

# Medium Structural Collapse Operations: Tools

## *Student Manual*

Technical Rescue  
01-04-0057 (Rev. 06/07)



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PRODUCTION AND DELIVERY OF THIS PROGRAM IS A COOPERATIVE EFFORT BETWEEN  
THE NYS OFFICE OF FIRE PREVENTION AND CONTROL AND THE NYS OFFICE OF HOMELAND SECURITY



Medium Structural  
Collapse Operations:

# TOOLS

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Types of power used  
by tools

- Electric
- Fuel
- Pneumatic - (air powered )
- Hydraulic
- Gas (compressed gas)
- Hand Tools

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## ***ELECTRICITY***

- ***IS NATURAL ENERGY***
- ***THREE BASIC TYPES***
- ***FRICTION - static electricity such as lightning***
- ***CHEMICAL REACTION - batteries, a temporary supply***
- ***MAGNETISM - normal use, the magnet must be turned to produce***

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## **ELECTRICAL CIRCUIT**

- **HAS TO HAVE 4 COMPONENTS OR THE CIRCUIT WILL FAIL**
- **A SOURCE - generator, battery**
  - **A PATH OUT - hot wire leg**
- **RESISTANCE - light bulb, heater**
  - **A PATH BACK - return wire**

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## **AMPS & VOLTS**

**AMPS - THE AMOUNT OF CURRENT THE TOOL DRAWS**

**VOLTS - THE FORCE THAT PUSHES THE ELECTRICITY THROUGH THE WIRE**

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## **WATTS**

**AMPS X VOLTS = WATTS**

*a unit of power; the power required to do work at the rate of 1 joule per second, which is equal to the power dissipated in an electric circuit in which a potential difference of 1 volt causes a current of 1 ampere to flow*

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## Types of Tool Motors

- Induction
- Universal

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## ***TOOL BURNOUT***

- ***EXTENSION CORD TOO LONG***
- ***WIRE SIZE TOOL SMALL***  
*(larger the number, smaller the wire)*
- ***DUST BUILD UP ON VENTS AND PARTS***

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▪ **MOST COMMON CAUSE OF ELECTRIC MOTOR FAILURE IS HEAT**

▪ **MAIN CAUSE OF HEAT BUILDUP IN MOTORS IS RUNNING THE TOOL WITH REDUCED VOLTAGE**

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## ***EXTENSION CORDS***

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

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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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# Phase

- Single Phase
- Triple Phase
  
- Portable Generators

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Electric Powered

# TOOLS

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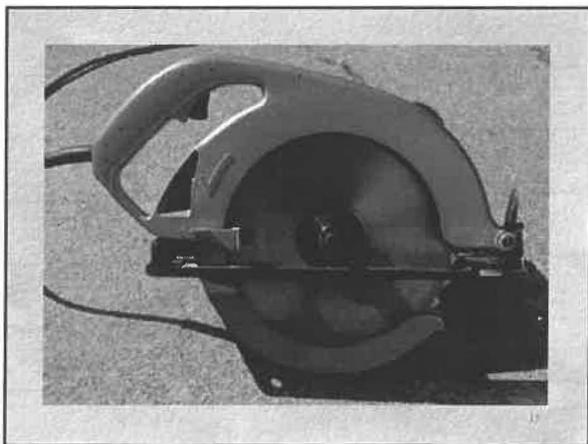
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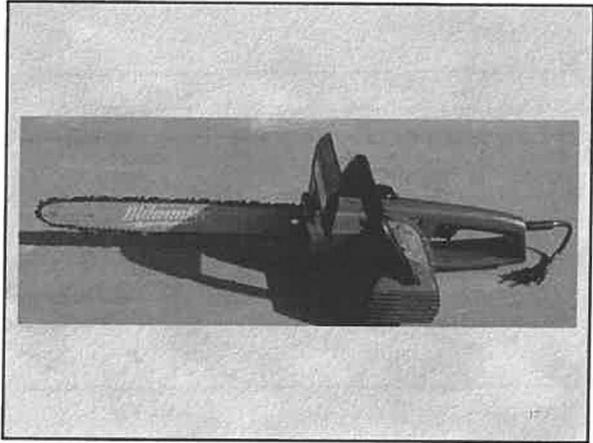
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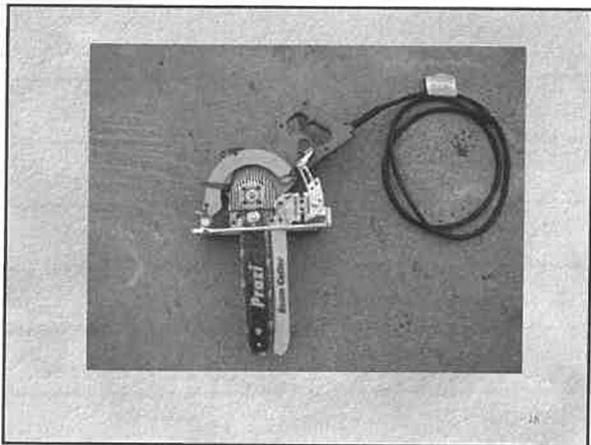
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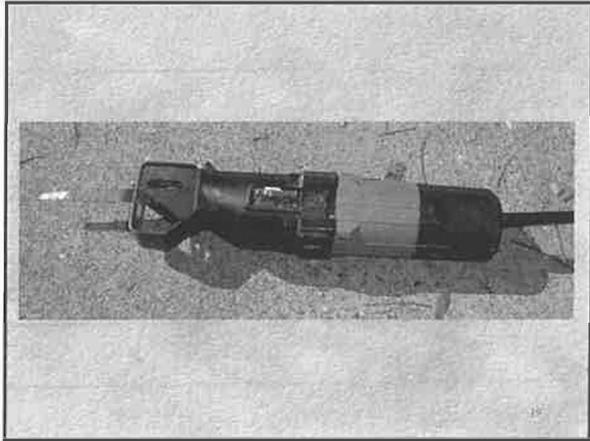
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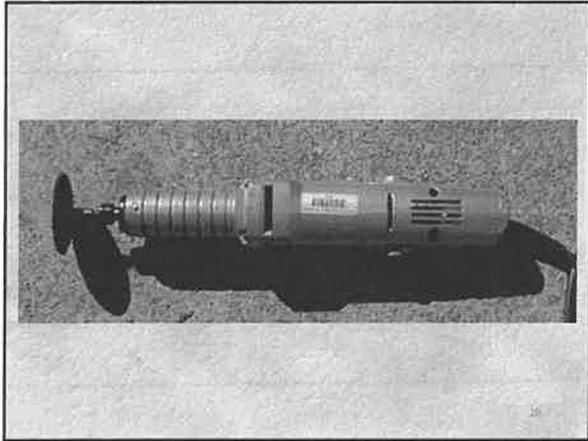
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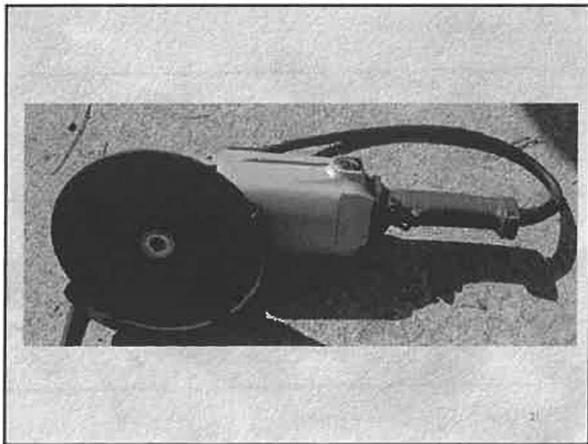
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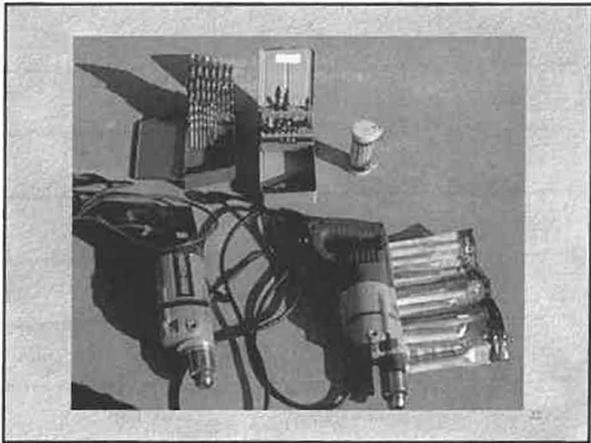
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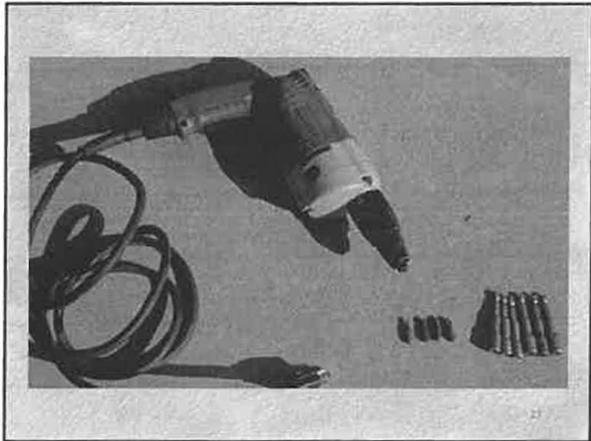
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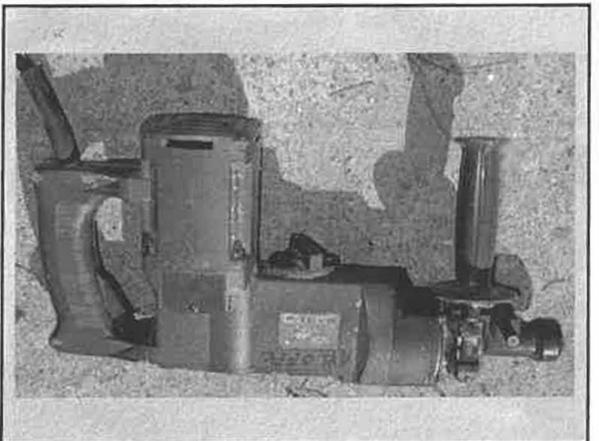
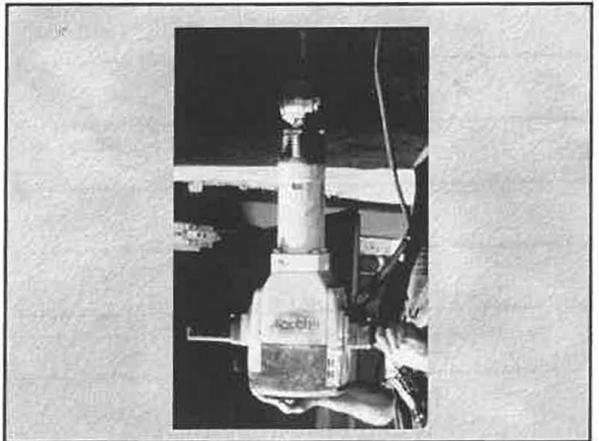
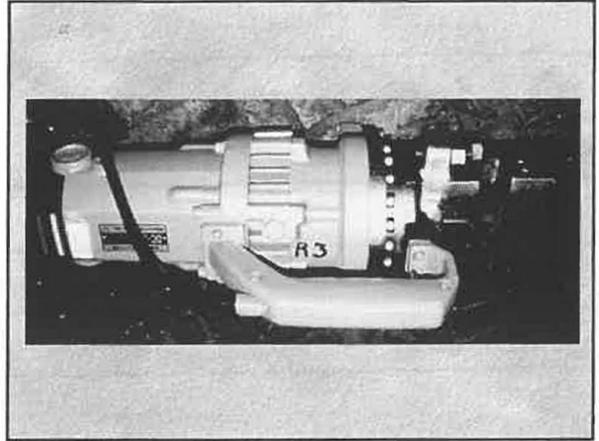
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# Battery Powered

