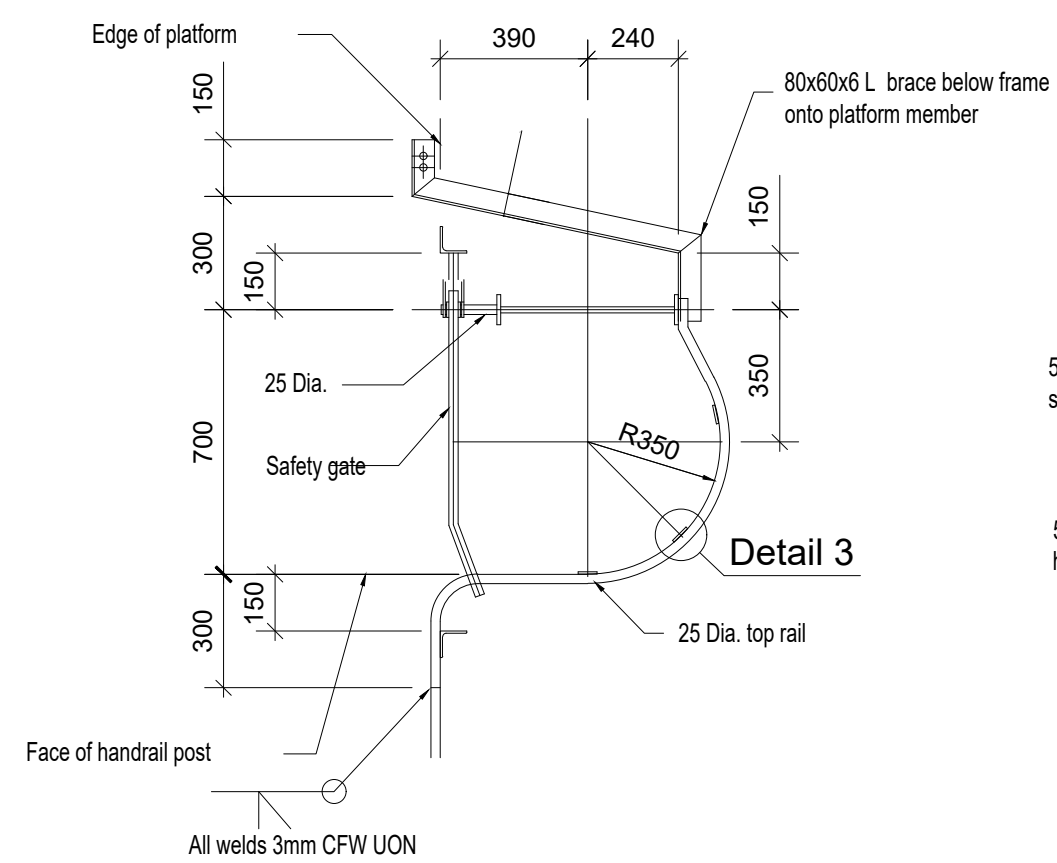
TYPICAL DETAILS

WAKWAYS, PLATFORMS AND STAIRWAYS

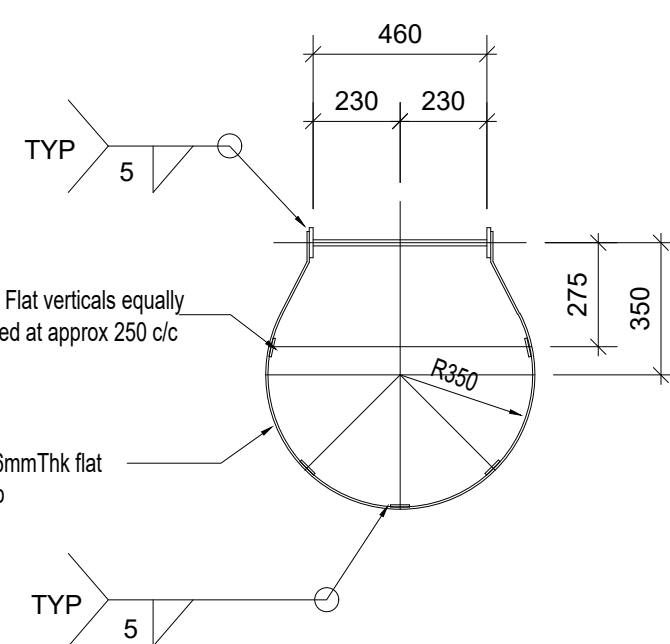
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TRACED	CAD	DATE	18-10-2024
CHECKED	MM	APPROVED	MM
SCALE		N. T. S.	
DRAWING No.			REV
PL 107253 SHEET 2			0



