



APPLICATION MANUAL

For

LONG SHORE RESCUE SUPPORT SYSTEMS

**("Raker" Shores)
(Window and Door Shores)
(Horizontal Shores)
(Spot Shores)
(Vertical Shores)
(Sloped Floor Shores)**

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CONTRACT/NO.**I-VALIDATION**

Except as stated in II, the technical manual identified above has been satisfactorily validated in accordance with all requirements of the applicable contract. The technical manual is hereby certified to be accurate and complete, and the information, instructions, text, and illustrations conform in all respects to the applicable general and detailed specifications.

II - EXCEPTIONS**EXCEPTIONS**

NONE

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FOREWORD

This technical manual conforms to Military Specifications MIL-M-38784, General Style and Format Requirements and MIL-M-7298, Commercial Equipment Technical Manuals. The manual contains description, applications (installation) instructions, scheduled maintenance recommendations and parts support for the Rescue Strut Long Shore Systems manufactured by Paratech Incorporated, 1025 Lambrecht Road, Frankfort, Illinois 60423-1648.

All pertinent data relative to the Rescue Strut Long Shore Systems is contained herein without specific reference to other publications. Refer to the table of contents for the arrangement of the contents within this publication.

This manual consists of one volume arranged in three chapters as follows:

Chapter 1 - Safety Precautions and General Information

Chapter 2 - Application Guide

Chapter 3 - Scheduled Maintenance

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SAFETY SUMMARY

The following are general safety precautions that are not related to any specific procedures, and therefore do not appear elsewhere in this publication. These are recommended precautions that Structures Specialists and rescue personnel must understand and apply during the many phases of incident operations and maintenance of equipment.

The Structures Specialist responsible for rescue personnel involved in incident operations shall be thoroughly familiar with the Urban Search and Rescue Field Operations Guide (FOG) published by the US Army Corps of Engineers. The guide serves as a working reference document to be used during incident operations.

The RescueStrut Long Shore Systems covered in this publication should be used only by trained and qualified Structure Specialists and rescue personnel familiar with collapse and containment procedures.

Before using this equipment, read and understand these instructions.

Personnel not directly involved in incident operations or maintenance of components comprising a RescueStrut Long Shore System should keep a safe distance from the working areas.

To effectively provide a management strategy needed to ensure that the Structure Specialists and rescue personnel are used effectively, the

Readiness Support Center will be responsible for the composition of the teams. The teams will be dependent upon the scope and type of the Urban Search and Rescue mission.

Application (installation) of a RescueStrut Long Shore System by unauthorized non-Structures Specialists, excluded rescue personnel or minors is prohibited.

Due to the need for rapid response to a disaster event, all personnel must have all necessary personal clothing, equipment and supplies readily available for immediate mobilization.

During operation, do not over reach. Maintain a stable footing and balance at all times.

Rescue struts used in shoring and rescue operations must be used in accordance with the Urban Search and Rescue (US&R) Field Operations Guide (FOG) published by the US Army Corps of Engineers.

Keep the work area clean when maintaining or repairing components of a RescueStrut Long Shore System.

Long Shore struts with an effective length from 3' to 16' are designed for use with one 2', 4' or a 6' strut extension.

CHAPTER 1

SAFETY PRECAUTIONS AND GENERAL INFORMATION

1-1 SAFETY PRECAUTIONS.

Refer to the Safety Summary preceding Chapter 1, Safety Precautions and General Information, for safety precautions necessary for the protection of personnel and equipment.

1-2 INTRODUCTION.

1-2.1 This technical manual provides instructions for the application (installation), maintenance and parts support for RescueStrut Long Shore Systems manufactured by Paratech Incorporated, 1025 Lambrecht Road, Frankfort, Illinois 60423-1648.

1-2.2 The RescueStrut Long Shore Systems, figure 1-1, are designed for use in search and rescue situations involving collapse, containment and/or stabilization. It is defined as the temporary stabilization or re-support of only that part of, section of, or structural element of a physically damaged, partially or totally collapsed structure. This is done in order to provide a safe and efficient atmosphere while conducting trapped victim search and rescue operations at a relatively safe and reduced risk environment to the collapse incidents victim's, as well as the collapsed trained rescue forces.

1-2.3 The use of a RescueStrut Long Shore System has several advantages over wood shoring systems. In the area of collapse rescue where many times speed is an issue, these "raker" shores provide an invaluable service. They can be installed quickly and in many cases are stronger than their wood counterparts. Minimal measuring for the placement of the "raker" shores is a distinct advantage in the speed of the "raker" shore's erection time. The only measurements needed are (1) the length of the "raker" rails and (2) the overall length of the "raker" struts including the strut extensions. In

most cases with wood it is necessary to measure and cut, and insert a set of wedges for fine adjustments. "Raker" struts provide an excellent use as quickly installed safety struts. A Rescue Strut Long Shore System includes several varieties of bases to provide versatility for use in different shoring applications.

1-2.4 This publication will help the Structures Specialist and/or authorized rescue personnel erect the "raker" shores generally necessary for a safe operation at a structural collapse incident.

1-3 EQUIPMENT DESCRIPTION.

1-3.1 The Rescue Strut Long Shore System components are manufactured from aluminum alloys for light weight and strength. They are designed to be used in place of or in conjunction with wood cribbing, or other shoring or support devices. The system consists essentially of various lengths of extendible struts ("raker" and "sole"), strut extensions, "raker" rails, base plates and interconnecting devices.

1-3.2 Take down and repositioning is accomplished by removing the load pressure and then manually turning the nut down the inner shaft. If during release, a load shift begins to forcibly collapse the strut, simply releasing the nut will again lock the strut in that extended position where the nut was released.

1-3.3 **Long Shore Struts.** Struts shown in figure 1-2 consist of a standard 6' to 10' extendible strut or optional 8' to 12' and 10' to 16' extendible struts. Each strut consists essentially of a 3" (7.62 cm) diameter aluminum alloy inner movable acme threaded shaft and a 3-1/2" (8.89 cm) diameter aluminum alloy outer tube. The struts are extended manually.

1-3.3.1 The design of the strut permits "soft"

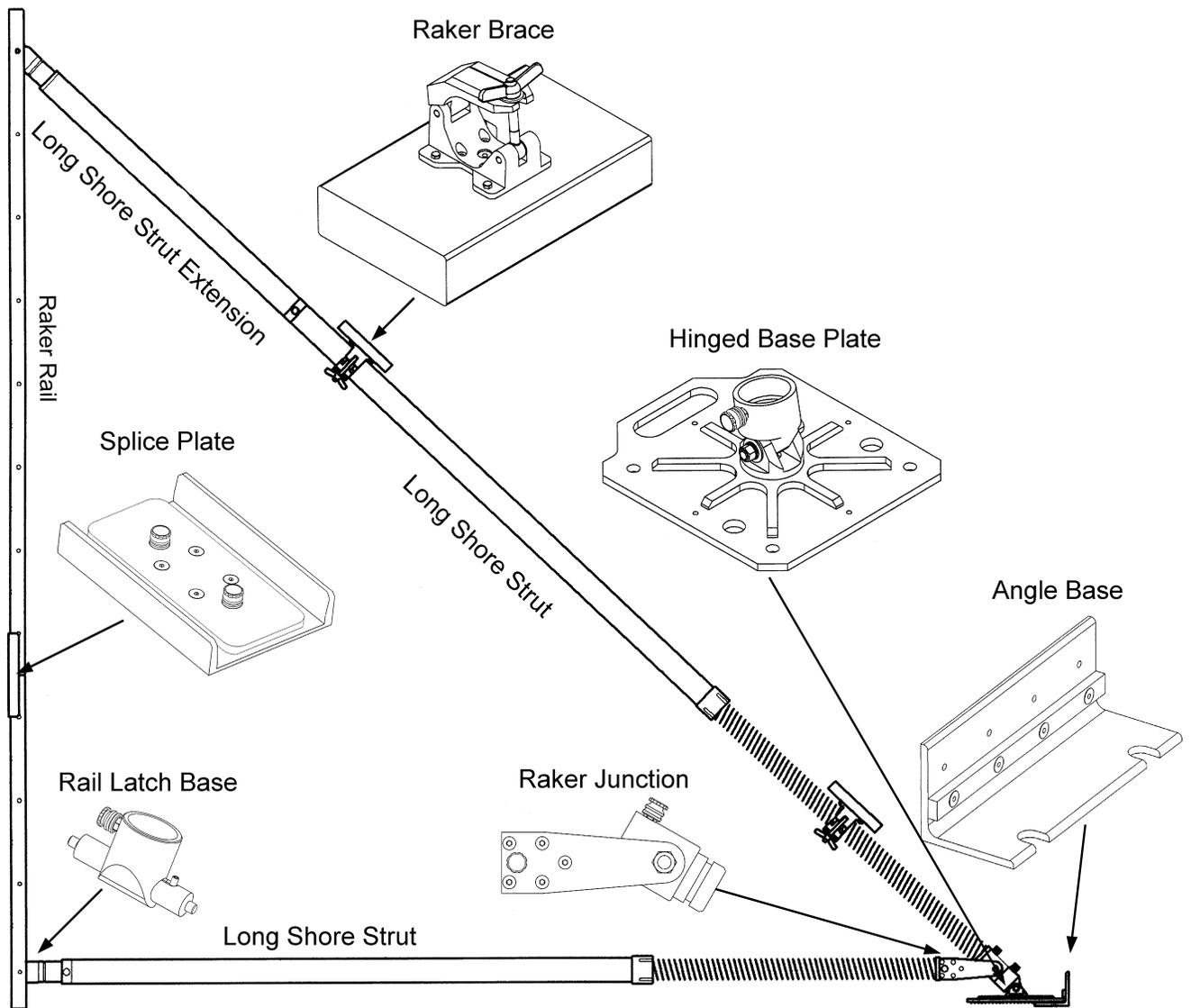


Figure 1-1. Rescue Strut Shoring System ("Raker" Shore Set Shown)

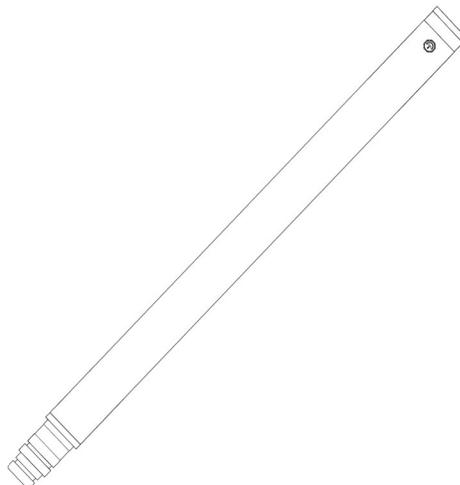
placement with sensitive positioning, and locking at an infinite number of extended positions within the range of the strut. When the strut is extended, an acme threaded nut moves with the inner, acme threaded shaft. The nut can be manually turned up the inner shaft and secured against the outer tube to lock the strut in any desired extended position. This feature permits the strut to lock at any desired set point rather than at a predetermined specific set point. This will result in the gentle yet secure support with a minimum of shock and displacement of the load. The maximum buckling strength values and recommended safe working values for the use of struts are presented in table 1-1 and 1-2 respectively.

