Electrical Properties of Marine Dock Hose Assemblies

Electrically Conductive Hose Assemblies

Low conductivity petroleum products and solvents such as gasoline & toluene become electrostatically charged when flowing through a pipeline and the pipeline itself acquires a charge of opposite polarity.

If the pipeline is earthed, the accumulated charge flows safely to ground. However, if the pipeline is not earthed, a charge could accumulate which may then be discharged instantaneously by an incendive spark to a nearby earthed conductor. If the spark has sufficient energy and an inflammable air/product mixture is present an explosion will result.

It is therefore normal practice for hoses generally to be specified that they be electrically conductive (with a maximum resistance of 10 ohms) so that the electrostatic charge is continuously drained away. Even so, it is common practice in the petroleum industry to specify a maximum flow velocity of 7m/sec when pumping low conductivity products to ensure that a charge is not generated more quickly than can be dissipated through normal arrangements.

Charges generated can be of many thousands of volts, but currents are of the order of a few microamps.

Insul-Flange: A Cast-Nylon Insulating Flange for use on Marine Docks and Terminals

If the piping system of a marine terminal is electrically conductive, an elecrical charge flows along the piping because of dock/pier-side cathodic protection systems. With the potential inductive effect of the piping system, a spark could occur at the moment when the hose is disconnected.

Insul-Flange controls undesirable electrical currents. The Insul-Flange prevents the heavy electrical flow in the piping system and eliminates the risk of an electrical arc when the hose is disconnected.

Construction: Insul-Flange is constructed of cast Nylon and is resistant to most common solvents, lubricants, hydrocarbons, esters, key tones and aqueous solutions of acids and alkalies at pH5 to pH 11. For more severe chemical service, PTFE lining is an option. Melting Point: 428°F/220°C. Elect. Resistivity: 1012 ohm/cm.

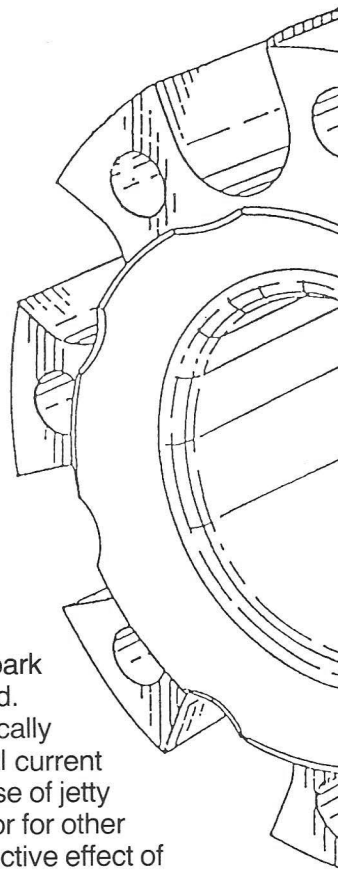
- Insul-Flange retains the properties of insulating flange gasket kits, but they are much easier to install and inspect for the properties of non-conductivity.
- Provides greater electrical resistance than regular insulating gasket kits.
- Prevents any possibility of an electric arc upon disconnection of the hose.
- Eliminates the need for separate bonding wire.
- Complies with several standards:
  - California State Lands Commission, M.F.D. § 2380
  - U.S.C.G. 154.810 Vapor Line Connections, Section G - Facility Vapor Connections
  - ISGOTT Chapter 6 - Electrical Insulation

INSUL-FLANGE: ANSI CLASS 150 DRILLING						
Bore	O.D.	Length	No. of Bolts	Bolt Hole Diam.	Test Pressure (psi)	Longitudinal Stress (psi)
4	9	4¾	16	¾	750	600
6	11	9½	16	⅞	750	1221
8	13½	11¾	16	⅞	750	1333
10	16	14¼	24	1	750	1408
12	19	17	24	1	750	1273
16	23½	21¼	32	1⅛	750	1608

Other flange ratings or standards available on request

US HOSE
TITEFLEX

Insulating Flange



SPOOL TYPE INSULATING FLANGE

A different principle of an insulating joint is to use a spool of insulating material bolted between the two hose flanges and an isometric view of this is shown in figure 1.

