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*KM Regulations for Works in
the Vicinity of Electricity
Transmission Installations*

KM Regulations for Work in the Vicinity of Electricity Transmission Installations

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1. Introduction

This document was issued as KM document with first issue in 2006 and now re-named as: "KM Regulations for Works in the Vicinity of Electricity Transmission Installations". It is a KM regulation and procedure document set by KM for all authorities to follow. The document was originally issued in 12.05.1991 as a MEW (Ministry of Electricity and Water) Circular No. 6 for 1991.

Having considered,

- Law No. 11 of 1979 dealing with the protection of Public Utilities and the Ministerial Circular No. 06 of 1991.
- Law no. 5 for 1970 for determining the responsibilities of Ministers, defining the functions of Ministries and various Governments Bodies;
- Law no. 3 of 1986 for re-organizing the Ministry of Electricity & Water and defining its functions;
- The Emiri Decree No. (3) of 1990 for appointing the Minister of the Municipal Affairs & Agriculture as the Acting Minister of Electricity & Water during the term of the vacancy of this post.
- The Ministerial Decision no. (12) Of 1990 dated 27.08.1990 for re-organizing the structure of the Ministry of Electricity & Water;
- And aimed at the realization to protect KM installations and render guidance to other utilities and services, previous Ministerial Circular 6/1991 has been updated & revised and issued as: "KM Regulations for Works in the Vicinity of Electricity Transmission Installations"

2. Purpose

This document is issued by KM under the authority established by the Emiri Decree 2000. The purpose of the regulations is to:

- Prevent damages or interference to KM's medium, high & extra-high voltage installations;
- Ensure safe and continuous supply of electricity.
- Ensure safe working practices by contractor while working in the proximity of KM's MV, HV & EHV installations.

The regulations stipulate the conditions for execution of public services works in the vicinity of MV, HV & EHV electricity transmission installations.

3. Scope

These regulations apply to the Electricity Transmission Medium, High & Extra High Voltage System assets of Electricity Networks Affairs - ENA. These regulations apply to all persons, organizations and governmental bodies carrying out any type of works in the vicinity of KM's Medium, High & Extra High Voltage installations to facilitate construction of roads, rails and infrastructure, new installations, maintenance and repair of utilities in the vicinity of KM Electricity Transmission assets.

3.1. Article (1)

To issue this circular under the titled subject "KM Regulations for Works in the Vicinity of Electricity Transmission Installations" with the aim of notifying all authorities, persons, organizations and government bodies which carry out the supervision and execution of works for Public Services on roadways, public places or any other locations in State of Qatar where KM's MV, HV & EHV installations are present to conform with the requirements provided in their plans and relevant methods of execution in case these works interfere or affect the present and future MV, HV & EHV electricity installations.

3.2. Article (2)

All Ministries, Government Departments & Statutory Bodies, Organizations and persons, concerned must comply strictly with the contents of the documents detailed in this circular, copy of which are enclosed in both Arabic and English languages. Also all those concerned must distribute this circular to all Directors and Managers of Projects, Consultants and Contractors currently engaged by them or to all prospective contractors.

3.3. Article (3)

Any questions on the contents of the circular can be directed to Electricity Networks Affairs, KM.

4. Responsibilities & Authorities

KM is the responsible authority for the enforcement, interpretation and update of these Regulations. The KM Directorate to be contacted for all matters relating to these regulations is Electricity Networks Affairs - ENA.

5. Abbreviation and Terminology

KM	:	KAHRAMAA
MV	:	Medium Voltage ($1\text{kV} \leq \text{MV} \leq 33\text{kV}$)
HV	:	High Voltage ($33\text{kV} < \text{HV} \leq 132\text{kV}$)
EHV	:	Extra High Voltage ($\text{EHV} > 132\text{kV}$)
ROW	:	Right of Way /Way leave/Reservation
ESIS	:	Electronic Service Information Sheet
RO	:	Road Opening Permit
ENA	:	Electricity Networks Affair

6. Work in the vicinity of Electricity Transmission Installations

Introduction

This provides rules for planning and construction of Rails, roadways, pipe-lines, buildings, structures and other works in the vicinity of high voltage installations of KM. These rules cover the following Electricity Transmission Installations:

- Overhead lines – 400kV, 220kV, 132kV, 66kV & 33kV
- Cable installations – 400kV, 220kV, 132kV, 66kV & 33kV (including associated pilot and Fiber Optic cables either laid alongside of power cables or laid independently of power cables)
- Primary substations – 400kV, 220kV, 132kV, 66kV & 33kV

All activities in the vicinity of MV, HV & EHV installations shall be subject to prior approval of ENA, KAHRAMAA. The compliance with these rules alone does not absolve the responsibility of the concerned party from obtaining the necessary approvals from the concerned section of KM & other state departments. Approval of such works to the contractor shall be in the form of Electronic Service Information Sheets (ESIS) supported by relevant documents as per the procedures, prior to the establishment of any work within the boundary limits and time period as described therein.

For any queries related to the MV, HV & EHV installations, please contact ENA, Planning Department for existing record drawings and for future proposals. Issue of ESIS will be by the Electricity Transmission Department.

6.1. Overhead Lines

6.1.1. General Requirements & Definitions:

6.1.1.1. KM has the right of way (ROW) of 25 meters for 33kV/66kV/132kV, 35 meters for 220kV and 50 meters for 400kV (mandatory requirements) widths on either side of the centre line of overhead transmission lines unless otherwise defined for specific locations. Right of the way for transmission lines operating at voltages other than these levels will be advised when such are added to the system.

6.1.1.2. Other than the roadways and boundary fences of security establishments any temporary or permanent structures / buildings, parapet walls, etc. shall not be permitted within the above way leave limits. With regard to services crossing the way leave they should be under-grounded and kept minimum 25 meters away from the nearest tower foundation of 33kV/66kV/132kV, and at minimum 35 meters for 220kV / 50 meters for 400kV respectively for overhead lines.

6.1.1.3. The nearest side of the road (Except Expressways) reservation to the nearest tower foundation shall be at-least 25, 35 and 50 meters for 33kV/66kV/132kV, 220kV and 400kV

overhead lines respectively. The vertical clearance from finished road level to bottom conductor shall be minimum 8.0 Mtrs. (for 33kV, 66kV & 132kV), 9.0 Mtrs. (for 220kV) and 11.0 Mtrs. (for 400kV).

6.1.1.4. The pipelines (water, oil/gas etc.) crossing the way-leaves of 33kV/66kV/132kV, 220kV and 400kV shall be minimum 25, 35 and

50 meters respectively away from the nearest base of tower leg. Where it is not feasible to avoid parallel running of the metallic pipelines, cables and fences with the overhead lines within the way-leave or outside, in specific and special cases, KM (Director - ENA) shall accord the approval only after establishing that responsible authorities shall comply with KM requirements to counter the detrimental effects of their services or infrastructure on overhead lines and vice-versa, proven by measurements and calculations that the interference effects are within permissible limits. Pipelines cathodic protection shall not adversely affect any KM installations such as O/H Lines Pylon foundations and Earthing. All pipelines shall be under grounded within the OHL defined way leave (ROW).

6.1.1.5. The use of OHL way leave (ROW) as a road or vehicle track is not allowed for public vehicles. Driving any type of vehicle through OHL Towers is strictly prohibited. Dumping of rubbish / debris is prohibited within the limits of way leaves and it is the Government rule "Not to discharge rubbish / liquid except in allocated areas".

6.1.1.6. Parking of vehicle: Parking of Light / Heavy Vehicle over or beneath the Transmission services (Cable / OHL) corridor is prohibited.

6.1.1.7. All excavation within the way leave shall be backfilled and compacted to withstand the loads of maintenance machinery having a G.V.W of up to 40tons. All excess material shall be removed and, surface reinstated to the original condition to permit free access of maintenance vehicles/machinery as above. The backfilling shall be carried out as per the Civil Engineering Standards followed by the Public Works Authority (PWA) for back filling and compaction. A compaction certificate shall be obtained by the contractor from the approved laboratory/consultant and shall be submitted to Electricity Transmission Department of KM along with the completion certificate and As-Built Drawings/Documents for the work within the OHL way-leave (ROW) duly signed by the client, consultant and the contractor and stating that KM requirements are completed with the provisions of "KM Regulations for Works in the Vicinity of Electricity Transmission Installations" in accordance to checklist Form provided by KM.

6.1.1.8. Two weeks prior to the commencement of any work within the way leave, the contractor shall advise KM Electricity Transmission Operation & Maintenance Section (Electricity

Transmission Department) and obtain an Electronic Service Information Sheet (ESIS) from the concerned O & M Engineer. The Electricity Transmission Department reserves the right to stop any construction activities within the way leave limits, in the absence of Service Information Sheet or works which are carried out in a manner contrary to the instruction given in the Service Information Sheet or have not obtained the necessary approval of the appropriate KM Department as required under different clauses of the Regulation.

