LESSON

10

LIFTING AND STABILISING LOADS

Lecture: 02 Periods, Practical: 10 Periods Total: 12 Periods

LESSON OBJECTIVES

Upon completion of this lesson, you should be able to:

1. List three factors that you must determine before lifting a load.
2. List and describe three methods for lifting a load.
3. Define a lever, its three components and the three classes of a lever.
4. List at least three applications of the hoist.
5. List two types of cribbing used to stabilise a load.
6. List the five steps to build cribbing for lifting and stabilising a load.
7. List the steps to roll a load using pipes.
8. Demonstrate in two practical stations the techniques for lifting, stabilising and rolling loads.

1

Before Lifting or Moving a Load

The following factors must be examined before lifting or moving a load:

- Weight of the load

_____

_____

- Consequences when the load is moved (what will happen)

_____

_____

- Selection of the method for lifting or moving the load

_____

_____

Notes

2

Methods for Lifting Loads

2.1. The Lever

The lever is the _____ method for lifting a load. A lever is a rigid bar, either straight or bent, that is free to move on a fixed point called a _____. The fulcrum is the object or place that supports the load when a lever is used to move another object.

2

Methods for Lifting Loads
(Cont.)

Notes

Applications of levers:

- To move a load that is too heavy to move by hand
- Pulling / hauling
- Raising

There are three components that make-up a lever: **fulcrum, load, and force.**

Fulcrum : _____

Load: **:** _____

Force: **:** _____

Three Classes of Levers

Levers are divided into three classes based on where the fulcrum is located in relation to both the load and force.

▸ **Class One Lever**

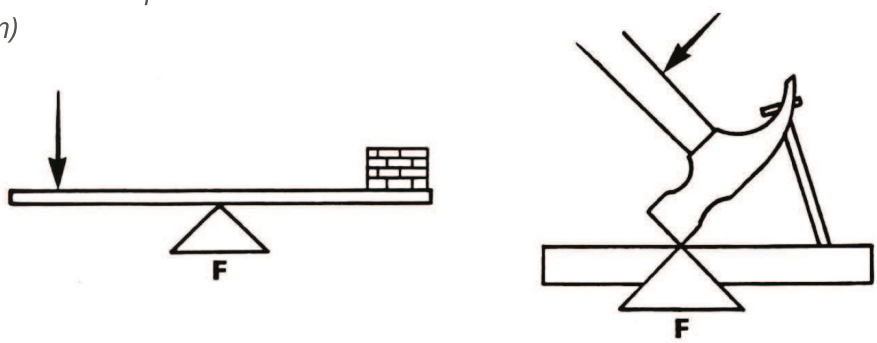
The fulcrum is placed between the force and the load, which provides the greatest mechanical advantage when lifting a load vertically. You can increase the mechanical advantage by using a longer lever.

Examples:

_____

_____

Figure 1 ▸
Class One lever examples (F=fulcrum)



2

Methods for Lifting Loads (Cont.)

Notes

- **Class Two Lever**

  The load is placed between the force and the fulcrum. This is the most useful and efficient lever for moving objects horizontally.

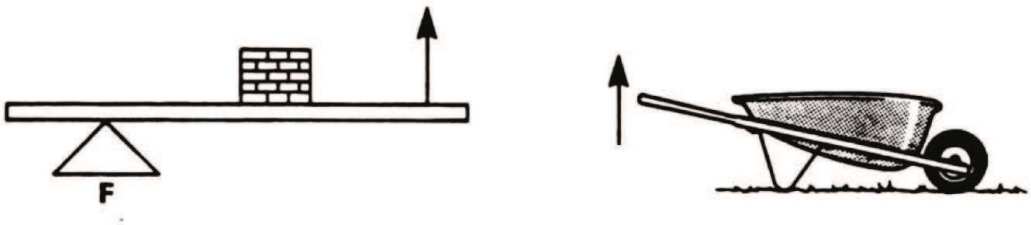
  Examples:

_____

_____

Figure 2 ▾

Class two lever examples



- **Class Three Lever**

  The force is placed between the load and the fulcrum. This type of lever is used when force may be sacrificed for distance, and reduces mechanical advantage.

  Examples:

_____

_____

Figure 3 ▾

Class three lever examples

Methods for Lifting Loads (Cont.)

