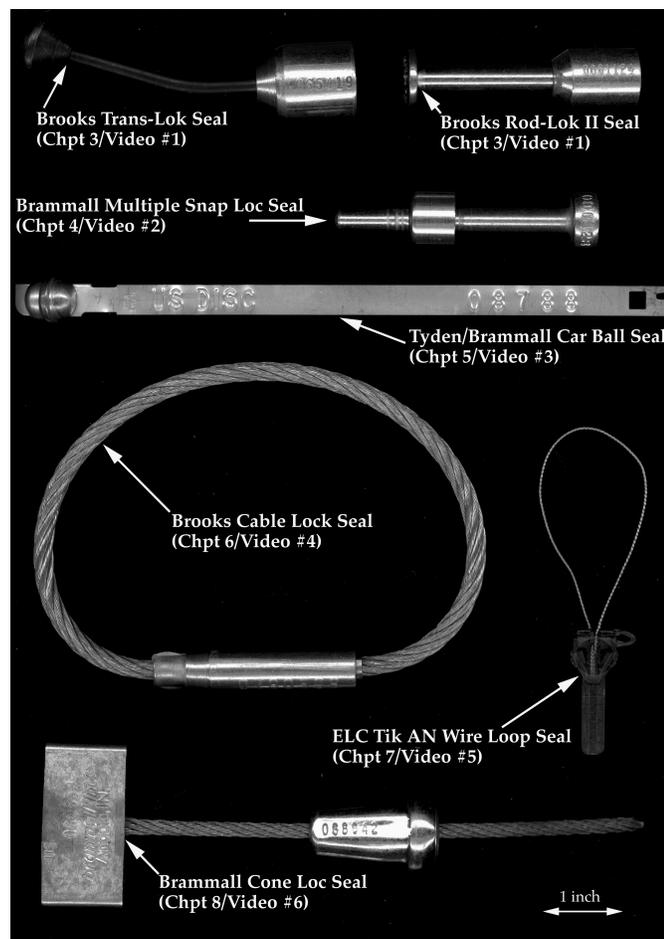




NAVAL FACILITIES ENGINEERING SERVICE CENTER
Port Hueneme, California 93043-4370

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DOD TRAINING COURSE FOR EFFECTIVE SEAL USE



June 2000

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FOREWORD

The purpose of this course is to provide insight on the procedures and methods for effectively using tamper-indicating seals. Chapter 1 provides a course overview. Chapter 2 covers the philosophy behind, and the importance of, the proper attitude and approach for effectively using seals. The remaining chapters discuss application, installation, removal, and inspection. The accompanying videos were developed to clarify techniques discussed in this manual and should be used concurrently. We recommend reading this manual and then viewing the videos. Although not all applications or all seals are covered, the successful student will be able to adapt these procedures to most applications.

Although the setup and execution of a security seal control program is not covered in this course, it is a critical component of a seals program. Contact the Department of Defense (DoD) Lock Program Technical Support Office (below) for information on establishing and executing a seal control program.

Copies of this manual, as well as the associated videos and CD-ROM, are available from:

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These training materials and the protocols discussed and demonstrated in them were developed in collaboration with the Vulnerability Assessment Team at Los Alamos National Laboratory.

CONTENTS

	Page
CHAPTER 1 INTRODUCTION.....	1
Definitions	3
A Brief History of Seals	6
Safety	8
Review and Discussion Questions	9
CHAPTER 2 THE THEORY OF EFFECTIVE SEALING	11
Proper Attitude	11
Seal Protocols – Basic Principles	11
Major Sealing Blunders	13
Is All This Really Necessary?	13
Adversarial Attacks	14
Review and Discussion Questions	15
CHAPTER 3 BROOKS TRANS-LOK SEAL, WITH APPLICABILITY TO THE BROOKS ROD-LOK II SEAL	17
Introduction	17
Installation Process: Examining the Container	17
Installation Process: Examining the Seal	19
Installation Process: Recording the Seal Serial Number	19
Installation Process: Sealing the Container	19
Inspection Process: Examining the Container	20
Inspection Process: Examining the Seal Prior to Removal	20
Inspection Process: Removing and Re-Examining the Seal	20
Review and Discussion Questions	21
CHAPTER 4 BRAMMALL MULTIPLE SNAP LOC SEAL	24
Introduction	24
Installation Process: Examining the Container	24
Installation Process: Examining the Seal	26
Installation Process: Recording the Seal Serial Number	27
Installation Process: Sealing the Container	27
Inspection Process: Examining the Container	28
Inspection Process: Examining the Seal Prior to Removal	28
Inspection Process: Removing and Re-Examining the Seal	28
Review and Discussion Questions	29
CHAPTER 5 TYDEN/BRAMMALL CAR BALL SEAL	32
Introduction	32
Installation Process: Examining the Container	32
Installation Process: Examining the Seal	34
Installation Process: Recording the Seal Serial Number	34
Installation Process: Sealing the Container	34
Inspection Process: Examining the Container	35
Inspection Process: Examining the Seal Prior to Removal	35

	Page
Inspection Process: Removing and Re-Examining the Seal	36
Review and Discussion Questions	36
CHAPTER 6 BROOKS CABLE LOCK SEAL	40
Introduction	40
Installation Process: Examining the Container	40
Installation Process: Examining the Seal	43
Installation Process: Recording the Seal Serial Number	44
Installation Process: Sealing the Container	44
Inspection Process: Examining the Container	44
Inspection Process: Examining the Seal Prior to Removal	44
Inspection Process: Removing and Re-Examining the Seal	45
Review and Discussion Questions	45
CHAPTER 7 ELC TIK AN WIRE LOOP SEAL	49
Introduction	49
Installation Process: Examining the Container	49
Installation Process: Examining the Seal	51
Installation Process: Recording the Seal Serial Number	52
Installation Process: Sealing the Container	52
Inspection Process: Examining the Container	53
Inspection Process: Examining the Seal Prior to Removal	53
Inspection Process: Removing and Re-Examining the Seal	54
Review and Discussion Questions	54
CHAPTER 8 BRAMMALL CONE LOC SEAL	59
Introduction	59
Installation Process: Examining the Container	59
Installation Process: Examining the Seal	61
Installation Process: Recording the Seal Serial Number	61
Installation Process: Sealing the Container	62
Inspection Process: Examining the Container	63
Inspection Process: Examining the Seal Prior to Removal	63
Inspection Process: Removing and Re-Examining the Seal	63
Review and Discussion Questions	64
APPENDIX A – BIBLIOGRAPHY	69
APPENDIX B – GLOSSARY	74
APPENDIX C – CONTACTS	81

**CHAPTER 1
INTRODUCTION**
(see **Introductory Video** for more information)

This course covers the proper way to use seven types of passive tamper-indicating seals. The seven seals are commercial products made by three manufacturers: E.J. Brooks, Brammall, and ELC Security Products. The seals are shown in Figure 1 on the next page. Active seals are not covered in this course.

Accompanying this training manual are seven videos: one introductory video and six videos about specific seals. These videos are listed in Table 1.

The videos cover much of the same material in this training manual and permit you to watch each type of seal being installed and inspected.

The individual chapters, and their associated videos, are self-contained. If you are interested only in one type of seal, it is not necessary to read the entire manual or watch all seven videos. Instead, you should read Chapters 1 and 2 and watch the introductory video. Next, read the chapter in this manual for the seal you are interested in, and watch the video that accompanies that chapter.

At the end of Chapters 3 through 8 you will find checklists for seal installation and inspection procedures.

Installation procedures are the steps you use to install a seal (on a container, room, truck, railcar, etc.).

Inspection procedures are the steps you go through to check tampering or unauthorized access.

The seal installation and inspection checklists at the end of Chapters 3 through 8 are similar though not identical to the sequence of tasks shown in the corresponding videos, #1 through 6. These checklists can be copied and used for work in the field. You may want to modify a checklist to better help you remember the steps or to more accurately reflect the details of your particular security program.

At the end of each chapter are review and discussion questions. The review questions are meant to remind you of the material in each chapter. The discussion questions will hopefully get you to think about seal security. Many of them have no obvious or simple answers.

Table 1. Where to Find Information about a Specific Seal and its Protocol

Manual	Video	Seal	Seal Designation
Chapter 1&2	Introductory Video	Generic seals	-
Chapter 3	#1	Brooks Trans-Lok & Brooks Rod-Lok II	NSN 5340-01-334-0791 & NSN 5340-01-260-9935
Chapter 4	#2	Brammall Multiple Snap Loc	NSN 5340-01-318-6771
Chapter 5	#3	Tyden/Brammall Car Ball	NSN 5340-01-237-7646
Chapter 6	#4	Brooks Cable Lock	NSN 5340-00-084-1570
Chapter 7	#5	ELC Tik AN Wire Loop	None
Chapter 8	#6	Brammall Cone Loc	NSN 5340-01-177-7405

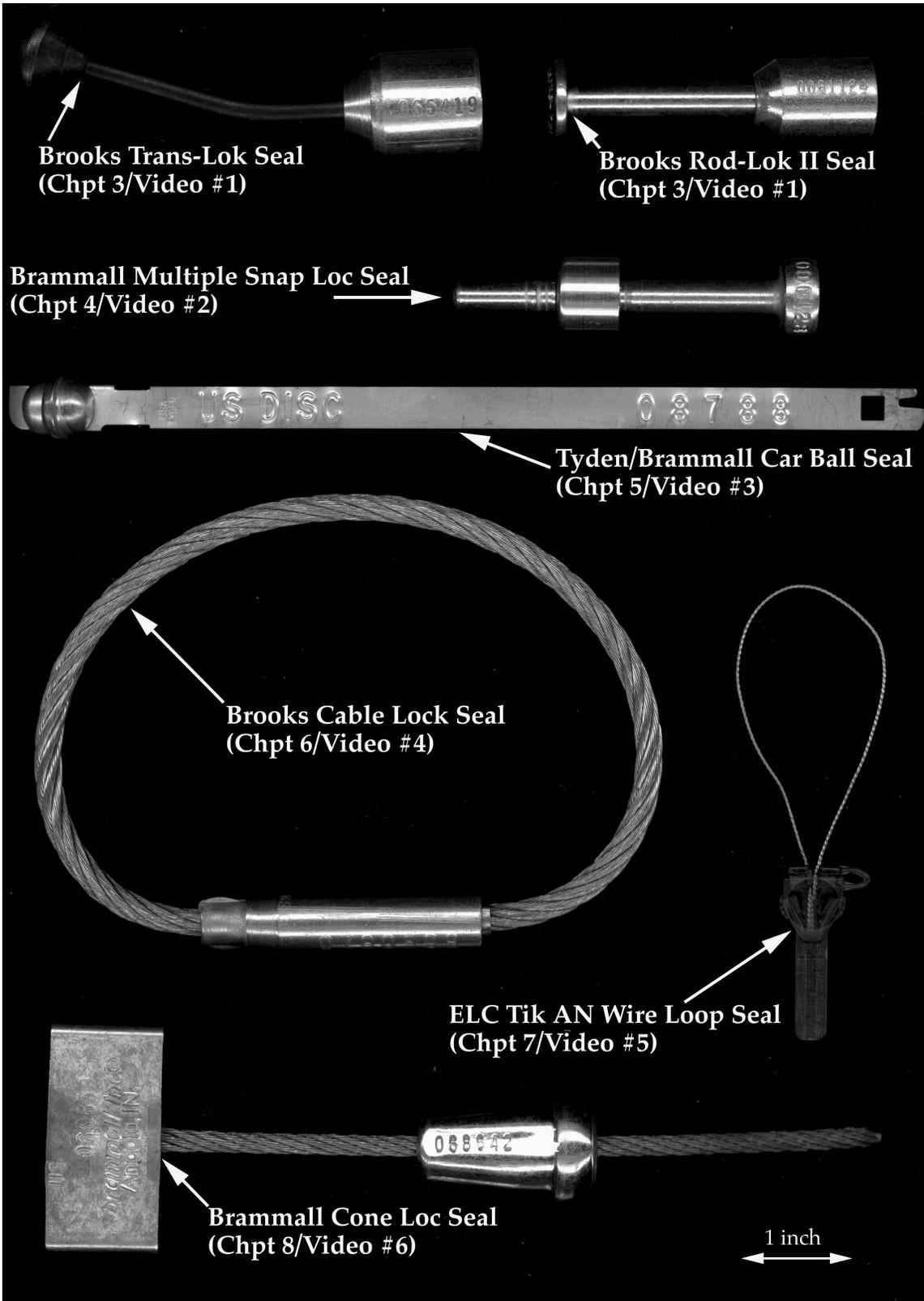


Figure 1. The seven seals covered in this course.

DEFINITIONS

The glossary in Appendix B contains the definitions for a number of terms used in this course. Some of the more important terms are emphasized here.

Seals are tamper-indicating devices (TIDs) used to detect and provide evidence of unauthorized access, and perhaps psychologically discourage it (e.g., see Figures 2, 3, and 4). Unauthorized access (or entry) might be for the purpose of theft or to sabotage the contents of a container, room, building, truck, railcar, package, or equipment

Seals are also called “security seals,” “tamper-indicating seals,” or “indicating seals.” When seals are primarily being used to detect theft, they may be called “antipilferage seals.”

It is important to avoid confusing seals with other types of security devices. For example, seals are not locks. Locks are meant to delay and complicate entry. Seals, in contrast, do not need to physically resist entry. Indeed, some seals are made of paper or plastic and can be easily removed or cut off. The strength of a seal is not the point. If the seal is missing, damaged, or replaced, tampering should be detected by the seal inspector.

Certain security products, known as “barrier seals” (sometimes called “hybrid seals”) do provide a physical barrier to entry. Five of the seven seals covered in this course are barrier seals. Barrier seals are part lock and part seal, and are not optimum as a lock or as a seal. Their dual functions tend to complicate issues about how to best use them. They are widely used for cargo security.

More than almost any other type of security product, seals are effective only if used correctly.

The proper procedures for using seals are known as “protocols.” Seal protocols are the official and unofficial procedures used for seal procurement, storage, checking out, record keeping, installation, inspection, removal, disposal, reporting, interpreting findings, and training. With good protocols, a modest seal can provide excellent security. On the other hand, a sophisticated seal used poorly may be ineffective.

Seals are categorized as passive or active, depending on whether they contain active electronics. Passive seals are usually meant for one-time use. Most passive seals cost from a few cents per unit to a few dollars per unit. All seven seals covered in this course are passive seals, intended for one-time use. Active seals (sometimes called “dynamic seals”) are generally 10 to 100 times more expensive, but can usually be reused many times.

Most seals fit within one of the following categories (defined in the glossary in Appendix B):

Passive -

- wire loop seals
- metal cable seals
- plastic strap (ribbon) seals
- metal ribbon (car box/car ball) seals
- bolt seals
- “padlock” seals
- pressure-sensitive adhesive tape or label seals
- secure containers
- tamper-evident packaging
- passive fiber optic seals

Active -

- active fiber optic seals
- electronic seals (without fiber optics)

In this course, we sometimes talk about adversaries “attacking” or “defeating” a seal. To attack a seal means to try to bypass the seal to get to what the seal is protecting, without being detected. If the attack is successful, it is called a defeat.

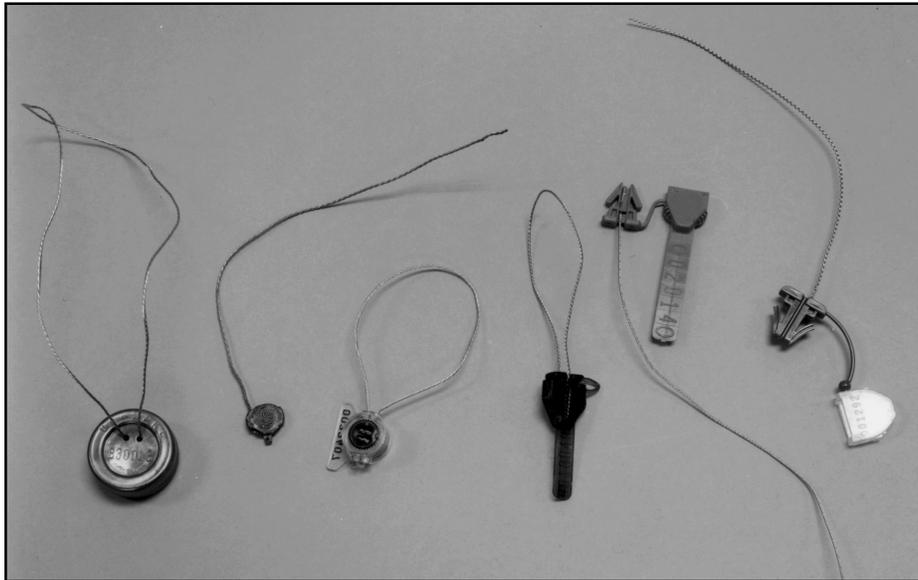


Figure 2. Examples of wire loop seals.

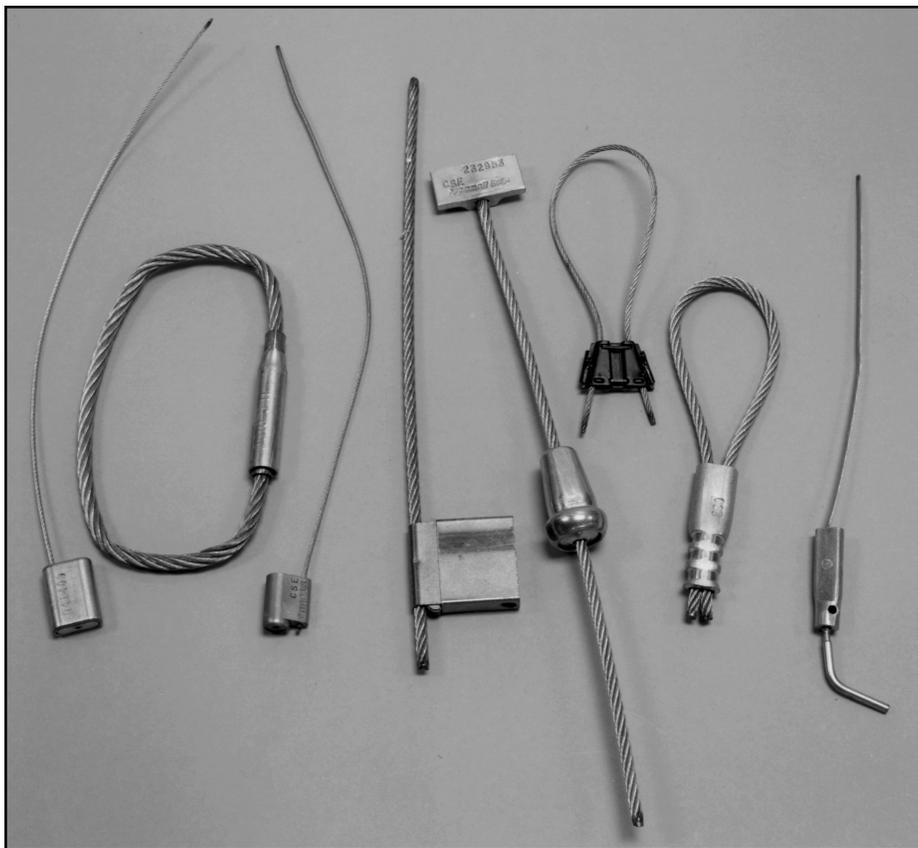


Figure 3. Various metal cable seals.



Figure 4. Examples of commercial bolt seals (top row) and “padlock” seals (bottom row).

A BRIEF HISTORY OF SEALS

People who work with seals are involved in an important and time-honored profession. Seals were in use before the invention of writing. In fact, some scholars think that the symbols used on seals may have encouraged the development of both writing and arithmetic.

Many thousands of ancient seals or seal impressions have been discovered by archeologists, some nearly 7000 years old (Figure 5). These can be viewed in museums around the world.

Ancient seals served many of the same functions as modern seals. They were used to control access, provide cargo security, protect goods against tampering, guarantee authenticity, help with inventory control, mark ownership or trademark, and assist customs inspections. Unlike modern seals, ancient seals were sometimes used for decoration, or as a kind of legal signature, before reading and writing came into common use.



Figure 5. A cylinder seal from Syria, 2000 B.C. The cylinder (left) was rolled along the clay to produce the impression to the right. (From First Impressions: Cylinder Seals in the Ancient Near East, Copyright 1987 by Dominique Collon. Used with permission of the University of Chicago Press.)

A typical ancient seal consisted of a small disk or cylinder (called a “stamp seal” or “cylinder seal,” respectively) made of clay, wood, stone, or bone, and carved with a complex design (Figure 6).

The stamp or cylinder seal was used to impress a pattern into the clay stopper of a jar, either by pressing the stamp seal into the soft clay, or by rolling the cylinder seal along the clay. The clay

stopper was then allowed to harden, perhaps by baking in the sun. Any attempt to open the jar would presumably require fracturing the clay stopper. Replicating the pattern to reseal the jar (and hide the fact that it had been opened) would require significant time and skill if the trespasser did not possess the original seal.



Figure 6. The pattern (impression) left from a 5,000+ year old Iraqi cylinder seal. (From First Impressions: Cylinder Seals in the Ancient Near East, Copyright 1987 by Dominique Collon. Used with permission of the University of Chicago Press.)

Sometimes the jar opening was covered first with animal skin. The skin was then pressed against the sides of the jar with clay, and the seal pattern imprinted into that clay prior to drying.

Baskets or doors could be sealed by running a wooden pole or dowel through the hasp. The ends of the pole would be plastered with clay, and the seal pattern imprinted into the clay. This clay prevented the pole or dowel from being removed through the hasp. Anyone who tried to open the basket or door without damaging it would have to remove the clay in order to slide the pole or dowel out through the hasp. Replicating the seal pattern in the clay would be difficult.

Sometimes, goods were simply rolled up into rugs, mats, or packages. The rolls would be stacked together, with a rope tightly tying them all together. A lump of clay (“bulla”) would be placed around the knot, with the seal pattern imprinted into the bulla (see Figure 7). Getting to the rolls would require cutting the rope, which could be detected, or destroying the seal pattern on the bulla to get to the knot.



