IN TO
MCC 950920

Monsanto

FROM (NAME & LOCATION) Jon Bullock

MLW, SHAC
by for: J.A. Martin
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DATE June 14, 1978

SUBJECT 650 PSIG Steam Fittings

REFERENCE Memo DRW to JWB, May 26, 1978

TO : D. R. Wise

cc: F. E. Grissom
Mark Illian
J. R. Sheehan
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Central Files

200.2

Pressure gauges?

PLAINTIFF'S EXHIBIT
MON-506

In reply to the questions raised in your memo of May 26, I have the following comments:

1) Question: Should we permit use of threaded fittings to connect instruments to 650 psig steam systems?

Answer: Yes, we should permit threaded connections to instruments on 650 psig steam systems. This should not be interpreted to mean that we allow threaded piping systems for 650 psig steam service.

Instruments for 650 psig steam systems are not subjected to live steam, hence, they will normally see only 500°F temperature. The instrument should be well supported and the piping to the instrument should be well supported so fatigue due to vibration will not be a problem. Also, the instrument should be downstream of a double block & bleed.

2) Question: Where should we draw the line on requiring backwelding of instrument lines?

Answer: For new and/or revised installations we should socket weld all except the instrument connection. Back welding of threaded connections should be kept to a minimum.

3) Question: What should be our policy on correcting existing installations?

Answer: I would recommend checking existing system to be sure they are adequately supported, however, I would not recommend backwelding. We may create more problems than we solve.

Additional comments:

A. CED standards group is in the process of revising corporate standards to specify either welded or flanged steam traps for 400 psig and above.

B. Attached are pages from the old Engineering General Standards, the CED Piping Manual and B31.3 Refinery Pipe Code. These are for your information.

Jon W. Bullock

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311.3.3 *Fillet Welds*

Fillet welds may be used in properly designed connections.

312 FLANGED JOINTS

Except as qualified below, flanged joints may be used within the limitations on materials in Chapter III, and on components in Chapter II, Part 3.

312.1 Joints with Flanges of Different Ratings

Where flanges of different ratings are bolted together, the rating of the joint shall be that of the lower-rated flange. Bolting torque shall be limited so that excessive loads will not be imposed on the lower-rated flange in obtaining a tight joint.

312.2 Metal to Non-Metal Flanged Joints

Where metallic flanges are bolted to non-metallic flanges, both should be flat-faced. Full faced gaskets are preferred. If a gasket extending only to the inner edge of the bolts is used, bolting torque shall be limited so that the non-metallic flange is not overloaded.

313 EXPANDED JOINTS

Expanded joints shall not be used under severe cyclic conditions. For other services, adequate means shall be provided to prevent separation of the joint. If the fluid is toxic or damaging to human tissue, appropriate safeguarding is required.

314 THREADED JOINTS

314.1 General Limitations

Except as provided in 314.2.1(c) and 314.2.2, threaded joints shall not be used under severe cyclic conditions. Unless limited elsewhere in 314, they may be used in other services within limitations on materials in Chapter III and on components in Chapter II, Part 3. Consideration shall be given to the following in applying threaded joints:

(a) Threaded joints should be avoided in any service where crevice corrosion, severe erosion, or cyclic loading may occur.

(b) When threaded joints are designed to be seal welded, thread sealing compound shall not be used.

(c) Layout of piping employing threaded joints should, insofar as possible, minimize stress on joints, giving special consideration to stresses due to thermal expansion and operation of valves (particularly a valve at a free end). Provision should be made to counteract forces that would tend to unscrew the joints.

(d) Except for specially designed joints employing lens rings or similar gaskets, threaded flanges in which the pipe ends project through to serve as the gasket surface shall be used only for Category D fluid service.

314.2 Limitations on Threaded Joints for Metallic Piping

314.2.1 *Joints Using Taper Pipe Threads*

(a) Threaded joints in which both of the mating components have NPT taper pipe threads conforming to ANSI B2.1 may be used within the limitations in 314.1 if they are not over 2" NPS and conform to the following:

(1) Except in Category D fluid service, nominal thickness of male elements of carbon steel or other notch-sensitive material shall be at least as thick as Schedule 80 pipe in sizes 1½" NPS and smaller, and Schedule 40 pipe in larger sizes as defined in ANSI B36.10.

