

To: General Distribution

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From: Applications Engineering

Subject: ASME B16.20 – Metal Gaskets for Pipe Flanges

KNOW YOUR FLANGE TYPE WHEN USING SPIRAL WOUND GASKETS

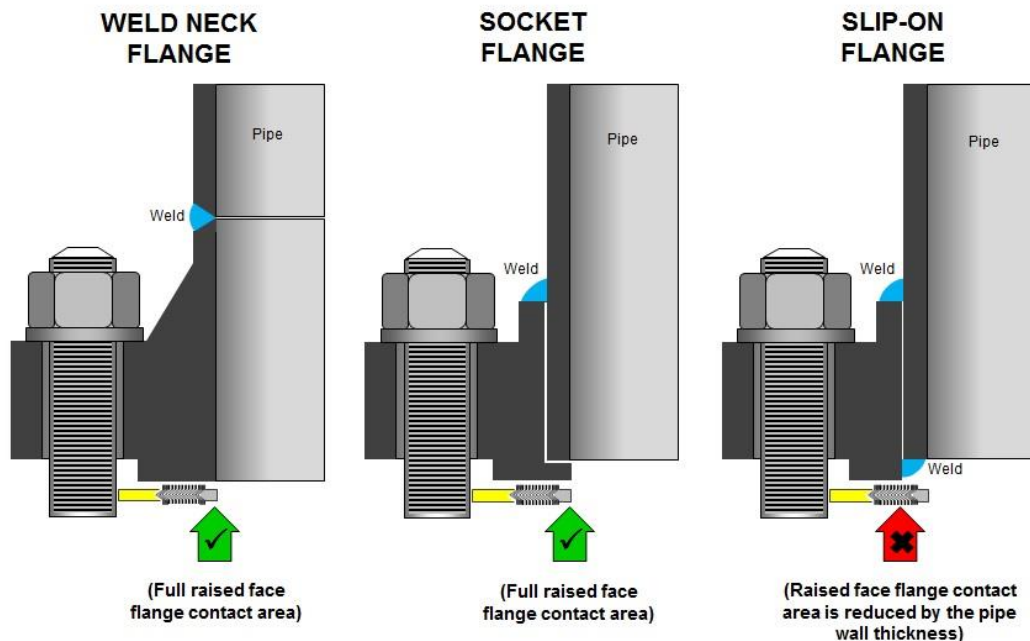
One of the most commonly specified gaskets in industry is the spiral wound gasket. In many cases, “ASME B16.20” compliance (a dimensional specification) is specifically called out for gaskets are being used in ASME B16.5 or B16.47 series flanges. However, simply knowing that a flange is “ASME B16.5 or B16.47” is not enough.

Equally important is knowing the FLANGE TYPE. There are five different types of ASME flanges that are readily available and used throughout industry.

1. Weld neck
2. Socket
3. Slip-on
4. Threaded
5. Lap Joint

From a bolt hole diameter, number of bolt holes, bolt circle diameter, outer flange diameter perspective, these flanges are all the same. In other words, it is possible to bolt a 3”-150# weld neck flange to a 3”-150# slip-on flange. The difference that can impact the performance of the assembly is in the BORE or INNER DIMENSION of the flange.

The diagram below shows how and why the bores are different for the various flange types:



WELD NECK FLANGE:

A weld neck flange provides the optimal sealing surface for a spiral wound gasket, as the bore is close to that of the pipe. Note that even weld neck flanges are subject to restrictions with certain pipe schedules (discussed later in the bulletin), That being said, in the most popular classes (150# and 300#) there are no restrictions when it comes to using ASME B16.20 compliant gaskets with weld neck flanges.

SOCKET WELD FLANGE:

Socket weld flanges are built with a bore slightly larger than the outside diameter of the pipe so that the flange will slide over the pipe. However, the bore diameter steps in approximately half way through the flange. This prevents the pipe from moving any further through, and also creates a sealing face similar to that of a weld neck flange. This flange type provides the optimal sealing surface for an ASME compliant spiral wound gasket, as well.

SLIP-ON FLANGE:

Slip-on flanges are also built with a bore slightly larger than the outside diameter of the pipe, but, unlike a socket flange, this larger bore is the same dimension all the way through. Therefore, the larger bore means the flange sealing surface is reduced (approximately the width of the pipe wall). This is where problems can occur with ASME B16.20 dimensioned spiral wound gaskets, as the inner ring and a portion of the winding can be left unsupported and protrude into the process stream. This can also occur with threaded flanges (if the pipe is not machined flush to the flange face) and lap joint flanges (with lighter schedule pipes that are rolled over to create the sealing surfaces).

Why is this important to know?

Having a portion of the gasket inside the pipe can be detrimental to the process, equipment, flow rates and the life expectancy of the gasket. In the case of spiral wound gaskets, if the inner ring and/or windings are not secured between the flange faces, radial buckling can occur when the assembly bolts are tightened. The images below were taken from inside a pipe where an ASME B16.20 compliant spiral wound gasket was installed between SLIP-ON flanges:



If the buckling is not found before the system is pressurized there is a high likelihood that the gasket could leak or fail catastrophically. Even if no leakage occurs during start up buckled windings can potentially unravel, travel through the pipe, and entangle in equipment, such as a valve or pump.

