

Title: **FERRUM UPINGTON  
NO1 400KV LINE OPGW and  
Hardware SOW Installation  
Specification**

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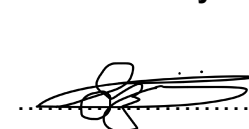
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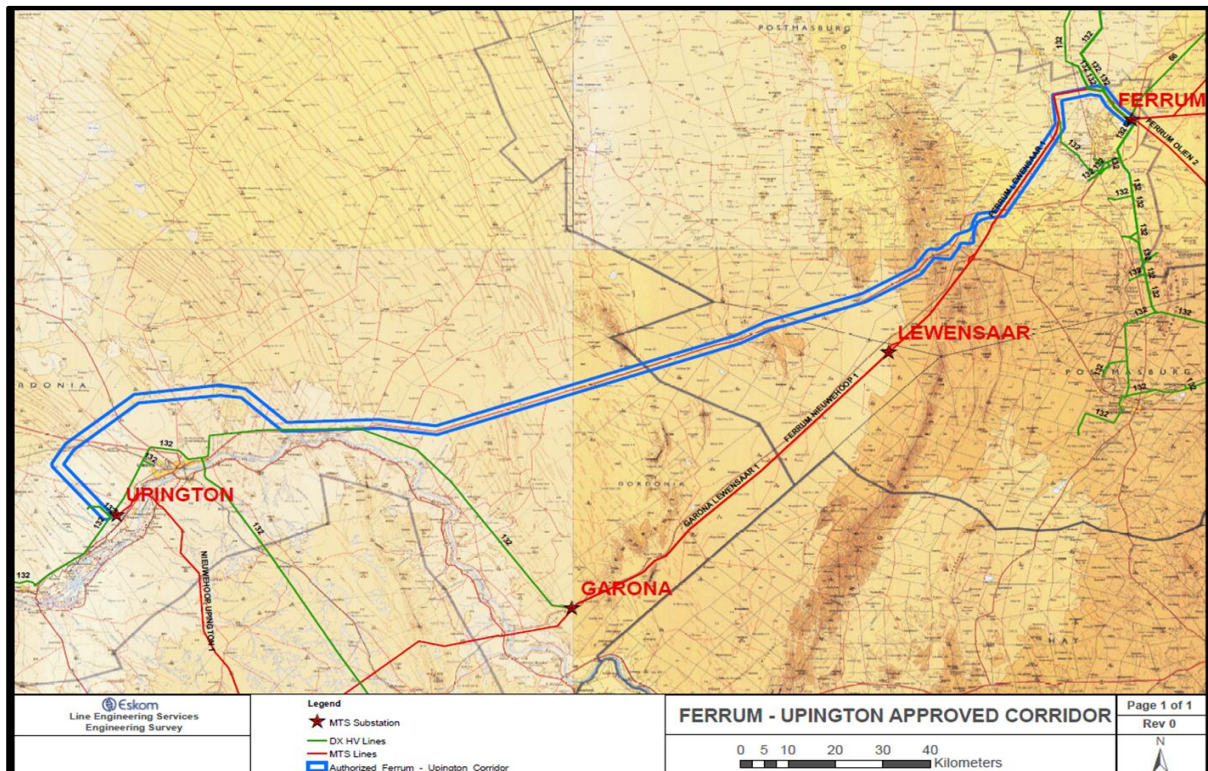
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## 1 PROJECT DESCRIPTION

The Ferrum – Upington 400 kV line is approximately 260 km long. The line starts from Ferrum substation near Sishen town and ends at Upington substation near the Upington town in the Northern Cape province. The line is required to evacuate renewable power (particularly, solar energy) that is generated at Solar Park in Upington and at Sishen. In addition to this, the line will provide N-1 contingency compliance at both Ferrum and Upington substations. The line also provides a link from Ferrum substation to the Aries – Upington 400 kV line.

The concept design for the project was approved with triple Tern ACSR conductor with 450 mm sub-conductor bundle spacing, templated at 60 °C on the 529A, 529C, 520B, 517 and 518 tower series. The line will use a combination of Horse ACSR and 12 kA OPGW as groundwires. There is need to transpose the line by applying two 6-swap transpositions to correct the voltage unbalance. A 10.1 m ground clearance was proposed to comply with electric field limits. The concept design was also approved on the bases that similar design to the Aries – Upington 400 kV line should be applied to standardize the design of both the lines.

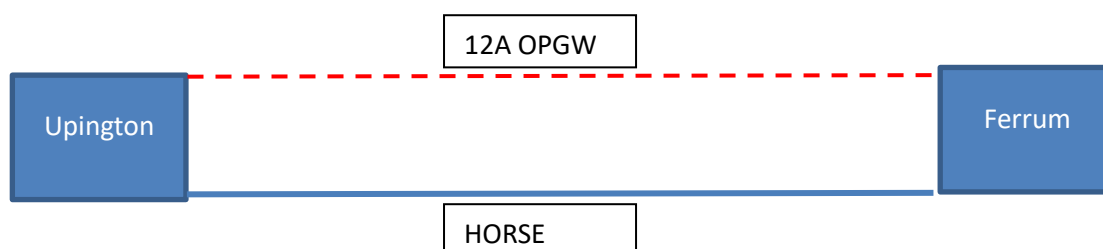


**Figure 1: Ferrum-Upington No1 400 kV Line Corridor Shown in Solid blue lines**

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## 2 SCOPE OF WORK

- 2.1. For the Ferrum Upington no1 400kV line, the design requires an installation of a 12kA OPGW from gantry to gantry.
- 2.2. From the studies performed as part of the concept design, it was found that the fault levels at Ferrum and Upington are 18.38 kA and 12.26 kA respectively. Based on this, it is recommended that Horse earth wire with a combination of 12 kA OPGW be utilized for this line.
- 2.3. The OPGW and Horse earthwire will be installed on the side as per the final profile. The OPGW as per the profile will be installed on the right hand side eathpeak looking at Upington from Ferrum. PM to confirm this information from the Design Leader before construction begins.
- 2.4. Only 1 specified joint box location was required by Telecoms at T439.



**Figure 2: POSITION OF OPGW AND HORSE ON LINE**

## 3 GENERAL

- 3.1. The detailed project plan must be agreed between the contractor and Eskom project manager prior to commencement of work. This will include amongst others, finalisation of attachment points, hardware fittings, stringing plan and safe work procedures.
- 3.2. ***Note that a site visit with the project manager must be undertaken to finalise the exact details if there are queries that cannot be resolved in the office.***
- 3.3. Contractors must note that all entry into substations and high-voltage yards must comply with the relevant Eskom regulations.
- 3.4. All lengths of OPGW must be confirmed by the contractor prior to commencement of work.
- 3.5. The drum size(s) and the locations of joints must be agreed between the contractor and Eskom to optimise the installation.
- 3.6. All jointing must be performed by the contractor.


- 3.7. The contractor must ensure that the companion earthwire to the OPGW is continuous to ensure optimal sharing of fault current.
- 3.8. All fibre cable off-cuts must be disposed of in accordance with TST 32-245, Eskom's waste management procedure.
- 3.9. Aircraft warning spheres will be free-issued by the project manager if required and must be installed either to replace existing spheres, or in new locations as instructed. Existing spheres may be re-used if required.
- 3.10. All spare cable drums and hardware are to be sent back to allocated TX stores and not be taken by the contractor.

#### **4 LINE CHARACTERISTIC**

The Ferrum – Upington No2 400 kV overhead transmission line have the following characteristics:


<b>Line route</b>	The line will run from Ferrum substation near Sishen to Upington substation near the town of Upington in the Northern Cape province.
<b>Line length</b>	Approximately 260 km
<b>Conductor</b>	<ul style="list-style-type: none"><li>• Triple Tern ACSR, IEC315 403.77-A1/S1A-45/3.38-7/2.25</li><li>• Sub-conductor spacing: 450 mm</li><li>• Tern ACSR for closing span</li><li>• Tern ACSR jumpers</li><li>• Ungreased conductor</li><li>• C-Value:<ul style="list-style-type: none"><li>○ Phase Conductor: 1800 m</li><li>○ Earth wire and OPGW: 2100 m</li></ul></li><li>• Conductor templating temperature: 60 °C.</li><li>• Thermal limits at 60 °C:</li><li>• Rate A = 1646 MVA</li><li>• Rate B = 2307 MVA</li></ul>
<b>Ground wire</b>	<ul style="list-style-type: none"><li>• Horse ACSR conductor (73.36-A1S1A-12/7/2.79)</li><li>• 1 x 12 kA 0.399 Ω/km OPGW 48 Core</li><li>• Duct cables to be used for the OPGW at the closing spans at both substations.</li><li>• Ungreased earth wire</li></ul>
<b>Insulators</b>	120 kN and 210 kN glass cap and pin insulators (20 mm/kV creepage respectively) will be used throughout the line.

	<p>120 kN Composite longrod insulators will be used for the earth wire where required.</p> <p>The 529 structures shall be fitted with a composite line post insulator for the earth wire where required.</p>
<b>Hardware</b>	<p>Standard I-assembly and strain structure hardware.</p> <p>Modified V-assembly including extension link.</p> <p>(As per SANS 10280:2017) with live line fittings.</p> <p><b>Take note that:</b></p> <ul style="list-style-type: none"> <li>- Corona prevention fittings must be installed on all hardware assemblies.</li> <li>- Ensure that preformed fittings are used for spacer dampers, Stockbridge dampers and other accessories</li> <li>- To reduce the adverse impact of bird streamers, the smallest corona rings that a hardware supplier has available must be used.</li> <li>- Due to low velocity constant wind speeds, Aeolian Vibration could pose a problem and Aeolian Vibration dampers must be used.</li> <li>- All major road crossings, (N14 and R358) shall have aircraft warning spheres at the respective crossing spans.</li> </ul>
<b>Towers types</b>	<p>New Fall Arrest Anchors (FAA) to be used on all towers and towers to be fitted with "DANGER" signs in high public exposure areas.</p> <p>The following tower family will be used:</p> <ul style="list-style-type: none"> <li>• 529A guyed cross rope suspension</li> <li>• 529C guyed cross rope suspension</li> <li>• 520B Guyed "Vee" suspension</li> <li>• 518H/J heavy self-supporting suspension structure</li> <li>• 518H/J heavy self-supporting suspension structure (Sugar cane)</li> <li>• 518C self-supporting strain (0° - 45°)</li> <li>• 518C self-supporting strain (0° - 45°) (Sugar cane)</li> <li>• 518D self-supporting strain (45° - 70°)</li> <li>• 518D self-supporting strain (45° - 70°) (Sugar cane)</li> <li>• 517E self-supporting strain (0° - 35°)</li> <li>• 517F self-supporting strain &amp; terminal (35° - 60°)</li> <li>• Fall arrest anchors (FAA) must be installed on towers at every step bolt position.</li> <li>• Install cattle guards on guyed towers.</li> </ul>
<b>Foundations</b>	<p>Soil nominations to be conducted by the contractor and reviewed by LES for acceptance.</p>