6.1.2. Road Construction

6.1.2.1. **General Conditions shall be applicable for all road construction (whether Expressway or Not Expressway).**

- The contractor shall coordinate with KM EP/ET department to collect plan & profile drawings from GIS unit and it's the responsibility of the contractor to verify the received data at site before superimposing it with the road to get the vertical and horizontal clearances.
- The finished road surface shall have a specific minimum clearance (mandatory requirement) below the bottom conductor of overhead line, under the designed operating conditions. Such clearance depends on the line voltage and other design parameters.
- Direct height measurements at site are misleading, as the height of the conductor along the profile would vary considerably when operating at maximum design temperature. The Electricity Transmission Department (ET) of KM shall, therefore, be consulted to obtain the design values to each individual case and the applicable minimum clearance.
- Vertical clearance shall be from finished road level to bottom conductor as per KM requirements.
- If the vertical clearance will not be achieved with the minimum requirements, the client will be responsible to submit the proposal to ET Manager to achieve the required vertical clearance without any cost impact on KM.
- Horizontal clearance shall be from the nearest side of the road to the nearest tower foundation as per KM requirements.
- If the horizontal clearance will not be achieved, the client shall raise Special approval request to ET Manager.
- If any outage will be required by the client to finalize the work, the client shall raise official request to ET Manager and the approval of the outage will depends on the System control decision.
- The client shall provide permanent access to KM substation & Overhead lines.

- Free access from the road-ways to the maintenance tracks shall be provided. The access shall be properly ramped & compacted to suit the maintenance vehicles having a G.V.W of up to 40 tons. Barrier gates shall also be provided as required.
- Guard wire and poles of approved type (Appendix-B), strictly in accordance to KM standard drawing and specification, shall be erected by the contractor at 75 meters, or as directed by KM, ahead of the crossing point of the line. The poles shall be galvanized and painted over with red & white strips. The Red and White paint shall be of reflective florescent type. Guard wire height shall be based on 3.7m, 5.2 m and 6.4 m clearances below the level of the lowest conductor under rated operating conditions for the 33kV/66kV/132kV, 220kV and 400kV overhead lines respectively. The guard wires carrying approved type warning shall be strung across the roadway at the above mentioned minimum clearance (mandatory requirement) below the level of the lowest conductor under rated operating conditions/temperatures. Every installation shall be subject to prior approval of the Electricity Transmission Department (ET) of KM.
- Permanent guard wire poles shall be installed by the contractor before opening the road, the contractor shall submit request for KM inspection & approval before opening the road (whether completely or partially).
- Depends on site condition, Concrete barriers protection around the guard wire poles & galvanized steel wire shall be installed by the contractor if required without any cost impact on KM.
- Guard wires / poles shall be erected by the contractor prior to the establishment of any work within the 25, 35 and 50 meters way leave limits for 33kV/66kV/132kV, 220kV and 400kV respectively.
- Construction of roundabout or part thereof or T- offs or road junctions within way leave (ROW) limits is not permitted.
- Traffic signal, Road Sign board, or substation for street light within OHL way leave (ROW) is not permitted.
- Any change in the SoW, Client/Consultant/Contractor shall coordinate with KM concerned department and get approval for any change which maybe affected the transmission network.
- Construction of any kind of Civil Structure is not allowed in the OHL Way-leave.
- For construction of underground chamber or manhole within way leave (ROW) limits is not permitted, in specific and special cases, KM (Director - ENA) shall accord the approval only after establishing that responsible authorities shall comply with KM requirements to achieve at least a minimum horizontal distance 6m from the LIVE conductor on either side for 33kV, 66kV & 132kV and 10m from the LIVE conductor on either side for 220kV& 400kV.

- If any utility services / diversions included in the proposed road work contract, clearance details of the services, (Water, Drainage, storm water, Irrigation pipelines Etc., Ooredoo duct, Electricity HV and LV) Crossing details, substation in OHL way leave details to be submitted.
- clearance details from the proposed bridge, ramp, and side wall of ramp, bridge pillar/ pier, roundabout and underpass to the transmission lines, crossing and protection details to be submitted.

6.1.2.2. All roads Except Expressways:

- The vertical clearance from finished road level to bottom conductor shall be minimum 8.0 Mtrs. (for 33kV, 66kV & 132kV), 9.0 Mtrs. (for 220kV) and 11.0 Mtrs. (for 400kV).
- The nearest side of the road (Except Expressways) reservation to the nearest tower foundation shall be at-least 25, 35 and 50 meters for 33kV/66kV/132kV, 220kV and 400kV overhead lines respectively.
- The installation of crash barriers (Appendix-A), if required, shall be installed around the tower foundation and the distance from the nearest point of the tower foundation shall be proposed by the consultant and approved by KM OHL Unit.
- The installation of steel guard rail, if required, shall be installed by the contractor for tower protection without any cost impact on KM.

6.1.2.3. Expressways

The construction of any new Expressway shall conform to the guidelines as detailed in the following Paras:

- The Minimum horizontal & vertical clearances shall be as the explanation in Para 6.1.2.1 and as the following values:

System Voltage	Vertical (top pavement to the lowest conductor)	Horizontal (nearest side of road to nearest tower foundation)
400kV	17m	70 m
220kV	16m	60 m
132/66/33 kV	14m	50 m

- The installation of crash barriers (Appendix-A), if required, shall be 25 m from the nearest point of the tower foundation.
- The installation of steel guard rail, if required, shall be installed by the contractor for tower protection without any cost impact on KM.
- The expressways shall be designed to run with minimum interference to the overhead lines (preferably perpendicular to the line when crossing).

6.1.3. Pipelines

- 6.1.3.1. Pipelines shall not be laid parallel to the overhead line within the limits of a way leave (ROW).
- 6.1.3.2. All pipes within the way leave shall be buried and adequately protected against weight of heavy maintenance machinery used for overhead lines having G.V.W of up to 40 tons. If cathodic protection for pipelines is necessary, then the design of such protection should not affect O/H Lines foundations and Earthing systems and shall not interfere with the protection systems of transmission lines.
- 6.1.3.3. Pipe-line crossing the 33kV/66kV/132kV, 220kV and 400kV transmission lines way leave (ROW) shall be 25, 35 and 50 meters (minimum) respectively away from the nearest base of tower leg.
- 6.1.3.4. For construction of underground chamber/manhole within way leave (ROW) limits is not permitted, in specific and special cases, KM (Director - ENA) shall accord the approval only after establishing that responsible authorities shall comply with KM requirements to achieve at least a minimum horizontal distance 6m from the LIVE conductor on either side for 33kV, 66kV & 132kV and 10m from the LIVE conductor on either side for 220kV & 400kV.

6.1.4. Boundary Fences

- 6.1.4.1. Boundary fences shall not be laid parallel to the overhead line within the limits of a way leave (ROW). The safe distance for proposed fences running parallel to the transmission overhead lines shall be proved for safety by calculations, by contractor or their consultants.
- 6.1.4.2. Where necessary, fences running parallel to the transmission lines or crossing the way leave (ROW) of lines shall be earthed using appropriate means to avoid any electrical accidents while working on the fences.
- 6.1.4.3. In case of fences running parallel to the transmission lines within the way leave (ROW) of lines, it shall be achieving the horizontal distance at the tower location by using U-Shape fence arrangement or keep plastic barriers instead of fence nearby towers.
- 6.1.4.4. The Plastic Barrier shall be filled partially with sand together with the necessary flashing lamps by the contractor and It's the full responsibility of the client/contractor to maintain the plastic barriers & Flashing lamps working in good conditions and do any rectifications whenever required without any cost impact on KAHRAMAA.
- 6.1.4.5. During the emergency case to carry out the necessary maintenance work, It's the full responsibility of the client/contractor to clear the site by dismantling the fence and re-fixing it again within OHL Way-Leave whenever KAHRAMAA is facing any problem to carry out the required maintenance without any cost impact on KAHRAMAA.
- 6.1.4.6. Access gates without horizontal top beams shall be provided at the points of crossing of way leaves.

- 6.1.4.7. Free access for the maintenance staff shall be provided / arranged on day and night basis.

6.1.5. Gardens & Land-Scapping

Development of gardens, planting of trees, etc. within the limits of way leaves is strictly prohibited.

6.1.6. Street Lighting

Street Lighting columns and overhead wires are not permitted within the way leave.

- 6.1.6.1 Where due to lighting and traffic safety requirements the street lighting columns are essential within the overhead lines way leave (ROW), in specific and special cases, Director, KM-ENA shall accord the approval only after establishing that no other alternatives are practicable and that the responsible authorities shall comply with KM requirements.
- 6.1.6.2 Only street light pole with maximum height 6 meter maybe allowed within a minimum horizontal distance 6m from the LIVE conductor on either side.
- 6.1.6.3 High mast Street Light Pole with height more than 6 meters within the limits of way leaves is strictly prohibited.
- 6.1.6.4 Only maintenance activities for street light poles which is located within OHL wayleave and not complying with the item # 6.1.6.2 & 6.1.6.3 can be carried out with strictly arrangement & in the presentence of Contractor safety engineer after getting ESIS from KM OHL unit
- 6.1.6.5 Street light poles within ROW shall be individually earthed in addition to common earth.

6.1.7. Installations of Plant Outside the Way leave which May Influence EHV Services

- 6.1.7.1. Firing ranges shall be located well away from the electrical installations (transmission lines and substations) such that it shall not impose any danger to the personnel and the installations of the department.
- 6.1.7.2. Ammunition stores shall be located well away from the installations such that accidental casualty to the stores shall not cause any damage to the MV, HV or EHV installations.
- 6.1.7.3. The radar and similar radiating installations shall be located at a distance such that the level of radiation at the site of KM installations is within the acceptable limits to ensure safety of personnel & avoid mutual interference between both installations.

