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*T.C.I*




*Telecommunication Company Of Iran*

*FIBER OPTIC*

**TECHNICAL SPECIFICATION  
FOR 2 to 12 CORE  
SINGLE MODE  
OPTICAL FIBER AERIAL CABLES  
WITH CENTRAL TUBE  
AND  
REINFORCEMENT MEMBER**

*Telecommunication Company Of Iran*

*Standards and International Law Office*

 <b>TCI</b>	<b>TECHNICAL SPECIFICATION FOR 2 to 12 CORE  SINGLE MODE OPTICAL FIBER AERIAL CABLES WITH  CENTRAL TUBE AND REINFORCEMENT MEMBER</b>	Spec .No	2 / 22
		OC-109	

**TABLE OF CONTENTS**

**1.General .....3**

**2.Optical Fiber Characteristic .....4**

**3.Color Test .....7**

**4.Cable Construction .....8**

**5.Performance Tests .....12**

**6.Identification Marking .....17**

**7.Length Marking .....17**

**8.Factory Testing, Documentation & Inspection .....17**


**9.Delivery.....19**


**10.General Requirements For Cable Drums .....19**

**11.Labelling .....20**

**12.Cable Sealing .....21**

**TABLE 1&2 .....22**


 <b>Telecommunication  Company of Iran</b>	<b>Approved</b>	<b>Issue Date</b>	<b>Rev.5</b>
	<b>TCI</b>	<b>1395/10</b>	<b>-----</b>


 TCI	<b>TECHNICAL SPECIFICATION FOR 2 to 12 CORE          SINGLE MODE OPTICAL FIBER AERIAL CABLES WITH          CENTRAL TUBE AND REINFORCEMENT MEMBER</b>	Spec .No	3 / 22
		OC-109	

**TECHNICAL SPECIFICATION  
 FOR 2 to 12 CORE  
 SINGLE MODE  
 OPTICAL FIBER AERIAL CABLES  
 WITH CENTRAL TUBE  
 AND  
 REINFORCEMENT MEMBER**

**1.GENERAL**

This specification covers the constructional, optical and mechanical properties of single mode optical fiber aerial cables with central tube and reinforcement member used in optical fiber networks.

 Telecommunication Company of Iran	Approved	Issue Date	Rev.5
	TCI	1395/10	-----

 <b>TCI</b>	<b>TECHNICAL SPECIFICATION FOR 2 to 12 CORE  SINGLE MODE OPTICAL FIBER AERIAL CABLES WITH  CENTRAL TUBE AND REINFORCEMENT MEMBER</b>	Spec .No	4 / 22
		OC-109	


## 2.OPTICAL FIBER CHARACTERISTICS


Optical Fiber Characteristics shall be as bellow (The optical properties listed in the following table are according to ITU-T recommendation G652, type D).

The T.C.I approved fibers will be subsequently announced through contracts.

### 2-1 Construction


<b>SINGLE-MODE OPTICAL FIBER</b>			
<b>FIBER REGION</b>	<b>PROPERTY</b>	<b>TEST PROCEDURE</b>	<b>SPECIFICATION</b>
Core(Glass)	Diameter	EIA/TIA-455-176-A	Typ8.3μm, Shall be mentioned in the SOC
	Effective Area	EIA/TIA-455-132-A	≥ 72 μm <sup>2</sup>
	Non-Circularity	ANSI/TIA-455-176-A	≤6%
	Core/Cladding Offset	ANSI/TIA-455-176-A	≤0.5μm
Cladding (Glass)	Diameter	EIA/TIA-455-176-A	125± 0.7 μm
	Non-Circularity	EIA-TIA- 455-176-A	< 0.7%
	Concentricity Error	EIA-TIA- 455-176-A	≤ 0.5 μm
Coating	Material		UV-Acrylate
	Diameter (Uncolored)	IEC 60793-1-21(2001-8)	245±5μm
	Non-Circularity	IEC 60793-1-21(2001-8)	<5%
	Concentricity Error	IEC 60793-1-21(2001-8)	<10μm
	coating/Cladding Offset	EIA-TIA- 455-176-A	<17.0μm


 <b>Telecommunication  Company of Iran</b>	<b>Approved</b>	<b>Issue Date</b>	<b>Rev.5</b>
	<b>TCI</b>	<b>1395/10</b>	<b>-----</b>

 <b>TCI</b>	<b>TECHNICAL SPECIFICATION FOR 2 to 12 CORE  SINGLE MODE OPTICAL FIBER AERIAL CABLES WITH  CENTRAL TUBE AND REINFORCEMENT MEMBER</b>	Spec .No	5 / 22
		OC-109	

