

सुपरविज़न चार्ज जमा कर विद्युत तंत्र निर्माण का कार्य स्वयं करा रहे आवेदकों हेतु ध्यान देने योग्य महत्वपूर्ण बिंदु

प्रिय आवेदक,

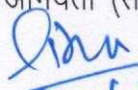
आपके द्वारा सुपरविज़न चार्ज जमा कर विद्युत तंत्र निर्माण का कार्य स्वयं कराया जा रहा है। यह ध्यान दें कि इस कार्य में प्रयुक्त सामग्री तथा किये गए कार्य की गुणवत्ता हेतु अंततः आप ही पूर्णतया जिम्मेदार हैं। यदि कार्य/सामग्री की गुणवत्ता सही नहीं होगी तो विद्युत तंत्र में बार-बार outage आएंगे एवं इन व्यवधानों से आपका ही कार्य प्रभावित होगा। अतः इस कार्य को कराते समय ही गुणवत्ता सुनिश्चित किया जाना अत्यंत आवश्यक है। इस सम्बन्ध में ध्यान देने योग्य कुछ प्रमुख बिंदु हेतु advisory निम्नवत है:

1- विद्युत कार्य करने वाले ठेकेदार का चयन करते समय ध्यान रखने योग्य बिंदु:

- (1) ऐसे ठेकेदार का चयन करें, जो कि वैध Class-A, Licensed Electrical Contractor हो। यह सुनिश्चित कर लें कि ठेकेदार के पास कार्य करने हेतु पर्याप्त कुशल manpower हो। कुशल manpower का तात्पर्य उन श्रमिकों या तकनीशियनों से है जिनके पास बिजली के काम को सुरक्षित और सटीक तरीके से करने के लिए आवश्यक तकनीकी ज्ञान (Technical Knowledge), प्रशिक्षण (Training) और व्यवहारिक अनुभव (Practical Experience) होता है। कुशल मैनपावर के पास इलेक्ट्रिकल ट्रेड में Recognition of Prior Learning (RPL) सर्टिफिकेट या NCVT/SCVT द्वारा मान्यता प्राप्त ITI सर्टिफिकेट, और वायरमैन परमिट होता है। कुशल manpower की पुष्टि हेतु आप ठेकेदार से कार्मिकों के EPFO No. मांग कर देख सकते हैं। ठेकेदार के पास इस प्रकार का कार्य करने का पर्याप्त अनुभव हो तथा उसके विरुद्ध विगत में कोई विभागीय कार्यवाही न की गयी हो और न ही लंबित हो। यह भी सुनिश्चित कर लें कि ठेकेदार के पास विद्युत कार्य करने हेतु एवं कार्मिकों की सुरक्षा हेतु आवश्यक उपकरण, जैसे- क्रिम्पिंग टूल, सेपटी बेल्ट, हेलमेट, अर्थिंग रॉड, अर्थिंग चैन आदि उपलब्ध हों।
- (2) इस कार्य में आपके द्वारा बड़ी धनराशि व्यय की जा रही है। कुछ प्रकरणों में यह धनराशि लाखों-करोड़ों में भी हो सकती है। आपके द्वारा इतनी धनराशि खर्च करने के पश्चात भी यदि आपका ठेकेदार, कार्य के टेक्निकल सुपरविज़न हेतु किसी अनुभवी इंजीनियर को नहीं रखेगा, तो कार्य में गुणवत्ता सुनिश्चित कर पाना संभव नहीं है। अतः अपने ठेकेदार से किसी अनुभवी विद्युत अभियंता के माध्यम से ही कार्य को सुपरवाइज़ किया जाना अवश्य सुनिश्चित कराएं। आप स्वयं भी अनुभवी/knowledgeable इंजीनियर रखें, जिससे आगे आपको विद्युत आपूर्ति में ट्रिपिंग इत्यादि समस्याओं का सामना न करना पड़े।

2- प्रयुक्त सामग्री की गुणवत्ता हेतु ध्यान रखने योग्य बिंदु:

- (1) विद्युत तंत्र निर्माण में प्रयुक्त समस्त सामग्री के क्रय की रसीदें (Tax Invoice) मूल रूप में सुरक्षित रखें एवं विभाग द्वारा मांगे जाने पर उपलब्ध कराएं।
- (2) परिवर्तक (ट्रांसफार्मर) का क्रय डिस्कॉम में प्रचलित निर्माताओं से तथा अनुमोदित जी०टी०पी० (Guaranteed Technical Particulars- G.T.P.) के अनुसार ही किया जाये। डिस्कॉम में प्रचलित निर्माताओं की सूची आप डिस्कॉम से प्राप्त कर सकते हैं एवं जी०टी०पी० को अनुमोदित कराने हेतु आपको सामग्री-विशेष की जी०टी०पी०, सप्लायर फर्म से प्राप्त कर उसे अनुमोदन हेतु डिस्कॉम के अधीक्षण अभियंता (सामग्री प्रबंधन) को प्रस्तुत करना होगा।


10.6.2026

- (3) विभाग में प्रचलित व्यवस्था के अनुसार, उन्हीं परिवर्तकों को स्थापित किया जाता है जिनके निर्माताओं के पास समान डिजाइन वाले परिवर्तक का वैध टाइप टेस्ट सर्टिफिकेट होता है। परिवर्तक निर्माताओं द्वारा टाइप टेस्ट Central Power Research Institute-CPRI अथवा Electrical Research and Development Association-ERDA की लैब में कराया जाता है और इस सर्टिफिकेट की मान्यता निर्गत करने की तिथि से पांच वर्ष होती है। अतः यह सुनिश्चित कर लें कि क्रय किये जा रहे परिवर्तक के समान डिजाइन वाले परिवर्तक पर टाइप टेस्ट पास होने का सर्टिफिकेट, जो कि 5 वर्ष से पूर्व का न हो, अवश्य प्राप्त किया जाये एवं विभाग को प्रस्तुत किया जाये। यहाँ यह पुनः स्पष्ट करना है कि जो परिवर्तक आप क्रय कर रहे हैं, उस पर ही टाइप टेस्ट हुआ हो—यह आवश्यक नहीं है, अपितु यह आवश्यक है कि जो परिवर्तक आप क्रय कर रहे हैं, उस जैसे समान डिजाइन वाले परिवर्तक पर सफल टाइप टेस्ट अवश्य हुआ हो।
- (4) आपके द्वारा उपलब्ध करायी गयी जी०टी०पी० के अनुमोदित हो जाने के पश्चात ही सप्लायर को परिवर्तक का आर्डर दें। जब परिवर्तक डिलीवरी के लिए तैयार हो जाये, तो इसकी सूचना डिस्कॉम के क्वालिटी सेल को दें। विद्युत तंत्र निर्माण में प्रयुक्त ट्रांसफार्मर का निरीक्षण निर्माता परिसर पर डिस्कॉम क्वालिटी सेल (D.Q.C.) द्वारा गठित टीम के माध्यम से ही किया जाना अनिवार्य है। सफल निरीक्षण कराये बिना परिवर्तक की आपूर्ति न लें।
- (5) प्राक्कलन के अनुसार विद्युत तंत्र निर्माण में प्रयुक्त अग्रलिखित सामग्री – कंडक्टर, केबल (HT/LT), VCB तथा पोल में से किसी सामग्री का प्राक्कलन में मूल्य रू० 2.00 लाख से अधिक होने पर इन सामग्रियों का निरीक्षण भी निर्माता परिसर पर ही डिस्कॉम क्वालिटी सेल (D.Q.C.) द्वारा गठित टीम के माध्यम से कराया जाना आवश्यक है। सफल निरीक्षण कराये बिना इन सामग्रियों की आपूर्ति न लें।
- (6) प्राक्कलन के अनुसार विद्युत तंत्र निर्माण में प्रयुक्त अन्य सामग्री का निरीक्षण स्थानीय स्तर पर सम्बंधित अधीक्षण अभियंता (वितरण) द्वारा गठित टीम से कराया जाता है। यह निरीक्षण आपके स्थानीय भण्डार/साइट—जहाँ कार्य होना है, पर किया जाता है। इस निरीक्षण के लिए आप स्थानीय अधीक्षण अभियंता (वितरण) को सूचित करें।
- (7) विद्युत तंत्र निर्माण में प्रयुक्त समस्त सामग्री की गारण्टी अवधि भी विभाग में प्रचलित गारण्टी अवधि के समान ही होनी चाहिए। विभिन्न सामग्रियों हेतु विभाग में प्रचलित गारण्टी अवधि (मई 2026 तक अद्यतन) निम्नवत हैं:

S No.	Material	Guarantee Period
1	Power Transformer (1MVA and above)	15 Years and extendable by 1 more year if damaged within 15 years
2	Distribution Transformer (250kVA to 630 kVA)	10 Years and extendable by 1 more year if damaged within 10 years
3	Distribution Transformer (Up to and including 100 kVA)	8 Years and extendable by 2 more years if damaged within 5 years
4	Aerial Bunched Cables	3 Years
5	ACSR Conductors	2 Years
6	XLPE Cables (HT/LT)	2 Years
7	VCB	5 Years
8	Poles	2 Years
9	Insulators	2 Years
10	Any other material	2 Years

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10.6.2026

3- कार्य कराये जाने के दौरान कार्य की गुणवत्ता (Workmanship) हेतु ध्यान रखने योग्य बिंदु:

- (1) विद्युत तंत्र निर्माण के समय तकनीकी बिंदुओं जैसे-पोल की सही प्रकार से ग्राउटिंग करना, ट्रांसफार्मर/पोल की भली-भाँति अर्थिंग करना इत्यादि अत्यंत ही महत्वपूर्ण है। इस प्रकार के प्रमुख तकनीकी बिंदुओं को **Annexure-A** में संकलित किया गया है। कृपया समस्त बिंदुओं का अनुपालन सुनिश्चित कराएं। अंडरग्राउण्ड कार्यों हेतु मानक **Annexure-B** में संकलित हैं।
- (2) कार्य कराये जाने के दौरान भी विभागीय अधिकारियों एवं TPIA (Third Party Inspecting Agency) से निरीक्षण कराते रहें। इन निरीक्षण हेतु स्थानीय अधीक्षण अभियंता एवं डिस्कॉम क्वालिटी सेल से संपर्क करें। सभी विभागीय अधिकारियों की ईमेल आई०डी० एवं संपर्क विवरण, डिस्कॉम्स के आधिकारिक वेब पेज पर उपलब्ध है, जिनका विवरण निम्नवत है:
 - a. PuVVNL- <https://puvvn.in/en/page/officers-staff>
 - b. MVVNL- <https://mvvn.in/post/en/directory?cd=NQA2AA%3d%3d>
 - c. DVVNL- <https://dvvnl.org/uploadfiles/Officer%20List%20Final.pdf>
 - d. PVVNL- <https://www.pvvn.org/en/24/65/Who-Is-Who>
 - e. KESCo- <https://kesco.org.in/EmployeeDirectory>

