



EXPRESS
ENGINEERING
SOLUTIONS

PRESSURE VESSEL DESIGN

**AS PER
ASME SEC VIII DIV 1**



No one can de-code the code like us...!



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COURSE CONTENT

1

Pressure Vessel Design

(84 hrs)

Lecture No	Topics CLICK ON TOPICS FOR DETAILS	Hours (hrs)
1	Introduction	6
2	Internal Pressure Calculations	7
3	External Pressure Calculations	7
4	Nozzle Design	12
5	Flange Design	12
6	PWHT & PHFT	5
7	Impact Testing	5
8	Lifting Lug Design	2
9	Hydrostatic Test, Pneumatic Test Requirements Of Code	4
10	Wind , Seismic & Combine Loading	9
11	Materials	5
12	All weld figures	4
13	Supports	6



COURSE CONTENT

1

Introduction

(6 hrs)

- Understanding ASME BPV Code.
- Structure of ASME Section VIII Div-1.
- Thin cylinder stress derivations.
- Important Code definitions.
- ASME Section VIII div-1 - Scope and Limitations.
- Types of Loadings on Pressure Vessel (UG-22).
- Important Properties of Pressure Vessel materials.
- Introduction to UG-23 and ASME Section II Part D, Factor of Safety.
- Table U-3: Year of acceptable Edition of referenced Standards in this Division.
- Categories of Weld Joints.
- Joint Efficiency and Table UW-12 understanding.

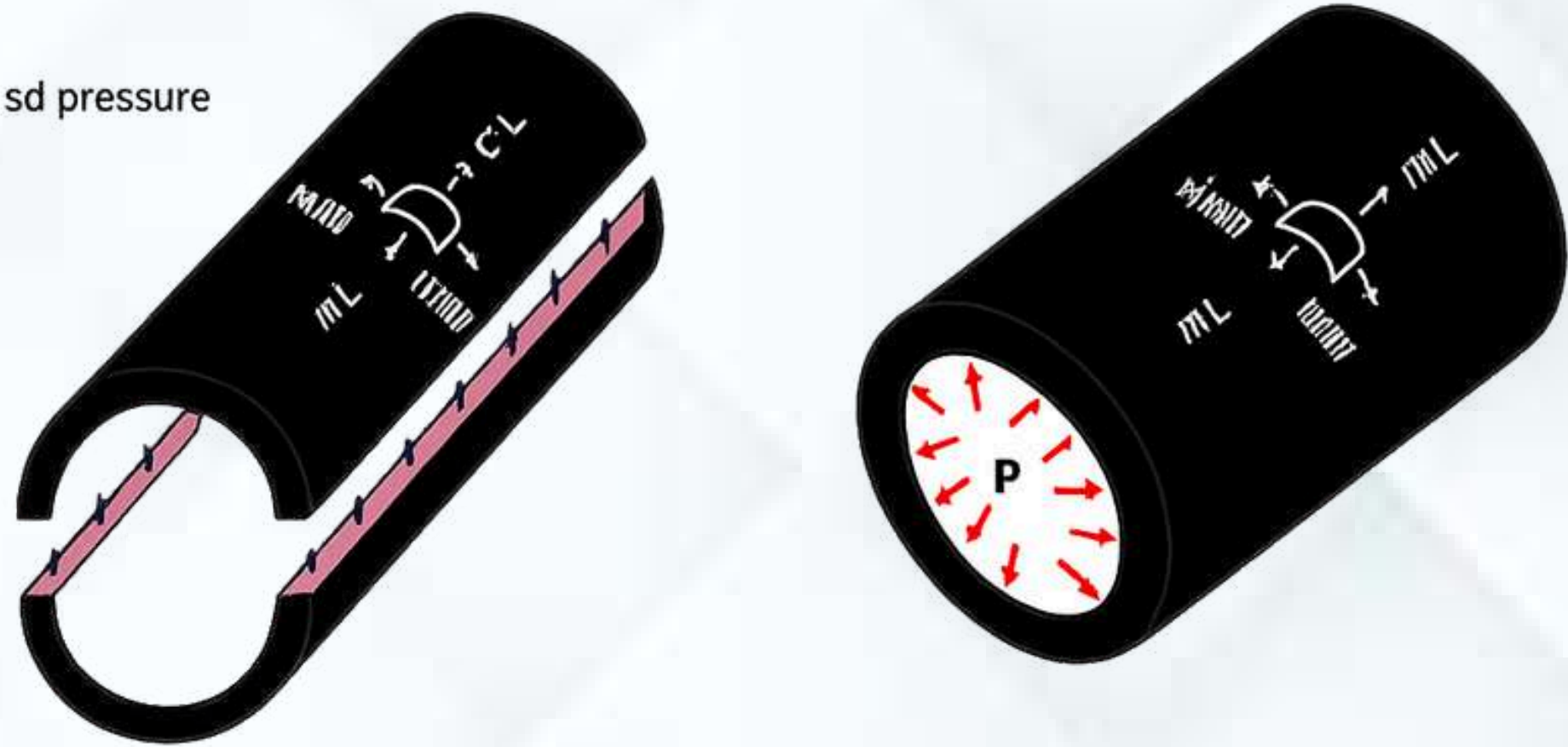
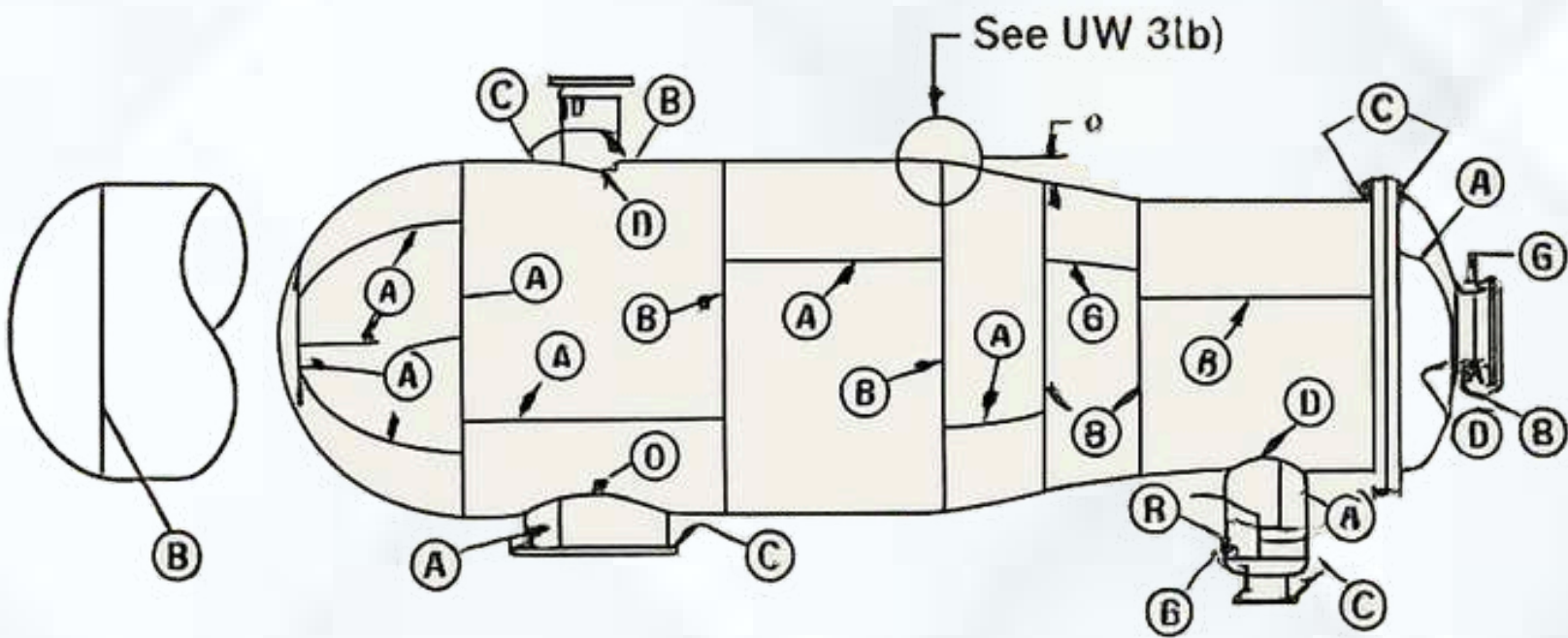


Figure UW-3

Illustration of Welded Joint Locations Typical of Categories A, B, C, and D



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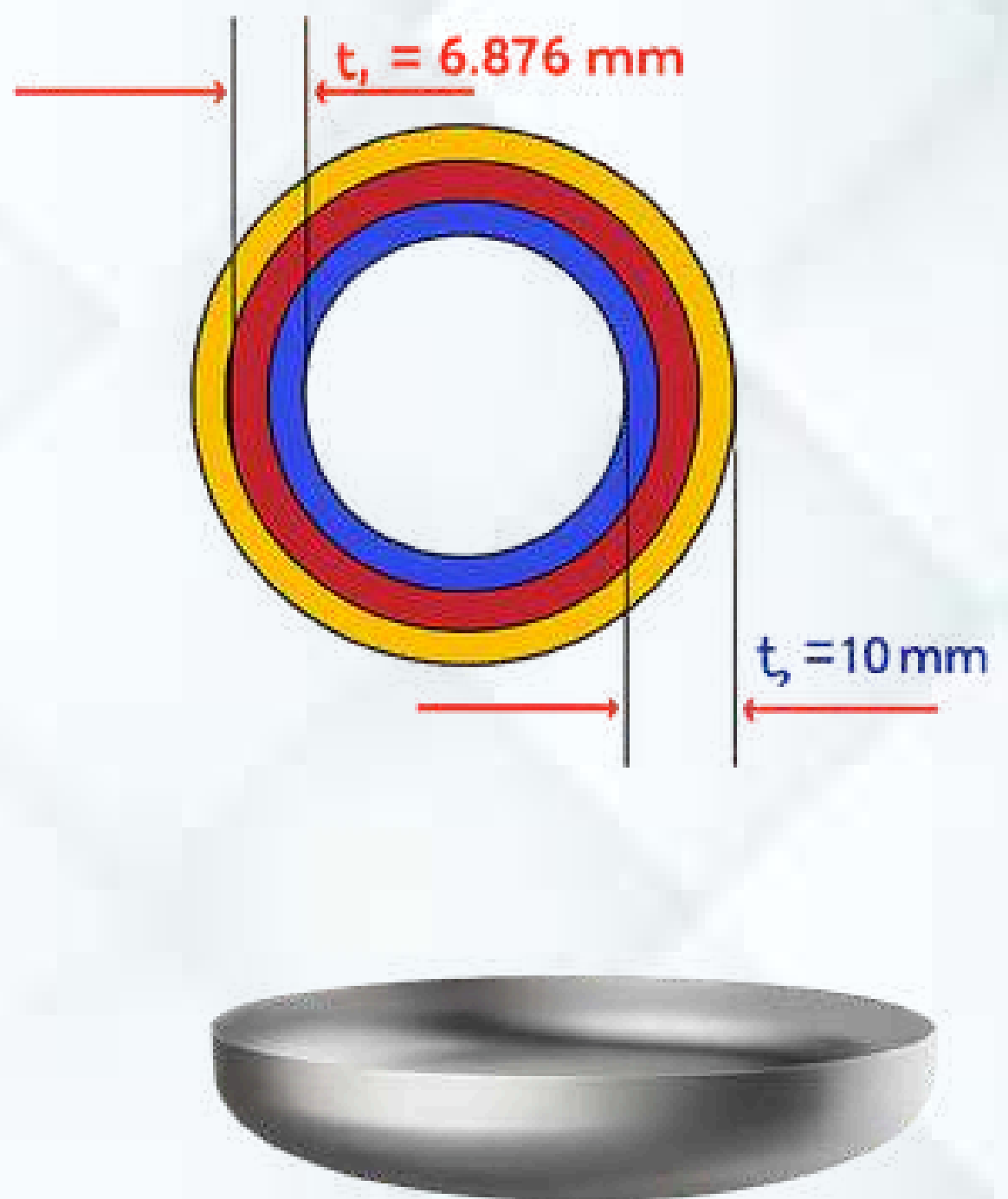
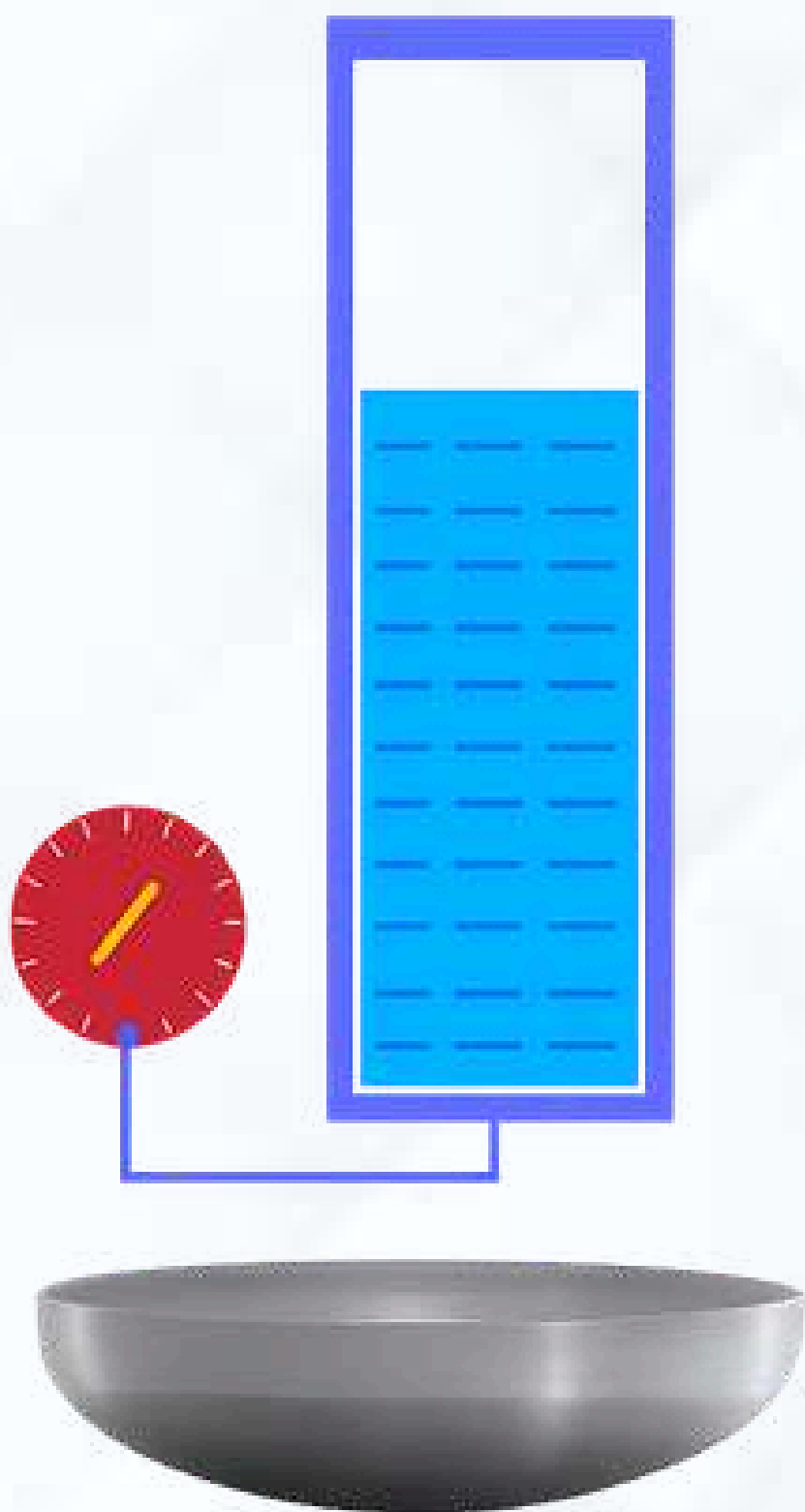
COURSE CONTENT

