# User's Guide

# Antipilferage Seal


October 1997

The United States Department of Defense

Approved for public release; distribution is unlimited.

DEPARTMENT OF THE NAVY
OFFICE OF THE CHIEF OF NAVAL OPERATIONS
WASHINGTON, DC 20350-2000

IN REPLY REFER TO

From: Assistant for Law Enforcement and Physical Security

Subj: ANTIPILFERAGE SEAL USER'S GUIDE

1. DoD Lock Program personnel at the Naval Facilities Engineering Service Center, Port Hueneme, CA prepared this guide. It is intended to help security personnel select, apply, control, and inspect antipilferage seals.

2. We will provide periodic revisions of the user guide as work continues on antipilferage seals and additional information becomes available. We encourage comments or recommended changes to improve this guidance document. Please forward comments directly to the Naval Facilities Engineering Service Center.

D. R. CAVILEER

# REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-018



| 1. AGENCY USE ONLY *(Leave blank)* | 2. REPORT DATE | 3. REPORT TYPE AND DATES COVERED |
|---|---|---|
| | October 1997 | Not final; October 1996 - September 1997 |

**4. TITLE AND SUBTITLE**

## ANTIPILFERAGE SEAL USER'S GUIDE

**5. FUNDING NUMBERS**

**6. AUTHOR(S)**

Physical Security Division
Code ESC66

**7. PERFORMING ORGANIZATION NAME(S) AND ADDRESSE(S)**

Naval Facilities Engineering Service Center
1100 23rd Ave.
Port Hueneme, CA 93043-4370

**8. PERFORMING ORGANIZATION REPORT NUMBER**

**9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESSES**

Assistant for Law Enforcement and Physical Security
Office of the Chief of Naval Operations
Washington, DC 20350-2000

**10. SPONSORING/MONITORING AGENCY REPORT NUMBER**

**11. SUPPLEMENTARY NOTES**

**12a. DISTRIBUTION/AVAILABILITY STATEMENT**

Approved for public release; distribution unlimited.

**12b. DISTRIBUTION CODE**

**13. ABSTRACT** *(Maximum 200 words)*

This guide is intended to help security personnel select, apply, control, and inspect antipilferage seals. Topics covered are: the role of seals, how to select the correct seal, examples of seals, identifying the different types of seals, and installation, inspection, and removal of seals.

This guide does not give step-by-step procedures, but provides information and suggestions that will help a facility develop a seal control program that meets its site-specific requirements. This guide complements Federal Specification FF-S-2738, if there is a conflict FF-S-2738 shall prevail.

**14. SUBJECT TERMS**

Antipilferage seal, seal control program, security personnel, seal styles, seal installation tags, unauthorized seal

**15. NUMBER OF PAGES**

73

**16. PRICE CODE**

| 17. SECURITY CLASSIFICATION OF REPORT | 18. SECURITY CLASSIFICATION OF THIS PAGE | 19. SECURITY CLASSIFICATION OF ABSTRACT | |
|---|---|---|---|
| Unclassified | Unclassified | Unclassified | UL |

## FOREWORD

The purpose of this guide is to provide guidance on the subject of antipilferage seals to Department of Defense (DoD) personnel.

Some of the topics covered in this guide are:

- Role of seals
- Selection of seals
- Examples of Seals
- Identification of seals
- Control of seals
- Installation of seals
- Inspection of seals
- Removal of seals

This guide can help the reader develop a seal control program that can be integrated with an overall security system. This guide does not intend to give detailed, step-by-step procedures for developing a seal program. Instead, the goal is to provide information and suggestions that will help a seal control program be developed by a facility to meet its site-specific requirements. This guide is to complement Federal Specification FF-S-2738. If there is a conflict between this guide and FF-S-2738, FF-S-2738 shall prevail.

> **NOTE:** Any reference to a manufacturer is included only to illustrate a piece of equipment. It is not intended to be a recommendation or an endorsement of any product or company.

## CONTENTS

## CONTENTS

## CONTENTS

## CONTENTS



## LIST OF FIGURES

## CONTENTS

Page

## CONTENTS

Page



## LIST OF TABLES

# CHAPTER 1
# INTRODUCTION

## DEFINITION

An antipilferage seal is a device or material that indicates tampering or entry. Usually, antipilferage seals are for one-time use. However, there are some reusable seals. For the purposes of this guide, the term *seal* will be synonymous with antipilferage seal, security seal, anti-tamper device, and tamper indicating device. An example of an electronic seal is shown in Figure 1-1.

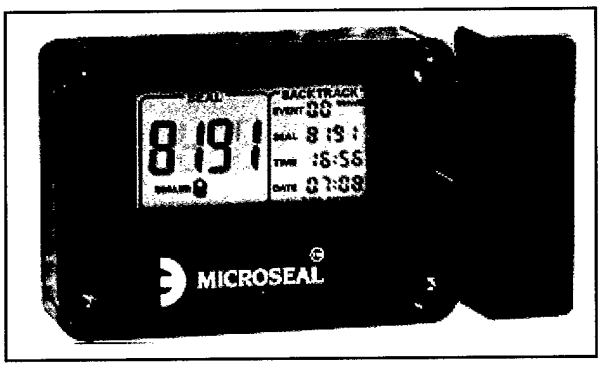



Figure 1-1. Microseal, Electronic Seal

## ROLE OF SEALS

- Seals are used to indicate unauthorized opening or an attempted opening of containers (see Appendix A for the definition of container as used in this guide).

- Currently, the majority of seals are not used to prevent access into a secured area. Some seals are constructed of material such as solid steel or cable to delay intrusion.

- Seals can act as psychological deterrents by making potential violators aware that security measures are in effect.

- Seals can help with material control, accountability, and inventory by associating a seal's identification with a container or the container's contents.

- An intact seal permits verification of container contents without repeatedly opening the container, thus reducing the number of personnel needed to control secured items and minimizing the potential of exposure to hazardous materials.

- Seals are used as part of an overall security program. Seals are **not used as the main line of defense.**

## WHEN SEALS SHOULD BE USED

Some guidelines to consider when determining whether to use a seal are:

- Use seals when there is a DoD requirement.

- Use seals when there is a concern about a covert attack.

- Do not use seals if a violated seal cannot be detected soon enough to have an effective response.

- Do not use seals if existing security procedures can be modified to reduce risk and will cost less than the cost of adding seals.

## USING SEALS EFFECTIVELY

To be effective, seals must be:

- Used with a seal control program
- Selected properly

### Seal Control Program

Seals must be used with a seal control program that is part of an overall security system. Security systems usually consist of multiple components. Individually, these components may not provide the desired protection. Integration of components can result in a system that will provide a high level of confidence and protection in depth. If any single element fails to function in a multiple component security system, the other components will continue to provide protection. Seals and a seal control program are examples of components that can be important to an integrated security system.

Seals' contributions and limitations to a security system must be understood if they are to be used effectively. The following are two examples of how seals can contribute to an overall security system:

- Seals aid in determining how to respond to an alarm. If an alarm is activated and an intact seal is found, a false alarm may have occurred. A broken seal indicates possible tampering or entry into a secured area.

- Seals add protection to a security system by indicating tampering with security devices in the system such as alarms.

Seals' limitations are that they can be easily defeated by a direct attack and can be surreptitiously defeated by one of the following methods:

- Counterfeited seals or parts
- Forcible entry then repair to the seal
- Careful manipulation of the seal

Seals can be counterfeited by substituting a similar seal procured from the manufacturer and marked with the same identifier, such as a serial number. These substitute seals can be used to replace a broken seal after unauthorized entry. That is why it is important for the records of seal identification marks to be secure.

Seals can be defeated and put back together by using the broken parts or parts from another seal. Inspection of the seals before, during, and after use is necessary.

Some seals can be defeated by manipulation with tools and then put back in place to give the appearance that no unauthorized entry was accomplished. Careful inspection must be done to find any anomalies in the seal structure.

These are reasons why seals must be used with a seal control program. Seals alone are not intended as deterrents to prevent unauthorized entry.

**Selection**

Selecting the proper seal for a particular application is very important. Making a decision about which seal to use involves several considerations that are presented in Chapter 2.

# CHAPTER 2
# SELECTION

## SELECTING THE PROPER SEAL

Consider the following topics covered in this chapter when selecting a seal:

- Purpose of the seal
- Type of container to be protected
- Size and shape of the seal
- Durability of the seal
- Ease of installation and removal
- Tamper resistance qualities
- Tamper indicating qualities
- Uniqueness
- Cost
- Integrating capabilities
- Disposition of the seal
- Seal control program (see Chapter 5)

More information about specific examples of seals can be found in Chapter 4.

## PURPOSE OF SEAL

Determine if the main purpose of the seal is to be used for tamper indication only. If a seal is used for tamper indication and for inventory control and accountability, consider a seal with bar codes or other automatic identification (Figure 2-1).

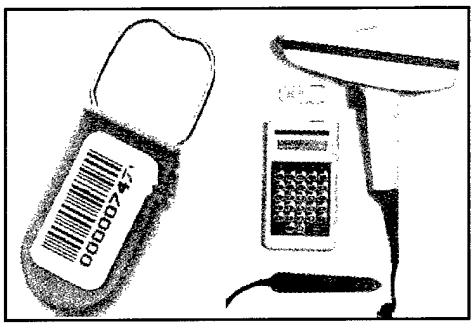


Figure 2-1. Seal with Bar Code and Scanner

If you select a seal to aid in inventory control, make sure that the identification system for the seals is compatible with the existing inventory system of the facility where it will be used. For example, there are different types of bar code "languages" or symbology as well as different types of bar code readers. The standard DoD symbology is detailed in MIL-STD-1189A. The serial number of a seal can be also be linked to the inventory in a container or area (Figure 2-2).

If the seal needs to give some protection against forced entry, use a padlock (Figure 2-3), bolt (Figure 2-4), or cable (Figure 2-5) style seal because they require more effort to break.


Figure 2-2. Plastic Strap Style Seal with Serial Number

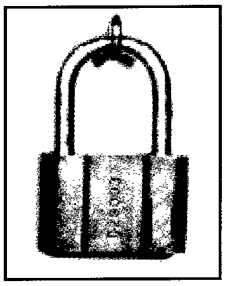


Figure 2-3. Padlock Style Seal

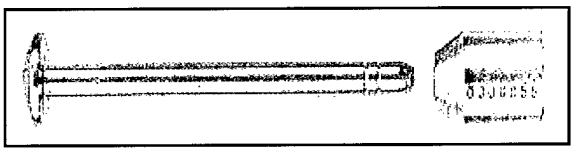


Figure 2-4. Bolt Style Seal

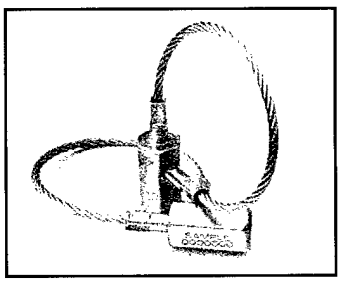


Figure 2-5. Cable Style Seal

## TYPE OF CONTAINER TO BE SECURED

Select a type of seal that is compatible to the design of the container. The seal must fit snugly so a container cannot be opened or partially opened without breaking the seal.

The container must be tamper resistant. For example, a door must not be able to be removed by its hinges without disturbing the seal or leaving evidence of entry.

## SIZE AND SHAPE OF SEAL

The size and shape of a seal will be affected by the type of container it will protect and the seal's surface area may need to accommodate bar codes, serial numbers, or other information (Figure 2-6).

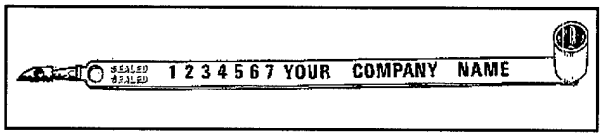



Figure 2-6. Car Plastic Strap Style Seal ID Number

## DURABILITY

### Environmental Compatibility and Length of Use

A seal must survive the environment in which it is used. Choose the seal most acceptable for the environment and the length of time the seal will be exposed. For example, an environment near salt water may warrant the use of a plastic seal (Figure 2-7) rather than a metal seal that is prone to corrosion over a long period of time. A corroded seal could impair the detection of tampering.

Figure 2-7. Plastic Tie Pull-Tight Style Seal

If a metal seal is required in a corrosive environment, it could be used for a short period of time before corrosion begins. This is why you must determine the length of time the seal will be used in an environment. Consider using a bolt seal that is encased in a plastic covering that protects against corrosion such as the one in Figure 2-8. Some metal seals are specially treated to slow corrosion (Figure 2-9).

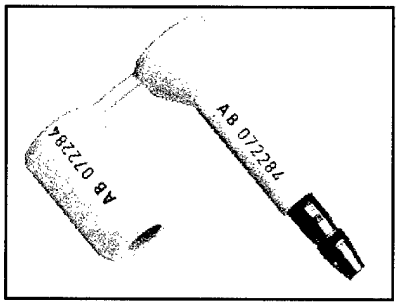



Figure 2-8. Snapper Bolt Seal

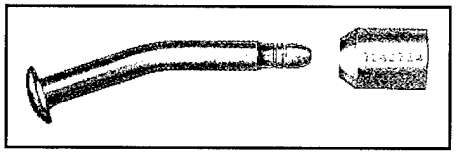


Figure 2-9. Bolt Style Seal Coated with Zinc Chromate

### Activity of the Stored Container

Consider the seal's durability compared with the expected activity of the container and its surroundings. A seal can be accidentally broken when the container is in frequent contact with other cargo. If an inappropriate seal is used causing the seal to be prone to accidental breakage, the seal system can fail. A history of accidental destruction might be used to conceal tampering. Padlock (Figure 2-3), bolt (Figure 2-4), and cable (Figure 2-5) style seals could have the strength to resist breakage in this situation.

Consider the flexibility of a seal. For example, a cable seal (Figure 2-5) may be flexible enough to withstand contact with other cargo without breaking. If high security is not a primary factor, consider one of the plastic seals such as a plastic strap style seal or a pull-tight style seal because of its flexibility.

### Physical Holding Capabilities

See Appendix B for the strength specifications of the seal.

## EASE OF INSTALLATION AND REMOVAL

Some seals, such as the plastic seal below (Figure 2-10), are easily installed with no tools.

Some seals require an installation tool(s) (Figure 2-11). Make sure that the facility has the necessary tool and personnel are trained in the proper installation of that seal.

If a container is shipped with a seal that requires a removal tool, verify that the receiver has the removal tool. These tools need to be controlled as carefully as the seals.

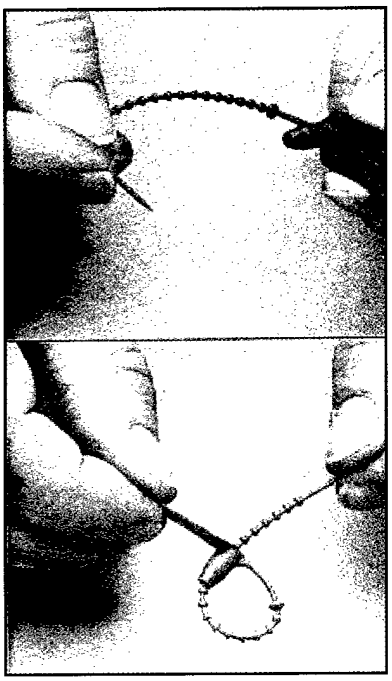


Figure 2-10. Plastic Pull-Tight Seal Installation

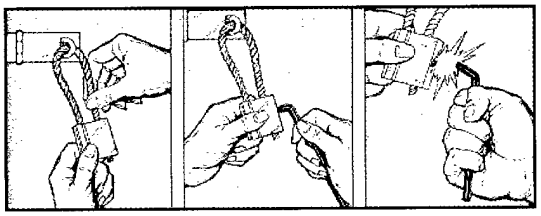


Figure 2-11. Cable Lock Seal with Installation Tool

## TAMPER RESISTANCE QUALITIES

Tamper resistance of seals in terms of defeat times is presented in Chapter 4 and in Appendix B.

## TAMPER INDICATION QUALITIES

Seals differ in tamper indicating properties. Some of these are easily identified upon visual inspection. Other indicating methods require close examination by a post-mortem procedure. Determine what indicating properties best fit your inspection capabilities, such as the training of your inspection personnel.

## UNIQUENESS

All seals should be distinguished from other seals by serial numbers, scratches, organization's logo, random marks, or other unique signature features (Figure 2-12). The seal identification marks must be recorded and those records controlled. This makes it more difficult for the seals to be counterfeited.

Figure 2-12. Fold Wire Seal with Logo

## COST EFFECTIVENESS

Consider the cost of the seal compared to the importance of the material it is protecting. Consider the overall system cost, such as cost of inspection, disposal, extra tools, scanners, and/or training of personnel. However, the cost should not dictate the use of an otherwise unacceptable seal.

## INTEGRATING CAPABILITIES

Choose the type of seal that integrates with the existing or planned security system. For example, seals can be used to augment an existing lock (Figure 2-13).

## DISPOSITION OF USED SEALS

Determine if the user or the receiver of the seal has the capability to properly dispose of the seal per the disposal procedures of that facility's seal control program.

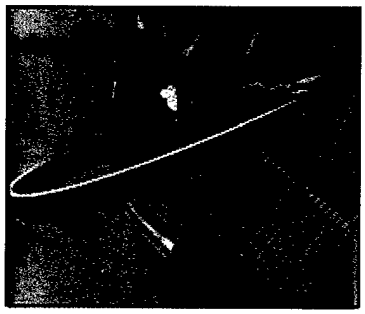


Figure 2-13. Plastic Tie Seal Over a Padlock

# CHAPTER 3
# CONTAINERS AND SEAL EXAMPLES

## INTRODUCTION

Various situations that may require seals are presented in this chapter. More than one style of seal may be used depending upon the factors that were presented in Chapter 2. These are only suggestions. You must determine the style and specific seal that best fits your needs. Check DoD requirements for the use of a specific seal.

For more information about specific examples of seals presented here, refer to Chapter 4.

