SENTRYLINE - M®
Wire Rope Terminal End

Anchoring cables for Sentryline - M® Wire Rope Barrier System

Updated November 2021

Trusted infrastructure products

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Introduction

The Sentryline - M® Wire Rope Terminal End is used to anchor the high tensioned four-cable Sentryline - M® Wire Rope Barrier System. The terminal end features a unique assembly of trigger post, deflection post and connecting rail (patent pending) for added safety during end-on motor vehicle impact collisions. The Sentryline - M® Wire Rope Terminal End can be installed with either a piled or concrete block footing to suit ground conditions on site and the installers preferences.

The Sentryline - M® Wire Rope Terminal End has been designed and tested to meet the evaluation criteria of MASH 2016 Test Level 3 (TL-3) and can be used to anchor the Sentryline - M® Wire Rope Barrier which is a MASH 2016 TL-3 and TL-4 product.

System Overview

The Sentryline - M® Wire Rope Terminal End is designed and constructed to provide acceptable structural adequacy, minimal occupant risk and a safe trajectory as set forth in the 'Manual for Assessing Safety Hardware (MASH)' 2nd edition MASH 2016 for cable barrier terminal ends.

When impacted with an 1100kg and 2270kg vehicle at speeds of 100kph, due to the partial de-tensioning of the cables, the errant vehicle is prevented from vaulting or rolling which is common in terminal ends where cables remain fully tensioned during impact.

During end-on impacts the trigger post is impacted first, it engages the deflection post through the connecting rail and all cables partly de-tension instantaneously. During reverse angle impacts, the trigger post, deflection post and connecting rail fold sideways, preventing the cables from snagging on the front of the impacting vehicle.

The Length of Need (LoN) of the Sentryline - M® Wire Rope Terminal End is 13.5m downstream from the Deflection Post (DP) in Figure C which is physically at the 5th Transition Line Post (TLP5).

Limitations and Warnings

The Sentryline - M® Wire Rope Terminal End has been rigorously tested and evaluated per the evaluation criteria in the MASH 2016 guidelines for gating cable barrier terminal ends. The impact conditions recommended in MASH 2016 are intended to address typical in-service collisions.

The Sentryline - M® Wire Rope Terminal End allows a safe trajectory for the impacting vehicle under the MASH 2016 impact conditions. It is imperative that the system is installed as per the manufacturers' specification.

Vehicle impacts that vary from the MASH 2016 impact conditions described for cable barrier terminal ends, may result in significantly different results than those experienced in testing. Vehicle impact characteristics different than, or in excess of, those encountered in MASH 2016 testing (weight, speed and angle) may result in system performance that may not meet the MASH 2016 evaluation criteria.

The Road Controlling Authority guidelines may in some cases take precedence over the installation details contained in this manual – especially in terms of the positioning of the terminal end and the foundations specification.

Before Installation

Design, selection and placement of the Sentryline - M® Wire Rope Terminal End shall be in accordance with the Road Controlling Authority's guidelines and the details shown in the construction drawings. Installation shall be in accordance with the installation instructions supplied for this product.

NOTE: Concrete foundations will have to be designed by a local geotechnical engineer if soil conditions on site do not meet the required level described in the manual.

Depending on the application and circumstances at the site, installation and assembly of the system should take one person around 30-45 mins once the concrete foundations are poured and set.

The Sentryline - M® Wire Rope Terminal End is a highly engineered safety device made up of a relatively small number of parts. Before starting installation ensure that one is familiar with the makeup of the terminal end.

Safety statements

General Safety

- All required traffic safety precautions should be complied with. All workers should wear required safety clothing. (Examples, and not limited to, include: high visibility vests, steel capped footwear, gloves etc.)
- Only authorised trained personnel should operate any machinery. Where overhead machinery is used, care must be taken to avoid any overhead hazards.
- Before drilling or excavation always ensure that the area is clear of underground services. (The appropriate service providers may need to be contacted).

Sentry Barrier - M Safety Statements

- All installers must be well clear of drilling or excavating machinery operating.
- The components are not heavy enough to require specialised lifting equipment, but due to the dimensions and bulky nature, care should be taken when lifting the larger components into position. If the ground strut and rebar cage assembly is assembled prior to installation, suitable lifting equipment will be required.
- Avoid placing hands or fingers in and around moving machine parts when components are being lifted and manoeuvred into place.

Geotechnical Warning

The Sentryline - M® Wire Rope Terminal End concrete foundations require sufficient strength from the supporting soil and guidelines contained within this manual on foundation sizes relate specifically to the corresponding soil strength. If it is determined that soil conditions on site do not meet or exceed these requirements, alternative size foundations must be designed by a local geotechnical engineer for use at that location.

Limited Warranty

CSP Pacific (CSP) has tested the impact performance of its barrier systems and crash cushion systems, and other highway safety hardware under controlled conditions, however, CSP does not represent nor warrant that the results of those controlled conditions would necessarily avoid injury to persons or property.

TO THE MAXIMUM EXTENT PERMITTED BY LAW, CSP EXPRESSLY DISCLAIMS ANY WARRANTY OR LIABILITY FOR CLAIMS ARISING BY REASONS OF DEATH OR PERSONAL INJURY OR DAMAGE TO PROPERTY RESULTING FROM ANY IMPACT, COLLISION OR HARMFUL CONTACT WITH THE PRODUCTS OR NEARBY HAZARDS OR OBJECTS BY ANY VEHICLE, OBJECTS OR PERSONS.

CSP warrants that any product or component part manufactured by CSP will be free from defects in material or workmanship. CSP will replace free of cost any product or component part manufactured by CSP that contains such a defect.

TO THE MAXIMUM EXTENT PERMITTED BY LAW, CSP EXPRESSLY DISCLAIMS THE FOREGOING WARRANTY IS IN LIEU OF AND EXCLUDES ALL OTHER WARRANTIES NOT EXPRESSLY SET FORTH HEREIN, WHETHER EXPRESS OR IMPLIED BY OPERATION OF LAW OR OTHERWISE, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. CSP'S LIABILITY UNDER THIS WARRANTY IS EXPRESSLY LIMITED TO REPLACEMENT FREE OF COST OF PARTS SUPPLIED BY CSP ONLY (IN THE FORM AND UNDER THE TERMS ORIGINALLY SHIPPED), OR TO REPAIR OR TO MANUFACTURE BY CSP, PRODUCTS OR PARTS NOT COMPLYING WITH CSP SPECIFICATIONS, OR, AT CSP'S ELECTION, TO THE REPAYMENT OF AN AMOUNT EQUAL TO THE PURCHASE PRICE OF SUCH PRODUCTS OR PARTS, WHETHER SUCH CLAIMS ARE FOR BREACH OF WARRANTY OR NEGLIGENCE. CSP SHALL NOT BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL OR SPECIAL LOSSES, DAMAGES OR EXPENSES OF ANY KIND, INCLUDING, WITHOUT LIMITATION, ANY SUCH LOSSES, DAMAGES OR EXPENSES ARISING DIRECTLY OR INDIRECTLY FROM THE SALE, HANDLING OR USE OF THE PRODUCTS FROM ANY OTHER CAUSE RELATING THERETO, OR FROM PERSONAL INJURY OR LOSS OF PROFIT.

Any claim by the Buyer with reference to Products sold hereunder for any cause shall be deemed waived by the Buyer unless CSP is notified in writing, in the case of defects apparent on visual inspection, within ninety (90) days from the delivery date, or, in the case of defects not apparent on visual inspection, within twelve (12) months from the said delivery date. Products claimed to be defective may be returned prepaid to CSP's plant for inspection in accordance with return shipping instructions that CSP shall furnish to the Buyer forthwith upon receipt of the Buyer's notice of claim. If the claim is established, CSP will reimburse that Buyer for all carriage costs incurred hereunder.

The forgoing warranty benefits shall not apply to (i) any Products that have been subject to improper storage, accident, misuse or unauthorised alterations, or that have not been installed, operated and maintained in accordance with approved procedures and (ii) any components manufactured by the Buyer.

The customer acknowledges that it has acquired the Goods for the purposes of a business and that the Consumer Guarantees Act 1993 will not apply to the supply of the Goods by CSP Pacific to it.

Design Considerations

Kerbs

As with all road side safety hardware, the Sentryline - M® Wire Rope Terminal End has been designed and tested so that the centre of gravity of the impacting vehicle is at a constant height in relation to the system. For this reason, it is preferred that kerbs or channels are not in front or behind the terminal end as they will result in altering the height of the vehicle at impact. If there is no option but to install near a kerb, advice should be followed from the Road Controlling Authority's guidelines.

Undulating Ground Conditions

Site specific grading may be necessary to ensure that there are no 'humps' or 'hollows' that may significantly alter the impacting vehicles stability or substantially alter the cable heights in relation to the ground. The Ground Base Frame is required to lay flush with the foundation piles and must not protrude more than 100mm from ground level, when measured using a 1500mm cord pulled along the centreline of the anchor assembly.

Flare Rate

The preference is to not flare the system. If this is unavoidable then the maximum flare rate should be 30:1 over the entire length of the terminal end.

Clearzone

The Sentryline - M® Wire Rope Terminal End is a gating, non-energy absorbing terminal end and therefore requires a clearzone directly behind as recommended by Road Controlling Authority guidelines. The minimum size of the clearzone should be an area 22.5m long by 6m wide, reasonably traversable and free from fixed object hazards. (See drawing in Appendix on Page 35).

Tension

The Sentryline - M® Wire Rope Terminal End is designed to anchor to the 4 of the high tensioned cable barriers. Please refer to the relevant literature for instructions on how to tension the barrier that is being installed.

NOTE: Do NOT tension a barrier for 7 days after the foundation piles have been cast.

Line Posts

The 8 Transition Line Posts (TLP1, TLP2, TLP3, TLP4, TLP5 and 3 x TLP6 in Figure C) that make up the remainder of the Sentryline - M® Wire Rope Terminal End are to be installed as per the instructions in the Sentryline - M® Wire Rope Barrier installation manual. The first TLP1 is to be installed 1.5m away from the deflection post, the remaining TLP are to be installed at 3m centres.

System Design

Foundation Options

Sentryline - M® Wire Rope Terminal End anchors the barrier cables relying on the interaction of the concrete foundation and the surrounding soil conditions on site. Soil conditions have various characteristics that may affect the strength of the concrete foundations.

IF SOIL CONDITIONS ON SITE DO NOT MEET OR EXCEED THE REQUIRED STRENGTH DETAILED IN THIS MANUAL, SITE SPECIFIC FOUNDATIONS MUST BE DESIGNED BY A GEOTECHNICAL ENGINEER.

NOTE: Additional technical information required to assist in designing a site-specific foundation is available from CSP®.

The Sentryline - M® Wire Rope Terminal End has two approved concrete foundation systems – drilled piles and excavated concrete block footings. Both foundation options have been designed for the ground conditions that meet AASHTO standard specifications M 147: grading A or B.

The Sentryline - M® Wire Rope Terminal End is delivered with 12 x 2.0m long M20 threaded bars which are installed and arranged differently depending on whether a piled or concrete block foundation is used – see drawings in Appendix on Page 25 and 26. For the concrete block foundation 6 x threaded rods need to be cut in half with a disc grinder.

Terminal End Foundation Options

Piled Foundation (Figure A)	Concrete Block Foundation (Figure B)	Concrete Block Foundation (Appendix Page 28)	Concrete Block Foundation (Appendix Page 29)
3 x 500mm ø x 2500mm	2.3m L x 1.5m W x 1.0m D	3.4m L x 1m W x 1m D	3.4m L x 1.5m W x 0.74m D

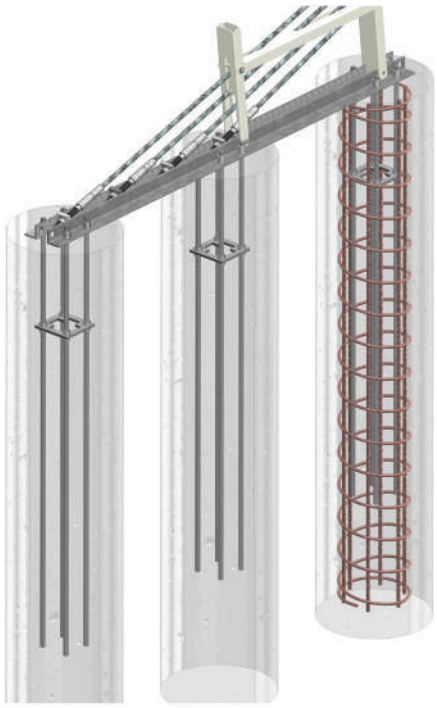


Figure A

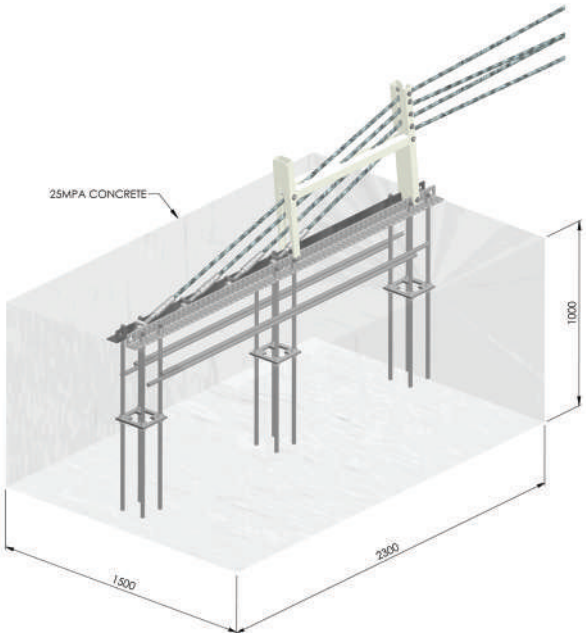


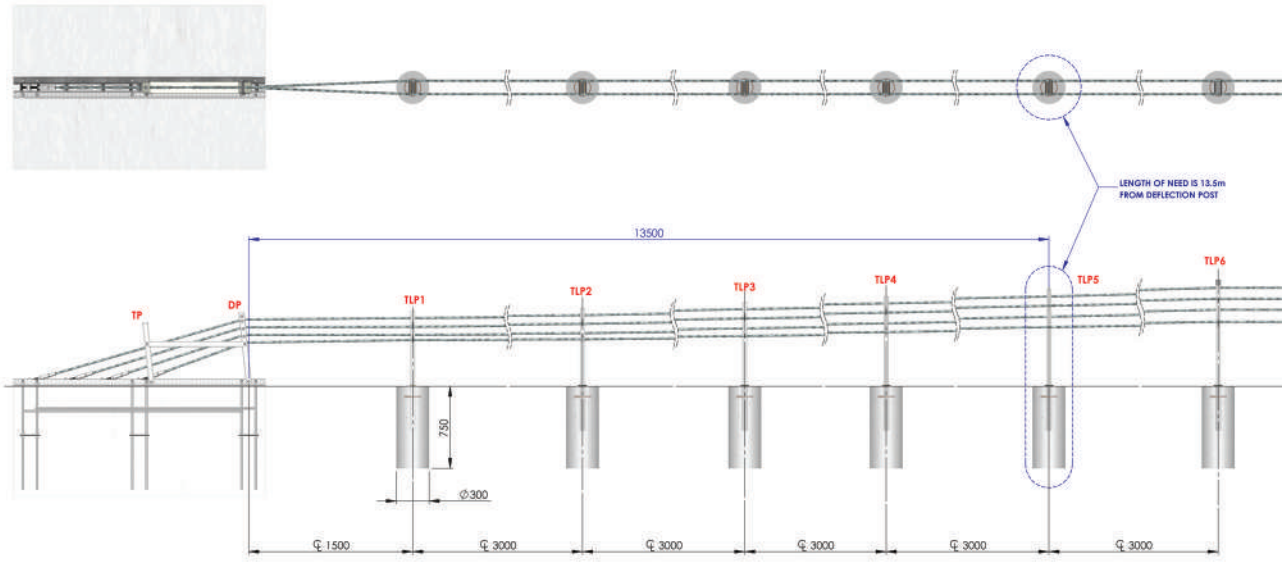
Figure B

Length of Need (LoN)

The Length of Need (LoN) for the Sentryline - M® Wire Rope Barrier connected to a Sentryline - M® Wire Rope Terminal End is the length of the barrier designed to contain and re-direct errant vehicles. The LoN distance from the cable anchorage is determined by the point at which the barrier has re-directed the 2270kg vehicle impacting at 100kph and 25 degree angle (MASH test 3-35).