## 2-2 Optical Characteristics


<b>SINGLE-MODE OPTICAL FIBER</b>		
<b>PROPERTY</b>	<b>TEST PROCEDURE</b>	<b>SPECIFICATION</b>
Maximum Individual Fiber Attenuation at: { 1310 nm 1550 nm	ANSI/TIA-455-78-B	0.35dB/Km  0.25dB/Km
Temperature Variation of attenuation	EIA/TIA-455-52	$\leq 0.05\text{dB/Km}$
Point Discontinuities at 1310/1550nm	ANSI/TIA-455-78-B	$\leq 0.10\text{dB}$
Water Peak Attenuation at 1383±3nm	TIA-455-78-B	$\leq 0.31\text{dB/Km}$
Attenuation Change vs. Wavelength { 1285 to 1330nm 1525 to 1575nm	TIA-455-78-B	$\leq 0.05\text{dB/Km}$  $\leq 0.05\text{dB/Km}$
Attenuation Change vs. Bending at 1550nm { 100wraps/50mm dia 1 wrap/32mm dia	EIA/TIA-455-62-B	$\leq 0.1\text{dB}$  $\leq 0.5\text{dB}$
Zero Dispersion Wavelength	EIA/TIA-455-175-B	1300-1324nm
Maximum Chromatic Dispersion at: { 1310nm 1550nm	EIA/TIA-455-175-B	$\leq 3.2\text{ps/nm.Km}$  $\leq 18.0\text{ps/nm.Km}$
Zero Dispersion Slope	EIA/TIA-455-175-B	$\leq 0.092\text{ps/nm}^2.\text{Km}$
Nominal Mode Field Diameter: { 1310nm 1550nm	IEC 60793-1-45	$9.2\pm 0.4\mu\text{m}$  Typ $10.4\pm 0.8\mu\text{m}$
Cabled Fiber Cut off Wavelength ( $\lambda_{cc}$ )	IEC 60793-1-44	$< 1260\text{nm}$
PMDQ (M=20 cables,Q=0.01%)	EIA/TIA-455-113	$< 0.2\text{ps}/\sqrt{\text{Km}}$


 <b>Telecommunication  Company of Iran</b>	<b>Approved</b>	<b>Issue Date</b>	<b>Rev.5</b>
	<b>TCI</b>	<b>1395/10</b>	<b>-----</b>

 TCI	<b>TECHNICAL SPECIFICATION FOR 2 to 12 CORE SINGLE MODE OPTICAL FIBER AERIAL CABLES WITH CENTRAL TUBE AND REINFORCEMENT MEMBER</b>	Spec .No	6 / 22
		OC-109	

## 2-3 Mechanical & Environmental Characteristics

<b>SINGLE-MODE OPTICAL FIBER</b>				
<b>PROPERTY</b>		<b>TEST PROCEDURE</b>		<b>SPECIFICATION</b>
Proof Test Stress		EIA/TIA-455-31-C		Min 0.69Gpa
Dynamic Fatigue Parameter (Nd)		EIA/TIA-455-28-C, 76		≥20
Static Fatigue (Ns)@85°c,85% RH		EIA/TIA-455-28-C, 76		≥20
Dynamic Tensile Strength	Aged	EIA/TIA-455-28-C, 76		≥3 GP
	unaged			≥3.8 GP
Cleavability	100%	Telcordia GR-20-Core		≤2.0
	90%			≤1.0
Fusibility	@1310, @1550	Per link	Telcordia GR-20-Core	≤0.05dB
		Per splice	Telcordia GR-20-Core	≤0.07 dB for %10 of splicing ≤0.05 dB for %90 of splicing
Coating Strip Force N		TIA-455-178-B		Min: 1.3 N Max: 8.9 N
Induced Attenuation@1310- 1550 nm dB/km	Temperature Cycling Performance (-60°C to85°C)		EIA/TIA-455-3-A	0.05
	Water Immersion, (23°C/70°C)at1550 and1310nm		EIA/TIA-455-74-A	0.05
	Filling compound immersion,(23°C/70°C 30days) at 1550 and 1310nm(mineral oil)		EIA/TIA-455-74-A	0.05
	Retention of coating color		No discernible change in color when aged <b>for</b> 30 days at 95°C and 95%humitdity and <b>for</b> 20 days in dry heat 125°C	
	Pullout force (Adhesion of coating to glass surface)		EIA/TIA-455-28-C,76	Min: 6.2 N Max: 22 N

 Telecommunication Company of Iran	<b>Approved</b>	<b>Issue Date</b>	<b>Rev.5</b>
	<b>TCI</b>	<b>1395/10</b>	<b>-----</b>

 <b>TCI</b>	<b>TECHNICAL SPECIFICATION FOR 2 to 12 CORE  SINGLE MODE OPTICAL FIBER AERIAL CABLES WITH  CENTRAL TUBE AND REINFORCEMENT MEMBER</b>	Spec .No	7 / 22
		OC-109	

## 2-4 Fiber Identification


2-4-1 Fibers in each loose tube shall be identified by the following colors:

FIBER NO.	COLOR
1	WHITE
2	RED
3	GREEN
4	BLUE
5	YELLOW
6	BLACK
7	BROWN
8	VIOLET
9	ORANGE
10	PINK
11	GREY
12	AQUA(TURQUOISE)

2-4-2 The color coating shall be transparent in order to allow local light injection and detection for splicing and other purposes.