ADVANTAGES

The main advantage of this type of insulating flange is that the minimum resistive path is in the order of one inch. The flange is very simply a one piece item and the method of fixing is foolproof and failsafe. Tests carried out on this flange show very high electrical resistance and during a flow test, when a flow rate of 4.7 metres/sec using Kerosene was achieved, there was no indication of any electrostatic build up whatsoever.

CONSTRUCTION

The material of construction is cast nylon, machined to suit the relevant flange sizes and early test indications of this type of insulating flange show that it possesses all the required properties of a properly fitted standard insulating gasket set with the additional advantage of being more easily fitted and more readily inspected and tested.

CONDUCTIVITY

There is no doubt that the undesirable electrical currents that occur in ships product transfer hoses can be controlled by inserting an insulating flange between two lengths of conductive hose. The spool type flange has the definite advantage of simpler fitting, greater resistive path, and the very high resistance of this flange has not produced dangerous electrostatic fields under test conditions.

EXTRACT FROM W. M. WOOD.
POWELL DUFFRYN TERMINALS
PAPERS 3–10–85.

The purpose of the insulating flange is to prevent any possibility of a spark when the pipe is disconnected. If the whole pipeline is electrically continuous, a strong electrical current is likely to flow along it because of jetty cathodic protection systems or for other reasons. Because of the inductive effect of the pipeline, a spark would occur at the moment of disconnection. An insulating flange prevents a heavy current flow in the pipeline and avoids the risk of sparking when the pipeline is disconnected. The resistance measured across the flange should be of the order of 25,000 ohms. A value much less than this could indicate damage to or deterioration of the insulating flange, which should be checked as a matter of urgency. It is undesirable to have a flange with a very high resistance because of the possible danger of electrostatic sparking across the flange.

Before the introduction of the insulating flange, it was a common practice to attempt to overcome the risk of sparking by the use of a bonding cable connected across the break-point in the pipeline. The bonding cable was incapable of reducing current flow in the pipeline to a level which would have completely avoided the risk of a spark on disconnection of the pipeline, and for this reason the insulating flange was adopted.

It is a common misconception that a bonding cable connected across the insulated flange is still required; its use in such circumstances is now an unnecessary complication, and some forms of bonding could be positively dangerous.

EXTRACT FROM
INTERNATIONAL MARITIME ORGANISATION
M SC/CIRC 299/ADD1 13 JULY 1983

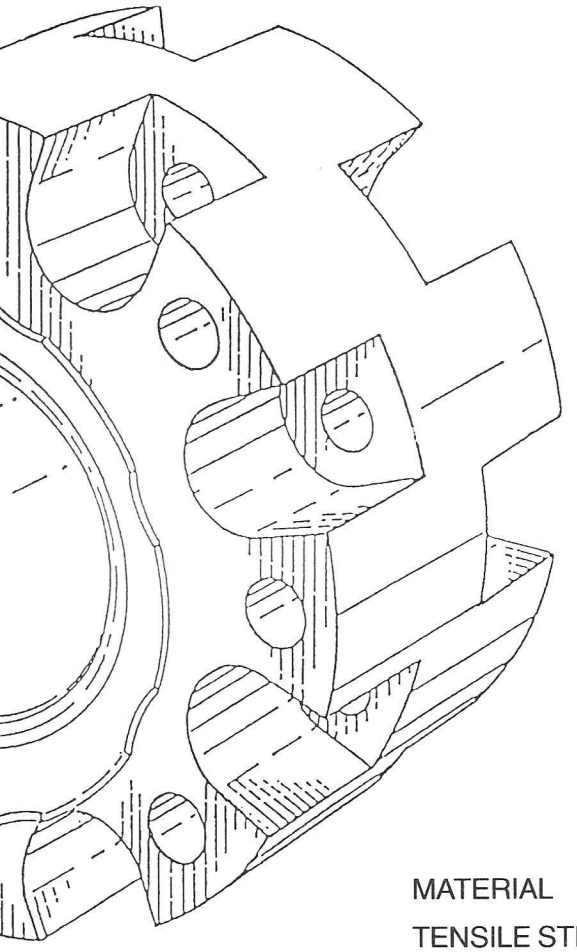
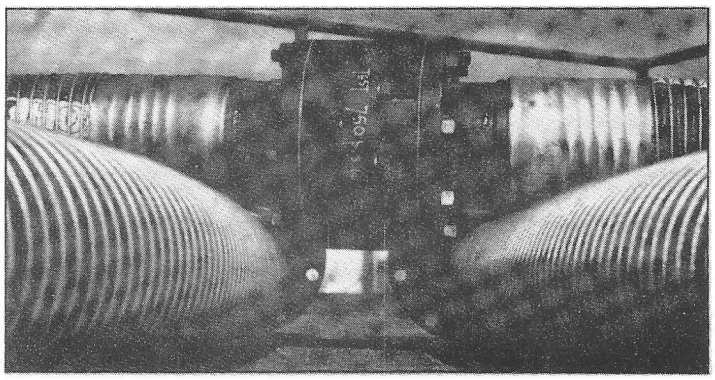