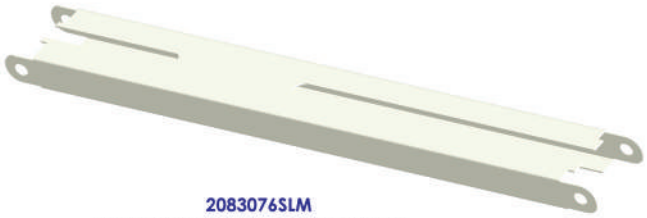
The LoN of the Sentryline - M® Wire Rope Terminal End is 13.5m downstream from the Deflection Post (DP) which is physically at TLP5, see figure C.

NOTE: As per the LoN design section of the Road Controlling Authority's guidelines, care must be taken when calculating the actual length of the barrier required versus the theoretical length of the LoN.



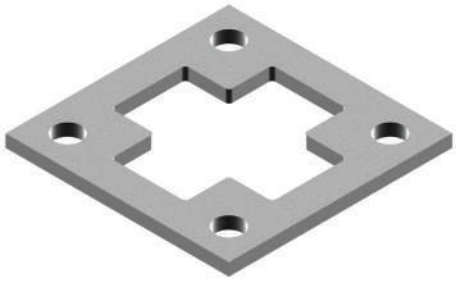
Parts Identification

2083032SLM x 1
SL WIRE ROPE STE GROUND BASE FRAME 2300mm GALV



2083076SLM
SL WIRE ROPE STE STRUT 107x50x2.5t
940mm WHITE x 1

2083133SLM x 1
SL WIRE ROPE STE TRIGGER
POST 570mm WHITE
DP



2110839SLM x 3
SL WIRE ROPE STE HDA BASEPLATE
180x180x10 4M20 130C.R.S

2083077SLM x 1
SL WIRE ROPE STE DEFLECTION POST
660mm WHITE
TP

2081131 x 2
BNW ENG BOLT & 1/2NUT M16x120
GALV 8.8

2081130A x 6
BNW ENG BOLT & 1/2NUT M16x110
GALV 8.8

2110230H x 12
BNW FULLY THREADED ROD M20x2000L GALV

Parts Identification (cont.)

2083075SLM x 4
SL WIRE ROPE SWAGE FITTING M24

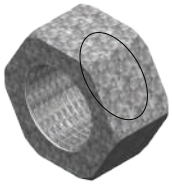
2083072SLM x 3
SL WIRE ROPE LINEPOST CAP

2083086 x 8
SL WIRE ROPE REBAR RING SMOOTH

2083131SLM-A x 3
SL WIRE ROPE LINEPOST 1370mm WHITE - 4 SLOTS
TLP6

2110839 x 4
BNW WASHER ROUND M24x50x3 GALV

2083070SLM x 8
SL WIRE ROPE POST SOCKET



2110162 x 4
BNW ENG NUT M24 GALV 4.6

2110162SLM x 28
SL WIRE ROPE HALF TIE 8mm ALUMINIUM

2110161 x 48
BNW ENG NUT M20 GALV 4.6

2083073SLM x 8
SL WIRE ROPE LINEPOST O-RING 5mm

Parts Identification (cont.)

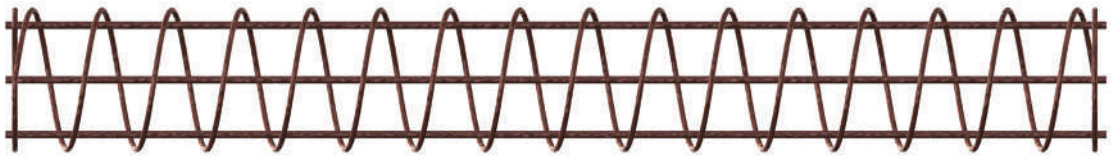
2083078SLM x 1
SL WIRE ROPE STE TRANSITION
POST 1 1086mm WHITE
TLP1

2083079SLM x 1
SL WIRE ROPE STE TRANSITION
POST 2 1112mm WHITE
TLP2

2083080SLM x 1
SL WIRE ROPE STE TRANSITION
POST 3 1167mm WHITE
TLP3

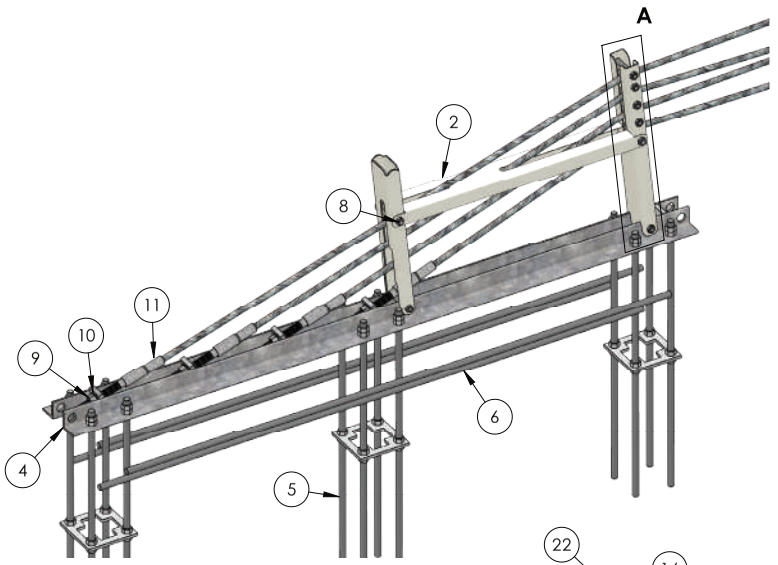
2080223SLM x 1
SL WIRE ROPE STE TRANSITION
POST 4 1220mm WHITE
TLP4

2083130SLM x 1
SL WIRE ROPE STE TRANSITION
POST 5 1283mm WHITE
TLP5

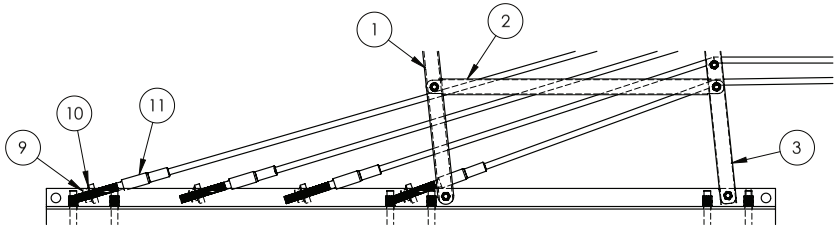


2083071CSLM x 1
SL WIRE ROPE REINFORCING CAGE 2325L
RQEUIRED FOR PILE FOUNDATION ONLY

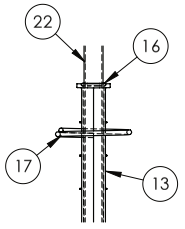
ITEM NO.	PART NO.	DESCRIPTION	QTY.	WEIGHT EA.	DWG NO.
1	2083133SLM	SL WIRE ROPE STE TRIGGER POST 570mm WHITE	1	3.46	FX750-4
2	2083076SLM	SL WIRE ROPE STE STRUT 107x50x2.5t 940mm WHITE	1	3.95	FX750-5
3	2083077SLM	SL WIRE ROPE STE DEFLECTION POST 660mm WHITE	1	2.68	FX750-3
4	2083032SLM	SL WIRE ROPE STE GROUND BASE FRAME 2300mm GALV	1	36.77	FX750, FX750-1
5	2083071SLM	SL WIRE ROPE STE HOLD DOWN ASSEMBLY 4M20x1000L 130CRS	3	13.25	FX751
6	2110230H	BNW FULLY THREADED ROD M20x2000L GALV	6	5	
7	2081130A	BNW ENG BOLT & 1/2NUT M16x110 GALV 8.8	6	0.21	
8	2081131	BNW ENG BOLT & 1/2NUT M16x120 GALV 8.8	2	0.23	
9	2110162	BNW ENG NUT M24 GALV 4.6	4	0.11	
10	2110839	BNW WASHER ROUND M24x50x3 GALV	4	0.03	
11	2083075SLM	SL WIRE ROPE SWAGE FITTING M24	4	1.54	
12	2200036	SL WIRE ROPE 19mm DIA	AS REQUIRED		
13	2083070SLM	SL WIRE ROPE POST SOCKET	8	0.41	FX747-4
14	2083078SLM	SL WIRE ROPE STE TRANSITION POST 1 1086mm WHITE	1	6	FX749-1
15	2110162SLM	SL WIRE ROPE HALF TIE 8mm ALUMINIUM	28	0.04	FX747-2
16	2083073SLM	SL WIRE ROPE LINEPOST O-RING 5.33mm	8	0.01	FX747-5
17	2083086	SL WIRE ROPE REBAR RING SMOOTH	8	0.34	
18	2083079SLM	SL WIRE ROPE STE TRANSITION POST 2 1112mm WHITE	1	6	FX749-2
19	2083080SLM	SL WIRE ROPE STE TRANSITION POST 3 1167mm WHITE	1	6	FX749-3
20	2080223SLM	SL WIRE ROPE STE TRANSITION POST 4 1220mm WHITE	1	6	FX749-4
21	2083130SLM	SL WIRE ROPE STE TRANSITION POST 5 1283mm WHITE	1	7	FX749-5
22	2083131SLM-A	SL WIRE ROPE LINEPOST 1370mm WHITE - 4 SLOTS	3	7	FX747A-1
23	2083072SLM	SL WIRE ROPE LINEPOST CAP	3	0.05	FX747-3



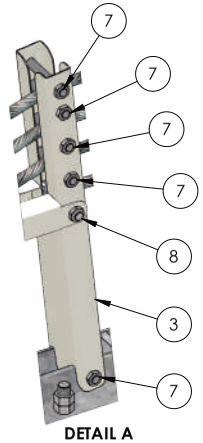
ISO VIEW
SCALE 1:20



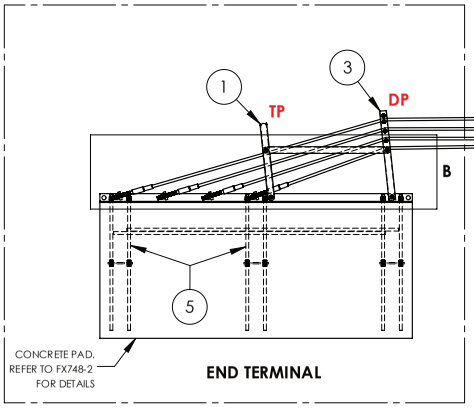
DETAIL B
SCALE 1 : 15



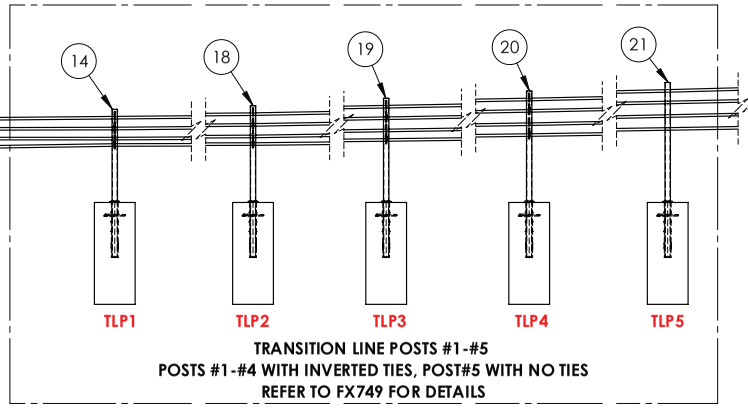
DETAIL C
SCALE 1 : 10



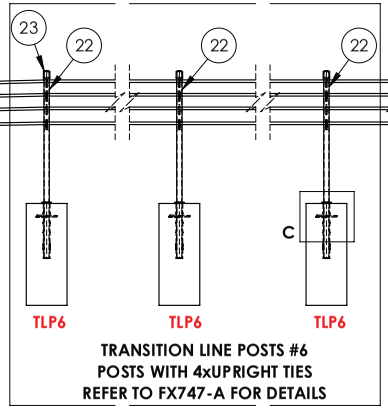
DETAIL A
SCALE 1 : 8



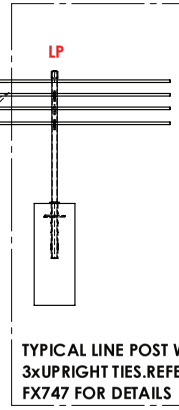
END TERMINAL



TRANSITION LINE POSTS #1-#5
POSTS #1-#4 WITH INVERTED TIES, POST#5 WITH NO TIES
REFER TO FX749 FOR DETAILS



TRANSITION LINE POSTS #6
POSTS WITH 4xUPRIGHT TIES
REFER TO FX747-A FOR DETAILS



TYPICAL LINE POST WITH
3xUPRIGHT TIES.REFER TO
FX747 FOR DETAILS

NOTES:

REVISION	REV.DATE	CHANGES MADE

CSP PACIFIC
304 Neilson Street
Onehunga, Auckland
P O Box 12949, Penrose
Auckland, New Zealand
Telephone: 09 634 1239
Facsimile: 09 634 4525

SCALE A3	1:35
ASSEMBLY NO.	2083091SLM
WEIGHT(Kg)	
DESCRIPTION	SL WIRE ROPE TERMINAL END UNIT WHITE - CONCRETE BLOCK OPTION BILL OF MATERIALS
DRAWN	S KERAI
DRW NO.	FX748-1
DATE	29/05/2020
DESTROY ALL PREVIOUS ISSUES	0 REVISION

Installation Preparation

Getting Started

The Sentryline - M® Wire Rope Terminal End is a cable barrier terminal end designed to anchor four cables of the Sentryline - M® Wire Rope Barrier. For all installations, whether median or edge of road locations, the installation should start with setting out the position of the foundation. The Sentryline - M® Wire Rope Terminal End must be correctly located in relation to both the Sentryline - M® Wire Rope Barrier it is anchoring and the roadway.

