

Medium Level Structural Collapse: Tools

Session 2





Suffolk County Fire Academy

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Session Overview

Session 2

- Hydraulic Powered Tools
- Concrete Properties
- Breaching and Breaking
- Lifting and Moving
- Torches
- Hands-on Stations.



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Session Objectives

Session 2

- Identify Various Tools, How They Are Powered, and Their Operating Principles
- Explain concrete properties and the difference between reinforced and un-reinforced concrete
- Describe best practices for breaching and breaking concrete
- Define the physical properties involved with lifting and moving objects
- Demonstrate the use of tools and equipment for lifting and moving objects and breaching and breaking materials
- Demonstrate lighting and cutting with torches.

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Hydraulic Powered Tools



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Hydraulic Generator (Stanley System)



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Concrete Cutting Chain Saw



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Cut-off Saw



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Jack Hammer



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Hydraulic Drill



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Hydraulic Chipper



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Extrication Tools



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Concrete Properties



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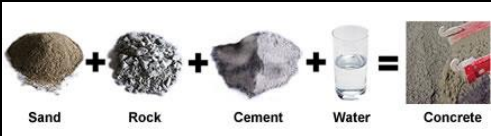
Cement and Hydration

- Initially Utilized By The Greeks and Romans (Quicklime and Volcanic Ash)
- Portland Cement (1824) Invented In England (Limestone and Clay)
- **Hydration** – The exothermic reaction which occurs when cement is mixed with water, binding aggregate, forming concrete
- Most Concrete Cures To Rated Strength In 28 Days.



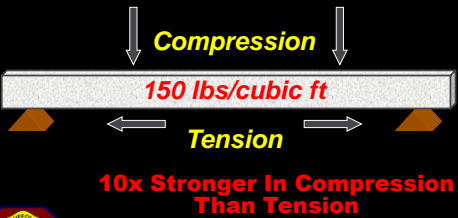
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Concrete Components



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Forces On Concrete



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Environment Effects Concrete



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Types of Concrete


• Cast In Place



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Types of Concrete



• Pre-Cast



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Types of Concrete



• Reinforced



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Types of Concrete



• Reinforced



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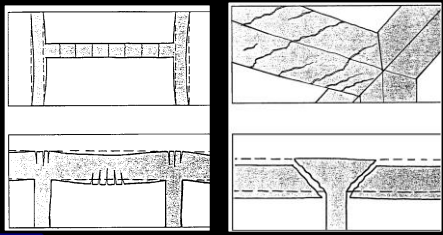
Types of Concrete

• Reinforced



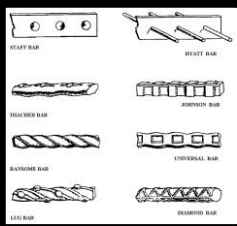
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Why Add Rebar?



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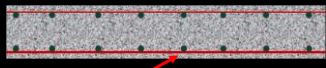
Rebar Types



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Rebar Sizes

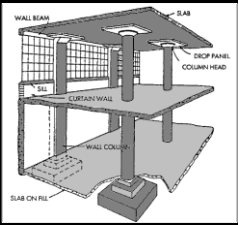
- Sized At 1/8" Intervals
- #2 = 1/4"
- #4 = 1/2"
- #5 = 3/8"
- #6 = 3/4"
- Max #18 2 1/4"
- Larger Size Rebar Is Placed At Bottom Of Pad.



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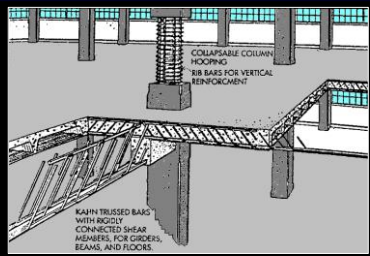
Rebar Placement

- Walls
- One Way Slabs
- Pan Joist
- Two Way Slabs
- Beams and Girders
- Columns.



