# CAPITAL PROGRAM (TELECOMMUNICATIONS PROJECT)

# USER REQUIREMENT SPECIFICATION

# (TECHNICAL REQUIREMENTS)

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# CONSTRUCTION OF TRAIN RADIO HIGH SITES FOR PYRAMID-SOUTH – ELLISRAS LINE

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| | | Date: | 30 June 2009 |


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Transnet Freight Rail

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## ABBREVIATIONS, ACRONYMS AND DEFINITIONS

| ABBREVIATIONS AND ACRONYMS | DESCRIPTION |
|---|---|
| **AC** | Alternating Current |
| **CoC** | Certificate of Completion |
| **LDW** | Light Delivery Wagon |
| **mm** | Millimetre |
| **MPA** | Mega Pascal |
| **RF** | Radio Frequency |
| **RTO** | Radio Train Order |
| **TFR** | Transnet Freight Rail |

| DEFINITIONS | DESCRIPTION |
|---|---|
| **Works** | Construction of infrastructure for radio communications |
| | |

## 1. INTRODUCTION

This contract specification covers the construction of infrastructure for radio communications high sites for the Radio Train Order (RTO) network between Pyramid -South and Ellisras, herein after referred to as the "WORKS", and any other work arising out of or incidental to the above, or required of the Contractor for the proper completion of the "WORKS" in accordance with the true meaning and intent of the contract.

## 2. BACKGROUND INFORMATION

2.1. Transnet Freight Rail (TFR) is a business division of Transnet Limited, and it has a broad range of telecommunications services. These services include, amongst others, radio communications for the safe operation of trains.

2.2. The "WORKS" called for in this document are for the construction of infrastructure for radio high sites. These high sites will house radio communications systems used for RTO, a system used by Transnet Freight Rail for the control of train operations between PYRAMID-SOUTH and ELLISRAS.

2.3. The "WORKS" called for in this document have an impact on the safe operations of trains by TFR. The level of workmanship, the quality and durability of the installations, and adherence to safety rules and regulations is of the utmost importance.

2.4. TFR will hold a site meeting and conduct visits to all the sites that are covered in the "WORKS". **Attendance of the site meeting and visits to all sites is compulsory for all tenderers. Tender responses from Contractors who have not attended the compulsory briefings will be automatically disqualified**.

## 3. SCOPE OF WORK

3.1. This specification covers the construction of radio high sites for RTO communication systems.

3.2. These requirements will be refined after the **compulsory site briefings**, and any changes to the requirements will be communicated to those Contractors that attended the site briefings. The scope of work for the sites includes the following:

3.2.1. The upgrade of an access road to the applicable site, such that it can be possible for a 2x4 LDW vehicle to access the site. The sites where access roads are required will be identified during the site meetings.

3.2.2. The clearance of terrain for the construction of a concrete plinth. The concrete plinth must be 25 MPA and 100 mm thick with expansion joints (1.5$m^2$ blocks).

3.2.3. The supply and installation of a 3 X 30 mm copper earth mat, 500 mm from the outside perimeter of the site and connected to the mast, fence corner posts and container/building earth.

3.2.4. Supply and install 2,5 m palisade steel fence (hot dipped galvanised) with an access gate. Refer to the applicable site plans (Appendix D) and see Appendix F for fence specification details.

3.2.5. On each of the sites powered by solar, supply and install a container as per Drawing 1 "Equipment Housing" and Appendix A of this specification, namely "Container Requirements 12 volt DC Solar Feed".

3.2.6. On each of the sites where 220 volt AC power is available, supply and install a container as per Drawing 1 "Equipment Housing", and Appendix B of this specification, namely "Container Requirements 220 volt AC Feed".

3.2.7. Supply and install a mast as per the Site Plans. The mast must be a self-supporting lattice type mast. Details of the mast requirements are listed in Appendix C.

3.2.8. Supply and install an antenna system, inclusive of antenna(s), RF cabling, connectors, cable trays, cable entry plates, lightning protection and earthing, refer to Appendix C and Appendix D.

3.3. When the construction of each site is completed in terms of this specification, the Contractor must complete a Certificate of Completion (CoC) and present it to the TFR.

3.4. When the TFR is satisfied that the site has been built according to specification, the CoC will be signed.

3.5. A signed CoC is required for payment to be processed.

## 4. FORMAT OF TENDER PRICING SUBMISSIONS

All tender responses must include pricing in the format of the template shown in Appendix E of this specification.

# APPENDIX A : CONTAINER REQUIREMENTS
# 12 VOLT DC SOLAR FEED

A1. The typical layout of this type of container is shown in Drawing 1 "Equipment Housing ".

A2. The container is a basic housing unit with **two** cable entry facilities at opposite ends for the mounting of **aluminium** cable entry panels.

A3. The electrical wiring must be as follows:

A3.1 A 12 volt DC power distribution box, including circuit breakers and regulator, with vertical PVC cable duct with dimensions 40 mm x 40 mm.

A3.2 Four circuit breakers:

A3.2.1 12 volt DC solar main feed breaker rated 40 ampere.

A3.2.2 Feed for equipment rated 15 ampere.

A3.2.3 Lights rated 5 ampere.

A3.2.4 Extractor fan rated 5 ampere.

A3.3 A 12 volt internal fluorescent lamp to be mounted on the ceiling of the container. The light must have a switch.

A3.4 An earth bus bar to be connected to the stainless steel frame at the base of the container.

A3.5 Forced ventilation to be provided with a single temperature controlled 12 volt DC extractor fan. Natural airflow should be possible in the event of extractor fan failure. The ventilation openings shall be equipped with dust filters and wire mesh, and be designed to prevent rain from flowing into the interior and for easy replacement and cleaning of filter material.

A4. General requirements for container:

A4.1 Dimensions: Height 2500 mm, Length 2400 mm, Width 2400 mm.

A4.2 Panel thickness: 50 mm.

A4.3 Wall finish: Chromadeck – silicone polyester baked enamel exterior and interior with white colouring.

A4.4 The Frame must be made of 304-grade stainless steel.

A4.5 Cable entry panels: two aluminium panels of dimensions 210 mm x 297 mm with water drip shall be provided on both sides at each end of the horizontal cable tray. A vertical aluminium strip of 1 mm x 100 mm shall be provided to connect each entry plate to the stainless steel frame at the base of the container. The aluminium strips shall be BETWEEN the foam and the outer Chromadeck. The container housing entry shall be 170 mm x 255 mm.

