

## **Bucket and Teeth Vendor Literature**

### Section 03-06

Komatsu has made every effort to make this manual as accurate as possible based on the information available at the time of publication and printing. Continuous improvement and advancement of product design may cause changes to machines which may not have been included in this publication. Komatsu reserves the right to make changes and improvements at any time. To ensure the most current information, please contact your service center.

## **Vendor Literature**

VL 09 - ESCO Top Lok Maintenance

VL 42a - ESCO Loadmaster Lip Loader Installation Instructions

VL 43a - ESCO Welding Procedures

VL 101a - ESCO Construction Products Usage and Maintenance

VL 136 – Cast Lip – J Bolt Lip and Wing Shrouds

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# MAINTENANCE

## ESCO® T4-V71 Toplok® Adapter for Loadmaster II Lips

**▲ WARNING:** All persons performing maintenance work should wear OSHA-approved hard hat, safety glasses, steel-toed shoes, and gloves. To avoid injury to others, keep people not directly involved well out of the way.

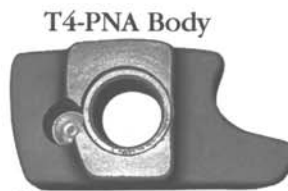
### Adapter and Pin Installation

#### Tools for Pin Install and Removal

- Impact Wrench, 7/8" or 22 mm Hex Head Bit and Universal Joint. If air impact wrench is not available use "L" shaped wrench.
- Pry tool

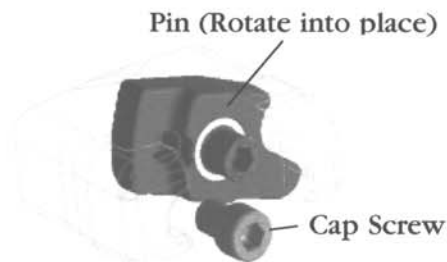
#### Adapter Installation

1. Clean lip fit area of fines.
2. Safely lift and slide adapter onto lip boss to a butt fit condition.



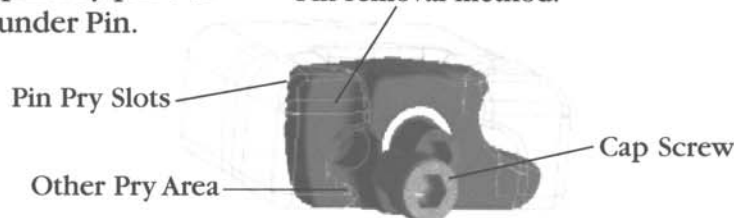
#### Pin Installation

1. Remove Cap Screw from Pin.
2. Insert Pin into Adapter Pin Hole and rotate into place.
3. Reinstall Cap Screw but don't fully tighten.

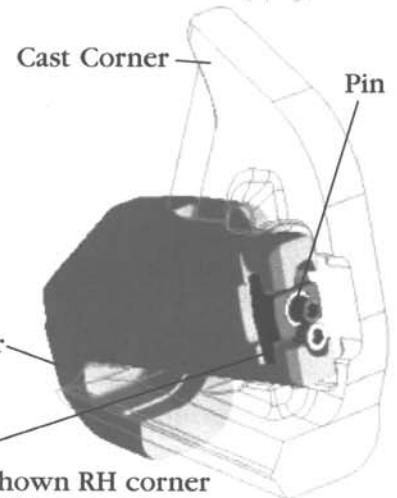
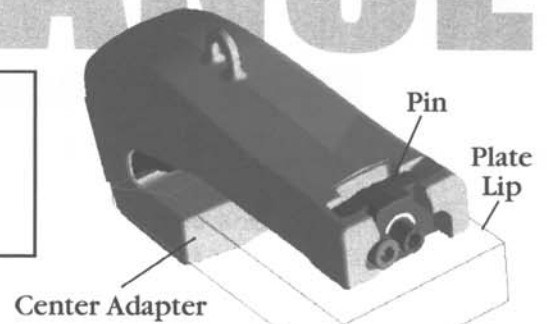


#### Adapter and Pin Removal

1. Clean fines from Cap Screw Hex Recess.
2. LH turn Cap Screw and remove.
3. Use pry tool to remove pin. Pry pin out using Pry Slots or from under Pin.
4. Slide adapter off.



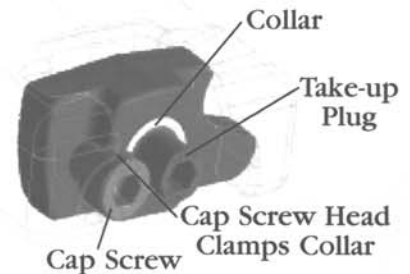
If adapter is to be replaced, burn off Pin Hole Tab for alternate Pin removal method.