2

Internal Pressure Calculations

(7 hrs)

- Joint Efficiency and Table UW-12 understanding.
- Concept of MAWP.
- Liquid Static head calculations.
- Mill Tolerances- UG-16.
- Units and Conversion.
- Thickness calculation for internal pressure for
 - Cylindrical shell
 - Spherical and Hemispherical shell
 - Conical shell
 - Torispherical dished end
 - Ellipsoidal dished end
 - Flat Head Thickness calculation



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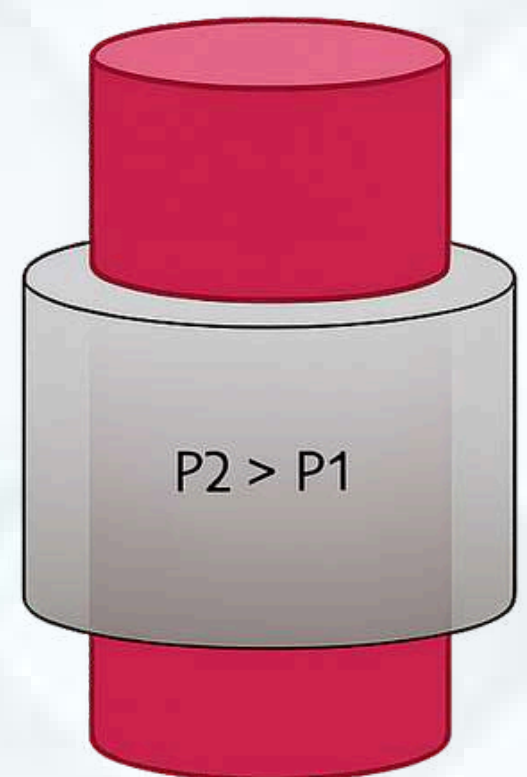
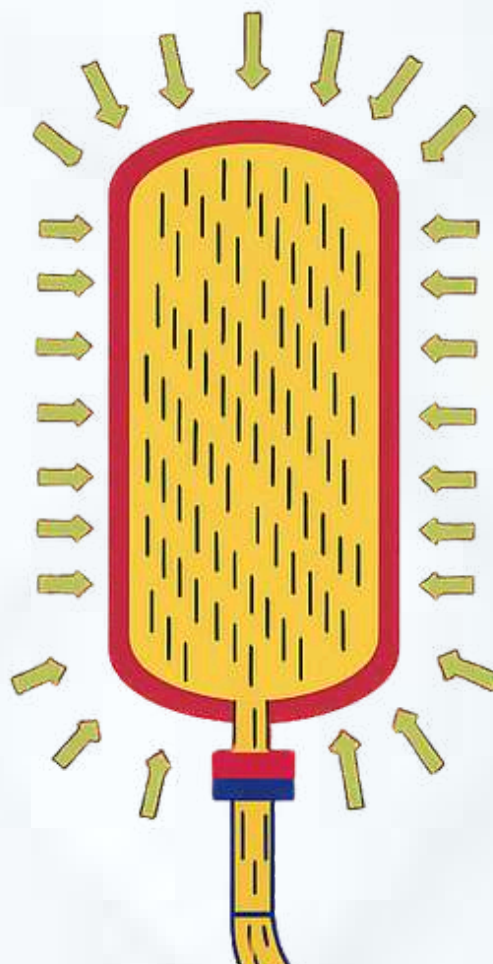
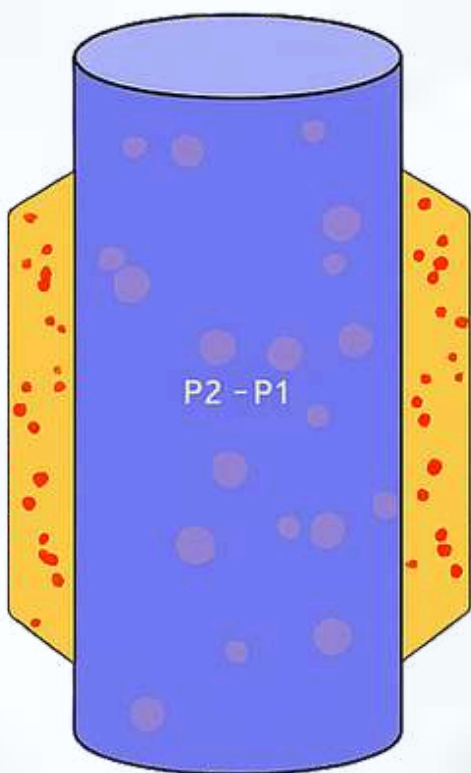
COURSE CONTENT

3

External Pressure Calculations

(7 hrs)

- Failures caused by External Pressure & Concept of External Pressure.
- How external pressure works?
- Line of support concept.
- Significance of L/D_o and D_o/t ratios.
- Cylindrical shell, Spherical shell.
- Thickness calculation procedures for External pressure
 - Graphical method
 - Tabular Method
 - Thickness calculation for External pressure
 - Cylindrical shell, Thickness reduction by using stiffeners
 - Spherical and Hemispherical shell
 - Conical shell
 - Torispherical dished end
 - Ellipsoidal dished end
 - Flat Head Thickness calculations
- Concept of Stiffener design for external pressure.
 - Procedure for Stiffener design for external pressure
 - Moment of inertia calculations for various stiffener cross sections
 - Manual calculations of stiffener sizing

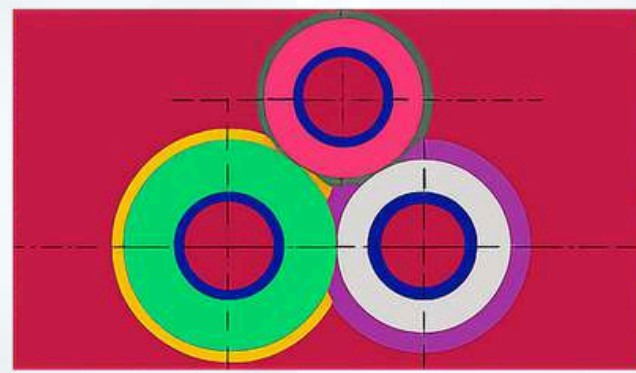
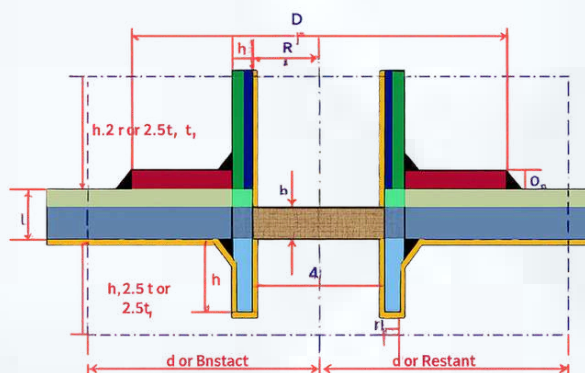


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- Types of Nozzles.
- Nozzle neck thickness calculation criteria.
- Nozzle neck thickness calculation as per UG45 theory & manual problem.
- Openings in Pressure Vessel as per UG-36.
- Understanding the Reinforcement of Multiple openings.
- Shape of opening.
- Openings in end closures.
- Strength and Design of finished opening.
- Small opening criteria for cylinder, cones & Flat Heads.
- Concept of reinforcement for Cylindrical & conical shell
 - For normal opening other than large opening- As per UG-37.
 - Reinforcement for large opening- As per UG-37, & 1-7
- Concept of reinforcement for Dished Ends
 - Reinforcement for all openings - As per UG-37
- Concept of reinforcement requirements in Flat Heads
 - Reinforcement for normal opening other than large opening as per UG-39.
 - Reinforcement for central large opening- As per Mandatory Appendix -14
- Understanding of Concept- As per UG-37- for Set in nozzles.
- Understanding of Concept- As per UG-37- for Set on nozzles.
- Manual problem solving for Set in Nozzle.
- Concept of multiple openings criteria for Vessels.
- Manual Problem solving for Set on Nozzle.
- Manual Problem solving for multiple openings.
- Manual Problem solving for openings in Flat head as per UG-39(b).
- Manual Problem solving for openings in Flat head as per UG-39(d) alternative method.



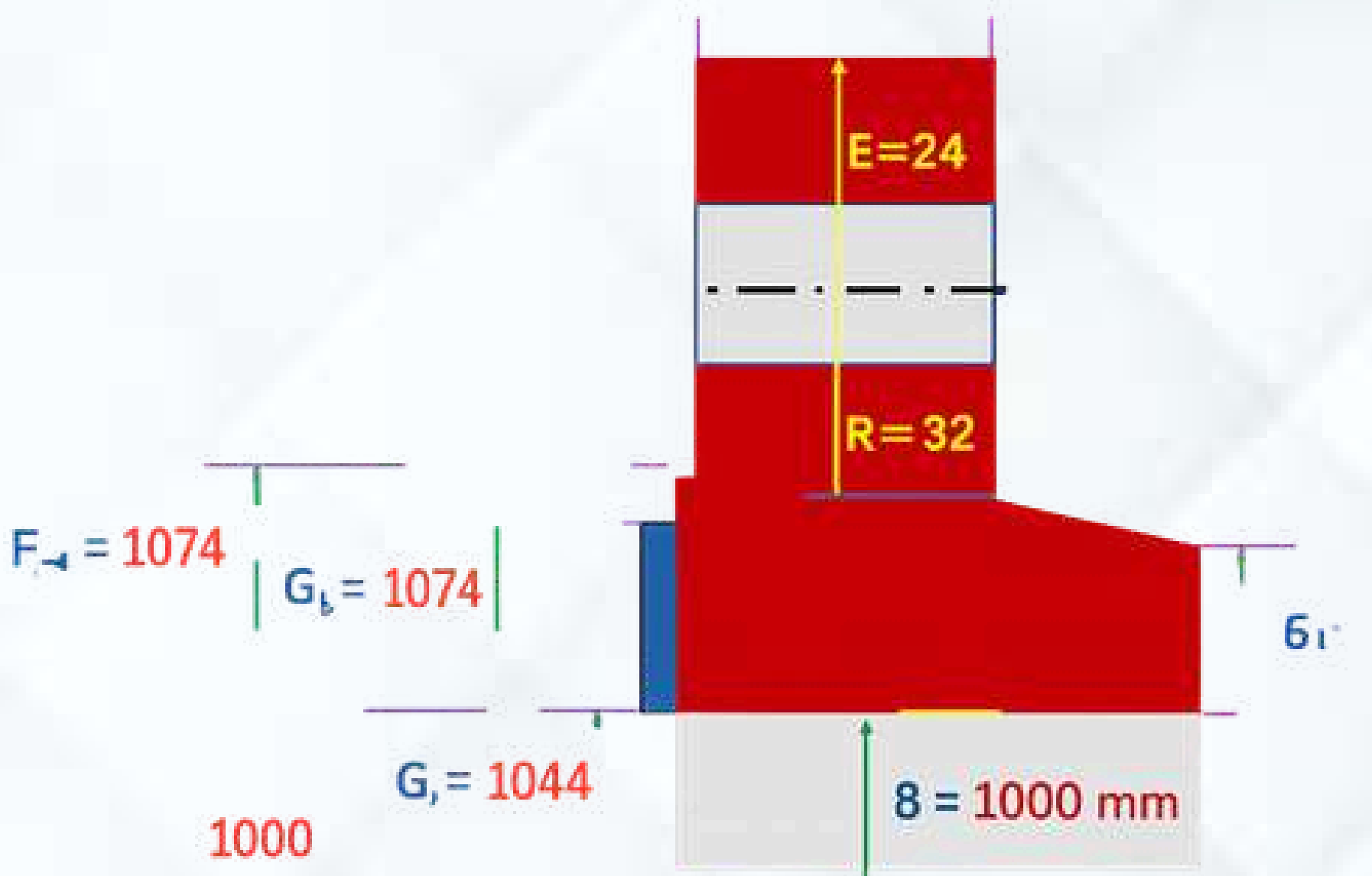
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- Types of Flanges as per its application.
- Selection of Standard Flanges.
- Scope Of Mandatory Appendix-2.
- Type of Flanges as per Mandatory Appendix-2.
- Flange design concept and steps as per Mandatory Appendix -2.
- Defining Flange Geometry for Integral flange.
- Defining Flange Geometry for Loose ring & optional type.
- Blind Flange Design concept.
- Manual Problem for Integral Flange.
- Manual Problem for Loose ring Flange.
- Blind Flange Design calculations & finding deflection as per TEMA.
- Rectangular Flange Design as per PD-5500.