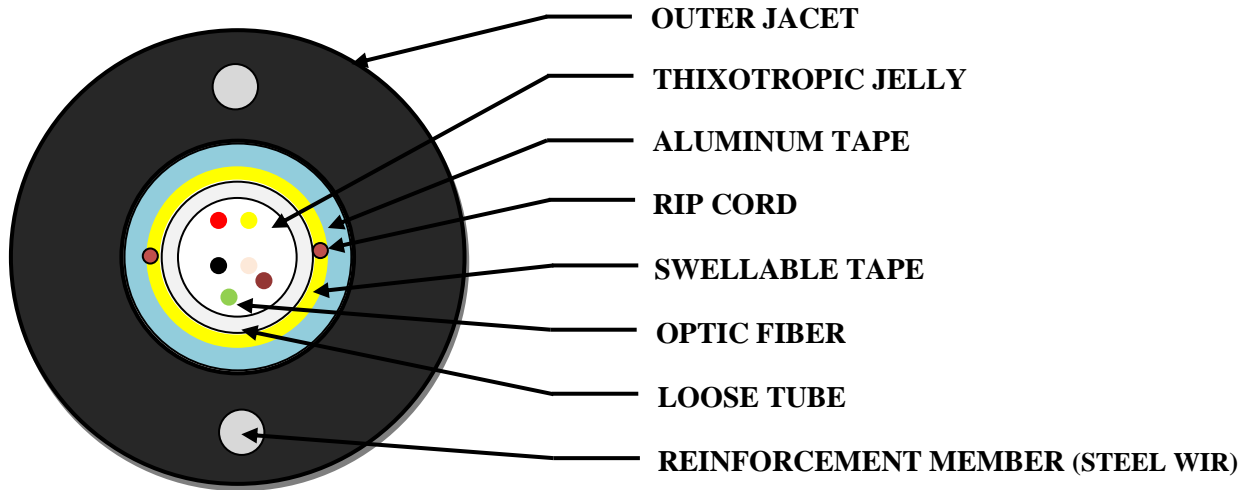
## 3. COLOR TEST

3-1 Color test shall be done according to standards that presented by manufacturer.

 <b>Telecommunication  Company of Iran</b>	Approved	Issue Date	Rev.5
	TCI	1395/10	-----

## 4. CABLE CONSTRUCTION

### 4-1 The Cable Shall Be Constructed As Follows:



### 4-2 REINFORCEMENT MEMBER


**4-2-1** Tensile strength shall be provided by two steel wire members situated on either side of the loose tube.

**4-2-2** The steel wires shall be galvanize steel wire with 0.7 mm min.


**4-2-3** The zinc coating of steel wire shall be at least 120g/m<sup>2</sup> when tested in according to ASTM A-475 and minimum tensile strength of wire shall be 1600N/mm<sup>2</sup> according to ISO R-89.

### 4-3 Loose Tube

**4-3-1** The loose tube shall be made from polybutylene terephthalate group 1, class 2, grade 1 of TPES table of ASTM D4507 standard, and shall have the following properties:

 Telecommunication Company of Iran	Approved	Issue Date	Rev.5
	TCI	1395/10	-----



 <b>TCI</b>	<b>TECHNICAL SPECIFICATION FOR 2 to 12 CORE  SINGLE MODE OPTICAL FIBER AERIAL CABLES WITH  CENTRAL TUBE AND REINFORCEMENT MEMBER</b>	Spec .No	9 / 22
		OC-109	

Specific gravity	Tensile strength (MPa)	Flexural modulus (MPa)	Izod impact (J/m)	Deflection temperature under load at 1820 kPa(°c)
1.4-1.44	55 min	2700 min	60 min	60 min

**4-3-2** The outer diameter of each tube shall be 2.5 mm min.

**4-3-3** The inner diameter of each tube shall be maximum 65% of outer tube diameter.

**4-3-4** Loose tube shall be stranded around the strength member by S-Z stranding method.


**4-3-5** Loose tube shall be subjected to kink test according to EN 187000, and no kinking of the loose tube shall be visible after the test. The moving length shall be 100mm.


**4-3-6** The loose tube shrink back shall be conducted in accordance with ASTM D4565 paragraph 14.1 using a talc bed at a temperature of 90°C and shall not be more than 5% of the original 150 mm length of specimen.

**4-3-7** Cold Bend shall be conducted in accordance with RUS.1755.900 on loose tube in the cable.

**4-3-8** In loose tube 2 to12 coated optical fibers (as per order) with the Color coding mentioned in paragraph 2-4-1 shall be stranded.