Preparation

Before installing a Sentryline - M® Wire Rope Terminal End, ensure that all components required for the system are on site and have been identified. The Sentryline - M® Wire Rope Terminal End is a highly engineered safety device made up of relatively small number of parts. Before starting installation ensure that one is familiar with the make-up of the system. Refer to the Bill of Materials and Parts Identification sections in this manual for more information.

Ensure that the area where the Sentryline - M® Wire Rope Terminal End is to be installed is flat enough so that the Ground Base Frame will not protrude more than 100mm from ground level, when measured using a 1500mm cord pulled along the centreline of the anchor assembly.

Minor site grading may be required.

Soil Conditions

The Sentryline - M® Wire Rope Terminal End foundation piles have been designed to withstand a constant static load and dynamic impact load that can be exerted on it from the tensioned barrier cables. It is extremely important that the Sentryline - M® Wire Rope Terminal End has the required strength to anchor the cable barrier.

It is recommended that soil tests are carried out at the location the Sentryline - M® Wire Rope Terminal End is to be installed.

IF SOIL CONDITIONS ON SITE DO NOT MEET OR EXCEED THE REQUIRED STRENGTH DETAILED IN THIS MANUAL, SITE SPECIFIC FOUNDATIONS MUST BE DESIGNED BY A LOCAL GEOTECHNICAL ENGINEER.

Tools Required

The following tools will be required to complete a typical Sentryline - M® Wire Rope Terminal End installation:

- Drilling machinery (piled option) or excavator (concrete block option)
- M16, M20 and M24 open wrenches
- M24 ring spanner
- Measuring tape
- String line
- Concrete trowel or float
- CSP® Swaging tool

Bill of Materials

Item No.	Part No.	Description	Total Qty per	DWG No.
0	2083091SLM	SL Wire Rope Terminal End Unit White	1	FX748
1	2083133SLM	SL Wire Rope Ste Trigger Post 570mm White	1	FX750-4
2	2083076SLM	SL Wire Rope STE Strut 107x50x2.5t 940mm White	1	FX750-5
3	2083077SLM	SL Wire Rope STE Deflection Post 660mm White	1	FX750-3
4	2083032SLM	SL Wire Rope STE Ground Base Frame 2300mm GALV	1	FX750, FX750-1
5	2110839SLM	SL Wire Rope STE HDA Baseplate 180x180x10 4M20 130C.R.S	3	FX751-1
6	2110230H	BNW Fully Threaded Rod M20x2000L GALV	12	
7	2110161	BNW Eng Nut M20 GALV 4.6	48	
8	2081130A	BNW Eng Bolt & 1/2Nut M16x110 GALV 8.8	6	
9	2081131	BNW Eng Bolt & 1/2Nut M16x120 GALV 8.8	2	
10	2110162	BNW Eng Nut M24 GALV 4.6	4	
11	2110839	BNW Washer Round M24x50x3 GALV	4	
12	2083075SLM	SL Wire Rope Swage Fitting M24	4	
13	2200036	SL Wire Rope 19mm Dia	As required	
14	2083070SLM	SL Wire Rope Post Socket	8	FX747-4
15	2083078SLM	SL Wire Rope STE Transition Post 1 1086mm White	1	FX749-1
16	2110162SLM	SL Wire Rope Half Tie 8mm Aluminium	28	FX747-2
17	2083073SLM	SL Wire Rope Linepost O-Ring 5mm	8	FX747-5
18	2083086	SL Wire Rope Rebar Ring Smooth	8	
19	2083079SLM	SL Wire Rope STE Transition Post 2 1112mm White	1	FX479-2
20	2083080SLM	SL Wire Rope STE Transition Post 3 1167mm White	1	FX749-3
21	2080223SLM	SL Wire Rope STE Transition Post 4 1220mm White	1	FX749-4
22	2083130SLM	SL Wire Rope STE Transition Post 5 1283mm White	1	FX749-5
23	2083131SLM-A	SL Wire Rope Linepost 1370mm White - 4 Slots	3	FX747A-1
24	2083072SLM	SL Wire Rope Linepost Cap	3	FX747-3

Installation Instructions

Step 1 – Site Preparation

It is preferred that the Sentryline - M® Wire Rope Terminal End be installed on flat, level ground. The Sentryline - M® Wire Rope Terminal End starts at the last post of the cable barrier and the setup is always the same configuration over the length of the terminal.

The Sentryline - M® Wire Rope Terminal End is a continuation of the cable barrier and should be installed in a tangent position. If this is not possible, a maximum flare rate of 30:1 is accepted.

Step 2 – Installing barrier transition line posts

The 8 Transition Line Posts (TLP1, TLP2, TLP3, TLP4, TLP5 and 3 x TLP6 in Figure G) are to be installed as per the instructions in the Sentryline - M® Wire Rope Barrier installation manual. The TLP1 is to be installed 1.5m away from the Sentryline - M® Wire Rope Terminal End deflection post, the remaining transition line posts are to be installed at 3m centres (see Appendix on page 25).

It is critical that the transition line posts be inserted into sockets in the correct sequence – starting from the Sentryline M® Wire Rope Terminal End: (TLP1, TLP2, TLP3, TLP4, TLP5 and 3 x TLP6 posts).

BEFORE DRILLING OR EXCAVATION ALWAYS ENSURE THAT THE AREA IS CLEAR OF UNDERGROUND SERVICES.

Step 3a - Installing the Ground Base Frame (pile foundation option)

Drill three 450mm diameter, 2.5m deep holes for piles, at the correct location and spaced at 1.0m centres (as shown in Figure D). Install four M20 threaded rods in the boltholes of the HDA baseplate and lock their position with nuts top and bottom. Attach the top end of the rods through the boltholes in the Terminal End Frame angles and lock their position with nuts top and bottom. Lower the cages into drilled holes so that the HDA baseplate is located around 400mm below top of concrete and the Ground Base Frame is not protruding more than 100mm above ground level. Fill the holes with 25MPa concrete ensuring there are no air pockets and the bottom face of the Ground Base Frame is in contact with concrete (as shown in Figure E). Trowel the top surface of concrete so that it gently falls away from the frame.

Figure D

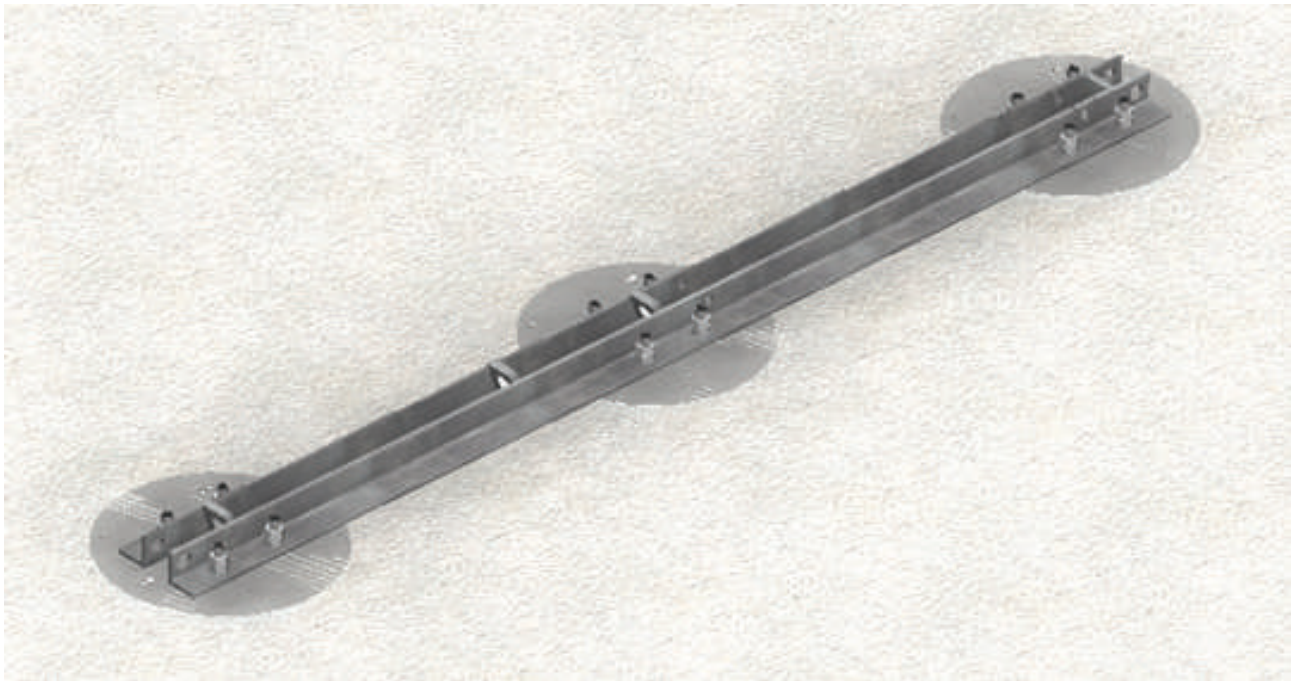


Figure E

Step 3b - Installing the Ground Base Frame (concrete block foundation option)

- Excavate a hole 2.3m long, 1.5m wide and 1.0m deep at the correct location.
- Cut 6 x 2m long M20 threaded rods in half.
- Put the 1m long rods through boltholes of the HDA baseplate (uncut end up) and lock their position with nuts top and bottom.
- Attach the top end of the rods through the boltholes in the Ground Base Frame angles and lock their position with nuts top and bottom.
- Tie 4 x full length rods.
- Thread the remaining two full length rods through 25mm diameter holes at the ends of the Ground Base Frame.
- Place packers on the sides of the hole so that the bottom of the Ground Base Frame is flush with the top of concrete.
- Lower the Ground Base Frame into hole so that the HDA baseplate is located around 400mm below top of concrete and the Ground Base Frame is not protruding more than 100mm above ground level.
- Fill the hole with 25MPa concrete ensuring there are no air pockets and the bottom face of the Ground Base Frame is in contact with concrete (see Figure F).
- Trowel the top surface of concrete so that the it gently falls away from the frame.

The theoretical volume of concrete required to construct the concrete block option of the Sentryline - M® Wire Rope Terminal End footing is 3.45m^3.

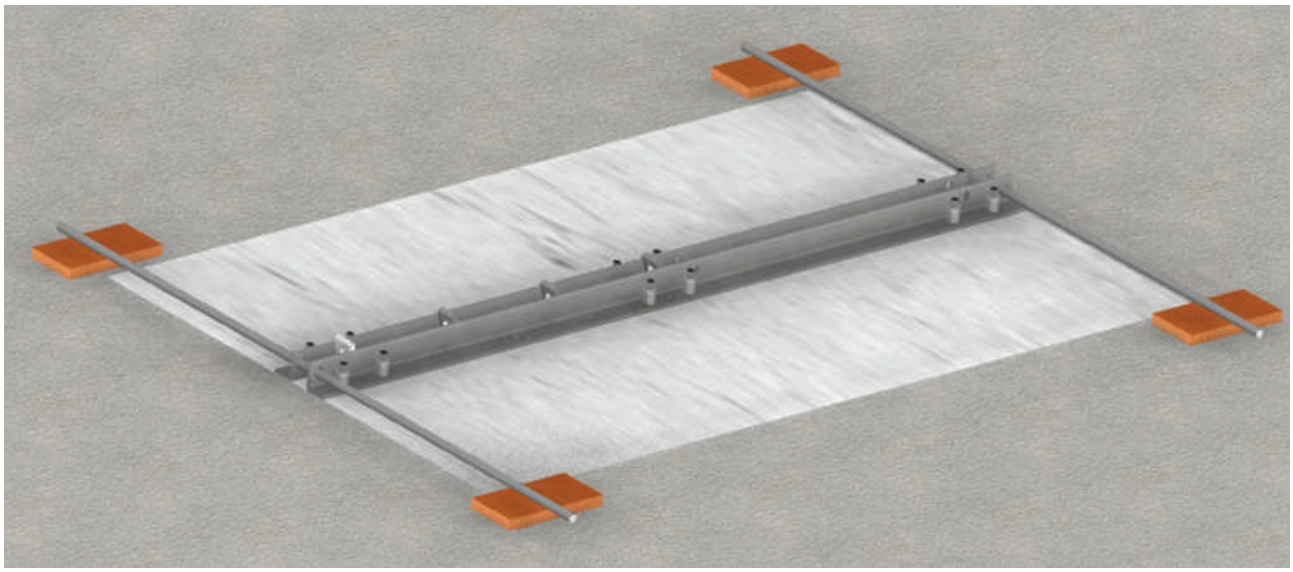


Figure F

Step 4 – Attaching the barrier cables to transition line posts

- Three Transition Line Posts TLP6 have four aluminium Half Ties installed in the side slots in the upright position.
- Transition Line Post TLP5 has no side slots and no Half ties.
- Transition Line Posts TLP1, TLP2, TLP3 and TLP4 have four Half Ties installed in the side slots in the upside-down position.

The barrier cables can be attached to the transition line posts either before or after anchoring the cables to the Ground Base Frame (see figure G). In many cases it will be most convenient to attach the cables to the three Transition Line Posts TP6 before anchoring them and install the half ties on Transition Line Posts TP1, TP2, TP3 and TP4 after the cables have been anchored (see appendix on page 37 for Half Tie Installation procedure).