Figure 7. The outside and inside of a 5,000-year old broken bulla. The seal pattern can be seen on the outside, while the impression left by the knot and string can be seen on the inside. (From First Impressions: Cylinder Seals in the Ancient Near East, Copyright 1987 by Dominique Collon. Used with permission of the University of Chicago Press.)

Another ancient use for seals was for documents. From 5000 B.C. onward, clay tablets with writing were often imprinted with the design from a stamp or cylinder seal. This was like a signature - the pattern authenticated the document and identified the author. The clay tablet might also be sealed inside a clay envelope to prevent tampering as in Figure 8. The envelope would also be imprinted with a seal design.

The Egyptians were using bullae and string to seal papyrus documents shortly after 3000 B.C. They also used seals on the tombs of their dead. When the burial chamber was completed and the mummified body placed inside, the door was sealed with mud and plaster. The door could still be opened, but it would then be obvious that the seal was broken. In modern times, archaeologists were able to tell if a tomb had been looted by checking to see if the seal was intact.

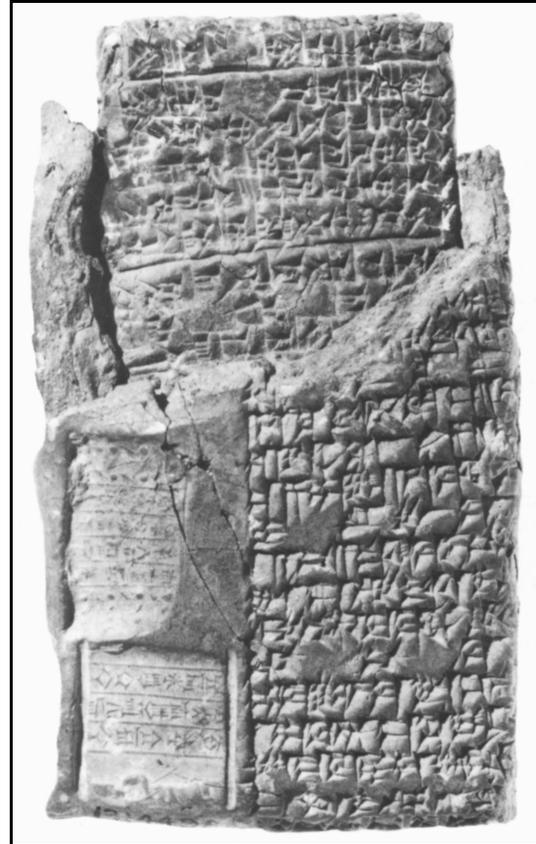


Figure 8. A clay tablet with a seal impression, inside its clay envelope. From Turkey, about 1600 B.C. (From First Impressions: Cylinder Seals in the Ancient Near East, Copyright 1987 by Dominique Collon. Used with permission of the University of Chicago Press.)

From 1100 B.C. through medieval times, wax seals were widely used in Europe. Wax was melted and then dripped onto a scroll or envelope (Figure 9) (shellac eventually replaced wax). A signet ring engraved with a distinctive design was then pressed into the molten blob of wax, leaving behind the complex design. (A signet ring is a stamp seal mounted on a ring to keep it handy.)

Some people still like to seal personal letters with wax seals, though nowadays this is more for decoration than for serious security.



Figure 9. Close-up of a wax seal.

In modern times, tamper-evident seals came to widespread public attention following the infamous 1982 Tylenol product tampering incident. Tylenol capsules were deliberately tainted with cyanide, resulting in several deaths.

Following this incident, producers of food and medicine began redesigning their packages to be tamper evident. Manufacturers of over-the-counter drugs in the U.S. are now required to employ some sort of tamper-evident packaging.

Some passive seals in use today have been available for many years. The lead-wire seal is one example. (The seal shown second from left in Figure 2 is a typical lead-wire seal.) This type of seal consists of a small disk or ball of lead with holes for the passage of the sealing wire (or string). The wire is passed through the closure hasp on the container, and then through the holes in the lead, which is then crimped to embed the wire.

Sometimes a soft, non-lead alloy is used in place of lead; such seals may still (misleadingly) be called a “lead seal” or “lead-wire seal.” Often a logo or serial number is embossed into the lead when it is crimped.

DoD no longer permits the installation of lead-wire seals because of the health and environmental hazards of lead.

In recent years, plastic strap, fiber optic, and electronic seals have become increasingly popular. Nevertheless, the seven seals covered in this course continue to play an important role in DoD

security, and for security elsewhere in government and private industry. This will no doubt continue to be the case for many years to come.

SAFETY

Risk Factors

Working with seals is not a high risk activity. Nevertheless, you can get hurt or killed in the process of doing your job. The greatest hazards you face have more to do with the nature of your work and the environment you are working in than with the seals themselves.

Always bear in mind that your work is being used to guard important material. Terrorists, anxious burglars, or enemies in time of war may not hesitate to use force to gain access to the items you are protecting. That is why it is important to pay close attention to what is going on around you. You need to observe, then challenge or report any unusual activity or personnel in your work area. Staying alert not only improves the overall security program and national security, it also helps to protect you and your co-workers.

The second type of serious danger you face in doing your job has to do with location. Seals are often used in loading docks, cargo areas, rail yards, and warehouse operations. These can be hazardous places to work.

Accidentally falling off a loading dock is a common source of injury. Being hit by moving trucks, railcars, forklifts, or moving or falling containers can also be a significant hazard.

Once again, paying attention to what is going on around you is critical. You must also know and obey all the safety rules for the area you are working in. Always use the required safety gear!

Seal Hazards

Seals themselves can, under the right circumstances, cause injury.

- Loop-type seals such as cable or wire seals can get caught on fingers or jewelry as they move past you on a container, truck, or railcar.

- Moving seals can also gouge eyes or skin, or grab onto clothing.
- Metal or wire seals may have sharp edges or burrs that can cut you as you feel along the seal for examination or inspection purposes.
- Metal seals can also become extremely cold in the winter, or very hot from sitting in the sun.

Probably the most likely hazard from seals has to do with removing them from a container. Wear safety glasses! A seal can sometimes spring out at you when cut off from a hasp. Keep fingers away from the seal as it is cut off. If an assistant is needed to help hold the seal while it is being removed, make sure his/her fingers, hands, and face are well clear of the seal.

Never use cutoff tools unless you are fully trained and knowledgeable about how to use them, and authorized to do so.

Always use the proper tools for seal removal, even if this means having to take some extra time to locate the proper removal tool.

Lead Hazards

Lead-wire seals represent another potential hazard. If you should come across any used or unused lead seals (or parts of lead seals), report them immediately to your supervisor. Also, be sure the health, environment, and safety officer at your facility is aware of them.

Wash your hands after handling lead seals! Do NOT dispose of them in the trash: by law, lead requires special disposal procedures.

The lead in these seals does NOT represent any immediate threat to your health or the environment when casual, short-term exposure is involved. Nevertheless, lead is a hazardous material and must be recognized and properly handled.

Lead is a soft, gray metal that sometimes has a slight bluish tint. The lead in an unused lead-wire seal is often in the shape of a small disk or ball. The lead in an installed or cutoff lead-wire seal may have a logo or number embossed into it.

Bottom Line

The bottom line with safety: don't perform any task until you are sure it can be done safely! Safety is about more than just protecting the DoD and national interests and doing your job well. It is about preserving your life, limbs, and health.

CHAPTER 1 REVIEW QUESTIONS

1. What is a seal?
2. What are some other names for seals?
3. What are some of the differences between a lock and a seal?
4. What is a barrier seal?
5. True or False: Seals are a modern invention.
6. What are seal protocols and why are they important?
7. What is the difference between an active and a passive seal?
8. Into which category of seals should each of the seven seals discussed in this course be placed?
9. Is the following statement true or false, and why: "A flimsy seal made of paper or plastic can't provide good security--the best seals stand up to considerable force."
10. What were some of the uses for ancient seals?
11. What are some of the uses for modern seals?
12. True or False: Working with seals is about the safest job imaginable.
13. What are some of the hazards associated with working with seals?

14. What do lead-wire seals look like? What should you do if you find some laying around?

15. True or False: If you can think of a safer way to do your job, you should just keep your mouth shut because safety's not your area of expertise.

11. Discuss how you can report suspicious situations, conditions, and personnel to your supervisor. Will you be listened to?

12. How many different ways can you think of for adversaries to use force or threat of force against you to defeat your seal security program?

CHAPTER 1 DISCUSSION QUESTIONS

1. When might it be better to use a seal instead of a lock? When would a lock be better?

2. Look up the word "seal" in the dictionary. How many meanings does it have? How do these meanings differ from what we mean?

3. What are some of the good and bad features of a barrier seal?

4. How do you suppose ancient seals were inspected?

5. How do you think the job of ancient seal installers and inspectors compares to the job today? Imagine what topics of discussion and common viewpoints you might share if you could go back in time and meet them.

6. Why would you imagine that the use of ancient seals would encourage people to develop reading, writing, and arithmetic?

7. How many ways can you think of to open a jar or package protected by a sealed bulla without being detected?

8. Do you think wax seals provided good security (a) in the old days, and (b) now? How would you defeat them?

9. List a dozen different ways you could get hurt while working with seals on the job. What are 3 or 4 ways you could get killed?

10. Of all seven seals covered in this manual, which seem like they would be the safest to use? Which seem the least safe?

CHAPTER 2
THE THEORY OF EFFECTIVE SEALING
(see Introductory Video for more information)

PROPER ATTITUDE

DoD uses seals for a variety of purposes. These include weapons and weapons cases, ammunition boxes, footlockers, railcars, trucks, document cases, filing cabinets, and even rooms.

In many cases, theft or unauthorized access to items being protected by seals could cost considerable amounts of money, compromise national security, result in casualties, or even aid terrorists.

Working with DoD seals is a serious business. By selecting you to work with seals, DoD has given you an important responsibility and placed considerable faith in your professionalism, diligence, and concern for your country. Installing and inspecting seals is often hard and tedious work. You must never, however, allow yourself to just go through the motions.

Effective security, first and foremost, is about paying attention. Take your job seriously, stay alert, and give it your best effort!

A conscientious seal installer or inspector:

- Understands the importance of the work
- Takes pride in the confidence placed in his/her skills and integrity
- Does careful work
- Double checks the work
- Asks questions, stays observant, and reports problems, unusual situations, or unauthorized personnel
- Tries to think like an adversary so security problems can be spotted
- Will not let bad weather, tight deadlines, disruptions, rotating personnel, morale problems, or chaos compromise security

SEAL PROTOCOLS - BASIC PRINCIPLES

As discussed in Chapter 1, seal protocols are the official and unofficial procedures used for seal procurement, storage, checking out, record keeping, installation, inspection, removal, disposal, reporting, interpreting findings, and training.

This course concentrates primarily on seal installation and inspection, because that is mostly what seal installers and inspectors do. However, other aspects of seal use protocols are also discussed.

There are a few basic principles found in any set of effective seal protocols, regardless of the type of seal being used, the applications, or the security program. These are discussed below.

Seal Procurement

Only a small number of individuals within your organization should have the authority to order seals. They must keep careful records and be able to recognize when unauthorized or unofficial seals enter the system.

Seals ordered or provided by unauthorized individuals must not be used! They may have been tampered with to permit easy, undetected access to what the seal is meant to protect.

The authorized seal purchaser within your organization must avoid ordering seals with duplicate serial numbers.

Seal Storage

Unused seals must be stored in a secure location at all times. Unauthorized personnel must not have access to unused seals. They might tamper with the seals and induce a vulnerability.

Unauthorized personnel must not be allowed to view unused seals or seal paperwork. Information about the serial numbers of unused seals, for example, can help an adversary develop counterfeit seals.

Seal Checkout

Seals must be carefully protected prior to use. Adversaries must not be given a chance to tamper with them.

Seals should be checked out from the secure storage area or checkout point at the beginning of a shift and turned in (or secured) at the end of the shift.

Unused seals need to be recorded by serial number and assigned to a seal installer or seal control program agent, who is then responsible for their protection.

Once a seal installation is started, it should be taken to completion. If the process must be halted part way through, the whole process should be restarted at a later time.

Seal checkout procedures and paperwork are usually part of an overall “seals control program.” See the DoD “Antipilferage Seal User’s Guide” for examples of seals control paperwork forms.

Record Keeping

Seal serial numbers need to be neatly recorded. There must be no question as to whether the serial number written on the paperwork has been tampered with.

Seal Installation

Seals need to be carefully examined just prior to being installed. Look for abnormalities, defects, discoloration, unusual appearance, and damage. Check the lettering, logo, and serial number carefully, including the depth of imprinting and the font and character size and spacing. This examination is for the purposes of detecting seal counterfeiting, or possible tampering with the seal prior to use.

This examination should be done at the container, just before installing the seal. Any delay between this examination and seal installation gives an adversary an opportunity to tamper with (or swap) the seal. This final examination of the seal prior to installation cannot be done hours or days before hand.

Ideally, seals should be installed by a two-person team, with partners being chosen randomly at the start of each shift. This offers the best security. Realistically, however, most security programs do not have enough personnel. Often, seals must be installed by a single individual.

At the very least, each person’s seal installations should be checked by colleagues or supervisors without warning from time to time.

Seal Inspection

One of the differences between locks and seals is that, once installed, locks provide security even if you ignore them. Seals, on the other hand, must be carefully inspected to determine if unauthorized access has taken place. Seals also differ from intrusion or burglar alarms, in that seals indicate unauthorized entry only after the fact.

Seal Removal

A seal must be removed using the officially approved method. To ease the monotony and speed things up, loading dock personnel often like to develop their own inventive methods of removing seals - methods that typically involve seal parts flying violently through the air. Don’t do this! This makes it difficult to reliably inspect the seal parts to look for signs of tampering after the seal has been removed from a container. It can also compromise safety. Follow the correct procedures!

Seal Disposal

Used seals and seal parts **MUST** be returned to the seal checkout point (or other approved station) for proper destruction, post-mortem analysis, or archiving. They must **NOT** be thrown in the trash or left lying around. This is the sure sign of a sloppy security program. Used seal and seal parts provide adversaries with useful information, parts for counterfeiting, and pieces to practice attacks on.

MAJOR SEALING BLUNDERS

There are ten serious mistakes that crop up frequently in seal programs. If you use the seal protocols taught in this course, you will automatically avoid most of these errors - at least the ones over which you have control.

Mistake #1: Using seals with little idea as to your security goals and likely adversaries.

Mistake #2: Failing to choose an appropriate seal for your application.

Mistake #3: Believing there is such thing as a “tamper-proof” seal.

Mistake #4: Installing a seal without first inspecting it, the container (or room, truck, railcar, etc.), door (or lid), hasp, and locking mechanism carefully.

Mistake #5: Correctly installing the seal, but forgetting to close the container door (or lid) first.

Mistake #6: Failing to seal all the doors or lids, or failing to seal both sides of a lid that can be opened at either end.

Mistake #7: Failing to sufficiently protect the seal data and paperwork. Adversaries must not have access to them, nor be able to tamper with them.

Mistake #8: Writing the seal serial number on the container, truck, or railcar; or storing the working copy of the seal paperwork inside the sealed container; or giving the working copy of the paperwork to the truck driver.

Mistake #9: Having poorly motivated and poorly trained seal installers and inspectors who are reluctant to report problems and suspicious seals.

Mistake #10: Failing to properly deal with used seals and seal parts. Used seals and seal parts must NOT be left lying around loading docks, rail yards, or warehouse facilities, nor thrown in the trash.

IS ALL THIS REALLY NECESSARY?

Some seal vendors, manufacturers, and users would like you to believe that you can slap their seals on any container without much regard for proper seal protocols. They insist that their seals are so “tamper-proof” that they provide high security without any effort.

Unfortunately, this is a fantasy. With seals - as in most of areas of security - you only get out what you put in. Optimum seal security requires a lot of care and attention to detail.

If you watch all the steps taking place in the videos, it might seem like seal installation and inspection are too complicated, and take an impossible amount of time. Bear in mind, however, that the people in the videos are going through the procedures in something close to slow motion to make it easy to follow.

When you are well practiced at the protocols, you will find that it only takes you a few minutes per seal or less. (The trick, however, is to NOT make the protocols so routine that you fail to pay attention to what you are doing!) The installation and inspection checklists provided in this manual for each seal can help you keep all the steps straight.

The seal protocols taught here are a compromise. Better seal security would be possible if the seal protocols were made even more complicated. These protocols, however, strike a good balance between security, complexity, and reasonable allotment of time.

A few extra protocol steps will not significantly improve security. On the other hand, skipping some of the steps recommended here WILL strongly degrade security.

If you should find that, because of limited time or manpower, you absolutely must simplify the seal protocols, contact the Naval Facilities Engineering Service Center for guidance as to which steps to simplify or eliminate. (Contact information can be found in Appendix C.) Be aware, however, that in doing so you will decrease the reliability of your seal program and the confidence you can properly place in it.

ADVERSARIAL ATTACKS

There are basically three ways to gain unauthorized access to items being protected by a seal:

- Attack the seal
- Attack the container
- Trick the security program into falsely believing there has been no unauthorized access

Seal Attacks

Successfully attacking a seal requires step 1 below, plus 2A or 2B, followed by step 3 as follows:

1. Opening the seal. This may or may not involve damaging the seal. It may or may not involve creating evidence of entry.

Then...

2A. Resealing using the original seal, accompanied by one or more of the following as needed:

- Repairing damage (if any), either thoroughly or cosmetically
- Erasing or hiding evidence of entry (if any), either thoroughly or cosmetically
- Replacing relevant parts of the original seal with counterfeits

OR

2B. Replacing the entire seal with a duplicate seal obtained by one of the following methods:

- Counterfeiting the seal
- Obtaining the duplicate seal surreptitiously or non-surreptitiously from the original seal manufacturer

RESULTING IN ...

3. Fooling the seal inspector and overall security program into believing that no unauthorized access occurred.

Usually, seal counterfeiting (2B) is NOT the easiest way to defeat modern seals.

Container Attacks

If an adversary decides to attack the container (or room, truck, railcar, etc.) being protected by a seal, instead of the seal itself, then the seal has accomplished its mission. A container attack, however, must be of as much concern to a seal installer and inspector as an attack directly on the seal.

Note that:

- Container attacks can involve the top, bottom, or sides of the container.
- They may involve tampering with the container door or lid, hinges, hasp, or locking/closing hardware.
- Attacks may focus on container welds, rivets, screws, nails, adhesives, corners, edges, and any repair patches.
- Mismatched paint or surface finishes may indicate that a cover-up of a container attack has been attempted.
- A given container attack may involve a complicated assortment of methods. When inspecting a container for signs of tampering, be aware that the route that an adversary initially uses to gain access to the container may not be the same as the route he uses to remove items or to exit.

Containers can be attacked:

- before they are loaded or sealed
- after they are loaded but before they are sealed
- after they are sealed.

Tricking the Security Program

An adversary can defeat a seal program by tampering with the seal data, such as the recorded seal serial numbers. Adversaries can also bribe or threaten seal installers or inspectors, or use other methods of “social engineering” to compromise security. (This term is defined in the glossary in Appendix B.)

Adversaries may instead simply wait until seal installers or inspectors make a mistake, then take action only when that mistake can be exploited. Adversaries may also try to get hired or assigned as a seal installer or inspector in order to compromise security from the inside.

A variety of other trickery is possible, including “misdirection” and “sleight of hand.” Ironically, simple trickery is often particularly effective against high-tech, complex security devices or programs.

One simple trick is for the adversary to remove a seal, then replace it with a lock or a different kind of seal (perhaps with the same serial number). The adversary hopes that the seal inspector will just figure that some kind of mistake was made by the seal installer, but that everything is still OK because, after all, the container is still locked or sealed!

After removing a seal, an adversary may instead leave a forged note from another seal inspector or supervisor saying that, though the container is now unsealed, it has already been inspected and found to be fine.

Don’t fall for such simple-minded tricks! Also keep in mind that an adversary may not care if the seal inspector detects his tampering, as long as that message never reaches the proper officials. If you detect tampering, you need to be sure that the proper officials are aware of your findings.

CHAPTER 2 REVIEW QUESTIONS

1. True or False: Installing and inspecting seals is mostly grunt work of no real importance. Why or why not?
2. Security is mostly about...
 - a. looking sharp.
 - b. bashing heads whenever possible.

- c. showing respect for authority.
- d. getting the work done on time.
- e. paying attention.

3. Why are the following important characteristics of a good seal installer or inspector:
 - a. thinks on the job
 - b. double checks his/her work
 - c. takes the job seriously
4. What’s the major difference between a seal and a burglar alarm?
5. What is a seals control program, and why is it important?
6. Why must you examine a seal just prior to installing it?
7. Security managers sometimes ask for seals that don’t have to be inspected. Is this a reasonable request? Why or why not?
8. List three common, serious sealing mistakes.
9. True or False: If you get interrupted during the seal installation process, you should resume where you left off when the interruption is over.
10. Why do seals have to be removed using only the approved methods?
11. Why can’t you just throw used seals and seal parts in the trash?
12. True or False: High-tech security seals automatically provide the best security.
13. Is counterfeiting a seal the easiest way to attack it?
14. Are there a lot of potential ways to defeat seals?
15. What are some of the tricky ways to defeat a seal security program?
16. If you skip or gloss over some of the steps in the seal installation or inspection protocols, will it matter?

CHAPTER 2 DISCUSSION QUESTIONS

1. Think about how you could make your own crude seal out of items typically found in an office. Your seal will be used to determine if someone has opened a filing cabinet since the seal was last inspected.
2. What are the best ways to get seal installers and inspectors to pay attention and think on the job? How would you motivate seal installers and inspectors to do the best possible work day in and day out?
3. Why is it unacceptable to store the working copy of the seal paperwork (with the serial number) inside the container being sealed? How could an adversary exploit that situation?
4. Which is more critical to effective security and why: a good container, a good seal, good protocols, or good seal installers and inspectors? If you had to compromise on one of them, which would it be?
5. What are the advantages and disadvantages of using two-person teams for doing seal installation and inspection?
6. Think of a dozen ways that a disloyal or dishonest seal inspector could compromise seal security.
7. How are the attacks on a seal by an outsider likely to differ from the attacks of an insider?
8. How many ways can you think of to defeat locks? How do these attacks differ from seal attacks?
9. Should seals blend into the background, or should they be painted loud and obnoxious colors? How might this depend on the nature and goals of the security program, and the characteristics of the likely adversaries?
10. What are the advantages and disadvantages of a covert seal?
11. Review the general list of ways to attack seals. Which methods do you think might generally be easiest? Which are likely to be the hardest to implement?
12. What are some of the ways that a lazy seal installer or inspector can cause harm? What are some of the ways that a disloyal seal installer or inspector can cause harm?
13. Why do you think that simple trickery is often very effective for attacking high-tech, complex security devices or programs?
14. What are the advantages and disadvantages of having a seal serial number on more than one part of a seal?
15. What is the purpose of having a logo on a seal if there is already a serial number?
16. Why do you have to start over from the beginning if the seal installation process is interrupted?

