

Sliders, Acoustic, Guides & Anchors

**T O R G Y   G R O U P**



### **TORGY LOW FRICTION SLIDE BEARINGS:**

When a structure has got changes in temperature during its operation, installation or testing, they expand or contract. This thermal movement plus any reciprocating motions due to seismic or differential forces has to be accommodated within the design of the structure, otherwise such items can produce higher stresses and may also overload the system leading to failure. One effective way of dealing with this problem is to allow one item to move in relation to the other and this can be achieved by using slider bearings.

PTFE Slide bearings are superior to conventional expansions plates, rollers and rocker arm type supports. Some of the applications of PTFE slide bearings are

- 1) Oil, water and chemical transportation pipes,
- 2) LNG pipelines and Vessels,
- 3) Heavy Machinery
- 4) Buildings, Bridges etc..

Slide Bearings for such applications must operate at high loads and low speeds, and it is under just these conditions that the self lubricating properties of PTFE are at maximum. This factor together with its no stick-slip, very low coefficient of friction and anti weathering properties makes PTFE a successful slide bearing material.

### **ADVANTAGES:**

- 1) Torgy low friction slide bearings uses PTFE, which has the lowest coefficient of friction of any know solid 'engineering material' including lubricated steel. There is no stick –slip action.
- 2) Life expectancy is higher – resistant to chemicals and weather, very less (0.01%) moisture absorption.
- 3) No maintenance – No Lubrication required.
- 4) Easy Installation, less bulky than other bearings.
- 5) Small particles which may become embedded do not cause binding of the surface.
- 6) The slide bearing can accommodate some misalignment in construction without setting up stress corrosion along a leading edge, as can occur in conventional bearings.

### **COEFFICIENT OF FRICTION:**

The coefficient of friction of PTFE materials depends on various factors including pressure, sliding velocity and temperature. It has been variously reported from 0.02 to 0.2 depending upon the surface preparation and the test method. **Graph 1** gives the coefficient of friction of PTFE against the load. The coefficient of friction between the mating surface and PTFE will be minimum when the stress at the PTFE is maximum (consistent with the acceptable levels of creep), the bearing is made from unfilled PTFE, and the finish of the mating surface is highly polished. In addition, one of the most important frictional characteristics of PTFE is the absence of 'stick-slip', because unlike all other conventional bearings, the static friction of PTFE is equal to or only marginally higher than the dynamic friction.

### **BEARING PRESSURE:**

**Graph 2** indicates the optimum pressure, but depending on the circumstances design pressures may be allowed to vary from optimum. With these pressures, a design Coefficient of friction of 0.1 for unfilled PTFE and 0.12 for filled PTFE will give a significant margin of safety when all operating conditions cannot accurately be predicted, but the figures obtained in practice will normally be considerably less than these.

### **DESIGN:**

Torgy Slide Bearings consists of two pads, PTFE sliding against polished Stainless Steel. Generally Torgy slide bearing has top pad (Polished SS) larger than the bottom (PTFE) pad by an amount equal to the expected movement of the system, with allowance for over travel. This will provide constant area of contact and prevent ingress of dirt on the bearing surface.

Torgy produces slide bearings in wide range of configurations to match the individual applications. The basic design is shown in the **Fig 4**. 6mm PTFE pad recessed (3mm) & bonded to the base 10mm backing plate sliding against 2mm polished SS plate tack welded to 6mm backing plate. **Table 1** gives the general dimensions, load and expected movement for various configurations. The size of the PTFE pad or strips can be calculated using the applied load and operating conditions and the size of the top polished SS pads is based on the amount of expected movement. PTFE bearings can be arranged in strips for rigidity and function of the structure, as shown in the (Fig 6), where PTFE slide bearings were used to accommodate the thermal movement in vessels. The Plates and the bearing pads can be supplied rectangular or square to cater for co-ordinate direction movements.