6.1.7.4. High structures, whether temporary or permanent, are not permitted to be constructed within its falling distance + 6 meters from the nearest O/H line conductor deflection with "full swing" design conditions.

6.1.8. Passage of High Loads under the Overhead Lines:

The Transporter or the end user of transported goods shall check the height of the cargo that could be transported safely under the lines in consultation with the O&M section of Electricity Transmission department of KAHRAMAA. Head of O&M (Electricity Transmission Department) section shall be notified minimum 14 days in advance about the proposed movement of "High Load" under the line(s) enabling them to study the feasibility. The end user/transporter shall provide all assistance and support to facilitate safe passage of the loads. Necessary co-ordination between different departments and other utilities / law enforcing agencies shall be carried out by the end user.

6.1.9. Rails

The construction of railway lines shall conform to the guidelines as detailed below

6.1.9.1. The finished rail tracks shall have a specific minimum clearance (mandatory requirement) below the bottom conductor of overhead line, under the designed operating conditions. Such clearance depends on the line voltage and other design parameters as detailed below.

System Voltage	Horizontal Clearance at crossing points (Outer Edge of Tower & Rail Alignment)	Vertical Clearance (Lowest Conductor to Top of Rail track)
66KV / 132kV	50 Meter	16 Meter
220kV	60 Meter	17 Meter
400 kV	70 Meter	18 Meter

6.1.9.2. The safe distance for proposed rails running parallel to the power transmission overhead lines shall be proved for safety by calculations (induction effect), by the Consultants of the project. All such cases shall be raised to KM for review and approval. Director, KM-ENA shall accord the approval for all cases of parallel operation of rails with transmission overhead lines.

6.1.9.3. Angle of crossing of rails with power transmission lines shall normally be at right angle (90°) to the overhead line. In specific cases only if this angle of approach is not achieved, then angle of approach shall be between 60° and 120° .

6.2. Cable Circuits

6.2.1. General Requirements & Definitions

- 6.2.1.1. This heading covers all types of MV/HV/EHV cables (Power, Pilot, Telemetry and Fiber Optic) which are installed beneath the ground level.
- 6.2.1.2. Typically, the cables are 'off road' installations, except at road crossings where the cables are inside concrete ducts filled with BENTONITE Mixture. There are few exceptions where some of the cable circuits are allowed to remain along the extended carriageway with certain conditions by prior agreement.
- 6.2.1.3. The cable routes shall be free of any permanent temporary structures. KM reserves its right to excavate along the cable route for necessary repair works.
- 6.2.1.4. Cables are normally buried directly in the ground in trenches located as per applicable Road Hierarchy or inside open ground in

the desert i.e.; inside the carriageway, under the pavement, across the road, inside ducts, or in the desert, protected by suitable cable tiles (for typical drawing see Appendix-C). Where ever cables have been laid / installed, KM has the ROW along the cable routes; the horizontal width of the ROW is generally 1 to 4 meters depending on the installation arrangement.

- 6.2.1.5. Submarine cables are normally buried 1.1 meter below seabed. Horizontal distance between phases in sea is 50meters, and gradually reducing to 5 Mtrs when approaching sea shore and ROW is 200 meters for one Submarine cable circuit. For submarine cables 60 meter horizontal clearance from boundary of ROW is required for any installation.
- 6.2.1.6. Although KM can furnish reasonably accurate drawings/records of the routes of these cables the responsibility of positively ascertaining the location and depth of a cable rests with the parties involved with the works at the vicinity of the cables.
- 6.2.1.7. Usually, KM Data Base maintains records of cables installed in the ground. The records are reasonably accurate but, not a guarantee of the precise location and depth of the cable. It is possible that some cable circuits have not been entered in the records or that they are in the process of being entered in the records.
- 6.2.1.8. The existence of MV/HV/EHV cables beneath the ground shall be ascertained by taking trial holes over the cable route, without depending on the available records.

- 6.2.1.9. Usually, the cables are buried such that the average depth from the ground level to the top of the cable protective tile is between 0.8 to 1.2 meters. The location of the cable along the route is usually identified with cable route markers but, the accuracy of information is not guaranteed as it is possible that the cable route markers may have been shifted by others without approval of KM.
- 6.2.1.10. Within the cable reserves no excavation will be allowed except for the crossing of other services e.g. telephone lines, pipe-lines or to make trial holes for the positive identification of the cable.
- 6.2.1.11. Excavations parallel and very close to the cable route but, outside the ROW will be allowed only if the total length of traverse is not more than 500 m and that there is no danger to the existing installation from collapse. Where the proposed new service very close to the route extends for more than 500 m, the concerned utility shall produce induced voltage calculations to confirm that their installation is safe from Induced voltages and Step & Touch voltages.
- 6.2.1.12. Foundations and civil structures (temporary or permanent) will not be permitted in the close proximity to the cable circuit. A minimum horizontal distance of 1.5 m from such structures to the nearest edge of the cable trench shall be observed provided that excavations for such structures are not deeper than the bottom level of the cable trench. For deep excavations below the level of cable trench, advice of KM shall be sought to establish the horizontal distance that could be permitted.
- 6.2.1.13. Any posts of the fences and sign boards crossing the cables way leave should be erected outside the way leave limits.
- 6.2.1.14. KM shall be informed of all the development works which involve the cable reservation and specific approval shall be obtained prior to detailing any works in these areas. The Operation and Maintenance (O&M) Section of Electricity Transmission Department shall be informed 14 days prior to commencement of any excavation work in the vicinity of cables and necessary Service Information Sheet (SIS) /Clearance shall be obtained.
- 6.2.1.15. The use of mechanical excavators shall not be permitted for excavation work approaching three meters to the cable reservations and within ROW. All excavations shall be done manually. Limited use of jackhammer under direct supervision may be allowed by KM.(excavation by machine within cable wayleave need special approval from senior cable engineer)
- 6.2.1.16. Excavation approaching three meters to ROW and deeper than 1.1 meters shall be protected by shuttering to prevent collapse of soil protecting the cable circuits.

- 6.2.1.17. The excavation Contractor shall provide a competent person (approved by KM) at site at all times to receive the instruction from the representative of KM concerning requirements to safeguard the integrity of the cables.
- 6.2.1.18. Removing Cable protective tiles and exposing the cable installation is not allowed unless the Contractor has been served with a Safety Document as per the rules and regulations of KM supported by an approved method statement concerning the procedure protecting the cable installation. The exposed cables shall be normalized exactly to the original condition. Usually, the cables are embedded in dune sand or inside stabilized backfill below the cable tiles. The bedding below the cable tiles, installation cable tiles, Backfilling and Reinstatement above the cable tiles shall be supervised by an authorized person on behalf of KM. Any dislocated cable route markers shall also be reinstated.
- 6.2.1.19. Any damage to the installation will be subject to a claim for reimbursement of cost of repairs including the consequential loss against the contractor.
- 6.2.1.20. When the cables are running parallel to the MV/HV/EHV OH lines or crossing them the necessary impact of fault on lines and vice versa shall be studied and provided to Kahramaa before commencing any excavations.
- 6.2.1.21. In case any of the existing MV/HV/EHV overhead lines (whether completely or partially) are proposed to be replaced by cable circuits, following maximum achievable ratings for cables shall be taken into consideration.

1000 MVA for 400kV.

515 MVA for 220kV.

250 MVA for 132kV.

120 MVA for 66kV.

6.2.2. New Roadways

Cable reservation is either provided along the central reservation or the edge of the roadway. The development of existing roadways in some cases has encroached the cable reservations. In such cases the existing cables shall be diverted and rerouted as off-road installations free of cost to KM. System outages for such works shall be between 1st week of October to 30th March of the following year subject to prior agreement with KM. As built drawings of diverted / rerouted cables shall be submitted to KM for review and record.

Following KM cable diversion general requirements shall be implemented:

Keeping cables under carriageway for short lengths (maximum 500meter) and road crossings:-

- 6.2.2.1. Cables to be protected by additional concrete slabs if clearance between cable tiles & final road level less than 70 cm .
- 6.2.2.2. Accessible HDPE type H spare ducts (for typical drawing see Appendix-D) to provided parallel with cables for road crossings (50% of circuits numbers with minimum one spare type H duct)
- 6.2.2.3. LINK BOXES to be shifted out of carriageway by KM approved electrical contractor and to be levelled with new road level (link boxes to shifted out the carriageway by KM main contractor if cable circuit under warranty).
- 6.2.2.4. Cables shall not be exposed and all works shall be carried out as per KM procedures.
- 6.2.2.5. Ashghal shall give the commitment that for maintenance and emergency repairs, KM will reinstate only the cut asphalt area, not all street width.