- Pin End**
- Down as shown RH corner
  - Up LH corner

#### Tighten Adapter

1. Cap Screw must be slightly loose.
2. RH turn Take-up Plug until Adapter is tight.
3. RH turn Cap Screw until Collar is tightly clamped.
4. After first 8 hours of service, loosen Cap Screw, retighten Take-up Plug, retighten Cap Screw.



The Customer's Choice

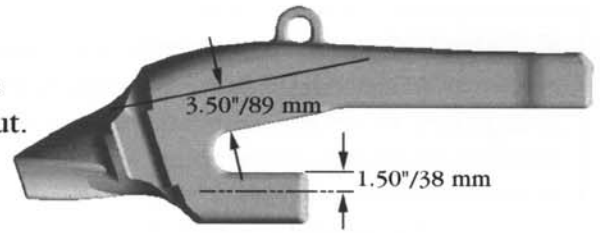
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# MAINTENANCE

## ESCO® T4-V71 Toplok® Adapter for Loadmaster II Lips

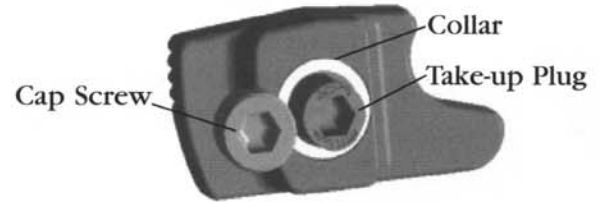
### Adapter Replacement

The top and bottom wear dimensions (opposite) are recommendations for determining adapter change out. These however are not absolute values as wear and change out frequency may vary depending on machine and application.



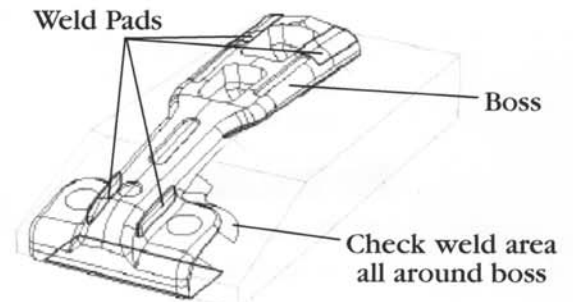
### Pin Maintenance

- Pin is usually reusable.
- To extend pin life, replace worn or damaged Take-up Plug, Collar, or Cap Screw.
- Contact your ESCO representative for details.



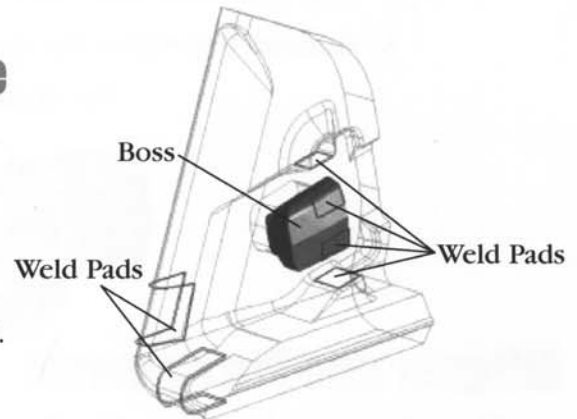
### Center Adapter Boss Maintenance

- Every six months, clean and visually check weld all around boss for cracks. Repair any cracks and grind smooth.
- Loose adapter fit should be tightened by building up weld pads as shown. Fit weld pads with ESCO provided template WRT-T4-1.
- Excessively worn or damaged boss should be replaced. Remove boss, and clean and rebuild plate surfaces as needed. Contact your ESCO representative for details.



### Corner Adapter Boss Maintenance

- Loose adapter fit should be tightened by building up weld pads as shown. Fit weld pads with ESCO provided template WRT-T4-2.
- Excessively worn or damaged boss should be replaced. Remove worn boss and install new boss. Contact your ESCO representative for details.



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# **ESCO Loadmaster Lip for Wheel Loader**

## Installation Instructions

## Safety and Warnings

### General/Safety Information

The safety practices described in this manual are meant as guidelines for safe operation under most conditions and are meant to supplement any safety rules and/or laws that may be in force in your area. Your safety and the safety of others results from putting into practice your knowledge of the correct operating procedures.

### Signal Words

Throughout this manual are statements preceded by a special attention symbol: ▲ The symbol is used with the following signal words to attract your attention to information of special priority. Read the paragraphs carefully and make sure you understand their significance, especially the possible causes of injury.