Figure 1-2.
Long Shore
Strut



1-3.4 Long Shore Strut Extensions. When combined with a 12" hinged base plate and/or optional rigid or swivel base and ground plates, the 2', 4' and 6' strut extensions, figure 1-3, are

Figure 1-3.
Long Shore
Strut
Extensions



designed to function independently as rigid support devices. They may also be integrated with "raker" and/or "sole" struts to add length. Struts are not designed to accept more than one extension with a total strut and extension combined length of 16'.

Table 1-1 Maximum Buckling Strength Values
(excluding Extensions)

Strut Length (Feet)	Maximum Buckling Strength Pounds (Kilograms)
16 (12' to 16' Strut)	8,500 (3,850)
14 (12' to 16' Strut)	15,500 (7,000)
12 (12' to 16' Strut)	28,000 (12,700)
12 (8' to 12' Strut)	20,000 (9,100)
10 (8' to 12' Strut)	42,500 (5,400)
10 (6' to 10' Strut)	33,000 (19,300)
8 (6' to 10' Strut)	63,000 (28,500)

Table 1-2. Recommended Safe Working Values
(Excluding Extensions)

Strut Length (Feet)	Maximum Buckling Strength Pounds (Kilograms)
16 (12' to 16' Strut)	3,000 (1,400)
15 (12' to 16' Strut)	4,500 (2,000)
14 (12' to 16' Strut)	6,000 (2,700)
13 (12' to 16' Strut)	7,000 (3,200)
12 (8' to 12' Strut)	7,000 (3,200)
12 (12' to 16' Strut)	10,000 (4,500)
11 (8' to 12' Strut)	10,000 (4,500)
10 (6' to 10' Strut)	12,000 (5,400)
10 (8' to 12' Strut)	16,000 (7,200)
9 (6' to 10' Strut)	16,000 (7,200)
8 (6' to 10' Strut)	20,000 (9,100)
7 (6' to 10' Strut)	22,000 (10,000)
6 (6' to 10' Strut)	22,000 (10,000)

1-3.5 **Hinged Base** (Part Number 22-796180R). The hinged base, figure 1-4, is a 12" square with a non-skid surface manufactured from hard-anodized aluminum alloy. It will pivot 45° from vertical in either direction about the pivot pin axis. An incorporated lock pin assures rapid engagement and security to a mating strut, extension or interconnecting component.

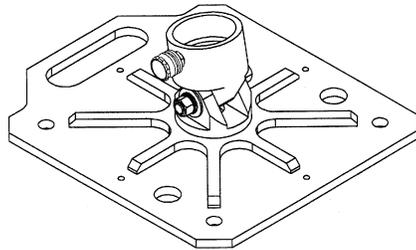


Figure 1-4. Hinged Base

1-3.6 **"Raker" Rail** (Part Number 22-796258C) and **Splice Plate** (Part Number 22-796469). Four "raker" rails, figure 1-5, are provided in six foot lengths for use as a component of a "raker" shore. They are designed for use either singly or in pairs through an interconnecting splice plate.

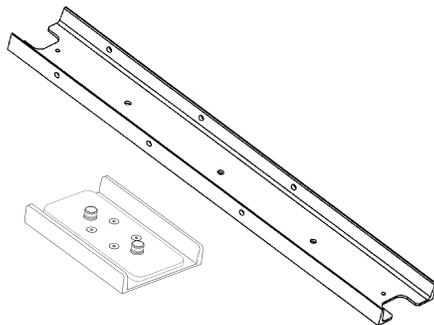


Figure 1-5. "Raker" Rail and Splice Plate

1-3.7 **Interconnecting Components**. The interconnecting components of the Rescue Strut Long Shore System shown in figure 1-1 are: (1) the "raker" rail latch bases (Part Number 22-796250) used in a "raker" shore to interconnect "raker" or "sole" struts as well as extensions to

the wall plates, (2) nailing pads (Part Number 22-796310) to provide nailing surfaces when interconnecting a pair of "raker" shores through the use of wood 2" x 6" bracing, (3) "raker" junction bases (Part Number 22-796290) that permit "raker" or "sole" struts as well as extensions to join a hinged base, and (4) angle bases (Part Number 22-796475) that provide a 4" x 12" support between the hinged base and wood "sole" anchor. The "raker" rail latch bases, and "raker" junction bases utilize lock pins to assure rapid engagement and security to mating components whereas the nailing pad utilizes a quick release clamp for a rapid and secure attachment to a "raker" strut or extension.

1-4. REFERENCE DATA.

1-4.1 Reference data pertaining to the "raker" struts and extensions are summarized for quick reference in table 1-3.

Table 1-3. Reference Data

Manufacturer..... Paratech, Incorporated
 1025 Lambrecht Road
 Frankfort, Illinois 60423-1648
 CAGE Code 30978

STANDARD STRUT

6' TO 10' "Raker" Strut (1.83 m to 2.95 m)
 Part Number 22-796360
 Outside Diameter 3.5" (8.89 cm)
 Weight..... 41 pounds (18.6 kg)

OPTIONAL STRUTS

8' TO 12' "Raker" Strut (2.33 m to 3.73 m)
 Part Number 22-796370
 Outside Diameter 3.5" (8.89 cm)
 Weight..... 53 pounds (24 kg)
 10' TO 16' "Raker" Strut (2.9 m to 5.03 m)
 Part Number 22-796390
 Outside Diameter 3.5" (8.89 cm)
 Weight..... 67 pounds (30.2 kg)

STRUT EXTENSIONS

2' (0.61 M) Extension

Part Number 22-796342
Nominal Diameter 3.5" (8.89 cm)
Weight 9 pounds (4.1 kg)

4' (1.22 M) Extension

Part Number 22-796356
Nominal Diameter 3.5" (8.89 cm)
Weight 15 pounds (6.8 kg)

6' (1.7 M) Extension

Part Number 22-796376
Nominal Diameter 3.5" (8.89 cm)
Weight 20 pounds (9.1 kg)

1-5. ACCESSORIES.

No accessories are supplied with the Rescue Strut Long Shore System. However, the following accessories are designed for use with and are required to obtain full utilization of the Rescue Strut Long Shore System.

1-5.1 BASE PLATES.

1-5.1.1 6" Square Rigid Base-Part Number 22-796070 (Figure 1-6). The 6" (15.2 cm) square rigid base accommodates struts and strut extensions. It is manufactured from hard anodized aluminum alloy and is provided with a non-skid surface.

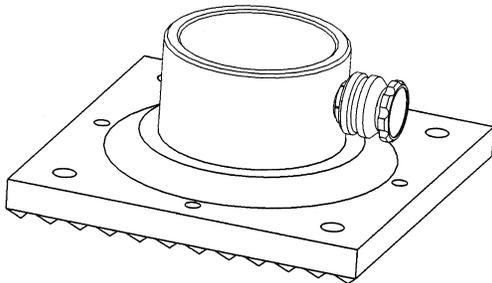


Figure 1-6. 6" Square Rigid Base

1-5.1.2 6" Square Swivel Base-Part Number 22-796060 (Figure 1-7). The 6" (15.2 cm) square swivel base accommodates struts and strut extensions and can rotate 20° in any direction. It is manufactured from hard anodized aluminum alloy and is provided with a non-skid surface. The swivel base is utilized in situations where objects to be braced are not in direct alignment with each other or in situations where the possibility of slight load shifting may cause an alteration in alignment.

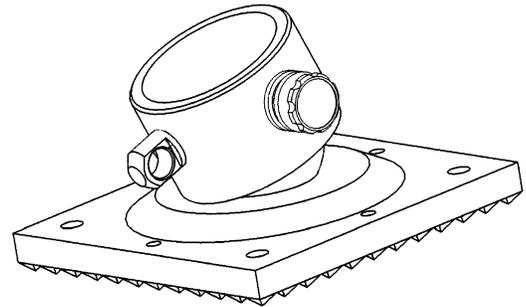


Figure 1-7. 6" Square Swivel Base

1-5.1.3 6" Square Hinged Base-Part Number 22-796140 (Figure 1-8). The 6" (15.2 cm) square hinged base accommodates struts and strut extensions and can pivot 45° from vertical in either direction about the pivot pin axis. It is manufactured from hard anodized aluminum alloy and is provided with a non-skid surface.

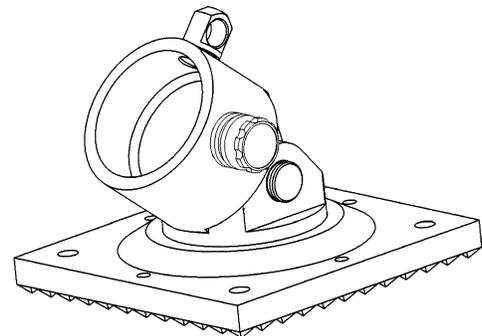


Figure 1-8. 6" Square Hinged Base

1-5.1.4 12" Square Rigid Ground Plate-Part Number 22-796180A (Figure 1-9). The 12" (30.5 cm) square rigid ground plate accommodates struts and strut extensions. It is manufactured from hard anodized aluminum alloy and is provided with a non-skid surface. The larger surface area makes the ground plate more suitable where unstable soil conditions are encountered.

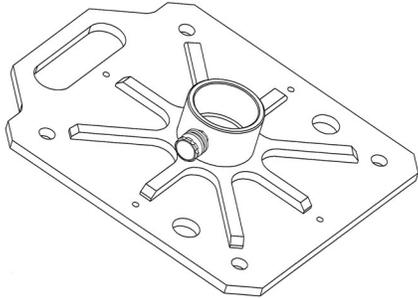


Figure 1-9. 12" Square Rigid Ground Plate

1-5.1.5 12" Square Swivel Ground Plate-Part Number 22-796180B (Figure 1-10). The 12" (30.5 cm) square swivel ground plate accommodates struts and strut extensions and can rotate 20° in any direction. It is manufactured from hard anodized aluminum alloy and is provided with a non-skid surface. The swivel base is utilized in situations where objects to be braced are not in direct alignment with each other or in situations where the possibility of slight load shifting may cause an alteration in alignment. The larger surface area makes the ground plate more suitable where unstable soil conditions are encountered.

makes the ground plate more suitable where unstable soil conditions are encountered.
1-5.2 MISCELLANEOUS ACCESSORIES.

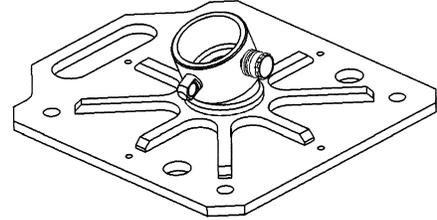


Figure 1-10. 12" Square Swivel Ground Plate

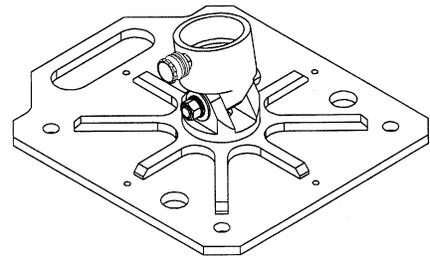


Figure 1-11. 12" Square Hinged Ground Plate

1-5.1.6 12" Square Hinged Ground Plate-Part Number 22-796180C (Figure 1-11). The 12" (30.5 cm) square hinged ground plate accommodates struts and strut extensions and can pivot 45° from vertical in either direction about the pivot pin axis. It is manufactured from hard anodized aluminum alloy and is provided with a non-skid surface. The larger surface area

1-5.2.1 Angle Base-Part Number 22-796092 (Figure 1-12). The angle base incorporates a lip to hang a strut onto for hands-free operation. Typically used where re-bracing is required before rescue personnel are permitted to enter the structure.