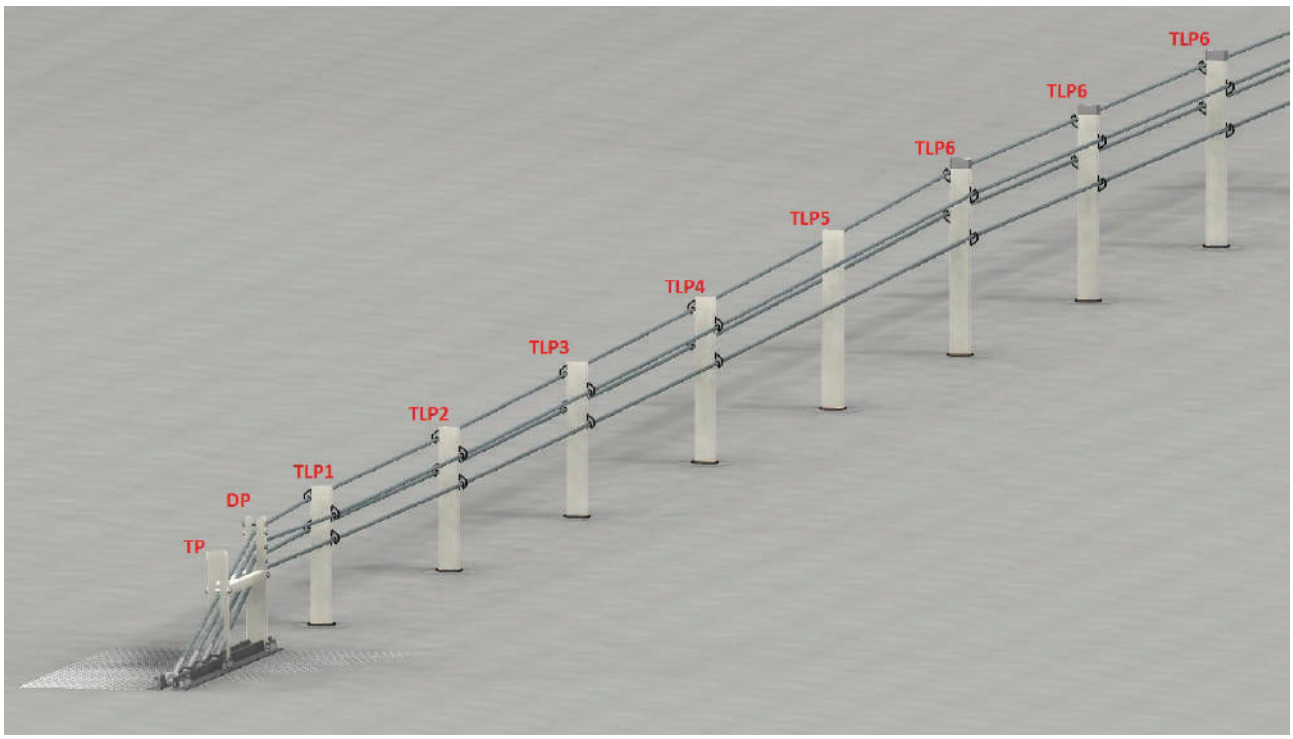


Figure G

Step 5 – Attaching the anchor cables

Cables can be attached with caution when the concrete has sufficiently set to secure the position of the Ground Base Frame. The cables must not be tensioned for at least 7 days after concrete pour. Ensure the swage fittings have been installed as per the Sentryline - M® Wire Rope Barrier installation manual.

Insert the M24 ends of the swage fittings in the holes in the Anchor Blocks welded between the Ground Base Frame angles.

Lock the swage fittings by tightening the M24 nuts – ring spanner may have to be used on the end nut as shown in Figure H.

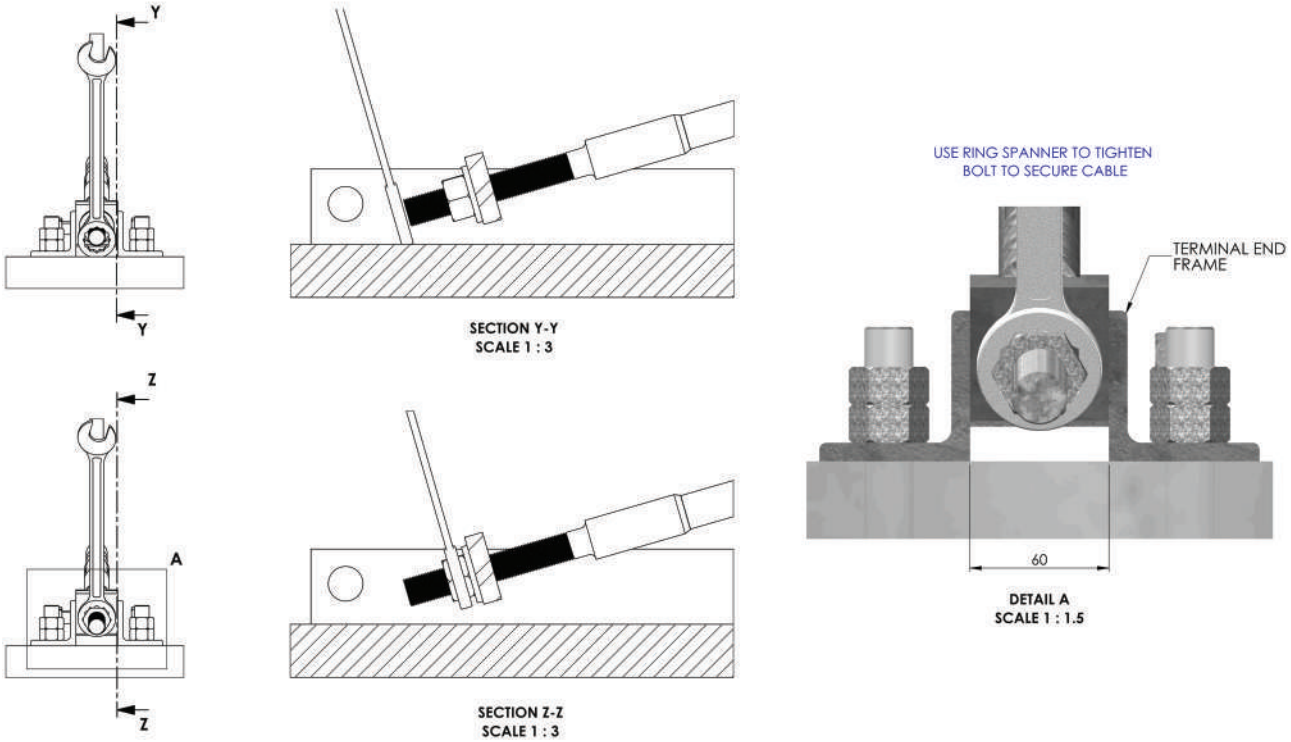


Figure H

Step 6 - Trigger post and deflection post assembly

Attach the trigger post by placing it over the cables and bolting the base to Ground Base Frame with a M16x110mm bolt with half nut supplied in the kit (see Figure I). Then attach the deflection post by sliding it under the cables and bolting the base to Ground Base Frame with a M16x110mm bolt with half nut supplied in the kit as shown in Figure J.

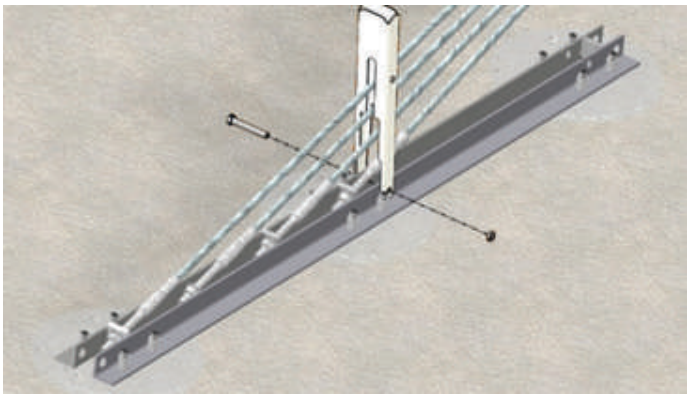


Figure I

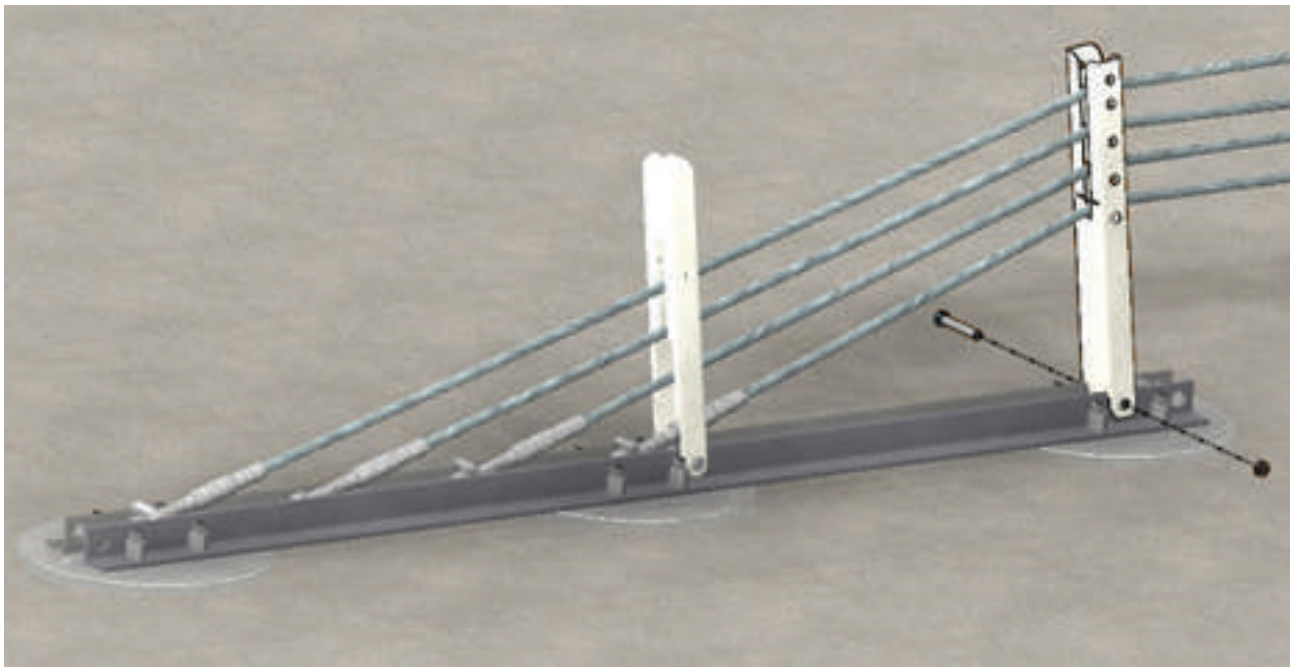


Figure J

Rotate both posts close to vertical position and install the connecting strut by sliding it sideways between cables #3 and #4 and levelling it so that the boltholes at the end of the strut align with the boltholes in the posts.

Attach the strut to posts by bolting with M16x120mm bolts with half nuts supplied in the kit. The bolt on the trigger post should fit above the top cable, the bolt on the deflection post should be under the bottom cable (see Figure L).

Install the three M16x110mm bolts under the top three cables as shown in Figure K. Adjust the position of the assembly so that the posts are leaning back at around 8 degrees (the notches at the bottom of the deflection post bearing on the Ground Base Frame should naturally produce the required lean).

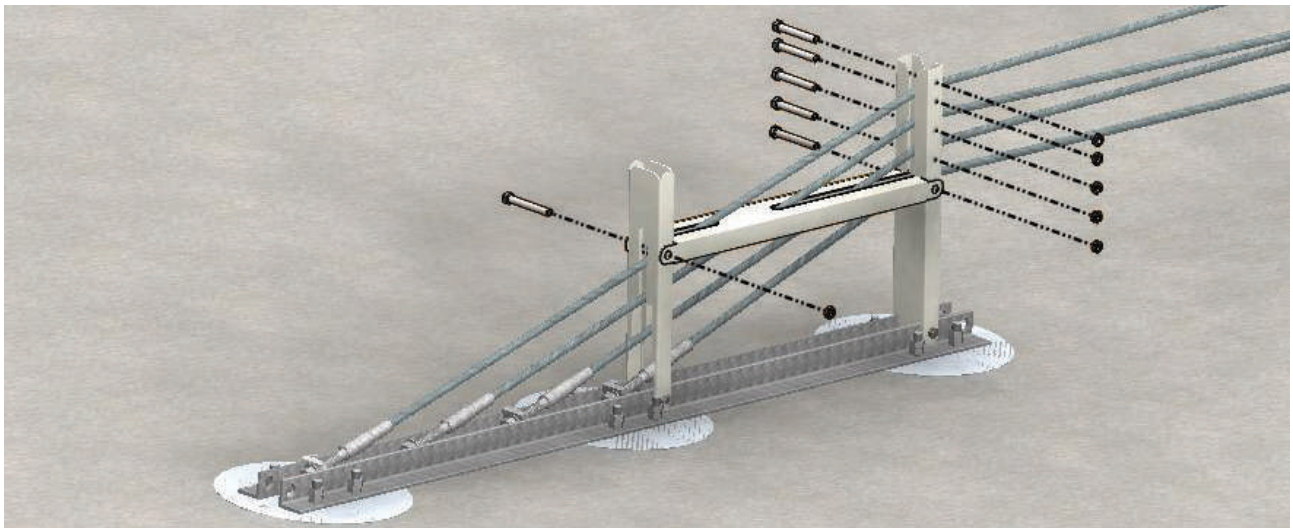


Figure K

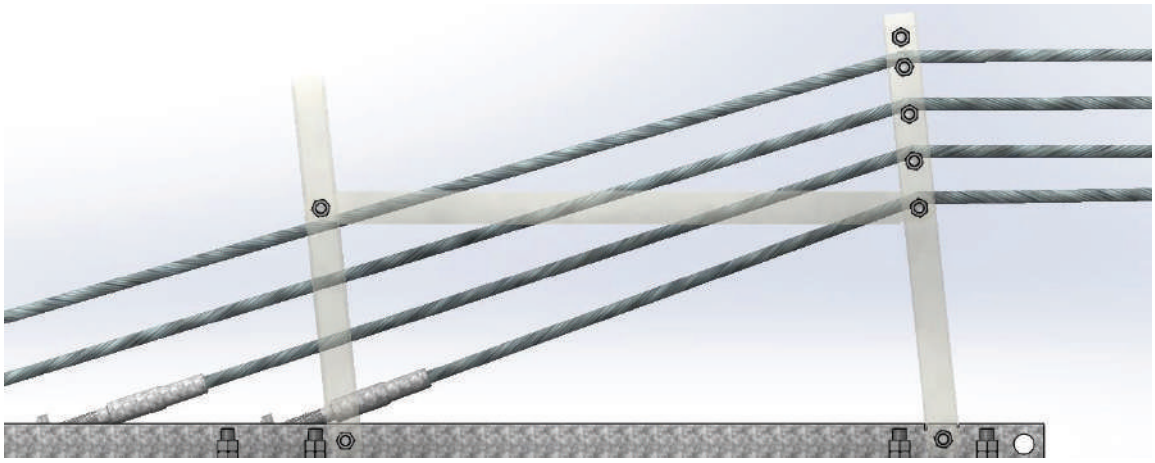


Figure L

Step 7 – Tensioning the cables

Cables must not be tensioned until at least 7 days after the concrete pour. Start by tensioning the bottom cable using the method described in the Sentryline - M® Wire Rope Barrier. installation manual. After the bottom cable has been tensioned re-adjust the position of the trigger post and deflection post assembly so that it leans back at around 8 degrees before tensioning the remaining three cables. The trigger post deflection post assembly may need to be re-adjusted again as the remaining three cables are being tensioned.

Step 8 – Delineation

Delineation may be required as per the Road Controlling Authority guidelines.

For further details including type, location and placement contact the Road Controlling Authority or CSP®.