### **MATERIAL:**

Torgy slide bearings uses PTFE pads (Etched on one side for bonding) sliding against polished SS pads. The bearings shall have carbon steel backing plates for fixing (bolted or welded) to the existing steel work. The whole unit including the backing plates can also be supplied completely in Stainless Steel for use in corrosive environments.

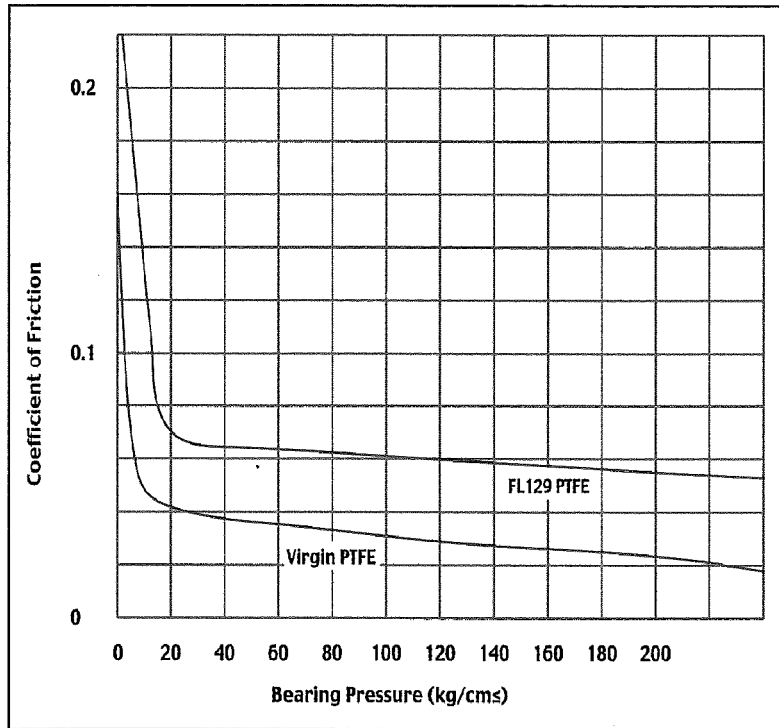
### **TEMPERATURE:**

The design temperature of the Torgy Slide bearings shall be **-40°C to +130°C**. This is the temperature at the surface of the slide bearing not the design or operating temperature of the system. As a general rule, under normal conditions for every 100mm of exposed steel to ambient the temperature falls by 200°C. For structures with critical temperature distribution, the above general rule should not be followed, a detailed FE thermal analysis is required to determine the temperature at the slide bearing surface.

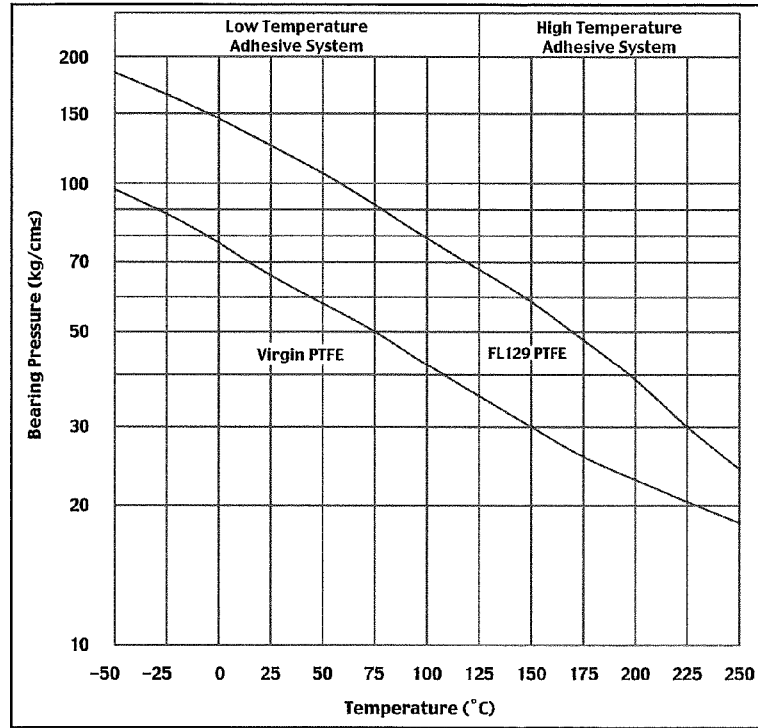
If the temperature at the slide bearings falls outside the above design temperature limit, **ASEplas** high/low thermal insulation blocks shall be used to reduce the temperature at the bearing area.

