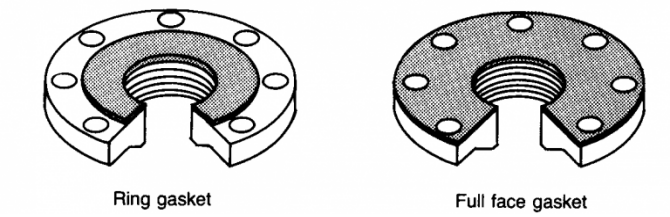
Which Flange Should I Use?

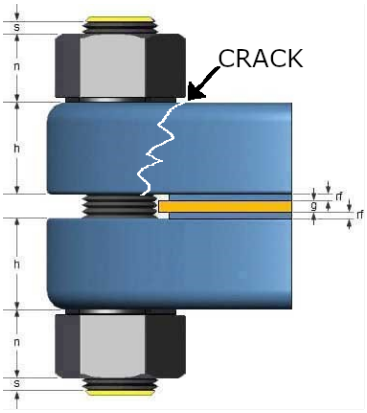
Questions often arise about flat faced [FF] and raised face [RF] flanges and their suitability to be mated together. The intent of this paper is to provide guidance on the installation of Elkhart Brass firefighting monitors.

Bolted pipe flanges come in several styles. The two most common styles are flat faced [FF] and raised face [RF]. Pictured at the left is an RF weld neck flange. It is easily identifiable by the raised annular ring around the perimeter of the flow area. A FF flange looks similar but without the raised portion.

RF flanges are commonly used on forged steel or forged stainless steel flanges. An RF flange uses a gasket called a ring gasket. The ring gasket is sized to fit onto the raised portion of the flange. (See illustration below.) The bolts in the flange compress this gasket, and because the ring gasket has a smaller surface area than the entire flange face, the compressive forces are more concentrated than experienced with a full face gasket on a FF flange. This concentrated pressure between mating surfaces creates a very reliable seal.



FF flanges use a full-face gasket. (See illustration above.) FF flanges are made specifically to mate with other FF flanges. These flanges are often made from cast instead of forged metal. Castings are generally more brittle than forgings, so they crack easily. By mating FF flanges together with a full face gasket, the flanges are well supported across their entire face and not subject to the bending forces experienced in RF flanges that can cause the cast flange to crack.



Use of FF flanges is common piping practice for firefighting monitors. The majority of Elkhart Brass monitors are made with flanges that are either cast brass or cast aluminum, and therefore perform best with a FF connection. FF flanges with full face gaskets provide a robust, leak free seal. In addition, monitors with FF flanges are far more able to tolerate accidental impact from a vehicle because of the better support across the entire flange face.

As an option, Elkhart Brass offers some monitors with an RF flange. Some customers require an RF connection and they have been successful. However, great care must be taken when tightening the flange bolts to prevent cracking the flange. The bolts must be gradually and uniformly tightened in a cross pattern, and the torque required for the chosen gasket must not be exceeded. In addition, RF monitor flanges cracked on installation are not warrantable.

Elkhart Brass does not recommend connecting FF flanges to RF flanges. Some codes such as ASME B31.1 prohibit connecting FF flanges to RF flanges. Although it does not directly address FF cast brass flanges used with raised face flanges, the intent of the specification is to prevent the cracking of the more brittle flange.

In some cases, such as the WPO-2000 water powered oscillator, no raised face option exists. Because the WPOs flange is extremely robust, it is unlikely to crack when mated to a raised face flange on the inlet piping with the appropriate ring gasket. Elkhart Brass recommends against this practice; however, if the WPO must be mated to an RF flange, the studs and nuts should be torqued slowly and uniformly in a cross pattern, and the required bolt torque dictated by the chosen gasket must not be exceeded. Regardless of the joint on the inlet side of the WPO, Elkhart Brass always recommends mating a monitor with a FF flange to the outlet side of the WPO with a full face gasket to ensure a reliable water tight seal and to prevent cracking of the monitor flange.

Installing firefighting monitors with FF flanges onto piping with FF flanges using a full face gasket is always the preferred method and the recommendation of Elkhart Brass. Deviations from this practice may be possible, but it is ultimately the responsibility of the end user to have his piping joints evaluated by a qualified engineer and to meet all applicable codes and standards.