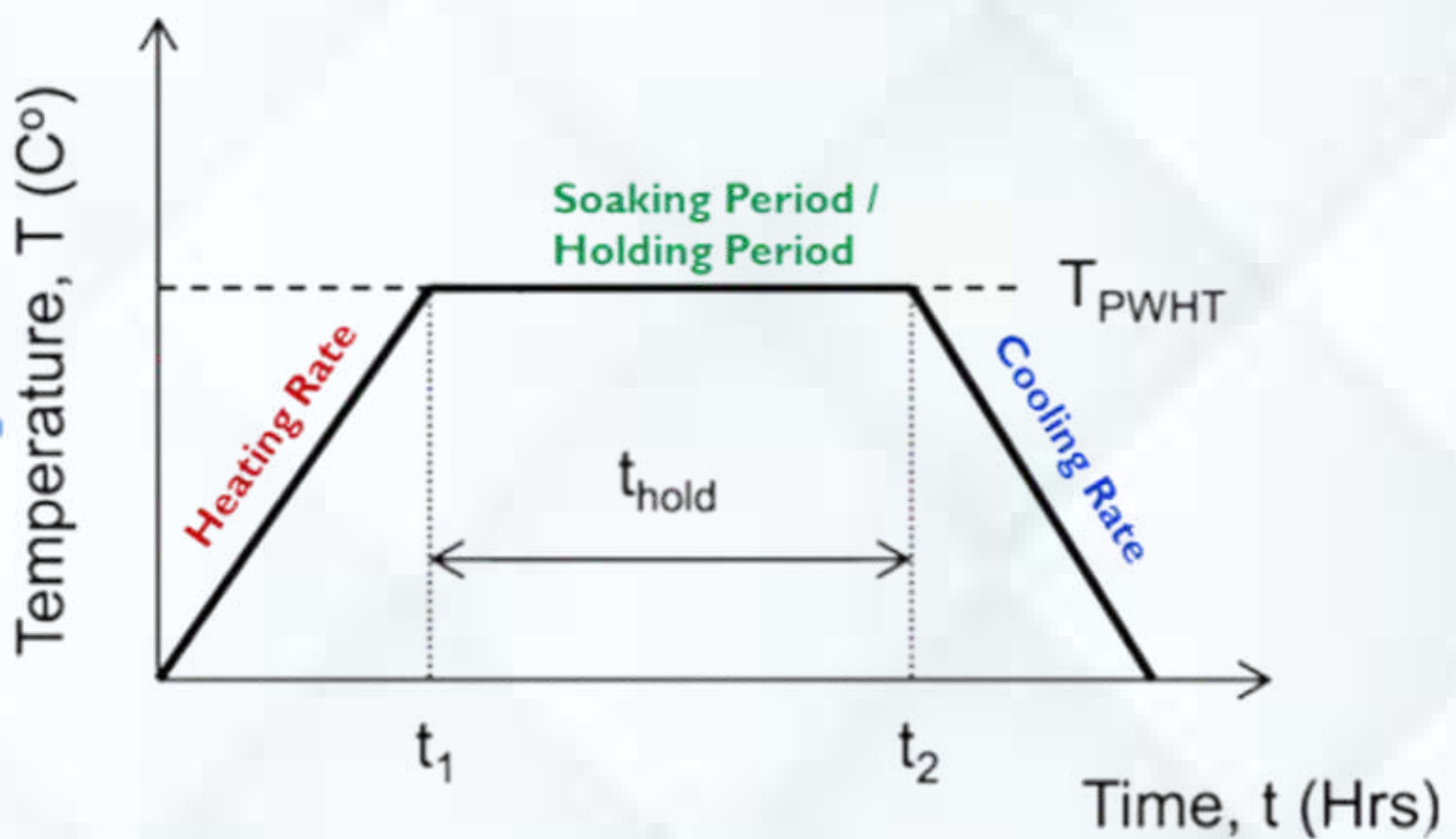
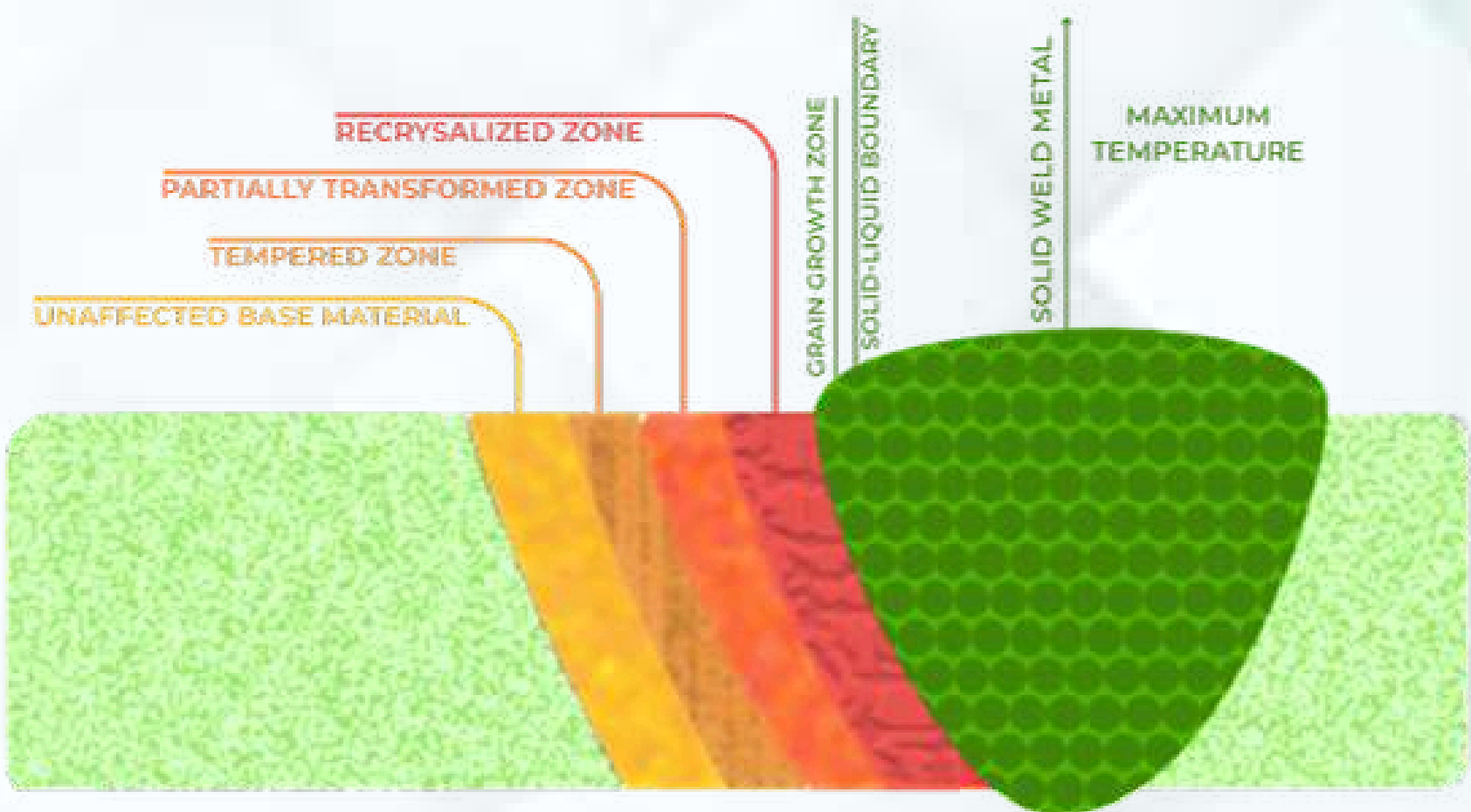


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- Welding Procedure understanding.
- HAZ and Residual stress understanding.
- How stress relieving works?
- Understanding the need and significance of PWHT (UCS-56).
- PWHT exemption requirements in ASME codes.
- Procedures and methods for PWHT.
- PFHT requirements of code.
- Procedures for PFHT.
- Heating / cooling rates.
- Manual problems solving for PWHT and PFHT calculations.



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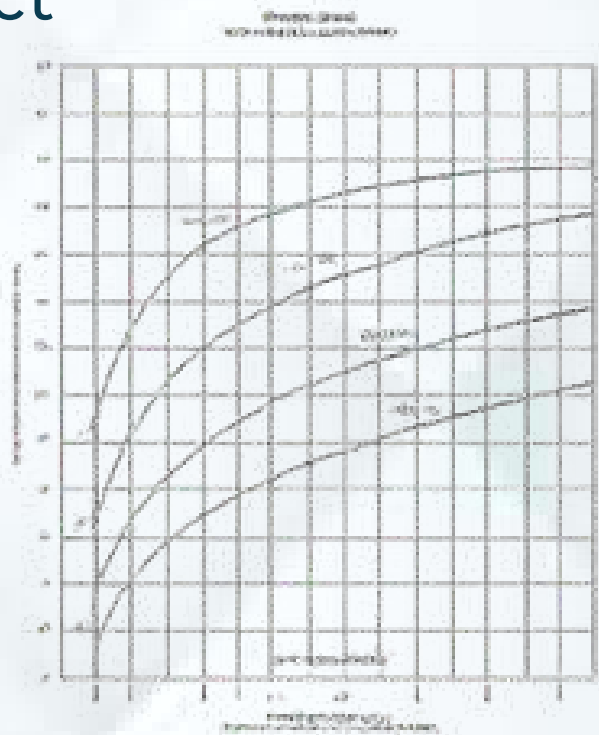
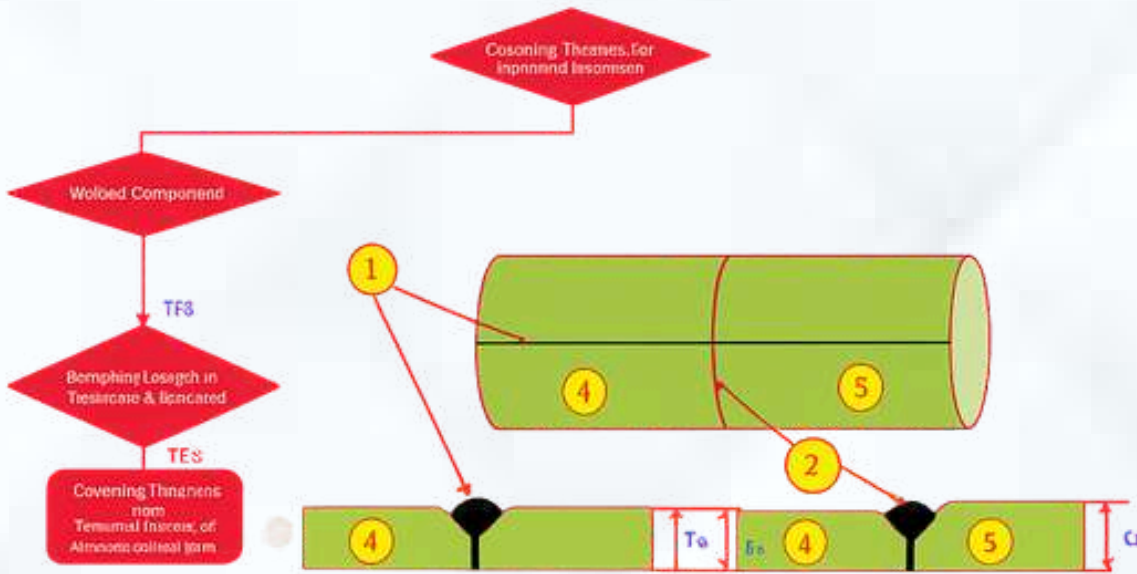
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Impact Testing

(5 hrs)

- Low temperature working of different material.
- Governing thickness concept for impact testing.
- Understanding Impact test requirement.
- Impact test code exemptions.
- Impact test acceptance criteria.
- Material Thickness criteria for impact test.
- Impact test exemption curves.
- Manual Problem solving for Impact testing requirement.

