Facilitator Guidebook

SCAFFOLD DESIGN ENGINEER

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Scaffold Design Engineer
Sector:- Cross Sectoral
Sub-Sector:- Construction, Infrastructure, Real estate, Iron & Steel, Mining, Logistics, Hydrocarbon
Occupation:- SCAFFOLDING ENGINEERING & MANAGEMENT
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Acknowledgments

The Facilitator Guidebook for **Scaffold Design Engineer**, **SSD/Q0203**, developed by the **Safety Skill Development Foundation (SSDF),** reflects our commitment to industry requirement for the job role, best practices in the profession, quality training requirement, regulatory compliances, workplace safety, health and sustainable practices. This guide is enriched with insights from **Subject Matter Experts (SMEs), trainers, and industry professionals**, ensuring its relevance to real-world applications.

We extend our special thanks to **CORE-EHS Solutions Pvt Ltd** for their invaluable expertise and support in developing course materials, significantly enhancing the safety and quality aspects of this guide.

Our gratitude also goes to trainers, assessors, industry experts, government bodies, and sector skill councils for their contributions toward advancing occupational safety across industries, including Hydrocarbon, Iron & Steel, Mining, Power, Automotive, Construction, Chemicals & Petrochemicals, and more.

The qualification is aligned with **NSQF** and this guide supports the **Skill India** initiative and is dedicated to trainers committed to excellence in skill development. SSDF welcomes feedback for continuous improvement.

Disclaimer

About this Guide Book

The increasing emphasis on safety across various industries is driving a growing demand for qualified Scaffold Design Engineers. As scaffolding plays a critical role in ensuring the structural integrity and safety of construction sites, the need for skilled professionals in this field continues to rise. Consequently, there is a heightened demand for trainers who can equip individuals with the essential knowledge and skills to become proficient Scaffold Design Engineers.

The objective of this guidebook is to provide a structured approach for trainers interacting with trainees enrolled in the SSD/VSQ/Q0203: Scaffold Design Engineer program. This course aims to deliver both theoretical and practical knowledge, guiding trainees in the procedures involved in designing safe and efficient scaffolding systems. While this guide is not intended to be a complete roadmap or a substitute for hands-on experience, it serves as a valuable tool to help trainers impart knowledge in a clear, systematic manner.

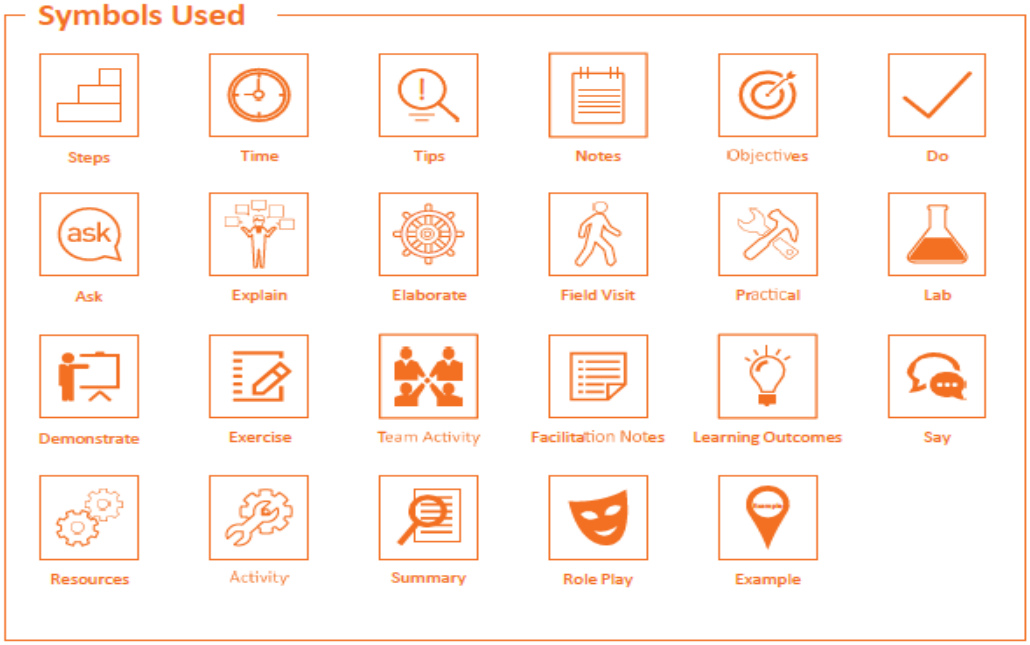
It is expected that trainers using this guide are fully familiar with its contents. This guidebook serves as a framework for covering each topic comprehensively and includes supplementary information designed to enhance the trainer's understanding of key aspects related to scaffold design, safety standards, regulatory compliance, and best practices.

This Facilitator Guide is designed based on the Qualification Pack (QP) under the National Skill Qualification framework (NSQF) and it comprises of the following National Occupational Standards (NOS)/topics and additional topics.

1. SSD/VSQ/N0213: Scaffoldings & Specifications.
2. SSD/VSQ/N0214: Understanding Scaffold Drawings & Designs, Indian & International Standard Codes
3. SSD/VSQ/N0215: Scaffold Design & Drawings using the scaffold & Computer-Aided Design (CAD) system
4. SSD/VSQ/N0216: Calculation of loads in scaffold designs as per Indian & International Standard
5. SSD/VSQ/N0217: Analysis of Scaffold design using STAAD Pro as per applicable IS and International Codes
6. SSD/VSQ/N0218: Plan, Organise & Monitor Scaffolding Safety Protocols
7. DGT/VSQ/N0102: Employability Skills (60 Hours)

The SSD/VSQ/Q0203: Scaffold Design Engineer Qualification provides comprehensive guidance for trainers to equip participants with advanced knowledge in scaffold design. This qualification covers complex scaffold systems, design safety protocols, and compliance with regulatory standards, empowering engineers to create safe, efficient scaffolding solutions. Trainers are provided with clear learning objectives aligned with National Occupational Standards (NOS), focusing on key aspects of scaffold design. The guidebook emphasizes practical design methods, safety considerations, and regulatory compliance, enabling facilitators to deliver hands-on training that meets industry standards.

Symbols Used



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Contents

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1. Unit 1 Introduction to Scaffolding Design Engineer

1.1. Key Learning Outcomes

At the end of this module, the trainees will be able to:

- Describe the function and duties of to Scaffolding Design Engineer
- Describe fundamental process for Scaffolding Design
- Describe fundamental terms used in the scaffolding industry
- Discuss potential future progressions and career options for a Scaffolding Design Engineer

1.2. Unit 1.1: Overview of the Industry

1.2.1. Unit Objectives

At the end of this unit, students will be able to:

- Give an overview of the Hydrocarbon, Iron & Steel, Mining, Power, Automotive, Construction, Chemicals & Petrochemicals
- Fundamental terms used in the scaffolding industry
- fundamental process for Scaffolding Design

1.2.2. Resources to be used

- Available objects such as Projection screen, whiteboard, projection screen, laptop, speaker, notebook, pen, participant handbook, etc
- Flip chart
- Attendance sheet
- Activities (role plays and games)

1.2.3. Ask

- Ask the participants to share their expectations from the program
- Ask them to tell what they know about the Hydrocarbon, Iron & Steel, Mining, Power, Automotive, Construction, Chemicals & Petrochemicals
- What is the 'Make-in-India' initiative?

1.2.4. Do

- Introduce yourself to the participants.
- Give an overview of the program to the participants - duration of the program, objective etc.
- Give an overview of the Hydrocarbon, Iron & Steel, Mining, Power, Automotive, Construction, Chemicals & Petrochemicals

1.2.5. Explain

- Explain about the Hydrocarbon, Iron & Steel, Mining, Power, Automotive, Construction, Chemicals & Petrochemicals

1.2.6. Tips

- Go slow with information flow with participants.
- Observe each participant's body language.
- Keep a positive and supportive approach towards the candidates

1.2.7. Activity: Team Spot

This exercise is to be done for acquainting the learner with various specialized scopes of application in scaffold design and engineering.

Materials:

Presentation slides or handouts on the industries of scaffold design, internet or library to gather the information, whiteboard or flip chart and markers, printed scaffold design reports or data to be used (if needed), worksheets for the students to be filled up during the exercise.

Procedure

Step 1: Introduction

Start by explaining the importance of knowing various sectors in scaffold design. Specialized knowledge in scaffold design is crucial for working on different construction projects, from residential buildings to large-scale industrial projects. Knowing these specializations will help professionals recognize opportunities and areas of expertise within the scaffold design field.

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Step 2: Presentation

Present on the different sectors in scaffold design, including residential scaffold design, commercial and industrial scaffolding, infrastructure projects, and special areas such as scaffolding for unique or challenging structures, like historical restoration, offshore projects, or complex high-rise buildings. Use visual aids, diagrams, and case studies to make it easier to understand and participate.

Step 3: Group Research

Divide the participants into small groups and assign each group a specific sector in scaffold design. Provide the groups with internet or library resources to research their assigned area. They should explore the scope of work, current trends, major players, challenges, safety protocols, and design innovations within their sector.

Step 4: Group Presentation

Each group will present their findings to the class. Suggest the use of graphics, statistics, and examples from everyday life to complement the presentation. There should be a short Q&A session following each presentation so that any confusion or lack of knowledge can be cleared.

Step 5: Reflection and Discussion

Discuss in class the outcome of the activity. Ask the students to consider which sectors of scaffold design appeal to them most and why. Explain the skills, qualifications, and certifications associated with each sector and how to prepare for success in that sector.

Expected Outcome:

- By the end of this activity, the students will be able to:
- Understand the concept of market segmentation within scaffold design engineering.
- Identify the various categories of scaffold designs, including residential, commercial, industrial, infrastructure, and others.
- Characterize each category in terms of its opportunities and challenges.
- Career path and specializations in the scaffold design field
- Review their interest and skills to take an informed decision about vocational course and their future career prospects in scaffold design engineering.

1.2.8. Notes for Facilitation

- Revise the important points discussed in this unit.
- Clear the doubts of the students, if any. Encourage them to ask questions.
- Discuss the question with the class and answer their queries satisfactorily.
- Help participants identify how to apply the skills taught in the course to their work
- Praise participants and the group on improving their performance and developing new skills.
- Encourage participants to move through the initial difficulties of learning new skills, by focusing on steps in their progress and the importance of what they are learning to do.

1.2.9. Summary

This book, therefore, proves to be the most authoritative and helpful guide for an aspiring as well as a practicing Scaffold Design Engineer; it will be required for mastery in this challenging area of construction. The scope, processes, and best practices in the safe, effective, and efficient designing of scaffolding systems are explored across industries-including residential, commercial, industrial, and infrastructure projects.

These include:

Introduction to Scaffold Design Engineering

This section covers the role of the scaffold design engineer, major responsibilities, and safety considerations in scaffold design. It also outlines the regulatory frameworks and safety standards governing scaffold design practices.

Types of Scaffolding Systems

It gives a detailed description of the various scaffold systems: traditional scaffolds, modular scaffolds, suspended scaffolds, and special-purpose scaffolds. The book elaborates on applications and design considerations for each system.

Load Calculations and Structural Integrity

- This includes precise explanations of load calculations theories with what loads can be supported by scaffolding.
- This includes, practical techniques for assessing the strength of material, weight distribution and scaffolding structural stability.

Design Standards and Compliance

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This section reviews applicable industry standards, codes, and regulations that apply to scaffold design. This section will highlight the significance of compliance with these standards to ensure safety and compliance with local and international construction laws.

Materials and Elements for Scaffold Design

Information on commonly used materials, including steel, aluminium, and wood, during the construction process of scaffolds. The book focuses on their characteristics, benefits, and downsides in their use for designing a scaffold.

Safety Measures

It deals more with the safety conditions incorporated in a scaffold design and entails risk assessments, hazard recognition, and ensures the design meets safety conditions. Such areas discussed are fall protection system, load bearing limit, and scaffolding inspection procedures.