General Arrangement of Torgy Low friction slide bearing with a thermal insulation is shown on **Fig 2**.

Torgy also manufactures Graphite Bronze slide bearings that are suitable to work upto 500°C - 600°C. Please see the attached datasheet for Self Lubricated Graphite Bronze Slide bearings for details.



**FIG 1 COEFFICIENT OF FRICTION VS LOAD**



**FIG 2 RECOMMENDED BEARING PRESSURE**

**ACOUSTIC PADS:**

Slide bearing units can be built with variety of acoustic damping pads to suit the client requirements. General Torgy Acoustic slide bearings is shown in **Fig 3**, 2mm polished SS plate tack welded to top backing plate sliding against 3mm PTFE pad bonded to 6mm Anti vibration / acoustic pad bonded to the base plate. Acoustic pads shall be selected based on the operating conditions, thickness, damping characteristics and load requirements. Simple Elastomers shall be used to accommodate any angular or rotational movements are required.

**DUST SEAL:**

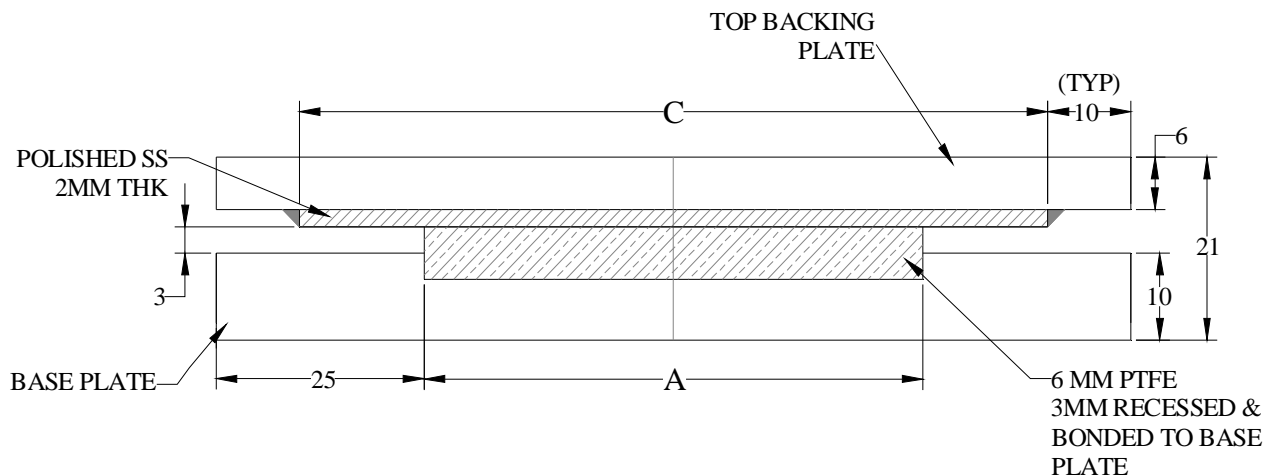
Torgy Slide Bearings can be built with Dust Seal for use in a place where significant amount of dust or other contaminants present. The bearing arrangement is shown on **Fig 4**.

