

**المواصفات الفنية الخاصة بالمناقصة العامة**

**رقم المناقصة : ( ٢٠١١/٢٠ )**

**الخاصة بشراء وتوريد (١٧) كم كابلات رئيسية مختلفة**

**السعات**

**المؤسسة العامة للاتصالات السلوكية واللاسلكية**

**الإدارة العامة للمشتريات والمخازن**

**إدارة المشتريات - قسم العقود والمناقصات**

*REPUBLIC OF YEMEN*

*Ministry of Telecommunication  
& Information Technology*

**Public Telecommunication Corporation**

**Technical Specifications  
& Schedule Of Quantities  
(PRIMARY CABLES)**

# CABLE POLYETHYLENE UNIT TWIN FILLED PRIMARY CABLES (UNARMOUR)

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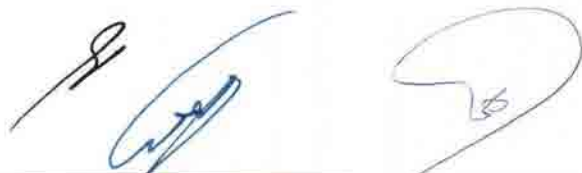
### 1. GENERAL NOTES:

This specification cover the construction, properties, testing and packing of polyethylene insulated and filled, moisture barrier sheathed, telephone cable.

### 2. ASSOCIATED DOCUMENTS:

- (a) Where international standards are not available, standards in accordance with ASTM (American Society for Testing and Materials), IP (Institute of Petroleum) and BS (British Standards Institute) have been specified. The latest issues shall be apply and deemed to be integral parts of the specification.
- (b) The following standards are referred to in this specification:

ASTM B3	Conductor, Quality of Copper.
ISO R402	Conductor, Tensile Strength and Elongation.
ASTM D 1248	Insulation and Sheath, Quality of Polyethylene material
IBC 189-2	Colour Code for Conductor Insulation and group markers.
IEC 304	Standard for colours.
ASTM D 792	Insulation and Sheath, Density
ISO R 292	Insulation and Sheath, Melt Flow Index.
ISO R 527	Insulation and Sheath, Tensile Strength and Elongation
ASTMD 1603	Sheath, Carbon Black Content.
ASTMD 1693	Sheath, Environmental Stress Cracking.
BS 6007	Sheath, Spark Test.
IP 31	Filling Compound, Drop Point.
ASTM D 1169	Filling Compound, Volume Receptivity.
ASTM D 924	Filling Compound, Dielectric Constant
ASTM D 93	Filling Compound, Flash Point
ASTM D 937	Filling Compound, Penetration
ASTM D 150	Dissipation Factor
CCITT	Relevant Publication
MAT-061	Inspection and Testing
MAT-062	Packing and Marking



### 3. DEFINITIONS:

(a) Conductor

A solid continuous copper wire, circular in section.

(b) Conductor Insulation

The insulation material immediately surrounding a conductor

(c) Pair

Two identical (except for colours) insulated conductors twisted together.

(d) Group

Ten pairs stranded together with an identification binder applied over it.

(e) Unit

Five or ten groups stranded together with an identification binder applied over it.

(f) Core Center

The inner unit(s) of a cable symmetrically arranged around the axis of the cable.

(g) Core

The stranded group(s) or unit(s) laid up and wrapped, before the addition of a screen or a sheath.

(h) Lay

The axial length of one complete turn of the helix formed around an imaginary line between the center of the conductors of a pair or around an imaginary longitudinal line at the center of a unit, group, or core, (whipping, lapping, screening or armouring as applicable).

### 4. TEMPERATURE AND ENVIRONMENT:

- (a) The cable shall be retain the mechanical and electrical characteristics, within specified limits detailed in this specification, over a working temperature range of  $-10\text{ C}^{\circ}$  to  $+60\text{ C}^{\circ}$ .
- (b) The cable shall be suffer no deterioration. From corrosive elements found naturally in the ground.

### 5. CONSTRUCTION OF CABLE:

#### 5.1 Conductor:

- (a) Each conductor shall be consist of a solid wire of commercially pure copper annealed, circular in section, uniform in quality and free defects. Conductors shall be meet the requirements of ASTM B3 with the exception of the dimension and permissible variation.
- (b) The nominal conductors diameters shall be 0.4 mm .
- (c) The conductor diameter shall be within such limits of the specified nominal diameter as to meet the resistance limits given in Table 7.