## SEALS FOR CONVENTIONAL ARMS, AMMUNITION & EXPLOSIVES, AND CLASSIFIED SHIPMENTS

**NOTE**: These are specific seals by specific manufacturers. Refer to manufacturers in Appendix C.

### Seals Required and Authorized by DoD

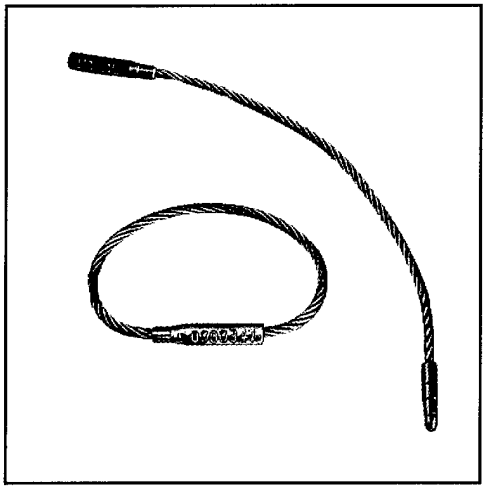


Figure 3-1. Cable Lock Seal by E.J. Brooks **NSN 5340-00-084-1570**

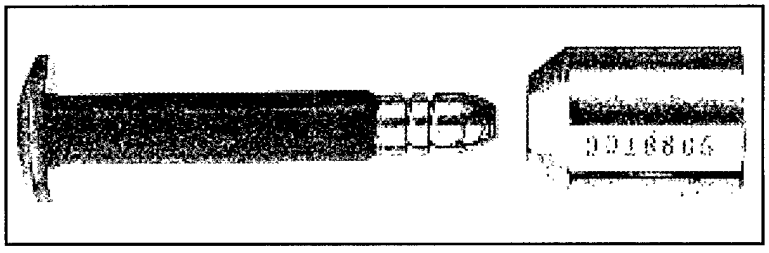


Figure 3-2. Modified Rod-Lok II Seal by E.J. Brooks **NSN 5340-01-260-9935**

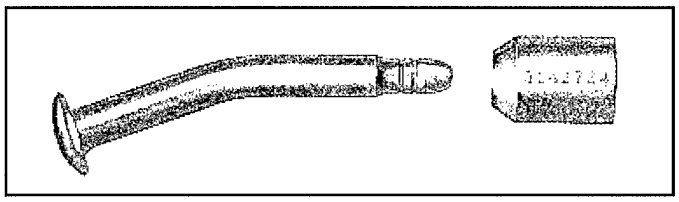


Figure 3-3. Trans-Lok Seal by E.J. Brooks **NSN 5340-01-334-0791**

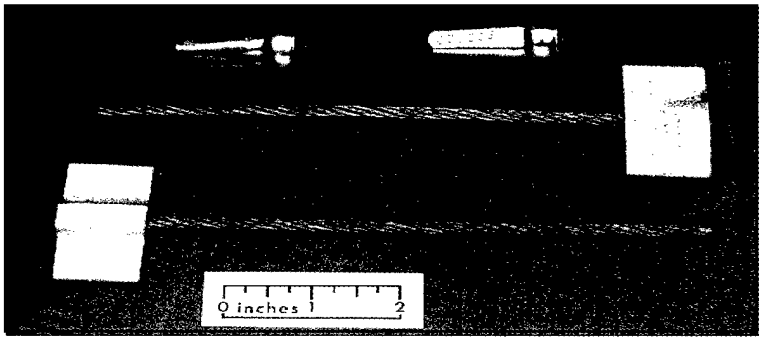



Figure 3-4. Cone-Lok Seal by Brammel, Inc. **NSN 5340-01-177-7405**

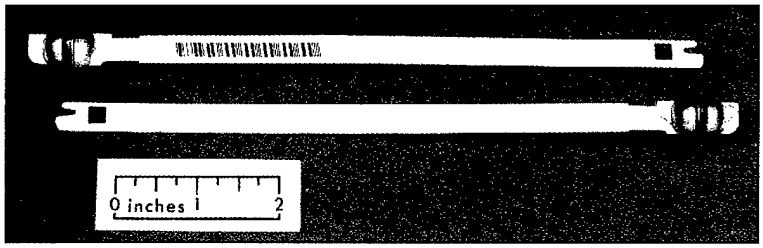



Figure 3-5. Tyden Car Ball Seal by Brammel, Inc. **NSN 5340-01-237-7646**

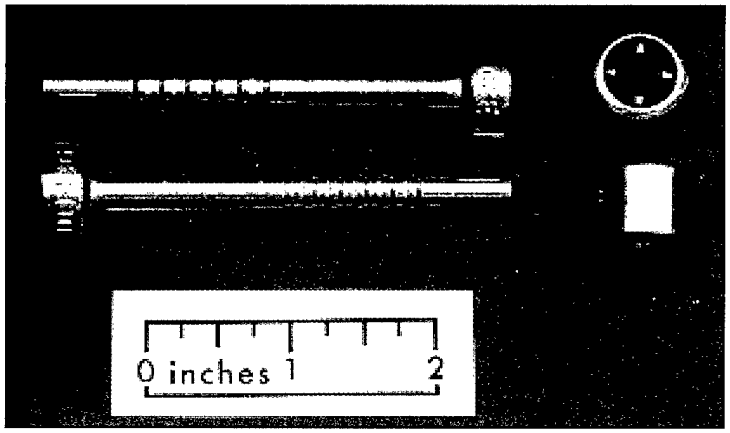
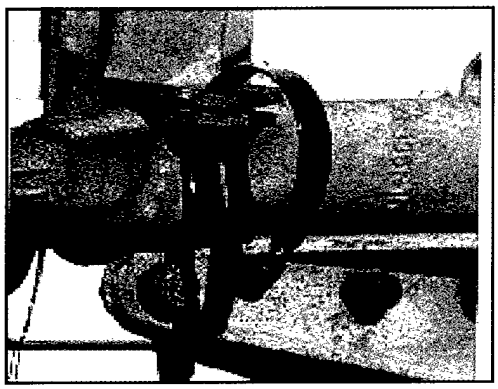



Figure 3-6. Multiple Snap Lock Seal by Brammel **NSN 5340-01-318-6771**

## HASPS ON RAIL CARS, TRUCKS, CONTAINERS AND VANS



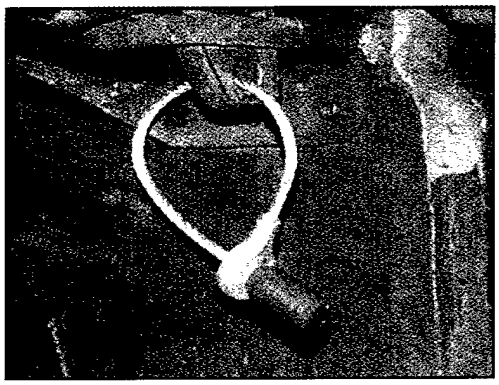


Figure 3-7. Hasps

### Seal Examples

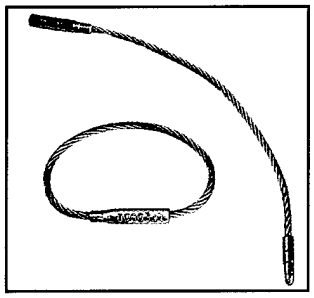


Figure 3-8. Cable Style Seal

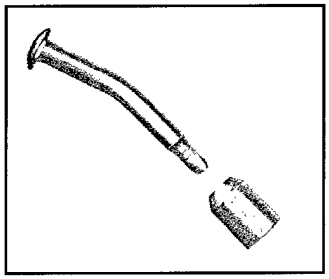


Figure 3-9. Bolt Style Seal

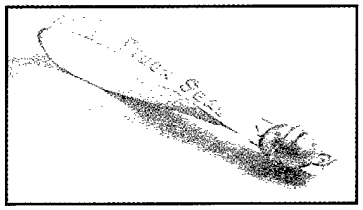


Figure 3-10. Strap Style Seal, Car Ball

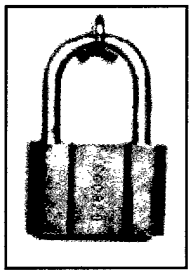


Figure 3-11. Padlock Style Seal

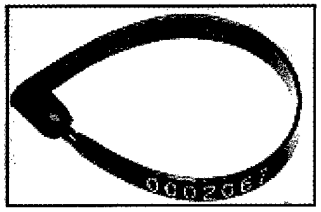


Figure 3-12. Strap Style Seal, Car Plastic

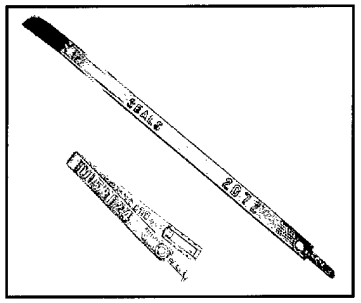


Figure 3-13. Strap Style, Car Box Seal

## DRUMS

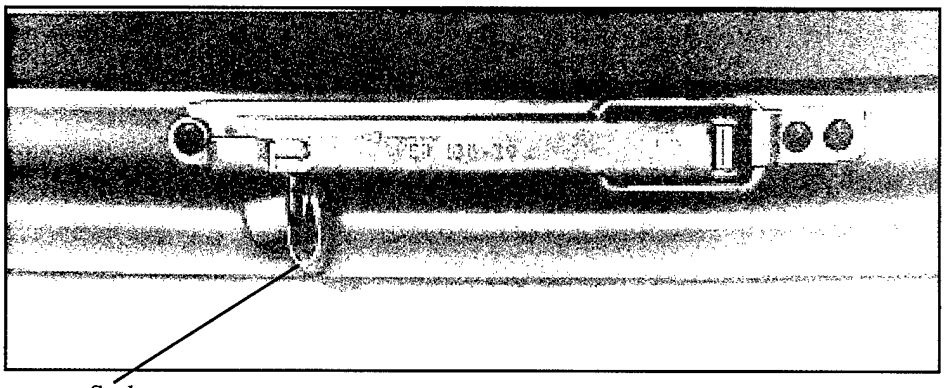



Figure 3-14. Drum

## Seal Examples

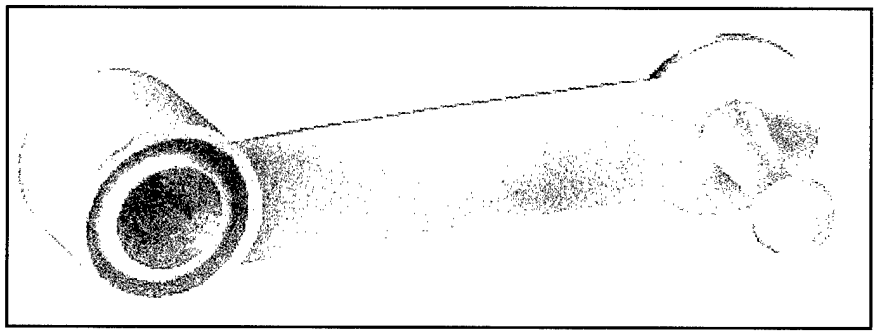


Figure 3-15. Strap Style, Plastic Ball Drum

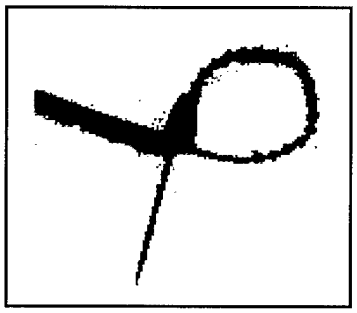


Figure 3-16. Pull-Tight Seal

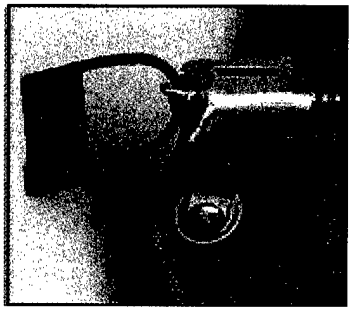


Figure 3-17. Padlock Style, Plastic

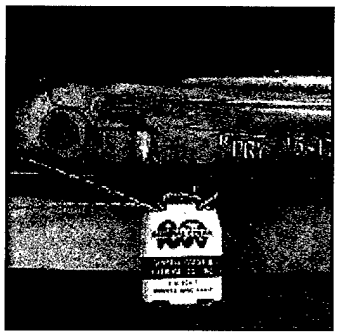


Figure 3-18. Wire Style, Folded

## OTHER SEAL EXAMPLES

Figure 3-19. Strap Style, Plastic Seal

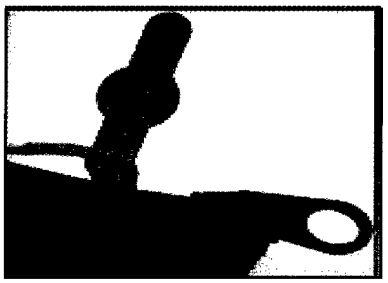


Figure 3-20. Strap Style, Plastic Seal

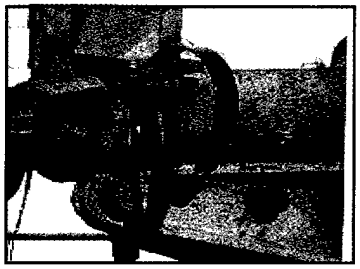


Figure 3-21. Strap Style, Plastic Seal

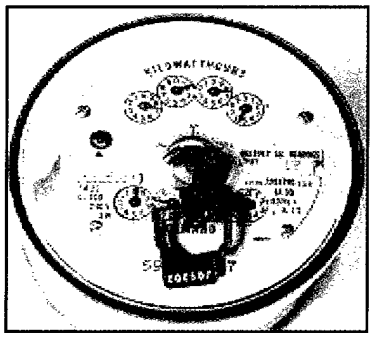


Figure 3-22. Plastic Padlock Style Seal

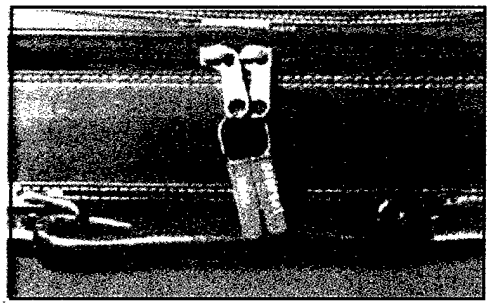


Figure 3-23. Wire Padlock Style Seal

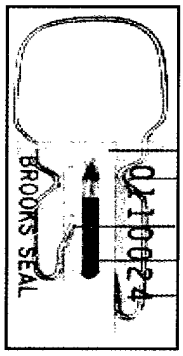



Figure 3-24. Wire Padlock Style Seal

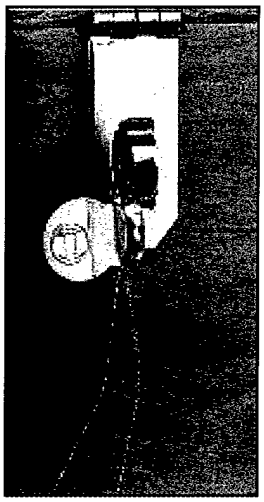


Figure 3-25. Wire Style, Aluminum Roll Over Seal

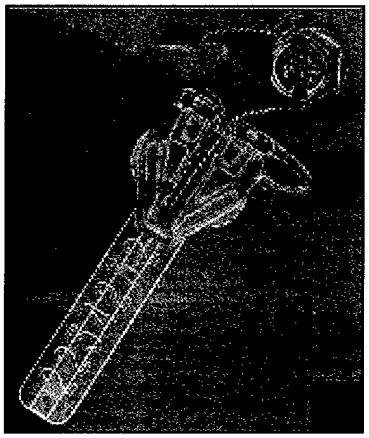


Figure 3-26. Wire Style, AN Seal

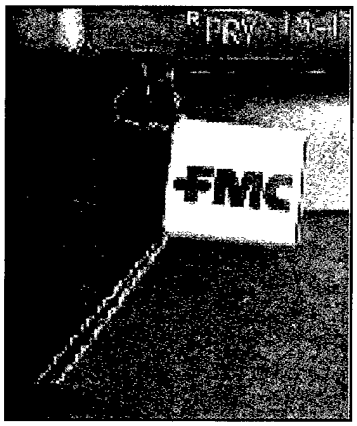



Figure 3-27. Wire Style, Fold Wire Seal

# CHAPTER 4
# SEAL STYLES

## INTRODUCTION

In this chapter, seals are grouped according to style as follows:

- Wire Style
- Pull-Tight Style
- Strap Style
- Bolt Style
- Padlock Style
- Cable Style (Figure 4-1)
- Label Style (not covered in this guide)

This chapter describes the seals in general terms common to the style. Within these styles, there can be several variations. For an exact description of a specific seal, consult the manufacturer's product catalog. You can refer to Appendix C for a partial list of manufacturers.

Figure 4-1. Hasp with Cable Style Seal

### Seal Description

The seal description is a short narrative that supplements the seal image and provides information concerning the design features of the seal.

It is advisable that seals with sequential serial numbers be used. However, in this chapter there are some examples of seals that cannot be procured with sequential serial numbers because they are already in use and you should be familiar with these seals.

### Tamper-Resistance Summary

This summary presents the time to open and re-close the seal using the original parts with commercially available hand tools or very simple instruments; for example, shims or wire.

The minimum time estimates in the tamper-resistance summary are based on the results of testing a specific seal or are estimates based on the results of actual attacks in optimal conditions using an adversary proficient in performing the defeat.

### Installation Guidelines

The special installation guidelines contain information about seal installation.

### Check, Inspect, and Record

This is information about how to check the seal for indications of tampering. It is also a reminder to: (1) check the seal to determine if it is properly installed, and (2) record information about the seal.

### Unit Cost

This is an estimated cost of each unit based upon a certain quantity purchased at one time. This cost figure is only to show relative cost of one seal to another. This figure is not intended to be used for ordering purposes. This figure does not reflect the total system costs such as cost of personnel training, installation, removal, disposal, and any extra tools that may be needed to install or remove the seal.

## WIRE STYLE SEALS

Some of the available spirally wound sealing wires for wire style seals are shown in Figure 4-2. Sealing wires 1 through 6 (Figure 4-2) are explained below:

**Wire 1** - Used for light sealing requirements. Available in 1/2-pound and 2-1/2-pound spools. Overall diameter of wire is 0.034 mm, with an approximate break strength of 7 pounds. Galvanized steel.

**Wire 2** - Most popular for general sealing purposes. Available in 1/2-pound and 2-1/2-pound spools. Overall diameter of wire is 0.044 mm, with an approximate break strength of 17 pounds. Galvanized steel.

**Wire 3** - Heavy-duty wire for applications where seals and wire are exposed to rough handling. Available in 1/2-pound and 2-1/2-pound spools. Diameter of wire is 0.034 mm, with an approximate break strength of 34 pounds. Galvanized steel.

**Wire 4** - Galvanized steel for heavy duty sealing where greatest tensile strength is needed. Available in 1/2-pound and 2-1/2-pound spools. Diameter of wire is 0.038 mm, with an approximate break strength of 40 pounds.

**Wire 5** - Aluminum breakaway designed for fire extinguishers and other applications requiring a quick and easy break-in. Diameter is 0.037 mm with an approximate break strength of 6 pounds.

**Wire 6** - Single strand is used where small diameter and strength are important. Diameter is 0.035 mm and an approximate break strength is 45 pounds. Galvanized steel.

### Crimp Wire Seals

Crimp wire seals are seals that consist of wire passed through a housing that is crimped or pressed against the wire holding the wire in place (Figure 4-3). The types of crimp wire seals are:

- Steel Disk Seals
- Aluminum Roll-Over Seals
- Aluminum Crimp Seals
- Aluminum Sleeve Seals

**NOTE: Lead crimp wire seals are not used by Dod for environmental reasons.**

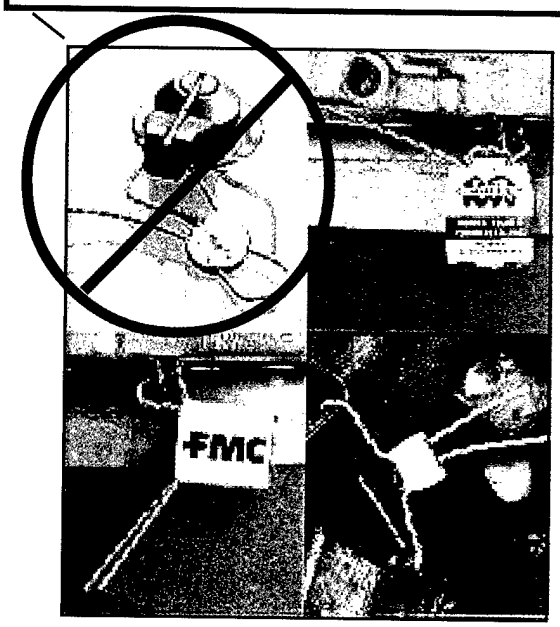



Figure 4-3. Alternatives to Lead Seals

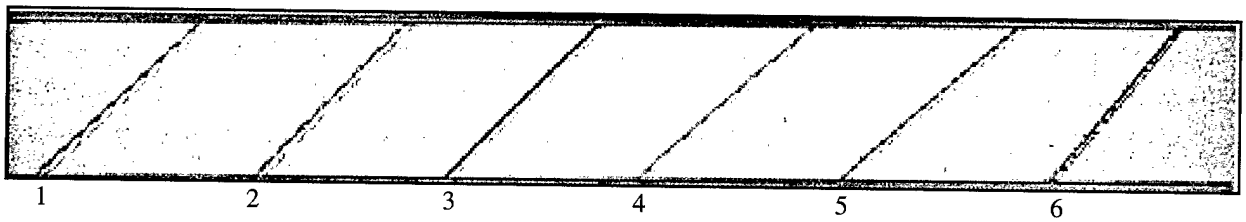



Figure 4-2. Available Wire, Actual Size

**Steel Disk Seal**. The steel disk seal consists of a steel cup, available in three sizes, and an accompanying paper disk insert that contains printed information (Figures 4-4 and 4-5). The seal is attached to the wire using a special die that rolls the outer edge into a bead capturing the paper insert and the wire. This seal can be procured with sequential serial numbers.

- **Tamper-Resistance Summary** - Defeat of a steel disk seal will take a minimum of 30 seconds.

- **Installation Guidelines** - The steel disk seal is installed with a stamping tool similar to the seal press in Figure 4-13 and Figure 4-15.

Minimize the length of the wire loop, making the seal a tight fit around the item being sealed. Pass the loose ends of the wire through the seal as many times as possible before crimping. Spirally wound wire is recommended to ensure non-slip sealing.

- **Check, Inspect, and Record** - Once the seal is properly installed, ensure that there is no free play between the seal body and the wire. Verify and record the serial number.

During post-mortem examination, compare the removed seal with an unused sample seal, side by side. Examine the seal to determine if the seal and wire are glued back together. Examine the seal for evidence of crimping with tools other than the designated crimping or pressing tool. Be aware that crimping and pressing dies are easy to duplicate, making most of these seals relatively easy to counterfeit.

- **Unit Cost** - $0.04 (based on a quantity of 1,000).