Transmission cables diversion requirements:-

- 6.2.2.6. Confirmation that the proposed cable route should be at least one meter away from any installation or foundations and have no conflict with private properties and commitment to shift any cable if wrongly installed inside the private properties.
- 6.2.2.7. Diversions of cable route lengths shall not affect the existing Earthing system, diversion to be extended out of LOW to the nearest existing joint or cable sealing end, as additional joints are not allowed (maximum extension 200m. to the nearest existing joints or cable sealing ends).
- 6.2.2.8. Under warranty cable circuits shall be diverted only by original installation contractor.
- 6.2.2.9. Cable current carrying capacity to be maintained and accordingly, changing the existing depth of cables is not allowed.
- 6.2.2.10. New cables, joints and accessories shall be from KM approved supplier, supported by Type and FAT tests. All Materials and test reports shall be approved by KM. The FAT will be attended by KM.
- 6.2.2.11. All civil and electrical works associated with the diversion shall be carried out by an Electrical Contractor acceptable and approved by KM.
- 6.2.2.12. Cable backfilling materials shall be identical with the existing backfill materials.
- 6.2.2.13. All pre-commissioning tests including HVAC and its related substation works are mandatory. The substation works like degassing, gassing and VT dismantling and installation shall

be carried out by the switchgear manufacturer specialist without any impact cost to KM.

- 6.2.2.14. Two years warranty from the electrical work contractor shall be provided for the diverted sections of cables from date of energization. During this period the Contractor shall be responsible for rectifying any failure, except third party damages.
- 6.2.2.15. All activities within MV/HV/EHV reservation shall be strictly as per the procedures ET-P13: ESIS, ET-P15: Project Execution and KM Rules & Regulations.
- 6.2.2.16. All works shall be supervised by an Electrical Consulting Engineer approved by KAHRAMAA. (CVs will be reviewed by KM). Provision shall be made for daily on site route patrolling by the Consultant to ensure that there are no unauthorized activities over the cable route [ET-P14/WI] during the execution of the diversion works.
- 6.2.2.17. Diversion works shall be carried out during KM outage window, from 1st week of October to 31st March of the following year, one cable circuit at a time.
- 6.2.2.18. Link boxes shall be leveled to match with finished roads level.
- 6.2.2.19. For proposed new cables / road crossing, additional spare ducts shall be provided or where road is to be widened, the existing ducts to be extended type H to be installed. Duct banks for new proposed crossing shall be HDPE type G or type H.
- 6.2.2.20. Where KM has agreed to keep to cables under the extended carriageway, KM reserves the exclusive right of excavation of even newly laid road for repair works, if this becomes necessary. Any future revision to the existing Road Hierarchy must comply with KM reservation and corridor requirements and shall obtain prior approval of KM.
- 6.2.2.21. At all crossing points of roads & cable reservations, approved type and number of cable ducts shall be provided for future cable circuits. Spare cable ducts shall also be provided at the existing cable crossing points.

6.2.3. Rails

The construction of railway lines shall conform to the guidelines as detailed below in addition to the General Requirements.

- 6.2.3.1. In case the existing cables shall be diverted and rerouted for rails installations, it shall be done without any cost impact to KM. System outages for such works shall be between 1st week of October to 30th March of the following year, subject to prior agreement with KM. As built drawings of diverted / rerouted cables shall be submitted to KM for review and record.

6.2.3.2. The Consultant of the project shall submit the proposed depth of the cables under the rails, depending on compliance to Mechanical and Electrical (de-rating) parameters, to KM for review and record.

6.2.3.3. The finished rail tracks shall have a specific minimum clearance of 10 meters (mandatory requirement), subject to induced voltage calculations. The Consultant of the project shall produce induced voltage calculations to confirm that rail installations are safe from Induced voltages and Step & Touch voltages.

6.2.4. Explanatory Notes Concerning MV/HV/EHV Cable Installations

Wherever the existing cable installations may be affected by the proposed development work, the requesting authority shall make an application to KM for *Service Information Sheet* (SIS) and carry out initial investigations by taking *Trial Holes* along the MV/HV/EHV cable route to ascertain the exact position of cables and the depth to the top of cable cover. The investigation should generally be undertaken prior to the award of Contract by the concerned Authority.

In the event MV/HV/EHV installations are within the proposed development work the requesting authority shall examine alternative options and ensure that the existing installations are unaffected. Where this is not possible, MV/HV/EHV cable installation shall be diverted and re-routed. The funds for such additional works shall be met from the concerned Service Authority.

The following requirements are complementary to those already stipulated as above and shall be satisfied as a minimum for any activity within the vicinity of MV/HV/EHV installations.

6.2.4.1. After the preliminary investigations, detailed drawings shall be submitted showing the precise location of other services and the proposed development works with respect to existing MV/HV/EHV installations superimposed on single sheets.

6.2.4.2. KM shall have the right to excavate within the cable reservation, be it new roadways, pavements, walkways, roundabout, center reservation etc., and remove any obstruction whatsoever at any time should it be necessary to attend to cable repair and maintenance.

6.2.4.3. Where the line of the proposed carriageway/hard shoulder infringes on existing cable installation which has hitherto remained as an off road installation, and where the depth from final surface level to the top of the cable cover is not more than 0.8m over a length not exceeding 200 m of cable route, suitable RCC raft protection may be installed with the consent of KM. The proposed raft protection shall incorporate the following requirements and the proposed installation details and methodology shall be submitted to the Electricity Transmission Department for review.

- 250 mm wide with suitable lifting facility
- Capability of withstanding 10 Ton wheel load

- The length of the raft extending 0.5 m beyond each outside edge of cable tile.
 - 200 mm dune sand bedding between the top of cable tile and bottom of raft protection.
- 6.2.4.4. In the event of widening of the road (or part thereof), the cable ducts of the existing road crossings shall be extended to cover the increased area falling under the new road including a length of 0.5 m beyond the furthest edge of the proposed curb line on each side of the extended carriageway/road crossing. Split ducts shall be used for the existing cables, which shall be filled with BENTONITE Mixture after installation. All the ducts shall be sealed with caps to prevent the migration of contaminants inside the ducts. The work shall be co-ordinated and carried out with the approval of the Electricity Transmission Department.
- 6.2.4.5. One Spare type "H-HDPE" ducts shall be constructed parallel to the circuits (Two Feeders) at road crossings.
- 6.2.4.6. Constructions such as water gullies, soak pits, chambers, water mains, high mast foundations, Traffic signal control equipment, Traffic Radar Cabinets shall be located 1.5 METER away from the nearest edge of cable protective cover, Tank pit or cable joint bay.
- 6.2.4.7. Use of heavy mechanical excavators (other than hand operated pneumatic jack hammers) or driving sheet piles within 3m reach of the nearest edge of cable cover, cable joint and tank pits are not permitted.
- 6.2.4.8. Heavy machinery engaged in the civil construction or road works shall be located in such a manner that the operating load/thrust/weight will not be applied directly on the cable installation.
- 6.2.4.9. Trench excavations parallel to the cable installations shall have a minimum separation of 1.0 m to the nearest edge of cable tile. Trench shall NOT remain open at any time unless suitable shoring, timbering and shuttering are provided acceptable to KM, to protect the MV, HV and EHV installations and the cable from collapsing.
- 6.2.4.10. Laying of metal pipes over a long distance parallel to cable in close proximity is not permitted unless the concerned authority satisfies that the Step and Touch Potentials at any point of the pipe line do not exceed 65 Volts.
- 6.2.4.11. Temporary access or approach roads so required for diversion of vehicular traffic during the progressive stages of construction works, which falls over the cable installations shall be subject to limitations noted under (4) above.
- 6.2.4.12. The hard surface, if any, falling above the cable installation shall be loosened by pneumatic jack hammers or similar machinery prior to scooping out the debris to prevent the

transmission of vibration to the cable installation below.

- 6.2.4.13. Where the requirement of other services, such as water mains, telephone, sewerage mains etc. necessitate the crossing of MV, HV or EHV installations, prior approval of KM shall be obtained for the precise location and the method of crossing. Where the proposed services shall cross under, the MV/HV/EHV cables shall temporarily protected in a manner acceptable to KM Such protection measures shall be made with the cables switched off (applicable for FTB & CBS protected cables) IF REQUIRED for which purpose 14 days notice will be required. In the event KM is unable to arrange the outages as requested, such reworks shall be programmed during the period spanning from 01st October to 30th March of the following year when the plant can be conveniently taken out of service.
- 6.2.4.14. Work within the MV, HV & EHV reservation shall be continuously supervised by the authority or the Consultant engaged in the proposed development work. However, if it becomes necessary to disturb the cable installation or expose the cables such works shall be carried out only after obtaining necessary safety documents.
- 6.2.4.15. Continuous interaction shall be maintained by the authority or the consultant with KM as the work progresses in order to ensure highest safety and security to the integrity of MV/HV/EHV installation(s).

6.3. Telecom

General Notes on Diversion or Replacement of FO/Pilot Cable

- 6.3.1. Joint manholes are required on diversion location / points.
- 6.3.2. Two (2) manholes from both sides of tunnel are required for FO/Pilot cable that needs to pass through the tunnel.
- 6.3.3. Concrete manhole specification shall be taken from KM Civil Unit.
- 6.3.4. On FO/Pilot joint manholes, FO/Pilot Cable spare shall have 5 meters spare length.
- 6.3.5. For FO/Pilot cable that needs to pass through the tunnel, we require two FO/Pilot cables for each feeder which makes (e.g. if two Feeders will be diverted in a Tunnel we require 4 nos. of FO/Pilot Cable) to be laid from point of entry. Two will be jointed for diversion and other two for spare purpose.
- 6.3.6. Power budget calculation should be considered at each time FO/Pilot Cable will be diverted.
- 6.3.7. FO/Pilot cable used for diversion shall be the identical or shall have the same specification with existing FO/Pilot Cable.
- 6.3.8. Any FO/Pilot Cable diversion shall be coordinated first with KM

Telecom section (EST-ES dept.) before commencement, enabling us to shift any affected signal traffic (Telecom & Protection).

