ROOSBOOM LOW COST HOUSING

ELECTRICAL SERVICES REPORT

February 2019

Rev 0

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ALFRED DUMA LOCAL MUNICIPALITY

ROOSBOOM LOW COST HOUSING

ELECTRICAL SERVICES REPORT

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1 INTRODUCTION

Green Vision Engineering Services (Pty) Ltd were appointed to provide electrical professional services for Roosboom Low Cost Housing in Alfred Duma Local Municipality by SSS Invest (Pty) Ltd. This report covers the bulk electrical supply needed to electrify the whole area consisting of approximately 1114 houses.

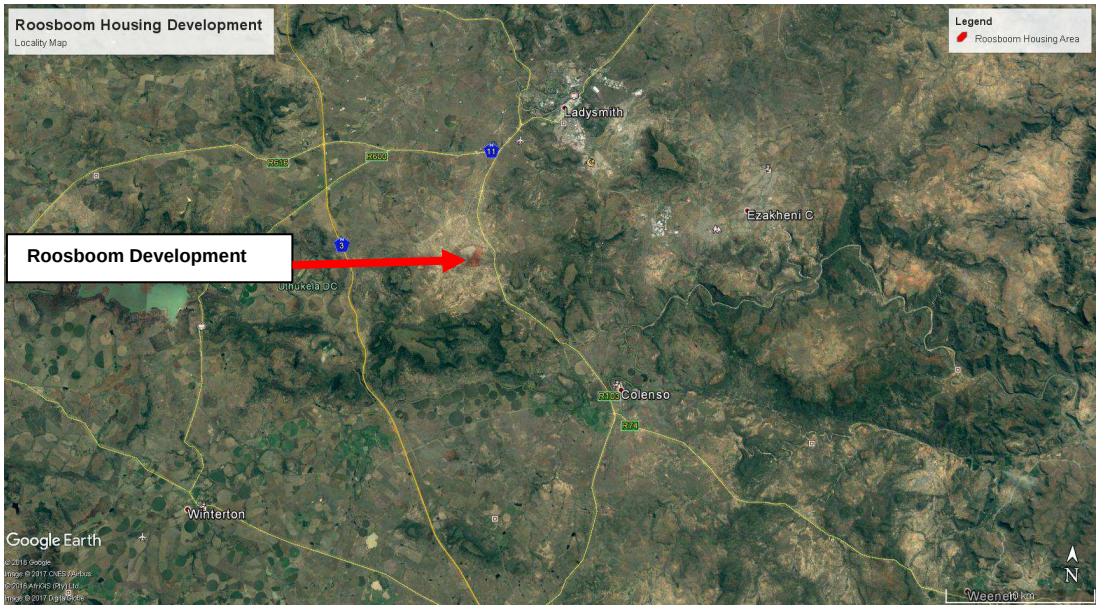
2 PURPOSE OF THE REPORT

The purpose of the report is to provide information to all stakeholders regarding the following:

- Existing electrical infrastructure.
- Bulk supply and bulk link to the development.
- To notify Eskom and the Municipality of the electrical load required.

3 PROJECT LOCATION

Roosboom Low Cost Housing is approximately 17km km South West of Ladysmith Township at grid reference S28°38'5.08"; E29°42'49.31" the township is within Eskom's area of supply. Please refer to the attached locality plan. (Figure 1)



Red Area = Roosboom Low Cost Housing

Figure 1: Roosboom Low Cost Housing Development Location

4 SCOPE

The proposed Roosboom Low Cost Housing will consist of approximately 1114 low income housing units. Fig 2 shows the entire proposed development layout.

Electrification will be done as per Eskom's specifications and standards, and will comprise of Bulk Supply, Bulk Link, MV network and LV network.

Figure 2: Roosboom Low Cost Housing Study Area

5 POWER DISTRIBUTION

5.1 Load Requirements

The following Eskom Low Voltage design parameters are set as the bench mark for low cost Housing and will be used to calculate the estimated bulk load for the development:

b) Low Voltage Parameters (Final Design)

ADMD	2.4KVA/stand.
Supply voltage	415/240V
Regulation	+ 10% / - 8%
Service connection	20A max
Estimated Total Load =	**2.7MVA**

NB: ADMD=After Diversity Maximum Demand

5.2 Bulk Power Supply

Within the vicinity of Roosboom Development there is an existing Eskom High Voltage (HV - 275kV and 400kV) and a Medium Voltage (11Kv) network which is running next to the proposed site boundary. This is shown in Figure 3 below:

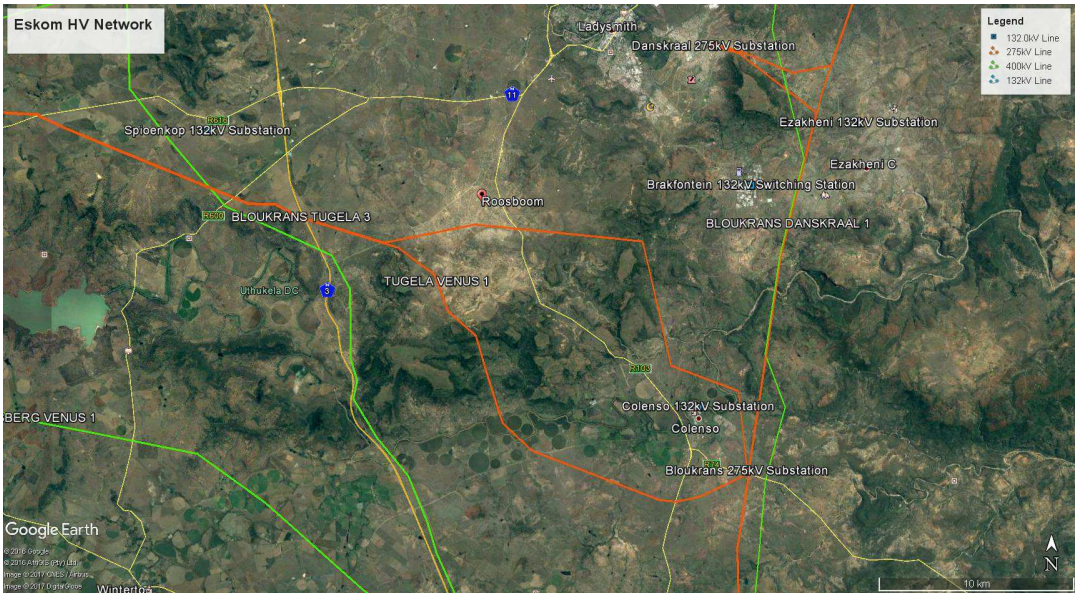


Figure 3: Existing Eskom HV/MV Network

5.3 Electrical Bulk Supply Option

Eskom Network Planning department has approved 557 connections so far with an ADMD of 1kVA/stand. The take-off feeder will be **Twin Hills NB106** and with pole number **COR 237**.This capacity will be split according to Eskom standard 16kVA, 50kVA, 64kVA, 100kVA and 200kVA pole mounted transformers to make up the 2.4MVA.

Existing Medium Voltage (MV) Network

There is an Existing Eskom MV network close or adjacent to the development which is planned to be used for supplying the development. The proposed Take/Off Pole is **COR 237** as confirmed by Eskom.

Figure 4: Existing Eskom 11kV MV Infrastructure

Eskom Network planning department was engaged to provide a Network Planning Report and they confirmed availability of capacity in addition to providing the necessary recommendations that fall within their Network mater Plan through the municipality.

Figure 5 below shows the existing MV line (in red) within the vicinity of the housing development which is proposed to supply the permanent bulk electrical supply.

Figure 5: Existing MV Line Route

5.4 Medium Voltage Reticulation

The external and internal MV reticulation will be done according to Eskom standards and taken over by Eskom for maintenance and customer servicing.

Conductor types will include Mink, Hare and Fox.

Medium Voltage supply consists of three phase conductor as a backbone. The conductor shall be mounted on 11m & 12m wood poles and shall run street-front. Pole mounted transformers of the type 11kV/420V SABS 780 shall be mounted on 11m & 9m poles.

No initial design implementation will be used, and the Final design philosophy will be implemented from the start.

All MV structures shall be constructed in accordance with Eskom Medium Voltage Distribution Standard and specifications.

MEDIUM VOLTAGE (MV) OVERHEAD LINE

The MV overhead feeder system shall comply with the requirements of Eskom's Distribution Technology, Electrification Standards and Guidelines as and where applicable for an urban wooden pole reticulation system.

a) Conductor

Type	:	Aluminum conductor reinforced
Code Name	:	Hare/Mink/Fox
Mass	:	101kg/m
Ultimate tensile strength	:	7900 / 13 200 Newtons
Max working tension	:	@ -5oC + wind 5 240 / 8760 Newtons
Configuration	:	Staggered Vertical, Delta

The maximum working tension may be exceeded only during the construction stages when the conductors are to be "over-tensioned" to 1.05 x MWT for a period of not less than 8 hours nor longer than 24 hours after which the tension is to be reduced to a figure not to exceed the stated maximum working tension of the conductor concerned.

b) Poles

Pole type	-	Wood
Pole lengths	-	11m for M.V Line and 11m +9m for transformers
Pole diameters	-	(180-199) mm
Planting depth	-	N/A
Pole label	-	aluminium plate with required detail

c) Stays

Type	-	Eskom Type
Rods	-	M29 – 2000 long
Base plate	-	380 x 380 x 6 galvanized
Staywire	-	7/4mm, 1100 MPA - galvanized
Planting depth	-	2m

Stays will be indicated on the drawings by means of the structure codes.

d) Flying Stays

Flying stays shall be installed in the positions indicated on the final design drawings and shall be indicated by the Eskom design codes. Anchor poles shall be as specified for the line structures and of sufficient length to ensure the required ground clearance. Overhead stay wire shall be 7/4.00mm as specified for stays.

e) Pole Mounted Transformers

Transformers shall generally comply with the following details:

Mounting	:	H-pole configurations
Type	:	SABS 780
kVA rating	:	KVA as required.
No load voltage ratio	:	22000/415/231
Vector group	:	Dyn 11
Parallel operation	:	Not required
MV & LV connections	:	External bushings with suitable insulated connections
Protection	:	Each transformer will be fused individually, preferably one span before the transformer installation.

f) **Struts**

Struts shall be installed in the positions indicated on the final design drawings by the structure codes. Strut poles shall be as specified for the line structures. Line structure poles shall be fitted with suitable ground anchors at all strut positions. Struts shall be fitted with barbed wire anti climbing devices.

g) Insulators, Line Clamps and Other Line Components, Pole Dressing Hardware etc.

All in accordance with Eskom's Distribution Reticulation Technology, Electrification Standards and Guidelines with particular reference to the detailed material take off sheets provided for the various line structures.

h) Sags and Tensions

The contractor shall provide suitable dynamometer sighting rods or other approved apparatus necessary for proper checking of the work. Dynamometers shall be calibrated in kg or kN.

i) Surge Arrestors

Surge arrestors shall be of the metal oxide outdoor hermetically sealed, vertical base mounted type, rated at 22kV, 10kA impulse current.

k) Reclosers

Pole Mounted Breaker (Reclosers) requirements will be confirmed for this project as per the Eskom Planning proposal and per S.L.D.

l) Section links / Protection

Position of section links to be determined in conjunction with the TSO. Transformers will be fused individually.

5.5 Low Voltage Reticulation

The low voltage feeders shall be three phase 4 core aerial bundle conductor with bare neutral and shall be 70mm² and 35mm². The LV network is to be constructed on street-front layout on 7m wooden poles. The feeders shall be fused at the transformer pole.
Refer to Eskom Distribution Standard Part 3: Section 1, 4.10 and section 3.

All LV structures shall be constructed in accordance with Eskom Low Voltage Distribution Standard and specifications.

5.5.1 LOW VOLTAGE (LV) AERIAL BUNDLED CONDUCTORS(ABC) OVERHEAD LINES

LV ABC overhead lines shall comply with the requirements of Eskom's Distribution Reticulation Technology, Electrification Standards and Guidelines as and where applicable. The LV ABC system may share pole structures with the MV system wherever these follow parallel routes.

LV ABC shall be provided with phase cores as required and a separate neutral/support catenary core.

System Detail - 415/231 volt, 3 phase, 4 wire, 50 Hz
Type ABC - Bare Neutral ABC in accordance with SABS 1418

The following ABC sizes are to be utilized (aluminum conductors).

Ultimate strength			
(54.6 BN supporting core)	-	16 600 N	1690 kgf
Max working tension			
(54.6 BN supporting core)	-	6640 N	676 kgf

The ABC shall be installed in strict accordance with the manufacturer's recommendations and so as to ensure that the statutory clearances as specified in the Eskom Distribution Standard are maintained at all times. The Contractor shall submit details of terminations to be used to the Engineer for his approval before installation of the bundle.

a) Poles

Pole type	: wood
Pole lengths	: 7m (120-139) mm for LV distributor
Planting depth	: 1,3m
Pole marker	: aluminum plate with required detail

b) Stays

LV stays for wooden poles in the Eskom Distribution Standard. Stays shall be indicated on the drawings by means of the structure codes.

c) Flying Stays

LV flying stay for wooden poles in the Eskom Distribution Standard and shall be indicated on the drawings by means of the structure codes.

d) Struts

Struts shall be installed in the positions indicated on the final design drawings by the structure codes. Strut poles shall be as specified for the line structures. Line structure poles shall be fitted with suitable ground anchors at all strut positions. Struts shall be fitted with barbed wire anti climbing devices.

e) Line Clamps, Connections, Pole Dressing and Mounting Hardware

All in accordance with Eskom's Distribution Construction Standards.

i) **Connectors**
Connectors shall be of the insulation piercing type for main and tap conductors, except for the bare neutral when a double PG clamp will be utilized.

ii) **Mounting brackets**
All mounting hardware shall comply with the Eskom Distribution Standard for bare neutral ABC.
Suspension clamps -
Strain clamps -

iii**)** **Sags and Tensions**

The contractor shall provide suitable dynamometer sighting rods or other approved apparatus necessary for proper checking of the work. Dynamometers shall be calibrated in kg or kN.

iv**)** **Surge Arrestors**
No surge arrestors are required on the LV system except for the neutral surge arrestor.

5.6 Civil Infrastructure

The Contractor shall provide the following excavations.

a) Pole holes as required for both MV and LV overhead line systems.

Pole excavations :	5m	-	1200 long 1000 wide 1000 deep
	4m	-	1200 long 1000 wide 1000 deep
	7m	-	1200 long 1000 wide 1300 deep
	9m	-	1200 long 1000 wide 1500 deep
	10m	-	1200 long 1000 wide 1800 deep
	11m	-	1200 long 1000 wide 1800 deep

b) Strut and stay holes as required for both MV and LV overhead line systems. Strut and stay excavations: 2000 long, 1000 wide, 1700 deep

b) Trenching for structure and operator earthing systems.
Trench excavation: 300 wide, 600 deep.

Trenches for M.V underground cable shall a minimum of 1m deep inside towns and 1.5m deep outside.

5.7 Clearances

Eskom Standards as well as Occupational Health and Safety Act shall be adhered to. The overhead line routes require a number of both MV and LV crossings over roads. Correct clearance heights as specified in the Eskom Distribution Standard shall be adhered to.

5.8 Earthing

In accordance with Eskom Distribution Standard Part 2.

Low Voltage

11 kV systems	: 20 Ohms
22 V systems	: 30 Ohms

Medium Voltage

11kV system	: 30 Ohms
22kV system	: 30 Ohms

Allowance shall be made for the supply and installation of the various earthing requirements as listed hereunder.

a) Bonding all pole top and/or crossarm hardware
b) Basic pole earthing - MV and LV systems. (All structures not listed below).
c) Pole mounted transformer tank and MV surge arrestors.
d) Pole mounted transformer LV neutral.
e) LV ABC at first structure from transformer.

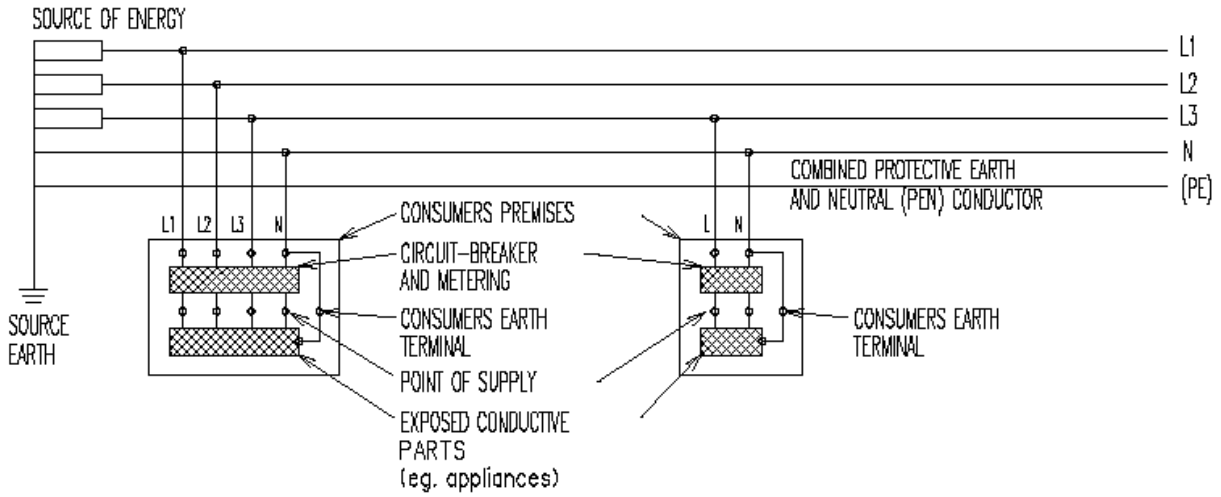


Figure 6: Typical Service Connection

5.9 Budget Energy Controllers

20A ECU's will be supplied in accordance with Eskom's Specification.

5.10 Pole Top Boxes

As per Eskom Distribution Standard, Part8 utilising 1- 4 Way and 5 – 8 Way Pole Top Boxes.

a. Service Connections

All consumers at this stage are expected to purchase a 20 Amp supply, with the design catering for 60A connections. All connections will be wired with 4mm² concentric cable (as per Eskom Distribution Standard, Part 8: Low Voltage Services Section 1; electrification, Ref: DISASAAS3) from the pole top box to the customer interface unit installed outside the house in a U7 Box as per Eskom specification.

Where the concentric cable enters the U7 Box, suitable protection shall be applied around the cable to prevent damage to the insulation.

The ECU consists of a standard passive base unit mounted externally with the 4 x 4 double socket arrangement situated in the house/dwelling.

The ECU integrates the incoming service cable with the metering, protection and household distribution. It provides the separation of the earth and neutral for the customer's installation. The wiring between the standard dispenser terminals and the socket outlet box is part of the customer's installation. The wiring shall be done with a separate earth and neutral wire.

Refer to 7.9 in SABS 0142 for the positioning of distribution boards. On brick walls, a 6mm diameter "easy-drive" with screw (D-DT-3149) shall be used to mount the ED. In all other cases, a threaded rod with washers shall be used. A non-metallic cable gland (D-DT-3070) shall be provided at the service cable entry point to the standard passive unit.

All services shall be in accordance with Eskom Distribution Services Standard and specifications.

b. Metering and Vending

The metering policy for a specific town, village or area will be determined in accordance with the requirements of the energy balancing and statistical metering policies. The details of these requirements will be implemented according to the specific site requirements.

Two basic packages will be available, viz. Bulk Metering, where measurements are taken on the MV system and Low Voltage Metering where measurements are taken at the transformer installations. Eskom approved meters are to be used for this purpose and overall accuracy of the installation shall be 2 % or better.

For individual customers, prepayment meters are preferred. These must be Eskom approved and should be one of the meters on the Eskom National Contract. Should an alternative be tendered, then proof of Eskom approval as well as compliance to the Standard token specifications is required. Both token meters are acceptable.

Vending must make use of an Eskom approved common vending system. The system must be compatible to a common vending master station. A telephone connection and a power connection point must be provided at the vendor. The general principles that will influence metering choices are as follows:

MV Bulk meter installations can be installed where:

- The connections are able to be ring fenced within a specified project area that will have a group project code for the villages included in the project area; the code is issued for vending purposes.
- Have a customer / meter ratio of at least 2000 minimum.
- No series bulk metering installations will occur.

Low Voltage metering will meet all the above requirements due to the inherent flexibility. The high level estimated cost breakover between MV / LV metering installations are 15: 1.

c. Street Lighting

Street lighting will not form part of this project due to different funding models or funding sources.

d. Wayleaves

A surveyor will be appointed to survey all line routes and necessary wayleaves arranged to comply with regulations, statutory bodies, etc.

6 PROJECT DESIGN

6.1 ELECTRIFICATION INDICATORS

In accordance the DT Standards for electrification, Annexure G contains a completed electrification indicator that has been completed by the designer.

6.2 RETICULATION DIAGRAMS

Annexure H shows the entire electrical reticulation map of the township whereas Annexure I shows a details MV transformer zone. The following drawing form part of the Electrical Design Report:

Medium and Low Voltage Reticulation Final Design

6.3 VOLTAGE DROP STUDIES

LV structures (poles) are numbered on the drawings in accordance with the CART 4.0 schedules. The voltage profiles are attached as Annexure J for the Final Design (ADMD = 1.4kVA)

+/- 10 % measured at the furthest customer premises. + 10 % would be for the first connected customer from the transformer and - 10 % will be for the last / furthest connected customer from the transformer.

6.4 PROTECTION SCHEDULE

See Annexure J for the protection schedule. Earth fault protection will be by means of providing Morsdorfer fuses in accordance with the LV protection schedule.The application of MV protection (line and transformers), LV protection (transformers, feeders and pole-mounted distribution boxes), and bulk metering. Detail shall be given of all proposed MV and LV switchgear to be used, and of the requirement for bulk metering.

6.5 PROJECT COST ESTIMATE

The estimated project cost for the Developer is attached as Annexure M.

6.6 BILL OF MATERIAL

Annexure N presents the Bill of quantities as well as Bill of Structures.

6.7 PROJECT PROGRAMME

Annexure O shows the project schedule of various milestones for the project such as the expected approval of the detail design, completion of construction as well as hand over of project.

6.8 Design Standard

Annexure P details all Eskom design standards and philosophies used with respect to MV conductor, LV conductor, Single-, dual-, and three-phase technology; and Transformer loading.

7.0 ADDITIONAL INFORMATION REQUIRED

Annexure Q contains any additional information to the project. Most of this information is the one required for detailed design submission. This involves

a) Design changes or deviations
b) Completed design indicators
c) Single line diagram
d) Schedule of :
    1) “As-built” drawings
    2) Auxiliary installations
    3) Voltage drop files
    4) Earthing installation values
    5) Percussion stay details

Annexure G

Design indicators

In accordance with national standard: Electrification indicators to complete all respective columns in accordance with local PE brief.

Item	*Description*	*Benchmark*	*Project's Value*	*Comment*
A	*Design Parameter*			
A1	***NO OF CONNECTION***			
1	***INITIAL***	***245***	***232***	
2	***SATURATION***		***245***	
A2	***DENSITY***			
1	***STAND SIZE (NON-CORE)***		***800 M^2***	
2	***CONN/KM^2 (VILLAGE)***		***833***	
3	***CONN/KM (VILLAGE)***		***N/A***	
4	***CONN/KM (PROJECT)***		***N/A***	
A3	***STRUCTURE TYPE***			
1	***% MUD***		***0%***	
2	***% TIN***		***0%***	
3	***% BRICK***		***100%***	
4	***% OTHER***		***0%***	
A4	***DESIGN PARAMETERS***			
1	***FINAL(KVA)***	***<0.85***	***1.4***	
2	***A, B ,C (HEMAN BETA)***		***0.28, 0.74, 20A***	
B	*Technology choice and Application*			
B1	***MV LINES (EXCLUDING LINKS AND FEEDER LINES)***			
A)	***CONDUCTOR***			
	I. % HARE 100MM^2			
	II. % MINK 63MM^2		***100%***	
	III. % FOX 63MM^2			
B)	***SPAN LENGTHS***			
	I. MIN	***>60M***	***51M***	
	II. MAX	***<160M***	***97M***	
	III. AVERAGE	***>100M***	***76M***	
C)	***STAYS/KM (NC)***	***<3***	***14***	
D)	***BENDS/KM (NC)***	***<1,5***	***1.4***	
E)	***POLES/KM***	***<8 OVERALL***		
	I. >11M		***11***	
	II. 11M		***25***	
	III. 10M		***0***	
	IV. 9M		***0***	
F)	***MMV/CONN***	***<10M***		
	I.E. > 70% DUAL PHASE		***0***	
	> 30% THREE PHASE		***3.9M***	
Item	*Description*	*Benchmark*	*Project's Value*	*Comment*
B2	***MV LINK LINES***			

A)	***CONDUCTOR***			
	I. % HARE 100MM²			
	II. % MINK 63MM²			
	III. % FOX 63MM²			
B)	***SPAN LENGTHS***			
	I. MIN	***>80M***		
	II. MAX	***<160M***		
	III. AVERAGE	***>110M***		
C)	***STAYS/KM (NC)***	***<2***		
D)	***BENDS/KM (NC)***	***<1***		
E)	***POLES/KM***	***<8 (OVERALL)***		
	I. >11M			
	II. 11M			
	III. 10M			
	IV. 9M			
F)	***MMV/CONN***	***<10M***		
G)	***DUAL PHASE/THREE PHASE RATIO***	***>0,7***		
B2	***MV FEEDER LINES***			
A)	***CONDUCTOR***			
	I. % HARE 100MM²			
	II. % MINK 63MM²			
	III. % FOX 63MM²			
	II. % SQUIRREL 35MM²			
	II. % MAGPIE			
B)	***SPAN LENGTHS***			
	I. MIN	***>80M***		
	II. MAX	***<160M***		
	III. AVERAGE	***>110M***		
C)	***STAYS/KM (NC)***	***<2***		
D)	***BENDS/KM (NC)***	***<1***		
E)	***POLES/KM***	***<8 (OVERALL)***		
	I. >11M			
	II. 11M			
	III. 10M			
	IV. 9M			
F)	***MMV/CONN***	***<10M***		
G)	***DUAL PHASE/THREE PHASE RATIO***	***>0,7***		
B3	***MV/LV TRANSFORMERS***			
1	***SINGLE PHASE NUMBERS***			
2	***DUAL PHASE NUMBERS***			
3	***THREE PHASE NUMBERS***			
4	***KVA (NAMEPLATE) / CONNECTION INSTALLED***	***<0,6***		
5	***LINKS/TRFR***	***<0,3***		
6	***TOTAL NUMBER OF TRFR***			

Item	*Description*	*Benchmark*	*Project's Value*	*Comment*
C	*55LV Reticulation*			
C1	***STAYS/KM***	***<6***		
C2	***BENDS/KM***	***<1***		
C3	***SPAN LENGTHS***			
1	***I. MIN***	***>30***		
2	***II. MAX***	***<110***		
3	***III. AVERAGE***	***>70***		
C4	***M OF LV/CONNECTION***	***<40***		
C5	***CONDUCTOR***			
1	***% SINGLE PHASE***	***>60***	***0%***	
2	***% DUAL PHASE***	***>30***	***0%***	
3	***% THREE PHASE***	***<10***	***100%***	
C6	***% 70MM^2 ABC***	***<5%***	***0%***	
C7	***CONNECTIONS/RETIC POLE***			
1	***% DIRECT***		***100%***	
2	***% INDIRECT***		***0%***	
C8	***POLES INSTALLED***			
1	***POLES PER KM***			
2	***% 7M***		***0%***	
3	***% 9M***		***0%***	
4	***% 10***		***0%***	
5	***% 11M***		***0%***	
6	***% OTHER***		***0%***	
D	*Services*			
D1	***CONCENTRIC***			
1	***% 16MM^2***	***<5***	***0%***	
2	***% 10MM^2***	***<15***	***0%***	
3	***% 4MM^2***	***>80***	***100%***	
D2	***LENGTH AIRDAC/CONNECTION***	***20 < X < 50***	***60M***	
D3	***NUMBER OF HOUSE POLES PER CONNECTION***	***<0,2***	***1***	
D4	***NUMBER OF SERVICES POLES PER CONNECTION***	***<0,7***	***0***	
1	***% 5M***		***0%***	
2	***% 7M***		***0%***	
3	***%9M***		***0%***	
D5	***% OVERHEAD CONNECTIONS***		***100%***	
D6	***% UNDERGROUND CONNECTIONS***		***0%***	
E	***MATERIAL COST/TOTAL COST (EXCLUDING TRANSPORT, IDC AND O/H) EXPRESSED AS %***	***60%***	***...***	
F	***COST PER CONNECTION***	***AS PER BUDGET***	***R***	

Annexure H

MV transformer map

a) show the transformer zones (numbered) and the MV network which make up the project;
b) show the proposed modifications to the transformer zone boundaries for the final phase of the project (if applicable);
c) show the transformer rating for the initial phase of the project and for the final phase of the project in brackets;
d) show the position of any Schools. Clinics, Shops, parks, etc; and
e) transformer schedule showing number of connections.

Annexure J

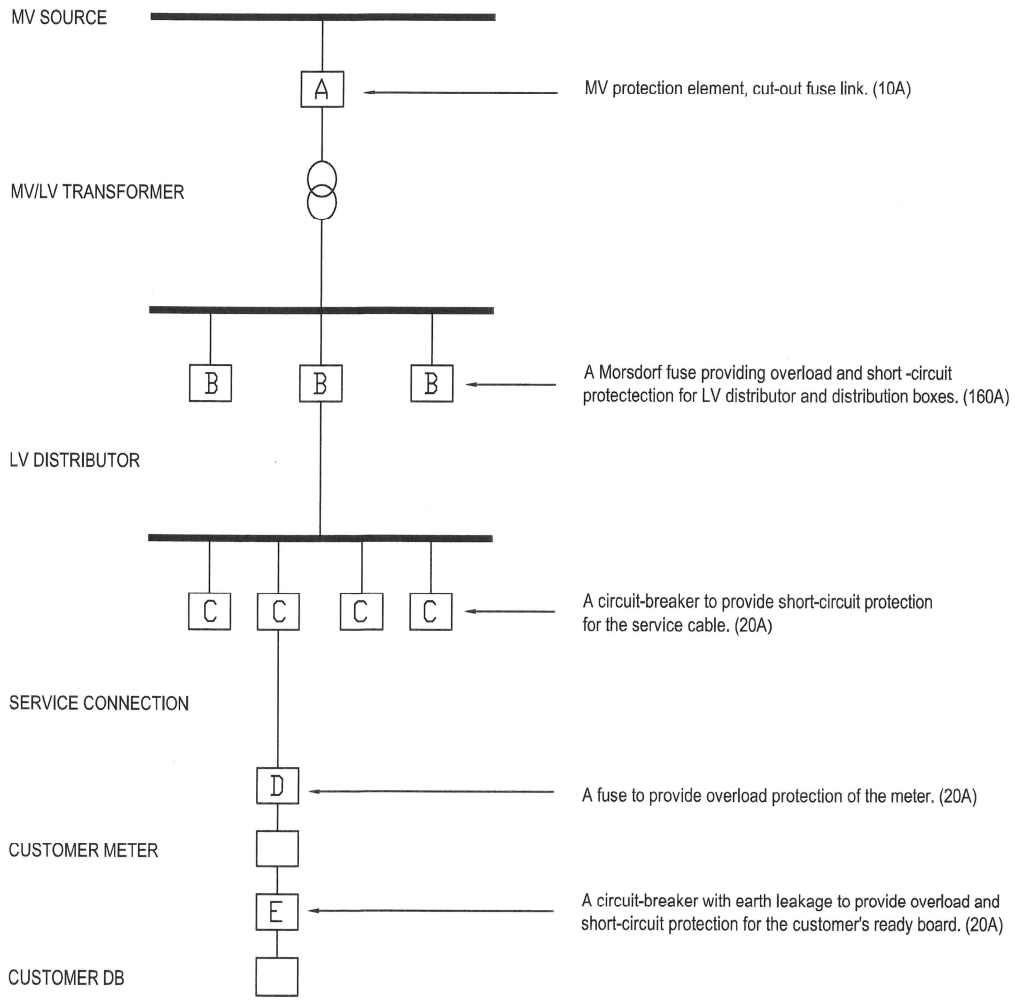
Voltage drop studies

a) Studies for the LV network using final ADMD.
b) Models representing all existing and identified potential connections (including bulk loads, sewerage pumps, schools, etc).
c) Models shall correspond exactly to drawings.
d) Studies shall ensure that low load values and full load values are used appropriately.
e) A statement of the set-up parameters used for both sets of studies and motivation for deviation from parameters stated in appointment (if applicable).
f) Hard copies of draw input, draw output and voltage profiles for both sets of studies.
g) Provision of 3½" CD with copies of all studies.