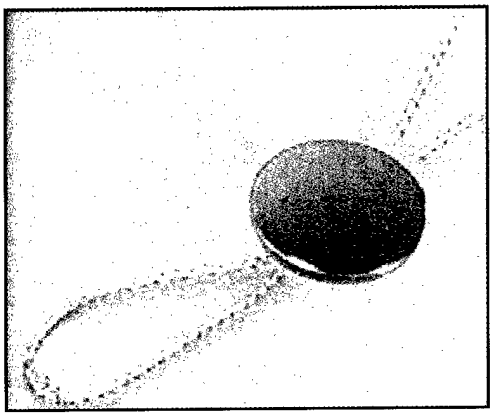


Figure 4-4. Steel Disk Seal

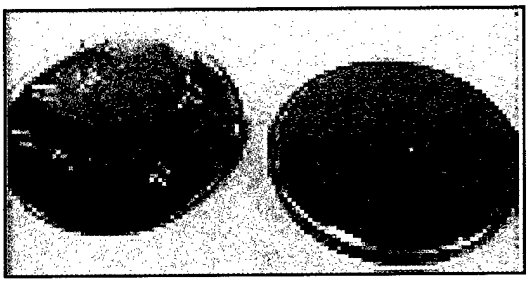


Figure 4-5. Steel Disk Housing

**Aluminum Roll-Over Seal**. The aluminum roll-over seal is an aluminum stamping similar to a fold wire seal, except that the attachment of the wire to the seal is done by means of a special tool that wraps the aluminum around the wire (Figures 4-6 and 4-7). These seals cannot be procured with sequential serial numbers.

• **Tamper-Resistance Summary** - Defeat of the aluminum roll-over seal will take a minimum of 30 seconds.

• **Installation Guidelines** - The aluminum roll-over seal is installed with a crimping tool as shown in Figures 4-8 and 4-9.

Minimize the length of the wire loop, making the seal a tight fit around the item being sealed. Pass the loose ends of the wire through the seal as many times as possible before crimping. Spirally wound wire is recommended to ensure non-slip sealing.

• **Check, Inspect, and Record** - Once the seal is properly installed, ensure that there is no free play between the seal body and the wire.

During post-mortem examination, compare the removed seal with an unused sample seal, side by side. Examine the seal to determine if the seal and wire are glued back together. Examine the seal for evidence of crimping with tools other than the designated crimping or pressing tool. Be aware that crimping and pressing dies are easy to duplicate, making most of these seals relatively easy to counterfeit.

• **Unit Cost** - $0.02 to $0.07 (based on a quantity of 1,000).

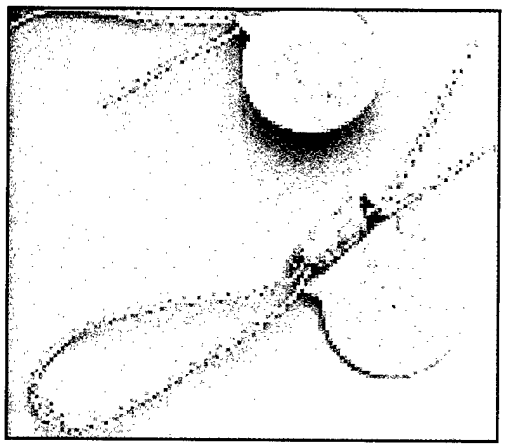


Figure 4-6. Aluminum Roll-Over Seal

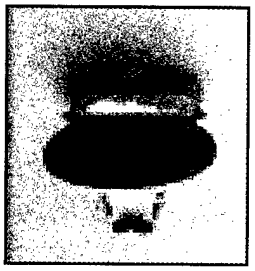


Figure 4-7. Aluminum Roll-Over Seal, Actual Size

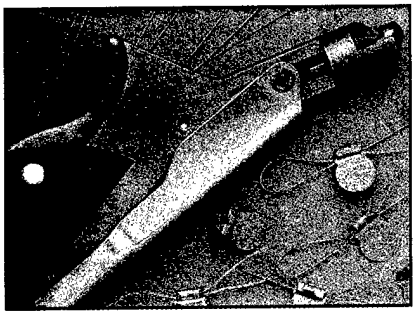


Figure 4-8. Crimp Tool for the Aluminum Roll-Over Seal

Put seal into head of sealer by pressing the seal backwards against the spring slider until the point of the seal lies under the curl of the tool.

Hook wire or cord behind the point of the seal and compress handles of sealer.

Be sure the prong of the seal curls around the wire or cord, gripping it firmly.

Press handles of sealer all the way to a firm stop. This puts an end crimp in the seal, and firmly locks it around the wire or cord and embosses the code on the seal.

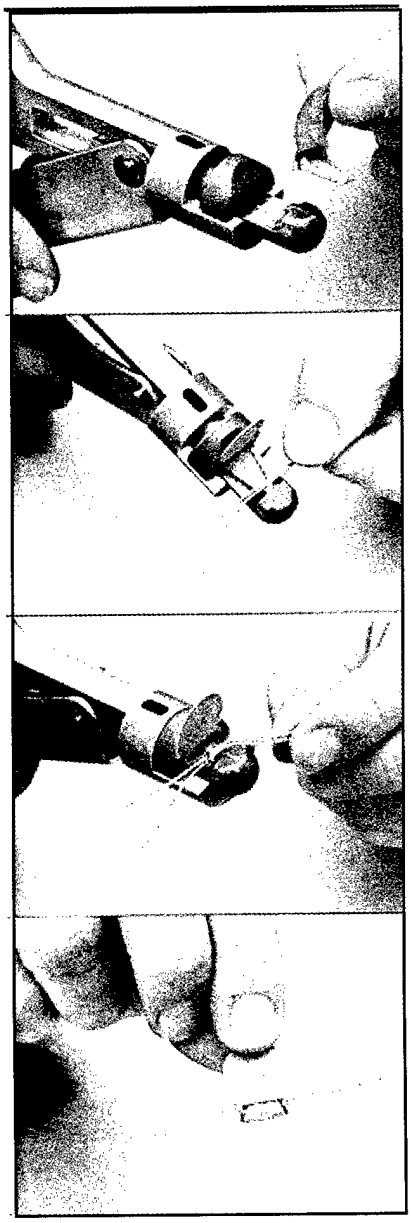


Figure 4-9. Aluminum Roll-Over Seal Installation

**Aluminum Crimp Seal**. The aluminum crimp seal (Figure 4-10) is an aluminum stamping that is rectangular in shape and contains wire receptacles similar to solderless connectors. The seal is applied by means of a seal press or solderless connector crimping tool. This seal can be supplied with a company identification and sequential serial numbers.

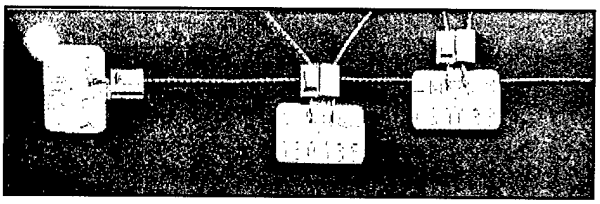


Figure 4-10. Aluminum Crimp Sleeve Seal

• **Tamper-Resistance Summary** - Defeat of the aluminum crimp seal will take a minimum of 30 seconds.

• **Installation Guidelines** - A seal press similar to that in Figure 4-11 and Figure 4-15 is used to install this seal.

Minimize the length of the wire loop, making the seal a tight fit around the item being sealed. Pass the loose ends of the wire through the seal as many times as possible before crimping. Spirally wound wire is recommended to ensure non-slip sealing.

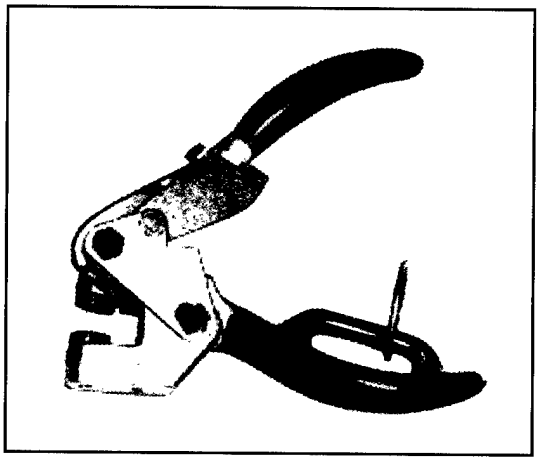


Figure 4-11. Seal Press Tool

• **Check, Inspect, and Record** - Once the seal is properly installed, ensure that there is no free play between the seal body and the wire. Verify and record the serial number.

During post-mortem examination, compare the removed seal with an unused sample seal, side by side. Examine the seal to determine if the seal and the wire have been glued back together. Examine the seal for evidence of crimping with tools other than the designated crimping or pressing tool. Be aware that crimping and pressing dies are easy to duplicate, making most of these seals relatively easy to counterfeit.

• **Unit Cost** -

1. $0.02 to $0.11 (based on a quantity of 1,000) depending upon logo.

2. Seal press (Figure 4-11) is $54.80 with female engraved dies including 8 characters. $1.45 per each additional character. For male engraved die add $12.60 plus $2.50 for each additional character.

3. For tongue and groove dies add $1.85.

4. Blank dies are $47.55.

**Aluminum Sleeve Seal**. The aluminum sleeve seal (Figures 4-12 and 4-13) may be applied by means of a seal press. The press contains dies that provide numbers, letters, or other details to be embossed on the aluminum and compresses the aluminum around the wire. These seals cannot be procured with sequential serial numbers.

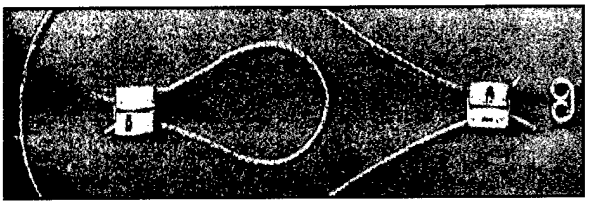


Figure 4-12. Aluminum Sleeve Seal

• **Tamper-Resistance Summary** - Defeat of the aluminum sleeve will take a minimum of 30 seconds. Evidence of tampering most likely will be detected during careful examination of the installed seal.

• **Installation Guidelines** - A seal crimping tool (Figure 4-14) or a seal press (Figures 4-11 and 4-15) is used to install this seal.

Minimize the length of the wire loop, making the seal a tight fit around the item being sealed. Pass the loose ends of the wire through the seal as many times as possible before crimping. Spirally wound wire is recommended to ensure non-slip sealing.

Figure 4-13. Aluminum Crimp Sleeve

• **Check, Inspect, and Record** - Once the seal is properly installed, ensure that there is no free play between the seal body and the wire.

During post-mortem examination, compare the removed seal with an unused sample seal, side by side. Examine the seal to determine if the seal and the wire have been glued back together. Examine the seal for evidence of crimping with tools other than the designated crimping or pressing tool. Be aware that crimping and pressing dies are easy to duplicate, making most of these seals relatively easy to counterfeit.

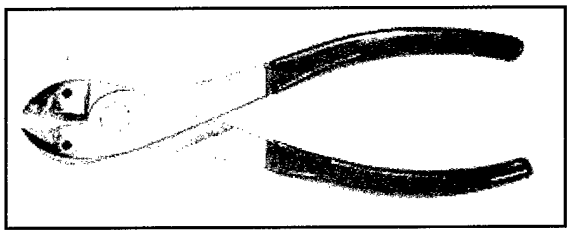


Figure 4-14. Crimping and Cutting Tool

• **Unit Cost** -

1. $0.02 to $0.04 (based on a quantity of 1,000).

2. Crimp tool (Figure 4-14) is $62.05 with female engraved dies including 8 characters. $1.45 per each additional character.

3. Blank dies are $54.75.

Place one end of the wire through the opening of the item to be sealed; forming a loop.

Enter the ends of the wire through the hole(s) of the seal and pull the wire tight to decrease the size of the loop.

Place the metal seal into the sealing tool and compress the seal to lock the wires firmly in the seal.

Gently pull the wires to ensure that the seal has been engaged.

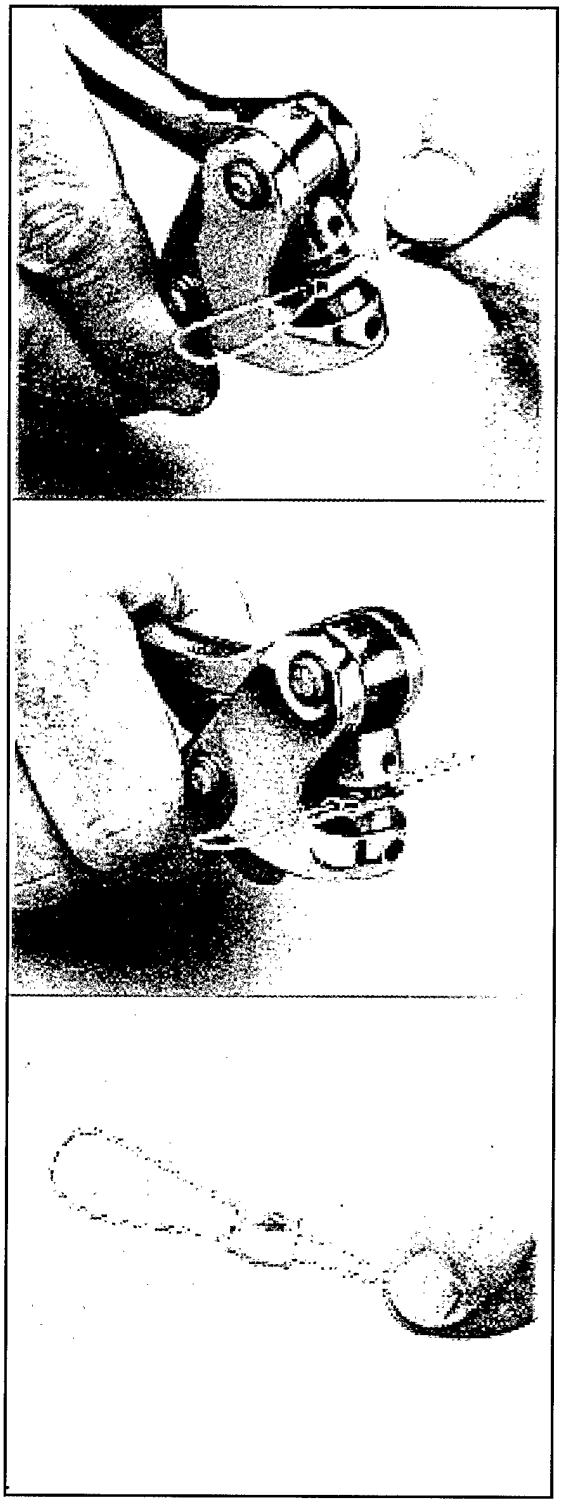


Figure 4-15. Aluminum Sleeve Seal Installation

**Roto-Seal**. The Roto-Seal is one of several seals that has been tested and approved as a replacement for lead wire seals (Figures 4-16 and 4-17). The Roto-Seal is a two-piece acrylic body through which wire is threaded and then crimped like traditional lead wire seals. A unique crimping press rotates and secures the wire inside the Roto-Seal while, at the same time, putting an impression on the colored insert. The positive sealing action of the Roto-Press makes certain each Roto-Seal is crimped securely.

This seal comes with the following:

1. Heat stamped consecutive numbers
2. Transparent body for see-through inspection
3. Color coded inserts
4. Inserts accept die impressions from the Roto-Press
5. Wire available in 4 x.014 inch
6. Wire types - copper, galvanized, and monel

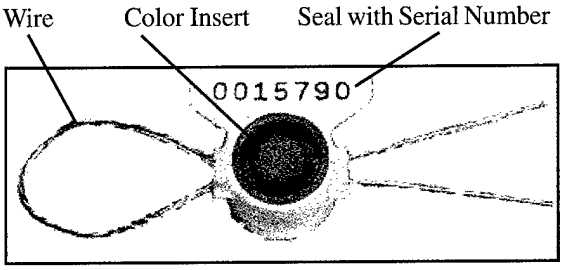



Figure 4-16. Roto-Seal

• **Tamper-Resistance Summary** - Defeat of this seal will take a minimum of 30 seconds. Evidence of tampering most likely can be detected during careful examination of the installed seal.

• **Installation Guidelines** - Minimize the length of the wire loop, making the seal a tight fit around the item being sealed (Figure 4-18).

• **Check, Inspect, and Record** - Once the seal is properly installed, ensure that there is no free play between the seal body and the wire. Verify and record the serial number.

The body of this seal is clear plastic so look carefully before removing the seal to detect any break in the wire. Look for any discoloration of the plastic.

During the post-mortem examination, look at the seal carefully to determine if the seal and the wire have been glued back together.

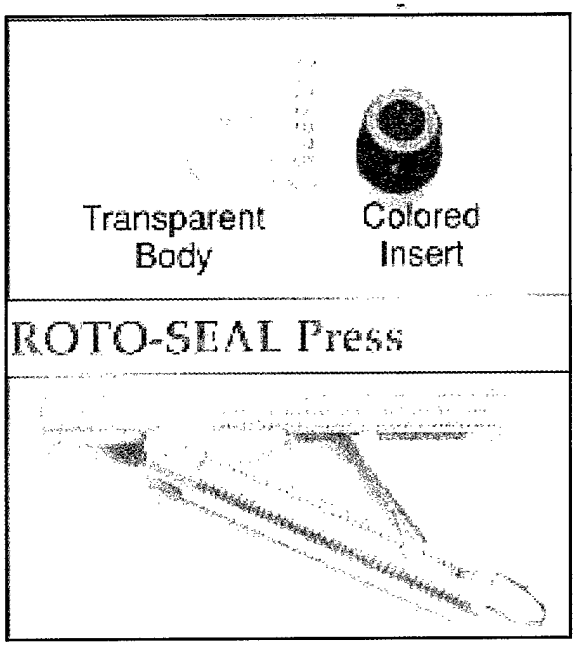
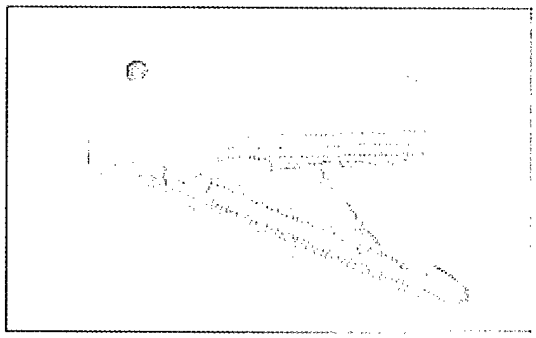


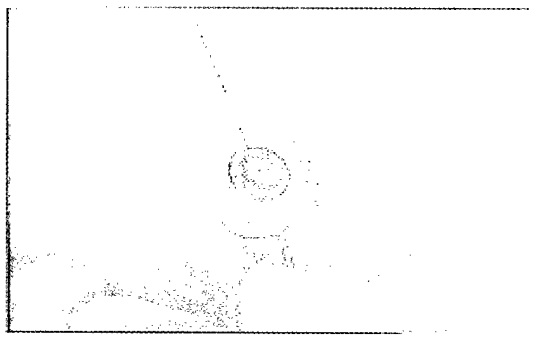

Figure 4-17. Roto-Seal with Press

**Unit Cost** -

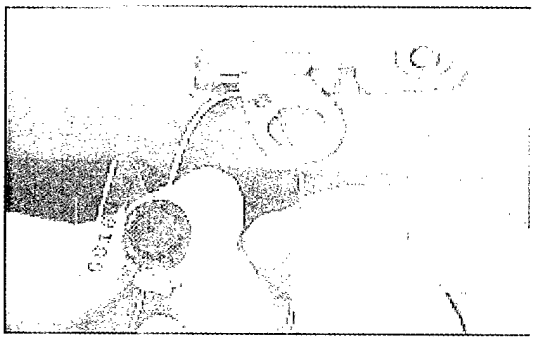
1. $0.25 (based upon a quantity of 1,000).
2. Press with blank die is $85.00.
3. Press with engraved die is $99.00.



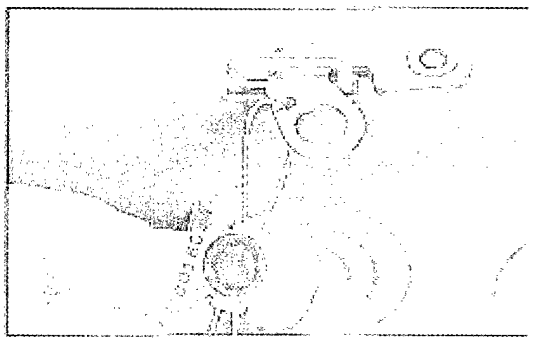
1. Roto-Seal, cut wire, and Roto-Press



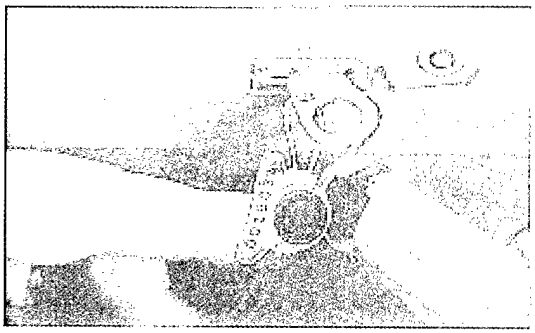
2. Insert wire through body.