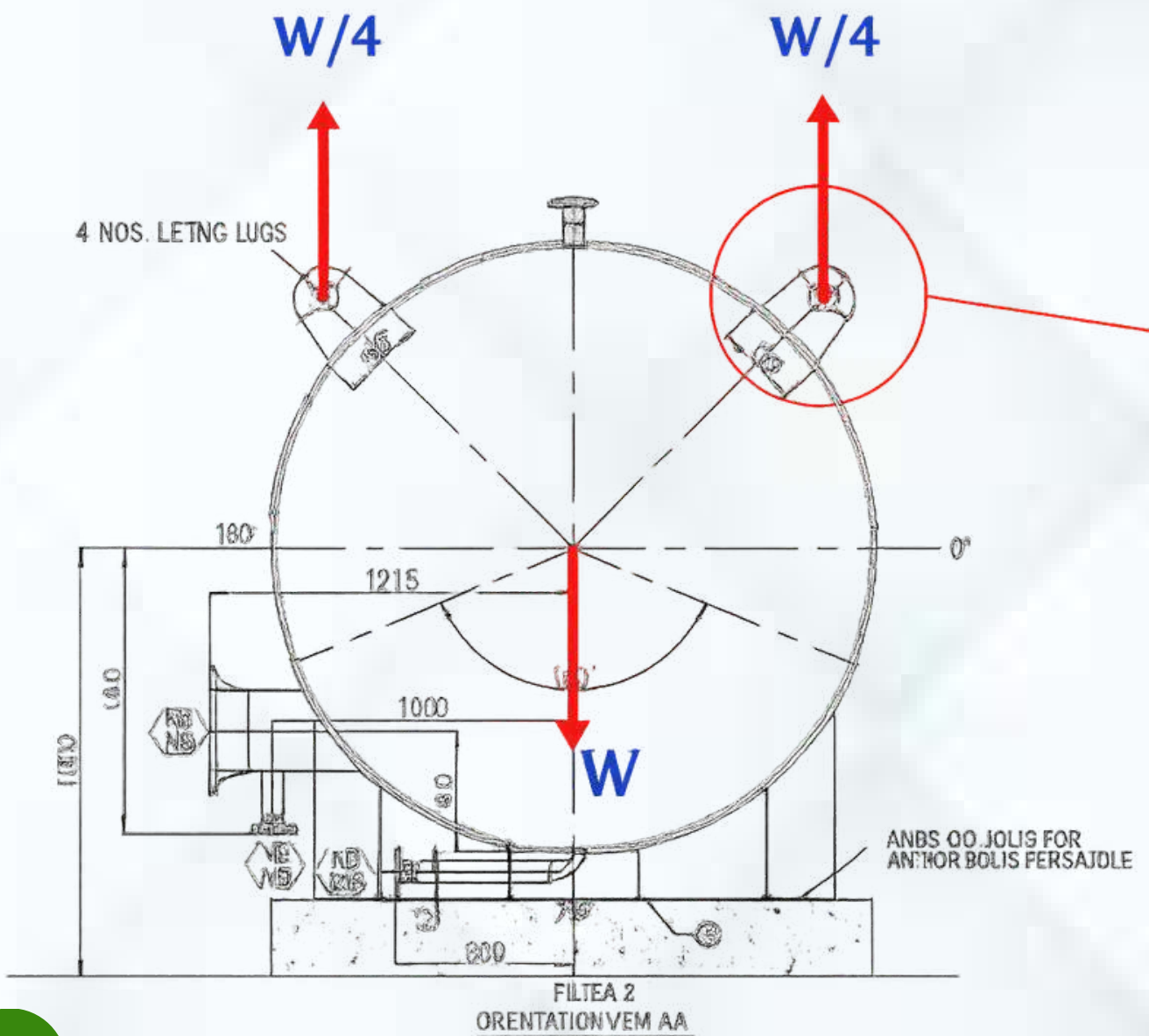


8

Lifting Lug Design

(2 hrs)

- Lifting Lug Design.
- Lifting Lug Design in PV elite.

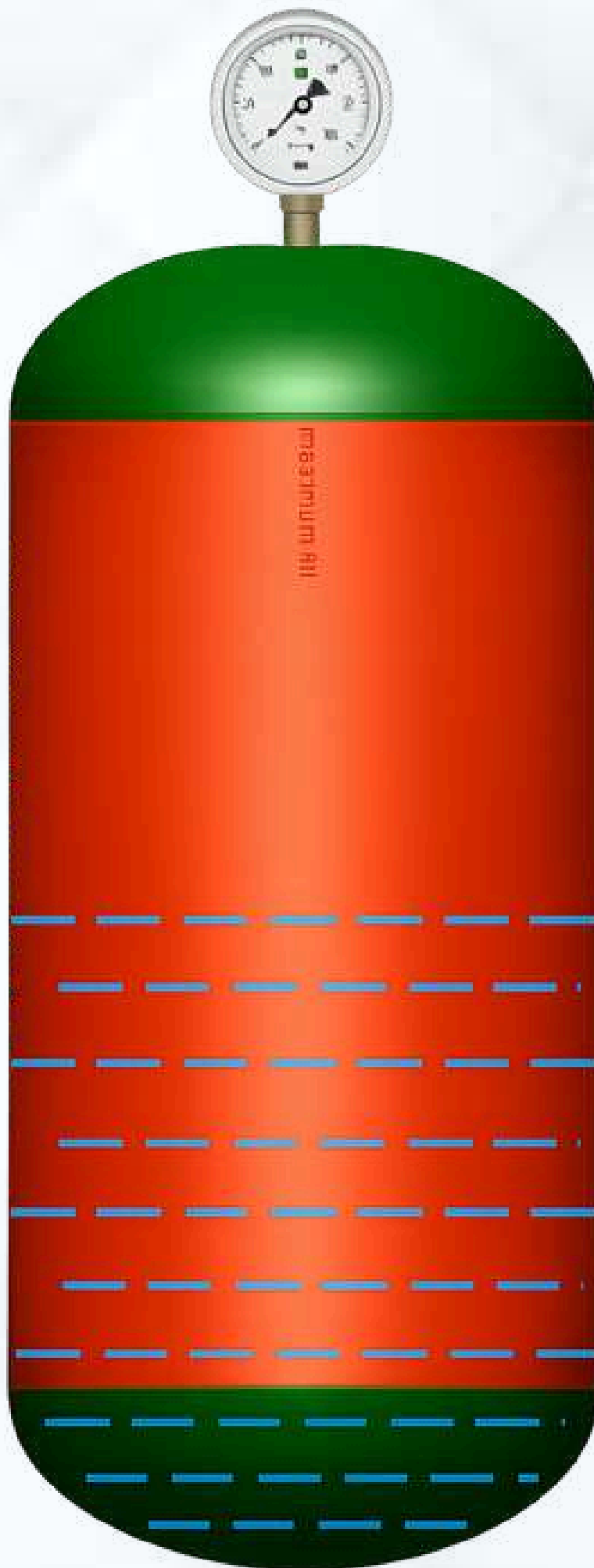


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- Pressure Testing requirements.
- Important definitions- MAWP, LSR, Calculated Test pressure.
- Hydrostatic Test requirement and significance.
- Hydrostatic Test procedure & Code requirements.
- Pneumatic Test requirement and significance.
- Pneumatic Test procedure and Code requirements.
- Calculating Test pressures, inspection pressures.
- Understanding pressurization stages, Test temperatures, & Test time significance.
- Proof Tests to establish maximum allowable working pressure.
- Manual Problem solving & PV Elite hydrotest calculations.



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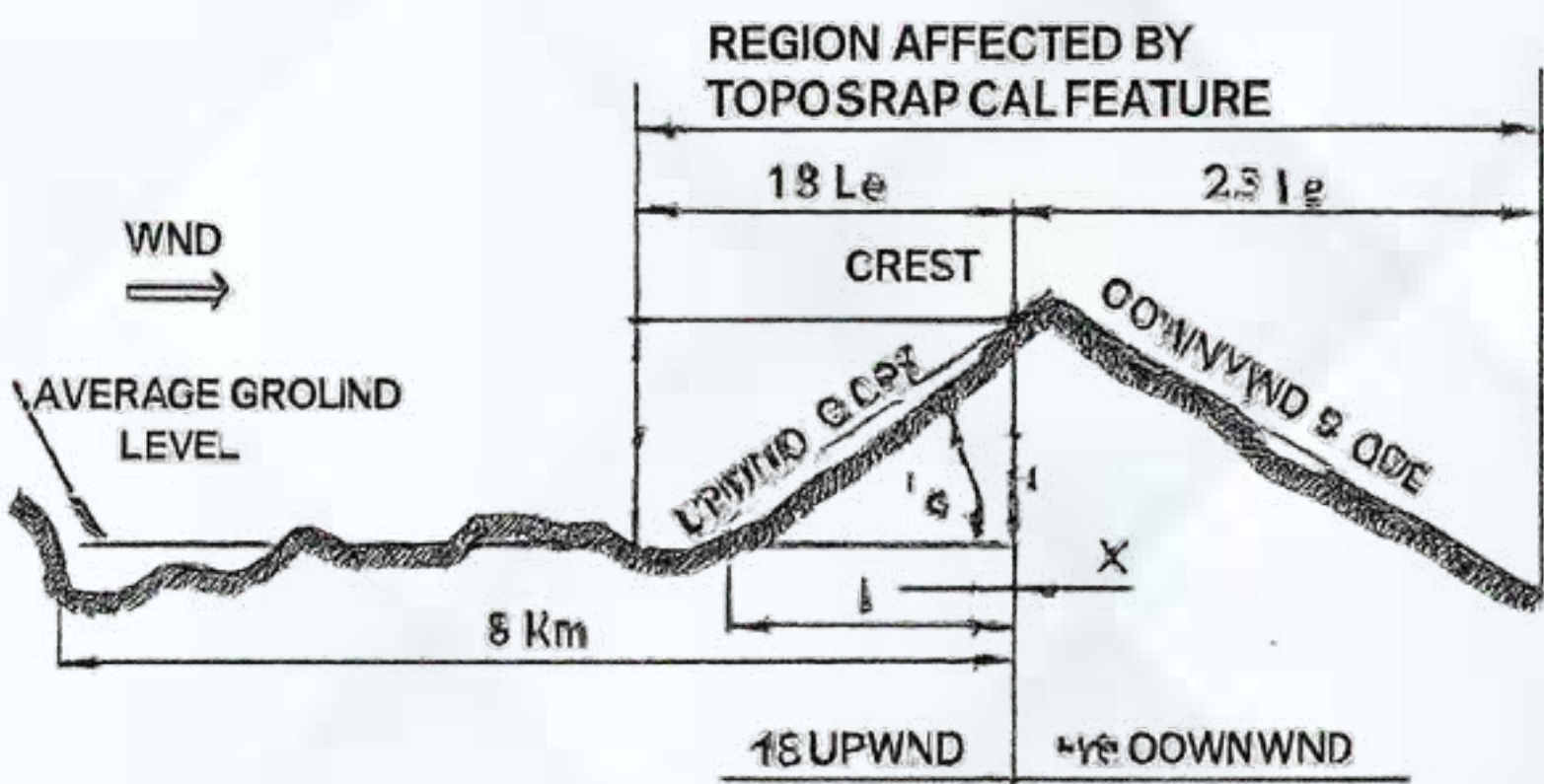
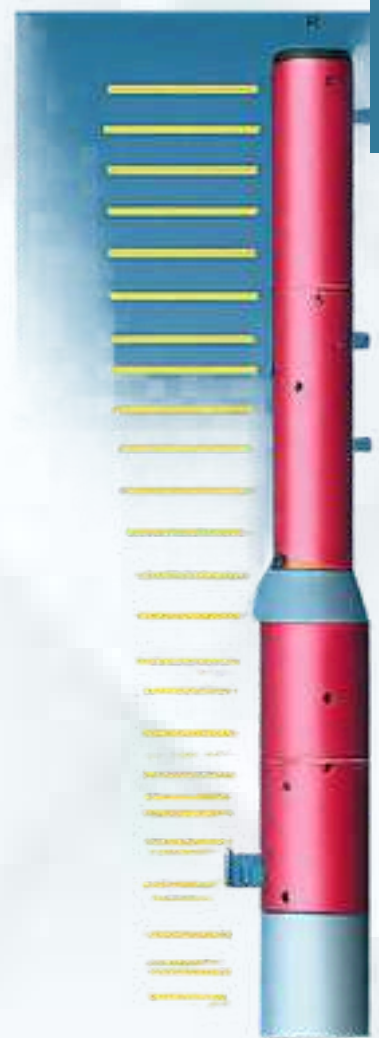
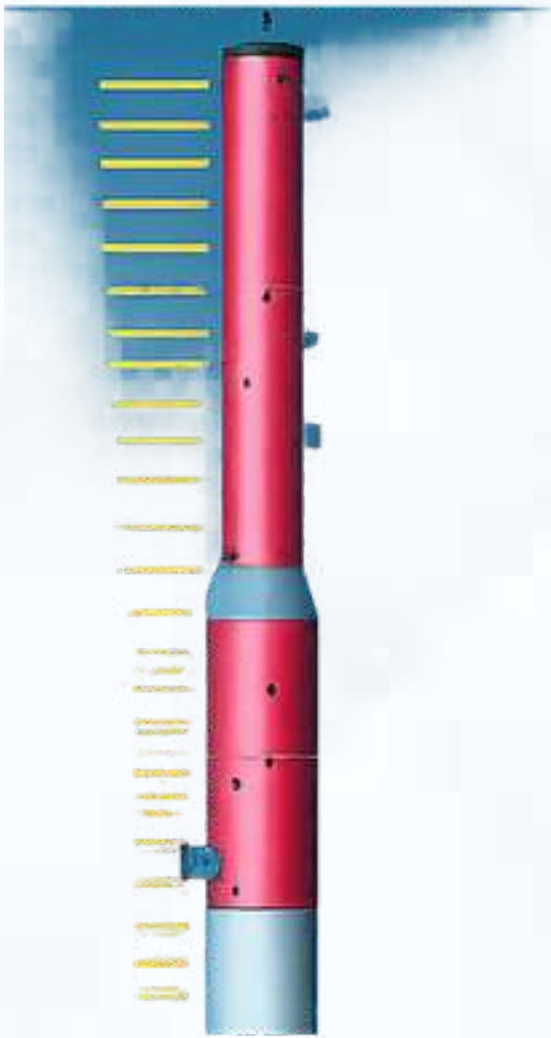
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10

Wind , Seismic & Combine Loading

(9 hrs)

- Understanding Concept of Wind load.
- Calculation of wind load as per IS 875.
- Understanding concept Of Seismic load.
- Calculation of seismic load as per IS 1893.
- Concept of Combined Loading.
- Manual Problem Solving for seismic Load + PV Elite calculations.
- Manual Problem Solving for wind Load + PV Elite calculations.
- Manual Problem Solving for combined loadings + PV Elite calculations.