## TOOLS

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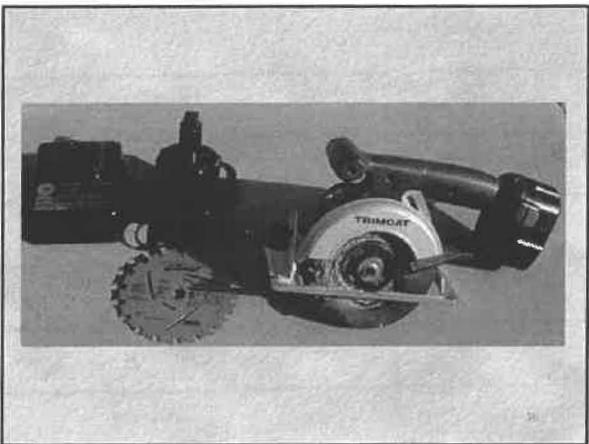
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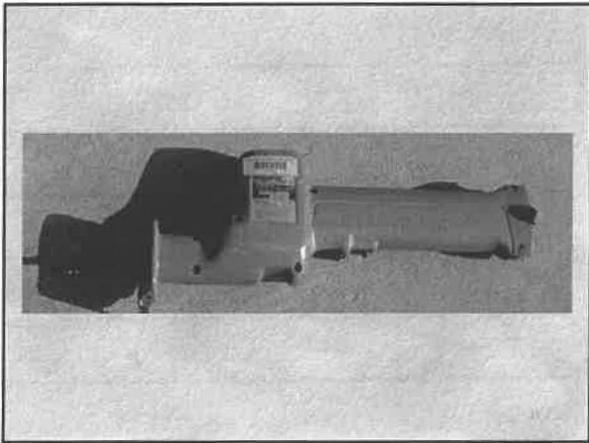
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Fuel Powered  
TOOLS

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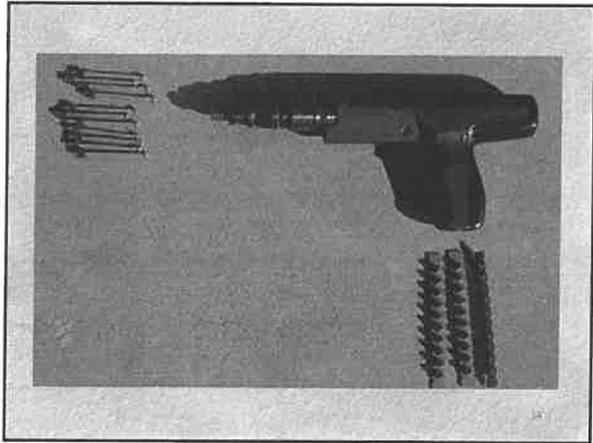
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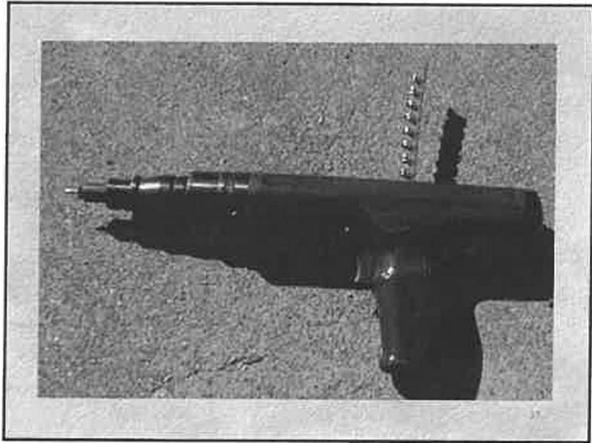
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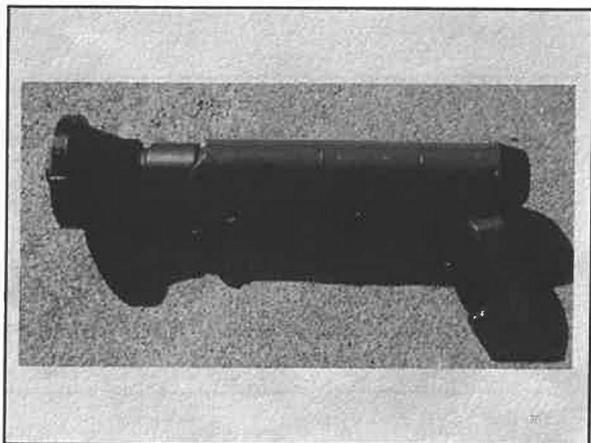
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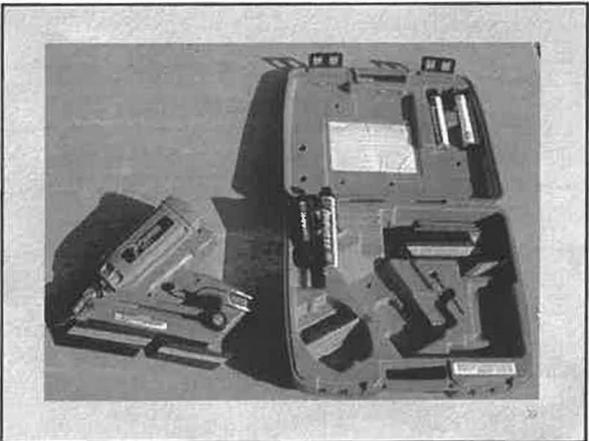
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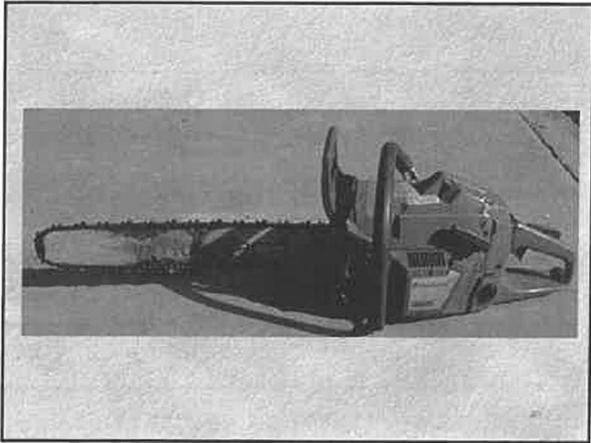
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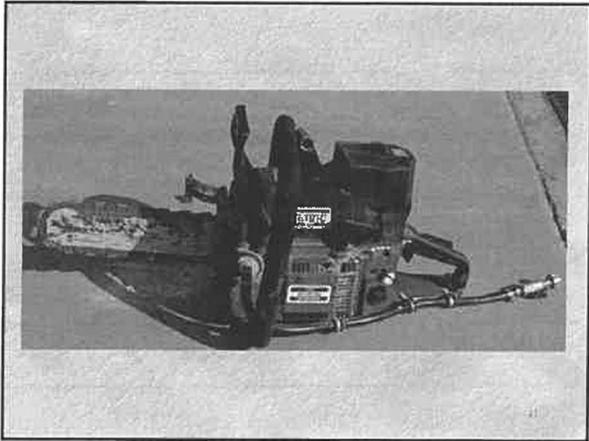
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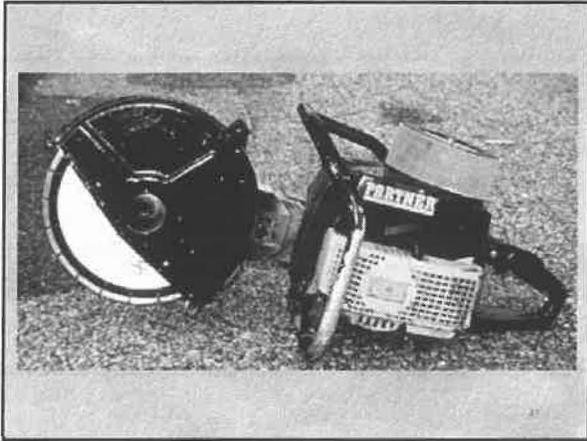
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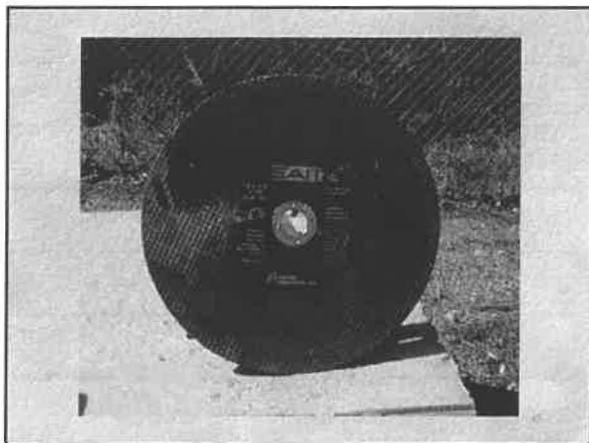
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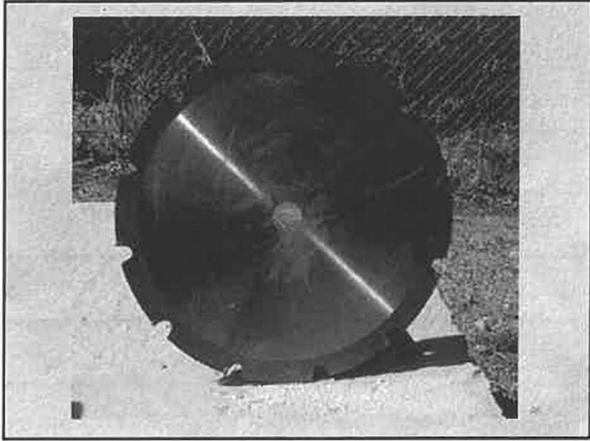
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Pneumatic Powered