**4-3-9** The color of loose tube shall be withe.

 <b>Telecommunication  Company of Iran</b>	<b>Approved</b>	<b>Issue Date</b>	<b>Rev.5</b>
	<b>TCI</b>	<b>1395/10</b>	<b>-----</b>

 <b>TCI</b>	<b>TECHNICAL SPECIFICATION FOR 2 to 12 CORE  SINGLE MODE OPTICAL FIBER AERIAL CABLES WITH  CENTRAL TUBE AND REINFORCEMENT MEMBER</b>	Spec .No	10 / 22
		OC-109	

## 4-4 Thixotropic Jelly

The filling compound used for inside of the loose tubes shall be thixotropic and shall have the following properties:

### 4-4-1 Thixotropic jelly properties

A. Appearance	Natural color (opal)	
B. Corrosivity	Non corrosive	
C. H <sub>2</sub> generation: 21 days at 80 °C		0.13µl/g
D. Drop point	ASTM D566	Non Melting (<150 °C)
E. Softening point	ASTM D127	≥90 °C
F. Unworked cone penetration	ASTM D937	200mm Min
G. Oil separation at 65 °C 24hrs	ASTM 127-DC method	No Separation
H. Acid Value mg KOH/g	ASTM D974	0.02 Max
	Or IEC 538	


## 4-5 Water Swellable Tape


**4-5-1** A layer of water swellable tape shall be applied over the loose tube.

**4-5-2** Overlap shall be at least 30% of the water swellable tape width.

**4-5-3** The water swellable tape should have the following properties:

Property	Test method	Unit
Mass per unit area	ISO 9073-1	87gr/m <sup>2</sup> ± 5%
Thickness	ISO 9073-2	0.25 ± 0.01mm
Tensile strength	ISO 9073-3	>25N/Cm
Elongation	ISO 9073-3	>10%
Swelling speed	---	>10mm/1minute
Swelling height	---	>15mm/3minute
Short term thermal stability	IEC216	230 °C
Long term thermal stability	IEC216	90 ± 5 °C
Moisture content	ISO 287	3% Nominal

 <b>Telecommunication  Company of Iran</b>	<b>Approved</b>	<b>Issue Date</b>	<b>Rev.5</b>
	<b>TCI</b>	<b>1395/10</b>	<b>-----</b>

 <b>TCI</b>	<b>TECHNICAL SPECIFICATION FOR 2 to 12 CORE  SINGLE MODE OPTICAL FIBER AERIAL CABLES WITH  CENTRAL TUBE AND REINFORCEMENT MEMBER</b>	Spec .No	11 / 22
		OC-109	

**4-5-4** The tape’s material shall consist of the following:

- Polyester non-woven fabric
- Polyacrylate swelling powder
- Water soluble powder
- Corrosion inhibitor

## **4-6 Aluminum Tape**

**4-6-1** A corrugated aluminum tape with copolymer coted shall be applied directly over the swelling tape. (as per order)

Remove the aluminum tape should have no effect on the all performance test result.

## **4-7 Ripcords**

**4-7-1** 2 Diametrically opposed ripcords shall be placed over the intermediate strength member under the outer jacket. The ripcord shall be strong and flexible enough to be able to strip or rip the jacket easily.


## **4-8 Outer jacket**


**4-8-1** A layer of black polyethylene conforming to ASTM D1248 type III class C category 4 or 5 grade E8 shall be extruded over steel wire and buffer tube. The jacket shall be continuous, free from pinholes, splits and shall be as much as smooth.

**4-8-2** The HDPE shall contain carbon black to provide ultraviolet light protection and shall not promote the growth of fungus.

**4-8-3** The thickness of the outer jacket shall be 2 mm min.

**4-8-4** Drop cable shall have nominal diameter 8.0 mm.

 <b>Telecommunication  Company of Iran</b>	<b>Approved</b>	<b>Issue Date</b>	<b>Rev.5</b>
	<b>TCI</b>	<b>1395/10</b>	<b>-----</b>

 TCI	<b>TECHNICAL SPECIFICATION FOR 2 to 12 CORE          SINGLE MODE OPTICAL FIBER AERIAL CABLES WITH          CENTRAL TUBE AND REINFORCEMENT MEMBER</b>	Spec .No	12 / 22
		OC-109	

## 5. PERFORMANCE TESTS

### 5-1 Testing of Cable jacket

#### 5-1-1 Density

The density shall be tested in accordance with ASTM D792 method A1.

#### 5-1-2 Carbon black content

Carbon black content in the jacket measured in accordance with ASTM D 1603 OR BS 2782 method 405 A Shall be 2.5 %  $\pm$  0.5 % by weight.

#### 5-1-3 Absorption coefficient


Carbon black particle size shall be 20 nm and the absorption coefficient shall be measured as per ASTM D-3349-1984 and its value shall be more than 4000 (1/Cm).


#### 5-1-4 Tensile strength and ultimate elongation

Tensile strength and ultimate elongation – sample of the polyethylene material, die cut from the jacket shall be tested in accordance with ASTM D2633-82 except the speed of jaw separation shall be 50mm per minute. The tensile strength shall be minimum 19 N/mm<sup>2</sup> and the ultimate elongation minimum 400 percent.

#### 5-1-5 Melt flow rate

Melt flow rate for the jacket in the completed cable shall be determined as described in ASTM D-1238 condition E. The rate shall show a maximum 50% increase from raw material.

