
Medium Level Structural Collapse: Tools
Session 1
Suffolk County Fire Academy

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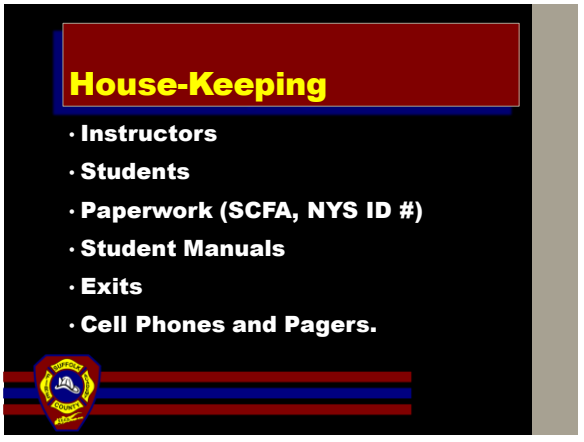
House-Keeping
· Instructors
· Students
· Paperwork (SCFA, NYS ID #)
· Student Manuals
· Exits
· Cell Phones and Pagers.

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Structural Collapse Course Series
· Basic Structural Collapse = Awareness Level
· Medium Level Structural Collapse Concepts
· Medium Structural Collapse Operations: Tools
· Medium Structural Collapse Operations: Exterior Shoring
· Medium Structural Collapse Operations: Interior Shoring
· Medium Structural Collapse Operations: Void Search and Rescue.

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Course Overview

2 Sessions

- **Session 1**
  - **Tools – General Power Overview**
  - **Electric Tools**
  - **Battery Powered Tools**
  - **Fuel Powered Tools**
  - **Hand Tools**
  - **Pneumatic Tools**
  - **Stabilization / Cribbing**
  - **Trench and Struts**
  - **Hands-on Stations.**

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Course Objectives

- **Select and operate basic and specialized tools and equipment for collapse shoring (NFPA 1006 6.2.6 B)**
- **Identify heavy construction types and characteristics (NFPA 1006 6.3.1 A)**
- **Identify the resources for breaching, breaking, lifting, prying, shoring, and/or otherwise moving or penetrating an offending structural component to release a trapped victim (NFPA 1006 6.2.7)**
- **Discuss the procedures and tools used to lift a heavy load as a team member, so that the load is lifted; control and stabilization are maintained before, during and after the lift; and access can be gained (NFPA 1006 6.2.9, 6.3.9).**

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Course Objectives (Cont'd)

- **Discuss the procedures and tools used to move a heavy load as a team member, so that the load is moved the required distance to gain access and so that control is constantly maintained (NFPA 1006 6.2.10, 6.3.10)**
- **Identify and operate tools used to breach heavy structural components, while maintaining structural stability, and using methods that are safe and efficient (NFPA 6.3.11)**
- **Define the lighting procedures of various torches and cut through structural steel so that the steel is efficiently cut, and fire control methods are in place (NFPA 1006 6.3.14).**

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Course Objectives (Cont'd)

- Construct cribbing systems using various dimensions of lumber, wedges, and shims so that the cribbing system will safety support the load and the system is stable (NFPA 1006 6.2.12, 6.3.12)
- Define shoring and shielding in relation to a trench rescue incident (NFPA 1006 12.2.4 A)
- Discuss the procedure and install a temporary shoring system using pre-constructed trench panels (NFPA 12.2.4 B).

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Session Objectives
Session 1

- Identify various tools, how they are powered, and their operating principles
- Describes The Principles of Stabilization
- Define The Procedure For Installing Trench Panels
- Demonstrate the use of air bags and stabilization for lifting and capturing loads
- Demonstrate the installation of trench panels.

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Tools – General Power Overview

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Why Do We Need A Class On Basic Tool Operation?

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Types of Power

- Electric
- Fuel
- Pneumatic (air)
- Hydraulic
- Gas (compressed)
- Hand.

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Electricity

- Natural Energy
- Three Basic Types
  - **Friction** – static electricity such as lightening
  - **Chemical reaction** – batteries, temporary supply
  - **Magnetism** – normal use, the magnet must be turned to produce energy.

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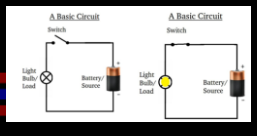
Electrical Circuit

- Requires Four (4) Components or the Circuit Will Fail
  - Source – generator, battery
  - Path out – hot wire leg
  - Resistance – light bulb, heater, tool
  - Return path – return wire.



