DESIGN OF MACHINE FOUNDATIONS

ONLINE COURSE ID : DYN-STR-001

Link: https://sqveconsultants.com/dyn-str-001
email address: dynamics@sqveconsultants.com

INTRODUCTION

Design of machine foundation is always considered as a special design since the machine foundation may not be safe, merely by increasing the size of the foundation. Also, failure of the machine foundation can severely damage the costly equipment which may lead to substantial financial loss due to impact on performance of the plant. In the first batch of the course, there was participation from different parts of India as well as there was participation from Australia, Kuwait, Algeria, Sri Lanka, Nepal, Canada, UAE and Pakistan. Recently, we have received numbers of requests for relaunching the course. Accordingly, we are glad to announce 2nd batch of the course which will commence from **14-DEC-23**.

Designing machine foundations involves a variety of complexities due to the dynamic interactions between the machine, the foundation, the soil and the surrounding structure. Following are some of the key areas for which appropriate understanding is required, while performing the design:

- Fundamentals of Structural dynamics
- Effective interface with the machine manufacturer
- Unbalanced dynamic loads from machine
- Fixing details of the foundation
- Thumb rules for preliminary sizing of the foundation
- Soil dynamics
- Restriction on permissible amplitude for the foundation
- Avoiding resonance in all the conditions
- Software application (Do's and Don'ts), etc.

In view of the above, we are glad to launch a unique online course (**DYN-STR-001**) which addresses the step-by-step approach for the machine foundations. We will start with basics of structural dynamics like single degree of freedom, free vibration, forced vibration, damping, multi degree of freedom, resonance, etc. along with examples in the software. Thereafter, we will discuss about different types of machines, dynamic loads generated from the machines, soil dynamics, spring calculations for FEM analysis, etc. We will also address the requirements of design standards such as IS 2974 & ACI 351 3R 04. Finally, we will take up actual modelling in the software for block foundation supporting reciprocating machine, block foundation supporting centrifugal machine and table top foundation supporting centrifugal machine. Detailed dynamic analysis will be performed in the software STAAD.Pro and the important do's and don'ts will be highlighted for the software application.

The entire course will be extremely useful for preparation of in-house check-list, working procedure, Do's and Don'ts, etc. for design of the machine foundations.

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**.
- ✓ Certificate for participation will be issued on successful completion of the online course (minimum 80% of attendance is required).
- ✓ We will create a **focused group** of engineers after the course who would like to contribute further for the design of machine foundations.
- ✓ 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.

METHODOLOGY

- ✓ The entire course is designed in the **ONLINE mode**.
- ✓ The course will spread over ~**three weeks** with **approximate 20+ contact hours.**
- ✓ 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	**14-DEC-2023**
End Date	**2-JAN-2024**
Total contact hours	**20+** (Sessions will be arranged on **Monday to 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 **12500 INR** (inclusive of 18% GST).
For participant <u>outside from India</u>	Cost per participant shall be **185 USD.**

Discount offered:

- ✓ **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 send us an email at: dynamics@sqveconsultants.com . 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, pl 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/dyn-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: **dynamics@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 : DYN-STR-001

Session no.	Title	Date	Time (IST)
1	**Fundamentals of structural dynamics (PART 1)** • Basics of structural dynamics • Single Degree of Freedom System (SDOF) • Importance of SDOF in structural dynamics • Time period • Modelling of SDOF in STAAD.Pro • Understanding of free vibration, forced vibration, damping using computer model • Natural frequency vs forcing frequency, etc.	**14-DEC-23**	**8:30 PM TO 10:00 PM**
2	**Fundamentals of structural dynamics (PART 2)** • Multi degree of freedom systems (MDOF) • Mode shapes • Generating MDOF system in STAAD.Pro • Damping • Phase angel • Resonance • Importance of damping during resonance • Transient response and Steady state response • Understanding of underdamped system, overdamped system, resonance through computer models in STAAD.Pro, etc.	**15-DEC-23**	**8:30 PM TO 10:00 PM**
3	**Different types of machine foundations |step-by-step approach for design of machine foundations** • Different types of machines • Input required for design of the machine foundation • What is unbalanced dynamic loads?	**18-DEC-23**	**8:30 PM TO 10:00 PM**