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	<p><b>Self-supporting towers:</b> Conventional concrete pad and column foundations, augured piles (vertical only), micro piles and driven piles. Rock anchors will be incorporated into the foundation design where warranted as per the latest revision of Eskom Specification 240-47172520: TRMSCAAC 6.</p> <p><b>Guyed towers:</b> Conventional concrete pad and column foundations, conventional concrete guy-anchor foundations, augured piles, micro piles and driven piles. Rock anchors will be incorporated into the foundation design where warranted as per the latest revision of Eskom specification 240-47172520: TRMSCAAC 6.</p>
<b>Jumpers</b>	<p>Tern ACSR conductor will be used for the jumper. The jumper spacing is 450 mm and should be kept throughout the jumper. Suitable rigid spacers should be offered to keep the sub-jumper spacing to 450 mm for the Tern ACSR.</p>
<b>Corrosion protection</b>	<p>Galvanizing thickness of 85 µm to be used on foundation (stub and cleat), towers and Hardware</p> <p>Defined by SANS 121.</p>
<b>As built requirements</b>	<p>As - built information to be provided as per Eskom requirements.</p> <p>As - built Document 240-72252925</p> <p>This must include ALS. (Aerial Laser Survey) as per specification 240-75909189</p>
<b>Line labels</b>	<p>Line is to be labelled as per Eskom transmission specification 240-120804300. Line labels must be manufactured according to the Substation and Network Equipment Label Specification, 240-75660336.</p> <p>Install High Voltage danger signs for towers.</p>
<b>Bush Clearing</b>	<p>For bush clearing guidelines, refer to Eskom specification entitled "Vegetation Management and Maintenance within Eskom Land, Servitudes and Rights of Way (unique identifier 240-70172585)" and to relevant environmental documents such as the Environmental Assessment (EA), Environmental Impact Assessment (EIA), Environmental Management Plan (EMP) and Construction and Operation Environmental Management Plan (EMP).</p>
<b>Line Impedance Measurement</b>	<p>N/A</p>
<b>Anti-Climb &amp; Anti-Theft</b>	<p>Anti-theft specification 240-75884508 &amp; technical instruction 12TI-013</p> <ul style="list-style-type: none"> <li>• Anti-climb devices to be installed on all towers.</li> <li>• Anti-climb devices as per manufacturing drawings (palisade type)</li> <li>• All anti-vandal bolts must be the swage type as per the anti-vandal specification, all members will be fitted with minimum of two anti-vandal bolts - one on each side of every member.</li> <li>• All plates below the anti-climb device should contain anti-vandal bolts for at least 60 % of total number of bolts.</li> <li>• All anti-vandal bolts to be installed before stringing on guyed type towers.</li> </ul>



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	<ul style="list-style-type: none"> <li>Weld the bolts and nuts of the shackles of U-bolts of the guyed towers (529A) to prevent theft as per anti-theft specification where applicable.</li> <li>All steel members shall be stamped with the word “ESKOM” at 300 mm – 500 mm intervals as mentioned in the towers section.</li> </ul>
<b>Pipeline coupling mitigation</b>	Three pipelines have been identified along the line route. If any of the pipelines are metallic, the pipeline studies will be done once the final profiles for the line are completed.
<b>Animal Guards (Free issue)</b>	<ul style="list-style-type: none"> <li>The contractor must supply and install the anti-bird perch devices in accordance to the guideline that is stated in Eskom specification 240-126259196.</li> <li>Install cattle guards on guyed towers</li> </ul>
<b>Fall Arrest Systems</b>	Any temporary fall arrest system installed by the contractor during construction must be removed after construction. Make use of horizontal fall arrest system in beam of towers.
<b>Safe Working Procedures</b>	No construction work will be done until all such safe working procedures of sound logic are reviewed by LES.
<b>Crossings</b>	<p>A complete list of crossings will be provided in the templating report. The major crossings are listed below:</p> <ul style="list-style-type: none"> <li>N14 and N10 highways</li> <li>22 kV and 132 kV distribution lines</li> <li>Ferrum – Lewensaar 275 kV line</li> <li>Ferrum – Nieuwehoop 400 kV line</li> <li>Electrified railway line</li> <li>IPP owned land</li> </ul>
<b>Risk and Hazard Identification</b>	<ul style="list-style-type: none"> <li>A small section of the line traverses through rough, hilly terrain. Suitable vehicles will be required during construction.</li> <li>Access roads will have to be constructed.</li> <li>Electrocution risk due to induction, electromagnetic fields and static (mitigate using proper earthing practices).</li> <li>Areas prone to erosion, erosion on access roads.</li> <li>Rigging equipment must be tested timeously and valid certificates must be available.</li> </ul>


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## 5 STANDARDS, SPECIFICATIONS AND DRAWINGS

### 5.1 STANDARDS

The standards within this section provide for the design and technical requirements for the line:

<b>IEC 60120</b>	Dimensions of ball and socket couplings of string insulator units.
<b>IEC 60372</b>	Locking devices for ball and socket couplings of string insulator units.
<b>IEC 60383</b>	Insulators for overhead lines with nominal voltage above 1 000 V.
<b>IEC 60471</b>	Dimensions of clevis and tongue couplings of string insulator units.
<b>IEC 60815</b>	Guide for the selection of insulators in polluted conditions
<b>IEC 60826</b>	Loading and strength of overhead transmission lines.
<b>IEC 61089</b>	Round wire concentric lay overhead electrical stranded conductors
<b>IEC 61109</b>	Composite insulators for AC overhead with nominal voltage greater than 1 000 V
<b>IEC 61284</b>	Overhead lines – Requirements and tests for fittings.
<b>SANS 1556-1</b>	ISO Metric screw threads part 1
<b>SANS 1700</b>	ISO Metric screw threads part 2
<b>SANS 121</b>	Hot-dip galvanized coatings on fabricated iron and steel articles specification.
<b>SANS 935</b>	Hot-dip zinc coatings on steel wire specification.
<b>ISO 9001 ; 2000</b>	Quality management systems – Requirements

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## 5.2 SPECIFICATIONS

The line specification must take precedence if there is any conflict between it and the following specifications:

<b>NRS 061-1:2019</b>	Specification for overhead ground wire with optical fibre – part 1: product specification
<b>NRS 061-2:2022</b>	Specification for overhead ground wire with optical fibre – part 2: installation guidelines
<b>NWS 1612 Rev 0</b>	Specification for composite insulators.
<b>SANS 10280: 2015</b>	Code of practice for overhead power lines for conditions prevailing in South Africa.
<b>240-70732888</b>	Fibre optic cable system acceptance testing procedure
<b>32-245</b>	Waste management procedure
<b>TPC41-701</b>	Approval and registration of drawings submitted by contractors
<b>NRS 088</b>	Duct and direct buried underground fibre optic cable
<b>240-70733995</b>	Optical distribution frames
<b>240-47172520</b>	The standard for the construction of overhead powerlines
<b>240-60777474</b>	Specification for suspension and strain assemblies and for hardware for transmission lines.
<b>240-72274816</b>	Fibre optic joint enclosures for aerial cables
<b>TST41-168</b>	Quality requirements for the procurement of assets, goods and services.
<b>240-130615862</b>	Earthing of transmission line towers
<b>240-110403330</b>	OPGW hardware and installation requirements for overhead lines

## 5.3 DRAWINGS- LIST DRAWINGS OF ASSEMBLIES TO BE USED THAT ARE NON-STANDARD

	N/A- all assemblies used are standard.

- Eskom will accept project-specific hardware drawings illustrating the manner in which hardware on different towers is to be installed. These drawings shall be provided by the hardware supplier as per instruction from the PM, then reviewed and accepted by Eskom. The conceptual drawings in Section E are not the project – specific drawings, these drawings will be provided prior to construction after the cable and hardware have been procured from the supplier.

## 6 SECTION A – OPGW HARDWARE REQUIREMENTS

All OPGW hardware shall be acquired from an approved Eskom supplier. All hardware to conform to relevant IEC specifications and NRS related documents. Installation shall be done in accordance to NRS061-2 latest revision.

The use of spiral vibration dampers is not allowed.

All hardware to installed as per accepted drawings and as per tower schedule. No deviation from the schedule is allowed unless prior acceptance is obtained due to incorrect design or change of tower etc.

## 7 SECTION B – CABLES SPECIFICATIONS

The design leader should ensure that in instances where specific cable parameters are required from a design perspective, the project manager is made aware of these requirements so that the cable from the correct supplier is procured. The cable supplier should ensure that the cable can be strung up to a C-value of 2 100 m which ensures a similar sag profile to the parallel earthwire and therefore ensures adequate clearance to the phase conductors. For this particular application, 1 x 12 kA 0.399  $\Omega$ /km OPGW 48 Core is specified.

## 8 SECTION C – TESTING REQUIREMENTS

### 8.1 JOINT TESTING

All joints must be tested in accordance with the latest revision of Eskom Fibre Acceptance Test Procedure 240-70732888, Class B.

**The project manager and contractor are to be aware that no acceptance testing should be conducted without a representative from Eskom Telecommunications being present. The contractor should notify the design engineer and project manager well in advance as to when acceptance testing is being conducted and the project manager should make arrangements for an Eskom Telecommunications representative to be on site.**

**NB.** For the requirements to test secondary plant equipment, please refer to the secondary plant document.

## 9 SECTION D – SUMMARY OF HARDWARE QUANTITIES & OPGW JOINT POSITIONS

### 9.1 FERRUM – UPINGTON NO1 400 KV LINE (OPGW INSTALLATION) SECTION A

**Table 9.1.1** and **Table 9.1.2** below details the cable and hardware quantities required for the section A installation on the line.

FERRUM UPINGTON NO1 400KV SECTION A							
No of OPGW: 1							
ITEM	DESCRIPTION	UNIT	QUANTITY	Quantity with spares	Comments	Unit Price	Total
<b>1 OPGW cable (material only )</b>							
1.1	Supply of 48-core, 12kA OPGW cable	m	137298	151028.02			
<b>2 Aerial Hardware</b>							
2.1	Standard Strainer assemblies non insulated (FNISTA)	ea	52	57			
2.2	Standard Strainer assemblies complete for joint towers (FNISTA-JT)	ea	34	37	7 crossrope towers to be supplied with 8048 plates		
2.3	Insulated Strainer assemblies complete for joint towers (FISTA-JT)	ea	18	20	4x assembly to be supplied with twisted tongue oval eye and 5x crossrope Tower to be supplied with 8048 plate.		
2.4	Insulated Strainer assemblies complete (FISTA)	ea	40	44	assembly to be supplied with twisted tongue oval eye		
2.5	Standard suspension assemblies (FNISUA)	ea	54	60	To be supplied with tongue oval eyes-plate type (for self supporting)		
2.6	Insulated suspension assemblies complete (FISUA)	ea	46	50	Supplied with tongue oval eye plate type		
2.7	Standard Crossrope assemblies (FNISUA)	ea	117	126	Long Bolts and Spacers + 8048 Plates		
2.8	Insulated Crossrope assemblies complete (FISPA)	ea	31	34	Tower to be supplied with 8148M plate		
2.9	Standard down lead clamps Non Insulated	ea	420	450			
2.10	Insulated down-lead clamps	ea	240	270			
2.11	Double Tab Earthbonds (XREB)	ea	171	180			0
2.12	Current Transfer Saddles (CTS)	ea	68	75			
2.13	Current Transfer Saddles Double Shunt (CTS-DS)	ea	12	14			
2.14	Earthwire Insulators	ea	<b>Comes with assemblies</b>				
2.15	Extension Links	ea					
2.16	Supply and install Vibration dampers (based on stockbridge dampers)	ea	1300	1500			0
2.17	Joint Boxes insulated	ea	12	13			0
2.18	Joint Boxes Non insulated	ea	21	22			0
2.19	Assembly for joint on suspension (Non-Insulated) - supplied from PLP as a complete unit no need to order two (FNISTA-DST)	ea	4	5	To be supplied with chainlinks		
2.2	Assembly for joint on suspension (Insulated) - supplied from PLP as a complete unit no need to order two (FISTA-DST)	ea	3	4	To be supplied with chainlinks		

**Table 9.1.3: Summary of hardware quantities for Section A**

FERRUM UPINGTON NO1 400KV SECTION A		
Structure numbers	Drum Lengths	With Spares
FER GANTRY	0	0
FER-UPI 16	4260.885	4687
FER-UPI 27	4276.396	4704
FER-UPI 38	4626.154	5089
FER-UPI 47	4265.962	4693
FER-UPI 56	4250.225	4675
FER-UPI 66	3996.397	4396
FER-UPI 76	4501.093	4951
FER-UPI 86	4528.576	4981
FER-UPI 97	4924.454	5417
FER-UPI 107	4566.944	5024
FER-UPI 115	3514.839	3866
FER-UPI 125	4236.386	4660
FER-UPI 136	4089.955	4499
FER-UPI 147	4557.097	5013
FER-UPI 156	3817.532	4199
FER-UPI 167	4584.728	5043
FER-UPI 178	3735.722	4109

FER-UPI 191	4815.105	5297
FER-UPI 204	4540.521	4995
FER-UPI 214	4394.541	4834
FER-UPI 223	3963.512	4360
FER-UPI 233	4431.369	4875
FER-UPI 243	4357.288	4793
FER-UPI 254	4590.919	5050
FER-UPI 265	4518.262	4970
FER-UPI 275	4242.56	4667
FER-UPI 284	4325.144	4758
FER-UPI 294	4656.854	5123
FER-UPI 303	4430.763	4874
FER-UPI 312	4617.607	5079
FER-UPI 320	3731.591	4105
FER-UPI 326	2948.822	3244

**Table 9.1.4: Summary of drum lengths and joint positions for Section A**

## 9.2 FERRUM – UPINGTON NO1 400 KV LINE (OPGW INSTALLATION) SECTION B

**Table 9.2.5** and **Table 9.2.6** below details the cable and hardware quantities required for the section B installation on the line.