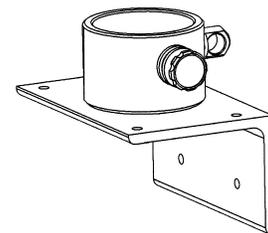


Figure 1-12. Angle Base

1-5.2.2 4" x 4" Channel Base-Part Number 22-796134 (Figure 1-13). The 4" x 4" channel base is designed specifically to fit over 4" x 4" shoring lumber where it can then be anchored with either nails or screws.

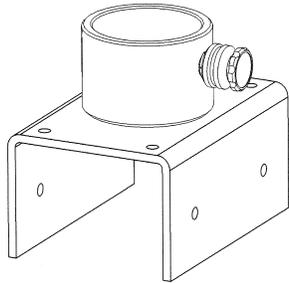


Figure 1-13. 4" Channel Base

1-5.2.3 6" x 6" Channel Base-Part Number 22-796136 (Figure 1-14). The 6" x 6" channel base is designed specifically to fit over 6" x 6" shoring lumber where it can then be anchored with either nails or screws.

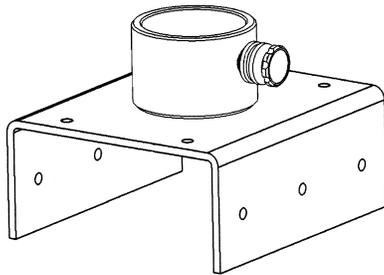


Figure 1-14. 6" Channel Base

1-5.2.4 3" Standard Base-Part Number 22-796050 (Figure 1-15). The 3" standard base is designed to cover either end of a strut to provide

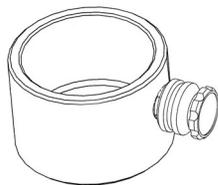


Figure 1-15. 3" Standard Base

vide strut protection during shoring operations. 1-5.2.5 Cone Base-Part Number 22-796080 (Figure 1-16). The cone base, designed with hardened steel point, is used primarily to secure struts at a slight angle against smooth bearing surfaces that the cone can pierce.

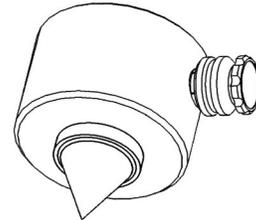


Figure 1-16. Cone Base

1-5.2.5 4" Rubber Base-Part Number 796190 (Figure 1-17). The 4" rubber base is a standard base with a 4" rubber cap used to stabilize struts where the bearing surface is smooth but cannot be pierced.



Figure 1-17. 4" Rubber Base

1-5.2.6 V-Base-Part Number 22-796090 (Figure 1-18). The V-base provides a V to stabilize anything with a corner or angle at the point of support.

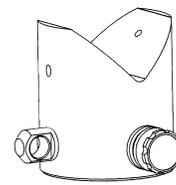


Figure 1-18. V-Base

1-5.2.7. Spot Shore-Part Number 22-796300 (Figure 1-19). The spot shore in conjunction with "raker" and "sole" struts provides a stable tripod as a temporary support until a complete shoring system can be installed.

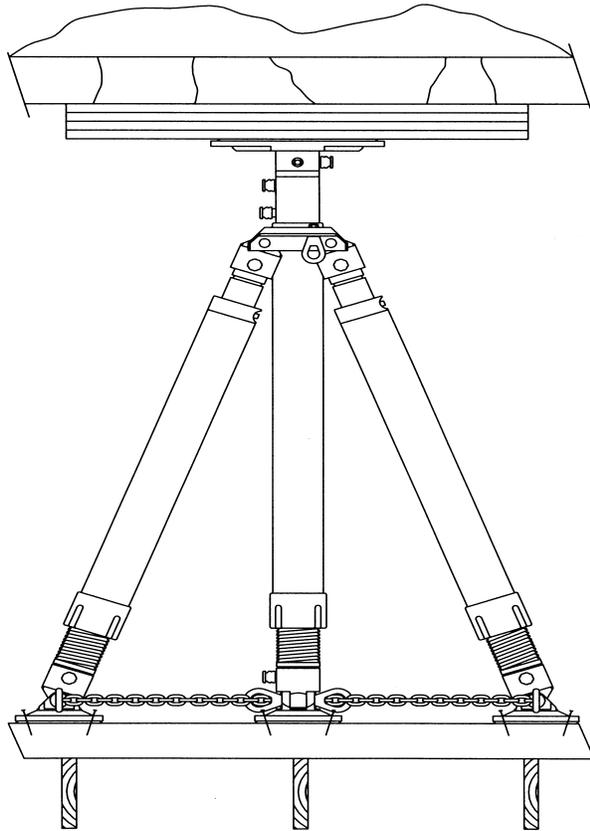


Figure 1-19. Spot Shore

CHAPTER 2 APPLICATION GUIDE

2-1 RESCUE SHORING.

2-1.1 THE OBJECTIVES OF RESCUE SHORING OPERATIONS.

2-1.1.1 The main and paramount objective of emergency rescue shores is to properly maintain the strength and integrity of any and all structurally damaged or unstable elements such as but not limited to beams, joists, girders, columns, arches, headers, or bearing walls.

2-1.1.2 The main objective of the rescue shoring operation is to properly and effectively receive, transmit and/or redirect the now unstable collapse loads. These new loads, many times forming in specific areas heavy concentrated load effect and overstressing the existing structural elements, must be transferred ultimately to stable ground. Many times, depending on the type of structure, these loads can be transferred or directed to the remaining structural elements that are sound and capable of handling the additional collapse loads.

2-1.2 CONCENTRATED VS DISTRIBUTED LOADS.

2-1.2.1 One of the main concepts of rescue shoring is to take the concentrated overload from debris and redirect, or redistribute it to structural elements that will support the collapse load. When a collapse situation is encountered, frequently a structural overload condition will occur. This will happen when the structures contents as well as the structural elements of the structure have collapsed on to a lower level.

2-1.2.2 Depending upon the type of collapse voids created, the upper level loads will be directed into a specific area. This will happen most often in a cantilever, supported lean-to,

v-shaped, and a-framed type collapse pattern. In these patterns, the material from the levels above will be directed into specific areas. That material which above in its normal state and position was an evenly distributed load that the structure would be easily able to support. However, the material now has come to rest on a lower level in a large concentrated form. In essence the structures supporting elements are being overloaded because this concentrate load is now being supported by only a few elements, generally joists or a girder, or both.

2-1.2.3 The job of the Rescue Shoring Officer and the Structures Specialist is to determine the overload and how to redistribute that overload to either the ground or other structural elements capable of supporting that overload. This is normally accomplished through some type of rescue shoring.

2-1.2.4 There are several options that are generally available; either take the load and directly feed it to the ground or to a lower level (normally done with vertical struts) or transfer the load laterally to an exterior bearing support. Other options are available but these two are generally the most practical and frequently utilized.

2-1.3 BASIC RESCUE SHORING POINTS.

2-1.3.1 **Emergency Shoring Must Be Erected As A System.** Unlike what is common practice in the construction industry, emergency shoring must be constructed as a complete system. By securing all the "raker" struts together, their stability as well as efficiency is significantly increased.

2-1.3.2 The possibility of secondary collapse is the primary concern at any structural collapse rescue operation. In order to minimize this haz-

ard and to assure maximum safety, all the "raker" struts must be assembled together as a complete system. The increase in stability of the "raker" struts when they are a whole system will serve to fulfill that function. It is important to remember the emergency shoring must be able to withstand a possible secondary collapse.

2-1.3.3 Lateral Bracing Must Be Installed To Prevent System From Buckling. It is very important that all the "raker" struts be laterally braced, and in both directions. The "raker" struts must be able to withstand lateral pressures that may be applied to the shoring system from any direction. Sudden shifts can easily occur in unstable collapsed structures, thus applying eccentric and/or torsional loading.

2-1.3.4 The minimum level of lateral strength in vertical support should be 2%; however, 10% is more desirable. Rescue shoring is unique compared to "normal" contractor installed shoring. Contractor shoring is generally the friction type of shoring. This type of shoring relies on the pressure of the "raker" shore against the damaged material for it to stay in position. A major problem with friction types of "raker" shores is that they have very little lateral stability and can be easily vibrated or knocked loose; something that cannot be tolerated in an emergency shoring situation. The potential for secondary collapse is always present in structural collapse rescue operations and must always be prepared for.

2-1.3.5 In rescue situations, fixed shoring systems must be installed because of the dangerous possibility of secondary collapse. Rescue Strut Long Shore Systems will withstand this type of threat much better than friction type shoring. The shoring that rescuers erect must be a complete system and must be capable of properly resisting multi-directional forces. This can only

be accomplished through the use of lateral bracing secured to the "raker" shores, integrating all "raker" shores together as a system.

2-2 RESCUE STRUT LONG SHORE SYSTEM.

2-2.1 ADVANTAGES OF THE SYSTEM.

2-2.1.1 There are several major advantages to this prepackaged Rescue Strut Long Shore System.

1. The "raker" shores can be easily assembled with very little training. Minimal carpentry skills are needed to properly install a Rescue Strut Long Shore System.

2. There are no angles to determine, or lumber to cut to size, or specific nail patterns to install (excluding cross bracing).

3. There are less elements (pieces) in the Rescue Strut Long Shore System than is normally required in a wood friction type shoring system.

4. The Rescue Strut Long Shore System requires less time and effort to setup and install. It can be completely assembled in a few minutes.

5. "Raker" shores can be easily adjusted to sloped or leaning walls much faster than conventional wood struts.

6. The Rescue Strut Long Shore System is stronger than comparable wood shoring systems.

7. Wood can be damaged by storage, or weather conditions; this is not the case of an aluminum Rescue Strut Long Shore System.

8. The elements of a Rescue Strut Long Shore System can easily be stored and transported in areas that are less than 7 feet long; this cannot be done with wood shoring systems.

2-2.2 EXTERIOR SHORING EVALUATION.

2-2.2.1 Some of the most difficult and complicated rescue shoring is exterior rescue shoring. Exterior rescue shoring consists primarily of installing "raker" struts and exterior "sole" (horizontal) struts to stabilize and re-support existing bearing or nonbearing exterior walls. These walls may be cracked, leaning, bulged, or in some other way damaged or not properly supporting their loads.

2-2.2.2 When assembling exterior "raker" shores, the Structures Specialist and/or rescue personnel will work with lumber ranging from 4" x 4" up to lumber possibly as large as 12" x 12". However, most situations will require 4"x4" or 6"x6" lumber. Assembling and installing exterior rescue shoring is involved, exacting and may require large amounts of material. Enough material must be available to complete a given rescue situation. The "raker" shores and flying strut shores may appear to be complicated, but after a minimal amount of practice they are not that difficult to construct.

2-2.2.3 Erecting a series of fixed "raker" shores, properly anchored and braced together, will stop an unstable wall from moving outward any further. At least two fixed "raker" shores should be installed in any given situation. Usually they are erected in a series for stability. By connecting the individual "raker" shores together, a stable system of support is created that can safely handle extensive loads.