Fig 1
Spool Type Flange
Isometric View

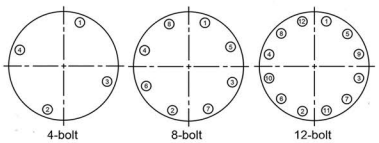


SPECIFICATION SHEET FOR INSULATING FLANGE

MATERIAL	– NYLATRON GSM
TENSILE STRENGTH @ 23°C	– 11,000-14,000 psi/7750-9850 kg/cm^2
MOD. OF ELAST @ 23°C	– 350,000-450,000 psi/246000-316000 kg/cm^2
FLEXURAL STRENGTH @ 23°C	– 15,000-15,800 psi/10500-11200 kg/cm^2
COEF OF LIN EXP	– 105×10^{-5}in/in/°F/100×10^{-6} mm/mm/°C
MELTING POINT	– 428°F/220°C.
FLAMMABILITY	– SELF EXTINGUISHING
ELECT. RESISTIVITY	– 10^{12} ohm/cm.
ELEC. FIELD GENERATION	– NONE

FLANGE SIZE IN.	OUTSIDE DIA. IN.	PCD IN.	LENGTH IN.	NO. OF BOLTS	BOLT SIZE IN.	WASHER TYPE	NUT TYPE	BOLT TORQUE FT. LBS	TEST PRESS PSI	LONGITUDINAL STRESS PSI
4	9	7.5	4.75	16	0.625	SAE	FINISHED	100	750	600
6	11	9.5	5.625	16	0.750	SAE	FINISHED	130	750	1,211
8	13.5	11.75	5.625	16	0.750	SAE	FINISHED	130	750	1,333
10	16	14.25	6	24	0.875	SAE	FINISHED	215	750	1,408
12	19	17	6	24	0.875	SAE	FINISHED	220	750	1,273
14	21	18.75	6.5	24	1.000	SAE	FINISHED	320	750	1,656
16	23.5	21.25	6.5	32	1.000	SAE	FINISHED	320	750	1,608

INSULATING FLANGES ARE DESIGNED TO CL150 FLANGES
USE ONLY SAE WASHERS AND FINISHED HEX NUTS FOR PROPER FIT



RESISTANT TO: MOST COMMON SOLVENTS, LUBRICANTS, HYDROCARBONS, ESTERS, KEYTONES AND AQUEOUS SOLUTIONS OF ACIDS AND ALKALIES AT pH 5 to pH 11.
SEE SEPARATE CHEMICAL RESISTANT CHART.

CAN BE CONTINUOUSLY P.T.F.E. LINED FOR MORE SEVERE CHEMICAL SERVICE.