GENERAL INFORMATION

FAST AVAILABLE ITEMS

Items which are available faster are marked by * in the catalogue. Though it does not indicate any definate period of delivery, these items can be manufactured faster than the other items of its range. For example, Pipe section PS18/1000 can be supplied faster than any other pipe section of 450DN. This is because of following reasons :

- Semi finish goods or raw material for these items will be always available.
- Method of production of these items are set.
- Being fast moving items, these items may be available ex-stock with us.

REPAIRS

Though any damaged glass equipment can be repaired, mostly it is not economical to do so. Generally, the repair which involves less than one third of its original work, is worth to carry out repairing. Repair work is costly because :

a. It generally require greater skill than making a new one.
b. Since it involves high risk of total breakage, the risk of total loss of time spent on its repairing goes along with.
c. The work involved in receiving a damaged equipment, identifying it throughout the handling, cleaning it, estimating its repairing charges, re-estimating the repairing charges in case damage extends etc are relatively expensive.
d. Each job require individual attention throughout the execution.

However, while sending an equipment for repairing, following care must be taken :

a. Inform the nature of breakage and get an estimate of repairing charges in advance to avoid the loss of transportation expenses in case it is uneconomical to go for repairing.
b. Since repairing takes longer time to fit into production schedules and completion of repairing is highly uncertain, it is generally suggested to arrange for a substitute equipment to continue the work.
c. Equipment to be repaired should be clean. Since it can be cleaned better and at less cost at owner's premises, it should be cleaned before sending it for transportation. This also makes it safer to transport.
d. Pack with extra care, since cracks in glass have a tendency to extend with every jerk.
e. If possible, send broken pieces along with it.
f. Generally repairing work is accepted only for the equipment manufactured by us, and are repaired at owner's risk only.

DIMENSIONS, WEIGHTS AND SPECIFICATIONS

In this catalogue, dimensions, weights and other specifications are taken more or less in accordance with Corning. This is to keep the flexibility of maximum interchange ability. However, some difference are unavoidable due to local manufacturing conditions. All the odd dimensions are rounded off.

All the dimensions and weights are approximate. The specifications given in the catalogue are intended to present a general description of the items. Since manufacturing of glass equipment involves all manual operations, certain tolerances are obvious and permissible while passing the items through quality control.

CATLOGUE REFERENCES

To avoid querries and delays in delivery, please always quote the catalogue reference in your order.

MODIFICATIONS

We reserve the right to carry out technical modifications of products and data mentioned in this catalogue as and when require.

STANDARDS PRACTICED

DIN ISO	3585
DIN ISO	3586
DIN ISO	3587
DIN ISO	4704
BSEN	1595
DIN ISO	718

XTRONG

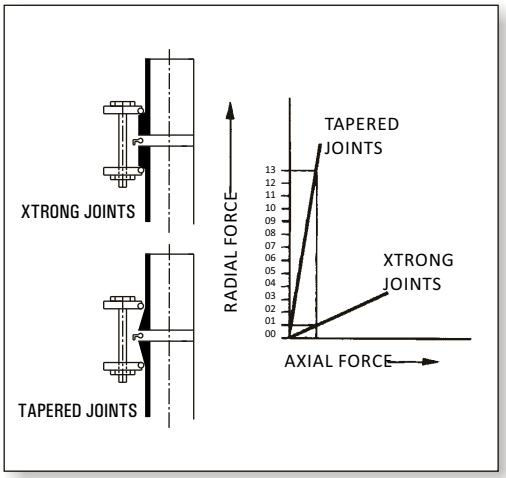
INTRODUCTION

Tapered glass joints are predominantly used in industrial glass equipments. This design has a high ratio of radial to axial force, which frequently leads to breakage while tightening the flange joints.

A cylinder can withstand a much higher axial force than radial force plus glass has a very high compressive strength. We at GOEL recognized these features and by our innovative design practices developed XTRONG joints. The XTRONG joints are so designed that the harmful radial stresses are dramatically reduced. For a given axial force the radial forces are 14 times lesser than that in tapered joints.