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Rebar Placement



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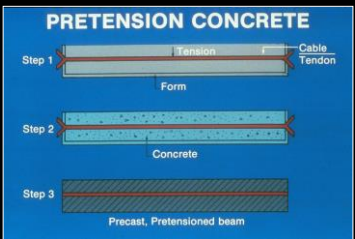
Types of Concrete

- **Pre-Stressed / Pre-Tensioned**
 - Help concrete act as a beam (tension/shear)
 - Tensioned 5,000 – 150,000 lbs
 - Found In Many Different Configurations (2 – 3 inches from surface).



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Types of Concrete



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Types of Concrete



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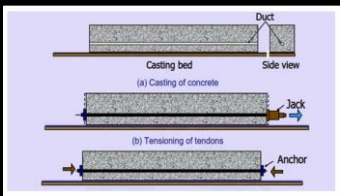
Types of Concrete



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Types of Concrete

Post-Tensioned



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Types of Concrete



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Breaching and Breaking



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Breaching Concrete

- Relief Cuts
- Bevel Cuts
- Stitch Cuts
- Bolting
- Wetting
- Cutting and Burning.



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Breaching Concrete



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Breaching Concrete



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Breaching Concrete



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Breaching Concrete



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Breaching Concrete



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Breaching Concrete



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Breaching Concrete



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Breaching Concrete



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Breaking Tools



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Feather and Wedge



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Breaching and Breaking Safety

- Heat Exposure – can weaken concrete
- Shifting Weight – load shift
- Atmosphere
- Confined Space
- Tool Reaction
- Material Reaction
- Sharp Objects
- Trip and Fall Hazards.



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Breaching and Breaking



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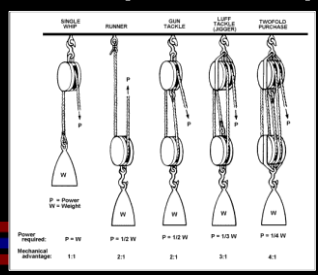
Lifting and Moving



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Mechanical Advantage

• Is The Ratio of Output Force to Input Force.



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Simple Machines

- Consist of Levers, Pulley Wheels, Gears, Ropes, Belts, and Cams
- Rigid or Resistant Bodies That Have Definite Motions, Capable of Performing Work
- Two Types:
 - Levers
 - Inclined planes.



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Levers

- Transfers Force From One Place To Another
- Changes The Forces Direction
- Can Move A Load Heavier Than Can Be Moved By Manpower Alone
- Pulling, Hauling and Raising.



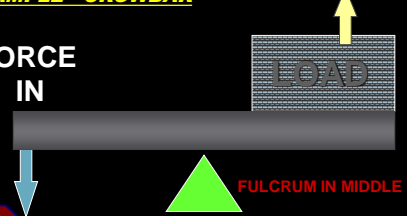
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Class I Lever