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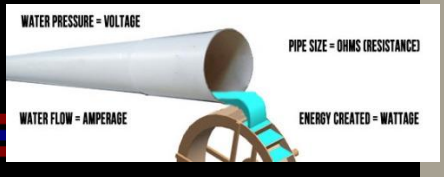
Amps & Volts

- Amps – The Amount of Current the Tool Draws (Flow)
- Volts – The Force That Pushes The Electricity Through The Wire (Pressure).



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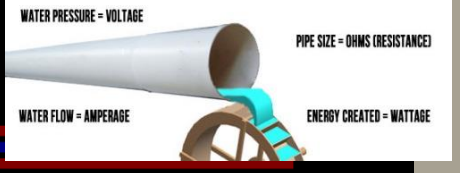
Watts

- Amps x Volts = Watts

A unit of power; the power required to do work.



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Types of Tool Motors

- Induction – Most Commonly Used In AC Motors
- Universal – AC or DC (Most Hand-held Electric Tools)
  - AC – alternating current; the electrons flow in one direction and then another
  - DC – direct current; the electrons flow in one direction only.

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Universal Motors

- Need:
  - Sufficient voltage
  - Ample air flow
  - Good brushes
- Brushes – Solid Blocks of Carbon Graphite On A Spring Located On Opposite Sides of the Commutator
  - Replace when they are ¼" long or there is excessive sparking.

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Tool Burnout

- Extension Cord Too Long
- Extension Cord Wire Size Too Small
  - Larger the number, smaller the wire
- Dust Build Up On Vents and Parts.

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Electric Motor Failure

- Most Common Cause Is **HEAT**
- Main Cause of Heat Build-up Is Running The Tool With Reduced Voltage (i.e. Increased Resistance).

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Extension Cords

TOOL AMPS	EXTENSION CORD				
	25'	50'	75'	100'	150'
0-5	16	16	16	14	12
5-8	16	16	16	14	10
8-12	14	14	12	12	--
12-15	12	12	10	10	--

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Types of Plugs

- Firepower
- 3 Prong Twist
- 2 Prong Twist
- Conventional 3 Prong
- Conventional 2 Prong.

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Power Supply

- Large Generators
- Portable Generators
- Apparatus – Electric Converters.

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Electric Tools

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Electric Tools
Advantages / Disadvantages

- **Advantages**
  - Increased power
  - Continuous work with sufficient power supply
- **Disadvantages**
  - Limited portability
  - Requires sufficient power supply.

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Questions To Ask For The Following Slides...

- What Are They Used For?
- Have We Used Them?
- What Can We Use To Power Them?
- Advantages and Disadvantages
- How Can They Be Used At A Collapse.

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10¼" Circular Saw

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Electric Band Saw

27

Electric Chain Saw

28

Timber Saw (Beam Cutter)

29

Tiger Cub Saw

30

Die Grinder

31

Cut-Off Saw

32

Electric Drill

33

Electric Screw-Gun

34

Demolition Hammer Drill

35

Electric Jack Hammer

36

Electric Rebar Cutter

37

Battery Powered Tools

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Battery Powered Tools
Advantages / Disadvantages

- **Advantages**
  - Portability
  - Interchangeable power supply among same platform
- **Disadvantages**
  - Limited use time
  - Require extra batteries
  - Lithium-ion dangers.

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Battery Tool Kits

40

7¼" Circular Saw

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Reciprocating Saw

42

Cut-off Saw

43

Drills

44

Rebar Cutter (Lobster Tool)

45

Extrication Tools

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Fuel Powered Tools

47

Semi-Auto Fastening Tool

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Cartridge Fastening Tool

49

Fuel Cell Nailers

50

Chain Saw

51

Concrete Cutting Chain Saw

52

Rotary Saw

53

Rotary Saw Blades

Aluminum Oxide or Silicone Carbide

Carbide Toothed

Alpha / Diamond

54

Gasoline Powered Jack Hammer

55

Compressor

56

Portable Generator

57

Hand Tools

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Hand Tools

Collapse Entry Kit

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Pneumatic Tools

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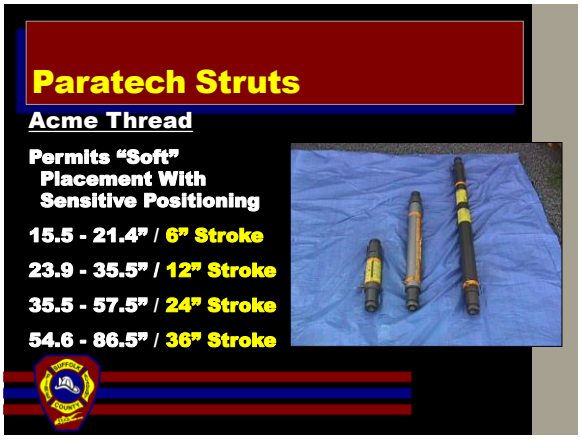
Paratech Struts
Acme Thread
Permits "Soft" Placement With Sensitive Positioning
15.5 - 21.4" / 6" Stroke
23.9 - 35.5" / 12" Stroke
35.5 - 57.5" / 24" Stroke
54.6 - 86.5" / 36" Stroke