**PTFE BONDING:**

Chemical bonding is the recommended for bonding the PTFE to the backing plate, the shear value of the epoxy adhesive is greater than that of the PTFE. Site bonding of PTFE is not recommended – strictly controlled conditions of cleanliness, pressure and temperature are required to obtain a satisfactory bond.

**INSTALLATION:**

General Torgy Slide bearings are designed for site welding to the main structure. The bearings can be fixed to the mains system by tack welding, full welding or bolting. The PTFE surface should be protected from weld spatter, paint spray, metal swarf etc. during installation.



**FIG 1 STANDARD TORGY LOW FRICTION SLIDE BEARING**

LOAD RANGE		PTFE	Polished SS		
			A (SQR)	C (SQR)	
		Kgf		KN	mm
100-250	1-2.5	20	50	75	125
200-600	2-6	30	60	85	135
400-1100	4 - 11	40	70	95	145
800-2450	8 - 24	60	90	115	165
2000-5500	20 - 54	90	120	145	195
3200-9700	32 - 97	120	150	175	225
7000-22000	69 - 215	180	210	235	285
16000-46000	160 - 450	260	290	315	365
26000-70000	255 - 686	320	350	375	425

TABLE 1 STANDARD SLIDE BEARING - LOAD AND MOVEMENT RANGE

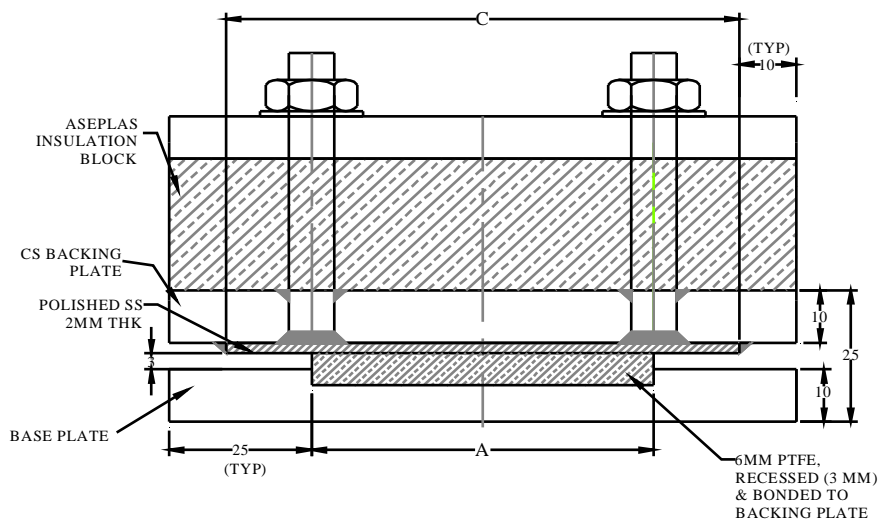
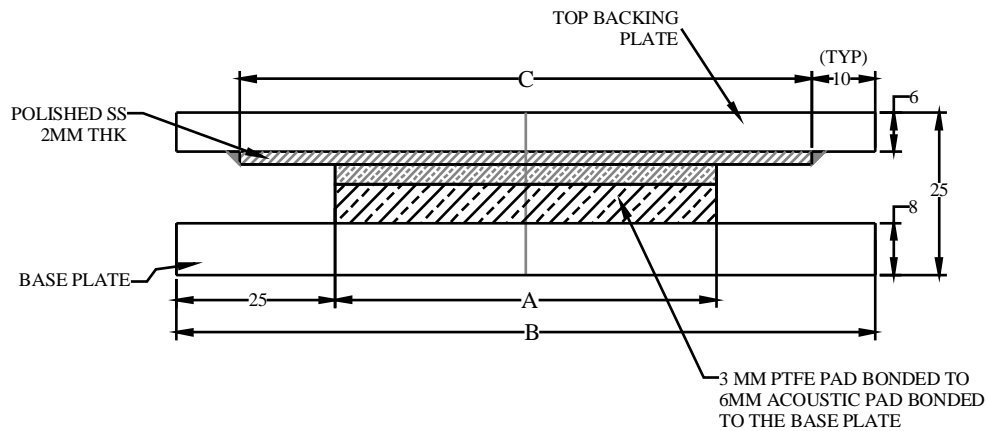
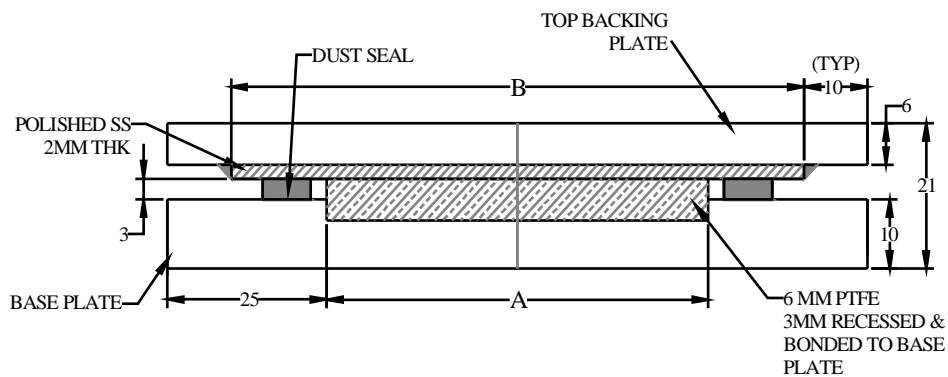