#### 5.2 Conductor Insulation:

- (a) Each conductor shall be insulated with foams-skin coloured insulating high density polyethylene conforming to ASTM D1248.
- (b) The cells produced by the expanding process shall be uniformly distributed circumferentially and shall be substantially non-intercommunicating.
- (c) The minimum thickness of the insulation shall be such that the electrical requirements of this specification are met and shown in the following Table.

Table 1

Conductor dia. (mm)	Minimum Thickness of insulation (mm)
$0.4 \pm 0.01$	0.20

- (d) The insulation shall be coloured in accordance with IEC 198-2 as shown in Table 2. The colors shall be readily identifiable and durable. Colours shall be correspond to reasonably with the standard colours shown in the IEC Publication IEC-304.

*Table 2*

Number of Pairs	Conductor (A)	Conductor (B)
1	White	Blue
2	White	Orange
3	White	Green
4	White	Brown
5	White	Gray
6	Red	Blue
7	Red	Orange
8	Red	Green
9	Red	Brown
10	Red	Gray

**5.3 Twinning:**

Two insulated conductors shall be uniformly twisted together to form a pair. The lay shall be different for each pair in a group and shall not be less than 30mm nor greater than 200mm and the group lay not less than 500mm. The unit lay shall not be less than 200mm.

**5.4 Stranding:**

- (a) Ten pairs, coloured as in Table 2, shall be stranded together to form a group.
- (b) An open lapping of plastic tape(s) or textile threads, durably coloured, shall be applied over each group as shown in Table 3, Colours shall be correspond to reasonably with the standard colours shown in IEC Publication IEC 304 .  
The groups shall be stranded together.

*Table 3*

Group Number	Color Code
1	Blue
2	Orange
3	Green
4	Brown
5	Gray
6	Red
7	White
8	Black
9	Yellow
10	Violet

- (c) Cable up to an including 100pairs shall be formed by stranding group together and laid as shown in (Table 4). Alternatively the pairs may be stranded in concentric layers.  
- Adjacent layers shall be stranded in opposite directions.

*Table 4*

Number of pairs	10-pair group number	
	Center	Layer 1
10	1	-
20	1,2	-
30	1 - 3	-
50	1	2 - 5
70	1	2-7
100	1,2(3)	(3) 4 - 10

- (d) An open lapping of durably tape(s), or threads shall be applied over each unit or subunit. The binder shall be of same colour for all units except for the first unit, which shall be different colour.
- (e) The length of lay of the binders shall not be exceed 100 millimeters when laid in the same rotation as the pairs. When laid in the opposite rotation the length of lay shall not be exceed 200 millimeters.

- (f) Cable with 100 pairs or more shall have spare pairs as shown in table 5. The spare pairs shall be stranded to form a separate unit whipped with an open helix of durable coloured tape(s).
- (g) The spare pairs shall be placed in the interstices of the outer layer. The electrical and physical characteristics of each spare pair shall meet all pertinent requirements for the standard pairs.

Table 5

Number of pairs	Number of pairs in the unit	Unit number			Number of spare pairs
		Core Center	Layer 1	Layer 2	
100					1
200	50	1-4			2
300	50	1	2-6		4
400	50	1-2	3-8		4
600	100	1	2-5		6
800	100	1-2	3-8		8
900	100	1-2	3-9		9
1000	100	1-3	4-10		10
1200	100	1-4	5-12		12
1500	100	1	2-6	7-15	15
1800	100	1	2-7	8-18	18
2400	100	1-3	4-11	12-24	24

#### 5.5 Filling:

- (a) The interstices between conductors, groups, units and sheath shall be completely filled with a water repellent compound.
- (b) The filling compound must not have any harmful effect upon the other materials of which the cable is made and must not change or blur the colours of the insulated conductors and identification markers.
- (c) The filling compound shall be easily removable from the insulated conductors and must not emit hazardous or unpleasant vapour and must not contain skin irritants or poison.
- (d) The filling compound must not influence the long-term stability of the electrical properties of the cable.
- (e) A three-meters length of cable shall be stabilized at 25°C + 3°C. A watertight closure shall be placed over the jacket. The closure shall not be placed over the jacket so tightly that the flow of water through preexisting voids or air spaces within the core is restricted. The other end of the sample shall remain open. The closure shall be filled with water to a one-meter head over the sample or placed under the equivalent continuous pressure for one hour. There shall be no water leakage in the sheath interfaces, under the core warping or between any insulated conductors in the core. If water leakage is detected, another one 3 meters additional adjacent sample from the same reel of cable shall be tested. If the remaining sample exhibits water leakage, the entire reel of cable is considered acceptable.