TOOLS

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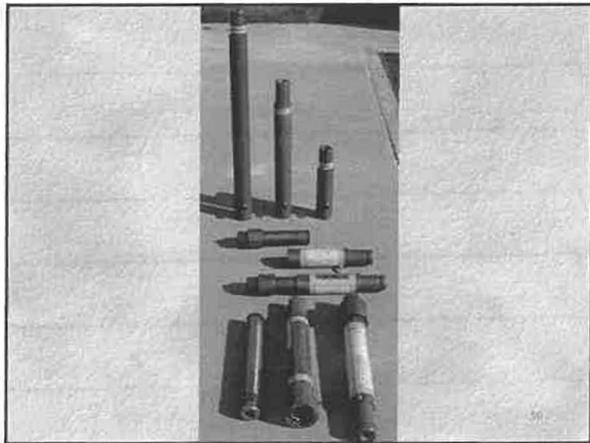
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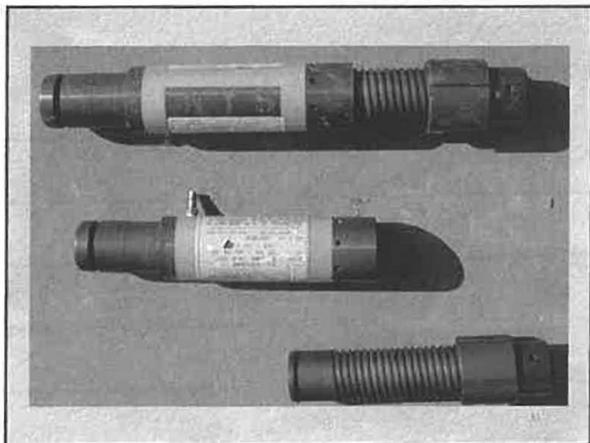
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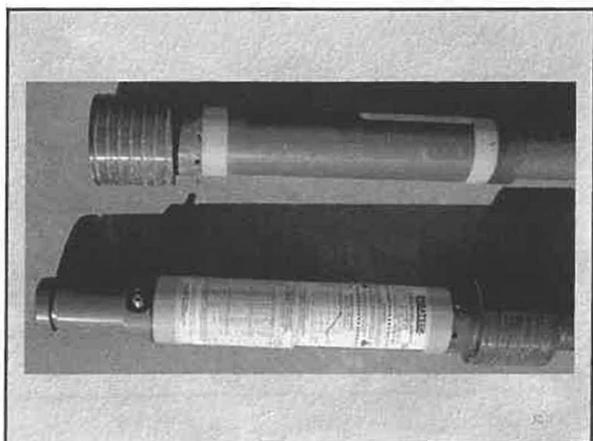
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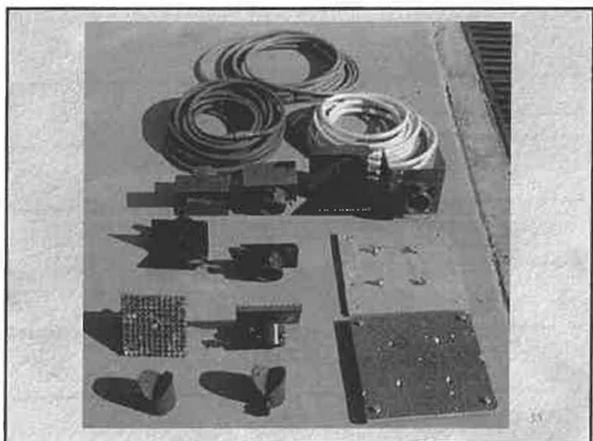
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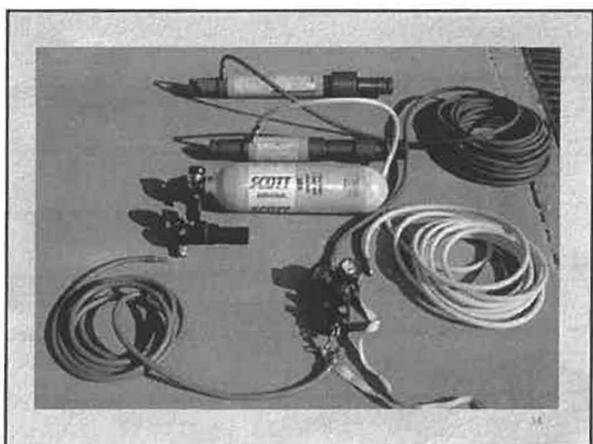
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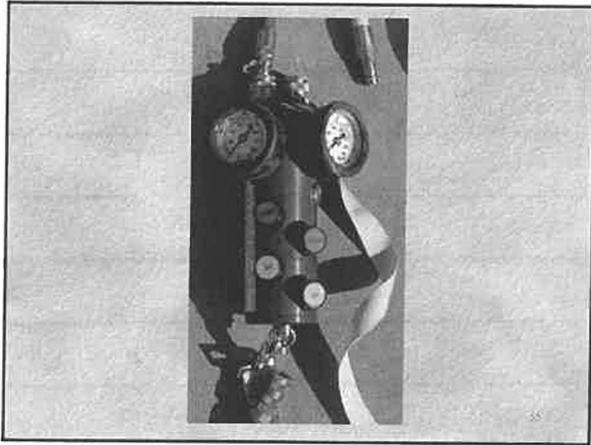
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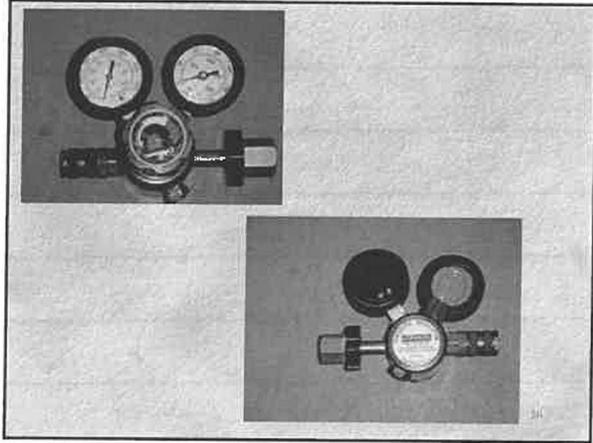
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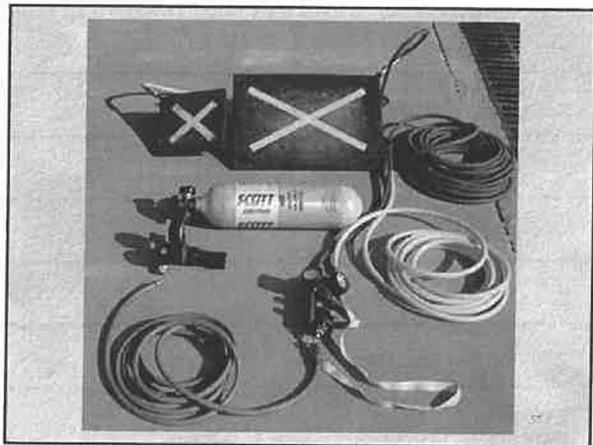
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Hydraulic Powered  
**TOOLS**