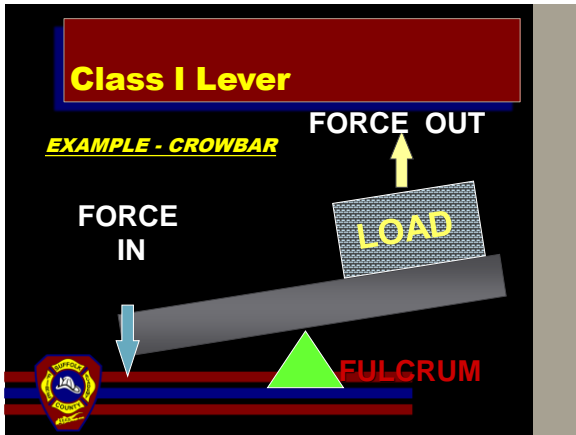
EXAMPLE - CROWBAR

FORCE IN

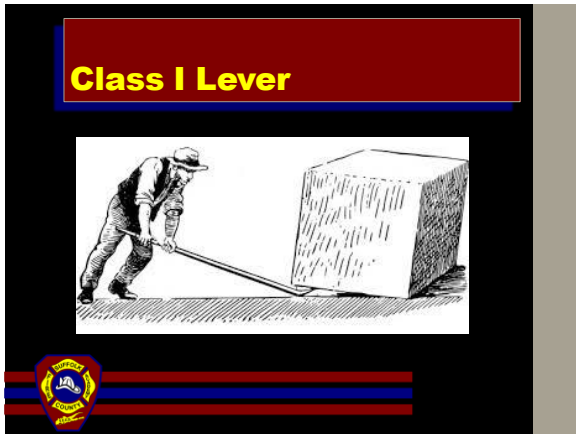
FORCE OUT



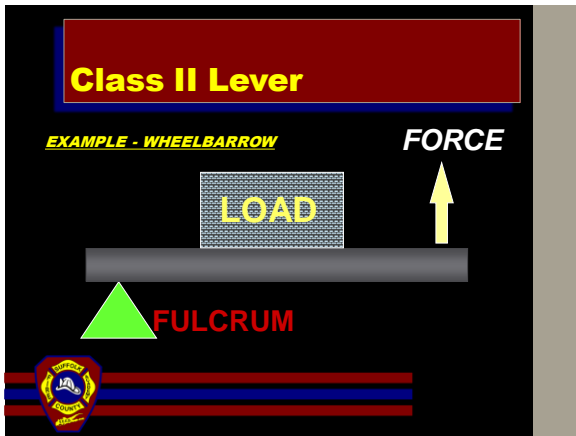
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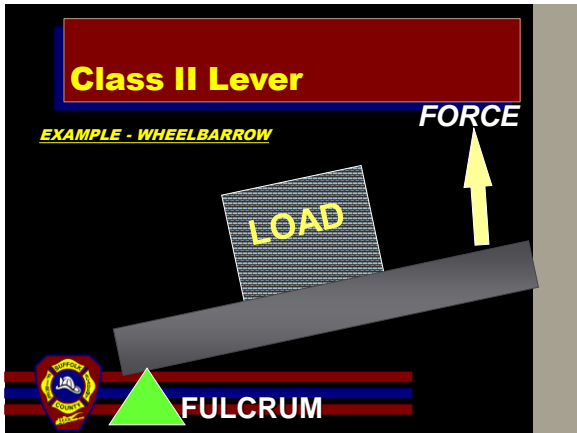
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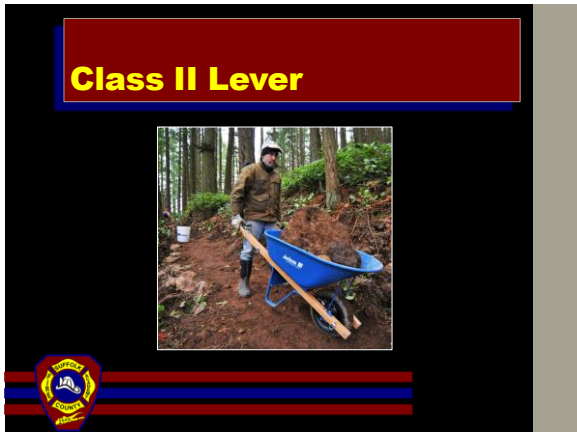
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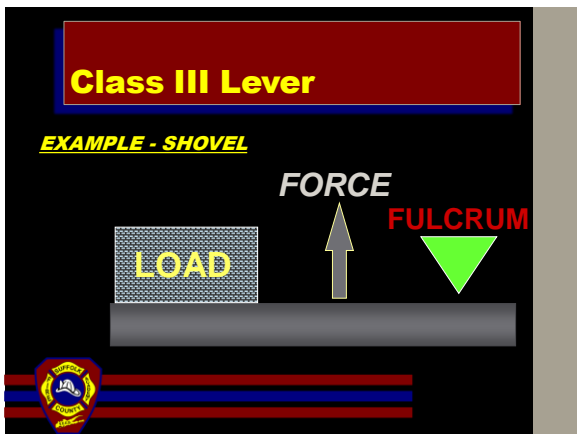
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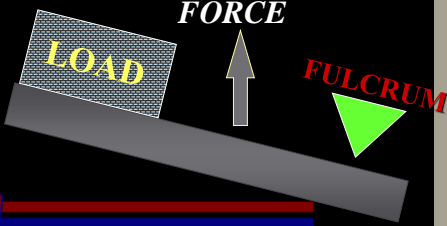
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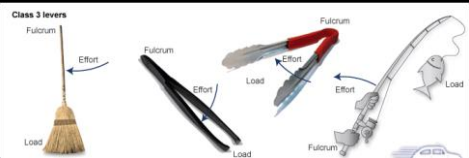
Class III Lever