#### 5.6 Core wrapping:

- (a) The stranded units shall be wrapped with a continuous layer of non-hygroscopic dielectric material forming a compact and circular core. The wrapping shall have an overlap of 30% for the wrapping but not less than 5mm. If required for manufacturing reasons, the center core may be similarly wrapped with polyester tape 40 μm.
- (b) The wrapping shall not adhere to the insulation or to the screen.
- (c) The wrapping shall be designed to allow the filling compound to penetrate or may be applied with the filling compound for both sides.

#### 5.7 Identification:

An identification tape, durably marked with R.Y.P.T.C the Manufacturer's name and the year of manufacture of the cable, shall be placed longitudinally, straight or in spiral, under or over the wrapping. Alternatively these details may be printed on the outer wrapping.

This information shall be repeated at intervals of maximum 300 millimeters.

### 5.8 Moisture Barrier (Screen):

- (a) Over the core wrapping shall be applied a moisture barrier sheath. This shall be consist of a metallic foil bonded to polyethylene sheath.
- (b) The metallic foil may be consisting tape or a 0.2 mm aluminum tape coated on both sides with a protective plastic coating .The thickness of the coating on each side shall be minimum 0.03mm.
- (c) The metallic foil shall be electrically continuous throughout the cable length.
- (d) The metallic foil shall be applied longitudinally with an overlap of at least 6mm.
- (e) The polyethylene sheath shall be fuse with a coated metallic foil.

### 5.9 Outer sheath:

- (a) An outer sheath of high density black polyethylene meeting the requirement according to A STMO 1248 shall be extended over the screen
- (b) The polyethylene sheath shall be consist of tough, weather resistant, high molecular, weight polyethylene compound meeting the requirement of A STMD 1248
- (c) The sheath shall be circular, free from pinholes, joints mended places and other defects. The ratio of maximum/minimum diameter shall not be exceed 1.2 at any point for cables with a nominal diameter not greater than 25mm.
- (d) The average thickness at any cross-section shall not be less than 90% of the nominal thickness. The minimum spot thickness shall be not less than 80% of the nominal thickness.
- (e) The nominal thickness of the sheath shall be as shown in table 6.

Table 6

Average external diameter of cable core (mm)	Nominal Thickness of Sheath (mm)
Up to 10	1.4
10 – 15	1.6
15 – 20	1.8
20 – 25	2.0
25 – 30	2.2
35 – 40	2.5
40 – 45	2.6
50 – 55	2.8
55 – 60	2.9
60 – 65	3.0
65 – 70	3.1
70 – 75	3.2
80 – 85	3.4
85 – 90	3.5
90 – 95	3.6

### 5.10 Length Marking:

Sequentially numbered length markers should be placed at regular intervals of 1m longitudinally on the outside sheath. Continuous sequential numbering should be employed for any single length .The number shall not be less than 3mm in height and spaced to produced Good legibility. The numbers shall be of clear distinguishable contrast marking.

The accuracy of the length marking shall be within  $\pm 1\%$ .

An occasional illegible is permissible if there is a legible marking on either side of it.

### 5.11 Identification Marking:

Each length of cables shall be identified with the manufacturers name, and with the Ministry of Telecommunications & Information Technology, Republic of Yemen and PTC so as to have the type of cable. The number of pairs and gauge of conductor marked on the outer surface of the polyethylene sheath .The interval of the marking shall be approximately two meters. Marking shall be indented to give permanency.



### 5.12 Cable Size:

The cable size shall be as specified in schedule of quantities .

## 6. ELECTRICAL REQUIREMENTS AT 20°C:

### 6.1 Conductor Resistance:

For any length of cable the conductor resistance shall not be exceed the values given in table 7. The resistance temperature coefficient for cooper conductors used in the cable should be specified.

Table 7

Conductor diameter (mm)	Maximum average resistance for all pair (Ohm/Km)	Maximum resistance one pair (Ohm/Km)
0.4	143	150

### 6.2 Resistance Unbalance:

The resistance unbalance between the two conductors of a pair shall not be exceed 2 ohm.

$$\% \text{ Resistance Unbalance} = \frac{\text{Max Res} - \text{Min Res}}{\text{Min Res}} \times 100\%$$

### 6.3 Mutual Capacitance:

The mutual capacitance shall be measured with 800Hz or 1000Hz .The average mutual capacitance shall be 44±6nF/Km and individual values shall be within, tolerances for average and individual values of 46F/Km and ± 8nF/Km respectively may apply.

