



المعايير الفنية المرجعية لمكونات المدينة الذكية بأمانة العاصمة المقدسة

((المكون الثالث))

شبكة الألياف الضوئية



صفحة وحدة مدينتي ذكية

<http://www.holymakkah.gov.sa/mundeps/SmartCity>

البريد الإلكتروني لوحدة مدينتي ذكية

smartcity@holymakkah.gov.sa

Fiber Optical المعايير الفنية لشبكة الألياف الضوئية

المواصفات

General Requirements (OSP) :

(48) Fiber G.652D single mode cable that is suitable for ducted route shall be installed inside one of the Duct and or sub-duct newly installed.

Manholes, Handholes and cable entrance shall be placed when it is required along the route and new site intra-building.

Along the cable route, one warning tape at mid-level shall be installed. Also, Marker post shall be installed where ever applicable.

Splicing, termination in ODF, labeling, testing and commissioning are part of the work.

Bidder shall provide a list that identify and specify all civil works material and services required to meet the proposed OSP Design for each site and changes of existing OSP.

Successful bidder shall be responsible to provide all materials required and execute the civil works required for each segment.

Contractor shall supply all materials required and deliver it to customer Store.

Contractor is responsible for the coordination of delivery of Company supplied materials. No time extensions will be allowed for Contractors failure to completely coordinate Company supplied material deliveries

Contractor shall be responsible for the proper care of all materials, and shall replace or repair any damage to the materials, which occurs as a result of insufficient or improper protection and handling

All materials required shall be new and late model.

Outside Plant Specifications :

The trench width shall allow adequate compaction of the backfill material, normally 40-cm. The trench depth shall be 1.2 meter. The line of trench shall be straight and all loose, broken stone shall be removed from the trench after excavation.

Material for back-filling shall be uniform in character throughout, free from substances that by decay, erosion or otherwise may cause the formation of cavities, or otherwise affect the stability of the filling and or damage the installed cable.

The backfilling operation shall be as stated above, however the first 20-cm of fill surrounding the cable shall be sand containing no particles larger than 10-mm. The cable shall be centered in the sand bed.

Excavated material could be used for backfilling, if it is free from big boulders / pieces of rock (maximum allowable size is 2.5 cm) and suitable for compaction. Backfilling shall be done in layers not more than 30-cm. Each layer shall be compacted well before putting another layer on it.

Warning tape written "WARNING! TELEPHONE CABLE " both in Arabic and English shall be installed above the cable as follows:

- o Two warning tapes at one-third and two-third level in normal soil.**
- o One warning tape at mid-level in rocky area.**

Horizontal Directional Drilling :

Horizontal Directional Drilling is a technique of precision boring in any direction that allows pipes/ducts to be laid at any depth under the highway without disturbing the road surface or traffic.

A minimum 110-mm dia. HDPE pipe shall be installed with 4-32mm or 3-50mm subduct in it. The depth of the directional drilling shall not be less than 2-meter from the asphalt level. All requirements of customer of Transportation shall be observed.

PVC-Duct in Sand / Cable Installation :

The contractor shall place two 110-mm dia. (minimum 3.2-mm thickness) PVC-pipes in excavated trench with a sand bed 10-cm below and 20-cm above the pipe. The backfilling and compaction shall be done as stated above.

The cable shall be pulled in the duct after backfilling the trench. The end of the duct shall be sealed with adequate material after cable installation.

Empty duct shall be plugged with end cap. Warning tape written "WARNING! TELEPHONE CABLE" both in Arabic and English shall be installed above the duct at mid-level.

PVC-Duct in Concrete / Cable Installation :

E 2.4.4.1. The contractor shall place two 110-mm dia. (minimum 2.2-mm thickness) PVC-pipes in excavated trench with spacers after cleaning the trench bed.

A minimum cover of 15-cm with concrete shall be all around the pipe.

The strength of concrete shall not be less than 250kg/cm² with Type-V (Sulphate resistant) cement. The backfilling and compaction shall be done as stated above.

The cable shall be pulled in the duct after backfilling the trench. The end of the duct shall be sealed with adequate material after cable installation.

Empty duct shall be plugged with end cap. Warning tape written "WARNING! TELEPHONE CABLE "both in Arabic and English shall be installed above the duct at mid-level.