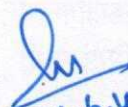
4- कार्य पूर्ण होने के उपरान्त नियमित ऊर्जाकरण हेतु ध्यान रखने योग्य बिंदु:

- (1) कार्य पूर्ण होने के उपरान्त:
 - a. नवनिर्मित विद्युत तंत्र का ठेकेदार के टेक्निकल सुपरवाइजर के माध्यम से भौतिक निरीक्षण करा लें। यदि रास्ते में पेड़ों की टहनिया आदि लाइन के संपर्क में दिखाई दें, तो उन डालियों की पर्याप्त छटनी करा दें।
 - b. परिवर्तक/पोल की अर्थिंग भली-भाँति की गयी है अथवा नहीं इसकी जांच के लिए अर्थ रेजिस्टेंस की वैल्यू का मापन करा लें। अर्थिंग से सम्बंधित विस्तृत तकनीकी बिंदु **Annexure-A** में दिए गए हैं।
 - c. पोल की ग्राउटिंग भली-भाँति की गयी है अथवा नहीं इसकी जांच कर लें। पोल की ग्राउटिंग न होने से पोल के टेढ़े होने, यहाँ तक कि गिरने का खतरा होता है। इससे जान-माल की हानि भी हो सकती है। इससे सम्बंधित प्रमुख मानक तकनीकी बिंदु **Annexure-A** में दिए गए हैं।
 - d. सभी मानक ठीक होने के पश्चात विभाग से कार्य उपरान्त निरीक्षण एवं ऊर्जाकरण हेतु अनुरोध करें।
- (2) विद्युत सुरक्षा निदेशालय से नियमानुसार निरीक्षण करा कर अनापत्ति प्राप्त करें (यदि लागू हो)।
- (3) उपकरण तथा कराये गए कार्य की गुणवत्ता के विषय में जानने हेतु, कार्य पूर्ण होने पर ऊर्जाकरण कराएं एवं विद्युत तंत्र की **sustainability** एवं **reliability** को **observe** करें। यदि कमियां पायी जाती हैं, जैसे- ट्रिपिंग, वोल्टेज का सही न होना, लाइन में हॉट-स्पॉट्स का दिखना इत्यादि, तो उनके निराकरण के पश्चात ही तंत्र को नियमित प्रयोग में लाया जाये जिससे भविष्य में कार्य में व्यवधान न आये।

- (4) उक्त प्रक्रिया से विद्युत तंत्र भली-भांति ऊर्जीकरण होने के पश्चात ही आवेदक द्वारा कार्य हेतु **engaged agency** को भुगतान किया जाये। भुगतान का कुछ अंश, या अन्य रूप में प्रतिभूति (Security), अगले तीन साल तक नए तंत्र की मरम्मत आदि हेतु होल्ड किया जाये। यह सभी शर्तें आवेदक द्वारा कार्य हेतु **engaged agency** से कार्य से पूर्व ही तय कर ली जाएं।

5- क्या न करें:

- (1) विभागीय निरीक्षण कराये बिना कोई भी निर्माण सामग्री उपयोग में न लें। यदि विभागीय अधिकारी निरीक्षण में विलम्ब करते हैं तो निम्नलिखित माध्यमों से आप शिकायत दर्ज करा सकते हैं:
- 1912 Helpline
 - सम्बंधित अधीक्षण/मुख्य अभियंता
 - प्रबन्ध निदेशक को निम्नलिखित ईमेल आई०डी० पर:
 - PuVVNL – md@puvvnl.in
 - MVVNL- md@mvvnl.org
 - DVVNL- md@dvvnl.org
 - PVVNL- md@pvvnl.org
 - KESCo- mdkesco@kesco.org.in
- (2) विद्युत सुरक्षा निदेशालय से नियमानुसार निरीक्षण कराये बिना विद्युत तंत्र का ऊर्जीकरण न किया जाये।
- (3) विद्युत तंत्र का निर्माण विभाग द्वारा बनाये गए **approved** एस्टीमेट के अनुसार ही करें, इसमें किसी भी प्रकार का विचलन न करें।
- (4) विद्युत तंत्र का निर्माण **Class-A, Licensed electrical contractor** के स्थान पर अन्य किसी माध्यम से न कराएं।
- (5) कार्य प्रारम्भ होने के पश्चात विभागीय अधिकारियों/TPIA द्वारा **supervision** एवं निरीक्षण हेतु कार्य पूर्ण होने की प्रतीक्षा न करें। कार्य के दौरान ही निरीक्षण कराते रहें एवं पायी गयी कमियों (NCs- Non-Conformities) को दूर करते चलें। इसका रिकॉर्ड भी अपने पास रखें।
- (6) किसी भी प्रलोभन में पड़कर चोरी की गयी या स्टोर से **issued** सामग्री का अनधिकृत प्रयोग न करें, चाहे यह प्रलोभन विभागीय कार्मिकों द्वारा ही कम खर्च में लाइन निर्माण हेतु आपको दिया गया हो। ऐसे कदाचारी तत्वों की उच्च अधिकारियों को रिपोर्ट करें। चोरी की सामग्री से निर्मित लाइन ऊर्जीकृत नहीं की जाएगी एवं पकड़े जाने पर विधिक कार्यवाही की जाएगी। यह सुनिश्चित कर लें कि समस्त सामग्री आपके द्वारा स्वयं क्रय की गयी हो और सामग्री पर विभागीय योजना आदि का नाम खुदा हुआ न हो।
- (7) विद्युत सामग्री को खुले में अथवा ऐसी जगह भंडारित न करें जहाँ आग अथवा गुणवत्ता प्रभावित होने का भय हो।


10-6-2026

विभागीय अधिकारियों हेतु परामर्शी

6-

A. क्या करें:

- (1) आवेदक द्वारा विद्युत कार्य करने वाले ठेकेदार का चयन करते समय, उचित विकल्प चुनने में यदि आवेदक द्वारा आपसे परामर्श माँगा जाता है, तो उसकी हरसंभव सहायता करें। जिन ठेकेदारों के विरुद्ध मानक के अनुरूप कार्य न करने के कारण अथवा कार्य में अनियमितता करने के कारण विभाग में कोई कार्यवाही प्रचलित है, उनकी पूरी जानकारी आवेदक को उपलब्ध कराते हुए, उनके चयन के विरुद्ध अपनी अनुशंसा आवेदक को करें।
- (2) डिस्कॉम के अधीक्षण अभियंता (सामग्री प्रबंधन), विभाग में उपयोग होने वाली प्रमुख सामग्रियों के प्रचलित निर्माताओं से तथा इन सामग्रियों की पूर्व में अनुमोदित नवीनतम जी०टी०पी०, डिस्कॉम की वेबसाइट पर प्रकाशित करा दें, जिससे सभी वर्तमान/भावी आवेदकों को यह सुगमता से प्राप्त हो सके।
- (3) आवेदक द्वारा किसी सामग्री को क्रय किये जाने से पूर्व सप्लायर फर्म से जी०टी०पी०, प्राप्त कर उसे अनुमोदन हेतु प्रस्तुत करने पर डिस्कॉम के अधीक्षण अभियंता (सामग्री प्रबंधन) तीन कार्यदिवस के भीतर जी०टी०पी० को अनुमोदित करने/ न करने हेतु गुण-दोष के आधार पर निर्णय लें एवं आवेदक को निर्णय से सकारण अवगत करा दें।
- (4) परिवर्तक की जी०टी०पी० अनुमोदित करने से पूर्व सप्लायर के टाइप टेस्ट पास सर्टिफिकेट का भली-भाँति निरीक्षण कर लें। इसका उत्तरदायित्व डिस्कॉम के अधीक्षण अभियंता (सामग्री प्रबंधन) का होगा।
- (5) डिस्कॉम के अधीक्षण अभियंता (सामग्री प्रबंधन) द्वारा यह अवश्य सुनिश्चित किया जाये कि विद्युत तंत्र निर्माण में प्रयुक्त समस्त सामग्री की गारंटी अवधि भी विभाग में प्रचलित गारंटी अवधि के समान ही हो। विभिन्न सामग्रियों हेतु विभाग में वर्तमान में प्रचलित गारंटी अवधि इस परामर्शी के बिंदु संख्या-2(7) में वर्णित है।
- (6) जिन सामग्रियों का आपूर्ति-पूर्व निरीक्षण निर्माता परिसर पर किया जाना है, उन सामग्रियों का निरीक्षण आवेदक द्वारा सम्बंधित सामग्री के निरीक्षण के लिए तैयार होने की सूचना देने के दिनांक से एक सप्ताह के भीतर अवश्य पूर्ण कर लें। इसका उत्तरदायित्व डिस्कॉम के मुख्य/अधीक्षण अभियंता (क्वालिटी सेल) का होगा।
- (7) जिन सामग्रियों का निरीक्षण स्थानीय स्तर पर सम्बंधित अधीक्षण अभियंता (वितरण) द्वारा गठित टीम से कराया जाना है, उन सामग्रियों का निरीक्षण भी आवेदक द्वारा सामग्रियों के निरीक्षण के लिए तैयार होने की सूचना देने के दिनांक से एक सप्ताह के भीतर अवश्य पूर्ण कर लें।
- (8) कार्य कराये जाने के दौरान विभागीय अधिकारियों एवं TPIA (Third Party Inspecting Agency) के माध्यम से कार्य का निरीक्षण करते रहें। विद्युत तंत्र निर्माण के समय तकनीकी बिंदुओं जैसे- पोल की सही प्रकार से ग्राउटिंग करना, ट्रांसफार्मर/पोल की भली-भाँति अर्थिंग करना इत्यादि अत्यंत ही महत्वपूर्ण है। इस प्रकार के प्रमुख तकनीकी बिंदुओं को **Annexure-A** में संकलित किया गया है। कृपया समस्त बिंदुओं का अनुपालन सुनिश्चित कराएं। कार्य के

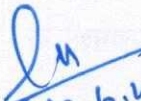
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दौरान पायी गयी कमियों (NCs- Non-Conformities) को दूर कराते रहें। इसका रिकॉर्ड भी अपने पास रखें। इसका उत्तरदायित्व डिस्कॉम के मुख्य/अधीक्षण अभियंता (वितरण) का होगा।