13 (A) GENERAL NOTATIONS



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(5 hrs)

- | The Effect of Alloying Elements On The Properties Of steel | | | | | | | |
|--|-----------------------|----------------|------------|----------|----------------------|-------------|------------------------|
| Alloying Element | Mechanical Properties | | | | Corrosion Resistance | Weldability | Controlled Environment |
| | Tensile Strength | Yield Strength | Elongation | Hardness | | | |
| Carbon | A | B | C | D | E | F | G |
| Manganese | H | I | J | K | L | M | N |
| Silicon | O | P | Q | R | S | T | U |
| Phosphorus | V | W | X | Y | Z | AA | AB |
| Sulfur | AC | AD | AE | AF | AG | AH | AI |
| Nickel | AJ | AK | AL | AM | AN | AO | AP |
| Copper | AQ | AR | AS | AT | AU | AV | AW |
| Aluminum | AX | AY | AZ | BA | BB | BC | BD |
| Chromium | BE | BF | BG | BH | BI | BJ | BK |
| Molybdenum | BL | BM | BN | BO | BP | BQ | BR |
| Niobium | BS | BT | BU | BV | BW | BX | BY |
| Vanadium | BZ | CA | CB | CC | CD | CE | CF |
| Titanium | CG | CH | CI | CJ | CK | CL | CM |
| Antimony | CN | CO | CP | CQ | CR | CS | CT |
| Strontium | CU | CV | CW | CX | CY | CZ | CA |
| Barium | CB | CC | CD | CE | CF | CG | CH |
| Lead | CI | CJ | CK | CL | CM | CN | CO |
| Zinc | CP | CQ | CR | CS | CT | CU | CV |
| Aluminum | CA | CB | CC | CD | CE | CF | CG |
| Magnesium | CH | CI | CJ | CK | CL | CM | CN |
| Calcium | CO | CP | CQ | CR | CS | CT | CU |
| Sulfur | CU | CV | CW | CX | CY | CZ | CA |
| Phosphorus | CA | CB | CC | CD | CE | CF | CG |

	Region	Country	City	Year	Population	Area	Notes
North America	USA	California	Los Angeles	2010	13.2 million	130,000 sq km	Population density: 100/sq km
	USA	Texas	Houston	2010	10.0 million	697,000 sq km	Population density: 14/sq km
	USA	Florida	Miami	2010	21.0 million	170,000 sq km	Population density: 124/sq km
	USA	New York	New York City	2010	19.0 million	14,000 sq km	Population density: 1357/sq km
Europe	Germany	Bavaria	Munich	2010	12.0 million	70,000 sq km	Population density: 171/sq km
	France	Paris	Paris	2010	11.0 million	105,000 sq km	Population density: 105/sq km
	Italy	Rome	Rome	2010	4.0 million	12,000 sq km	Population density: 333/sq km
	Spain	Madrid	Madrid	2010	3.0 million	6,000 sq km	Population density: 500/sq km
Asia	China	Beijing	Beijing	2010	1.3 billion	164,000 sq km	Population density: 79/sq km
	India	New Delhi	New Delhi	2010	1.1 billion	1,400,000 sq km	Population density: 79/sq km
	Japan	Tokyo	Tokyo	2010	120 million	377,000 sq km	Population density: 318/sq km
	South Korea	Seoul	Seoul	2010	45 million	100,000 sq km	Population density: 450/sq km
Africa	Nigeria	Lagos	Lagos	2010	160 million	125,000 sq km	Population density: 1280/sq km
	Egypt	Cairo	Cairo	2010	90 million	1,000,000 sq km	Population density: 90/sq km
	South Africa	Johannesburg	Johannesburg	2010	12 million	1,200,000 sq km	Population density: 10/sq km
	Kenya	Nairobi	Nairobi	2010	3.5 million	225,000 sq km	Population density: 15.6/sq km
South America	Brazil	Brazilia	Brazilia	2010	190 million	8,500,000 sq km	Population density: 22/sq km
	Argentina	Buenos Aires	Buenos Aires	2010	40 million	2,000,000 sq km	Population density: 20/sq km
	Colombia	Bogota	Bogota	2010	10 million	1,100,000 sq km	Population density: 9/sq km
	Venezuela	Caracas	Caracas	2010	28 million	912,000 sq km	Population density: 30.7/sq km

(4 hrs)

-



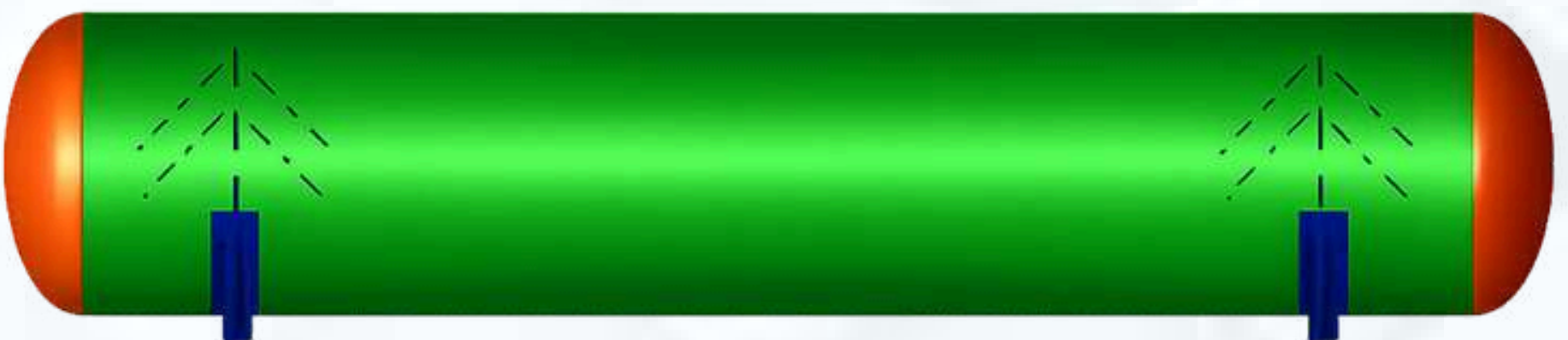
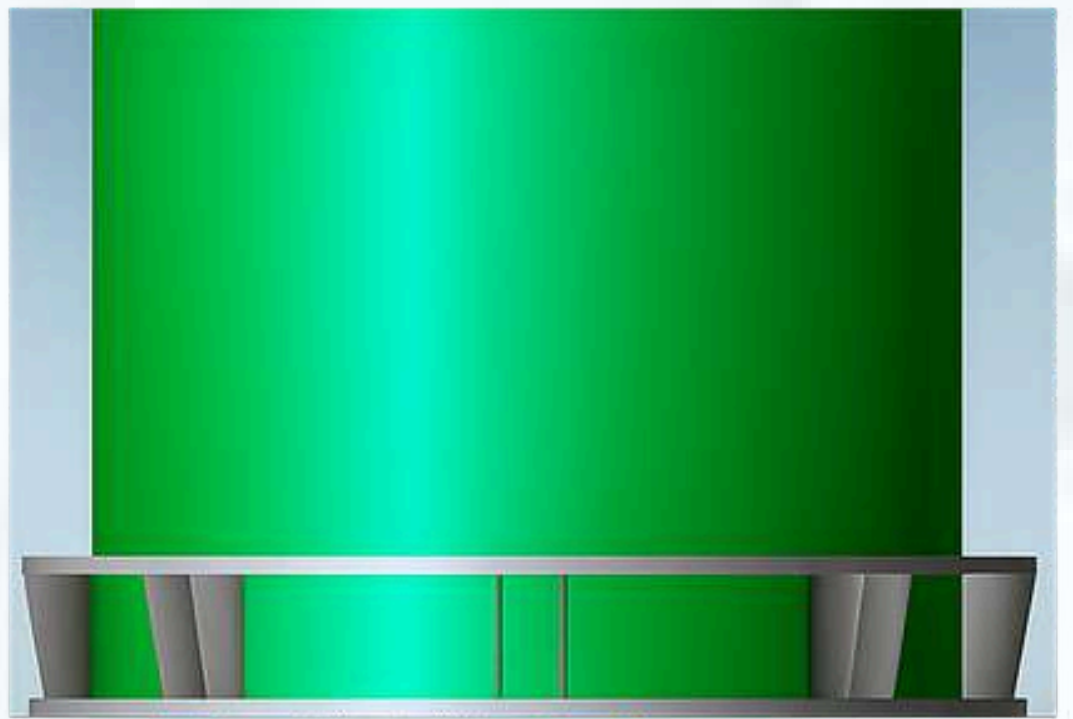
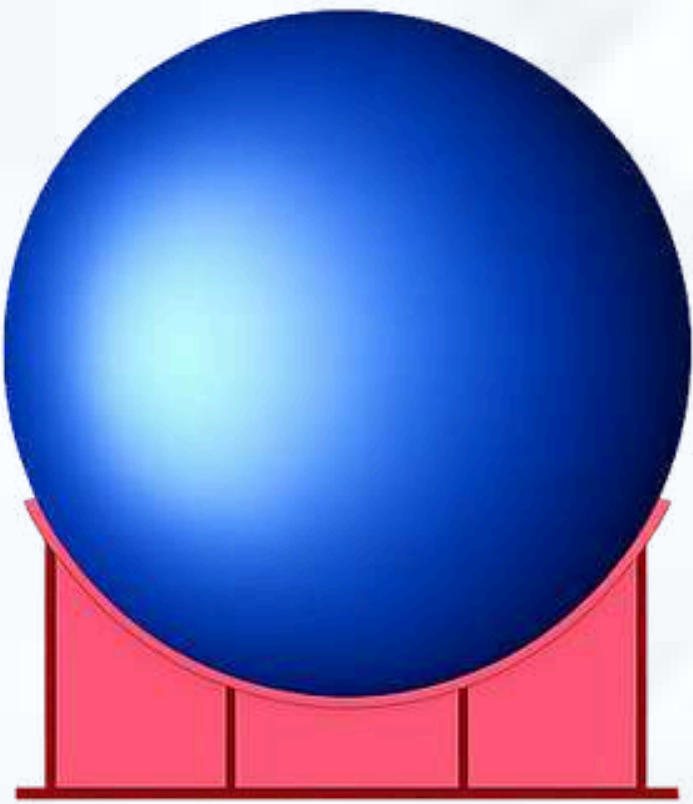
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Supports

(6 hrs)

- Types of Supports.
- Significance of following types of supports
 - Skirt Support
 - Leg Support
 - Lug Support
 - Saddle Support
- Stresses in Vessel due to Saddle Locations.
- Procedure for saddle support location.
- Calculation of stresses in vessel component as per Zick method (Div.2).
- Manual Problem Solving for calculation of stresses in vessel.
- Manual Problem Solving for saddle support design.
- WRC concept and sign conventions.



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About Us



Why Choose Us

With vast domain experience, highly capable & equipped Engineering Team we are specialized in providing the most professional Engineering services with fast turn around time. We also help businesses meet their goals with our cutting edge Engineering & Training services.



Mission

Our mission is to deliver world-class engineering solutions with simplicity, precision, and speed, while empowering professionals through comprehensive training that meets global industry standards.



Vision

To create a future where our cutting-edge expertise in engineering solutions and professional training empowers both clients and the industry, making us an indispensable partner in their success.



Our Core Values

1) INNOVATION

We consistently challenge the status quo by exploring new ideas & technologies to deliver creative, cutting-edge solutions.

2) INTEGRITY

We operate with unwavering honesty & transparency, building lasting trust with every client and partner.

3) CUSTOMER FOCUS

We are committed to understanding our clients' unique challenges & providing tailored, value-driven solutions.

4) ETHICS

We collaborate & support one another, believing our collective strength drives the best results for our clients.



Know The Trainer



Sachin Pol

Sachin is a Mechanical Engineer from Pune University and a Postgraduate in Pressure Vessel Design. He has **15+ years experience in Static Equipment Design**. He has worked in the field of Process Industry, Renewable Energy, Oil & Gas and Power Sector.

He is a well-known **corporate trainer** with versatile experience in the field of Static Equipment Design and FEA. He has successfully conducted trainings on PV Elite and ASME Codes across the globe for **more than 3500 professionals**.

Sachin served in some esteemed organizations like PRAJ, Thermax, Quadrogen.

He was an official presenter for Flange Design, Lifting Lug Design & WRC sign conventions at **CAU 2018** organized by Image Graphix across 8 cities in India.

With thorough technical knowledge and unmatched problem solving ability he has supported the customers to address their challenges and deliver quality output.



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Who Should Do This Course?



How We Can Help..!



Mechanical Engineer aspiring to make a career in Static Equipment Design in the field of Oil & Gas, Process Industry, Refinery, EPC, Chemical, Pharma & Power Sector.



Static Equipment Design Engineers looking to develop and excel in their role. This training will help them to **better understand** the code requirements and to **optimize the Design**. They will be able to **understand & resolve the queries and comments from customers and authorized inspectors**. They can **get answers** to their questions related to **live projects** as well. **No more delay** in Design due to any technical queries or questions.



Any Engineer seeking to switch to Static Equipment Design. The **in-depth** course content with detailed explanation of **code requirements, manual calculations** and easy to understand training material make it convenient to **transform** themselves into a **highly proficient** Static Equipment Design Engineer **in few months**.



Proposal/ Estimation Engineer looking to enhance their knowledge about materials, Design & various code requirements. This will help them to **optimize Design in a very short time** to match the proposal submission schedule.