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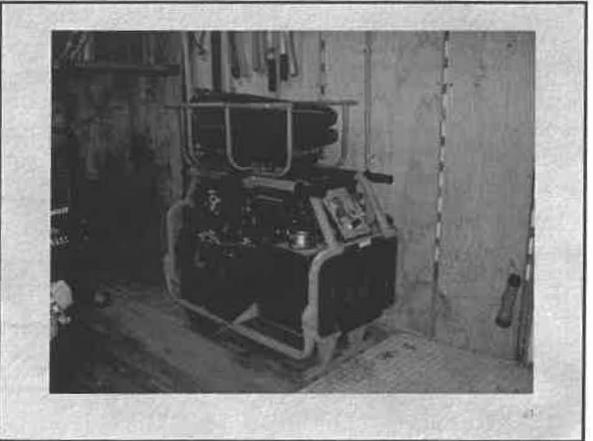
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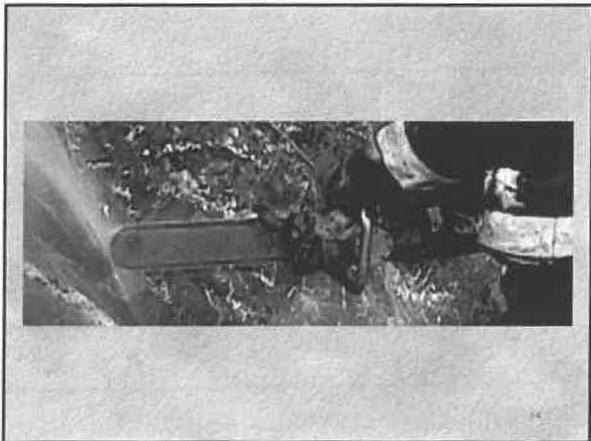
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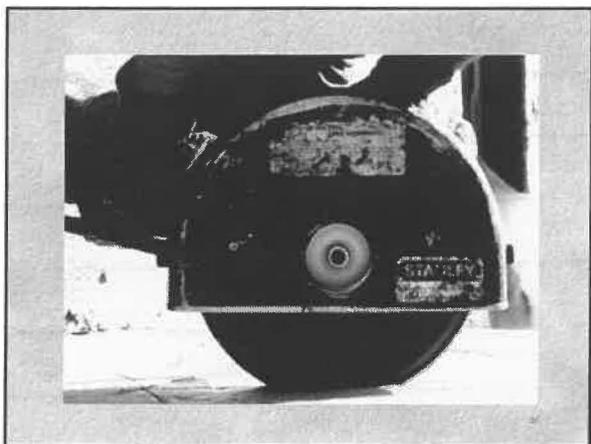
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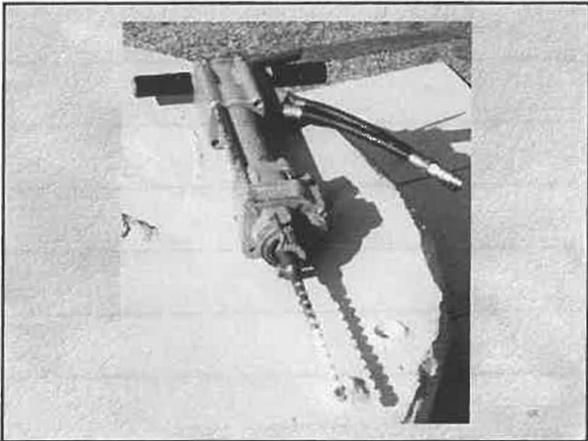
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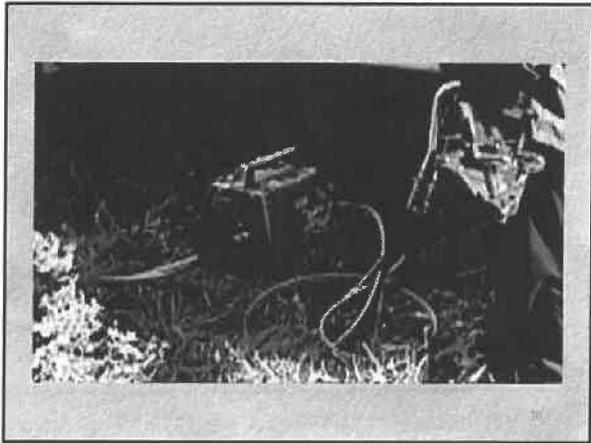
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Compressed Gas  
Powered  
TOOLS

