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متعلقات عایقی و آب بندی مربوط به غلاف های خطوط لوله

Pipeline Casing Insulators and End Seals

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باسلام،

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- **FOREWORD**

This standard specification has been technically revised , and up dated , it intended to be mainly used by all divisions of N.I.G.C. and EPC contractors , and has been prepared on interpretation of recognized standards , technical documents , knowledge , backgrounds and experiences in gas industries at national and international levels.

Iranian Gas Standards (IGS) are prepared, reviewed and amended by technical standard committees within NIGC standardization division of research & technology management and submitted to "the standards council of NIGC" for approval.

Iranian Gas Standards (IGS) are subjected to revision, amendment or withdrawal, if required, thus the latest edition of IGS shall be checked / inquired by IGS users.

Any comments from concerned parties or individuals in IGS'S are welcomed.

Element	Page No.
1.0 Scope	1
2.0 References	1-2
3.0 Definitions	2-3
4.0 Requirements	3-6
5.0 Inspection, tests and certification	6-7
6.0 Marking	7
7.0 Packing & packaging	7
8.0 Documentation	8
9.0 Annexes.	
9.1.Normative annexes	
9.1.1. Pipeline casing insulator and end seal data sheet,	9
9.1.2. Insulators and end seals data sheet.,	10
9.2.informative annex.	
9.2.1. Recommended insulators spacing	11

1.0 Scope

This standard specification covers the minimum requirements for the design , material , fabrication , inspection , testing , marking and packaging of pipeline casing insulators and End seals to be used for pipeline cased road and rail crossings .

Notes:

1. Pipeline casing insulators and End seals shall be for use with natural gas pipelines as per attached data sheet.
2. The insulators are intended to be used for electrical isolation of coated steel pipelines from metallic casings.
3. The End seals intended to be used for sealing annulus(void space) between the carrier pipe and the casing at both ends to prevent water and fines from entering casing.

2.0 References

Throughout this standard the following standards and codes are referred to. The applicability of changes in codes and standards that occur after the date of this specification shall be mutually agreed upon by the purchaser and manufacturer.

2.1.Normative references .

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|----------------------------------|-----|--|
| 2.1.1. ASTM D 149- (2004) | : | Standard test methods for dielectric break down voltage and dielectric strength of solid electrical insulating materials at commercial power frequencies |
| 2.1.2. ASTM D 790-(2003) | : | Standard test methods for flexural properties of unreinforced and reinforced plastics and electrical insulating materials |
| 2.1.3. ASTM D 695-(2002) | : | Standard test method for compressive properties of rigid plastics. |
| 2.1.4. ASTM D 638-(2003) | : | Standard test method for tensile properties of plastics. |
| 2.1.5. ASTM D 256-(2006) | : | Standard test methods for determining the Izod pendulum impact resistance of plastics. |
| 2.1.6. ASTM D 2240-(2005) | : | Standard test method for rubber property – durometer hardness . |
| 2.1.7. ASTM D 570-(1998) | : : | Standard test method for water absorption of plastics |

- 2.1.8. ASTM D 1248- (2005)** : Standard specification for polyethylene plastics extrusion materials ,for wire and cable.
- 2.1.9. ASTM D 2000-(2006)** : Standard classification system for rubber products in automotive applications.
- 2.1.10. ASTM A 1011/A 1011 M (2008)** : Standard specification for steel sheet and strip , hot – rolled
Carbon ,structural ,high strength formability ,and ultra high
Strength.
- 2.1.11. ASTM D 883-(2007)** : Standard terminology relating to plastic.
- 2.1.12. ASTM D 709-(2001)** : Standard specification for laminated thermosetting Materials.
- 12.1.13. Condensed chemistry dictionary .**

3.0 Definitions

-Elastomer

A macromolecular material that at room temperature returns rapidly to approximately its initial dimensions and shape after substantial deformation by a weak stress and release of the stress .

Extrusion

A process in which heated or unheated plastic is forced through a shaping orifice (a die) in one continuously formed shapes , as in film , sheet , rod , or tubing .

-EPDM

A terpolymer elastomer made from ethylene propylene diene monomer . EPDM has good abrasion and tear resistance and offers excellent chemical resistance to a variety of acids and alkalis .

-Hot rolled

Sheets manufactured by rolling slabs in a continuous mill to the required thickness and could be supplied in coils or cut lengths as specified .

-Injection as specified

The process of forming a material by forcing it , in a fluid state and under pressure , through a runner system (sprue , runner , gate (s)) into the cavity of a closed mold .

-Lot

A lot is any amount of material of one type and size presented for acceptance at time .

-Neoprene (polychloroprene)

A synthetic elastomer resistant to oils , oxygen , ozone and electric current .

-NBR (Nitrile – butadiene rubber)

A synthetic rubber recommended for sealing of water , oil , solvents and many fluids . because of the excellent resistance to petroleum products and its wide temperature range , it is one of the most versatile of all of the elastomers .