**▲WARNING:** A statement preceded by “**WARNING**” is information that should be acted upon to prevent serious injury.

**▲CAUTION:** A statement preceded by “**CAUTION**” is information that should be acted upon to prevent machine damage.

Additional signal words that are not preceded by the attention symbol are:

**IMPORTANT:** A statement preceded by the word “**IMPORTANT**” is information that possesses special significance.

**Tip:** A statement preceded by “**Tip**” is information that is handy to know and may make your job easier.

### Personal Safety

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## Introduction

Installing an ESCO Loadmaster lip into a front end loader bucket involves burning away a carefully measured area of the existing bucket lip; then welding the Loadmaster Lip into place.

In order to maintain the bucket's capacity, loading ability and weight balance, follow these instructions carefully. Careful installation will also help ensure that the mechanically attached parts will provide maximum strength, wear life and efficiency.

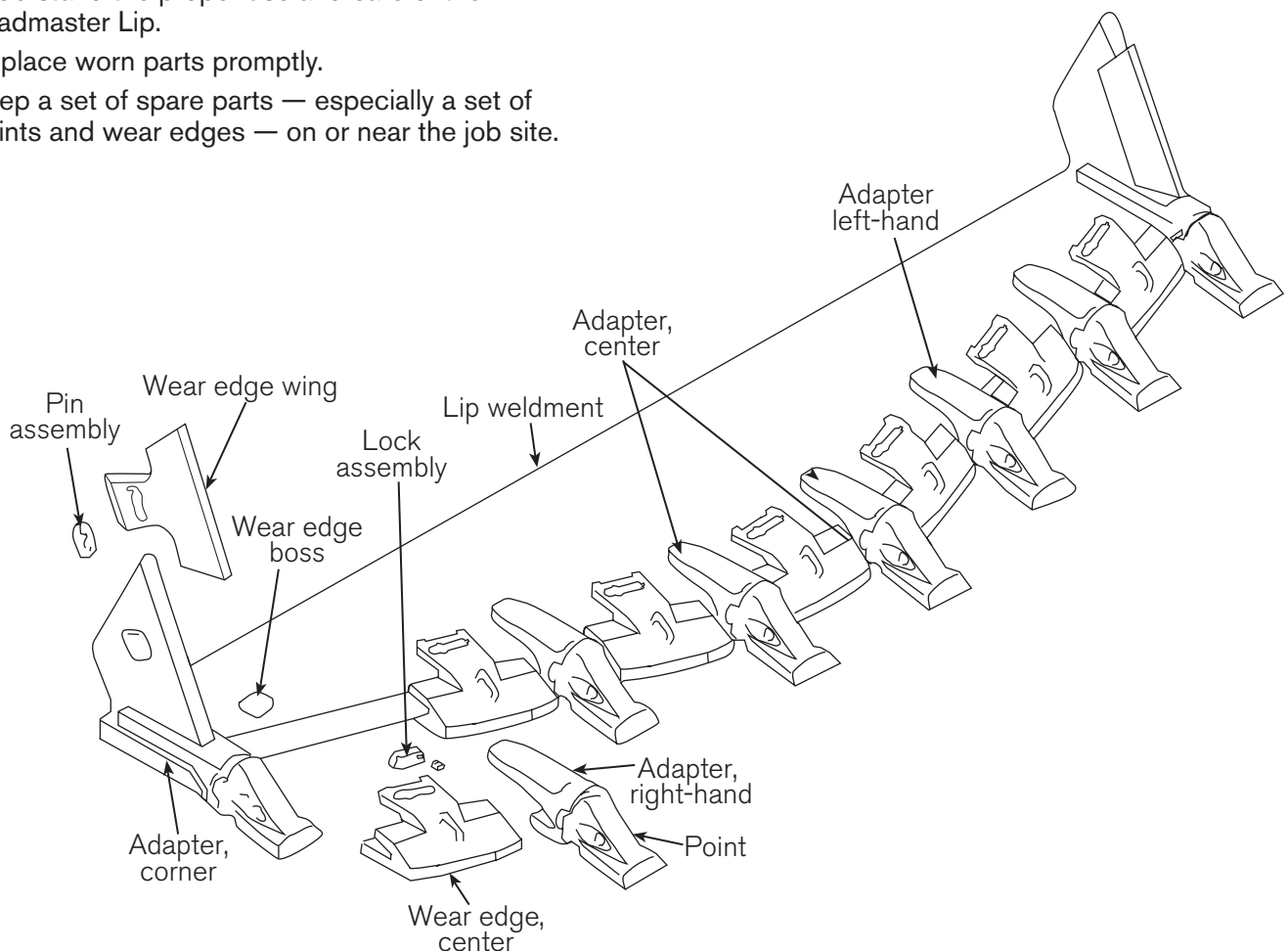
If you need additional information or assistance, contact your ESCO dealer.