FIG 2 TORGY LOW FRICTION SLIDE BEARING WITH THERMAL INSULATION BLOCK FOR HOT/COLD APPLICATION



**FIG 3 TORGY ACOUSTIC – LOW FRITCION SLIDE BEARING**



**FIG 4 TORGY LOW FRICTION SLIDE BEARING WITH DUST SEAL**

### TECAFLON PTFE

Chemical Designation: Polytetrafluoroethylene

DIN Abbreviation: PTFE

Colour, Filler: Opaque

TECAFLON PTFE is a semi-crystalline high performance thermoplastic with excellent chemical resistance, very good non-stick characteristics as well as good machinability.

#### MAIN CHARACTERISTICS:

- Extremely good chemical resistance against virtually all media
- Very good sliding properties
- Anti-adhesive
- Very tough
- Hot water resistant
- Very good UV resistance
- Very good electrical insulation Soft
- Difficult to bond

- Gamma radiation sensitive Self-extinguishing V-O
- Non-melting

#### PREFERRED FIELDS:

Chemical Engineering, machine parts, transport and conveyor technology, pump and instrument construction, electrical industry, electronics, laser technology, fume purification, pure water production, cryogenics, filter technology, food and medical technology.

#### APPLICATIONS:

- Valve seats
- Pump housings
- Filter housings
- Tank linings
- Pipe linings
- Etching plates
- High frequency insulation
- Pump parts
- Seals
- Slide runners
- Slide bearings
- Roller coverings

#### **TECAFLON PTFE**

The following information corresponds with our current knowledge and indicates our products and possible applications. We cannot give a legally binding guarantee of certain properties or the suitability for a specific application. Existing commercial patents must be observed. A definitive quality guarantee is given in our general conditions of sales. Unless otherwise stated, these values represent averages taken from injection moulding samples. We reserve the right of technical alterations.

