

January 20, 1971

Mr. Richard M. DiValerio  
United Natural Gas Company  
308 Seneca Street  
Oil City, Pennsylvania 16301

Dear Mr. DiValerio:

This is in reply to your letter requesting an interpretation of the relationship of 49 CFR, Sections 192.241(b) and 192.719(a)(2).

Section 192.241(b) established limited exceptions to the requirement for non-destructive testing of all welds on pipe to be operated at 20 percent or more of SMYS, while §192.719(a)(2) deals only with repair welds.

As you have mentioned repairs usually consist of replacing a short section of pipe. The tie-in welds on these short sections of pipe are generally more difficult to make and more often performed under adverse conditions. Experience has demonstrated there is a greater need to require weld quality in these situations.

Therefore, if these welds are not strength tested, the requirements of §192.719(a)(2) must override the exceptions in §192.241(b).

Thank you for your interest in pipeline safety.

Sincerely,

/signed/

Joseph C. Caldwell  
Director, Acting  
Office of Pipeline Safety

December 21, 1970

Mr. J. F. Nienhueser  
Administrative Assistant  
Missouri Power and Light Company  
101 Madison Street  
Jefferson City, Missouri 65101

Dear Mr. Nienhueser:

This is in answer to your letter of November 4, 1970, requesting information on hoop stress and the current method used by this office for determining hoop stress in steel pipe.

Hoop stress is defined in Section 805.32 of ANSI B31.8 (formerly USAS B31.8) as follows:

"Hoop stress is the stress in a pipe wall, acting circumferentially in a plane perpendicular to the longitudinal axis of the pipe and produced by the pressure of the fluid in the pipe."

The hoop stress, then, is an action which is attempting to pull the pipe apart in a circumferential direction with the "pull" being produced on the pipe wall by the internal pressure of the natural gas or other fluid in the pipe.

Barlow's Formula is the common method used to determine hoop stress in the wall of pipe. The formula is written as follows:

$$S = \frac{PD}{2t}$$

where: S = hoop stress, psi  
P = internal pressure, psi  
D = diameter, in.  
t = wall thickness, in.

This basic formula written in terms of solving for the pressure is used in Part 192 to determine the design pressure for steel pipe. The formula, located in Section 192.105, contains factors in addition to the basic formula which limit the design pressure in gas pipelines for safety purposes.

An example of applying hoop stress in Part 192 would probably be helpful. Section 192.241(b) requires the nondestructive testing of welds on pipeline "to be operated at a pressure that produces a hoop stress of 20 percent or more of SMYS." If, the instance, the pipe being installed

in Grade B, the SMYS is 35,000 pounds per square inch (psi) and 20 percent of 35,000 psi is 7,000 psi. For this particular example then, nondestructive testing of welds is required where the operating pressure will produce a hoops stress of 7,000 psi or more.

The pressure which will produce a hoop stress of 7,000 psi is now determined by using the formula in Section 192.105 and solving for "P". In this example all of the elements in the formula would be as defined in Section 192.105 except for "S" which is no longer the hoop stress at yield but a hoop stress of 7,000 psi, and "P" which is no longer the design pressure but the pressure which will produce a hoop stress of 7,000 psi.

If the proposed operating pressure is equal to or greater than the pressure solved for, nondestructive testing is required. If the proposed operating pressure is less than this pressure, nondestructive testing is not required.

I hope this explanation answers your questions. If I can be of any further assistance, please contact me.

Sincerely,

/signed/

Joseph C. Caldwell  
Director, Acting  
Office of Pipeline Safety