Installation Checklist

Item	Y	N
Site soil conditions checked and appropriate anchor foundation installed to suit.		
Ground is level and the Ground Base Frame **does not protrude more than 100mm** when measured using a 1500mm cord along its centreline.		
The M20 nuts holding the Ground Base Frame to the foundation are **spanner tight**.		
At least one thread is showing above the nuts holding the Ground Base Frame to the foundation.		
The 3mm thick steel round washer and M24 Nut has been used to fix the anchor cables to the **upstream end** of the Ground Base Frame.		
The elongated slots in the Strut are positioned in the correct orientation. Longer slot is located towards the Deflection post.		
The **anchor cables are firmly held** in the body of the anchor plates on the Ground Base Frame and the M24 nuts at the upstream end of the ground strut are **spanner tight**.		
The plastic socket for Transition Line Posts are cast in correctly and a rebar ring is positioned **100mm down from the top for all Transition Line Posts**.		
All posts are spaced as per the **construction drawings**.		
Posts are installed with **slot orientation** consistent for entire length of the terminal end.		
All Transition Line Posts have been installed in the correct **sequence**.		
An o-ring seal is positioned on all Transition Line Posts at the **top of the socket**.		
TLP6 has a plastic cap inserted in the top.		
Three Transition Line Posts, TLP6 have four aluminium Half Ties installed in the **upright position**, TLP5 has no cables ties, Transition line posts TLP1, TLP2, TLP3 and TLP4 have four Half Ties installed in the side slots in the **upside-down position**.		

Job Number:			
Location:			
Client/Asset Owner:			
Principal Contractor:			
Installer:			
Installed by:		Date:	
Inspected by:		Date:	

Contact CSP Pacific for more information on this or other road safety products.

Frequently Asked Questions

1. What type of equipment is required to install the Sentryline - M® Wire Rope Terminal End?

   Standard tools required include a set of wrenches, measuring tape, string line and trowel. Machinery suitable for drilling or excavating the foundations.

2. How much concrete is required to install the concrete foundations on an S.T.E and what strength does it need to be?

   The theoretical volume of concrete required to construct the piled option of the Sentryline - M® Wire Rope Terminal End footing is 1.47m^3. The theoretical volume of concrete required to construct the concrete block option of the Sentryline - M® Wire Rope Terminal End footing is 3.45m^3. Due to uneven excavation surfaces the actual volume of concrete used to construct the footings may be more than specified above. The concrete used must be 25MPa.
   Note: Other foundation sizes and types might be required due to on site soil conditions. Concrete volume requirements will vary accordingly.

3. Is there a curing period for the concrete before the barrier can be tensioned?

   Yes, do not tension until at least 7 days after the concrete footings have been poured.

4. Does your company provide spare parts? What is the lead-time for supply?

   It is important to fix a damaged cable barrier as soon as possible because it most probably won't perform as required when damaged. For this reason, it is recommended that spares are held by Maintenance Contractors. (The concrete footings and Ground Base Frame are highly unlikely to be damaged).

5. On average, how long does it take to install a Sentryline - M® Wire Rope Terminal End?

   Depending on circumstances at the site, installation and assembly of the system should take one person crew around 30-45mins once the concrete foundations are poured and set.

6. What about vandalism, can the Sentryline - M® Wire Rope Terminal End be easily damaged?

   No, once the system has been tensioned it is an extremely rigid system and tampering without the use of heavy duty tools or machinery is very unlikely to damage or affect the performance of the system.

7. How easily can the Sentryline - M® Wire Rope Terminal End and Sentryline - M® Wire Rope Barrier be restored after impact?

   The system is easily repaired after impact as the foundations and the Ground Base Frame should not be damaged in anyway. Damaged transition posts can be removed using a crow bar and new ones positioned in the sockets before the cables and caps are repositioned. It is recommended that the cable tension is checked after impact. If the system has been de-tensioned due to damage to the trigger post deflection post assembly, a hydraulic tension machine and trained personnel will be required to re-tension the system after the trigger post deflection post assembly is replaced.

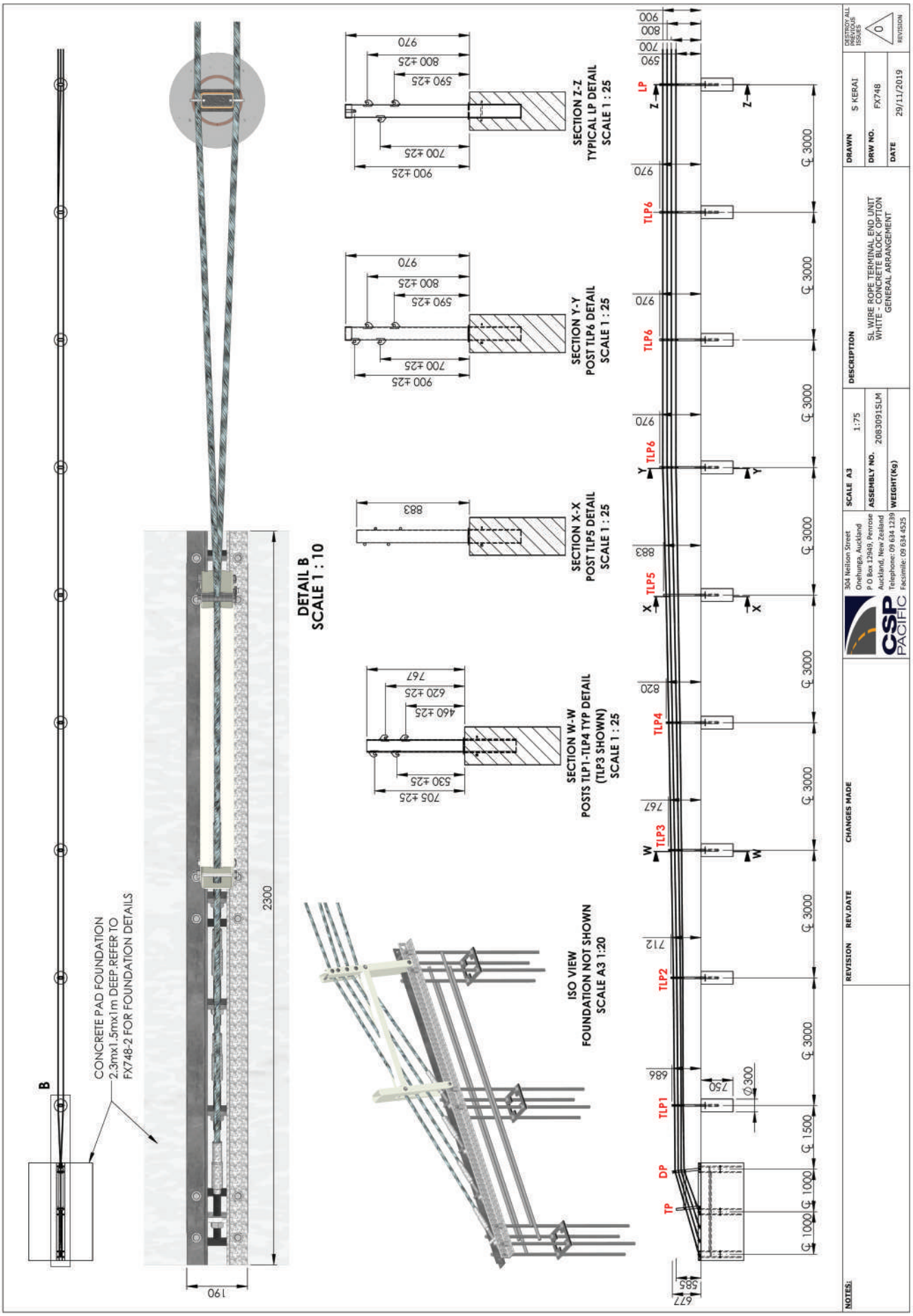
8. What maintenance does the S.T.E require?

   The Sentryline - M® Wire Rope Terminal End terminal end is maintenance free as the anchor cables used are pre-stretched. Refer to the Sentryline - M® Wire Rope Barrier Installation & Product Manual for recommendations on maintenance for the cable barrier itself which includes cable tension checking.

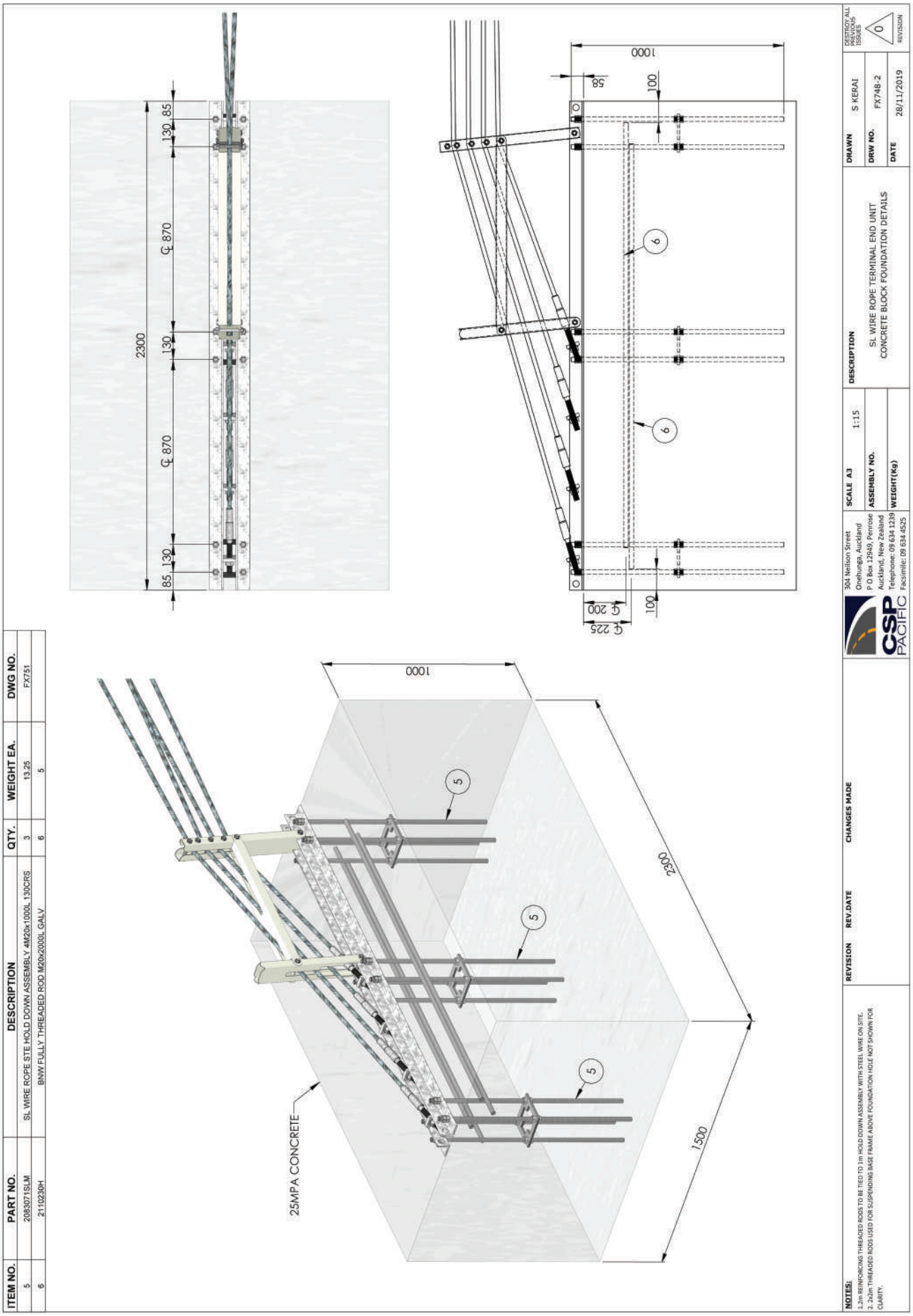
Appendix

Technical Drawings

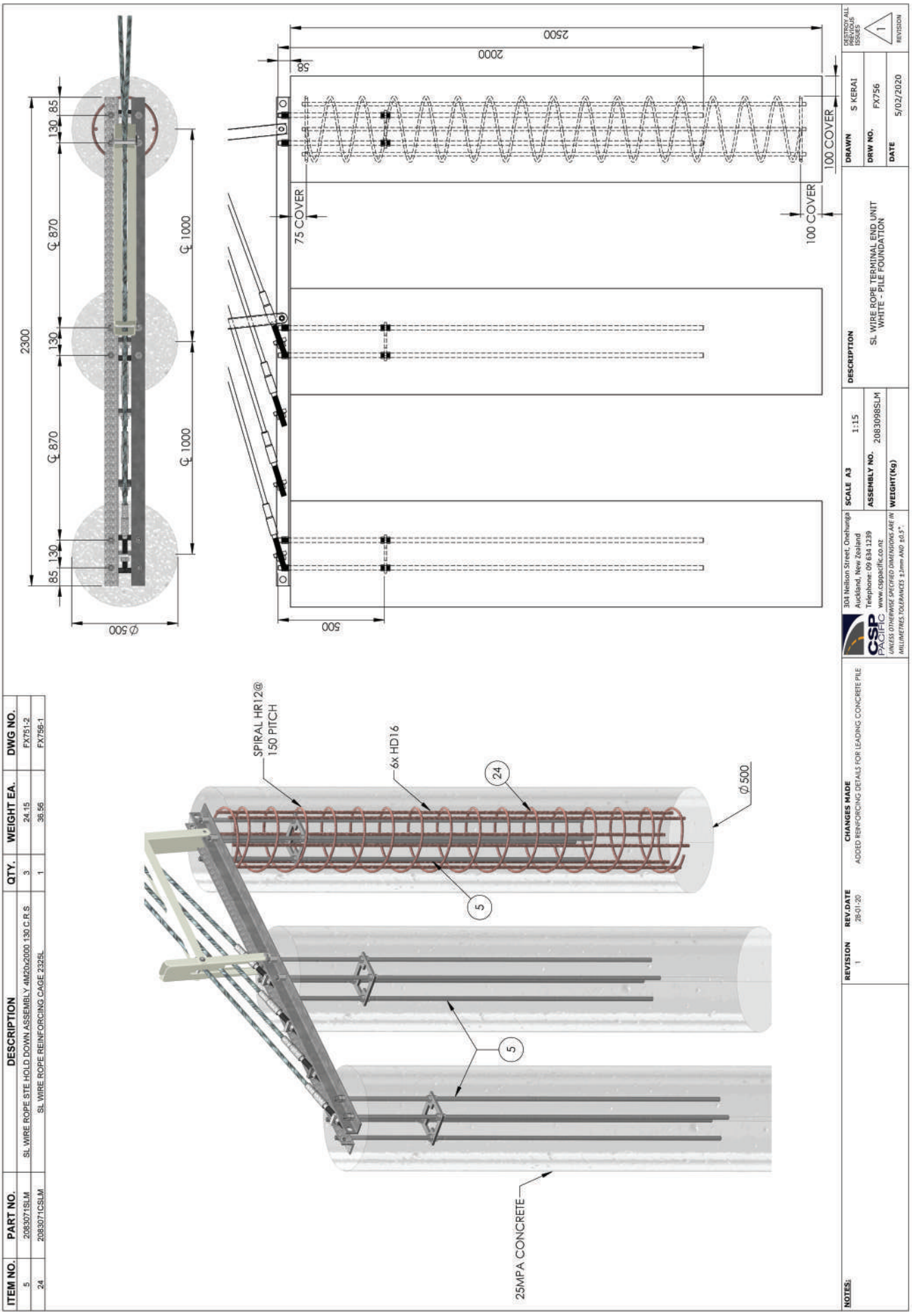
Sentryline - M® Wire Rope Terminal End General Arrangement