### 6.4 Capacitance Unbalance:

- The capacitance unbalances shall be measured with 800Hz or 1000Hz and shall be corrected to 500m length of cable. The correction factor shall be 500/L for RMS values and 500/L for maximum values (L- length of the cable in meters).
- The maximum pair-to-pair capacitance unbalance within a group shall be 22Pf/500m RMS and 150pf / 500m for individual values.
- The maximum pair-to-pair capacitance unbalance between adjacent groups or units shall be 20pF/500m for RMS values and 50pf / 500m for individual values.
- The pair - to - screen unbalances shall be measured at 800Hz or 1000Hz .The maximum pair to screen capacitance unbalances shall be 400pF/Km for RMS values and 1500pF/Km for individual values. Regarding screen refer to point 5-8' Moisture Barrier".

### 6.5 Insulation Resistance:

Each insulated conductor in the completed cable shall be tested with a potential of 500 volts DC, applied for one minute. Each insulated conductor shall have a minimum insulation resistance of 5000 megohm for 1000m.

Throughout the test all insulated conductors other than those under measurement and screen shall be earthed. Several pairs may be tested at the same time.

### 6.6 Dielectric Strength:

- In each length of completed cable the insulation shall be capable of withstanding DC potential for three seconds as the following table.

Table 8

Conductor Dia. (mm)	Test Potential (Volts)	
	Conductor to conductor	Conductor to screen
0.4	2400	5000

### 6.7 Spark Test of Sheath:

The sheath shall be spark tested in accordance with BS 6007 at the voltage shown in Table 9. The test may be make during sheath extrusion process.

Table 9

Radial thickness of sheath (mm)	Test voltage (Volts) DC
1.0	6,000
1.5	8,000
2.0	10,000
2.7	12,000

**6.8 Attenuation:**

Nominal attenuation 1KHz shown in the following table.

Table 10

Conductor Dia. (mm)	Nominal Attenuation (dB/Km)
0.4	1.8

**7. MECHANICAL REQUERMENTS:**

All tests shall be performed as specified in inspection and test of PTC's specification.

**7.1 Conductor:**

The tensile strength shall be minimum 200N/mm<sup>2</sup>. The percentage permanent elongation after completed test shall be not less than shown in table 11.

Table 11

Nominal Diameter (mm)	Permanent elongation
0.4	13%

**7.2 Insulation:**

The maximum melt flow index shall be 0.5.

The tensile strength shall be not less than 10N/mm<sup>2</sup> and the ultimate elongation not less than 300%.

**7.3 Filling Compound Properties:**

- (a) The drop point shall not be lower than +80°C.
- (b) The flash point shall not be less than +230°C.
- (c) There shall be no separation of the constituents forming the compounds.
- (d) The volume receptivity shall not be less than 10<sup>o</sup> ohm·cm
- (e) The dielectric constant shall not be exceed 2.3.
- (f) The dissipation factor shall not be exceed 0.0015.

**7.4 Screen:**

The minimum force required to peel the screen from the cable sheath shall be not less than 6.5N for a width of 26mm.

**7.5 Sheath:**

- (a) The maximum melt flow index shall be 0.5.
- (b) The tensile strength shall not be less than 12.5N/mm<sup>2</sup> and the ultimate elongation not less than 400%.
- (c) Resistance to environmental stress cracking shall not be allow more than 2 failures from 10 tested specimens.
- (d) The carbon block content shall be 2.5 ± 0.5 percent (weight).
- (e) The water vapour permeation rate shall not be exceed 0.13x Dg/100N/week (where D is the internal diameter of the polyethylene sheath in millimeters).

**8. COMPLINCE**

The tenderer shall be state their compliance with specification in figures and detailed statements any deviation suggested by manufacture, shall be fully documented and may be presented the word (comply) is not sufficient for this purpose.

### 9. SUPPLY EXPERIENCE:

The Tenderer shall submit document of supply experience.

### 10. SAMPLES:

- a) The sample must be corresponding to submitted offer with length not less 40cm, clearly showing all the cable layers.
- b) The sample must be stamped by Manufacture Company.

### 11. DELIVERY LENGTH:

The cables shall be delivered on drums in standard length or as specified by order.