Front Elevation on Catladder
(Side approach)
Scale 1:20

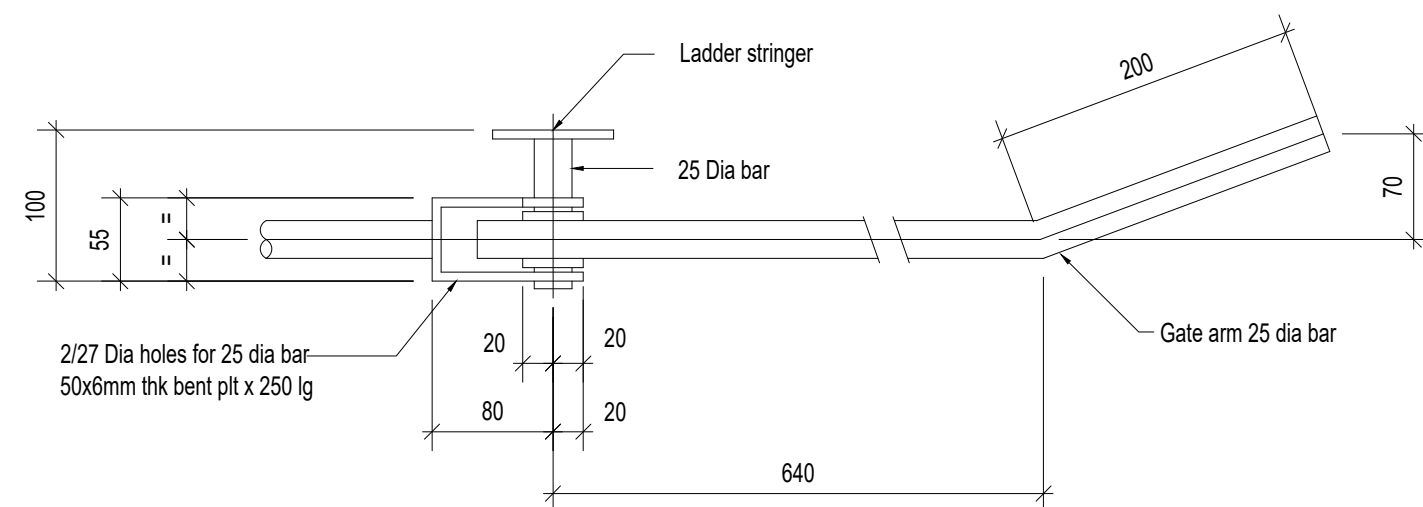


Section A-A
Scale 1:20

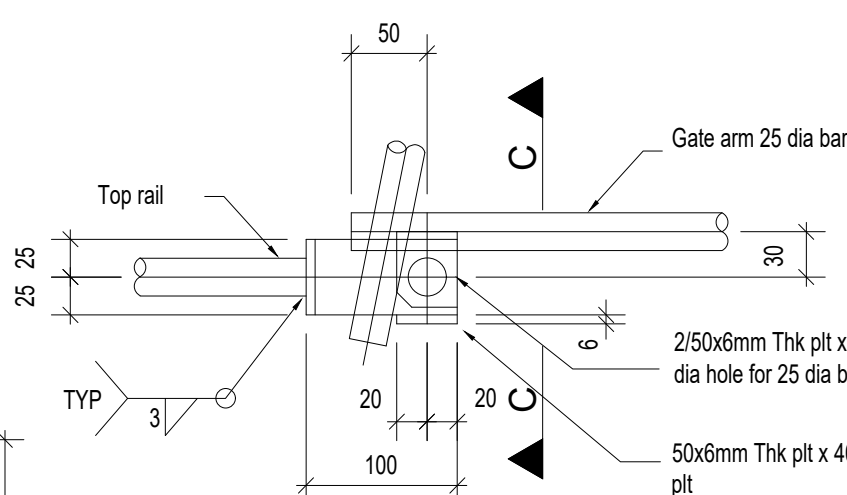


Section B-B
Scale 1:20

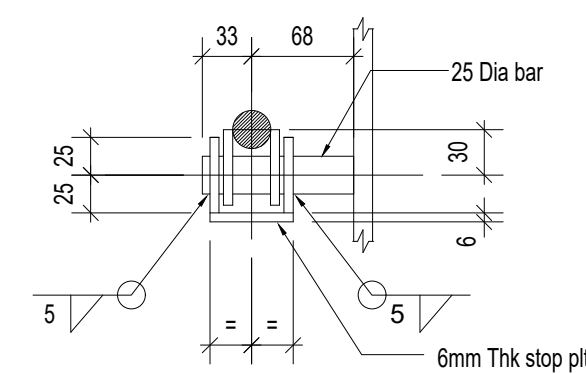
Ladder side rail to be sized according to unsupported length 'L'	
L	Ladder side rail
≤3000	60x10 Flat
≤8000	80x10 Flat
≤10000	PFC 100x50



