

Assembly Instructions for Bondstrand® Fiberglass Flanges

Scope

These instructions present NOV Fiber Glass Systems recommendations for the proper use of Bondstrand fiberglass flanges. The mounting of flanges on the pipe is addressed by the assembly instructions for the particular joint type and adhesive used.

Bondstrand Fiberglass Flanges

Bondstrand flanges are Glassfiber Reinforced Epoxy (GRE) filament-wound epoxy pipe flanges in diameters 25 through 1000 mm (1-40 inch) designed to be used in combination with Bondstrand pipes. Flanges are used in Bondstrand pipe systems to connect appendages and equipment, or to make connection with other lines of similar or other material. It also gives the ability to divide a pipeline into several (prefabricated) sections making it easier to install. Three type of flanges are available. Depending on the application and pressure one of the below described flanges can be used.

Bondstrand Flange Types

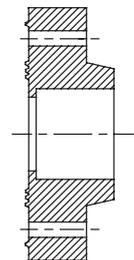
Hubbed Type Flange



Photo 1 - Hubbed flange

Applicable for low pressure up to a maximum of 12 bar (174 psi) and only in combination with flat face counter flanges.

Never use this type of flange against raised face flanges or in combination with wafer type valves. Hubbed type flanges are available in sizes 2-16 inch (50-400 mm) with Quick-Lock® adhesive bonded joints.

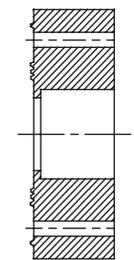


Heavy Duty (HD) Type Flange



Photo 2 - HD flange

The Heavy Duty type flanges are used for pressures up to 50 bar (725 psi). HD type flanges are available with a Quick-Lock sizes 1-16 inch (25-400 mm) or Taper/Taper sizes 2-40 inch (50-1000 mm) adhesive bonded joint. Heavy duty type flanges can be used when connecting to raised faced metal flanges and wafer type valves.



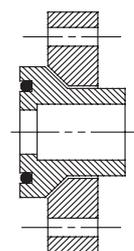
Stub-End (Lap Joint) Type Flange



Photo 3 - Stub-end flange

Stub-end type flanges are suitable for high pressures up to 100 bar (1450 psi). (higher pressure is available depending on the pipe size) Stub end flanges can be supplied with an o-ring groove or a flat face in combination with suitable gasket.

Stub-end type flanges are available with a Quick-Lock sizes 1-16 inch (25-400 mm) or Taper/Taper sizes 2-40 inch (50-1000) adhesive bonded joint. Stub-end type flanges can be used when connecting to raised faced metal flange and wafer type valves.



Stub-end (lap joint) type flanges consist of 2 parts; A Bondstrand GRE stub with a steel ring flange. Always use a flat faced (stub end) flange against an O-ring sealed stub end flange when using stub-ends as flange pairs.

Tooling

Check the presence and quality of joint material (bolt, nut, washer, gasket) and tooling (Photo 4). The tooling and joint material listed below are, as a minimum, required to make a flanged joint. A torque wrench and a ring spanner are required for proper assembly of Bondstrand fiberglass flanges.

1. Level
2. Torque wrench
3. Ring spanner
4. Flange square
5. Winches
6. Band clamp
7. Steel cross

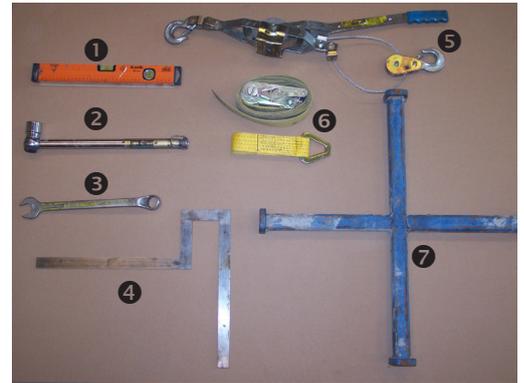


Photo 4 - Required Tooling

Gaskets

- For hubbed flanges use, a full-face gasket of a reinforced elastomer.
- For heavy duty flanges, use a full-face or raised face gasket of a reinforced elastomer or compressed fiber.
- For o-ring sealed stub end flanges, use an o-ring gasket. For flat-faced stub end flanges, use a raised face gasket of a reinforced elastomer or compressed fiber.
- Gasket material including o-ring gasket must be suitable for the service pressure, temperature and fluids in the system. Gaskets should be 3 mm (0.11 inches) thick. The hardness should be 60-75 durometer Shore A.
- The o-ring gasket must be suitable for Bondstrand GRE flanges, suggest sourcing o-ring gaskets directly from manufacturer. If there are any questions, please consult NOV FGS Engineering.