2-2.3 INTERIOR SHORING EVALUATION.

2-2.3.1 Interior shoring evaluation must cover

several factors including the type of construction, the extent of damage, the type and stability of the surface the "raker" shores will bear on, secondary collapse potential, the reason the structure failed, and the height of the wall being stabilized. Following is a more detailed discussion of these factors.

2-2.3.2 **Bulged Walls.** Bulged, bellied, or leaning walls are a sign of some type of structural instability occurring in the structure. Walls, when they are plumb, are designed to accept loads thru their center axis. If the walls for any reason become eccentrically loaded, there can be drastic results; especially if those walls are bearing walls. The weight on top of the wall can quickly become an eccentric load and cause the wall to fail. Any deformation in the wall indicates that the overall strength of that wall is compromised. The wall could possibly fail at any time, depending on how drastic the deformation. When this type of wall is encountered, time spent erecting interior "raker" shores to accept a floor load from above will be one of the safest ways to counteract any possible problem.

2-2.3.3 **Cracked Walls.** In concrete and masonry wall construction, whenever forces are applied to the walls there is the possibility of some type of cracking. This is especially true when those forces are applied either laterally or horizontally to the plane of the wall. Although masonry is excellent under a compression load, its lateral strength is not extremely efficient. As a result, lateral forces applied against masonry walls can cause them to crack.

2-2.3.4 In reinforced concrete, cracking is an inherent part of the curing process. Hairline or thin cracks in concrete do not signify failure nor need for concern. However, there is concern when the cracks are large and have depth and separation. This means the sections of material have sustained heavy damage and may have separated from each other.

2-2.3.5 Another major factor to consider is concrete adhesion to reinforcement bars (rebar). Concrete will maintain its structural integrity until the material itself has separated from the rebar. When there is no adhesion to the steel rebar, the lateral strength of the concrete is severely compromised. A possible collapse situation is a real concern at this point.

2-2.3.6 Masonry brick and block cracking will be much more of a concern than in concrete. The bond between the mortar and the masonry bricks/blocks is what keeps the walls integrity intact. When a lateral force is applied to the wall and it fractures that bond, structural integrity of the wall may be compromised. Thin cracks may not be much of an issue. However, large long cracks with noticeable depth will be of concern. In this situation the integrity of the wall has positively been compromised.

2-2.3.7 Another perilous situation that may also develop is when an "X" pattern crack appears on the wall. This indicates the wall has had stresses applied to it from two separate planes. Shifting or settling of the structure is occurring in two separate directions; this is a serious concern to all rescue personnel. A thorough evaluation of this situation is required when this occurs.

2-2.3.8 How the cracks that have occurred in a wall must be determined. A masonry wall may have a large crack at the base of the foundation that reduces in width as it travels laterally while rising up the length of the wall for an appreciable distance (10 or 20 feet), and terminates in a fine line at the top. This will indicate a settlement crack that has occurred over time and is indicative of a foundation problem affecting the stability of the wall as well as the complete structure.

2-2.4 FOUNDATION ISSUES.

2-2.4.1 Foundation issues are a major problem that can severely limit the possibilities for a rescue team to help re-stabilize a structure. In these situations, where there is structural instability due to the possible yield of the footings resulting from unstable soil conditions or water undermining the structure, there is a serious problem. All of the rescue shoring to be installed must be supported on a good bearing surface that can carry the additional loads that will be applied to them.

2-2.4.2 In some cases, the foundation can be another part of the structure. In many cases this may be the ground or at the basement level. If the foundation of the structure is somehow compromised, the effectiveness of rescue shoring will also be compromised. Support of the structure cannot be accomplished by the relatively simple installation of emergency building shoring.

2-2.4.3 Major efforts must be considered in order to re-support a structure which has foundation problems. This will entail efforts not generally associated with the application of rescue shoring, since it requires too much time and the excessive commitment of resources. When a rescue team responds to an incident involving a major foundation problem, after the structure has been evacuated there may have to be decisions made such as turning the building over to reputable contractors and letting them handle the operation and stabilization of the building.

2-2.5 RACKED STRUCTURE.

2-2.5.1 On some occasions, primarily during natural disasters such as tornado's, earthquakes and hurricanes, the entire structure may shift and become racked.

2-2.5.2 In order to stop the structure from shifting or racking any further, "raker" shores may be installed at the corners of the structure. A set of "raker" shores installed at each corner, especially on a smaller structure, should be sufficient to arrest any further racking. The percentage of racking that has occurred to the structure will be one of the prime considerations on whether it is practical to attempt to re-stabilize the structure. The first consideration will be if there is anyone trapped in or by the structure. If there is, then every effort must be made to rescue those victims and the structure must be adequately stabilized before rescue team members enter the structure. The application of "raker" shore bracing at the corners will lock in position the corners of the structure stopping further twist.

2-2.6 GROUND STABILITY.

2-2.6.1 Generally speaking, structure collapse in an urban environment, requires the erection of a Rescue Strut Long Shore System on concrete or asphalt. The ground plates and/or angle bases, and the wood "sole" plate anchors can easily be anchored to these hard surfaces using any number of methods. In suburban areas, where bare ground adjacent to the damaged structures is more likely to be encountered, soft or stable and firm ground may be encountered requiring different anchoring methods. In each collapse situation, different anchoring options are available. Select the one which is the easiest and most efficient to properly anchor the Rescue Strut Long Shore System.

2-2.7 ADJACENT STRUCTURES.

2-2.7.1 In many instances, the structure(s) adjoining the structure in question can be utilized to help support the partially collapsed structure. The physical shape and structural integrity of the adjacent structures must be thoroughly ex-

amined to insure their potential as a stabilizing force to assist in the support of the structure that has been affected by the collapse incident. If it has been determined that an adjacent structure is capable of supporting the additional loads that may be placed against it, then shoring operations can begin.

2-2.7.2 On occasion if the structures are close together, then exterior horizontal shoring can be erected to support the remains of the damaged structure. If the structures are farther apart, then it may require flying strut shores to be erected. In either case, this will be determined by the Structures Specialist on the scene in conjunction with the Incident Commander.

2-2.8 AMOUNT OF DAMAGE.

2-2.8.1 How extensively a structure is damaged will dictate whether any shoring is possible. As the structure is evaluated, it must first be determined whether the area is sufficiently stable to ensure the safety of the rescue personnel.

2-2.8.2 A check of the structural integrity of the partially collapsed structure is mandatory. Are major structural members cracked or bulging? Are walls out of plumb? How much of the remaining structure is relying on the wall that will be used for placement of the Rescue Strut Long Shore System? These factors will determine the anticipated quantity of shoring that will be required; the greater the damage the greater the potential for shoring. Extensive damage throughout a large structure may dictate the use of multi-story shoring systems in order to redirect the unstable loads to good bearing surfaces, generally the ground.

2-2.9 LOAD TRANSFER.

2-2.9.1 Most un-reinforced masonry structures are constructed in such a way that the interior

weight is carried by the floor beams and transferred to the bearing walls, which in the majority of these structures are exterior walls. An additional impact load transferred to these exterior bearing walls during an incident collapse can cause deflection and instability to occur.

2-2.9.2 The purpose of the exterior Rescue Strut Long Shore System is to help stabilize the bearing wall and transfer those additional loads to the ground. As the load is applied to the Rescue Strut Long Shore System, the "raker" strut comes under compression, causing it to attempt to slide upward on the "raker" rail and away from the wall on the "sole" plate. Anchoring the "raker" rail directly and the "sole" strut indirectly through a "sole" anchor prevents movement of the Rescue Strut Long Shore System.

2-2.10 "RAKER" INSERTION POINT.

2-2.10.1 It is critical that the Rescue Strut Long Shore System be placed in the proper position; if not it will be far less effective and may not help at all. The "raker" insertion point (the juncture of the "raker" strut and "raker" rail) should be at the level of the floor beams, or just below that level but within two feet from the top of the floor beams. The "raker" insertion point is critical and must be accurately located during the erection of the Rescue Strut Long Shore System.

2-2.11 "RAKER" SPACING.

2-2.11.1 Each Rescue Strut Long Shore System should be placed no more than 8 feet apart. If they are, the "raker" shore bracing will become far less effective and may not stand up under a secondary collapse.

2-3 RESCUE SHORING INSTALLATION.

2-3.1 STEP-BY-STEP "RAKER" SHORE FABRICATION AND ERECTION (FIGURE 2-1).

1. Select a suitable spot close to the area to be shored, but away from any possible collapse danger. A safe area must be available to pre-construct the "raker" shore out of the way of any damaged or leaning wall. The safety of the rescue personnel is the top priority. The area must be large enough and relatively level to help speed the assembly and make it easier to assemble the components. An area approximately 20 foot by 20 foot would be sufficient to fabricate the "raker" shore.

2. Determine the "raker" strut insertion point. This will determine the length of the "raker" rail. The "raker" rail should extend at least 12" above the "raker" strut insertion point. For example, if the insertion point is 10 feet high, two 6 foot "raker" rails would be used. The "raker" shore should contact the floor beams or be no more than 2 feet below them.

3. Lay out the "raker" rails in line with each other and parallel with the wall to be shored. This will make it easier to pick up and erect the pre-assembled "raker" shore. To splice the "raker" rails together, pull out the lock pin assembly knobs on the splice to retract the lock pins, fully engage the splice and "raker" rails and release the knobs. Then check the connections and make sure they are positively locked into position.

4. Determine the hole locations in the "raker" rails where the "raker" rail latch bases will be installed. One set should be at the "raker" strut insertion point and the other set should be either at the bottom set of holes or one set higher to accommodate the "sole" strut.