- (9) यह सुनिश्चित कर लें कि समस्त सामग्री आवेदक द्वारा स्वयं क्रय की गयी हो और सामग्री पर विभागीय योजना आदि का नाम खुदा हुआ न हो। इसका उत्तरदायित्व निरीक्षण हेतु नामित किये गए अधिकारी के साथ-साथ क्षेत्रीय अवर अभियंता/ उपखण्ड अधिकारी/ अधिशासी अभियंता का होगा।
- (10) कार्य पूर्ण होने के उपरान्त विद्युत तंत्र का सघन निरीक्षण करें। यदि कमियां पायी जाती हैं, जैसे- अर्थ रेजिस्टेंस की वैल्यूज का मानक अनुरूप न होना, पोल ग्राउटिंग उचित न होना, पोल टेढ़े होना, लाइन सैग सही न होना इत्यादि, तो सभी मानक ठीक होने के पश्चात ही तंत्र का ऊर्जीकरण करें। इसका उत्तरदायित्व क्षेत्रीय अवर अभियंता/ उपखण्ड अधिकारी/ अधिशासी अभियंता का होगा।
- (11) आवेदक से सदैव सम्मानपूर्ण एवं संवेदनशील शैली में ही बात करें।
- (12) सभी विभागीय अधिकारियों की ईमेल आई०डी० एवं संपर्क विवरण, डिस्कॉम्स के आधिकारिक वेब पेज पर अद्यतन प्रकाशित रखें एवं आवेदक को भी सूचित करें।

B. क्या न करें:

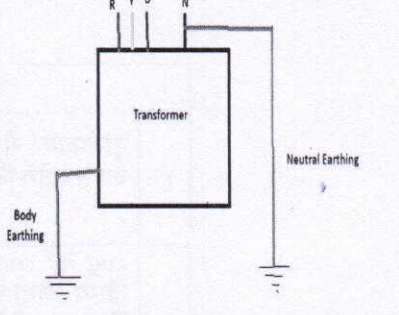

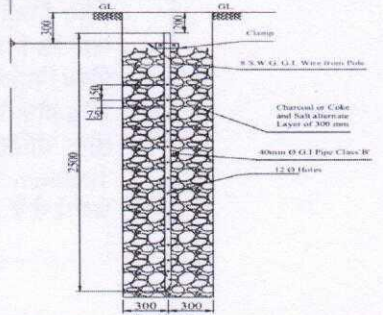
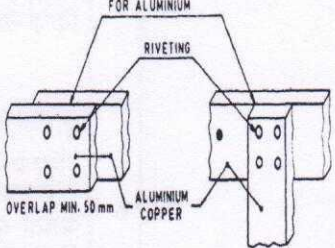
- (1) आवेदक से अशिष्ट व्यवहार कदापि न करें। यदि कोई कार्य निगमिय नियमों की परिधि में संभव न हो तो धैर्यपूर्ण रूप से आवेदक को अवगत करा दें।
- (2) विद्युत सुरक्षा निदेशालय से नियमानुसार निरीक्षण कराये बिना विद्युत तंत्र का ऊर्जीकरण न करें।
- (3) चोरी की सामग्री से निर्मित लाइन ऊर्जीकृत न करें।
- (4) विद्युत तंत्र निर्माण में प्रयुक्त सामग्री का निरीक्षण करने में विलम्ब न करें। विलम्ब की दशा में दोषी कार्मिकों के विरुद्ध कार्यवाही करें।


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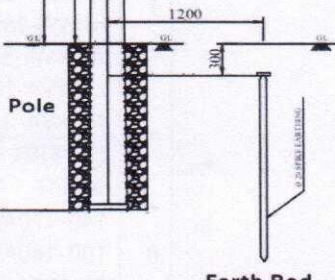
Annexure-A

परिवर्तक (ट्रांसफार्मर) कार्य		
1	ट्रांसफार्मर से लाइन को जोड़ने के लिए Lugs का उपयोग किया जाए।	
2	Lug को crimping tool माध्यम से ठीक से क्रिम्प किया जाये। Lugs के अच्छी प्रकार से क्रिम्प न होने पर स्पार्किंग होती है, जिससे ट्रांसफार्मर तथा केबल, दोनों के क्षतिग्रस्त होने की सम्भावना होती है।	
3	ट्रांसफार्मर के नीचे उसे बेस एंगल से कसे जाने हेतु स्लॉट दिया जाता है। डबल पोल पर स्थापित ट्रांसफार्मर को नट और बोल्ट के माध्यम से ही बेस एंगल पर कसा किया जाये।	
4	प्लिंथ निर्माण के समय ही यह सुनिश्चित किया जाये कि निर्माण सामग्री मानक के अनुरूप हो। प्लिंथ निर्माण में चैनल के नीचे 150mm कंक्रीट स्लैब होना चाहिए। इसके नीचे ईंट (ब्रिक वर्क) होना चाहिए। प्लिंथ की कुल लम्बाई(हाइट) 1200mm होनी चाहिए। सभी विन्यास इस प्रकार से हैं - 1500mm*1500mm*1200mm।	
5	Jumpering के लिए PG clamp का उपयोग किया जाए।	
6	ट्रांसफार्मर के LT bushings पर Copper L clamp का उपयोग किया जाए। इससे ट्रांसफार्मर बुशिंग्स पर मैकेनिकल लोड नहीं पड़ता एवं टर्मिनल्स तथा LT केबल का लग बिलकुल फ्लैट जॉइंट हो जाता है जिससे loose/uneven कनेक्शन नहीं होता।	
7	Transformer HT में fuse wire का उपयोग किया जाए। विभिन्न ट्रांसफार्मर पर लगाए जाने वाले फ्यूज वायर की रेटिंग निम्नवत है : 25kVA-40SWG 63kVA-38SWG 100kVA-33SWG 250kVA-26SWG 400kVA-23 SWG	
8	ट्रांसफार्मर के LT पर प्रत्येक सर्किट पर लोड के अनुसार फ्यूज वायर लगाया जाये : 140-170Amp-12SWG 100-140Amp-14SWG 70-100Amp-16SWG 50-70Amp-18SWG Below 50 Amp-20 SWG	


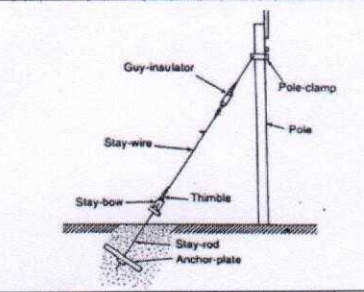
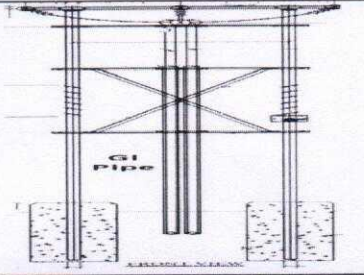

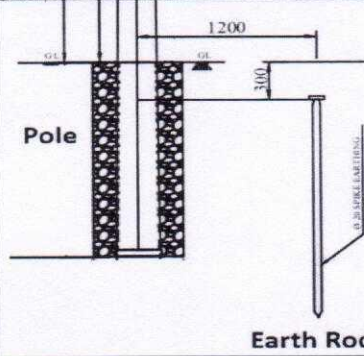
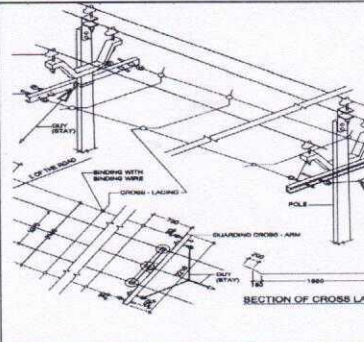
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9	<p>ट्रांसफार्मर पर neutral तथा body earthing earthing अलग-अलग की जानी चाहिए ट्रांसफार्मर की न्यूट्रल अर्थिंग करने से आउटपुट वोल्टेज स्थिर होता है तथा बॉडी अर्थिंग से ट्रांसफार्मर से करंट लगने का खतरा कम होता है </p>	
10	<p>100kVA क्षमता तक के परिवर्तक की बॉडी अर्थिंग तथा न्यूट्रल अर्थिंग हेतु 25*3 mm galvanised iron GI फ्लैट्स का प्रयोग किया जाये 100kVA से अधिक क्षमताके परिवर्तक की बॉडी अर्थिंग तथा न्यूट्रल अर्थिंग हेतु 50*3 mm galvanised iron GI फ्लैट्स का प्रयोग किया जाये </p>	 <p>Neutral Earthing with Flat GI Strip</p>
11	<p>पाइप अर्थिंग करते समय यह सुनिश्चित करें कि पाइप इलेक्ट्रोड का गहरा वाला सिरा भूमि में 2700mm नीचे तक जाये एवं इसका ऊपरी सिरा भूमि के 200mm नीचे रहे पाइप इलेक्ट्रोड के 2500mm गहराई के 300mm radius में कोयले तथा नमक का मिश्रण होना चाहिए </p>	
12	<p>अर्थिंग स्ट्रिप में यथासंभव जोड़ कम से कम होने चाहिए जहाँ जोड़ लगाया जाये वहाँ कम से कम 50mm ओवरलैपिंग की वेल्डिंग की जाये यदि कंडक्टर जोड़ना हो तो फ्लैट वॉशर के साथ लग लगा कर नट-बोल्ट से टाइट किया जाये </p>	<p>BRAZING FOR COPPER AND WELDING FOR ALUMINIUM</p>  <p>180° Straight Joint (Strips) 180° T Joint (Strips)</p>

लाइन कार्य

1	<p>पोल को भली-भांति अर्थ करने की लिए अर्थ-रॉड को भूमि के अंदर इस प्रकार से गाड़ें, की उसका ऊपरी सिरा भूमि सतह से 300mm नीचे रहे अर्थ-रोड की पोल से दूरी 1200mm होनी चाहिए अर्थ-रॉड को पोल से जोड़ने वाली GI वायर टूटी नहीं होनी चाहिए </p>	
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2	<p>एसटीपी (Steel Tubular Pole) muffing, ग्राउटिंग से भिन्न है। ग्राउटिंग जमीन के नीचे होती है। muffing जमीन की सतह से 300mm ऊपर तक की जाती है तथा उसके ऊपरी सिरे में ढलान रखी जाती है, जिससे एसटीपी के पास पानी न जमा हो।</p>	
3	<p>स्टे-सेट में Guy insulator लगाया जाये। Guy insulator स्टे वायर के निचले हिस्से को इलेक्ट्रिकली isolate करने के लिए लगाया जाता है। इसे अवश्य लगाना चाहिए जिससे स्टे-वायर में करंट आने की दुर्घटनाएँ रोकी जा सकें।</p>	
4	<p>11 केवी केबल की Hoisting GI पाइप के अंदर से की जाए। यह भी सुनिश्चित किया जाये की GI पाइप का नीचे वाला सिरा भूमि की सतह के अंदर गड़ा हो। यह केबल को सुरक्षित रखता है।</p>	
5	<p>किसी भी पोल की ग्राउटिंग उस पोल की लम्बाई के 1/6th पार्ट की करी जानी चाहिए। ग्राउटिंग करते समय सीमेंट:रेत:गिट्टी का अनुपात 1:4:8 का होना चाहिए।</p>	
6	<p>HT XLPE केबिल को spike earth rod के माध्यम से अर्थ किया जाये। Earth rod को भूमि के अंदर इस प्रकार से गाड़ें, की उसका ऊपरी सिरा भूमि सतह से 300mm नीचे रहे।</p>	
7	<p>HT लाइन की रोड क्रॉसिंग एवं अन्य संवेदनशील स्थानों पर गार्डिंग अवश्य की जाये। इसका विंग स्पान 2150mm होना चाहिए तथा हर 2000mm की लाइन की लम्बाई पर क्रॉस लेसिंग की जाये।</p>	