CHAPTER 3
BROOKS TRANS-LOK SEAL, WITH APPLICABILITY TO THE
BROOKS ROD-LOK II SEAL

(see Video #1 for more information)

INTRODUCTION

This chapter discusses the proper protocols for using the Trans-Lok Seal made by E.J. Brooks. This seal consists of a steel bolt with a black oxide surface finish. The bolt can be straight, curved (as shown in Figure 10), or bent at 90 degrees. The locking body (or end) has a silvery zinc dichromate finish. The locking body (sometimes called a “locking case”) has a serial number and often a logo or the name “Brooks” stamped onto the surface (see Figure 11). The bolt has no writing or serial number.

The procedures for using the Brooks Rod-Lok II Seal are virtually the same as for the Trans-Lok. The Rod-Lok II has a silvery finish on both the bolt and the locking body. The bolt can be either straight (as shown in Figure 10) or curved. A version of the Rod-Lok II having a shorter straight bolt is sometimes called the “Modified Rod-Lok II.”

Both the Trans-Lok and the Rod-Lok II are barrier seals. They can withstand several thousand pounds of pressure without pulling apart. As noted earlier, barrier seals can cause confusion if you are not careful. A lock is designed to delay unauthorized entry as compared to a seal, which is designed to record unauthorized entry.

Video #1 demonstrates the correct installation and inspection procedures. The checklists at the end of this chapter can be used in the field to assure all the necessary steps have been taken. The two checklists show the various steps in approximately (though not exactly) the same order as in the video.

INSTALLATION PROCESS: EXAMINING THE CONTAINER

As always, the container (or room, truck, rail-car, etc.) intended to be sealed must be carefully

inspected before installing the seal. Be sure the container is fully intact and in reasonably good shape. There must be no serious openings, cracks, or holes that could be used to gain easy access to the container, or to remove or insert items. Note anything abnormal about the container on the seal paperwork. Bear in mind that an adversary may have tampered with the container prior to its use in order to gain easier access once the container is sealed.

Ideally, the top, bottom, and sides of the container - both inside and out - should be carefully inspected visually and physically. As a practical matter, this may not always be possible. The container may be full of items at the time of inspection - making examination of the insides difficult. It may also be difficult to inspect the exterior of the container (especially the top and/or bottom) if the container is large, heavy, or stacked on or near other containers or walls. Note on your inspection paperwork which portions of the container have been inspected. Write down any anomalies or problems.

Pay particular attention to any welds, rivets, screws, nails, hinges, repair patches, and adhesive joints on the container. Are these old and damaged? Could they be exploited to gain entry into the container without being detected? Note on your paperwork any unusual surface finishes, decals, paints, or logos that you find on the container. Report to your supervisor if the container does not appear to be of the proper size, shape, or design.

Always devote considerable attention to the corners, seams, and edges of the container, as well as any dents, scratches, or corrosion. These are often where attacks on the container will take place. Report any serious problems.

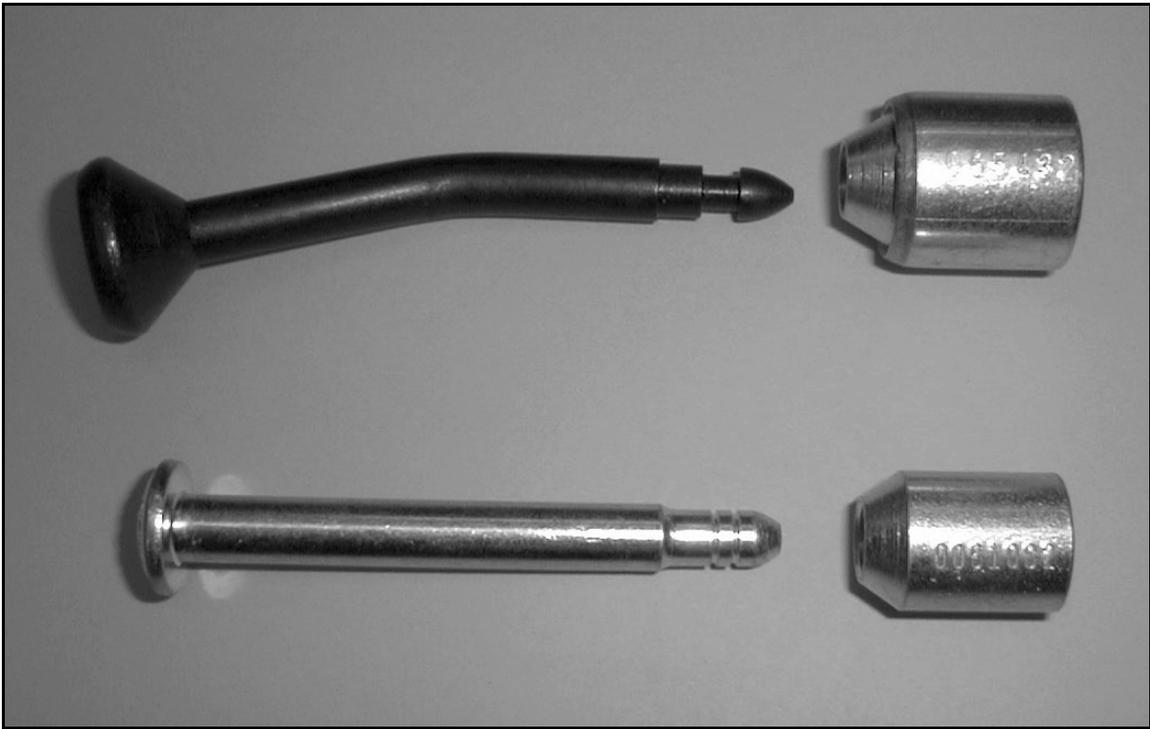


Figure 10. The Brooks Trans-Lok Seal (top) and the Brooks Rod-Lok II Seal (bottom).



Figure 11. A close-up of the bolt head on the Brooks Rod-Lok II Seal.

The environment the container will be exposed to during storage or transit is important to consider. If the sealed container will sit quietly in a secure area without being disturbed, it should be in excellent condition. On the other hand, if the container will be banged around in transit, or at a loading dock or warehouse, less than perfect condition may be acceptable since it is likely to take some dings anyway. Certainly the container must be in good enough shape to withstand its expected handling.

If the items being protected by the seal are extremely critical, the container should be in the best possible condition. If the items are less critical, it may be acceptable to compromise on the condition of the container. Always keep in mind, however, there is little point in installing a seal on a container than can be easily entered by bypassing the seal.

A thorough container inspection must include careful examination of the container locking mechanism, hasp, door, and/or lid. Be sure these are intact and in good working condition. Look for signs of serious damage, fractures, or corrosion. Look for signs of tampering, or anything out of the ordinary. Pay particular attention to any rivets, hinges, or screws. Make sure they are not missing, about to come loose, or fake.

INSTALLATION PROCESS: EXAMINING THE SEAL

Just prior to installing a new Brooks Trans-Lok Seal, it must be carefully inspected for signs of tampering or damage. Reject the seal if it has serious problems.

Look for significant defects, scratches, dents, or unusual markings, particularly on the bolt. Inspect the notch on the tip of the bolt carefully.

Check to be sure the color and surface finish is fairly uniform along the seal. Run your fingers along the surface of the bolt and locking body to feel for anything abnormal. Check the roundness of the bolt head and the locking body. Reject the seal if it is seriously out of round.

Next, compare the seal visually side-by-side with another unused, unlocked Brooks Trans-Lok Seal. Ideally, use one that you carry around with

you for this purpose. Don't use a seal from the same batch as the seal you intend to install. (This comparison seal should be marked or labeled so that you don't confuse it with the seal you intend to install when it comes time to seal the container.)

The logos on the two seals should match. The two serial numbers should have approximately the same depth, size, and font. The digit alignment and spacing should match.

To check the locking body, insert a toothpick, rigid wire, or small screwdriver into the open end of the locking body. Be sure the locking rings are free to move and rotate. If not, the seal is unacceptable.

INSTALLATION PROCESS: RECORDING THE SEAL SERIAL NUMBER

Record the seal's serial number on the appropriate seal paperwork or database. Double check that you made no error in recording the serial number.

Do not write the seal serial number on the container, or anywhere else that is not appropriate.

This paperwork must be protected from potential adversaries at all times! Do not let it out of your sight. It must never be stored inside the container being protected by the seal!

INSTALLATION PROCESS: SEALING THE CONTAINER

To install the Brooks Trans-Lok Seal, put the bolt through the hasp. Holding the bolt head, push the locking body into the bolt tip until it snaps and locks in place.

Tug on the locking body to be sure it does not come loose. A sharp clicking sound and some minor slippage is normal and should be disregarded. However, if the seal opens or the locking body slips considerably, the seal is faulty and must be removed, recorded, and turned back in to the seal checkout point.

Be sure to verify that the locking body can rotate a full 360 degrees after sealing. Reject the seal if it cannot (see Figure 12).



Figure 12. Be sure the locking body can rotate freely about the bolt.

Finally, double check that you have actually sealed the container and that its door or lid is truly closed and sealed. Double check that the seal serial number matches what you recorded.

INSPECTION PROCESS: EXAMINING THE CONTAINER

The first step in the inspection process, typically when a container (or truck, railcar, etc.) arrives at its destination, is to carefully examine it. This is similar to the examination process described in the above Section on “Installation Process: Examining the Container.”

Be sure the container lid or door is still closed and sealed. Are there any significant new holes, cracks, defects, scratches, or dents in the container that were not noted during the initial container examination, before the seal was put on? Is there a repair patch or weld where one is not expected, or noted on the paperwork? Look and smell for evidence of fresh paint or adhesives.

INSPECTION PROCESS: EXAMINING THE SEAL PRIOR TO REMOVAL

Check the seal’s serial number. It must match the paperwork. Look to see if the serial number might have been buffed off and re-stamped (see Figure 13).



Figure 13. Carefully compare the seal’s serial number with the paperwork.

Inspect the seal by comparing it alongside an unused but locked Brooks Trans-Lok Seal. Compare the colors, logos, and the serial number fonts, depth, and digit alignment/spacing. Are the seals of the same length and diameter?

Look for signs that the seal has been exposed to sawing, cutting, or grinding. Look for unusual scratches, features, or defects not noted in the paperwork. Does the seal look like it has been flame-heated? Has it been glued, soldered, or re-painted?

Feel along the bolt and the bolt head with your fingers to try to detect abnormalities.

Tug on the locking body to be sure it does not come off.

Check if the seal seems improperly out of linear alignment.

Verify that the locking body can still rotate 360 degrees about the bolt shaft.

INSPECTION PROCESS: REMOVING AND RE-EXAMINING THE SEAL

The next step is to cut off the bolt. This is usually done with a pair of bolt cutters (see Figure 14). However, a saw, grinding wheel, torch, or plasma cutter may also be used. Always take the proper safety precautions to avoid injuries.



Figure 14. Removing the seal with bolt cutters.

Try to cut off the bolt at about the half-way point. Be sure to note - and report - if it seems too easy to remove the seal.

The final inspection of the seal involves the following: carefully check that neither the bolt, bolt head, or locking body are out of round. Look carefully under the bolt head for signs of cutting, grinding, or gluing.

Take a wire brush and remove the finish of the remnants of the bolt and the outsides of the locking body. Look carefully at the underside of the bolt head. Look closely at the locking body for signs of a small hole that may have been drilled and then cosmetically repaired and repainted. This hole could be used to tamper with the seal.

Both pieces of the cut-off Trans-Lok Seal must be turned in for proper disposal, post-mortem analysis, or archiving. Do not throw used seal parts in the trash. Do not leave them laying around.

Once the seal is removed, you may want to inspect the interior of the container for signs of unauthorized entry, if time and practicality permit.

CHAPTER 3 REVIEW QUESTIONS

1. How do the lock functions of the Brooks Trans-Lok Seal differ from its seal functions?
2. Describe the similarities and differences between the Brooks Trans-Lok Seal and the Brooks Rod-Lok II Seal.

3. What are some of the unusual features of the Brooks Trans-Lok and Rod-Lok II seals compared to the other seals discussed in this manual?

4. What is a font?

5. How do you check the locking rings inside the locking body?

6. Why do you never store the seal paperwork inside the container being protected by the seal?

7. How should the Brooks Trans-Lok Seal be removed from a container?

8. After removing the Brooks Trans-Lok Seal from the container, why is it vigorously scratched with a wire brush? What are we looking for, and why?

CHAPTER 3 DISCUSSION QUESTIONS

1. Which parts of the Brooks Trans-Lok Seal do you think are most vulnerable to attack?

2. What are the likely advantages and disadvantages of the black color on the Trans-Lok?

3. What is the purpose of the bend found in some models of the Brooks Trans-Lok Seal?

4. Which seal do you imagine is easier to attack and why: the Brooks Trans-Lok Seal or the Brooks Rod-Lok II Seal?

5. Why should considerable attention be paid to the underside of the bolt head?

6. Why is the seal compared side-by-side with an identical seal, both before and after being used to seal a container?

7. Why do you suppose it is important to check the Brooks Trans-Lok Seal for signs of flame-heating?

8. Why should we be concerned if the locking body refuses to rotate on a locked Brooks Trans-Lok Seal or Rod-Lok II Seal?

Installation Checklist - Brooks Trans-Lok Seal

Note: Items marked with a * are particularly important to check carefully.

1. Examine the Container

The container is free of serious openings, cracks, or holes in the...

Exterior...

- sides
- top (if practical)
- bottom (if practical)

Interior...

- sides (if practical)
- top (if practical)
- bottom (if practical)

- The rivets, screws, corners, edges, seams, and repair patches are in good shape.
- The door or lid is in good working condition.
- Note on the paperwork which portions of the container that have been inspected, plus any problems.
- The hasp and locking mechanism are complete, intact, and in good working condition.

2. Inspect the Seal--JUST PRIOR TO INSTALLING IT!

- The **bolt** looks to be free of serious defects, damage, scratches, cuts, dents, cracks, abrasions, discoloration, or unusual stains or markings, ESPECIALLY UNDER THE BOLT HEAD.*
- The **bolt** feels uniform and free of irregularities.
- The **bolt** is not out of round.
- The **locking body** is visually free of serious defects, damage, scratches, cuts, dents, cracks, abrasions, discoloration, or unusual stains or markings.*
- The **locking body** feels uniform and free of irregularities.
- The **locking body** is symmetric.
- The seal matches the sample (comparison seal) in terms of...
 - diameter and length.
 - overall color, appearance, and surface finish.
 - serial number depth, size, alignment, spacing, and font.
- The locking rings inside the **locking body** are free to move and rotate.
(Poke at them with a pointed tip.)

3. Record the Seal Serial Number(s)

- The serial numbers match the numbers you have written on the paperwork.*

4. Install the Seal

- The installed seal does not open when you yank hard on the **bolt** and **locking body**.*
- The **locking body** is still free to rotate 360°.

5. Double Check the Seal Installation

- The container door or lid is truly shut and sealed.*
- The seal's serial numbers match the serial numbers written on the paperwork.*
- Major new scratches or dents (if any) in the seal, container, door, or lid as a result of installing and testing the seal are recorded on the paperwork.
- The seal looks OK.
- The seal stands up to one more solid tug.
- Sign off on the paperwork that the seal installation is acceptable

Inspection Checklist - Brooks Trans-Lok Seal

Note: Items marked with a * are particularly important to check carefully.

1. Examine the Container Exterior

- The door (or lid) is still closed and sealed.*
The container is free of serious openings, cracks, or holes in the...
 - Exterior...
 - sides
 - top (if practical)
 - bottom (if practical)
 - Interior...
 - sides (if practical)
 - top (if practical)
 - bottom (if practical)
- There is no sign of new painting, staining, or welding.
- There is no sign of tampering or abnormalities with the rivets, screws, corners, edges, repair patches, welds, or seams.
- There is no sign of tampering or abnormalities with the door (or lid), hasp, or locking mechanism.

2. Examine the Seal (prior to removal)

- The seal's serial numbers match the paperwork.*
- The serial number on the seal does not appear to have been buffed off and re-stamped.*
- The serial number written on the paperwork has not been erased, modified, or overwritten.*
The seal matches the sample (comparison seal) in terms of...
 - length and diameter.
 - approximate color and surface finish.
 - serial number depth, size, alignment, spacing, and font.*
- There are no signs that any portion of the seal has been sawed, cut, or ground down.
- There are no signs that any portion of the seal has been flame-heated, glued, or soldered, nor are there unusual scratches or defects not noted on the paperwork.*
- The **bolt** and bolt head feel normal.
- The seal does not open when you tug hard on it.*
- The seal is not inappropriately out of linear alignment.
- The **locking body** is still free to rotate 360°.*

3. Remove and Re-examine the Seal

- When you remove the seal with bolt cutters, it is not too easy to remove.
- The **bolt**, **bolt head**, and **locking body** are not out of round.*
- After vigorous rubbing with a stiff wire brush, the **bolt** shows no abnormalities.*
- After vigorous rubbing with a stiff wire brush, the **locking body** shows no abnormalities.*
- Sign off on the paperwork that the seal inspection is acceptable.
- Turn in the two used seal parts.
- If practical, inspect the interior of the container.

CHAPTER 4
BRAMMALL MULTIPLE SNAP LOC SEAL
(see Video #2 for more information)

INTRODUCTION

Brammall's Multiple Snap Loc Seal is composed of a straight, notched bolt and a separate short, cylindrical locking body with a hole through its center (Figure 15). Both the bolt head and locking body are inscribed with (typically) non-matching serial numbers. The bolt head is often stamped with the Brammall name and logo (Figure 16). Both the bolt and the locking body have a silvery surface finish.

Although similar in form and use to other bolt-type seals like the Brooks Trans-Lok and Rod-Lok, the Brammall Multiple Snap Loc is different because of its notched bolt. These five notches permit the user to push the locking body fairly tightly against the hasp. In comparison to some other bolt seals, the Brammall Multiple Snap Loc Seal is also softer and can be more easily removed with a bolt cutter.

As with all barrier seals, the distinction between the lock and seal functions must be kept clearly in mind.

Video #2 shows the correct installation and inspection procedures for the Brammall Multiple Snap Loc Seal. The checklists at the end of this chapter can be used in the field to assure all the necessary steps have been taken. The two checklists show the various steps in approximately (though not exactly) the same order as in the video.

INSTALLATION PROCESS: EXAMINING THE CONTAINER

The container (room, truck, railcar, etc.) intended to be sealed must be carefully inspected before installing the seal. Be sure the container is fully intact and in reasonably good shape. There must be no serious openings, cracks, or holes that could be used to gain easy access to the container, or to remove or insert items. Note anything abnormal about the container on the seal paperwork.

Bear in mind that an adversary may have tampered with the container prior to its use in order to gain easier access once the container is sealed.

Ideally, the top, bottom, and sides of the container - both inside and out - should be carefully inspected visually and also felt or poked at. As a practical matter, this may not always be possible. The container may be full of items at the time of inspection - making examination of the insides difficult. It may also be difficult to inspect the exterior of the container (especially the top and/or bottom) if the container is large, heavy, or stacked on or near other containers or walls. Note on your inspection paperwork which portions of the container have been inspected. Write down any anomalies or problems.

Pay particular attention to any welds, rivets, screws, nails, hinges, repair patches, and adhesive joints on the container. Are these old and damaged? Could they be exploited to gain entry into the container without being detected? Note on your paperwork any unusual surface finishes, decals, paints, or logos that you find on the container. Report to your supervisor if the container does not appear to be of the proper size, shape, or design.

Always devote considerable attention to the corners, seams, and edges of the container, as well as any dents, scratches, or corrosion. These are often where attacks on the container will take place. Report any serious problems.

The environment the container will be exposed to during storage or transit is important to consider. If the sealed container will sit quietly in a secure area without being disturbed, it should be in excellent condition. On the other hand, if the container will be banged around in transit, or at a loading dock or warehouse, less than perfect condition may be acceptable since it is likely to take some dings anyway. Certainly the container must be in good enough shape to withstand its expected handling. If the items being protected by the seal are extremely critical, the container should be in the best possible condition. If the items are less



Figure 15. The Brammall Multiple Snap Loc Seal, unsealed (left) and sealed (right).



Figure 16. The bolt head (left) and the locking body (right) for the Brammall Multiple Snap Loc Seal.

critical, it may be acceptable to compromise on the condition of the container. Always keep in mind, however, there is little point in installing a seal on a container than can be easily entered by bypassing the seal.

A thorough container inspection must include careful examination of the container locking mechanism, hasp, door, and/or lid (Figure 17). Be sure these are intact and in good working condition. Look for signs of serious damage, fractures, or corrosion. Look for signs of tampering, or anything out of the ordinary. Pay particular attention to any rivets, hinges, or screws. Make sure they are not missing, about to come loose, or fake.

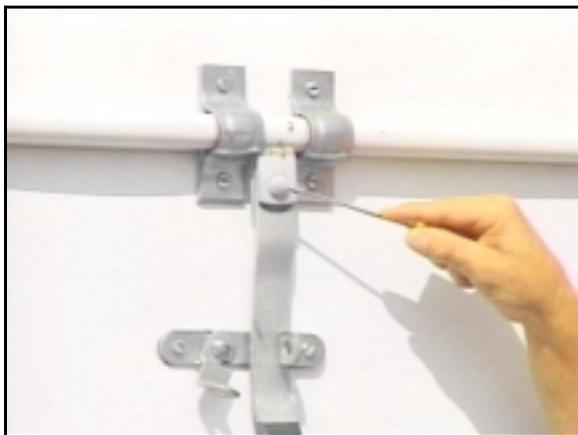


Figure 17. Carefully inspect the hasp and locking mechanism.