## Observe these Operational Procedures

- Make sure operators and maintenance personnel understand the proper use and care of the Loadmaster Lip.
- Replace worn parts promptly.
- Keep a set of spare parts — especially a set of points and wear edges — on or near the job site.

## Before you Begin to Install the Lip

1. Your Loadmaster Lip has been shipped fully assembled. For fitting and welding, remove the wing and lip shrouds to avoid heat damage to the rubber locks.
2. The Loadmaster Lip have welded wing braces to prevent warping during manufacturing and installation. Keep the braces in place until installation and welding are complete.
3. ESCO recommends that the bucket's sides be braced before removing the old lip and during Loadmaster Lip installation to make sure they do not move during burning and welding.



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## Burning Out the Old Bucket Lip

Locating the Loadmaster Lip profile onto the bucket floor, Figure 1.

1. Position the bucket on a flat surface so the lip is level. Block the bucket so it will not move during installation. Install bracing as shown in Figures 1 and 2.
2. Locate a line along the floor of the bucket perpendicular to the bucket's sides or parallel to the bucket's back that can be used as a reference line for measuring. The line may be a fabrication joint, a line between end plate joints, or between any other convenient symmetrical reference points on the bucket. Choose a line that is farther behind the bucket lip than the depth of the Loadmaster Lip.
3. Inboard of each bucket wing, locate a point equal to  $1/6$ th of the overall bucket lip width. From these points, measure and record the distance between the estimated original leading edge and the bucket reference line established in Step 2 (Dimension A).
4. Measure and record the depth of the Loadmaster Lip at points equivalent to the  $1/6$ th bucket width locations determined in Step 3 (Dimension B).
5. Subtract Loadmaster Lip (Dimension B) from bucket (Dimension A) to arrive at (Dimension C). Measure from the bucket reference line a distance equal to (Dimension C) at the  $1/6$ th shovel width locations to locate Points C.
6. Determine the bucket floor burn line by drawing a straight line between the two Points C (use a chalk line if available). Mark Points D where the burn line intersects the bucket sides.

