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August 18, 2004

Gaskets for Internal Manways and Handholes

Internal manways and handholes are a common but challenging application. Gaskets for these flanges are usually oval shaped or obround. The flange surface is typically less than perfect, and the compressive load is often very low and very uneven. Since most of the compressive load is developed by the internal pressure pushing on the inside of the cover, the load rarely reaches our recommended levels. Because of this, we lean towards soft, highly compressible gaskets, but those can blow out on the ends where the compression is low. Metal reinforced gaskets are most often used, in an effort to resist those blowouts, but they are sometimes tough to seal. A few notes and recommendations on gasket selection might be helpful.

Graphonic® Gaskets: These are probably our first choice for most manways where internal pressures do not exceed 1000 psig.. They work best when the flange width of the gasket is 1/2" and wider. For flange widths less than 1/2", consult Applications Engineering.

Flexseal spiral wounds: We commonly provide Flexseal® style MC (windings only) and MCR (Windings and inner ring) for manway connections. The gaskets often found on small handholes are style HH. Even though the compressive loads are below our recommended levels, we receive few complaints on these. We can change the manufacturing process for this style of gasket to address lower pressure (0-999 psi.) as well as higher pressure (1000psi and above). See below for a detailed explanation of Flexseal® Gaskets for these applications.

Graph-Lock®: GraphLock® can be successful in boiler handholes and manholes as long as the gasket is at least 1/2" wide, and we prefer 3/4" or greater. Again, for gaskets less than 1/2" wide, Flexseal® spiral wound gaskets are recommended. We have seen problems with Graph-Lock where the compressive load is very uneven.

GYLON®: Certainly GYLON styles 3545 and 3504 are successful in these type flanges for chemical services. They are not usually the first choice for the steam/boiler applications.

PSA Usage: Since manways and handholes require that the gasket is installed on the inside of the vessel, PSA is sometimes used to hold the gasket to the cover. This is probably not the best way to do this, since the PSA will soften or melt at steam temperatures. In chemical service, the PSA may break down. Metal gaskets can be made with tabs to hold them to the covers. We would prefer that GYLON and Graph-Lock gaskets be installed with no adhesive; however, the application of a few small spots of a spray contact adhesive might be used to hold the gaskets.

Recommendation Summary:

Internal Pressure below 1000 psi.

1. Garlock MC or MCR's, where the gasket width is limited.
2. Garlock Graphonic® (Recommended flange width 1/2" or greater)
3. Garlock Graph-Lock® (Recommended flange width 1/2" or greater)

Aggressive chemical service where flexible graphite is not recommended:

1. Garlock Gylon Styles 3545 and 3504 (Recommended flange width 1/2" or greater)

Internal Pressure above 1000 psi.

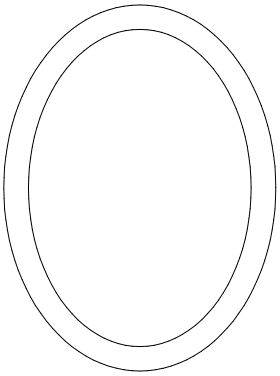
1. Garlock MC or MCR
2. Garlock Kammway

Further Info on Spiral Wound Gaskets for Manway Covers

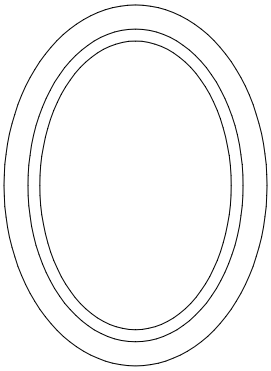
Pressure vessels commonly utilize an internally seating hinged door for access into the unit. This door is oriented such that the internal pressure of the system creates the stress that seats the manway gasket. Contrast this to the typical flanged connections, in which the load from the studs compresses the gasket while the internal pressure of the system tends to unload the connection. As such, the manway connection creates greater gasket stress as the internal pressure of the vessel increases. Because of the mechanics of this methodology, gasket construction must be commensurate with the design pressure of the vessel. Lower pressure systems must incorporate a softer, more easily deformed gasket; while higher-pressure vessels require a more rigid and higher density seal.

The use of spiral wound gaskets for this type of application is common. Lower pressure systems dictate the use of a thicker grade of filler to make the gasket softer. Conversely, higher-pressure vessels require a gasket to be manufactured with a thinner gauge of filler. This not only increases the number of metal plies in the gasket, but also makes the gasket more dense and therefore more capable of withstanding the higher compressive loads.

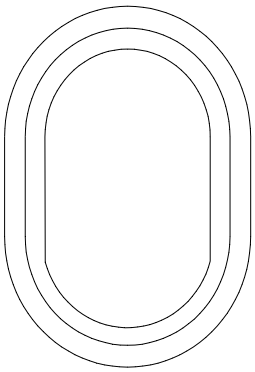
The pressure of the system is exerted on the OD of the gasket. Since the gasket rests at the door to vessel interface, connection failures are readily apparent as the gasket is seen protruding towards the ID of the connection. In applications with high pressure cycling, or where this gasket failure has been observed, a solid metal inner ring can be designed for the gasket.



Garlock MC Oval



Garlock MCR Oval



Garlock MCR Obround

Shapes:
The two most common shapes for this application are Oval and Obround. The oval maintains a radius throughout the gasket, and therefore has sufficient hoop strength for manufacturing and installation. The manufacturing limitations with the Obround shape are long straight sections that limit the radial strength of the gasket. These are manufactured to OEM specifications, as such there are a wide range of sizes available. Typically, these are dimensioned from the ID, with both major and minor axis delineated, along with the flange width of the gasket. In styles incorporating an inner ring, the width of the inner ring is also specified.

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