INSTALLATION PROCESS: EXAMINING THE SEAL

Just prior to installing a Brammall Multiple Snap Loc Seal, it must be carefully inspected for signs of defects, damage, or tampering (Figure 18). This should be done right at the container, moments before installing the seal (not minutes, hours, or days earlier).



Figure 18. Check carefully under the bolt head.

Look for significant defects, scratches, dents, or unusual markings, particularly on the bolt and under the bolt head.

The five notches on the bolt's shaft should be carefully inspected for any irregularities.

Feel the surface of the bolt and locking body. Are there any abnormalities? Are both pieces round, or have they been dented or bent? Are their colors and surface finishes uniform along each piece?

Is the black washer inside the locking body intact and able to rotate? The locking body also contains two C-spring retaining rings. Insert a small point or toothpick and check that they can rotate. If the rings do not move freely, the seal must be rejected.

Compare the seal you are about to install against another, unused Brammall Multiple Snap Loc Seal. (This should be labeled or marked so that you don't confuse it with the seal you intend to install when it comes time to seal the container.

Ideally, this comparison seal is one from a different batch that you carry around with you for this purpose.) See Figure 19.



Figure 19. Side-by-side comparison with a sample Multiple Snap Loc Seal.

The bolts and locking bodies should match in terms of length, diameter, color, surface finish, and approximate weight. Logos on both seals should match. The serial numbers (while different for the two seals) should have the same font, depth, and size. The digit alignment and spacing should be the same.

INSTALLATION PROCESS: RECORDING THE SEAL SERIAL NUMBER

Record the seal's serial number on the appropriate seal paperwork or database. Double check that you made no error in recording it!

Do not write the seal serial number on the container, or anywhere else that is not appropriate.

This paperwork must be protected from potential adversaries at all times! Do not let it out of your sight. It must never be stored inside the container being protected by the seal!

INSTALLATION PROCESS: SEALING THE CONTAINER

To install the Brammall Multiple Snap Loc Seal, insert the bolt into the hasp. Holding the bolt head, push the locking body onto the bolt tip. The black washer in the locking body needs to face away from the bolt head as the locking body slides along the bolt. See Figure 20.



Figure 20. Installing the Multiple Snap Loc Seal.

Continue to push the locking body along the bolt shaft until it fits as closely as possible to the hasp. The locking body will click as it passes each notch. It cannot be moved backwards after it has advanced a notch.

To check the seal installation, give the seal a sharp tug, first from the locking body, then from the bolt head. Disregard any small amount of play; this is normal for the Multiple Snap Loc Seal. However, if the seal opens, or the locking body slips a notch, the seal must be removed, recorded, and turned in.

As a final check, spin the locking body on the bolt. If it cannot rotate 360 degrees, the seal is faulty and must be rejected and removed.

Finally, double check that you have actually sealed the container and that its door or lid is truly

closed and sealed. The seal doesn't do much if you forgot to close the container door or lid, or sealed the wrong part of the door or lid! Double check that the seal serial number matches what you recorded. If you make an error here, seal security will be lost.

INSPECTION PROCESS: EXAMINING THE CONTAINER

The first step in the inspection process, typically when a container (or truck, railcar, etc.) arrives at its destination, is to carefully examine it. This is similar to the examination process described in the above Section on "Installation Process: Examining the Container."

Be sure the container lid or door is still closed and sealed. Are there any significant new holes, cracks, defects, scratches, or dents in the container that were not noted during the initial container examination, before the seal was put on? Is there a repair patch or weld where one is not expected, or noted on the paperwork? Look and smell for evidence of fresh paint or adhesives.

INSPECTION PROCESS: EXAMINING THE SEAL PRIOR TO REMOVAL

Check that the seal serial numbers match what is written on the paperwork.

Is there any evidence the serial number has been buffed off and then re-stamped?

Also, look carefully at the seal paperwork itself. Is there any evidence that the recorded serial number has been erased, modified, over-written, or tampered with? Report any suspicions immediately.

Next, compare the installed seal against an unused, locked Multiple Snap Loc Seal. You are checking for similar colors, logos, and serial number fonts, depth, alignment, and spacing. The seal lengths and diameters should be the same.

Next, tug on the locking body to make sure it is secure. Spin the locking body to be sure that it can still rotate 360 degrees.

Is the black washer on the underside of the locking body intact? Does it still face away from the bolt head?

Are there signs that the seal has been sawed, cut, or ground down? Does the seal look like it has been flame-heated, glued, or soldered?

Do the bolt and bolt head feel normal?

INSPECTION PROCESS: REMOVING AND RE-EXAMINING THE SEAL

The Brammall Multiple Snap Loc Seal can be easily removed with bolt cutters (Figure 21). (Be sure to note, however, if it seems too easy to remove the seal.)

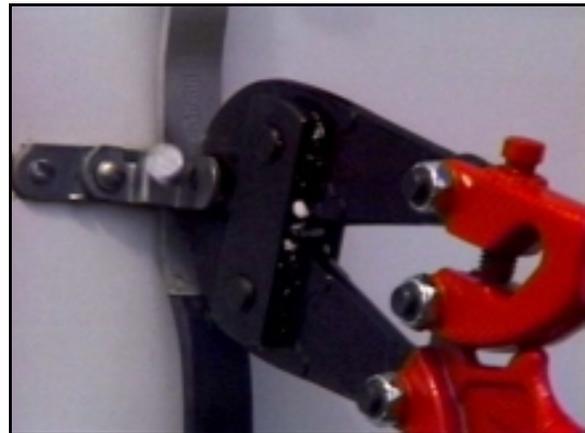


Figure 21. Removing the Brammall Multiple Snap Loc Seal with bolt cutters.

The seal can also be removed with a grinding tool, saw, plasma cutter, or torch, though bolt cutters are preferable.

Safety glasses must be worn when removing the seal, regardless of the tools used!

The final inspection of the seal involves the following: check that the bolt, bolt head, and locking body are not out of round. Look carefully under the bolt head for signs of cutting, grinding, soldering, or gluing.

Take a wire brush and scratch up the remnants of the bolt and the outsides of the locking body. This helps to remove the finish. Look particularly closely at the underside of the bolt head. Check the locking body for signs that a small hole has been drilled and then cosmetically repaired, refilled, or repainted. This hole can be used to tamper with the seal.

After the seal has been removed and examined, its two parts should be returned to the seal check-out point for proper disposal, post-mortem analysis, or archiving. Do not discard or abandon used seals or seal parts!

If possible, the interior of the container should also be inspected for signs of unauthorized entry. This may have to wait until the container is unloaded.

CHAPTER 4 REVIEW QUESTIONS

1. How do the lock functions of the Brammall Multiple Snap Loc Seal differ from its seal functions?
2. What are some of the unusual features of this seal compared to the other seals discussed in this manual?
3. True or False: A seal is no better than the container it is used on.
4. Prior to installing the seal, how do you check the two C-spring retaining rings inside the locking body?
5. Why do you never store the seal paperwork inside the container being protected by the seal?
6. The black washer inside the locking body faces which direction when you install it on the bolt?
7. How should the Brammall Multiple Snap Loc Seal be removed from a container?
8. After removing the Brammall Multiple Snap Loc Seal from the container, why is it vigorously scratched with a wire brush? What are we looking for, and why?

CHAPTER 4 DISCUSSION QUESTIONS

1. Which parts of the Brammall Multiple Snap Loc Seal do you think are most vulnerable to attack?
2. What do you suppose is the function of the black washer inside the locking body?
3. Why are the C-spring retaining rings needed?
4. Why should considerable attention be paid to the underside of the bolt head?
5. What types of containers and hasps might the Brammall Multiple Snap Loc Seal be best for?
6. What are the advantages and disadvantages of a seal design that allows some flexibility on the distance between the locking body and the other end of the seal?
7. Why is the seal compared side-by-side with an identical seal, both before and after being used to seal a container?
8. Why do you suppose it is important to check the Brammall Multiple Snap Loc Seal for signs of flame-heating?
9. The Brammall Multiple Snap Loc Seal has five notches. Would more notches be better? Why or why not?

Installation Checklist - Brammall Multiple Snap Loc Seal

Note: Items marked with a * are particularly important to check carefully.

1. Examine the Container

The container is free of serious openings, cracks, or holes in the...

Exterior...

- sides
- top (if practical)
- bottom (if practical)

Interior...

- sides (if practical)
- top (if practical)
- bottom (if practical)
- The rivets, screws, corners, edges, seams, and repair patches are in good shape.
- The door or lid is in good working condition.
- Note on the paperwork which portions of the container that have been inspected, plus any problems.
- The hasp and locking mechanism are complete, intact, and in good working condition.

2. Inspect the Seal--JUST PRIOR TO INSTALLING IT!

- The **bolt** looks to be free of serious defects, damage, scratches, cuts, dents, cracks, abrasions, discoloration, or unusual stains or markings, **ESPECIALLY UNDER THE BOLT HEAD.***
 - The five notches on the **bolt** are free of irregularities.*
 - The **bolt** feels uniform and free of irregularities.*
 - The **bolt** is symmetric.
 - The **locking body** is visually free of serious defects, damage, scratches, cuts, dents, cracks, holes, abrasions, discoloration, or unusual stains or markings.*
 - The **locking body** feels uniform and free of irregularities.
 - The **locking body** is symmetric.
- The seal matches the sample (comparison seal) in terms of...
- diameter and length.
 - overall color & surface finish.
 - logos.
 - serial number depth, size, alignment, spacing, and font.

3. Record the Seal Serial Number(s)

- The serial numbers match the numbers you have written on the paperwork.*

4. Install the Seal

- The **locking body** is pushed along the bolt as close to the hasp as possible.
- The installed seal does not open when you yank hard on the **bolt** and the **locking body.***
- The **locking body** is still free to rotate 360°.

5. Double Check the Seal Installation

- The container door or lid is truly closed and sealed.*
- The seal's serial numbers match the serial numbers written on the paperwork.*
- Major new scratches or dents (if any) in the seal, container, door, or lid as a result of installing and testing the seal are recorded on the paperwork.
- The seal looks OK.
- The seal stands up to one more solid tug.
- Sign off on the paperwork that the seal installation is acceptable.

Inspection Checklist - Brammall Multiple Snap Loc Seal

Note: Items marked with a * are particularly important to check carefully.

1. Examine the Container Exterior

- The door (or lid) is still closed and sealed.*
The container is free of serious openings, cracks, or holes in the...
 - Exterior...
 - sides
 - top (if practical)
 - bottom (if practical)
 - Interior...
 - sides (if practical)
 - top (if practical)
 - bottom (if practical)
- There is no sign of new painting or staining.
- There is no sign of tampering or abnormalities with the rivets, screws, corners, edges, repair patches, welds, or seams.
- There is no sign of tampering or abnormalities with the door (or lid), hasp, or locking mechanism.

2. Examine the Seal (prior to removal)

- The seal's serial numbers match the paperwork*
- The serial number on the seal does not appear to have been buffed off and re-stamped.*
- The serial number written on the paperwork has not been erased, modified, or overwritten.*
The seal matches the sample (comparison seal) in terms of...
 - length and diameter.
 - approximate color and surface finish.
 - logos.
 - serial number depth, size, alignment, spacing, and font.*
- The seal does not open when you tug hard on it.*
- The **locking body** is still free to rotate 360°.*
- The black washer in the **locking body** is still intact.
- There are no signs that any portion of the seal has been sawed, cut, or ground down.*
- There are no signs that any portion of the seal has been flame-heated, glued, or soldered.*
- The **bolt** and bolt head feel normal.

3. Remove and Re-examine the Seal

- When you remove the seal, it is not too easily cut off.
- The **bolt**, **bolt head**, and **locking body** are not out of round.*
- After vigorous rubbing with a stiff wire brush, the **bolt** shows no abnormalities.*
- After vigorous rubbing with a stiff wire brush, the **locking body** shows no abnormalities, especially evidence of a small hole that has been repaired, filled, or re-painted.*
- Sign off on the paperwork that the seal inspection is acceptable.
- Turn in the two used seal parts.
- If practical, inspect the interior of the container.

CHAPTER 5
TYDEN/BRAMMALL CAR BALL SEAL
(see Video #3 for more information)

INTRODUCTION

This chapter covers the proper protocols for using the Tyden/Brammall Car Ball Seal. This metal ribbon seal has been widely used on railcars for years. It is also sometimes used on trucks or transportainers. The seal is inexpensive, easy to use, and has better durability than wire loop or plastic strap seals.

The Tyden/Brammall Car Ball Seal consists of a metal ribbon, with a ball end (“locking body or head”) (Figure 22). The (female) ball end contains a double locking ring assembly that irreversibly captures the opposite (male) end of the metal ribbon after it is inserted. The ribbon can be color-coded, though it is usually silver/gray. The seal typically comes with an embossed serial number. Bar coding is an option.

Video #3 shows the installation and inspection procedures for the Tyden/Brammall Car Ball Seal. The checklists at the end of this chapter can be used in the field to assure all the necessary steps have been taken. The two checklists show the various steps in approximately (though not exactly) the same order as in the video.

INSTALLATION PROCESS: EXAMINING THE CONTAINER

As always, the container (or room, truck, railcar, etc.) intended to be sealed must be carefully inspected before installing the seal. Be sure the container is fully intact and in reasonably good shape. There must be no serious openings, cracks, or holes that could be used to gain easy access to the container, or to remove or insert items. Note anything abnormal about the container on the seal paperwork. Bear in mind that an adversary may have tampered with the container prior to its use in order to gain easier access once the container is sealed.

Ideally, the top, bottom, and sides of the container - both inside and out - should be carefully inspected visually and also felt or poked at. As a practical matter, this may not always be possible. The container may be full of items at the time of inspection - making examination of the insides difficult. It may also be difficult to inspect the exterior of the container (especially the top and/or bottom) if the container is large, heavy, or stacked on or near other containers or walls. Note on your inspection paperwork which portions of the container have been inspected. Write down any anomalies or problems.

Pay particular attention to any welds, rivets, screws, nails, hinges, repair patches, and adhesive joints on the container. Are these old and damaged? Could they be exploited to gain entry into the container without being detected? Note on your paperwork any unusual surface finishes, decals, paints, or logos that you find on the container. Report to your supervisor if the container does not appear to be of the proper size, shape, or design.

Always devote considerable attention to the corners, seams, and edges of the container, as well as any dents, scratches, or corrosion. These are often where attacks on the container will take place. Report any serious problems.

The environment the container will be exposed to during storage or transit is important to consider. If the sealed container will sit quietly in a secure area without being disturbed, it should be in excellent condition. On the other hand, if the container will be banged around in transit, or at a loading dock or warehouse, less than perfect condition may be acceptable since it is likely to take some dings anyway. Certainly the container must be in good enough shape to withstand its expected handling. If the items being protected by the seal are extremely critical, the container should be in the best possible condition. If the items are less

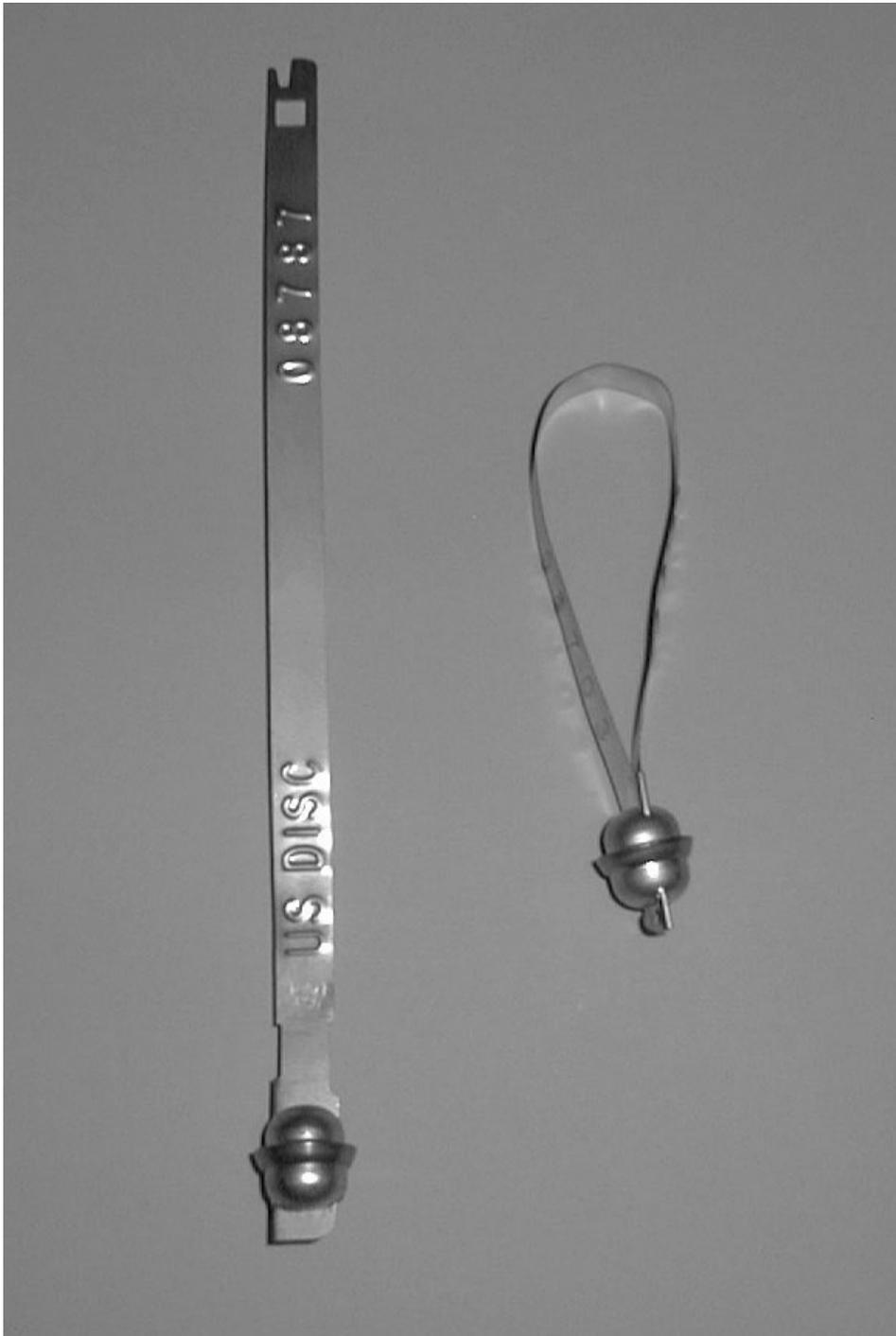


Figure 22. The Tyden/Brammall Car Ball Seal, unsealed (at left) and sealed (right).

critical, it may be acceptable to compromise on the condition of the container. Always keep in mind, however, there is little point in installing a seal on a container that can be easily entered by bypassing the seal.

A thorough container inspection must include careful examination of the container locking mechanism, hasp, door, and/or lid. Be sure these are intact and in good working condition. Look for signs of serious damage, fractures, or corrosion. Look for signs of tampering, or anything out of the ordinary. Pay particular attention to any rivets, hinges, or screws. Make sure they are not missing, about to come loose, or fake.

INSTALLATION PROCESS: EXAMINING THE SEAL

Just prior to installing a Tyden/Brammall Car Ball Seal, it must be carefully inspected for signs of defects, damage, or tampering. This should be done right at the container, moments before installing the seal (not minutes, hours, or days earlier).

Look for serious imperfections, abrasions, scratches, dents, or unusual markings, especially at each end of the metal ribbon. Be sure to visually inspect the entire surface area of the ball end.

Feel along the surface of the strap and around the outside of the ball end. Are there any abnormalities? Are there serious dents, scratches, or bends? Is the color and surface finish uniform along the seal?

Look inside the ball through the open slits, perhaps with a flashlight. Are there any foreign objects, dirt, or materials visible inside? See Figure 23.

Yank on the metal ribbon to be sure it does not come loose from the ball end.

Compare the seal you are about to install against another open, unused Tyden/Brammall Car Ball Seal. This sample seal should be one you carry around with you for this purpose - not one chosen from the same batch as the seal you plan to install. (Write "Sample" on this comparison seal with a permanent marker, or label it in some other way, so that you don't accidentally use it for sealing, instead of the seal you meant to install!)



Figure 23. Inspecting the interior of the ball.

The two seals should have the same dimensions and color. The parts should match. The serial numbers on the two seals should be different, but have approximately the same depth, size, digit alignment, spacing, and font. Report any problems. Do not install a seal that has serious discrepancies!

INSTALLATION PROCESS: RECORDING THE SEAL SERIAL NUMBER

Record the seal serial number on the appropriate seal paperwork. Double check that you made no error in recording the serial number!

Do not write the seal serial number on the container, or anywhere else that is not appropriate.

This paperwork must be protected from potential adversaries at all times! Do not let it out of your sight. It must never be stored inside the container being protected by the seal!

INSTALLATION PROCESS: SEALING THE CONTAINER

To install the Tyden Car Ball Seal, close the door and align the hasp. Next, orient the metal ribbon such that the serial number will be right side out when the flat end of the metal ribbon is inserted into the ball end. (If you fold the metal strap in the wrong direction, the serial number will be backwards.) Slide the flat (male) end of the

metal ribbon through the hasp and insert it into the slit in the rear of the ball end. See Figure 24.



Figure 24. Installing the seal.

You should hear a click as the double locking rings inside the ball head latch on to the male end of the metal ribbon.

To check the seal installation, hold the ball end with one hand and the metal ribbon (near the male end) with the other. Tug firmly on the metal ribbon to make sure the seal is secure. Some play is to be expected. You can compare the amount of play and the force needed to move the ribbon against a comparison seal that has been locked. The latching mechanism should permit about 1/4 inch of play, but not much more.

If the seal opens, or the metal ribbon slips substantially, the seal is faulty and must be removed. Record this fact and return the seal to the checkout point, making sure to emphasize that the seal is defective. (You do not want the seal to be re-used.)

Finally, double check that you have actually sealed the container and that its door or lid is truly closed.

Double check that the seal serial number matches what you recorded.

Any significant new scratches or marks made on the seal or the container during installation should be noted on the paperwork.