Signature
10.6.2016



UPPCL

U.P. Power Corporation Limited

GUIDELINES FOR LAYING UNDERGROUND CABLE IN POWER DISTRIBUTION

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10.6.2016

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10.6.2016

Table of Contents

<u>Particulars</u>	<u>Page No.</u>
1. U/G Cable Laying & Installation	13
Selection of The Route.....	13
Network Planning.....	13
Clearance.....	14
Depth of cable laying	14
Width of Cable	14
Bending Radius of Cables.....	14
Maximum Permissible Tensile strength for cables.....	14
Methods of Laying	15
Cable over Bridges	21
Earthing of cable.....	21
General Guidelines for Laying Cables.....	21
procedure of Laying.....	22
Excavation of the Trenches.....	23
Excavated Material	23
Pipe and Ducts	23
Jointing of Cables.....	24
Back Filling Tranches and Temporary Reinstatement.....	26
Permanent reinstatement of public road, Footpath & ground in private property.....	26
Cable Route maker	26
Cable Support/Clamps	26
Installation of cables in tunnels/basement/below the panels.....	27
Cable protection at overhead towers or poles.....	27
Sun shades	27
Route plan.....	27
Site facilities to be maintained by the contractor.....	28
Testing.....	28
Barricading and safety requirement.....	29

ANNEXURE-C: Checklist for Receipt/Storage/Pre-Installation/Installation of U/G Cable

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U/G Cable Laying & Installation-

Selection of the route: The cable route selection shall be done by the concerned Junior Engineer/Supervising engineer by first conducting joint route survey with contractor keeping the following points in mind-

- i. The side of road, which presents the least obstacles and the fewest roadways crossings.
- ii. The future consumers and existing cables
- iii. Railway, NHAI road crossings, PWD, Road pertaining to Municipal area/other government department.
- iv. Plans for future building projects.
- v. Identification of routes for laying cable(s) for alternative/double supply and feasible locations for installing associated RMUs.

The cable route shall be as far as possible away from parallel running gas, water pipes and telephone/telecommunication cables. Location with least damage conditions for cable joints and end terminations should be selected as required.

The contractor shall follow the routes indicated on the approved specification drawings as accurately as possible. Deviations from the routes laid down shall not be made without the authorized officers' approval. The final position of cable relative to kerbs, boundaries, and other services shall, where necessary, be indicated to the contractor by the engineer on site and must be strictly adhered to. In general, where obstacles not provided for in the specification drawings are encountered, cables shall circumvent such obstacles by being laid in as smooth a path as possible around the obstacles and by retaining maximum separation between cables.

Network Planning-

- i. UG network shall be planned in such a manner that reliable supply can be ensured by allowing quick restoration of supply through alternative source/circuit in case supply from main source/circuit gets disrupted.
- ii. For ensuring supply reliability of HT network installation of RMUs may be included in the network plan. Similarly, for reliability of supply in LT Network Auxiliary Distribution Boxes may be included in the planned network.
- iii. Discom shall identify appropriate locations to install RMUs/Distribution Boxes at the time of survey only so that seamless switching is made possible in the network.
- iv. RMUs will have at least two sources. Similarly, the auxiliary distribution boxes will have to be provided with supply from two or more Distribution Transformers.
- v. HRC fuses for outgoing and Fuse links for incoming may be used in Distribution Boxes. Discom may use additional protection as per requirement.
- vi. Auxiliary Distribution Boxes / Distribution Pillar Boxes can be customised as per site conditions like No visible hinges when Box closed, Locking system, CRCA sheet etc.
- vii. Parallel HT cable should run for same HT network in a single Cable Trench shall be avoided.
- viii. Cable raisers/exposures to connect HT overhead / HT network shall be avoided. Even if Discom requires to include them in the network, they shall be provided after continuous underground cable lengths of 1 KM or more.
- ix. The switchgear shall comply with relevant Indian/International standards IS 61439/62271.


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Clearance

The desired minimum clearances are as follows –

- i) Power cable to power cable – A minimum clearance equal to diameter shall be maintained. Trench drawings shall be referred for guidance.
- ii) Power Cable to control cables – 0.2 mtr.
- iii) Power cable to communication cable – 0.3 mtr.
- iv) Power cable to gas/water main – 0.3 mtr.

Depth of Cable Laying

Minimum depth of laying from ground surface to the top of cable as per IS is

- i) Low voltage (1.1 kV) and Control cable – 0.75 mtr.
- ii) 3.3 kV to 11 kV Cables – 0.90 mtr.
- iii) 22 kV to 33 kV Cables – 1.05 mtr.
- iv) Cables at Road crossing – 1.00 mtr.
- v) Cables at railway level crossings (measured from bottom of sleepers to the top of Pipe) – 1.00 mtr.

Note-The depth may be increased but not more than 1.6 M.

Whenever there is any obstacle at the laying depth, the cable should be lowered/ raised to cross the obstacle. However, variation in the depth must be approved by competent authority of Discom. The Contractor shall provide the same in deviation report.

Width of Cable-The width and depth of Cable Trenches shall depend upon number of circuits and Voltage Grade. Drawings of this specification are shown in the document itself.

Bending Radius Of Cables- While pulling of the Cable from the drum or during laying following minimum bending radius shall be maintained so that the cable, in particular the insulation does not get damaged. Minimum permissible bending radii for cables must be as below-

- i) Single Core Cables (PVC & XLPE)
 - a) Up to 11KV grade – 15 x D
 - b) Above 11KV grade - 20 x D
- ii) Multi Core Cables (PVC & XLPE)
 - a) Up to 1.1KV grade - 12 x D
 - b) Above 1.1KV grade – 15 x D

Where 'D' is overall diameter of the cable

Maximum Permissible Tensile Strength For Cables

- i) For cables pulled with Stocking
 - a) PVC and XLPE insulated armoured cables $P = 9 D^2$
 - b) PVC and XLPE insulated unarmoured cables $P = 5 D^2$

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Where P= pulling force in Kgm, D= Diameter of Cable in mm

ii) For cables pulled by Pulling eye- The maximum permissible tensile stress must be as below-

a) Aluminium conductor – $30 \text{ N/mm}^2 \approx 3 \text{ Kgf/sq. mm}$

b) Copper conductors – $50 \text{ N/mm}^2 \approx 5 \text{ Kgf/sq. mm}$

Permissible force is calculated by multiplying the above values by cross sectional area (CSA) of conductor of each core and then number of cores.

Methods of Laying

- i) Cables shall be laid in direct in ground, in trenches excavated therein and shall be protected with covers as given in the drawing. Cables shall also be drawn into pipes of ducts or laid in the formed trenches or troughs or on racks or supported in trays or cleats as required by the site exigencies. Where the cables are laid in the formed trenches, the installation shall include removal and replacement of the trench covers and the provision of temporary protective covers on the trenches where they cross the access ways.
- ii) HDPE (160/200 mm) pipes shall be used where cables cross roads and railways tracks. Spare ducts for future extensions should be provided. Spare duct should be sealed off. Buried ducts or ducting blocks shall project into footpath or up to the edge of road, where there is no footpath, to permit smooth entry of cable without un-due bending. The diameter of the cable conduit or pipe or duct should be at least 1.5 times the outer diameter of the cable. Angular alignment of the duct across road crossings shall be predetermined to maintain safe bending radius when direction of cable trench changes before or after the road.
- iii) The contractor shall lay cable in unavoidable circumstances by horizontal direct drilling (HDD) in main roads and highway with heavy traffic, passage to public property where excavation is not possible. Contractor shall take approval for laying of cable by means of HDD wherever required from the competent authority of Discom. The cable laid by HDD shall be minimized so that it doesn't exceed by 12% of total route length. This is to avoid De-rating of Cables.
- iv) Unless approved by Discom, the contractor shall lay the cables, direct in ground, in single layer. The cables shall be laid with the pre-determined and approved cable route.
- v) Spacing shall be maintained uniformly between the cables all along the length including the bends, as approved by Discom. To maintain the spacing, suitable non-metallic spacers shall be placed uniformly at intervals not exceeding 5 meters. Every bend shall have at least one spacer.
- vi) 75 mm of the sand bed shall be placed at the bottom of cable trench.
- vii) After the cables have been laid the trench shall be filled with the sand and shall be well rammed to a level not less than 75 mm above the top of the cables all throughout the route.
- viii) To protect the cables against external mechanical damage, which may be caused by other agencies, the cable shall be protected by suitable RCC cover (for dimensions of RCC cable cover refer cable laying drawing)

The type of the covers shall be as under

a) 1.1KV Cables – Single layer of brick thickness not less than 75 mm (3 inch)

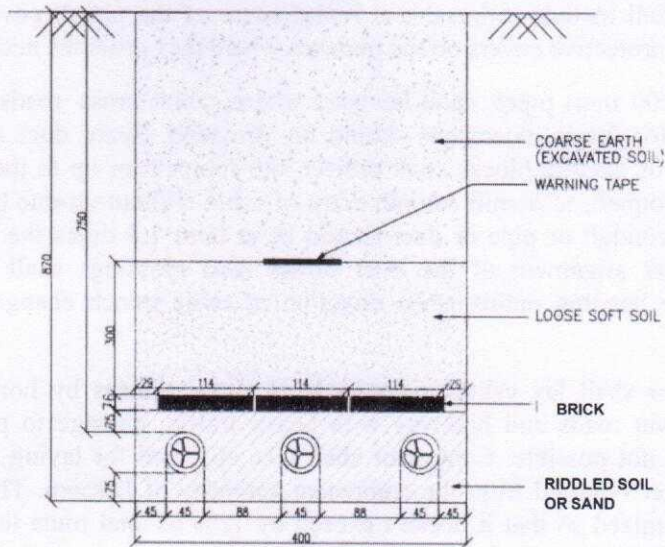
b) 11KV Cables – sand stone of thickness not less than 75mm (3 inch).

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c) 33KV Cables shall be protected by reinforced concrete cover of width 300 mm as per attached drawing with thickness not less than 50mm.

The RCC cable cover shall be embossed as "Discom name 33 or 11 KV or LT CABLE" whichever is applicable.

