Teleprotection Document User Guide

1. The teleprotection project scope (design) shall follow the scope of works template listed in the document 240-141828918, “Scope of Work Template for Teleprotection Projects”. This scope of work document shall adhere to the standards, 240-90353855, “Design Standard for Teleprotection Systems” and 240-103057370, “Application Design Standard for Teleprotection Systems”. The scope of works template for teleprotection shall be completed for each of the affected lines/feeders.
2. The Teleprotection and Power Line Carrier (PLC) terminal equipment are ‘links’ and need to be compatible at both station ends. This means the equipment units at both station ends must be the same make and type.
3. The position of Line Traps shall be allocated by Eskom Technology. The information listed in table 1 shall be provided to Eskom for each feeder/line before the study can be completed. The information shall include the existing line as well as the new line or loop-in sections. Once all information is provided, 3 months is required to complete the Line Trap allocation study.
4. The PLC frequency allocation shall be completed by Eskom Technology. The information listed in table 2 shall be provided before the study can be completed. Once all information is provided, 3 months is required to complete the PLC frequency allocation.
   Important to note that the PLC frequencies can only be allocated after the Line Trap positions have been determined.
5. The PLC terminal equipment, Line Matching Equipment (LMEs) and Line Traps require the allocated PLC frequencies before any of these equipment can be ordered. This is to ensure the correct equipment is ordered.
6. The Teleprotection and PLC equipment installed in the cabinet/s shall comply with the standard 240-75975613 “Standard for the Installation of Power Telecommunications Equipment”.
7. Depending on specific project requirements, the Teleprotection (TPE) equipment can either be installed in the corresponding Protection cabinet or a separate Teleprotection cabinet.
8. The X.21 circuits from Transmission Telecomms (TT) shall be detailed in TT’s SOW and shall be connected to the TPE equipment.
9. The installation of the LME is detailed in the document 240-141828918, “Scope of Work Template for Teleprotection Projects”
10. The installation of the Line Traps shall be detailed in the Substations scope of works document.
11. For a 132kV line trap, a CC or CVT or post insulators will be required. The Line Trap, CC and/or CVT shall be detailed in the corresponding Substations scope of works document.
12. The order of the 132kV CC or CVT or post insulator shall be checked by HV Plant to ensure compatibility with the Line Trap. Depending on the suppliers, an ‘adaptable plate’ might be required to be mounted on the CC/CVT/post insulator to allow the Line Trap to be fitted and installed correctly. This shall be detailed in the Substation scope of works document.
13. The contractor shall note that the Teleprotection, PLCs and Fibre requirements are affected by Lines and Substations and therefore a commissioning plan should be developed to mitigate the associated risks. A ‘sequence of events for commissioning shall be drafted by the contractor and discussed with all disciplines as this could change the Teleprotection and Fibre SOW documents.
14. If a bypass or underpass is to be used for commissioning/installation process, then there is a risk the PLC might be required to be ‘switched off’. This would result in Main 2 teleprotection not being available. This risk would need to be evaluated by the System Operator.
15. The contractor shall supply, install, terminate and test the teleprotection units and/or Line Traps and/or LME and/or PLC equipment at both station ends. Since teleprotection and PLCs operate as a link, the commissioning technicians are required at both station ends at the same time. Therefore most probably two separate commissioning teams are required.
16. Eskom approved equipment and suppliers are listed in the relevant proformas and are as follows:
    - LME: Supplier – Hitachi Energy, LME (High Pass or Band Pass).
    - PLC: Supplier – Hitachi Energy, ETL 651 or ABB ETL 6101 PLCs.
    - Teleprotection Equipment: Supplier – Hitachi Energy, NSD 570
    - Line Traps:
        - Supplier – High Voltage Technologies, Trench Line Traps
            - U2: 132 kV, 2500A, 40kA, 0.2mH
            - S3H: 275 kV, 2500A, 50 kA, 0,5 mH - Heavy Creep (25mm/kV)