Annexure K

Protection Schedule

Presentation of the protection schedule per transformer zone. At the preliminary stage, details shall be given of the philosophy with respect to the application of MV protection (line and transformers), LV protection (transformers, feeders and pole-mounted distribution boxes), and bulk metering. Detail shall be given of all proposed MV and LV switchgear to be used, and of the requirement for bulk metering.



Annexure L

Costing and estimation

Breakdown of cost to facilitates the preparation of the DRA form. Consultant must provide the cost breakdown regarding external and internal services. Costs benefit (NPV and IRR) analysis to be completed by Electrification / Network Planning Department.

Table 1: Initial Design (1114 Connections)

Annexure M

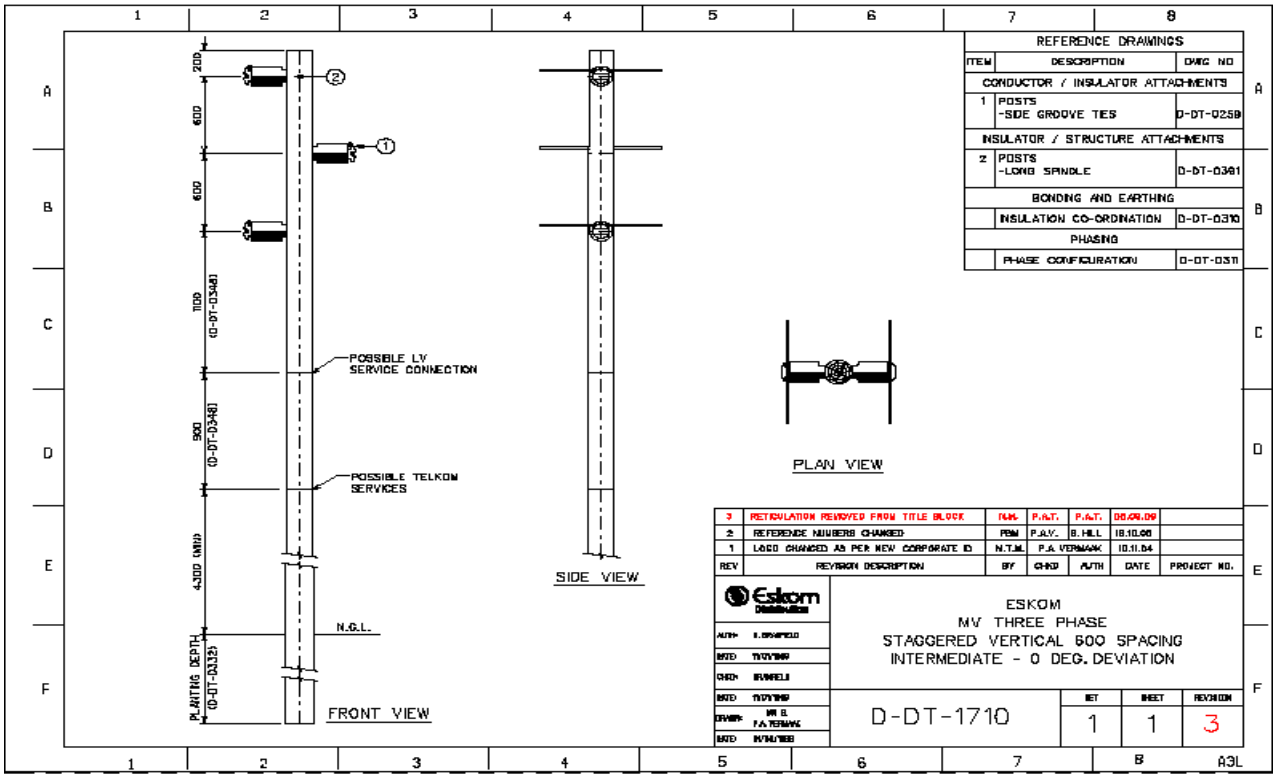
Bill of Materials

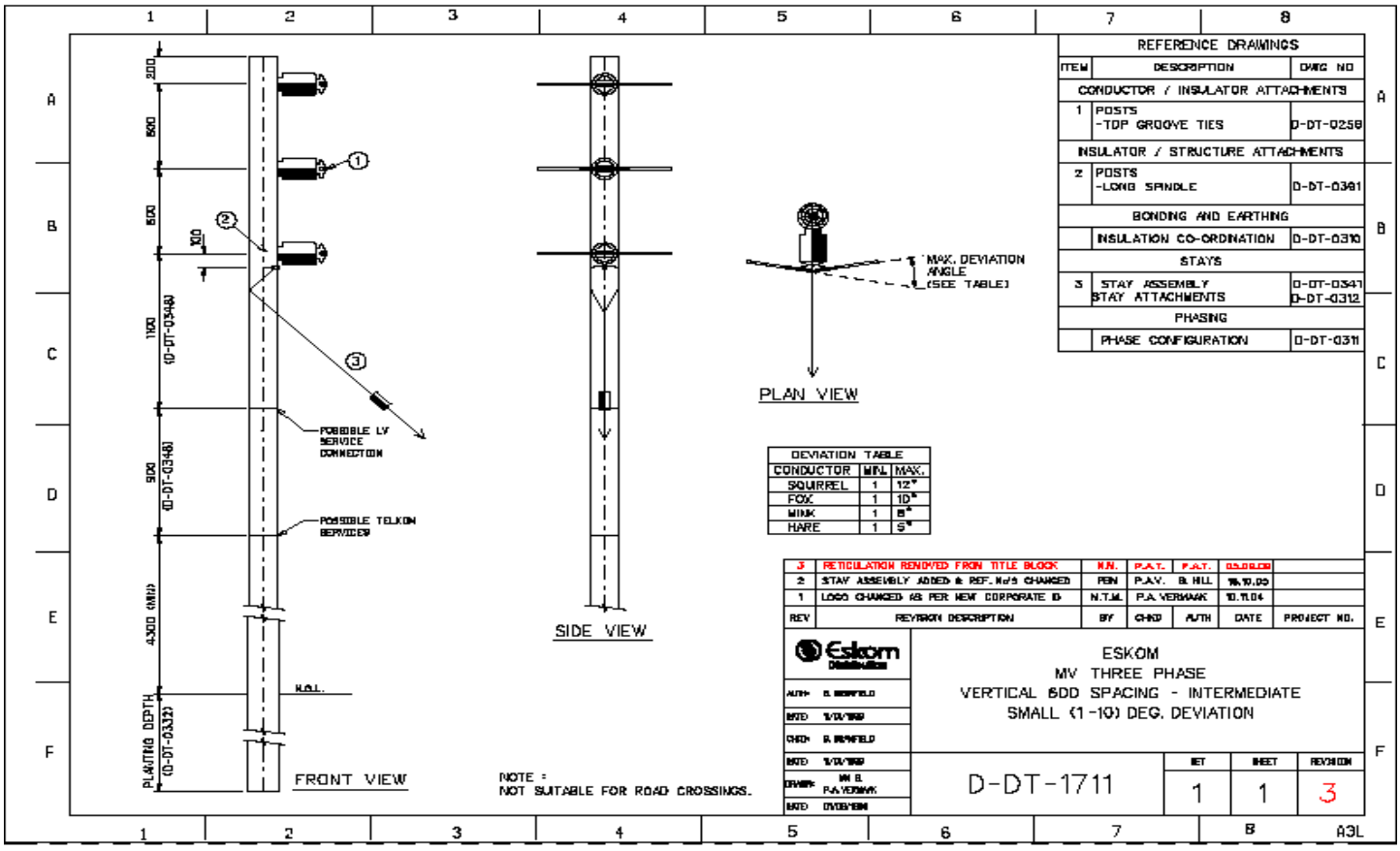
A detailed bill will be produced for the contractor to price

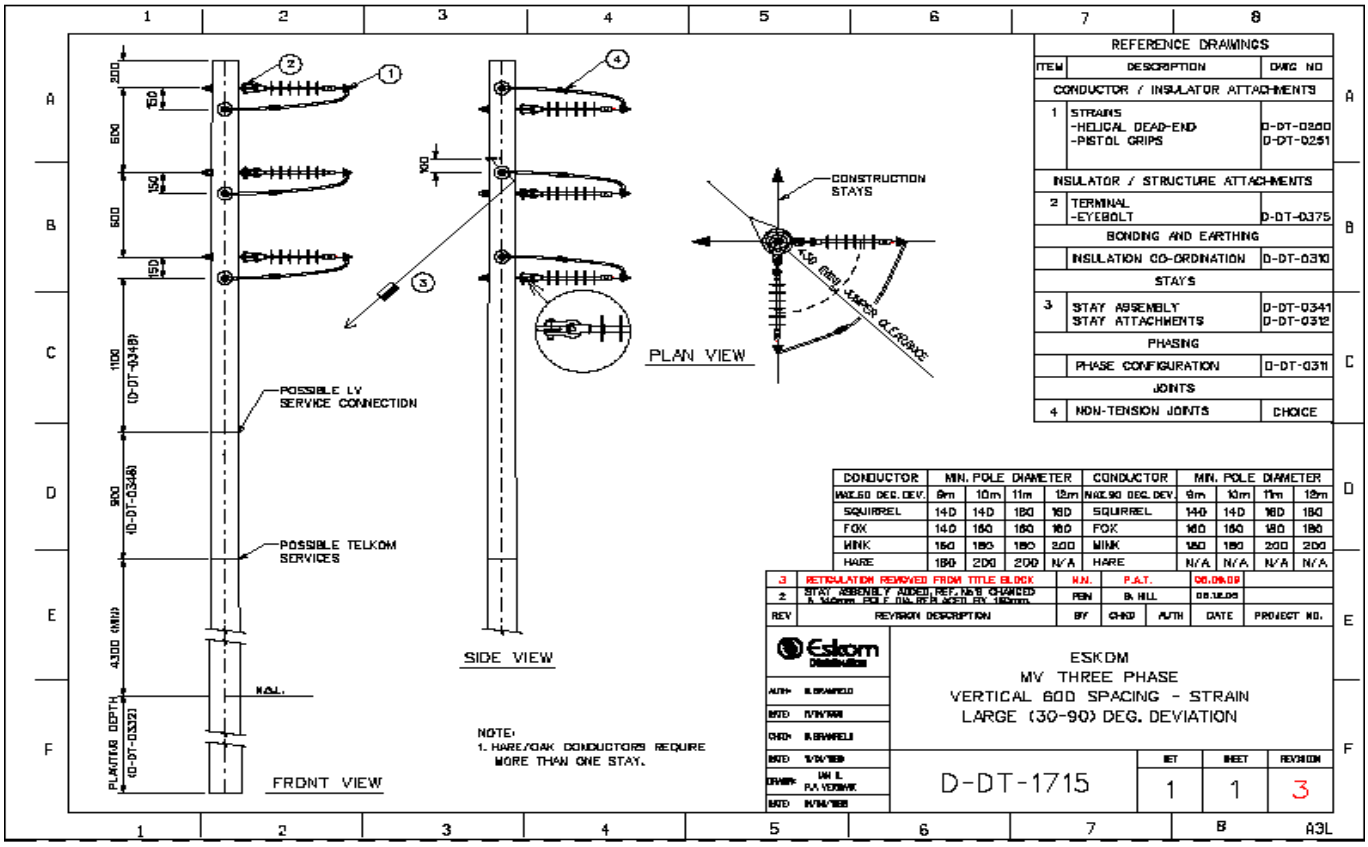
N1 - BILL OF QUANTITIES -(1114 CONNECTIONS)

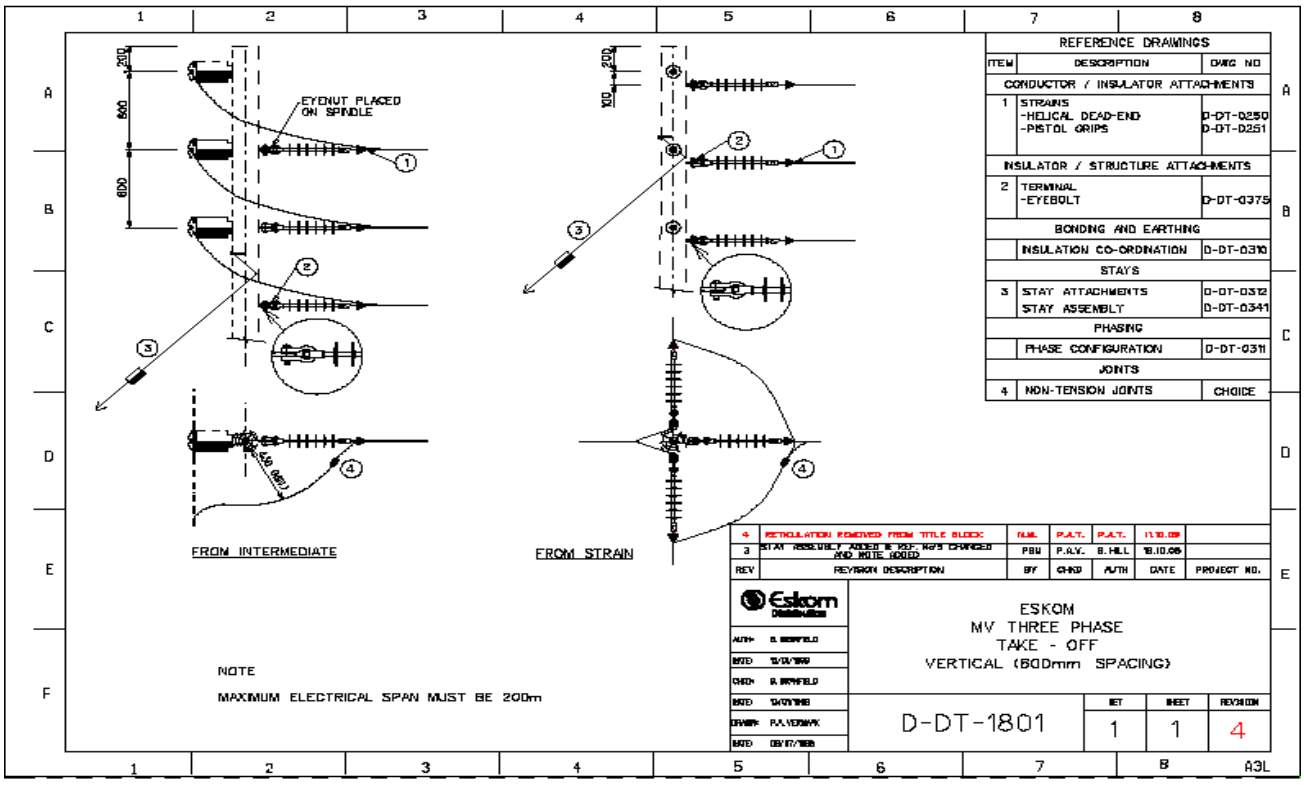
Schedule of Construction Drawings

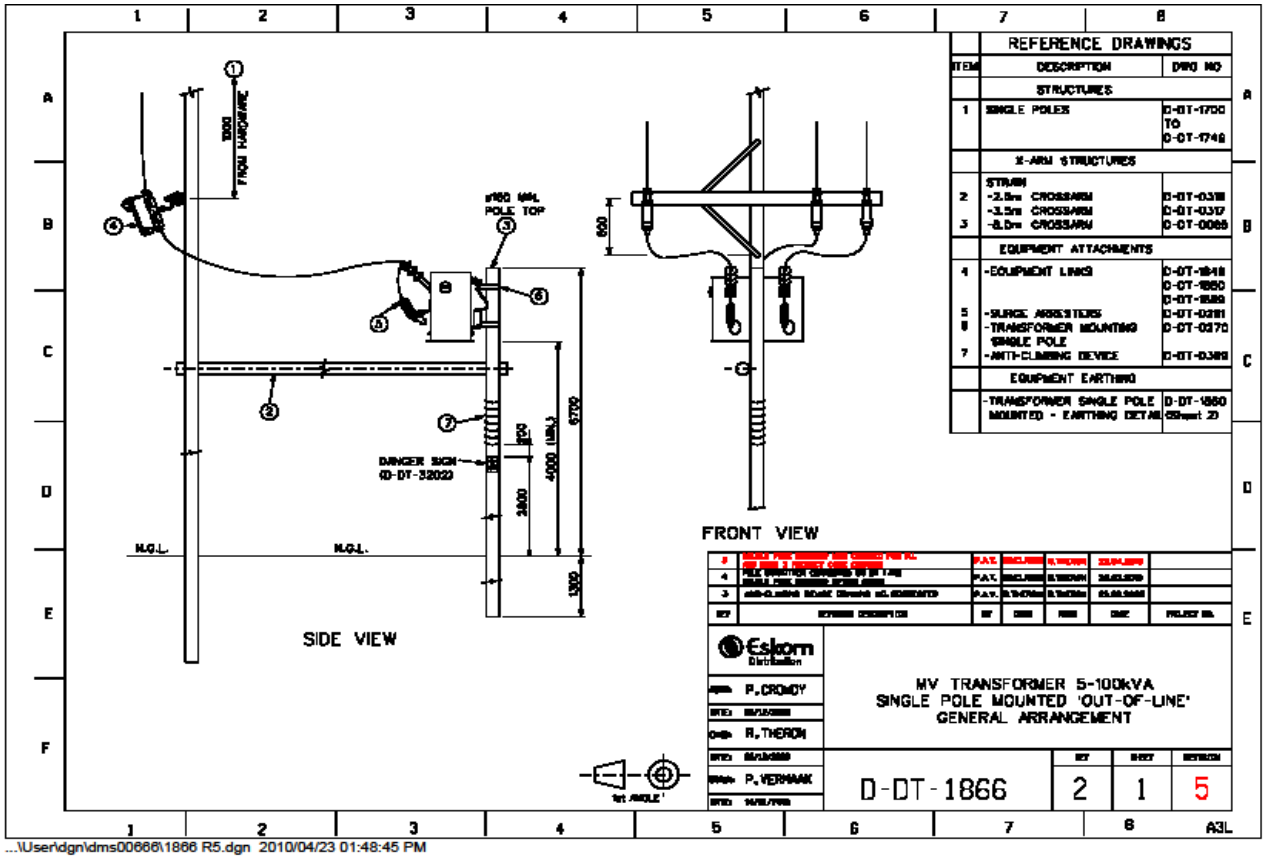
1. DESIGN DRAWINGS	
DESCRIPTION	**DRAWING NO.**
MV THREE PHASE STAGGERED VERTICAL (600mm SPACING) – INTERMEDIATE (0°) DEVIATION	D-DT-1710
MV THREE PHASE VERTICAL (600mm SPACING) – INTERMEDIATE (1 - 10°) DEVIATION	D-DT-1711
MV THREE PHASE VERTICAL (600mm SPACING) – STRAIN LARGE (30 - 90°) DEVIATION	D-DT-1715
MV THREE PHASE TAKE-OFF VERTICAL (600mm Spacing)	D-DT-1801
SINGLE POLE MOUNTED OUT OF LINE MV TRANSFROMER (5-100kVA) STRUCTURE	D-DT-1866
LV – THREE PHASE BARE NEUTRAL ABC (0 - 30°) ASSEMBLY	D-DT-1100
LV - 3 PHASE BARE NEUTRAL ABC TERMINAL ASSEMBLY	D-DT-1120
LV - 3 PHASE BARE NEUTRAL ABC (60 - 90°) ASSEMBLY	D-DT-1122
LV - 3 PHASE BARE NEUTRAL ABC T/OFF FROM INTERMEDIATE ASSEMBLY	D-DT-1140
LV - 3 PHASE BARE NEUTRAL ABC T/OFF FROM STRAIN ASSEMBLY	D-DT-1142


REFERENCE DRAWINGS
ITEM DESCRIPTION DWG NO
CONDUCTOR / INSULATOR ATTACHMENTS
1 POSTS -SIDE GROOVE TIES D-DT-0259
INSULATOR / STRUCTURE ATTACHMENTS
2 POSTS -LONG SPINDLE D-DT-0361
BONDING AND EARTHING
INSULATION CO-ORDINATION D-DT-0310
PHASING
PHASE CONFIGURATION D-DT-0311
POSSIBLE LV SERVICE CONNECTION
POSSIBLE TELKOM SERVICES
N.G.L.
PLANTING DEPTH (D-DT-0332)
FRONT VIEW
SIDE VIEW
PLAN VIEW
3 RETICULATION REMOVED FROM TITLE BLOCK N.M. P.A.T. P.A.T. 06.09.09
2 REFERENCE NUMBERS CHANGED PBN P.A.V. B. HILL 18.10.06
1 LOGO CHANGED AS PER NEW CORPORATE ID N.T.M. P.A. VERMAAK 10.11.04
REV REVISION DESCRIPTION BY CHKD AUTH DATE PROJECT NO.
ESKOM
MV THREE PHASE
STAGGERED VERTICAL 600 SPACING
INTERMEDIATE - 0 DEG. DEVIATION
D-DT-1710
SET 1 SHEET 1 REVISION 3
A3L


REFERENCE DRAWINGS
ITEM DESCRIPTION DWG NO
CONDUCTOR / INSULATOR ATTACHMENTS
1 POSTS -TOP GROOVE TIES D-DT-0258
INSULATOR / STRUCTURE ATTACHMENTS
2 POSTS -LONG SPINDLE D-DT-0361
BONDING AND EARTHING
INSULATION CO-ORDINATION D-DT-0310
STAYS
3 STAY ASSEMBLY D-DT-0347
STAY ATTACHMENTS D-DT-0312
PHASING
PHASE CONFIGURATION D-DT-0311
MAX. DEVIATION ANGLE (SEE TABLE)
POSSIBLE LV SERVICE CONNECTION
POSSIBLE TELKOM SERVICES
N.G.L.
PLANTING DEPTH (D-DT-0332)
FRONT VIEW
SIDE VIEW
PLAN VIEW
DEVIATION TABLE
CONDUCTOR MIN. MAX.
SQUIRREL 1 12°
FOX 1 10°
WINK 1 8°
HARE 1 5°
NOTE : NOT SUITABLE FOR ROAD CROSSINGS.
3 RETICULATION REMOVED FROM TITLE BLOCK N.M. P.A.T. P.A.T.
2 STAY ASSEMBLY ADDED & REF. No's CHANGED PBN P.A.V. B. HILL
1 LOGO CHANGED AS PER NEW CORPORATE ID N.T.M. P.A. VERMAAK 10.11.04
REV REVISION DESCRIPTION BY CHKD AUTH DATE PROJECT NO.
ESKOM
MV THREE PHASE
VERTICAL 600 SPACING - INTERMEDIATE
SMALL (1-10) DEG. DEVIATION
D-DT-1711
SET 1 SHEET 1 REVISION 3
A3L


REFERENCE DRAWINGS
ITEM DESCRIPTION DWG NO
CONDUCTOR / INSULATOR ATTACHMENTS
1 STRAINS -HELICAL DEAD-END -PISTOL GRIPS D-DT-0250 D-DT-0251
INSULATOR / STRUCTURE ATTACHMENTS
2 TERMINAL -EYEBOLT D-DT-0375
BONDING AND EARTHING
INSULATION CO-ORDINATION D-DT-0310
STAYS
3 STAY ASSEMBLY STAY ATTACHMENTS D-DT-0341 D-DT-0312
PHASING
PHASE CONFIGURATION D-DT-0311
JOINTS
4 NON-TENSION JOINTS CHOICE
CONSTRUCTION STAYS
PLAN VIEW
POSSIBLE LV SERVICE CONNECTION
POSSIBLE TELKOM SERVICES
FRONT VIEW
SIDE VIEW
NOTE:
1. HARE/OAK CONDUCTORS REQUIRE MORE THAN ONE STAY.
CONDUCTOR MIN. POLE DIAMETER (MAX.60 DEG. DEV.) 9m 10m 11m 12m
SQUIRREL 140 140 160 160
FOX 140 160 160 160
WINK 160 160 160 200
HARE 160 200 200 N/A
CONDUCTOR MIN. POLE DIAMETER (MAX.90 DEG. DEV.) 9m 10m 11m 12m
SQUIRREL 140 140 160 160
FOX 160 160 160 160
WINK 160 160 200 200
HARE N/A N/A N/A N/A
3 RETICULATION REMOVED FROM TITLE BLOCK N.N. P.A.T. 06.06.08
2 STAY ASSEMBLY ADDED, REF. NO'S CHANGED PEN B. HILL 08.10.05
REV REVISION DESCRIPTION BY CHKD AUTH DATE PROJECT NO.
ESKOM
MV THREE PHASE
VERTICAL 600 SPACING - STRAIN
LARGE (30-90) DEG. DEVIATION
D-DT-1715
SET 1
SHEET 1
REVISION 3
A3L


REFERENCE DRAWINGS
ITEM DESCRIPTION DWG NO
CONDUCTOR / INSULATOR ATTACHMENTS
1 STRAINS -HELICAL DEAD-END -PISTOL GRIPS D-DT-0250 D-DT-0251
INSULATOR / STRUCTURE ATTACHMENTS
2 TERMINAL -EYEBOLT D-DT-0375
BONDING AND EARTHING
INSULATION CO-ORDINATION D-DT-0310
STAYS
3 STAY ATTACHMENTS D-DT-0312 STAY ASSEMBLY D-DT-0341
PHASING
PHASE CONFIGURATION D-DT-0311
JOINTS
4 NON-TENSION JOINTS CHOICE
EYENUT PLACED ON SPINDLE
FROM INTERMEDIATE
FROM STRAIN
NOTE
MAXIMUM ELECTRICAL SPAN MUST BE 200m
4 RETICULATION REMOVED FROM TITLE BLOCK N.N. P.A.T. P.A.T. 11.10.09
3 STAY ASSEMBLY ADDED & REF. NO'S CHANGED AND NOTE ADDED PBU P.A.V. B. HILL 18.10.06
REV REVISION DESCRIPTION BY CHKD AUTH DATE PROJECT NO.
ESKOM
MV THREE PHASE
TAKE - OFF
VERTICAL (600mm SPACING)
D-DT-1801
SET 1
SHEET 1
REVISION 4
A3L


REFERENCE DRAWINGS
ITEM
DESCRIPTION
DWG NO
STRUCTURES
1 SINGLE POLES D-DT-1700 TO D-DT-1749
X-ARM STRUCTURES
STRAIN
2 -3.5m CROSSARM D-DT-0317
3 -8.0m CROSSARM D-DT-0065
4 -2.5m CROSSARMS D-DT-0320
EQUIPMENT ATTACHMENTS
5 -EQUIPMENT LINKS D-DT-1849 D-DT-1850
6 -POST INSULATOR 12.5kN SEE NOTE 2
7 -M20x600 THREADED ROD ASSEMBLY D-DT-3015
8 -TRANSFORMER MOUNTING SINGLE POLE D-DT-0270
9 -SURGE ARRESTERS (TRANSFORMER MOUNTING) D-DT-0261
10 -ANTI-CLIMBING DEVICE D-DT-0399
11 -SUSPENSION CRADLE AND ARMOUR ROD D-DT-3008 D-DT-3064
EQUIPMENT EARTHING
-TRANSFORMER SINGLE POLE MOUNTED - EARTHING DETAIL D-DT-1860 (Sheet 2)
FROM HARDWARE
1000
g160 MIN. POLE TOP
SEE NOTE
600
5600 (MIN. HEIGHT)
DANGER SIGN (D-DT-3202)
200
4000 (MIN.)
6700
2800
1300
N.G.L.
SIDE VIEW
FRONT VIEW
WILL BE INSTALLED IF REQUIRED FOR 3 PHASE
NOTE : (5) DROP OUT FUSE LINKS ARE NOT SHOWN ON FRONT VIEW
FRONT VIEW (SECTION A-A)
NOTE :
1. PORTABLE EARTH TO BE APPLIED ON ARMOUR ROD WITHIN 300mm OF THE SUSPENSION CRADLE.
2. 10kN 31mm/kV LINE POST TONGUE LIVE SIDE. (PFISTERER - BIRD FRIENDLY PRODUCT CODE 145 111-052)
1st ANGLE
Eskom Distribution
P.CROWDY
R.THERON
P.VERMAAK
MV TRANSFORMER 5-100kVA
SINGLE POLE MOUNTED 'OUT-OF-LINE'
GENERAL ARRANGEMENT
D-DT-1866
SET 2
SHEET 1
REVISION 5
A3L
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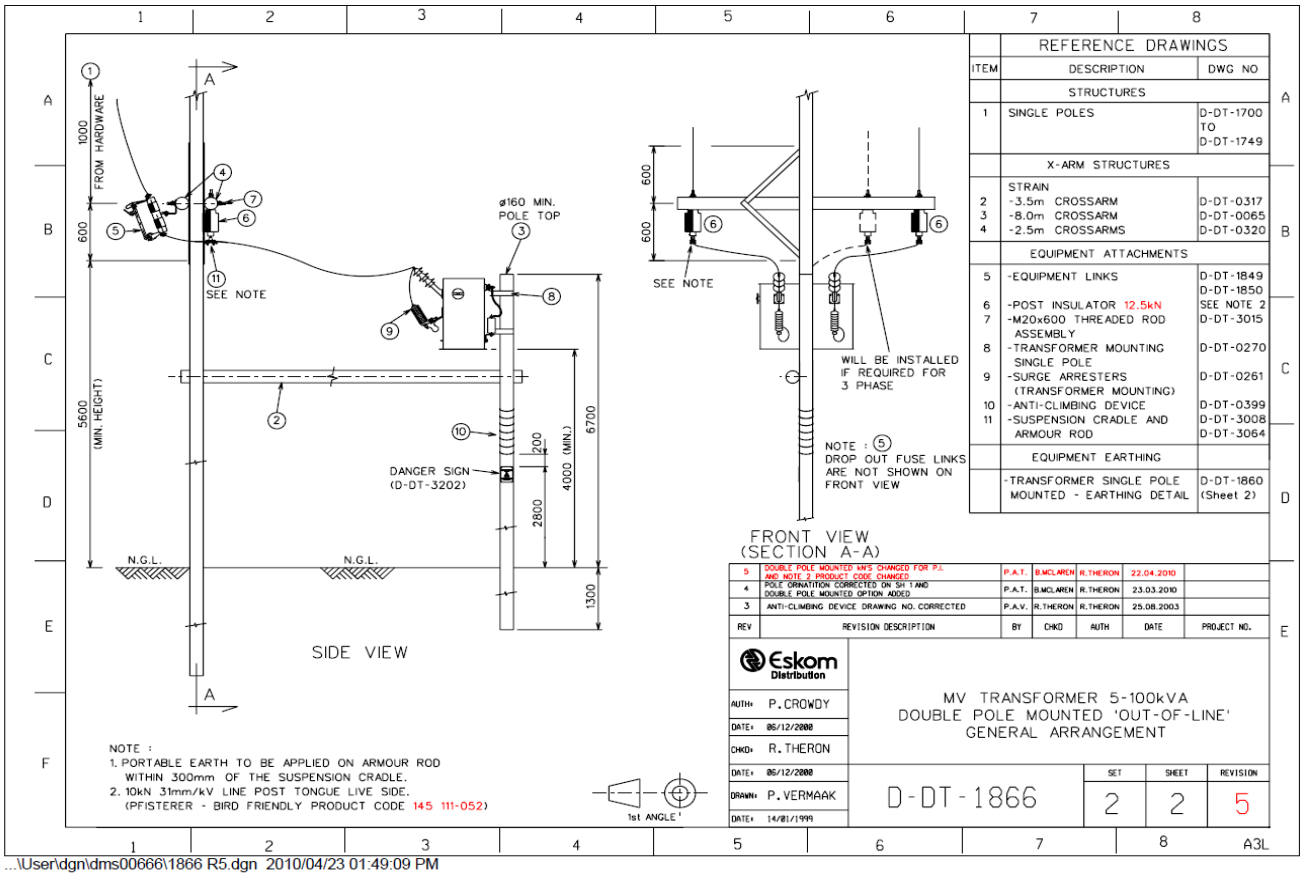
REFERENCE DRAWINGS
ITEM
DESCRIPTION
DWG NO
STRUCTURES
1 SINGLE POLES D-DT-1700 TO D-DT-1749
X-ARM STRUCTURES
STRAIN
2 -3.5m CROSSARM D-DT-0317
3 -8.0m CROSSARM D-DT-0065
4 -2.5m CROSSARMS D-DT-0320
EQUIPMENT ATTACHMENTS
5 -EQUIPMENT LINKS D-DT-1849 D-DT-1850
6 -POST INSULATOR 12.5kN SEE NOTE 2
7 -M20x600 THREADED ROD ASSEMBLY D-DT-3015
8 -TRANSFORMER MOUNTING SINGLE POLE D-DT-0270
9 -SURGE ARRESTERS (TRANSFORMER MOUNTING) D-DT-0261
10 -ANTI-CLIMBING DEVICE D-DT-0399
11 -SUSPENSION CRADLE AND ARMOUR ROD D-DT-3008 D-DT-3064
EQUIPMENT EARTHING
-TRANSFORMER SINGLE POLE MOUNTED - EARTHING DETAIL D-DT-1860 (Sheet 2)
FROM HARDWARE
1000
g160 MIN. POLE TOP
SEE NOTE
600
5600 (MIN. HEIGHT)
DANGER SIGN (D-DT-3202)
200
4000 (MIN.)
6700
2800
1300
N.G.L.
SIDE VIEW
FRONT VIEW
WILL BE INSTALLED IF REQUIRED FOR 3 PHASE
NOTE : (5) DROP OUT FUSE LINKS ARE NOT SHOWN ON FRONT VIEW
FRONT VIEW (SECTION A-A)
NOTE :
1. PORTABLE EARTH TO BE APPLIED ON ARMOUR ROD WITHIN 300mm OF THE SUSPENSION CRADLE.
2. 10kN 31mm/kV LINE POST TONGUE LIVE SIDE. (PFISTERER - BIRD FRIENDLY PRODUCT CODE 145 111-052)
1st ANGLE
Eskom Distribution
P.CROWDY
R.THERON
P.VERMAAK
MV TRANSFORMER 5-100kVA
DOUBLE POLE MOUNTED 'OUT-OF-LINE'
GENERAL ARRANGEMENT
D-DT-1866
SET 2
SHEET 2
REVISION 5
A3L
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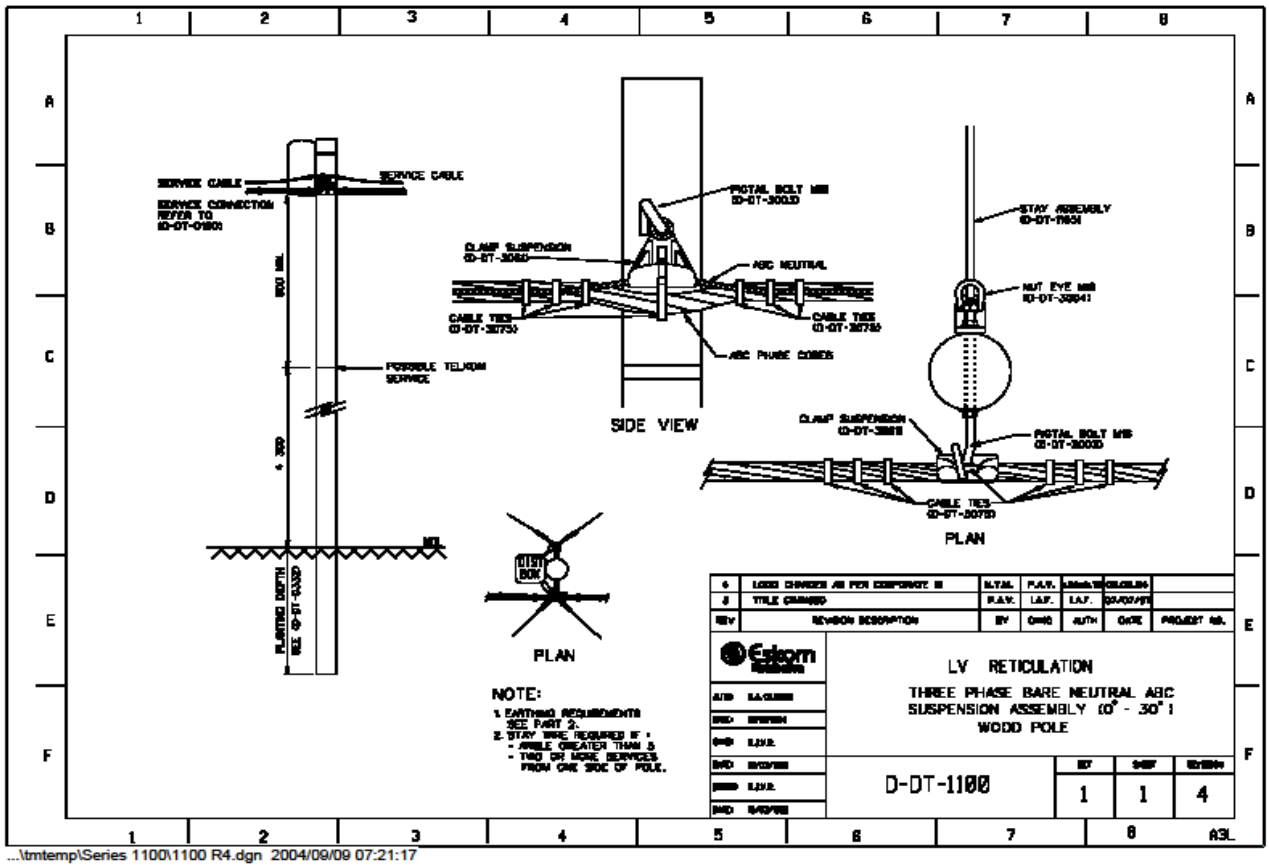