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Design Services

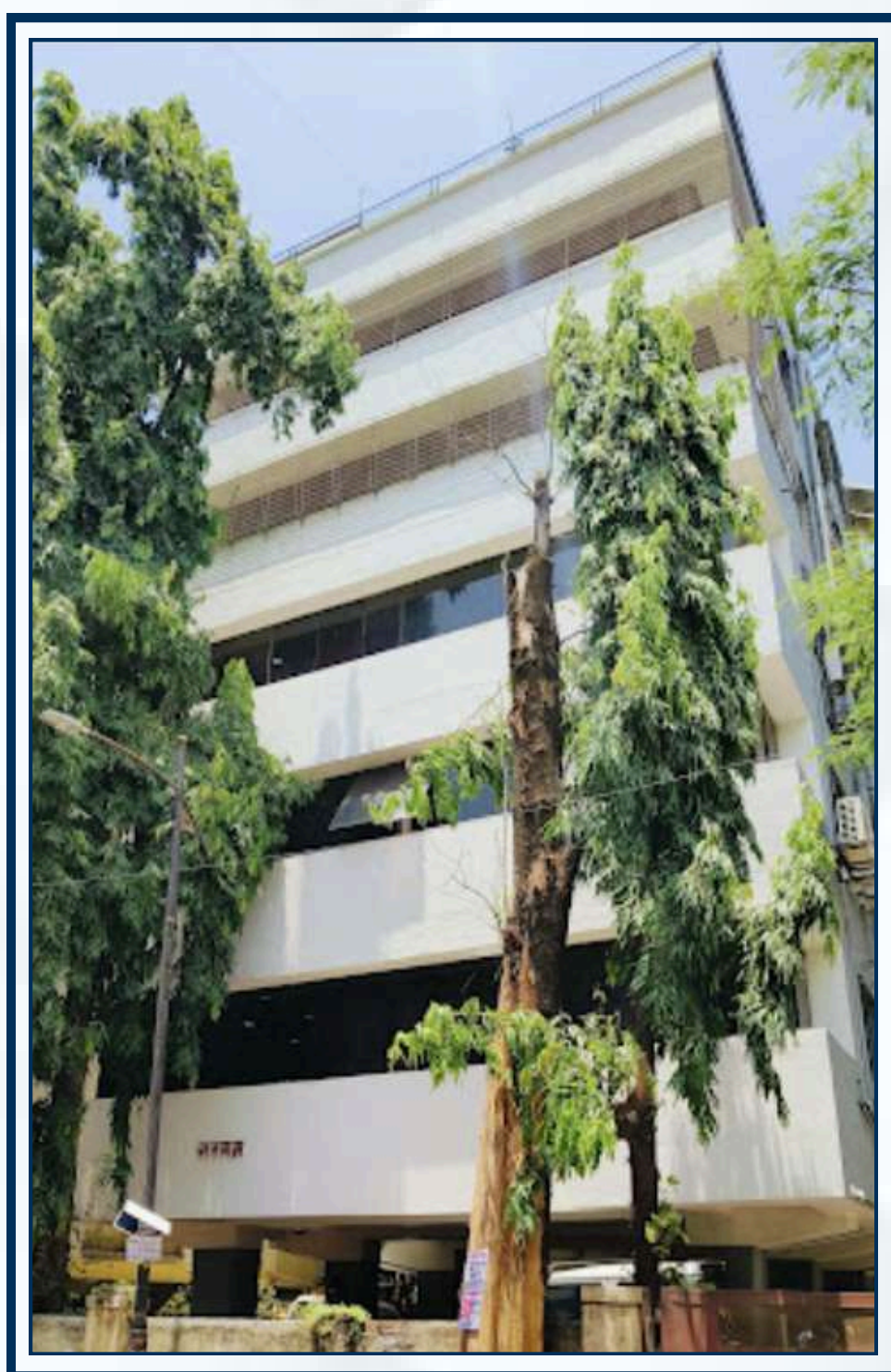
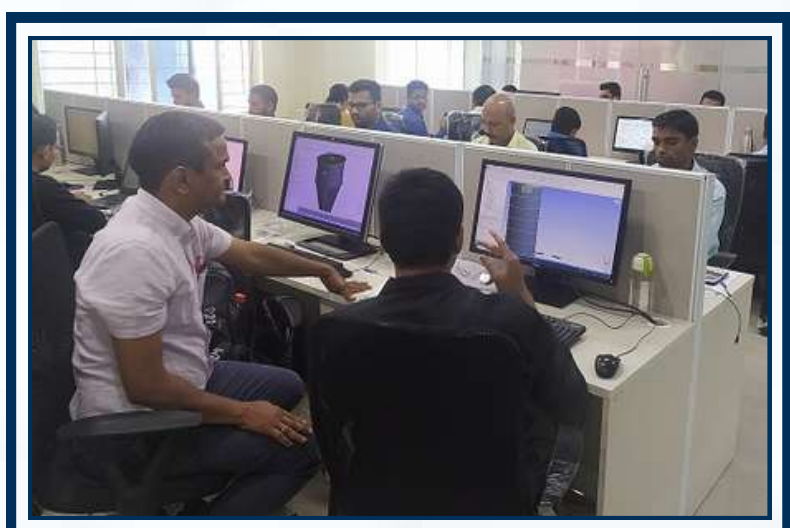


About Us

With vast experience in Static Equipment, Structure, Thermal & Piping Design, offer the best cost-efficient solutions to our customers. Our Engineering team is capable to deliver Design of Pressure Vessel, Heat Exchanger, Condenser, Reactor, Column, Storage Tank, and other static equipment, as per various national and international codes and standards.

The team is well experienced and trained to deliver Design as per ASME Sec VIII Div-1, Div-2, PED, ADMerk Blatter, PD5500, AS1210, GOST, TEMA, API 660, API 650, API 620, IBR, EN13445, etc.

We have successfully completed many ASME U-stamp audits and worked on hundreds of U-stamp vessels closely with many certifying agencies.



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Training Services



About Us

Our training program is the most professional and unique platform for Static Equipment Engineers. We are an Authorised Training Provider for ASME. We mean it, when we say, **“No one can de-code the code like us”**, as we have the experience and knowledge of working on various national and international codes and standards.

With a vast experience of Designing various Static Equipment, we provide the most **comprehensive** and **detailed** training courses to meet your needs. Within a short period, we have become the **most preferred training provider** to a lot of corporates and individuals.



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Corporate Training



Onsite Corporate Trainings

We have been instrumental in developing the workforce for organizations through our onsite training under our corporate training program. These training has helped the corporates to develop the skills and knowledge of their resources and as a result increase the output with better and optimized design of equipment.



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Our Customers



Our Corporate Customers

We have been instrumental in developing the workforce for organizations through our onsite training under our corporate training program. These training has helped the corporates to develop the skills & knowledge of their resources & as a result increase the output with better & optimized design of equipment.



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Our Track Record



How We Have Been Doing..!



100+

Corporate Customers



4000+

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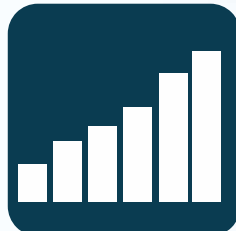
20+

Countries With Beneficiaries
Across The Globe



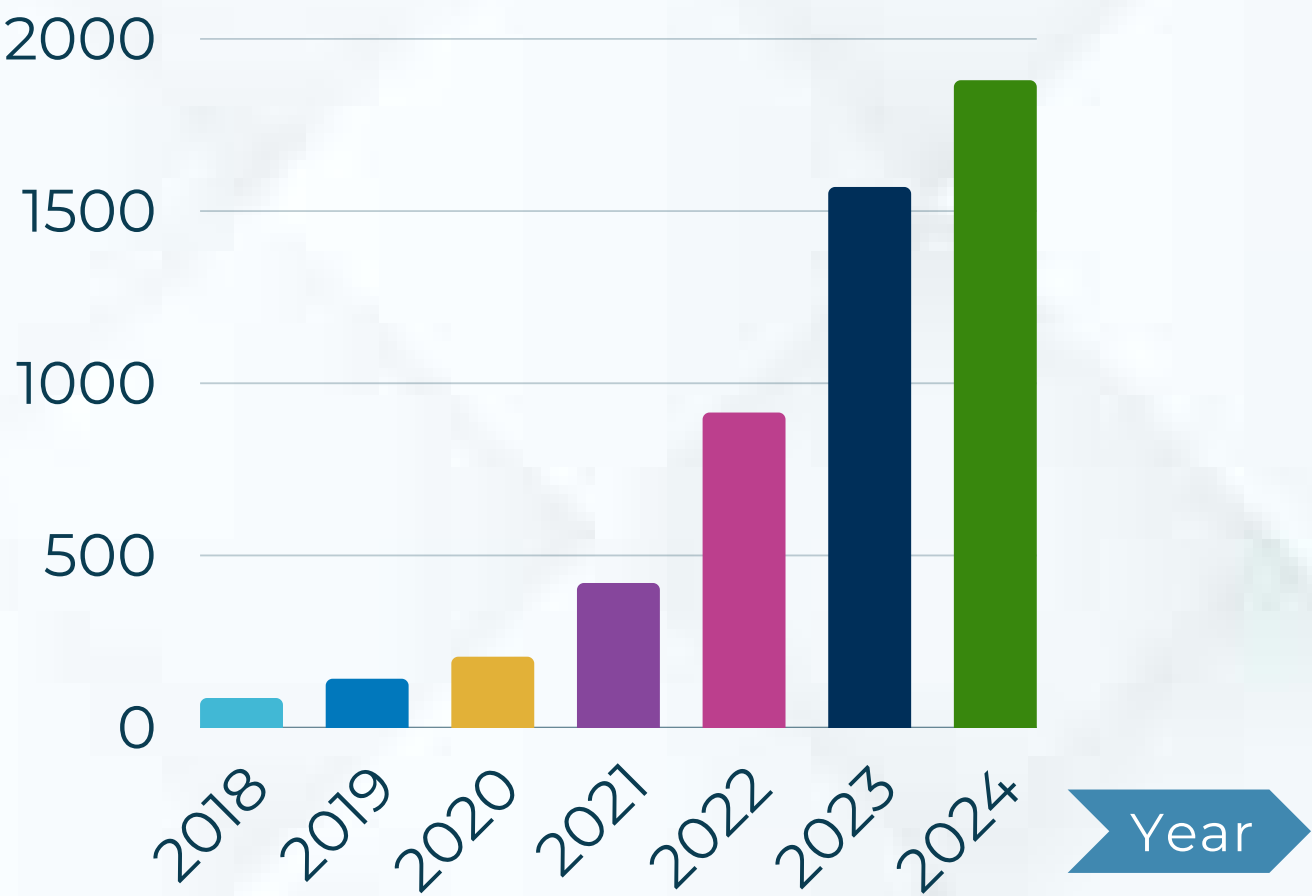
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Experience Range Of
Engineers Trained

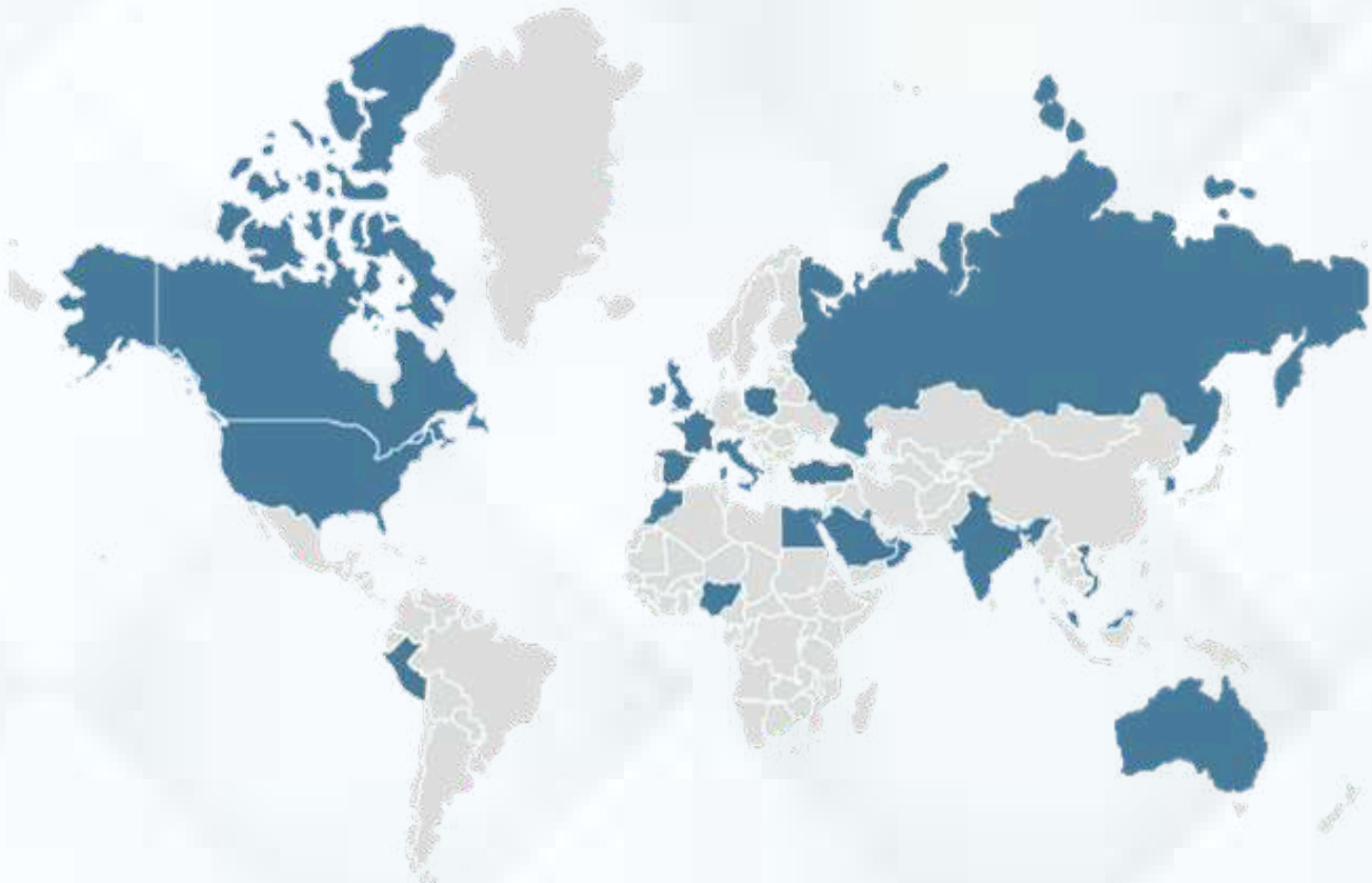


Over The Year...!

