



ONG-STR-001 | ONLINE COURSE

DESIGN OF

PIPE RACK

(For Oil & Gas Industry)

ASCE 7-16 | AISC 360-16 | AISC 341-16

STAAD.Pro | RAM Connection | RCDC



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<https://sqveconsultants.com/ong-str-001>

INTRODUCTION

We received numerous requests for launching the specific online courses for onshore oil & gas industry. In line of the same, we are going to launch series of the online courses with course id title starting with “ONG”. We are excited to launch a first online course of the series: **ONG-STR-001**- design of process pipe rack with steel structure.

A **process pipe rack** in the oil and gas industry is a critical structural framework that supports and organizes process pipelines, utility pipelines, electrical cable tray, instrument cable tray, etc. It provides a stable and elevated pathway for the safe routing of process fluids, utilities, etc., minimizing the risk of leaks, spills, and accidental damage. By consolidating these lines into a central structure, pipe racks optimize space usage, allowing for efficient layout and easy access for maintenance and inspection, which enhances operational efficiency and safety.

The course will begin with an overview of refinery processes, various process units, function of pipe rack, etc. We will also highlight **important interface areas** with different disciplines, including process, piping, electrical, instrumentation, electrical and equipment, ensuring a holistic understanding of multidisciplinary coordination for the pipe rack. We will cover details of each step for structural design of the pipe rack, starting from understanding functional requirements, important points to be checked in input documents, preparation of structural system, generating computer model, load calculations and application in the software, analysis & design of pipe rack, connection design, foundation design of pipe rack, etc.

Throughout the program, we will cover important provisions of **American codes** such as ASCE 7-16, AISC 360-16, AISC 341-16, ACI 318-19, etc. If required by the participants, we will discuss about relevant Indian codes as well. Additionally, you will learn how to apply these codes effectively using industry-standard software applications, including **STAAD Pro**, **RAM Connection** and **RCDC**.

Our **case study-based learning** approach will allow participants to explore real-world scenarios, with detailed discussions on sample documents. To ensure effective learning and hands-on experience, participants will be engaged in assignment designed to be completed step-by-step as the program progresses. There will be joint online review of the documents prepared by the participants as well as specific doubts or queries raised by the participants for each step will be addressed before moving to the next step. The program is designed to encourage maximum interaction with the participants to enable effective knowledge transfer.

The program will commence from **19-SEP-24** and will span over duration of nearly one month of time. Detailed content of the program is mentioned in the subsequent pages along with the schedule.

The program will be useful for the engineers who want to make successful career in the onshore oil and gas industry.

WHAT IS UNIQUE ABOUT THIS COURSE?

The course is designed by the **experienced engineer** (Mr. Bhavin Shah) who has more than two decades of experience in the field of structural engineering.

- ✓ The entire course is designed from the **practical aspects** which can be readily used in the real projects.
- ✓ The course is designed to have an **interactive mode** so that the problems / doubts of the participants can be addressed effectively.
- ✓ A WhatsApp group will be created for **quick communication** between the participants and the faculty. The participants will be able to share the discussion points, doubts, queries, etc. in the group. The details in the group will be collated for further discussion in the next session.
- ✓ All the sessions will be recorded and recording of each session will be shared **within few hours**. If someone miss out the live session then he/she can go through the recording before attending the next session. After going through the recording, the participants can share their doubts/queries in the WhatsApp group, which will be addressed in the next session.
- ✓ **Recording** will be available with all the participants for **180 days**. Additional six months of access can be purchased with only 10% of total fees.
- ✓ **Certificate** for participation will be issued on successful completion of the online course (to avail the certificate, it is mandatory to submit the assignments as per schedule).
- ✓ The course is designed as a **process of learning together**.

WHO SHOULD ATTEND?