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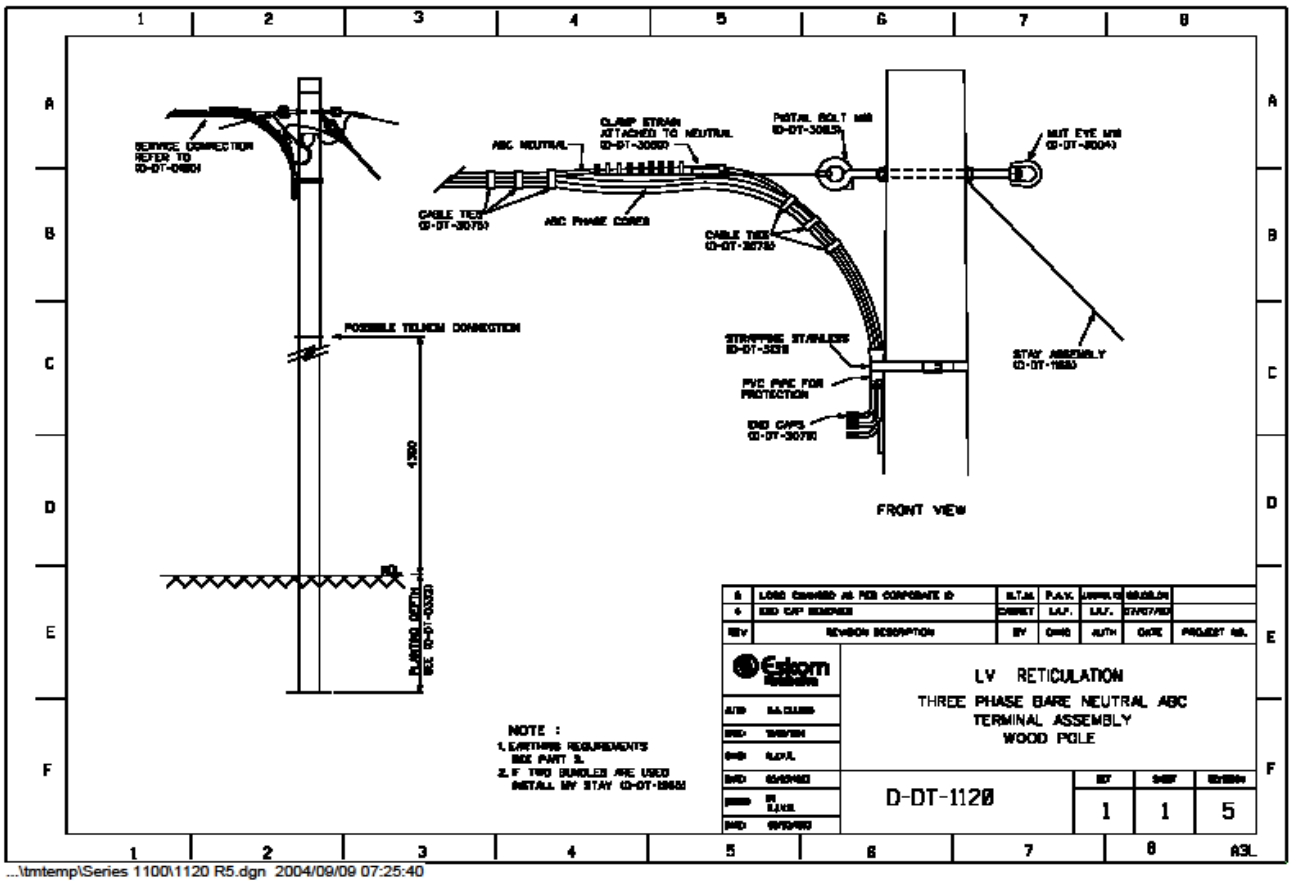

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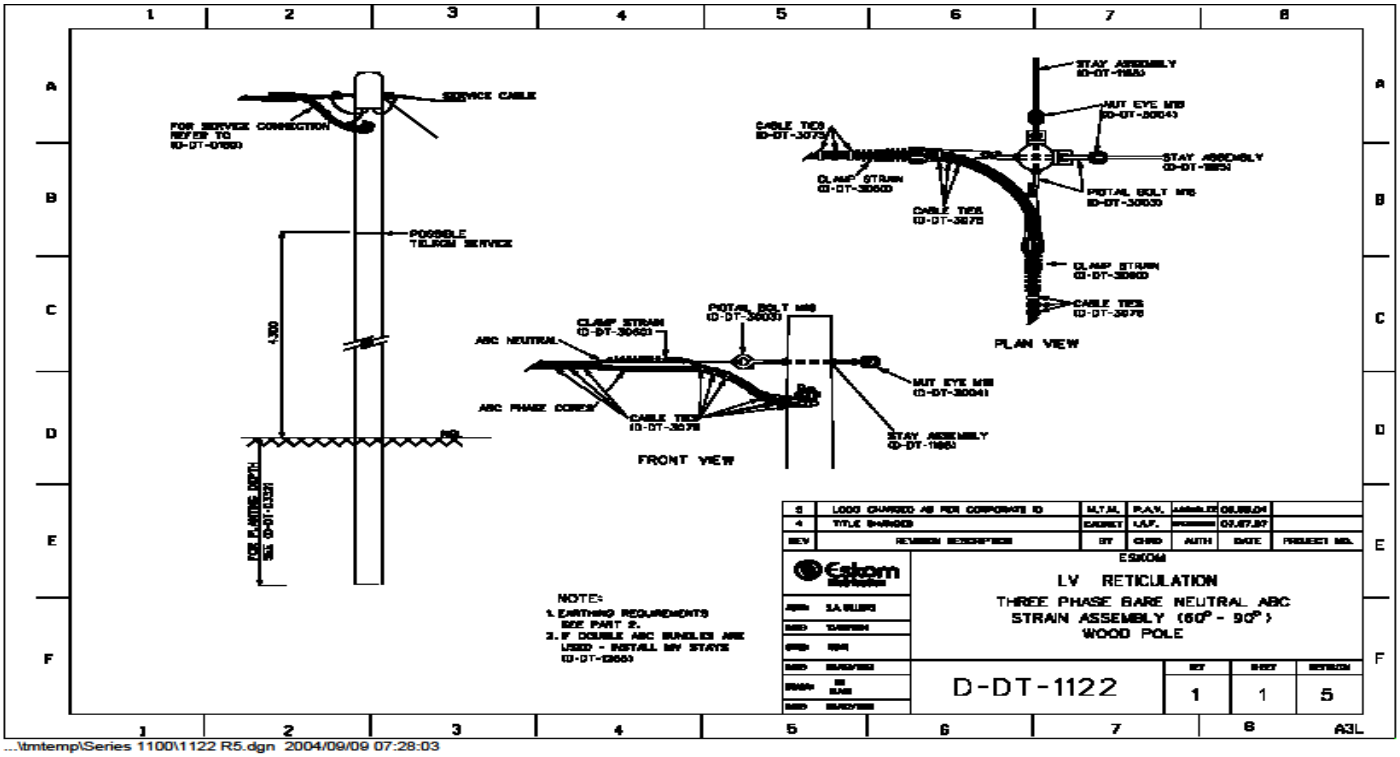

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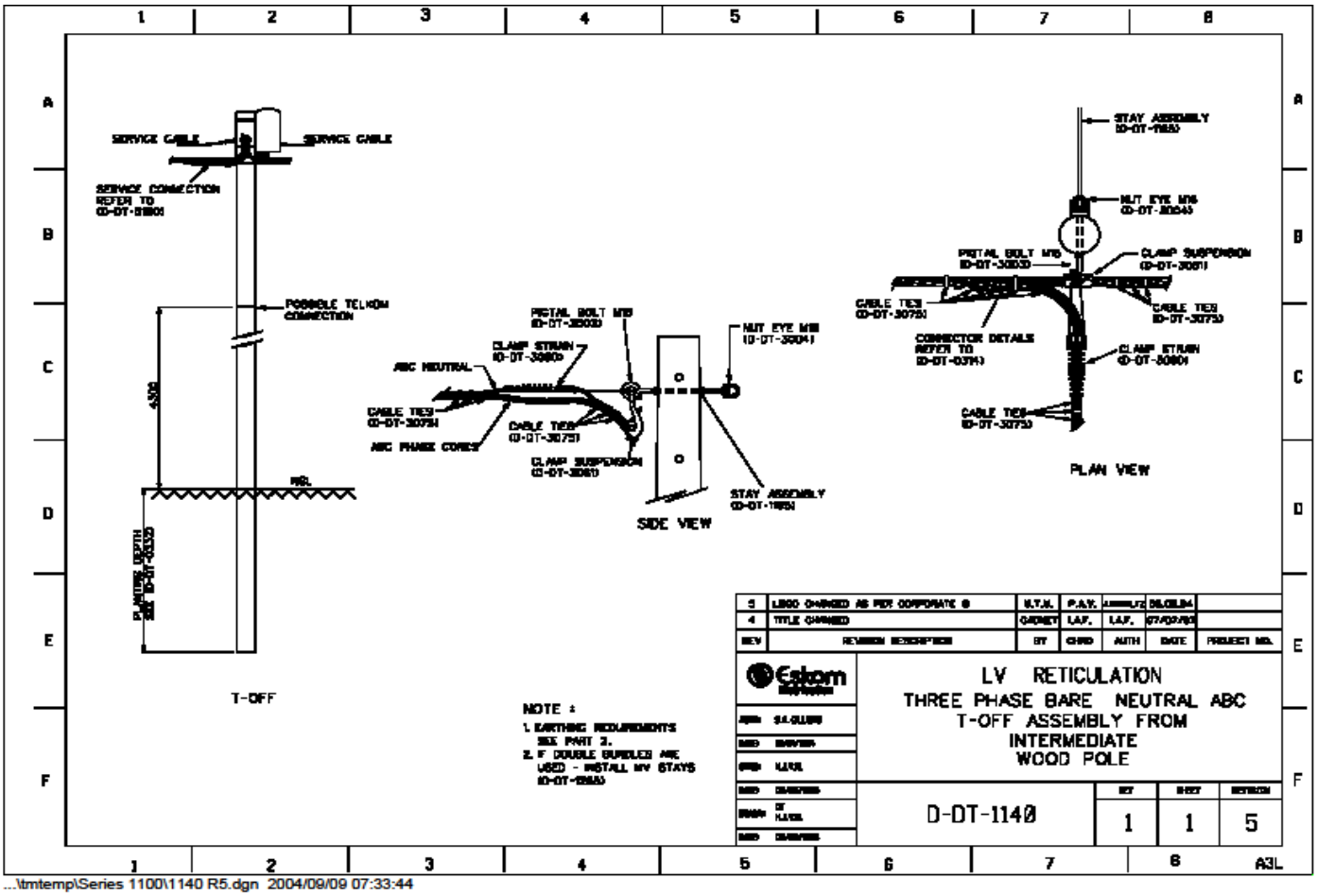

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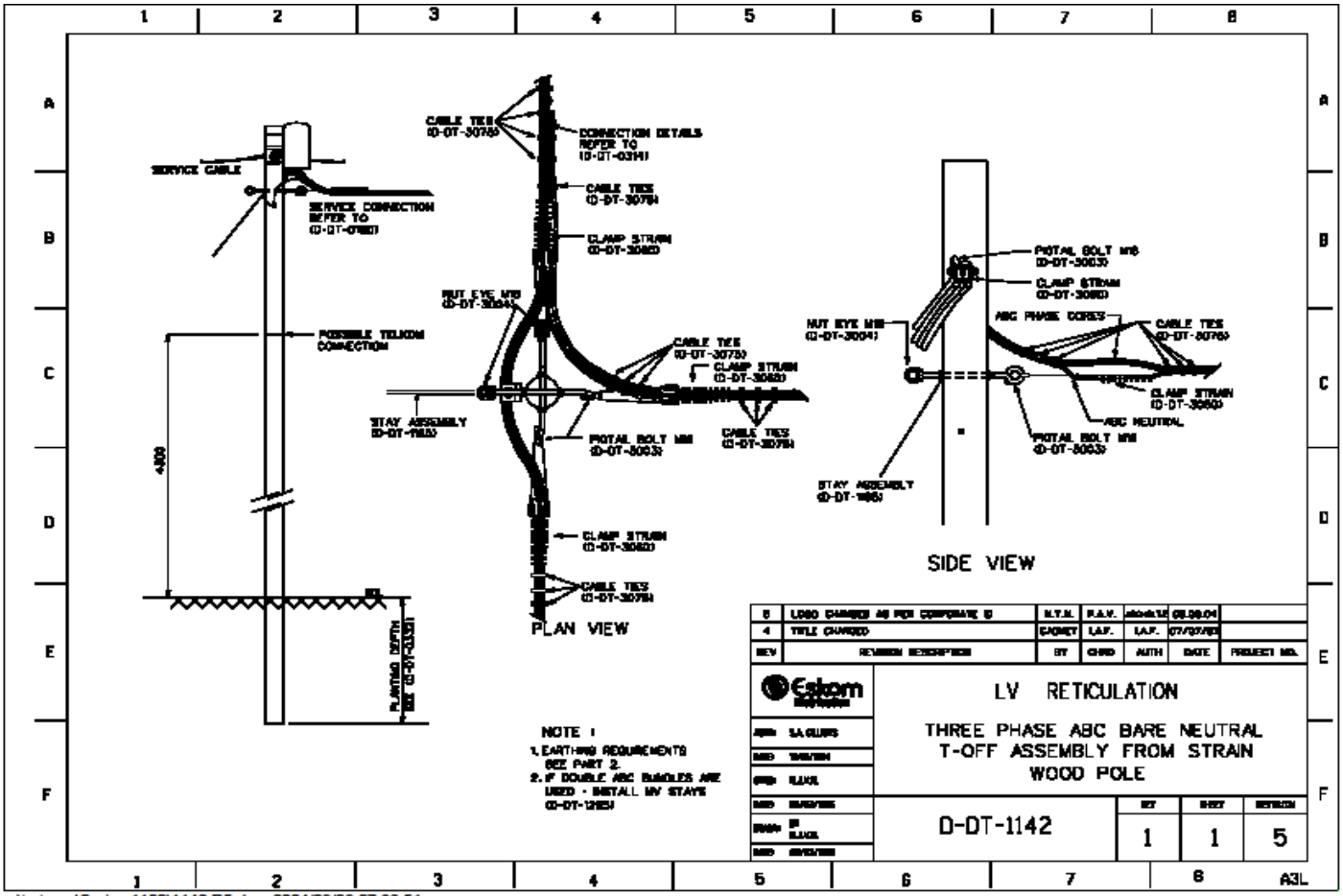

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2. ADDITIONAL DESIGN DRAWINGS	
DESCRIPTION	**DRAWING NO.**
Pole planting depth details	D-DT-0332
Pole foundation arrangement	D-DT-0330
Transformer earthing details	D-DT-0627
LV ABC Earthing	D-DT-0637
Stay attachment angles	D-DT-0312
Insulation coordination	D-DT-0310
Three Phase Transformer and LV Fuse holder Connections	D-DT-0309
MV and LV Strut Assembly	D-DT-0342
MV and LV Flying Stay Assembly	D-DT-0343
MV and LV shared Structures clearances	D-DT-0348
Service Connection to house	D-DT-0360
MV and LV Stay wire Assembly	D-DT-0341

WOOD POLES

POLE LENGTH	POLE TOP	APPLICATION	PLANTING DEPTH
5m (D-DT-0058)	80–100	SERVICE CONN.	1.0m
5.7m (D-DT-0047)	100–119	LV ABC	BASE PLATE SEE (D-DT-3197)
7m (D-DT-0050)	100–120 120–139	LV ABC	1.3m
9m (D-DT-0055)	140–159 160–179 180–199	LV BAREWIRE ABC & MV	1.5m
10m (D-DT-0052)	160–179 180–199 200–219	MV	1.7m
11m (D-DT-0051)	160–179 180–199 200–219	MV MV TRFRS.	1.8m
12m (D-DT-0053)	160–179 180–199 200–219	MV	2m
13m (D-DT-0056)	160–179 180–199	MV SPECIAL APPLICATION	2.2m
14m (D-DT-0054)	160–179 180–199 200–219	MV SPECIAL APPLICATION	2.2m
15m (D-DT-0057)	200–219	MV	2.2m
16m (D-DT-0049)	180–199 200–219	MV SPECIAL APPLICATION	2.2m
18m (D-DT-0048)	180–199 200–219	MV SPECIAL APPLICATION	2.4m

CONCRETE POLES

POLE LENGTH	APPLICATION	PLANTING DEPTH
4m (D-DT-0001)	SERV. CONN.	0.8m
7m (D-DT-0002)	ABC	1.3m
9m (D-DT-0003)	MV. LV.	1.5m
10m (D-DT-0007)	MV. LV. ROAD CROS.	1.8m
10m TRFR (D-DT-0007)	MV. LV.. TRFRS.	1.8m
11m (D-DT-0004)	MV	1.8m
12m (D-DT-0005)	MV	2m
13m	MV	2.2m
14m	MV	2.3m

REV	REVISION DESCRIPTION	BY	CHKD	AUTH	DATE	PROJECT NO.
7	FIELD LINERS REMOVED AND 12m AND 14m CONCRETE POLES ADDED	P.A.V.	B. HILL	B. HILL	09.10.2003	
6	WOOD POLE TABLE UPDATED	P.A.V.	[illegible]	[illegible]	11.01.1900	
5	3.4m WOOD POLE REMOVED BY ELECTRIFICATION SELECT COMMITTEE	P.A.V.	A.ABRISE	A. ABRISE	20.10.1998	
4	4.0m WOOD POLES CHANGED TO 3.4m WOOD POLE	P.A.V.	B. HILL	P. CRONJÉ	15.08.1996	
3	4.7m (1.7m, 2m, 9m AND 15m WOOD) POLES ADDED	P.A.V.	B. HILL	P. CRONJÉ	30.09.1997	

Eskom Distribution

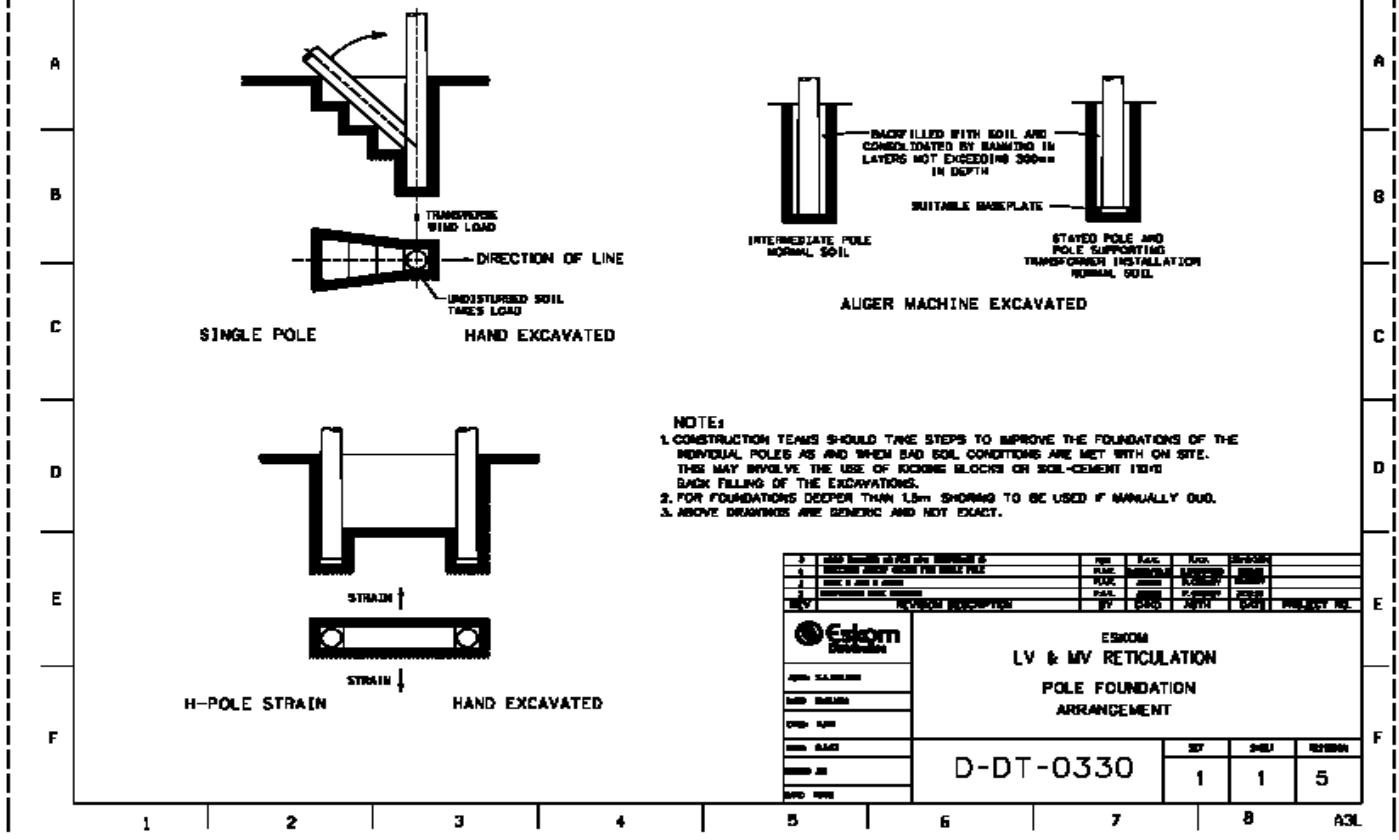
AUTH	P. CRONJÉ
DATE	08.11.1994
CHKD	B. HILL
DATE	08.11.1994
DRWN	P.A.V.
DATE	20.10.1994

MV & LV RETICULATION
POLE PLANTING
DEPTH DETAILS

SET	SHEET	REVISION
1	1	7

D-DT-0332

Page No. 00810



NOTES:
1. CONSTRUCTION TEAMS SHOULD TAKE STEPS TO IMPROVE THE FOUNDATIONS OF THE INDIVIDUAL POLES AS AND WHEN BAD SOIL CONDITIONS ARE MET WITH ON SITE. THIS MAY INVOLVE THE USE OF KICKING BLOCKS OR SOIL-CEMENT MIXED BACK FILLING OF THE EXCAVATIONS.
2. FOR FOUNDATIONS DEEPER THAN 1.5m SHORING TO BE USED IF MANUALLY DUG.
3. ABOVE DRAWINGS ARE GENERIC AND NOT EXACT.

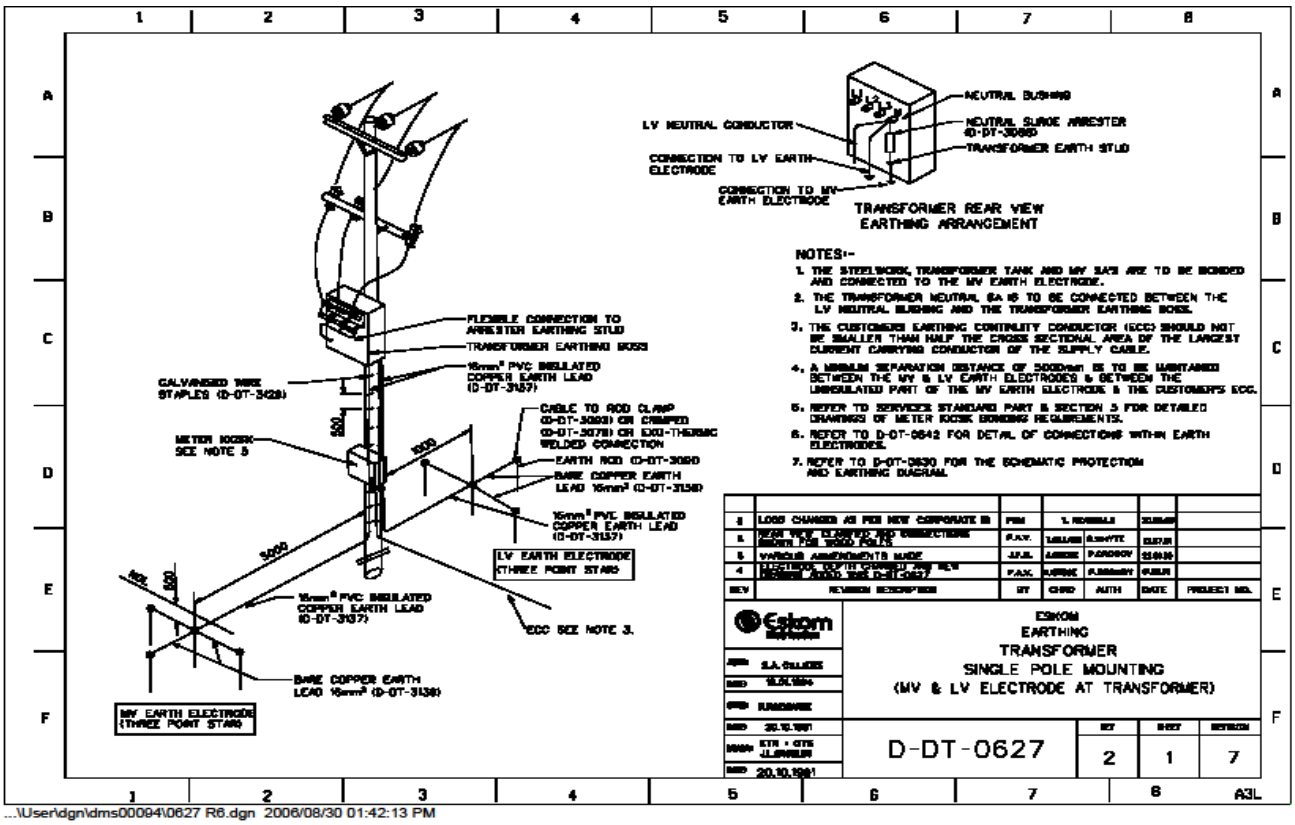
REV	REVISION DESCRIPTION	BY	CHKD	AUTH	DATE	PROJECT NO.
5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	