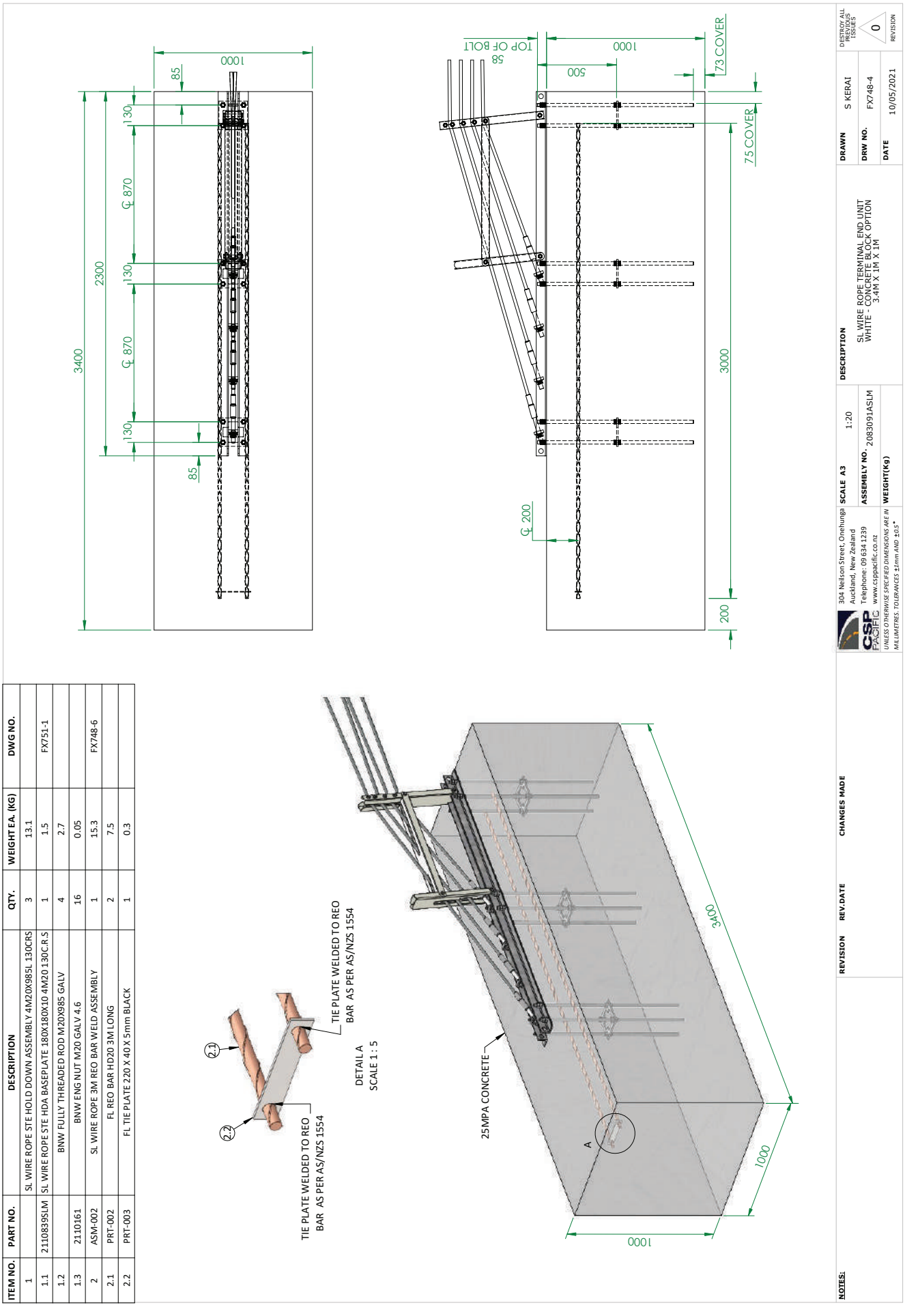
Sentryline - M® Wire Rope Terminal End Concrete Block Foundation Option



Sentryline - M® Wire Rope Terminal End Piled Foundation Option

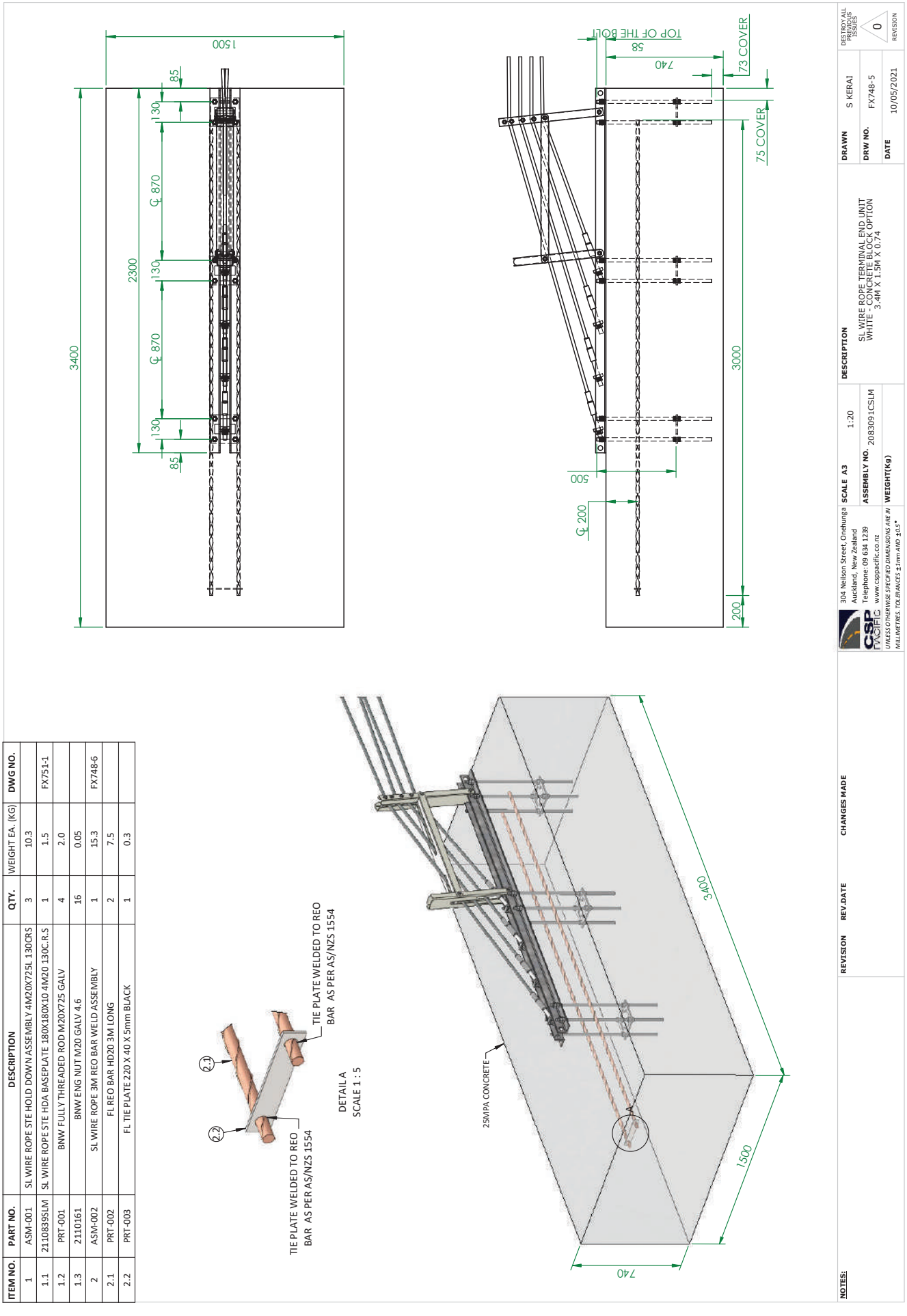


Sentryline - M® Wire Rope Terminal End Concrete Block Foundation Option



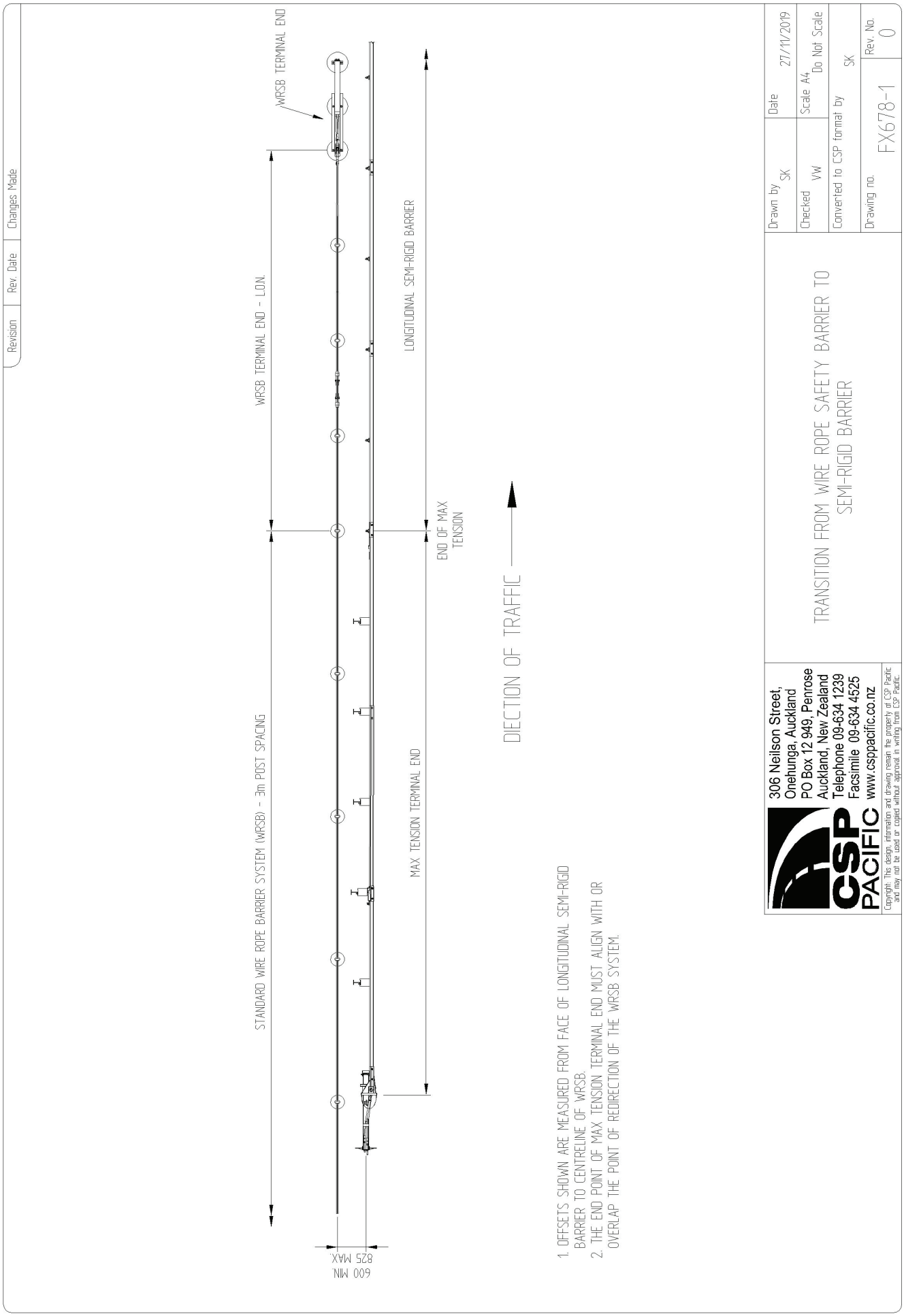
ITEM NO.	PART NO.	DESCRIPTION	QTY.	WEIGHT EA. (KG)	DWG NO.
1		SL WIRE ROPE STE HOLD DOWN ASSEMBLY 4M20X985L 130CRS	3	13.1	
1.1	2110839SLM	SL WIRE ROPE STE HDA BASEPLATE 180X180X10 4M20 130C.R.S	1	1.5	FX751-1
1.2		BNW FULLY THREADED ROD M20X985 GALV	4	2.7	
1.3	2110161	BNW ENG NUT M20 GALV 4.6	16	0.05	
2	ASM-002	SL WIRE ROPE 3M REO BAR WELD ASSEMBLY	1	15.3	FX748-6
2.1	PRT-002	FL REO BAR HD20 3M LONG	2	7.5	
2.2	PRT-003	FL TIE PLATE 220 X 40 X 5mm BLACK	1	0.3	