This course will be useful for following:

- ✓ **Practicing Structural Consultants**
- ✓ **Senior Structural Engineers in the company**
- ✓ **Junior Structural Engineers in the company**
- ✓ **Owner's consultants**
- ✓ **Proof checking consultants**
- ✓ **Research scholars, Academicians**
- ✓ **Post Graduate students in Structural Engineering**
- ✓ **Civil engineering students who are interested in Structural Engineering.**

COURSE FACULTY



Bhavin Shah – Founder & CEO, SQVe Consultants

Mr. Bhavin Shah is passionate about Engineering profession with two decades of experience. He is having a dream for enhancing the engineering profession in different organisations. He completed graduation in Civil Engineering and Masters in Structures from Sardar Patel University. He is having unique experience of working in the specialized firm of civil / structural consultancy which grew as multidisciplinary firm (VMS), large multidisciplinary firm (L&T Chiyoda Ltd.) and owner-based engineering set up (Adani Infra (I) Ltd.). He worked in different organisations at different levels, starting from junior design engineer to CEO. He is Founder & CEO of **SQVe Consultants**. He is pursuing Ph.D. in Structural Engineering related to earthquake resistant design of industrial steel structures. He has conducted similar offline programs for large engineering setup.

METHODOLOGY

- ✓ The entire course is designed in the **ONLINE mode**.
- ✓ The course will spread over **~one month** with **60+ contact hours** (~24 hrs. online + ~36 hrs. for preparation of assignment).
- ✓ During the program, the interaction can be done with faculty and the participants using **WhatsApp**.
- ✓ **Fundamentals and the concepts** will be demonstrated through study models in the **software**.
- ✓ The online sessions will be conducted using **ZOOM** software.

COURSE SCHEDULE

Start Date	19-SEP-2024
End Date	23-OCT-2024
Total contact hours	60+ contact hours (~24 hrs. online + ~36 hrs. for assignment) (Sessions will be arranged on Monday, Wednesday & Friday from 8:30 PM to 10:00 PM IST.)
Details of each session	Please refer subsequent page for details of each session.

FEES FOR THE COURSE**

For participant <u>from India</u>	Cost per participant shall be 14500 INR (inclusive of 18% GST).
For students** pursuing Post graduation or Graduation <u>from India</u>	Cost per participant shall be 11600 INR (inclusive of 18% GST).
For participant <u>outside from India</u>	Cost per participant shall be 220 USD.

****Discount offered:**

- ✓ To avail discounted **fess for student**, the participant shall have official email address of the institute. Please connect with us at email address for more details: steel@sqveconsultants.com
- ✓ **For continuous learner:** If you have attended earlier one course of SQVe Consultants than **5%** of discount will be offered. For prior two courses, **10%** of discount will be offered. For three or more prior courses, **15%** of discount will be offered. To avail the discount, please connect with us through the above-mentioned email address. We will arrange to send an invoice considering the discount for online payment.
- ✓ **Group participation** from a company or institute is encouraged to get the discounts on this course. For more details, please contact us at the above-mentioned email address.

HOW TO REGISTER FOR THE COURSE?

Please click on the following link and thereafter click on “**Register Now**” button at bottom of the page. You will be directed to the **payment page**. Your registration will be confirmed after receipt of the payment at portal.

<https://sqveconsultants.com/ong-str-001>

Important notes:

- ⇒ There are several modes of payment are available at the above link such as net banking, card, UPI, etc. For transferring the amount through Google Pay, please connect with us at following email address. We will share the required details.

- ⇒ Payment gateway at the above-mentioned portal is configured only for **Indian participants**. Interested foreign engineers can contact us at the email address: **earthquake@sqveconsultants.com**. An invoice will be shared through **PayPal** for online payment.

Kindly note that there are limited seats.

Your any queries/ doubts related to the online course are welcome at the above-mentioned email address.

SCHEDULE OF THE COURSE : ONG-STR-001

Session no.	Title	Date	Time (IST)
1	<p>Overview of oil refinery process FEED Detailed engineering</p> <ul style="list-style-type: none"> • What is Petroleum? • What is refinery? • Products of refineries divided in three categories – gasoline, liquid petroleum gas, kerosene, diesel oil, gas oil, etc. • Overall process in typical refinery • Overview of different processing units • Process Licensors for refinery processes • Front End Engineering Design (FEED) Basic engineering • Detailed engineering • Brief scope of Lump Sum Turnkey Contract (LSTK) • Brief of scope of work for different disciplines • Importance of interface and Overview of interface between different departments • Overview of 3D model generation and review process Software used for generation and review of 3D model Extent of 3D modelling Clash check procedure, etc. 	18-SEP-24	8:30 PM TO 10:00 PM