- 6.3.9. No Protection FO/Pilot Traffic shifting will be allowed if Sub-Station is on Single Feed (SFC).
- 6.3.10. The Contractor will be responsible for providing all the accessories required to complete Telecom & Protection traffic shifting process.
- 6.3.11. E2E Testing shall be done in presence of KM / Consultant and by KM LOA authorized person.
- 6.3.12. All Material used for diversion process like FO/Pilot Cable, FO/Pilot junction box, accessories, etc., shall be as per KM specifications and required to be submitted to KM Telecom section (EST-ES Dept.) for review and approval.
- 6.3.13. All FO/Pilot Test Procedures shall be submitted to KM Telecom section (EST-ES Dept.) for review and approval.
- 6.3.14. FO/Pilot Cable Details, Single Line / Schematic Diagram for existing FO/Pilot Cables and proposed Diversion Plan to be submitted by ASHGHAL/Contractor to KM Telecom section (EST-ES Dept.) for review and approval.
- 6.3.15. As-built to be submitted after completing diversion works including Key-plan Map.
- 6.3.16. Any diversion which involves Water FO/Pilot Cable shall be coordinated with KM Water Network Affairs.

Keeping FO cables under carriageway for short lengths (maximum 500meter) and road crossings:-

- 6.3.17. FO Cables to be protected by additional concrete slabs.
- 6.3.18. Accessible HDPE type H spare ducts (for typical drawing see Appendix-D) to be provided parallel with FO cables for the route length which will be under the carriageway or road crossings (50% of circuits numbers with minimum one spare type H duct)
- 6.3.19. FO Cables shall not be exposed and all works shall be carried out as per KM procedures.
- 6.3.20. Ashghal shall give the commitment that for maintenance and emergency repairs, KM will reinstate only the cut asphalt area, not all street width.

General Notes on Diversion or Section Replacement of OPGW

- 6.3.21. Joint Boxes are required on diversion location / points.
- 6.3.22. Diversion of both Feeders in same time is not permitted.
- 6.3.23. Power budget calculation shall be considered in any OPGW Cable diversion.

- 6.3.24. OPGW Cable used for diversion shall be the identical or have the same specification with existing OPGW Cable.
- 6.3.25. Any OPGW Diversion shall be coordinated first with KM Telecom section (EST-ES dept.) before commencement, enabling us to shift any affected traffic (Telecom & Protection). The Contractor will be responsible for providing all the accessories required to complete Telecom & Protection traffic shifting process.
- 6.3.26. Testing shall be done in presence of KM / Consultant and by KM LOA authorized person.
- 6.3.27. All Material used for diversion process like OPGW Cable, OPGW junction box, accessories, etc., shall be as per KM specifications and required to be submitted to Telecom section (EST-ES Dept.) for review and approval.
- 6.3.28. All OPGW Test Procedures shall be submitted to KM Telecom section (EST-ES Dept.) for review and approval.
- 6.3.29. OPGW Cable Details, Single Line / Schematic Diagram for existing OPGW Cables and proposed Diversion Plan to be submitted by ASHGHAL / Contractor to KM Telecom section (EST-ES Dept.) for review and approval.
- 6.3.30. As-built to be submitted after completing diversion works including Key-plan Map.

6.4. Substations

- 6.4.1. The current building permits regulations regarding minimum set back distances from neighbor's boundaries should be complied with for adjacent premises. At present a 5.0 meter set back is required from the substation boundary lines fixed at the approved site co-ordinates lines.
- 6.4.2. The design of dwellings and commercial building shall take into consideration that harmful objects are not thrown into the substation or exhaust from dust extractors etc. discharged in a manner which may cause serious damage or pollution to the EHV installations.
- 6.4.3. Prior to commencement of construction work in proximity to the outdoor high voltage installations, necessary safety measures, shall be observed.
- 6.4.4. KM substation entrance shall be kept clear all the time where no car parking is allowed near or around the substation. In neighborhood of KM installation dumping of scrap/rubbish or storage of dangerous materials (gas/explosives) or Building of High Rise Multi-story building overlooking the substation or utilization of open space for sports activity shall be strictly prohibited.

6.5. General Liabilities

- 6.5.1. It is the responsibility of the authorities installing other services to

ensure that no detrimental effects are encountered due to proximity of MV/HV/EHV installations (e.g. effects of induced voltages, cathodic protection, interference with T.V. & Radio reception etc.).

- 6.5.2. No work which may cause pollution or other detrimental effects to KM installations is permitted in the proximity of MV/HV/EHV services.
- 6.5.3. The contractor shall indemnify the KM against accidental injury or death to their personnel working in the proximity of live installations. It is the responsibility of the contractor to ensure that proper safety measures are taken by their personnel working in the proximity to MV/HV/EHV installations.
- 6.5.4. The above guidelines do not negate the need to carry out the Road Opening Procedures or any other procedure requested by other sections of KM or any other departments for the same other reason.
- 6.5.5. Neither these guidelines nor any information gathered from any other official source will absolve liability for damage.
- 6.5.6. As-Built Drawings would require to be submitted to KM for location of Road crossing ducts, Diversion or Relocation of MV/HV/EHV installations to up-date KM records.

6.6. Telephone, Water, Sewerage & Gas Services

The service facilities for telephone, water, sewerage, gas, etc. shall not be permitted to be laid within the cable reservations. The following minimum clearances shall be observed for respective service lines at crossing points. Such crossings may not be permitted if the cable’s rating / integrity will be affected in any way by the services to cross the cable reserve. Crossing under or above cable joints is strictly not allowed.

Service/Utility	Vertical clearance (Minimum)
Water & TSE Mains (to cross below EHV cable level)	500 mm
Water distribution lines	200 mm above cable protective tile
Sewerage Mains (to cross below EHV cable level)	1000 mm
Drainage Mains	500 mm below the cable
Drainage distribution lines	200 mm above cable protective tile
Gas pipes Mains	600 mm below cable
Gas distribution lines	200 mm above cable protective tile
Telephone lines	200 mm above the cable protective tile
LV / 11kV cables	150 mm above the cable protective tile

Appendix-A

Tower Crash Protection

LAYOUT
Scale 1:200

SECTION A-A
Scale 1:50

DETAILS
Scale 1:25

NOTE:-

- Dimensions in cm or as specified.
- Concrete surfaces will be isolated from contact with backfill by 400 microns, two coats of protective paint (e.g. cool tar epoxy) and 200 microns over ground level and have final coating of Red & White reflective paint.
- Deformed bars epoxy coated MT - $F_y = 250 \text{ N/mm}^2$ (X12); Plain bars MT - $F_y = 250 \text{ N/mm}^2$ (X8).
- Backfilling shall be done with selected material and properly compacted, FDT shall be 95% of dry density.

BAR SCHEDULE

Member	Bar mark	Type and size	No. of bars	No. of bars in each	Total no.	Length of each bar in m	Shape code	A mm	B mm	C mm	D mm	E/m
Chimney	1	X12	1	6	6	1100	20	1800	-	-	-	-
Chimney	2	X8	1	7	7	200	-	-	-	-	-	-

SUMMARY OF MATERIALS AND WORKS

	#12	#8	
Total length per dia	m	10.8	14
Unit weight of reinforcing steel	kg	0.888	0.365
Total weight of reinforcing steel (per dia)	kg	9.3	5.1
Concrete :	0.77	m ³	Total weight of reinforcement kg 13.00