Sentryline - M® Wire Rope Terminal End Concrete Block Foundation Option

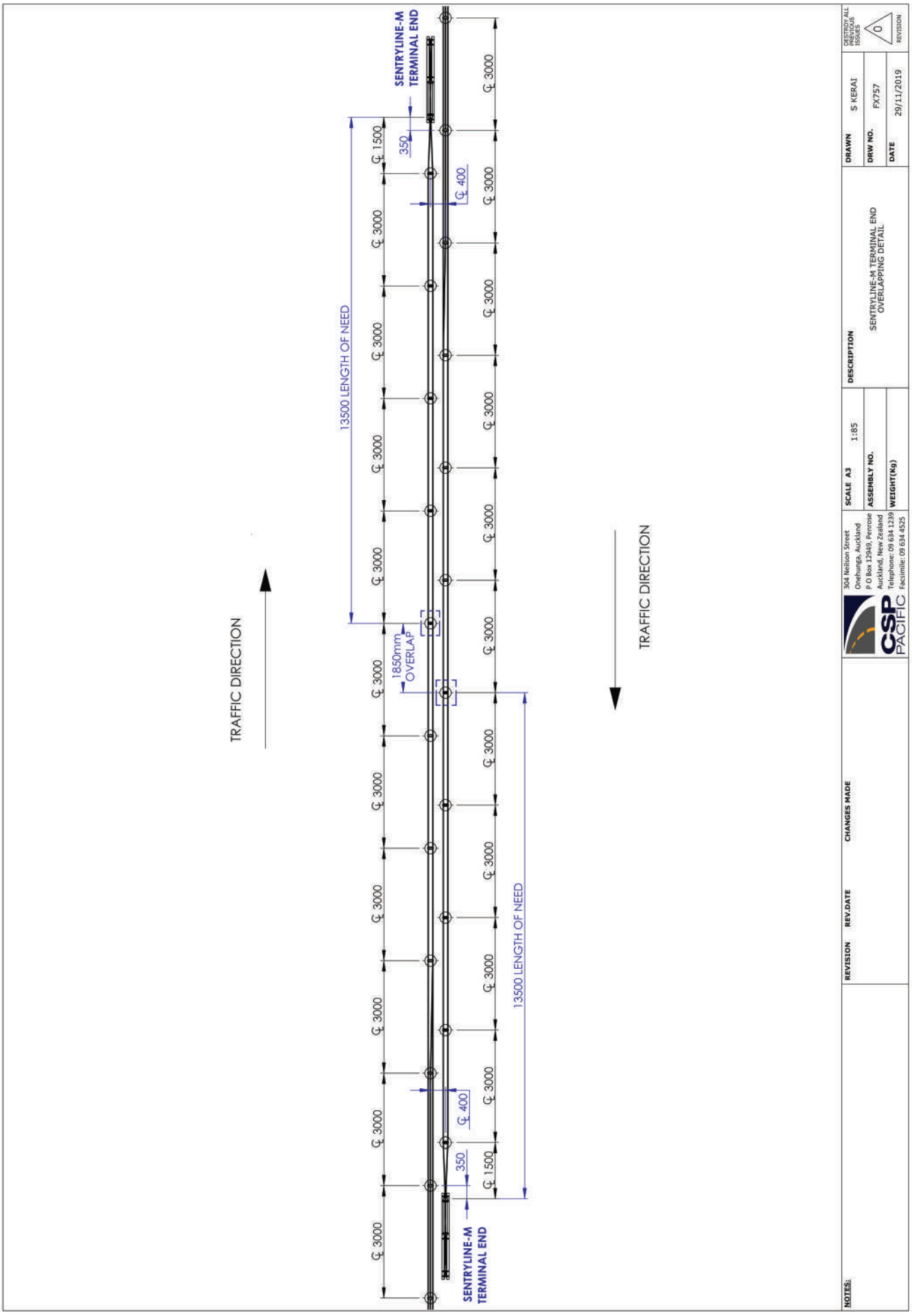


ITEM NO.	PART NO.	DESCRIPTION	QTY.	WEIGHT EA. (KG)	DWG NO.
1	ASM-001	SL WIRE ROPE STE HOLD DOWN ASSEMBLY 4M20X725L 130CRS	3	10.3	
1.1	2110839SLM	SL WIRE ROPE STE HDA BASEPLATE 180X180X10 4M20 130C.R.S	1	1.5	FX751-1
1.2	PRT-001	BNW FULLY THREADED ROD M20X725 GALV	4	2.0	
1.3	2110161	BNW ENG NUT M20 GALV 4.6	16	0.05	
2	ASM-002	SL WIRE ROPE 3M REO BAR WELD ASSEMBLY	1	15.3	FX748-6
2.1	PRT-002	FL REO BAR HD20 3M LONG	2	7.5	
2.2	PRT-003	FL TIE PLATE 220 X 40 X 5mm BLACK	1	0.3	

Sentryline - M® Wire Rope Barrier to Semi-rigid Barrier Transition Detail



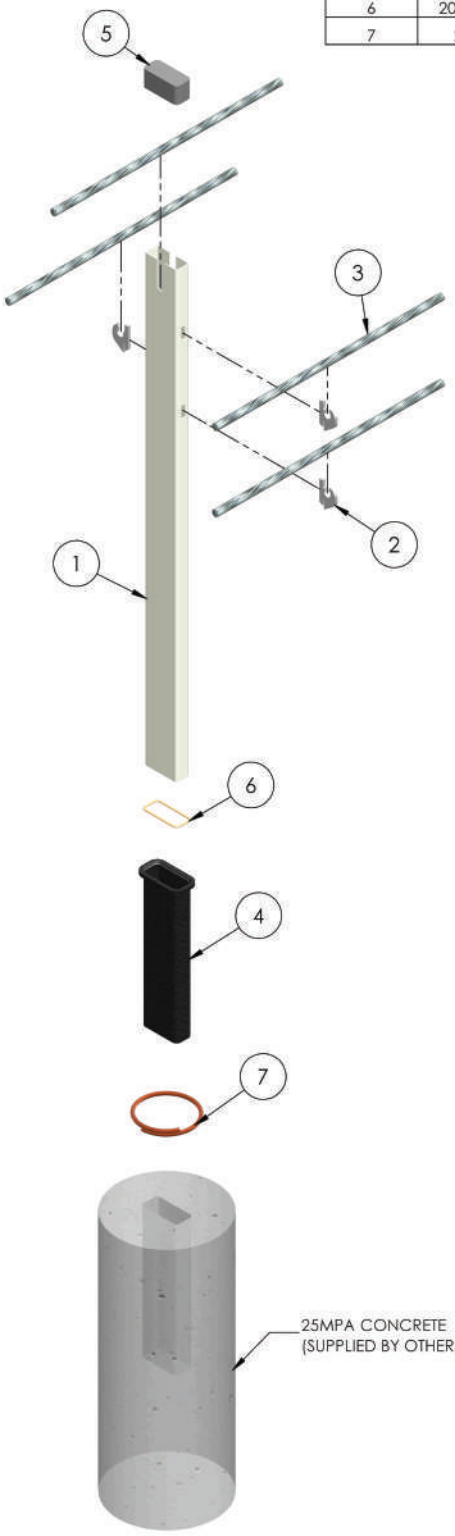
Sentryline - M® Wire Rope Terminal End Overlapping Detail



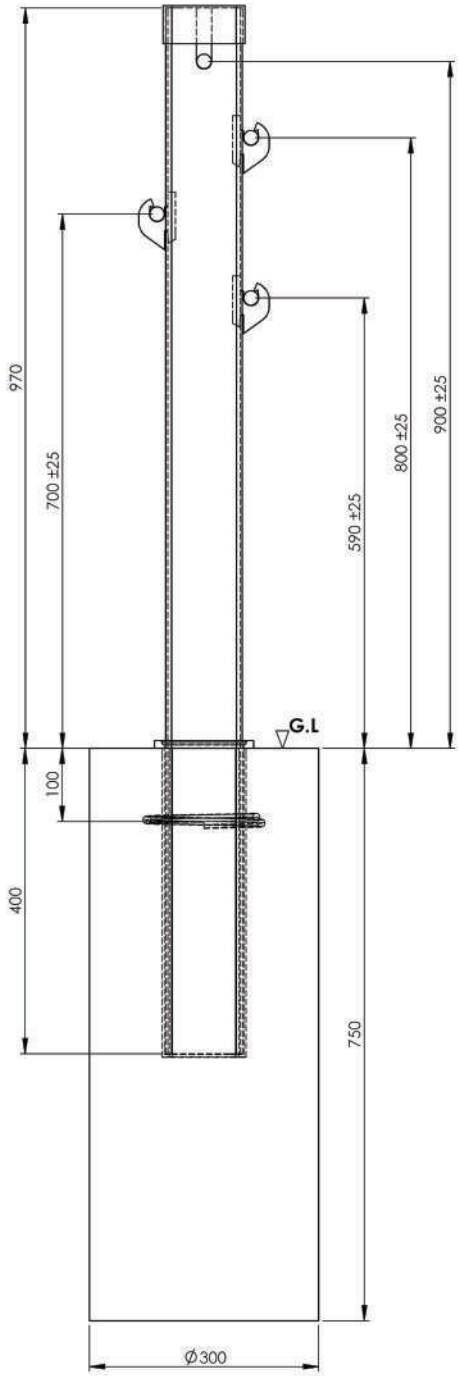
Typical Installation for Sentryline - M® Wire Rope Barrier Line Post

REVISION	REV.DATE	CHANGES MADE

ITEM NO.	PART NO.	DESCRIPTION	QTY.	WEIGHT EA.	DWG NO.
1	2083131SLM	SL WIRE ROPE LINEPOST 1370mm WHITE - 3 SLOTS	1	7	FX747-1
2	2110162SLM	SL WIRE ROPE HALF TIE 8mm ALUMINIUM	3	0.04	FX747-2
3	2200036SLM	SL WIRE ROPE 19mm DIA.	AS REQUIRED		
4	2083070SLM	SL WIRE ROPE POST SOCKET	1	0.37	FX747-4
5	2083072SLM	SL WIRE ROPE LINEPOST CAP	1	0.07	FX747-3
6	2083073SLM	SL WIRE ROPE LINEPOST O-RING 5mm	1	0.01	FX747-5
7	2083086	SL WIRE ROPE REBAR RING SMOOTH	1	0.34	



ISO EXPLODED VIEW
SCALE 1:10



NOTES:

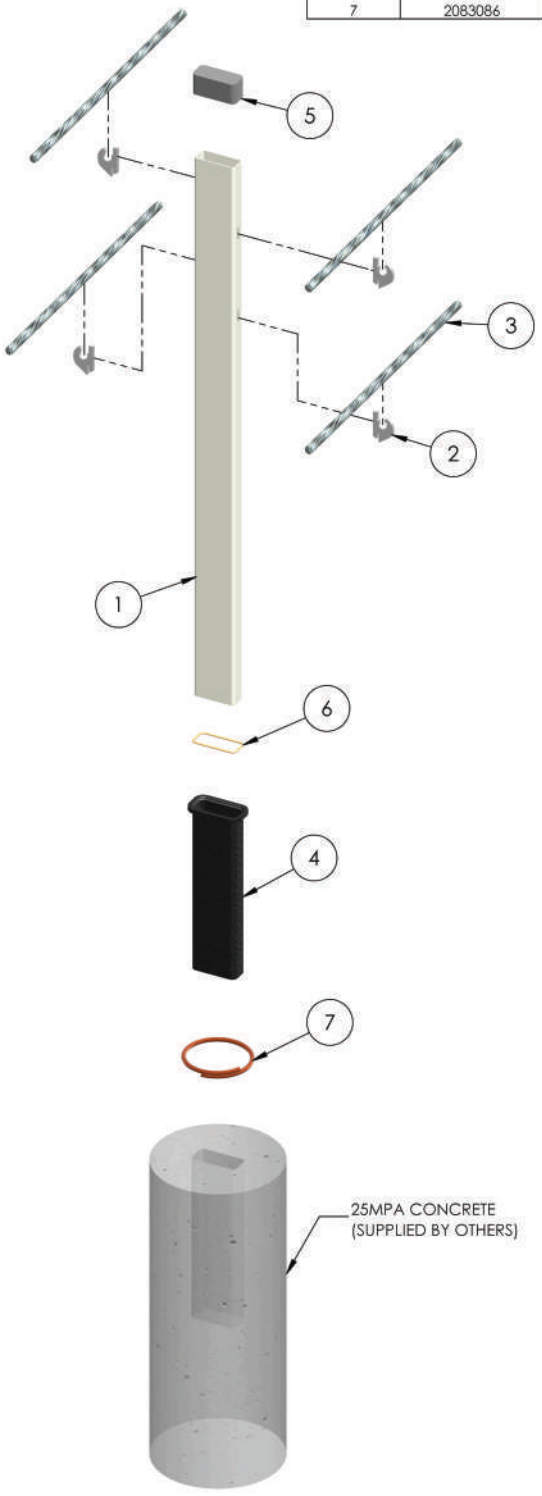
CSP PACIFIC
306 Neilson Street
Onehunga, Auckland
P O Box 12949, Penrose
Auckland, New Zealand
Telephone: 09 634 1239
Facsimile: 09 634 4525

SCALE A3	1:5
ASSEMBLY NO.	2083095SLM
WEIGHT(Kg)	
DESCRIPTION	SF WIRE ROPE POST STD ASSY WHITE - 3 SLOTS
DRAWN	S KERAI
DATE	26/11/2019
DRW NO.	FX747
DESTROY ALL PREVIOUS ISSUES	0 REVISION

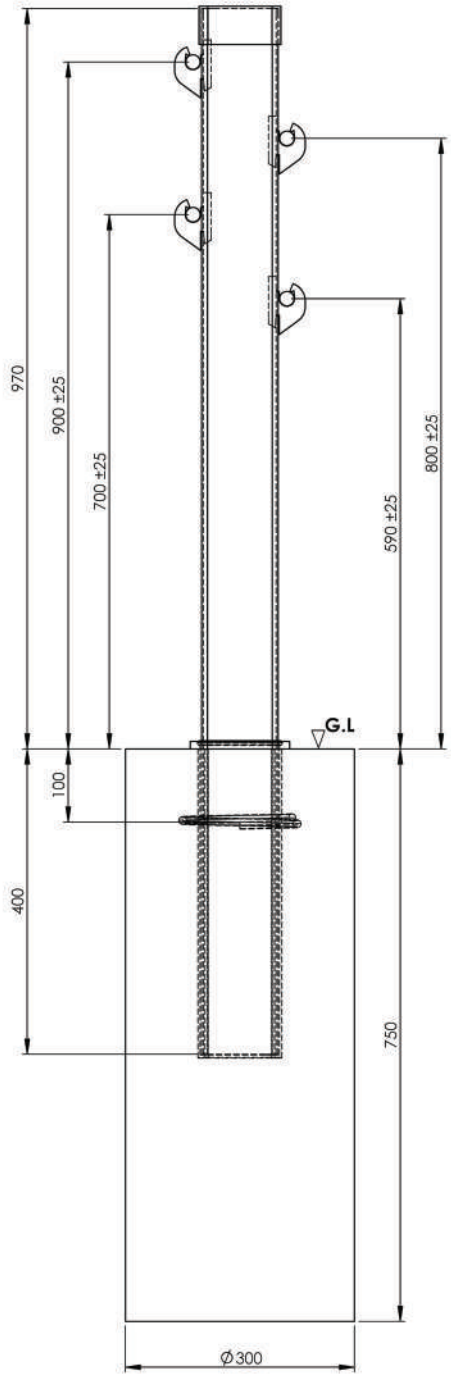
Typical Installation for Transition Line Post #6

REVISION	REV.DATE	CHANGES MADE

ITEM NO.	PART NO.	DESCRIPTION	QTY.	WEIGHT EA.	DWG NO.
1	2083131SLM-A	SL WIRE ROPE LINEPOST 1370mm WHITE - 4 SLOTS	1	7	FX747A-1
2	2110162SLM	SL WIRE ROPE HALF TIE 8mm ALUMINIUM	4	0.04	FX747-2
3	2200036SLM	SL WIRE ROPE 19mm DIA.	AS REQUIRED		
4	2083070SLM	SL WIRE ROPE POST SOCKET	1	0.37	FX747-4
5	2083072SLM	SL WIRE ROPE LINEPOST CAP	1	0.07	FX747-3
6	2083073SLM	SL WIRE ROPE LINEPOST O-RING 5mm	1	0.01	FX747-5
7	2083086	SL WIRE ROPE REBAR RING SMOOTH	1	0.34	