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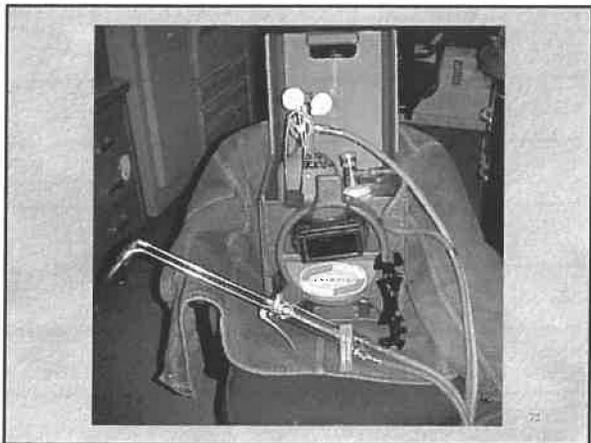
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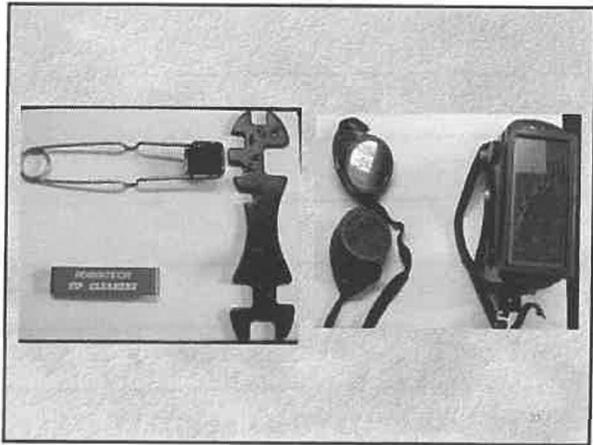
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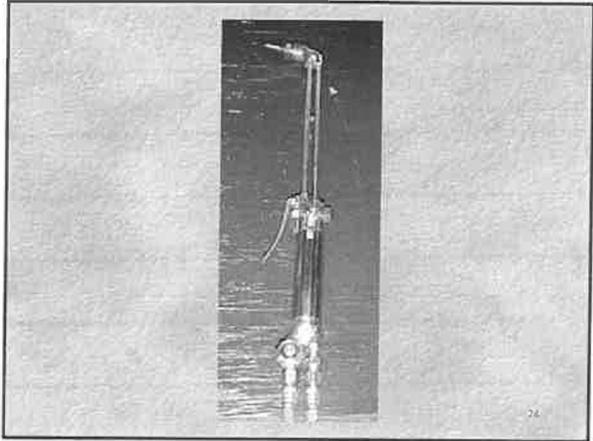
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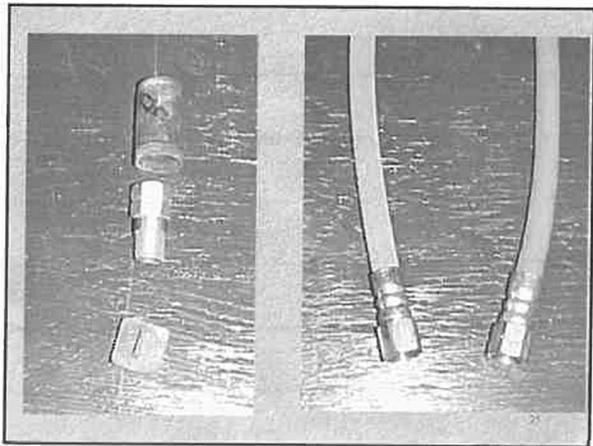
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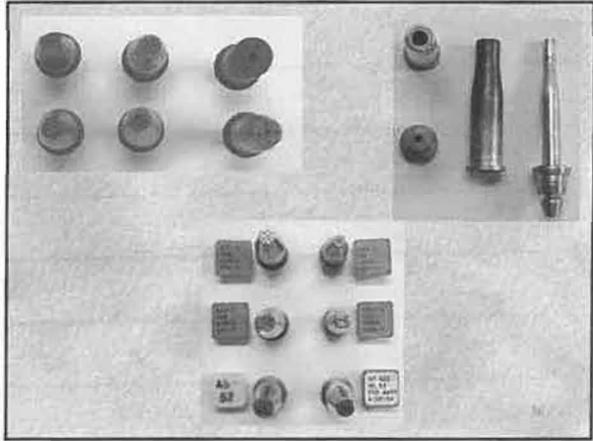
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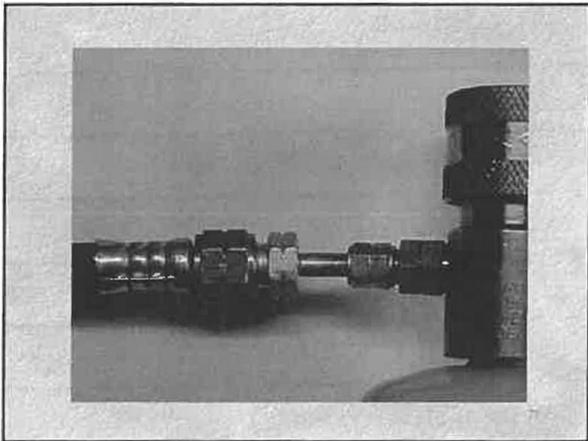
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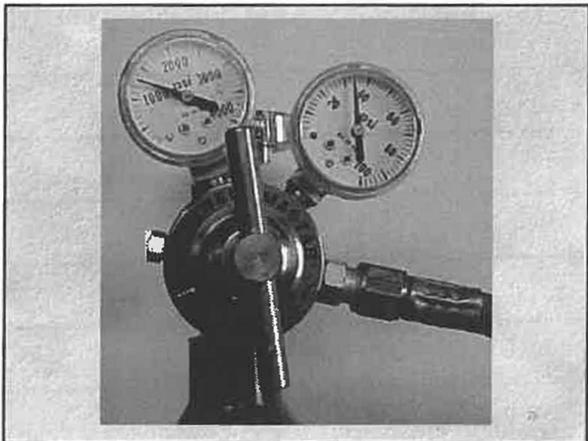
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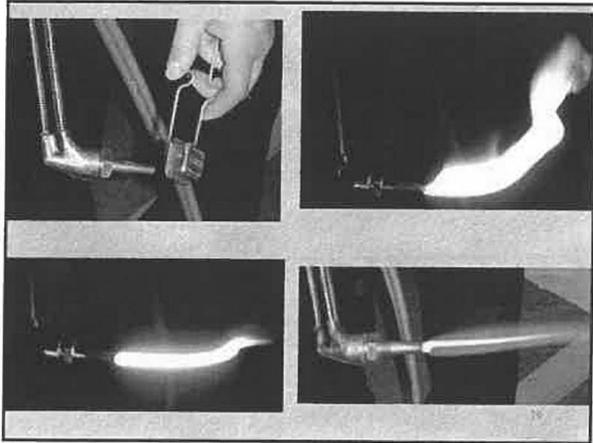
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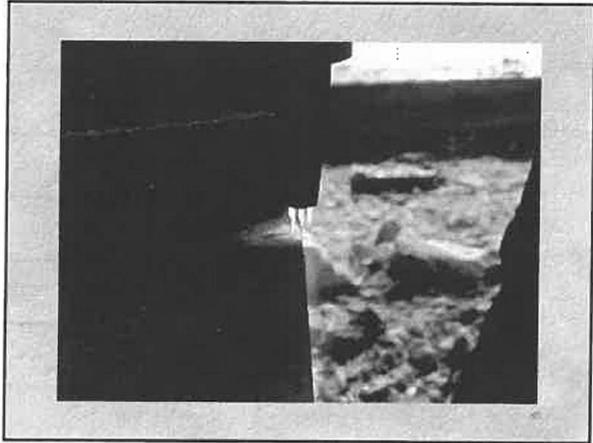
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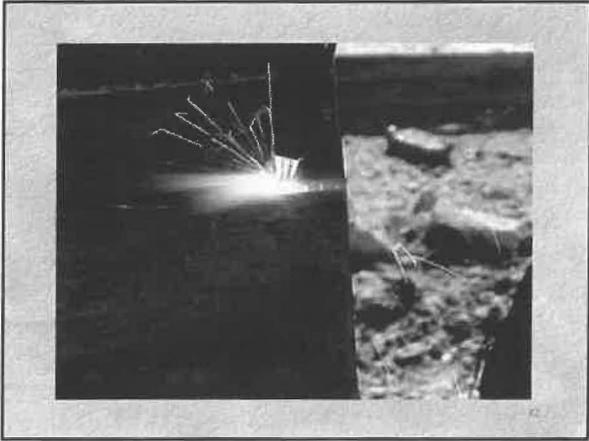
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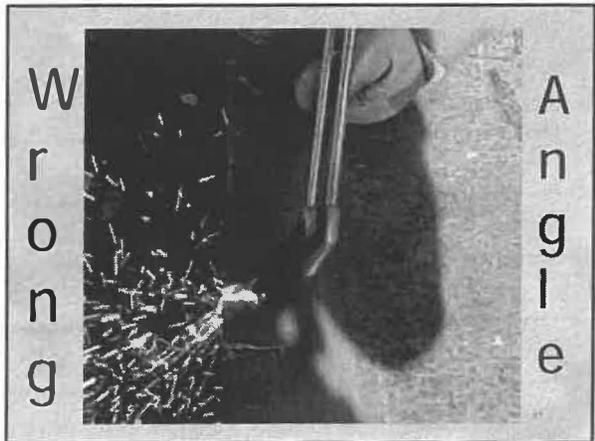
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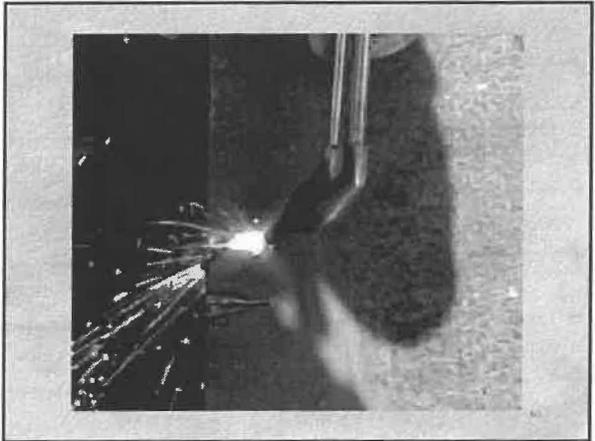
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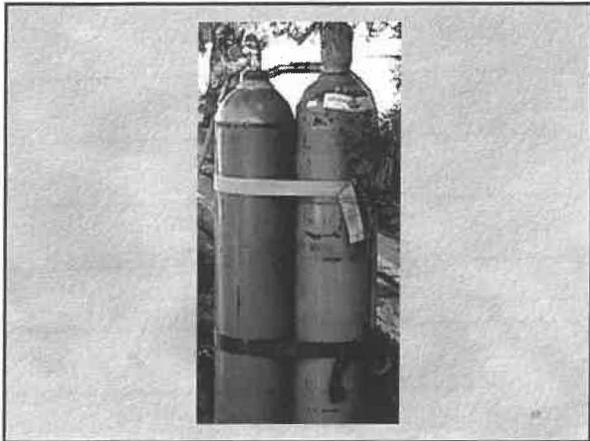
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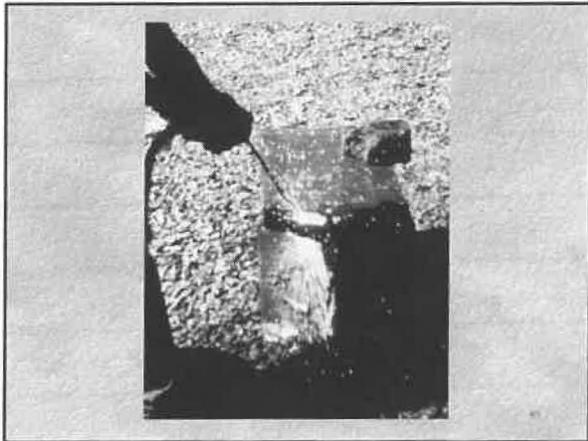
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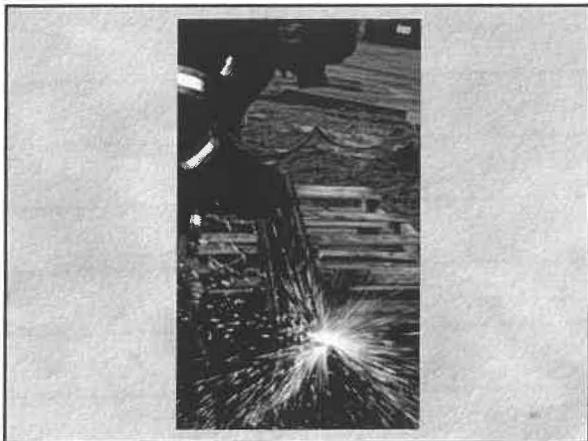
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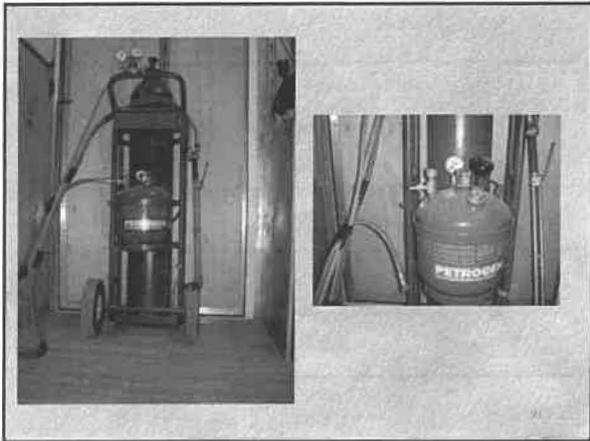
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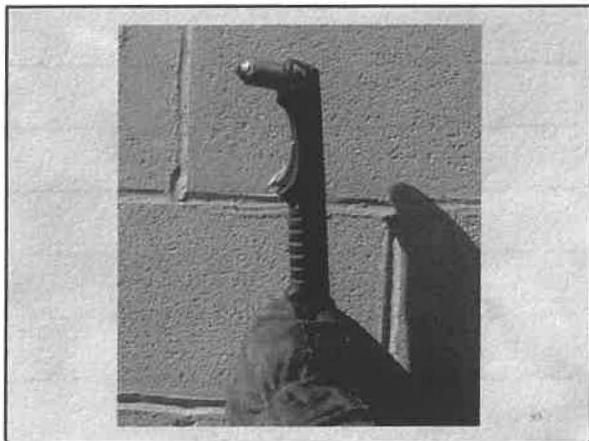
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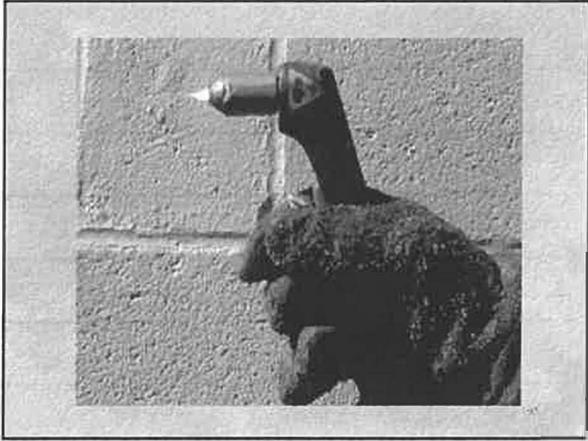
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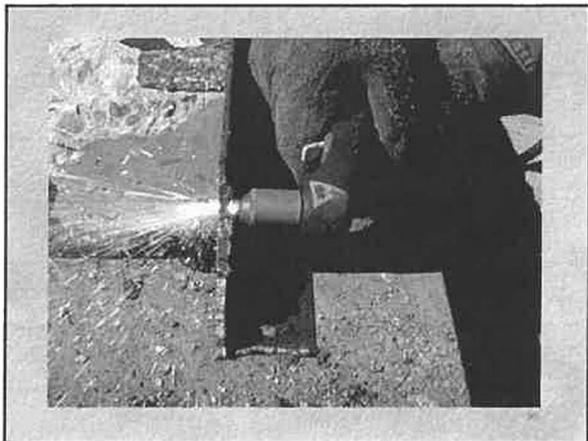
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Hand Powered  
TOOLS

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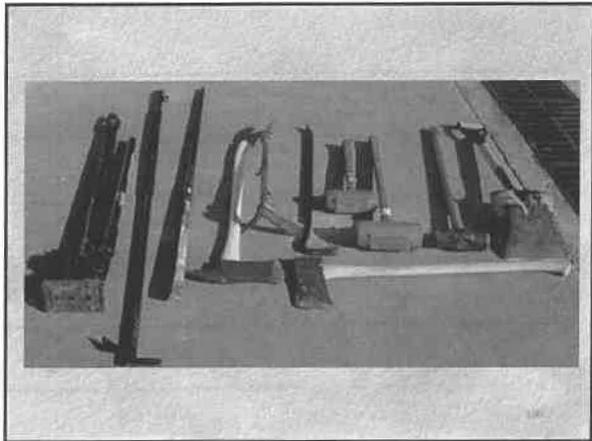
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# CONCRETE

Breaching  
and  
Breaking

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# Properties of Concrete

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**CONCRETE**



A cementitious mixture of  
Portland cement and water

- Sand
- Stone
- Shells
- Coral
- Cinders
- Vermiculite

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**CONCRETE**

	Conventional		Prestressed	
	Plain	Reinforced	Pretensioned	Posttensioned
Cast in place	<b>X</b>	<b>X</b>		<b>X</b>
Precast	<b>X</b>	<b>X</b>	<b>X</b>	