Properties	Unit	Test method DIN EN ISO / ASTM	
<b>Mechanical</b>			
Density	g/cm <sup>2</sup>	5271D792	2.18
Tensile strength at yield	MPa	5271D638	25
Tensile strength at break	MPa	5271 D 638	
Elongation at break	%	5271D638	>50
Modulus of elasticity in tension	MPa	5271D638	700
Modulus of elasticity in flexure	MPa	178ID790	
Ban Indentation hardness	MPa	203911	30
Impact strength	kJ/m <sup>2</sup>	179/D 256	no br.
Creep rupture strength after 1000 hrs with static load	MPa		5
Time yield limit for 1% elongation after 1000 hrs	MPa		1.58

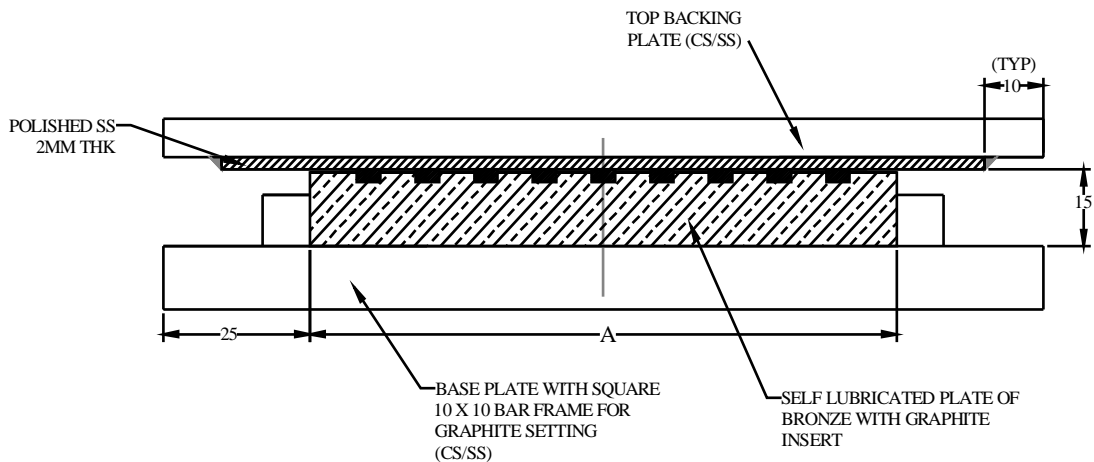


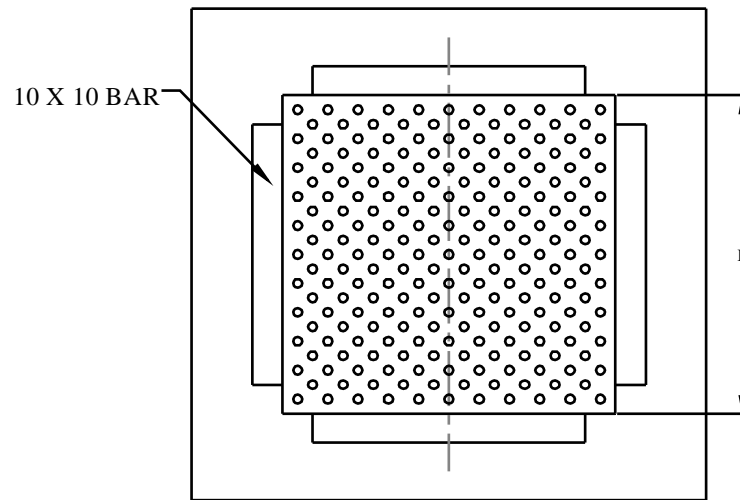
Coefficient of friction against hardened and ground steel $p = 0.05 \text{ N/mm}^2$ . $v = 0.6 \text{ m/s}$	-		0.08-0.10
Wear conditions as above	$\mu\text{m/km}$		21
<b>Thermal</b>			
Crystalline melting point	$^{\circ}\text{C}$	DIN 53 736	327
Glass Transition temperature	$^{\circ}\text{C}$	DIN 53 736	-20
Heat distortion temperature Method A Method B	$^{\circ}\text{C}$ $^{\circ}\text{C}$	R 75 R 75	55 121
Properties	Unit	Test method DIN EN ISO / ASTM	
Max. service temperature short term long term	$^{\circ}\text{C}$ $^{\circ}\text{C}$		260 260
Coefficient of thermal conductivity	$\text{W}/\{\text{m K}\}$		0.25
Specific heat	$\text{J}/(\text{g K})$		1
Coefficient of thermal expansion	$10^{-5}/\text{K}$	DIN 53 483 / D 696	12
<b>Electrical</b>			
Dielectric constant at 105 Hz		DIN 53 483	2.1
Dielectric loss - at 105 Hz		DIN 53 483	0.0002
Specific volume resistance	$\Omega \text{ cm}$	DIN 60093	1016.
Surface resistance	$\Omega$	DIN 60093	1016
Dielectric strength 1 mm	$\text{KV}/\text{mm}$	ASTM149	43
Tracking resistance		53 430	KA3c KB > 600