 Telecommunication Company of Iran	Approved	Issue Date	Rev.5
	TCI	1395/10	-----

 <b>TCI</b>	<b>TECHNICAL SPECIFICATION FOR 2 to 12 CORE  SINGLE MODE OPTICAL FIBER AERIAL CABLES WITH  CENTRAL TUBE AND REINFORCEMENT MEMBER</b>	Spec .No	13 / 22
		OC-109	

### 5-1-6 Environmental stress cracking


A maximum of two failures out of ten specimens is permitted .Test specimens shall be cut perpendicular to the cable axis. These specimens shall be prepared and subjected to an environmental stress cracking test as described in ASTM D1693, except that the specimens shall not be conditioned. The depth of the controlled imperfection shall be proportional to the jacket thickness. The stress cracking agent shall be a 10 percent solution (by volume) of " Igepal " Co-630 or equivalent. After 18 hours remove specimens from the bath and examine under strong light for cracks. Any cracks, however, small constitutes failure but deepening and widening of the nick does not.


### 5-2 Water Penetration Test

When tested in accordance with FOTP-82 "fluid penetration test for fluid-blocked fiber optic cable" a one meter length of unaged cable shall withstand a one meter static head or equivalent continuous pressure of water for one hour without leakage through the open cable end. A retest for a failed specimen shall be done according to with a 3 meters sample and 24 hours. In case of using fluid reservoir (tank), its vent shall be completely patulous. Otherwise, the water column shall be under open air pressure.

### 5-3 Compression Test

When tested in accordance with EIA/TIA 455-41-A "compressive loading resistance of fiber optic cables" ,the cable shall withstand a minimum compressive load of 220N/Cm applied uniformly over the length of the sample. The 220N/Cm load shall be applied at a rate of 2.5mm per minute. The load shall be maintained for a period of 1 minute. The load shall then be decreased to 110N/Cm. Alternatively, it is acceptable to remove the 220N/Cm load entirely and apply the 110N/Cm load within five minutes at a rate of 2.5mm per minute. The 110N/Cm load shall be maintained for a period of 10 minutes. Attenuation measurements shall be performed before release of the 110N/Cm load. One fiber per each loose tube shall be tested. The change in attenuation shall not exceed 0.05dB at 1550nm.

 <b>Telecommunication  Company of Iran</b>	<b>Approved</b>	<b>Issue Date</b>	<b>Rev.5</b>
	<b>TCI</b>	<b>1395/10</b>	<b>-----</b>

 TCI	<b>TECHNICAL SPECIFICATION FOR 2 to 12 CORE          SINGLE MODE OPTICAL FIBER AERIAL CABLES WITH          CENTRAL TUBE AND REINFORCEMENT MEMBER</b>	Spec .No	14 / 22
		OC-109	

### 5-4 Cable Flexing Test

When tested in accordance with EIA/TIA 455-104-A "fiber optic cable cyclic flexing test" ,the cable shall withstand 25 mechanical flexing cycles around a sheave diameter not greater than 20 times the cable diameter. The minimum load that applied is depended on the outside diameter as shown as in table 2 of mentioned standard (see page 22). The change in attenuation shall not exceed 0.05dB at 1550nm.


### 5-5 Impact Test


When tested in accordance with EIA/TIA 455-25-C "impact testing of fiber optic cables and cable assemblies" ,the number of cycles shall be two at three locations along a one meter cable length. The hammer mass and the impact energy shall be according to table 1 of mentioned standard (see page 22).

The change in attenuation of each fiber shall not exceed 0.05dB at 1550nm. Also after the completion of the test, the specimen shall be visually inspected for damage. Cable exterior deformation shall not be considered as damage, but cracking, splitting or similar effects shall be considered as damage.

### 5-6 Tensile Loading And Bending Test

When tested in accordance with EIA/TIA 455-33 "Fiber Optic Cable Tensile Loading and Bending Test", maximum mandrel and sheave diameter shall be 560mm. Tension the cable to 1330N load (known as rated installation load) and hold for 10 minutes. Reduce the tension to 30% of the rated installation load (known as residual load) and hold for 60 minutes. The change in attenuation while the cable is held at the residual load and also after load removal shall not exceed 0.05dB at 1550nm.

 Telecommunication Company of Iran	<b>Approved</b>	<b>Issue Date</b>	<b>Rev.5</b>
	<b>TCI</b>	<b>1395/10</b>	<b>-----</b>

 TCI	<b>TECHNICAL SPECIFICATION FOR 2 to 12 CORE          SINGLE MODE OPTICAL FIBER AERIAL CABLES WITH          CENTRAL TUBE AND REINFORCEMENT MEMBER</b>	Spec .No	15 / 22
		OC-109	

### 5-7 Twist Test:

When tested in accordance with EIA/TIA 455-85 "fiber optic cable twist test" ,a length of cable no greater than 2 meters shall withstand 10 complete cycles of mechanical twisting. The change in attenuation shall not exceed 0.05dB at 1550nm.