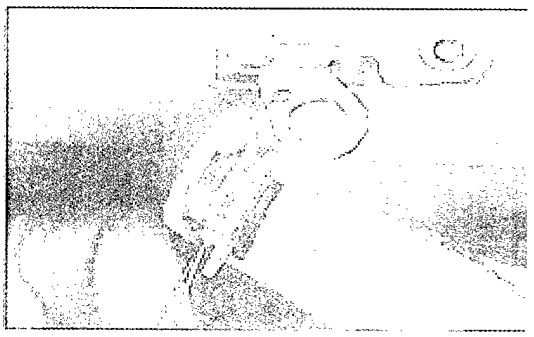
3. Thread wire into orifice with seal insert facing you.



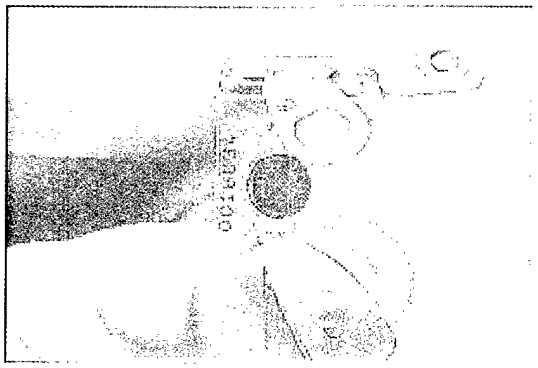
4. Pass wire back through seal; tighten to 1" loop.



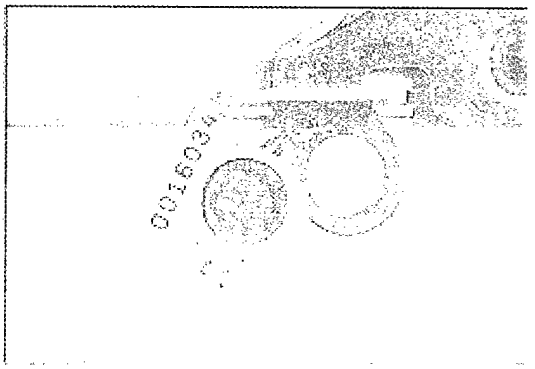
5. While holding numbered tag, position body in Roto-Press slot; seating it at the bottom.



6. Squeeze Roto-Press handle to fully closed position.



7. Trim excess wire, if desired.



8. Make sure the seal is snug fitting.

Figure 4-18. Roto-Seal Installation

**Fold Wire Seal.** The fold wire seal is a sheet metal stamping designed to fold together and securely hold a wire (Figures 4-19, 4-20, and 4-21). The fold lines of the seal are scored so that unfolding will cause the seal to break along the fold lines. This seal can be procured with sequential serial numbers.

• **Tamper-Resistance Summary** - Defeat of all the fold wire seals will take a minimum of 30 seconds.

• **Installation Guidelines** - Spirally wound wire is recommended to reduce slippage. Minimize the length of the wire, making the seal a tight fit around the item being sealed. Pass the loose ends of the wire through the seal body as many times as possible before the seal is snapped shut (Figure 4-22).

The Foldlok seal (Figure 4-21) is a variation of the seal in Figure 4-19. The installation instructions for this seal are presented in Figure 4-23.

• **Check, Inspect, and Record** - Once the seal is properly installed, make sure that there is no free play between the seal body and the wire. Verify and record the serial number.

During a post-mortem examination, compare the removed seal with a sample seal. Carefully examine the parts after unfolding to reveal if there is evidence of tampering, such as scratches on the internal and external surfaces. Examine the side flaps next to the wire for deformation and for scratches that differ from those on the sample. The metal box will fracture upon reopening. Look for discoloration on the boxes due to heating when an attempt is made to weld the boxes back together when opened.

• **Unit Cost** - $0.11 (based on a quantity of 1,000).

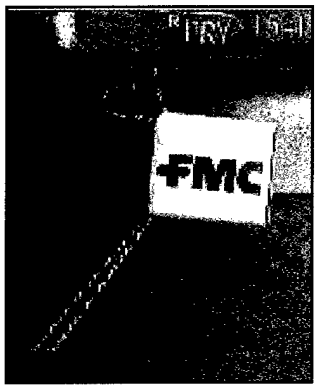


Figure 4-19. Fold Wire Seal

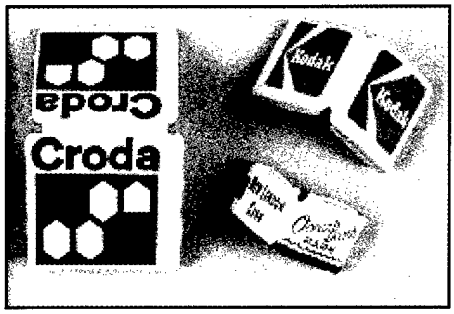


Figure 4-20. Fold Wire Seal with Logo

Figure 4-21. Foldlok Seal

Place the wire through the opening of the container to be sealed and form a loop.

Place both ends of the wire through the seal opening at the inside hinge of the seal.

With finger pressure, close the seal until two clicks are heard. The seal is now locked.

Gently pull on the wire to ensure that the lock is engaged.

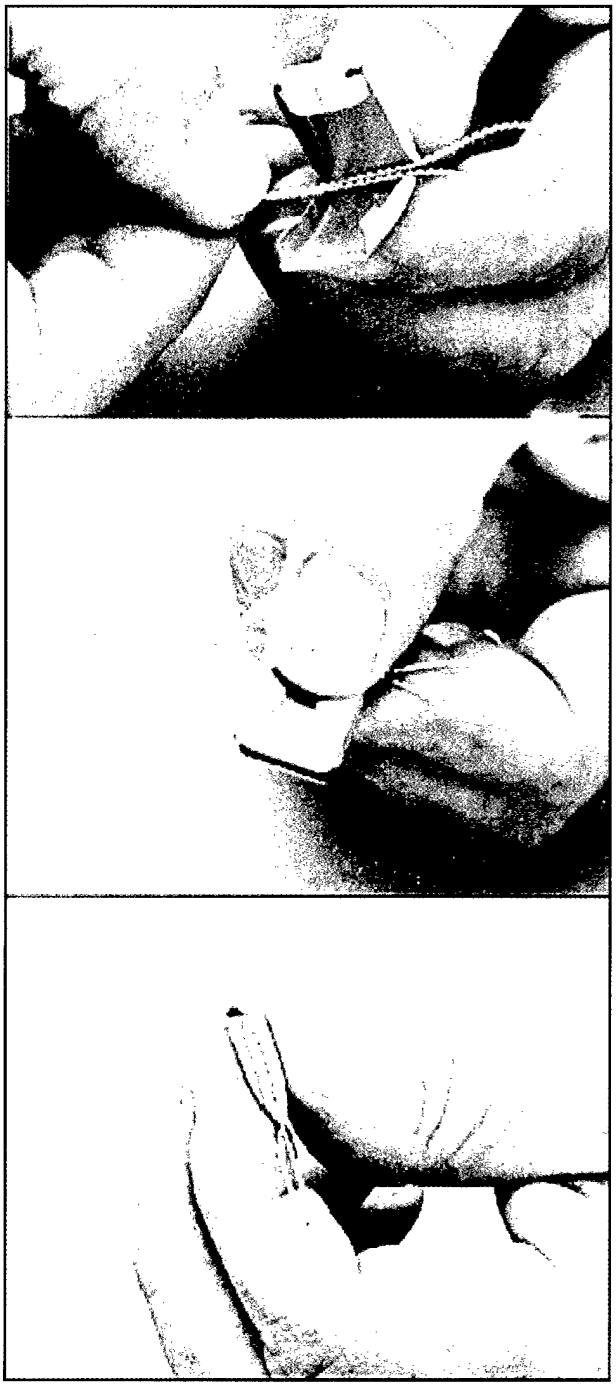


Figure 4-22. Fold Wire Seal Installation

After threading the wire through the appropriate holes of the object to be protected, wrap the two ends around the narrow portion of the Foldlok seal between the tab marker "SEAL BROKEN" and the body of the seal.

Fold tab "SEAL BROKEN" into the recess of the body making sure that the wire is firmly engaged in the crimp.

Fold in tab "SEAL BROKEN" to cover tab "SEAL BROKEN."

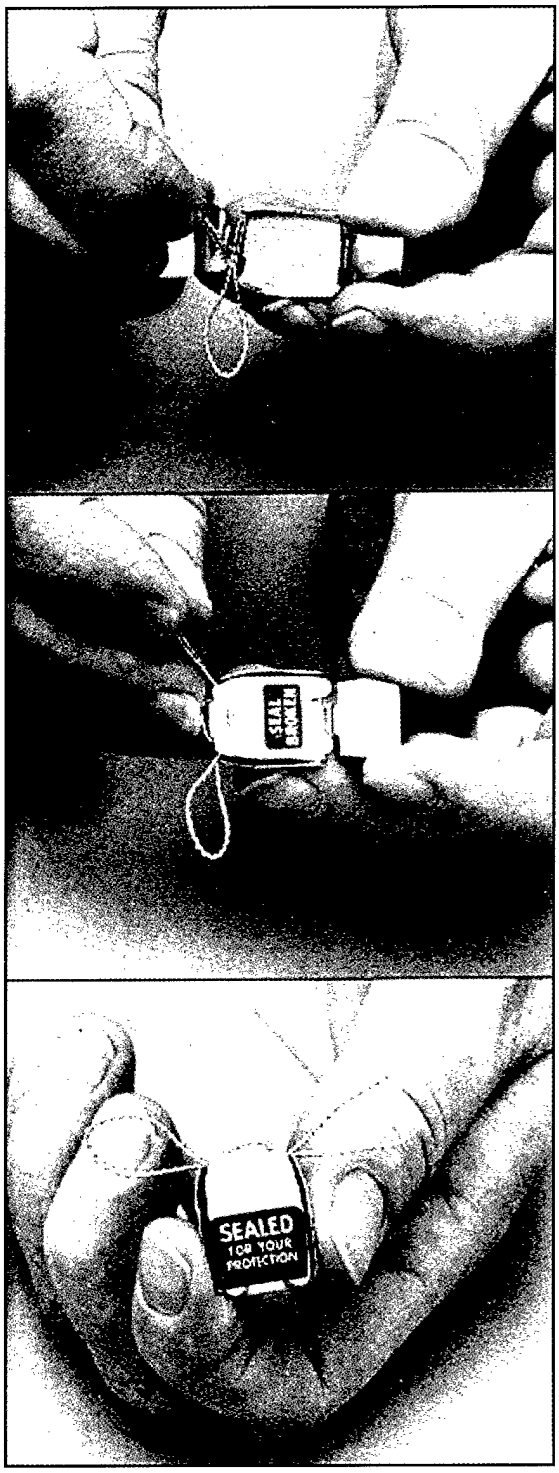



Figure 4-23. Foldlok Seal Installation

**Cup Wire Seal.** The cup wire seal (Figures 4-24, 4-25, and 4-26) consists of three sheet metal stampings. Two of the stampings are fastened together to form the bottom of the seal that is composed of the shell and crown. The third stamping forms a solid top piece. The seal is installed by threading the wire through the item to be sealed and then through the holes in the seal bottom. Fasten the two wire ends together with a crimp type sleeve or other device. The top is snapped into the bottom, thereby capturing the wire juncture within the metal cup enclosure.

The cup wire seal may be ordered in three sizes. Fingerprinting techniques and verification procedures were developed by Brookhaven National Laboratory for this seal.

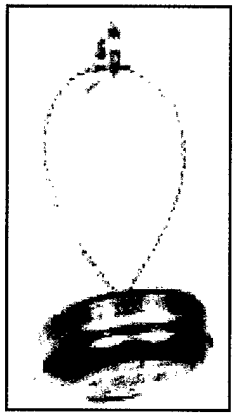


Figure 4-24. Cup Wire Seal

- **Tamper-Resistance Summary** - Defeat of the cup wire seal, whether it is fingerprinted or not, will take a minimum of 30 seconds. It will require the use of special tools as well as substitution of the wire and sleeve.

- **Installation Guidelines** - To minimize accidental breakage, use stainless steel wire with a minimum of 15 strands. A metal sleeve may be used to crimp the wire ends together within the cup. Imprint both the top and bottom of the seal with the same serial number. Minimize the length of the wire loop, making the seal a tight fit around the item being sealed, to prevent the insertion of covert tools.

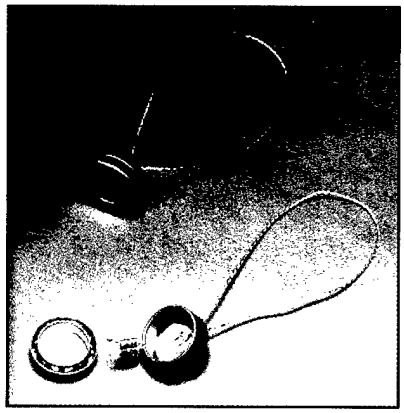


Figure 4-25. Cup Wire Seal

- **Check, Inspect, and Record** - Once the seal is properly installed, verify and record the serial number.

Before removing the seal, inspect for physical damage or signs of tampering.

During a post-mortem examination, compare the removed seal with a lot sample, and compare the top serial numbers with the bottom seal numbers. Compare the metal sleeve that is used to hold the ends of the wire together with the lot samples. Examine the surface areas of the shell, crown, and top for abrasions. Compare the shape of the seal with the sample parts to determine if dies other than the production dies were used to form the seal parts, particularly the bottom section of the seal.

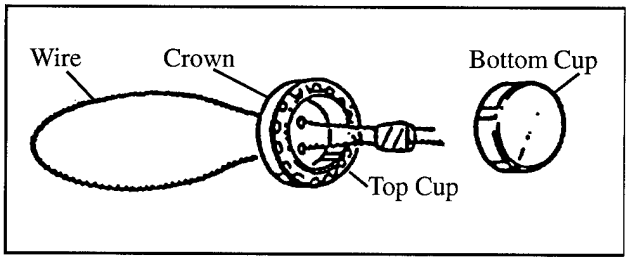



Figure 4-26. Cup Wire Seal, Exploded View

- **Unit Cost** - $0.40 to $0.59 (based on a quantity of 1,000).

**Tik A & AN Seals**. These seals have been tested and approved as replacements for lead wire seals (Figures 4-27, 4-28, and 4-29). The Tik one-piece plastic seal consists of a hollow capsule and anchor type insert connected by a thread. Upon insertion, the legs or barbs become permanently retained behind the inner stops of the capsule, so the anchor can not be withdrawn. The wire or cord is held securely in place within the capsule. These seals require no installation tools.

- **Tamper-Resistance Summary** - Defeat of these seals will take a minimum of 15 seconds.

- **Installation Guidelines** - Install according to manufacturer's instructions.

- **Check, Inspect, and Record** - Once the seal is properly installed, verify and record the serial number. Inspect for physical damage or signs of tampering. Look for discoloration of the plastic. Make sure there are no breaks in the thread.

  Perform a post-mortem inspection of this seal when it is not made of clear plastic.

- **Unit Cost** - $0.48 to $1.03 (based on a quantity of 1,000).

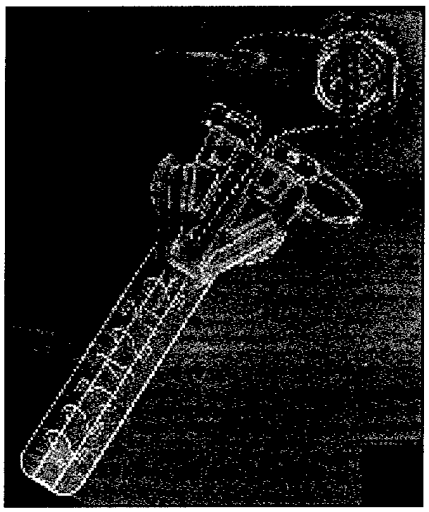


Figure 4-27. Wire AN Seal

Figure 4-28. Plastic AN Seal

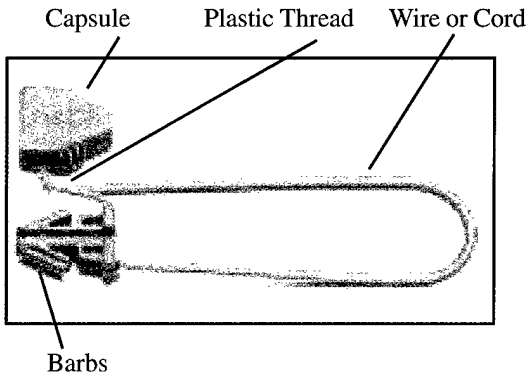



Figure 4-29. Tik A Seal

## PULL-TIGHT STYLE SEALS

### Plastic Tie Seal

The plastic tie seals are constructed of a one-piece plastic molded part (Figures 4-30 and 4-31). They consist of a serrated plastic string that is pulled through the hole of the seal body that contains spring fingers. The fingers grasp the serrated string and prevent its removal.

- **Tamper-Resistance Summary** - Defeat of the plastic tie seals will take a minimum of 10 seconds.

- **Installation Guidelines** - When plastic seals are used, minimize the length of the closed loop, making the seal a tight fit around the item being sealed (Figure 4-32). Do not remove the extra length of the serrated string.

- **Check, Inspect, and Record** - Once the seal is properly installed, verify and record the serial number. The extra length of serrated string must be present. The serrated string should have free play in the seal body and should not pull loose from the body before it breaks, either when in place or during post-mortem examination.

  During post-mortem examination, compare the removed seal with a sample seal and carefully examine for signs of heat welding.

- **Unit Cost** - $0.05 to $0.06 (based on a quantity of 1,000).

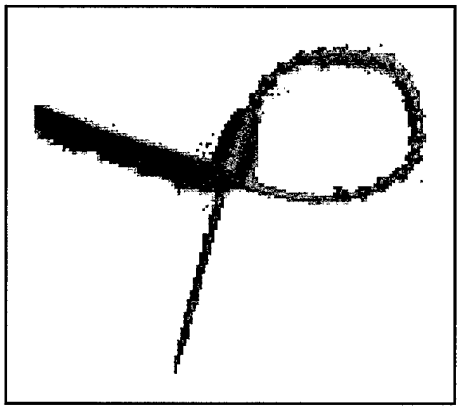


Figure 4-30. Plastic Tie Seal (locked)

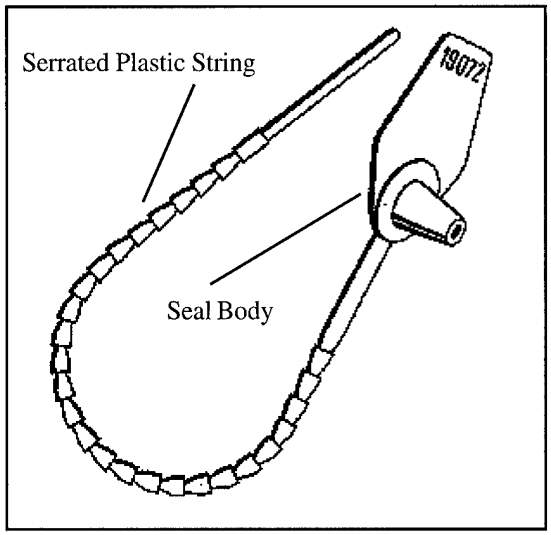



Figure 4-31. Plastic Tie Seal (open)

Slide narrow end of the seal through the opening of the item to be sealed.

Pull the remainder of the string through the seal body hole until the seal fits tightly on the item being sealed.

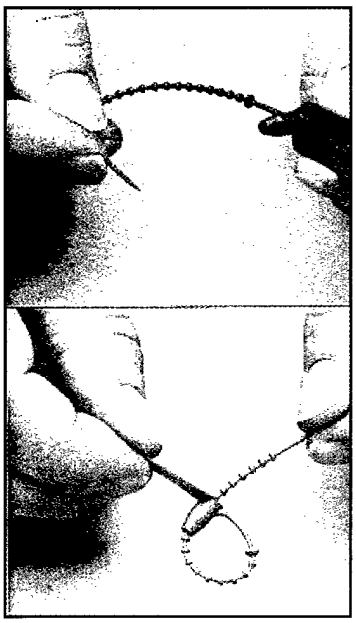


Figure 4-32. Plastic Tie Installation

## STRAP STYLE SEALS

### Car Box Seal

The car box end seals (Figures 4-33 and 4-34) are steel strap seals. The latching mechanism is contained within a folded box located on one end of the strap. All of these seals can be procured with the company name or logo and sequential serial numbers stamped in the strap (Figure 4-35). This seal has space for 18 to 22 letters and 7 digits. Letters cannot be substituted for numbers.