Session no.	Title	Date	Time (IST)
2	<p>Pipe rack Understanding of functional requirements</p> <ul style="list-style-type: none"> • Difference between process pipelines and utility pipelines • Piping stress analysis • Rules followed for arrangement of hot and cold pipes, instrumentation & electrical cable tray, etc. on pipe rack • Function of Air Fin cooler • Different types of pipe supports Anchor supports, Guide supports, etc. • Advantage of expansion loop • Load from piping Empty load, Operating load, test load, thermal anchor force, thermal friction force, pipe surge force, etc. • Fire proofing requirements Brief about HAZOP study • Review of input details received from piping department • Interface areas with different disciplines for pipe rack piping, electrical, equipment, process and equipment. 	20-SEP-24	8:30 PM TO 10:00 PM
3	<p>Pipe rack Overview of Process Industry Practices (PIP) for structural design criteria Structural system for pipe rack</p> <ul style="list-style-type: none"> • Brief about PIP document Process industry practices, Industry codes and standards, Empty load, Operating load, Test load, loads from grating, chequered plate, cable tray load, live load, wind load, seismic load, Thermal anchor force, Thermal friction force, load combinations for pipe rack, etc. • Elastic stability for steel structures • Moment frame in transverse direction • How to decide vertical bracing bay location in longitudinal direction? • Structural system for supporting air fin cooler 	23-SEP-24	8:30 PM TO 10:00 PM

Session no.	Title	Date	Time (IST)
	<ul style="list-style-type: none"> Integrated behaviour of structure and piping against lateral loads, etc. Handing over the input documents of Pipe rack to the participants for performing assignment 		
4	<p>Pipe rack Geometry generation Initial sizing of members Member specifications Support conditions Software STAAD Pro</p> <ul style="list-style-type: none"> Review of input for the pipe rack Discussion on structural system prepared by the participants Quick way of generating geometry in the software Preliminary sizing of columns, beams and bracings Advantage of grouping different members in the software Moment release, Member truss specification, Fire proofing load How to decide whether support should be pinned or fixed? 	25-SEP-24	8:30 PM TO 10:00 PM
5	<p>Pipe rack Detailed discussion on different types of loads Software applications in STAAD Pro (Part 1)</p> <ul style="list-style-type: none"> Review of models generated by the participants Discussion related to queries of the participants for geometry, property, member specifications, grouping, support, etc. Dead load Application of empty, operating and test weight of pipes Thermal anchor load Concept of thermal friction Why thermal friction force is generated? How to appropriately consider thermal friction for design of the pipe-rack? Local vs global design of the structure for thermal friction Temperature load 	28-SEP-24	8:30 PM TO 10:00 PM

Session no.	Title	Date	Time (IST)
6	<p>Pipe rack Detailed discussion on different types of loads Software applications in STAAD Pro (Part 2)</p> <ul style="list-style-type: none"> • Review of piping load, thermal load and thermal friction load applied in the software by participants and discussion related to queries of the participants • Modal analysis of Pipe rack to determine natural frequencies and mode shapes • Discussion on wind load calculations as per ASCE 7-16 for pipe rack • ASCE guidelines for wind loads for petrochemical facilities Discussion for pipe rack • Wind load calculations for structure, piping, cable tray, etc. • Wind load calculations in transverse and longitudinal direction of the pipe-rack • Application of wind load in STAAD Pro 	30-SEP-24	8:30 PM TO 10:00 PM
7	<p>Pipe rack Detailed discussion on different types of loads Software applications in STAAD Pro (Part 3)</p> <ul style="list-style-type: none"> • Review of wind load calculations by participants and discussions on queries of the participants • Seismic loads as per ASCE 7-16 • Risk category as per ASCE 7-16 • Seismic design category • Response modification coefficient, Overstrength factor & Deflection amplification factor • Permitted analytical procedure • Equivalent lateral force (ELF) procedure • Calculation of fundamental time period • Response spectrum analysis • Specific requirements for pipe rack as per ASCE 7-16 • ASCE guidelines for Seismic design of petrochemical facilities 	2-OCT-24	8:30 PM TO 10:00 PM