Technology in Scaffold Design

Incorporation of the modern technologies like Computer-Aided Design (CAD) software and Building Information Modelling (BIM) in the scaffold design. The book presents how these tools improve the accuracy, efficiency, and safety of scaffold designs.

Case Studies and Practical Applications

Real-life case studies that will illustrate how the design principles for scaffolds apply to different projects. These examples will be very informative when it comes to overcoming design challenges and ensuring scaffolds meet certain needs of projects.

Career Advancement in Scaffold Design Engineering

Elucidates skills, certifications, and qualifications to lead a successful career in scaffold design. It suggests ways for advancing your career through career development, professional advancement, and specializations.

1.2.10. Exercise

1.What is the primary responsibility of a Scaffold Design Engineer?
A) Building scaffolds
B) Designing scaffolds that are safe and structurally sound
C) Inspecting scaffolds on construction sites
D) Installing scaffolds
2.What is the main purpose of load calculations in scaffold design?
A) To determine the aesthetics of the scaffold
B) To calculate the total cost of materials
C) To ensure that the scaffold can safely support the weight placed on it
D) To choose the right scaffold colour
3._ _____is the process of evaluating the weight and distribution of loads on a scaffold to ensure it is structurally safe.
4.The primary material used in scaffold construction due to its strength and durability is _____
5.Scaffold design engineers must adhere to safety standards, local regulations, and building codes when designing scaffolding systems.(T/F)
6.Load calculations are a critical component of scaffold design to ensure safety and stability.(T/F)

1.3.Unit 1.2: Roles and Responsibilities of a Scaffolding Design Engineer

1.3.1. Unit Objectives

At the end of this unit, students will be able to:

1.Identify roles and responsibilities of Scaffolding Design Engineer
2.Identify essential skills of Scaffolding Design Engineer

1.3.2. Resources to be used

- Available objects such as Projection screen, whiteboard, projection screen, laptop, speaker, notebook, pen, participant handbook, etc
- Flip chart
- Attendance sheet
- Activities (role plays and games)

1.3.3. Ask

- Ask the participants to share their expectations from the program

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1.3.4. Do

- Give a brief introduction on the job description of Scaffolding Design Engineer outlining their personal attributes to the participants
- Provide the participants with a List of Roles and Responsibilities of Scaffolding Design Engineer
- Talk about the skills and knowledge which are essential to become a Scaffolding Design Engineer

1.3.5. Explain

Describe about the roles and responsibility of Scaffolding Design Engineer

1.3.6. Tips

- Go slow with information flow with participants.
- Observe each participant's body language.
- Keep a positive and supportive approach towards the candidates

1.3.7. Activity: Team Spot

- Separate the class in 2 different teams.
- Each team will be assigned with topics - Roles and responsibilities of Scaffolding Design Engineer
- Ask them to present the given topics team after team, and state examples individually to explain

1.3.8. Notes for Facilitation

- Revise the important points discussed in this unit.
- Clear the doubts of the students, if any. Encourage them to ask questions.
- Discuss the question with the class and answer their queries satisfactorily.
- Help participants identify how to apply the skills taught in the course to their work
- Praise participants and the group on improving their performance and developing new skills.
- Encourage participants to move through the initial difficulties of learning new skills, by focusing
- on steps in their progress and the importance of what they are learning to do.

1.3.9. Summary

A Scaffolding Design Engineer has a significant role to play in ensuring safety, stability, and efficiency with the scaffolding systems that are applied during construction projects. The important responsibility of a Scaffolding Design Engineer is to design scaffolding structures that are robust, reliable, and fulfil all the required safety standards, building codes, and regulations.

The key responsibilities include:

Designing and Planning

The design engineer of scaffolding designs with a great deal of detail to the scaffolding systems by keeping in mind the type of structure, the load required to the built, environmental conditions, and the project-specific requirements. Advanced design software like AutoCAD helps them produce accurate drawings and plans.

Load Calculations and Structural Integrity

One major role is load calculations in which scaffolds can support workers, materials, and equipment in a safe manner. An engineer evaluates the scaffolding structure to avoid collapses or failures for various conditions.

Material Selection

The engineer determines suitable material selection to be utilized for scaffolding structure. Material factors that are taken into consideration include weight, strength, durability, and resistance to corrosion. Materials of choice include steel, aluminium, and wood.

Design of the Scaffold Scaffold design engineers are expected to meet the national and international safety guidelines. Their designs must not include any OSHA standards or local building code. They incorporate protection through guardrails, secure platforms, and a fall protection system.

Consultation with Other Experts

Scaffold Design Engineers work closely with architects, construction managers, and safety inspectors to ensure that their designs integrate seamlessly with the overall construction project. They must also adapt their designs based on feedback from site conditions and real-time challenges.

Documentation and Reporting

They record their designs, calculations, and safety measures appropriately. They draw reports and communicate with stakeholders, for instance, the clients, the project managers, and the relevant regulatory bodies.

Continuous Learning and Improvement

The dynamic nature of construction technology requires Scaffold Design Engineers to be updated on the latest developments in the industry, new materials, and best practices. This way, their designs are innovative, efficient, and in line with the latest safety standards.

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1.3.10. Exercise

1. What is the primary responsibility of a Scaffolding Design Engineer?
A) To oversee the installation of scaffolds on-site
B) To design scaffolding systems that are safe and compliant with regulations
C) To inspect scaffolds after installation
D) To manage construction workers on scaffolding projects
2. Scaffold Design Engineers need to ensure compliance with which of the following?
A) Safety standards and local building codes
B) Aesthetic guidelines
C) Employee work schedules
D) Marketing strategies for scaffold companies
3. A Scaffolding Design Engineer's job includes conducting on-site inspections of scaffolding after installation.(T/F)
4. Load calculations are crucial for scaffold design to ensure the system's stability and safety.(T/F)
5. Scaffold Design Engineers use _____ software to create detailed design plans for scaffolding systems.
6.One of the primary responsibilities of a Scaffold Design Engineer is to perform _____ calculations to ensure the scaffold can safely support its load.

2. Unit 2 NOS 1: SSD/VSQ/N0213: Scaffoldings & Specifications

2.1. Key Learning Outcomes

At the end of this module, the trainees will be able to

- Identification of scaffold and components.
- Design load calculation of the scaffold.
- Fall protection requirements and provisions in the scaffold.

2.2. Unit 2.1: Types of Scaffoldings

2.2.1. Unit Objectives

At the end of this unit, students will be able to:

- Identification of several types of scaffolds, their components.
- Determination of type of scaffold required as per site & load requirements.
- Identification of working & faulty components and defect in the components.

2.2.2. Resources

- Whiteboard, erasable marker, board cleaner, projection screen, laptop, speaker, notebook, pen, participant handbook, etc
- Flip chart
- Participant Manual
- Projection screen and PowerPoint presentations.
- Activities (role plays)

2.2.3. Say

- Describe types of scaffolds, their components
- Describe about type of scaffold required as per load requirements
- Describe about how to identify working & faulty components and defect in the components

2.2.4. Explain

- Describe types of scaffolds, their components
- Describe about type of scaffold required as per load requirements
- Describe about how to identify working & faulty components and defect in the components

2.2.5. Activity

Group Activity

Divide the class into small groups. Provide each group with different scaffold pictures and a set of components (e.g., tubes, planks, braces).

Ask the groups to identify the type of scaffold depicted and match the components to their respective positions on the scaffold.

Each group will present their findings to the class, explaining the types of scaffolds and how the components are used.

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2.2.6. Notes for Facilitation

- Summarize the important points and terms explained in the session.
- Ask participants if they have any doubts. Encourage them to ask questions.
- Answer questions, as needed, providing concrete and brief answers.
- Tell participants to complete the questions at the end of the unit.
- Ensure that every participant answers all the questions.

2.2.7. Summary

Identification of Scaffold Types

The individual should be capable of distinguishing among different scaffold types, such as tube and clamp, frame, suspended, mobile, and cantilever scaffolds. Each type comprises specific elements, including base plates, standards, ledgers, and cross braces, which collectively ensure structural integrity and stability. Recognizing these elements and comprehending their roles is vital for safe scaffold assembly.

Assessment of Scaffold Type According to Site and Load Needs

The ability to evaluate site conditions—such as height, available space, and load-bearing requirements—is essential for selecting the correct scaffold type. Considerations like the nature of the task (e.g., construction, maintenance, or cleaning), the weight of materials, and the number of personnel involved will impact the scaffold selection. It is crucial that the chosen scaffold adheres to load specifications to guarantee worker safety and facilitate effective project execution.

Detection of Defective Components and Issues

The individual must be proficient in identifying defects or issues within scaffolding components. This includes spotting damaged or deteriorated parts, such as cracked poles, loose braces, or compromised planks. Routine inspections of scaffolds are imperative to avert accidents stemming from structural failures. Recognizing and addressing defective components is essential for maintaining scaffold integrity and ensuring worker safety.

2.2.8. Exercise

1. What is the primary purpose of determining the type of scaffold required on a worksite?

A) To decide the design of the scaffold

B) To ensure compliance with building codes

C) To match the scaffold to the site and load requirements

D) To determine the number of workers needed

2. Which of the following scaffolds would be most suitable for outdoor, large-scale construction sites?

A) Single-point suspension scaffold

B) Rolling scaffold

C) Suspended scaffold

D) System scaffold

3. True or False: Mobile scaffolds are always the best choice for high-load, heavy-duty construction.

4. True or False: The user must be able to identify both the working and faulty components of scaffolds to ensure safety.

5. The _____ scaffold is ideal for jobs requiring mobility and quick adjustments, as it is mounted on wheels.

6. One of the key factors in selecting the appropriate scaffold is determining the _____ requirements of the worksite.

2.3. Unit 2.2 Design Load Calculation

2.3.1. Unit Objectives

At the end of this unit, students will be able to

- Compute Load on Scaffold and Optimum Load
- Calculate Design Load for Scaffold
- To analyse the working requirements of scaffold components, including tie-offs, supports, and braces, ensuring they meet design specifications, safety standards, and load-bearing capacities.

2.3.2. Resources

- Whiteboard, erasable marker, board cleaner, projection screen, laptop, speaker, notebook, pen, participant handbook, etc
- Flip chart
- Participant Manual
- Projection screen and PowerPoint presentations.

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- Activities (role plays)

2.3.3. Say

- Describe how to Compute Load on Scaffold and Optimum Load
- Describe about how to calculate Design Load for Scaffold
- Describe working requirements of scaffold components, including tie-offs, supports, and braces.

2.3.4. Explain

- Describe how to Compute Load on Scaffold and Optimum Load
- Describe about how to calculate Design Load for Scaffold
- Describe working requirements of scaffold components, including tie-offs, supports, and braces.

2.3.5. Activity

Distribute worksheets with sample scaffold scenarios. Ask participants to calculate the load on a scaffold in small groups. They should:

- Identify the weight of workers, materials, and equipment.
- Determine the overall load on the scaffold.
- Calculate the optimum load capacity considering factors such as material type, scaffold configuration, and safety margins.

2.3.6. Notes for Facilitation

- Summarize the important points and terms explained in the session.
- Ask participants if they have any doubts. Encourage them to ask questions.
- Answer questions, as needed, providing concrete and brief answers.
- Tell participants to complete the questions at the end of the unit.
- Ensure that every participant answers all the questions.

2.3.7. Summary

Determine the Load on Scaffold & Optimum Load

The individual must come up for the total load-induced on the scaffold considering all workers, materials, and tools, along with environmental causes like wind.

The optimum load is then calculated so that the scaffold does not get overloaded and is able to bear well the maximum conceivable weight without loss of stability or structural failure.

Calculate the Design Load for Scaffold

The personal design load calculation is expected to be accurate. It all adds up: the anticipated load, safety margins, and the legal requirements. The design load is the scaffold required to bear the weights with regard to persons using the scaffold, together with equipment and the types of scaffold utilized.