2.2 The Come-Along

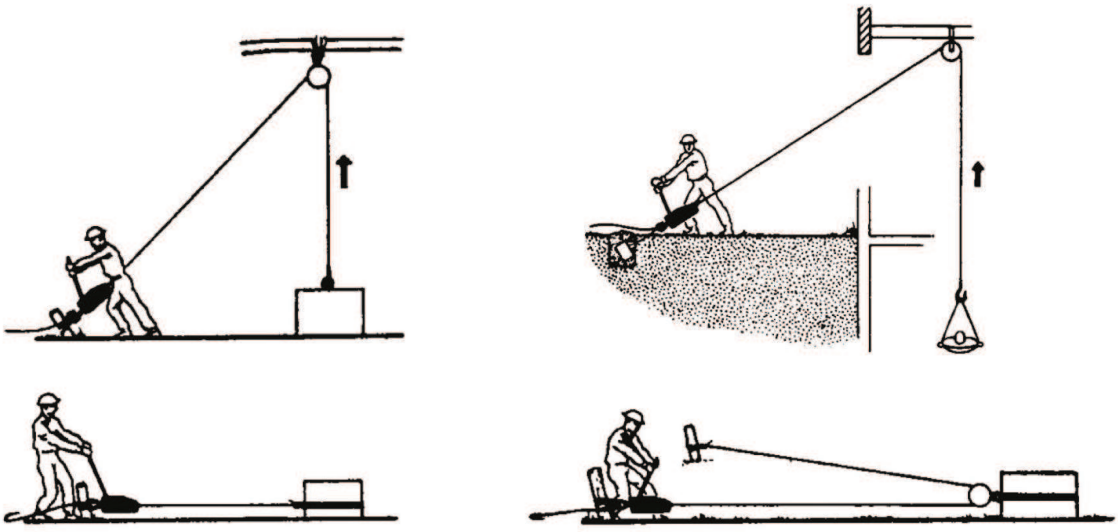
Notes

The _____ provides mechanical advantage for lifting and pulling using a lever and gear ratcheting system. It consists of an anchor hook on one end and another hook attached to a retractable chain or steel cable.

Figure 4 ▸
The come-along

The following figure shows the many uses of the come-along.

Figure 5 ▾
Various uses of the come-along



Notes

2.3 Hydraulic Jacks

These devices are operated with a lever to apply _____ to a ram. Hydraulic jacks are used primarily for lifting heavy loads. Though they usually have only a short reach, they are extremely powerful – a hand-operated bottle jack can lift as much as 50 tons. It is important to keep the hydraulic jack _____ to the ground - the jack is not designed to handle lateral loads.

_____

_____

Figure 6 ▾
Various bottle jacks

Cribbing:

The construction of a stable platform using wood pieces, which is used to stabilise and support loads.

Cribbing is constructed of _____-sized wood pieces arranged as a column to support the weight of an object. _____are used to fill in small spaces and secure the object in its position as it is being lifted. Shims are also used to change the angle of thrust in order to achieve optimum contact with uneven or sloping surfaces.

_____

_____

Notes

Failure of a wood cribbing system is _____ and _____ as the wood fibres are crushed. This usually provides ample warning of impending failure for rescuers.

The requirements for improvised cribbing are:

- The material must be flat on both surfaces
- The material must be able to withstand the weight of the object being supported.

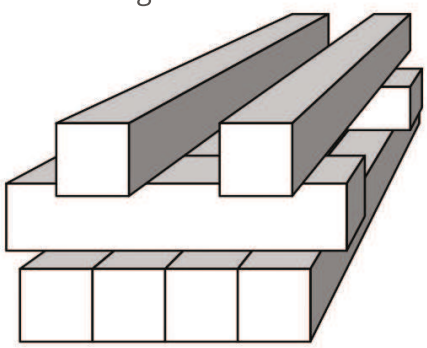
Examples include: Furniture, bricks, concrete blocks, tires, and rims

3.1 Types of Cribbing

BOX:
Built with wood blocks in a square configuration, using _____ parallel blocks per layer. Layers are set at 90 degrees to each other with the ends of the wood blocks overlapping each other by _____ cm. The box crib has an open centre.