QATAR GENERAL ELECTRICITY & WATER CORPORATION

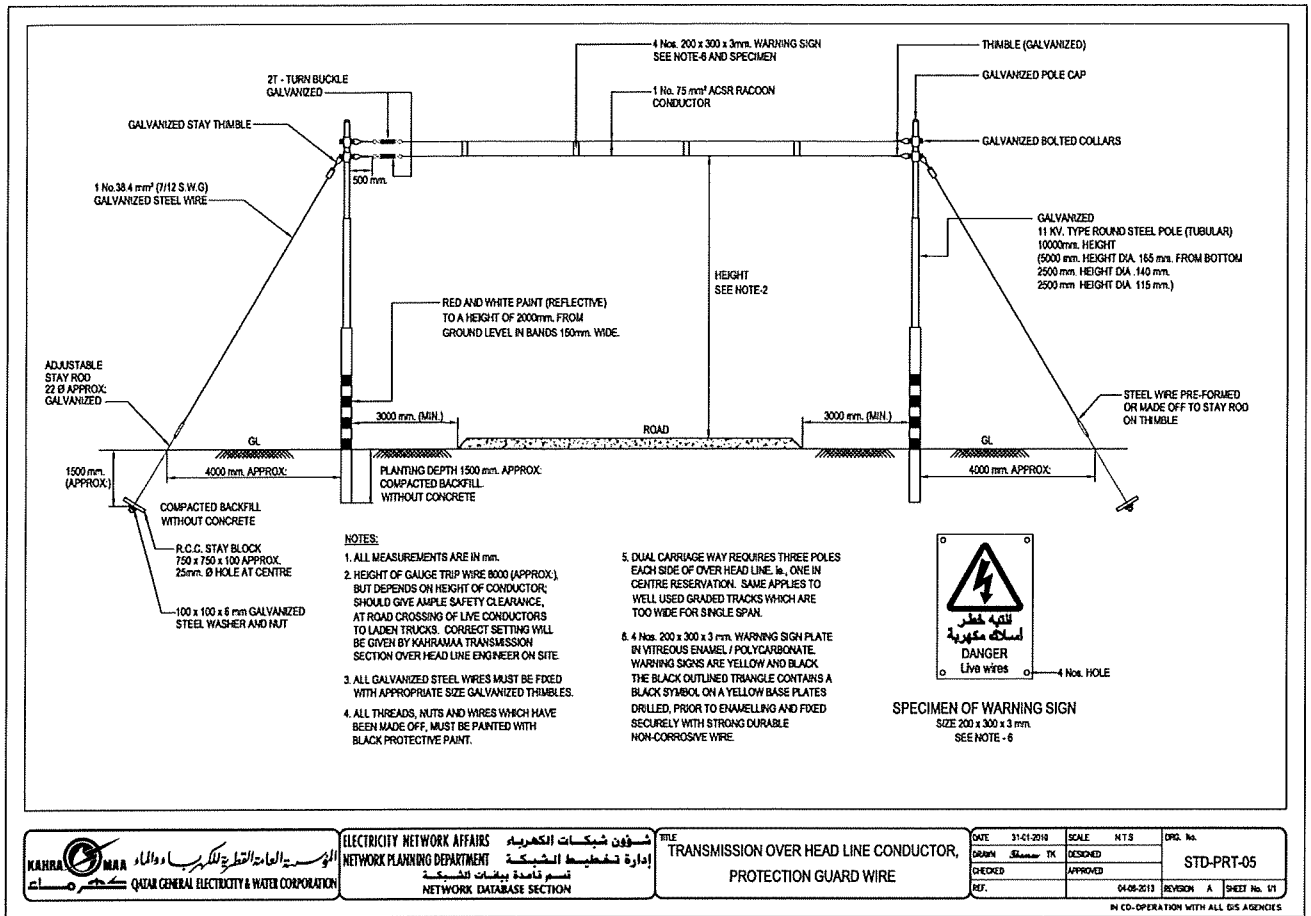
ELECTRICITY NETWORK AFFAIRS
NETWORK PLANNING DEPARTMENT
NETWORK DATABASE SECTION

CRASH PROTECTION
DETAILS

DATE: 7-8-2020 SCALE: AS SHOWN DPL No. STD/PRT/01
 DESIGNED: APPROVED: REVISION: 0 SHEET No. 1

Appendix-B

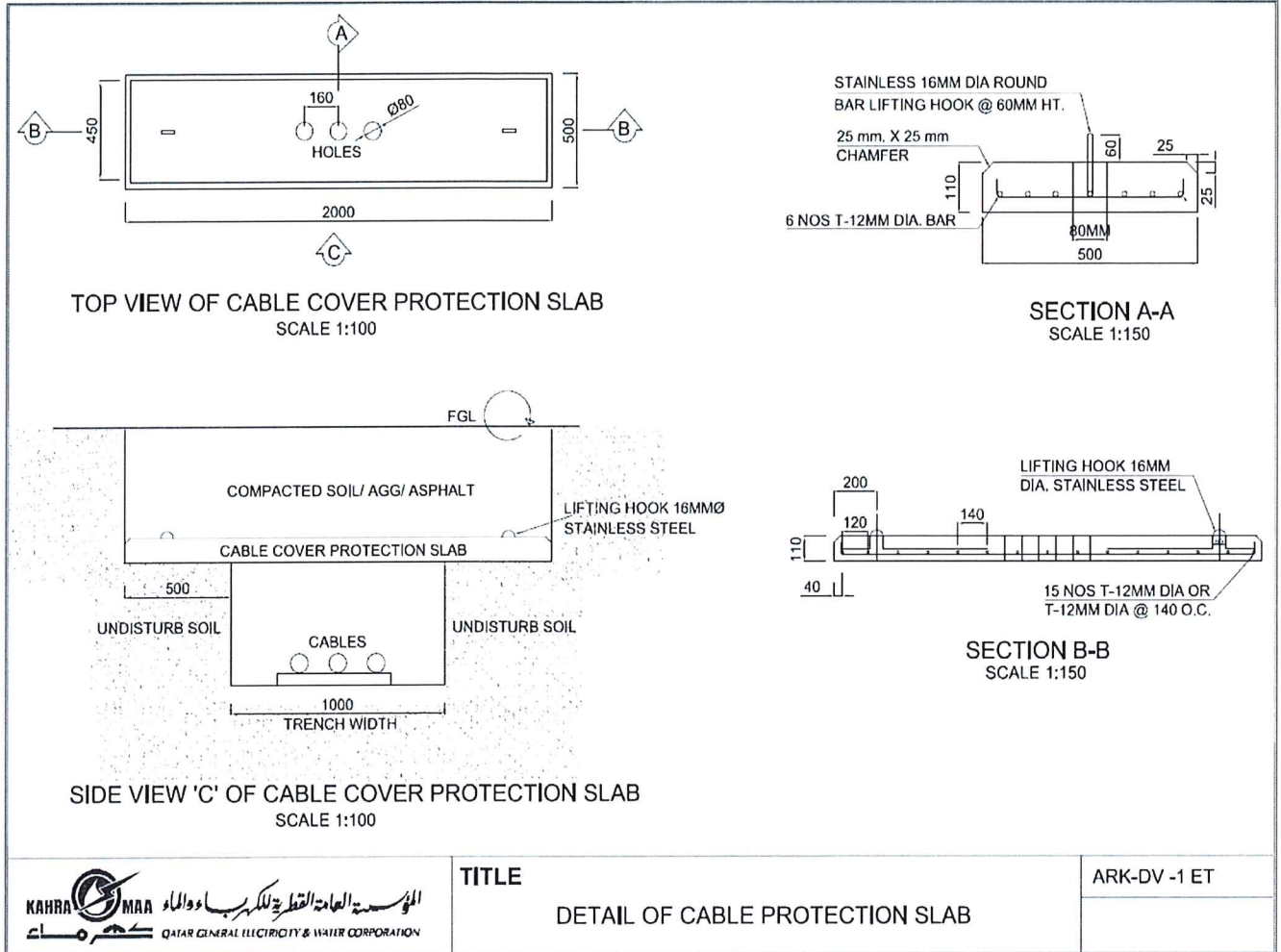
Transmission Overhead line Protection Guardwire



- Depends on site condition, Concrete barriers protection around the guard wire poles & galvanized steel wire shall be installed by the contractor if required without any cost impact on KM.