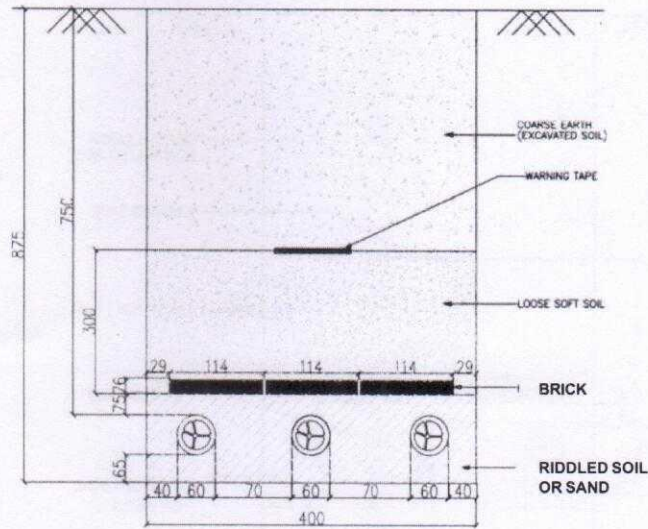
- ix) The warning tape shall be installed continuously. Tape shall be yellow in colour with Black / Red lettering of minimum 20mm height. The approved warning message shall be written in English and Hindi. The minimum thickness and width of the tape should be 300 microns and 150 mm respectively.
- x) The trench shall be filled-up by soft soil (300mm) and Excavated soil as indicated in drawings.



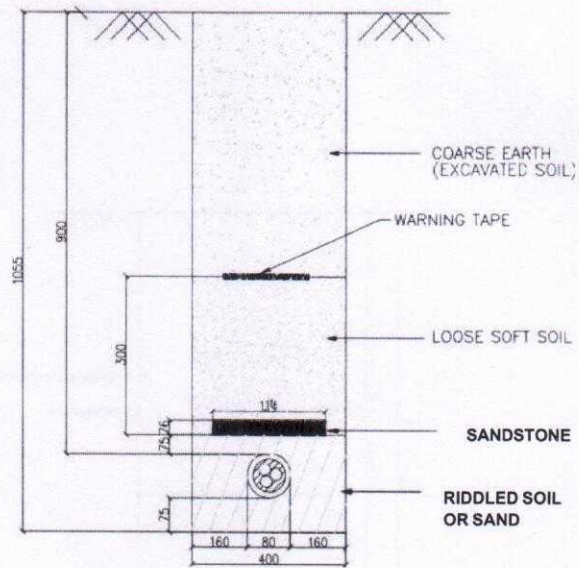
Drawing 3.1 – 1.1kV, 150sqmm Buried Cable

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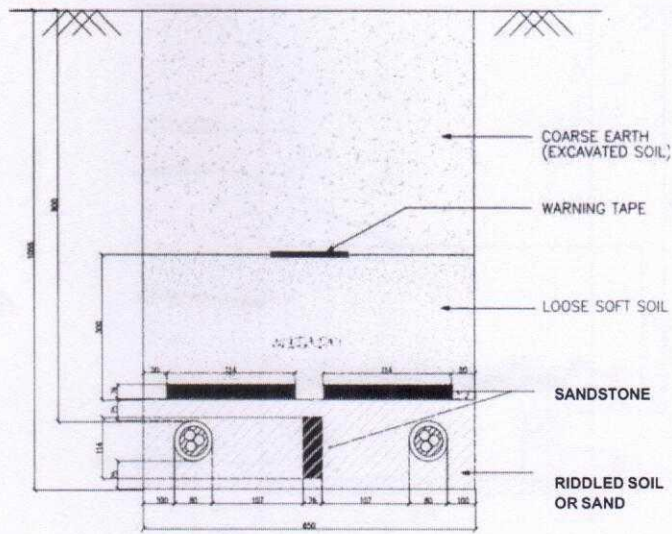


Drawing 3.2 – 1.1kV, 300sqmm Buried Cable

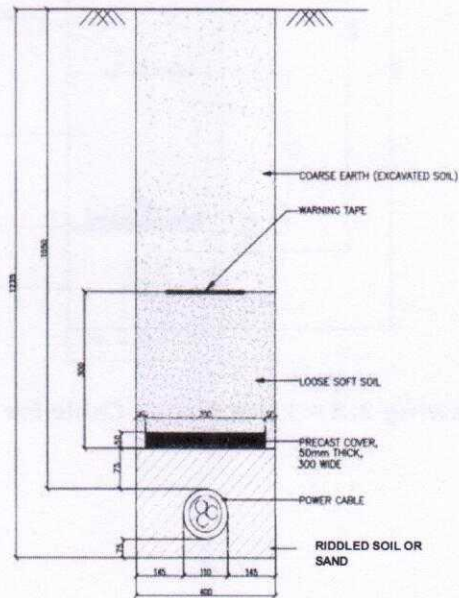


Drawing 3.3 – 11kV Buried Cable for Single Circuit

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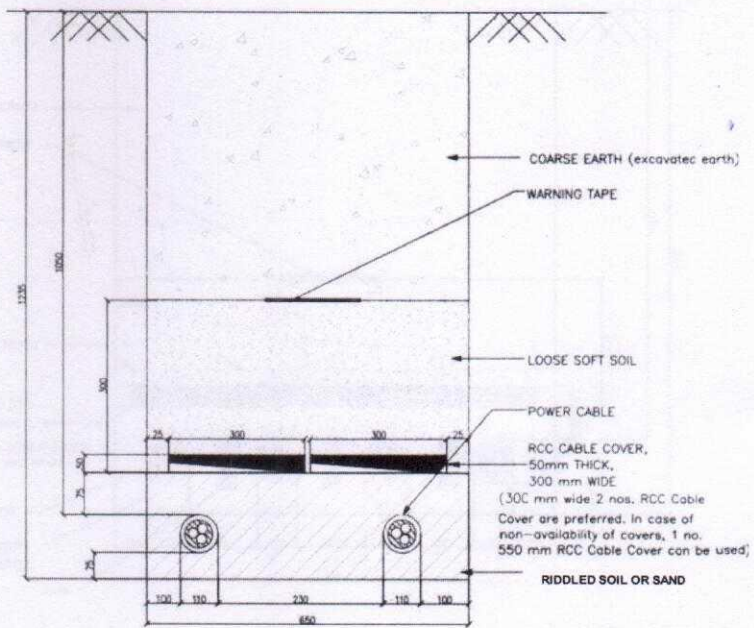


Drawing 3.4 – 11kV Buried Cable for Double Circuit

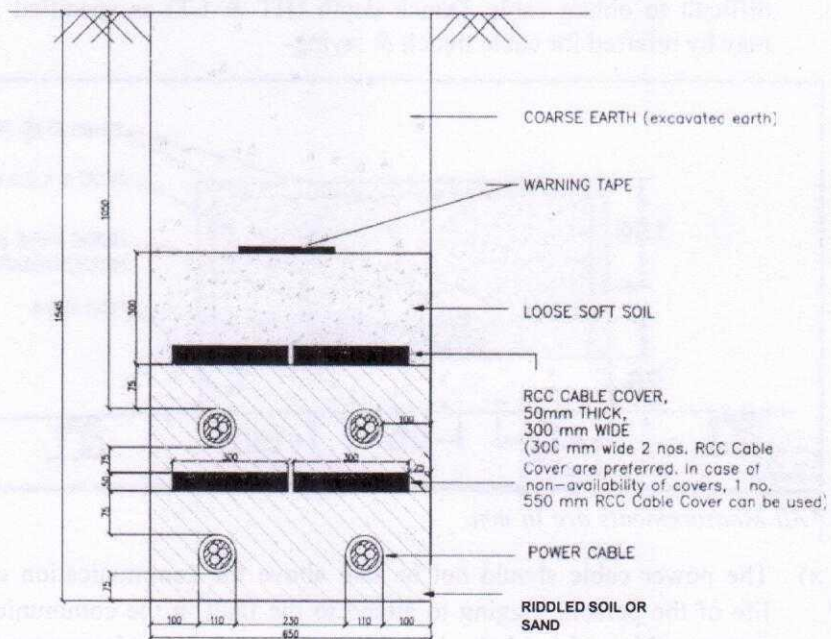


Drawing 3.5 – 33kV Buried Cable for Single Circuit

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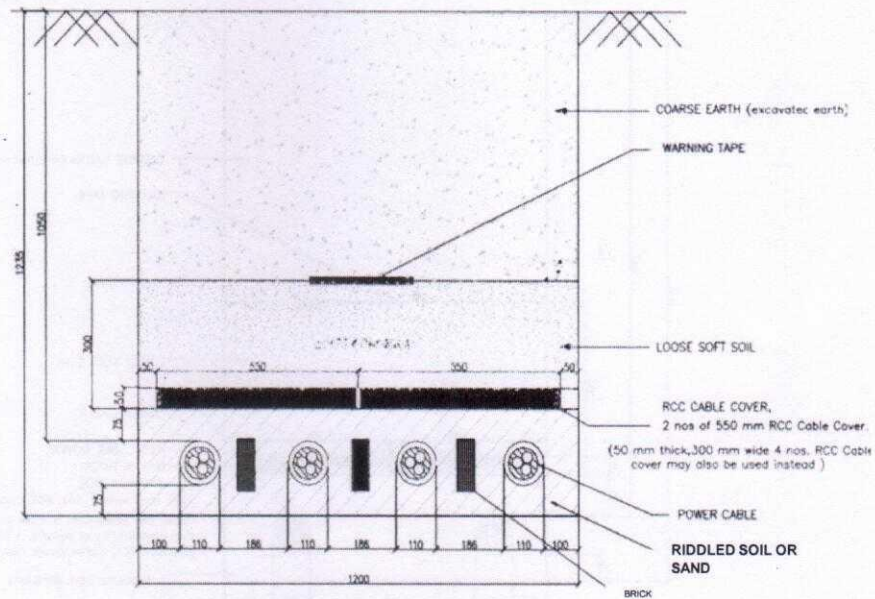


Drawing 3.6 – 33kV Buried Cable for Double Circuit



Drawing 3.7 – 33kV Buried Cable Option-1 for Four Circuits (Permissible In very acute conditions)