Size Range		Reinforced Elastomer		Compressed Fiber		Steel Reinforced Rubber		O-Ring (stub end)	
(inch)	(mm)	(bar)	(psi)	(bar)	(psi)	(bar)	(psi)	(bar)	(psi)
1-12	25-300	16	232	20	290	50	725	100	1450
14-24	350-600	16	232	16	232	40	580	75	1088
26-40	650-1000	16	232	16	232	25	363	50	725

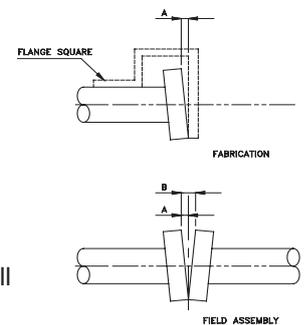
Alignment

Flange joints shall be installed aligned and stress free. Never pull flanges together by tightening the bolts. See table below for maximum misalignment allowance.

Table 2: Maximum misalignment allowance

Flange Size Range		A		B	
(inch)	(mm)	(bar)	(mm)	(bar)	(mm)
1-16	25-400	5/128	1	5/64	2
18-40	450-1000	5/64	2	5/32	4

Leakage problems due to misalignment could be solved by using O-ring type gaskets (e.g. Kroll & Ziller G-ST-P/S or Elastomet OR).



Bolt Length

Note: Bondstrand flanges are thicker than metal flanges and require washers. This should be taken into consideration when calculating the bolt length. For flange thickness, see the appropriate product data sheet, dimension data.

Connecting to Other Pipe Systems

When Bondstrand pipe is connected to metal pipe systems, the interface should be anchored to prevent movement or loads being transmitted to the Bondstrand pipe system.

Assembly of Quick-Lock Flanges

Prepare the cut pipe end by shaving the appropriate spigot. Apply adhesive to the pipe spigot and flange socket. Refer to the Bondstrand Quick-Lock assembly instructions for detailed instruction on joint preparation and assembly.



Photo 5 - Apply adhesive

Without delay, slowly push the Quick-Lock flange onto the Quick-Lock spigot in a straight forward motion. Do not rotate or jiggle the flange.



Photo 6 - Push flange onto spigot

After joint assembly, check the alignment of the bolt holes. Carefully turn the flange to position the bolt holes.



Photo 7 - Check bolt holes alignment

Final seating of the spigot can be accomplished by carefully tapping on a wooden block placed on the flange face. The spigot end should be seated against the bell stop of the socket. For sizes ≥ 6 inch (≥ 150 mm) a steel cross (see photo 15) can be used to get final seating.



Photo 8 - Final seating

Check the alignment of the flange face using a flange square.



Photo 9 - Check alignment of flange face

Once again check the alignment of the bolt holes. Remove excessive adhesive.



Photo 10 - Remove excessive adhesive

Support the flange from underneath while curing to maintain proper alignment. Cure the adhesive joint using an NOV Fiber Glass Systems approved heating blanket.

Check the position of the thermostat. It should be facing inwards (6 o'clock position) and must be covered by the blanket. For the smaller sizes 1-3 inch (25-80 mm) special inner blankets are available.



Photo 11 - Cure adhesive joint

Assembly of Taper/Taper Flanges

Prepare the cut pipe end by shaving the appropriate spigot. Apply adhesive to the pipe spigot and flange socket. Refer to the Bondstrand Taper/Taper assembly instructions for detailed instruction on joint preparation and assembly.

Without delay, slowly push the Taper/Taper flange onto the Taper/Taper spigot in a straight forward motion. Do not rotate or jiggle the flange.

After joint assembly, check the alignment of the bolt holes. Carefully turn the flange to position the bolt holes.