Professionals Trained So Far..!



Beneficiaries Across The Globe



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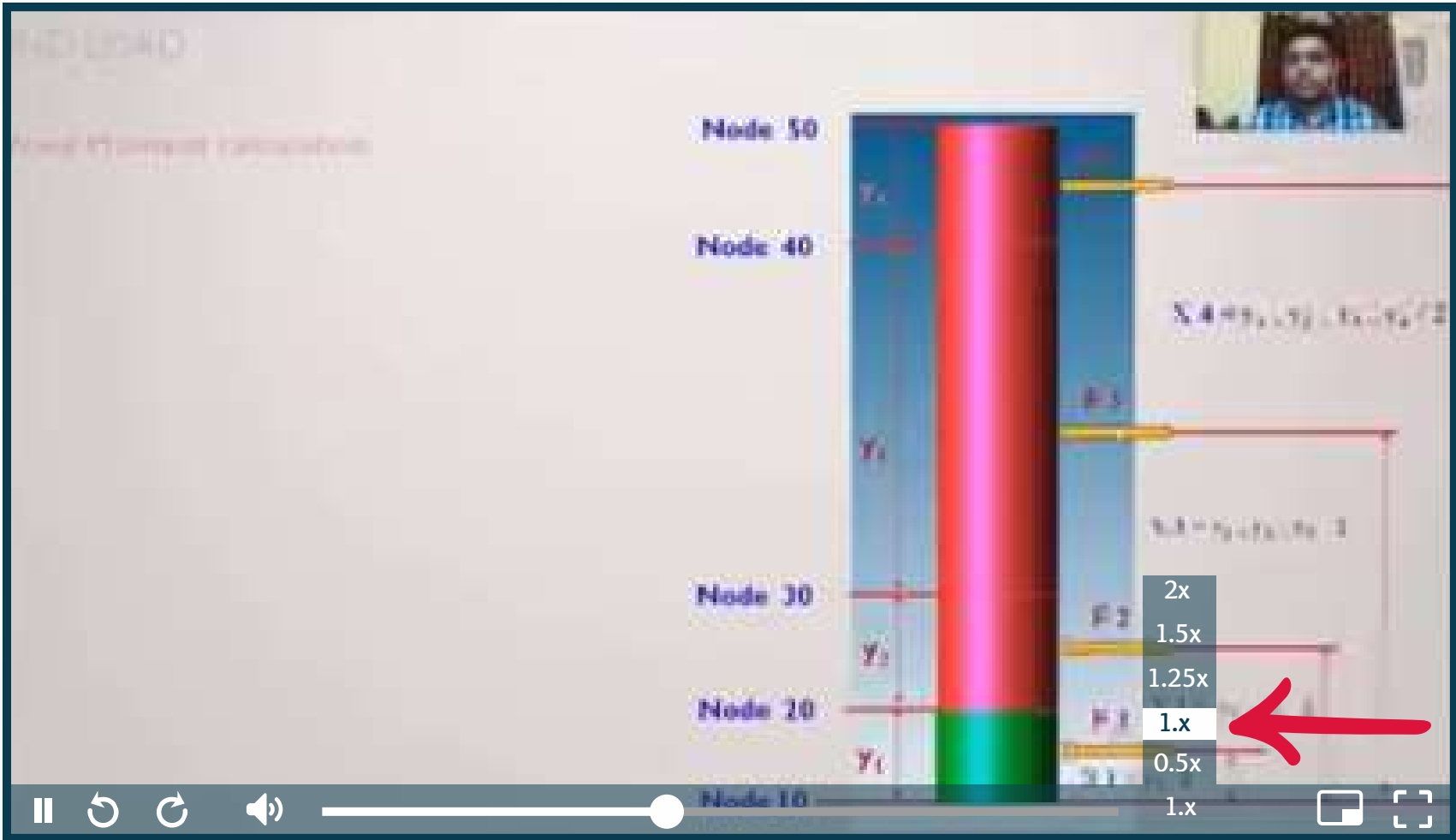


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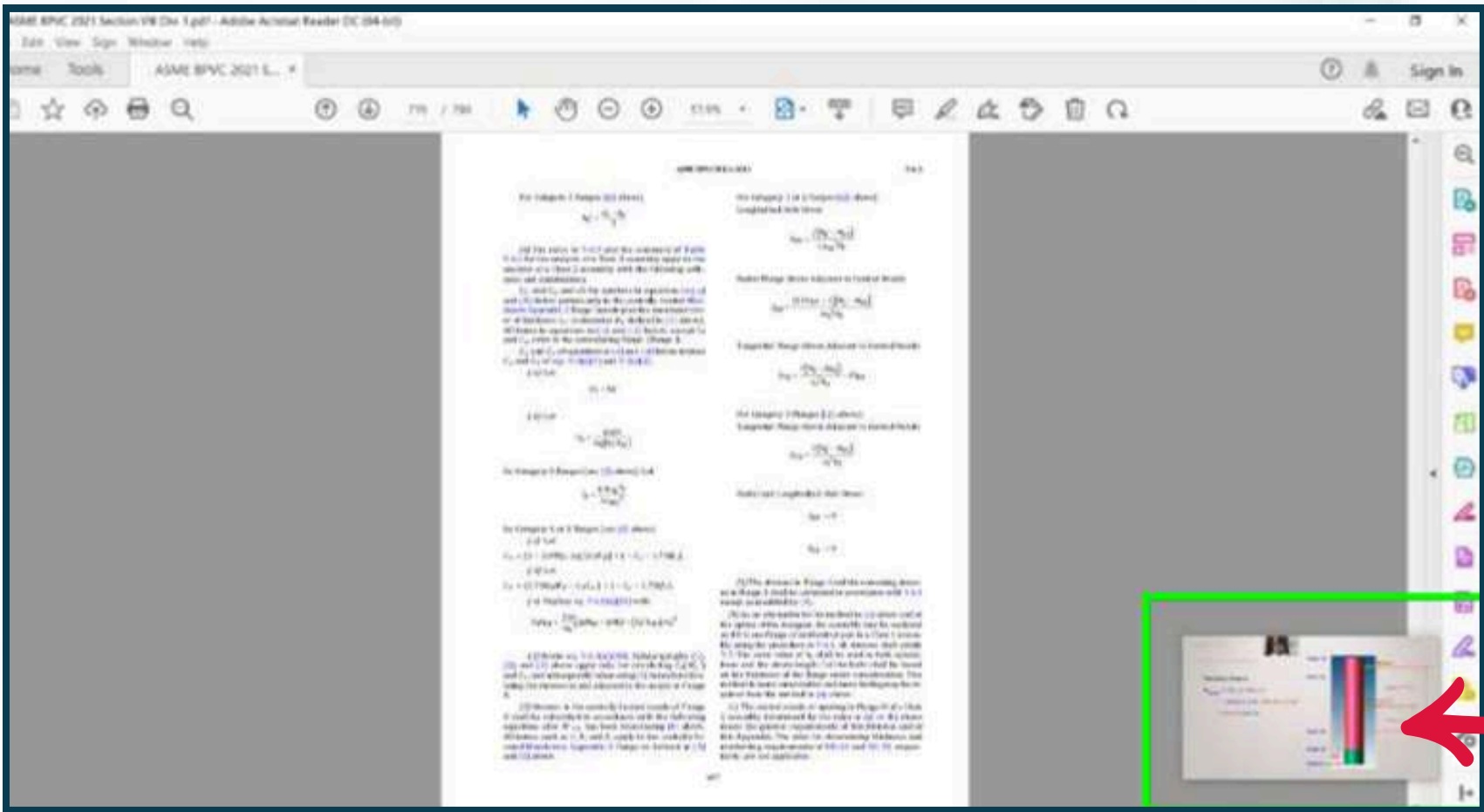


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Advantages Over Offline Courses



Benefits Of Online Training

Offline

Online

No more compromise on work or personal schedule

Getting late for the class. **Need to rush** or I'll miss the lecture.



I can **save travelling time** and **avoid stress** by watching lectures online **as per my convenience**.



Get answers on the go...!

I am stuck in the Project. But this topic is scheduled after 4 weeks in the live class. **How can I solve it now?**



I was stuck..! But I **just watched this topic online** and bingo..! **the problem is solved**. I simply love this platform.



Live Q&A session every week

The Classes are over. **Whom can I ask** the questions now?



My Course **validity is 18 months**. Also the **live Q&A session is twice a week**. I can get all the answers.



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Advantages Over Offline Courses



Benefits Of Online Training

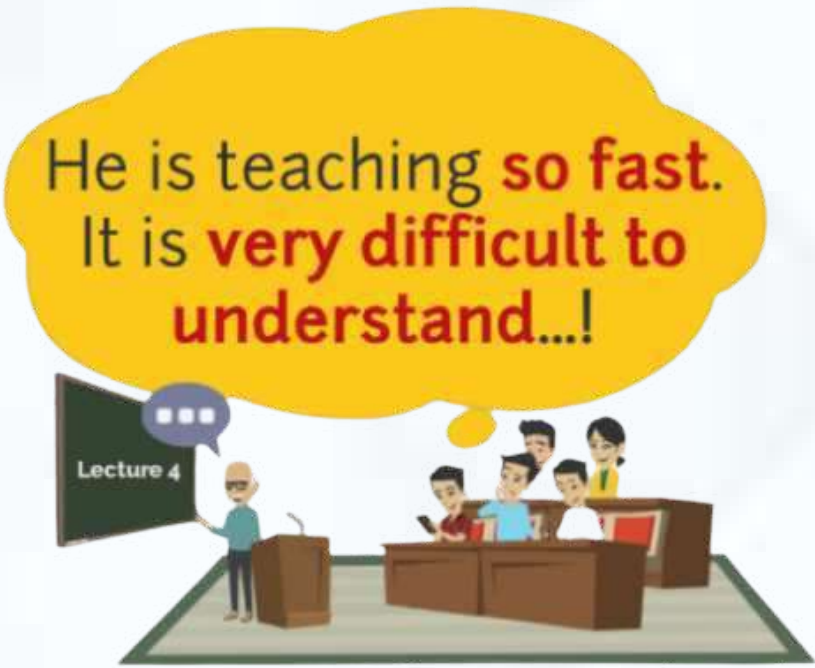
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Online