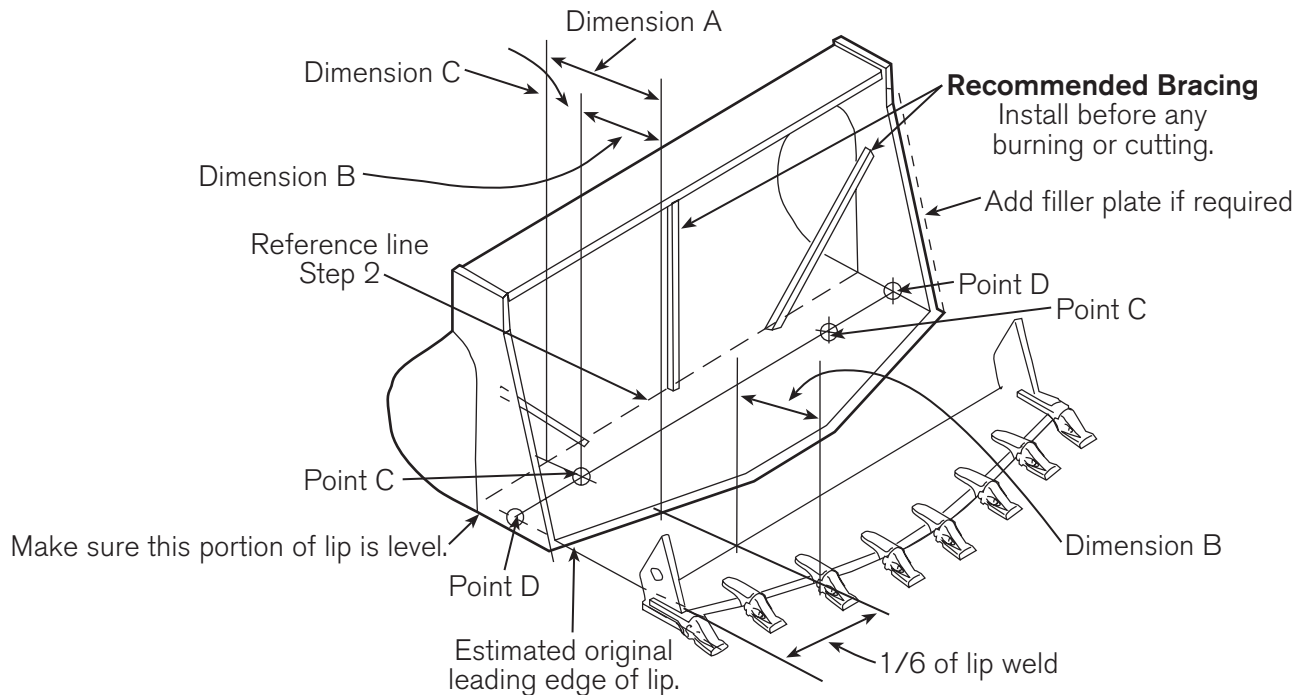


Figure 1 Locating Loadmaster Lip profile on bucket floor.

## Establishing and Cutting Burn Lines

1. Position the Loadmaster Lip template against the bucket sides so that template-Point D aligns with bucket-Points D (determined in Step 5). If template-Point E does not align with the bucket sides, the template may be moved within the following limits until it does, *Figure 2*.

- 2.5-5 yd. capacity buckets: 2.0"
- 5-8 yd. capacity buckets: 3.0"
- 8-12 yd. buckets: 3.5"
- 12-15 yd. capacity buckets: 4.0"

If point E alignment cannot be achieved within these limits or if undesirable alteration to the bucket profile will result from template realignment, contact your ESCO dealer for assistance.

2. Making sure the template is resting squarely on the bucket lip, trace the template outline on both bucket wings. If the template was moved within the limits described in Step 1, relocate the bucket floor burn line between template-Points D, parallel to the rear of the bucket.

**CAUTION:** ESCO recommends the dimensions be rechecked prior to cutting out the old lip. This will help ensure the cut dimensions are correct and avoid unnecessary repair if too much material is removed from the bucket.

3. Remove the template and burn out the old lip along the burn lines.

## Fitting the Loadmaster Lip

1. Make sure the burned bucket edge and the Loadmaster Lip edge are free of bumps or other irregularities that might interfere with a good butt fit, *Figure 3*.
2. Position the Loadmaster Lip centered in place adjacent to the bucket. Some trimming may be required to achieve a good fit.

**Important:** Make sure the Loadmaster Lip is level and at the same cutting angle as the original lip. The top of the Loadmaster Lip should align with the top of the bucket floor.

3. With the Loadmaster Lip properly positioned, tack-weld to prepare for final welding.

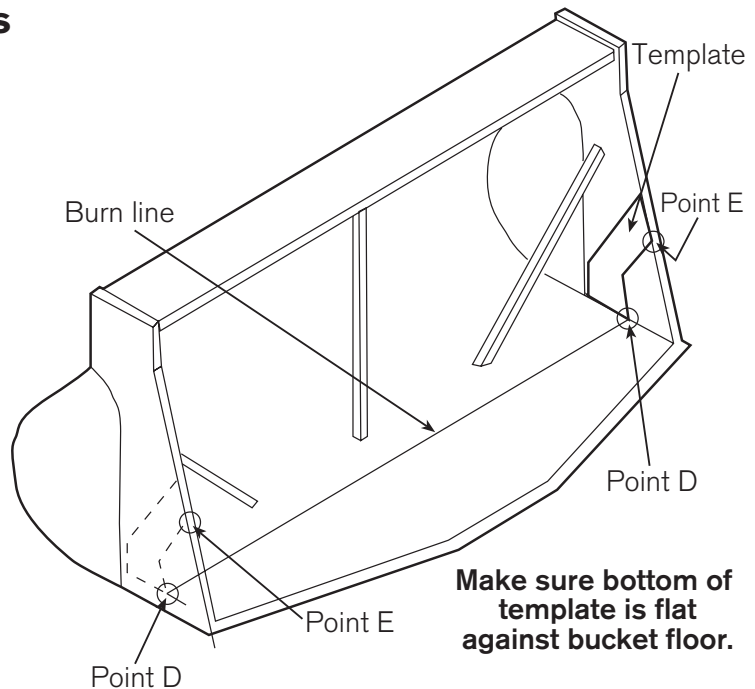


Figure 2 Establishing burn lines.