XTRONG joints are practically many times stronger than conventional tapered joints, As far as tightening of joints are concern, it is tested that a XTRONG joints does not break even at a torque of 20Nm, as against tapered joints, which starts breaking at 6-7 Nm torque. At times it may happen that because of over tightening, a metal backing flange breaks or the threads of nut-bolts give way but XTRONG glass joint remains intact.

Most of the old glass installations in general contain equipments with tapered glass joints. XTRONG joints are fully compatible with these tapered joints. i.e. an XTRONG equipment can replace another tapered equipment and vice versa in any existing unit. This interchangeability makes XTRONG design more adaptable in general conditions and change over cost is negligible.



XTRONG joints

XTRONG joints have been developed, to arrest the frequent breakage and leakage problems. The XTRONG joints are so designed that the harmful radial stresses are dramatically reduced. For a given axial force the radial forces are 14 times lesser than that in tapered joints.

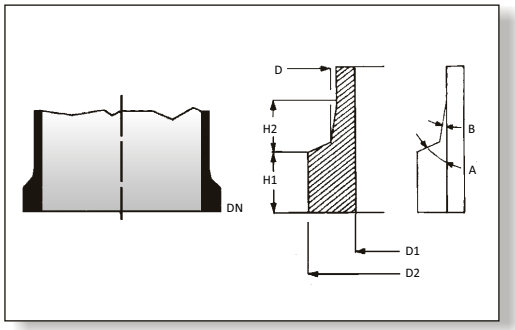
In addition to reducing the stresses, the XTRONG joint has the following advantages

- The ovality of the glass flange, present due to manufacturing process, has virtually no effect because the backing flange isn't in direct contact with the periphery.
- Continuous re-tightening of the backing flange or insert, due to bolting force & temperature effects, hence dismantling is easy. Also much smaller length threaded bolts are needed compared to the tapered joints.
- The XTRONG joint is leak-tight at all design temperatures & pressure, even with temperature cycling and frequent plant start-up as it is possible to tighten the joints upto a tightening torque of 20 Nm as against 6-7 Nm tightening torque in tapered joints. In some cases the metal backing flange breaks but nothing happens to the glass components !

With so many benefits and particularly low breakage risk, we have adopted XTRONG design for all equipments manufactured by us. XTRONG is widely accepted and adopted by users as well as manufacturers of Glass Equipments in India.

DIMENSIONS OF XTRONG ENDS

DN	D2	D1	D	H1	H2	A	B
12(0.5)	25	13	19	8	2	65	0
15(0.7)	28	16	22	8	2	65	0
25(1)	41	26	33	13	8	65	0
40(1.5)	56	38	46	14	9	65	0
50(2)	69	50	59	16	11	65	0
80(3)	98	77	87	18	12	65	0
100(4)	132	105	115	20	17	65	0
150(6)	184	153	165	22	19	65	0
225(9)	258	220	230	24	26	65	0
300(12)	340	300	315	24	26	65	0
400(16)	463	407	422	25	35	65	9
450(18)	525	457	470	25	50	65	9
600(24)	684	610	625	25	60	65	9
800(32)	916	820	832	30	97	65	9
1000(40)	1088	1020	1037	30	150	65	9



TECHNICAL INFORMATION

Borosilicate glass represents unmatched standardized glass for construction of plant and piping in the chemical, dyestuff, food pharmaceutical, petrochemical industries. Its steadily growing use is due to many advantages over conventional materials.

- Outstanding corrosion resistence
- Smooth pore free surface
- Transparency
- Catalytic intertness.
- No effect on taste and odour
- Physiological intertness.

Borosilicate glass is chosen for its unique chemical and physical properties. Borosilicate glass can be considered as being composed of Oxides, Silica (SIO_2) Magnesia (MgO) and Lead oxide (PbO) are the principle modifiers/fluxes.

The chemical and physical properties of any glass depends on a varying degree on chemical composition of glass.

CHEMICAL COMPOSITION

The composition of borosilicate glass used for chemical plants has following approximate composition.