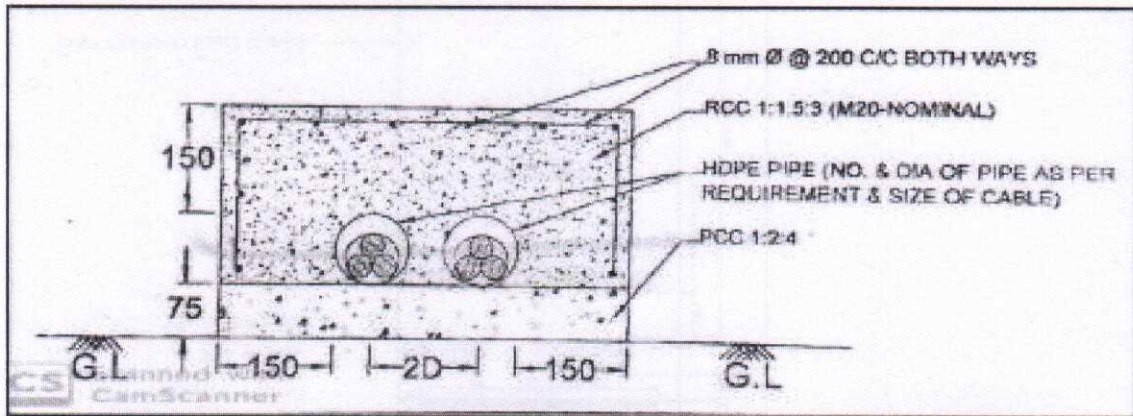
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Drawing 3.8 – 33kV Buried Cable Option-2 for Four Circuits

**All Measurements are in mm*

- xi) For cable laying at depth less than specified in the specifications – Areas where it is difficult to obtain cable Trench depth (HT & LT) as specified above, following drawing may be referred for cable trench & laying-



**All Measurements are in mm.*

- x) The power cable should not be laid above the communication cables, to avoid danger to life of the person, digging to attend to the fault in the communication cable. While laying power cables, the likely interference to existing telecommunication cables should be avoided by referring to and co-ordinating with the communication authorities.
- xi) Based on the site condition, if still an exception arises for cable depth from these guidelines/approved technical specifications a deviation report along with details and picture of the precautionary measure need to be prepared. The site engineer must ensure that precautionary measure should prevent any damage to the cable under adverse conditions.

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- xii) Apart from the methods of laying cable direct in ground and in ducts detailed above, there are other methods of cable laying mentioned below-
- a) **Laying on racks in air-** This method is employed for laying cable inside buildings, industrial plants, generating stations, substations and tunnels. In this method, cables are generally installed on racks fixed to the walls or supported from ceiling where racks may be ladder or perforated type and may be either fabricated at the site or pre-fabricated.
 - b) **Laying on racks inside a cable tunnel-** The difference between cable laying on racks in air and that inside a tunnel is with respect to heat dissipation. Here heat dissipation takes place through walls of tunnel hence, there is an increase in the temperature of the cables installed in the tunnel so a proper de-rating has to be applied to the current carrying capacity of the cables installed in the tunnel accordingly.
 - c) **Laying along buildings or structures-** Cables can be routed inside the building along with structural elements or with trenches under floor ducts or tunnels. The route of proposed cable should be such that intersection with other cables will be minimum. The route should not subject these cables to any vibrations, damage due to heat or other mechanical causes, otherwise adequate precautions should be taken.

In IS 1255 the merits, demerits including application of these methods is given under Appendix-B. It may be referred for selection of suitable method of cable laying as per requirements for eg; Cable laying on racks in air is suitable for power stations, sub-stations etc., laying on racks inside cable tunnel is suitable for power stations, switchyard, control room.

Cable over Bridges-

On Bridges the cables are generally supported on HDPE cleats and clamped on steel supports at regular intervals. Approval from appropriate authorities (PWD/railways) as applicable shall be taken by contractor. the cable laid in bridges shall be provided with sun-shields for protection against direct heating by sun rays as advised in IS 1255.

Earthing of Cables

- i) Single point bonded earthing shall be employed to prevent flow of induced circulating current in the armour & screen and consequential de-rating of cables for **single core cables** having length less than 2.0 KM. For all other cases cross bonding shall be provided.
- ii) Earthing and Bonding should be done in accordance with IS 3043.

General Guidelines for Laying Cables

- i. Laying of the cables and handling of the same shall be undertaken, at all times, by adequate staff suitably trained and supplied with all the necessary plant, equipment and tools.
- ii. The contractor shall be responsible for all the route survey, establishment of the position of the joints as per the site requirement and the drum lengths of cables to be laid. While carrying out the route survey the contractor shall take into account the obstacles on the route whether above or below ground. The cable shall be planned to be laid in an orderly formation, free from unnecessary bends and crossings

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- iii. The contractor shall submit a drawing for the complete scheme showing the entire route, road crossings, location of joints and also the arrangement of cables to be laid. In case due to site exigencies, cables have to cross over within the trench, the same shall be shown in the drawing. For each and every job, this drawing shall be approved by Discom, prior to commencement of work.
- iv. Contractor shall arrange for all the material and manpower required for jointing and end termination. The Contractor shall provide pit, carry out excavation for creation of working space required for jointing by the jointer. The contractor shall carry out all civil works, structural work, clamping and earthing, so that the cables and accessories perform satisfactorily during the entire lifetime.
- v. The entry and exit of the cables into the building shall be through RCC or GI pipe except for single core cables, which shall be properly sealed and shall be duly supported as per the method and technique approved by PVVNL, so that the outer sheath of the cable does not get damaged at the entry and exit points. The sealing should be of adequate length so that it minimizes the risk of spreading of fire or ingress of water.

Procedure of Laying

- i) The ground over which the drum is positioned at site should be properly consolidated and jacks placed on both sides of the drum to make the pay-out arrangement stable. Suitable arrangement be made to stop the drum rotation, during cable laying preferably by square wooden poles kept temporarily pivoted over cable roller under the flanges which when required can be applied on the flange as a brake by personnel manning the drum.
- ii) The cable should always be paid-out from the top of the drum. The drum must be positioned in such a way that the arrow on the drum points opposite to the direction of rotation marked on the drum.
- iii) It must be ensured that the cable is not dragged over sharp object or on the road surface, so as to avoid damage to the outer sheath of the cable.
- iv) The pulling method to be used shall be approved by Discom. Cable supplier's recommended maximum pulling tension shall not be exceeded.
- v) Rollers shall be placed at intervals and the cable shall be pulled over the rollers. The rollers shall be kept lubricated so that they rotate freely, minimize friction to the cable in motion. Rollers shall be positioned at the bends to minimize sidewall friction. The contractor shall ensure that PVC/HDPE sheath of cable is free from damage due to abrasion.
- vi) The cable should not be pulled out from the drum by lifting of the coil while the drum is lying flat on the flange. This leads to twisting of the armour and cores resulting in permanent damage to the cable.
- vii) To avoid ingress of moisture, it must be observed that the end capping of the cables is not damaged. Cut pieces of the cables must be capped immediately, before laying of the same is taken-up.

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Excavation of the Trenches

- i) The excavation of the trenches shall be commenced, with proper approvals from various authorities well in time.
- ii) Before opening of the section of the trench, the contractor shall satisfy himself that the line of the trench is clear of underground obstructions, by taking out trial pits on the line of the trench.
- iii) The exact location of each trench shall be approved on site by Discom. The trenches shall be kept as straight as possible and each trench shall be excavated to approved formation and dimensions. If necessary, the trenches shall be adequate shored by wooden planks and bracing to avoid trench cave-ins which would cause injury to the persons and also damage the cables laid.
- iv) The bottom of each trench shall be firm and of smooth contour. The contractor shall take reasonable precautions to prevent damage to the highway or ground surface from a slip or breaking away of the sides of the trench.
- v) The trench excavation and filling in shall be so executed that all walls, roads, sewers, drains, pipes, cables, structures, places and things shall be reasonably secured against risk of subsidence or injury and shall be carried out to the satisfaction of the authorities concerned. Should, however, a damage to an existing or other services be made, the Contractor will arrange and pay for any necessary repair, to make good the damages.
- vi) Where trenches pass from a footway to a roadway or at other positions where a change of level is necessary, the bottom of the trench shall rise or fall gradually. The rate of rise or fall shall be approved by Discom.
- vii) Contractor shall ensure that during excavation and until restoration has been completed, for reasonable access of persons and vehicles to property or places adjacent to the route.
- viii) When the excavation of the trenches has been accurately executed, the contractor shall inform Discom for approval. Laying of cables or building of structure shall not be started until the contractor has been advised by Discom to proceed with the work.

Excavated Material

- i) The materials excavated from each trench shall be placed so as to prevent nuisance or damage to adjacent ditches, drains fences, gateways and other property or things. Excavated material shall be stacked so as to avoid undue interference with traffic.
- ii) Where, owing to traffic or for reasons of safety or other considerations, this is not permissible, the excavated material shall be removed from the site and returned for refilling the trench on completion of laying; surplus material shall be disposed off by the contractor at his own cost.

Pipes and Ducts

- i) Care shall be taken to make the bend of the pipes or duct lines as easy as practicable and in no case of radius less than 3 meters. Where approved, split pipes may be used on bends, the pipes being fitted round the cable after laying.
- ii) All road crossings shall be ducted. This applies to present and future roads as indicated on the route plans. The pipes and the ducts shall be laid in an approved manner and shall be surrounded by 150 mm of PCC (1:2:4)

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- iii) Ducts under the road shall be provided by the contractor, by non-disruptive method, if road cutting is not permitted by the concerned authorities Cable laying shall be done by Horizontal Direct drilling method (HDD).
- iv) The cables shall be suitably protected at entry and exit from the pipes, so that the outer sheath does not come in contact with the edges of the pipes / ducts. The pipes and ducts shall have slope so that the seepage water can drain through the small opening provided on the lower side of the pipe sealing.
- v) The pipes and ducts shall be secured to the base at both ends and at regular interval, throughout the length, so that at no point the ducts or pipes get suspended over the threaded cable, and damage the same, thus defeating the very purpose of providing the pipe / duct.
- vi) At all road crossings at least one spare duct / pipe shall be provided for future use. The pipe shall be thoroughly cleaned of obstructions. A draw wire or rope shall be left in each pipe to facilitate the drawing in of the cables. The duct end shall be sealed temporarily to prevent the entry of foreign matter. End caps and permanent markers shall be placed flush with footpath / roadways at both the ends. The pipes and ducts shall be cleaned again immediately before the cables are drawn in.
- vii) The internal diameter of the pipe / duct should be such that the cables occupy about 45% of the area of the pipe / duct to avoid de-rating.

Jointing of cables

3.16.1 Types of Joints-

- i) Straight Through / Transition Joints - These Joints are used for connecting two cables in the run.
- ii) Termination or sealing end – This is generally used to connect a cable to switchgear terminals, H.T. pillars, transformer boxes and OH lines etc. GIS End termination should be used wherever required.

Requirements of Cable Joints

- i) Resistance of the jointed conductor should be equal to or less than resistance of the conductor of the same length.
- ii) Connector & lug should have a mechanical strength should be comparable to that of the conductor.
- iii) Thickness of built up insulation should be equal to or more than thickness of insulation of cable.
- iv) The Joint should provide proper mechanical protection to the insulated cores against damage by impact.
- v) The joints should ensure the continuity of metallic sheath or armour.
- vi) Proper stress control shall be provided to eliminate occurrences of high electrical stresses at screen cut points and over crimped connector.
- vii) The Joints shall be provided with an outermost layer resistant to corrosion by chemical effect.