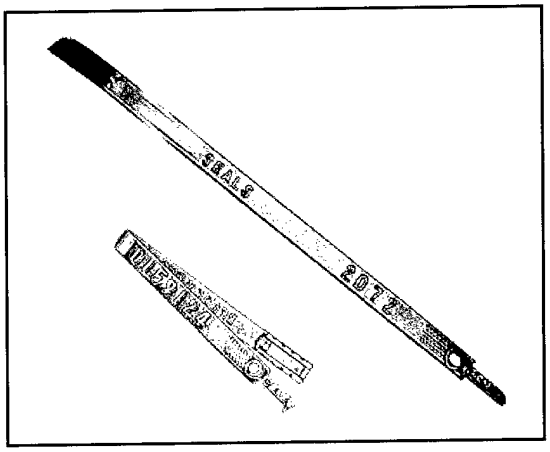


Figure 4-33. Car Box Seal (open)

- **Tamper-Resistance Summary** - Defeat of the car box end seals will take a minimum of 30 seconds. Evidence of tampering may not be detected by post-mortem examination.

- **Special Installation Guidelines** - Install the car box seal according to the manufacturer's instructions.

- **Check, Inspect, and Record** - Once the car box seal is in place, verify and record the serial number and any other identifying characteristics. Check for the proper amount of end play in the latching mechanism. There should be about 1/8-inch but no more than 3/8-inch free play.

  During post-mortem examination, compare the removed seal with a sample seal to detect tampering. Examine the seal latching surfaces for evidence of abrasions that do not appear on the sample seal. Post-mortem examination may not provide conclusive evidence of tampering.

- **Unit Cost** - $0.04 to $0.11 (based on a quantity of 1,000).

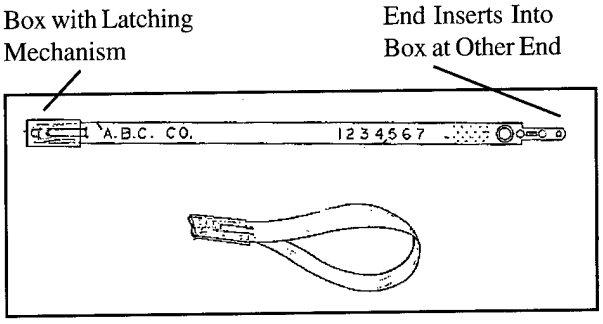



Figure 4-34. Car Box Seal (closed)

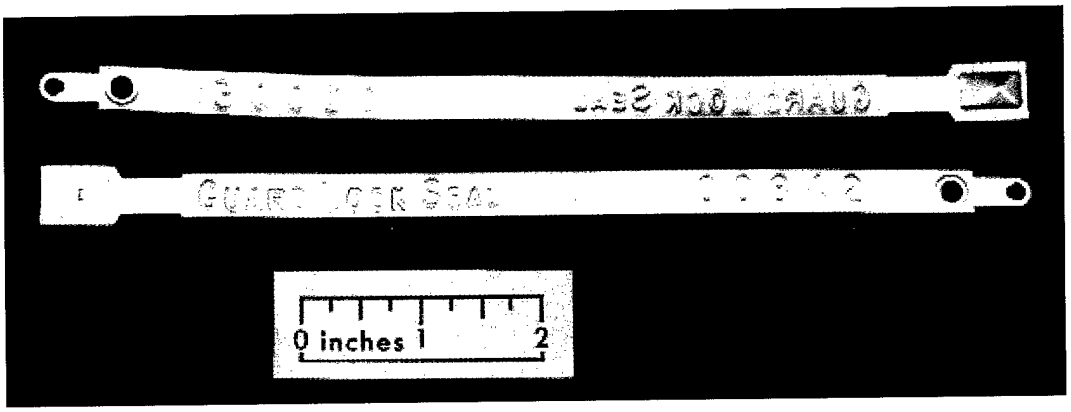



Figure 4-35. Car Box Seal with Logo and Serial Number

### Car Plastic Seal

The car plastic seals (Figures 4-36 through 4-44) are plastic strap seals manufactured as single-piece or double-piece plastic molded parts. The seal latching mechanism is contained in a cylinder at one end of the strap. All of these seals can be procured with the company name or logo and sequential serial numbers stamped on the strap.

- **Tamper-Resistance Summary** - Defeat of these seals takes a minimum of 15 seconds. Evidence of tampering will most likely be detected during careful examination.

- **Installation Guidelines** - Install the car plastic seal according to the manufacturer's instructions (Figure 4-37).

- **Check, Inspect, and Record** - Once the seal is properly installed, verify and record the serial number and any other identifying characteristics. Inspect the seal to ensure that the strap has free rotation in the body and the proper amount of end play. Look for a smooth texture. Twist the seal to test the strength.

  During post-mortem examination, compare the external surface of the removed seal with a sample seal. The strap should break before it can be pulled out of the seal body. Open the body and the internal parts to inspect and carefully compare with the sample. Examine the strap for evidence of heat welding.

- **Unit Cost** - $0.03 to $0.07 (based on a quantity of 1,000).

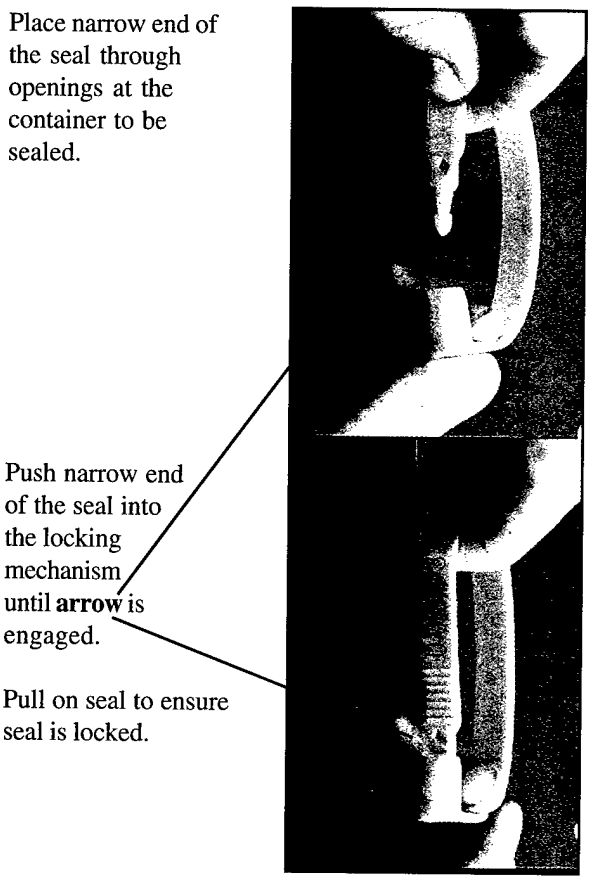



Figure 4-37. Car Plastic Seal Installation

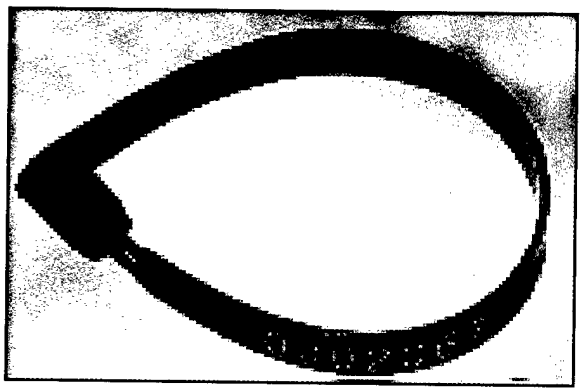


Figure 4-36. Car Plastic Seal

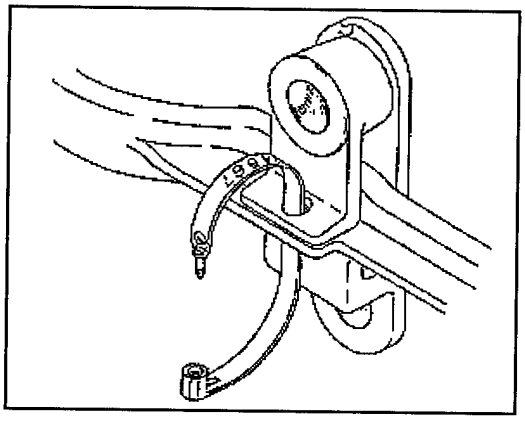


Figure 4-38. Car Plastic Seal with Hasp

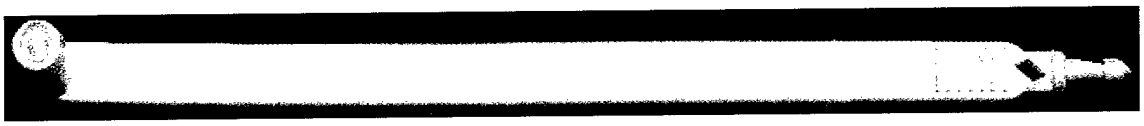


Figure 4-39. Car Plastic Seal, Actual Size

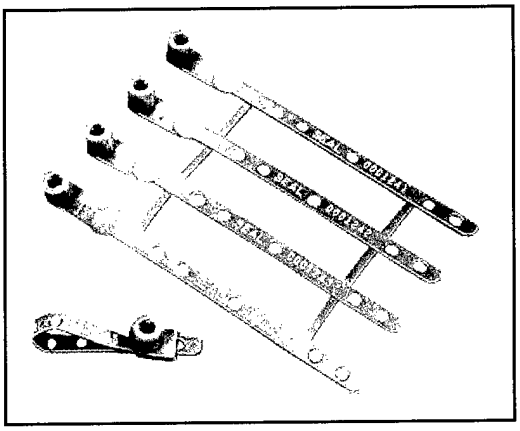


Figure 4-40. Adjustable Car Plastic Seal

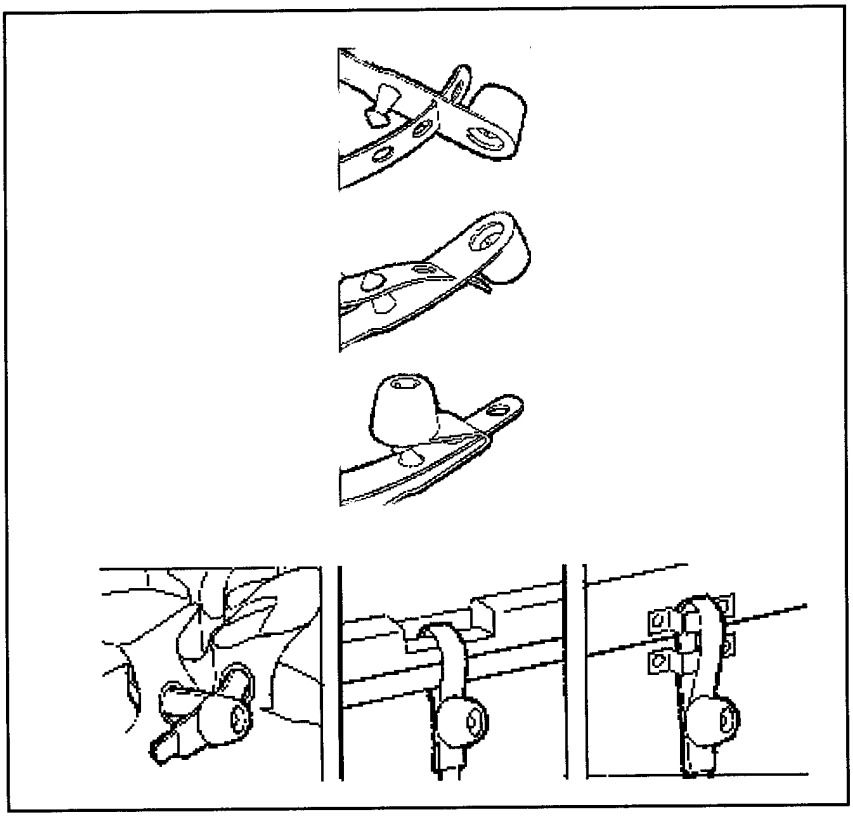


Figure 4-41. Car Plastic Seal Installation

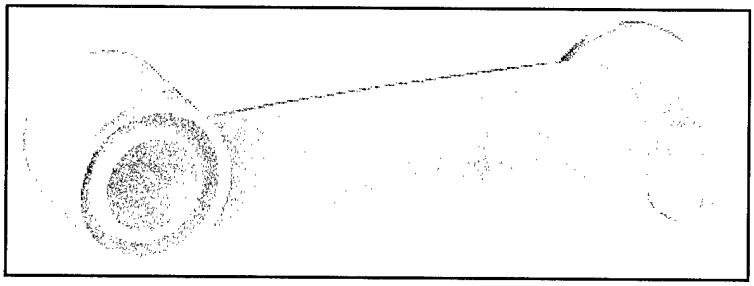


Figure 4-42. Plastic Drum Seal

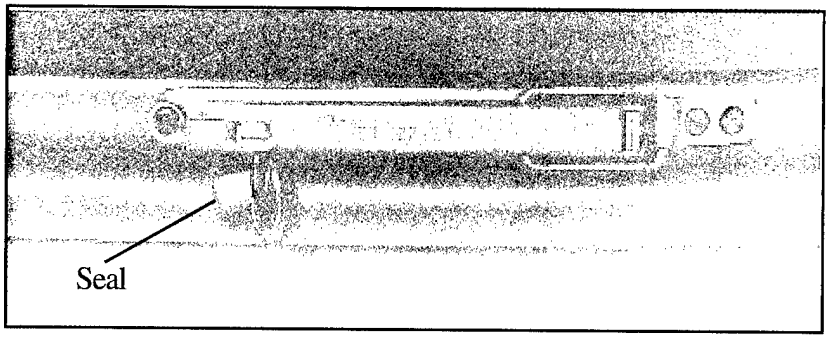



Figure 4-43. Plastic Drum Seal on Drum

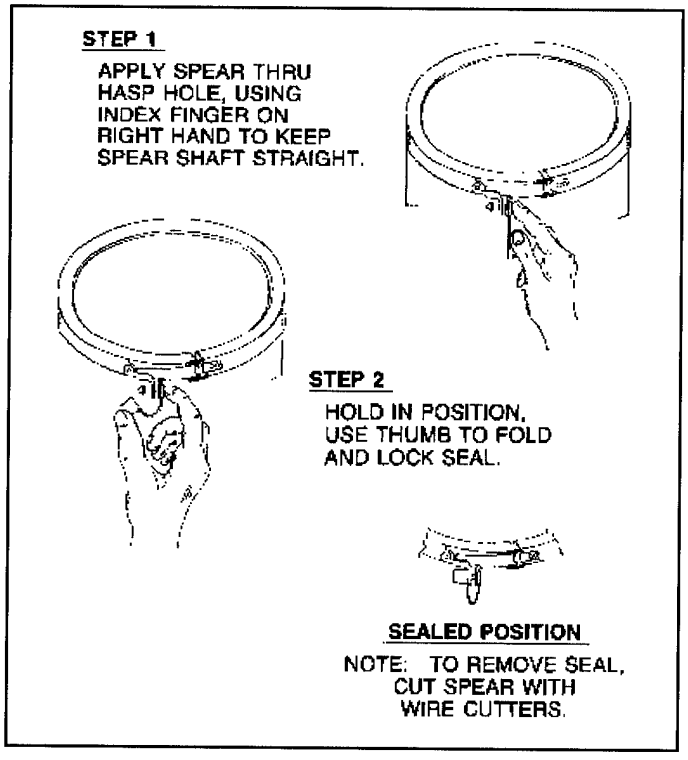



Figure 4-44. Plastic Drum Seal Installation

## Car Ball Seal

The car ball end seals are steel strap seals (Figures 4-45, 4-46, and 4-47). The latching mechanism is a piano wire loop that captures both ends of the strap. These seals can be procured with the company name or logo and sequential serial numbers stamped in the strap.

- **Tamper-Resistance Summary** - Defeat of car ball seals will take a minimum of 30 seconds and require the use of special tools.

- **Installation Guidelines** - Install the car ball seal according to the manufacturer's instructions.

- **Check, Inspect, and Record** - Once the seal is properly installed, verify and record the serial number and any other identifying characteristics. Ensure that there is a proper amount of end play in the latching mechanism.

  During post-mortem examination, compare the removed seal with a sample seal. Carefully inspect the exterior and interior surfaces to determine if dies other than production dies were used to form the ball enclosure. Open the ball housing to verify that all the internal parts are present.

- **Unit Cost** - $0.03 to $0.04 (based on a quantity of 1,000).

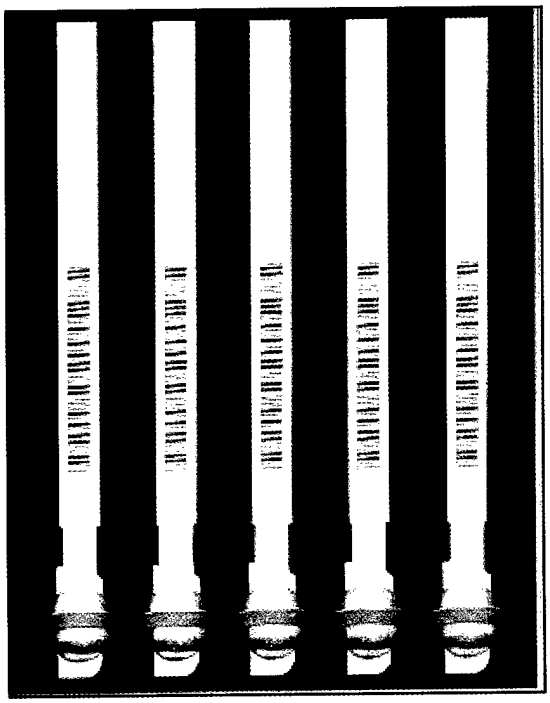


Figure 4-45. Car Ball End Seal

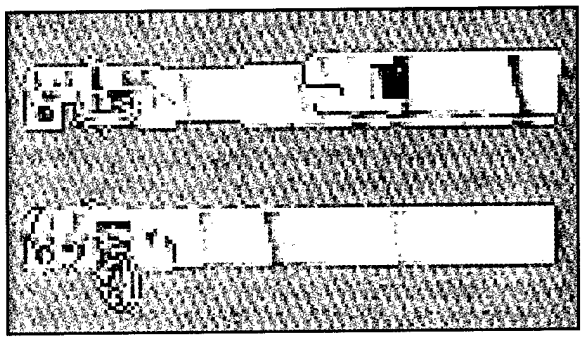


Figure 4-46. Car Ball Seal, Cross Section View

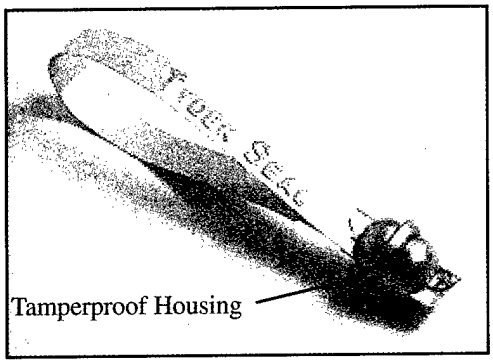



Figure 4-47. Car Ball Seal, Closed

## BOLT STYLE SEALS

### Bolt Seal

Bolt seals (Figures 4-48 and 4-49) are based on two different design principles. Item 1 is an unthreaded pin that is inserted into a cylinder that contains a C-ring as the locking mechanism. Item 2 is simply a threaded bolt that is inserted into a specially designed spin nut. The spin nut will move up and down the bolt, provided that the threads are smooth, but will not advance when the threads are burred or when resistance is met. Item 2 may also be supplied with a regular nut in place of the spin nut. These seals can be procured with sequential serial numbers.

- **Tamper-Resistance Summary** - Defeat of Item 1 will take a minimum of 30 seconds. Defeat of Item 2 equipped with the regular nut will take 5 minutes; with the spin nut, 7 minutes.

- **Installation Guidelines** - Install Item 1 according to the manufacturer's instructions. Both parts should contain serial numbers. Install Item 2 so that the nut or spin nut is threaded tightly against the hasp and the threads are damaged beyond repair.

- **Check, Inspect, and Record** - Once the seal is properly installed, verify and record the serial numbers and any other identification.

  During post-mortem examination, compare the removed seal with a sample seal. Inspect the internal parts of Item 1 (Figure 4-50) for signs of abrasion. Examine the head of the Item 2 bolt to verify that it has not been removed and replaced.

- **Unit Cost** - $0.20 to $1.35 (based on a quantity of 1,000).