Plan View

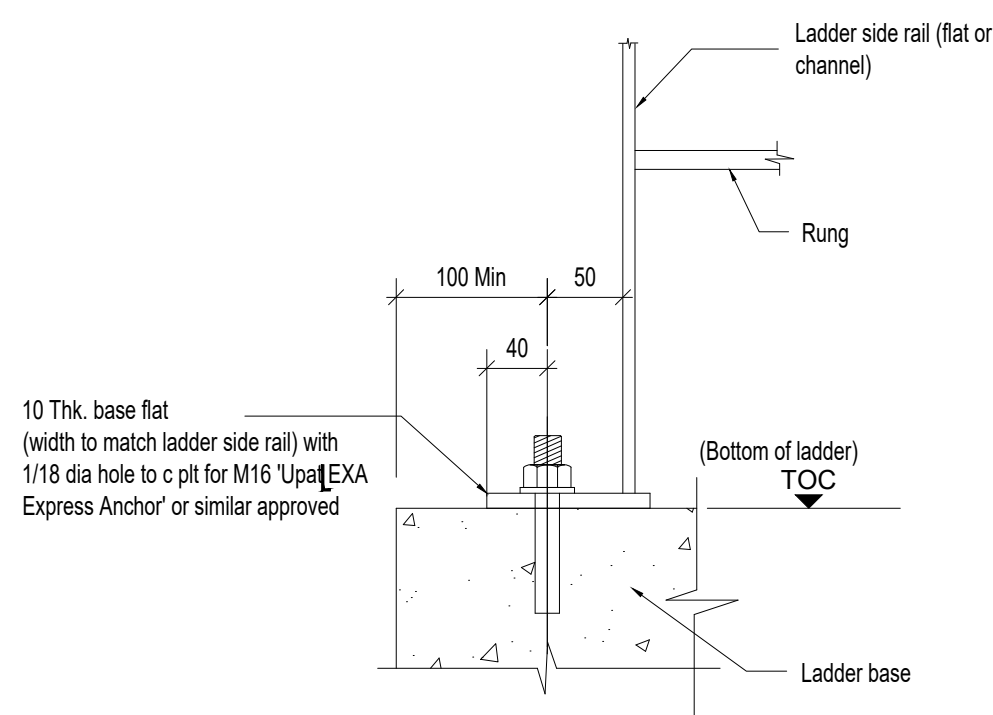


Elevation

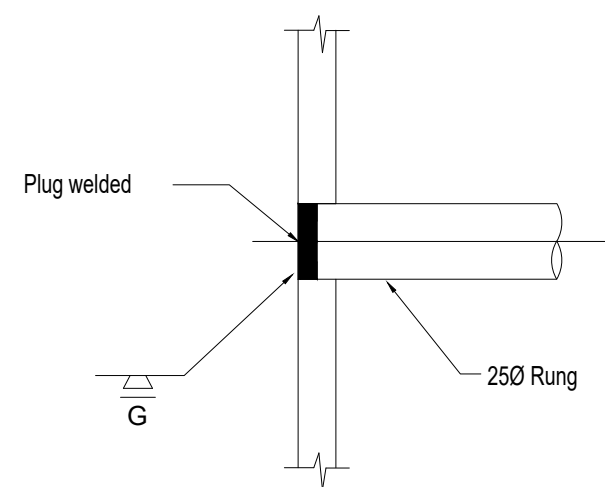


Section C-C