Know the Working Requirements of Scaffold Components

The candidate must know the working requirement for each of the components of the scaffold, such as base plates, ties, supports, and couplers.

All the components must be properly designed and positioned such that they effectively distribute all loads throughout the structural system and also to maintain its integrity with the changing in-loading. Tie-offs and support must be as safe and stable as possible.

2.3.8. Exercise

1. What is included when determining the load on a scaffold?
a) Only the workers' weight
b) Only the materials used
c) Workers, materials, tools, and environmental factors like wind
d) None of the above
2. Which of the following is part of the scaffold's working requirements?
a) Only the base plates
b) The safe and stable positioning of all components, including base plates, ties, supports, and couplers
c) Only the tie-offs
d) The aesthetic appearance of the scaffold
3. The design load for scaffolding includes legal requirements and safety margins to ensure the scaffold can support its intended use.
4. Only the weight of workers should be considered when determining the load on a scaffold.
5. The design load must account for the anticipated _____, safety _____, and legal _____.

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6. Each scaffold component, such as _____ plates, ties, supports, and _____, must be designed and positioned for proper load distribution.

2.4. Unit 2.3: Fall Protection Requirements

2.4.1. Unit Objectives

At the end of this unit, students will be able to

- Identification of types of fall protection for the scaffolds, tie-offs, supports, and ladders.
- Working out of fall protections required in the scaffold for various activities and effectiveness.

2.4.2. Resources

- Whiteboard, erasable marker, board cleaner, projection screen, laptop, speaker, notebook, pen, participant handbook, etc
- Flip chart
- Participant Manual
- Projection screen and PowerPoint presentations.
- Activities (role plays)

2.4.3. Say

- Describe about different types of fall protection for the scaffolds.

2.4.4. Explain

- Describe about different types of fall protection for the scaffolds.

2.4.5. Activity

- Divide the participants into small groups. Give each group a scaffold activity scenario and ask them to determine the fall protection requirements.

Scenarios can include:

- Working on a scaffold at different heights (low, medium, high).
- Moving materials or equipment on the scaffold.
- Installing or adjusting scaffolding components.
- Accessing the scaffold using ladders or elevated platforms.
- For each scenario, participants should:
- Identify the type of fall protection required (e.g., PFAS, guardrails).
- Specify where tie-off points should be located on the scaffold.
- Determine if safety nets or other protection measures are needed.
- After each group completes the exercise, have them present their fall protection plan for the scenario. Encourage the class to discuss the choices and reasoning behind their decisions. Address any concerns or misunderstandings related to the placement of fall protection systems.

2.4.6. Notes for Facilitation

- Summarize the important points and terms explained in the session.
- Ask participants if they have any doubts. Encourage them to ask questions.
- Answer questions, as needed, providing concrete and brief answers.
- Tell participants to complete the questions at the end of the unit.
- Ensure that every participant answers all the questions.

2.4.7. Summary

Identification of Fall Protection Types

The person can identify and select the appropriate types of fall protection for various scaffolding components, including guardrails, personal fall arrest systems (PFAS), tie-offs, supports, and ladders. All these systems serve as a deterrent to fall and assure that workers are restrained. Meanwhile, scaffold stability is maintained during elevated work. In this case, ladder fall protection consists of ladder tie-offs and cages.

Determining Fall Protection Needs for Tasks

The person would now determine and calculate how much fall protection really is needed for different scaffolding activities. This would require knowing the specific need based on the activity's nature, height of scaffold, and equipment. Must determine the effectiveness of the selected fall protection systems so that they are suitable and dependable for the given task to ensure they provide adequate safety for the worker.

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2.4.8. Exercise

1. Which of the following is NOT a type of fall protection for scaffolds?
a) Guardrails
b) Personal fall arrest systems (PFAS)
c) Ladders
d) Safety nets
2. What should be considered when determining the fall protection requirements for a scaffold?
a) The height of the scaffold and the task being performed
b) The colour of the scaffold
c) The material used for the scaffold only
d) The time of day when the work is performed
3. For scaffolds, a common fall protection system includes _____, which are installed along the edges to prevent workers from falling off the platform.
4. When working on a scaffold at heights greater than _____ feet, a personal fall arrest system (PFAS) is typically required.
5. True or False: The effectiveness of a fall protection system is determined by the height of the scaffold and the worker's activity.
6. True or False: Ladders do not require any form of fall protection when used in scaffolding work.

3. Unit 3 NOS 2: SSD/VSQ/N0214: Understanding Scaffold Drawings & Designs, Indian & International Standard Codes

3.1. Key Learning Outcomes

- Reading & Understanding scaffold drawings.
- Scaffold parameters for design & safety.
- Identification & selection of fall protection & design selection

3.2. Unit 3.1. Understanding Scaffold Drawing & Details

3.2.1. Unit Objectives

At the end of this unit, students will be able to:

- To correctly interpret scaffold drawings, designs, and safety features
- To understand the structural details and safety requirements

3.2.2. Resources

- Whiteboard, erasable marker, board cleaner, projection screen, laptop, speaker, notebook, pen, participant handbook, etc
- Flip chart
- Participant Manual
- Projection screen and PowerPoint presentations.
- Activities (role plays)

3.2.3. Say

- Describe about scaffold drawings components.
- Describe design and planning process of scaffold
- Describe about structural details and safety requirements of scaffold

3.2.4. Explain

- Describe about scaffold drawings components.
- Describe design and planning process of scaffold
- Describe about structural details and safety requirements of scaffold

3.2.5. Activity

Divide participants into small groups. Provide each group with a different scaffold drawing (can vary in complexity depending on the experience level of participants). Each group will:
Identify and label all components of the scaffold.
Interpret the safety features and load details in the drawing.
Discuss the assembly requirements based on the drawing (e.g., the order of assembly, the role of each component).
Hand out worksheets with specific questions to guide the analysis. The questions can include:

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What safety elements are included in this drawing?
Where are the tie-offs and guardrails located?
What are the load-bearing capacities indicated in the design?
Are there any special considerations (e.g., access, working at height)?
Once the groups have completed their analysis, have each group present their findings to the class. Encourage participants to ask questions and provide feedback. Discuss any challenges the groups faced while interpreting the drawings.

3.2.6. Notes for Facilitation

- Summarize the important points and terms explained in the session.
- Ask participants if they have any doubts. Encourage them to ask questions.
- Answer questions, as needed, providing concrete and brief answers.
- Tell participants to complete the questions at the end of the unit.
- Ensure that every participant answers all the questions

3.2.7. Summary

Reading and Understating the Scaffold Drawings.

A person must be able to read and understand scaffold drawings wherein the scaffold system is specifically constructed. One should recognize the component related to the dimensions, the material specifications, the different types of scaffolds, and load capacities. As able to interpret, this is to prevent construction of scaffolds under a specific design.

Interpret the Scaffold Drawings

The effectiveness of interpreting scaffold drawings is critical. Understand the symbols and dimension measurements, and the various indications in the drawings denote materials, dimensions, and safety standards of the scaffold. Correct interpretation enables identification of correct components, understanding of hazard conditions, and building critical requirements.

Interpret Scaffold Drawings & Designs.

The design and drawing of scaffold involve an understanding of the technical aspect, which encompasses the materials used in the scaffold structure, such as the dimensions and connections between the elements in the scaffold system. The scaffolding design is drawn to depict how different components, including standards, braces, and planks, fit together to form a safe, stable platform. This PC can allow individuals to be able to correctly read designs and identify scaffold types, supported, suspended. Finally, design elements must adhere to structural and safety requirements to fulfil regulatory elements and ensure the scaffolding can support loads applied within expected working conditions.

3.2.8. Exercise

1. What is the key step in interpreting scaffold drawings correctly?
a) Understanding symbols and notations
b) Estimating the cost of materials
c) Choosing the right workers for assembly
d) Visualizing the project in 3D
2. Which of the following statements is true when preparing scaffold drawings?
a) Only one person needs to be involved in the drawing process.
b) The drawings should be detailed with scale and measurements.
c) It is not important to include safety measures.
d) The drawings should only focus on aesthetics.
3.True or False: Scaffold drawings typically show the components of the scaffold, including dimensions, materials, and layout.
4.True or False: Safety elements such as guardrails and tie-offs are irrelevant in scaffold drawings as long as the structure is stable.
5.Scaffold drawings include important _____ elements such as guardrails, tie-offs, and access points to ensure safety.
6.To interpret scaffold drawings effectively, one must understand the _____, materials, and structural layout depicted in the design.

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3.3. Unit 3.2. Scaffold Parameters for Design & Safety

3.3.1. Unit Objectives

At the end of this unit, students will be able to:

- To work out the design and safety parameters of scaffolds based on Indian Standards (IS-2750 & IS-3696), as well as international standards like OSHA and BS
- To check and interpret details of scaffold designs correctly for safety and compliance.

3.3.2. Resources

- Whiteboard, erasable marker, board cleaner, projection screen, laptop, speaker, notebook, pen, participant handbook, etc
- Flip chart
- Participant Manual
- Projection screen and PowerPoint presentations.
- Activities (role plays)

3.3.3. Say

- Describe about design details of scaffolds as per Indian Standards
- Describe about design details of scaffold as per International Standards of OSHA & BS standards
- Describe about how to Check of design details of scaffolds.

3.3.4. Explain

- Describe about design details of scaffolds as per Indian Standards
- Describe about design details of scaffold as per International Standards of OSHA & BS standards
- Describe about how to Check of design details of scaffolds.

3.3.5. Activity

Provide each group with a scaffold design drawing (it can be a simple scaffold for a construction site or a more complex design for industrial use).
Ask each group to review the design and identify the following design parameters:
Material type (e.g., steel, wood)
Load-bearing capacity (as per IS-2750 or BS standards)
Dimensions and structural layout (height, width, and spacing of components)
Safety features (guardrails, toe boards, access, etc.)
Instruct groups to compare these design details with the respective standards (IS-2750 and IS-3696 for Indian standards, OSHA and BS for international standards).

3.3.6. Notes for Facilitation

- Summarize the important points and terms explained in the session.
- Ask participants if they have any doubts. Encourage them to ask questions.
- Answer questions, as needed, providing concrete and brief answers.
- Tell participants to complete the questions at the end of the unit.
- Ensure that every participant answers all the questions

3.3.7. Summary

Design & Safety Parameters as per Indian Standards (IS-2750 & IS-3696):
IS-2750 specifies the material, construction techniques, and structural design of scaffolds so that they are safe and reliable.
IS-3696 provides particular safety requirements for scaffolds such as load-bearing capacity, height limit, and access methods.
Based on these standards, one can determine the proper materials, dimensions, and structural features for scaffolds.
As per International Standards (OSHA & BS):
OSHA or Occupational Safety and Health Administration is responsible for the safety of the work site with regard to scaffolds. The standards are primarily about worker safety, stability, and prevention of hazards.
BS or British Standards also provides information about the conditions regarding safety during the design of a scaffold. It includes the calculation for the design, safe working loads, and accessibility to the workers.
Competency applies for the interpretation of the international standards in order to ensure that scaffold designs conform to the world's safest practices.
Checking Design Details and Interpretations

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An individual must be competent in assessing and verifying scaffold design details for compliance with Indian and international standards.
Checking structural integrity, load-bearing capacity, bracing systems, and safety features, which include guardrails and access ladders.
Further, the details of a design must be correctly interpreted, and the proper correction or amendment must be done in case of any differences.

3.3.8. Exercise

1.What does IS-3696 focus on regarding scaffolds?
a) Material procurement
b) Safety requirements and load-bearing capacities
c) Scaffold aesthetics
d) Site worker uniforms
2.When checking scaffold design details, what should be verified?
a) Only the appearance of the scaffold
b) Compliance with load-bearing and safety standards
c) Colour coding of scaffold components
d) The number of scaffold components used
3.The Indian standard IS-2750 provides guidelines for the _____ and _____ of scaffolds.
4.IS-3696 specifies the _____ parameters for scaffolds, including load-bearing capacities and stability.
5.True/False: OSHA standards do not address the safety of scaffolds in the workplace.
6.True/False: BS standards only focus on the materials used in scaffolds and do not include safety parameters.