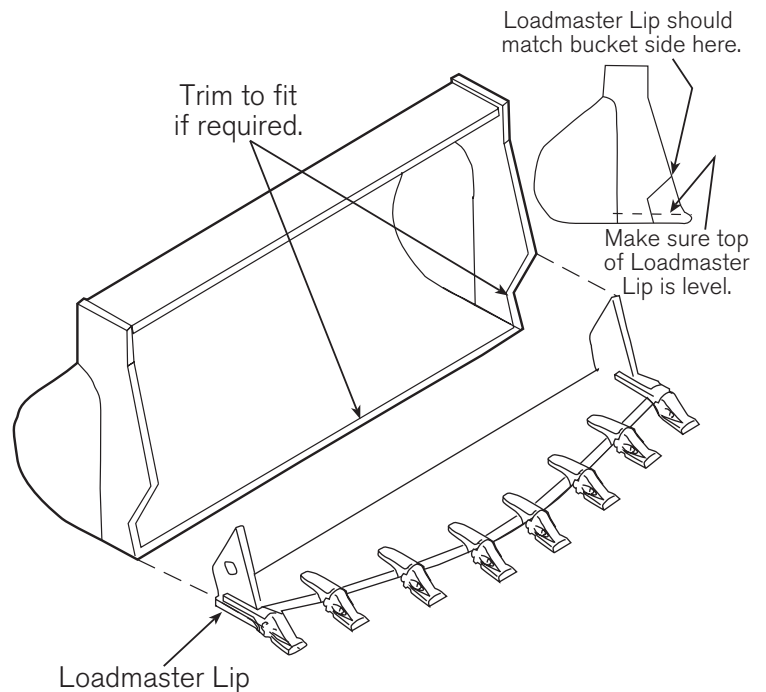
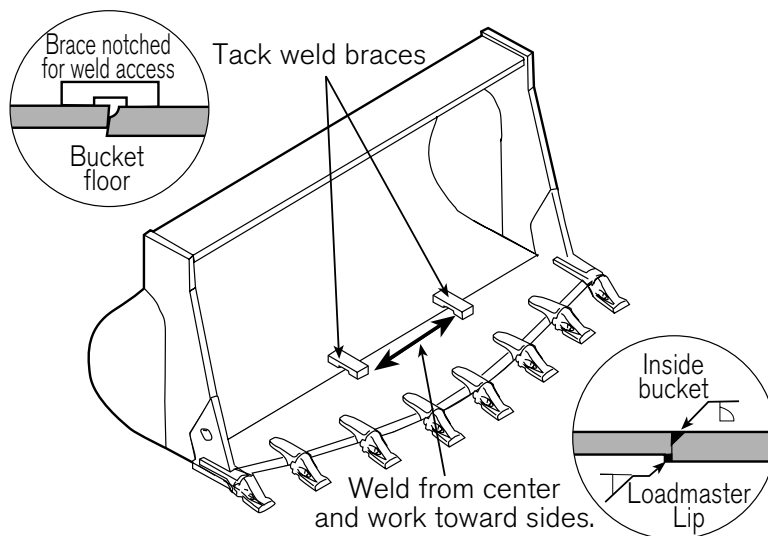


Figure 3 Fitting the Loadmaster Lip.

## Final Welding

1. Using scrap material, tack-weld one or two braces between the bucket floor and the Loadmaster Lip to assist in stabilization. Notch the material to allow access for welding, *Figure 4*.
2. On the under side of the bucket, burn off any wear plates or stiffener plates 12-18" behind the back of the Loadmaster Lip. Do not remove any structural components. Install a reinforcing plate the full width of the bucket as shown in *Figure 5*. The plate should be thick enough to make up the difference between the thickness of the Loadmaster and the bucket, but no thicker than 1". In addition, ESCO recommends the installation of reinforcing plates at the outsides of the bucket adjacent to the Loadmaster Lip, especially on buckets used in heavy-duty applications, *Figure 5*. Use the same plate thickness specifications as for the bottom reinforcing plate.
3. Recommended welding methods and materials are described in maintenance literature P6000GEN included with the installation packet. After preheating, begin welding the Loadmaster Lip to the bucket by beginning at the center of the lip and moving toward the sides.



*Figure 4 Final welding.*

## Summary of Welding Specifications

- Electrodes: E7016 or E7018 low hydrogen (Keep dry!)
- Preheat: 200°F (350-400°F if air temperature is 40°F or lower)
- Interweld: Maintain interweld temperature less than 500°F
- Postheat: If air temperature is 40° F or lower, postheat 350-400F°, then let cool

Bevel joints for full weld penetration. Use short stringer beads with single bead weave width not to exceed 3/4". Remove slag after each pass and peen each bead.