FERRUM UPINGTON NO1 400KV SECTION B							
No of OPGW: 1							
ITEM	DESCRIPTION	UNIT	QUANTITY	Quantity with spares	Comments	Unit Price	Total
<b>1 OPGW cable (material only)</b>							
1.1	Supply of 48-core, 12kA OPGW cable	m	137772	151548.94			
<b>2 Aerial Hardware</b>							
2.1	Standard Strainer assemblies non insulated (FNISTA)	ea	34	37			
2.2	Standard Strainer assemblies complete for joint towers (FNISTA-JT)	ea	42	44	15 crossrope towers to be supplied with 8048 plates		
2.3	Insulated Strainer assemblies complete for joint towers (FISTA-JT)	ea	4	5	assembly to be supplied with twisted tongue oval eye		
2.4	Insulated Strainer assemblies complete (FISTA)	ea	10	11	assembly to be supplied with twisted tongue oval eye		
2.5	Standard suspension assemblies (FNISUA)	ea	63	70	To be supplied with tongue oval eyes-plate type (for self supporting)		
2.6	Insulated suspension assemblies complete (FISUA)	ea	3	4	Supplied with tongue oval eye plate type		
2.7	Standard Crossrope assemblies (FNISUA)	ea	170	187	Long Bolts and Spacers + 8048 Plates		
2.8	Insulated Crossrope assemblies complete (FISPA)	ea	3	4	Tower to be supplied with 8148M plate		
2.9	Standard down lead clamps Non Insulated	ea	620	682			
2.10	Insulated down-lead clamps	ea	40	45			
2.11	Double Tab Earthbonds (XREB)	ea	233	256			0
2.12	Current Transfer Saddles (CTS)	ea	79	87			
2.13	Current Transfer Saddles Double Shunt (CTS-DS)	ea	2	3			
2.14	Earthwire Insulators	ea	<b>Comes with assemblies</b>				
2.15	Extension Links	ea					
2.16	Supply and install Vibration dampers (based on stockbridge dampers)	ea	1168	1285			0
2.17	Joint Boxes insulated	ea	2	3			0
2.18	Joint Boxes Non insulated	ea	31	34			0
2.19	Assembly for joint on suspension (Non-Insulated) - supplied from PLP as a complete unit no need to order two (FNISTA-DST)	ea	10	11	To be supplied with chainlinks		
2.2	Assembly for joint on suspension (Insulated) - supplied from PLP as a complete unit no need to order two (FISTA-DST)	ea	0	0			

**Table 9.2.7: Summary of hardware quantities for Section B**

FERRUM UPINGTON NO1 400KV SECTION B		
Structure numbers	Drum Lengths	With Spares
FER-UPI 335	4039.685	4444
FER-UPI 343	4209.712	4631
FER-UPI 352	4344.821	4779
FER-UPI 361	4465.582	4912
FER-UPI 370	4428.483	4871
FER-UPI 380	4202.347	4623
FER-UPI 390	4535.904	4989
FER-UPI 399	4408.353	4849
FER-UPI 408	4201.341	4621
FER-UPI 417	4362.366	4799
FER-UPI 427	4529.231	4982
FER-UPI 435	3523.777	3876
FER-UPI 439	1937.8	2132
FER-UPI 448	4317.828	4750
FER-UPI 457	4438.315	4882

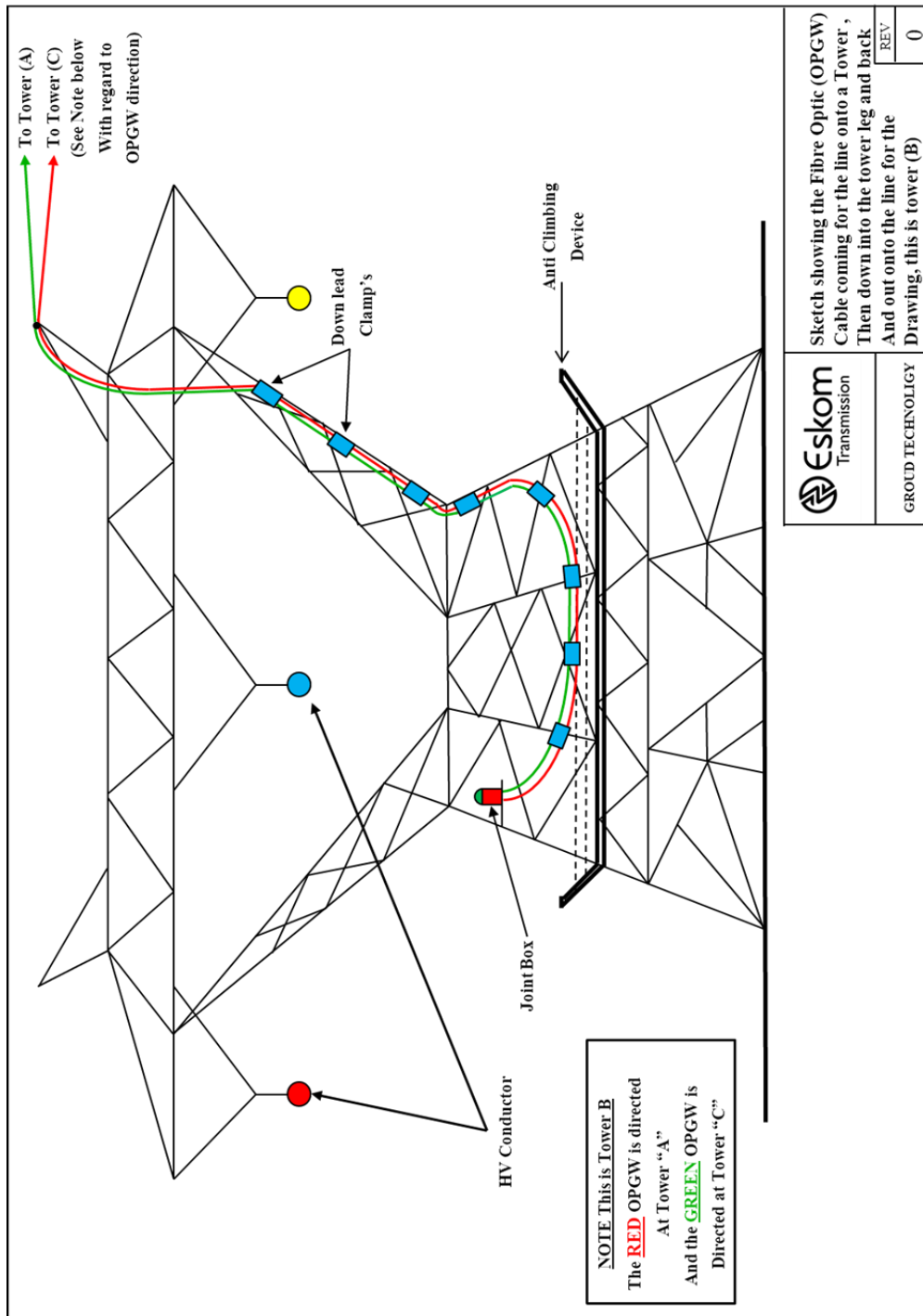
FER-UPI 466	4190.68	4610
FER-UPI 475	4249.857	4675
FER-UPI 484	4307.871	4739
FER-UPI 494	4453.203	4899
FER-UPI 504	4377.578	4815
FER-UPI 514	4638.101	5102
FER-UPI 523	4354.649	4790
FER-UPI 532	4494.28	4944
FER-UPI 541	4383.517	4822
FER-UPI 550	4453.944	4899
FER-UPI 559	4266.114	4693
FER-UPI 569	4750.566	5226
FER-UPI 579	4893.919	5383
FER-UPI 589	4450.404	4895
FER-UPI 598	4402.853	4843
FER-UPI 607	4307.179	4738
FER-UPI 617	4347.052	4782
UPI GANTRY	504.455	555

**Table 9.2.8: Summary of drum lengths and joint positions for Section A**

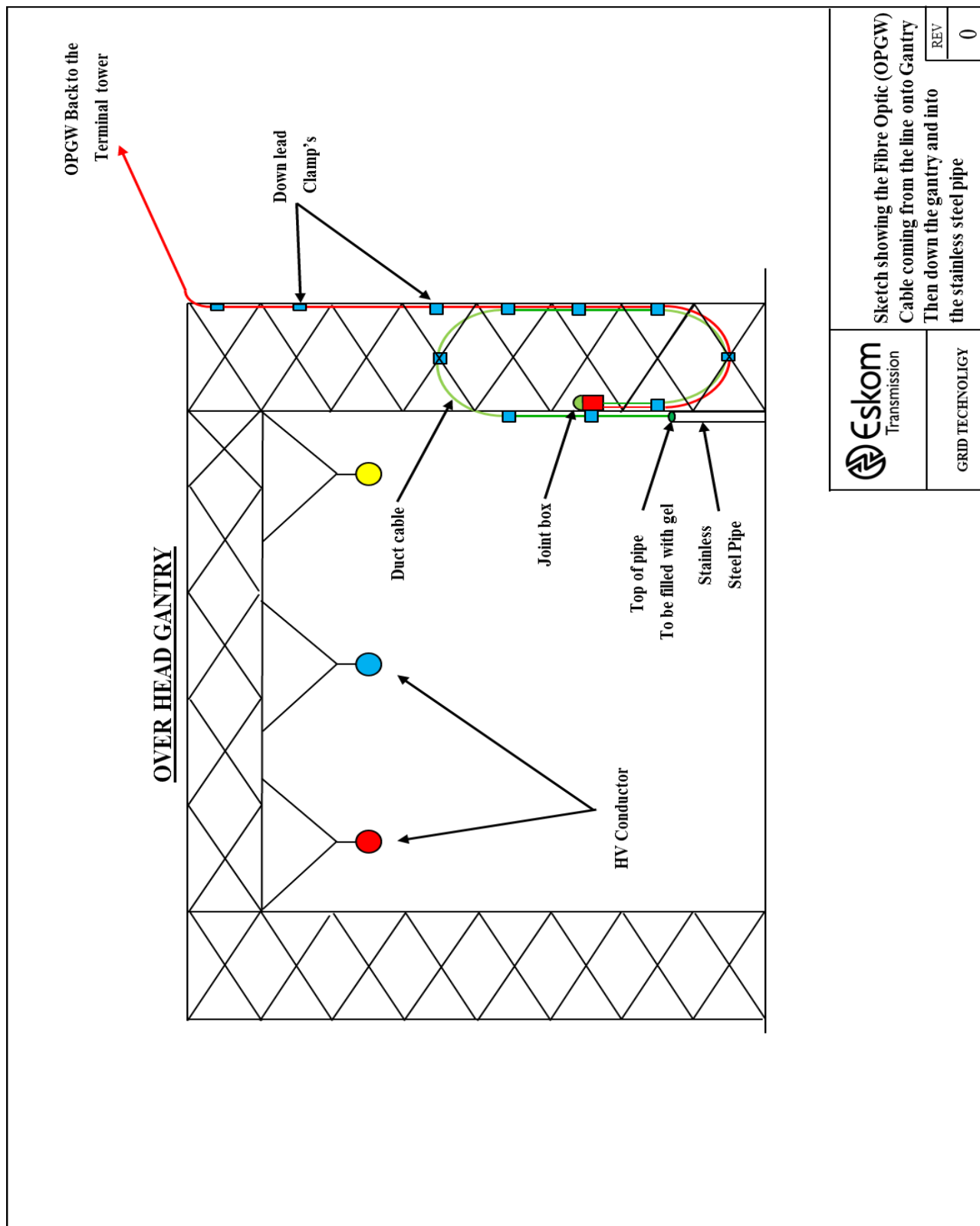



**10 SECTION E – OPGW HARDWARE DRAWINGS- DRAWINGS OF ALL ASSEMBLIES THAT  
ARE NON-STANDARD TO BE IN THIS SECTION.**

Drawing 1-JOINT BOX AND DOWNLEAD CLAMPS RECOMMENDATIONS



Drawing 2- INSTALLATION AT GANTRY



	<b>FERRUM UPINGTON NO1 400KV LINE OPGW and Hardware Scope of Work INSTALLATION SPECIFICATION</b>	<b>Transmission</b>
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**11 SECTION F – RISKS- ALL PROJECT RELATED RISKS FOR THIS ACTIVITY TO BE LISTED HERE**