### 12. INSPECTION Mat 061:

- a) Manufacturer shall keep suitable summary records for a period not less than five years of all electrical and physical tests required in such a form that test data, for a particular drum may readily available to the ministry upon request and easily readable form.
- b) Following test results should be supplied with each cable drum:-
  - a) Continuity
  - b) Conductor resistance.
  - c) Resistance unbalance.
  - d) Mutual Capacitance.
  - e) Capacitance unbalance.
  - f) Insulation resistance.
  - g) Dielectric strength.
- c) PTC Shall have a right to depute a representative to inspect at factory during the manufacture of the cable at the cost of the tenderer.

### 13. PACKING AND MARKING Mat 062:

- a) Packing and marking shall be performed according to PTS's specification MAT-062.
- b) The cable shall be coiled on strong wooden drums. The ends shall be firmly secured in order to withstand all transportation conditions.
- c) When viewed from ends of the cable the direction of the rotation of the colour scheme of pairs shall be indicated by making the clockwise and anti-clockwise ends with red and green bands respectively the end of cable shall provide with Matel cap / Row Ring for the pulling.
- d) Unless otherwise specified, the lengths shall be so drummed that the rotation of the colour scheme at the running end is clockwise cables normally need not be so drummed if , for some unforeseen manufacturing reason, this direction is reversed.
- e) The cable shall be tested after being coiled on drums and if found satisfactory by the engineer, or his representative, the drum shall be lagged with stout closely fitting battens to prevent damage to the cable during storage or transportation.
- f) All cable ends shall be sealed against the ingress of dirt and moisture. Cable shall not be stored or transported without the ends being sealed.
- g) Drum Axle diameter shall be (110 mm).
- h) A distinguishing number and the following information shall be plainly marked on the outside of each drum:-
  - (i) Manufacture's name and Country of origin.
  - (ii) Contract Number
  - (iii) M.T.I.T.R.Y.P.T.C
  - (iv) Tender number
  - (v) Year of manufacture
- i) Description of cable in short, stating the type, the number of pairs and conductor size:-
  - (i) Length in meters
  - (ii) Net and gross weights
- j) An arrow shall be painted on the drum to show direction of rolling (i.e. in the opposite direction to that in which the outer end of the cable points) and the words 'ROLL THIS WAY' shall be lettered on the drums. Drums shall be lettered 'HANDLE WITH CARE' and 'SLING THROUGH CENTRE HOLE ONLY' in English language and also in Arabic.
- k) All cables shall be protected against damage by insects, vermin's, termites and other similar creatures.

Information to be submitted with the Tender: -

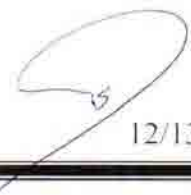
Tenderers shall give details of the Construction of cable, electrical characteristics and mechanical characteristics relating to the concerned tender in the form given in the table below:-

Characteristics	300P	600P	900P	1200P	1500P	1800P	2400P
<b>1- Construction of cable: -</b>							
1.1 Conductor. Min, Max & Nom diameter and material							
1.2 Conductor insulation Material and Min thickness (mm)							
1.3 Colour code for - Conductor insulation - Binders							
1.4 No. Of pairs in a group							
1.5 Number and location of spare pairs in the cable							
1.6 Average lay of cable - lay of single pair (mm) - lay of unit (mm) - lay of group							
1.7 Filling compound - Material							
1.8 Core wrapping - Material and thickness (mm)							
1.9 Screen - Material & thickness (mm) - Min thickness of Polymer coating							
1.10 Outer sheath - Material and nom. Thickness (mm)							
1.11 Outer diameter of cable (mm)							
1.12 Cable Core diameter							
1.13 Carbon content of cable %							
1.14 Weight of copper per km of conductor							
1.15 Weight of copper per km of cables							
1.16 Weight of copper per km of cables with spares.							
1.17 Weight of cable per Km.							
1.18 Drawing for cable construction							
1.19 Standard length (M)							
1.20 Dram axle dia. (spindle hole =110mm)							
<b>2. Electrical characteristics at 20 °C:</b>							
2.1 Conductors Resistance. - Max average resistance for all pairs - Max resistance of any single pair							
2.2 average resistance unbalance between two conductors							
2.3 Mutual capacitance per Km at 150KHz - Average mutual capacitance - Maximum individual values							
2.4 Capacitance unbalance - Max pair to pair unbalance within 10 pairs group – r.m.s/Indi. (for500m) - Max pair to screen capacitance unbalance r.m.s /Indi. Per Km							
2.5 Min. insulation resistance of conductors per Km with 500v meggar in Gega Ohm.							