3.4. Unit 3.3. Identification & selection of fall protection & design

3.4.1. Unit Objectives

At the end of this unit, students will be able to

- Identification of types of fall protection for the scaffolds, tie-offs, supports, and ladders.
- To recognize appropriate fall protection systems
- To design effective fall protection measures
- To calculate the needs of ladders and temporary ladders, and critically evaluate factors in scaffold design.

3.4.2. Resources

- Whiteboard, erasable marker, board cleaner, projection screen, laptop, speaker, notebook, pen, participant handbook, etc
- Flip chart
- Participant Manual
- Projection screen and PowerPoint presentations.
- Activities (role plays)

3.4.3. Say

- Describe about different types of fall protection for the scaffolds, tie-offs, supports, and ladders
- Describe about design of effective fall protection measures
- Describe about needs of ladders and temporary ladders

3.4.4. Explain

- Describe about different types of fall protection for the scaffolds, tie-offs, supports, and ladders
- Describe about design of effective fall protection measures
- Describe about needs of ladders and temporary ladders.

3.4.5. Activity

Divide the participant into small groups (4-5 people per group).
Provide each group with a set of real-life scenarios (e.g., working at height on roofs, scaffolds, open edges).
Ask each group to identify the appropriate fall protection system (e.g., guardrails, safety nets, personal fall arrest systems) for each scenario.
Groups will present their findings and explain why they selected specific fall protection methods.
As a class, discuss the advantages and limitations of each system.

3.4.6. Notes for Facilitation

- Summarize the important points and terms explained in the session.

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- Ask participants if they have any doubts. Encourage them to ask questions.
- Answer questions, as needed, providing concrete and brief answers.
- Tell participants to complete the questions at the end of the unit.
- Ensure that every participant answers all the questions.

3.4.7. Summary

Identification of Fall Protection Types

The person can identify and select the appropriate types of fall protection for various scaffolding components, including guardrails, personal fall arrest systems (PFAS), tie-offs, supports, and ladders. All these systems serve as a deterrent to fall and assure that workers are restrained. Meanwhile, scaffold stability is maintained during elevated work. In this case, ladder fall protection consists of ladder tie-offs and cages.

Ladder/Temporary Ladder Requirements & Design

Many construction and maintenance tasks require access to elevated areas, which is accessed with a ladder. The design, selection, and material of ladders should be considered for use.

Material: They are made from wood, aluminium, fiberglass, and steel, and have different environments where it is to be used; thus, fiberglass is normally used for electrical work.

Length and Height: Ladders should be long enough to reach the desired height safely, with an appropriate angle, usually 75°.

Load Capacity: Ladders should be designed to support the expected load, including workers and any tools or equipment.

Stability: Temporary ladders must be stable and secure. Adequate anchorage or support is essential to prevent accidents. For temporary ladders, portability, durability, and ease of setup are all important factors. The design should meet safety standards, such as OSHA or local regulations.

Evaluating Factors Influencing Scaffold Design

The scaffold design is very important in the safety of the workers performing the task at heights. Several factors affect scaffold design, including:

Load Requirements: The scaffold has to be able to support both the weight of the workers and any materials or equipment they use. This includes dynamic loads such as workers moving or shifting weight.

Height and stability: The scaffolding height, the taller a scaffold is erected, the stiffer it would be and much more support required to prevent falling.

Ground Condition: The ground which the scaffold erected on must have stability to its ground to enable it to sustain the weight from the scaffold together with the weights of the erecting workers; soft or rough ground may warrant additional measures for example base plates or foundation works.

Environmental Factors: The stability of scaffolds may be influenced by wind, rain, or snow. The major environmental factor affecting scaffold stability is the wind speed for tall scaffolds.

Material and Design Specifications: Scaffold materials shall be safe for the work being undertaken and fit for purpose. Designs should provide ease of access, safety in use, and comply with applicable regulations.

3.4.8. Exercise

1. Which of the following is NOT a type of fall protection for scaffolds?

a) Guardrails

b) Personal fall arrest systems (PFAS)

c) Ladders

d) Safety nets

2. Which of the following is a key consideration when analysing the design of fall protection systems?

a) Cost of installation

b) Load capacity and stability

c) The colour of safety equipment

d) Time of day when fall protection is needed

3. True or False: The primary purpose of guardrails is to catch workers who fall.

4. True or False: When designing a ladder, the load capacity must be considered to ensure it can support the weight of the worker and equipment.

5. Personal Fall Arrest Systems (PFAS) consist of a _____, a _____, and an _____ point.

6. When designing a temporary ladder, it is essential to calculate the required _____ to ensure it reaches the necessary height.

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4. Unit 4 NOS 3 SSD/VSQ/N0215: Scaffold Design & Drawings using the scaffold & Computer-Aided Design (CAD) system

4.1. Key Learning Outcomes

At the end of this module, the trainees will be able to:

- To accurately determine the dimensions of the scaffold components
- Prepare detailed drawings of the scaffolds
- Pick out the significant components, specifications, and key features of Scaffolding
- Prepare tables and symbols for use in the drawing in accordance with industry standards.

4.2. Unit 4.1 Calculation of dimensions of components & completing drawings

4.2.1. Unit Objectives

At the end of this unit, students will be able to:

- To carry out calculations for the dimensions of the scaffold components and convert them into the scale requirements
- To understand and interpret plans, sections, elevations, and other views
- To understand proper drafting principles and computer commands

4.2.2. Resources to be used

- Available objects such as Projection screen, whiteboard, projection screen, laptop, speaker, notebook, pen, participant handbook, etc
- Flip chart
- Attendance sheet
- Activities (role plays and games)

4.2.3. Ask

- Describe about calculations for the dimensions of the scaffold components
- Describe about different kind of scale requirements
- Describe about plans, sections, elevations, and other views
- Describe about drafting principles and computer commands

4.2.4. Explain

- Describe about calculations for the dimensions of the scaffold components
- Describe about different kind of scale requirements
- Describe about plans, sections, elevations, and other views
- Describe about drafting principles and computer commands

4.2.5. Activity

Provide students with the dimensions of scaffold components (in real-world measurements like meters or feet).
Ask students to convert these dimensions to a specific scale for use in CAD software (e.g., a 1:50 scale for floor plans).
For example, if the scaffold beam is 5 meters long, the student would convert this to a 1:50 scale (i.e., 5 meters = 10 cm on the drawing).
Once completed, have the students discuss how the conversion affects their drawings, including scaling down heights, lengths, and widths.

4.2.6. Notes for Facilitation

- Revise the important points discussed in this unit.
- Clear the doubts of the students, if any. Encourage them to ask questions.
- Discuss the question with the class and answer their queries satisfactorily.
- Help participants identify how to apply the skills taught in the course to their work
- Praise participants and the group on improving their performance and developing new skills.
- Encourage participants to move through the initial difficulties of learning new skills, by focusing
- on steps in their progress and the importance of what they are learning to do.

4.2.7. Summary

Conducting calculations

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The first step of drawing detailed drawings is proper calculation to work out the scale of the different constituents. For instance, in developing scaffolds, users must calculate the various lengths, width, height, and spacing between parts of the building based on specific requirements of a project. Therefore, these must be highly accurate to obtain a stable end product.

Measurement of Dimensions of Required Scale:

Once the dimensions are calculated, these must then be reduced to a scale suitable for use in the drafting machines. Then, in the drawing, there will be shown the real dimension but on a scale that suits viewing at manageable size. Thus, for example, in 1:50 scale, any unit represented on the paper equates to 50 units in real life. This, of course, then makes it quite easy to view and work on the drawings.

Use of Drafting Principles in Procreation of CAD drawings

Once the dimensions have already been converted to scales, then the drawings are to be created. An individual applies draft principles to generate reasonable, accurate, and standardized drawings. In order to present the representation of the various parts, these different views would need to include the plan, section, and elevation. Thus, the draft becomes a detailed representation of building or fabricating components.

Software Commands

Modern design will require computer-aided design software to use to design or change the drawings easily. A person will be required to master a series of CAD commands in the order that can involve lines, circles, arcs, and dimension addition. When executed appropriately, one ensures high quality with respect to accuracy in terms of drawing by being standardly consistent with the practices involved in the industries.

4.2.8. Exercise

1.Which of the following is the first step when calculating the dimensions of components in scaffolding design?
a) Convert dimensions to the required scale
b) Carry out necessary calculations for component parts
c) Use drafting principles to produce CAD drawings
d) Use the appropriate software commands to input the dimensions
2.What is a key principle of drafting when creating scaffold drawings?
a) Use of multiple scale types
b) Representation of components from different angles
c) Simplification of all measurements
d) Only including the final design without preliminary drafts
3.True or False: CAD software allows you to produce detailed drawings that include plans, sections, elevations, and various views.
4.True or False: The drafting principles used in CAD drawings for scaffolding are not important as long as the final design is accurate.
5.The first step in creating a scaffold drawing is to carry out necessary _____ to calculate the dimensions of the components.
6.After performing the necessary calculations, the dimensions should be _____ to the required scale for input into the CAD system.

4.3. unit 4.2 Preparation of scaffold drawings & highlighting the components, specification & critical feature

4.3.1. Unit Objectives

At the end of this unit, students will be able to:

- To prepare effective scaffold drawings using CAD system
- To highlighting critical features to ensure adherence to specifications and to conventions for instance,
- To use keyboard commands, pull-down menus, standardized codes and references.

4.3.2. Resources

- Whiteboard, erasable marker, board cleaner, projection screen, laptop, speaker, notebook, pen, participant handbook, etc
- Flip chart
- Participant Manual
- Projection screen and PowerPoint presentations.
- Activities (role plays)

4.3.3. Say

- Describe about design of effective scaffold drawings using CAD system

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- Describe about critical features to ensure adherence to specifications and to conventions
- Describe about how to use keyboard commands, pull-down menus, standardized codes and references

4.3.4. Explain

- Describe about design of effective scaffold drawings using CAD system
- Describe about critical features to ensure adherence to specifications and to conventions
- Describe about how to use keyboard commands, pull-down menus, standardized codes and references

4.3.5. Activity

Provide students with a scaffold design specification (e.g., scaffolding for construction at a specific height with certain load-bearing requirements).
Ask students to:
Draw the scaffold structure, focusing on key components like vertical posts, horizontal beams, braces, and platforms.
Highlight critical features, such as:
Load-bearing points
Safety elements (e.g., guardrails, platform width)
Access points (e.g., ladders)

4.3.6. Notes for Facilitation

- Summarize the important points and terms explained in the session.
- Ask participants if they have any doubts. Encourage them to ask questions.
- Answer questions, as needed, providing concrete and brief answers.
- Tell participants to complete the questions at the end of the unit.
- Ensure that every participant answers all the questions

4.3.7. Summary

Using CAD Tools and Commands
Ability to prepare scaffold drawings begins with familiarization with any of the commonly used CAD systems. This would mean using keyboard commands and pull-down menus in drawing the major parts and components. This means a user must be aware of the tools available in software for it to draw structures accurately and to the standard required in industries.
Using Codes and References
The codes and references should be standardized for the design drawings of a scaffold. The codes determine the safety, material, and load-bearing qualities of the parts. The user must understand how to apply the codes and conventionally accepted notation and ensure all the elements in the design are appropriately labelled and conform to regulation standards.
Noting Important Elements
Some features of the scaffold to be illustrated would be the load-carrying elements, access points, safety guardrails, and any other critical structural component. The structures must be able to draw in such a way that they emphasize key elements for the design to be suitable in every detail of the requirements as well as in meeting expectations about safety.
Drawing Scaffold Assemblies
Assemblages of scaffolds need to be combined in several components to function. The assemblies must be drawn with precision, especially the relationships between different elements such as beams, supports, platforms, and braces, as well as the structural integrity. Important features should be clearly indicated for connection points and support structures.