No	Risks identified	Eskom mitigation proposal	Contractor proposal
1	Earthing risks – Possibility of induced voltages.	Contractor to follow Eskom safety practises stipulated in 240-47172520, Annex D and all other relevant Eskom safety practices.	
2	Line crossings	A proper mitigation method must be provided by the contractor detailing how they will mitigate against the earthwire falling during stringing, regulation and clamping in.	
3	Incorrect drum lengths being strung on sections.	Contractor to provide a schedule detailing where they will start and end each section based on drum lengths. This will determine how each tower should be stabilised during the pulling of sections.	
4	Safety considerations during stringing	Contractor to ensure all safety considerations outlined in 240-110403330 are adhered to.	
5	Installation of joint boxes on suspension towers	Contractor to specify how the yoke plate arrangement will be secured during regulation	





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FER-UPI 51	19446.459	2017.062	305.481	518C	Strain	Yes					1							4	FISTA	assembly to be supplied with twisted tongue oval eye
FER-UPI 52	19751.94	2322.543	442.454	517F	Strain	Yes					1							4	FISTA	assembly to be supplied with twisted tongue oval eye
FER-UPI 53	20194.394	2764.997	502.017	520B	Suspension	Yes						1						4	FISUA	Tongue Oval Eye-plate type
FER-UPI 54	20696.411	3267.014	495.251	520B	Suspension	Yes						1						4	FISUA	Tongue Oval Eye-plate type
FER-UPI 55	21191.662	3762.265	487.96	520B	Suspension	Yes						1						4	FISUA	Tongue Oval Eye-plate type
FER-UPI 56	21679.622	4250.225	505.637	520B	Suspension	Yes		1		20		1					1	4	FISTADST	Supplied with Chain link
FER-UPI 57	22185.259	505.637	486.47	520B	Suspension	Yes							1					4	FISUA	Tongue Oval Eye-plate type
FER-UPI 58	22671.729	992.107	508.893	520B	Suspension	Yes							1					4	FISUA	Tongue Oval Eye-plate type
FER-UPI 59	23180.622	1501	474.571	520B	Suspension	Yes							1					4	FISUA	Tongue Oval Eye-plate type
FER-UPI 60	23655.193	1975.571	402.905	520B	Suspension	Yes							1					4	FISUA	Tongue Oval Eye-plate type
FER-UPI 61	24058.098	2378.476	405.5	520B	Suspension	Yes							1					4	FISUA	Tongue Oval Eye-plate type
FER-UPI 62	24463.598	2783.976	417.721	520B	Suspension	Yes							1					4	FISUA	Tongue Oval Eye-plate type
FER-UPI 63	24881.319	3201.697	383.863	520B	Suspension	Yes							1					4	FISUA	Tongue Oval Eye-plate type
FER-UPI 64	25265.182	3585.56	219.353	517E	Strain	Yes					1							4	FISTA	assembly to be supplied with twisted tongue oval eye
FER-UPI 65	25484.536	3804.913	191.484	518D	Strain	Yes					1							4	FISTA	assembly to be supplied with twisted tongue oval eye
FER-UPI 66	25676.019	3996.397	518.552	518D	Strain	Yes		1		20		1					1	4	FISTAJT	Supplied with Twisted tongue oval eye
FER-UPI 67	26194.571	518.552	467.95	520B	Suspension	Yes							1					4	FISUA	Tongue Oval Eye-plate type
FER-UPI 68	26662.521	986.502	453.119	520B	Suspension	Yes							1					4	FISUA	Tongue Oval Eye-plate type
FER-UPI 69	27115.64	1439.621	451.654	520B	Suspension	Yes							1					4	FISUA	Tongue Oval Eye-plate type
FER-UPI 70	27567.294	1891.275	433.184	520B	Suspension	Yes							1					4	FISUA	Tongue Oval Eye-plate type
FER-UPI 71	28000.478	2324.459	469.042	520B	Suspension	Yes							1					4	FISUA	Tongue Oval Eye-plate type
FER-UPI 72	28469.52	2793.501	460.513	520B	Suspension	Yes							1					4	FISUA	Tongue Oval Eye-plate type
FER-UPI 73	28930.033	3254.014	436.97	520B	Suspension	Yes							1					4	FISUA	Tongue Oval Eye-plate type
FER-UPI 74	29367.003	3690.994	377.667	520B	Suspension	Yes							1					4	FISUA	Tongue Oval Eye-plate type
FER-UPI 75	29744.67	4068.651	432.442	520B	Suspension	Yes							1					4	FISUA	Tongue Oval Eye-plate type
FER-UPI 76	30177.112	4501.093	517.51	517E	Strain	Yes		1		20		1					1	4	FISTAJT	Supplied with Twisted tongue oval eye
FER-UPI 77	30694.622	517.51	503.258	518H	Suspension	Yes							1					4	FISUA	Tongue Oval Eye-plate type
FER-UPI 78	31197.88	1020.768	424.087	517E	Strain	Yes					1							4	FISTA	assembly to be supplied with twisted tongue oval eye
FER-UPI 79	31621.967	1444.855	440.975	520B	Suspension	Yes							1					4	FISUA	Tongue Oval Eye-plate type
FER-UPI 80	32062.942	1885.83	431.544	520B	Suspension	Yes							1					4	FISUA	Tongue Oval Eye-plate type
FER-UPI 81	32494.486	2317.374	470.191	520B	Suspension	Yes							1					4	FISUA	Tongue Oval Eye-plate type
FER-UPI 82	32964.677	2787.565	506.847	520B	Suspension	Yes							1					4	FISUA	Tongue Oval Eye-plate type
FER-UPI 83	33471.524	3294.412	430.517	517E	Strain	Yes					1							4	FISTA	assembly to be supplied with twisted tongue oval eye
FER-UPI 84	33902.041	3724.929	387.856	520B	Suspension	Yes							1					4	FISUA	Tongue Oval Eye-plate type
FER-UPI 85	34289.897	4112.785	415.791	520B	Suspension	Yes							1					4	FISUA	Tongue Oval Eye-plate type
FER-UPI 86	34705.688	4528.576	422.037	518D	Strain	Yes		1		20		1					1	4	FISTAJT	Supplied with Twisted tongue oval eye
FER-UPI 87	35127.725	422.037	432.348	520B	Suspension	Yes							1					4	FISUA	Tongue Oval Eye-plate type
FER-UPI 88	35560.073	854.385	542.623	518D	Strain	Yes					1							4	FISTA	assembly to be supplied with twisted tongue oval eye
FER-UPI 89	36102.696	1397.008	405.607	520B	Suspension	Yes							1					4	FISUA	Tongue Oval Eye-plate type
FER-UPI 90	36508.303	1802.615	235.659	520B	Suspension	Yes							1					4	FISUA	Tongue Oval Eye-plate type
FER-UPI 91	36743.962	2038.274	429.741	517E	Strain					1							1	4	FNSTA	
FER-UPI 92	37173.703	2468.015	501.912	520B	Suspension							1				1		4	FNSUA	Tongue Oval Eye-plate type
FER-UPI 93	37675.615	2969.927	487.63	520B	Suspension							1				1		4	FNSUA	Tongue Oval Eye-plate type
FER-UPI 94	38163.245	3457.557	481.749	520B	Suspension							1				1		4	FNSUA	Tongue Oval Eye-plate type
FER-UPI 95	38644.994	3939.306	493.581	520B	Suspension							1				1		4	FNSUA	Tongue Oval Eye-plate type
FER-UPI 96	39138.575	4432.887	491.567	520B	Suspension							1				1		4	FNSUA	Tongue Oval Eye-plate type
FER-UPI 97	39630.142	4924.454	491.383	517E	Strain			1		20		1					2	4	FNISTAJT	
FER-UPI 98	40121.525	491.383	430.528	529C	crossrope									1		1		4	FNSUA	Long Bolts and Spacers + 8048 Plates
FER-UPI 99	40552.053	921.911	466.113	529C	crossrope									1		1		4	FNSUA	Long Bolts and Spacers + 8048 Plates
FER-UPI 100	41018.166	1388.024	446.535	529C	crossrope									1		1		4	FNSUA	Long Bolts and Spacers + 8048 Plates



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FER-UPI 101	41464.701	1834.559	445.737	529C	crossrope										1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UPI 102	41910.438	2280.296	439.539	529C	crossrope										1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UPI 103	42349.977	2719.835	443.141	529C	crossrope										1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UPI 104	42793.118	3162.976	463.174	529C	crossrope										1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UPI 105	43256.292	3626.15	473.28	529C	crossrope										1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UPI 106	43729.572	4089.43	467.514	529C	crossrope										1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UPI 107	44197.086	4566.944	461.663	520B	Suspension			1	20		1							2		4	FN1STADST		Supplied with Chain link
FER-UPI 108	44658.749	461.663	446.99	529C	crossrope										1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UPI 109	45105.739	908.653	440.659	529C	crossrope										1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UPI 110	45546.398	1349.312	388.336	529C	crossrope										1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UPI 111	45934.734	1737.648	448.279	529C	crossrope										1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UPI 112	46383.013	2185.927	424.46	529C	crossrope										1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UPI 113	46807.473	2610.387	449.645	529C	crossrope										1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UPI 114	47257.118	3060.032	454.807	529C	crossrope										1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UPI 115	47711.925	3514.839	480.749	517E	Strain			1	20		1							2		4	FN1STAJT		
FER-UPI 116	48192.674	480.749	406.557	529C	crossrope										1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UPI 117	48599.231	887.306	478.668	529C	crossrope										1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UPI 118	49077.899	1365.974	406.697	520B	Suspension							1					1			4		FNISUA	Tongue Oval Eye-plate type
FER-UPI 119	49484.596	1772.671	222.298	529C	crossrope										1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UPI 120	49706.894	1994.969	392.433	517E	Strain					1								1		4		FN1STA	
FER-UPI 121	50099.327	2387.402	503.515	520B	Suspension							1					1			4		FNISUA	Tongue Oval Eye-plate type
FER-UPI 122	50602.842	2890.917	480.486	520B	Suspension							1					1			4		FNISUA	Tongue Oval Eye-plate type
FER-UPI 123	51083.328	3371.403	443.535	529C	crossrope										1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UPI 124	51526.863	3814.938	421.448	529C	crossrope										1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UPI 125	51948.311	4236.386	352.956	529C	crossrope			1	20		1							2		4	FN1STAJT		Tower to be supplied with 8048 plate
FER-UPI 126	52301.267	352.956	332.925	529C	crossrope										1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UPI 127	52634.192	685.881	431.731	517E	Strain					1								1		4		FN1STA	
FER-UPI 128	53065.923	1117.612	212.623	518C	Strain					1								1		4		FN1STA	
FER-UPI 129	53278.546	1330.235	468.715	518D	Strain					1								1		4		FN1STA	
FER-UPI 130	53747.261	1798.95	390.609	520B	Suspension						1						1			4		FNISUA	Tongue Oval Eye-plate type
FER-UPI 131	54137.87	2189.559	327.827	520B	Suspension						1						1			4		FNISUA	Tongue Oval Eye-plate type
FER-UPI 132	54465.697	2517.386	315.841	520B	Suspension							1					1			4		FNISUA	Tongue Oval Eye-plate type
FER-UPI 133	54781.538	2833.227	466.88	518C	Strain					1								1		4		FN1STA	
FER-UPI 134	55248.418	3300.107	380.89	518D	Strain					1								1		4		FN1STA	
FER-UPI 135	55629.308	3680.997	408.958	520B	Suspension							1					1			4		FNISUA	Tongue Oval Eye-plate type
FER-UPI 136	56038.266	4089.955	411.986	517E	Strain			1	20		1							2		4	FN1STAJT		
FER-UPI 137	56450.252	411.986	382.538	529C	crossrope										1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UPI 138	56832.79	794.524	420.016	529C	crossrope										1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UPI 139	57252.806	1214.54	414.397	529C	crossrope										1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UPI 140	57667.203	1628.937	481.287	529C	crossrope										1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UPI 141	58148.49	2110.224	416.124	520B	Suspension							1					1			4		FNISUA	Tongue Oval Eye-plate type
FER-UPI 142	58564.614	2526.348	413.248	520B	Suspension							1					1			4		FNISUA	Tongue Oval Eye-plate type
FER-UPI 143	58977.862	2939.596	537.16	520B	Suspension							1					1			4		FNISUA	Tongue Oval Eye-plate type
FER-UPI 144	59515.022	3476.756	271.277	518H	Suspension							1					1			4		FNISUA	Tongue Oval Eye-plate type
FER-UPI 145	59786.299	3748.033	375.046	520B	Suspension							1					1			4		FNISUA	Tongue Oval Eye-plate type
FER-UPI 146	60161.345	4123.079	434.018	520B	Suspension							1					1			4		FNISUA	Tongue Oval Eye-plate type
FER-UPI 147	60595.363	4557.097	454.807	517F	Strain			1	20		1							2		4	FN1STAJT		
FER-UPI 148	61050.17	454.807	512.42	518H	Suspension							1					1			4		FNISUA	Tongue Oval Eye-plate type
FER-UPI 149	61562.59	967.227	313.843	520B	Suspension							1					1			4		FNISUA	Tongue Oval Eye-plate type
FER-UPI 150	61876.433	1281.07	348.324	520B	Suspension							1					1			4		FNISUA	Tongue Oval Eye-plate type