Look closely at the seal and give it one more tug as a check.

INSPECTION PROCESS: EXAMINING THE CONTAINER

The first step in the inspection process, typically when a container (or truck, railcar, etc.) arrives at its destination, is to carefully examine it. This is similar to the examination process described in the above Section on “Installation Process: Examining the Container.”

Be sure the container lid or door is still closed and sealed. Are there any significant new holes, cracks, defects, scratches, or dents in the container that were not noted during the initial container examination, before the seal was put on? Is there a repair patch or weld where one is not expected, or noted on the paperwork? Look and smell for evidence of fresh paint or adhesives.

INSPECTION PROCESS: EXAMINING THE SEAL PRIOR TO REMOVAL

Before removing the seal, carefully check that its serial number matches the paperwork.

Compare the installed seal against an unused, locked Tyden/Brammall Car Ball Seal. The colors and surface finish should be very similar. The logos should match and the serial numbers should have the same location, font, depth, size, and spacing. The seals should be the same length and width. See Figure 25.



Figure 25. Comparing the seal against another Car Ball Seal prior to removal.

Next, tug on the metal ribbon near the male end to see if the seal stays intact. The amount of play should match fairly closely that of the comparison seal. The latching mechanism should permit about 1/4 inch of play, but not much more.

Use a flashlight to peer inside the slit in the ball end. Is there any foreign material in there? Does it look right?

Are there signs that the seal has been sawed, cut, abraded, glued, soldered, or ground down? Does the seal look like it has been flame-heated?

Has the serial number been buffed off and re-stamped?

INSPECTION PROCESS: REMOVING AND RE-EXAMINING THE SEAL

The Tyden/Brammall Car Ball Seal should be removed from the container with tin snips. Cut the seal near the half-way point. Do NOT pry it off or use force! This may damage the seal and hide evidence of tampering – also, it isn't very safe. See Figure 26.



Figure 26. Removing the seal with tin snips.

The final inspection of the seal involves the following: check the cut seal one more time for abnormalities. Take a wire brush and scratch up the ribbon and ball end. This helps to remove the finish. Look closely for signs of cosmetic repair, a small hole in the ball end, or fresh painting, gluing, or soldering.

After the seal has been removed, it should be turned into the checkout point for proper disposal, post-mortem analysis, or archiving.

The Car Ball Seal is one seal that can particularly benefit from a post-mortem exam. Such an analysis, however, is not the proper function of the person responsible for inspecting and removing the seal in the field.

If possible, the interior of the container should also be inspected for signs of unauthorized entry. This may have to wait until the container is unloaded.

CHAPTER 5 REVIEW QUESTIONS

1. Should the Tyden/Brammall Car Ball Seal be considered a barrier seal? Why or why not?
2. What is the Tyden/Brammall Car Ball Seal commonly used for?
3. What are some important ways that the Tyden/Brammall Car Ball Seal differs from other seals covered in this course?
4. After the seal is sealed, how much play should there be in the metal ribbon inserted into the ball end?
5. Why is it important to compare the seal with a comparison seal, both before and after the seal is installed?
6. What is the purpose of scratching the seal with a wire brush after it has been removed from the container?
7. How should the Tyden/Brammall Car Ball Seal be removed from a container? Why should you not remove it by prying it off or yanking on it?
8. What is a seal post-mortem analysis?

CHAPTER 5 DISCUSSION QUESTIONS

1. Why do you suppose the Tyden/Brammall Car Ball Seal is popular for use on railcars?

2. How do you suppose the Tyden/Brammall Car Ball Seal might stand up to the elements as compared to other types of seals?

3. What are some of the potential safety hazards involved in using the Tyden/Brammall Car Ball Seal? How do they differ from the hazards associated with more modern plastic strap seals?

4. What is the purpose of a seal post-mortem exam? What benefits might it offer? How do you

think it might be conducted for the Tyden/Brammall Car Ball Seal?

5. Why do you think the Tyden/Brammall Car Ball Seal might particularly benefit from a careful post-mortem examination?

6. Why do you think a post-mortem exam must be done by someone other than the seal inspector who examined and removed the seal in the field?

Installation Checklist - Tyden/Brammall Car Ball Seal

Note: Items marked with a * are particularly important to check carefully.

1. Examine the Container

The container is free of serious openings, cracks, or holes in the...

Exterior...

- sides
- top (if practical)
- bottom (if practical)

Interior...

- sides (if practical)
- top (if practical)
- bottom (if practical)

- The rivets, screws, corners, edges, seams, and repair patches are in good shape.
- The door or lid is in good working condition.
- Note on the paperwork which portions of the container that have been inspected, plus any problems.
- The hasp and locking mechanism are complete, intact, and in good working condition.

2. Inspect the Seal--JUST PRIOR TO INSTALLING IT!

- The **ribbon** is free of serious defects, damage, scratches, cuts, dents, cracks, abrasions, discoloration, or unusual stains or markings, especially at the male end.*
 - The **ribbon** feels free of abnormalities.
 - The entire surface area of the **ball end** is free of serious defects, damage, scratches, cuts, dents, holes, cracks, abrasions, discoloration, or unusual stains or markings.*
 - The interior of the **ball end** is free of foreign objects and dirt.*
 - The surface of the **ball end** feels free of abnormalities.
 - The **ribbon** does not tear loose from the ball end when you pull on it.*
- The seal matches the sample (comparison seal) in terms of...
- width and length.
 - overall color and surface finish.
 - serial number location, depth, size, alignment, spacing, and font.

3. Record the Seal Serial Number(s)

- The serial number matches the number you have written on the paperwork.*

4. Install the Seal

- Install the seal so that the serial number will face outward.
- The seal clicks when the male end of the metal ribbon is inserted into the ball end.*
- The metal ribbon does not come loose when you tug on it.*
- The male end of the metal ribbon has approximately 1/4 inch of play inside the ball end.*

5. Double Check the Seal Installation

- The door or lid is definitely closed and sealed.*
- Verify that you recorded the correct serial number on the paperwork.*
- Major new scratches or dents (if any) in the seal, container, door, or lid as a result of installing and testing the seal are recorded on the paperwork.
- The seal looks OK.
- The seal stands up to one more tug.
- Sign off on the paperwork that the seal installation is acceptable.

Inspection Checklist - Tyden/Brammall Car Ball Seal

Note: Items marked with a * are particularly important to check carefully.

1. Examine the Container Exterior

- The door (or lid) is still closed and sealed.*
The container is free of serious openings, cracks, or holes in the...
 - Exterior...
 - sides
 - top (if practical)
 - bottom (if practical)
 - Interior...
 - sides (if practical)
 - top (if practical)
 - bottom (if practical)
- There is no sign of new painting or staining.
- There is no sign of tampering or abnormalities with the rivets, screws, corners, edges, repair patches, welds, or seams.
- There is no sign of tampering or abnormalities with the door (or lid), hasp, or locking mechanism.

2. Examine the Seal (prior to removal)

- The serial number matches the paperwork*
The seal matches the sample (comparison seal) in terms of...
 - approximate width and length.
 - overall appearance, color, and surface finish.
 - serial number location, depth, size, alignment, spacing, and font.
- The metal ribbon does not come loose when you tug on it.*
- The male end of the metal ribbon has approximately 1/4 inch of play inside the ball end.*
- The interior of the **ball end** is free of foreign objects and dirt.*
- The **ribbon** is free of serious defects, damage, scratches, cuts, dents, cracks, abrasions, discoloration, or unusual stains or markings.*
- The **ribbon** feels free of abnormalities.
- The entire surface area of the **ball end** is free of serious defects, damage, scratches, cuts, dents, holes, cracks, abrasions, discoloration, or unusual stains or markings.*
- The surface of the **ball end** feels free of abnormalities.
- The serial number does not appear to have been buffed off and re-stamped or tampered with.*

3. Remove and Re-examine the Seal

- After vigorously rubbing the **metal ribbon** with a stiff wire brush, it shows no abnormalities such as signs of cosmetic repair, fresh paint, gluing, or soldering.*
- After vigorously rubbing the surface of the **ball end** with a stiff wire brush, it shows no abnormalities such as signs of cosmetic repair, a small hole, fresh paint, gluing, or soldering.*
- Sign off on the paperwork that the seal inspection is acceptable.
- Turn in the used seal.
- If practical, inspect the interior of the container.

CHAPTER 6
BROOKS CABLE LOCK SEAL
(see Video #4 for more information)

INTRODUCTION

The Cable Lock Seal made by Brooks is a strong barrier seal commonly used on railcars and truck trailers. Being part lock and part seal, users must be careful not to confuse the two separate functions.

The Brooks Cable Lock Seal (Figure 27) uses crimped aircraft cable and a C-retaining ring locking mechanism to irreversibly capture the (brass-colored) male end of the cable in the attached female locking body (see Figures 28, 29, and 30). There is a serial number on the locking body.

Video #4 shows the installation and inspection procedures for this seal. The checklists at the end of this chapter can be used in the field to assure all the necessary steps have been taken. The two checklists show the various steps in approximately (though not exactly) the same order as in the video.

INSTALLATION PROCESS: EXAMINING THE CONTAINER

As always, the container (or room, truck, railcar, etc.) intended to be sealed must be carefully inspected before installing the seal. Be sure the container is fully intact and in reasonably good shape. There must be no serious openings, cracks, or holes that could be used to gain easy access to the container, or to remove or insert items. Note anything abnormal about the container on the seal paperwork. Bear in mind that an adversary may have tampered with the container prior to its use in order to gain easier access once the container is sealed.

Ideally, the top, bottom, and sides of the container - both inside and out - should be carefully inspected visually and also felt or poked at. As a practical matter, this may not always be possible.

The container may be full of items at the time of inspection - making examination of the insides difficult. It may also be difficult to inspect the exterior of the container (especially the top and/or bottom) if the container is large, heavy, or stacked on or near other containers or walls. Note on your inspection paperwork which portions of the container have been inspected. Write down any anomalies or problems.

Pay particular attention to any welds, rivets, screws, nails, hinges, repair patches, and adhesive joints on the container. Are these old and damaged? Could they be exploited to gain entry into the container without being detected? Note on your paperwork any unusual surface finishes, decals, paints, or logos that you find on the container. Report to your supervisor if the container does not appear to be the proper size, shape, or design.

Always devote considerable attention to the corners, seams, and edges of the container, as well as any dents, scratches, or corrosion. These are often where attacks on the container will take place. Report any serious problems.

The environment the container will be exposed to during storage or transit is important to consider. If the sealed container will sit quietly in a secure area without being disturbed, it should be in excellent condition. On the other hand, if the container will be banged around in transit, or at a loading dock or warehouse, less than perfect condition may be acceptable since it is likely to take some dings anyway. Certainly the container must be in good enough shape to withstand its expected handling. If the items being protected by the seal are extremely critical, the container should be in the best possible condition. If the items are less critical, it may be acceptable to compromise on the condition of the container. Always keep in mind, however, there is little point in installing a seal on a container than can be easily entered by bypassing the seal.

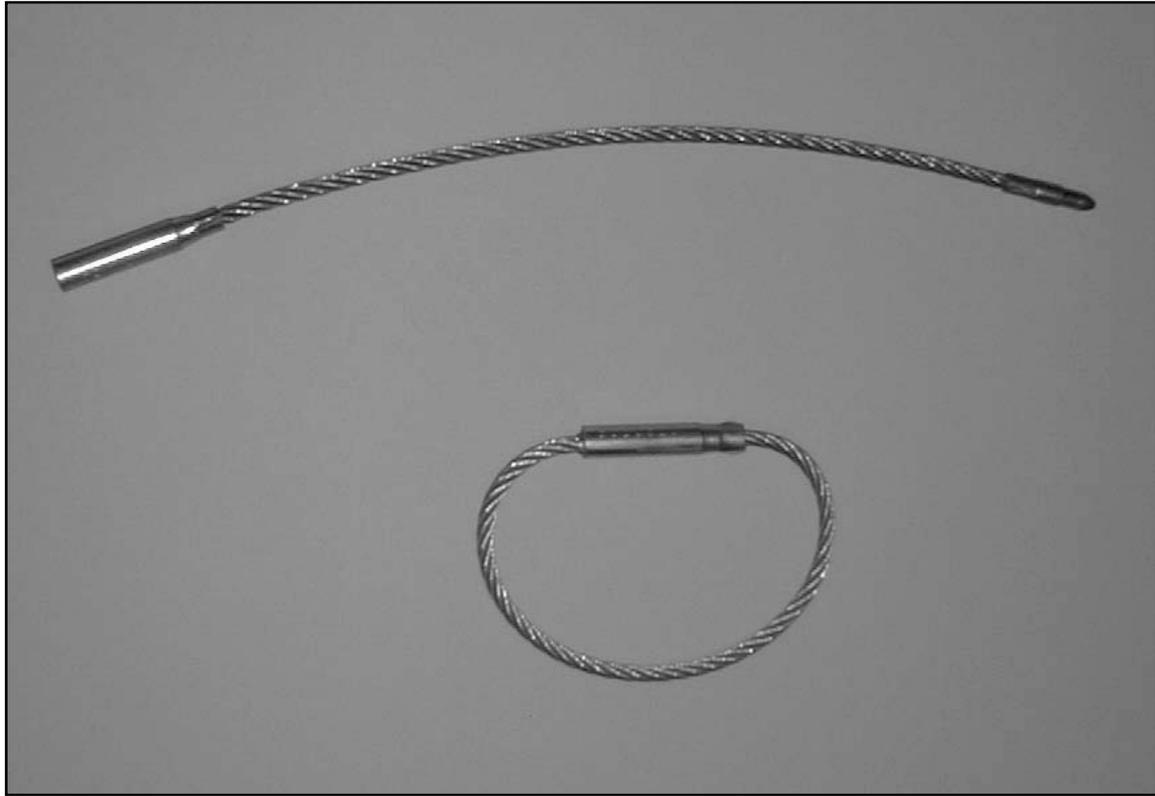


Figure 27. The Brooks Cable Lock Seal, open (top) and sealed (bottom).



Figure 28. The locking body, or female end.



Figure 29. The male end.

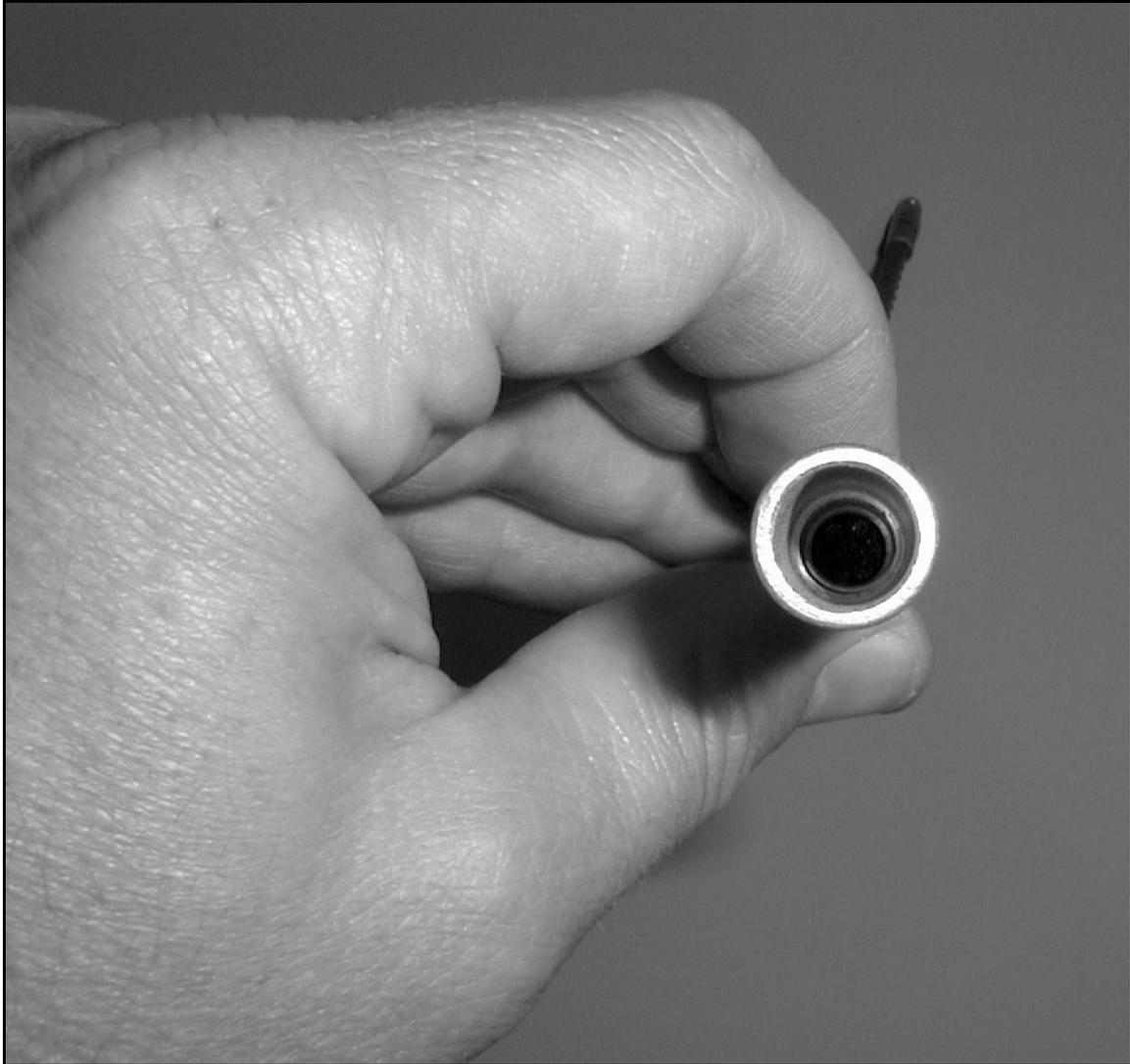


Figure 30. A view inside the locking body, showing the internal C-locking ring.

A thorough container inspection must include careful examination of the container locking mechanism, hasp, door, and/or lid. Be sure these are intact and in good working condition. Look for signs of serious damage, fractures, or corrosion. Look for signs of tampering, or anything out of the ordinary. Pay particular attention to any rivets, hinges, or screws. Make sure they are not missing, about to come loose, or fake. See Figure 31.



Figure 31. Pay particular attention to the rivets on the hasp and locking mechanism.

INSTALLATION PROCESS: EXAMINING THE SEAL

Just prior to installing a Brooks Cable Lock Seal, it must be carefully inspected for signs of defects, damage, or tampering. This should be done right at the container, moments before installing the seal (not minutes, hours, or days earlier).

Look for significant defects, scratches, cuts, cracks, abrasions, or damage on the cable. Is the color and surface finish uniform? There should be no evidence that the cable has been flame-heated, glued, soldered, or welded.

Carefully feel along the cable for uniformity. (Watch out for burrs that might cut you!) Are there any abnormalities?

Inspect the open end of the locking body. Be sure that the C-locking ring is present and intact (see Figure 30).

Carefully inspect the outsides of the male and female ends. Look for damage, defects, cracks, small holes, or cuts in the metal. Feel along the metal surfaces for any abnormalities.

Test whether the crimping is secure for both the male and female ends. Loose crimping is the most likely manufacturing defect, and can greatly compromise seal security. Any seal with loose crimping should not be used, and must be turned back into the checkout point.

Try bending and coiling the cable. It should not fray, nor should the metal ends come loose.

Next, compare the Brooks Cable Lock Seal you intend to install visually, side-by-side with an unused Brooks Cable Lock Seal. See Figure 32.

This sample seal should be one you carry around with you for this purpose - not one chosen from the same batch as the seal you plan to install. (Write "Sample" on this comparison seal with a permanent marker, or label it in some other way, so that you don't accidentally use it for sealing instead of the seal you meant to install!)

The two seals should have the same length and cable diameter. The male and female ends on each seal should match. Do the two seals have approximately the same color, sheen, and weight? The logos (if any) should match in terms of shape and location. The serial numbers on the two seals should be different, but have approximately the same depth, size, digit alignment, spacing, and font. Report any problems. Do not install a seal that has serious discrepancies!



Figure 32. Side-by-side comparison of the seal you intend to install vs. an unused Cable Lock Seal.

INSTALLATION PROCESS: RECORDING THE SEAL SERIAL NUMBER

Record the seal's serial number on the appropriate seal paperwork (Figure 33). Double check that you made no error in recording the serial number!



Figure 33. Recording the seal's serial number prior to installation.

Do not write the seal serial number on the container, or anywhere else that is not appropriate.

This paperwork must be protected from potential adversaries at all times! Do not let it out of your sight. It must never be stored inside the container being protected by the seal!

INSTALLATION PROCESS: SEALING THE CONTAINER

To install the Brooks Cable Lock Seal, loop the cable through the locking mechanism or hasp. The male end is then inserted into the locking body.

To check the seal installation, yank strongly on the cable. If the seal opens or the cable slips, the seal is defective, or has been incorrectly installed. It must be removed and turned into the seal checkout point.

Finally, double check that you have actually sealed the container and that its door or lid is truly closed. The seal doesn't do much if you forgot to

close the container door or lid, or sealed the wrong part of the door or lid!

Double check that the seal serial number matches what you recorded (Figure 34). If you make an error here, seal security will be lost.



Figure 34. Double check the serial number after the seal is installed!

INSPECTION PROCESS: EXAMINING THE CONTAINER

The first step in the inspection process, typically when a container (or truck, railcar, etc.) arrives at its destination, is to carefully examine it. This is similar to the examination process described in the Section on "Installation Process: Examining the Container."

Be sure the container lid or door is still closed and sealed. Are there any significant new holes, cracks, defects, scratches, or dents in the container that were not noted during the initial container examination, before the seal was put on? Is there a repair patch or weld where one is not expected, or noted on the paperwork? Look and smell for evidence of fresh paint or adhesives.

INSPECTION PROCESS: EXAMINING THE SEAL PRIOR TO REMOVAL

Before removing the seal, check its serial number against the recorded serial number on the seal paperwork. Does it match?

Is there any evidence the serial number has been buffed off and then re-stamped?

Also, look carefully at the seal paperwork itself. Is there any evidence that the recorded serial number has been erased, modified, overwritten, or tampered with? Report any suspicions immediately.