Eskom Distribution

ESKOM
LV & MV RETICULATION
POLE FOUNDATION
ARRANGEMENT

SET	SHEET	REVISION
1	1	5

D-DT-0330


LV NEUTRAL CONDUCTOR
CONNECTION TO LV EARTH ELECTRODE
CONNECTION TO MV EARTH ELECTRODE
NEUTRAL BUSHING
NEUTRAL SURGE ARRESTER (D-DT-3088)
TRANSFORMER EARTH STUD
TRANSFORMER REAR VIEW EARTHING ARRANGEMENT
FLEXIBLE CONNECTION TO ARRESTER EARTHING STUD
TRANSFORMER EARTHING BOSS
16mm² PVC INSULATED COPPER EARTH LEAD (D-DT-3157)
GALVANISED WIRE STAPLES (D-DT-3129)
METER KIOSK SEE NOTE 5
CABLE TO ROD CLAMP (D-DT-3093) OR CRIMPED (D-DT-3076) OR EXO-THERMIC WELDED CONNECTION
EARTH ROD (D-DT-3088)
BARE COPPER EARTH LEAD 16mm² (D-DT-3158)
LV EARTH ELECTRODE (THREE POINT STAR)
ECC SEE NOTE 3.
MV EARTH ELECTRODE (THREE POINT STAR)
NOTES:-
1. THE STEELWORK, TRANSFORMER TANK AND MV SA'S ARE TO BE BONDED AND CONNECTED TO THE MV EARTH ELECTRODE.
2. THE TRANSFORMER NEUTRAL BAR IS TO BE CONNECTED BETWEEN THE LV NEUTRAL BUSHING AND THE TRANSFORMER EARTHING BOSS.
3. THE CUSTOMERS EARTHING CONTINUITY CONDUCTOR (ECC) SHOULD NOT BE SMALLER THAN HALF THE CROSS SECTIONAL AREA OF THE LARGEST CURRENT CARRYING CONDUCTOR OF THE SUPPLY CABLE.
4. A MINIMUM SEPARATION DISTANCE OF 5000mm IS TO BE MAINTAINED BETWEEN THE MV & LV EARTH ELECTRODES & BETWEEN THE UNINSULATED PART OF THE MV EARTH ELECTRODE & THE CUSTOMERS ECC.
5. REFER TO SERVICES STANDARD PART 5 SECTION 5 FOR DETAILED DRAWINGS OF METER KIOSK BONDING REQUIREMENTS.
6. REFER TO D-DT-0642 FOR DETAIL OF CONNECTIONS WITHIN EARTH ELECTRODES.
7. REFER TO D-DT-0630 FOR THE SCHEMATIC PROTECTION AND EARTHING DIAGRAM.
REV REVISION DESCRIPTION BY CHKD AUTH DATE PROJECT NO.
5 LOGO CHANGED AS PER NEW CORPORATE ID PBM T. NKAMBULE 30.08.06
5 REAR VIEW CLARIFIED AND CONNECTIONS SHOWN FOR WOOD POLES P.A.V. T.GILLARD G.WHYTE 13.07.01
5 VARIOUS AMMENDMENTS MADE J.F.S. A.ABROSIE P.CROWDY 22.06.99
4 ELECTRODE DEPTH CHANGED AND NEW DRAWING ADDED WAS D-DT-0627 P.A.V. A.ABROSIE P.CROWDY 01.02.96
Eskom Distribution
AUTH: S.A. CILLIERS
DATE: 10.01.1994
CHKD: K.ROZMAREK
DATE: 20.10.1991
DRAWN: ETR + OTS J.L.GROBLER
DATE: 20.10.1991
ESKOM
EARTHING
TRANSFORMER
SINGLE POLE MOUNTING
(MV & LV ELECTRODE AT TRANSFORMER)
D-DT-0627
SET 2
SHEET 1
REVISION 7
A3L
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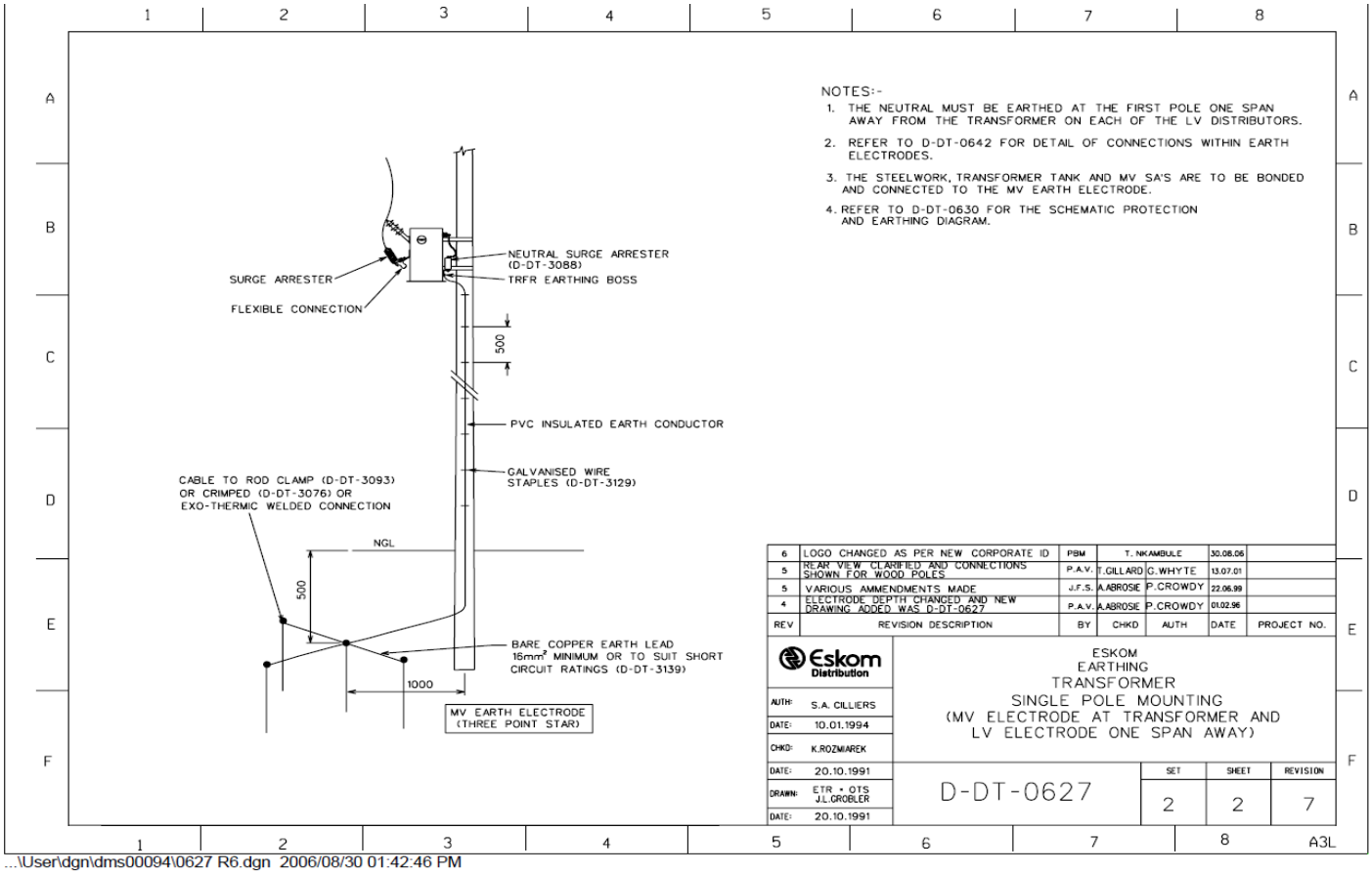
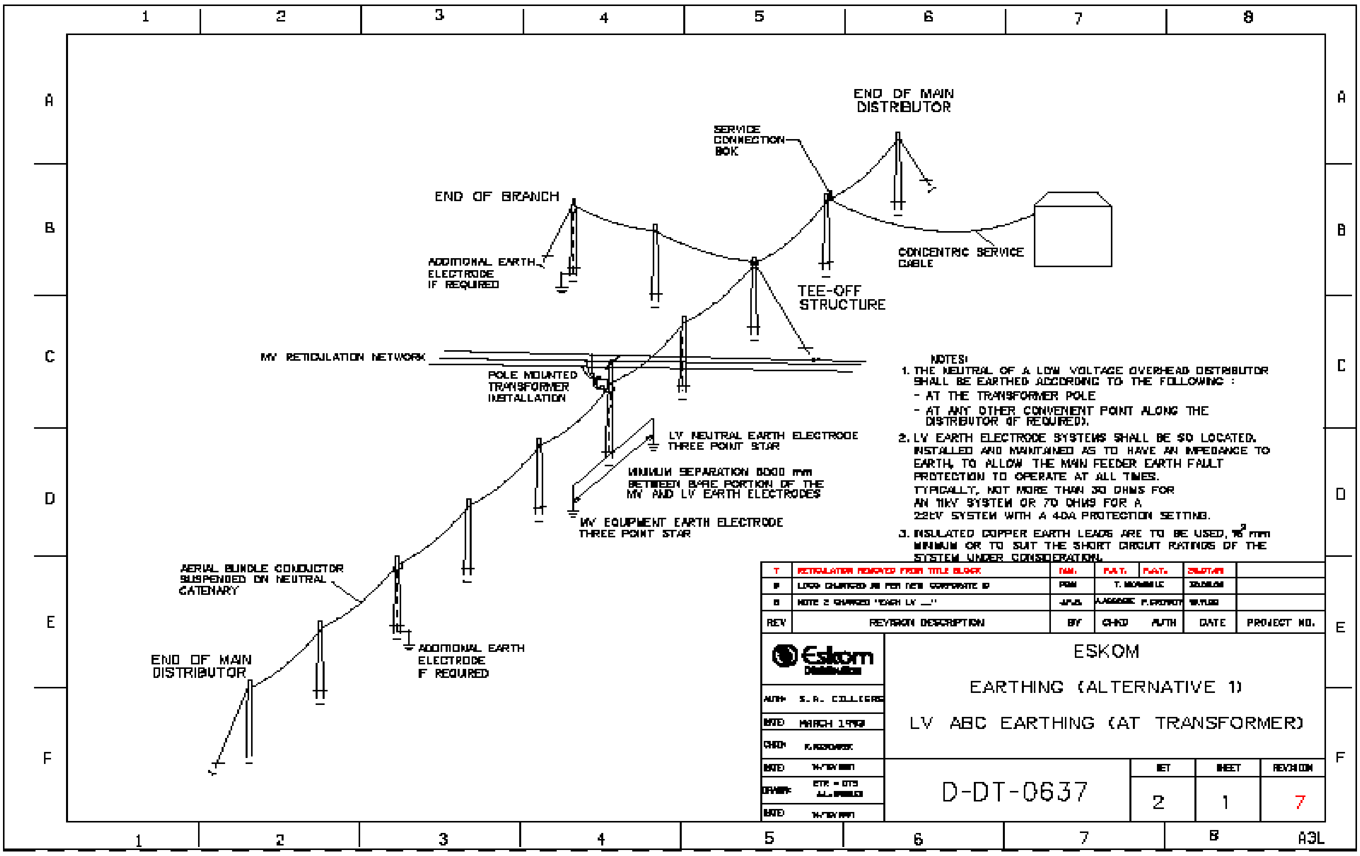
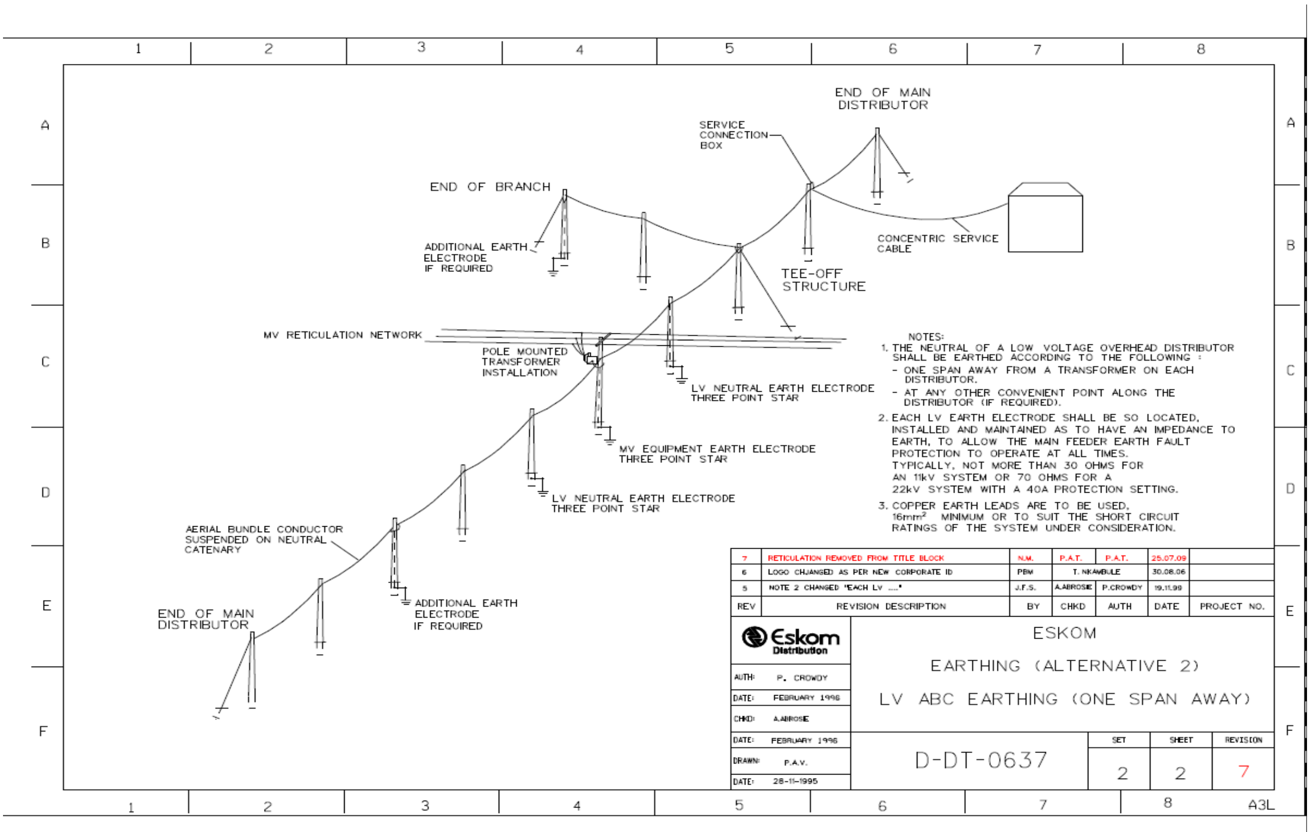
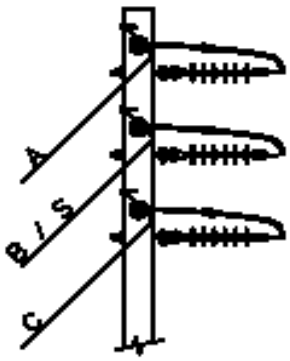
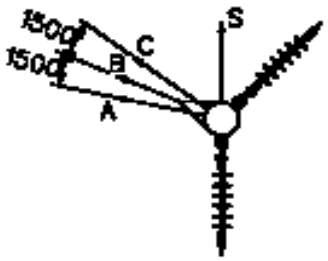

NOTES:-
1. THE NEUTRAL MUST BE EARTHED AT THE FIRST POLE ONE SPAN AWAY FROM THE TRANSFORMER ON EACH OF THE LV DISTRIBUTORS.
2. REFER TO D-DT-0642 FOR DETAIL OF CONNECTIONS WITHIN EARTH ELECTRODES.
3. THE STEELWORK, TRANSFORMER TANK AND MV SA'S ARE TO BE BONDED AND CONNECTED TO THE MV EARTH ELECTRODE.
4. REFER TO D-DT-0630 FOR THE SCHEMATIC PROTECTION AND EARTHING DIAGRAM.
SURGE ARRESTER
FLEXIBLE CONNECTION
NEUTRAL SURGE ARRESTER (D-DT-3088)
TRFR EARTHING BOSS
500
PVC INSULATED EARTH CONDUCTOR
GALVANISED WIRE STAPLES (D-DT-3129)
CABLE TO ROD CLAMP (D-DT-3093) OR CRIMPED (D-DT-3076) OR EXO-THERMIC WELDED CONNECTION
NGL
500
BARE COPPER EARTH LEAD 16mm² MINIMUM OR TO SUIT SHORT CIRCUIT RATINGS (D-DT-3139)
1000
MV EARTH ELECTRODE (THREE POINT STAR)
6 LOGO CHANGED AS PER NEW CORPORATE ID PBM T. NKAMBULE 30.08.06
5 REAR VIEW CLARIFIED AND CONNECTIONS SHOWN FOR WOOD POLES P.A.V. T.GILLARD G.WHYTE 13.07.01
5 VARIOUS AMMENDMENTS MADE J.F.S. A.ABROSIE P.CROWDY 22.06.99
4 ELECTRODE DEPTH CHANGED AND NEW DRAWING ADDED WAS D-DT-0627 P.A.V. A.ABROSIE P.CROWDY 01.02.96
REV REVISION DESCRIPTION BY CHKD AUTH DATE PROJECT NO.
Eskom Distribution
AUTH: S.A. CILLIERS
DATE: 10.01.1994
CHKD: K.ROZMAREK
DATE: 20.10.1991
DRAWN: ETR + OTS J.L.GROBLER
DATE: 20.10.1991
ESKOM
EARTHING
TRANSFORMER
SINGLE POLE MOUNTING
(MV ELECTRODE AT TRANSFORMER AND LV ELECTRODE ONE SPAN AWAY)
D-DT-0627
SET 2
SHEET 2
REVISION 7
A3L
...\User\dgn\dms00094\0627 R6.dgn 2006/08/30 01:42:46 PM


END OF MAIN DISTRIBUTOR
SERVICE CONNECTION BOX
END OF BRANCH
ADDITIONAL EARTH ELECTRODE IF REQUIRED
CONCENTRIC SERVICE CABLE
TEE-OFF STRUCTURE
MV RETICULATION NETWORK
POLE MOUNTED TRANSFORMER INSTALLATION
LV NEUTRAL EARTH ELECTRODE THREE POINT STAR
MINIMUM SEPARATION 5000 mm BETWEEN BARE PORTION OF THE MV AND LV EARTH ELECTRODES
MV EQUIPMENT EARTH ELECTRODE THREE POINT STAR
AERIAL BUNDLE CONDUCTOR SUSPENDED ON NEUTRAL CATENARY
END OF MAIN DISTRIBUTOR
ADDITIONAL EARTH ELECTRODE IF REQUIRED
NOTES:
1. THE NEUTRAL OF A LOW VOLTAGE OVERHEAD DISTRIBUTOR SHALL BE EARTHED ACCORDING TO THE FOLLOWING :
- AT THE TRANSFORMER POLE
- AT ANY OTHER CONVENIENT POINT ALONG THE DISTRIBUTOR (IF REQUIRED).
2. LV EARTH ELECTRODE SYSTEMS SHALL BE SO LOCATED, INSTALLED AND MAINTAINED AS TO HAVE AN IMPEDANCE TO EARTH, TO ALLOW THE MAIN FEEDER EARTH FAULT PROTECTION TO OPERATE AT ALL TIMES. TYPICALLY, NOT MORE THAN 30 OHMS FOR AN 11kV SYSTEM OR 70 OHMS FOR A 22kV SYSTEM WITH A 40A PROTECTION SETTING.
3. INSULATED COPPER EARTH LEADS ARE TO BE USED, 16mm² MINIMUM OR TO SUIT THE SHORT CIRCUIT RATINGS OF THE SYSTEM UNDER CONSIDERATION.
REV
REVISION DESCRIPTION
BY
CHKD
AUTH
DATE
PROJECT NO.
Eskom
ESKOM
EARTHING (ALTERNATIVE 1)
LV ABC EARTHING (AT TRANSFORMER)
D-DT-0637
SET
SHEET
REVISION
2
1
7
A3L


END OF MAIN DISTRIBUTOR
SERVICE CONNECTION BOX
END OF BRANCH
ADDITIONAL EARTH ELECTRODE IF REQUIRED
CONCENTRIC SERVICE CABLE
TEE-OFF STRUCTURE
MV RETICULATION NETWORK
POLE MOUNTED TRANSFORMER INSTALLATION
LV NEUTRAL EARTH ELECTRODE THREE POINT STAR
MV EQUIPMENT EARTH ELECTRODE THREE POINT STAR
LV NEUTRAL EARTH ELECTRODE THREE POINT STAR
AERIAL BUNDLE CONDUCTOR SUSPENDED ON NEUTRAL CATENARY
END OF MAIN DISTRIBUTOR
ADDITIONAL EARTH ELECTRODE IF REQUIRED
NOTES:
1. THE NEUTRAL OF A LOW VOLTAGE OVERHEAD DISTRIBUTOR SHALL BE EARTHED ACCORDING TO THE FOLLOWING :
- ONE SPAN AWAY FROM A TRANSFORMER ON EACH DISTRIBUTOR.
- AT ANY OTHER CONVENIENT POINT ALONG THE DISTRIBUTOR (IF REQUIRED).
2. EACH LV EARTH ELECTRODE SHALL BE SO LOCATED, INSTALLED AND MAINTAINED AS TO HAVE AN IMPEDANCE TO EARTH, TO ALLOW THE MAIN FEEDER EARTH FAULT PROTECTION TO OPERATE AT ALL TIMES. TYPICALLY, NOT MORE THAN 30 OHMS FOR AN 11kV SYSTEM OR 70 OHMS FOR A 22kV SYSTEM WITH A 40A PROTECTION SETTING.
3. COPPER EARTH LEADS ARE TO BE USED. 16mm² MINIMUM OR TO SUIT THE SHORT CIRCUIT RATINGS OF THE SYSTEM UNDER CONSIDERATION.
7 RETICULATION REMOVED FROM TITLE BLOCK N.M. P.A.T. P.A.T. 25.07.09
6 LOGO CHANGED AS PER NEW CORPORATE ID PBM T. NKAMBULE 30.06.06
5 NOTE 2 CHANGED "EACH LV ...." J.F.S. A.ABROSE P.CROWDY 19.11.99
REV
REVISION DESCRIPTION
BY
CHKD
AUTH
DATE
PROJECT NO.
Eskom Distribution
ESKOM
EARTHING (ALTERNATIVE 2)
LV ABC EARTHING (ONE SPAN AWAY)
AUTH: P. CROWDY
DATE: FEBRUARY 1996
CHKD: A.ABROSE
DATE: FEBRUARY 1996
DRAWN: P.A.V.
DATE: 28-11-1995
D-DT-0637
SET
SHEET
REVISION
2
2
7
A3L





1-30°	STAYS
SQUIRREL	S, B
FOX	S. B
MINK	S, B
HARE	S, B
CHICADEE	2S, A, C
KINGBIRD	3S, A,B,C

30-60°	STAYS
SQUIRREL	S, B
FOX	S. B
MINK	S, B
HARE	2S, A, C
CHICADEE	3S, A, C
KINGBIRD	2S, A, 2xB, C

60-90°	STAYS
SQUIRREL	S, B
FOX	S, B
MINK	S, A, C
HARE	2S, A, B, C
CHICADEE	3S, A, B, C
KINGBIRD	4S, 2xA, 2xB, 2xC

- S - CONSTRUCTION STAYS SLACK OFF AFTER INSTALLATION.
- WHERE 2 x S ARE REQUIRED USE TOP AND BOTTOM PHASE.
- WHERE 1 x S IS REQUIRED USE MIDDLE PHASE.
- WHERE 3 x S IS REQUIRED USE TOP, MIDDLE AND BOTTOM PHASE.

NOTE :
FOR CHICADEE AND KINGBIRD USE 19/2.65 STAY WIRE AND 24mm DIAMETER HV STAYRODS MIN. 2.4m LONG.

STRAIN (±30 - 90 DEG. DEVIATION)

REV	REVISION DESCRIPTION	BY	CHKD	AUTH	DATE	PROJECT NO.
8	0 DEG. TABLE REPOSITIONED ON SH. 3 0 DEG. IN-LINE STRAIN	P.A.T.	S.MASHABA	B. HILL	08.06.11	
7	CHICADEE CONDUCTOR ADDED TO STRAIN H-POLES AND SQUIRREL, FOX, MINK, HARE ADDED TO 1-30° ANGLES	P.A.T.	B. HILL	V.SINGH	03.03.11	
6	VARIOS AMENDMENTS MADE TO ALL STAYS	P.A.T.	B. HILL	B. HILL	05.10.10	

Eskom Distribution

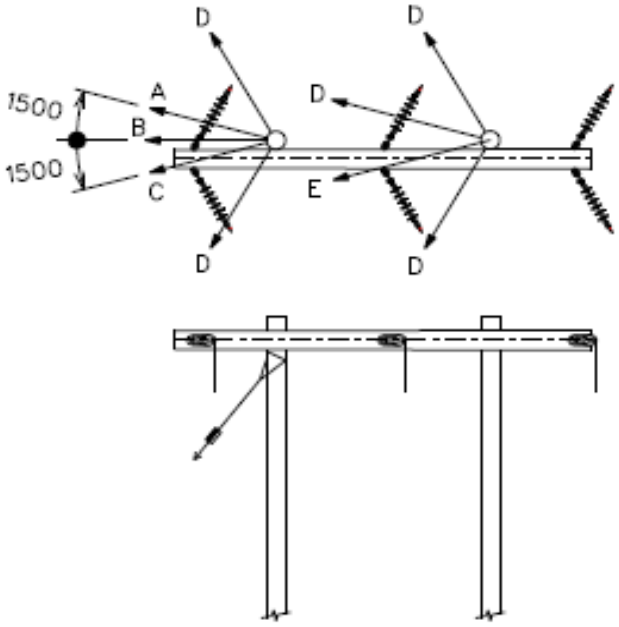
AUTH P. CROWDY
DATE MAY 1998
CHKD J. SWAN
DATE MAY 1998
DRWN P.A.VERMAAK
DATE 31.10.1995

MV RETICULATION STAY ATTACHMENT ANGLES

DRG	SET	SHEET	REVISION
D-DT-0312	7	1	8

1 2 3 4 A4L

0312 R8.dgn 2011/08/08 10:34:43 AM



0°	STAYS
SQUIRREL	4 (INLINE)
FOX	4 (INLINE)
MINK	4 (INLINE)
HARE	4 (INLINE)
CHICADEE	4 (INLINE)

1-30°	STAYS
SQUIRREL	4D, B
FOX	4D, B
MINK	4D, B
HARE	4D, B
CHICADEE	4D, B

30-60°	STAYS
SQUIRREL	4D, B
FOX	4D, B
MINK	4D, B
HARE	4D, A, C
CHICADEE	4D, A, C

60-90°	STAYS
SQUIRREL	4D, B
FOX	4D, B
MINK	4D, B
HARE	4D, A, C
CHICADEE	4D, A, B, C

- D - CONSTRUCTION STAYS KEEP AS PERMANENT STAY AFTER INSTALLATION.
- FOR MINK, HARE AND CHICADEE CONDUCTOR USE DOUBLE CROSSARM.
- FOR CHICADEE USE 19/2.65 STAY WIRE AND 24mm DIAMETER HV STAYRODS MIN. 2.4m LONG.

STRAIN H-POLE

REV	REVISION DESCRIPTION	BY	CHKD	AUTH	DATE	PROJECT NO.
8	0 DEG. TABLE REPOSITIONED ON SH. 5 0 DEG. IN-LINE STRAIN	P.A.T.	S.MASHABA	B. HILL	08.08.11	
7	CHICADEE CONDUCTOR ADDED TO STRAIN H-POLES AND SQUIRREL, FOX, MINK, HARE ADDED TO 1-30° ANGLES	P.A.T.	B. HILL	V.SINGH	03.03.11	
6	VARIOS AMMENDMENTS MADE TO ALL STAYS	P.A.T.	B. HILL	B. HILL	05.10.10	

Eskom Distribution

AUTH: P. CROWDY
DATE: MAY 1996
CHKD: J. SWAN
DATE: MAY 1996
DRAWN: P.A.VERMAAK
DATE: 31.10.1995

MV RETICULATION STAY ATTACHMENT ANGLES

	SET	SHEET	REVISION
D-DT-0312	7	2	8

1 2 3 4 A4L

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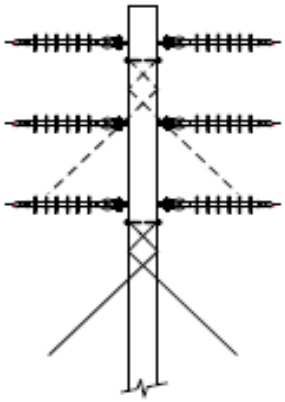
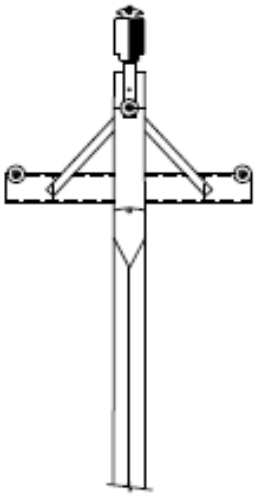
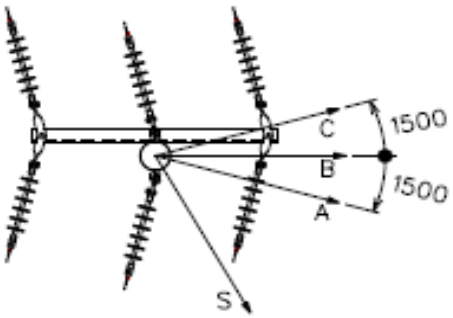


TEMPORARY STAY TO BE USED
DURING CONDUCTOR STRINGING

INLINE STRAIN VERTICAL





STRAIN DELTA

0°	STAYS
SQUIRREL	2 (INLINE)
FOX	2 (INLINE)
MINK	4 (INLINE)
HARE	4 (INLINE)

1-30°	STAYS
SQUIRREL	S, B
FOX	S, B
MINK	S, B
HARE	2S, B

30-60°	STAYS
SQUIRREL	S, B
FOX	S, B
MINK	S, B
HARE	2S, A, C

60-90°	STAYS
SQUIRREL	S, B
FOX	S, B
MINK	S, A, C
HARE	2S, A, B, C

REV	REVISION DESCRIPTION	BY	CHKD	AUTH	DATE	PROJECT NO.
8	0 DEG. TABLE REPOSITIONED ON SH. 5 0 DEG. IN-LINE STRAIN	P.A.T.	S.MASHABA	B. HILL	08.08.11	
7	CHICADEE CONDUCTOR ADDED TO STRAIN H-POLES AND SQUIRREL, FOX, MINK, HARE ADDED TO 1-30° ANGLES	P.A.T.	B. HILL	V.SINGH	03.03.11	
6	VARIOS AMMENDMENTS MADE TO ALL STAYS	P.A.T.	B. HILL	B. HILL	05.10.10	

Eskom Distribution

AUTH: P. CROWDY
DATE: MAY 1996
CHKD: J. SWAN
DATE: MAY 1996
DRAWN: P.A. VERMAAK
DATE: 31.10.1995

MV RETICULATION STAY ATTACHMENT ANGLES

D-DT-0312	SET	SHEET	REVISION
	7	3	8

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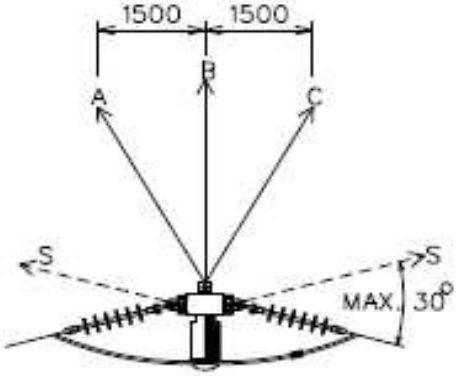
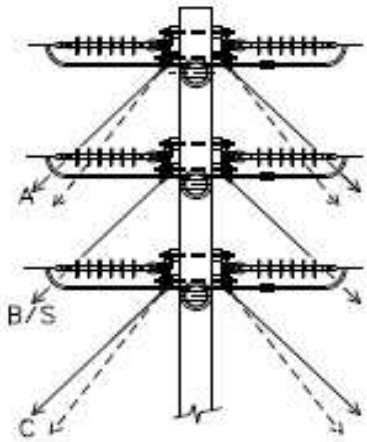


0°	
SQUIRREL	STAYS
FOX	2S, 2C
MINK	2S, 2C
HARE	2S, 2C
CHICADEE	4S, 4C
KINGBIRD	4S, 4C

1-30°	
CHICADEE	2S, A, C
KINGBIRD	3S, A, C



30-60°	
SQUIRREL	S, B
FOX	S, B
MINK	S, B
HARE	2S, A, C
CHICADEE	3S, A, C
KINGBIRD	3S, A, 2xB, C

60-90°	
SQUIRREL	S, B
FOX	S, B
MINK	S, A, C
HARE	2S, A, B, C
CHICADEE	3S, A, B, C
KINGBIRD	4S, 2xA, 2xB, 2xC

- S - CONSTRUCTION STAYS SLACK OFF AFTER INSTALLATION
- WHERE 2 x S ARE REQUIRED USE TOP AND BOTTOM PHASE.
- WHERE 1 x S IS REQUIRED USE MIDDLE PHASE

NOTE :
FOR CHICADEE AND KINGBIRD USE 19/2.65 STAY WIRE
AND 24mm DIAMETER HV STAYRODS MIN. 2.4m LONG.

