

CINTAR Connection

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Pipe Stress Analysis, Along with Pipe Code Review and Analysis, is Instrumental for a Successful Piping System

Pipe Stress Analysis and the ASME codes assist engineers with selecting the correct pipe material, size and fittings based on the specific system's parameters.

In the United States piping design, fabrication, installation, testing and certification is governed by the ASME B31 Code for Pressure Piping series of Piping Codes. At Cintar, we primarily deal with B31.1 Power Piping, B31.3 Process Piping and B31.8 Gas Transmission & Distribution. The Codes provide formulas for pipe selection, and they provide guidance for the pipe and pipe fitting materials. However, the ASME B31 Codes cannot determine the optimal solution for a given problem. Only experienced engineering judgement can determine the solution. And an experienced engineer knows the importance of Pipe Stress Analysis.

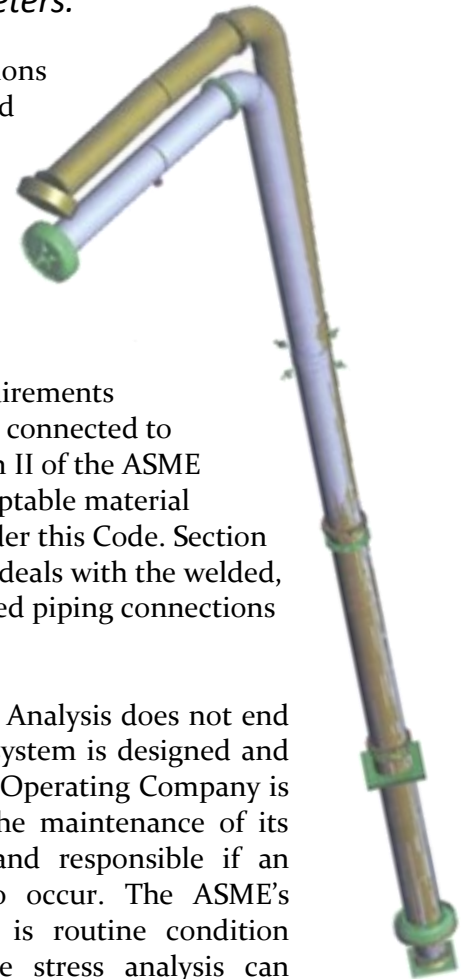
Code Review & Analysis

To start the engineering process, Codes need deciphered and applied to the design. Cintar specializes in the interpretation, implementation and compliance requirements not only for ASME B31 but ASME Boiler and Pressure Vessel Codes as well. The Codes all work hand-in-hand within a system; they work in harmony together.

Something as "simple" as a boiler installation requires a significant amount of engineering. Section I of the ASME Boiler and Pressure Vessel code addresses all external piping connections on single boiler or superheater installations including the first stop valve.

Multiple installations include the second stop valve and cross-connected piping. ASME B31.1 Power Piping Code establishes the design and construction requirements of external piping connected to the boiler. Section II of the ASME incorporates acceptable material specifications under this Code. Section VIII of the ASME deals with the welded, flanged or threaded piping connections to the vessels.

Code Review and Analysis does not end once the piping system is designed and constructed. The Operating Company is responsible for the maintenance of its piping systems and responsible if an incident were to occur. The ASME's recommendation is routine condition assessments. Pipe stress analysis can assist the Operating Company evaluate any degradation of the system piping or its supports.



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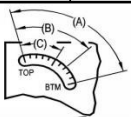

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What is Pipe Stress Analysis?

All piping systems are subjected to various loads. Over time, these loads cause stresses in the system. And the above Codes all indicate an allowable amount of stress placed on the piping system. The type of loads that apply stress to a piping system include Thermal, Sustained, Seismic, Wind, PSV Reaction Force, Slug Force and Forces induced by Surge Pressure. When stress on a piping system increases, the structural supports of the system face increased forces. And a system that is under-supported will result in structural failure. By conducting Pipe Stress Analysis, the engineer will be able to select the proper pipe size, pipe material and pipe fittings. Then the structural engineering team will provide supports and anchorage based on the piping selections.

At Cintar, we use the latest version of Caesar II to calculate for pipe stress. A Pipe Stress Analysis is recommended by industry standards for the following applications:

- Piping $\geq 3"$ dia. connected to rotating equipment
- Piping $\geq 3"$ dia. and at temperatures ≤ -20 °F or ≥ 250 °F
- Thin wall piping $\geq 18"$ dia with $OD/t > 90$
- All piping with temperatures > 600 °F
- All piping with pressure $> 1,500$ psig
- All lines requiring expansion joints
- AMSE B31.3 Category M Fluid Service (a very small quantity of fluid exposure can produce irreversible harm to a human)

HANGER INSPECTION RECORD										
COMPANY: ABC ENERGY PLANT NAME & LOCATION: Pennsylvania								SYSTEM: STEAM		
MARK NUMBER	SUPPORT TYPE	CONSTANT SUPPORT			VARIABLE SPRING SUPPORT			RIGID ASSEMBLY CONDITION	SNUBBER ASSEMBLY CONDITION	COMMENTS
		ASSEMBLY CONDITION	SCALE READING		ASSEMBLY CONDITION	SCALE READING				
			HOT (HS)	COLD (CS)		HOT (HS)	COLD (CS)			
SH-125	CONSTANT	OK	60%							
SH-126	CONSTANT	OK	TOPPED OUT							
SH-127	CONSTANT	OK	80%							
SH-128	CONSTANT	OK	75%							
SH-129	RIGID							OK		
SH-130	SPRING				OK	10%				
SH-131	SPRING				OK	TOPPED OUT				Action required
SH-132	SPRING				OK	35%				
SH-133	SNUBBER								OK	
		CONSTANT SUPPORT TRAVEL INDICATOR (A) TOTAL TRAVEL (B) ACTUAL TRAVEL (C) CALC. MOVEMENT			VARIABLE SPRING LOAD SCALE TOP ACTUAL BOTTOM		PERFORMED BY: SF DATE: 1/1/2017 TIME: 9:00 AM SHEET: SHT. 1 OF 1		ABC Energy - PA Generating Station Unit 1  CINTAR INC. GLENSHAW, PA 15116 PROJECT NO.: 01234 REF. ISO.: S1-AA	

Example of a pipe hanger assessment.

- All Pressure Relief Systems (review pipe system as a minimum)
- All Boiler feedwater lines, drain lines and blowdown lines
- All piping subjected to external pressure or internal vacuum

Cintar has the experienced engineers who can provide Pipe Stress Analysis services. In addition, we can assist clients with determining the codes that are applicable to their system, perform walk downs and conduct inspections to evaluate the piping system. In relation to proper pipe fitting material pipe welding procedures fall within the same ASME B31 Codes. When piping designs are modified based on the pipe stress analysis, proper welding procedures can be overlooked. Cintar can assist your in-house installations to ensure the proper welding procedures, based on applicable Codes, are utilized.



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