Carefully look at the seal cable for coiling, fraying, or unraveling. Look for abnormal stretching, snip marks, cuts, abrasions, or other abnormalities. Does the cable look like it has been exposed to flame-heating, sawing, cutting, grinding, soldering, welding, or gluing?

Feel along the length of the cable. (Use caution so as to avoid burrs!) The cable should feel normal and uniform along its length.

Tug very strongly on the cable. The cable should not open, though the male end should move about 1/16th of an inch. You should be able to rotate it a little as well, though not easily. If this is not the case, the seal may have been tampered with. The female locking body must not rotate about the cable or be loose.

Next, inspect the seal by comparing it alongside another locked Brooks Cable Lock Seal. They should look very similar and have the same size and shape. The serial numbers should have the same fonts, depth, alignment, and spacing.

INSPECTION PROCESS: REMOVING AND RE-EXAMINING THE SEAL

The Brooks Cable Lock Seal should be removed by cutting the cable with cable cutters. Be sure to wear safety glasses! Cut the cable near the half-way point, about 180 degrees opposite the locking body. Do NOT cut the cable with bolt cutters, a saw, a torch, or a grinding wheel.

After cutting off the seal, examine it carefully again. Take a wire brush and scratch up the cable (see Figure 35). This helps to remove the finish and show any signs of tampering.

Also use the wire brush to scratch the metal surface on the locking body. Look carefully to see if a small hole might have been drilled and then cosmetically repaired, refilled, or repainted.



Figure 35. Using a wire brush to abrade the cable surface.

After the seal has been removed, the aircraft cable and flag should be returned to the seal checkout point for proper disposal or archiving. Do not discard or abandon used seals!

If possible, the interior of the container should also be inspected for signs of unauthorized entry. This may have to wait until the container is unloaded.

CHAPTER 6 REVIEW QUESTIONS

1. Find the two locations on the Brooks Cable Lock Seal where crimping is used to fasten the parts together.
2. What are some of the unusual features of this seal compared to the other seals discussed in this manual?
3. When the seal is locked, how much should the male end slip within the locking body? Should you be able to rotate it?
4. How should the Brooks Cable Lock Seal be removed from a container?
5. After removing the Brooks Cable Lock Seal from the container, why are the cable and (female) locking body brushed with a wire brush? Why not the male end of the seal?

6. Why should you look out for burrs?

CHAPTER 6 DISCUSSION QUESTIONS

1. Which parts of the Brooks Cable Lock Seal do you think are most vulnerable to attack?

2. What are some of the advantages and disadvantages of a barrier seal compared to a “pure” seal?

3. What are some of the potential safety hazards involved in using the Brooks Cable Lock Seal?

4. Why should you not try to remove the Brooks Cable Lock Seal with bolt cutters, a saw, a grinding wheel, a torch, or your teeth?

5. What are some of the advantages and disadvantages of a seal design that always seals into a loop of the same size?

6. Why do you suppose it is important to check the Brooks Cable Lock Seal for signs of flame-heating?

7. Why should we be concerned if the male end refuses to slide out about 1/16 inch, or to rotate inside the locking body?

Installation Checklist - Brooks Cable Lock Seal

Note: Items marked with a * are particularly important to check carefully.

1. Examine the Container

The container is free of serious openings, cracks, or holes in the...

Exterior...

- sides
- top (if practical)
- bottom (if practical)

Interior...

- sides (if practical)
- top (if practical)
- bottom (if practical)

- The rivets, screws, corners, edges, seams, and repair patches are in good shape.
- The door or lid is in good working condition.
- Note on the paperwork which portions of the container that have been inspected, plus any problems.
- The hasp and locking mechanism are complete, intact, and in good working condition.

2. Inspect the Seal--JUST PRIOR TO INSTALLING IT!

- The **cable** is free of serious defects, scratches, cuts, cracks, abrasions, or damage.*
- The **cable** has a uniform color and surface finish.
- The **cable** shows no evidence of flame-heating, gluing, or soldering.
- The **cable** feels uniform along its length. (Be careful of burrs!)
- The C-locking ring inside the **female** end (locking body) is present and intact.*
- The **male** end looks symmetric, undamaged, and uniform in surface color and appearance.
- The **male** end feels uniform with no abnormalities.
- The **male** end is securely crimped onto the cable.*
- The **female** end looks symmetric, undamaged, and uniform in surface color and appearance.
- The **female** end feels uniform with no abnormalities.
- The **female** end is securely crimped onto the cable.*
- The **cable** does not fray or come loose with bending and coiling.*

The seal matches the sample (comparison seal) in terms of...

- size.
- cable** length and diameter.
- overall color and surface finish.
- serial number depth, size, alignment, spacing, and font.

3. Record the Seal Serial Number(s)

- The serial number matches the number you have written on the paperwork.*

4. Install the Seal

- The locked seal does not open when you yank hard on the cable.*

5. Double Check the Seal Installation

- The container door (or lid) is closed and sealed.*
- The seal's serial number matches the serial number written on the paperwork.*
- Major new scratches or dents (if any) in the seal, container, door, or lid as a result of installing and testing the seal are recorded on the paperwork.
- The seal looks OK.
- The seal stands up to one more solid tug.
- Sign off on the paperwork that the seal installation is acceptable.

Inspection Checklist - Brooks Cable Lock Seal

Note: Items marked with a * are particularly important to check carefully.

1. Examine the Container Exterior

- The door (or lid) is still closed and sealed.*
The container is free of serious openings, cracks, or holes in the...
 - Exterior...
 - sides
 - top (if practical)
 - bottom (if practical)
 - Interior...
 - sides (if practical)
 - top (if practical)
 - bottom (if practical)
- There is no sign of new painting or staining.
- There is no sign of tampering or abnormalities with the rivets, screws, corners, edges, repair patches, welds, or seams.
- There is no sign of tampering or abnormalities with the door (or lid), hasp, or locking mechanism.

2. Examine the Seal (prior to removal)

- The seal's serial number matches the paperwork*
- The serial number on the seal does not appear to have been buffed off and re-stamped.*
- The serial number written on the paperwork has not been erased, modified, or overwritten.*
- The **cable** is not coiled, frayed, or unraveling.
- The **cable** shows no visible evidence of flame-heating, sawing, cutting, grinding, soldering, welding, or gluing.*
- The **cable** feels normal and uniform along its length. (Use care to avoid burrs!)
- The seal does not open when you tug hard on the cable.*
- The **male** end has about 1/16 inch of play, but no more.*
- The **male** end can rotate inside the locking end, but not easily.*
- The **female** end isn't loose, nor can it rotate.*
- The seal matches the sample (comparison seal) in terms of...
 - size.
 - approximate color and surface finish.
 - serial number depth, size, alignment, spacing, and font.*

3. Remove and Re-examine the Seal

- Cut the cable with cable cutters at the half-way point.
- The seal shows no abnormalities.*
- After vigorous rubbing with a stiff wire brush, the **cable** shows no abnormalities.*
- After vigorous rubbing with a stiff wire brush, the **locking body** shows no abnormalities, nor evidence of a small hole that was drilled and then later filled or painted over.*
- Sign off on the paperwork that the seal inspection is acceptable.
- Turn in the used seal.
- If practical, inspect the interior of the container.

CHAPTER 7
ELC TIK AN Wire Loop Seal
(see Video #5 for more information)

INTRODUCTION

The ELC Tik AN Wire Loop Seal, shown in Figure 36, is a type of wire loop seal. Wire loop seals should not be considered barrier seals. They do not stand up to large amounts of force or weight, and may not be the best choice for large containers that will receive rough handling. They may, however, be good choices for smaller containers of modest size and weight.

Wire loop seals are traditionally viewed as replacements for old fashioned lead-wire seals. As discussed in Chapter 1 and the Safety Section of Chapter 2, DoD no longer permits the installation of lead-wire seals because of their health and environmental risks.

The ELC Tik AN Wire Loop Seal, like most other wire loop seals, consists of a “capsule” (really a locking body), some type of wire, plus an “anchor.” (The capsule is sometimes called the “housing,” while the anchor may be called the “head.”)

For the ELC Tik AN Wire Loop Seal, the anchor is permanently attached to the capsule by a plastic wire called a “connecting thread.” The capsule, anchor, and connecting thread may come in a variety of colors, including clear.

The anchor on the Tik seal has fingers (barbs) meant to snap irreversibly into the capsule when the seal is closed. The fingers are not supposed to release short of destroying the capsule and/or anchor. This damage can be detected.

The capsule may or may not have a logo. Imprinted on the post attached to the capsule is a serial number. The anchor has no serial number.

The “wire” available for use with the ELC Tik AN Wire Loop Seal includes a single strand wire, a twisted wire pair (one wire wound tightly around the other in a spiral), a string made of cotton or plastic, and a thin plastic or metal ribbon. For DoD purposes, however, the twisted wire pair should be used.

Video #5 shows the installation and inspection procedures for the ELC Tik AN Wire Loop Seal. It also shows some special preparation procedures for ammunition boxes that this seal is often used on.

The checklists at the end of this chapter can be used in the field to assure all the necessary steps have been taken. The two checklists show the various steps in approximately (though not exactly) the same order as in the video.

INSTALLATION PROCESS: EXAMINING THE CONTAINER

As always, the container (or room, truck, rail-car, etc.) intended to be sealed must be carefully inspected before installing the seal. Be sure the container is fully intact and in reasonably good shape. There must be no serious openings, cracks, or holes that could be used to gain easy access to the container, or to remove or insert items. Note anything abnormal about the container on the seal paperwork.

Bear in mind that an adversary may have tampered with the container prior to its use in order to gain easier access once the container is sealed.

Ideally, the top, bottom, and sides of the container - both inside and out - should be carefully inspected visually and also felt or poked at. As a practical matter, this may not always be possible. The container may be full of items at the time of inspection - making examination of the insides difficult. It may also be difficult to inspect the exterior of the container (especially the top and/or bottom) if the container is large, heavy, or stacked on or near other containers or walls. Note on your inspection paperwork which portions of the container have been inspected. Write down any anomalies or problems.

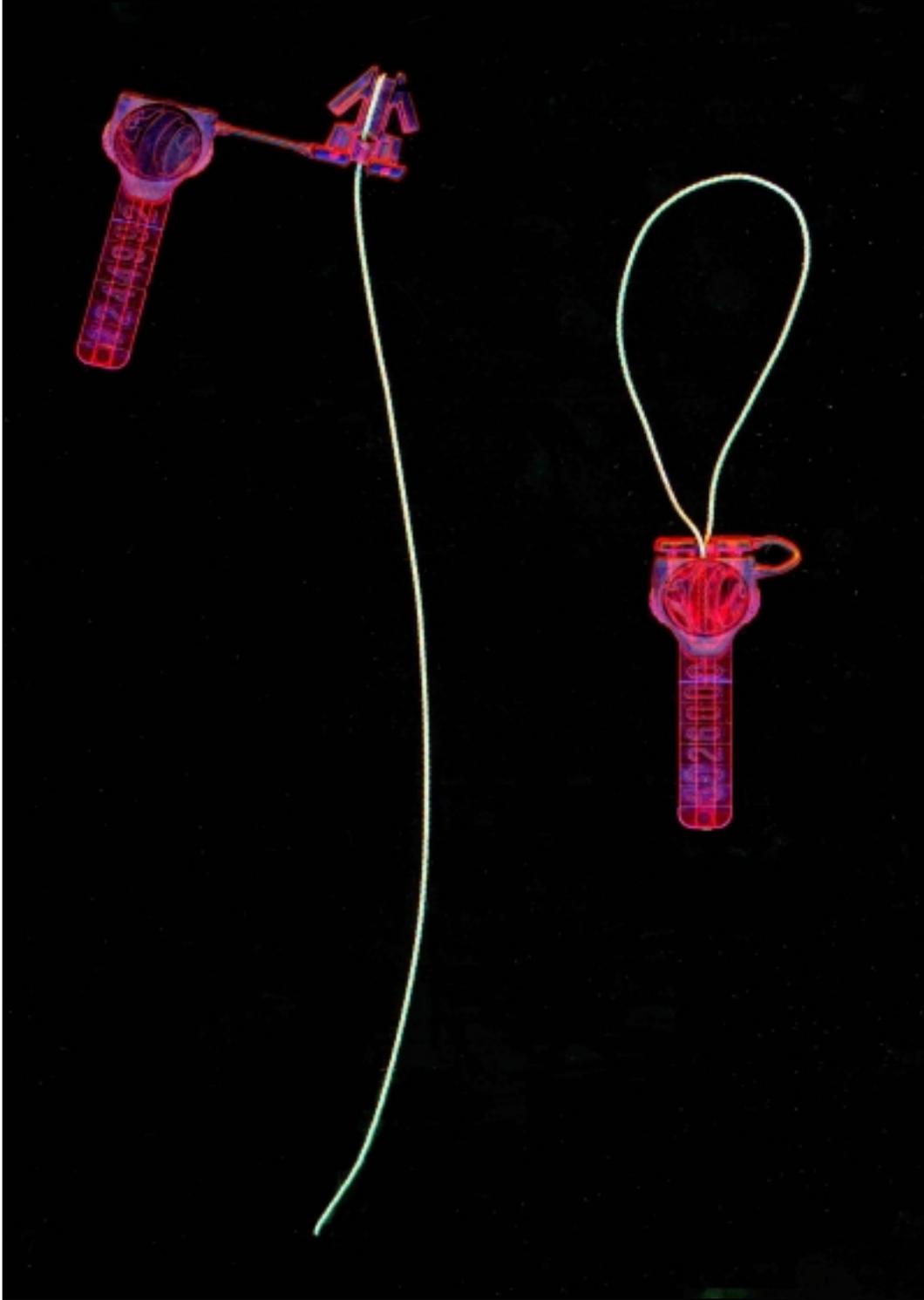


Figure 36. The ELC Tik AN Wire Loop Seal, unsealed (left) and sealed (right).

Pay particular attention to any welds, rivets, screws, nails, hinges, repair patches, and adhesive joints on the container. Are these old and damaged? Could they be exploited to gain entry into the container without being detected? Note on your paperwork any unusual surface finishes, decals, paints, or logos that you find on the container. Report to your supervisor if the container does not appear to be of the proper size, shape, or design.

Always devote considerable attention to the corners, seams, and edges of the container, as well as any dents, scratches, or corrosion. These are often where attacks on the container will take place. Report any serious problems.

The environment the container will be exposed to during storage or transit is important to consider. If the sealed container will sit quietly in a secure area without being disturbed, it should be in excellent condition. On the other hand, if the container will be banged around in transit, or at a loading dock or warehouse, less than perfect condition may be acceptable since it is likely to take some dings anyway. Certainly the container must be in good enough shape to withstand its expected handling. If the items being protected by the seal are extremely critical, the container should be in the best possible condition. If the items are less critical, it may be acceptable to compromise on the condition of the container. Always keep in mind, however, there is little point in installing a seal on a container than can be easily entered by bypassing the seal.

A thorough container inspection must include careful examination of the container locking mechanism, hasp, door, and/or lid. Be sure these are intact and in good working condition. Look for signs of serious damage, fractures, or corrosion. Look for signs of tampering or anything out of the ordinary. Pay particular attention to any rivets, hinges, or screws. Make sure they are not missing, about to come loose, or fake.

INSTALLATION PROCESS: EXAMINING THE SEAL

Just prior to installing an ELC Tik AN Wire Loop Seal, it must be carefully inspected for signs of defects, damage, or tampering. This should be

done right at the container, moments before installing the seal (not minutes, hours, or days earlier).

Be sure the connecting thread is intact. Check that the anchor fingers are not damaged or ready to break. Check the integrity of both the capsule and the anchor. Be sure that the capsule is empty.

Check that the color of the capsule, anchor, and connecting thread is uniform, and that there is no significant discoloration, crazing, cracks, holes, or fractures.

Look very carefully at the sides of the capsule, both inside and out. Poke at them with a toothpick or other pointed object to be sure they are in good shape, as shown in Figure 37.

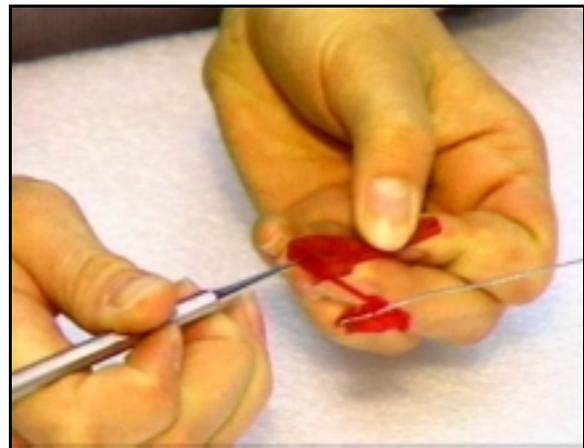


Figure 37. Checking the insides of the Tik Seal.

Look closely at the serial number on the post. The digits should stick out a bit above the plastic. Check that they look and feel right. The digits should be neatly aligned and evenly spaced. They should have the same font and size. Tug on the post with the serial number. It must not come loose from the capsule.

Next, examine the wire on the seal closely. Be sure it is properly inserted into the hole in the anchor.

Look for significant imperfections, abrasions, scratches, dents, unusual markings, or damage to the wire. Excessive wire kinking is not acceptable. The wire must not be frayed, knotted, or untwisted at any point. Also check that the color and surface finish are uniform along the wire. The

wire should have no coating. There should be no evidence of gluing, soldering, or flame-heating.

Feel along the wire with your fingers. Are there any abnormalities? Try very lightly bending and coiling the wire, but not so much as to put a kink in it. The wire should not unravel or break.

Compare the seal you are about to install against another open, unused ELC Tik AN Wire Loop Seal (see Figure 38).

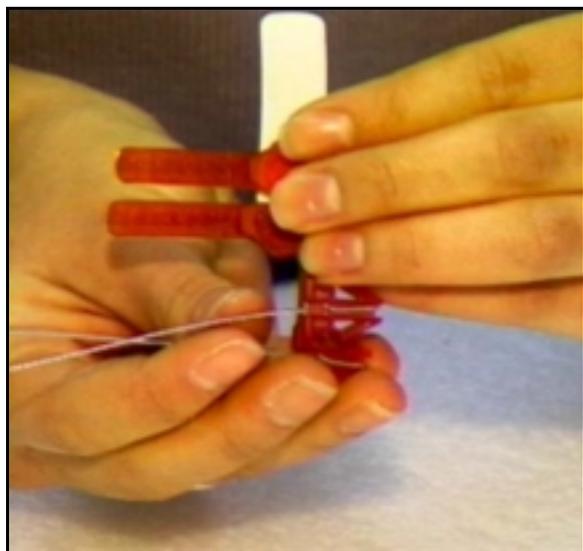


Figure 38. Side-by-side comparison of the seal to be installed vs. a sample seal.

This sample seal should be one you carry around with you for this purpose - not one chosen from the same batch as the seal you plan to install. (Write “Sample” on this comparison seal with a permanent marker, or label it in some other way, so that you don’t accidentally use it for sealing instead of the seal you meant to install!)

The two seals should have the same dimensions and color. The parts should match. The serial numbers on the two seals should be different, but have approximately the same depth, size, digit alignment, spacing, and font. Report any problems. Do not install a seal that has serious discrepancies!

INSTALLATION PROCESS: RECORDING THE SEAL SERIAL NUMBER

Record the serial number(s) of the seal on the appropriate seal paperwork. There will be either one or two numbers, depending on whether the cone has a stamped serial number or not.

Double check that you made no error in recording the serial number!

Do not write the seal serial number on the container or anywhere else that is not appropriate.

This paperwork must be protected from potential adversaries at all times! Do not let it out of your sight. It must never be stored inside the container being protected by the seal!

INSTALLATION PROCESS: SEALING THE CONTAINER

To install the ELC Tik AN Wire Loop Seal, the wire is inserted through the hasp of the container (Figure 39). Wrap the wire once around the anchor, as demonstrated in Video #5. Minimize the length of the wire used as much as is practical. Try to install the seal such that the serial number faces outward from the container. This simplifies inspection.

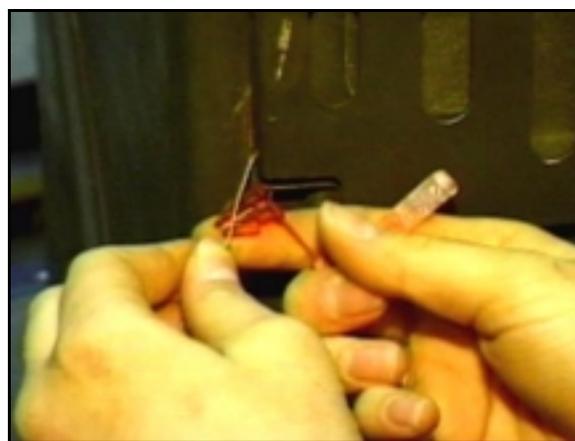


Figure 39. Installing the Tik Seal on an ammunition box.

Snap the anchor into the capsule. There should be a definitive clicking sound.

Check that the anchor is fully and permanently inserted into the capsule. The capsule must not be deformed, warped, fractured, or crazed from inserting the anchor. Make sure that the connecting thread is still intact.

Use wire cutters to remove the excess wire protruding from the capsule. **Be careful not to cut the wrong wire, or you will have unsealed the container!**

Tug moderately on the wire. Try to pull the anchor out of the capsule with light to moderate force. If the seal opens, the wire breaks, or the wire or anchor slips, the seal is defective and should be removed, recorded, and returned to the checkout point.

Finally, double check that you have actually sealed the container and that its door or lid is truly closed. Be sure that you sealed both ends of the container lid if it can be opened on either end (as is the case with some ammunition boxes)! The seal doesn't do much if you forgot to close the container door or lid, or sealed the wrong part of the door or lid! See Figure 40.



Figure 40. A Tik Seal installed on an ammunition box.

Double check that the seal serial number(s) match what you recorded. If you make an error here, seal security will not be maintained.

Any significant new scratches or marks made on the seal or the container during installation should be noted on the paperwork.

Look closely at the seal and give it one more tug as a check.

INSPECTION PROCESS: EXAMINING THE CONTAINER

The first step in the inspection process, typically when a container (or truck, railcar, etc.) arrives at its destination, is to carefully examine it. This is similar to the examination process described in the above Section on "Installation Process: Examining the Container."