Cable Pulling in New/Existing Duct :

Cable shall always be placed so as not to obstruct future placing of other cables. Cables shall be installed in the bottom duct whenever possible or duct assigned by relevant authorities.

When cables are installed in duct or sub-duct, care shall be taken to ensure that any pulling lubricant being used does not "pack" or otherwise form obstructions to the cabling progress

Warning/Identification markers shall be placed in at least three locations in the manhole/Hand-hole, to warn/identify the presence of cable.

Cable markers shall be employed to clearly identify the cables in the manhole/Hand-hole as belonging to customer .

Cable shall be set in manholes/Hand-holes in such a manner that they do not block vacant ducts or restrict the working space.

Installation of HDPE-Pipe in Open Trench :

The contractor shall place one 110-mm dia. (minimum 5.0-mm thickness) HDPE-pipe in excavated trench with a sand bed 10-cm below and 20-cm above the pipe. The backfilling and compaction shall be done as stated above.

The cable shall be pulled in the duct after backfilling the trench. The end of the duct shall be sealed with adequate material after cable installation.

Warning tape written "WARNING! TELEPHONE CABLE" both in Arabic and English shall be installed above the duct at mid-level.

This HDPE-pipe is being provided to give extra protection to the cable from salt water of the sea.

Installation Of Manholes / Hand-Holes :

Manholes/Hand-holes shall be installed in such a way that cover shall be at the level of asphalt/ground level. The cover of the manholes/hand-holes shall be accessible and open able.

All Manholes/Hand-holes shall be of reinforced concrete. It shall be strong enough to bear the load of trucks without any damage. It would be preferable to use pre-fabricated manholes/hand-holes. However, cast on site shall be done with all specification and standards. A drawing is attached for dimensions and specifications.

The excavated area shall be properly leveled and compacted before installing manhole/hand-hole.

All ducts entering the manhole/hand-hole shall be smoothly terminated with the wall of manhole/hand-hole.

All accessories (i.e. cable tray, cable ladder, ends plugs, ladder in manholes etc.) shall be properly fixed inside the manhole/hand-hole.

Aluminum marking plate shall be installed in each Manhole/Hand-hole at suitable location. The plate shall be marked with Manhole/Hand-hole number, route of the cable or any other information required.

E2.4.9. Marker Post :

Flexible marker post (drawing is attached) of yellow color shall be installed along the route of the cable.

The maximum distance if not specified in the design shall be 300-meters between two marker posts and shall be visible from one marker post to another.

Marker post shall be installed as follows:

Cable route deviates from its normal route, marker post shall be installed at the beginning and at the end of deviation.

Marker post shall be installed at the beginning and at the end of the duct / pipe /

thrust-bore made for crossing any utility or road / highway.

At joint locations along direct buried cable.

The installation shall be done according to the manufacture's recommendation and shall be submitted with all details to customer for approval before installation.

Aluminum identification plate shall also be fixed with post with necessary information on

Cable Installation and Termination Testing :

After completing the civil work and installation of the new cable, contractor shall inform customer a tentative date for testing and acceptance.

A 5-days prior notice shall be given in writing. End to end testing shall be recorded. Splicing in existing joints shall be done according the connectivity plan provided by customer.

All cable installations and terminations shall be tested according to the standard procedures and specifications set forth.

Fiber Optics Cable Testing :

The Contractor shall test all fiber optic cable upon receipt from Manufacturer Company. Contractor's acceptance of fiber optic cable indicates to MOD that fiber optic cable provided by manufacture meets specifications and is free from defects.

The Contractor is responsible for the protection and integrity of the cable until Final Acceptance.

The Contractor shall test the provided fiber optic cable to the following specifications:

A loss less than or equal to 0.20 dB/Km at 1550 nm

Dispersion less than or equal to 4.5 dB/Km at 1550 nm

PMD less than or equal to 0.1 ps/√Km at 1550 nm

Fiber Optics Cable Splicing :

All splices shall be performed with an industry-accepted fusion-splicing welder. The welder shall be a late model with the necessary software programming.

Contractor shall ensure welder has been calibrated and maintained in accordance with manufacturer specifications.

Splices shall be qualified during initial construction with an OTDR from only one direction.