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Besides the above requirement, cable joints should be simple and compact. It should require minimum time for jointing. It should be mechanically strong to withstand dynamic stresses due to short circuit current and impacts. The joints should further be resistant to corrosion and other chemical effects.

Preparation before Jointing

- i) A proper joint position should be selected for jointing. The joint pit should be of sufficient dimensions as to allow jointers to work. Sides of the pit should be well covered with tarpaulin sheets to prevent loose earth from falling.
- ii) When jointing cables in water logged ground or under monsoon conditions, sump hole should be excavated at one end of the joint pit in such a position so that the accumulating water can be pumped out or bailed out without causing interference to the jointing operation.
- iii) The jointing as far as possible is to be carried out inside a tent. Before proceeding for jointing, on the existing cable, it is very essential to identify the cable to be jointed.
- iv) For jointing of high tension cables, the cable should be made dead and earthed before commencement of the jointing. This should be confirmed by spiking method.
- v) Cleanliness is the most important factor in all jointing work. All tools should be clean and dry at the time of the jointing process. Cleanliness while handling the insulation is very important. Any contamination of the insulation by dust or moisture is detrimental to the joint.
- vi) In case of paper cables, the cable seals should be examined for any damage or puncture. The paper insulation should then be tested for the presence of moisture. This is done by dipping the insulation paper in hot G-38 compound (110 Deg - 120 deg.C). Care should be taken not to touch the paper with hand. Paper should be held with a plier which should be slightly warm. If moisture is present in the sample, it will be detected easily by a bubbling or crackling sound. In case of faulty cable, if on test moisture is detected, then further test would have to be carried out to arrest moisture. The cables to be jointed should then be meggered to check the condition of the insulation and a further check of further continuity of cables and tracing out cables to be jointed is necessary. While attending fault in paper cable after cutting the cable at jointing point, both sides of the cable shall again be tested for further faults. Number on cores represents the phases. But these should never be taken for granted. Crossing of the core should be avoided in a joint.

Process of jointing

The process of jointing mainly consists of-

- i) Connecting conductors together
- ii) Replacing the machine applied insulation
- iii) Providing earth continuity
- iv) Providing mechanical protection

Conductor joints should satisfy the following basic requirements-

- i) Ensure conductivity of the conductor by proper crimping.

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- ii) Leave a reasonably smooth finish and profile on the conductor joint so as to avoid under stress concentration.

Back Filling Trenches and Temporary Reinstatement

- i) Filling in of trenches shall not be commenced until Discom has inspected and approved the cables and accessories at site. The inspection should be done on daily basis so that the trenches do not remain open unnecessarily, to avoid inconvenience to public.
- ii) Where cables routes are in public highways, footpaths, gardens etc., the method of reinstatement will be subject to approval by concerned department. All costs incurred will be at the contractor's expenses.
- iii) The contractor shall be responsible for proper permanent reinstatement of the upper levels, which shall be carried out to the satisfaction of Discom and the concerned department./MCD authorities concerned.
- iv) Before finally leaving site, permanent reinstatement shall be executed by the contractor to the approval of concerned department./MCD and the property owners and all costs incurred shall be to the contractor's account.

Permanent reinstatement of Public Road, footpath & ground in private property

- i) In public roads and footways the surfaces and foundations shall be temporarily reinstated by the contractor. After settlement, temporary reinstatement material shall be removed as necessary and the permanent reinstatement shall be carried out to the approval of the appropriate concerned authority/MCD. Stone and pre-cast concrete paving kerbs and channels shall also be finally reinstated by the contractor.
- ii) Temporary reinstatement shall be maintained by the contractor until commencement of final reinstatement to ensure that the surface is always safe for the passage of pedestrians and vehicular traffic.

Cable Route Marker

- i) Route Indicators must be provided at every 200 meters or less and also at turning points of the power cable route wherever practicable. These indicators must have information like name of utility, cable operating voltage engraved on them along-with danger sign marked on them. Contact details must also be marked on these markers so that the concerned may be informed in case of accidents/excavation by other utility.
- ii) Concrete/RCC route markers shall preferably be used. It must be permanent and durable.
- iii) The route markers shall be of approved design. Additional markers shall be provided at joint locations with approved markings.

Cable supports / clamps

- i) The contractor shall supply and install all the supports, racks, trays, cleats, saddles, clips and other parts required to carry and secure the cables, without risk

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so that there is no undue mechanical load or stress due to weight of the cable at each end. Cleats, saddles and clips shall be of the design as approved by Discom. No cable shall be laid on the trench floor. They shall be run in a neat and orderly manner and the crossing of cables within the trench shall be avoided as far as possible. Where cable runs unavoidably cross, a suitable supporting arrangement shall be provided to maintain an adequate gap between the cables.

- ii) Every cable shall be supported at a point not more than 500 mm from its termination.

Installation of cables in tunnels / basement / below the panels

- i) The design of cable support for cables installed in air in cable tunnels, basements etc. shall consist of vertical steel members spaced at approved interval and secured to the walls, floors and ceilings as necessary by means of bolts either cemented in position or expanded into cored holes. Each vertical support shall have bolted to it a number of steel brackets spaced at the intervals and designed to support and retain trays constructed of galvanized sheet steel of adequate section to carry the weight of the cables, plus space for an additional quantity of future cables at least 25% by weight and dimensions in excess of the cables installed under the contract and an additional load of 100 kg at the extremity without distortion. The trays shall be designed with raised edges to retain the cables and shall incorporate an interlocking feature so as to prevent movement between supports.
- ii) The design and construction of all cable cleating and supporting arrangements shall suit the cable system design. The spacing of cable supports shall be approved by Discom.
- iii) Cable run on trays shall be neatly dressed and where not provided with cleats shall be secured by heavy gauge, type approved metal reinforced, clips or saddles. Not more than six cables shall be embraced by one clip.
- iv) Mild steel of appropriate sections, duly painted in an approved manner, shall be used for fabrication of cable supports. The steel shall be free from blisters, scales, laminations or other defects. Before final painting, the steel sections shall be provided with double coat of red primer.

Cable protection at overhead towers or poles

Where the cables terminate on overhead line poles or towers located outside substation compounds the contractor shall provide suitable cable supporting galvanized steel work attached to the pole or tower and comprising backboard, runners, sheet, steel cover of not less than 3.0mm thickness, stays, cable cleats, anti-climbing guard and all incidental items to provide secure protection for the cables. Isolators and Lightning arrestor. The erection and steel structure required shall also be in scope of the contractor.

Sun shades

All cables shall be protected from direct solar radiation by ventilated sun shields as approved by Discom.

Route plan

- i) Contractor should get updated the GIS map of Discom of route along with joints and other obstructions.


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- ii) During the progress of the contract works the contractor shall record on a set of route plans and cross section drawings of an approved form, these details so that the same can be transferred on the GPS maps. Such particulars will allow an accurate reference to be made in the case of any fault or projected modification. These records shall show, amongst other data, both indoors and outdoors the exact position of every joint, cable end termination and also the particulars of the depth of the trench, the arrangement of the cables, with cable numbers and the position of all obstructions revealed during the course of excavations. These completed records shall be submitted to Discom within 15 days of completion of any particular route/feeder.

Site facilities to be maintained by the contractor

- i) The contractor shall arrange for all the tools and tackles required for cable laying, jointing testing and commissioning as per this specification.
- ii) The contractor shall arrange illumination and Power supply so that the work can be carried out round the clock.
- iii) The contractor shall maintain functional dewatering pumping facility with suitable power supply so as to protect the cables and the joints from ingress of water due to rain or otherwise
- iv) The contractor shall make arrangement to provide suitable scaffolding arrangement to carry out the termination work
- v) The contractor shall carry out proper barricading of the dug cable route and the joint bays and shall take all necessary precautions to avoid any public hazard.

Testing

Following tests are to be carried out during and after completion of Cable Laying:

- i) Testing of cable before jointing Cable shall be tested for Insulation Resistance prior to laying by opening the end and resealing end properly.
- ii) Testing on complete Cable Installation –
 - a. Insulation resistance of each core shall be measured against all the other cores and the metal screen connected to earth.
 - b. The resistance of the conductor shall be measured.
 - c. High voltage – Very Low frequency (VLF) kit shall be used for high voltage testing of cables. Testing voltage and duration shall be as per IEEE 400.2 standards.
 - d. Charging of Cable at No-Load at Nominal working voltage for 24 Hours.
 - e. After laying and before termination of cable a sheath test shall be conducted for 33KV Single core Cable as under: -

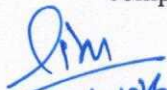
At both ends the cable shall be raised from ground. From the end graphite coat applied over the outer PVC jacket shall be removed with a piece of glass for a length of 300mm. A spiked steel rod with an eye for attaching a wire shall be driven into the ground and connected to a nearby water or hydrant pipe. Insulation resistance of PVC jacket shall be measured between the aluminum wire armour and the spike with a 500/1000V insulation tester. Measured resistance shall not be less than 2.5 mega ohm / KM. Thereafter 10KV DC shall be applied for one minute in the same way. After the test the armour shall be kept earthed to the steel spike for 15 minutes for discharging residual charge.

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- f. Any other testing required to complete the job shall be performed as per IEC/Indian standards.

Barricading and Safety requirement

- i) Dimensions of barricading- Height- 2 mtr, Length- 1.5 mtr.
- ii) There shall not have any gap in between two barricades.
- iii) LED Beacon light shall be placed at 1st and every 4th barricade
- iv) Name, painting, color, cleanliness etc. shall be done on regular basis.
- v) Vendor to ensure that traffic management shall not be excuse of work execution. The contactor shall not undertake loading and unloading at carriageways obstructing the free flow of vehicular traffic and encroachment of existing roads by the contactor applying the excuse of work execution.
- vi) Full height fence, barriers, barricades etc. shall be erected around the site in order to prevent the working area from the risk of accidents due to speedy vehicular movement. In same way barricades shall protect the road users from the danger due to construction equipment and temporary structures.
- vii) The structure dimensions of the barricades , material and composition, its color scheme, PVVNL logo and details shall be in accordance with specification and drawing laid down in the tender documents.
- viii) All the barricades shall be erected as per the design requirements of employer, numbered painted and shall be maintained in good condition. Barricading In-charge shall maintain barricade register at site.
- ix) All barricades shall be easily seen in the dark/night time by the road users so that no vehicle hits the barricades. Night vision shall be ensured by affixing retro reflective strips of required size and shape at appropriate angle at bottom and middle portion of the barricades at a minimum gap of 1000 mm. In addition minimum one red light /red blinker and red beacon light shall be placed at the top of each barricade.
- x) No dust deposit is permitted at the front side of barricades.
- xi) Cable drum shall be returnable and vendor shall take it back (by buy back process or as per PO agreement) from site at their own risk and cost.
- xii) Once cable lying complete of a drum, within two days empty drum shall be removed from site by buy back process.
- xiii) Trained traffic marshal with all PPE and traffic control light (Red and Green) shall be placed at site for 24x7.
- xiv) No excuse of theft (beyond 6 hrs. of FIR) shall be acceptable.
- xv) During execution of job, any damage to other agency's properties shall be counted in vendor account and necessary action shall be taken by vendor to recover, repair etc.
- xvi) Excess earth shall be removed from site after back filling. Site to be cleared to avoid flowing of dust. Barricades to be removed from site within 24 hrs after completion of job.


