

## Freeing Inoperable Semi-Automatic Twist Locks (SATLs) in Longshoring

**This guidance document provides recommendations and best practices to prevent fatalities and serious injuries related to inoperable SATLs in marine terminals.**

Semi-automatic twist locks are used to secure containers during transport. SATLs are also used during hoisting operations while loading and unloading a container ship. Inoperable or incorrectly installed SATLs expose workers to various hazards. The examples below describe SATL-related accidents that resulted in fatalities and demonstrate the hazards workers are exposed to while attempting to free inoperable SATLs:

A foreman was killed while attempting to hold an SATL in the unlocked position, while the container was being lifted. During the lift, the container was released. The container swung free, striking the foreman. The foreman was crushed between the container and the handrail, and subsequently fell overboard. The foreman was killed as a result of the accident.

A lasher was crushed when one of the two stacked containers broke free while the containers were being lifted. The SATLs were improperly installed in the corner castings of both of the containers, causing the bottom container to break free and fall, killing the lasher.

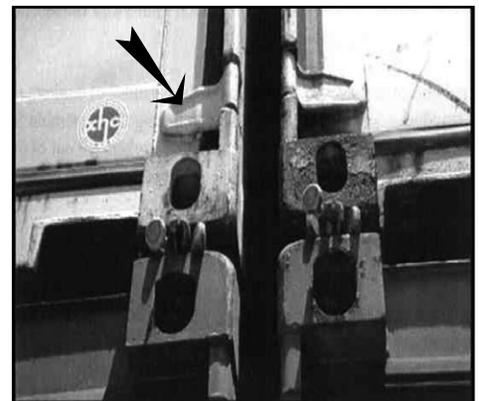
A container was being lifted with an inoperable SATL. The lasher was manipulating the SATL while positioned between the container bays. The lasher was fatally injured when the container disconnected from the inoperable SATL, swung and struck the lasher in the head.

### Inoperable SATLs

Workers and marine terminal operators often encounter inoperable SATLs that fail to work properly because they are jammed, defective, or improperly installed. Inoperable SATLs present hazardous conditions for longshore workers and vessel personnel. Oftentimes it is necessary for workers to manipulate SATLs to free them. Therefore, employers and workers should exercise caution to ensure that the removal and replacement of inoperable SATLs are carried out in the safest manner possible. Employers should ensure that workers always follow the manufacturers' instructions for correctly removing and replacing inoperable SATLs. Common causes of SATL inoperability include:

- The unlocking mechanism (pigtail) on the SATL can break off.
- Container movement during transit at sea damages/distorts corner castings/fittings, causing the SATL to jam.
- When SATLs are improperly inserted, they can jam or make the release wire inaccessible.
- The internal components of the SATL can become corroded from extended exposure to corrosive conditions (i.e., salt water), causing it to jam.

- Internal components of an SATL become overstressed and damaged (i.e., bent/twisted) causing it to jam.



*A typical SATL installation between two containers.*

### Basic Principles for Installing and Removing Inoperable SATLs

#### Safety supervision

Foremen and or supervisors should evaluate the hazards and take measures to reduce the risks associated with the removal and replacement of inoperable SATLs.

Neither the foreman, nor the supervisor should attempt to manipulate, remove or replace inoperable SATLs by themselves. Foremen and supervisors should ensure that all persons in the area, especially the workers manipulating the SATLs, maintain safety focus and safety awareness.

The foreman or supervisor should ensure that workers holding the SATL open (manipulating) during a container lift are not in the bight (pinch point) between the container and other structures, because the container may suddenly become free and swing.

### **Worker training**



*Foreman must direct the crane operator's movement.*

Workers responsible for manipulating SATLs should be trained to identify inoperable SATLs, and the methods used to safely remove and replace the SATLs. Employers should ensure that workers understand, demonstrate and maintain the ability to identify, and safely remove and replace

inoperable SATLs. As a best safety practice, the responsible foreman or supervisor should conduct a toolbox safety talk to discuss any concerns workers may have prior to the removal and replacement of inoperable SATLs.