### 5-8 Low Or High Temperature Bend Test


When tested in accordance with EIA/TIA 455-37 "low or high temperature bend test for fiber optic cable" ,the cable shall withstand four full turns around a mandrel of  $\leq 20$  times the cable diameter after conditioning for four hours at test temperatures of  $-30^{\circ}\text{C}$  and  $+60^{\circ}\text{C}$ . Neither the inner nor outer surfaces of the jacket shall exhibit visible cracks, splits, tears or other openings. The change in attenuation shall not exceed 0.1dB at 1550nm.

### 5-9 Cable Knot Test

When tested in accordance with EIA/TIA 455-87 "iber optic cable knot test" ,The maximum force in relation to the cross sectional diameter of the cable shall be 100N after the completion of the test, the attenuation shall not exceed 0.05dB at 1550nm.

### 5-10 Cable bend test

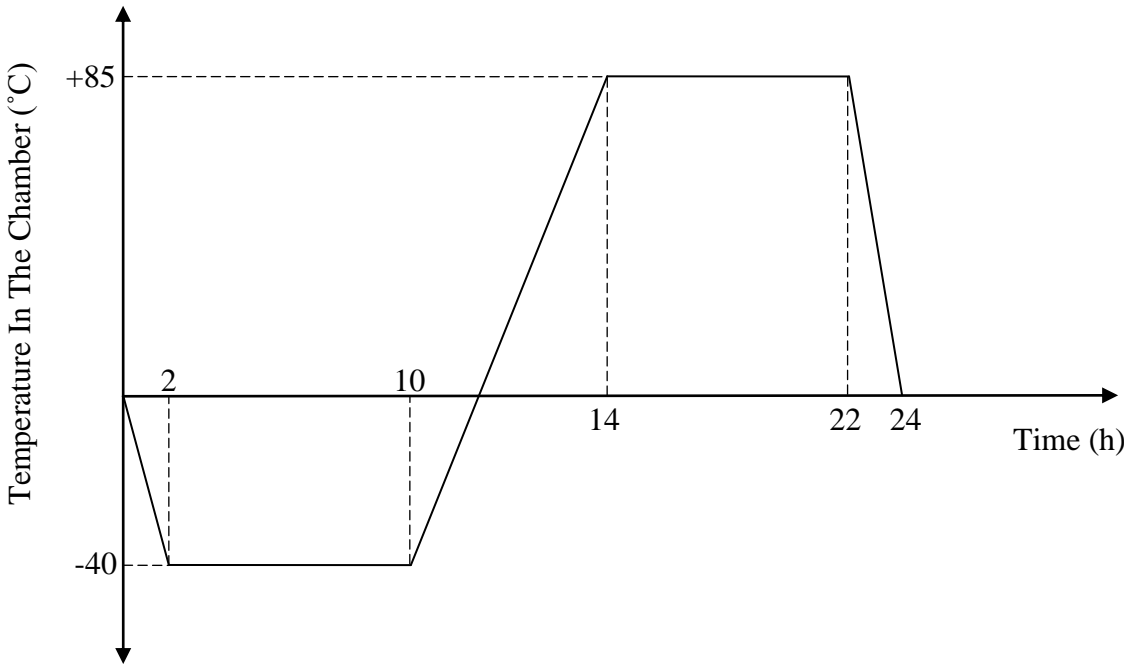
A Suitable length of cable shall be conditioned at  $-20 \pm 2^{\circ}\text{C}$  for a minimum of four hours. It shall then be tested at this temperature or alternatively, may be tested immediately upon removal from the cold chamber providing that the mandrel is a non-conducting surface such as wood. The mandrel diameter shall not be more than 20 times the cable diameter. After conditioning at the cold temperature, the cable shall be bent in a  $180^{\circ}$  around a mandrel, straightened, and then bent  $180^{\circ}$  in the opposite direction completing one cycle. The cable should be brought up to room temperature before inspection. The bent area of

 Telecommunication Company of Iran	Approved	Issue Date	Rev.5
	TCI	1395/10	-----

the cable shall show no visible evidence of fracture of the jacket. After each successive removal of a sheath component, the other components shall show no visible evidence of fracture.

**5-11 Temperature Cycling Test**


This test shall be done according to IEC 60794-1-22F1 at least 5 cycles shall be completed according to graph 1. After the completion of the 5 cycles, the increase over the original attenuation of the cable when measured at 1550nm shall not be more than 0.05dB.




Graph.1

**5-12 Attenuation at joint point**

For this test, all fibers of the completed cable shall be jointed by a standard fusion splicer machine and attenuation of fibers at joint point shall be measured by an O.T.D.R. The average attenuation of each fiber shall not exceed 0.05 dB.