Session no.	Title	Date	Time (IST)
	<ul style="list-style-type: none"> Application of seismic load in STAAD Pro 		
8	Pipe rack Load combinations Types of analysis <ul style="list-style-type: none"> Review of seismic load calculations and software applications by participants and discussion for queries of the participants Load combinations as per Process Industry Practices and as per ASCE 7-16 Types of analysis as per AISC 360-16 First order elastic analysis Effective length method Understanding P-Delta analysis along with software application Initial system imperfections, Notional loads, adjustment to stiffness in direct analysis method How to carry out Direct analysis as per AISC in STAAD Pro? 	4-OCT-24	8:30 PM TO 10:00 PM
9	Pipe rack Design parameters Design of steel structure (Part 1) <ul style="list-style-type: none"> Review of analysis carried out by participants and discussion for the queries related to the same Interpretation of results from analysis Review of statics check, bending moment diagram, shear force diagrams, support reactions, exaggerated deflected shapes, etc. Detailed discussion on design of steel members as per AISC 360-16 Design parameter in STAAD Pro as per AISC 360-16 Manual design of steel structure as per AISC Comparison between manual design and the software results from STAAD Pro 	7-OCT-24	8:30 PM TO 10:00 PM
10	Pipe rack Design parameters Design of steel structure (Part 2) <ul style="list-style-type: none"> Detailed discussion on design of steel members as per AISC 360-16 	9-OCT-24	8:30 PM TO 10:00 PM

Session no.	Title	Date	Time (IST)
	<ul style="list-style-type: none"> • Design parameter in STAAD Pro as per AISC 360-16 • Manual design of steel structure as per AISC • Comparison between manual design and the software results from STAAD Pro 		
11	Pipe rack Connection design RAM connection software (Part 1) <ul style="list-style-type: none"> • Review of design of steel structure by participants and discussion for queries of the participants • Design of shear connection as per AISC code • Integrated connection design of pipe-rack using STAAD Pro and RAM connection • Design of shear connection using RAM connection software • Design of bracing connection as per AISC code • Design of bracing connection using RAM connection software 	11-OCT-24	8:30 PM TO 10:00 PM
12	Pipe rack Connection design RAM connection software (Part 2) <ul style="list-style-type: none"> • Review of shear connection design performed by participants and discussion for queries based on the same • Design of moment connection as per AISC code • Design of moment connection using RAM connection software • Design of base plate connection as per AISC code and RAM connection software • Design of anchor bolts 	14-OCT-24	8:30 PM TO 10:00 PM
13	Pipe rack Vibration problem Drawings for steel pipe rack Fabrication drawings <ul style="list-style-type: none"> • Review of moment connection design and base plate design performed by participants and discussion for queries of the participants 	16-OCT-24	8:30 PM TO 10:00 PM

Session no.	Title	Date	Time (IST)
	<ul style="list-style-type: none"> • Discussion to avoid vibration in the pipe rack due to Air fin cooler • Brief about GA drawings & Fabrication drawings 		
14	Pipe rack Open Foundation design RCDC <ul style="list-style-type: none"> • Important points to be taken care for design of pipe rack foundations • How to decide whether open foundation or piled foundation to be provided? • Stability checks Contact area requirement for the open foundation • Design of open foundations for pipe rack RCDC • Discussion on output of the software and comparison with manual calculations 	18-OCT-24	
15	Pipe rack Pile Foundation design RCDC <ul style="list-style-type: none"> • Review of open foundation design performed by participants and discussion for queries based on the same • How to arrange piles? • Minimum thickness of pile cap • Design of pile foundations for pipe rack RCDC • Discussion on output of the software and comparison with manual calculations 	21-OCT-24	
16	Pipe rack Open discussion <ul style="list-style-type: none"> • Review of pile foundation design performed by participants and discussion for queries based on the same • Open discussion • Concluding remarks • Way forward 	23-OCT-24	

About SQVe Consultants

SQVe Consultants is a company established with a vision of enhancing the engineering profession. The name of the company is derived from first letters of goals of engineering, i.e. **S**chedule adherence, **Q**uality assurance & **Ve** -Value Engineering.

Our ALL services are designed to have maximum of ONLINE interaction with the least OFFLINE interaction.

We look forward for long term association with different organisations for enhancement of engineering profession through our unique services. We also provide mentoring to the structural engineers through one-on-one session. Please get in touch with us for any requirements related to online training related to civil/structural engineering as well as in the area of people management (soft skills).

For more details, please refer website : <https://sqveconsultants.com>

You may contact us at email address : contact@sqveconsultants.com

Access our earlier online recorded 194 sessions with 300+ contact hours:

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