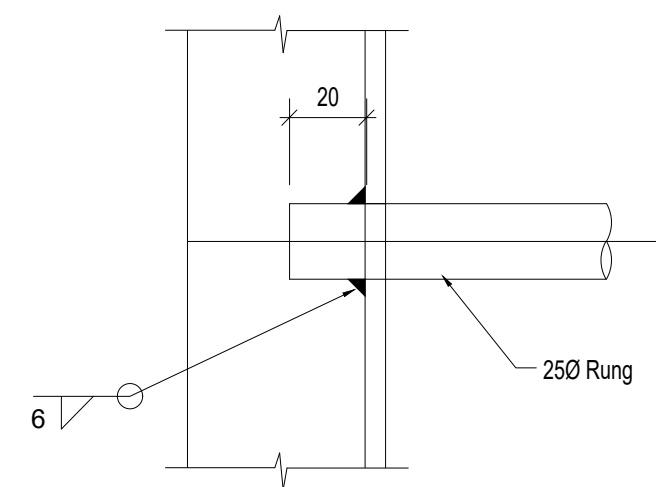
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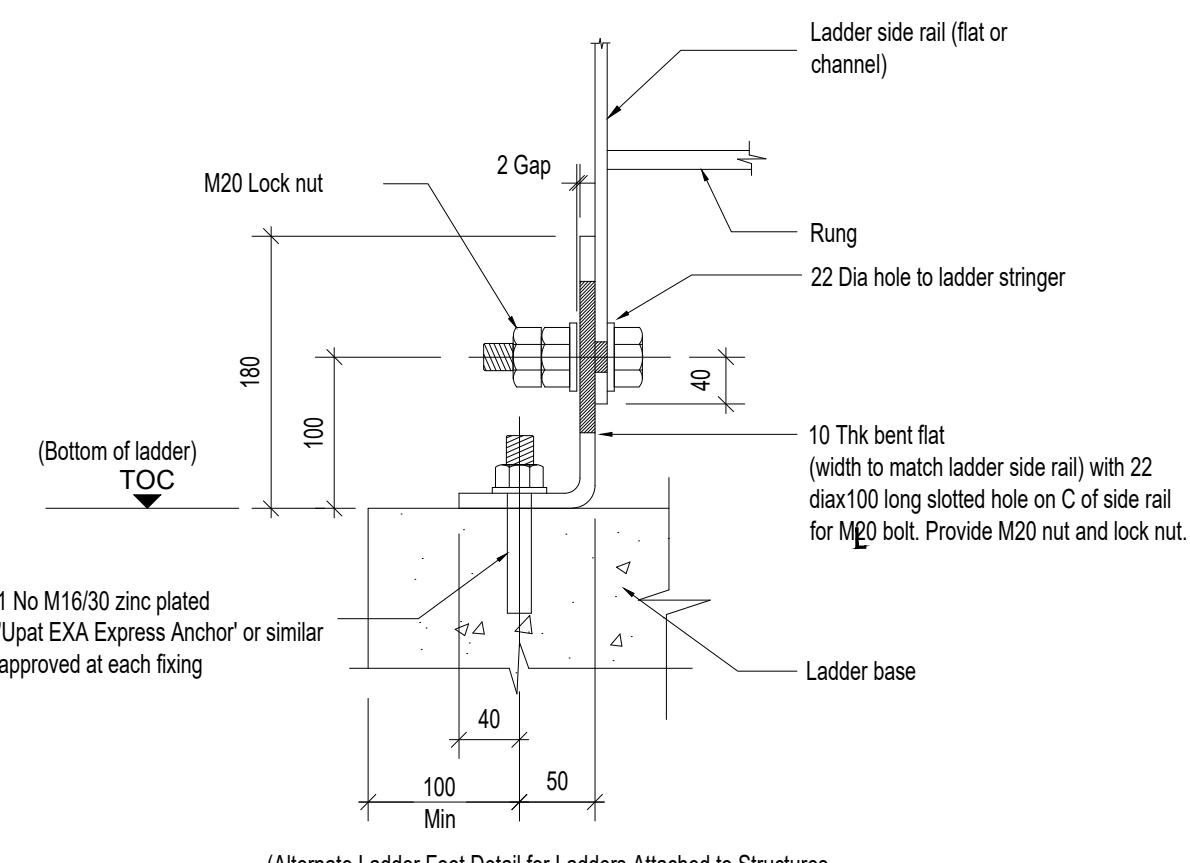
Detail 1
Scale 1:5