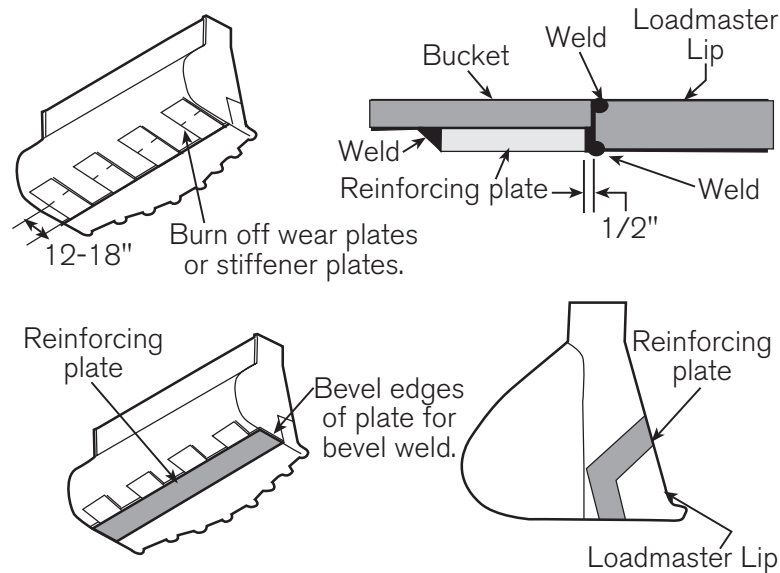


Figure 5 Reinforcing plate installation.

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# ESCO Welding Procedures

P6000GEN01L1009



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## Safety and Warnings

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## ESCO Alloys

ESCO Series 12 alloys are used to provide strength and hardness to a variety of ESCO mining, construction, industrial and dredging tools. They have been developed for toughness, with hardness ranging from 229-550 BHN. Most ESCO teeth, adapters, rippers, blades and end bits are made of durable Series 12 alloys. Some are weldable and some are not.

ESCO Series 14 alloy castings are manganese steels which work-harden on impact and thus maintain surface hardness and wear resistance. ESCO Series 14 alloys are used in select bucket applications, such as shovel dipper doors, lips and fronts, bushings, and other applications.

By following the welding instructions in this brochure you should have no difficulty welding and maintaining ESCO products. If questions arise that are not fully answered here, please contact your ESCO dealer or call ESCO direct at one of the locations listed on the back of this brochure.

### Acceptance Standard

The following requirements apply to any one layer of weld, including root and final. One layer is generally intended to mean a single plane of weld stringer beads, but suitable interpretation must be used if the shape results in a curving layer.

### Linear Discontinuity

No cracks, including crater cracks, are allowed in welds or heat affected zones. No other linear discontinuity in these areas shall exceed 6mm / 0.25in. in length.

### Porosity

Porosity shall not exceed (4) holes in every 100mm / 4.00in. of length of a single weld bead. No single void shall exceed 1.50mm / 0.06in. in diameter.

### Slag

No visual slag in any layer is allowed.

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### Undercutting

Undercutting shall not exceed 1.50mm / 0.06in. for material over 13mm / 0.50in. in thickness.

### Rollover

Rollover or weld overlap shall not exceed 1.50mm / 0.06in. beyond the fusion line of the weld.

### Weld Spatter

No bead of weld spatter shall exceed 0.8mm/0.03in. in diameter. The scatter density of beads of acceptable size shall not exceed 25 per 230 sq. cm. / 36 sq. in.

### Grinding

Grinding requirements shall be as specified on the applicable drawing. If grinding must be performed in only certain directions, these requirements will also be specified on the drawing.

### Overlay Plate Attachment

Overlay plate can be an effective method of prolonging the life of some ESCO products in certain applications. However, improper design, installation, and/or maintenance of the overlay plate may contribute to premature failure of any adjacent ESCO product.

Refer to and follow the recommendations of the specific overlay plate manufacturer for proper overlay plate design, installation, and maintenance. Cases may exist where the recommendations of the overlay plate manufacturer conflict with ESCO requirements or procedures. If a conflict exists, follow the ESCO requirements.

## Uses for ESCO Series 12 Alloys

Alloy	Weldability	Product Applications
12E (low hardness)	Good	Bucket lips and structural components
12E (high hardness)	Fair	Bolt-on or shank-type adapters
12F (low hardness)	Good	Bucket lips and structural components
12F (high hardness)	Fair	Bolt-on shank-type adapters
12C	Good	Front end loader weld-on adapters
12H	Not Recommended	Large points and adapters
12K	Not Recommended	Points and wearparts
12M (low hardness)	Good	Structural parts for smaller buckets
12M (high hardness)	Not Recommended	Bolt-on adapters and wearparts
12S	Not Recommended	Points and wearparts
12T	Very Good	Structural parts for larger buckets

### How to Weld ESCO Series 12 Alloys

Certain Series 12 alloys are not meant to be welded. See chart above. Welding can destroy the heat treatment given these parts, and cause inferior performance or failure.