 <b>Telecommunication  Company of Iran</b>	<b>Approved</b>	<b>Issue Date</b>	<b>Rev.5</b>
	<b>TCI</b>	<b>1395/10</b>	<b>-----</b>



 TCI	<b>TECHNICAL SPECIFICATION FOR 2 to 12 CORE          SINGLE MODE OPTICAL FIBER AERIAL CABLES WITH          CENTRAL TUBE AND REINFORCEMENT MEMBER</b>	Spec .No	17 / 22
		OC-109	

## 6. IDENTIFICATION MARKING

**6-1** The cable shall be identified by hot-stamping the name of cable manufacturer, type of cable, Number of optical fibers and name of fiber optic manufacturer in white ink at intervals of not less than 1 meter over the final jacket of the cable. The color shall be strongly durable as per IEC-60794.

**6-2** Two continuous orange UV resistant material lines positioned against each other ( $180^{\circ} \pm 5^{\circ}$ ) for identification purposes in accordance with color codes ral 2008, ral 2009 or ral 2010, with 2mm width shall be extruded overall length of the outer jacket.

**6-3** Two continuous orange line (6.2) and Cable identification (6-1) do not have any overlaps together.

## 7. LENGTH MARKING

**7-1** Cables shall have durable sequentially numbered length marking and “TCI” letters in white ink at regular intervals of 1.0m along the outside of the outer jacket.

**7-2** The accuracy of the length marking shall be within  $\pm 0.5\%$ .


**7-3** Delivered cable length shall be equal to costumer’s order due to the contract and according to the standard meter.


**7-4** The length marking shall not reset to zero along the cable length.

**7-5** The height of the numbers shall a minimum of 2 mm.

## 8. FACTORY TESTING, DOCUMENTATION AND INSPECTION

**8-1** The purchaser representative reserves the right to verify the produce at the source or subsequent to delivery. The purchaser representative reserves the right to inspect the area (s) of the supplier's plant where work on this contract is

 Telecommunication Company of Iran	Approved	Issue Date	Rev.5
	TCI	1395/10	-----

 TCI	<b>TECHNICAL SPECIFICATION FOR 2 to 12 CORE          SINGLE MODE OPTICAL FIBER AERIAL CABLES WITH          CENTRAL TUBE AND REINFORCEMENT MEMBER</b>	Spec .No	18 / 22
		OC-109	

being performed, during all of manufacture, testing and preparation of optical fiber cable for shipment. The purchaser representative will have free entry at all reasonable times while work on the contract covered by these specifications is being performed.

The supplier will afford the purchaser representative, without charge, all reasonable facilities and assistance necessary to satisfy the purchaser representative that the work is being performed in accordance with the requirements of these specifications.

All products will be, at all time, and open to inspection, acceptance or rejection by the purchaser representative.


Verification by the purchaser representative will in no way relieve the supplier of his responsibility to provide an acceptance product, will not be construed to imply the acceptance of any defective work or product, nor will be preclude subsequent rejection. The supplier will remove at his own expense any product declared non-conforming by the purchaser representative and will repair or replace same without extra charge.


Repair or rework of non-conforming product will be in accordance with documented procedures acceptable the purchaser representative.

**8-2** The manufacturer shall perform all the necessary and pertinent factory tests on the raw materials .Necessary test during manufacturing process and the tests on finished cable, at presence of purchaser inspectors and record the results.

**8-3** One copy of the test results will be attached to the Drum. Two additional copies of all test results will be submitted to purchaser engineering and purchaser contract departments.

*Note: If the manufacturer claims that certain tests could not be performed due to the lack of measuring equipment or for any other reason, the purchaser has the right to reject the produced cables.*

 Telecommunication Company of Iran	<b>Approved</b>	<b>Issue Date</b>	<b>Rev.5</b>
	<b>TCI</b>	<b>1395/10</b>	<b>-----</b>

 <b>TCI</b>	<b>TECHNICAL SPECIFICATION FOR 2 to 12 CORE  SINGLE MODE OPTICAL FIBER AERIAL CABLES WITH  CENTRAL TUBE AND REINFORCEMENT MEMBER</b>	Spec .No	19 / 22
		OC-109	

## 9. DELIVERY

**9-1** The finished cable shall be wound evenly on specially constructed metallic drums. The delivery length shall be  $2\pm 0.1$  km (as per order) for optical fiber aerial cables.

**9-2** The both ends of cable shall be available for tests.

## 10. GENERAL REQUIREMENTS FOR CABLE DRUMS

### 10-1 Drum Dimensions

For reel shipment, the diameter of the reel drum shall be large enough to prevent damage to the cable due to reeling or unreeling. The minimum drum diameter shall be 20 times the outside diameter of the cable on the reel. Reels shall be substantial and so constructed as to prevent damage to the cable during shipment and handling.

### 10-2 Cable Hole


A cable hole of sufficient diameter within the limits, to allow the free passage of the cable, shall be cut through one flange .The angle of the "lead to" and "lead from ", where required, shall not be less than  $150^\circ$  nor more than  $25^\circ$  to the flange face


### 10-3 Spindle Hole

A round spindle-hole of the appropriate size shall be cut through the centre of each flange and care shall be taken to see that the holes in the drum barrel supports coincide.