### **Safe access**

OSHA regulations generally prohibit workers from going on top of a container, but exceptions in [29 CFR 1918.85\(j\)](#) allow workers to perform necessary functions that cannot be eliminated by the use of positive container securing devices, including freeing an inoperable SATL. Safe access must be provided before attempting to unlock an inoperable SATL. Ladders meeting the requirements of [29 CFR 1918.24](#) may provide adequate access for workers attempting to access double-stacked containers to free inoperable SATLs. When the inoperable SATL is located on a container stacked more than two high (SATL is on top of a double-stacked container or higher), safe alternate means of access must be provided. One method to gain safe access is to move the adjacent containers to the same height as the container with the inoperable SATL to provide a container top work platform next to the inoperable SATL. Once the adjacent cell is empty, a worker can be carried aloft to gain access. Persons on top of a container

must have fall protection meeting the requirements of [29 CFR 1918.85\(k\)](#). Requirements for protecting workers being hoisted can be found in [29 CFR 1918.66\(c\)](#). Employers must provide and ensure that workers use fall protection when working within three feet of an unguarded edge [29 CFR 1918.85\(l\)](#).

### **Lifting operations**

The foreman or supervisor should be in direct contact with the crane operator, direct all movement of the crane from a safe vantage point, and maintain good visibility of the entire operation. The foreman or supervisor should know the locations of all workers in the area and should know which workers will be directly involved in freeing the inoperable SATLs. The foreman or supervisors should ensure that workers involved with freeing inoperable SATL are out of the bight (pinch point) and in a safe position prior to a lifting operation. All persons not directly involved with the operation should remain clear of the area (danger zone); see [29 CFR 1918.2](#).

### **Defective devices**

ALWAYS keep defective SATLs separated from non-defective SATLs. Cone boxes should be provided and clearly marked for defective and non-defective SATLs. Employers should insure that all defective SATLs that fail to work properly (SATLs with damaged wires or SATLs that do not move freely) are replaced and should not be reused until repaired. Workers should ensure that SATLs are installed correctly (right side up and with wires pointing toward the ends).

### **Possible Methods to Separate or Free Containers Connected with Inoperable or Improperly Installed SATLs**

#### **SATL locked but intact**

If the SATL is a two-wire version, recycle the inoperable SATL and reset it to the unlocked position. Observe and confirm that the SATL is installed in the proper manner. If the two-wire SATL is installed upside down, pull the opposite pigtail to unlock the SATL. If a single-wire SATL is inserted upside down, push the wire up to unlock the SATL.

#### **SATL unlocking wires are facing inward rather than outward**

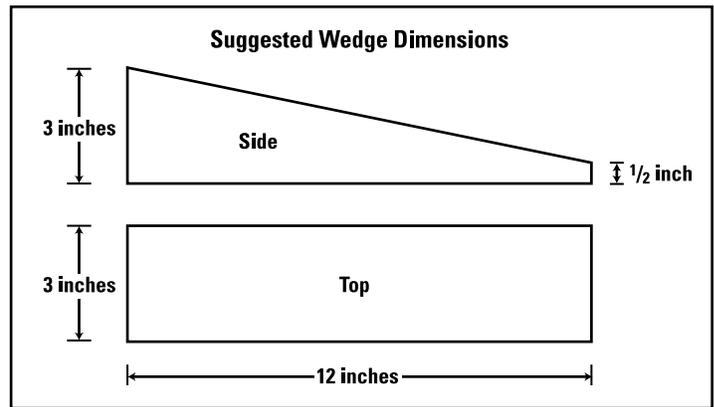
Usually these SATLs can be unlocked by reaching between the two containers to grab the appropriate SATL wire with a set of long-handled slip joint pliers.

#### **SATL will not stay unlocked and keeps relocking each time the crane operator attempts a lift**

If the SATL will not stay open, the SATL must be forced into the open position with a device inserted

into the corner casting. There are several methods which may be used.

If the unlocking wires are intact, then pulling on the correct wire may cause the SATL to stay unlocked. However, constant tension must be maintained on the SATL while the containers are being separated. The worker holding the SATL in the unlocked position must ensure that they remain outside of the bight (pinch point) between the container and the other structures to be safe if the container "pops" free and swings. Alternatively, devices such as hooks attached to wires can be fashioned to allow workers to hold the SATL in an unlocked position. This method will prevent workers from being crushed if the container swings. When a container is lifted after an inoperable SATL has been freed, workers should be aware of the possibility of the SATL falling, and they must stay clear of the area under the container [29 CFR 1918.85\(e\)](#). Workers must wear protective helmets when exposed to falling objects [29 CFR 1918.103](#).



