For details on using these *Discussion Forums*, click here.

New Topic Post a Poll Post Reply

login | register | search | faq | forum home

Previous Next

» You are not logged in. Login or register

COADE Discussion Forums » Software Issues » CAESAR II » static non-nuclear piping stress analysis - branch piping decoupling criteria

UBBFriend: Email this page to someone!

Author | **Topic: static non-nuclear piping stress analysis - branch piping decoupling criteria**

sam
Member
Member # 884

posted October 21, 2005 01:48 AM

Which is correct for static non-nuclear piping stress analysis decoupling criteria:

1) If branch pipe to run pipe section modulus(Z) falls below 7% (Used by us

or
2) If branch pipe to run pipe mpment of inertia (I = Z * OD/2) falls below 7% ?

regards,

sam

_

Posts: **202** | Registered: **Feb 2004** | IP: Logged | Report Post

John Breen
Member
Member # 95

posted October 21, 2005 10:04 AM

Hello again Sam,

Well, you ask some interesting questions - those that are impossible to answer with a few words (good for you!). So, there will be some ".....except where....." warnings.

I am not sure of the source of the two criteria that you cited in your posting. Sometime someone must question the explanation that “that is the way we have always done it” or “that is unwritten company policy”.

I have used an old "rule of thumb”: For large bore lines, where the moment of inertia ratio of the header pipe to the branch pipe was greater than ten, evaluation of the branch line MAY be neglected (or postponed for “later” evaluation). But, in any event the correct SIF must be included for analyses at the header pipe branch connection. "Back in the day" there was a literature survey commissioned by the NRC that tried to capture (i.e., reference) all the technical papers that had resulted from programs funded by US federal monies: TID-25553, Survey Report on Structural Design of Piping Systems and Components.

http://www.osti.gov/energycitations/searchresults.jsp?Author=Pickett,+A.G.

One of the papers in that document is the source of the cited "rule of thumb". Another document that might be an “interesting read” for someone who wonders if there is any “official statement” regarding the accuracy of analytical models is “EPRI Guidelines for Piping System Reconciliation" (NCIG-05, Revision 1).

Now for my first "..except where..". The distance between the branch attachment to

the larger bore pipe and the "anchor" for the smaller bore pipe must be given consideration. In fact regardless of the D/d ratio, I would be very careful with any branch of NPS 4 and larger. You must make a judgment regarding the flexibility of the branch piping and its "ability" to accommodate the displacement of the branch intersection attachment point (and especially regarding the design for the attachment welds). I would suggest a thorough reading of the B31.1 paragraph 119.3, regarding Local Overstrain. I have some great photographs of a "near miss" where an NPS 1 1/2 pipe was "tapped into" a vertical drip leg of an NPS 28 Main Steam Pipe (the small bore pipe carried steam to “preheat” a condensate heater). The Main Steam pipe moved down 7 inches and horizontally (SRSS) 11 inches at that point. The "tap-in" was a sock-o-let and at the toe of the fillet weld the NPS 1 1/2 pipe had a crack 75 percent through the pipe wall for a distance of 60 percent around the circumference (when we found it). The small bore pipe supports local to the “tap-in" were also wrong and the NPS 1 1/2 pipe was bending instead of deflecting the spring hanger. So, "..except where.." the support situation on the smaller bore piping needs further evaluation.

Also, "..except where.." there are dynamic considerations. Also, "..except where.." the small bore pipe provides a "handy" place for the maintenance people to step on to get to that "pesky" valve that always needs to be examined (but perhaps this I not a “design issue” (yes it is)). And of course, "..except where.." the branch pipe ends at a piece of strain sensitive equipment (e.g., vessel, turbine, or pump) that will require analysis of forces and moments).

And I hope you will see other opinions from our learned colleagues.

Regards, John.

[October 24, 2005, 02:58 PM: Message edited by: John Breen]

John Breen

Posts: **179** | From: **Pittsburgh, PA (when I cannot be in Texas)** | Registered: **Mar 2000** | IP: Logged | Report Post

Sun Wee
Member
Member # 35

posted October 21, 2005 02:04 PM

Sam,

The moment of inertia ratio(7 to 10) for the decoupling of header/header system is well explained by John Breen. So, I would like to talk only about where this number “7” is from.