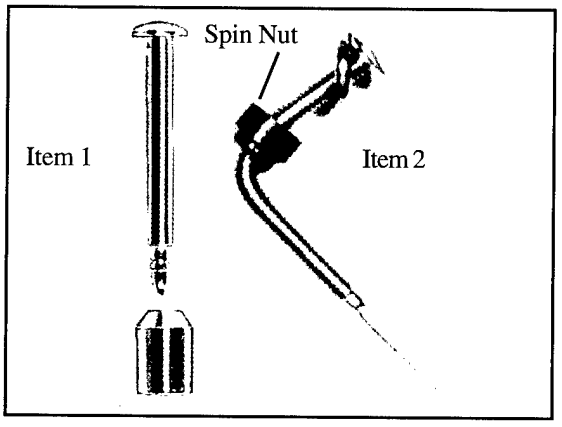



Figure 4-48. Bolt Style Seals

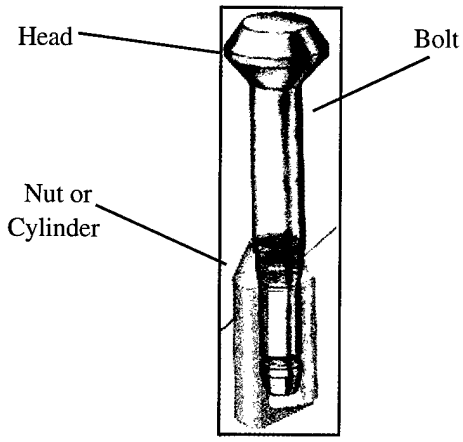



Figure 4-49. Bolt Seal Cutaway

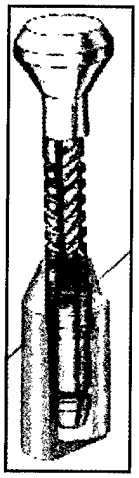


Figure 4-50. Bolt Internal Parts

**Clear Bolt Seal**

This clear bolt seal (Figure 4-51) uses polycarbonate plastic for all components. The observable clear locks make it a tamper evident seal. This is accepted as a high security seal.

This seal has two layers of locks with six locking elements. The clear locking stem has two locking barbed levers to prevent picking.

The serial numbers are embedded within the polycarbonate. According to the manufacturer, any attempt to alter could result in destruction of the seal's serial number area. The number is readable in 1/4-inch high alpha numeric characters. The serial number is also presented in a 1/4-inch high 3 or 9 bar code format.

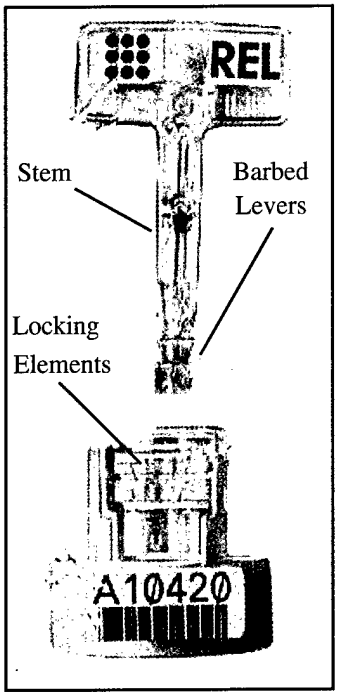



Figure 4-51. Clear Bolt Seal

- **Tamper-Resistance Summary** - Defeat of this seal will take a minimum of 3 minutes.

- **Special Installation Guidelines** - Install according to the manufacturer's instructions.

- **Check, Inspect, and Record** - Once the seal is properly installed, verify and record the serial numbers and any other identification. Since this bolt is constructed of clear plastic, carefully look at the internal parts for signs of discoloration or abrasion.

- **Unit Cost** - $0.40 to $1.60 (based on a quantity of 600).

**Snapper Bolt Seal**

The snapper bolt seal (Figure 4-52) consists of a solid steel bolt coated in plastic. The plastic shows evidence of tampering and protects against corrosion. The body contains a lubricant to hamper friction attack by spinning the body in a drill.

A plastic connection keeps the two parts that have the same serial number together until it is installed.

The snapper closes easily with finger pressure but requires a bolt cutter for removal.

- **Tamper-Resistance Summary** - Defeat of this seal will take a minimum of 3 minutes.

- **Installation Guidelines** - After installation pull the locking mechanism to verify that it is locked (Figure 4-53).

- **Check, Inspect, and Record** - Inspect the plastic cover for any marks of tampering. Feel the bolt under the plastic to check for any breaks in the steel bolt.

- **Unit Cost** - $1.18 (based on a quantity of 1,000).

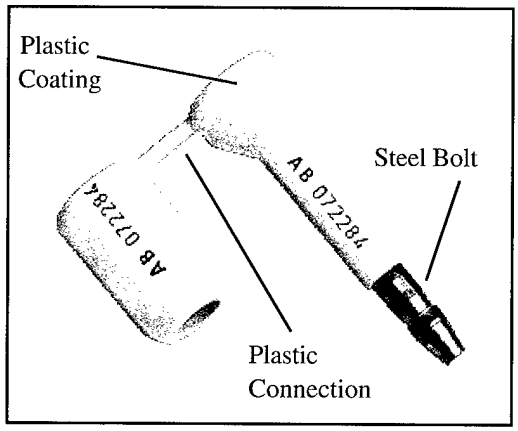



Figure 4-52. Snapper Bolt Seal

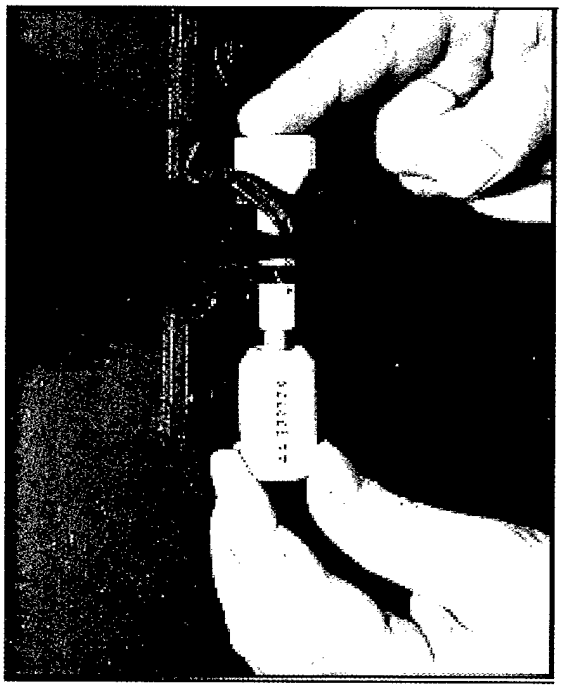


Figure 4-53. Snapper Bolt Seal Installation

## PADLOCK STYLE SEALS

Padlock style seals can be separated into three categories based upon the shackle construction of the padlock. These categories are:

- Plastic
- Steel (Figure 4-54)
- Wire

### Plastic Padlock Seal

The plastic padlock seals (Figure 4-55) are constructed of a one-piece plastic molded part that uses various locking mechanisms to secure the shackle. All padlock seals are self-locking. The materials generally used are polypropylene, polyethylene, and nylon.

- **Tamper-Resistance Summary** - Defeat of these seals will take a minimum of 15 seconds. Evidence of tampering will most likely be detected during careful examination of the seal.

- **Installation Guidelines** - During installation of the plastic padlock seals, pull the locking mechanism to verify that it is locked (Figure 4-56).

- **Check, Inspect, and Record** - Verify and record the serial number. Once the seal is properly installed, the shackle must have free play in the body.

During post-mortem examination, compare the removed seal with a sample seal. The shackle should be smooth-textured without signs of heat welding. All parts of the latching mechanism must be present. The shackle should break before the latching mechanism fails.

- **Unit Cost** - $0.02 to $0.04 (based on a quantity of 1,000).

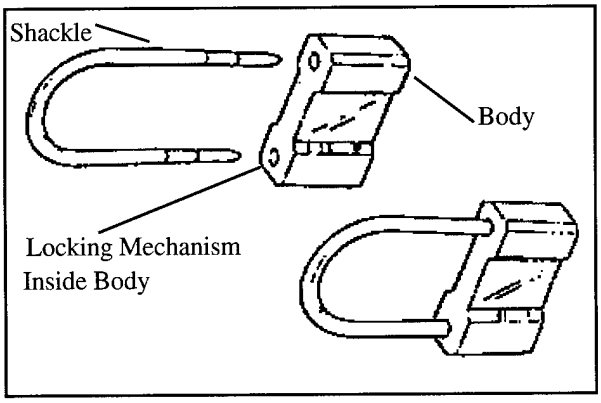



Figure 4-54. Steel Shackle Padlock (open)

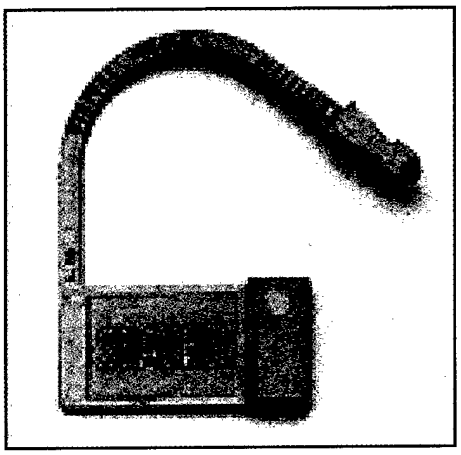


Figure 4-55. Plastic Padlock Seal, Actual Size

Insert seal arrow through opening to be sealed.

Push **arrow** into locking mechanism until arrow firmly engages locking teeth.

Gently pull seal to ensure seal is locked.

Figure 4-56. Plastic Padlock Seal Installation

**Steel Padlock Seal**

Lock seals are similar to padlocks without a key lock. The body of this steel padlock seal contains the locking mechanism and a hardened shackle is used with consecutive serial numbers stamped on the body (Figure 4-57).

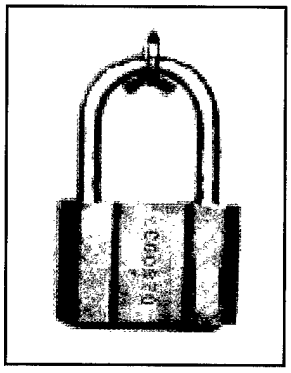


Figure 4-57. Steel Padlock Seal

- **Tamper-Resistance Summary** - Defeat of this seal will take 30 seconds.

- **Installation Guidelines** - Purchase with serial numbers on both the shackle and body of the lock seals. Install these seals according to the manufacturer's instructions.

- **Check, Inspect, and Record** - Once the seal is properly installed, verify and record the serial number.

  During post-mortem examination, compare the removed seal with a sample seal. The external seal surfaces should be free of any marks that might indicate forcible entry or tampering. Look for discoloration of the plastic. Look for heat weld spots. Compare the shackle and internal parts of the seal body with a sample seal. Examine for evidence of part replacement and repainting.

- **Unit Cost** - $1.35 to $3.75 (based on a quantity of 1,000).

**Wire Padlock Seal**

The plastic body wire shackle padlock seals (Items 1, 2, and 4 of Figure 4-58) consist of a plastic body with a solid steel wire shackle that is pushed into the plastic body. Attempts to withdraw the shackle cause the ends of the wire to become embedded in the plastic. The steel body wire shackle padlock (Item 3) uses the same principle as the plastic body wire shackle padlock except that the wire ends become trapped in the body due to the configuration of the steel stamping. All these seals can be procured with sequential serial numbers. Examples of wire padlock seals are presented in Figures 4-59 through 4-63.

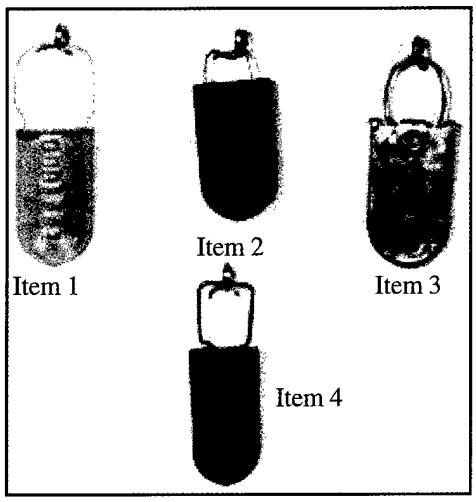


Figure 4-58. Wire Hasp Padlock Seal

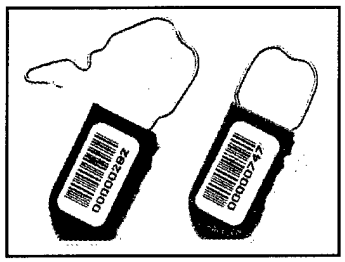


Figure 4-59. Wire Padlock with Bar Code

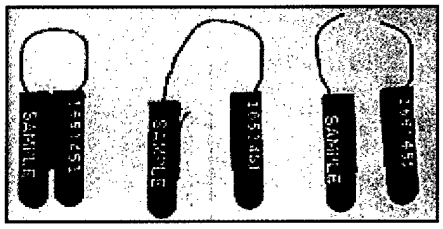


Figure 4-60. Split Wire Padlock Seal

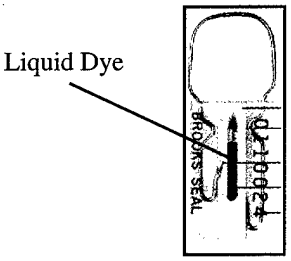


Figure 4-61. Wire Padlock Seal with Glycerin Dye in a Glass Vial Encased in Body

- **Tamper-Resistance Summary** - Defeat of these seals will take a minimum of 15 seconds and evidence of tampering may not be detected by post-mortem examination.

- **Installation Guidelines** - During installation of the wire hasp padlocks, pull the seal body to ensure that the wire is firmly embedded within the body.

- **Check, Inspect, and Record** - With the plastic body wire shackle padlock in place, there should be a minimum amount of free play between the wire and the plastic body. When the steel body wire shackle padlock is in place, make sure that 1/4 inch of free play is between the steel body and the wire. Verify the serial numbers for both plastic and steel padlocks.

During post-mortem examination, compare the removed seal with a sample seal. Carefully examine the parts to ensure that there are no signs of forcible entry. Examine the wire for abrasions that do not appear on the sample. Post-mortem examination of these seals may not provide conclusive evidence of tampering.

The wire padlock seal in Figure 4-58 splits when there is tampering to the seal. However, the shackle stays embedded in each side of the lock body. Cutting tools are necessary to remove this seal properly.

- **Unit Cost** - $0.03 to $0.27 (based on a quantity of 1,000).

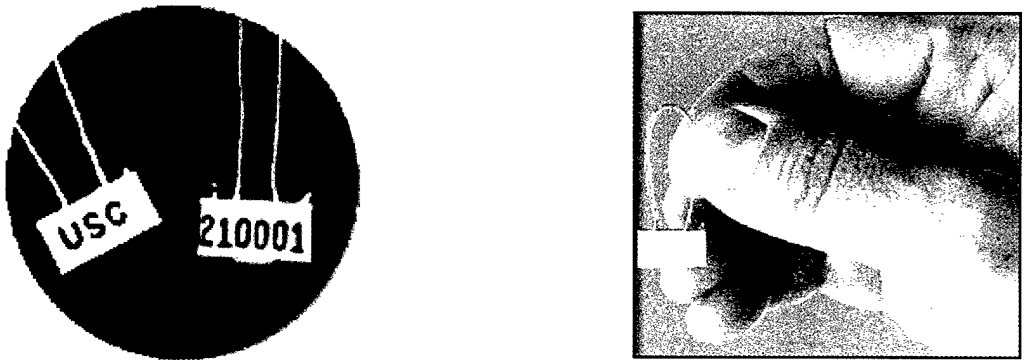



Figure 4-62. Uniplastic Wire Padlock Seal

1. This is the assembled open seal.
2. Thread wire through unit to be secured. Also thread wire through central plastic body.
3. Make U-turn with wire through small hole in plastic body.
4. Pull wire tightly with needle-nose pliers.
5. Separate plastic male locking unit or plug from plastic body.
6. Insert plastic male locking unit in bottom of plastic body until locked in place by pinching with needle-nose pliers.
7. Cut excess wire from top of the plastic body. Use the side cutters on the needle-nose pliers.
8. This is the completed seal on secured unit.

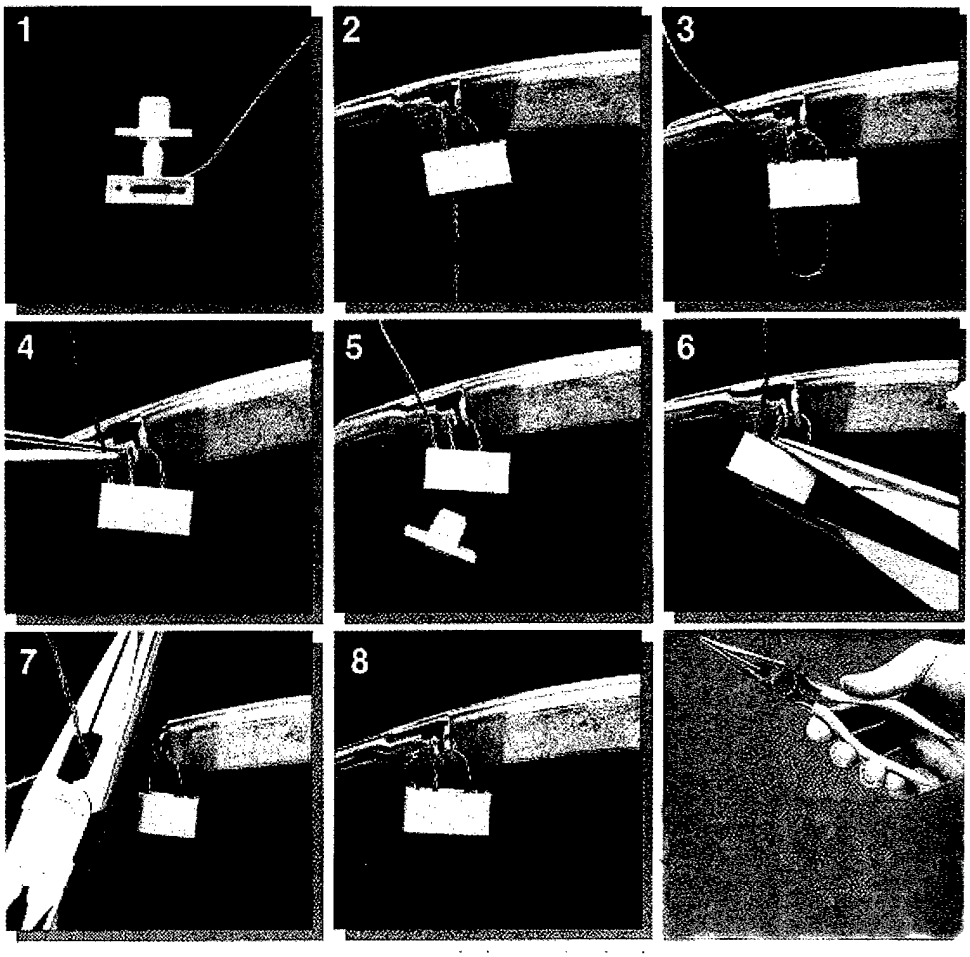



Figure 4-63. Uniplastic Wire Padlock Seal Installation

## CABLE STYLE SEALS

Cable seals (Figures 4-64 through 4-75) are high-strength security seals that use 3/16-inch or 1/4-inch aircraft cable. These seals are self-locking and employ locking mechanisms that consist of roller-incline, ball-incline, locking rings, and screw locks contained within steel bodies. All the seals can be procured with the company names and sequential serial number identification.

- **Tamper-Resistance Summary** - Defeat of cable seals will take a minimum of 30 seconds and most likely will not be detected by post-mortem examination.

- **Installation Guidelines** - Install Items 1 and 2 so that the length of the cable threaded through the hasp is minimized, making a tight fit on the object being sealed (Figure 4-66). Purchase with serial numbers on both parts of Items 2 and 4.

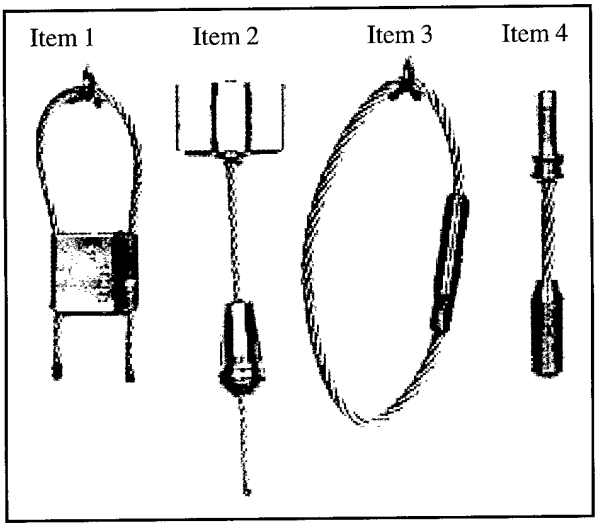



Figure 4-64. Cable Style Seals

- **Check, Inspect, and Record** - Once the seal is properly installed, verify and record the serial numbers and any other identification.