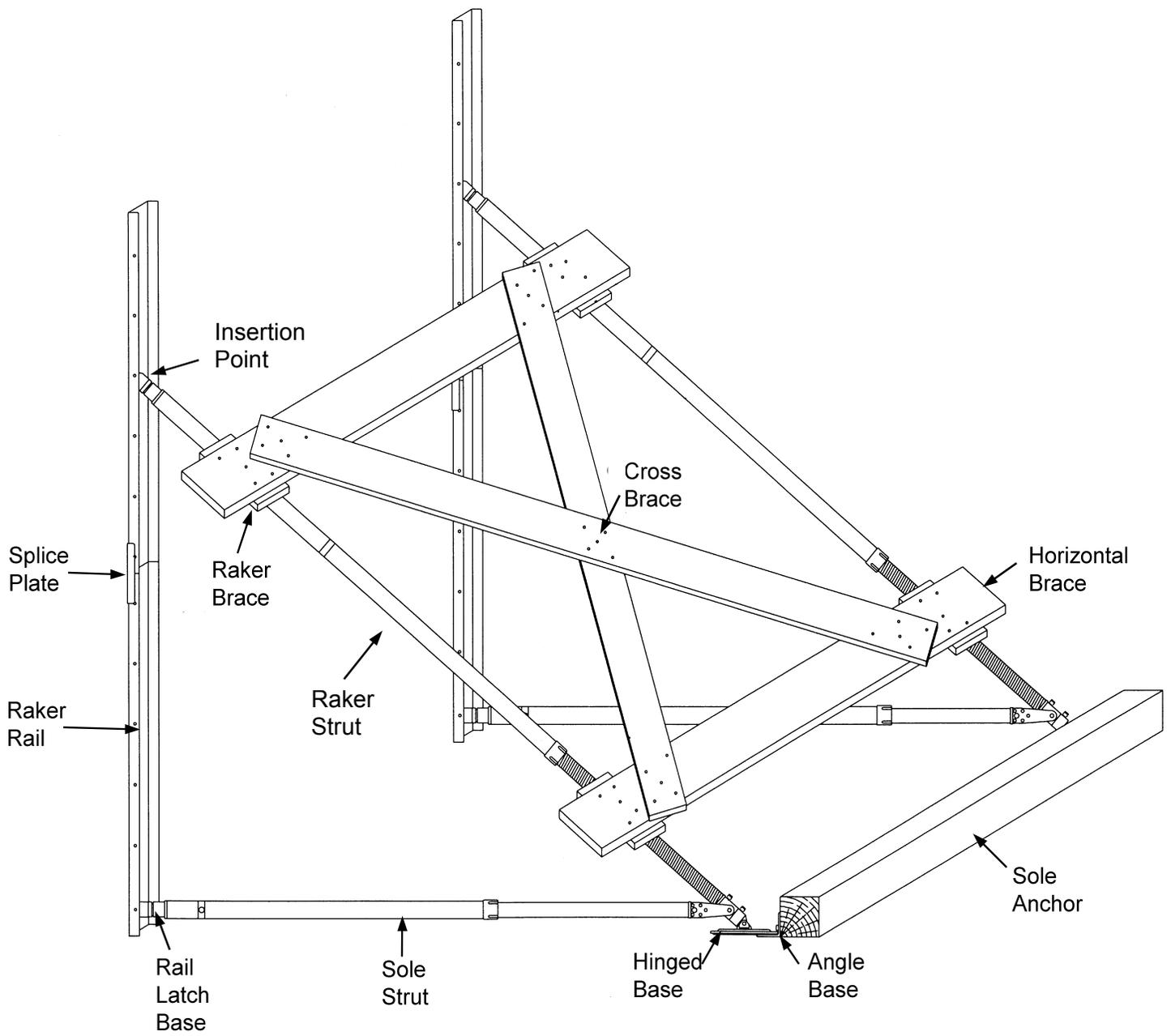


Figure 2-1. "Raker" Shore Set Fabrication and Erection

Place the "raker" rail latch bases between the channel legs of the "raker" rail locating and engaging the bases in the predetermined holes. The "raker" rail latch base should be slid in on an angle keeping the lock pin assembly up for easier engagement. The lock pin assembly is spring loaded and will retract as the "raker" rail latch base is slid into position and then extend into the "raker" rail holes.

5. Refer to tables 2-1 and 2-2 to determine the recommended safe working load and maximum height to the "raker" strut insertion point for "raker" shores with 45° and 60° "raker" angles. Determine the size of the "raker" struts and the extensions that will be utilized. Do this for both the "sole" strut as well as the "raker" strut. Any extension should be installed directly into the rail latch base connected to the "raker" rail. Place the extension, if used, in the "raker" strut rail latch base first. Align it to the approximate angle of the "raker" strut. Then place the "sole" strut extension in the "sole" strut rail latch base and align it to the approximate angle of the "sole" strut.

6. Insert the "sole" and "raker" struts into the extension pieces. To lock together, pull out the lock pin assembly knob on each extension, fully engage the extension with the "sole" and "raker" struts and then release the knobs to lock the components together. Place the longer strut into the "raker" strut extension. Make sure the strut pistons (inner acme threaded shaft) are facing away from the extensions to facilitate attachment to the "raker" junction base.

7. Extend the "sole" and "raker" struts (pull the inner acme threaded shafts out), with the "sole" strut perpendicular to the "raker" rail as much as possible, until the ends almost meet; the assemblage should be in the shape of a triangle.

8. Place the "raker" junction base onto the

"sole" and "raker" struts. Pull the lock pin assembly out when making the assembly, and when fully engaged, release the knob. Make sure the lock pin assemblies are locked in position. The swivel end of the "raker" junction base must be assembled onto the "raker" strut, and the fixed end must be assembled onto the "sole" strut.

Table 2-1 Recommended Safe Working Load When Raker Angle is 45 Degrees (Two Cross Braced Raker Shores)

Raker Strut Length (ft)	Maximum Height to Insertion Point (ft)	Maximum Load Lb (kg)
16	11.0	5,000 (2,300)
15	10.5	6,400 (2,900)
14	10.0	7,800 (3,500)
13	9.0	9,200 (4,200)
12	8.5	10,600 (4,800)

Table 2-2 Recommended Safe Working Load When Raker Angle is 60 Degrees (Two Cross Braced Raker Shores)

Raker Strut Length (ft)	Maximum Height to Insertion Point (ft)	Maximum Load Lb (kg)
16	13.8	3,00 (1,600)
15	13.0	4,500 (2,000)
14	12.0	5,500 (2,500)
13	11.25	6,500 (3,000)
12	10.4	7,500 (3,400)
11	9.5	10,000 (4,500)

9. Place the hinged base plate onto the swivel end of the "raker" junction base. Pull the lock pin assembly out when making the assembly, and when fully engaged, release the knob. Make sure the lock pin assembly is locked in

position.

10. Tilt up the assembled "raker" shore, it is now ready to be placed into position.

11. Place the assembled "raker" shore against the wall in question. Make sure the "raker" rail contacts the wall at the base and at the "raker" shore insertion point. If necessary shim the wall to accomplish this.

12. Set the hinged base plate flat on the ground. Turn the collars up the acme threaded shaft until they contact the outer tubes in order to lock the struts in their extended position.

13. Anchor the assembled "raker" shore to the ground at this time using at least two 1" diameter steel pins (reinforcing bars or equal) driven through the holes at the back of the hinged base plate. The pin length will be determined by the type of foundation they are driven into. Slide an angle base under the hinged base plate engaging the slots in the angle base with the pins driven through the hinged base plate.

14. If necessary, as a result of foundation instability, use a 6" x 6" x 10' or 8" x 8" x 10' wooden "sole" anchor directly behind the angle bases. Secure into the foundation with at least eight 1" diameter steel pins (reinforcing bars or equal). The pin length will be determined by the type of foundation they are driven into. Also secure the angle bases to the wooden "sole" anchor.

15. Anchor the "raker" shore to the wall utilizing the holes provided in the "raker" rail. The attaching nails, pins, etc. will depend upon the wall material.

16. At this time retighten the collars on the struts if necessary. The struts should be under compression and tight.

17. Repeat the instructions in steps 3 through 11 to assemble and install a second "raker" shore. One is not laterally stable enough to do the job.

18. After the second "raker" shore has been assembled and installed no more than 8' from the first installed "raker" shore, it will be necessary to cross brace the "raker" shores.

19. To accomplish this it is necessary to use four nailing pads; two on each "raker" shore. Place one nailing pad close to the "raker" rail latch base, approximately 12 inches down from the "raker" shore insertion point. Lock the nailing pad in position onto the "raker" strut or extension with the wood nailing surface facing up.

20. Place the second nailing pad approximately 12" up from the hinged base plate onto the acme threaded shaft of the "raker" shore. Lock the nailing pad in position with the wood nailing surface facing up.

21. Repeat steps 19 and 20 and assemble nailing pads onto the remaining "raker" shore.

22. Using 2" x 6" or 2" x 8" lumber, place one piece horizontally across the top pair and one piece horizontally across the bottom pair nailing pads. Nail the lumber to the nailing pads using a 5 spot nail pattern.

23. To complete the Rescue Strut Long Shore System, cross brace the two "raker" shores with 2" x 6" or 2" x 8" lumber and secure to the nailing pads.

2-3.2 STEP-BY-STEP WINDOW OR DOOR SHORE FABRICATION AND ERECTION (FIGURE 2-2).

NOTE

Depending upon the condition of the

supporting elements, it may or may not be required to utilize a wooden 4" x 8" or 6" x 12" header beam and/or "sole" plate to provide a sound foundation for placement of the window and door shores.

1. Refer to tables 1-1 and 1-2 for the maximum buckling strength values and the recommended safe working values to determine the specific strut and strut length to be used during the stabilization effort.

2. Place an optional rigid base, swivel base, ground plate, channel base or angle base onto the designated strut piston (inner acme threaded shaft) and outer tube. To lock together, pull out each lock pin assembly knob, fully engage the

strut and then release the knob.

3. Position the assembled strut in the opening requiring stabilization with the strut piston (inner acme threaded shaft) facing down to provide easy access to the collar. Shim the "sole" plate as required until it is as level as possible and then secure in position with nails.

4. If a header beam was required, it should be shimmed until level and then secured in position with nails. With the assembly resting on a solid "sole" plate or other foundation, slide the outer tube up slightly and turn the collar until it again contacts the outer tube. Repeat this procedure until the upper optional rigid base, ground plate, channel base or angle base contacts the upper structural member (header beam, lintel, joist, etc.) requiring stabilization.

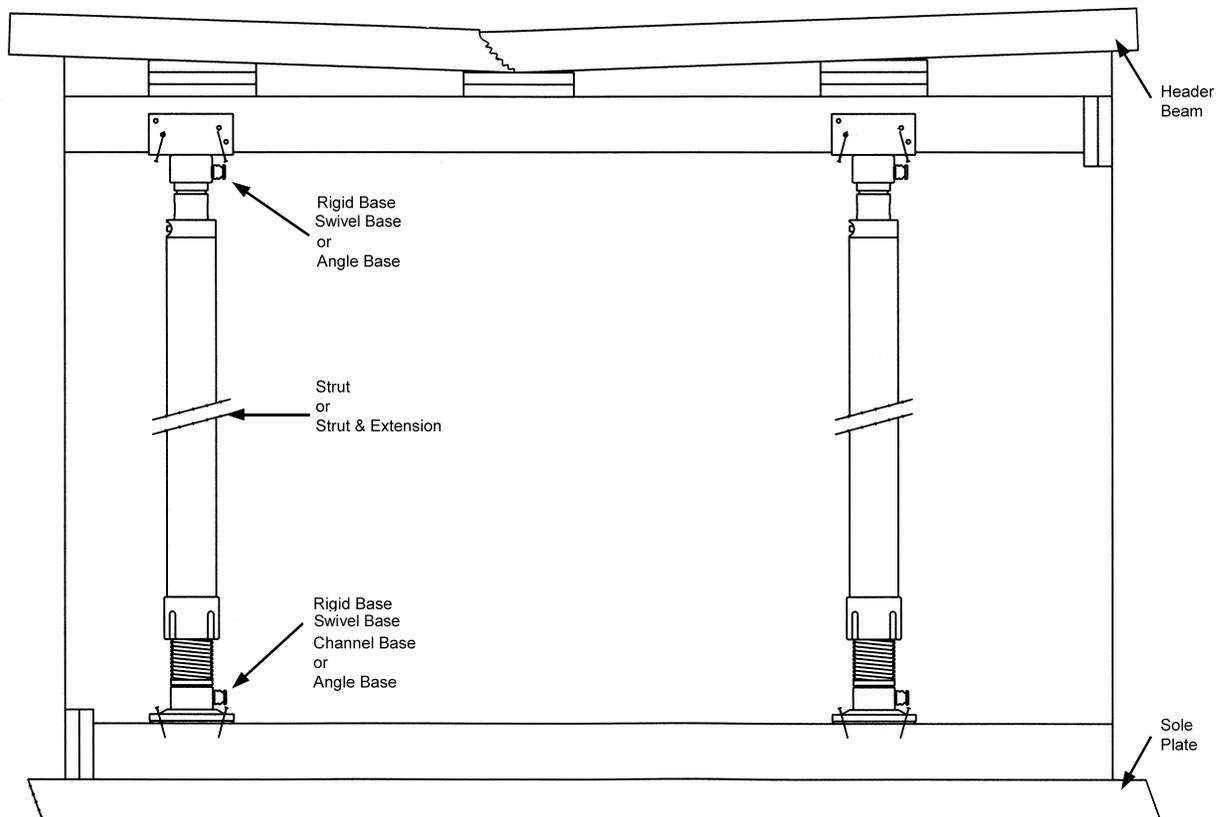


Figure 2-2. Window or Door Shore Fabrication and Erection

5. Repeat steps 2 through 4 to assemble and install additional window or door shores as required. The quantity of shores required and the spacing depends upon the strut length and recommended working load given in table 1-2.