You probably misunderstood. It would be 7 rather than 7 %. Long times back when I worked in nuclear power plant and my project had similar criteria to define decouple system. If moment of inertia ratio is greater than 7 between header/branch, instruction was to allow decouple system where dynamic(seismic) analysis was required with response spectrum data.
I remember number “7” is from an article from nuclear stress peoples and posted in ASME magazine. I will let you know that paper number when I find it later.

Sun Wee

Posts: **63** | From: **Calgary,Canada** | Registered: **Dec 1999** | IP: Logged | Report Post

El Gringo
Member
Member # 1271

posted October 21, 2005 04:07 PM

Gentlemen,

Many years ago a crusty old analyst told me, “You can decouple anything you like, just so long as you know what you’re doing.” I persisted with my questions for a while, hoping for more specific guidelines (meaning, I wanted something tangible: A number; a ratio; something less nebulous than “know what you’re doing.”) “The truth,” said my mentor, “is what Experience is for.”

Well, in the years since, I’ve often analyzed systems decoupled and then joined them together to determine the effect. What I have gained is a pretty good, gut feel as to what can be safely decoupled. Of course, I’m no nearer to learning the elusive “number” than I was to begin with, but at least I feel more comfortable knowing what can be decoupled and what should not.

Anyway, the reason Sam’s post interested me was that I worked on a decoupled system today. It consisted of a 3” HP steam line from a 16” sch 60 header. I’d analyzed the header several weeks ago before the 3” branch was designed. At that time I knew where the branch was to be, so I added a node at the approximate location. When I ran the 3” branch today I started (node 10) with the displacements from the 16” analysis. I used a weightless rigid from node 10 to the top of the weldolet and continued from there with 3” pipe. With the analysis complete I did an additional test run, joining the two systems together. Sure enough, the results were what I expected: The 3” portion of the system remained virtually identical to the decoupled run and the effect of the 3” system on the 16” header was insignificant.

(Not as scholarly a post as our erudite friends, John Breen and Sun Wee, but ‘tis mine own nonetheless.)

Ricardo

Posts: **34** | From: **Georgia, USA** | Registered: **Mar 2005** | IP: Logged | Report Post

sam
Member
Member # 884

posted October 24, 2005 01:26 AM

Thanks to John Breen Sir & you all, specially, Ricardo. Have I made a scholarly post ? I just asked, when in doubt - so what, if I question any rule of thumb.

I never hesitate to ask for help, when in need & believe me, never returned empty handed.

Three years ago on a fateful day in August, I lost my job, youngest CRS in a preety big organisation. While I was returning home, my accompanying friend was getting fearful about car safety & my future; but, I was driving cool at high speed in a risky highway in Baroda. When asked about the reason of my calmness, I broke the fact that I knew the capacity & reach of my seniors in this field -I really got a job in that evening, courtesy one of my seniors I always differed while working together- years ago.

This is the power of right connection.

When we help anyone, we regenerate ourselves; when people like John Breen lights up our earthen lamps with knowledge, we surely believe that it will flow years after. "Reading of the B31.1 paragraph 119.3, regarding Local Overstrain" & "dynamic decoupling considerations" may help someone somewhere in avoiding an avoidable accident. Connecting, networking & sharing makes ourselves useful in this small connected World.

regards,

sam

In clause 5.1 of the report

http://www.americanlifelinesalliance.org/pdf/Seismic_Design_and_Retrofit_of_Piping_Systems.pdf as earlier cited in this forum by by John Breen, moment of inertia ratio is mentioned. For nuclear piping undergoing seismic response spectrum dynamic analysis we were using mass and frequency ratio between subsystem(branch piping) & main system. Care were taken to avoid resonance among
main system and subsystem piping, too. (see page 9/75 here for reference)

http://japan.nonukesasiaforum.org/lungmen/CH_03/03_07.PDF

For nonnuclear piping thermal stress analysis controlled by restrained thermal expansion, moment of inertia ratio is appropriate when the effect of decoupled subsystem on main system is considered, while section modulus ratio is important when the effect of main system to subsystem is considered - Correct me if I am wrong.