Be sure the container lid or door is still closed and sealed. Are there any significant new holes, cracks, defects, scratches, or dents in the container that were not noted during the initial container examination, before the seal was put on? Is there a repair patch or weld where one is not expected, or noted on the paperwork? Look and smell for evidence of fresh paint or adhesives.

INSPECTION PROCESS: EXAMINING THE SEAL PRIOR TO REMOVAL

Before removing the seal, check its serial number against the recorded serial number on the seal paperwork. Does it match? Look carefully at the serial number on the post. Has it been buffed off and re-stamped or re-worked? The digits should be slightly raised, evenly spaced, and of uniform depth and font. The post should be of uniform color and finish.

Also, look carefully at the seal paperwork itself. Is there any evidence that the recorded serial number has been erased, modified, overwritten, or tampered with? Report any suspicions immediately.

Feel the plastic capsule with clean fingers. It should not feel oily, greasy, or wet. That may be a sign of tampering.

Look for unexpected wire kinking, coiling, damage, cuts, fraying, or unraveling. Look also for abnormal stretching, snip marks, abrasions, or other abnormalities.

Does the wire look like it has been flame-heated, glued, or soldered? Feel carefully along the wire with your fingers, checking for any irregularities.

Tug on the wire and on the capsule. There should be little give.

Next, compare the seal alongside another (closed) ELC Tik AN Wire Loop Seal. They should look very similar and have the same size and shape. The serial numbers, while different, should have the same fonts, alignment, spacing, and overall appearance.

INSPECTION PROCESS: REMOVING AND RE-EXAMINING THE SEAL

The ELC Tik AN Wire Loop Seal should be removed from the container by cutting the wire with wire cutters near the half-way point. Do NOT pry it off or use force! This may damage the seal and hide evidence of tampering - plus it isn't very safe.

Once removed from the container, hold the capsule up to the light and carefully examine the interior and exterior. Look for small holes or cuts, or evidence of cosmetic repair or gluing. Look for liquids or bubbles inside the capsule. These may indicate tampering attempts.

Be sure the anchor is still firmly inserted into the capsule. Verify that the top exterior of the anchor is not deformed or scratched. Be sure there are no discolorations, scratches, defects, or indentations that may be indicative of tampering.

Smell the seal! An unexplained solvent or chemical smell may be important evidence of tampering.

After the seal has been removed, it should be turned into the checkout point (including the used wire) for proper disposal or archiving.

If possible, the interior of the container should also be inspected for signs of unauthorized entry.

This may have to wait until the container is unloaded.

CHAPTER 7 REVIEW QUESTIONS

1. What are the four main parts of the ELC Tik AN Wire Loop Seal?
2. True or False: The ELC Tik AN Wire Loop Seal is a barrier seal.
3. Describe how to wrap the wire around the anchor and close the seal.
4. What are some of the unusual features of this seal compared to the other seals discussed in this manual?
5. What are some of the ways in which the ELC Tik AN Wire Loop Seal differs from a traditional lead-wire seal?
6. What do the serial number digits look and feel like?
7. True or False: Prior to installing the ELC Tik AN Wire Loop Seals, it is OK to do the final inspection during a slow time, such as during your coffee break.
8. How should the ELC Tik AN Wire Loop Seal be removed from a container? Why should you not remove it by prying it off or yanking on it?

CHAPTER 7 DISCUSSION QUESTIONS

1. Which parts of the ELC Tik AN Wire Loop Seal do you think are most vulnerable to attack?
2. Why is it important to be sure the connecting thread is still intact, both before seal installation and when inspecting the seal on a sealed container?
3. What are some reasons that the loop size of the wire should be kept to a minimum?

4. Why do you suppose the twisted wire is the best choice for use with the ELC Tik AN Wire Loop Seal?
5. Why should the serial numbers be felt during the seal inspection?
6. Why is it important that you feel carefully along the wire for lack of uniformity when inspecting the seal?
7. What are some of the potential safety hazards involved in using the ELC Tik AN Wire Loop Seal?
8. What does the ELC Tik AN Wire Loop Seal smell like? Why do you suppose this might be an important method to detect tampering with the seal?
9. Why is it a matter of great concern if liquid or bubbles are found inside the capsule?

Installation Checklist - ELC Tik AN Wire Loop Seal (page 1 of 2)

Note: Items marked with a * are particularly important to check carefully.

1. Examine the Container

The container is free of serious openings, cracks, or holes in the...

Exterior...

- sides
- top (if practical)
- bottom (if practical)

Interior...

- sides (if practical)
- top (if practical)
- bottom (if practical)
- The rivets, screws, corners, edges, seams, and repair patches are in good shape.
- The door or lid is in good working condition.
- Note on the paperwork which portions of the container that have been inspected, plus any problems.
- The hasp and locking mechanism are complete, intact, and in good working condition.

2. Inspect the Seal--JUST PRIOR TO INSTALLING IT!

- The **connecting thread** is intact.*
- The **capsule** is empty.
- The **capsule** is intact and free of defects, discoloration, crazing, holes, or cuts.
- Poke at the **capsule** sides, inside and out, with a pointed tip to verify that they are in good shape.*
- The **anchor** is intact and free of defects, discoloration, crazing, holes, or cuts.
- The **anchor** fingers are intact and undamaged, and not about to come loose.*
- The serial number on the post looks and feels right. The digits have neat alignment, even spacing, and a consistent depth, size, spacing, and font.
- The **post** does not come loose from the capsule when you yank on it.*
- The **wire** feeds through the small hole in the anchor.*
- The **wire** looks to be free of serious defects, damage, kinking, dents, fraying, untwisting, abrasions, scratches, cuts, discoloration, or abnormalities. It is also free of evidence of gluing, soldering, or flame-heating.
- The **wire** has no transparent or opaque coating.
- The **wire** feels consistent and uniform along its length.
- The **wire** does not break or kink with LIGHT bending and coiling.
- The seal matches the sample (comparison seal) in terms of...
 - approximate dimensions.
 - overall appearance, color, and surface finish.
 - logos (if any).
 - serial number location, depth, size, alignment, spacing, and font.

3. Record the Seal Serial Number(s)

- The serial number matches the number you have written on the paperwork.*

4. Install the Seal

- The **wire** is wrapped once around the anchor (and properly inserted into the anchor center channel) in a manner that will minimize the amount of wire used.
- The **anchor** snaps into the capsule with an obvious clicking sound.*
- The **anchor** is fully and permanently inserted into the capsule.*
- The **capsule** is not deformed, warped, fractured, or crazed after the anchor is inserted into the capsule.
- The **connecting thread** is still intact.
- The excess wire has been cut--without breaking the wire loop needed for the seal!

Installation Checklist - ELC Tik AN Wire Loop Seal (page 2 of 2)

5. Double Check the Seal Installation

- The **wire** does not slip or break when you yank on it.*
- The **anchor** does not pull out of the capsule with light to moderate force.*
- Major new scratches or dents (if any) in the seal, container, door, or lid as a result of installing and testing the seal are recorded on the paperwork.
- The seal looks OK.
- The seal stands up to one more tug.
- The door or lid is definitely closed and sealed (at both ends, if necessary).*
- Sign off on the paperwork that the seal installation is acceptable.

Inspection Checklist - ELC Tik AN Wire Loop Seal

Note: Items marked with a * are particularly important to check carefully.

1. Examine the Container Exterior

- The door (or lid) is still closed and sealed.*
The container is free of serious openings, cracks, or holes in the...
 - Exterior...
 - sides
 - top (if practical)
 - bottom (if practical)
 - Interior...
 - sides (if practical)
 - top (if practical)
 - bottom (if practical)
- There is no sign of new painting or staining.
- There is no sign of tampering or abnormalities with the rivets, screws, corners, edges, repair patches, welds, or seams.
- There is no sign of tampering or abnormalities with the door (or lid), hasp, or locking mechanism.

2. Examine the Seal (prior to removal)

- The serial number matches the paperwork.*
- The serial number on the post looks and feels right. The digits have neat alignment, even spacing, and a consistent depth, size, and font.*
- The serial number(s) written on the paperwork have not been erased, modified, or overwritten.*
- The **capsule** is not unexpectedly oily, greasy, or wet.*
- The **wire** does not slip or break when you yank on it.*
- The **capsule** does not slip or break when you yank on it.
- The **post** does not come loose from the capsule when you yank on it.
- The **wire** looks to be free of unexpected defects, damage, kinking, dents, fraying, untwisting, abrasions, scratches, cuts, discoloration, or abnormalities. It is also free of evidence of gluing, soldering, or flame-heating.
- The **wire** has no transparent or opaque coating.
- The **wire** feels consistent and uniform along its length.*
- The **wire** does not break or kink with LIGHT bending and coiling.
The seal matches the sample (comparison seal) in terms of...
 - approximate dimensions.
 - overall appearance, color, and surface finish.
 - serial number location, depth, size, alignment, spacing, and font.*

3. Remove and Re-examine the Seal

- Cut the wire with wire cutters near the half-way point.
- Hold the capsule up to light and verify the capsule is free of small holes, cuts, fractures, crazing, and any evidence of cosmetic repair or gluing.*
- The interior of the capsule is free of liquid or bubbles.*
- The seal smells normal.*
- Sign off on the paperwork that the seal inspection is acceptable.
- Turn in the used seal, including the wire.
- If practical, inspect the interior of the container.

CHAPTER 8

BRAMMALL CONE LOC SEAL

(See Video #6 for more information.)

INTRODUCTION

The Cone Loc Seal made by Brammall is sometimes called the “Cone Flag Seal.” This barrier seal consists of a metal rectangular “flag” permanently attached to a high tensile strength aircraft cable, plus a cone-shaped locking body which we shall call the “cone.” See Figures 41 and 42.

The flag has a serial number and logo. The cone often comes without a serial number, though cones can be ordered with one. Ideally, the serial number on the cone should match the serial number on the flag. Otherwise, the seal installer and inspector must record both numbers.

Video #6 shows the installation and inspection procedures for the Brammall Cone Loc Seal. The checklists at the end of this chapter can be used in the field to assure all the necessary steps have been taken. The two checklists show the various steps in approximately (though not exactly) the same order as in the video.

INSTALLATION PROCESS: EXAMINING THE CONTAINER

As always, the container (or room, truck, rail-car, etc.) intended to be sealed must be carefully inspected before installing the seal. Be sure the container is fully intact and in reasonably good shape. There must be no serious openings, cracks, or holes that could be used to gain easy access to the container, or to remove or insert items. Note anything abnormal about the container on the seal paperwork. Bear in mind that an adversary may have tampered with the container prior to its use in order to gain easier access once the container is sealed.

Ideally, the top, bottom, and sides of the container - both inside and out - should be carefully inspected visually and also felt or poked at. As a practical matter, this may not always be possible.

The container may be full of items at the time of Inspection - making examination of the insides difficult. It may also be difficult to inspect the exterior of the container (especially the top and/or bottom) if the container is large, heavy, or stacked on or near other containers or walls. Note on your inspection paperwork which portions of the container have been inspected. Write down any anomalies or problems.

Pay particular attention to any welds, rivets, screws, nails, hinges, repair patches, and adhesive joints on the container. Are these old and damaged? Could they be exploited to gain entry into the container without being detected? Note on your paperwork any unusual surface finishes, decals, paints, or logos that you find on the container. Report to your supervisor if the container does not appear to be of the proper size, shape, or design.

Always devote considerable attention to the corners, seams, and edges of the container, as well as any dents, scratches, or corrosion. These are often where attacks on the container will take place. Report any serious problems.

The environment the container will be exposed to during storage or transit is important to consider. If the sealed container will sit quietly in a secure area without being disturbed, it should be in excellent condition. On the other hand, if the container will be banged around in transit, or at a loading dock or warehouse, less than perfect condition may be acceptable since it is likely to take some dings anyway. Certainly the container must be in good enough shape to withstand its expected handling. If the items being protected by the seal are extremely critical, the container should be in the best possible condition. If the items are less critical, it may be acceptable to compromise on the condition of the container. Always keep in mind, however, there is little point in installing a seal on a container that can be easily entered by bypassing the seal.

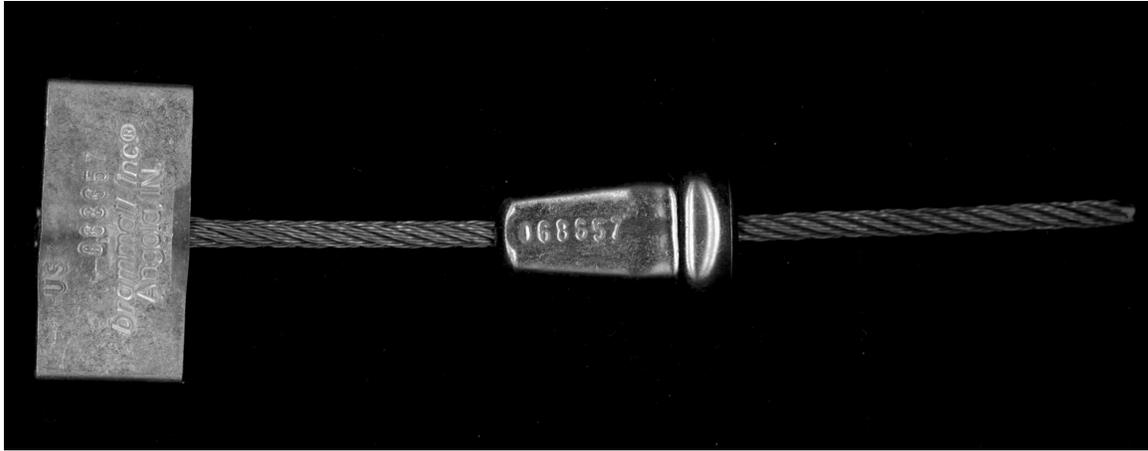


Figure 41. The Brammall Cone Loc Seal.

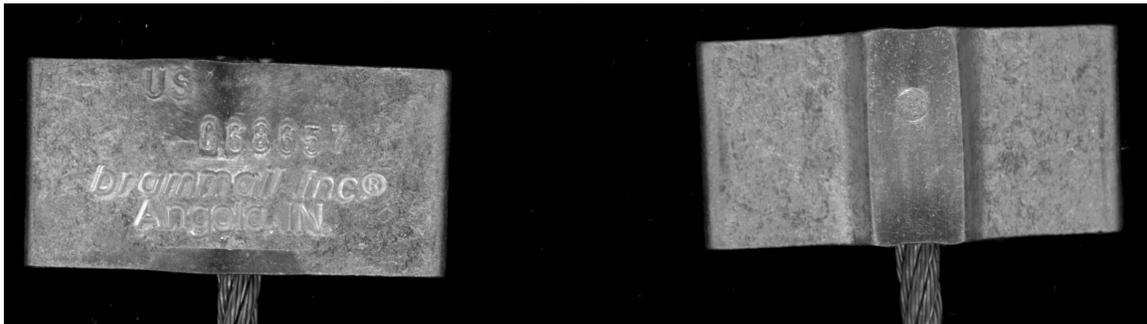


Figure 42. A close-up of the flag front and back.

A thorough container inspection must include careful examination of the container locking mechanism, hasp, door, and/or lid.

Be sure these are intact and in good working condition.

Look for signs of serious damage, fractures, or corrosion. Look for signs of tampering, or anything out of the ordinary.

Pay particular attention to any rivets, hinges, or screws. Make sure they are not missing, about to come loose, or fake.

INSTALLATION PROCESS: EXAMINING THE SEAL

Just prior to installing a Brammall Cone Loc Seal, it must be carefully inspected for signs of defects, damage, or tampering. This should be done right at the container, moments before installing the seal (not minutes, hours, or days earlier).

Look for significant defects, scratches, cracks, dents, small holes, discolorations, or unusual markings on the flag and cone.

Be sure the flag is well attached and cannot be moved along the cable or rotated about it. (Poor crimping of the flag is probably the most likely manufacturing defect, and greatly compromises security should it occur.) Pull hard on the flag and try to rotate it (see Figure 43). The flag should not budge.

Check the symmetry of the cone.

Shine a flashlight into the cone and verify that there are three steel balls on the inside.

Be sure the color and surface finish is fairly uniform along the flag, cone, and cable.

After visually examining the cable, run your fingers along it (carefully!) to feel for anything abnormal or uneven. Try to find any serious scratches, fraying, or cuts that might weaken the cable or indicate that it has been tampered with. (Do this carefully. The cable can sometimes have small burrs that might cut the skin.) Verify that the end of the cable is welded and not frayed.

Next, compare the Brammall Cone Loc Seal you intend to install visually, side-by-side with parts from an unused Brammall Cone Loc Seal. This sample seal should be one you carry around



Figure 43. Vigorously check that the flag cannot come loose from the cable.

with you for this purpose - not one chosen from the same batch as the seal you plan to install. (Write "Sample" on this comparison seal with a permanent marker, or label it in some other way, so that you don't accidentally use it for sealing instead of the seal you meant to install!)

The two seals should have the same length and size. The logos should match. The serial numbers on the two seals should be different, but have approximately the same location, depth, size, digit alignment, spacing, and font. Report any problems. Do not install a seal that has serious discrepancies!

INSTALLATION PROCESS: RECORDING THE SEAL SERIAL NUMBER

Record the serial number(s) of the seal on the appropriate paperwork (Figure 44). There will be one or two numbers, depending on whether the cone has a serial number or not. Double check the serial number(s) you recorded!



Figure 44. Recording the serial number.



Figure 45. Installing the seal.

Do not write the seal serial number on the container, or anywhere else that is not appropriate.

This paperwork must be protected from potential adversaries at all times! Do not let it out of your sight. It must never be stored inside the container being protected by the seal!

INSTALLATION PROCESS: SEALING THE CONTAINER

To install the Brammall Cone Loc Seal, the cable is inserted through the hasp of the container. The cone-shaped locking body is then made to slide along the cable, with the narrow end of the cone facing the flag (see Figure 45). The cone will not slide along the cable if you instead try to insert the wider end of the cone first. The cone can only travel along the cable in the direction of its narrow end.

One of the unusual features of the Brammall Cone Loc Seal is that the cone can be cinched tightly against the hasp. (In other words, the spacing between the flag and cone can be made almost zero.) This would theoretically provide optimal security. The recommended procedure, however, is to leave about 0.5 inch of gap. Otherwise, it is difficult to remove the seal. See Figure 46.

After installing the seal, do NOT cut off the unused portion of the cable after the cone.



Figure 46. Your thumb can be used to guarantee that the cone stays about 0.5 inch from the hasp.

To check the seal installation, yank strongly on the cable, then the cone, then the flag. If the seal opens or the cable, flag, or cone slip, the seal is defective and must be removed, recorded, and turned in to the seal checkout point. Also check that the flag still cannot be rotated about the cable.

Finally, double check that you have actually sealed the container and that its door or lid is truly closed. The seal doesn't do much if you forgot to close the container door or lid, or sealed the wrong part of the door or lid! Double check that the seal serial number(s) match what you recorded. If you make an error here, seal security will not be maintained.

INSPECTION PROCESS: EXAMINING THE CONTAINER

The first step in the inspection process, typically when a container (or truck, railcar, etc.) arrives at its destination, is to carefully examine it. This is similar to the examination process described in the above Section on “Installation Process: Examining the Container.”

Be sure the container lid or door is still closed and sealed. Are there any significant new holes, cracks, defects, scratches, or dents in the container that were not noted during the initial container examination, before the seal was put on? Is there a repair patch or weld where one is not expected or noted on the paperwork? Look and smell for evidence of fresh paint or adhesives.

INSPECTION PROCESS: EXAMINING THE SEAL PRIOR TO REMOVAL

Before removing the seal, check its serial number(s) against the paperwork. Is there a match?

Also, look carefully at the seal paperwork itself. Is there any evidence that the recorded serial number has been erased, modified, overwritten, or tampered with? Report any suspicions immediately.

Carefully look at the installed seal for signs of defects, damage, or tampering. Look for significant defects, scratches, cracks, fractures, dents, small holes, discolorations, or unusual markings on the flag, cable, or cone. Look for signs that the seal has been exposed to sawing, cutting, grinding, soldering, welding, or gluing.

Does the seal look like it might have been flame-heated along the flag, cable, or cone? Does the serial number look like it may have been buffed off and re-stamped? Feel along the cable (carefully!) with your fingers. Anything feel abnormal? (Watch out for burrs!)

Tug hard on the flag and cone. They should not come loose. Verify that the flag cannot rotate about the cable.

Next, inspect the seal by comparing it alongside another Brammall Cone Loc Seal. They should look very similar and have about the same size, shape, color, and surface finish. See Figure 47.

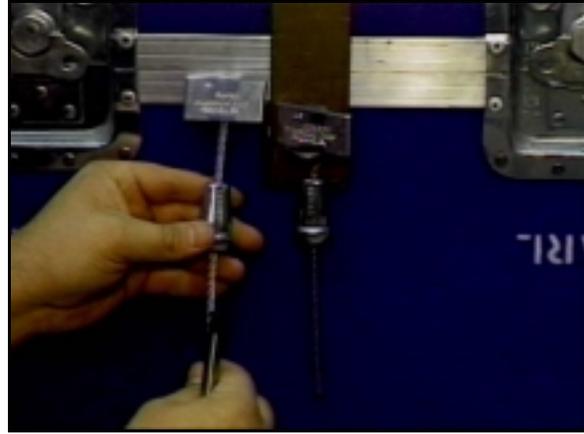


Figure 47. Side-by-side comparison of the installed seal vs. an unused Cone Loc Seal.

INSPECTION PROCESS: REMOVING AND RE-EXAMINING THE SEAL

The Brammall Cone Loc Seal should be removed by cutting the cable with cable cutters. (Be sure to wear safety glasses!) Do NOT cut the cable with bolt cutters, a saw, a torch, or a grinding wheel. It is also possible to remove the seal by cutting, drilling out, or grinding off the flag. This may be necessary if the seal installer improperly cinched the cone tightly against the hasp, instead of leaving the proper 0.5 inch of spacing.

After cutting off the seal, remove the cone by sliding it along the cable to the very end. Examine the interior and exterior of the cone. (A flashlight helps to see the insides of the cone.) Look carefully for abnormalities, and for scratches or evidence of damage to the hole on either end of the cone. Inspect the flag carefully as well.