6. Secure all optional rigid bases, swivel bases, ground plates, channel bases or angle bases to the header beam and "sole" plate with nails.

7. Fully tighten the collar on each shore until a safe condition exists through stabilization or re-support of the structural elements of the physically damaged structure. The window or door shores should be under compression and tight.

2-3.3 STEP-BY-STEP HORIZONTAL SHORE FABRICATION AND ERECTION (FIGURE 2-3).

NOTE

Depending upon the condition of the supporting elements, it may or may not be required to utilize wooden 4" x 4" or 6" x 6" wall plates to provide a sound foundation for placement of the horizontal shores.

1. Refer to tables 1-1 and 1-2 for the maximum buckling strength values and the recommended safe working values to determine the specific strut and strut length to be used during the stabilization effort.

2. Place an optional rigid base, ground plate, channel base or angle base onto the designated strut piston (inner acme threaded shaft) and strut outer tube. To lock together, pull out each lock pin assembly knob, fully engage the strut and then release the knob.

3. Shim the wall plates as required until they are as plumb and parallel as possible to each other and then secure them in position with nails. Position the assembled strut horizon-

tally between the wall plates in the opening requiring stabilization.

4. With the assembly resting against one solid wall plate or other foundation, slide the outer tube outward until both optional rigid bases, ground plates, channel bases or angle bases contact both wall plates or other foundations requiring stabilization. Turn the collar until it again contacts the outer tube.

5. Repeat steps 2 through 4 to assemble and install additional horizontal shores as required. The quantity of shores required and the spacing depends upon the strut length and recommended working load given in table 1-2.

6. Secure all optional rigid bases, ground plates, channel bases or angle bases to the wall plates with nails.

7. Fully tighten the collar on each shore until a safe condition exists through stabilization or re-support of the structural elements of the physically damaged structure. The horizontal shores should be under compression and tight.

8. To further stabilize the horizontal shores, they may cross brace providing the cross bracing does not interfere with access to the interior of the structure.

9. To cross brace the horizontal shores, it is necessary to place a nailing pad at the center of each alternate horizontal strut. Lock the nailing pad in position onto the horizontal strut with the wood nailing surface facing outward.

10. Place 2" x 6" or 2" x 8" lumber diagonally across the wall plates with the center contacting the nailing pad. Nail the lumber to the nailing pad and the wall plates using a 5 spot nail pattern.

11. Repeat steps 9 and 10 assembling a nailing pad on each alternate horizontal strut and cross brace as indicated.

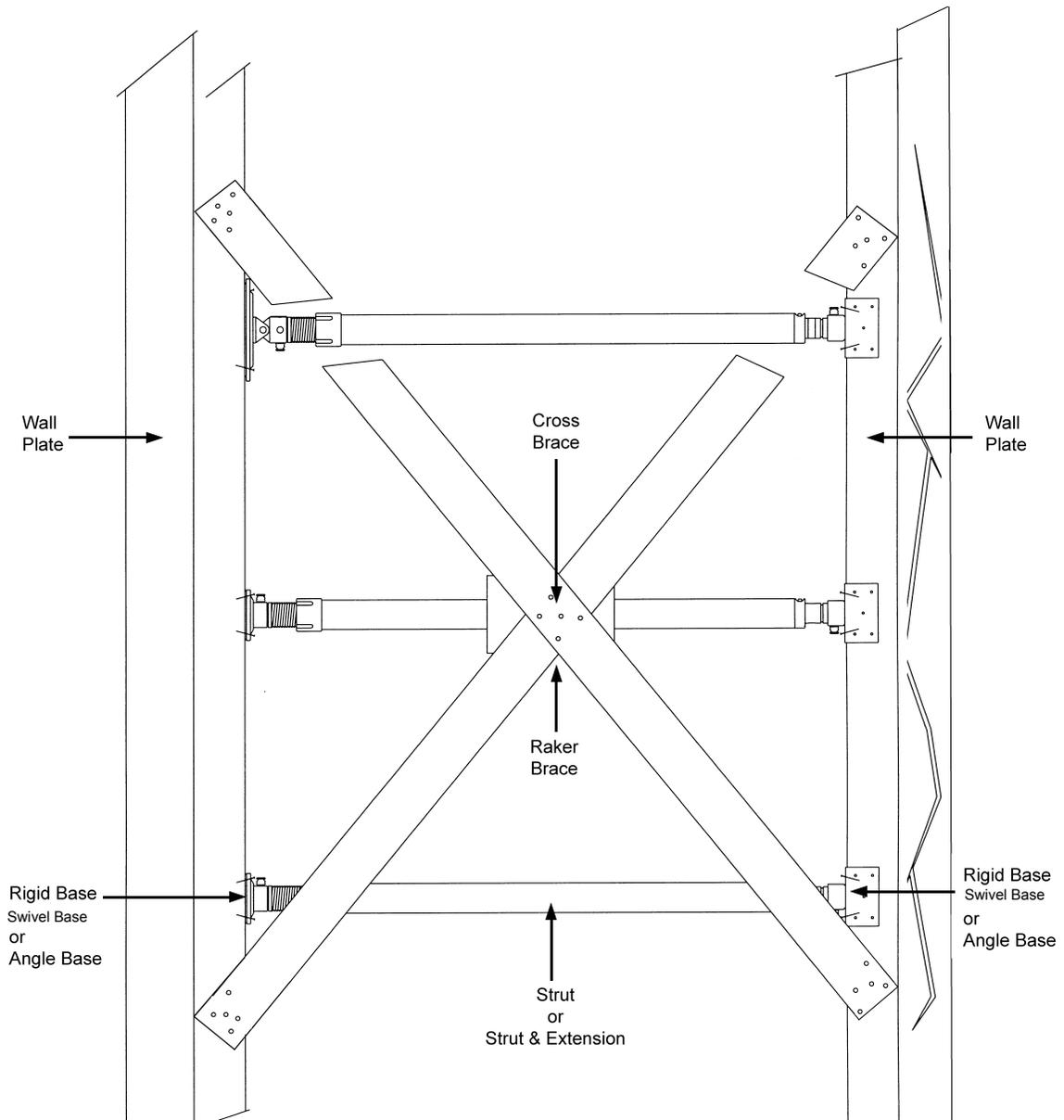


Figure 2-3. Horizontal Shore Fabrication and Erection

2-3.4 STEP-BY-STEP SPOT SHORE FABRICATION AND ERECTION (FIGURE 2-4).

1. Refer to tables 1-1 and 1-2 for the maximum buckling strength values and the recommended safe working values to determine the specific strut and strut length to be used during the stabilization effort.

2. Place an optional 12" square hinged ground plate onto each of three designated struts outer tube. To lock together, pull out the lock pin assembly knob, fully engage the strut and then release the knob. If the strut length when installed will place the locking collar beyond the reach of rescue personnel, reverse the orientation of the strut and place the optional 12" square hinged ground plate onto each of

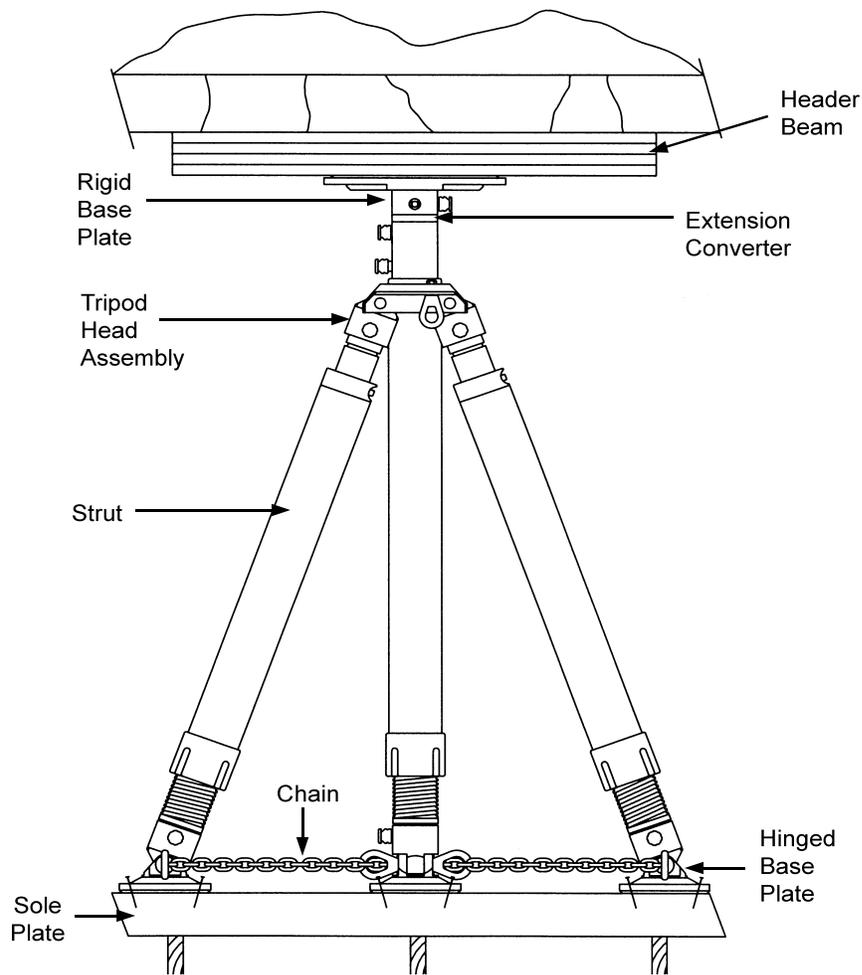


Figure 2-4. Spot Shore Fabrication and Erection

three designated struts pistons (inner acme threaded shaft).

3. Pre-assemble a 12" rigid base plate, extension converter and tripod head assembly. To lock these components together, pull out the lock pin assembly knob, fully engage the mating component and then release the knob.

4. Insert the three struts fully into the tripod assembly and lock in position with the lock pin assemblies.

5. Extend the struts outward to form a tripod and position under the area requiring stabilization. If necessary, use a shimmed "sole" plate under each of the struts to assure a stable

foundation. Secure the optional 12" square hinged ground plate to the floor or "sole" plate with nails. Lace the chain through both clevis links on each strut and engage the chain hook onto a chain link to stabilize the spot shore struts.

6. If a header beam is required, it should be shimmed until level and then secured in position with nails. With the tripod assembly resting on a solid "sole" plate or other foundation, slide the outer tubes up slightly and turn the collars until they again contact the outer tubes. Repeat this procedure until the 12" rigid base plate assembly contacts the upper structural member (header beam, lintel, joist, etc.) requir-

ing stabilization.

7. Fully tighten the collar on each strut until a safe condition exists through stabilization or re-support of the structural elements of the physically damaged structure. The spot shore struts should be under compression and tight.

2-3.5 STEP-BY-STEP VERTICAL SHORE FABRICATION AND ERECTION (FIGURE 2-5).

NOTE

Depending upon the condition of the supporting elements, it may or may not be required to utilize a wooden 4" x 8"

or 6" x 12" header beam and/or "sole" plate to provide a sound foundation for placement of the vertical shores.

1. Refer to tables 1-1 and 1-2 for the maximum buckling strength values and the recommended safe working values to determine the specific strut and strut length to be used during the stabilization effort.

2. Place an optional rigid base, swivel base, ground plate, channel base or angle base onto the designated strut piston (inner acme threaded shaft) and outer tube. To lock together, pull out each lock pin assembly knob, fully engage the strut and then release the knob.

3. Position the assembled strut in the opening requiring stabilization with the strut piston

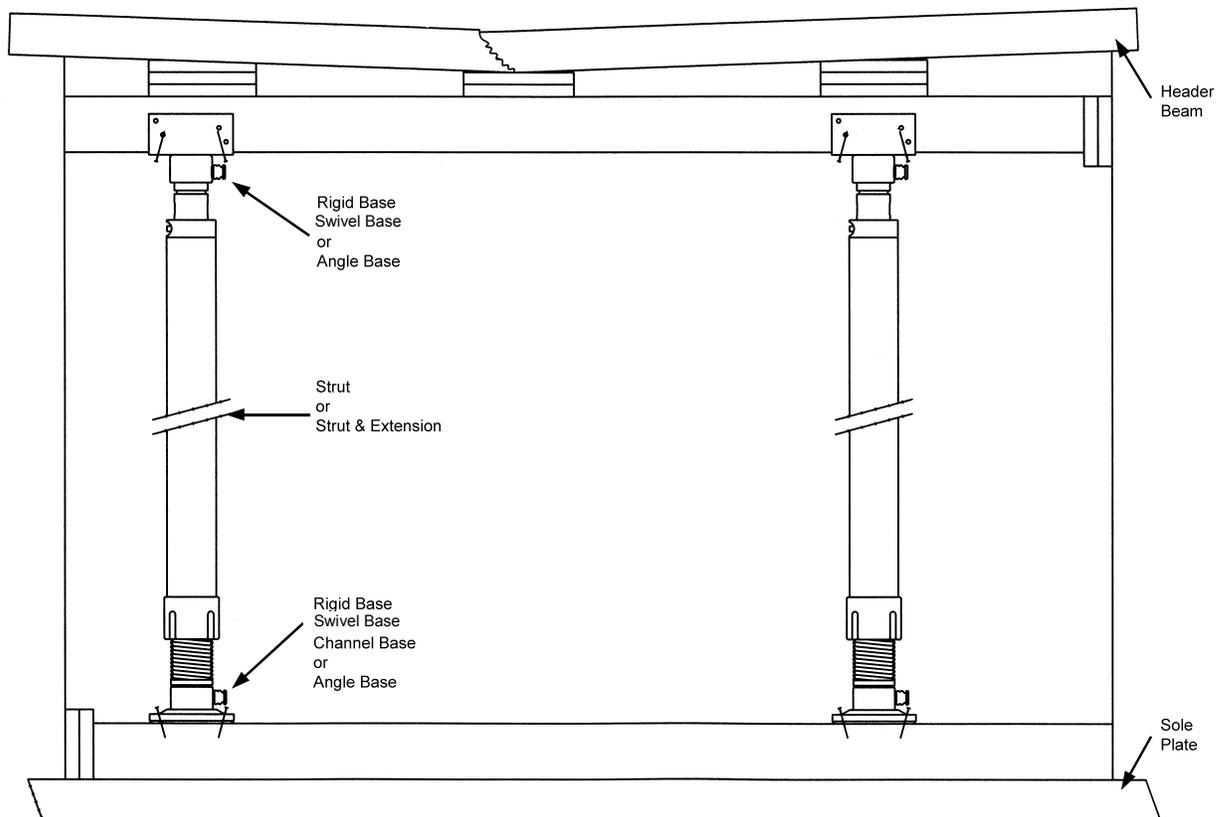


Figure 2-5. Vertical Shore Fabrication and Erection

(inner acme threaded shaft) facing down to provide easy access to the collar. Shim the "sole" plate as required until it is as level as possible and then secure in position with nails.

4. If a header beam is required, it should be shimmed until level and then secured in position with nails. With the assembly resting on a solid "sole" plate or other foundation, slide the outer tube up slightly and turn the collar until it again contacts the outer tube. Repeat this procedure until the upper optional rigid base, ground plate, channel base or angle base contacts the upper structural member (header beam, lintel, joist, etc.) requiring stabilization.

5. Repeat steps 2 through 4 to assemble and install additional vertical shores as required. The quantity of shores required and the spacing depends upon the strut length and recommended working load given in table 1-2.

6. Secure all optional rigid bases, swivel base, ground plates, channel bases or angle bases to the header beam and "sole" plate with nails.

7. Fully tighten the collar on each shore until a safe condition exists through stabilization or re-support of the structural elements of the physically damaged structure. The vertical shores should be under compression and tight.

8. To further stabilize the vertical shores, they may cross brace.

9. To cross brace the vertical shores, it is necessary to place a nailing pad at the center of each alternate vertical strut. Lock the nailing pad in position onto the vertical strut with the wood nailing surface facing outward.

10. Place 2" x 6" or 2" x 8" lumber diagonally across the header beam and "sole" plate

with the center contacting the nailing pad. Nail the lumber to the nailing pad, the header beam and the "sole" plate using a 5 spot nail pattern.

11. Repeat steps 9 and 10 assembling a nailing pad on each alternate vertical strut.

2-3.6 STEP-BY-STEP SLOPED FLOOR SHORE (ON HARD SURFACE) FABRICATION AND ERECTION (FIGURE 2-6).

1. If necessary, use debris to prevent the sloped floor from sliding before attempting to install a sloped floor shore.

2. Install temporary spot shores as required (paragraph 2-3.4) until a sloped floor shoring system may be erected.

3. If a 4" x 4" or 6" x 6" header beam is required, it should be shimmed until stable and then secured in position.

4. Select a suitable spot close to the area to be shored, but away from any possible collapse danger. A safe area must be available to pre-construct the sloped floor shores out of the way of any damaged or leaning floor slab. The safety of the rescue personnel is the top priority. The area must be large enough and relatively level to help speed the assembly and make it easier to assemble the components. An area approximately 20 foot by 20 foot would be sufficient to fabricate the sloped floor shores.

5. Determine from tables 2-1 and 2-2 the strut quantity and spacing to adequately support the sloped floor. Lay out one or two "raker" rails in line with each other. To splice the "raker" rails together, pull out the lock pin assembly knobs on the splice to retract the lock pins, fully engage the splice and "raker" rails and release the knobs. Then check the connections and make sure they are positively locked

into position.

6. Determine the hole locations in the "raker" rails where the rail latch bases will be installed. One set should be either at the bottom set of holes or one set higher to accommodate one strut and the other set should be at the approximate location determined in step 5 to maintain the proper spacing between the struts to support the load. Place the rail latch bases between the channel legs of the "raker" rail locating and engaging the bases in the predetermined holes. Each rail latch base should be slid in on an angle keeping the lock pin assembly up for easier engagement. The lock pin assembly is spring loaded and will retract as the rail latch base is slid into position and then extend into the "raker" rail holes.

7. Refer to tables 2-1 and 2-2 to determine the recommended safe working load and maximum height of the struts. Determine the size of

the struts and the extensions if any, that will be utilized. Position the strut with the strut piston (inner acme threaded shaft) facing the rail latch base to provide easy access to the collar.

8. Insert the struts into the strut rail latch bases first and the extension pieces onto the struts outer tube. To lock together, pull out the lock pin assembly knob on each strut and extension, fully engage the struts into the rail latch bases and the extension with the struts, and then release the knobs to lock the components together.

9. Place an optional rigid base, swivel base, ground plate, channel base or angle base onto the designated strut outer tube. To lock together, pull out each lock pin assembly knob, fully engage the strut and then release the knob.

10. Slide the assemblage under the sloped floor and extend the struts (pull the inner acme

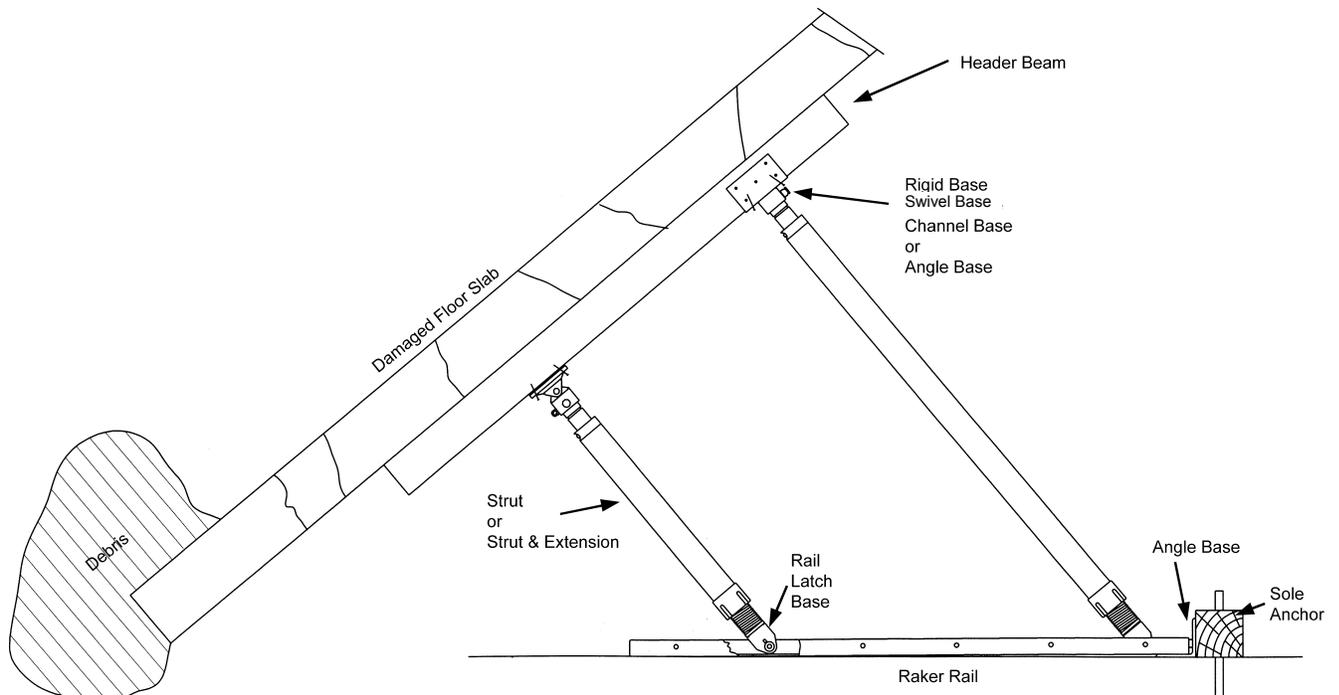


Figure 2-6. Sloped Floor Shore (On Hard Surface) Fabrication and Erection

threaded shafts out), until they contact the header. The struts should be as perpendicular to the header as possible.