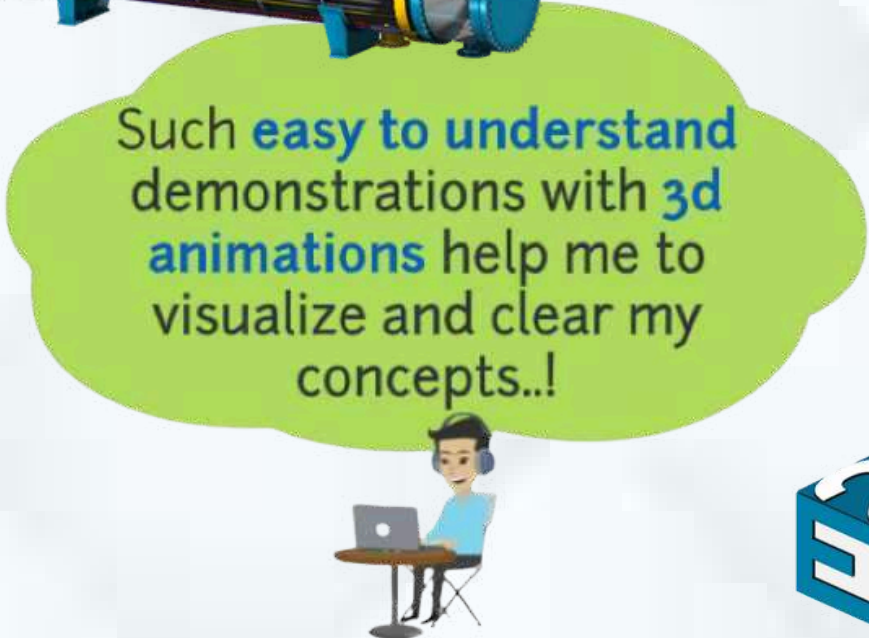
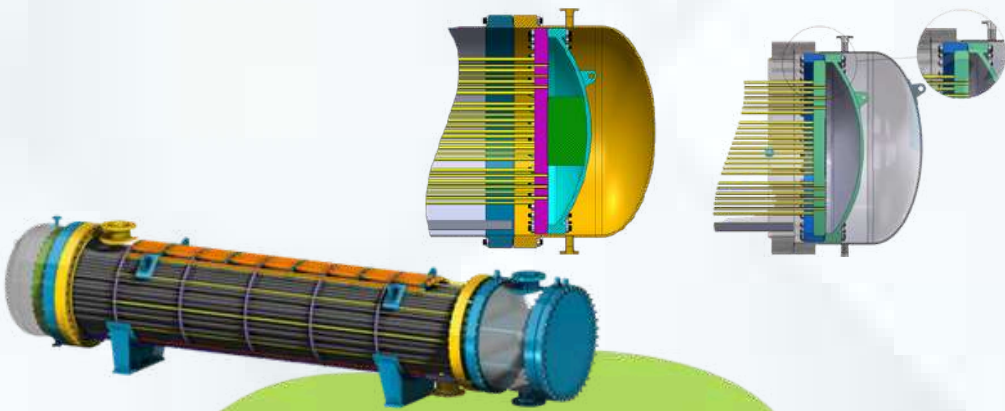
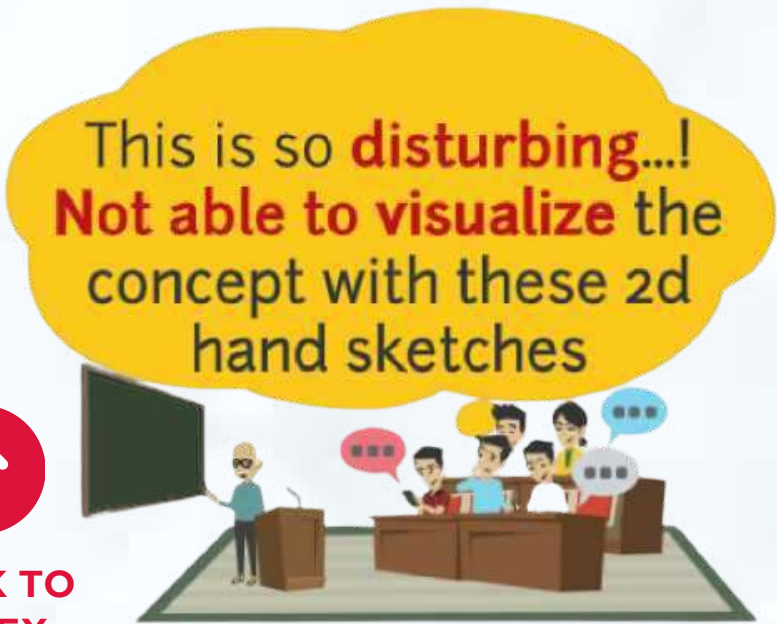
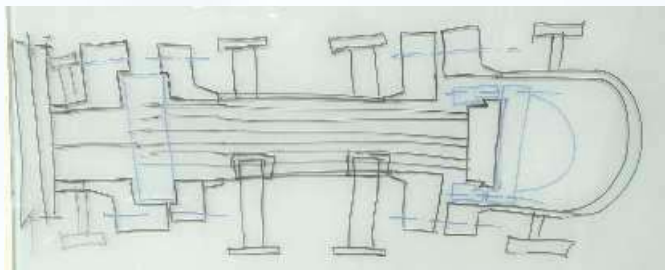
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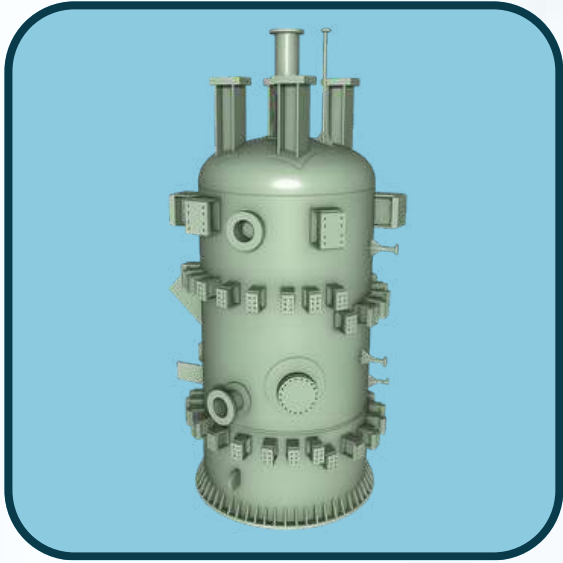
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Our Other Courses



STATIC EQUIPMENT DESIGN



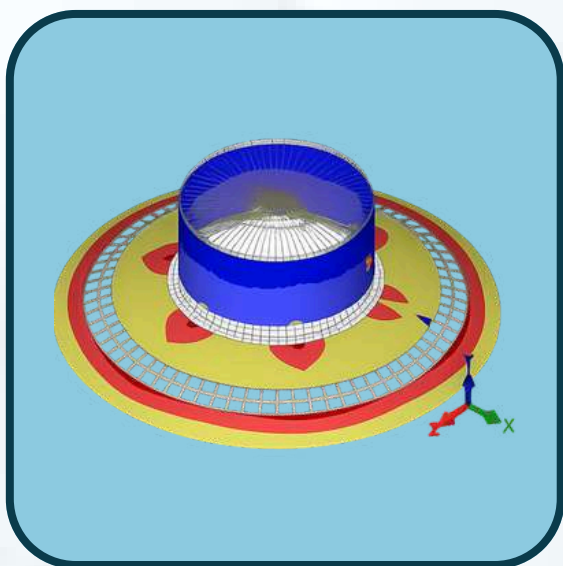
DIV 1 & DIV 2
COMBO 



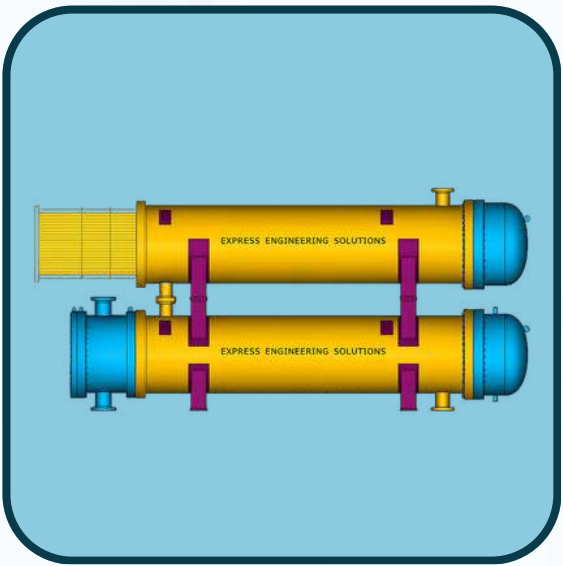
PRESSURE VESSEL
DESIGN (DIV 2) 



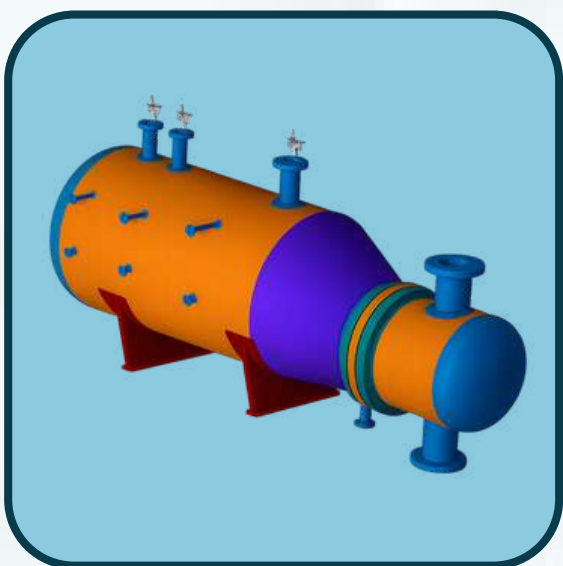
PREMIUM COMBO 



NOZZLE PRO FEA 



HEAT EXCHANGER
DESIGN 



PV ELITE
SOFTWARE 



ASME PD442 



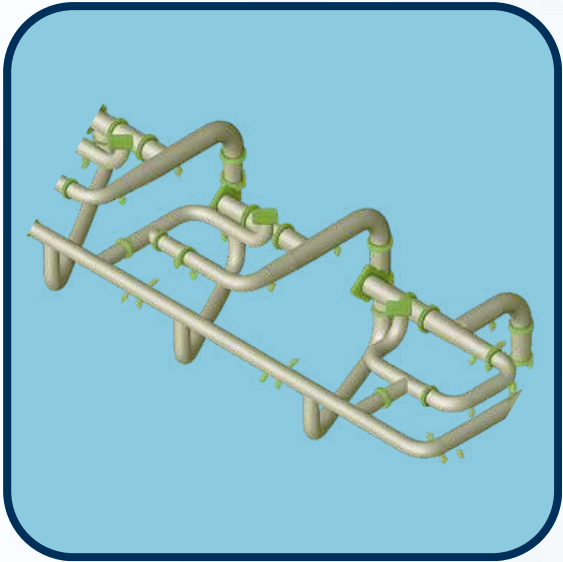
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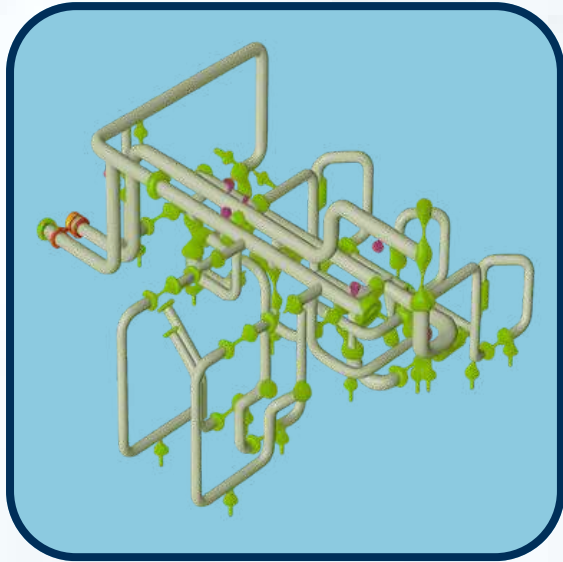
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PIPE STRESS ANALYSIS



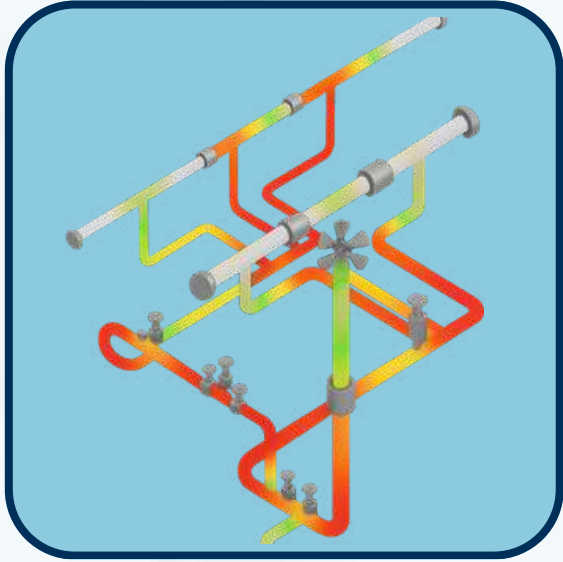
**BASIC PIPE
STRESS
ANALYSIS** 



**ADVANCE PIPE
STRESS
ANALYSIS** 



**BURIED
PIPELINE STRESS
ANALYSIS** 



**COMBO PIPING &
PIPELINE STRESS
ANALYSIS** 



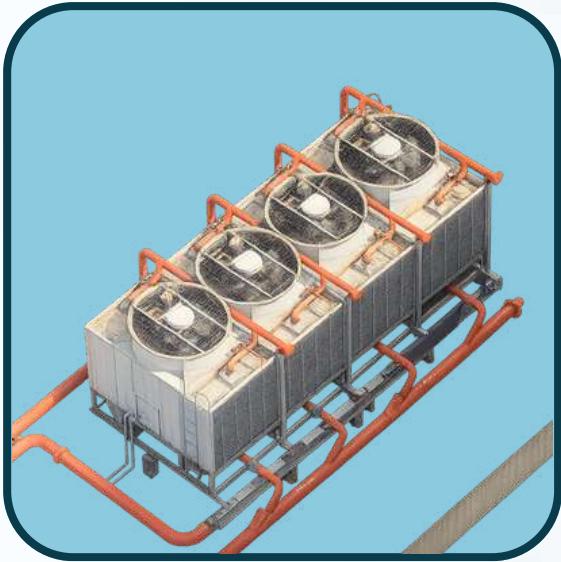
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Our Other Courses



THERMAL DESIGN



**AIR-COOLED
HEAT EXCHANGER
(ACHE)** 



**SHELL & TUBE
HEAT EXCHANGER
(STHE)** 



**THERMAL DESIGN
COMBO
(STHE & ACHE)** 



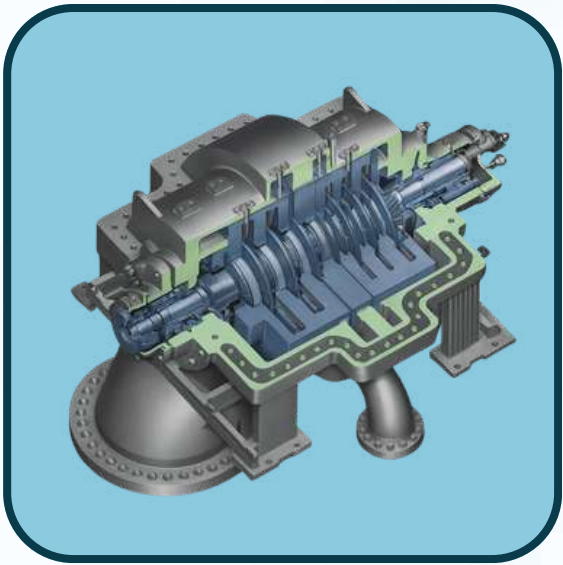
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Our Other Courses



ROTARY EQUIPMENT DESIGN



CENTRIFUGAL
COMPRESSOR 



CENTRIFUGAL PUMPS
IN OIL & GAS
INDUSTRY 



ROTARY EQUIPMENT DESIGN
COMBO 



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OTHER COURSES



MS EXCEL 



POWER BI 



GD&T (BASIC) 



GD&T (ADVANCE) 



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