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FER-UI 151	62224.757	1629.394	484.452	529C	crossrope									1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 152	62709.209	2113.846	491.577	517E	Strain					1							1		4		FNISTA	
FER-UI 153	63200.786	2605.423	433.965	520B	Suspension							1				1			4		FNISUA	Tongue Oval Eye-plate type
FER-UI 154	63634.751	3039.388	418.654	529C	crossrope									1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 155	64053.405	3458.042	359.49	529C	crossrope									1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 156	64412.895	3817.532	447.569	518H	Suspension			1	20		1						2		4	FNISTADST		Supplied with Chain link
FER-UI 157	64860.464	447.569	470.804	529C	crossrope									1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 158	65331.268	918.373	486.669	529C	crossrope									1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 159	65817.937	1405.042	509.892	520B	Suspension							1				1			4		FNISUA	Tongue Oval Eye-plate type
FER-UI 160	66327.829	1914.934	441.073	517E	Strain					1							1		4		FNISTA	
FER-UI 161	66768.902	2356.007	490.912	520B	Suspension							1				1			4		FNISUA	Tongue Oval Eye-plate type
FER-UI 162	67259.814	2846.919	497.411	529C	crossrope									1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 163	67757.225	3344.33	273.568	517E	Strain					1							1		4		FNISTA	
FER-UI 164	68030.793	3617.898	370.181	520B	Suspension							1				1			4		FNISUA	Tongue Oval Eye-plate type
FER-UI 165	68400.974	3988.079	301.987	529C	crossrope									1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 166	68702.961	4290.066	294.662	529C	crossrope									1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 167	68997.623	4584.728	152.994	517E	Strain			1	20		1						2		4	FNISTAJT		
FER-UI 168	69150.617	152.994	353.895	529C	crossrope									1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 169	69504.512	506.889	246.289	529C	crossrope									1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 170	69750.801	753.178	364.23	529C	crossrope									1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 171	70115.031	1117.408	366.462	517E	Strain					1							1		4		FNISTA	
FER-UI 172	70481.493	1483.87	365.627	529A	crossrope									1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 173	70847.12	1849.497	370.322	529A	crossrope									1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 174	71217.442	2219.819	367.054	518D	Strain					1							1		4		FNISTA	
FER-UI 175	71584.496	2586.873	330.544	518D	Strain					1							1		4		FNISTA	
FER-UI 176	71915.04	2917.417	379.021	518H	Suspension							1				1			4		FNISUA	Tongue Oval Eye-plate type
FER-UI 177	72294.061	3296.438	439.284	518H	Suspension							1				1			4		FNISUA	Tongue Oval Eye-plate type
FER-UI 178	72733.345	3735.722	338.373	517E	Strain			1	20		1						2		4	FNISTAJT		
FER-UI 179	73071.718	338.373	272.916	518H	Suspension							1				1			4		FNISUA	Tongue Oval Eye-plate type
FER-UI 180	73344.634	611.289	303.307	518H	Suspension							1				1			4		FNISUA	Tongue Oval Eye-plate type
FER-UI 181	73647.941	914.596	342.096	518H	Suspension							1				1			4		FNISUA	Tongue Oval Eye-plate type
FER-UI 182	73990.037	1256.692	328.464	518D	Strain					1							1		4		FNISTA	
FER-UI 183	74318.501	1585.156	269.888	518C	Strain					1							1		4		FNISTA	
FER-UI 184	74588.389	1855.044	394.286	517F	Strain					1							1		4		FNISTA	
FER-UI 185	74982.675	2249.33	436.914	517E	Strain					1							1		4		FNISTA	
FER-UI 186	75419.589	2686.244	448.707	529C	crossrope									1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 187	75868.296	3134.951	486.632	529C	crossrope									1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 188	76354.928	3621.583	368.871	518H	Suspension							1				1			4		FNISUA	Tongue Oval Eye-plate type
FER-UI 189	76723.799	3990.454	407.312	520B	Suspension							1				1			4		FNISUA	Tongue Oval Eye-plate type
FER-UI 190	77131.111	4397.766	417.339	520B	Suspension							1				1			4		FNISUA	Tongue Oval Eye-plate type
FER-UI 191	77548.45	4815.105	422.615	517E	Strain			1	20		1						2		4	FNISTAJT		
FER-UI 192	77971.065	422.615	308.897	529C	crossrope									1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 193	78279.962	731.512	327.899	529C	crossrope									1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 194	78607.861	1059.411	457.539	518H	Suspension							1				1			4		FNISUA	Tongue Oval Eye-plate type
FER-UI 195	79065.4	1516.95	427.107	529C	crossrope									1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 196	79492.507	1944.057	342.235	529C	crossrope									1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 197	79834.742	2286.292	312.632	529C	crossrope									1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 198	80147.374	2598.924	351.946	529C	crossrope									1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 199	80499.32	2950.87	283.939	520B	Suspension							1				1			4		FNISUA	Tongue Oval Eye-plate type
FER-UI 200	80783.259	3234.809	304.626	529C	crossrope									1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates





**FERRUM UPINGTON NO1 400KV LINE OPGW  
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**Transmission**

FER-UP1 201	81087.885	3539.435	330.746	529C	crossrope											1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates
FER-UP1 202	81418.631	3870.181	386.746	529C	crossrope											1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates
FER-UP1 203	81805.377	4256.927	283.594	520B	Suspension									1				1			4	FNSUA	Tongue Oval Eye-plate type
FER-UP1 204	82088.971	4540.521	446.792	529C	crossrope		1	20			1								2		4	FN1STAJT	Tower to be supplied with 8048 plate
FER-UP1 205	82535.763	446.792	445.522	529C	crossrope											1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates
FER-UP1 206	82981.285	892.314	405.657	529C	crossrope											1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates
FER-UP1 207	83386.942	1297.971	422.336	529C	crossrope											1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates
FER-UP1 208	83809.278	1720.307	444.617	529C	crossrope											1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates
FER-UP1 209	84253.895	2164.924	444.068	529C	crossrope											1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates
FER-UP1 210	84697.963	2608.992	446.74	529C	crossrope											1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates
FER-UP1 211	85144.703	3055.732	450.706	529C	crossrope											1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates
FER-UP1 212	85595.409	3506.438	443.504	529C	crossrope											1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates
FER-UP1 213	86038.913	3949.942	444.599	529C	crossrope											1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates
FER-UP1 214	86483.512	4394.541	457.538	529C	crossrope		1	20			1								2		4	FN1STAJT	Tower to be supplied with 8048 plate
FER-UP1 215	86941.05	457.538	455.748	529C	crossrope											1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates
FER-UP1 216	87396.798	913.286	449.583	529C	crossrope											1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates
FER-UP1 217	87846.381	1362.869	459.862	529C	crossrope											1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates
FER-UP1 218	88306.243	1822.731	488.104	529C	crossrope											1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates
FER-UP1 219	88794.347	2310.835	460.706	520B	Suspension									1				1			4	FNSUA	Tongue Oval Eye-plate type
FER-UP1 220	89255.053	2771.541	405.664	529C	crossrope											1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates
FER-UP1 221	89660.717	3177.205	403.497	529C	crossrope											1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates
FER-UP1 222	90064.214	3580.702	382.81	529C	crossrope											1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates
FER-UP1 223	90447.024	3963.512	412.97	517E	Strain		1	20			1								2		4	FN1STAJT	
FER-UP1 224	90859.994	412.97	451.726	529C	crossrope											1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates
FER-UP1 225	91311.72	864.696	433.291	529C	crossrope											1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates
FER-UP1 226	91745.011	1297.987	489.834	529C	crossrope											1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates
FER-UP1 227	92234.845	1787.821	484.021	518E	Suspension									1				1			4	FNSUA	Tongue Oval Eye-plate type
FER-UP1 228	92718.866	2271.842	445.427	529C	crossrope											1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates
FER-UP1 229	93164.293	2717.269	435.548	529C	crossrope											1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates
FER-UP1 230	93599.841	3152.817	404.157	529C	crossrope											1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates
FER-UP1 231	94003.998	3556.974	411.169	529C	crossrope											1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates
FER-UP1 232	94415.167	3968.143	463.226	529C	crossrope											1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates
FER-UP1 233	94878.393	4431.369	423.397	529C	crossrope		1	20			1								2		4	FN1STAJT	Tower to be supplied with 8048 plate
FER-UP1 234	95301.79	423.397	458.576	529C	crossrope											1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates
FER-UP1 235	95760.366	881.973	456.738	529C	crossrope											1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates
FER-UP1 236	96217.104	1338.711	465.657	529C	crossrope											1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates
FER-UP1 237	96682.761	1804.368	396.42	529C	crossrope											1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates
FER-UP1 238	97079.181	2200.788	388.521	529C	crossrope											1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates
FER-UP1 239	97467.702	2589.309	434.109	529C	crossrope											1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates
FER-UP1 240	97901.811	3023.418	429.23	529C	crossrope											1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates
FER-UP1 241	98331.041	3452.648	459.435	529C	crossrope											1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates
FER-UP1 242	98790.476	3912.083	445.205	529C	crossrope											1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates
FER-UP1 243	99235.681	4357.288	394.262	529C	crossrope		1	20			1								2		4	FN1STAJT	Tower to be supplied with 8048 plate
FER-UP1 244	99629.943	394.262	425.809	529C	crossrope											1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates
FER-UP1 245	100055.752	820.071	382.408	529C	crossrope											1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates
FER-UP1 246	100438.16	1202.479	327.053	529C	crossrope											1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates
FER-UP1 247	100765.213	1529.532	427.023	529C	crossrope											1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates
FER-UP1 248	101192.236	1956.555	439.529	529C	crossrope											1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates
FER-UP1 249	101631.765	2396.084	424.862	529C	crossrope											1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates
FER-UP1 250	102056.627	2820.946	416.676	529C	crossrope											1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates





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**Transmission**

FER-UI 251	102473.303	3237.622	445.383	529C	crossrope										1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 252	102918.686	3683.005	452.138	529C	crossrope										1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 253	103370.824	4135.143	455.776	529C	crossrope										1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 254	103826.6	4590.919	452.04	529C	crossrope			1	20			1						2		4	FNISTAJT		Tower to be supplied with 8048 plate
FER-UI 255	104278.64	452.04	479.87	529C	crossrope										1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 256	104758.51	931.91	457.501	529C	crossrope										1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 257	105216.011	1389.411	299.378	529C	crossrope										1		1			6		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 258	105515.389	1688.789	376.656	517E	Strain						1							1		4		FNISTA	
FER-UI 259	105892.045	2065.445	565.694	529C	crossrope										1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 260	106457.739	2631.139	366.489	529C	crossrope										1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 261	106824.228	2997.628	408.251	529C	crossrope										1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 262	107232.479	3405.879	362.397	529C	crossrope										1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 263	107594.876	3768.276	379.808	529C	crossrope										1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 264	107974.684	4148.084	370.178	529C	crossrope										1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 265	108344.862	4518.262	281.898	518C	Strain			1	20			1						2		4	FNISTAJT		
FER-UI 266	108626.76	281.898	468.181	518D	Strain							1						1		4		FNISTA	
FER-UI 267	109094.941	750.079	438.347	529C	crossrope										1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 268	109533.288	1188.426	439.862	529C	crossrope										1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 269	109973.15	1628.288	426.449	529C	crossrope										1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 270	110399.599	2054.737	426.286	529C	crossrope										1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 271	110825.885	2481.023	427.523	529C	crossrope												1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 272	111253.408	2908.546	414.712	529C	crossrope										1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 273	111668.12	3323.258	458.268	529C	crossrope										1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 274	112126.388	3781.526	461.034	520B	Suspension								1				1			4		FNISUA	Tongue Oval Eye-plate type
FER-UI 275	112587.422	4242.56	501.442	520B	Suspension			1	20			1						2		4	FNISTADST		Supplied with Chain link
FER-UI 276	113088.864	501.442	496.615	520B	Suspension								1				1			4		FNISUA	Tongue Oval Eye-plate type
FER-UI 277	113585.479	998.057	484.477	520B	Suspension								1				1		1	4		FNISUA	Tongue Oval Eye-plate type
FER-UI 278	114069.956	1482.534	485.631	520B	Suspension								1				1			4		FNISUA	Tongue Oval Eye-plate type
FER-UI 279	114555.587	1968.165	458.568	529C	crossrope										1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 280	115014.155	2426.733	376.276	529C	crossrope										1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 281	115390.431	2803.009	519.354	517E	Strain							1						1		4		FNISTA	
FER-UI 282	115909.785	3322.363	497.344	529A	crossrope										1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 283	116407.129	3819.707	505.437	529A	crossrope										1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 284	116912.566	4325.144	487.702	529A	crossrope			1	20			1						2		4	FNISTAJT		Tower to be supplied with 8048 plate
FER-UI 285	117400.268	487.702	475.608	529A	crossrope										1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 286	117875.876	963.31	481.689	529A	crossrope										1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 287	118357.565	1444.999	411.497	529A	crossrope										1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 288	118769.062	1856.496	338.847	529A	crossrope										1		1			4		FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 289	119107.909	2195.343	510.013	517E	Strain	Yes							1							4		FISTA	assembly to be supplied with twisted tongue oval eye
FER-UI 290	119617.922	2705.356	444.851	529A	crossrope	Yes											1			4		FISPA	Tower to be supplied with 8148M plate
FER-UI 291	120062.773	3150.207	507.112	529A	crossrope	Yes											1			4		FISPA	Tower to be supplied with 8148M plate
FER-UI 292	120569.885	3657.319	494.525	529A	crossrope	Yes											1			4		FISPA	Tower to be supplied with 8148M plate
FER-UI 293	121064.41	4151.844	505.01	529A	crossrope	Yes											1			4		FISPA	Tower to be supplied with 8148M plate
FER-UI 294	121569.42	4656.854	490.672	529A	crossrope	Yes		1	20			1							1	4	FISTAJT		Tower to be supplied with 8048 plate
FER-UI 295	122060.092	490.672	498.101	529A	crossrope	Yes											1			4		FISPA	Tower to be supplied with 8148M plate
FER-UI 296	122558.193	988.773	506.131	529A	crossrope	Yes											1			4		FISPA	Tower to be supplied with 8148M plate
FER-UI 297	123064.324	1494.904	509.518	529A	crossrope	Yes											1			4		FISPA	Tower to be supplied with 8148M plate
FER-UI 298	123573.842	2004.422	480.538	529A	crossrope	Yes											1			4		FISPA	Tower to be supplied with 8148M plate
FER-UI 299	124054.38	2484.96	465.92	529A	crossrope	Yes											1			4		FISPA	Tower to be supplied with 8148M plate
FER-UI 300	124520.3	2950.88	498.606	529A	crossrope	Yes											1			4		FISPA	Tower to be supplied with 8148M plate



**FERRUM UPINGTON NO1 400KV LINE OPGW  
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**Transmission**

FER-UIP 301	125018.906	3449.486	488.008	529A	crossrope	Yes										1				4	FISPA	Tower to be supplied with 8148M plate
FER-UIP 302	125506.914	3937.494	493.269	529A	crossrope	Yes										1				4	FISPA	Tower to be supplied with 8148M plate
FER-UIP 303	126000.183	4430.763	503.631	529A	crossrope	Yes		1		20		1							1	4	FISTAJT	Tower to be supplied with 8048 plate
FER-UIP 304	126503.814		503.631	529A	crossrope	Yes										1				4	FISPA	Tower to be supplied with 8148M plate
FER-UIP 305	127003.248		1003.065	529A	crossrope	Yes										1				4	FISPA	Tower to be supplied with 8148M plate
FER-UIP 306	127524.935		1524.752	529A	crossrope	Yes										1				4	FISPA	Tower to be supplied with 8148M plate
FER-UIP 307	128018.383		2018.2	529A	crossrope	Yes										1				4	FISPA	Tower to be supplied with 8148M plate
FER-UIP 308	128534		2533.817	529A	crossrope	Yes										1				4	FISPA	Tower to be supplied with 8148M plate
FER-UIP 309	129050.956		3050.773	529A	crossrope	Yes										1				4	FISPA	Tower to be supplied with 8148M plate
FER-UIP 310	129581.791		3581.608	529A	crossrope	Yes										1				4	FISPA	Tower to be supplied with 8148M plate
FER-UIP 311	130105.267		4105.084	529A	crossrope	Yes										1				4	FISPA	Tower to be supplied with 8148M plate
FER-UIP 312	130617.79		4617.607	529A	crossrope	Yes		1		20		1							1	4	FISTAJT	Tower to be supplied with 8048 plate
FER-UIP 313	131133.093		515.303	529A	crossrope	Yes										1				4	FISPA	Tower to be supplied with 8148M plate
FER-UIP 314	131636.564		1018.774	529A	crossrope	Yes										1				4	FISPA	Tower to be supplied with 8148M plate
FER-UIP 315	132140.987		1523.197	529A	crossrope	Yes										1				4	FISPA	Tower to be supplied with 8148M plate
FER-UIP 316	132580.009		1962.219	529A	crossrope	Yes										1				4	FISPA	Tower to be supplied with 8148M plate
FER-UIP 317	132975.981		2358.191	517E	Strain	Yes						1								4	FISTA	assembly to be supplied with twisted tongue oval eye
FER-UIP 318	133384.732		2766.942	529A	crossrope	Yes										1				4	FISPA	Tower to be supplied with 8148M plate
FER-UIP 319	133840.601		3222.811	529A	crossrope	Yes										1				4	FISPA	Tower to be supplied with 8148M plate
FER-UIP 320	134349.381		3731.591	529A	crossrope	Yes		1		20		1							1	4	FISTAJT	Tower to be supplied with 8048 plate
FER-UIP 321	134853.461		504.08	529A	crossrope	Yes										1				4	FISPA	Tower to be supplied with 8148M plate
FER-UIP 322	135349.539		1000.158	529A	crossrope	Yes										1				4	FISPA	Tower to be supplied with 8148M plate
FER-UIP 323	135838.984		1489.603	529A	crossrope	Yes										1				4	FISPA	Tower to be supplied with 8148M plate
FER-UIP 324	136338.85		1989.469	529A	crossrope	Yes										1				4	FISPA	Tower to be supplied with 8148M plate
FER-UIP 325	136812.284		2462.903	529A	crossrope	Yes										1				2	FISPA	Tower to be supplied with 8148M plate
FER-UIP 326	137298.203		2948.822	529A	crossrope	Yes		1		20		1							1	2	FISTAJT	Tower to be supplied with 8048 plate
																				2		
	Total							33	420	240	47	32	54	46	117	31	171	68	12	1300		

[illegible]



**FERRUM UPINGTON NO1 400KV LINE OPGW  
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INSTALLATION SPECIFICATION**

**Transmission**

FER-UI 378	24758.076	3269.793	488.974	529A	Crossrope										1		1			4		FNISUA
FER-UI 379	25247.05	3758.767	443.58	529A	Crossrope										1		1			4		FNISUA
FER-UI 380	25690.63	4202.347	482.5	529A	Crossrope			1	20		1							2		4	FNISTAJT	
FER-UI 381	26173.13	482.5	388.626	529A	Crossrope										1		1			4		FNISUA
FER-UI 382	26561.756	871.126	472.472	529A	Crossrope										1		1			4		FNISUA
FER-UI 383	27034.228	1343.598	480.105	529A	Crossrope										1		1			4		FNISUA
FER-UI 384	27514.333	1823.703	446.776	529A	Crossrope										1		1			4		FNISUA
FER-UI 385	27961.109	2270.479	453.432	529A	Crossrope										1		1			4		FNISUA
FER-UI 386	28414.541	2723.911	454.827	529A	Crossrope										1		1			4		FNISUA
FER-UI 387	28869.368	3178.738	465.567	529A	Crossrope										1		1			4		FNISUA
FER-UI 388	29334.935	3644.305	441.617	529A	Crossrope										1		1			4		FNISUA
FER-UI 389	29776.552	4085.922	449.982	529A	Crossrope										1		1			4		FNISUA
FER-UI 390	30226.534	4535.904	506.549	529A	Crossrope			1	20		1							2		4	FNISTAJT	
FER-UI 391	30733.083	506.549	493.191	529A	Crossrope										1		1			4		FNISUA
FER-UI 392	31226.274	999.74	516.734	529A	Crossrope										1		1			4		FNISUA
FER-UI 393	31743.008	1516.474	511.157	529A	Crossrope										1		1			4		FNISUA
FER-UI 394	32254.165	2027.631	497.074	529A	Crossrope										1		1			4		FNISUA
FER-UI 395	32751.239	2524.705	512.428	529A	Crossrope										1		1			4		FNISUA
FER-UI 396	33263.667	3037.133	396.057	529A	Crossrope										1		1			4		FNISUA
FER-UI 397	33659.724	3433.19	490.195	529A	Crossrope										1		1			4		FNISUA
FER-UI 398	34149.919	3923.385	484.968	520B	Suspension								1				1			4		FNISUA
FER-UI 399	34634.887	4408.353	497.529	520B	Suspension			1	20		1							2		4	FNISTADST	
FER-UI 400	35132.416	497.529	485.847	520B	Suspension								1				1			4		FNISUA
FER-UI 401	35618.263	983.376	495.26	520B	Suspension								1				1			4		FNISUA
FER-UI 402	36113.523	1478.636	439.833	520B	Suspension								1				1			4		FNISUA
FER-UI 403	36553.356	1918.469	388.752	520B	Suspension								1				1			4		FNISUA
FER-UI 404	36942.108	2307.221	426.119	517E	Strain					1								1		4		FNISTA
FER-UI 405	37368.227	2733.34	491.875	520B	Suspension								1				1			4		FNISUA
FER-UI 406	37860.102	3225.215	497.28	520B	Suspension								1				1			4		FNISUA
FER-UI 407	38357.382	3722.495	478.846	520B	Suspension								1				1			4		FNISUA
FER-UI 408	38836.228	4201.341	518.083	520B	Suspension			1	20		1							2		4	FNISTADST	
FER-UI 409	39354.311	518.083	502.161	529A	Crossrope										1		1			4		FNISUA
FER-UI 410	39856.472	1020.244	503.706	529A	Crossrope										1		1			4		FNISUA
FER-UI 411	40360.178	1523.95	463.106	529A	Crossrope										1		1			4		FNISUA
FER-UI 412	40823.284	1987.056	425.06	529A	Crossrope										1		1			4		FNISUA
FER-UI 413	41248.344	2412.116	459.555	529A	Crossrope										1		1			4		FNISUA
FER-UI 414	41707.899	2871.671	488.448	529A	Crossrope										1		1			4		FNISUA
FER-UI 415	42196.347	3360.119	477.011	529A	Crossrope										1		1			4		FNISUA
FER-UI 416	42673.358	3837.13	525.236	529A	Crossrope										1		1			4		FNISUA
FER-UI 417	43198.594	4362.366	488.31	529A	Crossrope			1	20		1							2		4	FNISTAJT	
FER-UI 418	43686.904	488.31	454.086	529A	Crossrope										1		1			4		FNISUA
FER-UI 419	44140.99	942.396	457.929	529A	Crossrope										1		1			4		FNISUA
FER-UI 420	44598.919	1400.325	503.732	529A	Crossrope										1		1			4		FNISUA
FER-UI 421	45102.651	1904.057	513.714	529A	Crossrope										1		1			4		FNISUA
FER-UI 422	45616.365	2417.771	396.824	529A	Crossrope										1		1			4		FNISUA
FER-UI 423	46013.189	2814.595	448.096	529A	Crossrope										1		1			4		FNISUA
FER-UI 424	46461.285	3262.691	405.675	529A	Crossrope										1		1			4		FNISUA
FER-UI 425	46866.96	3668.366	394.637	529A	Crossrope										1		1			4		FNISUA
FER-UI 426	47261.597	4063.003	466.228	529A	Crossrope										1		1			4		FNISUA
FER-UI 427	47727.825	4529.231	522.777	517E	Strain			1	20		1							2		4	FNISTAJT	