<i>Characteristics</i>	<i>300P</i>	<i>600P</i>	<i>900P</i>	<i>1200P</i>	<i>1500P</i>	<i>1800P</i>	<i>2400P</i>
2.6 Dielectric strength for 3 sec test. - Wire – wire							
- Wire – shield							
2.7 Spark test of sheath for 1-minute test.							
2.8 Nominal characteristic impedance							
2.9 Nominal Attenuation per Km at 1 KHz							
2.10 Cross Talk Loss per Km at 150KHz - Far – end cross talk - Near – end cross talk							
<i>3- Mechanical characteristics</i>							
3.1 Tensile strength and elongation of conductor							
3.2 Tensile strength and elongation of conductor insulation.							
3.3 Tensile strength and elongation of sheath.							
3.4 Water penetration of cable for 24h							
3.5 Operating temperature & relative humidity							
3.6 Appearance of cable ends in the drum							

\*\*\* END OF SPECIFICATION \*\*\*







المعايير الأساسية لمواصفات الكابلات: الرئيسية


م	1. تركيب الكابل	الحد الأدنى لمواصفات المؤسسة
1	قطر الموصل (ملم)	0.4 mm+0.01
2	مادة عازل الموصل	Foam-skin HDPE
	سمك عازل الموصل (ملم)	Min 0.20. mm
3	معدل التفاف الخط الواحد (ملم)	30 -200mm
4	مادة الجيلي	PETROLUM JELLY
5	مادة التآريض وسماكته (ملم)	Aluminum tape /min 0.2 mm
6	العزل الخارجي	HDPE

م	2. المتطلبات الكهربائية عند 20 م	الحد الأدنى لمواصفات المؤسسة
1	مقاومة الموصل أوم /كم	max.143 ohm /km
2	السعة التبادلية عند 1 كيلوهرتز	Avr. 44 +-6 nf/km Ind. 46 +-8 nf/km
3	السعة الغير متزنة لـ : خط مع خط في نفس المجموعة	Rms. 22pf/500m Ind. 150pf/500m
	السعة الغير متزنة لـ : خط مع التآريض	Rms. 400pf/km Ind. 1500pf/km
4	مقاومة العازلية عند 500 فولت	> 5GΩ/km
5	قوة العزل الكهربائي خلال 3 ثواني..	wire - wire : 2.4KVDC wire - shield : 5KVDC
6	الاضمحلال للإشارة	1.8 dB/km

م	3. المواصفات الميكانيكية	الحد الأدنى لمواصفات المؤسسة
1	قوة الشد والتمدد للموصل	Min200N/mm <sup>2</sup> ,/elong. 13%
2	قوة الشد والتمدد للعازل	Min.10N/mm <sup>2</sup> /elong. Min 300%
3	قوة الشد والتمدد للغلاف	Min.12.5N/mm <sup>2</sup> /elong, Min 400%

  
  
2008/1/23



  
2008/1/23

**Schedule to tender No. 20/2011  
for the supply of  
Primary Cables**

No.	Item descriptions	Quantity (Km)	Drum Length (m)
1.	Primary cable 2400 Pairs/0.4 mm	9	250
2.	Primary cable 1800 Pairs/0.4 mm	4	250
3.	Primary cable 1200 Pairs/0.4 mm	4	250
<b>Total</b>		17	

**NOTES: -**

The tenderers must reply to the following points, otherwise this offer will be rejected: -

1. Statement of complete form manufacturing company regarding the compliance with PTC specifications.
2. Respond to and comply with PTC Technical schedules.
3. Catalogs and documents, containing instructions on how to install Cables.
4. Manufacturer's brand name must be embossed on samples, which must be applicable to the submitted offer, as per PTC specifications.
5. Manufacturer must submit company profile and experience.

**ملاحظات:-**

- ١- الإجابة المعملية من الشركة المصنعة على كل مواصفات المؤسسة (عروض الاستجابة).
- ٢- الإجابة على المواصفات الفنية الموضحة في الجداول الفنية.
- ٣- الكاتالوجات والوثائق التي توضح تركيب الكابلات المطلوبة.
- ٤- العينات المقدمة يجب أن تكون مطابقة للعرض المقدم وأن يكون محدد عليها بحفر اسم الشركة المصنعة.
- ٥- الخبرة التزويدية للمصنع.