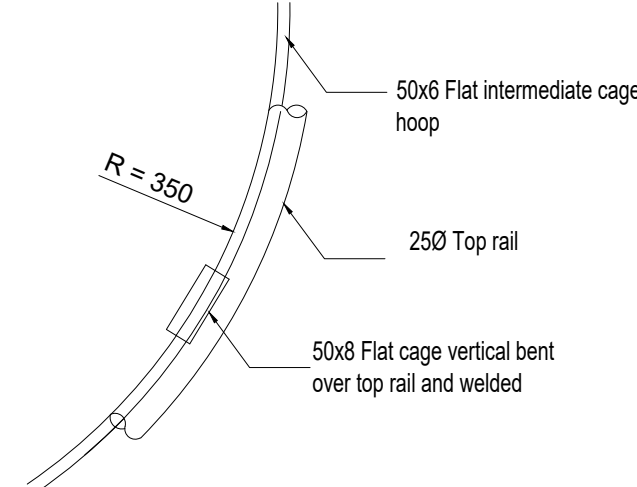
Detail 2
(At ladder flat side rail)
Scale 1:2



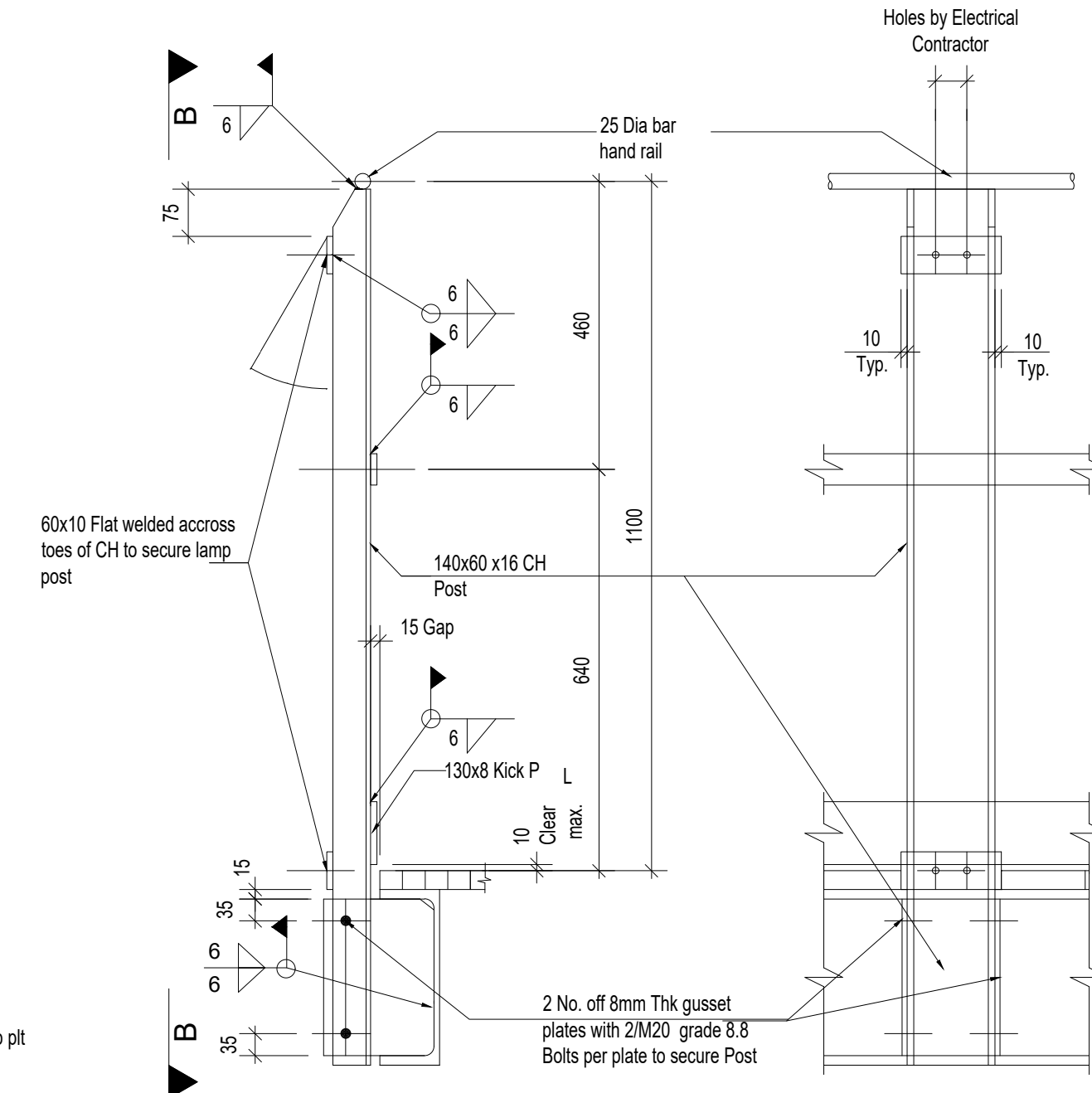
Detail 2
(At ladder channel side rail)
Scale 1:2



Detail 1
Scale 1:5



Detail 3
Scale 1:5



Light Mast Support Post
Scale 1:10

Elevation B-B

APPROVAL			
DISCIPLINE	NAME	SIGN	DATE
ELECTRICAL			
MECHANICAL	Thershni Pillay		8/11/2024
MC&I			
PROCESS			
CIVIL	Makhado Mulaudzi		11/11/2024
FIRE			

REFERENCES	
DWG NUMBER	DESCRIPTION

REVISIONS		
REV	DATE	DESCRIPTION

PROJECT NAME		
TRANSNET PIPELINES		
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TRACED	CAD	DATE 17-10-2024
CHECKED	MM	APPROVED MM
SCALE		N.T.S.
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