-PVC (Polyvinyl chloride)

A synthetic thermoplastic polymer , resistant to weathering and moisture , most acids , fats , petroleum hydrocarbons and fungus , with good dielectric properties . readily compounded into flexible and rigid forms by use of plasticizers , stabilizers , fillers ,and other modifiers .

-Polyethylene plastics

Plastics prepared by a polymerization of no less than 85 wt% ethylene and no less than 95 wt% of total olefins.

-High density polyethylene

Those linear polyethylene plastics, having a standard density of 0.941 g/cm^3 or greater .

-Sample

A sample is a quantity of production units selected at random from the lot for the purpose of determining conformance of the lot to the requirements of this specification .

4.0 Requirements

The material, design and fabrication of pipeline casing insulators and end seals shall be in accordance with the following clauses :

4.1 pipeline casing insulators

The insulators, as will be specified by the purchaser, shall be one of the following types :

- a) High density polyethylene (plastic insulators) for pipe sizes up to 12" inclusive.
- b) Steel band type (steel insulators) for pipe sizes above 12"

4.1.1 High density polyethylene insulators shall be injection molded and pre – formed as a two part unit, with ribbed inner side surfaces to prevent slippage and cold – flow of coating on the carrier pipe.

Processed polyethylene material not allowed , the employed polyethylene material shall be virgin and relevant certificate shall be submitted to purchaser .

The insulators shall have high impact strength , high abrasion resistance and low coefficient of friction sliding the pipe in to the casing .

The physical properties of finished material shall comply with the requirement of table 1.

Note: the H.D. PE base material type and grade with reference to ASTM D 1248 shall be defined by manufacturer / supplier .

Table 1- properties of plastic insulators

Element	Unit	Requirement	Test method
Density of base polymer (MIN)	g/cm ³	0.941	ASTM D 1505
Tensile strength (MIN)	Kg/cm ²	200	ASTM D638
Elongation (MIN)	%	800	ASTM D 638
Hardness (MIN)	--	60	ASTM D 2240 (shore D)
Impact strength (MIN)	J /m of notch	108	ASTM D 256
Dielectric strength (MIN)	Kv/ mm	20	ASTM D 149
Flextural strength (MIN)	Kg/cm ²	70	ASTM D 790
Compressive strength (MIN)	Kg/cm ²	225	ASTM D 695
Water absorption (MAX)	%	0.01	ASTM D 570
Service temperature	⁰ C	-20 to 80	--

4.1.2 steel band insulators shall be consisted of two – pieces steel band , fabricated from hot rolled , low carbon steel sheets , pickled and oiled , according to the ASTM specification A1011/A1011M cold formed to desired shapes with flanges formed at right angles and ribbed to provide rigidity .

The required thickness shall be 14 SWG (approx. 2mm), with 300mm width .

The risers if required, shall be fabricated from the same material as steel bands with the thickness of 10 SWG (approx. 3.5 mm). The steel band lengths and the required gap shall be suitable for specified pipe O.D. and coating thickness as per attached data sheet .

All steel works shall be coated with either fusion bonded epoxy or PVC coating system to a thickness of at least 0.4 mm for corrosion protection.

The insulators shall have a flexible synthetic rubber (I.E. neoprene or EPDM) or PVC liner of at least 3mm thickness with a durometer hardness of 85-90 (shore A) , with inner ribbed surfaces to prevent insulator slippage and minimize cold flow of pipe coating . the liner shall have suitable retainer type edges which fit over the sides of the steel band to completely isolate the steel band from the carrier pipe .

Electrical insulation of the carrier pipe from the casing shall be provided by means of runners (skids) bolted to the outside of the steel band. The runners shall be approx. 280mm long and 50mm width , manufactured from high pressure molded of either glass reinforced epoxy or phenolic based materials conforming to the applicable requirement of ASTM specification D 709. It shall have high mechanical strength and abrasion resistance to avoid damage as the carrier pipe is pulled into the casing.

4.1.3 Bolts and nuts required for joining top and bottom insulator segments shall be stainless steel.

4.1.4 The insulators shall be designed to accurately centralize the carrier pipe within the casing.

4.1.5 The insulators shall have sufficient skid height to limit vertical movement of the carrier pipe by soil settlement or operational conditions in the casing. The exact skid height shall be specified by manufacturer and to be approved by purchaser.

4.2 Casing End seals

The End seals, as will be specified by the purchaser , shall be one of the following types :

- a)** Molded flexible type (for new installations only) .
- b)** Sleeve type (for new installations only) .
- c)** Wraparound type (for existing pipelines) .

The End seals shall be manufactured from synthetic elastomers such as NBR, EPDM , neoprene , ETC. conforming to at least to ASTM specification D 2000.

The material shall be resistant to hydrocarbons, microorganisms (bacteria, fungus) , atmospheric exposures and buried laying in case of acid or alkaline and permanent deformation under load.

All materials and workmanship shall be accordance with good commercial practice and the resulting product shall be free from porous areas, air pockets, foreign matter , or other defects affection serviceability . The inner surface of the End seals shall be circumferentially ribbed,

where the bands squeeze the seal against the casing and carrier pipe , for increasing the contact pressure and insure a tighter joint .