Miscellaneous			
Moisture absorption: Equilibrium in standard atmosphere (23 .0C / 50 % relative humidity)	%	62	<0.05
Water absorption at saturation at 23 "-C	%	62	
Resistance to hot water. washing soda			Resistant
Flammability according to UL standard 94			VO
Resistance to weathering			Resistant

#### GRAPHITE-BRONZE SLIDE BEARINGS:

Graphite Bronze slider bearing is suitable for high temperature applications, with same friction coefficient as PTFE slide bearings. The base material is Bronze with small quantities of other metals (PB, Zn...). The lubricant inserted element is graphite with small addition of metals, metallic oxides and other lubricant elements.





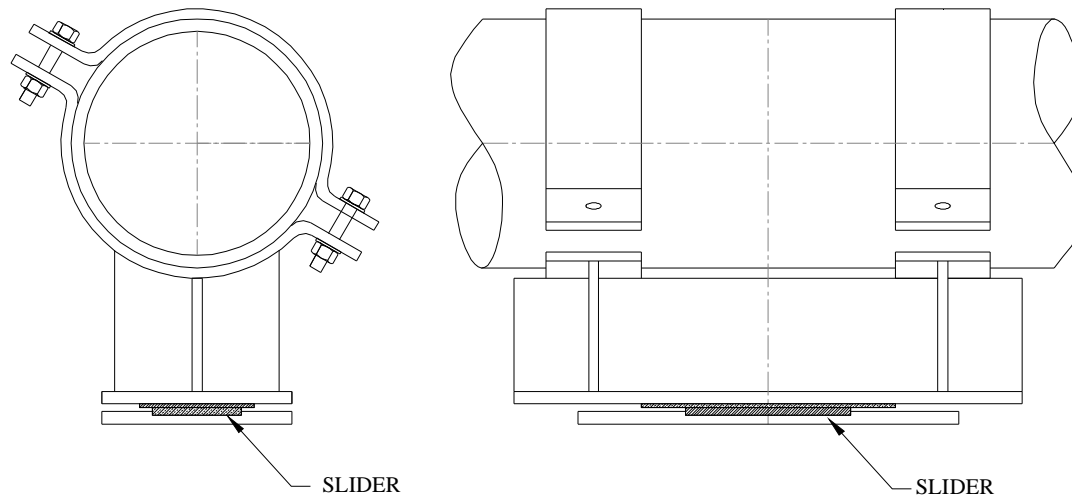
<b>Max Load</b>	<b>A</b>	<b>B</b>
Kg	mm	mm
3.75	50	50
5.625	75	50
7.5	100	50
11.25	150	50
8.435	75	75
11.25	100	75
16.875	150	75
22.5	200	75
33.75	300	75
15	100	100
22.5	150	100
30	200	100
45	300	100
33.75	150	150
45	200	150
67.5	300	150
90	400	150
60	200	200
90	300	200
120	400	200
150	500	200

TABLE 2 – GRAPHITE BRONZE PLATE DIMENSIONS.