Anyway, even after decoupling, we consider the SIF & movement of main system at the branch connection to the subsystem piping stress analysis & in the main piping analysis we include the branch piping past one/two significant supports (courtesy our revered senior Joseph Webb).

[October 24, 2005, 07:01 AM: Message edited by: sam]

_

Posts: **202** | Registered: **Feb 2004** | IP: Logged | Report Post

John C. Luf
Member
Member # 464

posted October 24, 2005 07:11 PM

Well Sam well done... and I hope to meet you and your colleauge Joseph Webb one day.

As for decoupling it is as all things a tricky subject where guidance may be given but where an exact rule does not suffice to cover all situations perhaps.

I would say that today with the PC power available that branch lines generally are not de-coupled as much as in the past and this may be a good thing.

Best Regards,

Posts: **413** | From: **U.S.A.** | Registered: **Mar 2002** | IP: Logged | Report Post

sam
Member
Member # 884

posted October 25, 2005 05:41 AM

Thank You, Sir. I communicated your message to Joe Sir (Joseph Webb). I am too far away to meet you.

Regarding cheap PC based piping stress capability, I recollect Aug'04 CAEPIPE Tips where the same argument is cited for older 70's ($1000/run days) exclusion of variable spring hanger stiffness in piping stress analysis.

regards,

sam

_

Posts: **202** | Registered: **Feb 2004** | IP: Logged | Report Post

T.Selvaraj
Member
Member # 1532

posted February 17, 2006 03:49 AM

Dear Friends

I am sorry for being late for this discussion as I didn't have the oppurtunity to see this earlier.
I would like add the following points.

1) It would be difficult to apply the decoupling criteria as per mass and frequency ratio for piping system. You may find at least one or few modes within the ratio.
2)As many experts indicated, one may not have a magic ratio of I or Z above which decoupling can be done. If branch pipe is 'FLEXIBLE' compared to the main pipe, one can decouple brach lines.

MY QUESTIONS ARE:

1) Having decoupled, how to perform seismic analysis of decoupled brach line with response spectrum method. Please note that you don't have FRS at the branch points (decoupled location). Then how to generate the FRS at that locations, generally called as header spectra? Or any alternate methods are availabel??

2) How to treat stress induced in branch lines from the movement of mainline at brach locations? Secondary stress as SAM?

Bye
Sels

Posts: **5** | From: **India** | Registered: **Oct 2005** | IP: Logged | Report Post

John C. Luf
Member
Member # 464

posted February 18, 2006 09:24 AM

What is it about the word static you do not comprehend? The title of this thread is " static non-nuclear piping stress analysis - branch piping decoupling criteria"

Not dynamic

Best Regards,

Posts: **413** | From: **U.S.A.** | Registered: **Mar 2002** | IP: Logged | Report Post

yukon chin
Member
Member # 1252

posted February 22, 2006 11:10 AM

The following document may be of interest to some of you on the decupling criteria as well as other technical position criteria. The document was developed by Welding Reserch Council (WRC). The document No. is WRC Bulletin 300 and was published in December, 1984. For decouoling criteria, please go to page 27. They recommended a ratio of run to branch pipe moment of inertia of 25 to 1. Regards.

Yukon Chin

Posts: **1** | From: **Houston, TX** | Registered: **Mar 2005** | IP: Logged | Report Post

El Gringo
Member
Member # 1271

posted February 23, 2006 01:53 PM

Yukon Chin,

Looking back through some old notes from my Kellogg days I found a decoupling rule referencing a section modulus ratio of 10:1. That produces fairly similar results to the WRC 25:1 moment of inertia rule. Personally, I prefer the 10:1 rule because even I

can work it out without a calculator!

Regards,

Ricardo

Posts: **34** | From: **Georgia, USA** | Registered: **Mar 2005** | IP: Logged | Report Post

New Topic Post a Poll Post Reply

Close Topic Feature Topic Move Topic Delete Topic

Previous Next

Printer-friendly view of this topic

Hop To: CAESAR II Go

Contact Us | COADE Homepage | Privacy Statement

Copyright @1996-2006 COADE, Inc., All Rights Reserved.

Powered by UBB.classic™ 6.7.3