Pull the joint together using the winches. Check the insertion depth.

Check the alignment of the flange face using a flange square, or by using a level and a measuring tape.

Once again check the alignment of the bolt holes. Remove excessive adhesive.

Cure the adhesive joint using an NOV Fiber GLass Systems approved heating blanket. Check the position of the thermostat. It should be facing inwards (6 o'clock position) and must be covered by the blanket. For the smaller sizes 1-3 inch (25-80 mm) special inner blankets are available. Do not remove the winches while curing the joint.



Photo 12 - Apply adhesive



Photo 13 - Push flange onto spigot



Photo 14 - Check boltholes alignment



Photo 15 - Check insertion depth



Photo 16 - Check alignment of flange face



Photo 17 - Check alignment of bolt holes



Photo 18 - Cure the adhesive joint

Flange Jointing

Place the gasket between the two flange faces.



Photo 19 - Place gasket

Insert the bolts and finger-tighten all nuts. Bolt threads must be clean and lubricated to attain proper torque. Use lubricated washers under both nuts and bolt heads to protect flange back face.



Photo 20 - Insert bolts

Tighten all nuts following the sequences shown under "tightening sequence". Do not exceed the torque increments given in "Recommended Bolt Torques." After all bolts have been tightened to the recommended torque, re-check the torque on each bolt in the same sequence, since previously tightened bolts may have relaxed.

Caution: Excess torque can damage the flange and prevent sealing.

Notes:

Always use washers on the back face of fiberglass Hubbed and HD (Heavy Duty) flanges. A steel backup ring is not necessary for Hubbed and Heavy Duty GRE flanges. Washers are optional on stub end flange assemblies with metal flange rings.

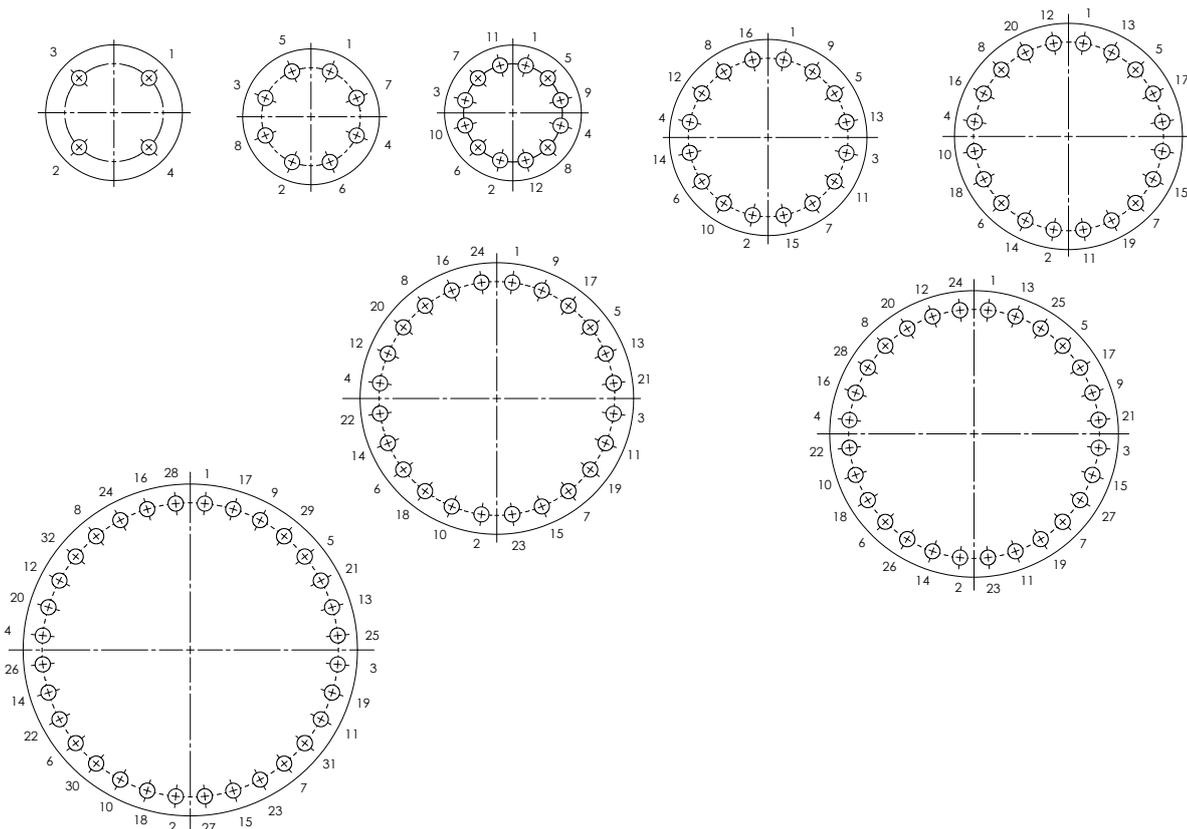
Filler or spacer rings are not required when connecting HD (Heavy Duty) or Stub End (Lap Joint) type flanges against Wafer valves.