REV	REVISION DESCRIPTION	BY	CHKD	AUTH	DATE	PROJECT NO.
8	0 DEG. TABLE REPOSITIONED ON SH. 5 0 DEG. IN-LINE STRAIN	P.A.T.	S.MASHABA	B. HILL	08.08.11	
7	CHICADEE CONDUCTOR ADDED TO STRAIN H-POLES AND SQUIRREL, FOX, MINK, HARE ADDED TO 1-30° ANGLES	P.A.T.	B. HILL	V.SINGH	03.03.11	
6	VARIOS AMMENDMENTS MADE TO ALL STAYS	P.A.T.	B. HILL	B. HILL	05.10.10	

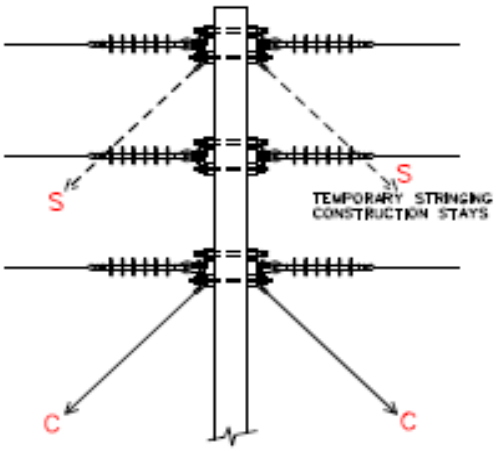
Eskom Distribution

MV RETICULATION STAY ATTACHMENT ANGLES

AUTH: P. CROWDY	
DATE: MAY 1996	
CHKD: J. SWAN	
DATE: MAY 1996	
DRAWN: P.A.VERMAAK	
DATE: 31.10.1995	

D-DT-0312

SET	SHEET	REVISION
7	4	8



TEMPORARY STAY TO BE USED
DURING CONDUCTOR STRINGING

0°	STAYS
SQUIRREL	2S, 2C (INLINE)
FOX	2S, 2C (INLINE)
MINK	2S, 2C (INLINE)
HARE	2S, 4C (INLINE)
CHICADEE	2S, 4C (INLINE)
KINGBIRD	2S, 4C (INLINE)

MV HEAVY CONDUCTOR - INLINE STRAIN VERTICAL

REV	REVISION DESCRIPTION	BY	CHKD	AUTH	DATE	PROJECT NO.
8	0 DEG. TABLE REPOSITIONED ON SH. 5 0 DEG. IN-LINE STRAIN	P.A.T.	S.MASHABA	B. HILL	08.08.11	
7	CHICADEE CONDUCTOR ADDED TO STRAIN H-POLES AND SQUIRREL, FOX, MINK, HARE ADDED TO 1-30° ANGLES	P.A.T.	B. HILL	V.SINGH	03.03.11	
6	VARIOS AMMENDMENTS MADE TO ALL STAYS	P.A.T.	B. HILL	B. HILL	05.10.10	

Eskom Distribution

AUTH: P. CROWDY
DATE: MAY 1996
CHKD: J. SWAN
DATE: MAY 1996
DRAWN: P.A.VERMAAK
DATE: 31.10.1995

MV RETICULATION
STAY ATTACHMENT
0 DEG. IN-LINE STRAIN

D-DT-0312	SET	SHEET	REVISION
	7	5	8

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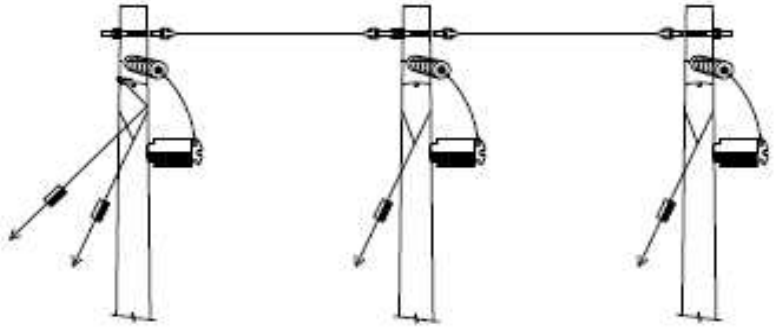
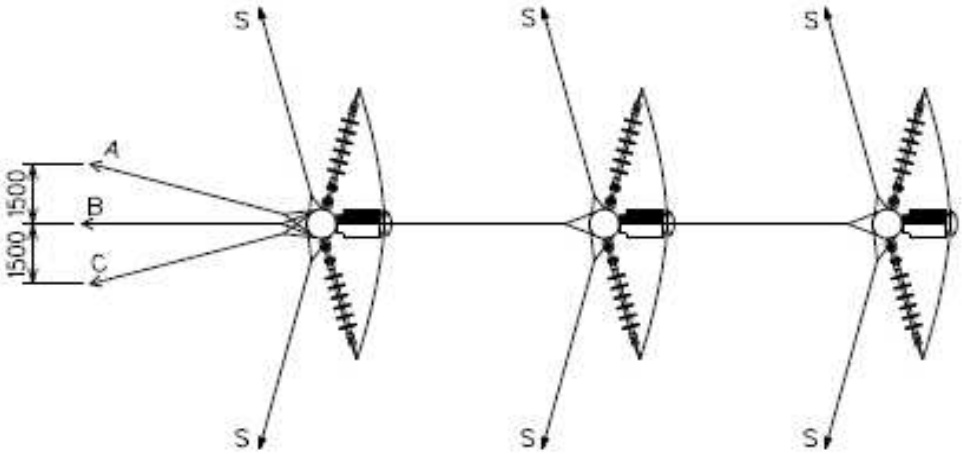


NOTE :
IF SPANS ON EITHER SIDE OF TRIPS ARE UNEQUAL BY A FACTOR OF 0.75 OR GREATER, THE IN-LINE STAYS OPPOSITE THE SHORTER SPAN MAY BE OMITTED.



30-60°	STAYS	60-90°	STAYS
SQUIRREL	S, B	SQUIRREL	S, B
FOX	S, B	FOX	S, B
MINK	S, B	MINK	S, B, C
HARE	S, B	HARE	S, A, C

REV	REVISION DESCRIPTION	BY	CHKD	AUTH	DATE	PROJECT NO.
8	0 DEG. TABLE REPOSITIONED ON SH. 5 0 DEG. IN-LINE STRAIN	P.A.T.	S.MASHABA	B. HILL	08.08.11	
7	CHICADEE CONDUCTOR ADDED TO STRAIN H-POLES AND SQUIRREL, FOX, MINK, HARE ADDED TO 1-30° ANGLES	P.A.T.	B. HILL	V.SINGH	03.03.11	
6	VARIOS AMMENDMENTS MADE TO ALL STAYS	P.A.T.	B. HILL	B. HILL	05.10.10	

Eskom Distribution

AUTH: P. CROWDY
DATE: MAY 1996
CHKD: J. SWAN
DATE: MAY 1996
DRAWN: P.A.VERMAAK
DATE: 31.10.1995

MV RETICULATION STAY ATTACHMENT TRIPS

SET	SHEET	REVISION
7	6	8

D-DT-0312

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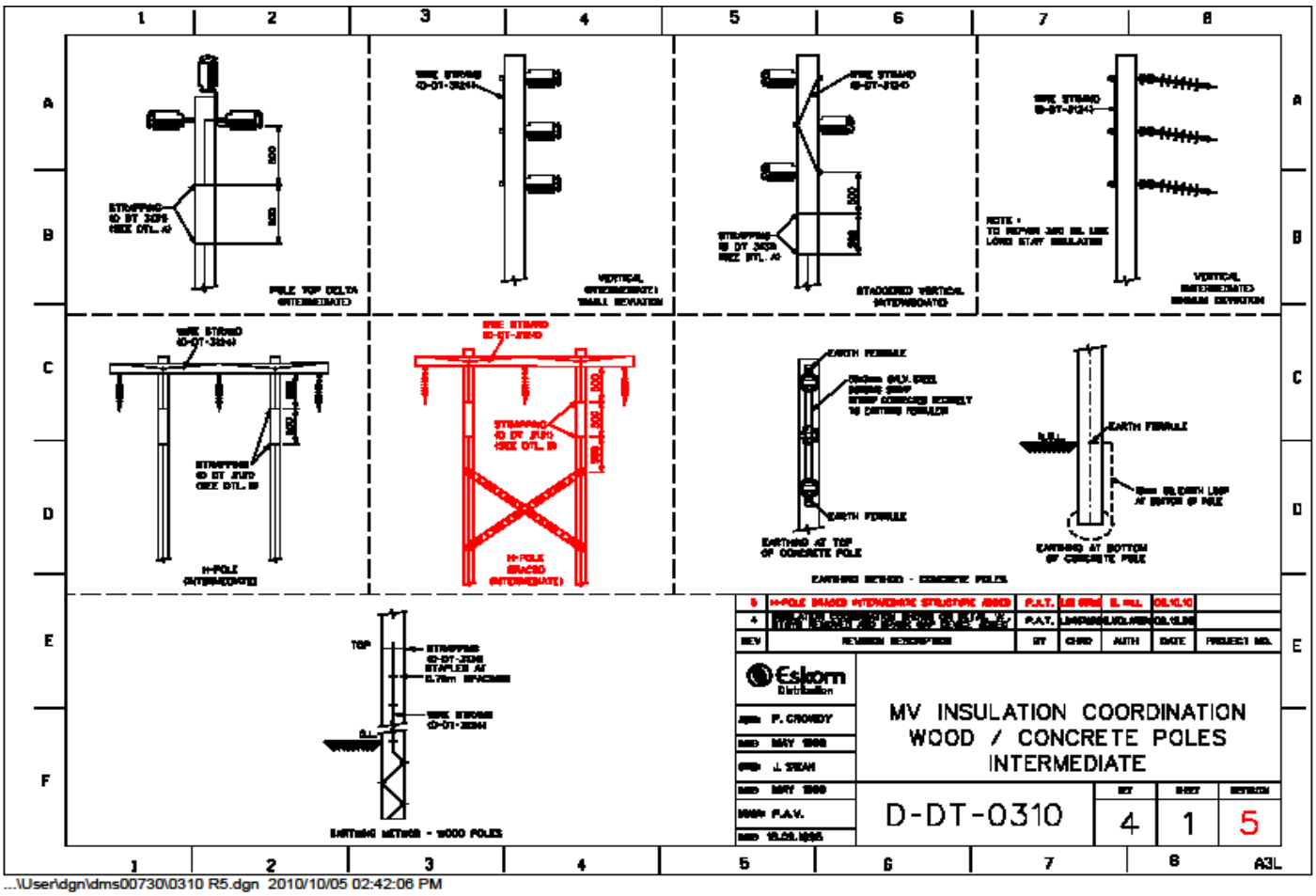
MV INSULATION COORDINATION
WOOD / CONCRETE POLES
INTERMEDIATE
D-DT-0310
4
1
5
A3L
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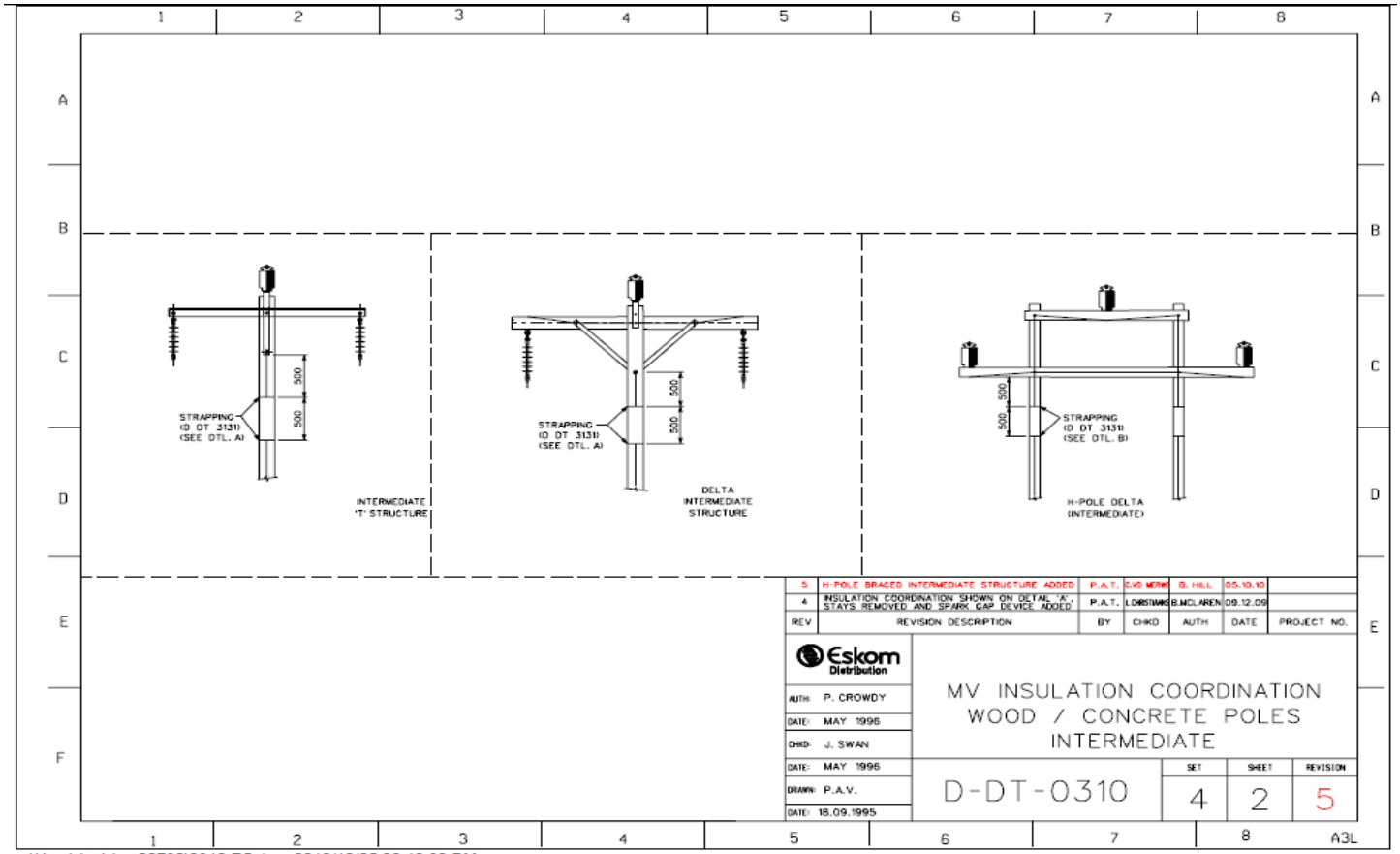

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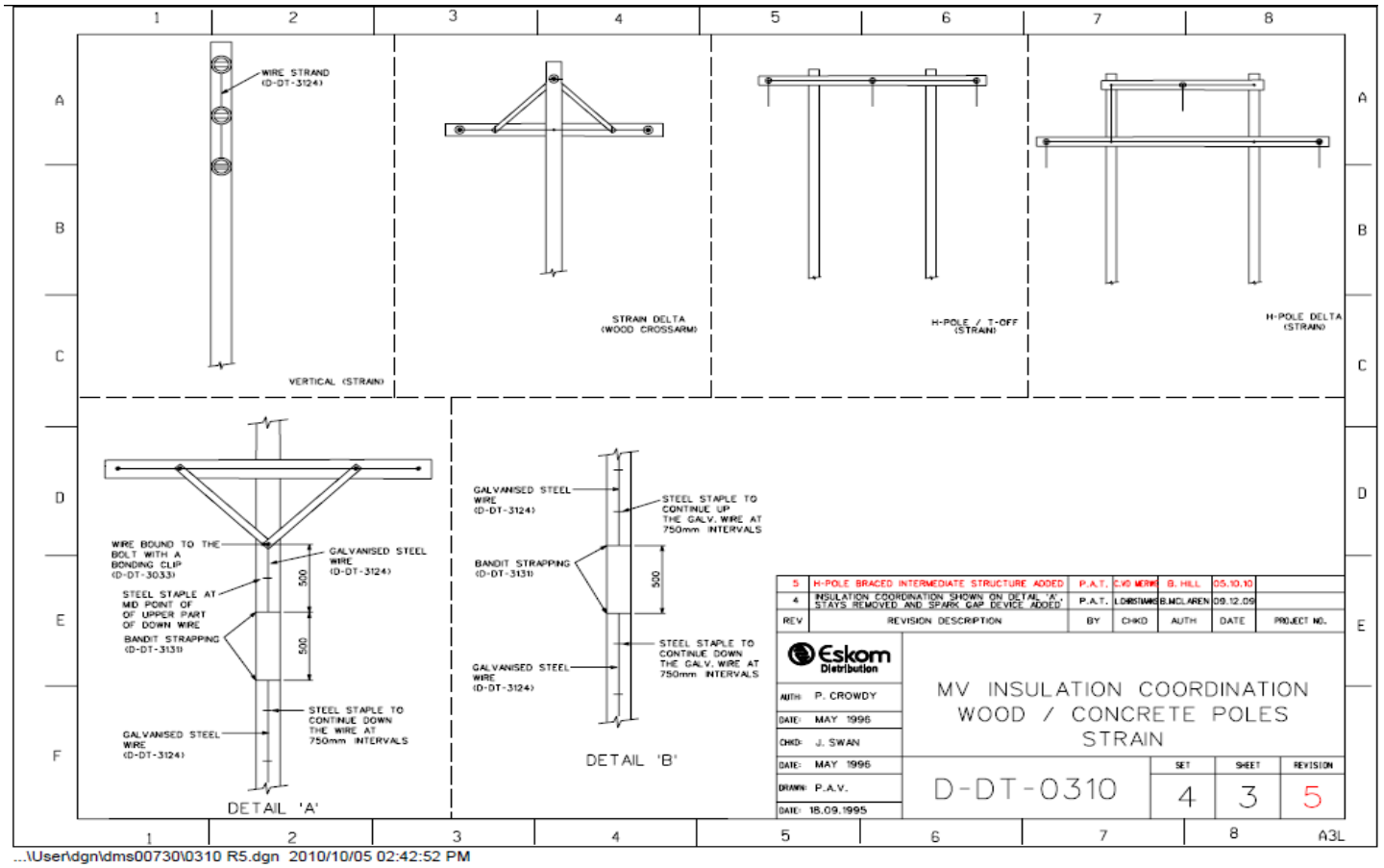

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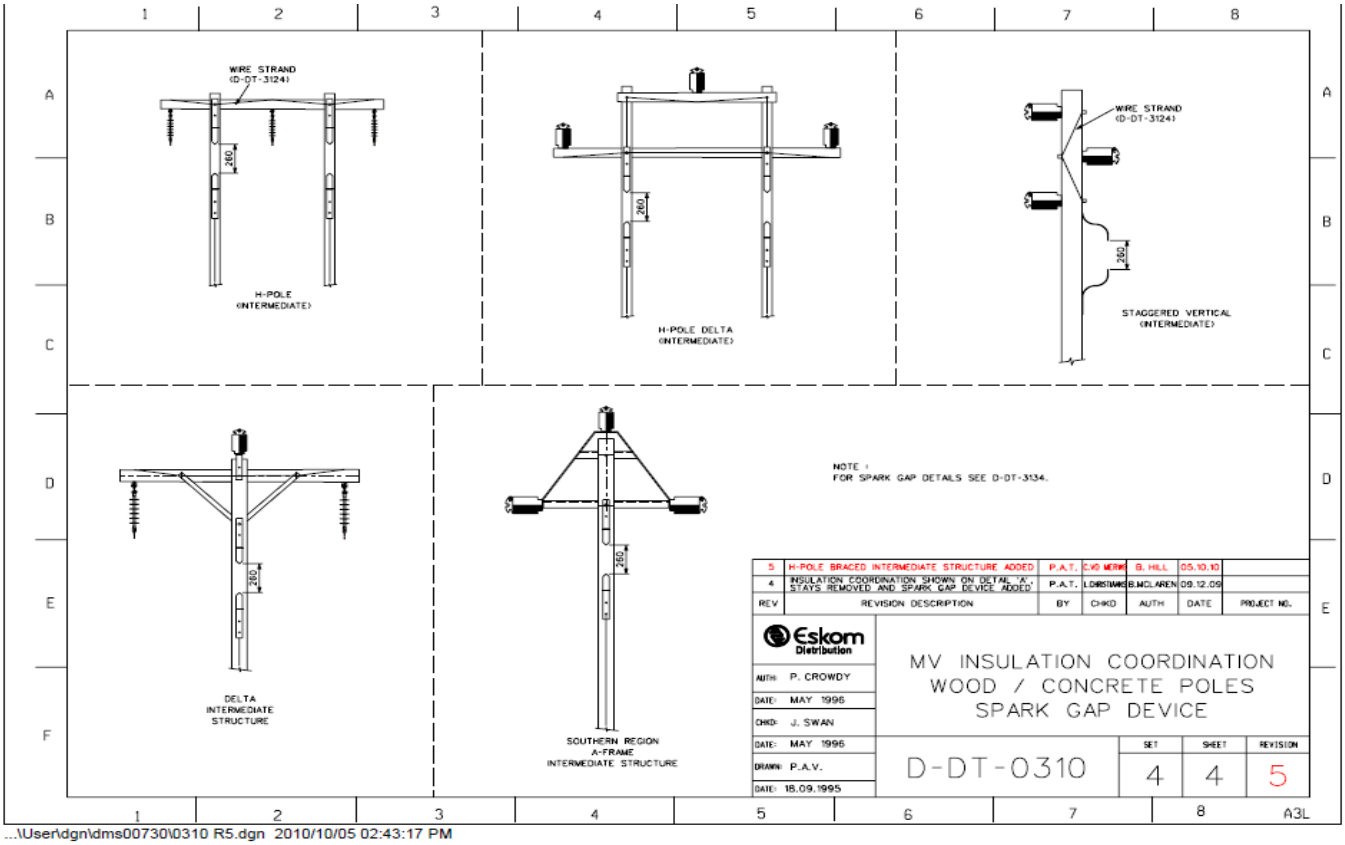

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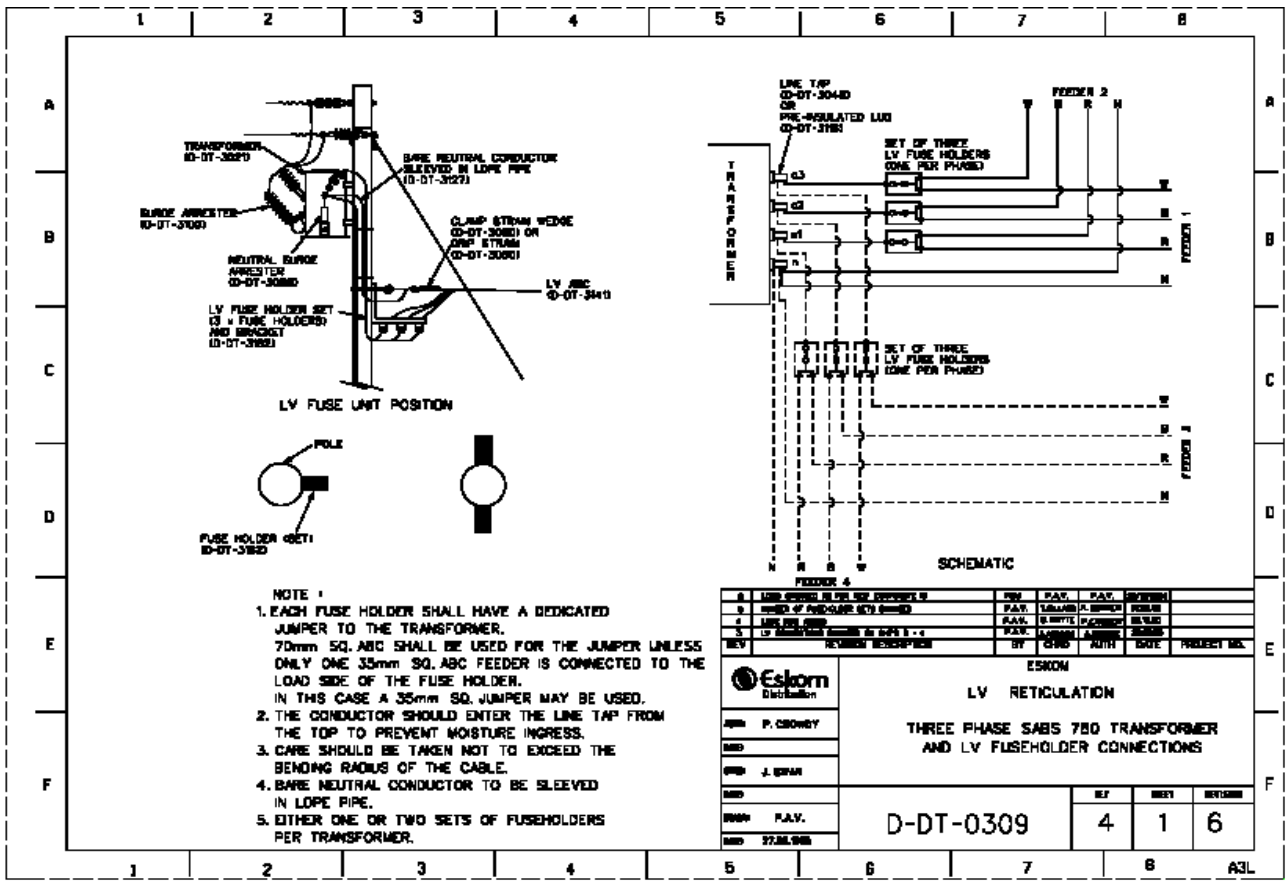
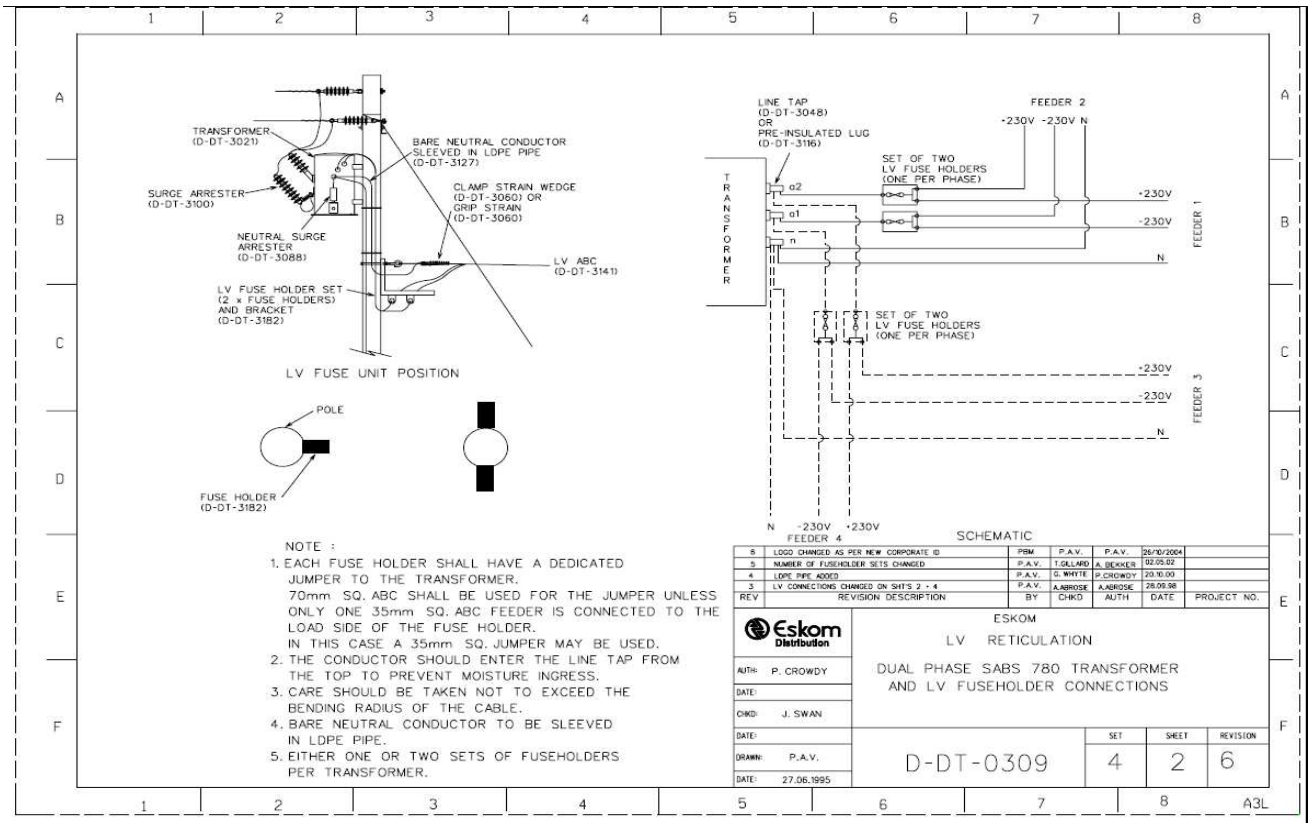
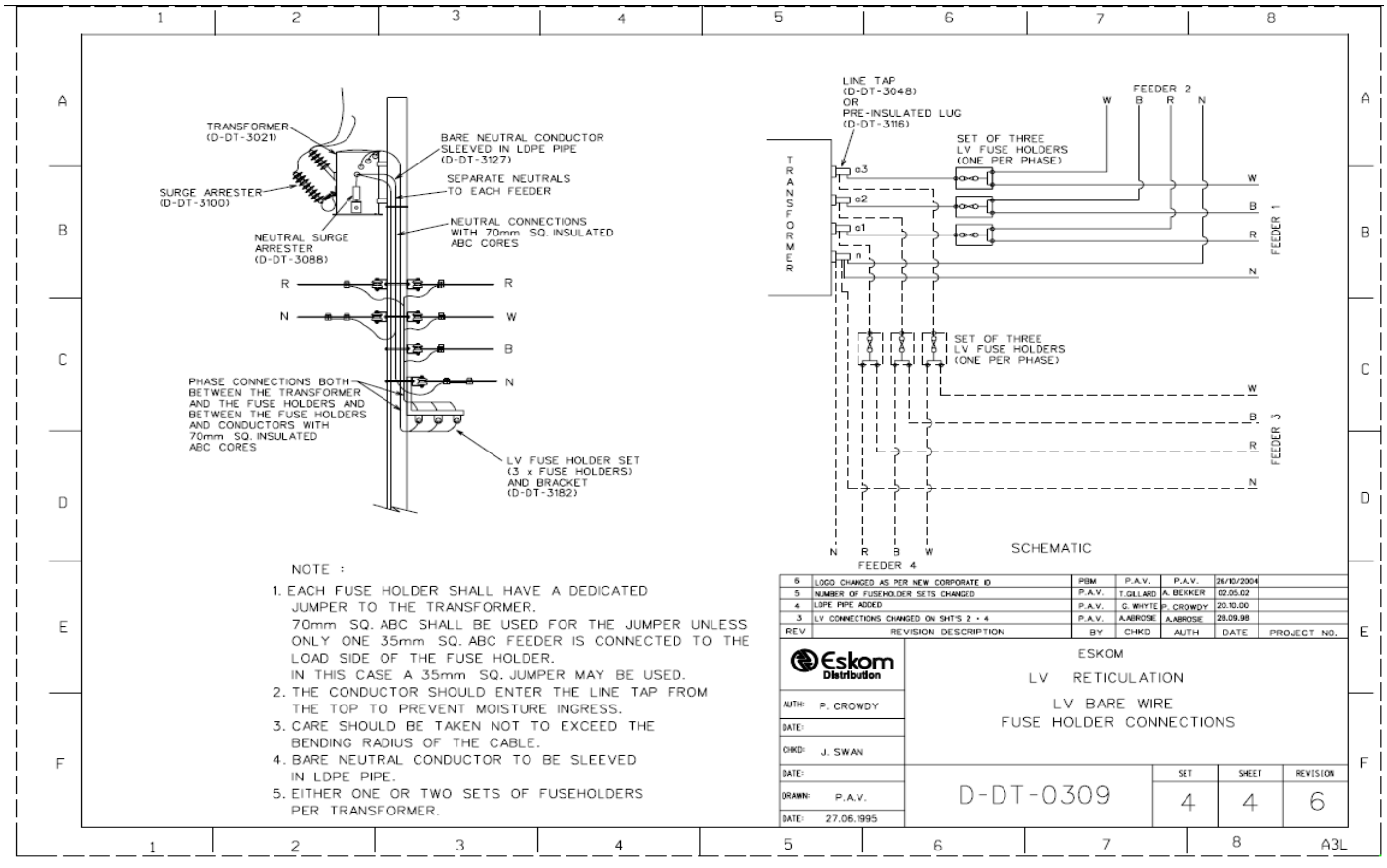
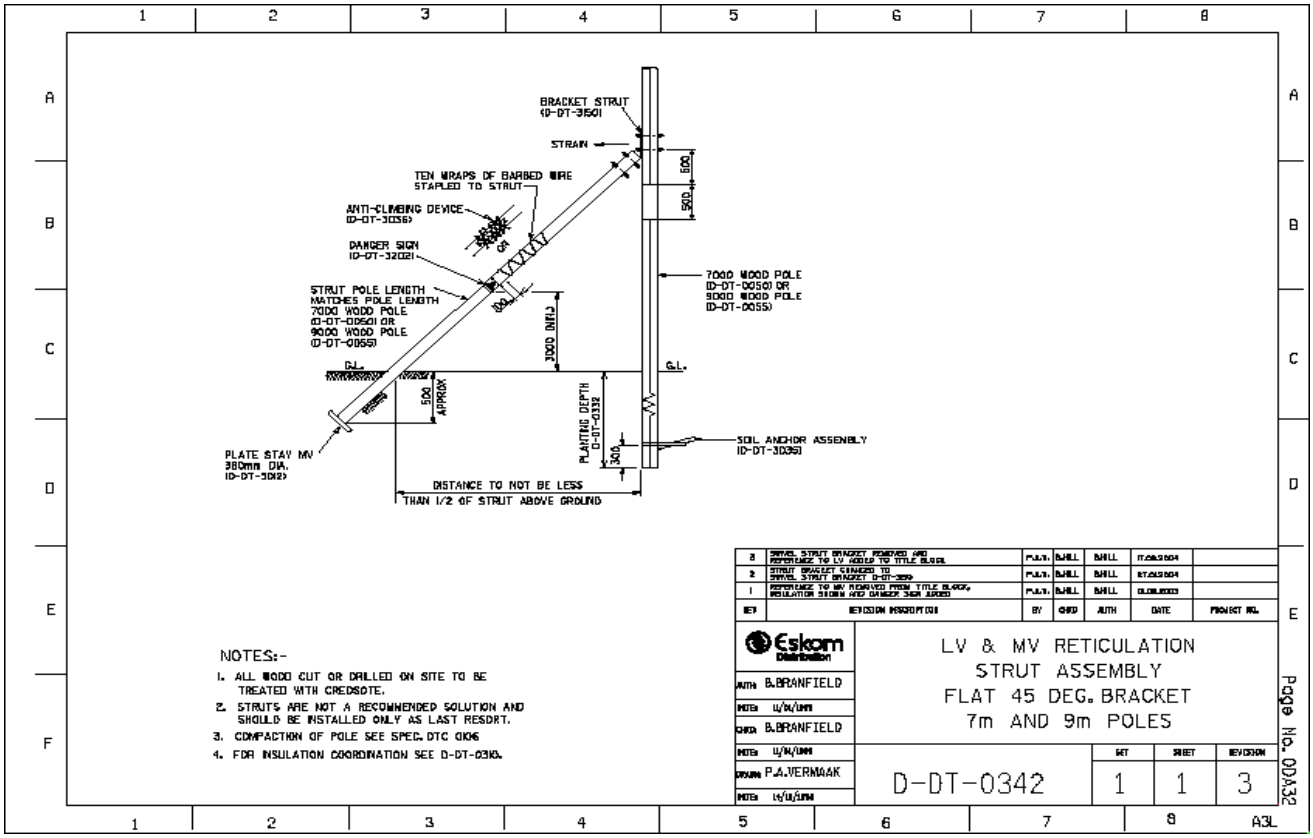
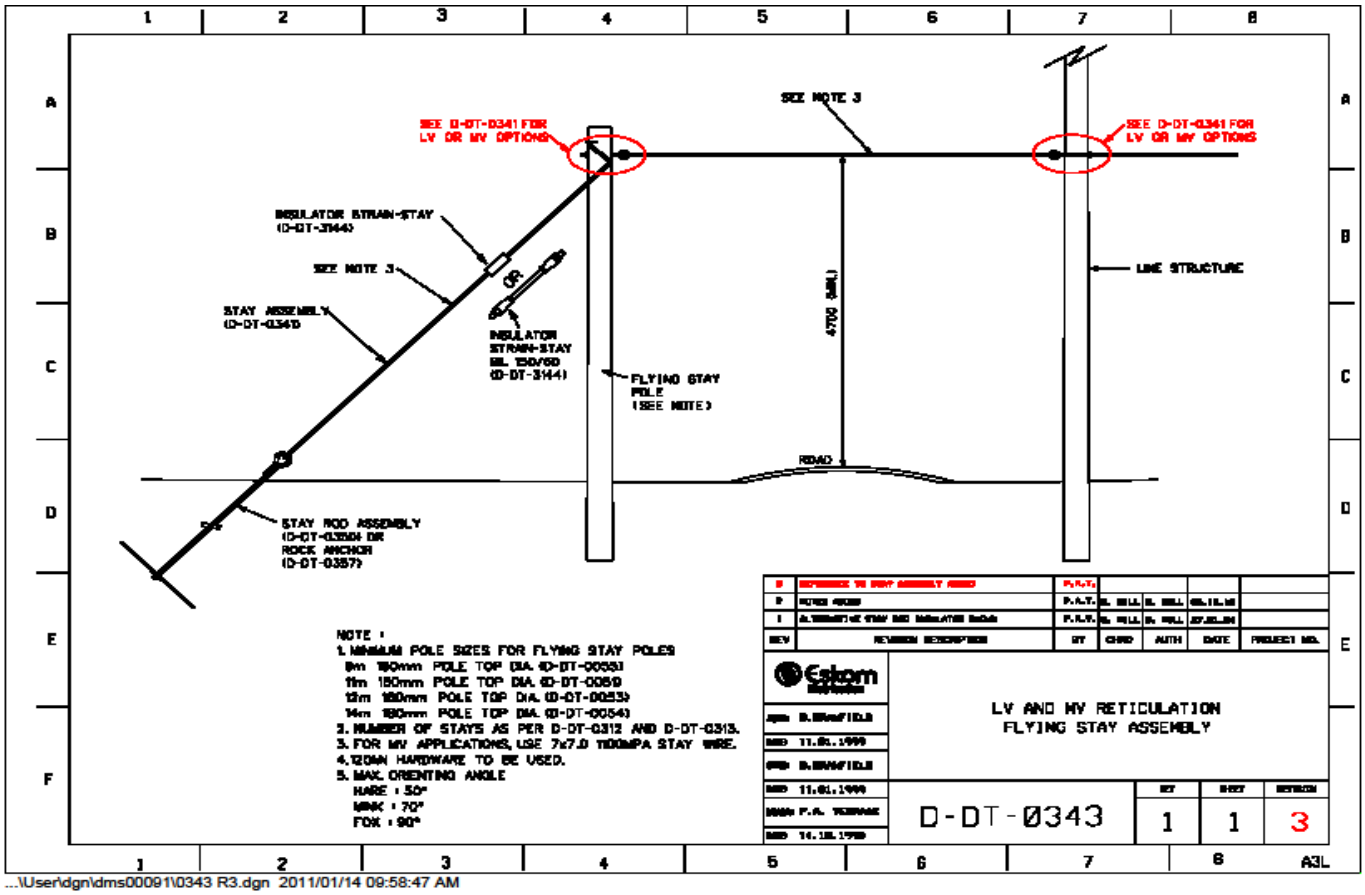
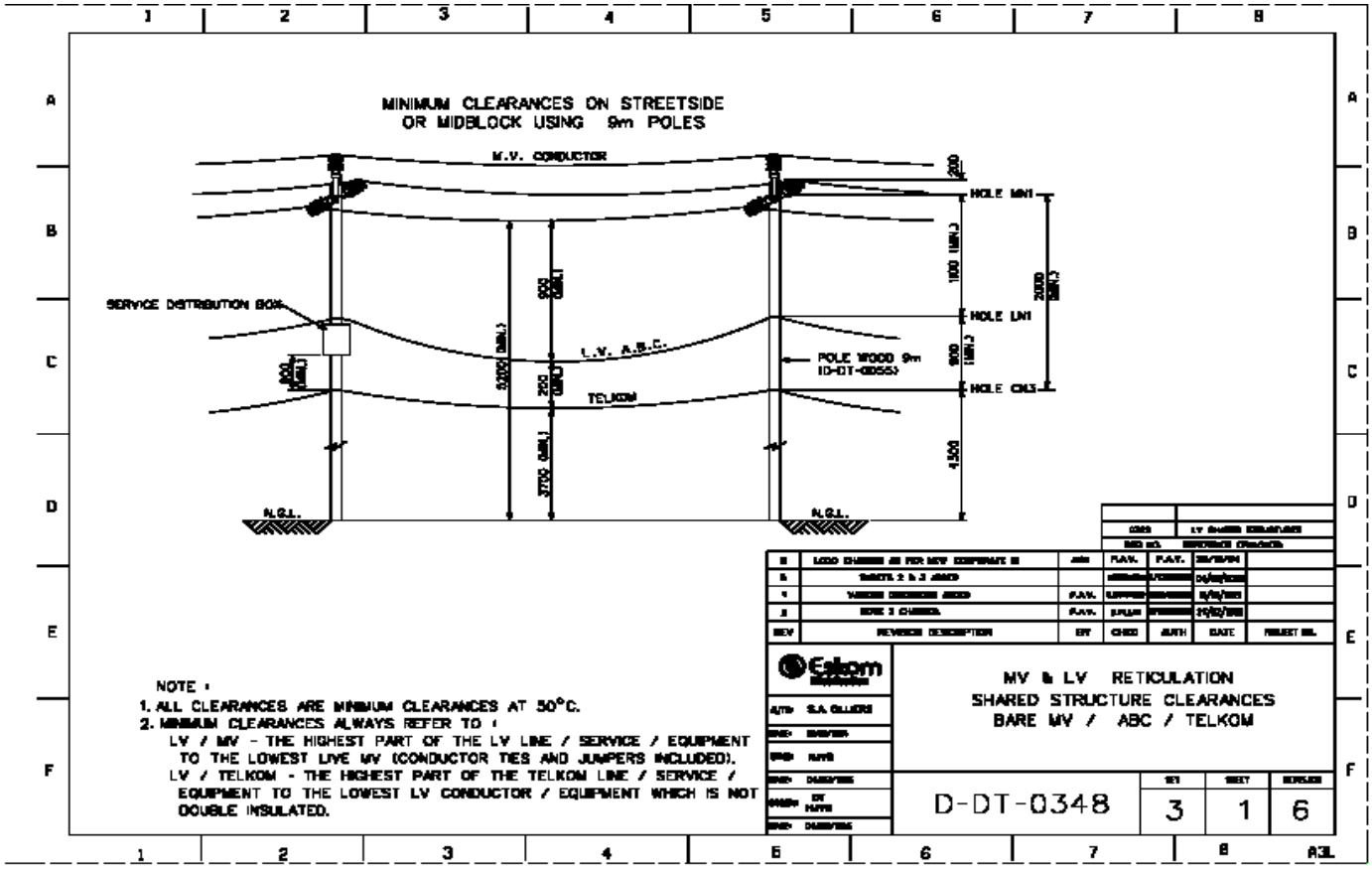