During post-mortem examination, compare the removed seal with a sample seal and carefully inspect the exterior and interior surfaces to detect tampering. Examine the body of Item 2 for a small hole drilled into the end. Obtain tensile test data for Item 3 seals that have not been tampered with and give all removed seals the same tensile test. A significant drop in tensile strength is a good indicator of seal defeat. Examine the body of the Item 4 seal internally and carefully compare with a sample for unusual signs of abrasion.

- **Unit Cost** - $0.55 to $1.60 (based on a quantity of 1,000).

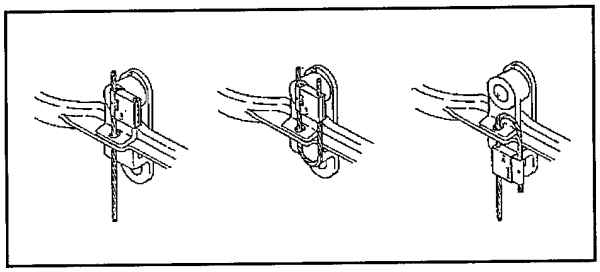


Figure 4-66. Cable Installation

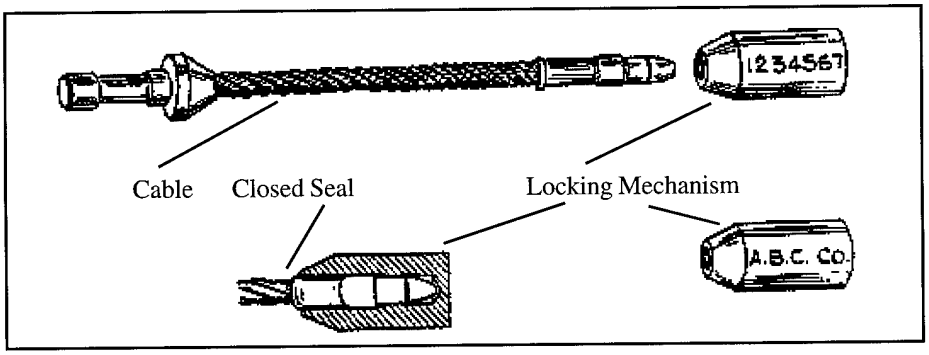



Figure 4-65. Cable Cutaway View

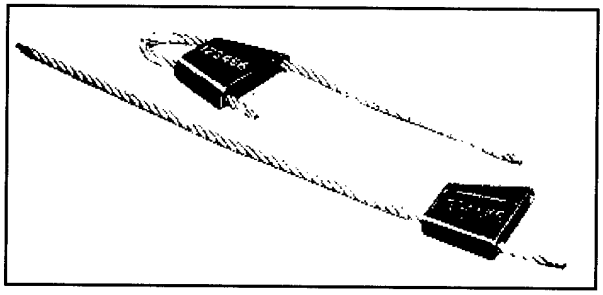


Figure 4-67. Taper Lock Cable Seal

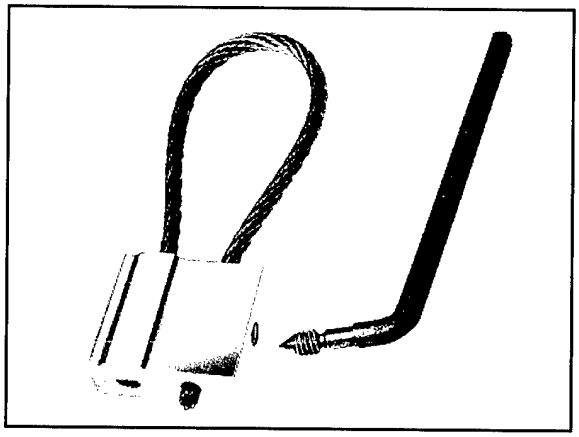


Figure 4-70. Cable Lock with Installation Tool

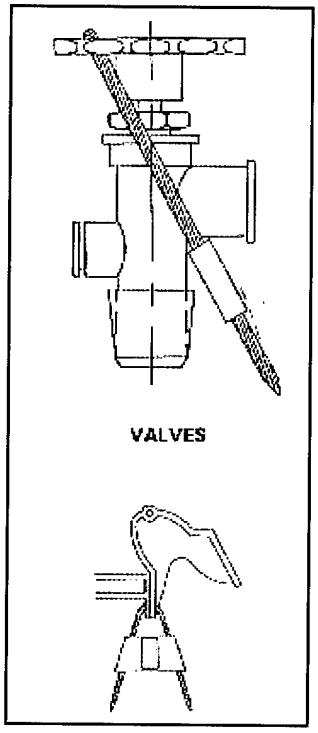
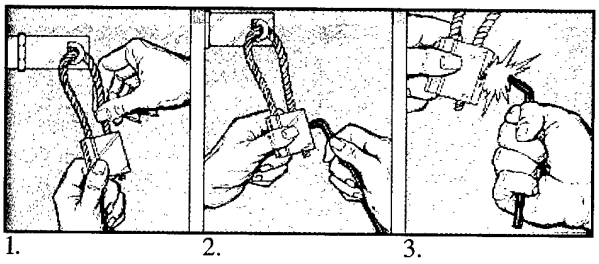



Figure 4-68. Taper Lock in Use




1. Place cable end through locking area and then through body hole with the end extending slightly below the case bottom.
2. Place threaded screw end of locking device in the threaded hole on the case side and screw in tightly.
3. Break off the handle with sudden pressure. Screw head remains tightly recessed in hole, securely locking the cable in place. Dispose of the handle piece.

Figure 4-71. Cable Lock Installation

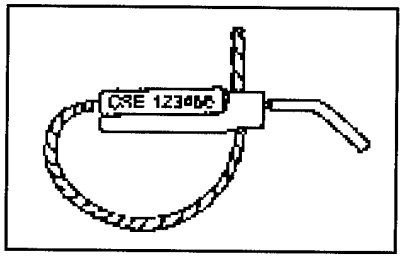



Figure 4-69. Mini Lock Cable Seal

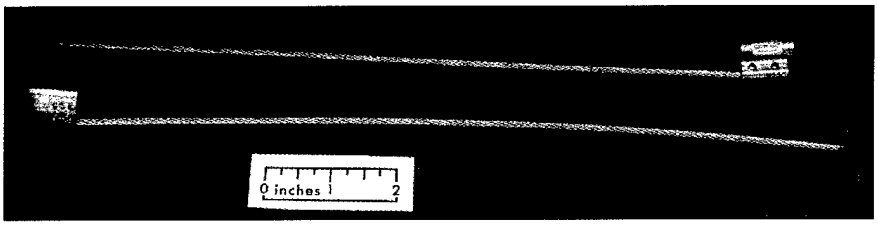



Figure 4-72. EZ Lock Cable Seal

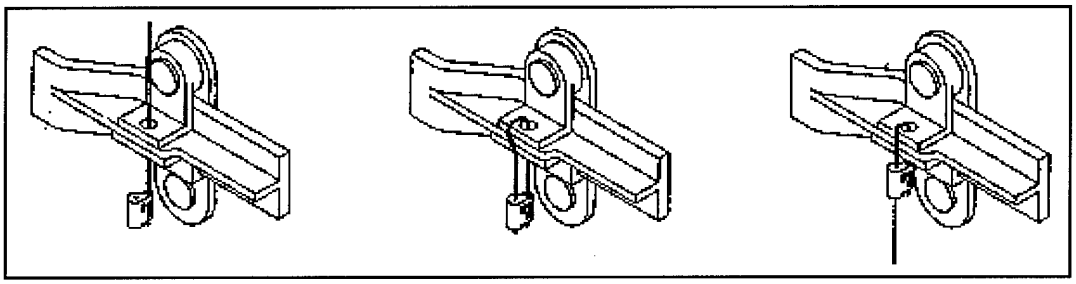


Figure 4-73. EZ Lock Installation

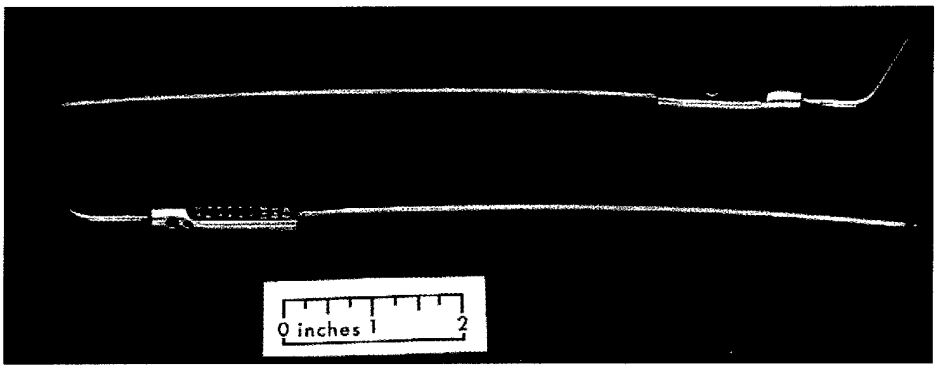



Figure 4-74. Mini Lock Cable Seal

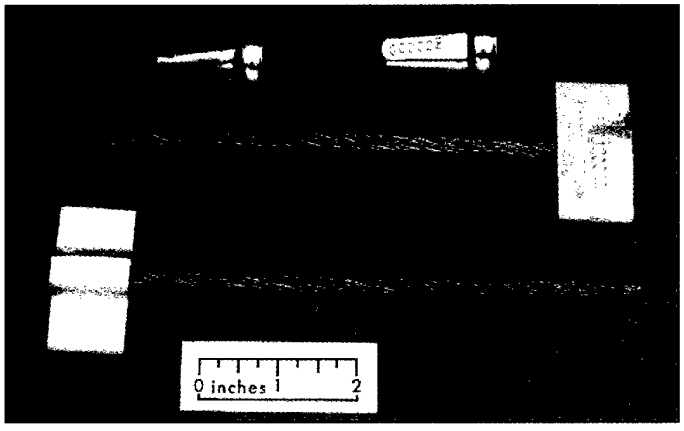



Figure 4-75. Cone Flag Cable Seal

# CHAPTER 5
# SEAL CONTROL

## INTRODUCTION

This chapter provides a general framework for developing the procedures and other elements of a seals control program. Modify the procedures to fit your overall security program.

## DOCUMENTATION

Document all seal program procedures. Have written instructions for every aspect of the seal control program so each person can look up any information regarding his/her duties within the program.

## TRAINING

Develop a program to train seal personnel. There are some suggestions for a training program in this chapter in Personnel and Roles.

Keep a list of all personnel that have been trained in the use of seals.

## PERSONNEL AND ROLES

Identify the personnel involved in the seal program. The size and complexity of the facility will determine how many personnel will be necessary. In a small operation, an individual can perform more than one role. Separate the important functional areas such as record control, seal administrator, seal application, and seal inspection. Suggested roles are discussed below.

### Vendor

The vendor is the manufacturer or distributor from whom the seals are purchased.

### Buyer

The buyer is the person or group responsible for purchasing and receiving the seals.

### Seal Administrator

In a smaller operation, the seal administrator and seal custodian can be combined. The roles include the following:

- Approves seals that are shipped by the vendor.
- Responsible for maintaining the seal supply and the associated records concerning the receipt and distribution of the seals.
- Reviews and approves all forms and procedures used for the accountability of seals.
- Periodically reviews seal control procedures to ensure compliance with approved seal procedures
- Designates authorized seal users.
- The person(s) in the operations area responsible for receipt and distribution of the seals and the associated documentation.

### Seal Custodian

The seal custodian:

- Receives seals from the seal administrator.
- Maintains a seal issuance log to record distribution of seals to subordinate units or applicators.
- Protects unissued seals and seal accountability records to prevent unauthorized seal substitution or illegal use.
- Controls keys for seal containers and accountability record containers.
- Controls installation tools.
- Ensures that the organization's seals are not issued to another organization.

### Seal Applicator/Remover

The seal applicator/remover is the person(s) trained in the correct procedures for using, applying and removing seals. The seal applicator:

- Receives seals from the seal custodian.
- Applies seals.

- Removes seals.
- Destroys seals.
- Forwards seals for post-mortem inspection.

Test the seal applicator/remover trainee after training. The following is a suggested test:

1. Apply two seals correctly in succession.
2. Test the integrity of each seal.
3. Remove each seal according to approved procedures.

The seal applicator/remover must demonstrate an understanding of the appropriate procedures such as what to do if there is seal breakage, how to record serial numbers, how to depose of used seals, and all other data flow pertaining to the seals.

To help ensure that seal applicators maintain a necessary level of proficiency, conduct periodic evaluation to determine their current knowledge of the seal program and their ability to apply and remove seals.

The seal applicator sends the seal custodian all information concerning the receiving, application, and removal of seals.

### Seal Inspector

In a facility with a small number of personnel, this function could be combined with the applicator/removal personnel. The seal inspector has the following roles:

- Inspects installed seals
- Audits seal records
- Reviews procedures
- Checks inventory
- Performs post-mortem inspection of removed seals
- Destroys seals or returns them to the seal administrator

Train the personnel who will be inspecting seals in inspection procedures and all the likely and most pertinent methods of defeating seals. Use caution in discussing this information so potential perpetrators will not get this information.

The seal inspector sends the seal custodian all information concerning the inspection and destruction of seals. Some seal plans require that destroyed seals be returned to the seal administrator. The destroyed seals should be logged against the inventory.

## PROCUREMENT

Figure 5-1 is an example of some seal control measures that could be incorporated into procurement procedures. In this illustration, the seals are shipped from the manufacturer in sealed plastic bags that have tamper indicating features and inventory and control logs.

Do not accept seals unless they meet the standards, specifications, and identification requirements of Federal Specification FF-S-2738. Testing may be done by the manufacturer, an independent laboratory, or by the DoD. Provide a procedure to question the quality of the seals if the seals seem unsatisfactory.

Require a vendor statement from the vendor that the seals have unique characteristics such as sequential serial numbers, logos, etc., and that these unique characteristics will not be provided to another customer without approval from the purchaser.

Require a statement by the manufacturer with each shipment of seals stating that those seals meet specifications and quality assurance requirements of Federal Specification FF-S-2738. An example of a manufacturer's statement is shown in Figure 5-2.

Review the manufacturer's statement and inspect the seal samples when received.

Accompany this statement with the following:

- Samples of the seals.
- A copy of any sales brochure or advertising material describing the seal and its use.
- An illustration or photograph of the seal that is suitable for Xerox copying to give to seal personnel.

Any extra seals will be given to the seal administrator.

Ensure that there are security requirements at the vendor's facility, such as stock control, die or mold control, access to product, item accounting, and background investigations of vendor employees

## STORAGE

After the seals are purchased and received, use the following storage procedures:

- Secure all unissued seals in a controlled area.
- Document personnel who have access to this area.

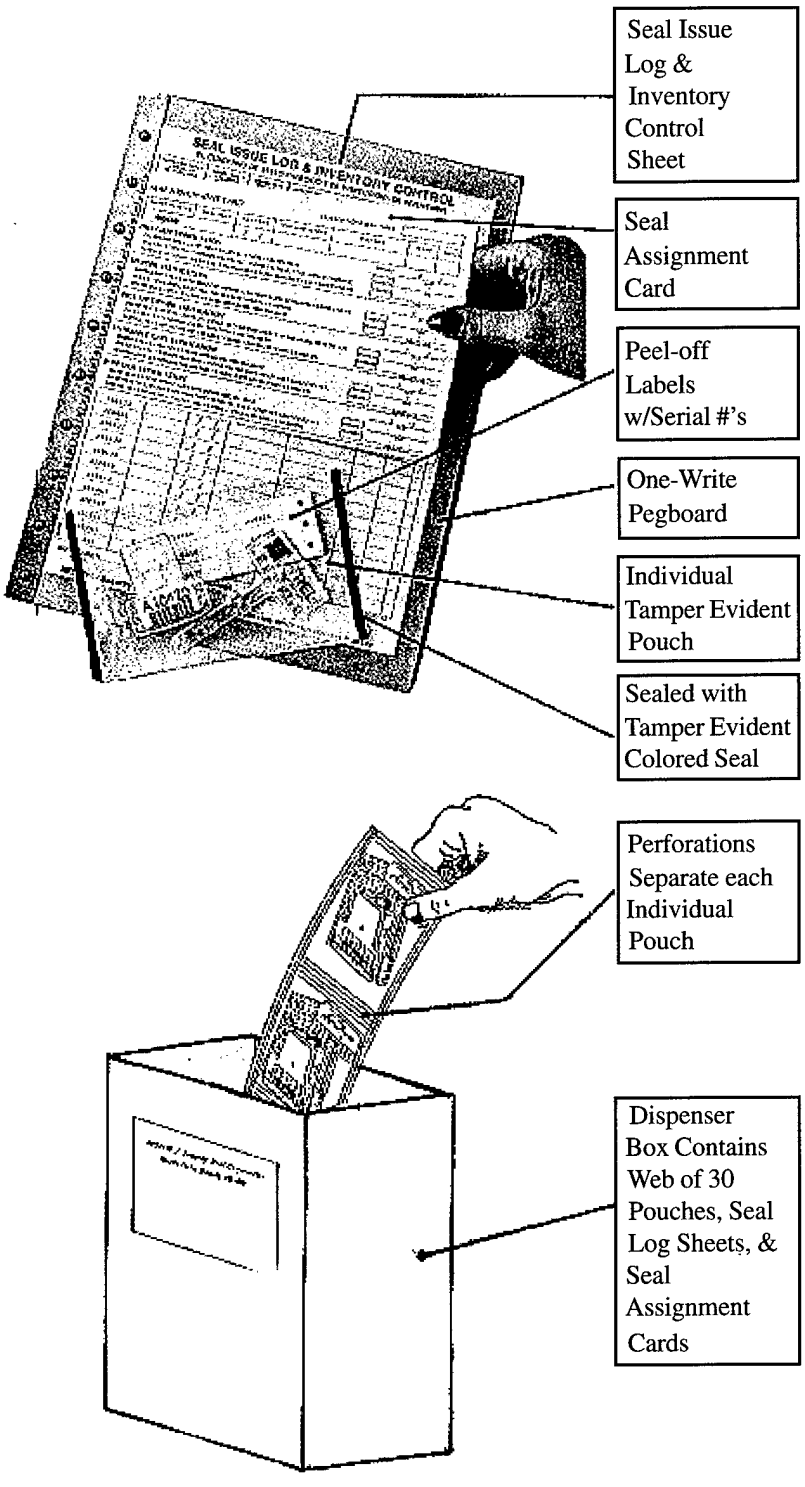



Figure 5-1. Example of Control of System Components

## MANUFACTURER STATEMENT

## COMPANY NAME AND ADDRESS

Seal Indentification

Seal Model Number: _____

Type of Seal: _____

Manufacturer's Part Number: _____

An artist's rendition or other pictorial representation of the seal is attached to this attestation. Also, six or more samples and advertising material for the seal are forwarded herewith for your inspection.

Tests of this seal were performed by (show name and address of the company or testing laboratory performing the test):

I hereby attest that the designated seal described above and depicted on the attachment meets or exceeds the United States Department of Defense seal standards, specifications, and identification requirements of the Department of Defense Regulations.

Signature and title of the person making the attestation:

Name: _____

Title: _____

Date: _____

Figure 5-2. Example of Manufacturer's Statement

- Maintain a record of all seal serial numbers.
- Maintain a file of Letters of Authority for using seals.

## ACCOUNTABILITY

Maintain a record for each type of seal, serial number, date used, item applied to, and the personnel who applied and verified the application of the seal.

- Maintain one log book for seals being issued.
- Use hard cover books; not loose-leaf books.
- Distribution log should contain the following:

  - Seal identification number or mark
  - Date and time the seal is applied
  - Designation or number of the item sealed
  - Destination, if the sealed container is being shipped
  - Name of the person applying the seal
  - Driver's name, if applicable

If the item is being delivered and the driver is not part of the shipper's organization, make the goods-inventory count and the seal application in the presence of the shipper's representative. Have the driver write on the bill of lading, or on the shipping order, the seal number applied to the shipped item, truck, container, or train, then sign it. Transfer seal information electronically to the receiving station.

## INSTALLATION

Once seals are distributed for use, they must be applied as soon as possible. When applying a seal, record the seal data. Include the following:

- Type of seal
- Seal number
- Material identification
- Location and identification of container
- Identification of person applying seal
- Identification of person witnessing application where a two-party program is in place
- Date

Obtain verification by the seal custodian that the information is correct and complete.

Establish a detailed procedure for applying seals for each type of seal and container. A suggested application procedure could be similar to the example in Figure 5-3.