Box Cribbing Capacity
10 cm x 10 cm beams: 11,000 kilos
15 cm x 15 cm beams: 27,000 kilos

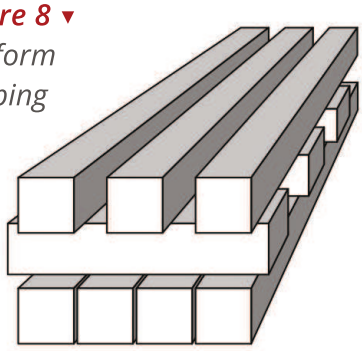
Figure 7 ▾
Box cribbing



Notes

PLATFORM (cross-tie):
Built with wood blocks in solid layers of _____ or more wood pieces each. Layers are set 90 degrees to each other. Little or no space is left between the wood pieces. The ends of the wood pieces must also overlap each other by 10 cm.

Figure 8 ▼
Platform cribbing



Platform Cribbing Capacity
10 cm x 10 cm beams = 48,000 kilos
15 cm x 15 cm beams = 120,000 kilos

3.2 General Guidelines for Cribbing

3.2.1 The first layer should be **solid** to fully distribute the load, especially on softer surfaces, such as soil and asphalt.

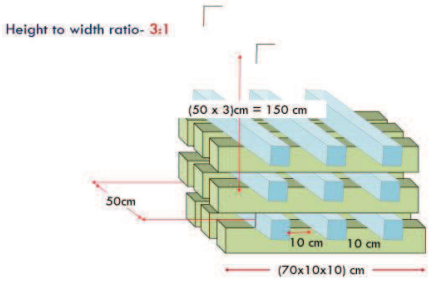
Solid first level

▶ *PPT 10-15*

3.2.2 **Height limit:** The general rule is to limit cribbing to _____ times the width of the base layer of cribbing wood being used for cribbing (3:1 height-to-width ratio). For example, if the pieces of wood are one meter wide from one side of the first crib to the outer side of the last crib (across), the crib should not exceed three meters in height.

Note: - In cribbing, the **base width** refers to the **distance between the two outer edges of the bottom-most layer (or the first row) of timbers** in the cribbing stack.

Height limits
Refer to RM regarding height-to-width ratio.



Overlapping corners

3.3.3 Always overlap corners by approximately 10 cm.

This prevents _____ corners of individual pieces, which can affect overall stability.

3

Using Cribbing to Stabilise Loads (Cont.)

Notes

3.3 Procedure for Lifting and Stabilising a Load

This procedure consists of gradually lifting the target object or load and inserting one layer of cribbing after another until sufficient clearance and stability are obtained. Make sure to use full PPE before starting any work.

3.3.1 Make an initial opening using a shims or similar tool.

_____

3.3.2 Set up a lever system with the pry bar.

_____

3.3.3 Lift the load _____ to create an opening large enough to set up the first layer of cribbing under it. Use wedges to prop up the load gradually as you are lifting; if the pry bar slips or breaks, this will prevent the load from dropping any distance. It is not necessary to lift the full height of the next layer of cribbing all at once.

_____

3.3.4 Raise the fulcrum, raise the load again, and set up the next level of cribbing with the wood pieces at 90 degrees to the previous layer.

_____

3.3.5 Reposition and raise the fulcrum and continue to raise the load until enough clearance is obtained to extricate the victim safely.

_____

Notes

Figure 9 ▸ Methods for safely lifting a load

3.4 Safety Measures for Cribbing

- "Lift an inch, crib an inch."

- Never place hands beneath a load while cribbing!

- For maximum stability, the height cribbing should not exceed three times the width of the cribbing blocks (3:1 ratio).

4

Rolling a Load

You can use metal tubes to roll heavy loads instead of lifting them. Follow the simple steps below using the picture as a guide.

4.1 Raise the load slightly using a **Class One lever**, just enough to slide three metal tubes underneath it (use the lifting technique for cribbing).

4.2 Using **Class Two levers**, push the load in the desired direction. The tubes may be fanned to turn the load as it rolls.

Notes

PRACTICAL EVALUATION

Lesson 10
Shoring Methods

Group #:

	Activity*	Lifting and Stabilizing Loads	Moving Loads
1	Described the characteristics of the TEA being used.		
2	Created a space between the load and lifting point.		
3	**Selected an appropriate location for the fulcrum.**		
4	**Used a lever suitable for the load to be lifted.**		
5	**Used proper cribbing under the load.**		
6	**Secured and stabilised the load properly.**		
7	Used proper placement of tubes for rolling the load.		
8	Used a Class 2 lever to move the load.		
9	Were able modify the direction of the load to the right or left.		
10	Used proper technique and moved the load approximately 8 metres.		
11	**Followed all applicable safety rules while performing the work.**		
12	Work was carried out as a team using proper task distribution.		

