KASA Redberg

Engineers & Technical Trainers

Piping Design to AS 4041 & ASME B31.3

A practical and interactive 2 day course

Piping Design to AS4041 & ASME B31.3

Introduction

The purpose of this two-day seminar is to provide guidance on the fundamentals of piping stress and flexibility analysis so that compliance with AS4041 and/or ASME B31.3 is achieved. The secondary aim is to show how to spot check the results from computer based solutions using conservative manual calculation methods.

Upon completion of this seminar, the attendee should be well placed to perform common pressure piping stress and flexibility analysis tasks under the minimal supervision of a Senior/Supervising Engineer.

Who Should Attend

Engineers who are required to design piping systems as part of their job function or those who want to have a better understanding of the requirements of AS4041 and/or ASME B31.3. This seminar is ideally suited to Junior/Graduate Engineers or those new to the field of piping design and stress analysis.

Delegate Pre-Requisites

As this seminar includes numerous design calculations, it is recommended that each attendee is degree or diploma qualified in a relevant technical discipline (e.g. mechanical, chemical or structural engineering).

For the maximum benefit to be obtained, it is recommended that each delegate:

•Is familiar with basic hydraulics theory.

•Has had some previous exposure to piping systems.

Those who have previously attended KASA's "*Liquid Piping Systems Fundamentals*" and "*Gas Piping Systems Fundamentals*" seminars should also be well placed to derive maximum benefit from this seminar.

Overlap With Other KASA Piping Seminars

Material relating to the pressure design of straight pipe (to AS4041) is briefly introduced in KASA's "*Liquid Piping Systems Fundamentals*" seminar. In this "*Piping Design to AS4041 & ASME B31.3*" seminar, this material is taken to a more advanced level. There is no overlap with any other KASA seminar.

Seminar Objectives

The following primary learning objectives have been designed so that each attendee can:

•Understand the difference between "piping hydraulic design", "piping stress analysis" and "piping flexibility analysis".

•Have an appreciation for how "strength of materials" theory forms a basis for all international piping design codes.

•Understand the intent of both AS4041 and ASME B31.3 and how the design process should proceed so as to ensure compliance with these piping codes.

•Using manual calculation methods, determine the required wall thickness for pipes exposed to load combinations such as internal or external pressure/vacuum, wind, earthquake etc in accordance with the nominated piping codes.

•Using manual calculation methods, design elbows, bends, branches, fabricated tees, headers etc in accordance with the nominated piping codes.

•Using manual calculation methods, determine pipe support spacing and design appropriate supports.

•Understand fatigue analysis, flexibility analysis, fabrication, testing and examination of piping.

•Use appropriate judgment when dealing with stresses at connections with rotating and stationary equipment.

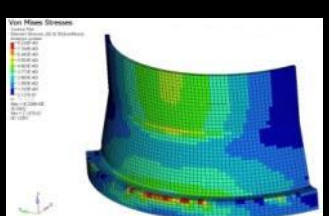
Training Seminar Materials

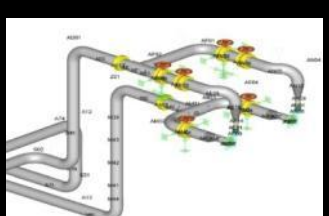
All delegates receive:

•**A Detailed Seminar Manual** – Which provides a reference text of all of the material presented during the seminar. Note: This manual is written as a textbook which allows it to be more useful as a future design reference.

•**Certificate of Attendance** – Which states the number of hours of training and serves as documentary proof of attendance.

Note: KASA is no longer supplying copies of AS4041 and ASME B31.3 for use during the seminar. It is not absolutely necessary to have a copy of AS4041 and ASME B31.3 available during the seminar (but attendees may wish bring their own copies of these piping codes should they wish to bookmark particular sections for future reference).