A4.6 Floor: the floor shall be 19 mm 8-ply marine wood covered with 3mm checker Aluminium plate.

A4.7 The power and earth cable entry shall be from the bottom of the container. The entries must be through watertight glands.

A4.8 A solar power system must be supplied. The system must have 600W output regulated at 13.8 volt, mounted as per site drawing for the particular site.

# APPENDIX B : CONTAINER REQUIREMENTS 220 VOLT AC FEED

B1. The typical layout of this type of container is shown in Drawing 1 "Equipment Housing ".

B2. The container is a basic housing unit with **two** cable entry facilities at opposite ends for the mounting of **aluminium** cable entry panels.

B3. The electrical wiring must be as follows:

B3.1 A 220 volt AC power distribution box, including circuit brakers, with a vertical PVC cable duct with dimensions 40 mm x 40 mm.

B3.2 Five circuit breakers:

A3.2.1 220 volt AC feed rated at 65 ampere.

A3.2.2 Two for equipment feed rated at 15 ampere.

A3.2.3 One for air conditioning rated at 25 ampere.

A3.2.4 One for lighting rated at 10 ampere

B3.3 A 220 volt 60 watt fluorescent light to be mounted on the ceiling of the container. The light must have a switch.

B3.4 A 220 volt external light mounted above door, with a switch inside the container.

B3.5 An earth bus bar to be connected to the stainless steel frame at the base of the container.

B3.6 A power duct as shown on Drawing 1 "Equipment Housing 1", equipped with six 220 volt AC socket outlets in total (three per equipment trip switch).

B3.7 Forced ventilation to be provided with a single temperature controlled 220 volt AC extractor fan. Natural airflow should be possible in the event of extractor fan failure. The ventilation openings shall be equipped with dust filters and wire mesh, and be designed to prevent rain from flowing into the interior and for easy replacement and cleaning of filter material.

B3.8 Only when specified in the schedule of requirements, a 12000 BTU air conditioner that provides cooling only, must be provided, with an extractor fan with a gravitational louver system. An adjustable temperature sensor must control the extractor fan. The air conditioner must be protected against theft.

B4. General requirements for container:

B4.1 Dimensions: Height 2500 mm, Length 1800 mm, width 1800 mm.

B4.2 Panel thickness: 50 mm.

B4.3 Wall finish: Chromadeck – silicone polyester baked enamel exterior and interior with white colouring.

B4.4 The Frame must be made of 304-grade stainless steel.

B4.5 Cable entry panels: two aluminium panels of dimensions 210 mm x 297 mm with water drip shall be provided on both sides at each end of the horizontal cable tray. A vertical aluminium strip of 1 mm x 100 mm shall be provided to connect each entry plate to the stainless steel frame at the base of the container. The aluminium strips shall be between the foam and the outer Chromadeck. The container housing entry shall be 170 mm x 255 mm.

B4.6 Floor: the floor shall be 19 mm 8-ply marine wood covered with 3mm checker Aluminium plate.

B4.7 The power and earth cable entry shall be from the bottom of the container. The entries must be through watertight glands.

C1. Antenna system requirements:

C1.1 Feeders must be 7/8" corrugated EC4-50 or equivalent.

C1.2 All connections must be waterproofed.

C2. Lightning protection: inline lightning protection and earth kit equivalent to polyphaser C002 must be provided.

C3. The mast requirements are as follows:

C3.1 Self-supporting mast to carry **2,5 m²** antenna load at top of the mast at 160 km per hour wind speed.

C3.2 Ladder with a safety cage.

C3.3 Lightning spike.

C3.4 Down conductor.

C3.5 Earth mat.

C3.6 12 Volt navigation lights.

C3.7 All the mast construction must be signed off by a Certified Civil Engineer.



D1. Electrical connection from main supply to container:

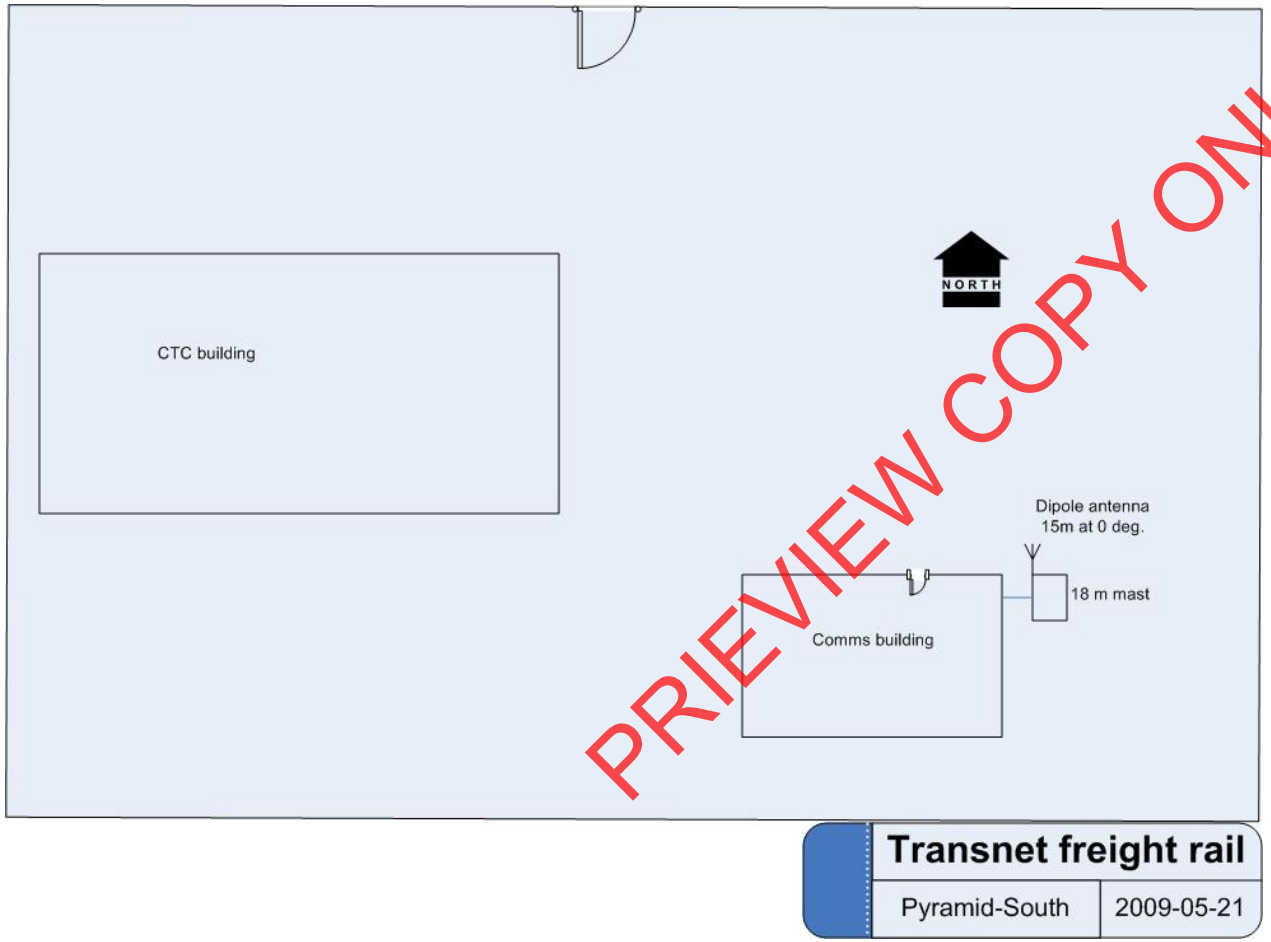
D1.1 Power cable to be supplied and installed underground by the contractor.

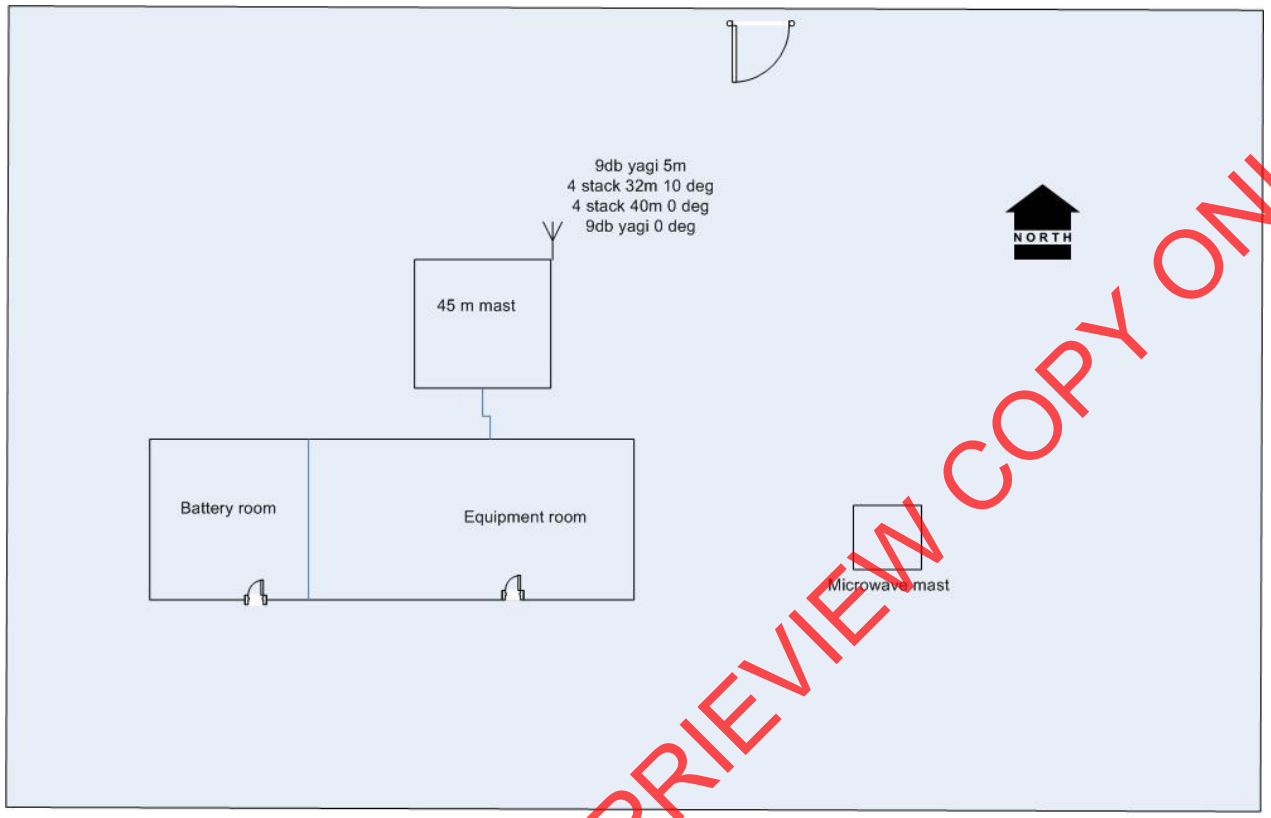
D1.2 Electrical installation compliance certificate must be provided by the contractor.

# APPENDIX C : SUMMARY OF REQUIREMENTS

| SITE NAME | CONTAINER | MAST | COVERAGE ANTENNA 455 MHz | COVERAGE ANTENNA HEIGHT & AZIMUTH | | LINK ANTENNA 455 MHz | LINK ANTENNA HEIGHT & AZIMUTH | |
|---|---|---|---|---|---|---|---|---|
| Pyramid-South | Existing building | Existing | Dipole | 12 m | 0 Deg | | | |
| Kameeldrift-West | 220 volt power | Existing | 4 stack dipole | 25 m | 0 Deg | | | |
| Nooitgedacht | Existing building | Existing | 4 stack dipole | 38 m<br>30 m | 0 Deg<br>45 Deg | 9 dB Yagi | 20 m<br>2 m | 0 Deg<br>30 Deg |
| Langberg | Exist building | Existing | 4 stack dipole | 19.5 m | 237 Deg | 2 X bayed 9 dB Yagi | 6 m | 240 Deg<br>340 Deg |
| Atlanta PPC | 220 volt power | 6 m Pole on containerRefer site plan | Dipole | 6 m | 270 Deg | 9 dB Yagi | 3 m | 160 Deg |
| Schoongezight | 220 volt power | Existing | Dipole | 12 m | 180 Deg | 9 dB Yagi | 10 m | 70 Deg |
| Bullskop | Existing building | Existing | 4 stack dipole | 27 m | 180 deg | 9 dB Yagi<br>9 dB Yagi | 8 m<br>8 m | 50 Deg<br>250 Deg |
| Ferrogate | Existing building | Existing | 4 stack dipole | 22 m | 255 Deg | 9 dB Yagi | 30 m | 45 Deg |
| Thabazimbe | 220 volt power | 21 m | 2 X bayed 9dB corner | 20 m | 0 Deg<br>220 Deg | 2 X bayed 9 dB Yagi | 15 m | 10 Deg<br>180 Deg |
| Paulskloof | 220 volt power | Existing | 4 stack dipole | 30 m | 320 Deg | 9 dB Yagi | 15 m | 190 Deg |

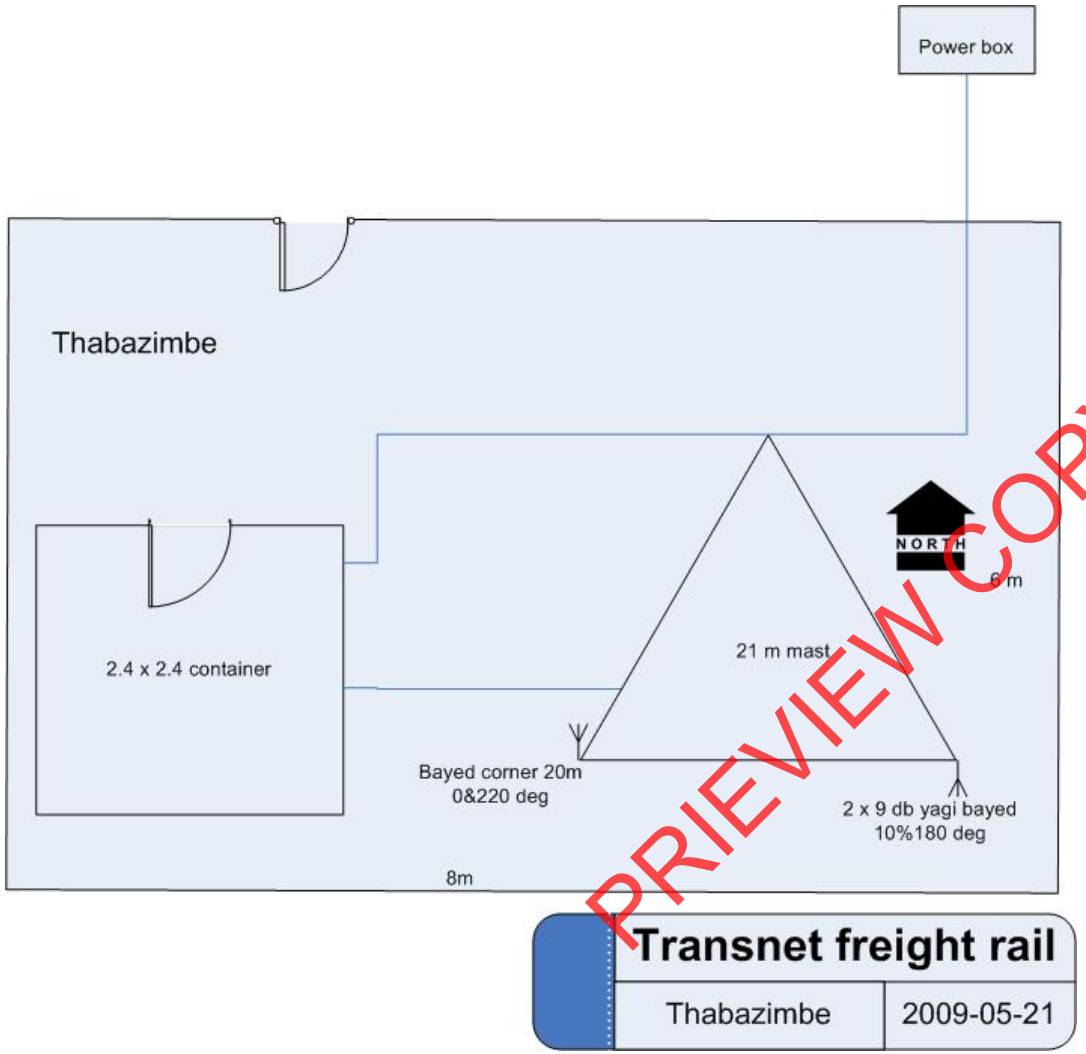
# APPENDIX D : SITE PLANS

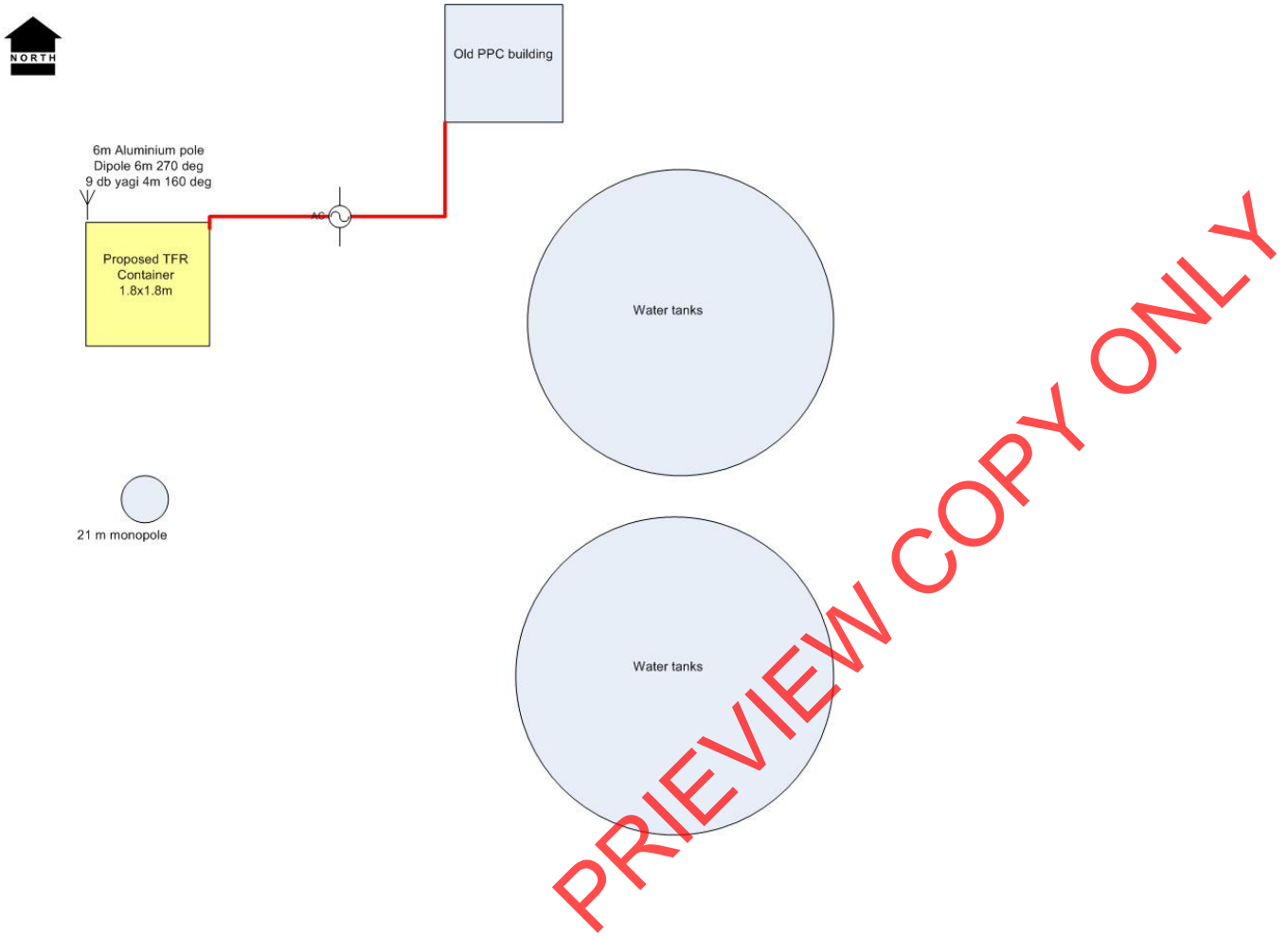






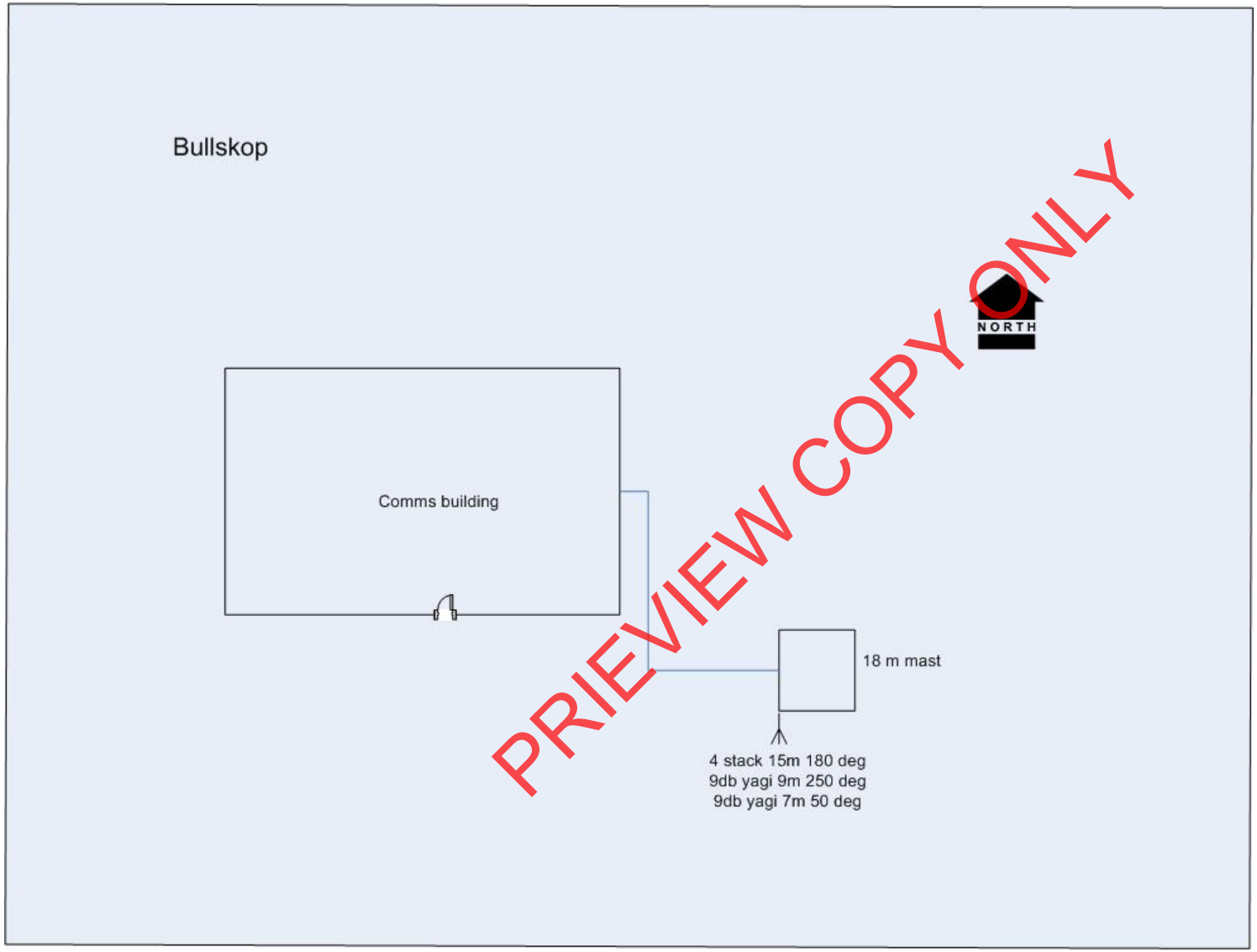

| Transnet freight rail | |
|---|---|
| Nooitgedacht | 2009-05-21 |

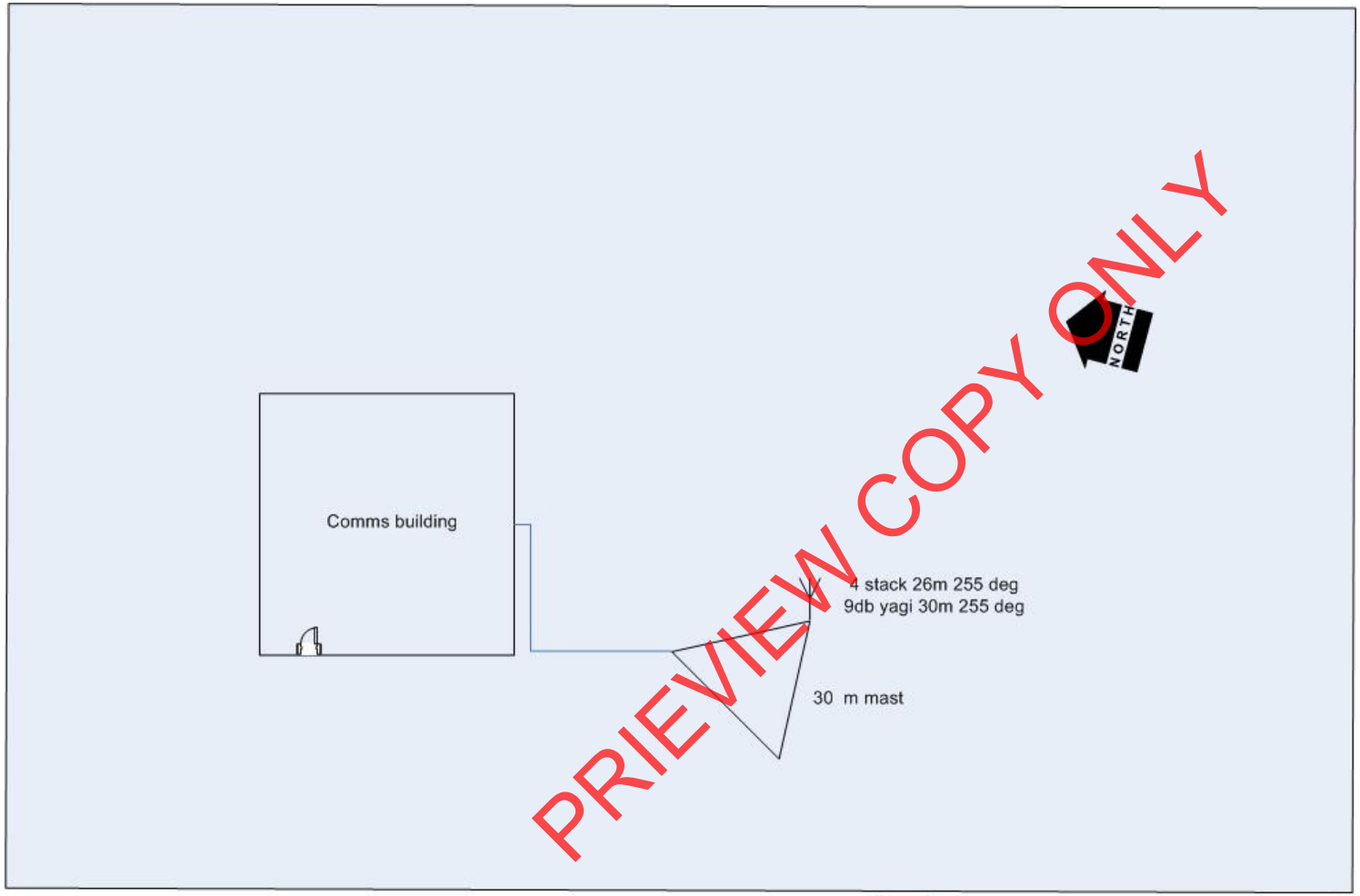






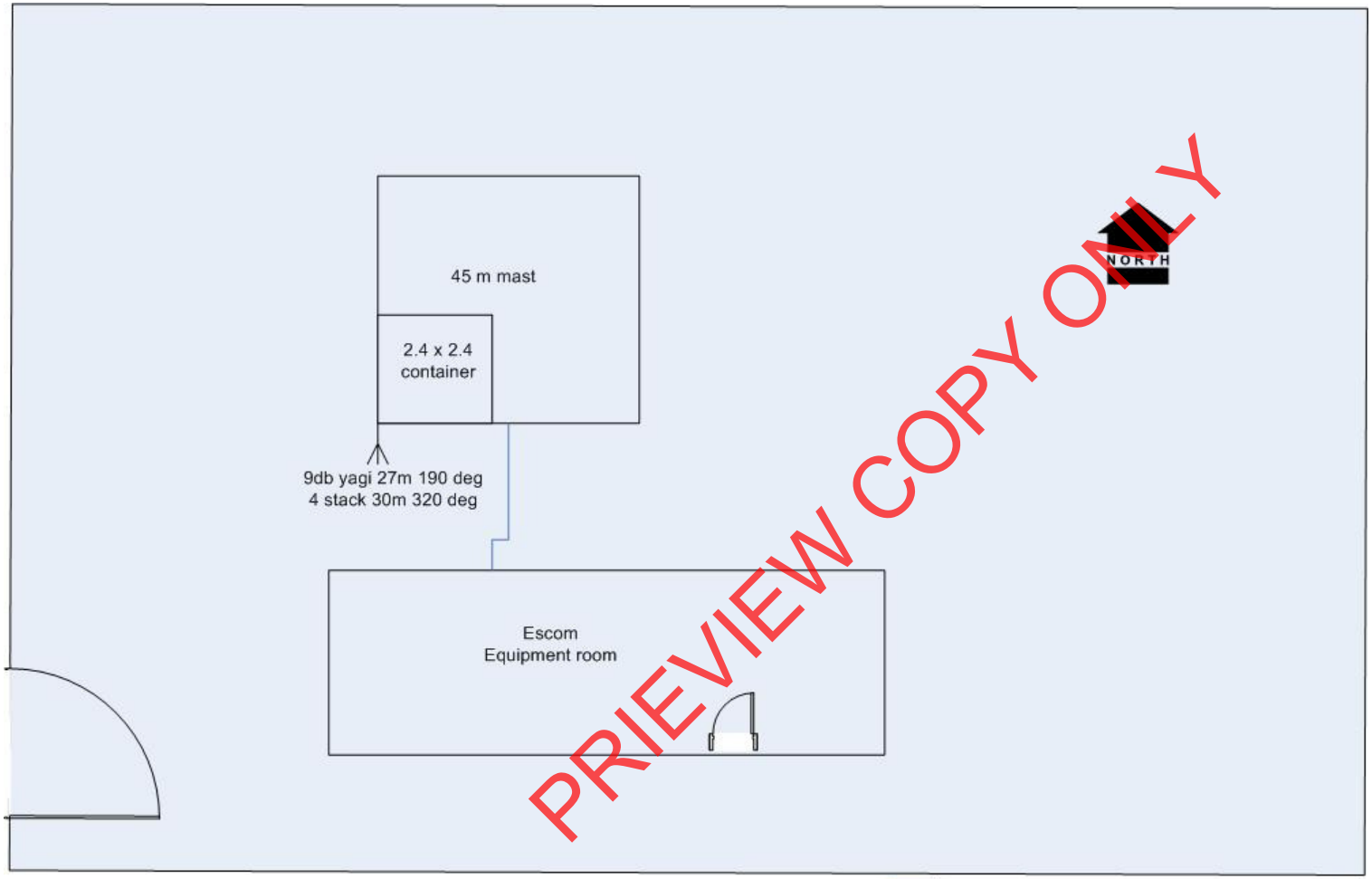

| Transnet Freight Rail | |
|---|---|
| PPC Atlanta | 2009-05-13 |





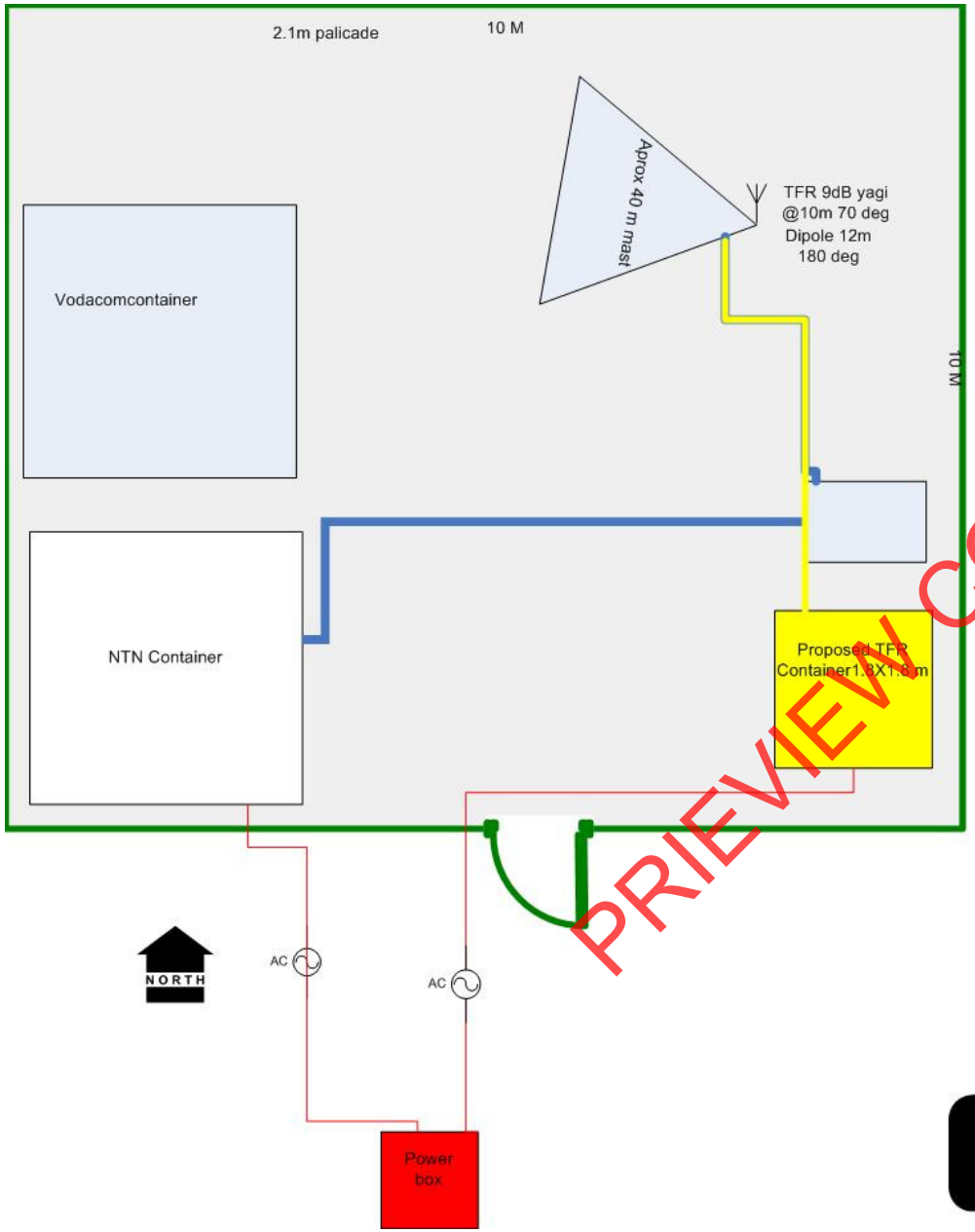



| Transnet freight rail | |
|---|---|
| Ferrogate | 2009-05-21 |






| Transnet freight rail | |
|---|---|
| Paulskloof | 2009-05-21 |



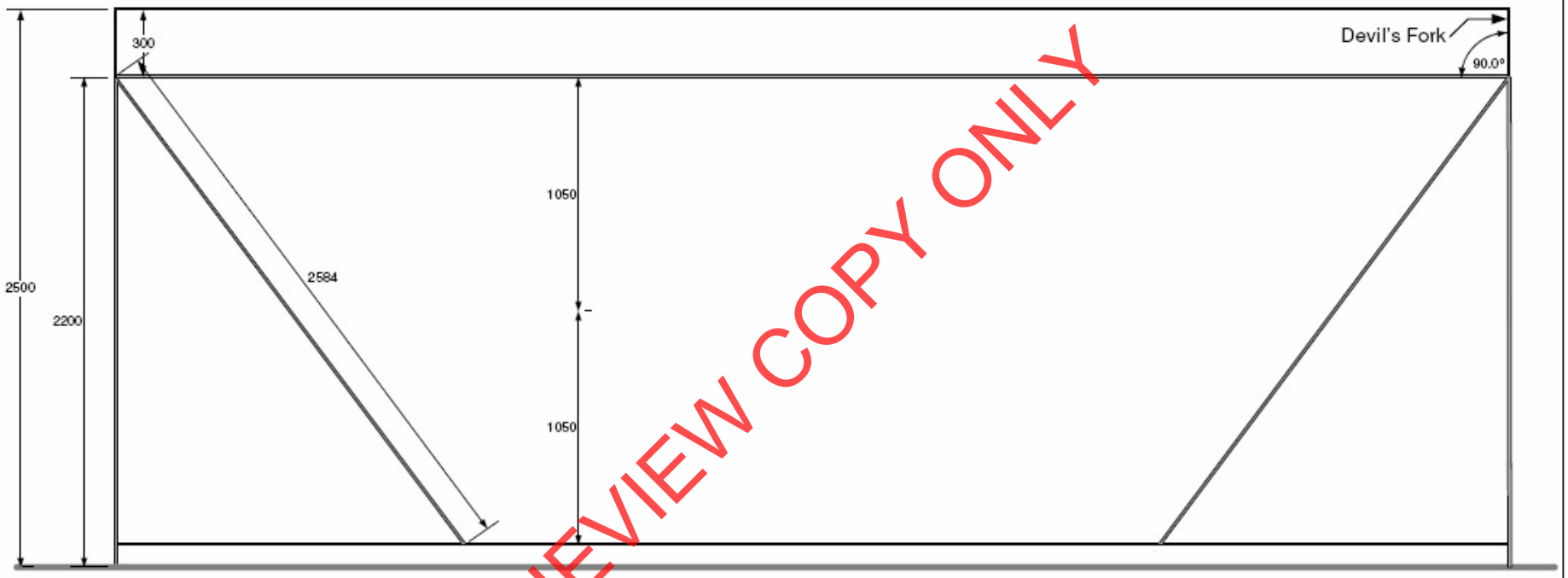



| Transnet freight rail | |
|---|---|
| Schoongesicht MTN | 2009-05-13 |

# SCHEDULE

| SITE NAME | ROAD | MAST | ANTENNA SYSTEM | CONTAINER | CONCRETE PLINTH | FENCING | TOTAL |
|---|---|---|---|---|---|---|---|
| Pyramid-South | N/A | N/A | | N/A | N/A | N/A | |
| Kameeldrift-West | N/A | N/A | | | | N/A | |
| Nooitgedacht | N/A | N/A | | N/A | N/A | N/A | |
| Langberg | N/A | N/A | | N/A | N/A | N/A | |
| Atlanta PPC | N/A | | | | | | |
| Schoongezight | N/A | N/A | | | | N/A | |
| Bullskop | N/A | N/A | | N/A | N/A | N/A | |
| Ferrogate | N/A | N/A | | N/A | | | |
| Thabazimbe | N/A | | | | | | |
| Paulskloof | N/A | N/A | | | | N/A | |
| **SUBTOTAL** | | | | | | | |
| **VAT @ 14%** | | | | | | | |
| **TOTAL** | | | | | | | |

# APPENDIX F





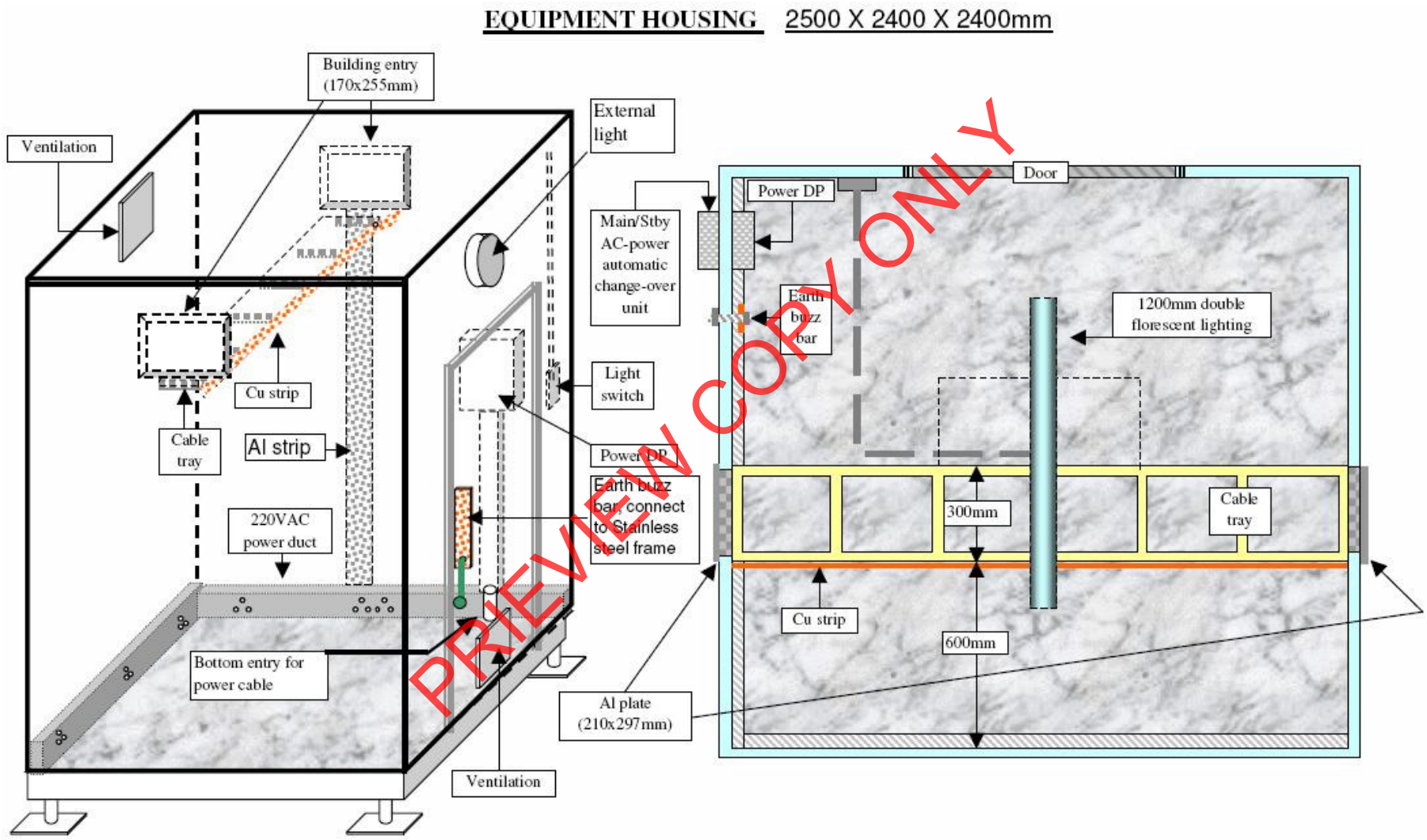

SECURITY FENCE SPECIFICATION

1) 2.5m Palisade uprights with devils fork .
2) Blade wire on top of uprights (Flat coil).
3) Matching gate with two tags to prevent bending .
4) Palisade uprights to be 3 mm thick.
5) Two angle iron horizontal hangers 40 x 40 x 5 mm.
6) Corner posts to be 100 x 100 x 3 mm Sq. tubing with end caps.
7) Locking mechanism on perimeter gate to take normal hasp type lock mounted on the inside of the gate with steel surround .
8) 25 MPa concrete apron, 100 mm thick with expansion joints

SPOORNET

| SECURITY FENCE | | |
|---|---|---|
| W6678000 | 6/24/2009 | D Coetzer |

# Drawing 1



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