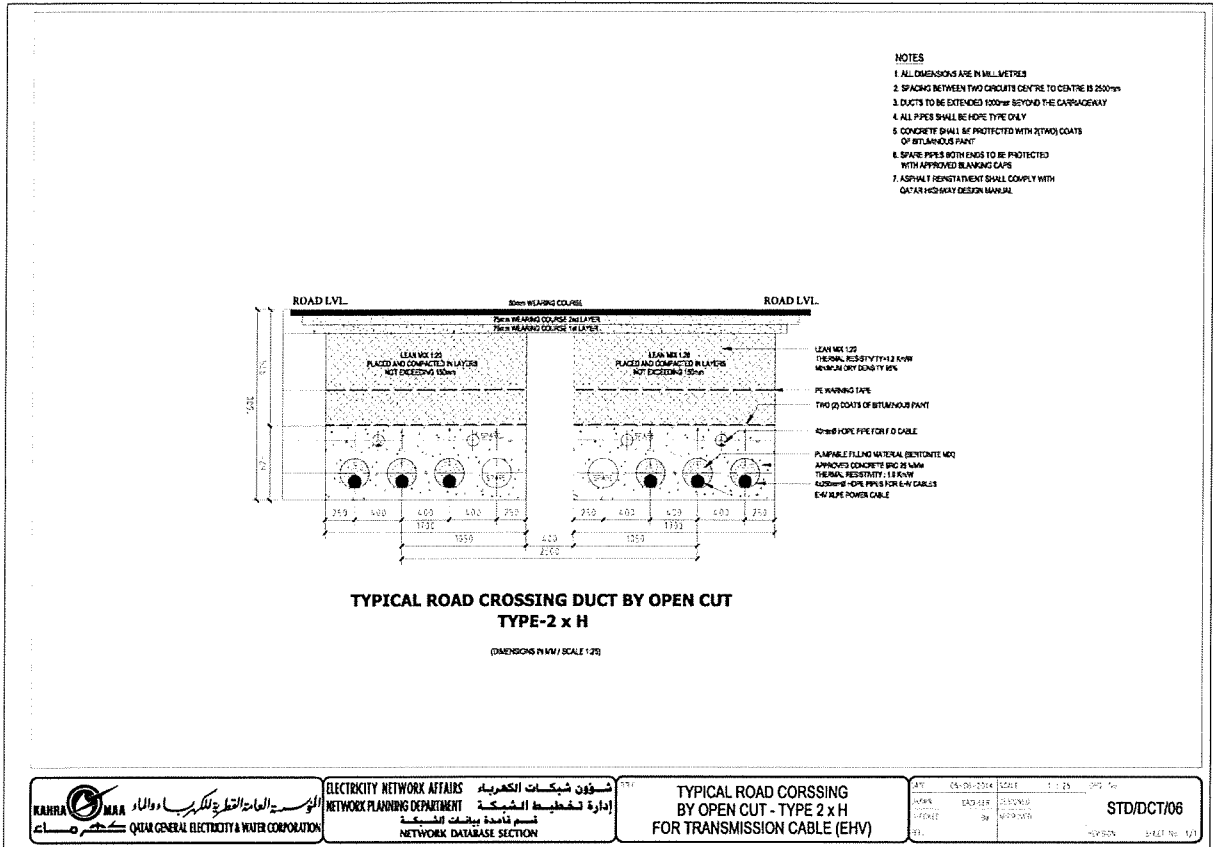
Appendix-C

Cable Concrete Protection Slabs



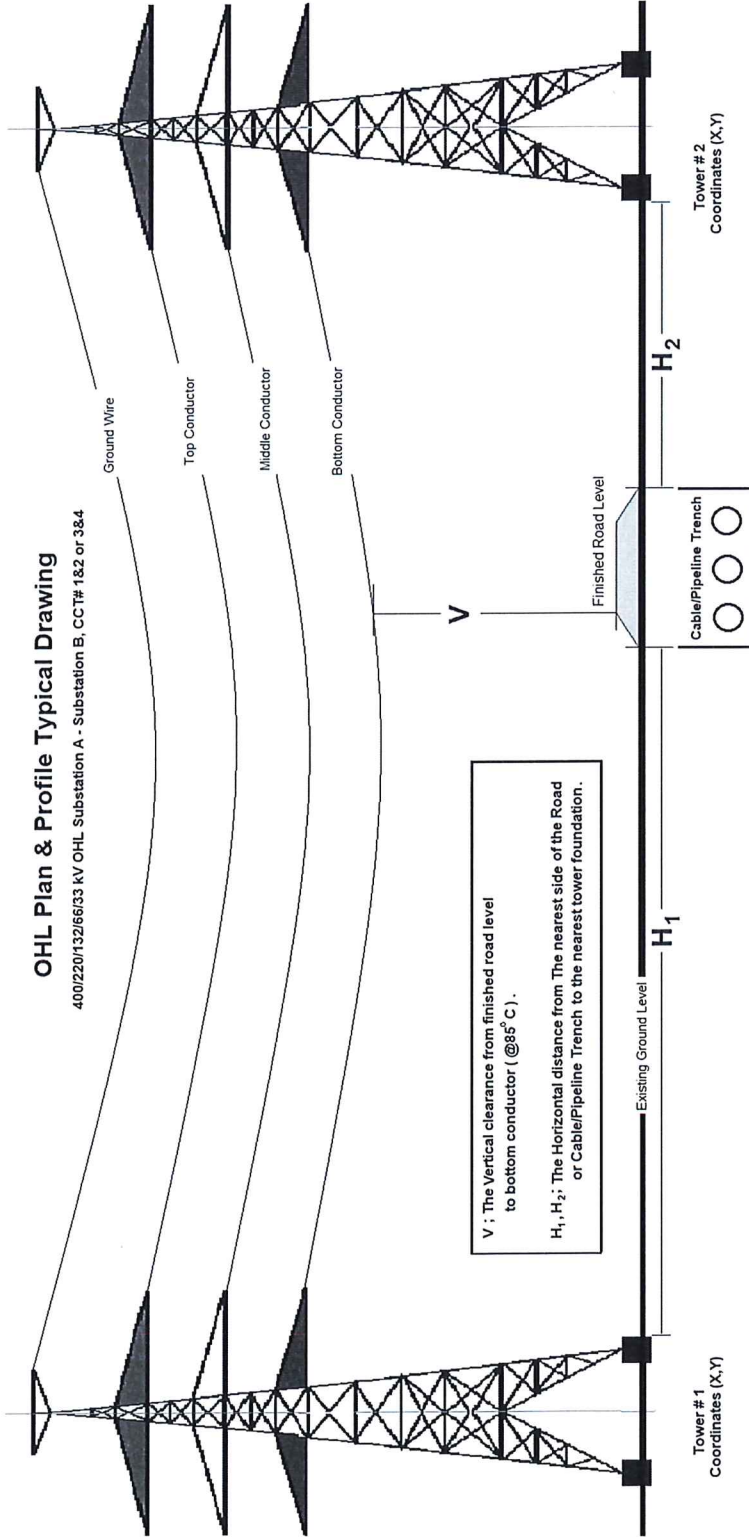
Appendix-D

HDPE Type-H Duct



Appendix-E

OHL Plan & Profile Drawing



Required data:-

- 1- OHL name, Circuit number, Tower number for each affected line.
- 2- Horizontal & Vertical clearances are required and it shall be as mentioned in EN-G1, (If not as per EN-G1, then Reject it).
- 3- For any road construction, Contractor must provide KAHRAMAA with the road classification to define it's Expressway or NOT.
 - * Construction of roundabout or part thereof or T-offs or road junctions within way leave (ROW) limits is not permitted.
 - * No Street light pole will be installed direct under the conductor.
 - * Only Street Lighting Pole with height 5meter can be installed within OHL Way-Leave with a minimum distance 6m from the LIVE conductor on either side.
 - * All Street Lighting Poles shall be individually earthed in addition to the common earthing.
 - * Boundary fences/ shall not be laid parallel to the overhead line within the limits of a way leave (ROW).
- 4- For any Pipeline (water, oil/gas etc.) crossing the way-leaves of 33kV/66kV/132kV, 220kV and 400kV shall be minimum 25, 35 and 50 meters respectively away from the nearest base of tower leg.
 - * All pipe lines shall be under grounded within the OHL defined way leave (ROW).
 - * Pipe-lines shall not be laid parallel to the overhead line within the limits of a way leave (ROW).
 - * All pipes within the way leave shall be buried and adequately protected against weight of heavy maintenance machinery used for overhead lines having G.V.W of up to 40 tons.
 - * If cathodic protection for pipelines is necessary, then the design of such protection should not affect O/H Lines foundations and Earthing systems and shall not interfere with the protection systems of transmission lines.
 - * Construction of any kind of Civil Structure/chamber is not allowed in the OHL Way-leave.

Appendix-F

Street Light Drawing

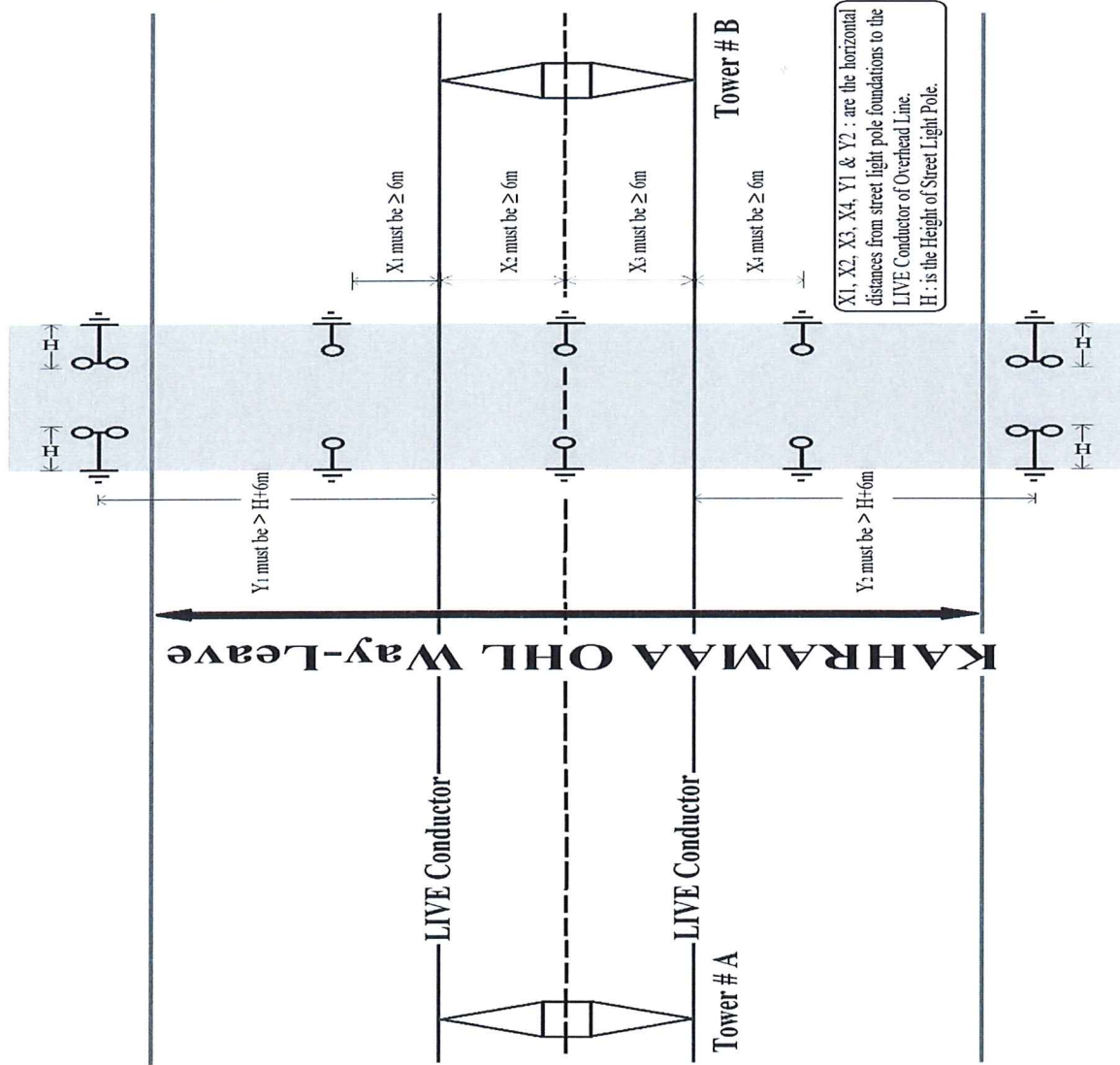
A- KAHRAMAA Conditions for installations of Street Light Poles within the Way-Leave:-

1- Street Lighting columns and overhead wires are not permitted within the way leave. Where due to lighting and traffic safety requirements the street lighting columns are essential within the overhead lines way leave (ROW), ONLY Street Lighting Pole with height 5/6meter may be allowed within a minimum horizontal distance 6m from the LIVE conductor on either side and all Street Lighting Poles shall be individually earthed in addition to the common earthing.