Heavy Duty and Stub End flanges with steel bolt ring can be assembled directly to valves with rubber lined flanges. Consult NOV FGS Engineering if you have special issues during the assembly of Bondstrand GRE flanges.



Photo 21 - Tighten bolts

Tightening Sequence



Recommended Bolt Torques

Table 3: Hubbed Flanges

Flange Size		Initial Torque		Torque Full Pressure Seal	
(inch)	(mm)	(N·m)	(ft·lb)	(N·m)	(ft·lb)
2-4	50-100	10	7	30	22
6-12	150-300	20	15	40	30
14-16	350-400	30	22	70	52

Table 4: Heavy Duty Flanges and Blind Flanges

Flange Size		Initial Torque		Torque Full Pressure Seal	
(inch)	(mm)	(N·m)	(ft·lb)	(N·m)	(ft·lb)
1-1.5	25-40	10	7	30	22
2-4	50-100	20	15	60	44
6-8	150-200	30	22	80	59
10-14	250-350	50	37	150	111
16	400	100	74	250	184
18-20	450-500	200	148	400	295
22-40	550-1000	250	184	500	369

Table 5: Stub end Flanges

Flange Size		Initial Torque		Torque Full Pressure Seal	
(inch)	(mm)	(N·m)	(ft·lb)	(N·m)	(ft·lb)
1-4	25-100	20	15	90	66
6-12	150-300	50	37	150	111
14-16	350-400	100	74	300	221
18-24	450-600	200	148	600	443
26-40	650-1000	300	221	800	590

Troubleshooting

If the assembled flange joint leaks, loosen and remove all bolts, nuts, washers and gasket. Check for alignment of assembly. Rebuild to correct alignment as required.

Check the gasket for damage. If damaged, discard and replace it with a new, undamaged gasket.

Check flanges for seal ring damage. In particular, check the condition of the inner seal rings. Flanges with damaged inner seal rings must be removed and new, undamaged flanges installed. If leaks occur as a result of deficiencies in non-fiberglass components of the piping system, consult the manufacturer of the defective components for recommended corrective procedures. Clean and re-lubricate old threads and washers before rejoining. Repeat the joining procedure outlined above. After corrective action has been taken, retest the joint.

Safety

Wear suitable protective clothing, gloves and eye protection at all times.



Photo 22 - Safety gear

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North America

17115 San Pedro Ave. Suite 200
San Antonio, TX 78232 USA
Phone: +1 210 477 7500

South America

Estrada de Acesso à Zona
Industrial Portuária de Suape, s/no.
Recife, PE, Brazil 55.590-000
Phone: +55 81 3501 0023

Europe

P.O. Box 6, 4190 CA
Geldermalsen, The Netherlands
Phone: +31 345 587 587

Asia Pacific

No. 7A, Tuas Avenue 3
Jurong, Singapore 639407
Phone: +65 6861 6118

Middle East

P.O. Box 17324
Dubai, UAE
Phone: +971 4881 3566

www.fgspipe.com • fgspipe@nov.com

The logo for NOV Fiber Glass Systems features the letters 'NOV' in a stylized, bold font with a red and white circular graphic element to the left of the 'V'. To the right of 'NOV', the words 'Fiber Glass Systems' are written in a blue, sans-serif font.

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