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When to Use Heavy Duty Hubless Flanges

The following information discusses when to use heavy duty hubless style filament wound FRP composite flanges for FRP composite piping systems:

We make two basic configurations of FRP composite flanges. One is the hub style Fig.#15. The other is the heavy duty hubless style Fig.#15-HD. Both of these flange styles are also made as either flat faced with sealing rings; or with a recessed face for sealing against raised faced valves.

Both styles are also made in various pressure classifications. However, pressure rating alone is not the reason that heavy duty hubless FRP composite flanges are used. FRP composite flanges typically do not fail because of pressure. The failure mechanism of a flange is usually in bending across the joint, when movement and moment forces within the piping system are not properly restrained and controlled by a well designed support system.

Unless otherwise specified at the time of inquiry, FRP composite flanges for all Navy and Air Force projects will be heavy duty. Military specifications call for heavy duty style flanges for on-board ship use, for jet fuel lines, and mission critical applications.

Typically all Ameron small diameter flange orders (1/2" through 1-1/2") flanges are heavy duty. It is Ameron's standard policy, especially for overseas projects, that all of the small diameter flanges be the heavy duty style.

All FRP composite flanges that are bolting directly to pumps and valves, and the first flange away from flexible connections at pumps, should be heavy duty.

All FRP composite flanges bolting to expansion joints and flexible connections, where the movement of the joint is limited by tie rods, should be heavy duty.

All FRP composite flanges that are bolting to raised face flanges should be heavy duty design. (Request our separate Technical Bulletin "Sealing of FRP Flanges Against Raised Face Steel Flanges" for further information on this subject.)

Heavy duty style FRP composite flanges should be used for those applications where there are high bending stresses due to the piping configuration. Or, where the complexity of the piping will create high bending stresses. For example, skid mounted piping isometrics and arrangements.

Flanges on short radius elbows should be of heavy duty FRP composite design, including the matching spool flanges mating to those short radius elbows. The bending stresses in short radius elbows are significantly higher than long radius elbows.

We recommend using heavy duty FRP composite flanges on projects where the cost of repairing or replacing flanges could be extremely costly. This would include on-board ship use, off-shore oil platforms, and other high profile projects.

Use heavy duty FRP composite flanges where it is known in advance that the supporting system for the pipe has not been properly designed using a stress analysis program such as Algor or Caesar. Such

stress analysis is necessary to properly locate, space, design, and install the supporting system - including anchors and guides to limit movement and control expansion and bending forces.

Use heavy duty FRP composite flanges in those piping systems where there is not a soft start controller installed on the pumps - especially where the pumps are starting up against closed valves.

Use heavy duty style FRP composite flanges in all locations where a support is installed against the back of the flange. This is typically where there needs to be an anchor in a piping line, and where the support is located near the structural steel of the building or bridge chase. Those supports are flat and bolt directly to the back of the flange. These types of supports will also be used for the flanges immediately adjacent to a heavy valves.

Use heavy duty FRP composite flanges for the first pair of flanges from a pump or valve, where the line makes a change. For example, at the flanges on both sides of a 90 degree elbow at the end of a long run; or again next to a pump discharge.

Use heavy duty style FRP composite flanges where the flanges, including the pipe and fittings, are to have a fire retardant and low smoke or intumescent coating applied. The secondary coating is stronger, more easily obtained, and has a stronger bond with the uniform configuration of the back of the flat heavy duty style flange.

Use heavy duty style FRP composite flanges on the ends of reducers, when the reducer is adjacent to a pump inlet or outlet, with or without expansion joints.

Use heavy duty FRP composite flanges where, because of changes in flow direction, throttling of flow, or abrupt changes in diameters, cavitation is likely to occur. For example, for tee branches off of a main header.

Use heavy duty FRP composite flanges for all flanges 14" diameter and larger - where the combined internal pressure and the system induced thermal expansion and bending forces create an effective pressure design greater than 100 PSI.

Use heavy duty FRP composite flanges for mission critical applications - such as flanges within a nuclear power plant. Extra assurance and "peace-of-mind" is provided by the stronger heavy-duty FRP composite flanges.

In recent years many of our most successful, and highest profile projects have involved the heavy duty hubless style FRP composite flanges being used for <u>all</u> flanges on the system. An example would be FirstEnergy's Bruce Mansfield Projects.

For a properly engineered, designed and implemented support system, we cannot recall of a field failure of a heavy duty style flange. If a customer, because of initial cost, makes a decision to use a standard hub style flange where a heavy duty flange is recommended or warranted - then the customer assumes the responsibility for the performance of those flanged joints.