(2) Nominal thickness of male elements which are not of notch-sensitive material shall be at least as thick as Schedule 40S pipe as defined in ANSI B36.19.

(3) Female elements shall be at least equivalent in strength and toughness to components listed in Appendix E which are suitable for the service as stated in Chapter II, Part 3.

(b) ANSI B2.1 threaded joints which do not conform to the requirements in (a) above, but which conform to the following, may be used within the limitations in 314.1, except that if the fluid is flammable, toxic, or damaging to human tissue, appropriate safeguarding is required.

(1) Pipe 4" NPS and smaller shall be at least as thick as Schedule 40 as defined in ANSI B36.10.

(2) 6" NPS pipe shall be at least 0.240 in (6.1 mm) in nominal wall thickness.

(3) 8", 10", and 12" NPS pipe shall be at least as thick as Schedule 30 as defined in ANSI B36.10.

(4) Couplings having straight threads shall not be used for other than Category D fluid service. When they are used, the mating male threaded element shall have taper threads.

(c) Threaded components of a specialty nature, and not subject to external moment loading, such as thermometer wells, may be used under severe cyclic conditions.

314.2.2 *Joints Using Other Than Taper Pipe Threads*

Threaded joints in which the tightness of the joint is provided by a seating surface other than the threads (e.g., a union comprising male and female ends joined with a threaded union nut, or other constructions shown typically in Figure 335.7) may be used. If used under severe cyclic conditions and subject to external

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L. Pipe Joining

1. Carbon and low alloy steel process and power steam piping 150 lb ASA and over shall be generally flanged and butt-welded over 2", socket welded 2" and under.

a. Proprietory connections of equivalent ratings (Graloc, etc.) may be considered when their particular features are desired.

2. Austenitic steels, higher alloys and exotic materials may be flanged, butt- or socket-welded as process and economic conditions dictate. Proprietory thin wall systems may be considered.

3. Threaded connections shall not be used inside of first block valves on process or power steam piping. In other words, threaded piping, where required for instrumentation or sampling, must be separated from the process flow by a flanged or welded valve which may be closed without interruption to the process. Experience with heavy process piping under severe external corrosion conditions indicates that every effort should be made in design, construction, and subsequent maintenance to preserve this integrity of the process systems.

a. Unavoidable threaded connections should be backwelded to the upstream side of the first block valve.

4. Threaded connections may be generally used on non-hazardous, non-critical utility and steam piping through 2", 125 and 250 lb ASA.

5. Intermediate flanges or separation points in piping shall be limited to the following:

a. In dirty and potential polymer forming services where dismantling may be required for cleaning.

b. Where required for installation when welding may be impractical.

c. In long blowdown headers and other locations where future branch connections may be needed, intermediate flanges may be installed to facilitate blinding for local decontamination.

3. JOINING METHODS

3.1 Threaded Systems Threaded piping systems are considered the most economical type of construction for non-critical services. Threaded piping systems are not used for service pressures higher than ANSI 300 lb.

Maximum size for threaded piping is 1½" NPS, with the exception that galvanized piping for potable water and air services may be threaded through 2" NPS.

3.2 Socket-Welded Systems The cost of socket-welded piping systems is higher than the cost of threaded piping systems because of the cost of welding joints. Because of this cost differential, socket-welded systems normally are not used in non-critical services.

Maximum size for socket-welded piping is 1½" NPS, with the exception that 2" socket-welding valves may be used when economy so dictates.

3.3 Machine-Flared and Flanged Systems Machine-flared and flanged piping systems are restricted to non-critical services. Pipe sizes are restricted to 1" NPS through 4" NPS because of flaring machine limitations.

Machine-flaring is acceptable for stainless steel, Monel, and nickel as well as carbon steel piping. In carbon steel flaring, electric resistance welded pipe meeting ASTM A587 specification produces a better machine-flared lap joint than do ASTM A53 or A106 seamless pipe.

3.4 Flanged and Welded Systems The economy of butt-welded piping joints, butt-welded fittings, and butt-welding-end valves is realized except where flanged joints and flanged components are necessary to meet assembly, process, and maintenance requirements. Flanged spool pieces are sized and located to facilitate cleaning and maintenance, and to minimize decontamination problems.