**Activities in bold type require satisfactory performance for a passing grade on this evaluation.*

Station 1	**Station 2**
Pass: ☐ Fail: ☐	Pass: ☐ Fail: ☐
Notes:	Notes:
Instructor: _____	Instructor: _____

POST-TEST | LESSON 10

Lifting and Moving Loads

ID #

1. List the three factors that must be examined before moving or lifting a load.

2. Considering that a concrete floor 15 cm thick weighs 30 kg/m2, if you need to lift a rectangular slab 4.2 metres by 2.5 metres, what would the approximate weight of the slab be?

   ( ) 1,000 kilos
   ( ) 3,150 kilos
   ( ) 315 kilos
   ( ) 12,300 kilos
   ( ) None of the above

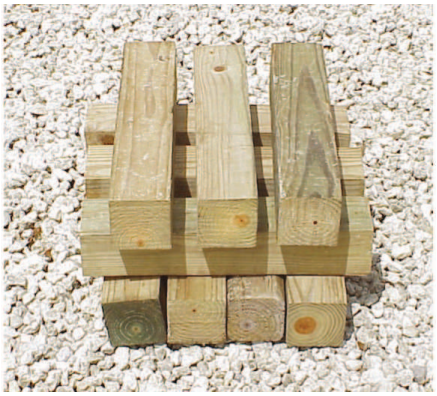
3. The type of lever that has the load between the fulcrum and the force is classified as what type?

   ( ) First Class
   ( ) Second Class
   ( ) Third Class

4. List three uses for a hoist (come-along) during a CSSR operation.

5. Describe the limitations of a hydraulic jack in a CSSR operation.

6. Identify the following images:



7. List the steps for rolling a load on metal tubes.

CSSR LESSON 10 EVALUATION

Course Location: _____ **Dates:** _____

Do not write your name on this form. Please complete a copy of this form at the end of every lesson. Your evaluations are very valuable towards improving the course. Please use the ratings below.

1 VERY POOR	2 POOR	3 AVERAGE	4 GOOD	5 EXCELLENT

Please fill in the required information.	**Lesson Number :**	**Lesson Name :**	
	Instructor's Name		
Use a scale from 1 to 5 as described above to rate the various lesson components.	**Lesson Rating (rate 1 to 5)**		
	Content	Instructor	Method
	Workbook	Interaction	
Mark your selection with an "**X**"	**Instruction Level**		
	☐ Too basic	☐ Appropriate	☐ Too advanced
	Duration		
	☐ Too short	☐ Appropriate	☐ Too long
	Usefulness Was this lesson useful to you?		
		☐ Yes	☐ No
Rate from 1 to 5	**Overall Lesson Rating** Taking all the above into consideration, I rate this lesson: _____		
If you need additional space, please use the back of the sheet.	**Comments and Observations**		

Thank you for your help. Your input is valuable.
Please turn in this completed form to the instructor.

EXERCISE EVALUATION
LESSON 10

Course Location: _____ **Dates:** _____

Do not write your name on this form. Please complete a copy of this form at the end of every lesson. Your evaluations are very valuable towards improving the course. Please use the ratings below.

1 VERY POOR	2 POOR	3 AVERAGE	4 GOOD	5 EXCELLENT

Lesson 10 **Lifting and Stabilizing Loads**	**Station 1**	**Station Name:** Lifting and Stabilizing Loads
	Instructor:	
Use a scale from 1 to 5 as described above to rate the various lesson components.	**Station Rating (rate 1 to 5)** Instructor ____ Materials ____ Method ____ Location ____	
Mark your selection with an "**X**"	**Instruction Level** ☐ Too basic ☐ Appropriate ☐ Too advanced	
	Duration ☐ Too short ☐ Appropriate ☐ Too long	
	Comments and Observations	
	Station 2	**Station Name:** Moving Loads
	Instructor:	
Use a scale from 1 to 5 as described above to rate the various lesson components.	**Station Rating (rate 1 to 5)** Instructor ____ Materials ____ Method ____ Location ____	
Mark your selection with an "**X**"	**Instruction Level** ☐ Too basic ☐ Appropriate ☐ Too advanced	
	Duration ☐ Too short ☐ Appropriate ☐ Too long	
	Comments and Observations	

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