4.3.8. Exercise

1. When drawing scaffold assemblies in CAD software, what should be highlighted to ensure the design is safe?
a) Decorative elements
b) Load-bearing components and access points
c) Worker uniforms
d) The colour of the scaffold
2. True or False: CAD software allows users to manually draw each component of a scaffold, without using any keyboard commands.
3. True or False: Critical features in scaffold drawings include load-bearing points, access ladders, and platform safety features.

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4. To ensure compliance with safety and building codes, scaffold drawings should use _____ and other relevant references.
5. It is important to _____ critical features such as load-bearing components, access ladders, and guardrails in scaffold drawings.
6. When drawing scaffold assemblies, it is essential to focus on the _____ features to ensure structural integrity and safety.

4.4. Unit 4.3. Creating table and symbols for the drawing

4.4.1. Unit Objectives

At the end of this unit, students will be able to

- To draw correct tables and symbols for scaffold drawings
- To use appropriate and relevant symbols in the drawings
- To present clear, standardized details as per the drawing specifications

4.4.2. Resources

- Whiteboard, erasable marker, board cleaner, projection screen, laptop, speaker, notebook, pen, participant handbook, etc
- Flip chart
- Participant Manual
- Projection screen and PowerPoint presentations.
- Activities (role plays)

4.4.3. Say

- Describe about how to draw correct tables and symbols for scaffold drawings
- Describe about how to use appropriate and relevant symbols in the drawings
- Describe about standardized details as per the drawing specifications

4.4.4. Explain

- Describe about how to draw correct tables and symbols for scaffold drawings
- Describe about how to use appropriate and relevant symbols in the drawings
- Describe about standardized details as per the drawing specifications

4.4.5. Activity

Create a scaffold drawing that includes all necessary components.
Insert a table that lists each component's name, dimensions, perimeter, and area.
Use appropriate symbols to represent the components within the drawing.

4.4.6. Notes for Facilitation

- Summarize the important points and terms explained in the session.
- Ask participants if they have any doubts. Encourage them to ask questions.
- Answer questions, as needed, providing concrete and brief answers.
- Tell participants to complete the questions at the end of the unit.
- Ensure that every participant answers all the questions.

4.4.7. Summary

Creating Tables

Part or component-related scaffold drawings often comprise tables of summative critical information. In this case, lists include names, dimensions, perimeters, and areas. Such data is crucial in understanding the structure's dimensions and layout. By allowing these tables to be constructed based on the needs of clients, all necessary information is provided and arranged to facilitate easy understanding for the reader in the construction, approval, or verification of safety aspects.

Using Symbols:

Symbols are used widely on technical drawings, especially to represent some parts, material, or special features in standard, concise wording. Symbols express necessary information quite fast without further elaboration on descriptions. Examples of symbols commonly used in a scaffold drawing represent posts, beams, braces, and safety attributes like guardrails. Knowing which symbol to apply and using them will ensure a standard industry approach in the use of the given drawing by different parties, even designers and teams during construction.

4.4.8. Exercise

1. What is the main purpose of creating tables in scaffold drawings?
a) To include aesthetic details

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b) To list the name, dimensions, perimeter, and area of components
c) To colour-coded the components
d) To display only the component names
2. Which information is typically included in the table for a scaffold component?
a) Component colour
b) Name, dimensions, perimeter, and area
c) Component weight
d) Contractor's name
3. True or False: Symbols in scaffold drawings are used to represent the name and dimensions of each component.
4. True or False: It is important to use standardized symbols to ensure that scaffold drawings can be easily understood by anyone in the construction industry.
5.To calculate the perimeter of a scaffold component, you need to add the _____ of all its sides.
6. The area of a scaffold component is calculated by multiplying its _____ and width.

5. Unit 5 NOS 4: SSD/VSQ/N0216: Calculation of loads in scaffold designs as per Indian & International Standard

5.1. Key Learning Outcomes

At the end of this module, the trainees will be able to

- Dead Loads, imposed loads, wind loads as per Indian Standard code of practice for design loads.
- Load combinations for design loads.
- International practices in the design of scaffolds.

5.2. Unit 5.1: Understand Load on Scaffold

5.2.1. Unit Objectives

At the end of this unit, students will be able to:

- To understand and apply the concepts of load analysis in scaffold design
- To identify and calculate various loads and load factors that affect scaffold design
- To understand design load calculations and assess the effects of these loads on the stability and safety of the scaffold.

5.2.2. Resources

- Whiteboard, erasable marker, board cleaner, projection screen, laptop, speaker, notebook, pen, participant handbook, etc
- Flip chart
- Participant Manual
- Projection screen and PowerPoint presentations.
- Activities (role plays)

5.2.3. Say

- Describe about concepts of load analysis in scaffold design
- Describe how to calculate various loads and load factors that affect scaffold design
- Describe design load calculations and assess the effects of these loads on the stability and safety of the scaffold

5.2.4. Explain

- Describe about concepts of load analysis in scaffold design
- Describe how to calculate various loads and load factors that affect scaffold design
- Describe design load calculations and assess the effects of these loads on the stability and safety of the scaffold

5.2.5. Activity

Ask participant to analyse how the loads affect the scaffold design and what safety measures should be considered to mitigate risks, such as:
Reinforcing the scaffold structure
Adding bracing to handle wind loads
Distributing imposed loads evenly

5.2.6. Notes for Facilitation

- Summarize the important points and terms explained in the session.
- Ask participants if they have any doubts. Encourage them to ask questions.

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- Answer questions, as needed, providing concrete and brief answers.
- Tell participants to complete the questions at the end of the unit.
- Ensure that every participant answers all the questions.

5.2.7. Summary

Loads & Load Factors Identification

Dead loads, imposed loads, and wind loads act on scaffolds.

Dead loads are the weight of the scaffold structure itself. This includes all permanent components, such as the frame, platforms, and safety rails.

Imposed loads are temporary loads from workers, materials, tools, and equipment placed on the scaffold.

This occurs when the forces applied to the scaffold are from wind pressure that changes with the height, location, and environmental conditions of the scaffold.

Knowledge of what affects them, including materials and environmental factors, is therefore essential for proper design of scaffolding.

Knowledge of Load Calculation for Design

The procedure for determining loads for design encompasses the computation of the value for each load, ensuring that all loads are securely sustainable by the scaffolding.

The main concept in dead load calculation is based on the weight of the components of the scaffold.

Imposed load calculation often considers a number of parameters including the number of workers, equipment, and materials intended to be supported by the scaffold.

Calculations of wind load often depend on information regarding wind speed and take into account the surface area exposed to wind pressure.

These calculations ensure that the scaffold is designed with enough strength to hold the loads that will be present when in use.

Dead Loads, Imposed Loads, and Wind Loads

Once the loads are identified and calculated, then it becomes paramount to assess how each load will influence the design of the scaffold as well as overall stability

Dead loads influence the foundation and the overall strength of the scaffold structure.

Imposed loads should be distributed evenly in order not to overload some parts of the scaffold.

The taller the scaffolding, the more heavy the loads of wind could be, and these structures may need further bracing support to make sure that such risks of toppling or even failing do not occur.

These loads are then analysed to be more safety-effective and efficient designs of the dynamic conditions to be withstood by the construction site.

5.2.8. Exercise

1.Which of the following is an example of a dead load in scaffold design?

a) The weight of workers on the scaffold

b) The scaffold's own weight, including components like frames and platforms

c) Wind pressure on the scaffold

d) Tools and equipment on the scaffold

2.What is the primary goal of analysing dead loads, imposed loads, and wind loads in scaffold design?

a) To make the scaffold look more appealing

b) To ensure the scaffold can safely bear the necessary loads and maintain stability

c) To reduce the weight of the scaffold

d) To increase the speed of construction

3.True or False: Imposed loads refer to the weight of materials, equipment, and workers on the scaffold.

4.True or False: Wind loads are only relevant for scaffolds taller than 10 meters.

5.Imposed loads include the weight of _____, equipment, and materials placed on the scaffold.

6.Wind loads are calculated based on the _____ of wind and the surface area of the scaffold exposed to the wind.

5.3.Unit 5.2 Understand Codes for Load Calculation

5.3.1. Unit Objectives

At the end of this unit, students will be able to:

- To understand and apply the relevant codes and standards for load calculations in scaffold design.
- To interpreting IS-875 and IS-3696 for load calculation
- To ensure that scaffold designs are safe, stable, and meet the regulatory requirements with international standards and practices

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5.3.2. Resources

- Whiteboard, erasable marker, board cleaner, projection screen, laptop, speaker, notebook, pen, participant handbook, etc
- Flip chart
- Participant Manual
- Projection screen and PowerPoint presentations.
- Activities (role plays)

5.3.3. Say

- Describe about IS-875 and IS-3696 for load calculation
- Describe about scaffold designs are safe, stable, and meet the regulatory requirements with international standards and practices

5.3.4. Explain

- Describe about IS-875 and IS-3696 for load calculation
- Describe about scaffold designs are safe, stable, and meet the regulatory requirements with international standards and practices

5.3.5. Activity

Divide participant into two groups: one group will analyse the elements of IS-875 related to scaffold load calculation, while the other group will focus on provisions of IS-3696.
Ask each group to identify key provisions in the respective codes that apply to scaffolds.
Provide them with code excerpts or summaries of key sections for discussion.

5.3.6. Notes for Facilitation

- Summarize the important points and terms explained in the session.
- Ask participants if they have any doubts. Encourage them to ask questions.
- Answer questions, as needed, providing concrete and brief answers.
- Tell participants to complete the questions at the end of the unit.
- Ensure that every participant answers all the questions.

5.3.7. Summary

IS-875: Loads for Scaffolds and Walls

IS-875 is an Indian standard that describes the calculation of various loads a scaffold has to bear. Dead loads are weights of the scaffolding itself, imposed loads comprise the weight of workers, materials, and equipment, and wind loads are forces exerted by wind on the scaffold. Based on the IS-875 analysis, one will be able to ensure the proper computation of these loads to avoid the failure or instability of the scaffold. There are also various means by which each of these constituents contributes to and interacts in bringing about the scaffolding loadbearing capability.

IS-3696: Scaffold Safety Provisions

IS-3696 is comprised of scaffolding standards that outline safety measures and guidance on the construction practice, load-bearing capacity, and material specifications. The standard gives the safety requirements to ensure scaffolds are constructed according to the safety measures to avoid accidents and structural failure among workers. The analysis of the provisions in IS-3696 allows the scaffold designers to determine the minimum safety requirements and structural integrity while designing and erecting scaffolds.

Applicable IS-875 & IS-3696 in Load Calculations

IS-875 and IS-3696 should be properly applied in the process to get accurate load calculations and design for the scaffold. With a combination of the provisions of the two standards, scaffold designers can obtain the total design loads, confirm the compliance with safety standards, and apply international codes and practices to further confirm the safety of the scaffold. Complying with these codes allows scaffold designers to ensure that the structure can bear expected loads, such as wind forces, and work safely throughout its usage.

5.3.8. Exercise

1. Which of the following is a load element defined in IS-875 applicable to scaffold design?
a) Imposed load
b) Wind load
c) Dead load
d) All of the above

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2. Which of the following international codes may be applied in conjunction with IS-875 and IS-3696?
a) OSHA regulations (U.S.)
b) EN 12811 (Europe)
c) Both a and b
d) None of the above
3.True or False: IS-3696 provides guidelines for scaffold safety, including material specifications and construction practices.
4.True or False: Wind load calculation is not a part of the scope of IS-875 for scaffold design.
5.True or False: IS-875 can be used in conjunction with international codes to verify scaffold design and ensure global compliance.
6.IS-3696 focuses on the safety provisions and _____ requirements for scaffolds, ensuring their stability and integrity.
7.The main goal of applying both IS-875 and IS-3696 is to ensure that the scaffold can safely bear _____ and maintain structural integrity.