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- xvii) During non working hrs vendor to ensure presence of supervisor for controlling any event from locals.
- xviii) PPEs
 - a) Helmets
 - b) Mask
 - c) Jacket
 - d) Safety Shoes, Gloves & Glasses
 - e) First Aid Box etc.
- xix) Above mentioned PPEs shall be available at site 24x7. Zero tolerance on absence of PPEs to the working personnel. No excuse shall be acceptable in this regards.
- xx) EPR/Scanning shall be done by vendor of whole the route and same shall be submitted to Discom. This work shall be done by vendor before execution of job.
- xxi) Lifting of cable drums with hydraulic machine, pulling of cable from top end of drum with pulling machine (hydraulic winch) is mandatory.
- xxii) Violation on barricading guideline and safety norms, a fine of Rs.5000 /day shall be imposed. Discom inspector/engineer in-charge shall be empowered to impose the above penalty.
- xxiii) Artwork & Text to be printed on barricading sheet shall be approved by Discom prior to start of work

2. Key Points Regarding Operation of U/G Power Distribution System:

1. The underground power line should be kept in charged and healthy condition.
2. It is to be ensured that all cables in the circuit are connected to the system and are charged.
3. Alternative/Spare cable circuit should be kept in healthy condition and charged.
4. In case of availability of alternative power supply then it must be kept in a state such that supply can be restored and there is minimum possible interruption in supply.
5. In districts where underground cabling work has been carried out, at least 2 no. Fault Locator Machines of appropriate rating (like for 33 kV cable, fault locator capable of impressing voltages up to 75 kV, for LT & 11 kV minimum voltage rating must be 16 kV) are to be made mandatorily available with regular adequate staff for operation/testing.
6. It is also to be ensured that sufficient number of gangs are present for patrolling and attending breakdown as per the capacity of substation, no. of feeders and length of line.
7. The Technical Feasibility Report (TFR) for UG work shall be prepared/approved considering site conditions and maintenance/repair work feasibility. In case UG cable installation/maintenance/repair work is not found to be feasible, then overhead line on Aerial Bunched Cable may be preferred to UG cable.
8. Availability of spare accessories (jointing kit, end terminations/lugs) tools etc. in the store must be ensured by the concerned officers.


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Annexure C

 UPPCL <small>Uttar Pradesh Power Corporation Limited</small>	Underground (UG) Cable checklist		Document No.	UPPCL/UG/01
	Checklist – Cable receipt and Storage		Rev. No.	1.0
	Document Name		Date	
Department				

Sl. No	Characteristics/ Items	Type of check	Instrum-ents	Class	Quantum of Check Contractor/PQCC	Quantum of Check TPIA/REC/NQM	Reference document & Acceptance Standard	Format of Records	Remarks
1	2	3	4	5	6	7	8	9	10
<i>1. Receipt & Storage</i>									
1.1	Receiving inspection (Completeness of documents, test certificates, etc.)	V	-	B	100%	Random	Delivery Challan	MRC	
1.2	Unloading	V	-	B	100%	Random	Instruction manual	MRC	
1.3	Visual examination	V	-	B	100%	Random	Packing list/ Instruction Manual	-	
1.4	Proper storage	V	-	B	100%	Random	Instruction Manual/ IS:1255	-	
1.5	End Sealing (Cable ends are sealed with PVC caps to avoid ingress of moisture)	V	-	B	100%	Random	IS:1255	Site Record	

Contractor Signature	Name of Engineer In charge (EIC)	:	:
Legends	A – Critical B – Major C – Minor	:	:
	TC – Test Certificate	:	:
	EIC – Engineer in Charge	:	:


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Underground (UG) Cable checklist

Document Name	Checklist – Cable Pre-Installation	Document No.	UPPCL/UG/02
Department		Rev. No.	1.0
		Date	

Sl. No	Characteristics/ Items	Type of check	Instrum-ents	Class	Quantum of Check Contractor/PQCC	Quantum of Check TPIA/REC/NQM	Reference document & Acceptance Standard	Format of Records	Remar
1	2	3	4	5	6	7	8	9	10
2.3	Excavation of trench for U/G cable laying	V	-	C	100%	Random	Utility specification or as per Acceptance norms	Site Record	
2.4	Sand cushioning for buried cables	V	-	C	100%	Random		Site Record	
2.5	Ascertaining cable route and length	V	-	B	100%	10%	Cable route	Site Record	
2.6	Conformity with cable schedule	V	-	B	100%	Random	Cable schedule	Site Record	
2.7	Insulation resistance checking - Megger (500 V for LT, 1000 V for cables up to 11 KV and 5000 V for cables above 11KV up to 33 KV) Proper route maintaining during cable laying	Electrical	Megger	A	100%	Random	IS:1255	Site Record	
2.8		V	-	B	100%	Random	Cable route	Site Record	

Contractor Signature	:	Name of Engineer In charge (EIC)	:
Legends	:	Signature	:
	:	Date	:
	:	Place	:
	:		:

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Underground (UG) Cable checklist			
Document Name	Checklist – Cable Pre-Installation		Document No.
Department			Rev. No.
		Date	
			UPPCL/UG/02
			1.0

Sl. No	Characteristics/ Items	Type of check	Instrum-ents	Class	Quantum of Check Contractor/PQCC	Quantum of Check TPIA/REC/NQM	Reference document & Acceptance Standard	Format of Records	Remar
1	2	3	4	5	6	7	8	9	10
2.9	Identification and dressing of cables	V	-	B	100%	Random	Standard Practice	Site Record	
2.10	Use of trefoil clamps for single core cables	V	-	B	100%	Random	Standard Practice	Site Record	
2.11	Proper verticality of multicore cables	V	-	B	100%	Random	Standard Practice	Site Record	

Contractor Signature	:	Name of Engineer In charge (EIC)	:
Legends	:	Signature	:
	:	Date	:
	:	Place	:
	:		:

UPPCL Uttar Pradesh Power Corporation Limited		Underground (UG) Cable checklist			Document Name		Document No.		UPPCL/UG/03	
		Checklist – Cable installation					Rev. No.		1.0	
Department					Date					

Sl. No	Characteristics/ Items	Type of check	Instruments	Class	Quantum of Check Contractor/ PQCC	Quantum of Check TPIA/REC/ NQM	Reference document & Acceptance Standard	Format of Records	Rem
1	2	3	4	5	6	7	8	9	1
3-7	Check the cable glands, lugs, ferrules, cable tag/marker are provided as per requirement	V	-	B	100%	Random	Utility specification or as per Acceptance norms	-	
3-8	Check the cable drum/cable to be laid for any external damage	V	-	B	100%	Random	Utility specification or as per Acceptance norms	-	
3-9	Check the availability and functionality of the rollers	V	-	B	100%	Random	Utility specification or as per Acceptance norms	-	
3-10	Check there are no damage/twisting of cable during laying	V	-	B	100%	Random	Utility specification or as per Acceptance norms	-	
3-11	Checks the cables are protected from the sharp bends while laying	V	-	B	100%	Random	Utility specification or as per Acceptance norms	-	

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Contractor Signature	:	Name of Engineer In charge (EIC)	:
Legends	:	A – Critical B – Major C - Minor	:
		TC – Test Certificate	:
		EIC – Engineer in Charge	:
		Signature	:
		Date	:
		Place	:



Underground (UG) Cable checklist

Document Name	Checklist – Cable installation	Document No.	UPPCL/UG/03
	Department		Rev. No.
			Date


Sl. No	Characteristics/ Items	Type of check	Instrum-ents	Class	Quantum of Check Contractor/ PQCC	Quantum of Check TPIA/REC/ NQM	Reference document & Acceptance Standard	Format of Records	Rem
1	Check the power cables are separated from the control cables	3	4	5	6	7	8	9	1
3.12	Check the phase matching at both end after each joint	V	-	B	100%	Random	Utility specification or as per Acceptance norms	-	
3.13	Check cable tags are provided at required interval/required places and both end as per cable schedule	V	-	B	100%	Random	Utility specification or as per Acceptance norms	-	
3.14	Check the cables are dressed, clamped and supported properly as per the drawing	V	-	B	100%	Random	Utility specification or as per Acceptance norms	-	
3.15	Insulation resistance check	Electrical	Megger	B	100%	Random	Utility specification or as per Acceptance norms	-	
3.16								Site Record	

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Contractor Signature	:	Name of Engineer In charge (EIC)	:
Legends	:	Signature	:
	:	Date	:
	:	Place	:

A – Critical B – Major C – Minor
TC – Test Certificate
EIC – Engineer in Charge

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 UPPCL <small>Uttar Pradesh Power Corporation Limited</small>		Underground (UG) Cable checklist	
		Document Name	Checklist – Cable installation
Department		Document No.	UPPCL/UG/03
		Rev. No.	1.0
		Date	

Sl. No	Characteristics/ Items	Type of check	Instrum-ents	Class	Quantum of Check Contractor/ PQCC	Quantum of Check TPLA/REC/ NQM	Reference document & Acceptance Standard	Format of Records	Rem
1	2	3	4	5	6	7	8	9	1
3-17	Check whether some extra length (1.5 mtrs.) is kept in each cable run for future use	Physical	-	B	100%	Random	Utility specification or as per Acceptance norms	Site Record	
3-18	Check that all wall opening/pipes/sleeves are sealed to avoid seepage of water	Physical	-	B	100%	Random	Utility specification or as per Acceptance norms	Site Record	
3-19	Check that burried cables are covered with sand layers and by protective bricks	Physical	-	B	100%	Random	Utility specification or as per Acceptance norms	Site Record	
3-20	Ensure that the location of underground cable joints are identified	Physical	-	B	100%	Random	Utility specification or as per Acceptance norms	Site Record	

Contractor Signature	:	Name of Engineer In charge (EIC)	:
Legends	:	A – Critical B – Major C - Minor	:
		TC – Test Certificate	:
		EIC – Engineer in Charge	:
		Signature	:
		Date	:
		Place	: