



SARAO

South African Radio
Astronomy Observatory

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Facility : SARAO (South African Radio Astronomy Observatory)
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MAIN POWER SUPPLY TO ATC PROPERTY-PHASE 1

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List of Abbreviations

MV/LV	Medium Voltage/Low Voltage
kV	kiloVolt
kVA	kiloVolt Ampere
kW	kiloWatt
HDPE	High-Density Polyethylene
KLM	Kareerberg Local Municipality
BOM/BOQ	Bill of Material/Bill of Quantities
DB	Distribution Board
SANS	South African National Standards
SARAO	South African Radio Astronomy Observatory
ATC	Artisan Training Centre
Cu	Copper
BCEW	Bare Copper Earth Wire
TP	Three Poles
PVC/SWA	Polyvinyl chloride/Steel Wire Armoured
ADSS	All-Dielectric Self-Supporting

1. INTRODUCTION

1.1 Purpose of the document

This document provides a statement of work for the main power supply to ATC Property that will be constructed in Carnarvon, Northern Cape Province.

2. BACKGROUND

2.1. Project Background

The proposed design scope of work was prepared in consultation with the Kareeberg Local Municipality Engineers.

The project is divided into two phases. Namely; Phase 1-Main Power Supply to ATC Property and Phase 2-Power Reticulation inside the ATC Property. But this report will detail the scope of work for the main power supply from KLM's Transformer House to outside's ATC Property. This work will be carried out by SARAO Operational Team and approved by KLM's Engineers.

3. DESIGNS

3.1. Design Assumptions

The following design solutions are based on the following assumption.

1. Existing Transformer in the Municipality Transformer House has enough capacity to supply the power demand of ATC.

3.2. Statement of Scope of Work

The following electrical scope of work for Phase 1 will be done by the SARAO Operational Team and be tested and approved by Kareeberg Municipality Engineers

- Install a new 100A TP F15D breaker and labels, clamps, and jumpers in the KLM 's low voltage panel in the substation.
- Trench approximately 115m long from KLM Transformer House to the second pole that is opposite to the ATC property, 1m away from the edge of Masolkweg road, and to the depth of 800mm, see Figures 1 and 2.
- The road crossing to be done at 1200mm deep. Install 3x110mm HDPE-06 sleeves. Sleeves must be 15m in length. Sleeves allocation will be as follows: one will be for main power supply,

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the second sleeve is for the fibre cable and the last sleeve will be reserved for future use.
Install the 4-way microduct inside the second HDPE-06 sleeve.

- A 4-Way microduct will be installed from the power pole located at 30° 57' 58.83" S 22° 08' 11.83" E to the CATC property in accordance with Figures 1 and 2, below.
- Three 1-m manholes will be installed on either side of the fibre 110mm duct at the road crossing, two below the powerline, and the third manhole will be within the CATC property, see Figure 2.
- The 4-Way microduct will be installed in galvanised Bosal pipe of minimum 3-metres secured to the power with 1-metre slack allowance of the micro-ducts.
- The 4-Way micro-duct from the power pole terminates in the 1-metre manhole within the CATC boundary.
- The 4-Way subduct must reach the existing overhead ADSS fibre cable with 1-metre slack allowance. On completion the Bosal pipe must be sealed at both ends with high-density foam filling.
- The 4-Way microduct must be extended through the 1-metre manhole below the powerline. The bend radii must not be exceeded and the micro-ducts shall remain encased in their outer sleeve for protection.
- A low voltage cable size 35mm² x 4 Core PVC/PVC/SWA/PVC Cu Cable from the KLM Transformer House to the metering kiosk will be used for this installation.
- The 13 cable route markers for the length of 115m from the KLM Transformer house to the pin located at point B will be used for this installation, see Figure 1.
- SARAO Site Staff shall carry out the trenching and install LV cable and danger tape and compact the ground with the recommended soil in accordance with the KLM guideline, see Detail 2 in **Annexure 2**.
- A Bare Copper Earth Wire of 16mm² cable shall be installed from the KLM transformer house to the metering kiosk outside the ATC Property. It shall also be strapped for the full length on the supply cable for every 3m, as prescribed by the KLM installation guideline.

- The 25mm² x 4 Core Cu cable and 16mm² of BCEW shall be installed from the metering kiosk at the prescribed depth into the ATC Property's Main Distribution Board.
- A metering kiosk with an 80A TP breaker will be required and installed on the sidewalk at ATC Property the composition and construction to be approved by KLM's electrical engineer, all work shall be as per the KLM Engineering Specification stated in **Annexure 1 and 2**.
- The SARAO Site Staff shall provide the C.O.C to Kareerberg Local Municipality Engineer for approvals.

Note: The Municipality to be notified to conduct the inspections of the work completed; ensuring work is done to the stipulated quality requirements.



Figure 1. Artisans Training Centre Municipality Cabling Layout

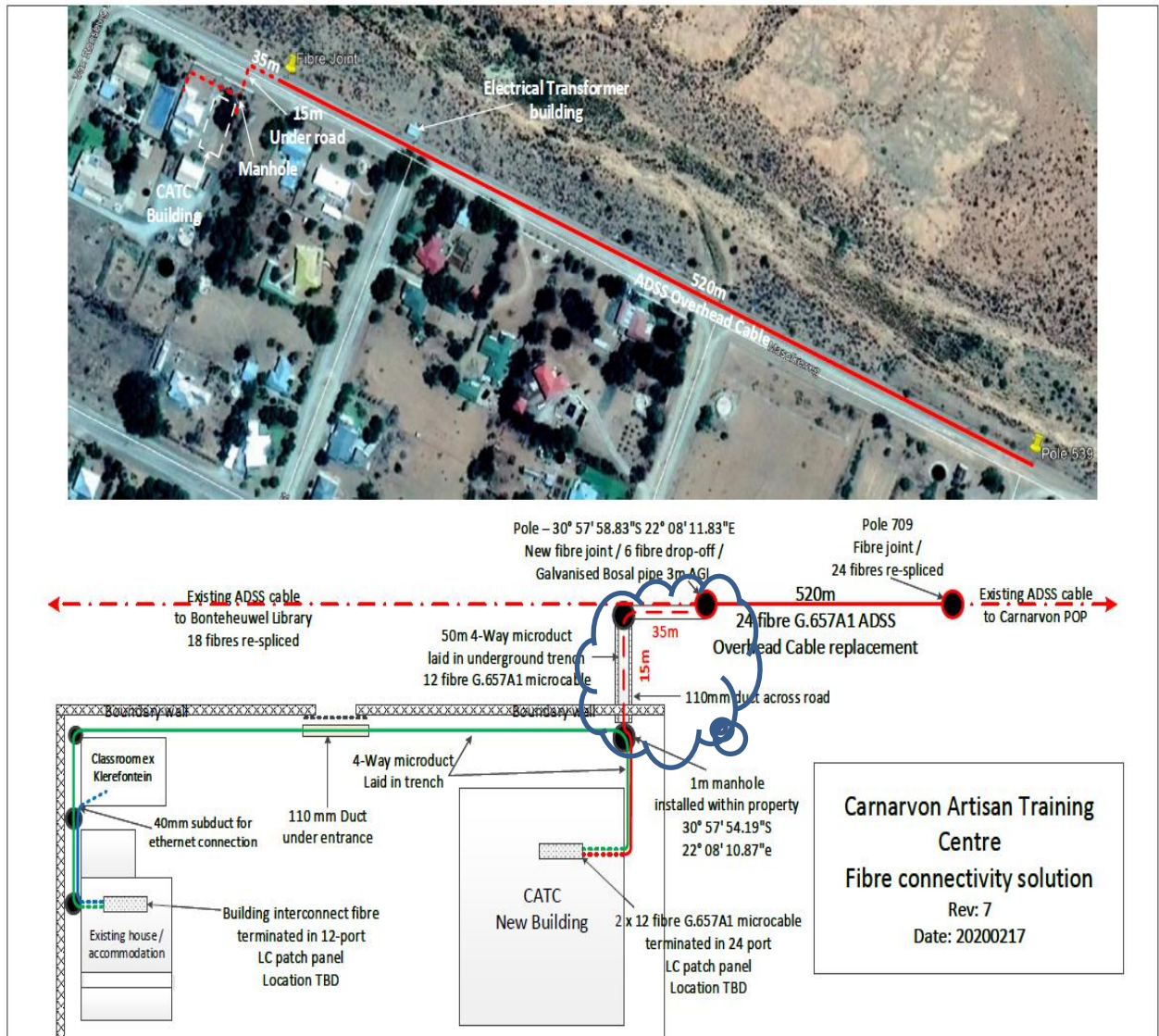


Figure 2. Municipality-ATC Showing 3 Manholes and Fibre Connectivity Plan

Note: SARAo Team scope of work in the bubble, as shown in Figure 2.

Table 1. Bill of Quantities for Artisans Training Centre

<u>ATC Municipal Power Supply and Delivery</u>						
No.	Item Description	Comments	Qty	Unit	Rate	Amount
1	600/1000V 35mm² 4 Core PVC/PVC/SWA/PVC	Main power cable to be terminated in the substation and to the new stubby . Supplier issuing units might be more than the required quantity.	140	m	R 260,87	R 36 521,80
2	16mm² Bare Copper Earth Wire (BCEW)	Earthing conductor running along the route of the above-mentioned power cable . Supplier issuing units might be more than the required quantity.	140	m	R 34,78	R 4 869,20
3	600/1000V 25mm² 4 Core PVC/PVC/SWA/PVC	Main cable to be installed from the Metering Kiosk to Main Distribution Board within the ATC Property.	20	m	R 235,00	R 4 700,00
4	16mm² Bare Copper Earth Wire (BCEW)	Earthing conductor running along the route of the above-mentioned power cable . Supplier issuing units might be more than the required quantity	20	m	R 40,00	R 800,00
6	100A 3 Pole TP F15D Circuit Breaker	Main power cable to protect the outgoing cable and load . Municipality engineer to confirm full specification. Price is for a 10kA Breaker.	1	each	R 3 000,00	R 3 000,00
7	LV Metering Kiosk Assembly					
7.1	Low Voltage Stubby	Municipality recommends the New Gamagara Kiosks by George Switch Boards.	1	each	R 11 500,00	R 11 500,00
7.2	80A 3Pole Circuit Breaker	Breaker to be installed in the metering kiosk for the kWh meter	1	each	R 1 600,00	R 1 600,00
7.3	kWh Meter	Meter to be installed in the Low Voltage Stubby , class to be confirmed by Municipality Engineer.	1	each	R 1 739,13	R 1 739,13
8	HDPE-06 Cable sleeves together with couplings and sealing rings	Sleeves to be installed at the road crossings	50	m	R 57,39	R 2 869,50
9	Trench Red Soil	Red soil to fill the first 450mm of the trench over the length of the trench and hand compacted. 10 % added to compensate for compacting.	77	m³	R 304,35	R 23 434,95
10	Danger Tape	Install danger 160m tape for the full length of the route	160	m	R 1,00	R 160,00
11	300mm high x 150mm Cable Route Markers	Concrete pyramid cable marker for a length from a KLM transformer house	15	each	R 177,84	R 2 667,60
12	Miscellaneous Equipment	Small items like warning signs and labels, glands, couplings for HDPE-06 Sleeves, cable ties and terminations that will be used in the installation	1	N/A	R 22 500,30	R 22 500,30
13	Delivery to Carnavon	All the above items	1	Item	R 33 000,00	R 33 000,00
SUB-TOTAL						R 149 362,48
Add VAT (15%)						R22 404,37
Note : The costs for installation and fibre materials are not included , The costs are purchase prices for major electrical components and delivery only						
GRAND TOTAL						R 171 766,85

Table 2. Fibre Bill of Quantities for Artisans Training Centre

ATC PHASE 1 -FIBRE CABLE BOQ						
No.	Item Description	Comments	Total Qty	Issuing unit	Unit Price	Extended Price Including VAT
1	Direct burial 4-Way microduct HDPE sleeving / 12/10mm microducts with silicone lining	4-Way microduct to be laid according to manufacturers specifications from fibre drop-off pole in the same trench as the power cable.	45	m	R 35,00	R 1 795,50
2	Direct burial 4-Way microduct HDPE sleeving / 12/10mm microducts with silicone lining	4-Way microduct to be laid according to manufacturers specifications from fibre drop-off pole in the same trench as the power cable.	100	m	R 35,00	R 3 990,00
3	Rocla Item 328858: 1000 x 0.50 IJ MH ws (Sil) - Alternative	To be installed in roadway	2	ea	R 1 040,00	R 2 371,20
4	Rocla Item 328778: 1000 x 0.25 IJ MH ws (Sil) - Alternative	To be installed in roadway	2	ea	R 525,00	R 1 197,00
5	Rocla Item 332566: 1000 C/Slab (HD) [Sil]	To be installed in roadway	2	ea	R 1 210,00	R 2 758,80
6	Rocla Item 394281: 560 Lockable Lid (HD) [Sil] - male band	To be installed in roadway	2	ea	R 735,00	R 1 675,80
7	Galvanised-steel Bosalpipe, 50mm diameter, 500mm bend radius, 4000mm long excluding bend	To be installed in roadway	1	each	R 400,00	R 400,00
8	Rocla Item 328858: 1000 x 0.50 IJ MH ws (Sil) - Alternative	To be installed in property	2	ea	R 1 040,00	R 2 371,20
9	Rocla Item 328778: 1000 x 0.25 IJ MH ws (Sil) - Alternative	To be installed in property	2	ea	R 525,00	R 1 197,00
10	Rocla Item 332566: 1000 C/Slab (HD) [Sil]	To be installed in property	2	ea	R 1 210,00	R 2 758,80
11	Rocla Item 394281: 560 Lockable Lid (HD) [Sil] - male band	To be installed in property	4	ea	R 735,00	R 3 351,60
12	Rocla Item 328495: 750 x 0.50 IJ MH ws (Sil) - Alternative	To be installed in property	2	ea	R 680,00	R 1 550,40
13	Rocla Item 328410: 750 x 0.25 IJ MH ws (Sil) - Alternative	To be installed in property	2	ea	R 342,00	R 779,76
14	Rocla Item 332259: 750 C/Slab (HD) [Dol]	To be installed in property	2	ea	R 749,00	R 1 707,72
15	Galvanised-steel Bosalpipe, 50mm diameter, 500mm bend radius, 4000mm long excluding bend	To be installed in property	2	each	R 400,00	R 800,00
16	Cable sleeves 110mm HDPE 6 together with couplings and sealing rings	Sleeves to be installed at the road crossings	18	m	R 66,00	R 1 188,00
SUB-TOTAL						R 29 892,78
Add VAT (15%)						R 4 483,92
NOTE: Cost for all installation and freight not included on other items						GRAND TOTAL R 34 376,70

4. ANNEXURES

4.1. Annexure 1: Kareeberg Local Municipality Electrical Connection Letter



Co. Reg #: 2013/042159/07
VAT Reg #: 4770272179
Cell #: 082 825 6146
Fax #: 086 224 7136

657 Lang Street, Douglas, 8730
PO Box 151, Douglas, 8730
bertram@tcbeng.co.za

KAREEBERG/Stand 1883

11 April 2019

KAREEBERG MUNICIPALITY

PO Box 10
CARNARVON
8925

ATTENTION: MR A. VAN SCHALKWYK

Dear Sir

RE: ELECTRICAL CONNECTION TO STAND 1883, CARNARVON

The application for a 50kVA connection to stand 1883 in Masolke Street as discussed refers.

The electrical infrastructure of the entire Koki's dorp area comes under strain during peak demand times. This would normally be before and after normal business hours. Connecting to the existing low voltage network and allowing additional usage during peak demand hours can therefore not be allowed.

The municipality can in the interim, before the area's electrical network is upgraded, afford the applicant capacity during normal business hours. The supply must however be taken directly from the substation in Masolke Street. **Should the applicant fail to honor the limitations as set forth during this interim period, the municipality reserves the right to disconnect the stand.**

CONSTRUCTION WORKS

The following must be provided at the cost of the applicant and to the satisfaction of the town's electrical engineer:

1. Install a new 100A TP F15D breaker in the low voltage panel in the substation. This must include jumpers, labelling, clamps, etc.
2. Install a new 25mm² x 4 core PVC/PVC/SWA/PVC cable and 16mm² BCEW from the substation to the new metering kiosk at the prescribed depths and method to be provided.
3. Install a new metering kiosk on the side walk at the property - Composition and construction to be confirmed and approved with town's electrical engineer. This shall include a municipal prescribed meter and an 80A TP breaker.
4. Install a 16mm² or 25mm² x 4 core cable and BCEW from the kiosk at the prescribed depth into stand.
5. All tests, quality assurance documents and as-built documents to be provided in hard and softcopy before the connection is energized. An inspection by the town's electrical engineer is also required before the point can be energized.

All work to be carried out by a registered electrical contractor and under the supervision of an installation electrical. All work as shall be done according to the OSH Act.

BULK SERVICES CONTRIBUTION

The applicant will have to pay R28 600.00 excluding VAT for Bulk Services Contribution for the capacity they require. This must be paid before construction can start.

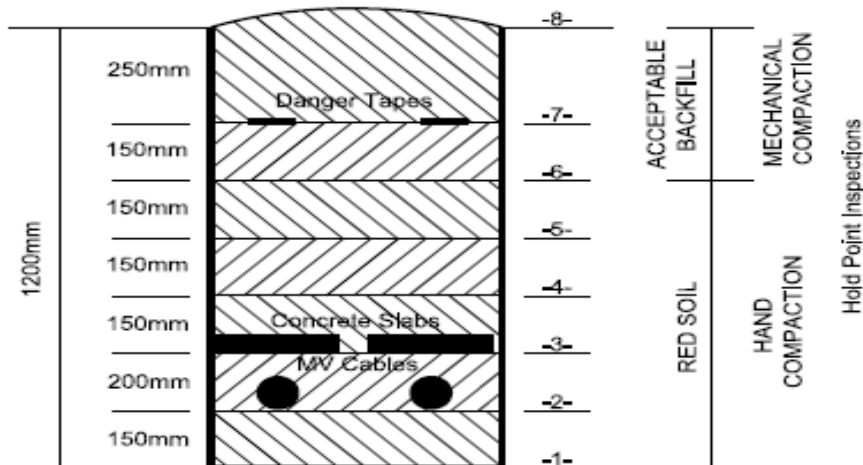
Yours faithfully,

AJ Jooste (Pr. Eng)
083 640 5002

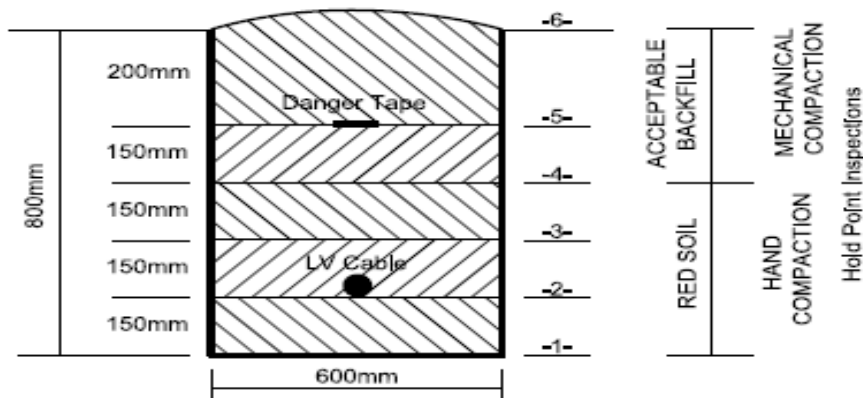
Director: BSJ Morolong

4.2. Annexure 2: Kareerberg Local Municipality Construction Guideline

DETAIL 1: MV TRENCH DETAIL



DETAIL 2: LV TRENCH DETAIL



Note;

1. Backfill to be compacted at 150mm layers with water and method indicated.
2. Engineer or his representative to be notified in advance of Hold Point Inspection Points.
3. Excavated material from trenches to be approved before used as backfill.
4. Road crossings to be done at 1200mm deep. Each cable to be installed in a 110mm dia. sleeve. One spare sleeve for every road crossing. Unused sleeves to have draw wire installed and all ends sealed with weak cement mix. Compaction on road services to be approved by civil department.
5. Cable and earth wire to be strapped every 3m with cable ties.