Next, take a wire brush and scratch up the flag, cone, and cable. This helps to remove the finish and show any signs of tampering with the seal. For the cone, look carefully to see if a small hole might have been drilled and then cosmetically repaired and repainted.

After the seal has been removed, the cone and the aircraft cable with the attached flag should be returned to the seal checkout point for proper disposal or archiving. To save money, some users of the Brammall Cone Loc Seal reuse the cone on a different seal. This is NOT recommended for

DoD applications because the cone and the flag may have matching serial numbers or the cone may be scratched during the removal/inspection process.

If possible, the interior of the container should be inspected for signs of unauthorized entry. This may have to wait until the container is unloaded.

CHAPTER 8 REVIEW QUESTIONS

1. What are the three parts of the Brammall Cone Loc Seal?
2. True or False: The Brammall Cone Loc Seal is a barrier seal.
3. Find the location on the Brammall Cone Loc Seal where crimping is used to fasten the parts together.
4. What are some of the unusual features of this seal compared to the other seals discussed in this manual?
5. True or False: Prior to installing the Brammall Cone Loc Seals, it is OK to do the final inspection during a slow time, such as during your coffee break.
6. If the cone (locking body) comes with a serial number, why is it best that the serial number matches the serial number on the flag?
7. Approximately how much space should be left between flag and cone when the seal is installed in a hasp? What is the reason for leaving this gap?
8. How should the Brammall Cone Loc Seal be removed from a container?

CHAPTER 8 DISCUSSION QUESTIONS

1. Which parts of the Brammall Cone Loc Seal do you think are most vulnerable to attack?
2. Why is the flag so large?
3. What are some of the advantages and disadvantages of a seal such as this one where the spacing between the locking body and end of the seal can be continuously adjusted?
4. What are some of the potential safety hazards involved in using the Brammall Cone Loc Seal?
5. At the time of installation, why should the cone be oriented such that the serial number on the cone (if there is one) faces the same direction as the serial number on the flag?
6. Why would a 0-inch gap between the cone and flag theoretically provide better security than a 0.5-inch gap? What are some of the ways, however, that an adversary could more easily avoid detection if he/she attacked a seal with a 0-inch gap?
7. Why does DoD not permit you to reuse the cone that can be removed from a used seal?
8. Why should you not remove the Brammall Cone Loc Seal by cutting the cable using bolt cutters, a saw, a grinding wheel, or a torch?
9. Why might an adversary want to drill a small hole in the cone, then cover it up later cosmetically?
10. Why do we do a side-by-side comparison with an unused Brammall Cone Loc Seal BEFORE unsealing the container?

Installation Checklist - Brammall Cone Loc Seal (page 1 of 2)

Note: Items marked with a * are particularly important to check carefully.

1. Examine the Container

The container is free of serious openings, cracks, or holes in the...

Exterior...

- sides
- top (if practical)
- bottom (if practical)

Interior...

- sides (if practical)
- top (if practical)
- bottom (if practical)

- The rivets, screws, corners, edges, seams, and repair patches are in good shape.
- The door or lid is in good working condition.
- Note on the paperwork which portions of the container that have been inspected, plus any problems.
- The hasp and locking mechanism are complete, intact, and in good working condition.

2. Inspect the Seal--JUST PRIOR TO INSTALLING IT!

- The **flag** is free of defects, serious scratches or dents, small holes, or unusual markings.
- The **flag** logo and serial number have not been tampered with.
- The **flag** cannot be removed from the cable with pulling, rotating, or skewing by hand.*
- The **cone** is free of defects, serious scratches or dents, small holes, deformations, or unusual markings, especially near the two openings.
- The **cone** serial number (if any) has not been tampered with.
- The **cone** is symmetric.
- The **cone** contains three steel balls. (Use a flashlight, if necessary.)
- The color and surface finish of the **flag** is fairly uniform.
- The color and surface finish of the **cone** is uniform.
- The color and surface finish are uniform along the **cable**.
- The **cable** is free of abnormalities, serious scratches or abrasions, dents, fraying, or cuts.
- The **cable** feels normal, with no signs of abnormalities. (Use care to avoid burrs!)
- The end of the **cable** is welded.

The seal matches the sample (comparison seal) in terms of...

- size.
- cable** length and diameter.
- flag** logo.
- overall color and surface finish.
- serial number location, depth, size, alignment, spacing, and font on the **flag**.*
- serial number (if any) depth, size, alignment and font on the **cone**.

3. Record the Seal Serial Number(s)

- The serial number on the **flag**, and that on the **cone** (if any) matches the number(s) you have written on the paperwork.*

4. Install the Seal

- The **cone** is brought to within about 0.5 inch of the hasp. (Do NOT cut the excess cable!)
The seal does not open, and nothing slips when you yank on the...
 - cable**.
 - cone**.
 - flag**.
- The **flag** cannot be rotated about the cable.*

Installation Checklist - Brammall Cone Loc Seal (page 2 of 2)

5. Double Check the Seal Installation

- The container door (or lid) is closed and sealed.*
- The serial number(s) on the **flag** and **cone** (if any) match the serial number(s) written on the paperwork.*
- Major new scratches or dents (if any) in the seal, container, door, or lid as a result of installing and testing the seal are recorded on the paperwork.
- The seal looks OK.
- The seal stands up to one more tug.
- Sign off on the paperwork that the seal installation is acceptable.

Inspection Checklist - Brammall Cone Loc Seal (page 1 of 2)

Note: Items marked with a * are particularly important to check carefully.

1. Examine the Container Exterior

- The door (or lid) is still closed and sealed.*
The container is free of serious openings, cracks, or holes in the...
 - Exterior...
 - sides
 - top (if practical)
 - bottom (if practical)
 - Interior...
 - sides (if practical)
 - top (if practical)
 - bottom (if practical)
- There is no sign of new painting or staining.
- There is no sign of tampering or abnormalities with the rivets, screws, corners, edges, repair patches, welds, or seams.
- There is no sign of tampering or abnormalities with the door (or lid), hasp, or locking mechanism.

2. Examine the Seal (prior to removal)

- The **flag** serial number and the cone serial number (if any) match the paperwork.*
- The serial number(s) written on the paperwork have not been erased, modified, or overwritten.*
The seal matches the sample (comparison seal) in terms of...
 - size.
 - cable** length and diameter.
 - flag** logo.
 - approximate color and surface finish.
 - flag** serial number location, depth, size, alignment, spacing, and font.*
 - cone** serial number (if any) location, depth, size, alignment, spacing, and font.
- The **flag** is free of defects, serious scratches or dents, small holes, or unusual markings not noted on the paperwork.
- The **flag** shows no evidence of sawing, cutting, grinding, soldering, gluing, or flame-heating.*
- The **flag** logo and serial number have not been tampered with.
- The **flag** cannot be removed from the cable with pulling, rotating, or skewing by hand.*
- The **cone** is free of defects, serious scratches or dents, small holes, deformations, or unusual markings not noted on the paperwork.
- The **cone** shows no evidence of sawing, cutting, grinding, soldering, gluing, or flame-heating.
- The **cable** is visually free of abnormalities, serious scratches or abrasions, dents, fraying, or cuts.
- The **cable** shows no visible evidence of sawing, cutting, grinding, soldering, gluing, or flame-heating.*
- The **cable** feels normal. (Use caution to avoid burrs!)
- The end of the **cable** is still welded.
- The seal does not open with a hard tug by hand.
- The **flag** can't rotate about the cable.

3. Remove and Re-examine the Seal

- Cut the **cable** with cable cutters.
- Collect all the seal parts.
- The **cone** shows no unexpected damage, especially near the hole on either end.*
- The **flag** shows no unexpected damage.
- The **cable** shows no unexpected damage.

Inspection Checklist - Brammall Cone Loc Seal (page 2 of 2)

- After vigorous rubbing with a stiff wire brush, the **flag** shows no abnormalities.*
- After vigorous rubbing with a stiff wire brush, the **cone** shows no abnormalities, and no evidence of painting or of a small drilled hole.*
- After vigorous rubbing with a stiff wire brush, the **cable** shows no abnormalities.
- Sign off on the paperwork that the seal inspection is acceptable.
- Turn in all the seal parts: flag, cone, and cable.
- If practical, inspect the interior of the container.

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Appendix B GLOSSARY

Abnormality - Something not normal or suspicious about a seal.

Access control - Controlling the entry and exit of personnel and vehicles into a protected area, building, room, vehicle, or container.

Active seal - A seal that is electrically powered and often reusable. Also called a **dynamic seal**. If the device reports tampering as it happens, it is more of an intrusion (burglar) alarm than a conventional seal.

Adhesive tape seal (or adhesive label seal or pressure-sensitive adhesive seal) - Sticky labels that are damaged if removed from what they are stuck to. Often used as **tags**.

Adversary - A 'bad guy' who wants to gain unauthorized access to a container for theft, tampering, mischief, sabotage, or to compromise national security.

Anchor - The male portion of a **wire loop seal** that snaps into the **capsule** ("female end," "housing," or "locking body").

Anomaly - Something **anomalous**.

Anomalous - Something not normal or suspicious about a seal.

Antipilferage seal - A **seal** used primarily to detect theft and possibly discourage it.

Archiving - Storing used seals and seal parts for later analysis in case questions arise about their history or security.

Attack - An attempt to **defeat**, **compromise**, and/or **circumvent** a security device or security program. A successful attack is also called a **defeat**.

Barrier seal - A security device that functions both as a lock and a seal. Also called a **hybrid seal**.

Bolt seal - A **barrier seal** consisting of a strong bolt with one end larger than the hasp and the other end designed to snap irreversibly into a cylindrical **locking body**. Especially popular for use on trucks and transportainers.

Boxcar seal - A **metal ribbon seal**.

Bulla - A lump of clay, usually oblong, used by ancients for a variety of security functions. The outer surface of bullae were usually marked with seal impressions. A bulla could also be used as a seal to protect the knot when a package was wrapped with string.

Bullae - Plural of **bulla**.

Burglar alarm - See **intrusion alarm**.

Burr - A small, sharp or irregular particle of metal that can cut skin if not handled carefully.

Cable seal - A **barrier seal** made from aircraft cable with each end crimped or irreversibly clamped into a **locking body**.

Capsule - The housing or **locking body** of a **wire loop seal**.

Car ball seal - A **metal ribbon seal**.

Car box seal - A **metal ribbon seal**.

Cinch - To tighten up; to take away all the excess or slack.

Circumvention - Defeating a security device or security program via bypassing its main security elements or functions. The word **defeat** is preferred.

Closure - An opening, door, bung, or cap designed to permit access to a container or package.

Compromise - To **defeat** a security device (such as a seal) or a security program. The word **defeat** is preferred.

Connecting thread - A thread or plastic wire that keeps the **anchor** of a **wire loop seal** attached to the **capsule**.

Container - A receptacle, case, cabinet, box, or jar for holding, storing, or carrying items.

Control of seals - To verify and regulate access to seals, and to protect their security and authenticity.

Counter-seal (contra sigillum) - A seal impression placed on the back of the main impression to prevent the main impression from being cut out and placed on an unauthorized document. The counter-seal impression was usually smaller than that of the main seal. Historically, often used on official documents or works of art to try to prevent counterfeiting.

Covert - Secret, surreptitious, hidden.

Covert seal - A seal that is either being used secretly, or else its use is known by the adversary, but is hard to find.

Covert tag - A tag that is either being used secretly, or else its use is known by the adversary, but is hard to find.

Crazed - To have **crazing**.

Crazing - Small cracks or fractures that may indicate a seal has been damaged or tampered with.

Crimp - To use pressure to form a crease or corrugation in metal for purposes of fastening and/or increasing the strength. In a **cable seal**, for example, the cable is crimped to the male and female ends. When two objects are fastened together by crushing pressure, they are often said to be “crimped” together, even if there isn’t any obvious creasing or corrugation.

Cup-wire seal - See **E-cup seal**.

Cylinder seal - An ancient type of seal that was rolled along a soft material (like clay or wax) to leave a replicated pattern.

Defeat - Successfully attacking a security device (e.g., lock, safe, vault, tag, or seal), a security program, or a facility.

Dynamic seal - See **active seal**.

E-cup seal - A **wire loop seal** consisting of two small metal cups. When snapped together, they form a closed chamber which protects the knot or crimp on a piece of string or wire passing through the closure hasp on the container.

Electronic seal - A **seal** that contains electronics and is electrically powered, often by batteries. (If the device uses active fiber optics, it is usually classified under that category.) Electronic seals typically check continuously for signs of tampering. If they report tampering immediately (in “real-time”), they may be considered intrusion or burglar alarms, rather than seals.

Fiber optic seal - A **seal** that uses fiber optics. The cable is an optical fiber or bundle of optical fibers. Cutting the optical fibers changes their light transmission or other properties. Fiber optics can be used to make both **passive seals** and **active seals**. For an active seal, light pulses are sent down the optical fiber(s) many times per second. If the optical fibers are cut, the light pulses fail to complete the loop and this is detected by electronics.

Fingerprint - A unique mark, attribute, or feature that uniquely identifies an object or container.

Font - Lettering style. Carefully checking the font of a seal’s serial number or lettering is important. If the numbers or letters are imprinted with the wrong font, the seal may be a counterfeit, or it may have been tampered with.

Hasp (or closure hasp) - A clasp for a door, lid, or container, especially one passing over a staple for purposes of locking or sealing.

High-tech attack - An attack on a security device (e.g., **lock**, **tag**, or **seal**) that uses tools, materials, supplies, and skills that are difficult and/or expensive to procure.

Housing - (typically) The **locking body** of a seal.

Hybrid seal - A **barrier seal**.

Indicating seal - A (redundant) term for a **seal**. This term is sometimes used to distinguish the device from a **barrier seal**. All seals are meant to indicate tampering.

Inspecting a seal - Examining a **seal** and/or container to determine if there has been unauthorized access or tampering.

Installing a seal - Applying a **seal**, or “sealing” a container so that tampering or unauthorized access can be detected.

Intrusion - Unauthorized entry into someone else’s container, room, or property.

Intrusion alarm - A security device that reports unauthorized entry in real-time, in contrast to a seal which is read at a later time. Intrusion alarms are usually electronic.

Lead seal - A small piece of lead with holes for the passage of the sealing wire or string. The wire (or string) is passed through the closure hasp on the container, and then through the holes in the lead, which is then compressed to embed the wire. Often a logo or serial number is embossed into the lead when it is compressed. Lead seals are falling out of favor because of their poor security and the health and environmental problems created by lead. Sometimes a soft, non-lead alloy is used in place of lead; such a seal may still be (misleadingly) called a “lead seal” or “lead-wire seal”.

Lead-wire seal -See **lead seal**.

Linear - Straight; in a line.

Lock - Hardware that resists, complicates, and/or delays unauthorized entry or removal of items.

Locking body - The female portion of a seal that mechanically grabs and irreversibly locks the end of a seal when the (male) end of the seal is passed through a hasp and inserted into the locking body. Also sometimes called a “locking end,” “locking case,” “head,” “housing,” or “capsule.”

Locking case - See **locking body**.

Logo - A unique, characteristic, stylistic, or identifying pattern or symbol. Logos are often imprinted on seals as a security measure.

Low-tech attack - An **attack** on a security device (e.g., **lock**, **tag**, or **seal**) that uses tools, materials, supplies, and skills readily available to the general public at modest cost.

Metal cable seal - A **cable seal**.

Metal cup seal - An **E-cup seal**.

Metal ribbon seal (boxcar, car box, car ball, or car/ball seal) - A seal made from sheet metal. After passing through the closure hasp on the container, one end of the ribbon snaps irreversibly into a head on the other end. Popular for use on railcars.

Metal ribbon seal (or car box or car ball seal) - A **seal** made from sheet metal. One end of the ribbon snaps irreversibly into a head on the other end. Popular for use on railcars. More robust than a plastic strap seal, though still not considered a barrier seal.

Misdirection - Distracting a person, or getting him/her to look at the wrong things. Commonly used by magicians. Can be a useful technique for an adversary to make it look like a container has been sealed properly when it hasn’t, or that a seal has been properly installed and inspected when it has not.

Padlock seal - A “self-locking” **seal** that looks like a padlock. The seal locking body (head) is often made of plastic, with the shackle being made of metal. The head usually has a serial number and sometimes a logo or company name. Despite the name, padlock seals are not meant to function as locks. Padlock seals with plastic locking bodies are popular for utility meters.

Passive seal - A **tamper-indicating device** that uses no electrical power or batteries (internal or external) when in regular use. (For some passive seals, electrical power may nevertheless be temporarily required to install, inspect, or check the seal status.)

Penetration - Introducing foreign items or substances into a container or package without opening it, often with a syringe needle, drill, or puncturing tool.

Personal seal - A **seal** used for private and personal use, rather than for official duties.

Plastic strap or ribbon seal - A one-piece plastic molded strap with one end that snaps irreversibly into a head or housing on the other end, after the plastic strap is passed through the hasp of a container or door. Typically very inexpensive. Closely related to metal ribbon seals, except that plastic is used instead of metal.

Post-mortem exam (post-mortem analysis) - Carefully studying used seals or seal parts, perhaps with sophisticated laboratory methods, to better determine if there has been tampering. The term literally means an autopsy.

Pressure-sensitive adhesive seal - See **adhesive tape seal**.

Reader - A device used to examine and/or identify a tag or seal to determine if it has been attacked, defeated, counterfeited, damaged, or compromised.

Seal - (1) a **tamper-indicating device** designed to leave non-erasable, unambiguous evidence of entry. Unlike locks, seals may offer little or no resistance to unauthorized access. Unlike an **intrusion alarm**, a seal reports entry after the fact. Seals must be inspected, either manually or electronically, to determine if unauthorized access has taken place. All seals have some kind of unique identifier or “fingerprint,” such as a serial number, (2) to install a seal on a container.

Seal control program - A set of procedures and policies that control access to seals in order to protect their security and integrity.

Seal impression - The pattern left behind in a soft material like clay or wax when an ancient **seal** is applied. Also called a **signet** or **seal stamp**.

Seal inspection - See **inspecting a seal**.

Seal installation - See **installing a seal**.

Seal protocols - The official and unofficial procedures used for **seal** procurement, storage, accounting, installation, inspection, removal, disposal, reporting, interpreting, and training. The security provided by a seal is no better than the protocols for using it.

Seal stamp - A **seal impression**.

Sealing - See **installing a seal**.

Security seal - See **seal**.

Shrink-wrap seals - Plastic wrap with printed patterns. The plastic sheet is wrapped several times around an object or container and then photographed. It is difficult to get to the object or container without disturbing the shape and patterns of the shrink wrap.

Sigil - A **seal** or **signet**.

Sigillography - The study or use of seals and seal impressions.

Signet - (1) a small seal, often contained on a finger ring, (2) a **seal impression**.

Signet ring - A **stamp seal** contained on a finger ring.

Sleight of hand - Misdirection techniques involving manual manipulation, such as “palming.” Often used by magicians. Can be an effective way for an insider adversary to appear to attach or inspect a seal.

Social engineering - Attacking or compromising a security program by exploiting the human angle. This may involve impersonating, tricking, befriending, romancing, converting, blackmailing, extorting, threatening, brainwashing, or kidnapping key personnel.

Spoofing - Defeating or compromising a security device or security program. The word **defeat** is preferable.

Stamp seal - A seal used to leave a mark on paper or an impression in a soft material like clay or wax.

Surreptitious - Secret, clandestine, stealthy, covert, undetected.

Symmetric - Having **symmetry**.

Symmetry - Of uniform size and shape; everything in proper proportion and not distorted. The lack of symmetry (such as out of roundness) of a seal part may be a clue that the seal has been attacked, damaged, counterfeited, or tampered with.

Tag - A product that can be used to fingerprint, recognize, or classify an object or container at a later date, to avoid confusing it with a similar looking object or container, and to detect counterfeiting. A tag may also be a unique intrinsic characteristic of the object (or container), or else a marker placed on or in the object (or container).

Tamper-evident packaging - The packaging contains the **seal** or is the seal. Used a lot on consumer products; required on over-the-counter drugs sold in the U.S. Often involves frangible foils, brittle films, plastic wrap, pop-up pressure bubbles/buttons, and break-off caps, lids, or tabs designed to indicate if the package has been opened.

Tamper-indicating device (TID) - See **seal**.

Tamper-indicating packaging - See **tamper-evident packaging**.

Tamper-indicating seal - See **seal**.

Tamper resistant - Resistance to tampering; the package, container, product, or instrument has features that increase the difficulty of opening the package or container (or tampering with the product or instrument) without being detected.

Tampering - Disturbing, destroying, contaminating, damaging, sabotaging, hacking, copying, scrambling, or interfering with an item in an unauthorized manner.

TID - A **tamper-indicating device**.

Type E seal - See **E-cup seal**.

Unauthorized seal - (1) a **seal** type or design that has not been formally approved for use, (2) a **seal** that is improperly applied or out of place, (3) a counterfeit seal.

Vault - A secure storage room that resists or delays unauthorized entry or removal of items. Essentially a large "safe." A vault is more like a **lock** (in that it is intended to delay entry) than a **seal**, which is supposed to detect entry.

Vulnerability assessment - Discovering and demonstrating ways to defeat a security device or security program. A thorough vulnerability assessment may include suggesting counter-measures and security improvements.

Wax seal - A glob of wax, used both as a **tag** and a **seal** since ancient times, into which the seal installer would imprint the pattern from a **stamp seal**. Often used to seal envelopes, or to impart the symbol of royal authority on a document.

Wire loop seal - A **seal** consisting of one wire twisted around one or more other wires with a metal or plastic **locking body** (also called a **capsule**) that **crimps**, traps, or holds the ends of the wires.

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Seal Manufacturers for the Seals Covered in this Course

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Angola, Indiana 46703
phone: 800-348-477, 219-665-3176
fax: 219-665-8309
email: brammall@brammall.com
<http://www.brammall.com/>

E.J. Brooks Company

164 North 13th Street
Newark, New Jersey 07107
phone: 800-458-7325, 201-483-0335
fax: 201-483-4571
<http://www.ejbrooks.com/default.asp>

ELC Security Products, Inc.

530 Eleventh Avenue
San Diego, CA 92101-7220
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