11. Turn the strut collars on the acme threaded shaft until they contact the outer tubes in order to lock the struts in their extended position.

12. Slide an angle base under the end of the "raker" rail. If necessary, as a result of foundation instability, use a 6" x 6" or 8" x 8" wooden "sole" anchor directly behind the angle base. Secure into the floor/foundation with 1" diameter steel pins (reinforcing bars or equal). The pin length will be determined by the type of floor/foundation they are driven into. Also secure the angle base to the wooden "sole" anchor.

13. Anchor the sloped floor shore to the floor/foundation utilizing the holes provided in the "raker" rail. The attaching nails, pins, etc. will depend upon the floor/foundation material.

14. At this time retighten the collars on the struts if necessary. The struts should be under compression and tight.

15. Repeat the instructions in steps 5 through 14 to assemble and installed a second sloped floor shore no more than 8' from the first installed sloped floor shore. One may not be laterally stable enough to do the job.

16. After the second sloped floor shore has been assembled and installed, it may be necessary to cross brace the sloped floor shores.

17. To accomplish this it is necessary to use four nailing pads; two each on the longer strut of each sloped floor shore approximately 12 inches from the end of the struts and extensions, if used. Lock the nailing pads in position

onto the struts or extensions with the wood nailing surface facing up.

18. Using 2" x 6" or 2" x 8" lumber, place one piece horizontally across the top pair and one piece horizontally across the bottom pair nailing pads. Nail the lumber to the nailing pads using a 5 spot nail pattern

19. To complete the sloped floor shore, cross brace the two sloped floor shores with 2" x 6" or 2" x 8" lumber and secure to the nailing pads.

2-3.7 STEP-BY-STEP SLOPED FLOOR SHORE (ON EARTH SURFACE) FABRICATION AND ERECTION (FIGURE 2-7).

1. If necessary, use debris to prevent the sloped floor from sliding before attempting to install a sloped floor shore.

2. If a 4" x 4" or 6" x 6" header beam is required, it should be shimmed until stable and then secured in position.

3. Select a suitable spot close to the area to be shored, but away from any possible collapse danger. A safe area must be available to pre-construct the sloped floor shores out of the way of any damaged or leaning floor slab. The safety of the rescue personnel is the top priority. The area must be large enough and relatively level to help speed the assembly and make it easier to assemble the components. An area approximately 20 foot by 20 foot would be sufficient to fabricate the sloped floor shores.

4. Install temporary spot shores as required (paragraph 2-3.4) until a sloped floor shoring system may be erected.

5. Refer to tables 2-1 and 2-2 to determine the recommended safe working load and maxi-

mum height of the struts. Determine the size of the struts and the extensions if any, that will be utilized.

6. Excavate the ground at the anticipated location of the struts so that the bearing surface is parallel to the sloped floor. Position a "sole" plate measuring approximately 18" square x 2" thick in each excavation.

7. As required, assemble an extension piece onto the outer tube of the strut. To lock together, pull out the lock pin assembly knob, fully engage the strut and extension and then release the knob.

8. Place a 12" square swivel base onto the strut piston (inner acme threaded shaft). Place an optional rigid base, swivel base, ground plate, channel base or angle base onto the strut outer tube or extension if used. To lock together, pull out each lock pin assembly knob, fully engage the components and then release

the knobs. Repeat steps 7 and 8 for the second strut.

9. Slide each sloped floor shore under the sloped floor with the 12" square hinged base toward the "sole" plate to provide easy access to the collar and the optional rigid base, ground plate, channel base or angle base toward the header beam.

10. Pull the inner acme threaded shafts out, until they contact the header. Turn the strut collars on the acme threaded shaft until they contact the outer tubes in order to lock the struts in their extended position. The struts should be under compression and tight. The struts should be as perpendicular to the "sole" plate and header as possible. Secure each sloped floor shore in position with nails.

11. After the second sloped floor shore has been assembled and installed no more than 8' from the first sloped floor shore, it may be nec-

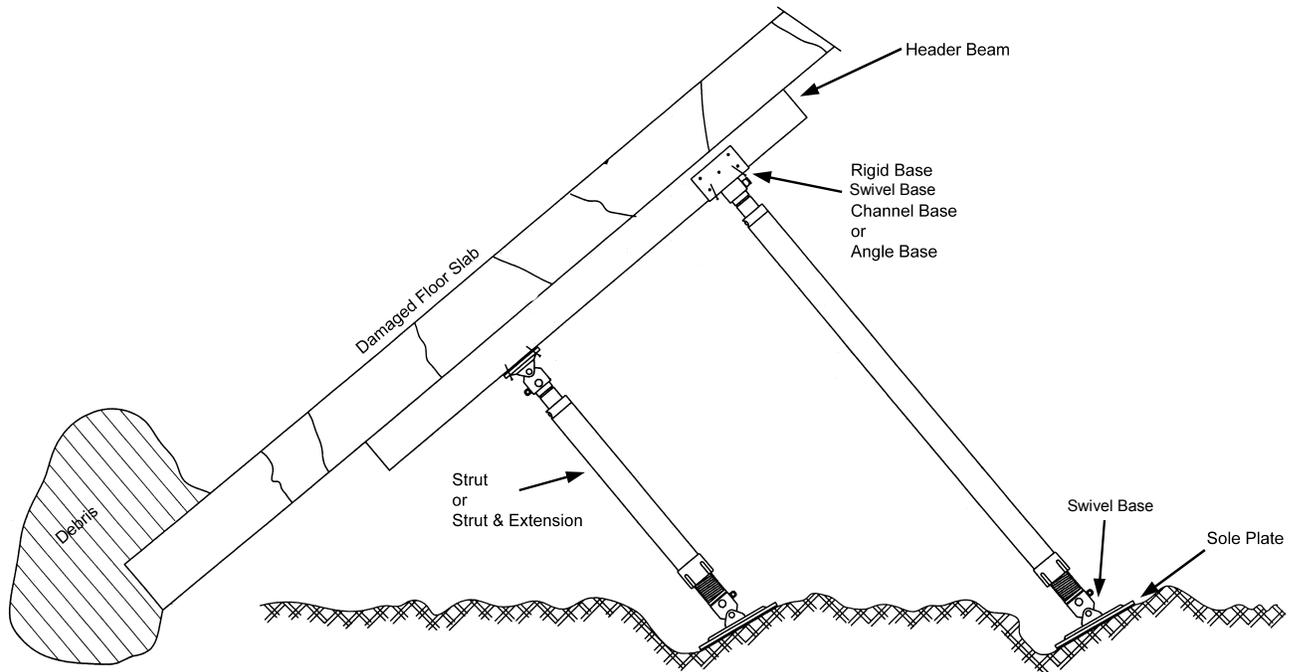


Figure 2-7. Sloped Floor (On Earth Surface) Fabrication and Erection

essary to cross brace the sloped floor shores.

12. To accomplish this it is necessary to use four nailing pads; two each on the longer strut of each sloped floor shore approximately 12 inches from the end of the struts and extensions, if used. Lock the nailing pads in position onto the struts or extensions with the wood nailing surface facing up.

13. Using 2" x 6" or 2" x 8" lumber, place one piece horizontally across the top pair and one piece horizontally across the bottom pair nailing pads. Nail the lumber to the nailing pads using a 5 spot nail pattern. One may not be laterally stable enough to do the job.

14. To complete the sloped floor shore, cross brace the two sloped floor shores with 2" x 6" or 2" x 8" lumber and secure to the nailing pads.

2-4 TAKEDOWN.

2-4.1 Take down and repositioning is accomplished by removing the load pressure and then manually turning the strut collar down the inner shaft. If during release, a load shift begins to forcibly collapse the strut, simply releasing the nut will again lock the strut in that extended position where the nut was released.

2-4.2 On occasion, load pressure may prevent either one or more struts from being taken down. When this occurs, an evaluation must be made to determine the safety of such removal. Before removing a bound strut, determine whether the bound strut can be replaced with a more permanent strut such as a timber or metal beam. If so, and safety will not be compromised, cut a permanent strut to the proper replacement size; the same size or slightly shorter. Install the permanent strut next to the strut to be removed and turn the strut collar down the inner shaft until the load rests on the permanent strut. Continue to turn the strut collar down the inner shaft until the strut can be removed. Repeat this procedure for each bound strut.

2-5 SHUTDOWN.

2-5.1 At the conclusion of use, perform the after use maintenance specified in chapter 3.

CHAPTER 3 SCHEDULED MAINTENANCE

3-1 INTRODUCTION.

3-1.1 The major components of the Rescue Strut Support System require little maintenance to ensure optimum performance. This chapter provides preventive maintenance procedures.

3-2 MAINTENANCE PLAN.

3-2.1 Preventive maintenance of the Rescue Strut Support System is accomplished in accordance with the maintenance schedule given in table 3-1.

3-3 GENERAL MAINTENANCE.

3-3.1 GENERAL.

3-3.1.1 General maintenance shall be performed as detailed in this chapter using the maintenance schedule in table 3-1. This chapter will provide the step-by-step procedures that are necessary to verify that the Rescue Strut Support System and optional accessories are operating satisfactorily.

3-3.2 SURFACE CLEANING.

3-3.2.1 Keep the exterior of all components clean of all dirt, grit, oil and grease accumulations. Wipe exterior surfaces with a lint-free cotton machinery wiping towel lightly damp-

ened with clean water, Then dry the surfaces thoroughly with a lint-free cotton machinery wiping towel or low pressure compressed air. Compressed air may be used for cleaning in less accessible areas.

3-3.3 INSPECTION.

3-3.3.1 Do not paint any of the Rescue Strut Support System or optional accessories . Check for cracked or deformed parts that may fail during their next use.

3-3.3.2 If during the last three months struts and ancillary equipment have not been used for training or collapse incidents, they should be field tested to ensure they are fully operational in preparation for their next use.

3-3.4 LOCK PIN ASSEMBLY REPLACEMENT.

3-3.4.1 To replace the lock pin assembly, pull up and turn the locking pin knob to expose the bonnet. Use a wrench on the bonnet hex and unscrew the defective lock pin assembly. Thread in by hand the replacement lock pin assembly, then pull up and turn the locking pin knob to expose the bonnet and use a wrench on the bonnet hex to fully tighten the lock pin assembly.

Table 3-1. Maintenance Schedule

Frequency	Maintenance Requirement	Applicable Paragraph
After Use	Clean all dust, oil and grease from the RescueStrut Support System components and optional accessories.	3-3.2.1
Quarterly	When not used periodically for training or collapse incidents, the full compliment of equipment shall be field tested to ensure its integrity and flawless operational capability	2-3