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## Types of Concrete

- Cast in place
- Pre-cast
- Reinforced
- Pre-stressed
- Pre-tensioned
- Post-tensioned

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## Rebar Placement

- Walls
- One way slabs
- Pan joists
- Two way slabs
- Beams & Girders
- Columns

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## Rebar Sizes

- Size      Diameter
- #4        0.500

## Rebar Placement



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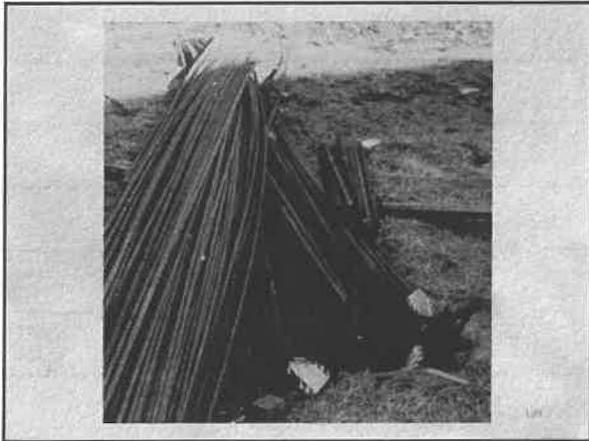
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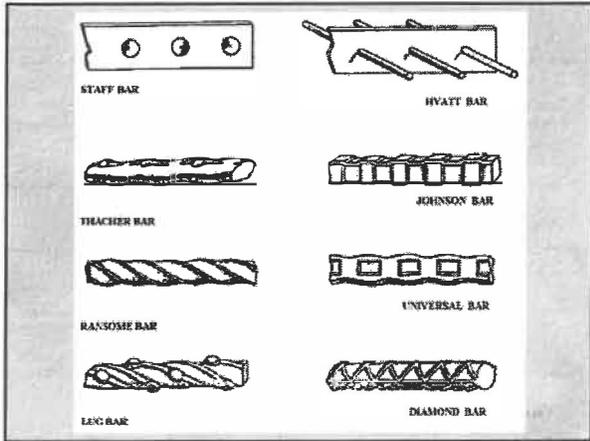
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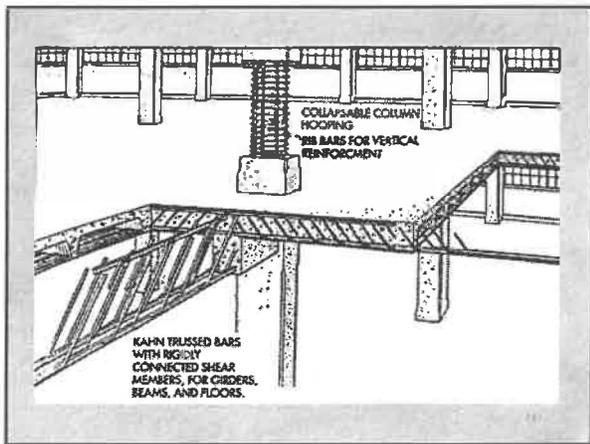
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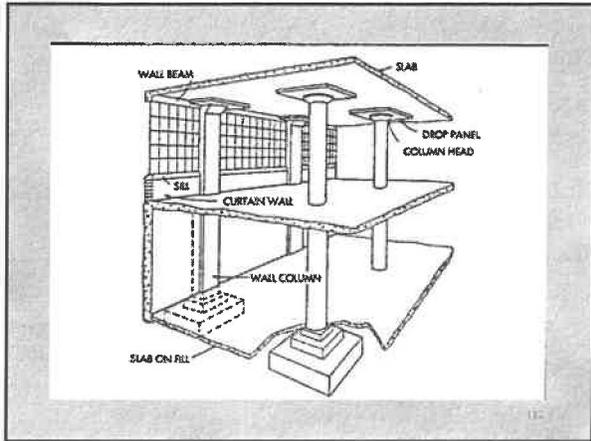
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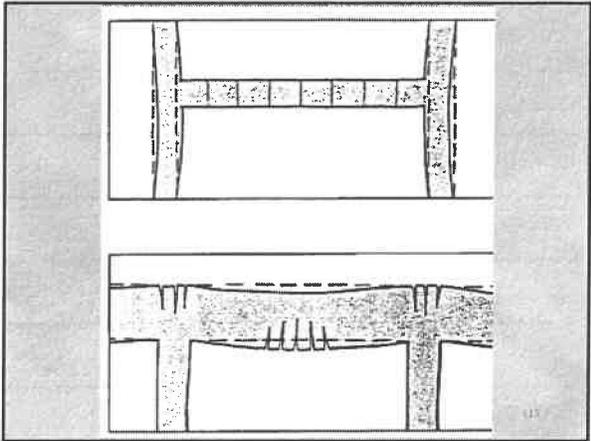
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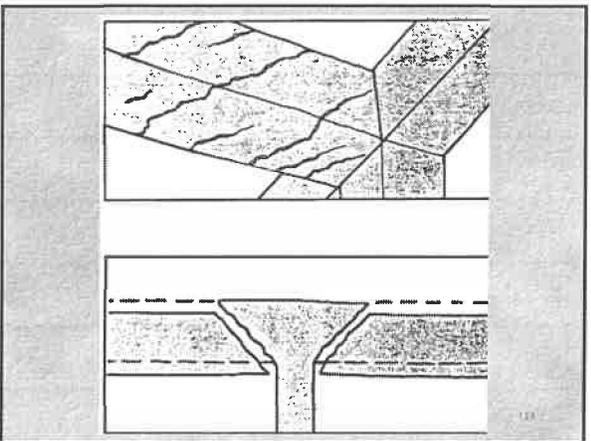
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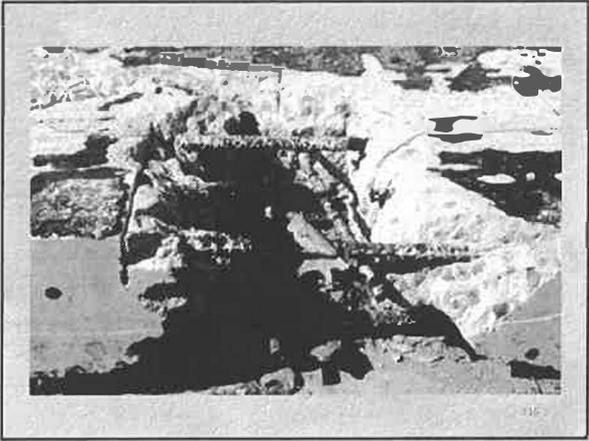
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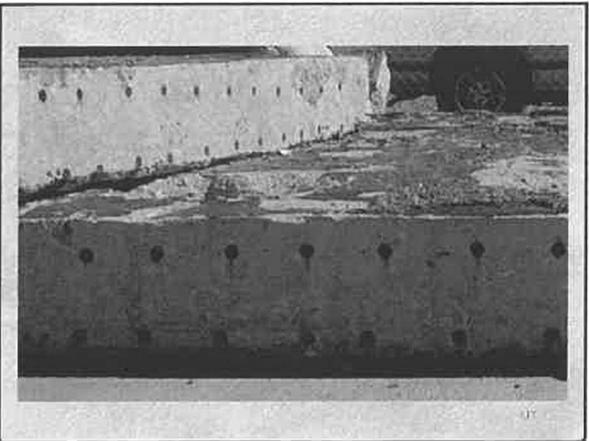
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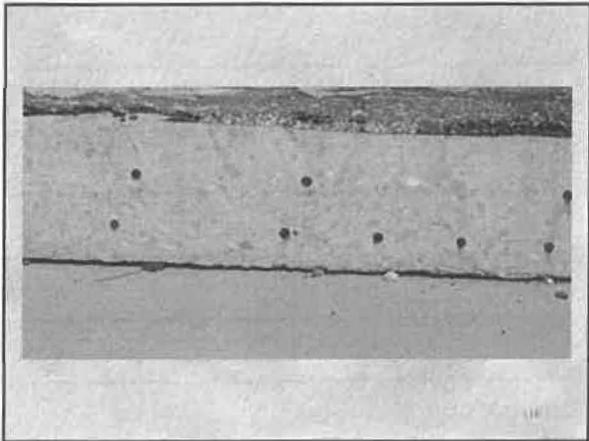
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# Tensioning Cables

## Pre-Stressed Concrete

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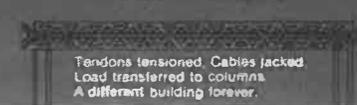
**POSTTENSION BUILDING CONSTRUCTION**

**Untensioned concrete**



The tendons are slack, the concrete is dry/curing.  
All the weight is on the falsework.  
In a falsework fire the concrete falls & building collapses.

**Tensioned concrete**



Tendons tensioned. Cables jacked.  
Load transferred to columns.  
A different building forever.