5.4. Unit 5.3 : Load calculation on Scaffold

5.4.1. Unit Objectives

At the end of this unit, students will be able to:

- To calculate and analyse the various types of loads that affect scaffold design, including dead loads, imposed loads, and wind loads, according to Indian and international standards.
- To learn how to determine which combination of loads on scaffolds and verify design loads details in order to ensure such scaffolding accords with standards internationally

5.4.2. Resources

- Whiteboard, erasable marker, board cleaner, projection screen, laptop, speaker, notebook, pen, participant handbook, etc
- Flip chart
- Participant Manual
- Projection screen and PowerPoint presentations.
- Activities (role plays)

5.4.3. Say

- Describe about various types of loads that affect scaffold design
- Describe how to determine which combination of loads on scaffolds and verify design loads

5.4.4. Explain

- Describe about various types of loads that affect scaffold design
- Describe how to determine which combination of loads on scaffolds and verify design loads

5.4.5. Activity

Give the participant a detailed scaffold design with the following:
Dimensions (height, width, length)
Material types (steel, wood, etc.)
Components like frames, platforms, guardrails, etc.
Ask participant to calculate the total dead load of the scaffold using the relevant sections of IS-875.

5.4.6. Notes for Facilitation

- Summarize the important points and terms explained in the session.
- Ask participants if they have any doubts. Encourage them to ask questions.
- Answer questions, as needed, providing concrete and brief answers.
- Tell participants to complete the questions at the end of the unit.
- Ensure that every participant answers all the questions.

5.4.7. Summary

Dead Load Calculation

Dead load is the weight of the components of the scaffold, which may include frames, platforms, guardrails, and other structural elements. According to Indian Standard Codes, such as IS-875, dead load needs to be calculated accurately so that the total weight of the scaffold structure is known. This way, it is ensured that the foundation of the scaffold will be able to carry its weight without any possibility of collapse.

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Calculations for imposed and wind loads

Imposed loads include additional loads on the scaffolds, created by the presence of workers, tools, and other materials. Their magnitude may vary with application and should be calculated based on the load-carrying capacity of workers and the quantities of materials expected on site.

Wind loads are forces applied to scaffolds by the wind, and their magnitude can be considerable based on the height, location, and exposure of the scaffold. Such loads are computed based on guidelines in IS-875 and international codes like EN 12811 and OSHA, based on wind speed and the surface area of the scaffold.

Combination of Loads

After evaluating separate loads, the second step is to establish combination of loads.} Load combinations are significant because scaffolds may be exposed to one or more force simultaneously, for example, dead load, imposed load, and wind load. Calculation of load combinations are made based on rules that are defined in standards, such as IS-875 so that it is possible to ensure whether a scaffold can resist the combined effect of all loads safely.

Check against Design Load

Lastly, one should ensure that the scaffold design is capable of meeting the loads. The check against design load is done by comparing the calculated load combinations with the designed capacity of the scaffold. The verification process thus ensures that it is not overloading the scaffold and meets all safety standards. International design standards such as EN 12811 and OSHA regulations guide the process, and scaffolds are built to be safe under expected loads.

5.4.8. Exercise

1.Which of the following load types is defined as the weight of the scaffold components themselves?

a) Imposed load

b) Dead load

c) Wind load

d) Dynamic load

2.Which Indian standard is used to calculate the load on scaffolds, including dead loads, imposed loads, and wind loads?

a) IS-1367

b) IS-875

c) IS-2901

d) IS-3696

3.True or False: The dead load of a scaffold includes the weight of workers, tools, and materials placed on the scaffold.

4.True or False: Imposed loads refer to the weight of the scaffold components, including frames and platforms.

5.The weight of the scaffold components such as frames, platforms, and guardrails is referred to as the _____ load.

6.To calculate the wind load on a scaffold, one must consider factors such as the scaffold's _____ and the wind speed at the location.

7.The _____ load includes the weight of workers, materials, and tools that are placed on the scaffold.

6. Unit 6 NOS 5: SSD/VSQ/N0217: Analysis of Scaffold design using STAAD Pro as per applicable IS and International Codes

6.1. Key Learning Outcomes

- Design check and analysis of scaffolding using STAAD Pro.
- Safety measures in the scaffold are to be covered during the design of the scaffold.
- Documents to be prepared and maintained in scaffold design.

6.2. Unit 6.1. Analysis of Scaffolding using STAAD Pro as per applicable IS and International Codes

6.2.1. Unit Objectives

At the end of this unit, students will be able to:

- To design and analyse scaffold structures by properly interpreting specifications, applying load calculations, and using software tools for analysis

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- To determine the appropriate scaffold components and their arrangement to ensure the structure's safety, stability, and compliance with relevant codes and standards
- Conducting software-based structural analysis while adhering to industry regulations.

6.2.2. Resources

- Whiteboard, erasable marker, board cleaner, projection screen, laptop, speaker, notebook, pen, participant handbook, etc
- Flip chart
- Participant Manual
- Projection screen and PowerPoint presentations.
- Activities (role plays)

6.2.3. Say

- Describe about design and analyse scaffold structures using software tools for analysis
- Describe about appropriate scaffold components and their arrangement
- Describe about software-based structural analysis

6.2.4. Explain

- Describe about design and analyse scaffold structures using software tools for analysis
- Describe about appropriate scaffold components and their arrangement
- Describe about software-based structural analysis

6.2.5. Activity

Participant will use STAAD Pro to draw the scaffold structure.
Instructions:
Start with defining the coordinate system and the dimensions of the scaffold.
Identify key nodes, supports, and load-bearing elements.
Use the software to input accurate coordinates for the nodes and define the scaffold geometry as per given specifications.
Ensure correct input of beam, column, and bracing elements.

6.2.6. Notes for Facilitation

- Summarize the important points and terms explained in the session.
- Ask participants if they have any doubts. Encourage them to ask questions.
- Answer questions, as needed, providing concrete and brief answers.
- Tell participants to complete the questions at the end of the unit.
- Ensure that every participant answers all the questions

6.2.7. Summary

Draw the Structure

In the process of analysis, draw the correct scaffold structure based on defining the coordinates, nodes, and dimensions as per the given specifications. In STAAD Pro, it is the creation of the geometric model of the structure from which all subsequent analyses are taken. The main nodes and elements including beams, columns, and bracing are all identified in the geometry.

Design Scaffold Assembly

Once the general form is established, scaffold assemblies are drawn to concentrate attention on important details such as bracing systems and connections. At this stage, the most critical aspects of the structure to the structural integrity of the scaffold come into view against a background of design needs.

Application of Loads

Apply loads on the scaffold structure based on the results of the calculation. Loads are dead load, live load, and wind load. STAAD Pro will allow for an accurate application of loads, therefore reflecting real conditions that the scaffold will experience in its use.

Design and Analysis in STAAD Pro:

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The software STAAD Pro is used to carry out a detailed analysis of the scaffold structure. This step includes running simulations to check the response of the scaffold to applied loads, such as stress, deflection, and stability. STAAD Pro provides detailed reports, which enables designers to optimize the structure for safety and efficiency.

Determining Scaffold Components:

Based on this analysis, required scaffold components-which include tubes, couplers, and planks-are identified. Where they are positioned in the structure of the scaffold is determined based on design calculations, ensuring each component meets its load-bearing requirement and safety standard.

Compliance with Codes and Standards:

The final stage includes checking the scaffold design against appropriate IS codes such as IS 2750, and international standards. It helps ensure that a scaffold complies with all relevant safety and regulatory requirements, whereby the risk to a minimum is achieved while the reliability of the structure is guaranteed.

6.2.8. Exercise

1.True or False: In STAAD Pro, it is essential to define the nodes and coordinates before applying any loads to the scaffold structure.
2.True or False: Scaffolding components such as tubes, couplers, and planks are determined based on the results of the structural analysis in STAAD Pro.
3.What is the first step in analysing a scaffold structure using STAAD Pro?
a) Apply the loads
b) Draw the structure with coordinates, nodes, and dimensions
c) Perform structural analysis
d) Review international scaffold codes
4.Which of the following is a key factor when determining scaffold components in STAAD Pro?
a) Building colour
b) Load-bearing requirements and placement
c) Scaffold colour
d) Type of software used for design
5.The _____ step in STAAD Pro involves applying loads to the scaffold structure based on design calculations.
6. The design and analysis process in STAAD Pro helps ensure that the scaffold complies with _____ codes and international standards.

6.3.Unit 6.2. Reading Scaffold Analysis data and details

6.3.1. Unit Objectives

At the end of this unit, students will be able to:

- To use structural analysis software to read and interpret scaffold analysis data
- To understand the analysed results, extract the necessary outcomes for each scaffold component, and prepare a comprehensive checklist for verification
- To identify and check critical nodes and inspection points within the scaffold structure to ensure safety, stability, and compliance with design specifications
- To assess and verify the structural integrity of scaffolding through detailed analysis and inspection processes.

6.3.2. Resources

- Whiteboard, erasable marker, board cleaner, projection screen, laptop, speaker, notebook, pen, participant handbook, etc
- Flip chart
- Participant Manual
- Projection screen and PowerPoint presentations.
- Activities (role plays)

6.3.3. Say

- Describe about how to use structural analysis software to read and interpret scaffold analysis data
- Describe about how to analysed results & extract the necessary outcomes
- Describe about how to identify and check critical nodes and inspection points within the scaffold structure to ensure safety, stability, and compliance with design specifications
- Describe about how to verify the structural integrity of scaffolding through detailed analysis and inspection processes

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6.3.4. Explain

- Describe about how to use structural analysis software to read and interpret scaffold analysis data
- Describe about how to analysed results & extract the necessary outcomes
- Describe about how to identify and check critical nodes and inspection points within the scaffold structure to ensure safety, stability, and compliance with design specifications
- Describe about how to verify the structural integrity of scaffolding through detailed analysis and inspection processes

6.3.5. Activity

Participant will check the critical nodes and inspection points as per the analysis report, focusing on areas where stress concentrations, excessive deflections, or potential failures might occur.
Instructions:
Participant will review the analysis report and identify critical nodes (e.g., points of maximum load, connections, supports).
Inspect whether the deflections and stress levels at these nodes are within permissible limits.
Mark any critical points that require additional review, reinforcement, or changes to the design.

6.3.6. Notes for Facilitation

- Summarize the important points and terms explained in the session.
- Ask participants if they have any doubts. Encourage them to ask questions.
- Answer questions, as needed, providing concrete and brief answers.
- Tell participants to complete the questions at the end of the unit.
- Ensure that every participant answers all the questions

6.3.7. Summary

Understanding the Analysed Results

Firstly, the output of the data from scaffold analysis must be interpreted as stress, deflection, and load distribution along the various scaffold components. Only a qualified person can interpret the result of analysis and conclude what part of the scaffolding passes the test while others are to be changed to be safe enough. That is, how different parameters impact the final stability and performance of the scaffold.

Extracting Required Results and Preparing Component Checklists

Following this understanding of the analysed data, the most important results that have an impact on the design need to be retrieved from the same. This will check whether every component of the scaffold is meeting up with enough load-bearing capacity, stress values, and deflection values. Then, for every component, a checklist will be prepared and cross-checked with respect to safety margins and design specifications. A checklist helps in assessing which component might need additional support or redesign to ensure quality.

Checking the critical nodes, and inspection points

Finally, checking critical nodes and inspection points within the scaffold is important to ensure that the structure is safe. These are the points where stresses and deflections are the highest, and they often represent points of potential failure. A thorough inspection involves reviewing these points for compliance with safety standards and ensuring that any potential issues are addressed. This process ensures that the scaffold will perform safely under expected loads and environmental conditions.