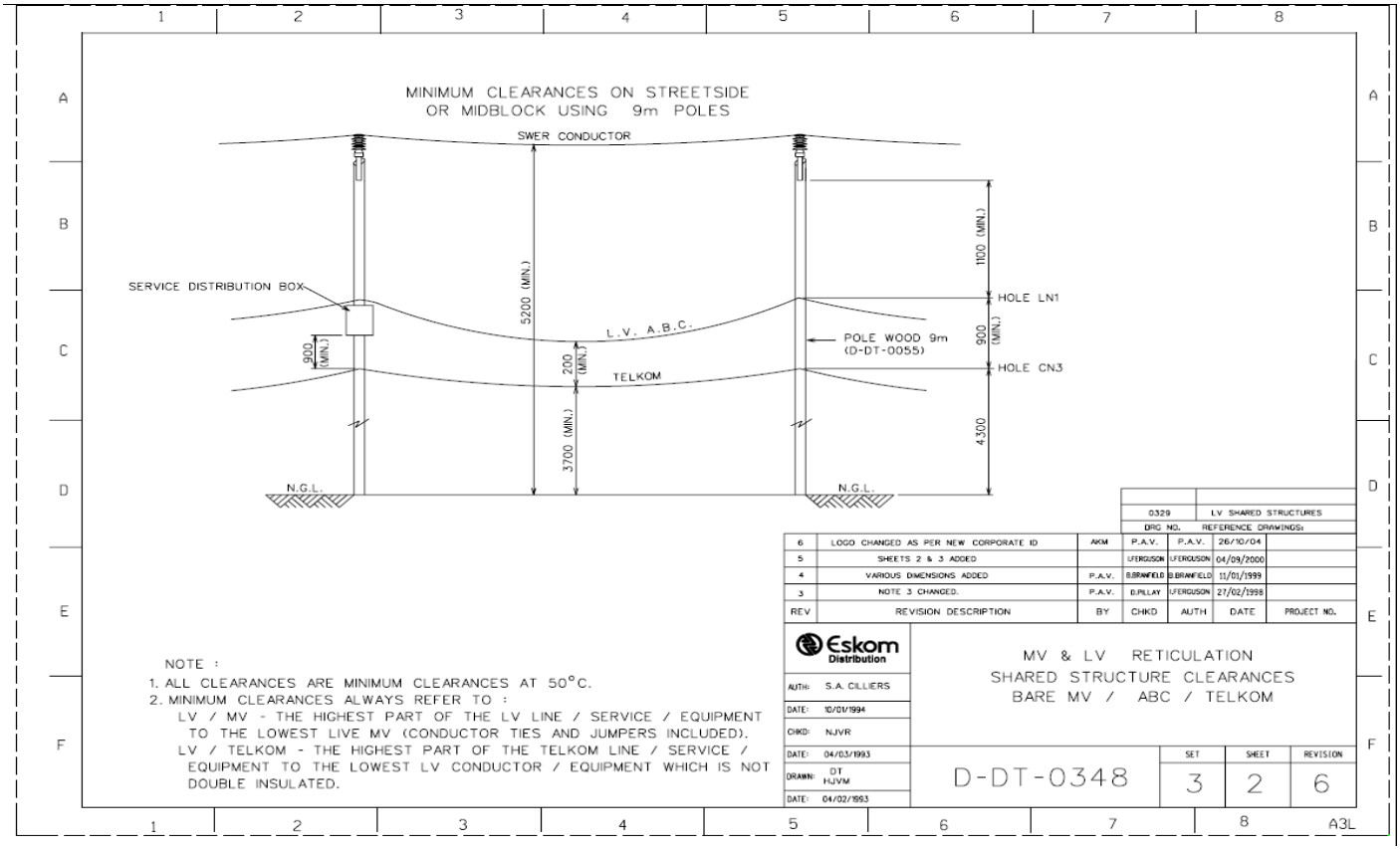

TRANSFORMER (D-DT-3021)
BARE NEUTRAL CONDUCTOR SLEEVED IN LDPE PIPE (D-DT-3127)
SURGE ARRESTER (D-DT-3100)
CLAMP STRAIN WEDGE (D-DT-3060) OR GRIP STRAIN (D-DT-3060)
NEUTRAL SURGE ARRESTER (D-DT-3088)
LV ABC (D-DT-3141)
LV FUSE HOLDER SET (2 x FUSE HOLDERS) AND BRACKET (D-DT-3182)
LV FUSE UNIT POSITION
POLE
FUSE HOLDER (D-DT-3182)
LINE TAP (D-DT-3048) OR PRE-INSULATED LUG (D-DT-3116)
SET OF TWO LV FUSE HOLDERS (ONE PER PHASE)
FEEDER 2
-230V -230V N
TRANSFORMER
a2
a1
n
+230V
-230V
N
FEEDER 1
SET OF TWO LV FUSE HOLDERS (ONE PER PHASE)
+230V
-230V
N
FEEDER 3
N -230V +230V
FEEDER 4
SCHEMATIC
NOTE :
1. EACH FUSE HOLDER SHALL HAVE A DEDICATED JUMPER TO THE TRANSFORMER. 70mm SQ. ABC SHALL BE USED FOR THE JUMPER UNLESS ONLY ONE 35mm SQ. ABC FEEDER IS CONNECTED TO THE LOAD SIDE OF THE FUSE HOLDER. IN THIS CASE A 35mm SQ. JUMPER MAY BE USED.
2. THE CONDUCTOR SHOULD ENTER THE LINE TAP FROM THE TOP TO PREVENT MOISTURE INGRESS.
3. CARE SHOULD BE TAKEN NOT TO EXCEED THE BENDING RADIUS OF THE CABLE.
4. BARE NEUTRAL CONDUCTOR TO BE SLEEVED IN LDPE PIPE.
5. EITHER ONE OR TWO SETS OF FUSEHOLDERS PER TRANSFORMER.
6 LOGO CHANGED AS PER NEW CORPORATE ID PBM P.A.V. P.A.V. 26/10/2004
5 NUMBER OF FUSEHOLDER SETS CHANGED P.A.V. T.GILLARD A. BEKKER 02.05.02
4 LDPE PIPE ADDED P.A.V. G. WHYTE P. CROWDY 20.10.00
3 LV CONNECTIONS CHANGED ON SHTS 2 - 4 P.A.V. A.ABROSE A.ABROSE 28.09.98
REV REVISION DESCRIPTION BY CHKD AUTH DATE PROJECT NO.
Eskom Distribution
AUTH: P. CROWDY
CHKD: J. SWAN
DRAWN: P.A.V.
DATE: 27.06.1995
ESKOM
LV RETICULATION
DUAL PHASE SABS 780 TRANSFORMER AND LV FUSEHOLDER CONNECTIONS
D-DT-0309
SET 4
SHEET 2
REVISION 6
A3L

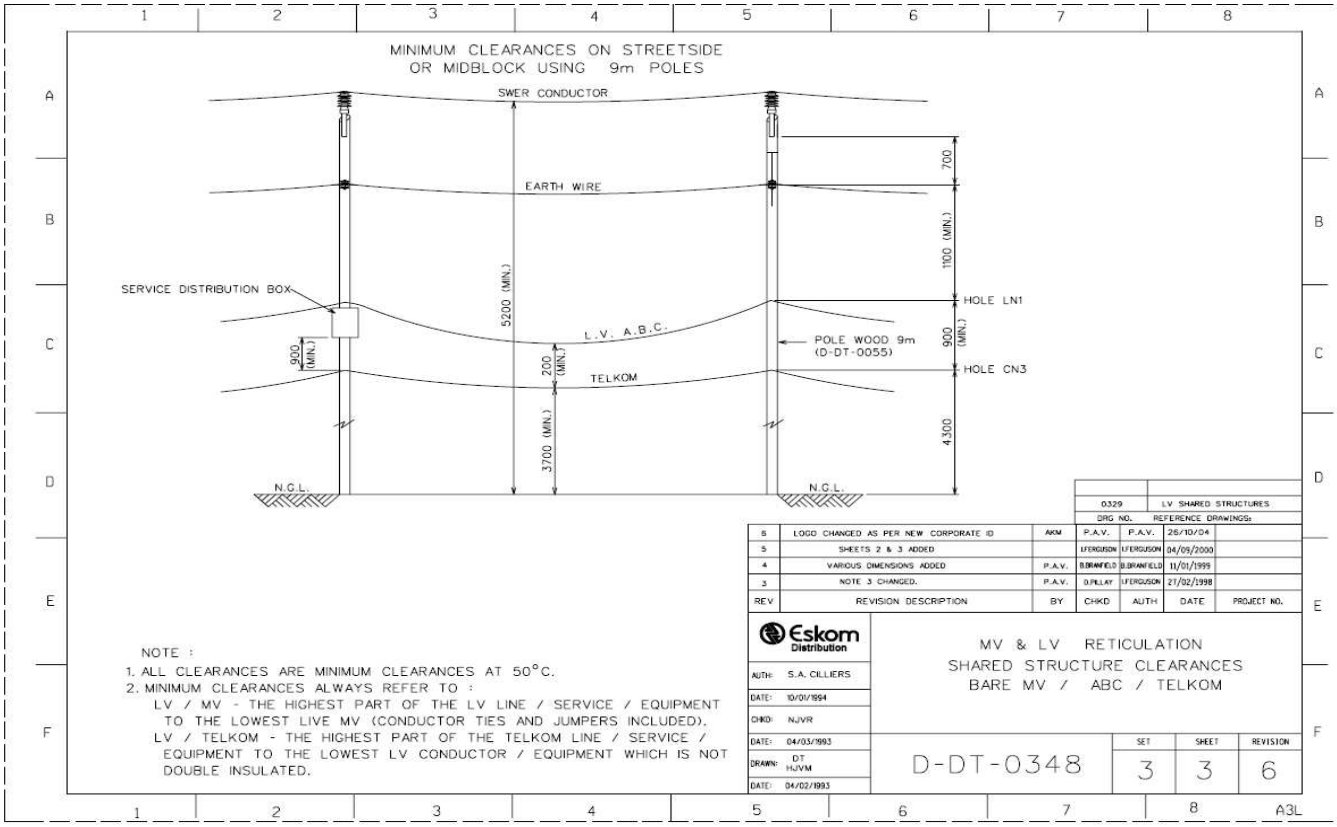

TRANSFORMER (D-DT-3021)
BARE NEUTRAL CONDUCTOR SLEEVED IN LDPE PIPE (D-DT-3127)
SURGE ARRESTER (D-DT-3100)
SEPARATE NEUTRALS TO EACH FEEDER
NEUTRAL CONNECTIONS WITH 70mm SQ. INSULATED ABC CORES
NEUTRAL SURGE ARRESTER (D-DT-3088)
R
N
R
W
B
N
PHASE CONNECTIONS BOTH BETWEEN THE TRANSFORMER AND THE FUSE HOLDERS AND BETWEEN THE FUSE HOLDERS AND CONDUCTORS WITH 70mm SQ. INSULATED ABC CORES
LV FUSE HOLDER SET (3 x FUSE HOLDERS) AND BRACKET (D-DT-3182)
LINE TAP (D-DT-3048) OR PRE-INSULATED LUG (D-DT-3116)
FEEDER 2
W B R N
SET OF THREE LV FUSE HOLDERS (ONE PER PHASE)
TRANSFORMER
a3
a2
a1
n
W
B
R
N
FEEDER 1
SET OF THREE LV FUSE HOLDERS (ONE PER PHASE)
W
B
R
N
FEEDER 3
N R B W
FEEDER 4
SCHEMATIC
NOTE :
1. EACH FUSE HOLDER SHALL HAVE A DEDICATED JUMPER TO THE TRANSFORMER. 70mm SQ. ABC SHALL BE USED FOR THE JUMPER UNLESS ONLY ONE 35mm SQ. ABC FEEDER IS CONNECTED TO THE LOAD SIDE OF THE FUSE HOLDER. IN THIS CASE A 35mm SQ. JUMPER MAY BE USED.
2. THE CONDUCTOR SHOULD ENTER THE LINE TAP FROM THE TOP TO PREVENT MOISTURE INGRESS.
3. CARE SHOULD BE TAKEN NOT TO EXCEED THE BENDING RADIUS OF THE CABLE.
4. BARE NEUTRAL CONDUCTOR TO BE SLEEVED IN LDPE PIPE.
5. EITHER ONE OR TWO SETS OF FUSEHOLDERS PER TRANSFORMER.
6 LOGO CHANGED AS PER NEW CORPORATE ID PBM P.A.V. P.A.V. 26/10/2004
5 NUMBER OF FUSEHOLDER SETS CHANGED P.A.V. T.GILLARD A. BEKKER 02.05.02
4 LDPE PIPE ADDED P.A.V. G. WHYTE P. CROWDY 20.10.00
3 LV CONNECTIONS CHANGED ON SHTS 2 - 4 P.A.V. A.ABROSE A.ABROSE 28.09.98
REV REVISION DESCRIPTION BY CHKD AUTH DATE PROJECT NO.
Eskom Distribution
AUTH: P. CROWDY
CHKD: J. SWAN
DRAWN: P.A.V.
DATE: 27.06.1995
ESKOM
LV RETICULATION
LV BARE WIRE FUSE HOLDER CONNECTIONS
D-DT-0309
SET 4
SHEET 4
REVISION 6
A3L

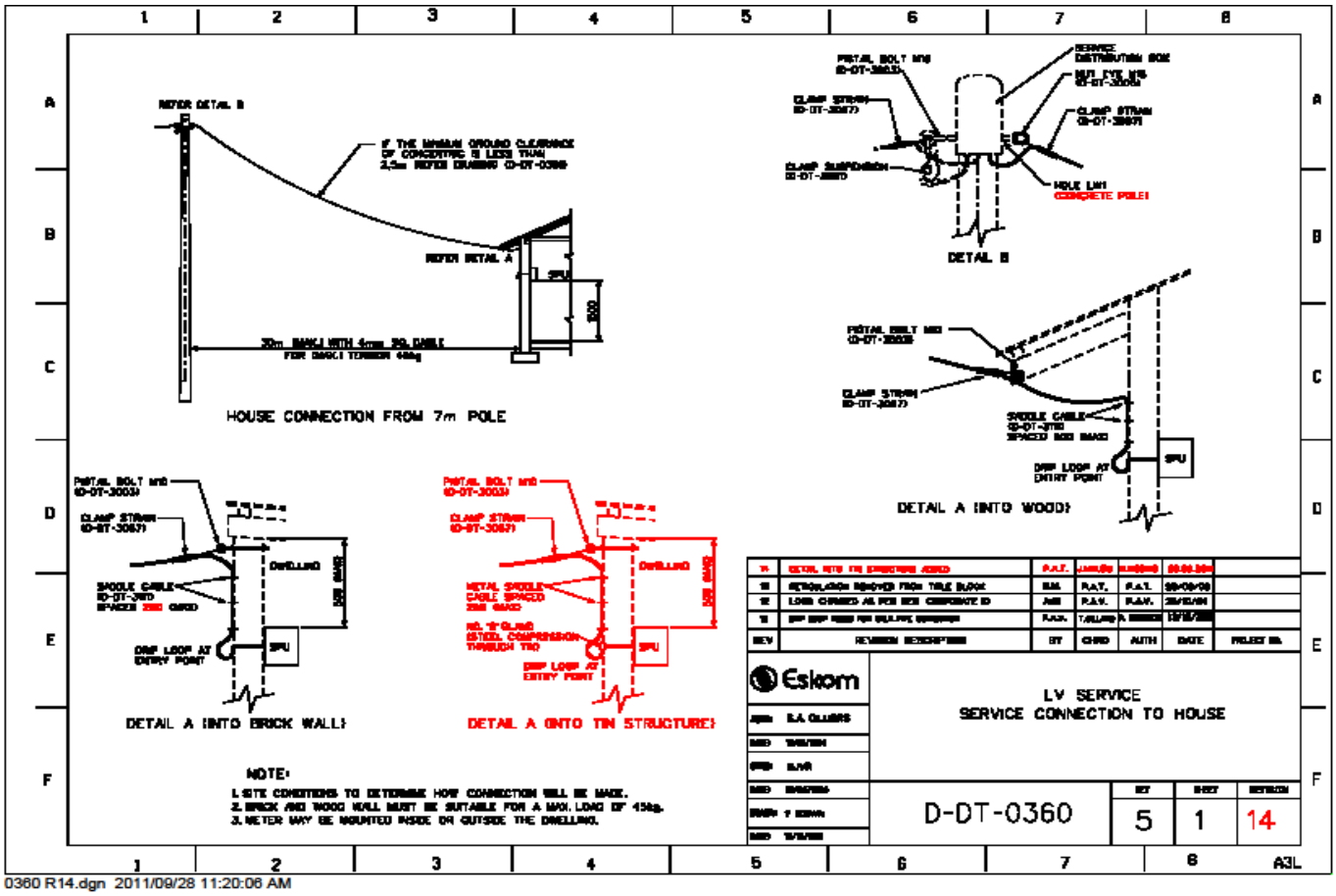

BRACKET STRUT (D-DT-3501)
STRAIN
TEN WRAPS OF BARBED WIRE STAPLED TO STRUT
ANTI-CLIMBING DEVICE (D-DT-3036)
DANGER SIGN (D-DT-32021)
STRUT POLE LENGTH MATCHES POLE LENGTH 7000 WOOD POLE (D-DT-00501 OR 9000 WOOD POLE (D-DT-0055)
7000 WOOD POLE (D-DT-00501 OR 9000 WOOD POLE (D-DT-0055)
3000 INFU
G.L.
500 APPROX
PLANTING DEPTH D-DT-0332
300
SOIL ANCHOR ASSEMBLY (D-DT-3035)
PLATE STAY MV 380mm DIA. (D-DT-3012)
DISTANCE TO NOT BE LESS THAN 1/2 OF STRUT ABOVE GROUND
NOTES:-
1. ALL WOOD CUT OR DRILLED ON SITE TO BE TREATED WITH CREOSOTE.
2. STRUTS ARE NOT A RECOMMENDED SOLUTION AND SHOULD BE INSTALLED ONLY AS LAST RESORT.
3. COMPACTION OF POLE SEE SPEC. DTC 0306
4. FOR INSULATION COORDINATION SEE D-DT-0310.
Eskom Distribution
LV & MV RETICULATION
STRUT ASSEMBLY
FLAT 45 DEG. BRACKET
7m AND 9m POLES
D-DT-0342
1
1
3
Page No. 00432


SEE NOTE 3
SEE D-DT-0341 FOR LV OR MV OPTIONS
SEE D-DT-0341 FOR LV OR MV OPTIONS
INSULATOR STRAIN-STAY (D-DT-3144)
SEE NOTE 3
STAY ASSEMBLY (D-DT-0341)
OR
INSULATOR STRAIN-STAY ML 150/60 (D-DT-3144)
FLYING STAY POLE (SEE NOTE)
4700 (MIN.)
LINE STRUCTURE
ROAD
STAY ROD ASSEMBLY (D-DT-03304 OR ROCK ANCHOR (D-DT-0357)
NOTE :
1. MINIMUM POLE SIZES FOR FLYING STAY POLES
9m 190mm POLE TOP DIA. (D-DT-00531
11m 190mm POLE TOP DIA. (D-DT-0059
12m 190mm POLE TOP DIA. (D-DT-00533
14m 190mm POLE TOP DIA. (D-DT-00541
2. NUMBER OF STAYS AS PER D-DT-0312 AND D-DT-0313.
3. FOR MV APPLICATIONS, USE 7x7.0 1100MPA STAY WIRE.
4. 120MM HARDWARE TO BE USED.
5. MAX. ORIENTING ANGLE
HARE = 30°
MINK = 70°
FOX = 90°
Eskom Distribution
LV AND MV RETICULATION
FLYING STAY ASSEMBLY
D-DT-0343
1
1
3
...\User\dgn\dms00091\0343 R3.dgn 2011/01/14 09:58:47 AM


MINIMUM CLEARANCES ON STREETSIDE
OR MIDBLOCK USING 9m POLES
M.V. CONDUCTOR
SERVICE DISTRIBUTION BOX
L.V. A.B.C.
TELKOM
POLE WOOD 9m
(D-DT-0055)
HOLE MN1
HOLE LN1
HOLE CN3
N.G.L.
N.G.L.
NOTE :
1. ALL CLEARANCES ARE MINIMUM CLEARANCES AT 50°C.
2. MINIMUM CLEARANCES ALWAYS REFER TO :
LV / MV - THE HIGHEST PART OF THE LV LINE / SERVICE / EQUIPMENT TO THE LOWEST LIVE MV (CONDUCTOR TIES AND JUMPERS INCLUDED).
LV / TELKOM - THE HIGHEST PART OF THE TELKOM LINE / SERVICE / EQUIPMENT TO THE LOWEST LV CONDUCTOR / EQUIPMENT WHICH IS NOT DOUBLE INSULATED.
Eskom
MV & LV RETICULATION
SHARED STRUCTURE CLEARANCES
BARE MV / ABC / TELKOM
D-DT-0348
SET 3
SHEET 1
REVISION 6


MINIMUM CLEARANCES ON STREETSIDE
OR MIDBLOCK USING 9m POLES
SWER CONDUCTOR
SERVICE DISTRIBUTION BOX
L.V. A.B.C.
TELKOM
POLE WOOD 9m
(D-DT-0055)
HOLE LN1
HOLE CN3
N.G.L.
N.G.L.
NOTE :
1. ALL CLEARANCES ARE MINIMUM CLEARANCES AT 50°C.
2. MINIMUM CLEARANCES ALWAYS REFER TO :
LV / MV - THE HIGHEST PART OF THE LV LINE / SERVICE / EQUIPMENT TO THE LOWEST LIVE MV (CONDUCTOR TIES AND JUMPERS INCLUDED).
LV / TELKOM - THE HIGHEST PART OF THE TELKOM LINE / SERVICE / EQUIPMENT TO THE LOWEST LV CONDUCTOR / EQUIPMENT WHICH IS NOT DOUBLE INSULATED.
Eskom Distribution
MV & LV RETICULATION
SHARED STRUCTURE CLEARANCES
BARE MV / ABC / TELKOM
D-DT-0348
SET 3
SHEET 2
REVISION 6