Session no.	Title	Date	Time (IST)
	• Unbalanced dynamic loads from reciprocating equipment • Unbalanced dynamic loads from centrifugal equipment • Permissible amplitude for design of the foundations • Single amplitude vs Double amplitude • Different types of foundations • Step-by-step procedure for design of machine foundations • Preliminary sizing criteria, etc.		
4	**Type of model in STAAD.Pro | Calculation of spring constants for soil** • Use of 3D solid element for modelling in STAAD.Pro for block foundation and table top foundation • 3D solid elements in STAAD.Pro • Bottom slab to be modelled or not? • Importance of geotechnical parameters in the design of machine foundations • Dynamic shear modulus • Calculation of spring values in vertical and lateral direction for foundation • Spring values for pile foundation foundations? • Range of spring values to be considered, etc.	**19-DEC-23**	**8:30 PM TO 10:00 PM**
5	**Discussion on important clauses of IS 2974 (Part 1) – Foundation for reciprocating type machines** • System of axis and six degrees of freedom • Data to be provided by machine manufacturer • Frequency ratio • Permissible amplitude • Dynamic modulus of elasticity • Minimum reinforcement in block foundations	**20-DEC-23**	**8:30 PM TO 10:00 PM**

Session no.	Title	Date	Time (IST)
6	**Design of reciprocating equipment foundation – Model 1** • Modelling of foundation in STAAD.Pro for reciprocating equipment • Block foundation using 3D solid elements • Calculations for spring values • Application of unbalanced dynamic loads • Performing dynamic analysis • Interpretation of results • Impact on the results by varying different parameters	**21-DEC-23**	**8:30 PM** **TO** **10:00 PM**
7	**Design of reciprocating equipment foundation | Block foundation | Model 2** • Modelling of foundation in STAAD.Pro for reciprocating equipment • Block foundation using 3D solid elements • Calculations for spring values • Application of unbalanced dynamic loads • Performing dynamic analysis • Interpretation of results • Impact on the results by varying different parameters	**22-DEC-23**	**8:30 PM** **TO** **10:00 PM**
8	**Discussion on important clauses of IS 2974 (Part 4) – Foundation for rotary type equipment | Low frequency** • Unbalanced loads from equipment • Data to be provided by machine manufacturer • Frequency ratio • Permissible amplitude • Dynamic modulus of elasticity • Minimum reinforcement in block foundations, etc.	**26-DEC-23**	**8:30 PM** **TO** **10:00 PM**
9	**Design of rotary equipment foundation | Block foundation | Model 3** • Modelling of foundation in STAAD.Pro for rotary equipment	**27-DEC-23**	**8:30 PM** **TO** **10:00 PM**

Session no.	Title	Date	Time (IST)
	• Block foundation using 3D solid elements • Calculations for spring values • Application of unbalanced dynamic loads • Performing dynamic analysis • Interpretation of results • Impact on the results by varying different parameters		
10	**Discussion on important clauses of IS 2974 (Part 3) – Foundation for rotary type machines | Medium and high frequency** • Isolation from adjacent structures • Data to be provided by machine manufacturer • Loading on the foundation • Sizing of the top deck • Sizing of the column • Forced vibration analysis • Static design • Minimum reinforcement requirement, etc.	**28-DEC-23**	**8:30 PM TO 10:00 PM**
11	**Design of rotary equipment foundation | Table top foundation | Model 4** • Modelling of foundation in STAAD.Pro for rotary equipment • Table top foundation using 3D solid elements • Calculations for spring values • Application of unbalanced dynamic loads • Performing dynamic analysis • Interpretation of results • Impact on the results by varying different parameters	**29-DEC-23**	**8:30 PM TO 10:00 PM**

Session no.	Title	Date	Time (IST)
12	**Comparison of Table Top foundation with different options** • Modelling of top slab with plate elements | Columns with frame elements • Model with or without base slab • Support condition fixed vs actual spring values • Consideration of soil mass, etc.	**1-JAN-24**	**8:30 PM TO 10:00 PM**
13	**Open discussion | Way forward** • Balance queries from the participants • Discussion related to queries of the ongoing projects, if any • Concluding remarks • Way forward, etc.	**2-JAN-24**	**8:30 PM TO 10:00 PM**

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 civi/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

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