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**Transmission**

FER-UI 428	48250.602	522.777	535.08	529A	Crossrope											1		1			4	FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 429	48785.682	1057.857	462.382	520B	Suspension											1		1			4	FNISUA	Tongue Oval Eye-plate type
FER-UI 430	49248.064	1520.239	446.905	529A	Crossrope												1		1		4	FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 431	49694.969	1967.144	434.358	529A	Crossrope												1		1		4	FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 432	50129.327	2401.502	414.192	529A	Crossrope												1		1		4	FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 433	50543.519	2815.694	365.614	529A	Crossrope												1		1		4	FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 434	50909.133	3181.308	342.469	529A	Crossrope												1		1		4	FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 435	51251.602	3523.777	526.938	517E	Strain				1	20			1							2	4	FNISTAJT	
FER-UI 436	51778.54	526.938	475.075	518H	Suspension											1			1		4	FNISUA	Tongue Oval Eye-plate type
FER-UI 437	52253.615	1002.013	467.072	529A	Crossrope												1		1		4	FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 438	52720.687	1469.085	468.715	529A	Crossrope												1		1		4	FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 439	53189.402	1937.8	443.589	518C	Strain				1	20			1							2	4	FNISTAJT	
FER-UI 440	53632.991	443.589	481.287	518C	Strain								1							1	4	FNISTA	
FER-UI 441	54114.278	924.876	468.264	520B	Suspension											1			1		4	FNISUA	Tongue Oval Eye-plate type
FER-UI 442	54582.542	1393.14	509.385	520B	Suspension											1			1		4	FNISUA	Tongue Oval Eye-plate type
FER-UI 443	55091.927	1902.525	479.105	520B	Suspension											1			1		4	FNISUA	Tongue Oval Eye-plate type
FER-UI 444	55571.032	2381.63	479.751	529A	Crossrope												1		1		4	FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 445	56050.783	2861.381	476.31	529A	Crossrope												1		1		4	FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 446	56527.093	3337.691	486.534	529A	Crossrope												1		1		4	FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 447	57013.627	3824.225	493.603	529A	Crossrope												1		1		4	FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 448	57507.23	4317.828	501.125	529A	Crossrope				1	20			1							2	4	FNISTAJT	Tower to be supplied with 8048 plate
FER-UI 449	58008.355	501.125	499.491	529A	Crossrope												1		1		4	FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 450	58507.846	1000.616	496.931	529A	Crossrope												1		1		4	FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 451	59004.777	1497.547	496.49	529A	Crossrope												1		1		4	FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 452	59501.267	1994.037	501.823	520B	Suspension											1			1		4	FNISUA	Tongue Oval Eye-plate type
FER-UI 453	60003.09	2495.86	493.389	520B	Suspension											1			1		4	FNISUA	Tongue Oval Eye-plate type
FER-UI 454	60496.479	2989.249	463.636	520B	Suspension											1			1		4	FNISUA	Tongue Oval Eye-plate type
FER-UI 455	60960.115	3452.885	490.198	520B	Suspension											1			1		4	FNISUA	Tongue Oval Eye-plate type
FER-UI 456	61450.313	3943.083	495.232	520B	Suspension											1			1		4	FNISUA	Tongue Oval Eye-plate type
FER-UI 457	61945.545	4438.315	473.494	520B	Suspension				1	20			1							2	4	FNISTADST	Supplied with Chain link
FER-UI 458	62419.039	473.494	478.807	529A	Crossrope												1		1		4	FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 459	62897.846	952.301	500.939	529A	Crossrope												1		1		4	FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 460	63398.785	1453.24	477.748	529A	Crossrope												1		1		4	FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 461	63876.533	1930.988	455.807	529A	Crossrope												1		1		4	FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 462	64332.34	2386.795	396.343	529A	Crossrope												1		1		4	FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UI 463	64728.683	2783.138	410.322	517F	Strain								1							1	4	FNISTA	
FER-UI 464	65139.005	3193.46	504.11	520B	Suspension											1			1		4	FNISUA	Tongue Oval Eye-plate type
FER-UI 465	65643.115	3697.57	493.11	520B	Suspension											1			1		4	FNISUA	Tongue Oval Eye-plate type
FER-UI 466	66136.225	4190.68	499.904	520B	Suspension				1	20			1							2	4	FNISTADST	Supplied with Chain link
FER-UI 467	66636.129	499.904	468.07	520B	Suspension											1			1		4	FNISUA	Tongue Oval Eye-plate type
FER-UI 468	67104.199	967.974	444.154	520B	Suspension											1			1		4	FNISUA	Tongue Oval Eye-plate type
FER-UI 469	67548.353	1412.128	477.692	520B	Suspension											1			1		4	FNISUA	Tongue Oval Eye-plate type
FER-UI 470	68026.045	1889.82	477.273	520B	Suspension											1			1		4	FNISUA	Tongue Oval Eye-plate type
FER-UI 471	68503.318	2367.093	511.731	520B	Suspension											1			1		4	FNISUA	Tongue Oval Eye-plate type
FER-UI 472	69015.049	2878.824	460.386	520B	Suspension											1			1		4	FNISUA	Tongue Oval Eye-plate type
FER-UI 473	69475.435	3339.21	436.402	520B	Suspension											1			1		4	FNISUA	Tongue Oval Eye-plate type
FER-UI 474	69911.837	3775.612	474.245	520B	Suspension											1			1		4	FNISUA	Tongue Oval Eye-plate type
FER-UI 475	70386.082	4249.857	464.925	520B	Suspension				1	20			1							2	4	FNISTADST	Supplied with Chain link
FER-UI 476	70851.007	464.925	467.879	520B	Suspension											1			1		4	FNISUA	Tongue Oval Eye-plate type
FER-UI 477	71318.886	932.804	523.508	520B	Suspension											1			1		4	FNISUA	Tongue Oval Eye-plate type



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FER-UPI 478	71842.394	1456.312	473.397	520B	Suspension										1				1				4	FNISUA	Tongue Oval Eye-plate type
FER-UPI 479	72315.791	1929.709	482.08	520B	Suspension										1				1				4	FNISUA	Tongue Oval Eye-plate type
FER-UPI 480	72797.871	2411.789	488.179	520B	Suspension										1				1				4	FNISUA	Tongue Oval Eye-plate type
FER-UPI 481	73286.05	2899.968	466.91	520B	Suspension										1				1				4	FNISUA	Tongue Oval Eye-plate type
FER-UPI 482	73752.96	3366.878	480.726	520B	Suspension										1				1				4	FNISUA	Tongue Oval Eye-plate type
FER-UPI 483	74233.686	3847.604	460.267	520B	Suspension										1				1				4	FNISUA	Tongue Oval Eye-plate type
FER-UPI 484	74693.953	4307.871	490.333	520B	Suspension			1	20		1								2			4	FNISTADST		Supplied with Chain link
FER-UPI 485	75184.286	490.333	503.243	520B	Suspension										1				1				4	FNISUA	Tongue Oval Eye-plate type
FER-UPI 486	75687.529	993.576	447.374	520B	Suspension										1				1				4	FNISUA	Tongue Oval Eye-plate type
FER-UPI 487	76134.903	1440.95	337.553	520B	Suspension										1				1				4	FNISUA	Tongue Oval Eye-plate type
FER-UPI 488	76472.456	1778.503	349.654	517F	Strain					1										1			4	FNISTA	
FER-UPI 489	76822.11	2128.157	410.712	529A	Crossrope												1		1				4	FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UPI 490	77232.822	2538.869	455.178	529A	Crossrope												1		1				4	FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UPI 491	77688	2994.047	490.844	529A	Crossrope												1		1				4	FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UPI 492	78178.844	3484.891	508.881	529A	Crossrope												1		1				4	FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UPI 493	78687.725	3993.772	459.431	529A	Crossrope												1		1				4	FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UPI 494	79147.156	4453.203	494.308	529A	Crossrope			1	20		1								2			4	FNISTAJT		Tower to be supplied with 8048 plate
FER-UPI 495	79641.464	494.308	448.267	529A	Crossrope												1		1				4	FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UPI 496	80089.731	942.575	531.148	529A	Crossrope												1		1				4	FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UPI 497	80620.879	1473.723	528.989	529A	Crossrope												1		1				4	FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UPI 498	81149.868	2002.712	329.493	518H	Suspension										1				1				4	FNISUA	Tongue Oval Eye-plate type
FER-UPI 499	81479.361	2332.205	464.319	517E	Strain					1										1			4	FNISTA	
FER-UPI 500	81943.68	2796.524	341.738	529A	Crossrope												1		1				4	FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UPI 501	82285.418	3138.262	336.774	529A	Crossrope												1		1				4	FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UPI 502	82622.192	3475.036	459.522	529A	Crossrope												1		1				4	FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UPI 503	83081.714	3934.558	443.02	520B	Suspension										1				1				4	FNISUA	Tongue Oval Eye-plate type
FER-UPI 504	83524.734	4377.578	410.929	520B	Suspension			1	20		1								2			4	FNISTADST		Supplied with Chain link
FER-UPI 505	83935.663	410.929	471.348	520B	Suspension										1				1				4	FNISUA	Tongue Oval Eye-plate type
FER-UPI 506	84407.011	882.277	518.492	529A	Crossrope												1		1				4	FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UPI 507	84925.503	1400.769	524.692	529A	Crossrope												1		1				4	FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UPI 508	85450.195	1925.461	540.608	529A	Crossrope												1		1				4	FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UPI 509	85990.803	2466.069	434.757	517E	Strain					1										1			4	FNISTA	
FER-UPI 510	86425.56	2900.826	388.37	529A	Crossrope												1		1				4	FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UPI 511	86813.93	3289.196	445.008	529A	Crossrope												1		1				4	FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UPI 512	87258.938	3734.204	445.276	529A	Crossrope												1		1				4	FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UPI 513	87704.214	4179.48	458.621	529A	Crossrope												1		1				4	FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UPI 514	88162.835	4638.101	481.747	529A	Crossrope			1	20		1								2			4	FNISTAJT		Tower to be supplied with 8048 plate
FER-UPI 515	88644.582	481.747	499.419	529A	Crossrope												1		1				4	FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UPI 516	89144.001	981.166	463.055	529A	Crossrope												1		1				4	FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UPI 517	89607.056	1444.221	472.506	529A	Crossrope												1		1				4	FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UPI 518	90079.562	1916.727	497.661	517F	Strain					1										1			4	FNISTA	
FER-UPI 519	90577.223	2414.388	480.857	517F	Strain					1										1			4	FNISTA	
FER-UPI 520	91058.08	2895.245	476.361	529A	Crossrope												1		1				4	FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UPI 521	91534.441	3371.606	495.054	529A	Crossrope												1		1				4	FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UPI 522	92029.495	3866.66	487.989	529A	Crossrope												1		1				4	FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UPI 523	92517.484	4354.649	509.199	517E	Strain			1	20		1								2			4	FNISTAJT		
FER-UPI 524	93026.683	509.199	447.42	529A	Crossrope												1		1				4	FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UPI 525	93474.103	956.619	492.652	529A	Crossrope												1		1				4	FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UPI 526	93966.755	1449.271	505.174	529A	Crossrope												1		1				4	FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UPI 527	94471.929	1954.445	442.815	529A	Crossrope												1		1				4	FNISUA	Long Bolts and Spacers + 8048 Plates