The profile alignment system or light injection detection system on the fusion welder shall NOT be used to qualify splices. The pigtails will also be qualified at this stage using an OTDR.

All measurements shall be taken at the 1550 nm wavelength.

During initial uni-directional OTDR testing, the objective for each splice is a loss of 0.1 dB or less. If, after three attempts, Contractor is not able to produce a loss value of less than 0.1 dB, then 0.15 dB will be acceptable. If, after two additional attempts, a value of less than 0.15 dB is not achievable, then the splice shall be marked as Out-of-Spec ("OOS") on the field report.

Each splicing attempt shall be documented on the field report. Failure to properly document each attempt may result in the requirement to re-splice OOS fibers.

After end-to-end connectivity of the fibers on a given span has been achieved, bi-directional span (ODF to ODF) testing shall be done at 1550 nm wavelength.

These measurements must be made after the splice manhole or hand hole is closed and the enclosure sealed in order to check for macro-bending problems.

Continuity tests shall be done to verify that no fibers have been crossed in any of the splice point or at the ODF. Any crossed fiber shall be immediately repaired and reported to a MOD representative.

Once the fibers have been terminated to an ODF, bi-directional OTDR traces shall be shot and saved to disk. Splice loss measurements on each link splice in each direction shall be recorded on a data sheet and the bi-directional average calculated.

Power loss measurements shall be recorded using an industry-accepted laser source and power meter at 1550 nm wavelength in both directions on a span.

Accurate uni-directional field reports are paramount in assessing whether a splice that does not meet the following bi-directional standards will need to be re-spliced.

Contractor shall strictly adhere to the following splicing standards.

During testing of a span, the objective for each individual splice is a bi-directional average loss of 0.15 dB or less.

The standard for each fiber within a span shall be an average bi-directional loss of 0.10 dB or less for each splice. For example, if a given span has 10 splices, each fiber shall have total bi-directional loss (due to the 10 splices) of 1.0 dB or less.

<i>Each individual splice may have a bi-directional loss of 0.15 dB or less, but the average bidirectional splice loss across the span must be 0.10 dB or less.</i>
<i>The loss value standard of the pigtail connector and its associated splice shall not exceed 0.50 dB. This value does not include the insertion loss from its connection to the ODF.</i>
<i>For values greater than this, the splice shall be broken and re-spliced until an acceptable loss value is achieved. If, after five attempts, Contractor is not able to produce a loss value less than 0.50 dB, the splice shall be marked as "OOS" on the field report.</i>
<i>Each splicing attempt shall be documented on the field report.</i>
<i>All disk and hard copy splicing and testing documentation must be submitted no later than five (5) working days after completion of splicing.</i>
<i>As splicing on each span is completed, Contractor shall immediately begin bi-directional OTDR testing and documentation.</i>
<i>Span documentation shall be submitted as a span testing is completed and not delayed until the end of the Project.</i>
<i>The specific documentation requirements for splicing and testing are :</i>
<i>The original field data reports on the uni-directional testing conducted during splicing organized in logical order on a span basis. All field reports must be legible.</i>
<i>Three sets of disk containing all OTDR traces. Contractor shall verify that all files on the disks were saved properly and file corruption problems do not exist. Disks shall be labeled with the span, direction, and fiber numbers. Contractor shall create and provide a "template" trace for each span in each direction of testing.</i>
<i>Three hard copies of the bi-directional OTDR splice loss averages, organized in logical order on a span basis. The reports shall list the OTDR parameter settings, splice number, distance from each test point (ODF), splice loss in each direction, and the bi-directional average splice loss.</i>
<i>Three hard copies of the bi-directional power loss testing results indicating the wavelength, type of test equipment, optical length of span, the loss in each direction, and the average loss on the span.</i>
<i>The fibers shall be terminated to an ODF with Angled Polish LC-APC or FC-APC connectors, unless another type of connector is specified in the Design.</i>
<i>Connectors Insertion Loss shall be less than or equal to 0.3 dB and the return loss shall be greater than or equal to 60 dB</i>
<i>The ODFs shall be installed in the site and pre-loaded with pigtails.</i>
<i>Contractor shall provide MOD an ODF layout As-Built diagram no later than five (5) days after termination of each panel.</i>
<i>Contractor shall label each fiber distribution panel with the Source, the fiber numbers, and destination/direction.</i>