2- ANY Street Lighting Pole with height more than 6meter will not be permitted within OHL Way-Leave.

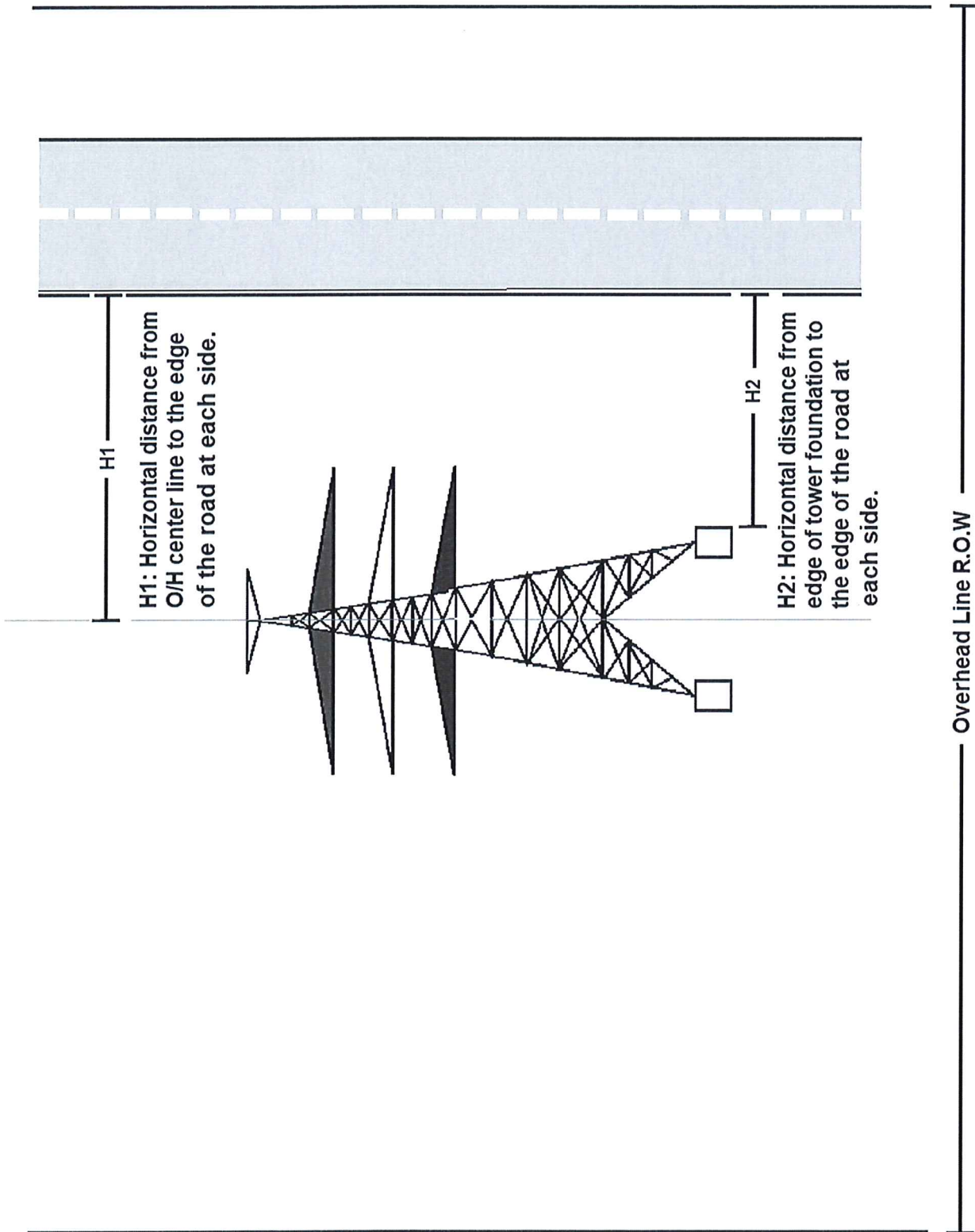
B- Installations of Plant Outside the Way-Leave which May Influence EHV Services

* High structures, whether temporary or permanent, are not permitted to be constructed within its falling distance + 6 meters from the nearest O/H line conductor deflection with "full swing" design conditions.



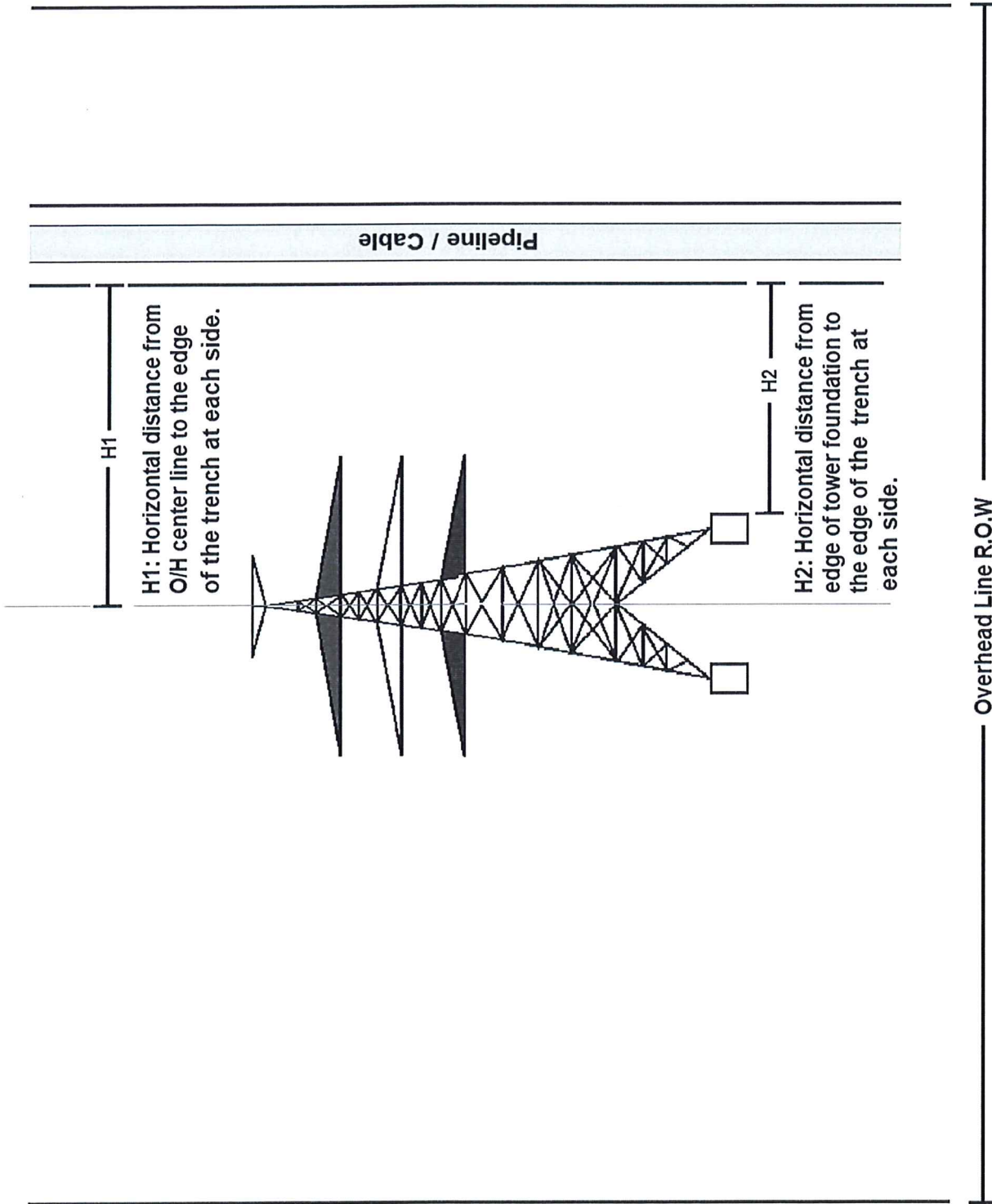
Appendix-G

Road Construction Drawing



Appendix-H

Underground Pipeline or Cable Drawing



--END