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C.3.1.15 400V DISTRIBUTION

C3.1.15.1 A. CABLES

600/1000V PVC insulated low voltage distribution cables shall be installed between the substations and kiosks. The required cable sizes shall be according to the drawings.

B. EARTH

A stranded bare copper earth conductor shall be installed with the cables. The required earth conductor sizes shall be according to the drawings. BCEW to be strapped to the cable every 3m.

C. TERMINATIONS

Cables shall be terminated by means of K clamps while 7 strands of the armouring shall terminate on the earth bar using a suitable lug.

All cable terminations shall be done with putty and heat shrink with 7 armouring strands with suitable lug terminated to the earth bar. Photos of the accepted end-product is available on request.

Only one termination per bolt will be allowed except in distribution stubby's on the earth bar, where the armouring and earth conductor may be terminated on one bolt, on opposite sides of the earth bar.

All LV cables shall be labelled with nursery type label. Labels shall be the same label as the feeder circuit breaker label, indicating the first stubby number / stand number / street light that it feeds to and the size on the other side. Refer to Addendum E for more information and photos. The cost of this labelling shall be included in the price for the termination.

D. SLEEVE

Sleeves manufactured of PVC are acceptable for use with low voltage cables.

C3.1.16 LOW VOLTAGE DISTRIBUTION STUBBY'S

All distribution stubby's shall be the standardised New **HVR Gamagara Kiosks** as manufactured by George Switch Boards in George. (Contact Johan Steyl at 044-873 4137 or johan@gsbm.co.za).

An alternative manufacturer may be offered, but acceptance is dependent on the written approval and acceptance by the engineer of a prototype to be built by the alternative manufacturer.

Refer to the municipal Addendums for more information on the construction.

Special care shall be taken to ensure that the height is correct and that the kiosk is

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installed plumb. Kiosks will be powder coated, Light Pastel Grey (Code G69).

The earthing of the kiosks shall be by means of a stranded copper earth conductor installed with the feeder cable (distribution cable) to the kiosk.

No pre-fabricated LV bus couplers to be used, only jumpers from the busbars.

Ventilation opening to be at least 2mm after power coating and situated at the top and bottom of the kiosks.

All wiring to be colour coded red, yellow, blue, black and green/yellow for earth and of appropriate size for the breaker installed.

C3.1.23

POINTS OF IMPORTANCE

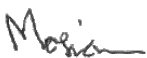
- a) Shop Drawings of items to be manufactured shall be approved to the Engineer before being manufactured. Failure to comply may result in items being rejected and the cost and delay will be for the contractor's account. It remains the contractor's responsibility to first liaise with the manufacturer to have all errors on the drawings corrected. Care should be taken to have all relevant information shown or indicated. When satisfied the drawing are complete, they shall be submitted for comment or approval. It further remains the contractor's responsibility manage these drawing and their approval process timeously and diligently.
- b) A Datafile shall be composed by the contractor and 3 sets of complete files shall be made for first handover. The contents of these files shall be discussed and finalized at an early stage with the Engineer. The datafile shall also be digitized and a CD / DVD with the organized content included in the hard copy file.
- c) As-Built drawing shall be meticulously kept up to date by the contractor. Any deviation from the IFC drawings shall be indicated and accurate measurements given. Measurements shall be from fixed and permanent land marks. Where coordinates are also taken of the MV cables, these shall correspond to the measurements taken on site. Should the contractor's actions or lack thereof with regards to the accuracy of the as-built drawings give reason to suspect failure in complying, the Engineer will have the right to have crucial points exposed to have measurements taken or confirmed.

The Contractor shall handover the as-built drawings marked as "As-Built" with the date and signatures of construction manager and person responsible for then as-builts.

PHOTOS OF TERMINATIONS



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Craig Smith (Apr 22, 2020)
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Main Power Supply to ATC Property Rev 7

Final Audit Report

2020-04-23

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