*How to make a wooden block.*

and the SATL is spring-loaded, a tool made from a wooden wedge (relatively easy to make, see image above) can be inserted into the corner casting of the container to push the locking mechanism into the open position. A piece of steel rod or "rebar" could be used in a similar fashion. However, the use of wooden wedging devices reduces the potential for the metal bar or SATL to fall out. Manufacturers have also developed specialty tools which can be clamped onto the container to force the SATL to the open position. In all cases where the rebar, wedge, or special tool is left in place when the container is lifted, workers should be aware of the potential for these devices to fall out while the container is being hoisted. All workers should stay well away from the container until it has been placed (landed) and the device has been removed.

### **Removing a jammed SATL**

Once an SATL is jammed, it should be opened with a wedge or tool. The foreman or supervisor should direct and provide instructions to the crane operator from a safe location. Continuous radio communication should be maintained between the foreman or supervisor and the crane operator while manipulating the SATL and lifting the container until the jammed SATL is freed. If the SATL inadvertently breaks, there should be a thorough inspection of the upper and lower corner castings of the two containers involved.

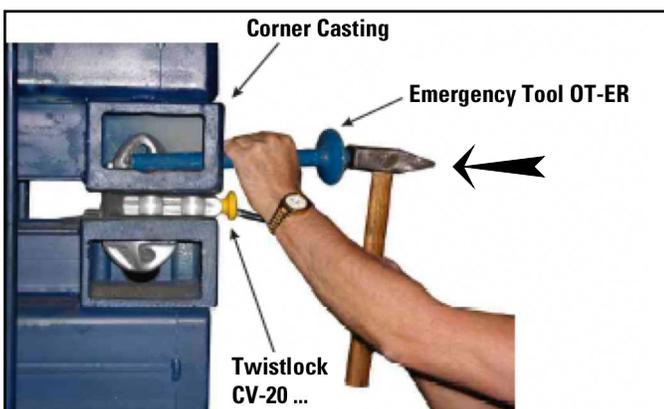
### **Examples of Methods of Last Resort for Freeing an Inoperable SATL**

#### **Relocking the SATL**

If the previous methods fail while attempting to free inoperable SATLs, the next option would be to relock all SATLs, establish a safe work zone around the entire area and carefully move the two interconnected containers to the nearest location where the inoperable SATLs can be reached and safely removed. This may entail an emergency lift to move the containers from a wing location to the nearest point of rest, such as a hatch cover or an adjacent cell. As a last resort to remove the



*Wedge inserted into a container (side view).*



**McGregor emergency tool** – The device is used to drive the tab of the SATL into the open or unlocked position. Wooden wedges and rebar can also be used.

### **Removing an SATL if the locking wire is broken**

If the unlocking wire is broken and the SATL is not spring-loaded, the manufacturer's tool may be used as a punch to reposition the SATL head to the unlocked position. If the unlocking wire is broken

SATL safely the containers may be moved to the highline or apron. These types of lifts should be performed with the container crane operating in the slow speed mode. A foreman or supervisor must ensure that the load to be lifted does not exceed the capacity of the crane. The employer should establish a safe work zone which is large enough so that workers are not in the area (danger zone) when the interconnected containers are in motion in the event that a container drops or separates and swings.

ship's crew should assemble fire extinguishers, fire hoses, and a bucket of water to douse small pieces of hot metal and prevent them from cutting off the SATL. Once the SATL has been burned off, a qualified person should inspect the corner casting of the container to ensure that the opening which connects the SATL has not been enlarged, or that the corner casting is not damaged. If the container is found to be damaged it must be taken out of service until satisfactory repairs have been made (29 CFR 1917.71(g)).



### ***Burning off the SATL***

Burning off the SATL should only be considered if the methods described above fail and there are no flammables or combustibles in the container or in the container(s) nearby. The U.S. Coast Guard may require a hot work permit before allowing any cutting or burning to take place on the ship. If the welding method is used, precautions must be taken to provide safe access, set a fire watch, and carefully burn off the head of the SATL without damaging the corner casting of the container. The

**Note:** Inoperable SATLs present a dangerous condition and must be approached with caution at the start of the operation. Each situation should be evaluated on a case-by-case basis (individually). To ensure worker safety, the process of removing an inoperable SATL should be controlled by a supervisor from start to finish.

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