EXAMPLE - SHOVEL



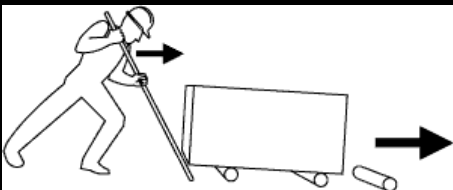
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Class III Lever



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Levers and Rollers



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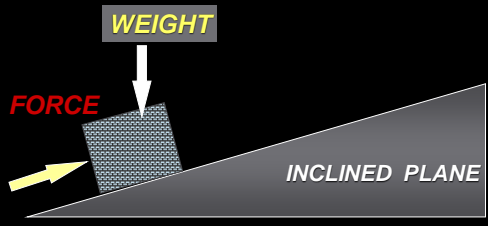
Inclined Plane

- Gain Effectiveness of Energy Used On The Distance – Mechanical Advantage
- Use of Slope – Less Force To Move An Object A Certain Distance
- Ramps, Wedges, Screw Thread.



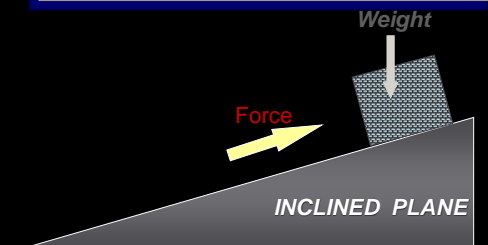
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Inclined Plane



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Inclined Plane



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Inclined Plane



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GripHoist



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GripHoist

GRIPHOIST TIRFOR TU
The GRIPHOIST TIRFOR TU is the ideal tool for lifting or pulling heavy loads.



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Come-Along



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Torches



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**MAPP Gas Torch
(Methyl Acetylene-Propadiene)**



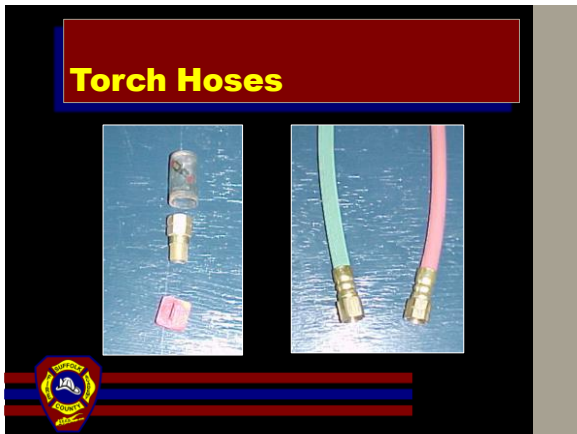
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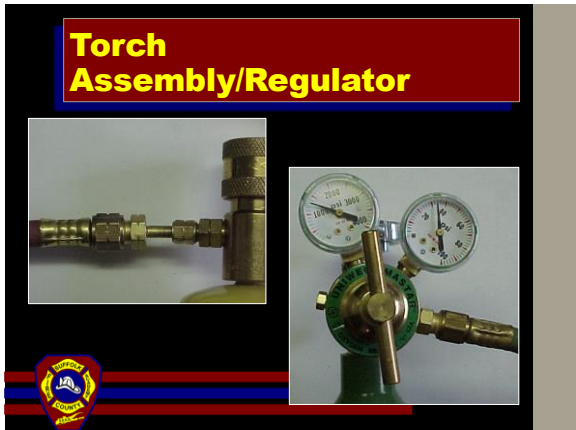
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Beginning The Cut



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Cutting



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Cutting



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Exothermic Torch



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Exothermic Torch Cutting



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Petrogen Torch



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Plasma Cutter



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Plasma Cutter Cutting



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Questions?



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