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
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
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
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

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.

### Table 1: Gasket Size Range

<table>
<thead>
<tr>
<th>Size Range (inch)</th>
<th>Reinforced Elastomer (bar)</th>
<th>Compressed Fiber (bar)</th>
<th>Steel Reinforced Rubber (bar)</th>
<th>O-Ring (stub end) (bar)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-12</td>
<td>25-300</td>
<td>16</td>
<td>20</td>
<td>50</td>
</tr>
<tr>
<td>14-24</td>
<td>350-600</td>
<td>16</td>
<td>20</td>
<td>50</td>
</tr>
<tr>
<td>26-40</td>
<td>650-1000</td>
<td>16</td>
<td>20</td>
<td>50</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Flange Size Range (inch)</th>
<th>A (bar)</th>
<th>B (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-16</td>
<td>5/128</td>
<td>1</td>
</tr>
<tr>
<td>18-40</td>
<td>5/64</td>
<td>2</td>
</tr>
</tbody>
</table>

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.

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.

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

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 $\geq 6$ inch ($\geq 150$ mm) a steel cross (see photo 15) can be used to get final seating.

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

Once again check the alignment of the bolt holes. 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.
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.
Flange Jointing
Place the gasket between the two flange faces.

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.

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.

Tightening Sequence
### Recommended Bolt Torques

**Table 3: Hubbed Flanges**

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

**Table 4: Heavy Duty Flanges and Blind Flanges**

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

**Table 5: Stub end Flanges**

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

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**Safety**

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

*Photo 22 - Safety gear*
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