The End seals shall be fixed on the carrier pipe and the casing be means of stainless steel bands and clamps , to be adjustable only by screwdriver .

A positive watertight means of sealing the wraparound type after installation shall be provided by a very strong adhesive solution .

The End seals shall conform to the requirements as to physical properties prescribed in table 2.

Table 2- physical properties of End seal materials

Element	Unit	Requirement	Test method
Thickness (MIN): Flexible type Sleeve /wraparound type	mm	4.5 in bellows to 10 at shoulder 3.2	ASTM D 3767
Tensile strength (MIN.)	Kg/cm2	70	ASTM D 412
Elongation (MIN.)	%	250	ASTM D 412
Hardness (shore A)	--	60 ±5	ASTM D 2240
Service temperature	0C	-20 to +80	--
Pipe size range	Inch	2 to 56	--

5.0 Inspection, Tests , And Certification

5.1 All tests and inspections shall be made at works prior to shipment. The manufacturer shall be responsible for carrying out all the tests and inspections required by this specification.

5.2 The purchaser or his representative shall have free access to manufacturer's works to inspect the quality of base and finished materials and to witness the quality control tests.

5.3 The manufacturer / supplier shall place free of charge at the disposal of the purchaser's inspectors all means necessary for carrying out their inspection, results of tests, checking of conformity of materials, marking and packing with this specification requirements .

5.4 The manufacturer / supplier shall furnish or allow the purchaser or his representative to select samples of the material representative to select samples of the material representative of each lot of product.

5.5 The manufacturer / supplier shall furnish the purchaser with a certified copy of results of tests made by the manufacturer covering physical and performance characteristics of each lot of product to be supplied under this specification.

Certified test reports and samples furnished by the manufacturer / supplier shall be properly identified with each lot of product.

6.0 Marking

All items (Insulators and End seals) shall be marked visibly with the following identification :

Element	Type of marking
NIGS symbol	Label
Enquiry No.	Label
IGS No.(IGS-M-TP-015)	Label
Material's type and designation	Label
Size (DN)	Engrave / Label
Manufacturer's name or trade mark	Engrave/ Label
Lot No.	Label
Manufacturing date	Label

7.0 PACKING / PACKAGING

All materials shall be packaged in suitable container to ensure safe delivery to their destination. Individual materials shall be packed in such a manner as to protect the material against physical and mechanical damage and contamination during shipment, handling and storage.

8.0 DOCUMENTATION

The technical bid shall include the following:

- a) Completed data sheet (clauses 9.1.1. & 9.1.2)
- b) Manufacturing specification .
- c) Original catalogue showing materials , dimensions , technical data and configuration .
- d) Material specification for the items to be offered.
- e) Test and inspection report and procedures .
- f) Packing specification .

g) Installation manual .

9.0.Annexes.

9.1.. Normative annexes.

9.1.1. Pipeline casing insulator and End seal data sheet.

Manufacturer ,s name and address:		Purchaser/end user :	
Enquiry no.		Project title :	
Pipeline casing insulator			
Type : Plastic insulator. ☐ Steel insulator. ☐		Quantity	
Carrier pipe size :		Casing pipe size	
		Wall thickness	
Coating type and standard :		Coating thickness (min)	
Pipeline End seal			
Type : Molded flexible. ☐ Sleeve ☐ Wraparound ☐		Quantity	
Carrier pipe size :		Casing pipe size	
Coating type and standard :		Coating thickness	

9.1.2. Insulators and end seals data sheet.

Manufacturer ,s name and address:		Purchaser/end user :	
Enquiry no.		Project title :	
Pipeline casing insulator			
Plastic insulator. ☐		Quantity : Size :x.....IN.(MM).	
Material & related std. :			
Metallic insulator. ☐		Material & related std.:	
Coating type and standard : Coating thickness :		Liner material & related std . : Runner material & related std.: Riser material & related std : (if applicable)	
Pipeline End seal			
Type : Molded flexible. ☐		Material & related std. :	
Sleeve ☐			
Wraparound ☐			
Size :x..... IN(MM).		Quantity :	

9.2. Informative annex.

9.2.1. Recommended insulator spacing.

Carrier pipe	Casing pipe		Insulator Spacing (c/c)*	Type of insulator
Nominal size (IN)	Nominal size (IN)	Thickness (MIN) (IN)	METER	Metallic / NON- Metallic
4	8	0.188	3.0	Non – metallic

6	10	0.219	3.0	Non – metallic
8	12	0.250	3.0	Non – metallic
10	16	0.312	3.0	Non – metallic
12	16	0.312	3.0	Non – metallic
16	20	0.312	4	metallic
20	24	0.312	4	metallic
24	30	0.375	3.5	metallic
30	36	0.438	3.5	metallic
36	42	0.500	3	metallic
40	48	0.625	3	metallic
42	48	0.625	2.5	metallic
48	56	0.625	2	metallic
56	64	0.688	2	metallic

*An additional insulator in each case should be fitted at the leading end of the pipe .