6.3.8. Exercise

1.True or False: The checklist for each scaffold component should only include aesthetic considerations, not structural data such as stress or deflection.
2.True or False: Checking critical nodes involves identifying areas where stresses and deflections are highest to ensure the scaffold is structurally sound.
3.What is the primary purpose of extracting the required results from scaffold analysis?
a) To understand the aesthetic appearance of the scaffold
b) To identify areas that may require modifications or reinforcement
c) To ensure that the scaffold is designed with the least amount of material
d) To calculate the cost of scaffold components
4.Which of the following is a critical aspect when preparing a checklist for scaffold components after reading the analysis data?
a) Checking the colour of the scaffold

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b) Verifying that the component can withstand the applied load and stress limits
c) Measuring the dimensions of the scaffold only
d) Verifying the installation schedule
5.After reading the scaffold analysis data, it is important to _____ the critical results such as stress and deflection to ensure the scaffold meets design requirements.
6.A checklist for each scaffold component should include a review of _____ to ensure the component can handle the loads it will experience.

6.4. Unit 6.3. Drawings & Documentation

6.4.1. Unit Objectives

At the end of this unit, students will be able to:

- To prepare, extract, and present software drawings as well as the result data resulting from a scaffold analysis
- To prepare drawing and data sheets that are accurate, thereby providing proper documentation for checking, records, and future reference
- To extract detailed analysis results, prepare organized data sheets, and generate software drawings

6.4.2. Resources

- Whiteboard, erasable marker, board cleaner, projection screen, laptop, speaker, notebook, pen, participant handbook, etc
- Flip chart
- Participant Manual
- Projection screen and PowerPoint presentations.
- Activities (role plays)

6.4.3. Say

- Describe about process of preparing drawing and data sheets
- Describe about extract detailed analysis results

6.4.4. Explain

- Describe about process of preparing drawing and data sheets
- Describe about extract detailed analysis results

6.4.5. Activity

Participant will use the structural analysis software (e.g., STAAD Pro) to generate and extract drawings of the scaffold structure after the analysis is complete.
Instructions:
Demonstrate how to access the drawing extraction tool in the software.
Guide participant to select the appropriate drawing view (top view, side view, elevation) and extract the necessary scaffold components, connections, and nodes.
Ensure that participant know how to customize the drawings to include important details like dimensions, material types, and labels.

6.4.6. Notes for Facilitation

- Summarize the important points and terms explained in the session.
- Ask participants if they have any doubts. Encourage them to ask questions.
- Answer questions, as needed, providing concrete and brief answers.
- Tell participants to complete the questions at the end of the unit.
- Ensure that every participant answers all the questions

6.4.7. Summary

Preparing & drawing software extracts

Once the scaffold analysis is complete, accurate software drawings representing the scaffold structure must be generated. The drawings should contain essential details such as dimensions, node locations, and component connections. Extracting these drawings ensures that the design can be reviewed, shared, and used for construction purposes, ensuring clarity and completeness in the visual representation of the scaffold.

Prepare and extract result data for verification and records

The outcome data from the analysis provides the necessary information of how the scaffold would behave under load. The data includes stress values, deflections, and load distributions for all parts of the scaffold. The data needs to be extracted for the scaffold to meet the standards in design and get a detailed check. This also serves as a record of the analysis for future inspection or audit, ensuring that all design criteria are met and documented.

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Preparing Data Sheets and Drawing Sheets for Records

Extracted software drawings and result data are compiled in formal data sheets and drawing sheets, with proper documentation. All such sheets must be well arranged and formatted, clearly showing every necessary detail involved, including the specifications of material, safety factor, and whether they comply with any relevant code or not. A well-prepared data sheet and drawing sheet, for this matter, would serve as a legal record important for future references, inspections, and approvals.

6.4.8. Exercise

1. What is the first step in preparing documentation after performing a scaffold analysis?
a) Extracting the result data for checking and records
b) Preparing the data sheet and drawing sheet for records
c) Preparing and extracting the software drawing after analysis
d) Reviewing the design for compliance with codes
2. When preparing the data sheet and drawing sheet for records, what must be included?
a) Personal information of the design engineer
b) Material specifications, component details, and analysis results
c) Future project deadlines
d) Non-structural component aesthetics
3.Why is it important to compile a data sheet after extracting result data from the analysis?
a) To provide a visual representation of the scaffold design
b) To ensure that all analysis results are documented and easy to reference
c) To reduce the need for safety checks
d) To estimate project costs
4.True or False: The software drawing extracted after analysis includes only visual representations, without any engineering data.
5.True or False: Compiling the data sheet and drawing sheet is an important step for ensuring that all analysis results are properly documented for future inspections and verification.
6.After completing the analysis, it is essential to _____ the software drawing to capture important details like dimensions, node locations, and component connections.
7.The extracted result data typically includes _____, stress values, and load distribution for each scaffold component.

7. Unit 6 NOS 5: SSD/VSQ/N0210: Plan, Organize & Monitor

7.1. Key Learning Outcomes

- Planning of resources for own work and communication to concerned subordinates, co-workers, and superiors.
- Provide necessary support to subordinates, coordinate with co-workers and liaise with superiors and other teams.
- Monitor progress of work and adjust, manage, or project requirements on time.

7.2. Unit 6.1: Planning of Work

7.2.1. Unit Objectives

At the end of this unit, students will be able to:

- Understand process of plan the resources, schedules, and timelines as per work timelines given by superiors.
- Understand hierarchy of the organization and communicate to concerned co workers and superiors.
- Understand how to do work within timelines.

7.2.2. Resources

- Whiteboard, erasable marker, board cleaner, projection screen, laptop, speaker, notebook, pen, participant handbook, etc
- Flip chart
- Participant Manual
- Projection screen and PowerPoint presentations.
- Activities (role plays)

7.2.3. Say

- Describe resource allocation and resource schedule
- Describe process of hierarchy of the organization and communicate to concerned co workers and superiors.

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- Describe Task allocation and timeline

7.2.4. Explain

- Describe resource allocation and resource schedule
- Describe process of hierarchy of the organization and communicate to concerned co workers and superiors.
- Describe Task allocation and timeline

7.2.5. Activity

Participant will create a Work Breakdown Structure (WBS) to break down the tasks involved in scaffolding design into smaller, manageable components.
Instructions:
Guide Participant to identify the primary tasks involved, such as:
Site assessment and survey
Structural design and analysis
Material procurement
Safety review and inspection
Drawing and documentation preparation
Assembly and disassembly
Encourage participant to further break down these tasks into smaller sub-tasks.
Have each group create a visual WBS chart on a whiteboard or using project management software.

7.2.6. Notes for Facilitation

- Summarize the important points and terms explained in the session.
- Ask participants if they have any doubts. Encourage them to ask questions.
- Answer questions, as needed, providing concrete and brief answers.
- Tell participants to complete the questions at the end of the unit.
- Ensure that every participant answers all the questions

7.2.7. Summary

Key components identification: Scaffolding design planning starts by identifying the main elements of the project. Determining load-bearing capacity, selection of material, installation of safety features such as guardrails and ladders, and compliance with applicable safety standards and building codes will be some of the key considerations.

WBS:

A WBS is prepared to break down the whole project into smaller, more manageable tasks. Tasks generally include site assessment, structural design and analysis, material procurement, safety review, and final assembly. Breaking down the project into smaller components helps ensure that no task is overlooked and that each phase of the project is executed efficiently.

Timeline Development:

Coordination of all tasks with a clear timeline will ensure the smooth flow of the project. Tasks have to be sequenced appropriately; in fact, some tasks can only be undertaken once others are complete (e.g., procurement of materials before assembling a scaffold). There should also be critical stages of the project that are supported by milestones, such as the completion of design, material procurement, and safety inspection.

Resource Allocation:

It includes planning for resources; this should ensure that all the needs for resources including personnel, tools, and funds are determined. Resources should be provided at appropriate times to complete tasks without time or resource deficits. Resource allocation implies an adequate number of persons, tools, and materials involved in each job and budget for the expenses that guide them.

Coordination and Communication:

Proper coordination and communication among all members of the design team are important as they prepare their designs for scaffolding systems. Proper communication should exist between the design team, procurement team, and on-site workers to avoid conflict and delay.

7.2.8. Exercise

1. What is the first step in planning safety resources for a work task?
A) Gathering feedback from team members
B) Reviewing the overall work timelines and objectives
C) Conducting a financial audit
D) Allocating tasks to subordinates

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2. What is the primary purpose of resource planning?
A) To allocate tasks to employees
B) To minimize costs
C) To ensure resources are available when needed
D) To increase profit margins
3. Which document typically outlines the project schedule?
A) Project charter
B) Statement of work
C) Project management plan
D) Risk management plan
4. Which term describes the resources needed to complete a project?
A) Resource pool
B) Resource allocation
C) Resource capacity
D) Resource requirement
5. True or False: In work planning, it is essential to consider worker skill levels and ensure adequate training for the tasks they will perform.
6. True or False: Work planning should avoid including safety protocols if the tasks seem simple or low-risk.
7. True or False: A detailed work plan helps in minimizing delays, reducing accidents, and increasing productivity.

7.3. Unit 6.2: Organizing of Work

7.3.1. Unit Objectives

At the end of this unit, students will be able to:

- Resource collection and provisioning.
- Understand Communication Medium to concerned co workers and superiors.
- Briefing to subordinates about the schedule, sequence, timing and resources to subordinates

7.3.2. Resources

- Whiteboard, erasable marker, board cleaner, projection screen, laptop, speaker, notebook, pen, participant handbook, etc
- Flip chart
- Participant Manual
- Projection screen and PowerPoint presentations.
- Activities (role plays)

7.3.3. Say

- Describe Resource collection and provisioning
- Describe process of hierarchy of the organization and communicate to concerned co workers and superiors.
- Describe process of Briefing to subordinates about the schedule, sequence, timing and resources to subordinates

7.3.4. Explain

- Describe Resource collection and provisioning
- Describe process of hierarchy of the organization and communicate to concerned co workers and superiors.
- Describe process of Briefing to subordinates about the schedule, sequence, timing and resources to subordinates

7.3.5. Activity

Have the participant identify and define the key tasks involved in scaffolding design.
Instructions:
Divide the participant into small groups (4-5 members per group).
Ask each group to brainstorm and list the major tasks involved in scaffolding design, such as:
Site survey and assessment
Structural analysis and load calculations
Material selection
Safety planning (e.g., guardrails, ladders)
Drawing and documentation preparation
Scaffold assembly planning
Safety review and compliance check

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Encourage each group to think about the dependencies between tasks and how one task may affect the next.

7.3.6. Notes for Facilitation

- Summarize the important points and terms explained in the session.
- Ask participants if they have any doubts. Encourage them to ask questions.
- Answer questions, as needed, providing concrete and brief answers.
- Tell participants to complete the questions at the end of the unit.
- Ensure that every participant answers all the questions

7.3.7. Summary

Work Organization involves task identification and breaking them down. The major tasks involved in scaffold design include site surveys, structural analysis, material selection, safety planning, load calculations, drawing preparation, and final assembly planning. Breaking down of each major task into smaller sub-tasks prevents overlooking details and making sure that all the steps are completed efficiently.

Delegation of task and responsibility

The second step after task breakdown is responsibility assignment. It is where clear delegation is brought in to show who should do what in the team. Thus, everyone knows what they are supposed to do and concentrate on accomplishing their respective assigned tasks. Proper delegation aids in the management of workflow so that nothing is repeated or missed. Each team member should be accountable for his or her specific responsibilities, such as calculations, material research, or safety checks.

Timeline Development:

Work organizing further requires that one sets up a realistic timeline of the project. A structured timeline ensures that tasks are undertaken in the correct sequence and time for their execution. The timeline set should be made to contain several milestones. It will enable checking on how things are faring in relation to the timelines that were initially given. To ensure minimal delays and make the project proceed without hitch, scheduling should occur in a sequence that follows task dependency. Resource allocation:

Proper resource allocation is the essence of organizing work. Resources, apart from material and equipment, are personnel, budget, and software tools. This means that in proper resource allocation, each job has what is needed to complete it on time and with the level of quality that is required, including the proper availability of right materials at the right time, the appropriate personnel for every task, and the right tool and software tools.