So what flange types can spiral wounds be used in?

Within the ASME B16.20 there is a specific table that can be confusing:

Table 16 Maximum Bore of ASME B16.5 Flanges for Use With Spiral-Wound Gaskets

Flange Size (NPS)	Pressure Class							
	75	150	300	400	600	900 (1)	1500 (1)	2500 (1)
1/2	No flanges	WN flange only (2)		No flanges Use Class 600	WN flange only (2)	No flanges Use Class 1500	WN flange only (2)	
3/4		SO flange (3) WN flange (2)			SO flange (3) WN flange (2)			
1		SO flange (3) WN flange, any bore			SO flange (3) WN flange, any bore			
1 1/4		SO flange (3) WN flange, any bore			SO flange (3) WN flange, any bore			
1 1/2		SO flange WN flange, any bore		WN flange with Schedule 10S bore described in ASME B36.19M [includes nozzle (4) but excludes SO flange]		WN flange with SW bore [includes nozzle (4) but excludes SO flange]		
2				WN flange with Schedule 10S bore described in ASME B36.19M [excludes nozzle (4) and SO flange] (5)				
2 1/2								WN flange with Schedule 10S bore described in ASME B36.19M [excludes nozzle (4) and SO flange] (5)
3				WN flange with Schedule 10S bore described in ASME B36.19M [excludes nozzle (4) and SO flange] (5)				
4		WN flange with Schedule 10S bore described in ASME B36.19M [excludes nozzle (4) and SO flange] (5)				WN flange with Schedule 80 bore [excludes nozzle (4) and SO flange] (5)		
6				WN flange with Schedule 10S bore described in ASME B36.19M [excludes nozzle (4) and SO flange] (5)				WN flange with Schedule 80 bore [excludes nozzle (4) and SO flange] (5)
8	WN flange with Schedule 10S bore described in ASME B36.19M [excludes nozzle (4) and SO flange] (5)		WN flange with Schedule 80 bore [excludes nozzle (4) and SO flange] (5)					
10					WN flange with Schedule 10S bore described in ASME B36.19M [excludes nozzle (4) and SO flange] (5)		WN flange with Schedule 80 bore [excludes nozzle (4) and SO flange] (5)	
12	WN flange with Schedule 10S bore described in ASME B36.19M [excludes nozzle (4) and SO flange] (5)		WN flange with Schedule 80 bore [excludes nozzle (4) and SO flange] (5)					
14					WN flange with Schedule 10S bore described in ASME B36.19M [excludes nozzle (4) and SO flange] (5)		WN flange with Schedule 80 bore [excludes nozzle (4) and SO flange] (5)	
16	WN flange with Schedule 10S bore described in ASME B36.19M [excludes nozzle (4) and SO flange] (5)		WN flange with Schedule 80 bore [excludes nozzle (4) and SO flange] (5)					
18					WN flange with Schedule 10S bore described in ASME B36.19M [excludes nozzle (4) and SO flange] (5)		WN flange with Schedule 80 bore [excludes nozzle (4) and SO flange] (5)	
20	WN flange with Schedule 10S bore described in ASME B36.19M [excludes nozzle (4) and SO flange] (5)		WN flange with Schedule 80 bore [excludes nozzle (4) and SO flange] (5)					
24					WN flange with Schedule 10S bore described in ASME B36.19M [excludes nozzle (4) and SO flange] (5)		WN flange with Schedule 80 bore [excludes nozzle (4) and SO flange] (5)	
	WN flange with Schedule 10S bore described in ASME B36.19M [excludes nozzle (4) and SO flange] (5)		WN flange with Schedule 80 bore [excludes nozzle (4) and SO flange] (5)					

GENERAL NOTES:

- (a) This Table shows the maximum bore of flanges for which the spiral-wound gasket dimensions shown in Table 9 are recommended, considering the tolerances involved, possible eccentric installation, and the possibility that the gasket may extend into the assembled flange bore.
- (b) For maximum permissible flange bores for nonmandatory inner rings, see Table 15.
- (c) Abbreviations: SO = slip on and threaded, WN = welding neck, and SW = standard wall.

NOTES:

- (1) Refer to para. 3.2.5 for required use of inner rings. These inner rings may extend into the pipe bore a maximum of 1.5 mm under the worst combination of maximum bore, eccentric installation, and additive tolerances.
- (2) In these sizes, the gasket is suitable for a welding neck flange with a standard wall bore, if the gasket and flanges are assembled concentrically. This also applies to a nozzle. It is the user's responsibility to determine if the gasket is satisfactory for a flange of any larger bore.
- (3) Gaskets in these sizes are suitable for slip-on flanges only if the gaskets and flanges are assembled concentrically.
- (4) A nozzle is a long welding neck; the bore equals the flange NPS.
- (5) An NPS 24 gasket is suitable for nozzles.

ASME B16.20 compliant spiral wound gaskets are acceptable for use in slip-on (SO) flanges, but only with certain sizes and classes. There are even certain cases with weld neck (WN) flanges where pipe schedule must be taken into consideration.

What is the best approach?

Ask the question, are these gaskets being used in ASME weld neck flanges? If the answer is no, get as much detail as possible about the flange type and pipe schedule and contact Garlock Applications Engineering.



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