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Paratech Strut Extensions
3'
2'
1'

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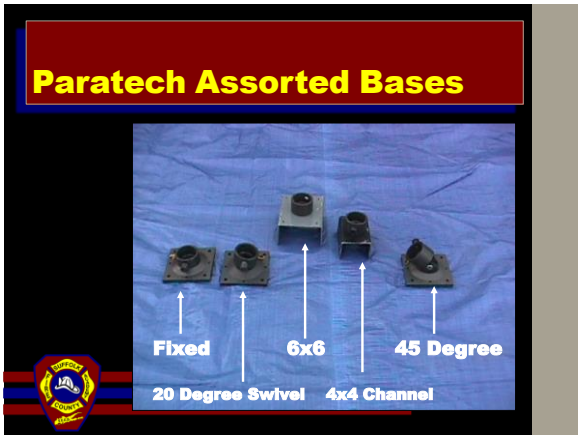
Paratech Assorted Bases
Fixed
6x6
45 Degree
20 Degree Swivel
4x4 Channel

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Paratech Strut System

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Paratech Strut Controller and Regulator

65

Gold Struts For Collapse Applications

- Non-Pressurized

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Gold Struts For Collapse Applications

- Non-Pressurized

67

Gold Struts For Collapse Applications

- Non-Pressurized

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Paratech Airbag System

- Not Universal With Strut System
  - Different Pressure
  - Different Fittings

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Airbags

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Airbags

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Other Pneumatic Tools

Pneumatic Breaking and Breaching Tools

Rig Mounted Air Compressor

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Stabilization / Cribbing

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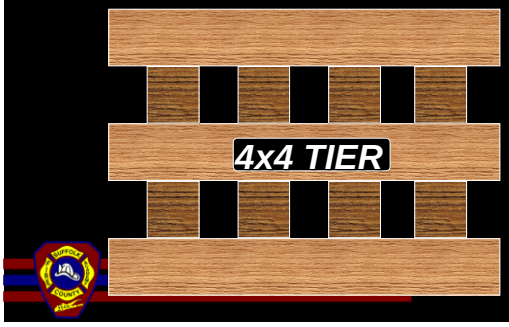
Box Cribbing



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Box Cribbing Rules of Thumb

- Overlap the Ends the Width of the Material (4x4 = 4")
- 3x the Height To the Width
- Over 3' – Can Use Other Shoring Methods (i.e. "T"-Shore, Struts).

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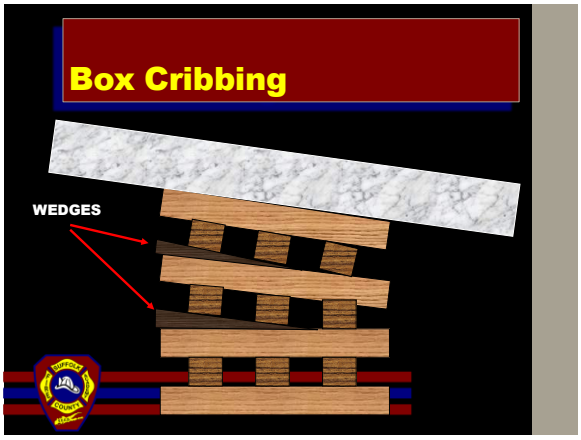
Box Cribbing
WEDGES

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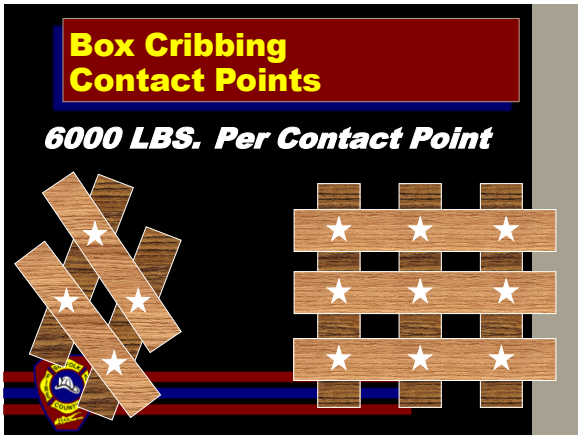
Box Cribbing
Contact Points
6000 LBS. Per Contact Point