Piping Design to AS4041 & ASME B31.3

Seminar Synopsis

DAY 1

STRENGTH OF MATERIALS
- Terms and definitions.
- Stress, strain, allowable stresses and safety factors.
- Principle and secondary stresses.
- Axisymetric loading.
- Bending and torsion of pipes.
- Pipes subjected to plane stress.
- Combined bending, torsion and pressure loading.
- Failure theories used in piping design codes.
- Stresses and deflections due to temperature.
- Cyclic loading and creep.
- Examples of piping failure.
- Worked example problems.

AS4041 & ASME B31.3 BACKGROUND
- The history and intent of AS4041 and ASME B31.3.
- The basis of AS4041 and ASME B31.3.
- How to use piping codes.
- A “walk-through” of AS4041 and ASME B31.3.
- Assessment and classification of piping/service combinations.
- Worked example problems.

AS4041 & ASME B31.3 PIPE STRESS ANALYSIS
- Design temperature, design pressure and design loading combinations for stress analysis purposes.
- Basis for determining allowable stresses.
- Reduction factors, allowable stress tables.
- Determining wall thickness for internal pressure.
- Determining wall thickness for external pressure.
- Design of stiffener rings for external pressure or vacuum conditions.
- Design of elbows, bends, branches, fabricated tees, headers etc.
- Determining pipe support spacing.
- Dealing with combined static loadings.
- Dealing with dynamic fluid loadings.
- Worked example problems.

DAY 2

AS4041 & ASME B31.3 PIPE FLEXIBILITY ANALYSIS
- Forces, stresses and displacements due to thermal expansion.
- Methods of providing piping flexibility.
- Stress Intensification and Flexibility Factors (SIFs), elastic equivalent stress, allowable thermal expansion range.
- Cold spring.
- Pressure and its effects on piping flexibility.
- Guidelines on when to perform a piping flexibility analysis.
- The balance between flexibility and structural stability.
- Worked example problems.

PIPE SUPPORTS
- Analysis of support types and placement.
- Selection of the most appropriate support type.
- Examples of common support situations and associated calculations.
- Dealing with support friction.
- Worked example problems.

STRESSES AND DISPLACEMENTS AT CONNECTIONS
- Bellows, slip joints, flexible hoses etc.
- Tie rods and limit rods for flexible connections.
- Flange loadings.
- Dealing with piping loads imposed on tanks and vessels.
- Dealing with piping loads imposed on pumps, turbines and compressors.
- Worked example problems.

FABRICATION, INSTALLATION & TESTING
- A brief discussion on selected core material relating to fabrication, installation and testing in AS4041 and ASME B31.3.

COMPUTER BASED SOLUTIONS
- A comparison between the results obtained from various manual calculation methods (e.g. Kellogg, Timoshenko etc) and those obtained from computer programs.
- Discussion relating to popular computer programs for pipe stress analysis.



About KASA Redberg

KASA Redberg is a technical training and engineering consulting group.

We have core competencies in pumping systems, piping systems, pipelines, pressure vessels and slurry handling systems. We also act as independent HAZOP workshop facilitators and Safety-in-Design workshop facilitators.

Our portfolio of services includes:

•Tank and vessel design.
•Chemicals plant design.
•Water treatment plant design.
•Pumping and piping systems design.
•Pump station and pipeline design
•Mine dewatering and water supply systems design.
•Pipe stress analysis
•Pipeline hydraulic modelling
•Water hammer analysis
•Slurry piping systems design and slurry pump selection.
•On-site troubleshooting of pumps and piping systems.
•Operator training courses
•HAZOP workshop facilitation
•Safety-in-Design workshop facilitation

Contact Details

KASA Redberg Pty Ltd
ABN: 35 107 585 375
PO Box 459
Balgowlah NSW 2093
AUSTRALIA

Phone: +61(0)2 5105 4082
Fax: N/A
Email: info@kasa.com.au
Web: www.kasa.com.au

For general email enquiries and for more information on our courses and consulting services, please email: info@kasa.com.au

For course registrations, general administration and accounts related enquiries, please email: admin@kasa.com.au