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**Transmission**

FER-UP1 528	94914.744	2397.26	513.715	529A	Crossrope										1		1			4	FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UP1 529	95428.459	2910.975	513.9	529A	Crossrope										1		1			4	FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UP1 530	95942.359	3424.875	548.628	529A	Crossrope										1		1			4	FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UP1 531	96490.987	3973.503	520.777	529A	Crossrope										1		1			4	FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UP1 532	97011.764	4494.28	534.998	529A	Crossrope				1	20		1						2		4	FNISTAJT	Tower to be supplied with 8048 plate
FER-UP1 533	97546.762	534.998	542.034	529A	Crossrope										1		1			4	FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UP1 534	98088.796	1077.032	473.152	529A	Crossrope										1		1			4	FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UP1 535	98561.948	1550.184	508.452	529A	Crossrope										1		1			4	FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UP1 536	99070.4	2058.636	519.279	529A	Crossrope										1		1			4	FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UP1 537	99589.679	2577.915	498.913	529A	Crossrope										1		1			4	FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UP1 538	100088.592	3076.828	388.161	529A	Crossrope										1		1			4	FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UP1 539	100476.753	3464.989	407.153	517F	Strain						1							1		4	FNISTA	
FER-UP1 540	100883.906	3872.142	511.375	529A	Crossrope										1		1			4	FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UP1 541	101395.281	4383.517	527.769	529A	Crossrope				1	20		1						2		4	FNISTAJT	Tower to be supplied with 8048 plate
FER-UP1 542	101923.05	527.769	512.628	529A	Crossrope										1		1			4	FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UP1 543	102435.678	1040.397	505.433	529A	Crossrope										1		1			4	FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UP1 544	102941.111	1545.83	510.588	529A	Crossrope										1		1			4	FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UP1 545	103451.699	2056.418	458.651	518C	Strain						1							1		4	FNISTA	
FER-UP1 546	103910.35	2515.069	462.833	518C	Strain						1							1		4	FNISTA	
FER-UP1 547	104373.183	2977.902	517.605	529A	Crossrope										1		1			4	FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UP1 548	104890.788	3495.507	469.185	520B	Suspension								1				1			4	FNISUA	Tongue Oval Eye-plate type
FER-UP1 549	106359.973	3964.692	489.252	520B	Suspension								1				1			4	FNISUA	Tongue Oval Eye-plate type
FER-UP1 550	105849.225	4453.944	501.808	520B	Suspension				1	20		1						2		4	FNISTADST	Supplied with Chain link
FER-UP1 551	106351.033	501.808	483.83	520B	Suspension								1				1			4	FNISUA	Tongue Oval Eye-plate type
FER-UP1 552	106834.863	985.638	447.153	520B	Suspension								1				1			4	FNISUA	Tongue Oval Eye-plate type
FER-UP1 553	107282.016	1432.791	486.138	520B	Suspension								1				1			4	FNISUA	Tongue Oval Eye-plate type
FER-UP1 554	107768.154	1918.929	511.017	520B	Suspension								1				1			4	FNISUA	Tongue Oval Eye-plate type
FER-UP1 555	108279.171	2429.946	459.809	520B	Suspension								1				1			4	FNISUA	Tongue Oval Eye-plate type
FER-UP1 556	108738.98	2889.755	447.455	520B	Suspension								1				1			4	FNISUA	Tongue Oval Eye-plate type
FER-UP1 557	109186.435	3337.21	469.607	520B	Suspension								1				1			4	FNISUA	Tongue Oval Eye-plate type
FER-UP1 558	109656.042	3806.817	459.297	520B	Suspension								1				1			4	FNISUA	Tongue Oval Eye-plate type
FER-UP1 559	110115.339	4266.114	478.315	520B	Suspension				1	20		1						2		4	FNISTADST	Supplied with Chain link
FER-UP1 560	110593.654	478.315	489.311	520B	Suspension								1				1			4	FNISUA	Tongue Oval Eye-plate type
FER-UP1 561	111082.965	967.626	458.323	520B	Suspension								1				1			4	FNISUA	Tongue Oval Eye-plate type
FER-UP1 562	111541.288	1425.949	483.882	520B	Suspension								1				1			4	FNISUA	Tongue Oval Eye-plate type
FER-UP1 563	112025.17	1909.831	454.231	520B	Suspension								1				1			4	FNISUA	Tongue Oval Eye-plate type
FER-UP1 564	112479.401	2364.062	491.982	520B	Suspension								1				1			4	FNISUA	Tongue Oval Eye-plate type
FER-UP1 565	112971.383	2856.044	392.703	518C	Strain						1							1		4	FNISTA	
FER-UP1 566	113364.086	3248.747	503.049	518C	Strain	Yes						1								4	FISTA	assembly to be supplied with twisted tongue oval eye
FER-UP1 567	113867.135	3751.796	495.391	520B	Suspension	Yes								1						4	FISUA	Tongue Oval Eye-plate type
FER-UP1 568	114362.526	4247.187	503.379	520B	Suspension	Yes														4	FISUA	Tongue Oval Eye-plate type
FER-UP1 569	114865.905	4750.566	495.053	518C	Strain	Yes			1	20		1							1	4	FISTAJT	Supplied with Twisted tongue oval eye
FER-UP1 570	115360.958	495.053	468.408	518C	Strain	Yes						1								4	FISTA	assembly to be supplied with twisted tongue oval eye
FER-UP1 571	115829.366	963.461	495.057	529A	Crossrope	Yes											1			4	FISPA	Tower to be supplied with 8148M plate
FER-UP1 572	116324.423	1458.518	532.347	529A	Crossrope	Yes											1			4	FISPA	Tower to be supplied with 8148M plate
FER-UP1 573	116856.77	1990.865	500.729	529A	Crossrope	Yes											1			4	FISPA	Tower to be supplied with 8148M plate
FER-UP1 574	117357.499	2491.594	531.661	529A	Crossrope										1		1			4	FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UP1 575	117889.16	3023.255	444.123	529A	Crossrope										1		1			4	FNISUA	Long Bolts and Spacers + 8048 Plates
FER-UP1 576	118333.283	3467.378	455.819	517E	Strain						1							1		4	FNISTA	
FER-UP1 577	118789.102	3923.197	507.963	529A	Crossrope										1		1			4	FNISUA	Long Bolts and Spacers + 8048 Plates



**FERRUM UPINGTON NO1 400KV LINE OPGW  
and Hardware Scope of Work  
INSTALLATION SPECIFICATION**

**Transmission**

FER-UP1 578	119297.065	4431.16	462.759	529A	Crossrope										1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates
FER-UP1 579	119759.824	4893.919	367.381	517E	Strain			1	20		1						2		4	FNSTAJT		
FER-UP1 580	120127.205	367.381	326.207	529A	Crossrope									1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates	
FER-UP1 581	120453.412	693.588	393.563	517F	Strain						1						1		4	FNSTA		
FER-UP1 582	120846.975	1087.151	515.132	529A	Crossrope									1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates	
FER-UP1 583	121362.107	1602.283	511.427	529A	Crossrope									1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates	
FER-UP1 584	121873.534	2113.71	520.048	529A	Crossrope									1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates	
FER-UP1 585	122393.582	2633.758	506.435	529A	Crossrope									1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates	
FER-UP1 586	122900.017	3140.193	458.574	529A	Crossrope									1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates	
FER-UP1 587	123358.591	3598.767	440.54	529A	Crossrope									1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates	
FER-UP1 588	123799.131	4039.307	411.097	529A	Crossrope									1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates	
FER-UP1 589	124210.228	4450.404	395.463	529A	Crossrope			1	20		1						2		4	FNSTAJT		Tower to be supplied with 8048 plate
FER-UP1 590	124605.691	395.463	461.497	529A	Crossrope									1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates	
FER-UP1 591	125067.188	856.96	497.858	529A	Crossrope									1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates	
FER-UP1 592	125565.046	1354.818	509.931	529A	Crossrope									1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates	
FER-UP1 593	126074.977	1864.749	510.641	529A	Crossrope									1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates	
FER-UP1 594	126585.618	2375.39	499.905	529A	Crossrope									1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates	
FER-UP1 595	127085.523	2875.295	506.665	529A	Crossrope									1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates	
FER-UP1 596	127592.188	3381.96	503.806	529A	Crossrope									1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates	
FER-UP1 597	128095.994	3885.766	517.087	529A	Crossrope									1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates	
FER-UP1 598	128613.081	4402.853	474.474	529A	Crossrope			1	20		1						2		4	FNSTAJT		Tower to be supplied with 8048 plate
FER-UP1 599	129087.555	474.474	446.613	529A	Crossrope									1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates	
FER-UP1 600	129534.168	921.087	459.714	529A	Crossrope									1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates	
FER-UP1 601	129993.882	1380.801	493.298	529A	Crossrope									1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates	
FER-UP1 602	130487.18	1874.099	518.01	529A	Crossrope									1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates	
FER-UP1 603	131005.19	2392.109	465.198	529A	Crossrope									1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates	
FER-UP1 604	131470.388	2857.307	398.206	529A	Crossrope									1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates	
FER-UP1 605	131868.594	3255.513	520.533	529A	Crossrope									1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates	
FER-UP1 606	132389.127	3776.046	531.133	529A	Crossrope									1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates	
FER-UP1 607	132920.26	4307.179	531.811	529A	Crossrope			1	20		1						2		4	FNSTAJT		Tower to be supplied with 8048 plate
FER-UP1 608	133452.071	531.811	504.298	529A	Crossrope									1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates	
FER-UP1 609	133956.369	1036.109	471.729	529A	Crossrope									1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates	
FER-UP1 610	134428.098	1507.838	500.949	529A	Crossrope									1		1			4	FNSUA	Long Bolts and Spacers + 8048 Plates	
FER-UP1 611	134929.047	2008.787	498.426	518C	Strain						1						1		4	FNSTA		
FER-UP1 612	135427.473	2507.213	364.028	518C	Strain						1						1		4	FNSTA		
FER-UP1 613	135791.501	2871.241	432.548	518H	Suspension							1					1		4	FNSUA	Tongue Oval Eye-plate type	
FER-UP1 614	136224.049	3303.789	365.434	518H	Suspension								1				1		4	FNSUA	Tongue Oval Eye-plate type	
FER-UP1 615	136589.483	3669.223	315.258	517F	Strain	Yes					1								4	FISTA	assembly to be supplied with twisted tongue oval eye	
FER-UP1 616	136904.741	3984.481	362.571	518H	Suspension	Yes								1					2	FISUA	Tongue Oval Eye-plate type	
FER-UP1 617	137267.312	4347.052	306.866	517F	Strain	Yes		1	20		1							1	2	FISTAJT		Supplied with Twisted tongue oval eye
FER-UP1 618	137574.178	306.866	125.823	517F	Strain	Yes						1							2	FISTA	assembly to be supplied with twisted tongue oval eye	
FER-UP1 619	137700.001	432.689	71.766	517F	Strain	Yes						1							2	FISTA	assembly to be supplied with twisted tongue oval eye	
UPI GANTRY	137771.767	504.455	0		Strain			1	20		1						2		2	FNSTAJT		