SiO_2 - 80.6%	B_2O_2 - 12.5%
Na_2O - 4.2%	Al_2O_3 - 2.2%

RESISTANCE TO CHEMICAL

Borosilicate glass is inert to almost all materials except Hydroflouric acid (HF) Phosphoric acid(H_3PO_4) and hot strong caustic solutions. Of these. Hydroflouric acid has the most serious effect, even when it is present in PPM (parts per million) in solutions. Where as phosphoric acid and caustic solutions cause no problems when cold but at elevated temperature corrosion occurs. In case of caustic solutions, upto 30% concentration can be handled safely at ambient temperature.

Under actual operating conditions, the effect of turbulence, and traces of other chemicals in the solution may increase or decrease the rate of attack. So it is not possible to give exact figures for corrosion by caustic solutions.

PHYSICAL AND THERMAL PROPERTIES

Linear coefficient of thermal expansion

The coefficient of thermal expansion of borosilicate glass over the temperature 0-300°C is 3.3×10^{-6}/°C. This is very low when compared with other glasses and metals. That is why, borosilicate glass is often called low expansion borosilicate glass.

Specific heat

Specific heat between 25°C and 300°C is average to be 0.233Kcal/Kg, °C

Thermal Conductivity

Thermal conductivity is 1.0 Kcal/hr,m°C. Over the permissible operating temperature range.

Mean Specific Heat

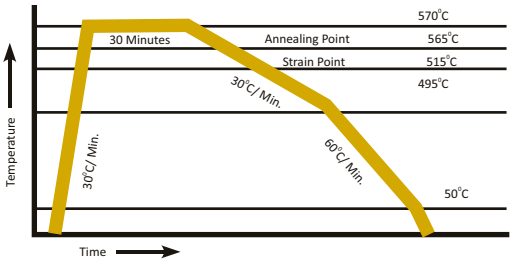
Mean specific heat capacity between 20°C and 200°C is 0.98 KJ/Kg K.

DENSITY

Density of glass at 20°C (J)=2.23g/cc
Modulus of elasticity (E)=6.3 KN/mm^2
Poissions ratio=0.2

ANNEALING

Annealing of glass is the process where the glass is heated and kept for a defined period of time to relive internal stresses. Careful cooling under controlled conditions is essential to ensure that no stresses are reintroduced by chilling/cooling.



RESHAPING

In the below given table, it shows characteristic temperature at a determined viscosity, essential for glass reshape.

Lower cooling temperature	10^{24}poise	515°C
Upper cooling temperature	10^{13}poise	565°C
Softening point	10^{7}poise	795°C
Reshaping point	10^{4}poise	120°C

MECHANICAL PROPERTIES

The lack of ductility of glass prevents the equalization of stresses at local irregularities or flows and the breakage strength varies considerably about a mean value. This latter is found to occur at a tensile strength of about 700kg/cm^2 In order to allow for the spread of breaking stress, a large factor of safety is applied when determining the wall thickness requirement to allow operation up to values given in the table of working pressure.

OPTICAL PROPERTIES

Borosilicate glass show no appreciable absorption in the visible region of spectrum and therefore appears clear and colorless.

In photo chemical processes, the transparency of ultra violet is of particular importance. It follows from the transmittance of material in uv region that photo chemical reactions such as Chlorination & Sulpho Chlorination can be performed in it.

TECHNICAL INFORMATION

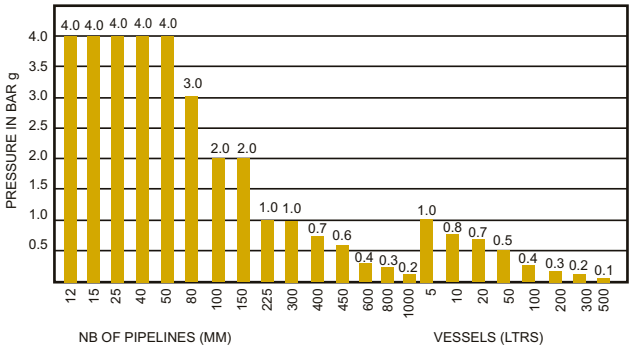
PERMISSIBLE OPERATING CONDITIONS

Working Pressure For Glass Pipelines & Vessels

The permissible internal operation pressure depends upon the nominal diameter of the glass components and on working temperature.