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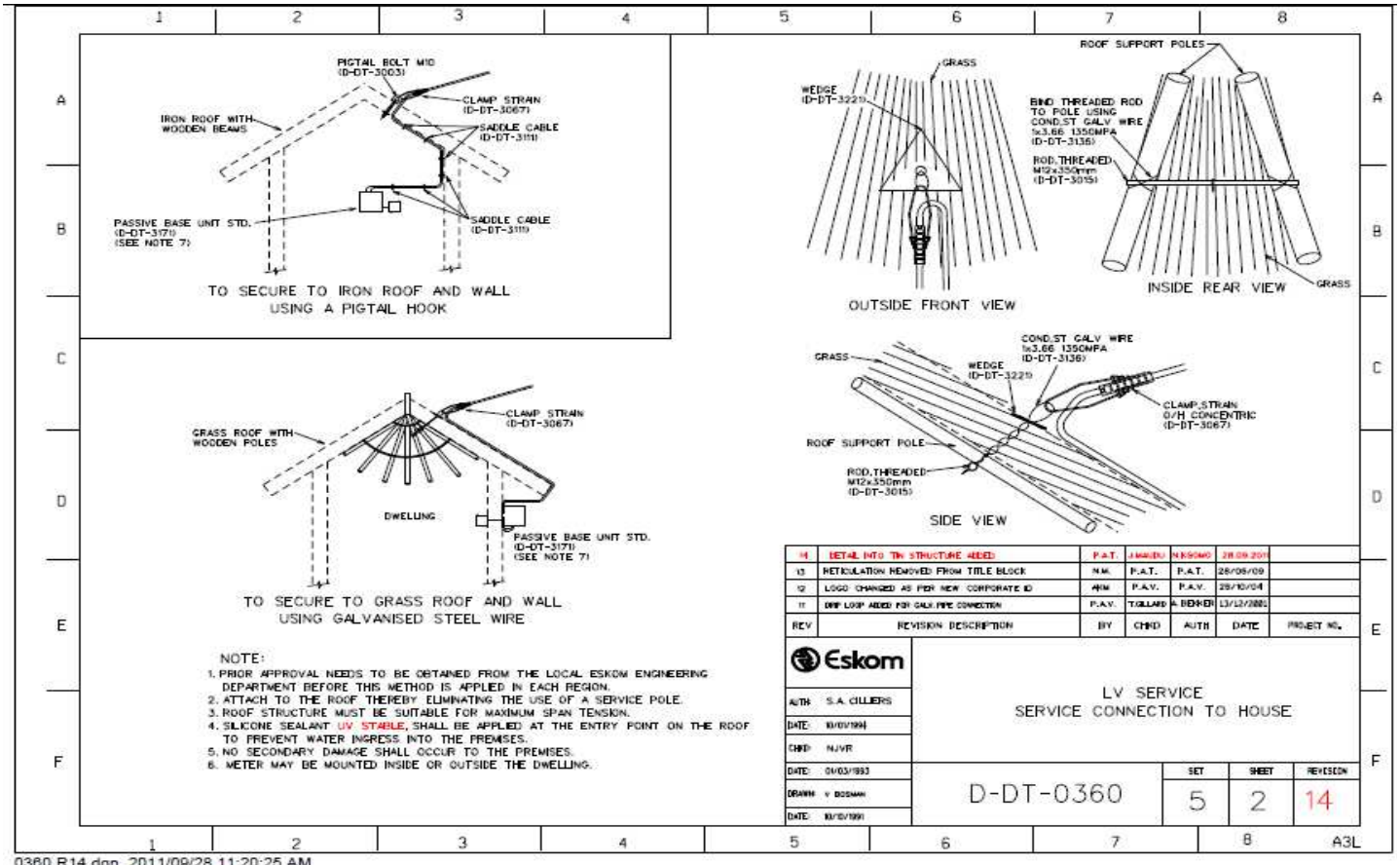

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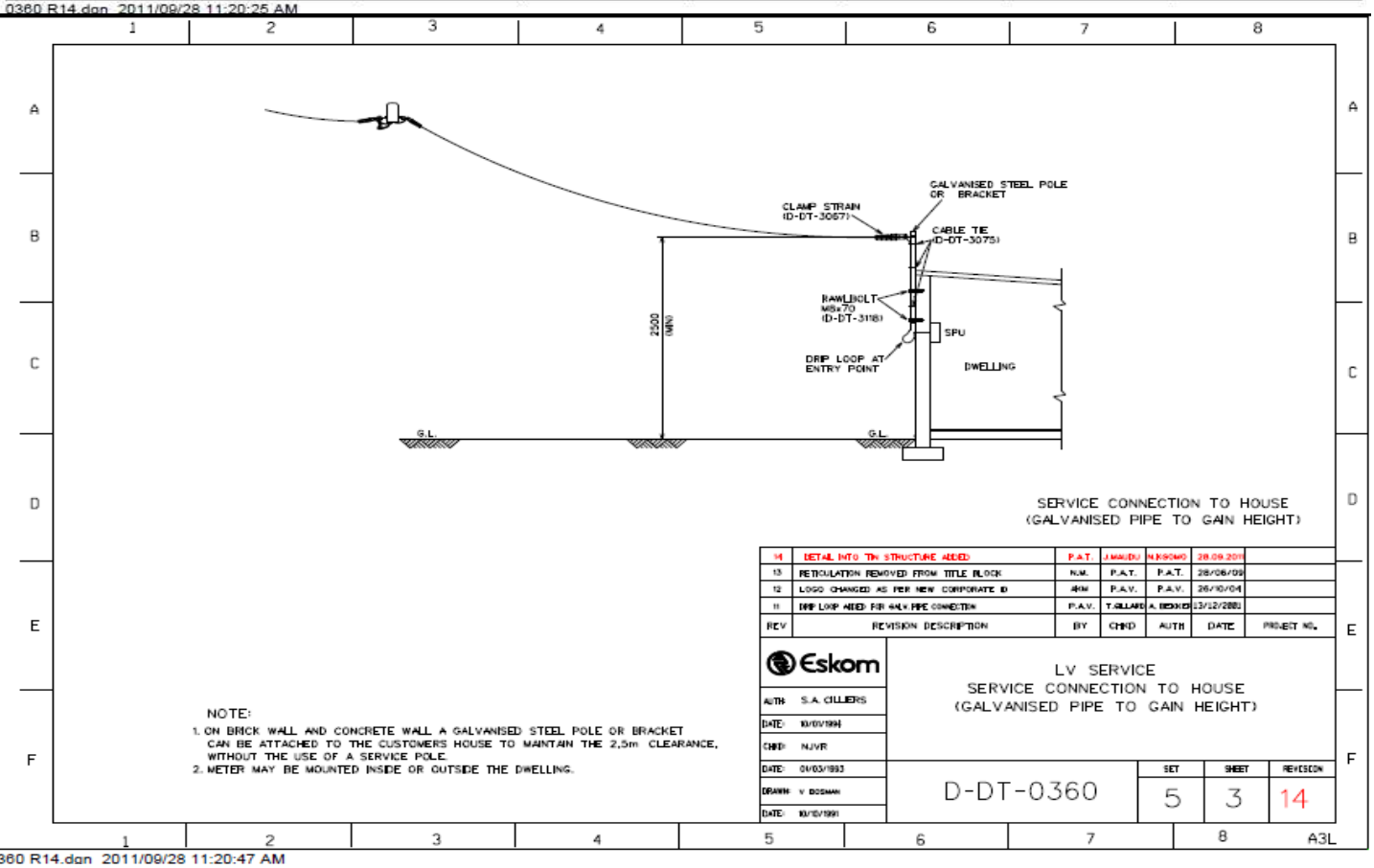

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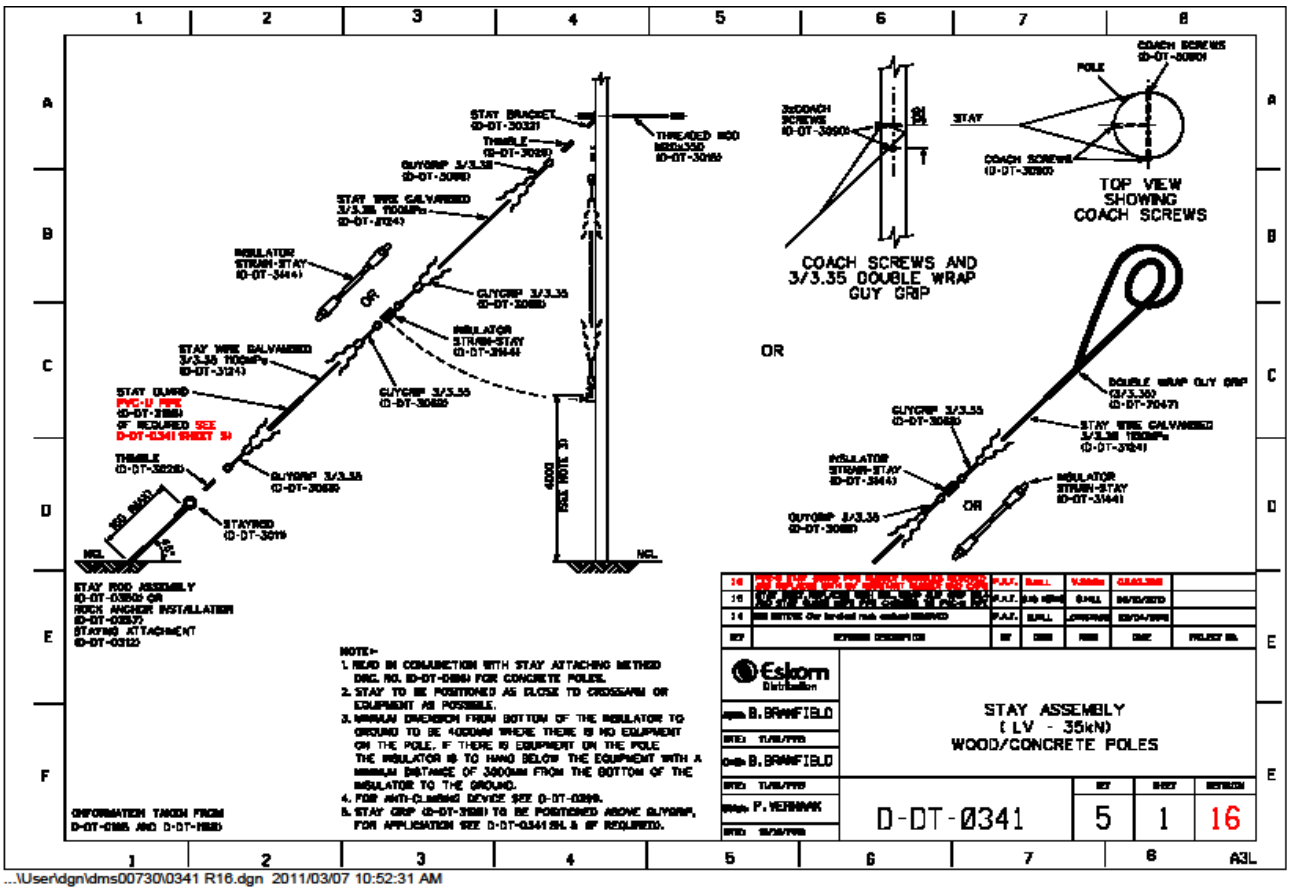
STAY ASSEMBLY
(LV - 35kN)
WOOD/CONCRETE POLES
D-DT-0341
5
1
16
B.BRANFIELD
P. VERMAAK
COACH SCREWS AND
3/3.35 DOUBLE WRAP
GUY GRIP
TOP VIEW
SHOWING
COACH SCREWS
NOTE:-
1. READ IN CONJUNCTION WITH STAY ATTACHING METHOD DRG. NO. D-DT-0000 FOR CONCRETE POLES.
2. STAY TO BE POSITIONED AS CLOSE TO CROSSARM OR EQUIPMENT AS POSSIBLE.
3. MINIMUM DIMENSION FROM BOTTOM OF THE INSULATOR TO GROUND TO BE 4000MM WHERE THERE IS NO EQUIPMENT ON THE POLE. IF THERE IS EQUIPMENT ON THE POLE THE INSULATOR IS TO HANG BELOW THE EQUIPMENT WITH A MINIMUM DISTANCE OF 3000MM FROM THE BOTTOM OF THE INSULATOR TO THE GROUND.
4. FOR ANTI-CLIMBING DEVICE SEE D-DT-0399.
5. STAY GRIP (D-DT-3195) TO BE POSITIONED ABOVE GUYGRIP, FOR APPLICATION SEE D-DT-0341 SH. 5 IF REQUIRED.
STAY ROD ASSEMBLY (D-DT-0350) OR ROCK ANCHOR INSTALLATION (D-DT-0357) STAYING ATTACHMENT (D-DT-0312)
INFORMATION TAKEN FROM D-DT-0385 AND D-DT-1265
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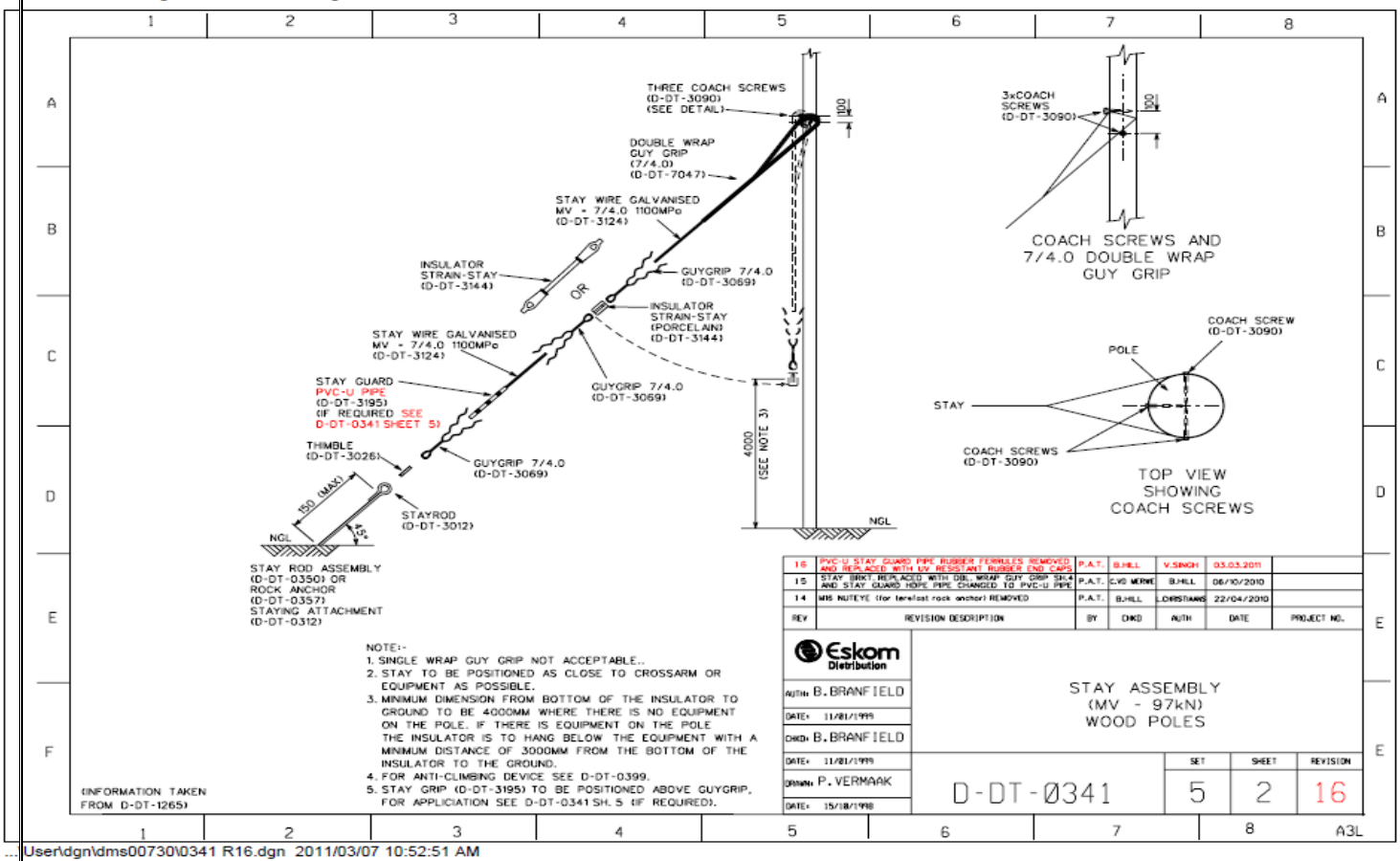
STAY ASSEMBLY
(MV - 97kN)
WOOD POLES
D-DT-0341
5
2
16
B.BRANFIELD
P. VERMAAK
COACH SCREWS AND
7/4.0 DOUBLE WRAP
GUY GRIP
TOP VIEW
SHOWING
COACH SCREWS
NOTE:-
1. SINGLE WRAP GUY GRIP NOT ACCEPTABLE..
2. STAY TO BE POSITIONED AS CLOSE TO CROSSARM OR EQUIPMENT AS POSSIBLE.
3. MINIMUM DIMENSION FROM BOTTOM OF THE INSULATOR TO GROUND TO BE 4000MM WHERE THERE IS NO EQUIPMENT ON THE POLE. IF THERE IS EQUIPMENT ON THE POLE THE INSULATOR IS TO HANG BELOW THE EQUIPMENT WITH A MINIMUM DISTANCE OF 3000MM FROM THE BOTTOM OF THE INSULATOR TO THE GROUND.
4. FOR ANTI-CLIMBING DEVICE SEE D-DT-0399.
5. STAY GRIP (D-DT-3195) TO BE POSITIONED ABOVE GUYGRIP, FOR APPLICATION SEE D-DT-0341 SH. 5 IF REQUIRED.
STAY ROD ASSEMBLY (D-DT-0350) OR ROCK ANCHOR (D-DT-0357) STAYING ATTACHMENT (D-DT-0312)
INFORMATION TAKEN FROM D-DT-1265
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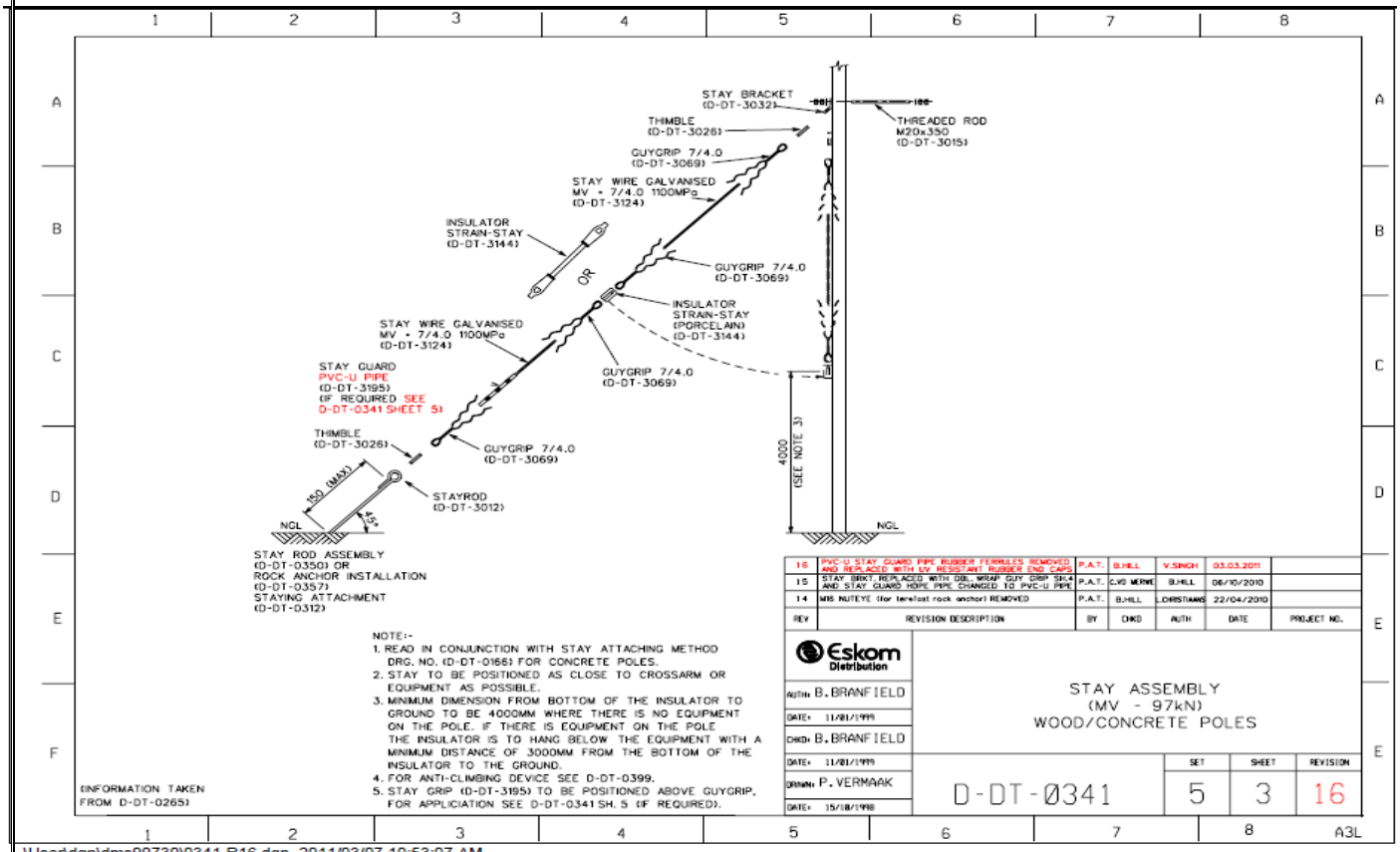
STAY BRACKET (D-DT-3032)
THIMBLE (D-DT-3026)
THREADED ROD M20x350 (D-DT-3015)
GUYGRIP 7/4.0 (D-DT-3069)
STAY WIRE GALVANISED MV - 7/4.0 1100MPa (D-DT-3124)
INSULATOR STRAIN-STAY (D-DT-3144)
OR
INSULATOR STRAIN-STAY (PORCELAIN) (D-DT-3144)
STAY GUARD PVC-U PIPE (D-DT-3195) (IF REQUIRED SEE D-DT-0341 SHEET 5)
4000 (SEE NOTE 3)
150 (MAX)
45°
NGL
STAYROD (D-DT-3012)
STAY ROD ASSEMBLY (D-DT-0350) OR ROCK ANCHOR INSTALLATION (D-DT-0357) STAYING ATTACHMENT (D-DT-0312)
(INFORMATION TAKEN FROM D-DT-0265)
NOTE:-
1. READ IN CONJUNCTION WITH STAY ATTACHING METHOD DRG. NO. (D-DT-0166) FOR CONCRETE POLES.
2. STAY TO BE POSITIONED AS CLOSE TO CROSSARM OR EQUIPMENT AS POSSIBLE.
3. MINIMUM DIMENSION FROM BOTTOM OF THE INSULATOR TO GROUND TO BE 4000MM WHERE THERE IS NO EQUIPMENT ON THE POLE. IF THERE IS EQUIPMENT ON THE POLE THE INSULATOR IS TO HANG BELOW THE EQUIPMENT WITH A MINIMUM DISTANCE OF 3000MM FROM THE BOTTOM OF THE INSULATOR TO THE GROUND.
4. FOR ANTI-CLIMBING DEVICE SEE D-DT-0399.
5. STAY GRIP (D-DT-3195) TO BE POSITIONED ABOVE GUYGRIP, FOR APPLICATION SEE D-DT-0341 SH. 5 (IF REQUIRED).
16 PVC-U STAY GUARD PIPE RUBBER FERRULES REMOVED AND REPLACED WITH UV RESISTANT RUBBER END CAPS P.A.T. B.HILL V.SINGH 03.03.2011
15 STAY BRKT. REPLACED WITH DBL. WRAP GUY GRIP SH.4 AND STAY GUARD HDPE PIPE CHANGED TO PVC-U PIPE P.A.T. C.VD MERWE B.HILL 06/10/2010
14 M16 NUTEYE (for terelast rock anchor) REMOVED P.A.T. B.HILL L.CHRISTIANS 22/04/2010
REV REVISION DESCRIPTION BY CHKD AUTH DATE PROJECT NO.
Eskom Distribution
AUTH: B.BRANFIELD 11/01/1999
CHKD: B.BRANFIELD 11/01/1999
DRAWN: P.VERMAAK 15/10/1998
STAY ASSEMBLY (MV - 97kN) WOOD/CONCRETE POLES
D-DT-0341
SET 5
SHEET 3
REVISION 16
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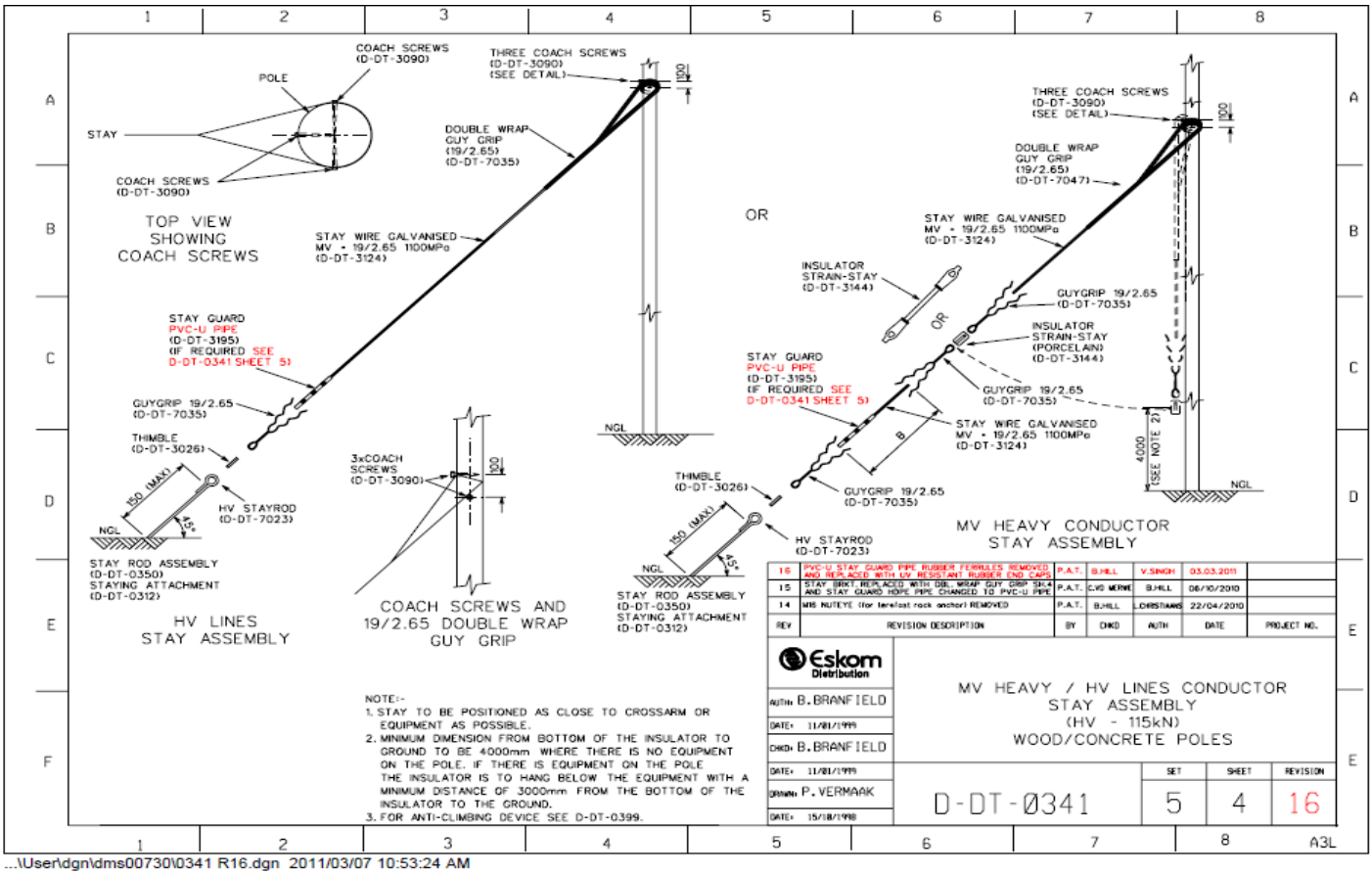
COACH SCREWS (D-DT-3090)
THREE COACH SCREWS (D-DT-3090) (SEE DETAIL)
POLE
STAY
COACH SCREWS (D-DT-3090)
TOP VIEW SHOWING COACH SCREWS
DOUBLE WRAP GUY GRIP (19/2.65) (D-DT-7035)
STAY WIRE GALVANISED MV - 19/2.65 1100MPa (D-DT-3124)
STAY GUARD PVC-U PIPE (D-DT-3195) (IF REQUIRED SEE D-DT-0341 SHEET 5)
GUYGRIP 19/2.65 (D-DT-7035)
THIMBLE (D-DT-3026)
150 (MAX)
HV STAYROD (D-DT-7023)
45°
NGL
STAY ROD ASSEMBLY (D-DT-0350) STAYING ATTACHMENT (D-DT-0312)
HV LINES STAY ASSEMBLY
3xCOACH SCREWS (D-DT-3090)
100
COACH SCREWS AND 19/2.65 DOUBLE WRAP GUY GRIP
OR
THREE COACH SCREWS (D-DT-3090) (SEE DETAIL)
DOUBLE WRAP GUY GRIP (19/2.65) (D-DT-7047)
STAY WIRE GALVANISED MV - 19/2.65 1100MPa (D-DT-3124)
INSULATOR STRAIN-STAY (D-DT-3144)
GUYGRIP 19/2.65 (D-DT-7035)
INSULATOR STRAIN-STAY (PORCELAIN) (D-DT-3144)
STAY GUARD PVC-U PIPE (D-DT-3195) (IF REQUIRED SEE D-DT-0341 SHEET 5)
4000 (SEE NOTE 2)
B
MV HEAVY CONDUCTOR STAY ASSEMBLY
NOTE:-
1. STAY TO BE POSITIONED AS CLOSE TO CROSSARM OR EQUIPMENT AS POSSIBLE.
2. MINIMUM DIMENSION FROM BOTTOM OF THE INSULATOR TO GROUND TO BE 4000mm WHERE THERE IS NO EQUIPMENT ON THE POLE. IF THERE IS EQUIPMENT ON THE POLE THE INSULATOR IS TO HANG BELOW THE EQUIPMENT WITH A MINIMUM DISTANCE OF 3000mm FROM THE BOTTOM OF THE INSULATOR TO THE GROUND.
3. FOR ANTI-CLIMBING DEVICE SEE D-DT-0399.
16 PVC-U STAY GUARD PIPE RUBBER FERRULES REMOVED AND REPLACED WITH UV RESISTANT RUBBER END CAPS P.A.T. B.HILL V.SINGH 03.03.2011
15 STAY BRKT. REPLACED WITH DBL. WRAP GUY GRIP SH.4 AND STAY GUARD HDPE PIPE CHANGED TO PVC-U PIPE P.A.T. C.VD MERWE B.HILL 06/10/2010
14 M16 NUTEYE (for terelast rock anchor) REMOVED P.A.T. B.HILL L.CHRISTIANS 22/04/2010
REV REVISION DESCRIPTION BY CHKD AUTH DATE PROJECT NO.
Eskom Distribution
AUTH: B.BRANFIELD 11/01/1999
CHKD: B.BRANFIELD 11/01/1999
DRAWN: P.VERMAAK 15/10/1998
MV HEAVY / HV LINES CONDUCTOR STAY ASSEMBLY (HV - 115kN) WOOD/CONCRETE POLES
D-DT-0341
SET 5
SHEET 4
REVISION 16
A3L
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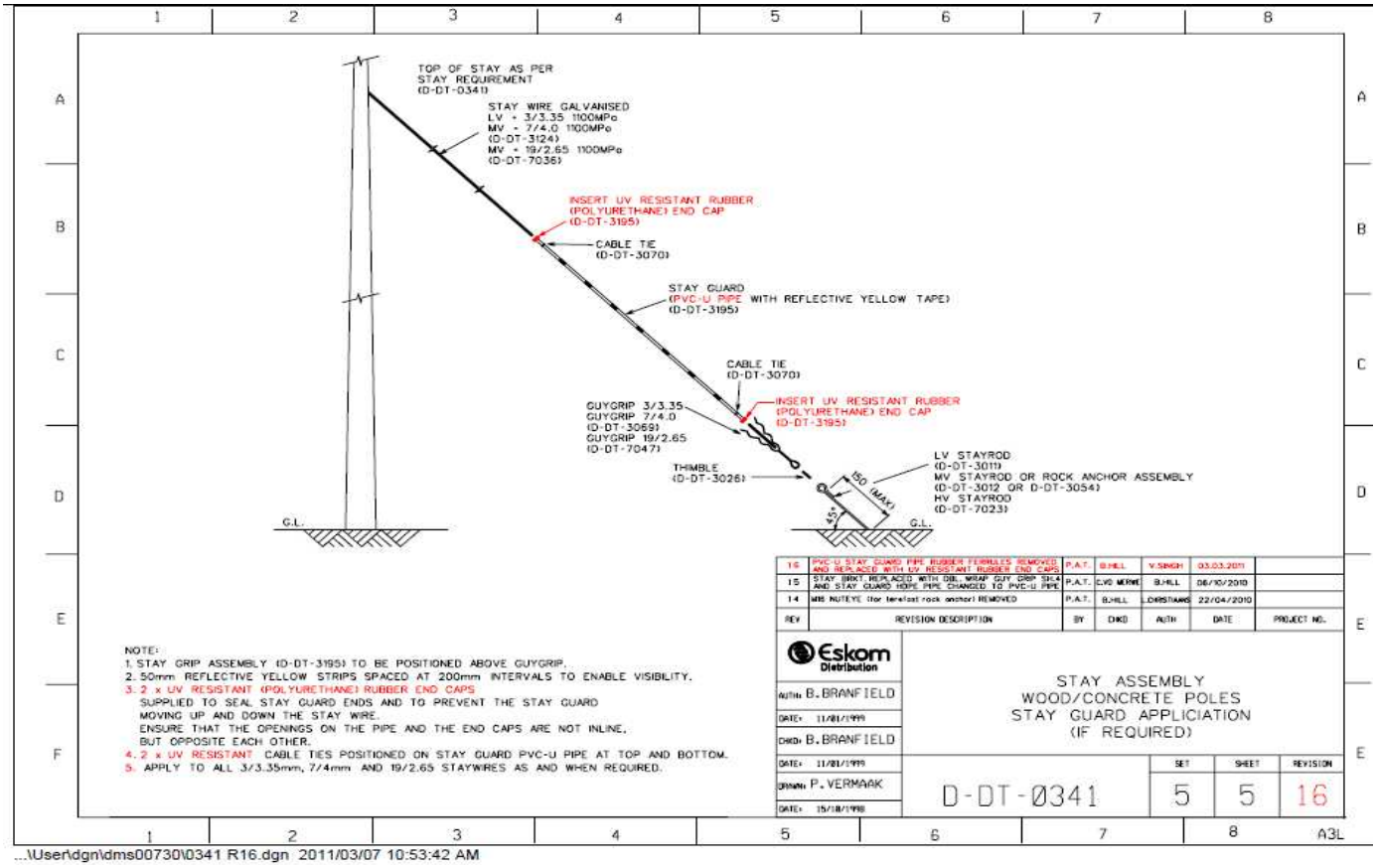
TOP OF STAY AS PER STAY REQUIREMENT (D-DT-0341)
STAY WIRE GALVANISED
LV - 3/3.35 1100MPa (D-DT-3124)
MV - 7/4.0 1100MPa (D-DT-3124)
MV - 19/2.65 1100MPa (D-DT-7036)
INSERT UV RESISTANT RUBBER (POLYURETHANE) END CAP (D-DT-3195)
CABLE TIE (D-DT-3070)
STAY GUARD (PVC-U PIPE WITH REFLECTIVE YELLOW TAPE) (D-DT-3195)
CABLE TIE (D-DT-3070)
INSERT UV RESISTANT RUBBER (POLYURETHANE) END CAP (D-DT-3195)
GUYGRIP 3/3.35
GUYGRIP 7/4.0 (D-DT-3069)
GUYGRIP 19/2.65 (D-DT-7047)
THIMBLE (D-DT-3026)
LV STAYROD (D-DT-3011)
MV STAYROD OR ROCK ANCHOR ASSEMBLY (D-DT-3012 OR D-DT-3054)
HV STAYROD (D-DT-7023)
450 (MAX)
45°
G.L.
G.L.
NOTE:
1. STAY GRIP ASSEMBLY (D-DT-3195) TO BE POSITIONED ABOVE GUYGRIP.
2. 50mm REFLECTIVE YELLOW STRIPS SPACED AT 200mm INTERVALS TO ENABLE VISIBILITY.
3. 2 x UV RESISTANT (POLYURETHANE) RUBBER END CAPS SUPPLIED TO SEAL STAY GUARD ENDS AND TO PREVENT THE STAY GUARD MOVING UP AND DOWN THE STAY WIRE. ENSURE THAT THE OPENINGS ON THE PIPE AND THE END CAPS ARE NOT INLINE, BUT OPPOSITE EACH OTHER.
4. 2 x UV RESISTANT CABLE TIES POSITIONED ON STAY GUARD PVC-U PIPE AT TOP AND BOTTOM.
5. APPLY TO ALL 3/3.35mm, 7/4mm AND 19/2.65 STAYWIRES AS AND WHEN REQUIRED.
16 PVC-U STAY GUARD PIPE RUBBER FERRULES REMOVED AND REPLACED WITH UV RESISTANT RUBBER END CAPS P.A.T. B.HILL V.SINGH 03.03.2011
15 STAY WIRE REPLACED WITH DBL WRAP GUY GRIP 3/4.4 AND STAY GUARD HDPE PIPE CHANGED TO PVC-U PIPE P.A.T. C.VD MERWE B.HILL 08/10/2010
14 M16 NUTEYE (for levelled rock anchor) REMOVED P.A.T. B.HILL L.CHRISTIANS 22/04/2010
REV REVISION DESCRIPTION BY CHKD AUTH DATE PROJECT NO.
Eskom Distribution
AUTH: B.BRANFIELD
DATE: 11/01/1999
CHKD: B.BRANFIELD
DATE: 11/01/1999
DRWN: P.VERMAAK
DATE: 15/10/1998
STAY ASSEMBLY
WOOD/CONCRETE POLES
STAY GUARD APPLICIATION
(IF REQUIRED)
D-DT-0341
SET 5
SHEET 5
REVISION 16
A3L
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3. ADDITIONAL INFORMATION