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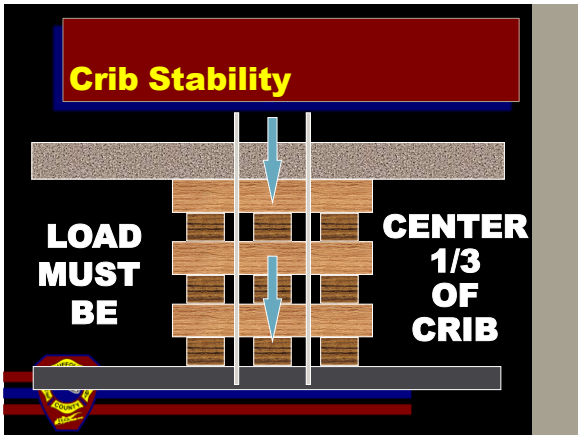
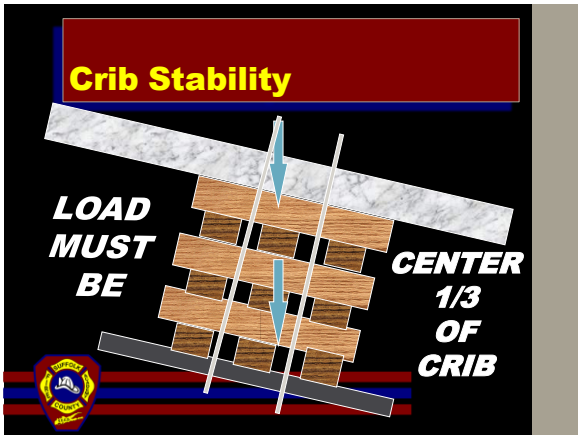

Crib Stability
LOAD
MUST
BE
CENTER
1/3
OF
CRIB

78


Crib Stability
LOAD MUST BE
CENTER 1/3 OF CRIB

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Box Cribbing Level

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Box Cribbing Level

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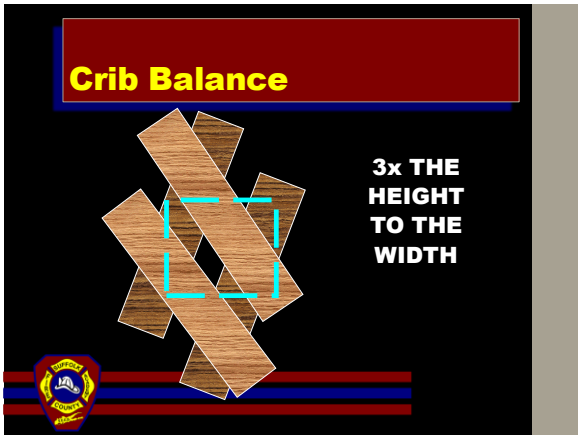
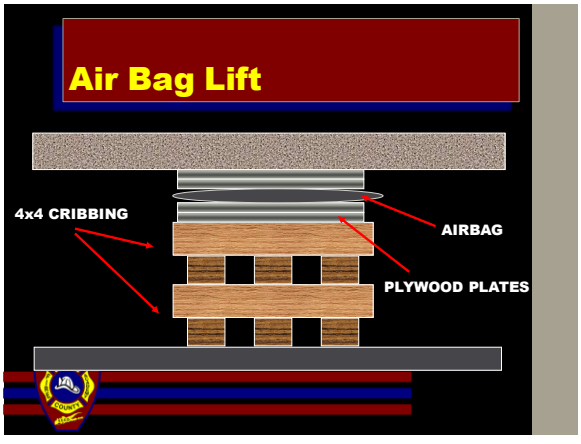

Crib Balance
3x THE HEIGHT TO THE WIDTH

82


Air Bag Lift
4x4 CRIBBING
AIRBAG
PLYWOOD PLATES

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Trench and Struts

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Paratech Struts

- Moveable grooved shaft (lockstroke)
- Moveable acme threaded shaft (acme thread)
- Consists of a 3" dia. Al alloy tube with a solid 2 ½" dia. Al alloy ram
- Axial crush strength exceeds 50,000lbs
- Working load = 20,000lbs.

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Paratech Strut Operations

- Rule of Thumb (Gray Struts):
  - No more than 3' of extensions
    - 1 - 3' Extension
  - No more than 2 extensions
    - Not to exceed 3'
    - 2 - 1' Extensions
    - 1 - 1' and 1 - 2' Extensions
  - Added to base of strut.

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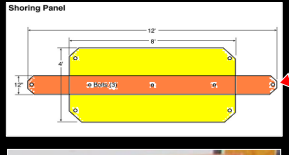
Trench Panels



Strong Back

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Trench Panels

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Strut Installation

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Questions?

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