Coordination and Communication:

Coordination and communication are effective factors, as everyone is aligned and the project runs smoothly. Teams need to communicate regularly to review progress, challenge problems, and make sure everyone is on the same page. A good communication plan is with regular team meetings and status updates, which helps in addressing any potential issues before they become significant problems.

7.3.8. Exercise

1. What is the primary purpose of resource collection in project management?
A) To allocate tasks
B) To gather necessary materials and inputs
C) To create budgets
D) To schedule meetings
2. What is the first step in resource collection?
A) Allocation of resources
B) Identifying resource needs
C) Distribution of resources
D) Evaluation of resources
3. What is the first step in the resource provisioning process?
A) Allocating resources
B) Identifying resource requirements
C) Monitoring resource usage
D) Reporting resource status
4. What is the best way to ensure your message is understood by co-workers?
A) Use technical jargon
B) Keep the message concise and clear
C) Avoid summarizing key points
D) Speak quickly

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5.True or False: It is not necessary to assign clear responsibilities for safety and emergency procedures when organizing work.
6.True or False: Organizing work includes scheduling tasks in a way that optimizes productivity without compromising safety.
7.True or False: Organizing work should only focus on the efficiency of the process and not on the health and safety of the workers.

7.4.Unit 6.3: Monitoring of Work

7.4.1. Unit Objectives

At the end of this unit, students will be able to:

- Understand process of monitoring progress of work, management of resources, guidance to subordinates.
- Understand process of reporting to superiors and keeping the other teams informed.
- Documentations and compliances and report submission.

7.4.2. Resources

- Whiteboard, erasable marker, board cleaner, projection screen, laptop, speaker, notebook, pen, participant handbook, etc
- Flip chart
- Participant Manual
- Projection screen and PowerPoint presentations.
- Activities (role plays)

7.4.3. Say

- Describe about process of monitoring progress of work, management of resources, guidance to subordinates
- Describe about process of reporting to superiors and keeping the other teams informed
- Describe importance of Documentations and compliances and report submission

7.4.4. Explain

- Describe about process of monitoring progress of work, management of resources, guidance to subordinates
- Describe about process of reporting to superiors and keeping the other teams informed
  Describe importance of Documentations and compliances and report submission

7.4.5. Activity

Have participant identify the key tasks involved in scaffolding design that need to be monitored.
Instructions:
Ask participant to list the major tasks in scaffolding design (e.g., site survey, structural analysis, material procurement, drawing preparation, safety review).
Discuss with participant which of these tasks are critical to monitor and why, such as tasks with deadlines, safety checks, or those dependent on previous steps.
Ask them to think about how they would track the completion of each task and how to measure success.

7.4.6. Notes for Facilitation

- Summarize the important points and terms explained in the session.
- Ask participants if they have any doubts. Encourage them to ask questions.
- Answer questions, as needed, providing concrete and brief answers.
- Tell participants to complete the questions at the end of the unit.
- Ensure that every participant answers all the questions

7.4.7. Summary

Monitoring: This step involves the tracking of the key tasks in the scaffolding design process. Some of the tasks may include site surveys, structural analysis, material selection, safety planning, and preparation of drawings. Monitoring ensures that tasks are accomplished as scheduled and delays are identified in good time.
Measuring Key Performance Indicators (KPIs):
Monitoring often relies on measurable factors like the completion rates of tasks, usage of resources, and adherence to safety standards to evaluate the effectiveness of work being done to assess the progress of the design and quality and efficiency.
Identification of Delays or Issues:
Effective monitoring takes attention to delays, issues, or bottlenecks that may arise during the scaffolding design process. This includes shortcomings in resources, safety issues that have not been met, or misalignments with the deadlines involved with the projects. Problems pinpointed early prompt necessary corrective actions.

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Corrective Action

Once issues are noticed, corrective actions are necessary to ensure they are solved and the project stays on track. Reallocating resources, adjusting timelines, improving communication within the team, or even design modifications may be required to adapt to unexpected issues.

Communication and Coordination:

Constant communication makes tracking the work highly possible. Updates, meetings, and reports keep team members and project managers posted on the progress status of the project and new risks involved. Effective coordination among team members in the process ensures that everyone is on the same pace and can solve problems together.

Compliance with Standards

Another critical monitoring of scaffolding is its design, to ensure that it complies with the safety standards and building codes, and also other regulations. Conducting regular safety inspections, review of design calculations, and verification of material specifications ensures that the final design is safe for use.

7.4.8. Exercise

1.What role does leadership play in monitoring work?

A) It is irrelevant

B) It sets the tone for accountability and support

C) It complicates processes

D) It should be avoided

2. What is the primary purpose of monitoring progress in a project?

A) To assign blame for delays

B) To ensure tasks are completed on time and within budget

C) To ignore issues as they arise

D) To complicate project management

3. Which of the following is a key indicator of project progress?

A) Employee satisfaction

B) Milestone completion

C) Office atmosphere

D) Social media engagement

4.True or False: Organizing work should consider the availability of resources, including tools, materials, and equipment, to avoid delays or inefficiencies.

5. True or False: It is not necessary to assign clear responsibilities for safety and emergency procedures when organizing work.

6. True or False: Organizing work includes scheduling tasks in a way that optimizes productivity without compromising safety.

8. Unit 8 NOS 7: Employability Skills (DGT/VSQ/N0102)

8.1. Key Learning Outcomes

- Introduction to Employability Skills Constitutional values - Citizenship
- Becoming a Professional in the 21st Century Basic English Skills
- Career Development & Goal Setting Communication Skills
- Diversity & Inclusion
- Financial and Legal Literacy Essential Digital Skills
- Entrepreneurship Customer Service
- Getting ready for Apprenticeship & Jobs

8.2.Unit 7.1: Preparing for Employment & Self Employment

8.2.1. Unit Objectives

At the end of this unit, students will be able to

1. **Develop Job Readiness Skills**:
2. **Create Effective Job Search Strategies:**.
3. **Prepare for job interviews and networking opportunities.**
4. **Identify potential self-employment ideas and business opportunities.**
5. **Understand Employment Rights and Responsibilities:**
6. **Enhance Personal Branding:**
7. **Develop Financial and Organizational Skills:**

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8.2.2. Resources

- Whiteboard, erasable marker, board cleaner, projection screen, laptop, speaker, notebook, pen, participant handbook, etc
- Flip chart
- Participant Manual
- Projection screen and PowerPoint presentations.
- Activities (role plays)

8.2.3. Say

Tell the participants that when an interviewer asks you to say something about yourself, he/she is not asking you to present your life history.

• Introduction should be short and crisp, and should present you in a positive light. It should include the following points:

o Any work experience that you might have

o A brief summary of your educational qualifications

o Your strengths and achievements

o Any special projects that you might have been part of

• The following topics should be avoided during an introduction:

o Detailed description of your family (unless you are specifically asked to do so)

o Too much information about your weaknesses

o Information that is not true

8.2.4. Do

- Congratulate each participant for making their first attempt towards creating an effective resume.
- As a follow up activity, you can suggest them to prepare their own resume and show it to you the next day.

8.2.5. Role Play

Conduct a role play for the situation given.

Role Play –

• The interviewer will start by asking the interviewee a few generic questions such as:

o What is your name?

o Tell me something about yourself?

o Can you tell me something about your family?

• Then, at the end of the interview, ask the interviewee:

o There are over 200 people who have applied for this job, some with excellent work experience.

Why should I hire you?

8.2.6. Notes for Facilitation

- Summarize the important points and terms explained in the session.
- Ask participants if they have any doubts. Encourage them to ask questions.
- Answer questions, as needed, providing concrete and brief answers.
- Tell participants to complete the questions at the end of the unit.
- Ensure that every participant answers all the questions

8.2.7. Summary

Job Readiness:

Develop skills for seeking and securing employment or starting a business.

Job Search Tools:

Create a professional resume, cover letter, and online presence.

Prepare for job interviews and networking.

Self-Employment:

Identify and explore potential self-employment or business ideas.

Understand the basics of starting and managing a small business.

Workplace Rights

Learn about employment laws, rights, and responsibilities.

Personal Branding:

Build a strong personal brand for career or business growth.

Financial Planning:

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Develop essential financial and organizational skills for employment or entrepreneurship.

8.2.8. Exercise

1.What is the first step in preparing for employment?
A) Writing a resignation letter
B) Creating a resume
C) Opening a business
D) Networking with friend
2.Which of the following is NOT typically required for self-employment?
A) A business plan
B) An employer to answer to
C) Financial management skills
D) Marketing and sales strategies
3.What should be included in a self-employment business plan?
A) The business idea and goals
B) A list of personal contacts
C) A resume
D) A job offer letter
4.True or False: In self-employment, you are responsible for your own business operations, including financial management and legal compliance.
5.True or False: Having relevant qualifications and work experience is the only factor to consider when preparing for employment.
6.True or False: Personal branding is important for both self-employment and traditional employment opportunities.

8.3.Unit 7.2. Understanding Entrepreneurship

8.3.1. Unit Objectives

At the end of this unit, students will be able to

1. Discuss the concept of entrepreneurship
2. Discuss the importance of entrepreneurship
3. Discuss the characteristics of an entrepreneur
4. Describe the different types of enterprises
5. List the qualities of an effective leader
6. Discuss the benefits of effective leadership
7. List the traits of an effective team
8. Discuss the importance of listening effectively
9. Discuss how to listen effectively
10. Discuss the importance of speaking effectively
11. Discuss how to speak effectively
12. Discuss how to solve problems
13. List the important problem solving traits
14. Discuss ways to assess problem solving skills

8.3.2. Resources

- Whiteboard, erasable marker, board cleaner, projection screen, laptop, speaker, notebook, pen, participant handbook, etc
- Flip chart
- Participant Manual
- Projection screen and PowerPoint presentations.
- Activities (role plays)

8.3.3. Say

Let's start this session with some interesting questions about Indian entrepreneurs

8.3.4. Do

Tell them that you will ask them few questions about a few entrepreneurs.
• Divide the class in to two groups.
• In turns ask the quiz questions to the groups.
• If the answer is incorrect pass the question to the other group.
• Share the answer if the groups are not able to answer.

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• Congratulate the participants who answered correctly

8.3.5. Team Activity

Divide the class into small teams (4-5 participants per team).

Each team needs to come up with a unique business idea. Encourage participants to think creatively, focusing on solving a real-world problem.

Teams should discuss and finalize their business idea

Business Plan Development

Teams will work together to develop a simple business plan for their idea. The plan should cover the following key points:

Business Idea: What is the product or service? How does it solve a problem?

Target Market: Who are the customers? What are their needs?

Unique Value Proposition: Why is the business idea different or better than others in the market?

Revenue Model: How will the business make money (e.g., sales, subscriptions, ads)?

Marketing Strategy: How will the business attract customers?

Launch Plan: How will they introduce the business to the mark

8.3.6. Notes for Facilitation

- Summarize the important points and terms explained in the session.
- Ask participants if they have any doubts. Encourage them to ask questions.
- Answer questions, as needed, providing concrete and brief answers.
- Tell participants to complete the questions at the end of the unit.
- Ensure that every participant answers all the questions

8.3.7. Summary

Close the discussion by summarizing about the opportunities for entrepreneurs in India

8.3.8. Exercise

1. Which of the following is a good practice for writing a professional email?

A) Using a casual tone and slang

B) Including a clear subject line

C) Writing long paragraphs without breaks

D) Not using a greeting

2. Which research method is often used to assess market opportunities for a new business?

A) Historical analysis

B) Surveys and questionnaires

C) Personal opinions

D) Guesswork

3. Which of the following is a primary motivation for entrepreneurs?

A) Seeking a stable salary

B) Solving problems and creating value

C) Avoiding risk

D) Working within a corporate structure

4.True or False: An entrepreneur's role in the economy is limited to running a business for profit.

5.True or False: The entrepreneurial mindset involves risk-taking, resilience, and the ability to adapt to challenges.

6. True or False: Entrepreneurship only applies to individuals who start their own businesses and does not include individuals who work within large corporations.