ISO EXPLODED VIEW
SCALE 1:10



ELEVATION VIEW
SCALE 1:6

NOTES:

CSP PACIFIC
306 Neilson Street
Onehunga, Auckland
P O Box 12949, Penrose
Auckland, New Zealand
Telephone: 09 634 1239
Facsimile: 09 634 4525

SCALE A3 1:5
ASSEMBLY NO. 2083095SLM-A
WEIGHT(Kg)

DESCRIPTION: SF WIRE ROPE POST STD ASSY WHITE - 4 SLOTS

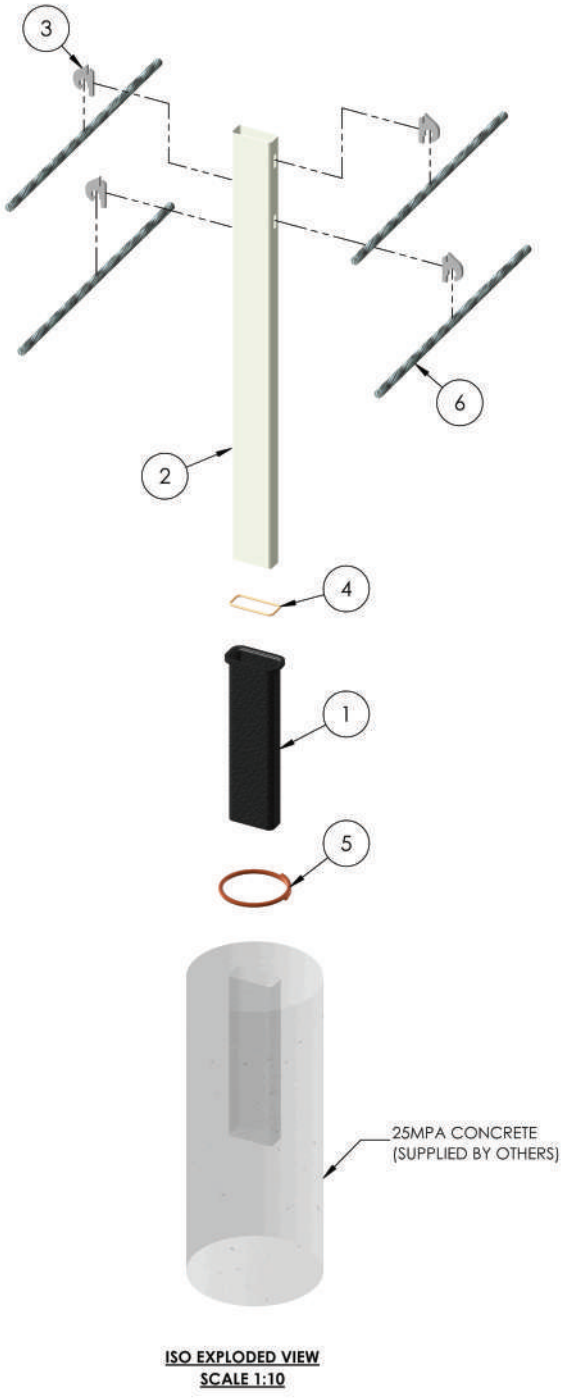
DRAWN S KERAI
DATE 29/11/2019
DRW NO. FX747A

DESTROY ALL PREVIOUS ISSUES
0
REVISION

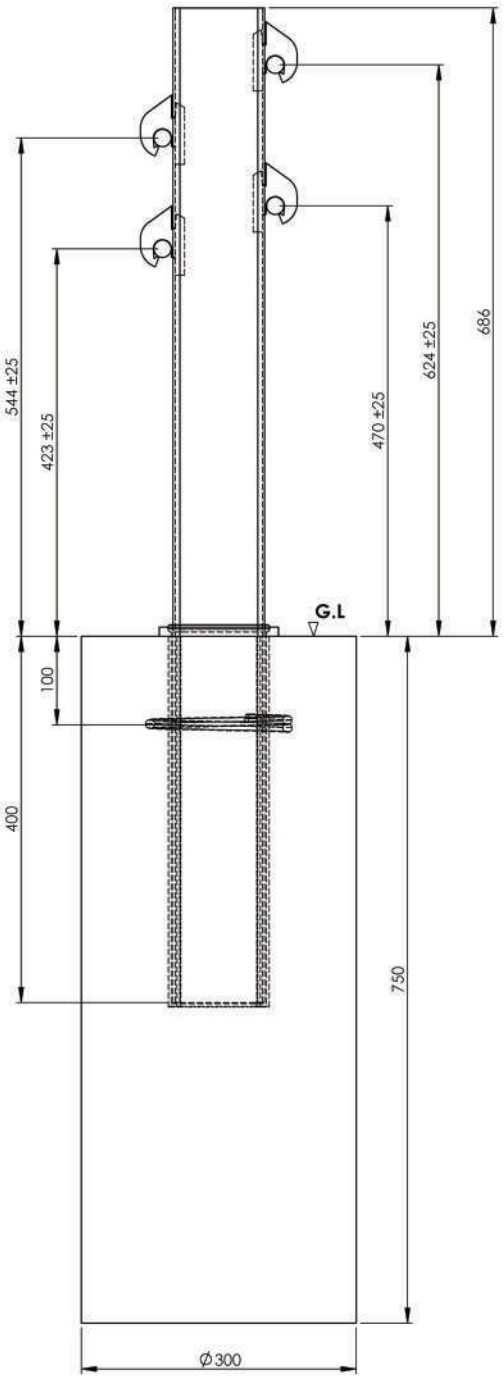
Typical Installation for Transition Line Post #1 - #4

REVISION	REV.DATE	CHANGES MADE

ITEM NO.	PART NO.	DESCRIPTION	QTY.	WEIGHT EA.	DWG NO.
1	2083070SLM	SL WIRE ROPE POST SOCKET	1	0.37	FX747-4
2	2083078SLM	SL WIRE ROPE STE TRANSITION POST 1 1086mm WHITE	1	6	FX749-1
3	2110162SLM	SL WIRE ROPE HALF TIE 8mm ALUMINIUM	4	0.04	FX747-2
4	2083073SLM	SL WIRE ROPE LINEPOST O-RING 5mm	1	0.01	FX747-5
5	2083086	SL WIRE ROPE REBAR RING SMOOTH	1	0.34	
6	2200036SLM	SL WIRE ROPE 19mm DIA.	AS REQUIRED		



ISO EXPLODED VIEW
SCALE 1:10



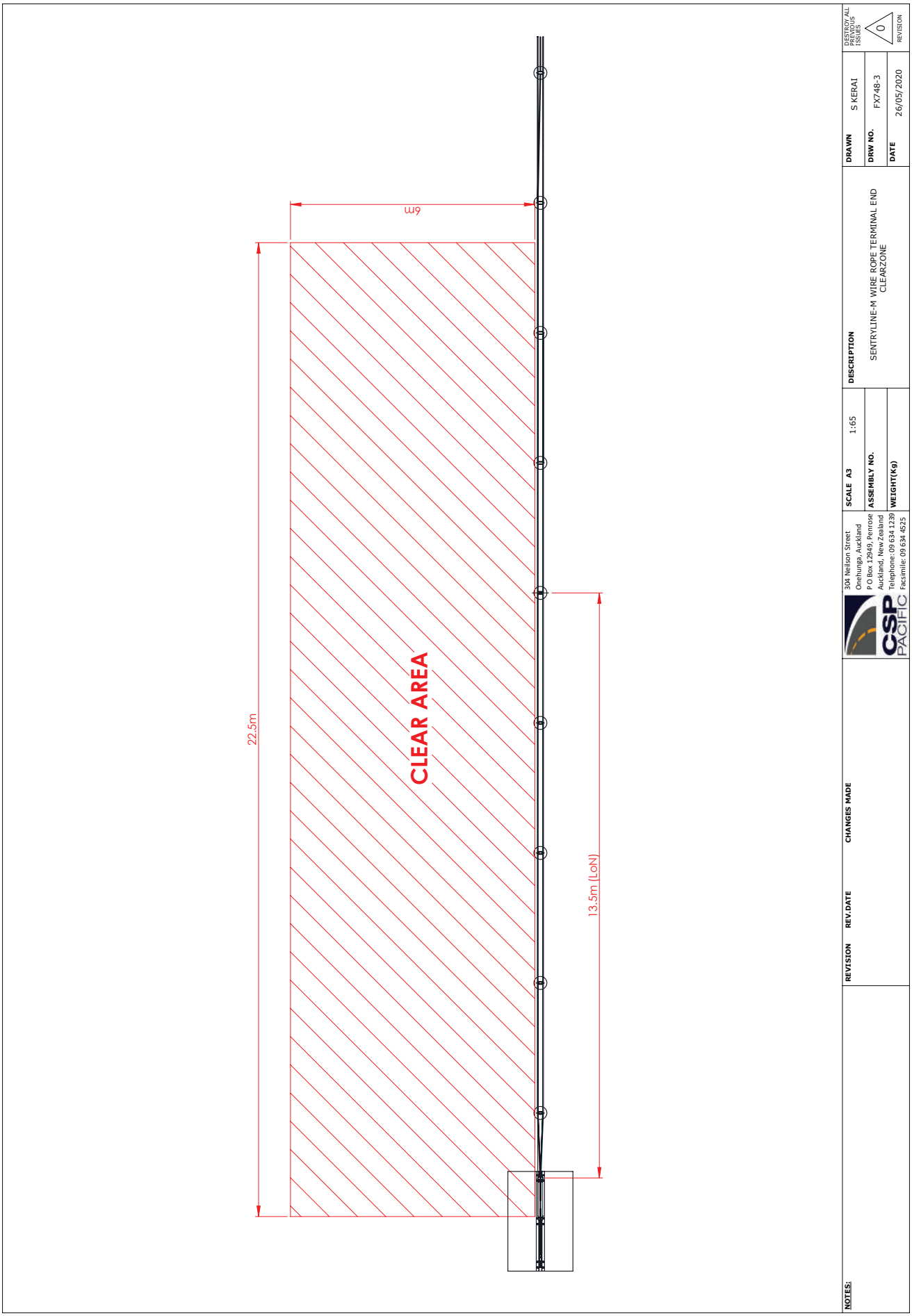
NOTES:

306 Neilson Street
Onehunga, Auckland
P O Box 12949, Penrose
Auckland, New Zealand
Telephone: 09 634 1239
Facsimile: 09 634 4525
CSP PACIFIC

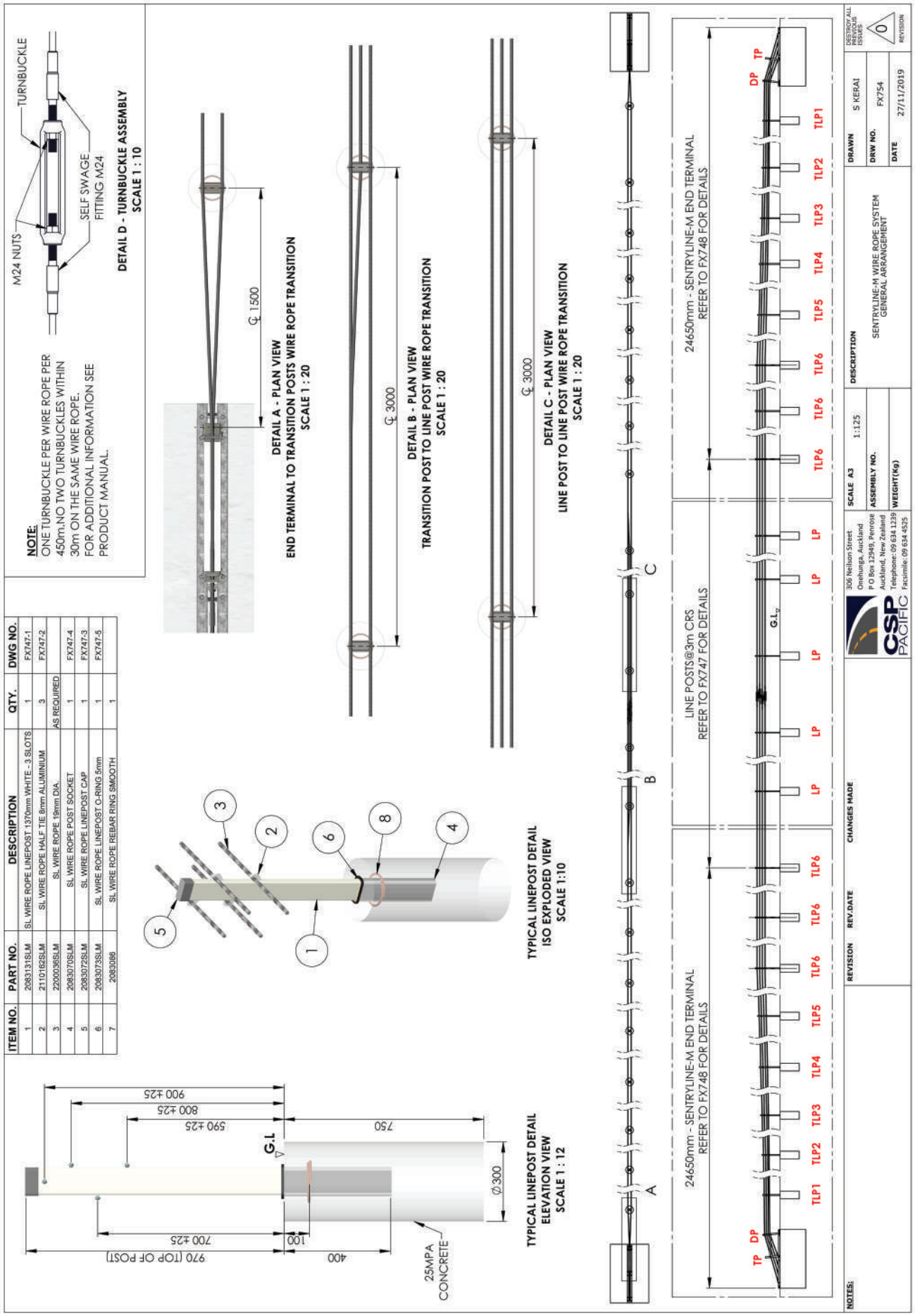
SCALE A3	1:5
ASSEMBLY NO.	
WEIGHT(Kg)	63.41
DESCRIPTION	SL WIRE ROPE TRANSITION LINE POST #1-#5 TYPICAL ARRANGEMENT (TRANSITION LINE POST #1 SHOWN)
DRAWN	S KERAI
DATE	29/11/2019
DRW NO.	FX749

DESTROY ALL PREVIOUS ISSUES
0
REVISION

Sentryline - M® Wire Rope Terminal End Clearzone



Sentryline - M® Wire Rope Terminal End and Sentryline - M® Wire Rope Barrier System General Arrangement



Sentryline - M® Wire Rope Terminal End Half Tie Installation Procedure