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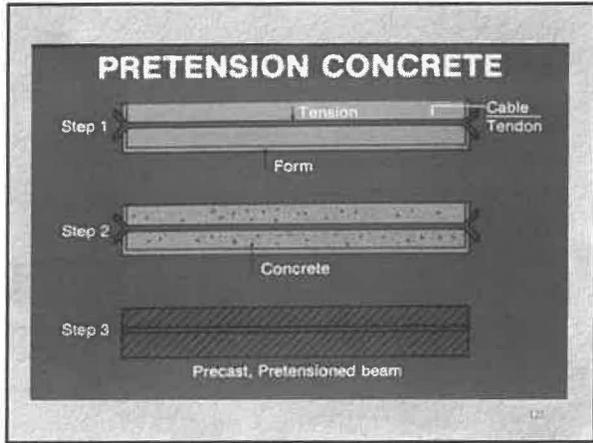
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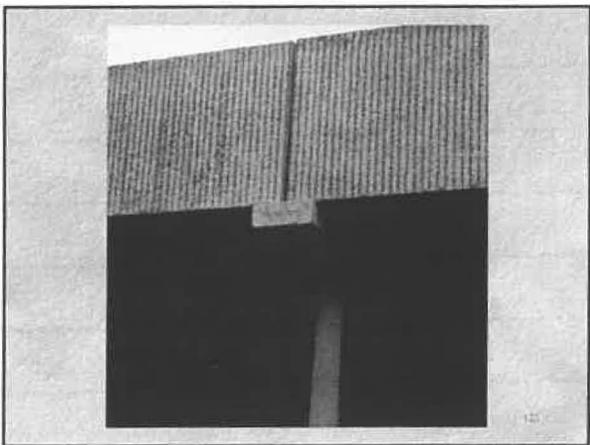
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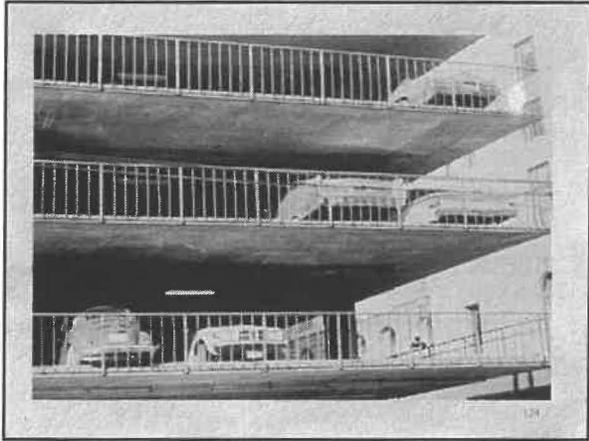
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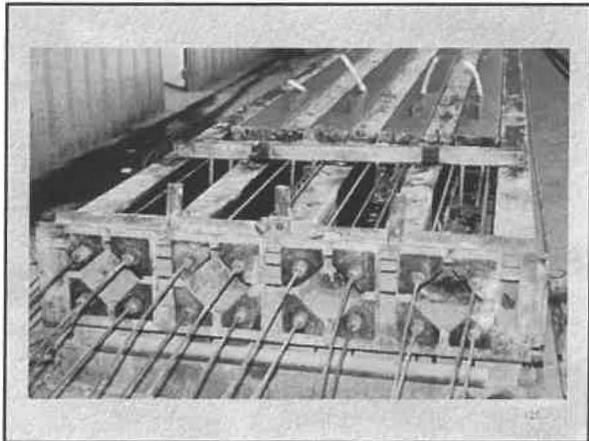
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## Breaching Concrete

- Relief Cuts
- Bevel Cuts
- Stitch Cuts
- Bolting
- Wetting
- Cutting & Burning

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## Cutting Tools

## Breaking Tools

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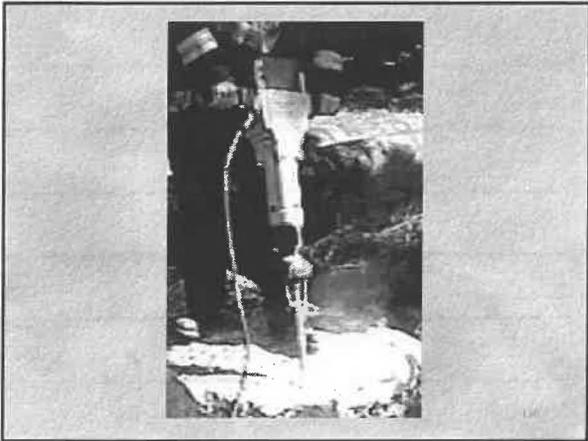
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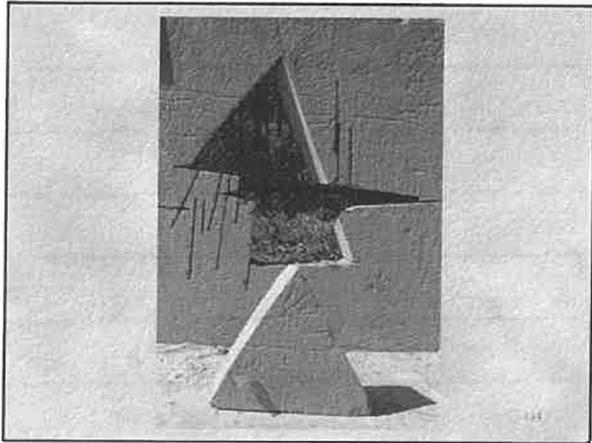
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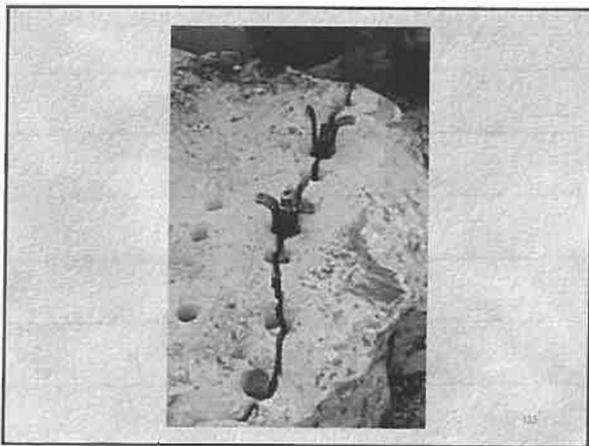
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# Safety Issues



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# Lifting and Moving

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# Mechanical Advantage

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# Simple Machines

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# Levers

- Class I
- Class II
- Class III

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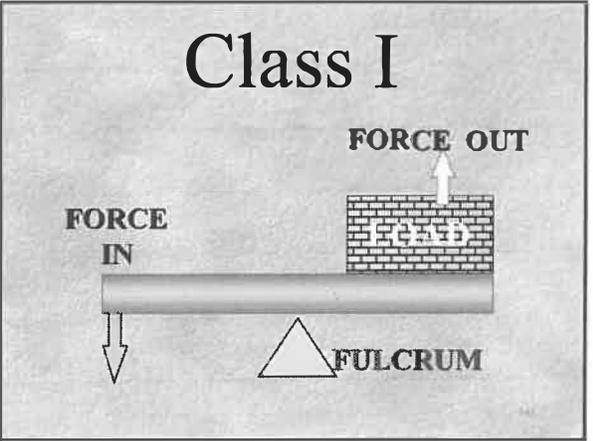
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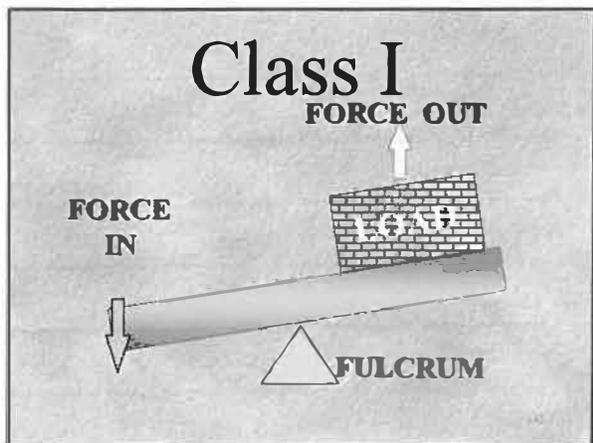
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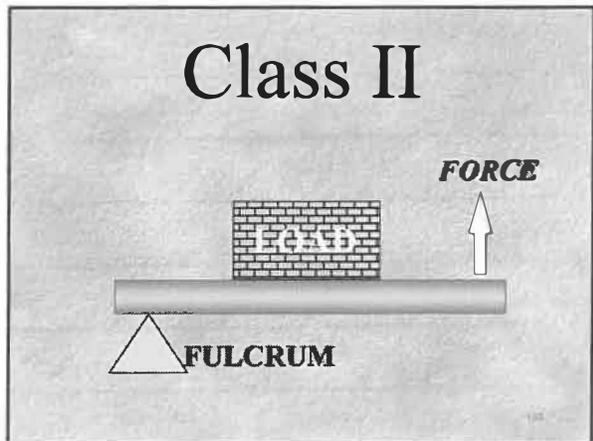
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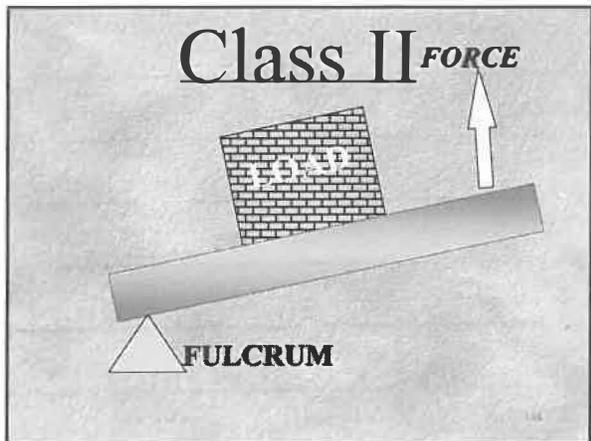
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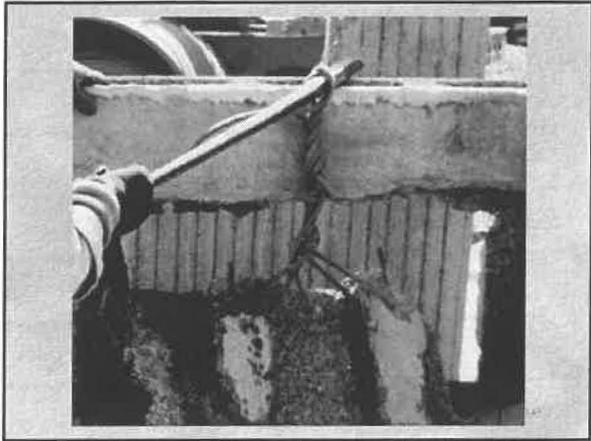
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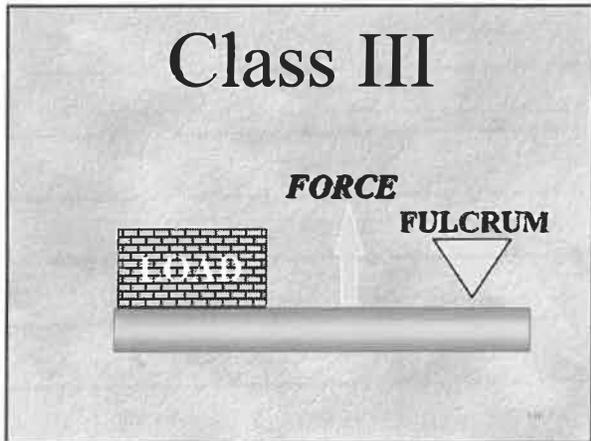
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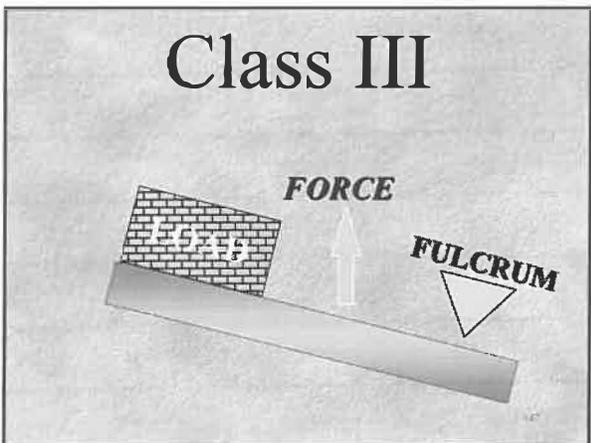
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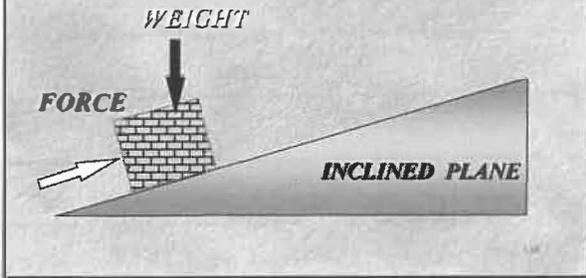
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# Inclined Plane