### 10-4 Securing The Cable

The inner end of the cable shall be taken through the cable hole and secured to the outer face of the flange by rot proof cordage; the outer end shall be secured to the inner side of one flange.

 <b>Telecommunication  Company of Iran</b>	<b>Approved</b>	<b>Issue Date</b>	<b>Rev.5</b>
	<b>TCI</b>	<b>1395/10</b>	<b>-----</b>

 <b>TCI</b>	<b>TECHNICAL SPECIFICATION FOR 2 to 12 CORE  SINGLE MODE OPTICAL FIBER AERIAL CABLES WITH  CENTRAL TUBE AND REINFORCEMENT MEMBER</b>	Spec .No	20 / 22
		OC-109	

**10-4-1** To provide access for testing the inner end of the cable shall be recessed into a slot in the flange and be protected by metal cover firmly secured to the flange. Alternatively the inner end may protrude through the inside of the drum. Minimum length of inner end shall be enough for any test requirements.

**10-4-2** The outer cable end shall be securely fastened to prevent the cable from becoming loose in transport.


**10-4-3** A thermal protective wrap shall be securely applied over the outer revolutions of the cable on each reel .The wrap shall be weather resistant and shall protect the cable from high surface temperature and physical damages the wrap shall be capable of remaining in place until the cable is installed. The Wrap’s specification shall be as per T.C.T specification C-219.


**10-4-4** Legs or other suitable material shall be securely applied to the reel to prevent mechanical damage to the cable during shipment.

## **11. LABELING**

**11-1** Each reel shall be clearly and permanently stenciled or labelled on both outside flanges with the information given below:

- An arrow to indicate direction of rolling the drum.
- Manufacture's name
- Year of manufacture
- Description of the cable (number of cores, type of optical fiber, manufacture's name of fiber optic and type of the cable)
- Actual shipping length
- Reel number and L/C No.
- Gross shipping weight
- The letters (TCI and the logo)

 <b>Telecommunication  Company of Iran</b>	<b>Approved</b>	<b>Issue Date</b>	<b>Rev.5</b>
	<b>TCI</b>	<b>1395/10</b>	<b>-----</b>


 <b>TCI</b>	<b>TECHNICAL SPECIFICATION FOR 2 to 12 CORE  SINGLE MODE OPTICAL FIBER AERIAL CABLES WITH  CENTRAL TUBE AND REINFORCEMENT MEMBER</b>	Spec .No	21 / 22
		OC-109	

## **12. CABLE SEALING**

**12-1** The cable ends shall be sealed with heat shrinkable caps.

**12-2** The End caps shall be according to T.C.T specification number C223.

END OF SPECIFICATION

 <b>Telecommunication  Company of Iran</b>	<b>Approved</b>	<b>Issue Date</b>	<b>Rev.5</b>
	<b>TCI</b>	<b>1395/10</b>	<b>-----</b>

**EIA/TIA-455-25C**

**Table 1**

**Drop hammer mass/test impact energy**

CABLE DIAMETER		MASS		IMPACT ENERGY	
mm	inches	kg	lb	N.m	lb.ft
0 < D ≤ 3.8	0 < D ≤ 0.15	0.50	1.10	0.74	0.54
3.8 < D ≤ 5.3	0.15 < D ≤ 0.21	1.00	2.20	1.47	1.08
5.3 < D ≤ 7.5	0.21 < D ≤ 0.30	1.50	3.31	2.21	1.63
7.5 < D ≤ 13.0	0.30 < D ≤ 0.51	2.00	4.41	2.94	2.17
13.0 < D ≤ 15.0	0.51 < D ≤ 0.59	3.00	6.61	4.41	3.25
15.0 < D ≤ 16.6	0.59 < D ≤ 0.65	3.50	7.72	5.15	3.80
16.6 < D ≤ 18.9	0.65 < D ≤ 0.75	4.00	8.82	5.88	4.34
18.9 < D ≤ 21.4	0.75 < D ≤ 0.84	4.50	9.92	6.62	4.88
21.4 < D	0.84 < D	5.00	11.02	7.35	5.42

**EIA/TIA-455-104A**

**Table 2**

**Tensile Loading (Nonmilitary)**

<u>Nominal Cable Diameter Range</u>		<u>Minimum Load</u>	
mm	( in. )	Kg Weight	N
≤ 2.5	( ≤ 0.1 )	1.5	14.71
2.6 to 4.0	( .101 to .159 )	2.5	24.52
4.1 to 6.0	( .160 to .239 )	4.0	39.23
6.1 to 9.0	( .240 to .355 )	4.5	44.13
9.1 to 13.0	( .356 to .514 )	5.0	49.03
13.1 to 18.0	( .515 to .711 )	5.5	53.94
18.1 to 24.0	( .712 to .948 )	6.5	63.74
24.1 to 30.0	( .949 to 1.180 )	7.0	68.65
≥ 30.1	( ≥ 1.181 )	7.5	73.55