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- S3HH: 275 kV, 2500A, 50 kA, 0,5 mH LT - Extra Heavy Creep (31mm/kV)
- Q1H: 400 kV, 2500A, 50 kA, 0,5 mH LT - Heavy Creep (25mm/kV)
- Q1HH: 400 kV, 2500A, 50 kA, 0,5 mH LT - Extra Heavy Creep (31mm/kV)
- Q3H: 400 kV, 2500A, 50 kA, 1,2 mH LT - Heavy Creep (25mm/kV)
- Q3HH: 400 kV, 2500A, 50 kA, 1,2 mH LT - Extra Heavy Creepe (31mm/kV)
- Q6H: 400 kV, 3150A, 50 kA, 0,5 mH LT - Heavy Creep (25mm/kV)
- Q6HH: 400 kV, 3150A, 50 kA, 0,5 mH LT - Extra Heavy Creep (31mm/kV)
- Q7H: 400 kV, 3150A, 63 kA, 0,5 mH LT - Heavy Creep (25mm/kV)
- Q7HH: 400 kV, 3150A, 63 kA, 0,5 mH LT - Extra Heavy Creep (31mm/kV)
- Q9H: 400 kV, 3150A, 63 kA, 1,2 mH LT - Heavy Creep (25mm/kV)
- Q9HH: 400 kV, 3150A, 63 kA, 1,2 mH LT - Extra Heavy Creep (31mm/kV)
- Q10H: 400 kV, 4000A, 63 kA, 0,5 mH LT - Heavy Creep (25mm/kV)
- Q10HH: 400 kV, 4000A, 63 kA, 0,5 mH LT - Extra Heavy Creep (31mm/kV)

- Supplier – Actom, Trench Line Traps
  - U4: 132 kV, 2500A, 40 kA, 0,5 mH LT – (WITHOUT PI)
  - S8H: 275 kV, 3150A, 50 kA, 0,5 mH LT - Heavy Creep (25mm/kV)
  - S8HH: 275 kV, 3150A, 50 kA, 0,5 mH LT - Extra Heavy Creep (31mm/kV)
  - S9H: 275 kV, 3150A, 50 kA, 1,2 mH LT - Heavy Creep (25mm/kV)
  - S9HH: 275 kV, 3150A, 50 kA, 1,2 mH LT - Extra Heavy Creep (31mm/kV)
  - S10H: 275 kV, 4000A, 50 kA, 0,5 mH LT - Heavy Creep (25mm/kV)
  - S10HH: 275 kV, 4000A, 50 kA, 0,5 mH LT - Extra Heavy Creep (31mm/kV)
  - Q8H: 400 kV, 3150A, 50 kA, 1,2 mH LT - Heavy Creep (25mm/kV)
  - Q8HH: 400 kV, 3150A, 50 kA, 1,2 mH LT - Extra Heavy Creep (31mm/kV)
  - QB1H: 765 kV, 5000A, 50 kA, 0,5 mH LT - Heavy Creep (25mm/kV)
  - QB1HH: 765 kV, 5000A, 50 kA, 0,5 mH LT – Extra Heavy Creep (31mm/kV)

- Supplier – MegaHVT, Arteche, Trench Line Traps
  - U5HH: 132 kV Post Insulators – Extra Heavy Creep (31mm/kV)
  - S1H: 275 kV, 2500A, 50 kA, 0,2 mH LT - Heavy Creep (25mm/kV)
  - S1HH: 275 kV, 2500A, 50 kA, 0,2 mH LT - Extra Heavy Creep (31mm/kV)

- S5H: 275 kV, 2500A, 50 kA, 1,2 mH LT - Heavy Creep (25mm/kV)
- S5HH: 275 kV, 2500A, 50 kA, 1,2 mH LT - Extra Heavy Creep (31mm/kV)

Table 1: Line Parameters

Tower Type(s)	
Line Length (km)	
Line Voltage (kV)	
Phase Conductors (Type)	
Earth Conductors (Type)	
Number of Phase Conductors in Bundle	
Bundle Spacing (mm)	
Attachment Position (Horizontal (x) & Vertical (y)) for all 3 Phase Conductors (Red/White/Blue) (m)	
Attachment Position (Horizontal (x) & Vertical (y)) for all Earth Conductors (m)	
Sag Phase Conductors (if available) (m)	
Sag Earth Conductors (if available) (m)	
Number of Transpositions	
Transposition locations (km)	
Transposition Swap sequences	
Phasing drawing displaying the Line Phasing which corresponds to the substation phasing diagrams at both ends of the line. (Should be provided by Substations department)	

Table 2: Checklist for requesting PLC frequencies from PTM&C Telecomms

Checklist of Required Information when requesting PLC Frequencies			
No.	**Item**	**Comments**	**Check Y/N**
1	Powerline Network diagram	A diagram showing the power network topology.	
2	Project Execution Plan	The sequence of events for project execution	
3	Teleprotection plan for new project	To determine the new requirements	
4	As-built PLC frequency allocations at local and remote substations	Photographs of all Carrier Panels at local and Remote Substations clearly	

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		displaying the frequencies	

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