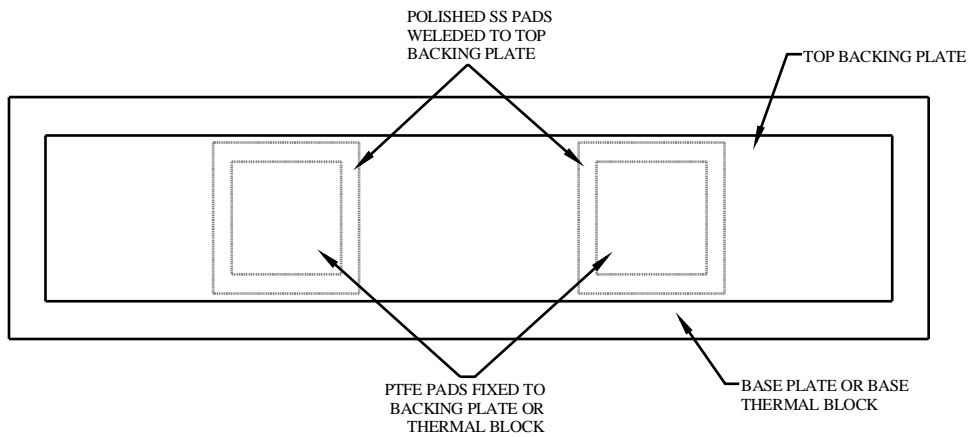
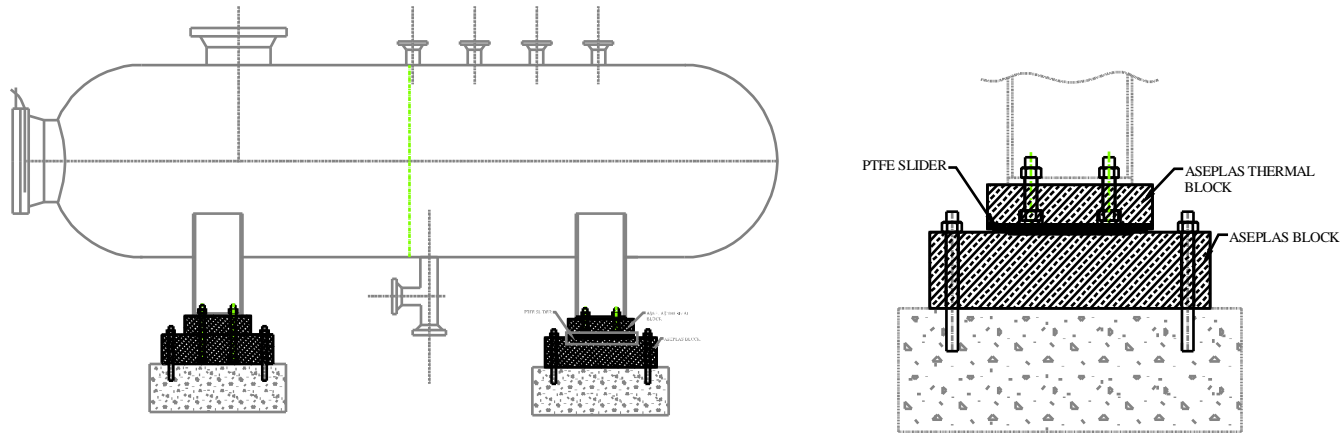
NOTES:

- 1) General Torgy slide bearing will have the Graphite Bronze plate sliding against the Polished SS.
- 2) Coefficient of friction less than 0.1.
- 3) Installation welding or bolt attachment to the main structure.
- 4) The slide bearings can be manufactured in any dimension of base and bronze-graphite plates and also in any thickness, with a minimum value of 15mm.
- 5) Design temperature 500°C - 600°C.

**SOME APPLICATIONS OF LOW FRICTION SLIDE BEARINGS:**



**FIG 5 SLIDE BEARING FOR PIPE**



**FIG 6 SLIDE BEARING USED IN VESSEL WITH THERMAL BLOCK**