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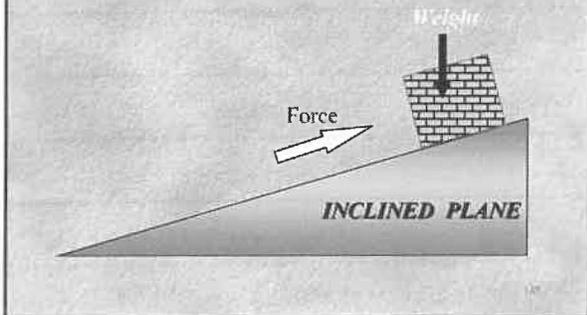
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# Inclined Plane



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# Stabilization

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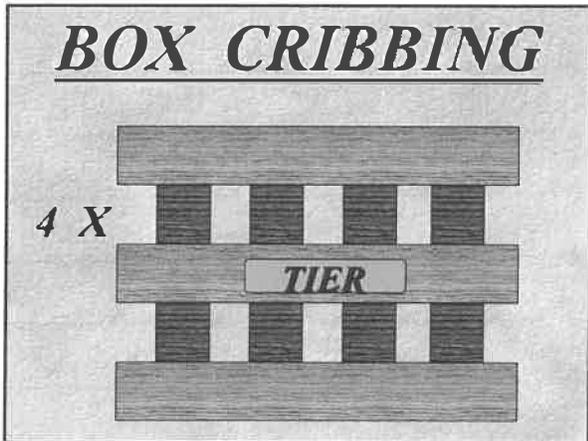
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## ***RULES of THUMB***

*Overlap Ends the Width of the  
Material*

*3 Times the Height to the Width*

*Over 3 Feet High Can Use Other  
Shoring Methods*

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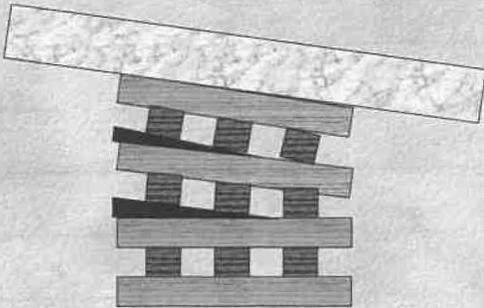
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## ***BOX CRIBBING***



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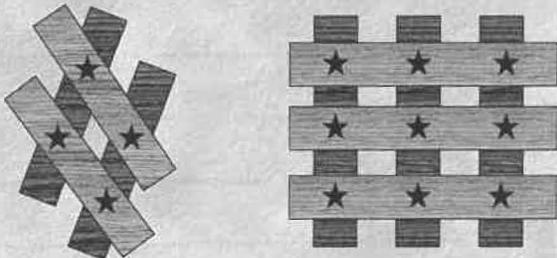
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## ***CONTACT POINTS***

**6000 LBS. Per Contact Point**



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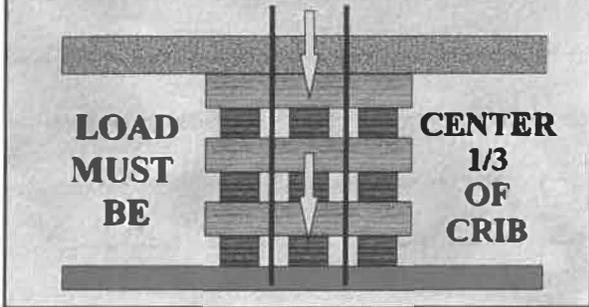
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## ***CRIB STABILITY***



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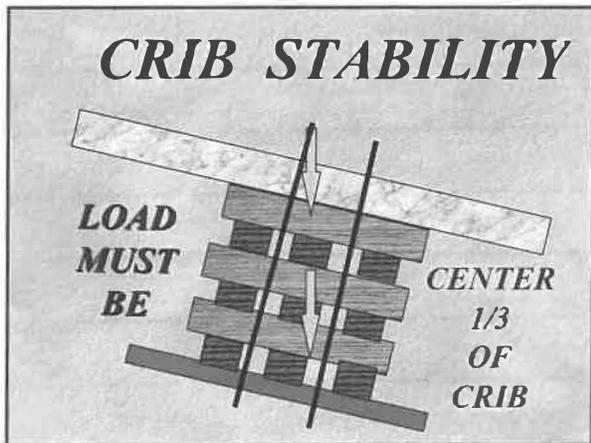
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## ***CRIB STABILITY***



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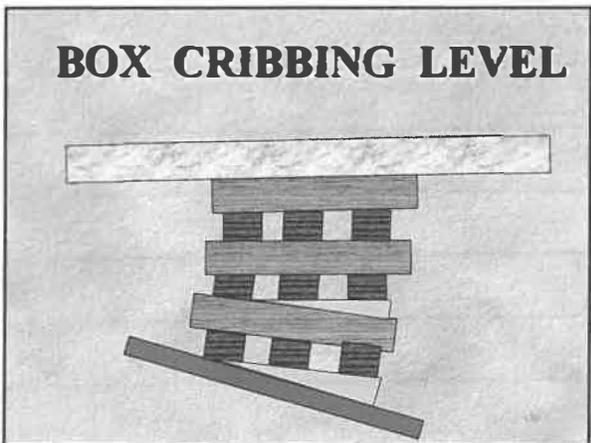
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## **BOX CRIBBING LEVEL**



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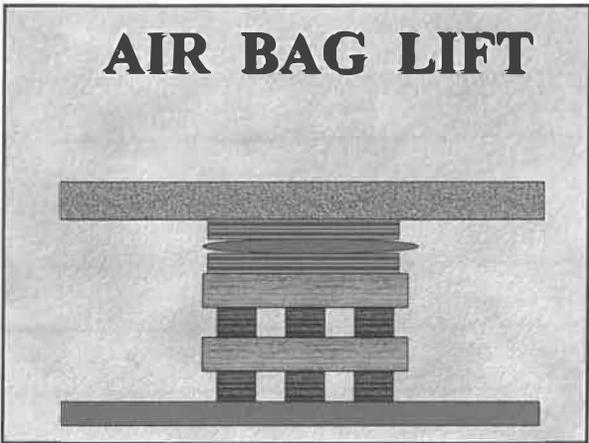
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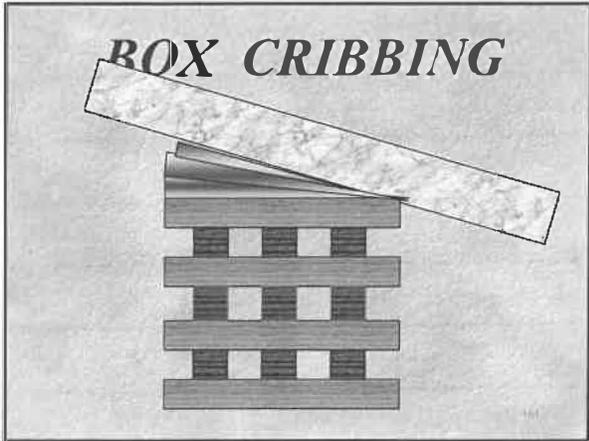
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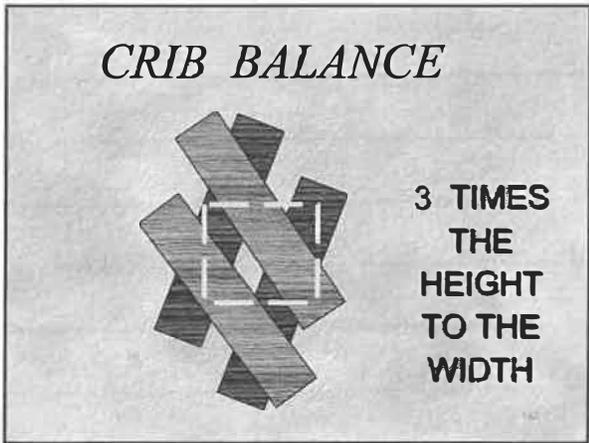
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THE  
**END**

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**OFFICE OF FIRE PREVENTION & CONTROL**  
NYS Department of State



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**Organization:**

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**Name:**

FOLD

**Please remember to:**

- Enter into the discussion enthusiastically.
- Give freely of your experience.
- Keep confidences and assume others will, too.
- Confine your discussion to the topic.
- Listen alertly and take accurate notes.
- Provide constructive feedback.
- Appreciate the other person's point of view.
- Practice learned skills on the job.
- Be prompt and regular in attendance.