The Contractor is further referred to the regulatory standards below. This list includes publicly available standard specifications which may not be attached, but which are part of the *project.*

DOCUMENT	REV./ISSUE	TITLE AND PUBLISHER	ATTACH Y/N
Act no. 85	1993	Occupational health and safety act.	N
ESKPVAAL7	2	Environmental impact assessment procedure for Eskom	N
ESKPBAAD6		Environmental management policy	N
OPR 6204		Eskom Operating Regulations	N
EVS 005	1	Quality requirements for quality related items and equipment	N
EVS 010		Quality requirements for quality related services	N
SCSASABZ4	0	Standard for Labelling of MV and LV line Equipment	N
SCSASAAL9	2	MV and LV Reticulation Earthing	N
SCSPVABF3	1	Occupational Health and Safety Requirements to be met by Contractors and Sub-Contractors Employed by Eskom.	N
04TI-020	1	COMMISSIONING TESTS FOR NEWLY INSTALLED MV, IV AND LV CABLES	N
01TI-04	0	MANDATORY COMMISSIONING TESTS FOR NEW INSTALLATIONS.	N
DDT0639	1	LV SERVICES – SMALL AND LARGE POWER USER OUTDOOR SUPPLY EARTHING ARRANGEMENT	N

Annexure N

Project programme

Gantt chart showing:

a) Detail design submission;
b) TEF Approval;
c) RIC Approval;
d) final design submission;
e) ERA Approval;
f) tender enquiry & evaluation;
g) contract award;
h) Kick-off meeting;
i) construction;
j) Site Inspection;
k) Energising and hand-over.

(Information in red/italic is to be provided internal in Eskom)

PROJECT NAME: Roosboom Village Electrification			
Activity	**Target Dates**		
Description	**Realistic**	**Optimistic**	**Actual**
Mapping Received			
TEC Presentation (CRA Approval)			
Design Approval (TEF Presentation – if required)			
RIC Presentation (DRA Approval)			
ERA Approval			
Contractor Appointment			
Construction Start (Site Handing-Over)			
Construction Completion			

Commissioning			
Project Close-Out			

Annexure O

Design standards and specification

1 Relevant Eskom Distribution Standards

The following Eskom standards and bulletins apply to this document.

Part 0: Definitions, Abbreviations and Exemptions			
Doc.Ref. No.	**Rev.No.**	**Description**	**Rev. Date**
SCSASAAM0		**Standard: Structures, definitions, abbreviations and exemptions**	**April 1998**

Part 1: Planning			
Doc.Ref. No.	**Rev. No.**	**Description**	**Rev. Date**
SCSAMAAF0	**0**	**Planning and design. Section 1: Planning and design processes and standards overview**	**January 2003**
SCSASABJ5	**0**	**Planning and design. Section 2: Electrification planning - rural**	**January 2003**
SCSASABJ6	**0**	**Planning and design. Section 12: Electrification design - rural**	**January 2003**
SCSASAB06	**0**	**Planning guidelines Section 20: Book - Quality of supply standards the Electricity Act**	**January 2003**
SCSASAB07	**0**	**Planning guidelines Section 21: Book - Electrification technology options**	**February 2003**
SCSASABO9	**0**	**Planning guidelines Section 23: Book - electrification load forecasting**	**February 2003**
SCSASABP1	**0**	**Planning guidelines Section 25: Book - electrification technology section**	**February 2003**
SCSASABP3	**0**	**Planning guidelines Section 27: Book - Voltage drop apportionment**	**February 2003**
SCSASABP4	**0**	**Planning guidelines Section 28: Book - LV Feeder Voltage drop calculation methods.**	**February 2003**
SCSASABP6	**0**	**Planning guidelines Section 30: Book - Voltage unbalance**	**February 2003**
SCSASABP7	**0**	**Planning guidelines Section 31: Book - LV Load balancing.**	**February 2003**
SCSASABP9	**0**	**Planning guidelines Section 33: Electrification Indicators**	**February 2003**
SCSASABQ2	**0**	**Planning guidelines Section 40: Tool - Domestic load forecasting tools**	**February 2003**
SCSASABO4	**0**	**Planning guidelines Section 42: Tool - Electrification technology selection**	**February 2003**
SCSASABQ6	**0**	**Planning guidelines Section 44: Tool - Reticmaster**	**February 2003**
SCSASABQ7	**0**	**Planning guidelines Section 45: Analysis tool - CART**	**February 2003**

SCSASABQ8	0	Planning guidelines Section 46: Tool electrification network modelling.	February 2004
SCSASABR0	0	Planning guidelines Section 48: Sag and tension calculations	February 2003
SCSASABR1	0	Planning guidelines Section 49: Tool - Financial evaluation calculations	February 2003
SCSAGAAI3	0	Project indicators to be used in electrification projects.	June 2000
SCSAGAAS3	0	Eskom (Distribution) insulator manual Part1 - Overview, selection and procurement of high-voltage, outdoor insulators.	January 2003
DT04/98	0	Effect of MV voltage on cost per connection	R Stephen
99TB-020	2	Rural electrification design philosophies and parameters *Replaces DT38/98 Electrification design & planning parameters*	I Ferguson

Part 2: Earthing

Doc. Ref. No.	Rev. No.	Description	Rev. Date
SCSASAAL9	2	Standard: MV & LV reticulation earthing	April 1998
DT005/96	0	Earthing at transformers supplying LV customers	A Abrosie
DT018/97	2	Auto-recloser earthing	R Theron
DT02/98	0	Earthing - Crow's foot	A Abrosie

Part 3 Low Voltage

Doc. Ref. No.	Rev. No.	Description	Rev. Date
SCSASAAM2	4	Standard: LV overhead reticulation Drawings Three phase design spans (excel spreadsheet)	May 2001
DT005/97	0	LV protection and the OHS Act	GA Whyte
DT03/98	0	Insulation piercing connector (IPC) clamps	A Abrosie
DT10/98	0	Platipus percussion stay/rick anchor approval	BP Hill
99TI-04	0	No rock anchor in soft rock DDT0357R2	BP Hill
99TI-010	0	MV/ LV staying	BP Hill
99TB-023	0	ABC connectors	G Stanford
00TB-036	0	Review of current practices on low voltage ABC Networks.	GA Whyte
SCSSCAAD5	4	Specification: Aerial bundled conductor with uninsulated (bare) neutral	March 2000
SCSSCAAL	2	Specification: Fittings for bare neutral ABC	May

4			2000
SCSSCAAS7	1	Specification: Parallel groove (PG) clamps (Al/Al) for low and medium voltage overhead powerlines.	February 2003
SCSSCAA01	1	Specification for conventional stay planting, percussion stay and rock anchor installations and compaction testing	June 2002
SCSAGAAF5	1	LV protection philosophy	April 1999
SCSAGAAH8	0	Standard: LV protection philosophy for low consumption areas	August 2000

Part 4 Medium Voltage

Doc. Ref. No.	Rev. No.	Description	Rev. Date
SCSASABE7	1	General information and requirements for overhead lines up to 33kV with conductors up to Hare/Oak.	Sept 2001
SCSASAAP2	0	22kV overhead reticulation up to Hare/Oak conductor (particular requirements)	Sept 2002
SCSASABE5	0	Distribution Standard Part 4: medium voltage reticulation Section 4: 33kV overhead reticulation forconductors up to Hare/Oak (particular requirements).	Sept 2002
SCSASABB6	1	MV reticulation/ 19kV Single Wire Earth Return (SWER) overhead reticulation	Aug 2003
SCSAGAAQ0	0	Distribution Standard Part 4: Medium Voltage Reticulation Section 8: Rural Reticulation Protection: Network Philisophy.	Oct 2003
SCSAGAAP9	0	Distribution Standard Part 4: Medium Voltage Reticulation Section 8: Rural Reticulation Protection: Settings Philisophy.	Oct 2003

Part 8 Services - Standards

Doc. Ref. No.	Rev.No.	Description	Compiler
SCSASAAS3	2	**LV Services - Electrifications.** Drawings	**A Abrosie**
SCSASABA6	2	**Outdoor LV services for small power and large power users.** Drawings	**T Gillard**

Technical Bulletins Part 8 Services

Doc. Ref. No.	Rev. No.	Description
DT06/97	0	**Concentric cable**
DT13/97	0	**Energy control units and earth leakage protection**
DT12/97	0	**Polarity tests for newly electrified house**
DT16/97	0	**50A poletop box MCB**
DT19/97	0	**Electrification - single phase supply options**
DT20/97	0	**50A poletop breaker - electrification**

DT21/97	0	**Installation certificate for energy control unit**
DT09/98	0	**2-way poletop box**
DT07/98	0	**Service connections - concentric cable**
DT17/98	0	**Ordering and implementation of 2.5A prepayment meters**
DT03/99	0	**Interface with TELKOM for joint use**
99TI-03	0	**Luminaires with ECU & ED supplies**
99TI-06	0	**60A connections from poletop boxes**
99TI-02R1	0	**ECU installations and change-outs**
01TI-02	0	**Minimum fault levels at the end of LV service connections in electrification areas.**
01TI-03	0	**Standard passive units.**
01TI-04	0	MANDATORY COMMISSIONING TESTS FOR NEW INSTALLATIONS**.um fault levels at the end of LV service connections in electrification areas.**

2 *NRS / SABS / IEC / British*

Any relevant bulletins, specifications of material and standards required for successful completion of the project are also applicable:

- SABS 0142:1993, *The wiring of premises.*
- SABS 780:1979, *Distribution transformers.*
- SABS 1524-1:1994, *Electricity dispensing systems — Part 1: Single-phase electricity dispenser*s.
- SABS 1619:1995, *Small power distribution units (ready boards) for single-phase 230 V service connections.*
- NRS 016:1995, *Electricity distribution — Code of practice for the earthing of low-voltage distribution systems.*
- NRS 032:1993, *Electricity distribution — Service distribution boxes — Pole-mounted types for overhead single-phase a.c. service connections at 230 V.*
- NRS 041:1995, *Electricity transmission and distribution — Code of practice for overhead power lines for conditions prevailing in South Africa.*
- NRS 043:1997, *Code of practice for the joint use of a pole route for power and telecommunication lines.*
- NRS 018-4:1996, *Fittings and connectors for LV overhead powerlines using aerial bundled conductors — Part 4: Strain and suspension fittings for aerial services cables.*
- NRS 038-1:1997, *Electricity Distribution? Concrete poles? Part 1: Concrete poles for LV and MV overhead distribution systems.*

3 *OHS ACT*

All legal requirements as stated in the OHS-act must be adhered to apart from the exemptions as in part 0 of the Distribution Standard.

4 *Code of Practice (Eskom / Telkom)*

The code of practice or the agreement with Telkom states that Telkom has to grant Eskom permission to erect plant in the midblock position. The Act also states that all proposed lines

must be submitted to the Postmaster general for approval prior to erection. This is mainly to avoid dangerous conditions arising as well as to ensure mutual co-operation on designs.

Annexure P

CLEARANCE REQUIREMENTS

1 CLEARANCE BETWEEN MV AND LV CONDUCTORS

The line profile for the 11kV line will satisfy the clearances given in the Occupational Health and Safety Act, Act No. 85 of 1983 (OHSA) detailed in the following table. Refer to the Construction Handbook for the minimum vertical clearances of power lines at maximum sag and swing.

Section 15 of the Electrical Machinery Regulations of the OHS Act specifies the minimum clearances between bare conductors and other conductors and objects. This is the minimum distance that must be maintained in all conditions up to a conductor temperature of 50 degrees centigrade and wind pressure of 500Pa. It is assumed that the lower conductor is at ambient temperature during design to establish this clearance.

Table 1. Minimum clearances for bare OH MV lines

Maximum phase-to-phase voltage (kVrms)	Clearance to ground A- Outside town B- Inside town	Above roads and railway lines	Clearance to communication lines and other power lines	Clearance to buildings and structures not forming part of power lines
1,1 or less	A - 4,9m B - 5,5m	6,1m	0,6m	3,0m
7,2	A - 5,0m B - 5,5m	6,2m	0,7m	3,0m
12	A - 5,1m B - 5,5m	6,3m	0,8m	3,0m
24	A - 5,2m B - 5,5m	6,4m	0,9m	3,0m

MV line crossing an LV line

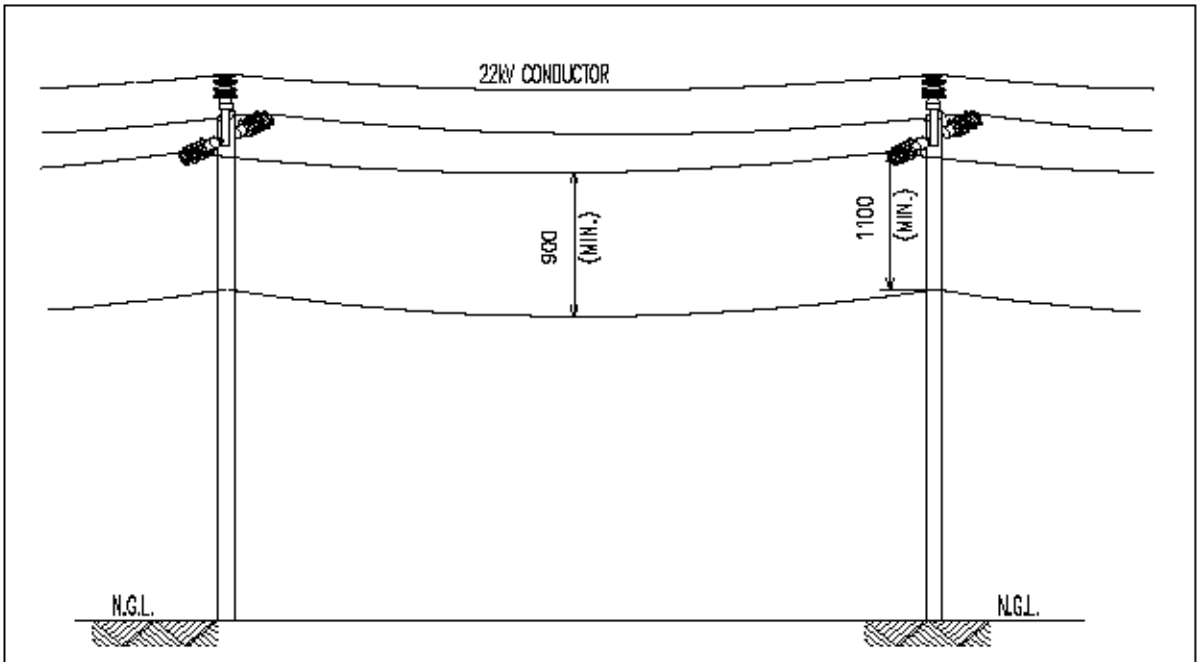
In the case of a MV line crossing a LV line then the spacing of column 6 of the table should be complied with under the conditions specified. For a 22kV line over a LV line the clearance is thus 900mm minimum. Should however a structure supporting the LV line be beneath the MV lines then the clearance between the **MV conductors** and the **LV structure** should be as per column 7 i.e. 3m. This is to provide a safety distance that will allow work to be carried out on LV equipment on the structure in addition to the minimum safety clearance.

Normal work to be carried out on the power line (e.g. planting/replacing the pole, stringing, tensioning or replacing conductor) will require the isolation and earthing of the MV line in accordance with OPR 6204 (ORHVS) regulation 5.03.

Shared structures

In the case of a set of structures being used to support both MV and LV lines then the clearances in column 6 are used to comply with the Act. For LV conductor running under 22kV conductors on the same structures the minimum clearance to satisfy the Act will be 900mm. The Distribution Standard

specifies a minimum spacing between the MV and LV conductors of 1100mm at the attachment point to ensure that the requirement in the Act is met.



Work is able to be carried out on LV equipment on this structure and still maintain the minimum working clearance, e.g. disconnecting, connecting, inspecting or installing a customer service connection, pole top box or streetlight. This is illustrated in figure 1. Normal work to be carried out on the power line (e.g. planting/replacing the pole, stringing, tensioning or replacing conductor) will require the isolation and earthing of the MV line in accordance with OPR 6204 (ORHVS) regulation 5.03.

Semi shared structures

For the case of a LV line running beneath a MV line where the line structures do not all support the MV line then it has been agreed with the Inspector that the spacing as in column 6 will apply. This clearance will apply to the conductors at the common support structures and within the span. At structures only supporting the LV conductors and LV equipment, then the clearance will apply between the MV conductor and the top of the LV structure. Again this clearance is to be the minimum clearance under the case of the MV conductor at 50 degrees centigrade. This is shown in figure 2.

It is further stipulated by the Inspector that, should work be carried on these LV power lines e.g. planting/replacing the pole, stringing, tensioning or replacing conductor, the MV line above the structure should be isolated accordance with OPR 6204 (ORHVS) regulation 5.03. Disconnecting, connecting, inspecting or installing a customer service connection, pole top box or streetlight on this pole will be carried out in the same way as would be done on a shared structure.

It must be noted that this DHO does not intend to restrict work in terms of the standard practices provided for in OPR 6204 (ORHVS) Regulation 5.03.6.3 – Work in close proximity or, OPR 6204 (ORHVS) Section 7 – Live Work. This implies that certain work on the power line (LV or HV) can commence with both systems alive utilizing prescribed live work techniques.

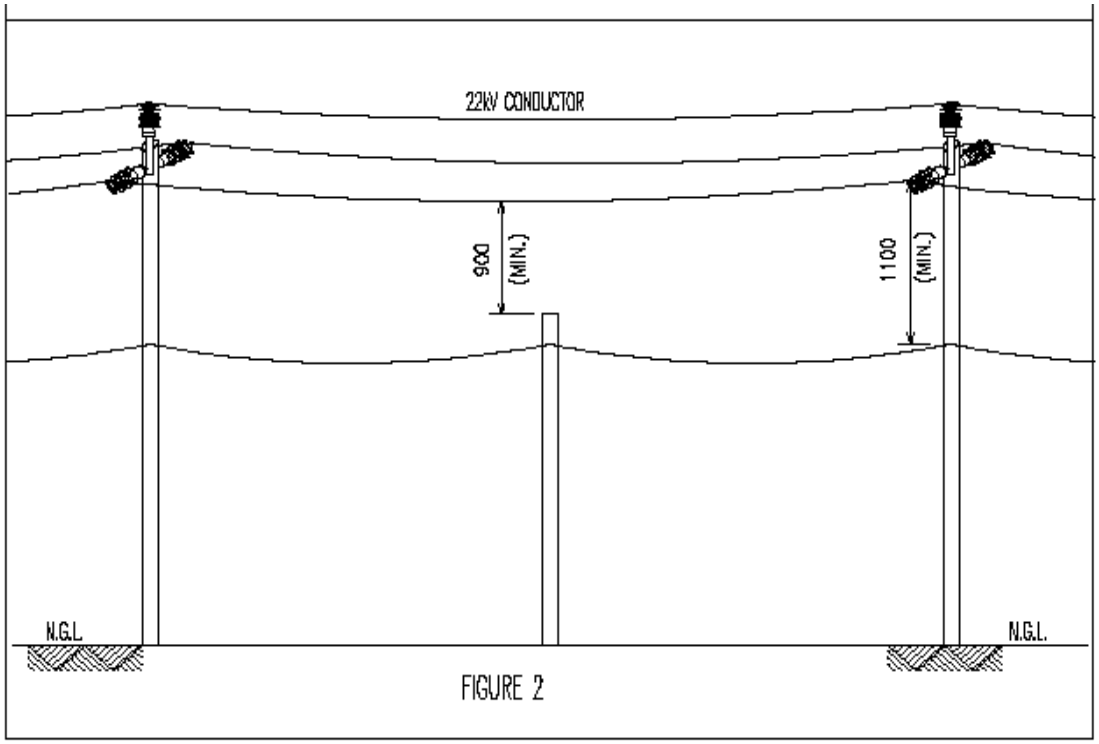


FIGURE 2

2. CLEARANCES FOR EQUIPMENT MOUNTED ON POWER LINE STRUCTURES

Section 15 is concerned with the safety of people by placing live conductors out of reach. It is not concerned with equipment or performance of the system. It is concerned with the clearances between a live conductor and another circuit's conductor or other places that a person may occupy. It does not apply to conductors of the same power line. It does not cover all possible configurations. It does not apply for clearances to insulated systems such as LV ABC, insulated services or MV cables.

Table 1, column 2 gives a minimum safety clearance for each system voltage. This is the minimum distance to an energised conductor that a person may approach with reasonable safety. There is a reasonable safety margin built into these distances to ensure that there will be a low probability of breakdown of the air between the conductor and a person at this distance.

The determination of clearances for specific cases is based on the determination of an "object" space, which is added to the electrical clearance. As an example, the clearances given in column 3, minimum clearance to a power line above ground outside townships, is based on an object space of 4.9m. The object in this case is the largest vehicle that will normally pass under the power line. This 4.9m object clearance is added to the electrical clearance of 0.3m at 22kV to give the 5.2m clearance for a 22kV power line.

Equipment on power line structures

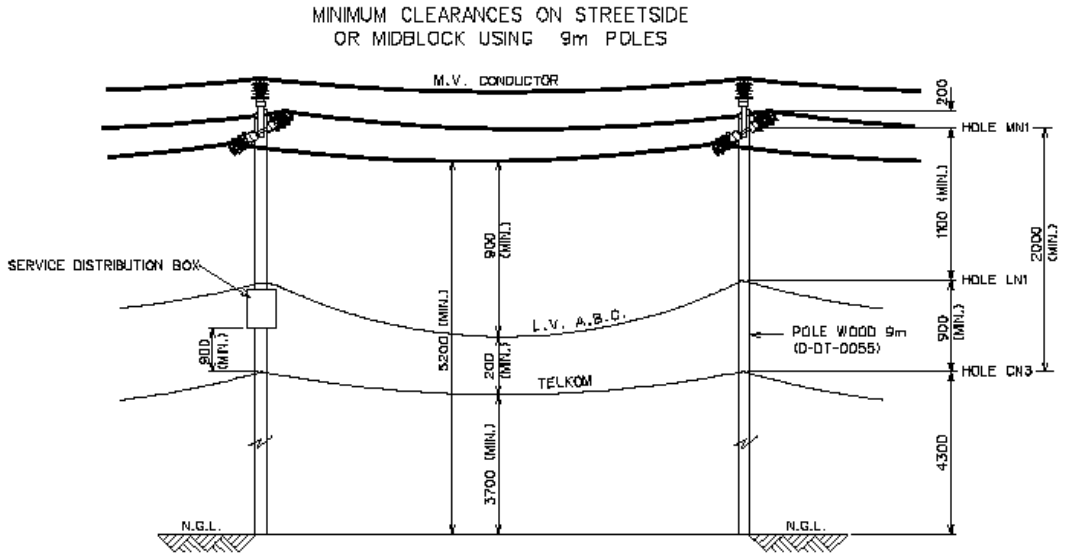
Table 2: Minimum clearance for live terminals of equipment mounted on line structures

MAXIMUM RATED PHASE TO PHASE VOLTAGE	MINIMUM CLEARANCE IN METERS	
1.1 or less	-	3.6
7.2	0.15	3.7
12	0.20	3.9
24	0.32	4.0

36	**0.43**	**4.2**

While the height of the power line is specified in the regulations the case of electrical equipment mounted on power line structures is not. The object space for this type of situation and the subsequent overall ground clearance was agreed to with the Inspector. The clearances are given in table 2. This is as per the Department of Manpower reference 34/2/4/1/2 of 5 May 1992.

The clearances given in table 2 are the clearance between the live terminals of the structure-mounted equipment and ground level. Since the equipment that Eskom install on poles does not have bushings at a consistent height from the base of the equipment the Distribution Standard mounting heights have been developed by ensuring that the equipment base is at a height of 4m from ground level.



3.LOW VOLTAGE

	ABC (Without Telkom)	ABC (With Telkom)
a) Main roads	: 5,1m	: 5,3m
b) Across roads in townships	: 4,7m	: 4,9m
c) Along roads	: 3,7m	: 3,7m
d) Across plots	: 3,3m	: 3,5m

Note that Eskom and Telkom have agreed that a minimum clearance of 1,8m will be provided between bare Eskom power lines above 1,1 kV, and communication lines at crossing points. For exemptions see part 0 of the Distribution Standard.

- Midspan clearance (Shared services)
  a) Not less than 0,2m between insulated LV power cables and telecommunication cables.
  b) Not less than 1,5m between bare MV power conductors and telecommunication cables at the worst condition of sagging.

c) Telkom ground clearances - over roads : 6,1m
- along roads in town : 3,6m
- along roads outside town : 3,0m

- Clearances at attachment points on a structure
  a) Telkom to ground : 4,3m
  b) Telkom to low voltage conductor : 0,9m
  c) Telkom to medium voltage conductor : 1,5m

4 SERVICE CABLES

a) Main roads : 5,2m
b) Across roads in townships : 4,7m
c) Along roads : 3,0m (align with Telkom)
d) Over private property : 2,5m

Annexure Q

Final Design: Additional information

a) Design changes or deviations
b) Completed design indicators
c) Single line diagram
d) Schedule of :
    1) “As-built” drawings
    2) Auxiliary installations
    3) Voltage drop files
    4) Earthing installation values
    5) Percussion stay details
    6) Sag and Tension/ Stringing Charts Charts

Annexure Q

FINAL DESIGN: ADDITIONAL INFORMATION

EARTHING RESULT PER TRANSFORMER

VILLAGE NAME	TRFR NUMBER	TRFR SIZE (KVA)	TRANSFORMER SERIAL NUMBER	MV EARTH OHM VALUE	LV EARTH OHM VALUE

ANNEXURE

SINGLE LINE DIAGRAMS

EXISTING SLDS

PROPOSED SLDS

ANNEXURE

SAG AND TENSION/ STRINGING CHARTS

i. **MV STRINGING CHARTS**

See attachment

ii. LV STRINGING CHARTS

See attachment

Annexure R

The Proposed process.

1. The Consultant receives the TEF Stakeholders List (TSL) from the PM after appointment by Eskom.

2. The Consultant prepares the project proposal with all relevant information to enable the stakeholders to understand the scope of works and project statement.

3. Consultant arranges a meeting (1 to 1 or all together) with each of the stakeholders that has input parameters into the design, e.g. Planning (Planning Proposal), EDNO, EDFS, etc.

4. The Consultant completes the design and arranges a meeting (1 to 1 or all together) with the stakeholders shown on TSL and gets the signature of each one. During this stage the Consultant also submits the required documentation to the specific stakeholder, e.g. Land Development (DESD, Wayleaves, and Design Drawing to Geographic Info etc) before it is signed off by this stakeholder.

5. The Consultant then discusses the design with the PE after which the PE will sign the TSL after scrutinising the design (hard and soft copy).

6. The Consultant brings the design (hard and soft copy) together with this signed TSL to the PM after receiving final approval from the PE.

7. The PM ticks it off as submitted (internal control system) and hands the design (hard and soft copy) to the TEF Chairman who adds the final signature and put it on the next TEF Agenda for notice and Minutes purposes.

8. The TEF Chairman returns a copy of the fully-signed TSL to the PM who forwards it to the Consultant for him/her to scan it into the RIC presentation.

Annexure S

N.B: Stakeholders must comment on the TEF Ticklist and only sign once their relevant comments are addressed and presented.

Annexure
DECLARATION LETTER

Annexure V

Land Development Requirements

L&R requirements are as follows:

a) Approval of the final network layout is needed from (Reference is needed to a numbered plan):

- Registered land owner
- Local Tribe residing on the property
- Local Municipality
- Telkom
- Roads authorities application
- Other Service providers affected
- Department of Local Government and Housing (If the town is located on unregistered state land and not yet formalised) [Refer to Work Instruction DISWIZAA0]

NOTE: use the attached wayleave agreement form for customer approval to install stays and struts in their stands as indicated on the MV and LV reticulation layout drawings