3.4.1 Flange Facings Raised face flanges are preferred for desi temperatures up to 750 F. Flat-faced flanges are used only in cast i: and brass. When bolting to steel the requirements in Par. 3.4.2 are followed. Above 750 F ring joint flanges are preferred; other facing may be used, provided the gasket is analyzed for ability to withstand line loadings and expected thermal gradients and cycling.

3.4.2 Gaskets and Bolting

(1) For Classes C and D, bolting may be ASTM A307 Grade B and sheet asbestos composition gaskets are 1/8 inch thick.

TABLE I. PIPING CHARACTERISTICS BY RELIABILITY CLASSES 650 psig STEAM CLASS B

1. APPLICATION		Class A	Class B	Class C	Class D
Services		Critical/Severe	Critical	General	Low-Hazard
Percent of all piping		2 - 5	15 - 20	50	30
2. LIMITATIONS					
OPERATING CONDITIONS	Maximum pressure	No limits	ANSI Class 1500	ANSI Class 300	ANSI Class 125
	Maximum temperature	Material Limits	1000 F	500 F	300 F
	Minimum temperature		Material Limits	-50 F ferritic -150 F other	-20 F
	Cyclic Conditions	No limits	Code "basic"	Code "basic"	Negligible
FLUID SERVICE (CONTENTS) HAZARD DOES NOT EXCEED	Lethal	Permitted	Selective/Dilute	Not Permitted	Not Permitted
	Toxic		Permitted		
	Highly Flammable			Dilute Soln	
	Corrosive to human tissue			Protected Area	
	Flammable above flash pt.	Permitted but not Recommended	Permitted but not Recommended	Permitted	In Protected Area
	Flammable below flash pt.				Permitted
	Combustible				
	Non-flammable				
	Transient irritant				
PIPING MATERIALS — METALLIC	Aluminum	Not Permitted	Permitted	Permitted	Permitted
	Brass, Bronze, Copper		Not Permitted	Restricted	
	Cast Iron, Malleable Iron			Permitted	
	Ductile Iron				
	Galvanized Steel				
	Carbon Steel	Permitted	Permitted		Permitted but not Recommended
	Low Alloy Steel				
	Stainless Steel				
	Nickel, Nickel Alloys				
PIPING MATERIALS — LINED	Joints Metal-Backed	Not Permitted	Permitted	Permitted	Permitted
	Non-metal Joints Exposed		Not Permitted	Not Permitted	
PIPING MATERIALS — NON-METALS	Reinforced Resin	Not Permitted	Restricted	Permitted	Permitted
	Armored Glass		Not Permitted	Not Permitted	
	Glass				
	Thermoplastics				
PRESSURE RATING CLASSES	Class 125 C.I.	Not Permitted	Not Permitted	Not Permitted	Permitted
	Class 250 C.I.	Not Permitted ◄	Restricted	Permitted	Not Permitted
	Class 150	Permitted	Permitted	Not Permitted	
	Class 300				
	Class 400 (non-std)				
	Class 600				
	Class 900				
	Class 1500				
	Class 2500 and up		Not Permitted		
3. COMPONENTS AND JOINTS					
PIPE PROCESS	Seamless	Permitted*	Permitted*	Permitted*	Permitted
	Fusion Weld	100% RT of joint†	5-10% RT, joint†		
	Electric Resistance Weld				
	Continuous Furnace B.W.	Not Permitted	Not Permitted	Restricted ●	
WALL THICKNESS	Sch 10 or 10S and up	Permitted	Permitted	Permitted	Permitted
	Sch 5 or Sch 5S	Not Permitted	Not Permitted	Not Permitted	
	less than Sch 5				
LINE JOINTS	Buttwelded	Permitted	Permitted	Permitted (2" Max on SW) (1½" Max Thrd)	Permitted (2" Max on SW) (4" Max Thrd)**
	Socket Welded	1" Max, branch	2" Max on SW		
	Threaded, Brazed		Restricted		
	Adhesive (Reinf. Plastic)	Not Permitted	Not Permitted	Not Permitted	
	Soldered, "Lap" Welded,				
	Adhesive, Thermal Bond,				

* If pipe material is permitted, examination method.

† If pipe material is permitted: RT means radiograph or any equivalent →

● Restricted to 1 1/2" NPS in 300 lb ANSI service

** Sprinkler systems frequently are threaded through 12" NPS.

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