Unused seals must be returned to the seal custodian for accountability and control.

## INSPECTION

Create a regular schedule for inspection of installed seals or a sampling if there are numerous seals in use. It is best to inspect each seal. There should be an audit of records, review of procedures, and an inventory count.

Make a post-mortem examination on the seal or at least a 10% sampling of the seals, depending upon your specific application.

## RESPONSE TO SEAL ANOMALIES

Conditions that require a response:

- Missing seal
- Open or disabled seal
- Seal number discrepancy
- Damaged seal
- Improperly applied seal
- Unauthorized seal
- Uncontrolled seal
- Uncontrolled seal records
- Questionable condition or appearance of seal
- Detection of foreign material not associated with seal
- Any other anomalies or suspicious condition

The individual(s) discovering the violated seal should notify the supervisor of this situation immediately and report the seal condition, container location, and seal identification number.

Determine if a violation has occurred. Take appropriate action, and verify of the contents of the violated container, if necessary.

If the condition that caused the seal to be violated has been determined, apply a replacement immediately.

Hold a suspect seal until investigation has resolved the situation and the seal administrator approves disposal of the seal.

Should it be necessary to break a seal before its arrival at the final destination, record the following information:

- The name of the person breaking the seal
- The reason for breaking the seal
- The time and date the seal was broken
- The serial number or identifying mark of the broken seal

## PROCEDURE FOR APPLICATION OF CUP WIRE SEAL

1. Obtain the following material:

   a) Cup wire seals (tops and bottoms)
   b) Seven-by-seven (49 strand), 175-pound braided wire
   c) Crush-type sleeves
   d) Electrician pliers (capable of crimping collars) and a pair of wire cutters.

2. Check that serial numbers of the seal bottom and top cups are identical.

3. Cut the required amount of wire from the roll. Exact length will depend on the container to be sealed.

4. Apply the seal to a location that will ensure that the container cannot be opened without destroying the seal.

5. Run the wire through the fixture and bring the ends to equal length. Always remove any slack in the wire by pulling it finger tight.

6. Run the wire ends through the holes in the numbered cup.

7. Slip the cup down the wire until it is in position near the fixture.

8. Place the ends through a sleeve.

9. Pull the ends of the wire to move the sleeve into position near the seal top.

10. Use electrician pliers to crush the sleeve firmly on the wire.

11. Trim the wire ends, leaving approximately 1 inch beyond each sleeve end.

12. Loop the remaining ends of wire into the inner cup, then pull on the cup while pushing the wire and collar into the inner cup, ensuring that there is no interference with closure of the seal.

13. Place the bottom cup over the top cup and apply firm pressure with the fingers around the rim of the bottom to ensure full closure.

14. Inspect the seal and wire. If the wire was damaged during application or full closure was not achieved, cut the wire, remove the seal (according to the cup wire seal removal procedure), and apply another.

15. Complete the material identification, location, seal number, and date portion of the seal application form.

Deliver the application form with both applicator and witness signatures to the seal custodian.

Figure 5-3. Example Installation Procedure for Cup Wire Seal

- The serial number or identifying mark of the replacement seal
- The names of witnesses to the breaking of the seal

Report the broken seal to security personnel regardless of where the seal is in transit

## REMOVAL AND INSPECTION

To ensure the integrity of a seal, physically inspect the seal before its removal. Some of the applicator/remover duties may overlap with that of the seal inspector because before the seal is removed, it must be inspected for indications of tampering.

Only authorized personnel may remove seals. Before removing the seal:

1. Provide a detailed procedure for removal of each type of seal. An example of this procedure could be similar to Figure 5-4.

2. Enter on the seal log the name, serial number, and all coding information appearing on the seal. Verify that it is the original seal from the manifests. An example of a Seal Application and Removal Form is shown in Figure 5-5.

3. Check for strange marks and tampering. Make sure the seal has not been shortened or falsely sealed.

4. Pull and twist the seal to the left and right to ensure that the seal head has not been violated.

5. Report any discrepancy to the proper personnel, as well as recording the discrepancy in the seal log.

6. Report any evidence of theft to the security department and start an investigation, regardless of the time of day.

7. Recommend findings be photographed.

8. Have a witness to the seal removal.

## DISPOSAL

Destroy or archive seals after use in such a way that the parts of a used seal cannot be used to tamper with seals that are in use. For example, with metal seals, significant destruction such as massive smashing, crushing, cutting, or drilling is necessary to prevent seal or part of a seal reuse. Dispose of contaminated seals with other contaminated waste. Some seals can be disposed of with classified or sensitive parts waste. Of course, your application may be different.

## ACCOUNTING

Design information, serial numbers, identifying marks, or logo so there can be no replication, depending on the application.

Use a chain of custody log or seal accountability log when seals transfer from one area of custody to another or one person to another. Figure 5-6 is an example of a seal accountability log.

Use audits to show weaknesses or problems with the seals or the seal program.

Conduct scheduled and unscheduled independent audits at least annually. The auditors should not be associated with the seal program. Have the auditors check the serial numbers of the seals against the log books and seal inventory of unused seals. Identify and correct weaknesses in the seal program. Investigate discrepancies in the seal inventory. Verify seal applications and destruction. Check for a deviation from established procedures.

## PROCEDURE FOR REMOVAL OF CUP WIRE SEALS

1. Before removing a cup wire seal, an authorized seal inspector should verify that:

   a) The seal is not broken, damaged, or improperly applied.

   b) The seal number corresponds to the number on the seal log for that container.

   c) There should be a witness to the seal removal and that witness must sign documentation.

2. If the inspection fails to verify a) or b) above, the seal applicator/remover will initiate the required response procedure.

3. To remove the seal, cut the wire at least 2 inches away from the seal, then the seal and wire are removed from the container.

4. The seal applicator/remover will record the date the used seal is removed, examine it for tampering and incorrect application, then give the seal to the seal inspector.

5. The seal inspector will perform a post-mortem inspection on the seal.

6. Dispose of seal consistent with procedures for disposal of seals. Record the date of disposal in the seal accountability records.

7. The seal applicator/remover will deliver the seal removal form to the seal custodian as soon as possible.

Figure 5-4. Example Removal Procedure for Cup Wire Seals

# SEAL APPLICATION AND REMOVAL FORM EXAMPLE

| | | | Check One | | | | | |
|---|---|---|---|---|---|---|---|---|
| Seal Serial # | Container ID | Location | Applied | Voided/Removed | Seal Type | Applicator | Witnessed By | Date |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

Seal Custodian Signature_____Date_____

Figure 5-5. Seal Application and Removal Form Example

# SEAL ACCOUNTABILITY LOG

| Seal ID # | Signature of Recipient | Badge Number | Location Issued | Date | Time | Check One | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Disassembly | New Receipt | Seal Replacement | Voided (Broken in Application) |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

Figure 5-6. Seal Accountability Log Example

# BIBLIOGRAPHY

American Society for Testing and Materials. ASTM F1157: Standard practice for classifying the relative performance of the physical properties of security seals.

American Society for Testing and Materials. ASTM F1158: Standard guide for inspection and evaluation of tampering of security seals.

American Society for Testing and Materials. ASTM F946: Guide for establishing security seal control and accountability.

Federal Specification FF-S-2738: Seals, antipilferage.

Federal Specification FF-S-2738A (Proposed): Seals, antipilferage.

Naval Air Systems Command (1995). NAVAIR Container, crate, cradle, pallet, and pallet adapter identification compendium, Jan 1995.

Naval Civil Engineering Laboratory (1988). Navy lock and key control guide (ashore). Port Hueneme, CA, Jun 1988.

Poli, David L. SAND78-0478: Security seal evaluation for tamper-resistance, Sandia Laboratories, Albuquerque, NM (to be published), CNSI.

Sastre, Cesar (1969). The use of seals as a safeguard's tool, Technical Support Organization, Brookhaven National Laboratory, Upton, Long Island, NY, Mar 1969.

United States Atomic Energy Commission (1974). Regulatory Guide 5.15: Selection and use of pressure-sensitive seals on containers for on site storage of special nuclear material, Jan 1974.

United States Customs Service (1989). Customs seal manual, Sep 1989.

United States Department of Energy. DOE Order 5630.1: Control and accountability of nuclear materials (rough draft).

# Appendix A
# GLOSSARY

| | |
|---|---|
| **Anomalies** | Irregular or abnormal. |
| **Antipilferage Seal** | A device or material that indicates tampering or entry into a secured area. Also termed seal, tamper indication device (TID), security seal. |
| **Attack** | An attempt to gain access to what the seal is protecting without being detected. |
| **Compromise** | In this guide, this means any action by which a seal can be opened and re-closed, using the original parts, with commercially available hand tools, or very simple instruments (shims, wire, etc.). |
| **Defeat** | A successful attack. A seal has been broken. |
| **Container** | In this guide, a container is a receptacle for holding or carrying material, an enclosure, or an enclosed area. |
| **Control** | To verify and regulate. |
| **Covert** | To open a seal and replace it with a counterfeit seal or to change the seal control records to hide that the seal was replaced. |
| **Fingerprinting** | A unique mark inside or outside a seal. |
| **Seal** | See Antipilferage Seal. |
| **Seal Control Program** | A set of procedures that will control seals. |
| **Locks** | Devices that hold an object fast by interlacing material or interlocking parts. Parts that engage with one another to hold fast. A device that is used, as on a door, to close, hold, or secure, and that is operated by various means, such as a key or combination. |
| **Post-Mortem Examination** | After a seal is removed, the internal parts are examined. |
| **Surreptitious** | Secret, clandestine, stealthy means. |
| **Tags** | Device or material used to identify, classify or label. |
| **Tamper** | An attempt to compromise a seal. |
| **Unauthorized Seal** | A seal that has not been approved. A counterfeit seal. |
| **Uncontrolled Seal** | A seal that is not properly part of a seal control program. A seal that is not documented. |
| **Verification** | To prove the truth by presenting evidence. To make sure that a seal is installed correctly and its identifying markings match with seal records. To confirm the contents of a con tainer. |

# Appendix B
# SPECIFICATIONS

The price ranges in Table B-1 show relative costs of the seal types and is not meant to be used for ordering. These prices are the approximate cost per unit as of the date of this publication and do not reflect the total system costs such as cost of personnel training, application, removal, and destruction.

The minimum time estimate for each seal in "Defeat Time" is the amount of time it takes to open and re-close the seal using the original parts with commercially available hand tools or very simple instruments, for example, shims or wire. This time is based upon the results of testing a specific seal in optimal conditions using an adversary proficient in performing the defeat.

The "Difficulty" column of this table shows the difficulty of seal application and/or removal. The ratings are as follows:

| | | |
|---|---|---|
| **E** | **Easy** | Requires no tools to install or remove |
| **M** | **Medium** | Requires a tool |
| **Df** | **Difficult** | Requires special tools |

Strength test results are presented in Table B-2.

# Seal Specifications

## Table B-1. Seal Specifications*

| | | | | |
|---|---|---|---|---|
| $ Price in U.S. dollars in quantities stated | **L** - Length | **LB** - Locking Body | **LR** - Locking Ring | **M** - Medium |
| **D** - Diameter | **TS** - Tensile Strength in pounds per sq. inch. | **H** - Head | **BS** - Break Strength | **Df** - Difficult |
| **W** - Width | **PS** - Pull Strength in pounds per sq. inch | **S** - Shaft | **E** - Easy | |

| Seal Type | Seal Price Range ($) (per 1,000 Unless Noted) | Dimensions | Strength | Environmental Test | Defeat Time | Difficulty | Figure |
|---|---|---|---|---|---|---|---|
| **Crimp Wire** | | | | | | | |
| Steel Disk | $0.02 to 0.07 | D 3/4" | PS less 200 | TBD | 30 seconds | Df | 4-4 |
| Aluminum Roll-Over | 0.02to 0.07 | D 3/4" | PS less 200 | TBD | 30 seconds | Df | 4-6 |
| Aluminum Crimp | 0.02 to 0.07 | 3/4" x 3/4" | PS less 200 | TBD | 30 seconds | Df | 4-10 |
| Aluminum Sleeve | 0.02 to 0.07 | 1/2" x 1/2" | PS less 200 | TBD | 30 seconds | Df | 4-11 |
| Roto-Seal | 0.25 | 3/4" x 3/4" | PS less 200 | TBD | 30 seconds | Df | 4-16 |
| Fold Wire | 0.02 to 0.07 | 1-1/16" x 7/8" | PS less 200 | TBD | 30 seconds | E | 4-19 |
| Cup Wire | 0.40 to 0.59 | D 1" | PS less 200 | TBD | 30 seconds | M | 4-25 |
| Tik A & An | 0.11 to 1.03 | 2-1/4" x 7/8" | PS less 200 | TBD | 15 seconds | E | 4-28, 4-29 |
| **Strap Style** | | | | TBD | | | |
| Plastic Tie | 0.05 to 0.06 | 5-3/8" to 6-7/8" | PS less 200 | TBD | 10 seconds | E | 4-31 |
| Car Box | 0.1 to 0.02 | L 8-1/4"L x W 3/8" | (See Table B-2) | TBD | 30 seconds | E | 4-34 |
| Car Plastic | 0.03 to 0.07 | L 5" to 7" | PS less 200 | TBD | 15 seconds | E | 4-37 |
| Car Ball | 0.03 to 0.04 | L 8 " | (See Table B-2) | TBD | 30 seconds | E | 4-46 |

* These are manufacturer's specifications.

## Table B-1. Seal Specifications *Continued*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Bolt Style** | $0.20 to 2.35 | | | TBD | | | 4-49 |
| Unthreaded Pin | 0.90 | S 3/8", H 3/4" | PS 4000, TS 79,000 | TBD | 30 seconds | M | 4-49 |
| Threaded/Regular Nut | 0.90 | S 3/8", H 3/4" | PS 4000, TS 79,000 | TBD | 5 minutes | M | 4-49 |
| Threaded/Spin Nut | 1.00 | S 3/8", H 3/4" | PS 4000, TS 79,000 | TBD | 7 minutes | M | 4-49 |
| Rod -Lok II | 1.30 each | S 3/8", H 3/4" | PS 4000, TS 79,000 (See Table B-2) | TBD | 7 minutes | M | 4-49 |
| Trans Lok | 2.35 each | S 3/8", H 3/4" | PS 4000, TS 79,000 (See Table B-2) | TBD | 5 minutes | M | 3-4 |
| Modified Rod-Lok II | 1.30 each | S 1-1/2" | PS 4000, TS 79,000 (See Table B-2) | TBD | | M | 3-2 |
| Straight Rod Lok III | 1.25 each | S 5/16", H 7/8" | PS 4000, TS 79,000 | TBD | | M | 2-4 |
| Multiple Snap Lock | 1.09 | LB 3/4", H 3/4", D 5/16 | TS 3417 | TBD | | M | 3-7 |
| Clear | 0.40 to 1.60 per 600 | L 4" | PS 3,000 | TBD | | M | 4-53 |
| Snapper | 1.18 | L 4-1/2" | PS 3,000 | TBD | | M | 4-54 |
| **Padlock Style** | | | | TBD | | | 4-56 |
| Plastic | 0.02 to 0.04 | W 1-1/2", L 3/4 | Less 200 | TBD | 15 seconds | E | 4-57 |
| Steel | 1.35 to 3.75 | Various | Greater 3000 | TBD | 15 seconds | M | 4-61 |
| Wire | 0.03 to 0.27 | 3" x 1" | Body BS 100 lb | TBD | 15 seconds | E | 4-62 |
| **Cable Style** | 0.55 to 1.60 | | | TBD | | M | 4-68 |
| Taper Lok | 1.25 | L 12", D 3/16" | PS 3,000 | TBD | 30 seconds | M | 4-71 |
| Model A | 2.65 | L Various, D 1/4" | YS 71,000, TS 79,000, LRTS 321,000, BS 7,000 (See Table B-2) | TBD | 30 seconds | M | 3-2 |
| Model B | 2.35 | D 1/4", L 2" | YS 71,000, TS 79,000, LRTS 321,000 (See Table B-2) | TBD | 30 seconds | M | 4-69 |

## Table B-2. Strength Test Results*

| Seal | Pull Room Temp. | Shear | Bend | Pull Heated 180°F |
|---|---|---|---|---|
| **Strap Style** | | | | |
| Car Box Galvanized | 131 | Less 200 | 17 | 144 |
| Car Box Tin | 139 | Less 200 | 12 | 140 |
| Car Ball Galvanized | 288 | Less 200 | 97 | 246 |
| Car Ball Tin | 303 | Less 200 | 69 | 218 |
| **Bolt Style** | | | | |
| Rod-Lok II | 3466 | 5343 | 54.39 | 3358 |
| Modified Rod-Lok II | 4403 | 9063 | 121.2 | 3878 |
| Trans Lok | 3801 | 12,290 | 139.8 | 3551 |
| **Cable Style** | | | | |
| Model A | 4941 | 3266 | 2001 | 4840 |
| Model B | 2253 | 3266 | 2001 | 2150 |

* In pounds per square inch. Strength test results performed by Engineering Testing Laboratory at Tri-State University, Indiana. These tests were performed in accordance with ASTM Specification F 1157-90.

# Appendix C
# SEAL MANUFACTURERS

**NOTE:** This is only a partial list

**NOTE:** Any reference to a manufacturer is included only to illustrate a piece of equipment. It is not intended to be a recommendation or an endorsement of any product or company.

**3M ID AND CONVERTER SYSTEMS DIVISION**
3M Center Building 229-7M-03
Saint Paul, MN 55144-1000
(612) 733-9343

**A.C. GIBSON COMPANY**
875 Englewood Avenue
P.O. Box 89
Buffalo, NY 14223
(716) 838-5960

**ADVANTAGE TECHNOLOGY, INC.**
1809 Olde Homestead Lane
Lancaster, PA 17605
(717) 293-4110

**AQUILA TECHNOLOGIES GROUP, INC.**
8401 Washington Place, NE
Albuquerque, NM 87113
(505) 828-9100
(505) 828-9115 FAX

**AMERICAN CASTING & MANUFACTURING CORPORATION**
51 Commercial Street
Plainview, NY 11803
(516) 349-7010

**BRAMMALL, INC.**
P.O. Box 208
1100 Wohlert Street
Angola, IN 46703
(219) 665-3176

**DICKEY MANUFACTURING COMPANY**
1315 East Main Street
St. Charles, IL 60174
(630) 584-2918

**E.J. BROOKS COMPANY**
164 North 13th
Newark, NJ 07107
(800) 458-SEAL
(201) 483-0335
(201) 483-1936 FAX

**ELC SECURITY PRODUCTS, INC.**
530 11th Avenue
San Diego, CA 92101-7220
(800) 37-SEALS
(619) 234-0523 FAX

**ENCRYPTA ELECTRONICS LTD.**
5 Gold Tops, Newport
Gwent NP9 4PG
United Kingdom
+44 (0) 16330265551
+44 (0) 16330265667 FAX

**J. J. KELLER & ASSOCIATED, INC.**
145 West Wisconsin Avenue
P.O. Box 368
Neenah, WI 5457-0368
(800) 558-5011 x208

**MEYERCORD**
365 East North Avenue
Carol Steam, IL 60188
(708) 682-6251
(708) 682-6345 FAX

**PETER MANGONE, INC.**
12687 West Cedar Drive, Suite 100
Lakewood, CO 80228
(800) 338-2448

**PORTER SAFETY SEAL COMPANY**
9230 West Grand Avenue
Franklin Park, IL 60131
(312) 455-8050

**RELCOR, INC.**
P.O. Box 14402
North Palm Beach, FL 33408-0402
(407) 624-3227
(407) 624-3228 FAX

**SPANSET, INC.**
P.O. Box 2828
3125 Industrial Drive
Sanford, NC 27330
(919) 774-6316

**STOFFEL SEALS**
400 High Avenue P.O. Box 825
Nyack, NY 10960
(914) 353-3800
(914) 353-3876

**THE TYDEN SEAL COMPANY**
210 North Industrial Park Road
Hastings, MI 49058
(616) 945-9501
(616) 945-9599 FAX
(800) 968-9501

**UNITED SEAL COMPANY**
17807 South Hobart Boulevard
Gardena, CA
(213) 321-4390

**UNITED SEAL COMPANY**
2000 Fairwood Avenue
Columbus, OH 43207
(614) 443-7633

NOTES

## User Guide's Comments/Suggestions

(Instructions: Fold on lines on reverse side, staple, and mail.)

**Document Title: User's Guide: Antipilferage Seal**

**Name of Organization and Address:** _____

_____

_____

1. Comments, Recommendations, or Suggestions:

   A. List page number(s): _____

   _____

   B. Remarks:

| **Submitted by:** (printed or typed name optional) | **Telephone No.** |
|---|---|
| | **Date:** |