In case of unit with various combination like vessels, filters, heat exchangers, the over all permissible internal gauge pressure is always governed by the component with the lowest permissible operating gauge pressure all components are suitable for full vacuum.

Bar is a measure of absolute pressure. The figure given for maximum recommended working pressure represents pressure above atmospheric.



Working Temperature

Borosilicate glass retains its mechanical strength and will deform only at temperature which approach its strain point. The practical upper limit for operating temperature is much lower and is controlled by the temperature differentials in the glass which depends on the relative temperature of the contents of the equipment and the external surroundings. Provided borosilicate glass is not subject to rapid change in temperature, creating undue thermal shock, it can be operated safely at temperatures upto 250^{0}C

It must be realised that in complete plants, composed not only of borosilicate glass, but also include other materials such as PTFE. The recommended max. operating temperature is 200^{0}C. Operating temperatures may have to be modified so as to compensate for the effects of other factors such as pressure, thermal cycling, rapid heating & cooling etc.

The degree of thermal shock (usually defined as sudden chilling or heating) which it can withstand depends on many factors such as stresses due to operating conditions, stresses imposed in supporting the equipment, the wall thickness of the glass. It is therefore undesirable to give sudden temperature changes. But up to 120^{0}C can be accommodated.

As sub zero temperature, the tensile strength of borosilicate glass tends to increase and equipment can be used safely at temperatures as low as -50^{0}C for XTRONG and components.

ELECTRICAL CHARACTERISTICS

Glass being a poor electrical conductor, surface, conductivity is insignificant and varies with the quantity of water absorbed on glass surface. The specific conductivity is 10^{0}ohm/cm at temperature of 200^{0}C. The dielectric coefficient varies with current frequency.

COMPOSITE MATERIALS

The last two decades have seen the new or further developments of particularly corrosion resistant plant construction materials. Typical examples of these are PTFE, tantalum, titanium, graphite and of course, Borosilicate 3.3 Glass.

The combination of different corrosion resistant materials with the utilization of the specific advantages of each permits both safe and economic construction.

Borosilicate glass/PTFE

Borosilicate Glass with PTFE is of particularly decisive importance for construction of glass installation For example. in Seals, Bellows, Stirrers, Pumps, Heat Exchangers, Column Inserts etc.

PTFE is used with Glass because of its excellent mechanical & thermal properties. They have near universal fluid compatibility. Wear life when compared with others is very low. Particularly PTFE is maintenance free and have cryogenic stability with non wetting property.

Service temperature of PTFE is considered as - 50^{0}C to + 200^{0}C

TIGHTENING TORQUE

Diameter	Maximum bolt-tightening torque* in Nm for couplings with backing flanges	
DN	Made of Plastic (K)	Made of Iron/steel/ Silumin(S)
12	1	1
15	1	1
25	2.5	2.5
40	2.5	3.5
50	2.5	3.5
80	2.5	3.5
100	3.5	4.5
150	3.5	4.5
225	-	4.5
300	-	4.5
400	-	6.5
450	-	6.5
600	-	11
800	-	20
1000	-	22

*The Indicated Tightening torques apply for ungreased bolts and are required only for the maximum operating pressures. They can be reduced.

with X-Bonding

without X-Bonding

EXTRA PROTECTION OF GLASS COMPONENTS 'X-BONDING'

X BONDING provide an added advantage of protection of standard glass components. The major advantage of X-Bonding systems is that if the glass is subject to accidental breakage, the bonded wrapping provides additional protection against the risk of injury, release of corrosive fluids or loss of expensive products.

X BONDING is a glass reinforced fibre coating which provide a higher level of protection on the glass components. This does have a slightly adverse effect on the transparency of the glass, making it translucent & not transparent.

Permissible Operating Temperature:
The permissible operating temperature for X-Bonding is 130° C unless limited by the individual operating temperature of the said component.

Permissible Operating Pressure:
The permissible operating pressure for X-Bonded components is same to that for Standard Glass Components.

Thermal Shock
Despite the thermal insulating effect of X-Bonding, the thermal shock characteristics remain the same as standard glass component.