As a rule, ESCO points should never be welded, repaired, or hardfaced. They are manufactured as hard as possible.

ESCO alloys 12E, 12C, 12M and 12T have excellent weldability. They are used for weld-on adapters, as well as structural parts such as dragline bucket lips, cheeks and arches; shovel dipper beams, lips and fronts; and dredge cutter arms, rings and hubs.

Structural parts in these alloys can be hardfaced, but this is generally unnecessary because of wear shrouds that ESCO provides to protect high wear areas.

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The alloy type is prominently marked on all ESCO cast parts: 12S, 12K, etc. In cases where extreme wear has obliterated the markings, Series 12 alloys can be identified by their magnetism; Series 14 manganese alloys are nonmagnetic.

### Recommended Welding Procedures for Series 12 Alloys

Follow these procedures for best results when welding the weldable Series 12 alloys together or to other low alloy castings, carbon steel castings, forgings, or plate.

Use filler material as specified in the table on the back page:

- Control the moisture in low hydrogen electrodes by purchasing electrodes in 4.5kg / 10lb sealed packages. Larger packages invite moisture contamination which can result in inferior welds.
- Bake previously opened packages of electrodes in a ventilated oven at 260°C / 500°F for two hours before using.
- Remove only one hour's supply at a time. Keep the remainder in a ventilated holding oven at 65°C / 150°F.
- Electrodes taken from cardboard boxes or non-airtight containers should also be heated to 260°C / 500°F for two hours in a ventilated oven. Then they should be placed in a ventilated holding oven set at 65°C / 150°F while still warm. Remove only one hour's supply at a time.
- Any electrode exposed to the air for more than one hour should be rebaked per the instructions above.
- Preheat and interpass temperatures are in the table in the back of this booklet.
- When welding, use short stringer beads and remove slag after each pass.
- Bevel joints to get 100% weld penetration, when possible.

### Dot Hardfacing ESCO Series 12 Alloys

ESCO does not recommend hardfacing ESCO Series 12 alloys. However, if hardfacing is performed, dot hardfacing is recommended over other methods.

Dot welding is faster, uses less material, and costs less than continuous beads or solid overlays. It also reduces the chance of cracking and weld failure that is common with other methods.

- Apply dots about 10-12mm / 0.38-0.50in. in diameter welded in rows about 25-37mm / 1.00-1.50in. apart.
- Dots serve as good wear indicators. Reweld them before they are completely worn off.
- Use Stooddy 31 or equivalent electrodes for hardfacing.
- Always rebuild worn areas to the original contour with an appropriate base filler material before hardfacing. If wear is very deep or excessive, buildup with low alloy steel plate to original contour, then use the dot hardfacing method described above.

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## How to Weld ESCO Series 14 Manganese Steel Alloys

To rebuild parts made of Series 14 alloys, follow these procedures:

- Check with a magnet to be certain the part is a manganese alloy. ESCO Series 14 manganese alloys are not magnetic.
- Use filler materials as specified in the table on the back page.
- Bevel joints with torch, grinder or arc air equipment to obtain 100% weld penetration.
- Avoid overheating when gouging.
- Grind or torch cut work-hardened surfaces at least 0.80mm / 0.03in. deep before welding.
- Check with prickpunch to determine if all hardened surface has been completely removed.

- Scarf out cracks completely before welding.
- Skip weld. Make beads less than 125mm / 5.00in. long.
- Avoid wide weaving beads in order to distribute heat evenly.
- Weld with short arc at low current setting “cold arc”. You should be able to touch the part 150mm / 6.00in. away.
- Peen each bead immediately to reduce contraction stress.
- Rebuild worn areas to original contour with austenitic manganese nickel electrodes to closely match the base material and allow work hardening.

## ESCO Alloy Welding Specifications

Series 12 Alloys and Plate

SMAW		FCAW		GMAW	
E7016	per AWS A5.1	E70T-5	per AWS A5.20  Wire must be certified by either the supplier or the manufacturer to deposit weld metal with less than 5 ml / 100g diffusible hydrogen	ER70S-6	per AWS A5.18
E7018	per AWS A5.1	E71T-1		ER80S-Ni2	per AWS A5.28
E7018-C1	per AWS A5.1	E71T-1 H4			
E8018-C1	per AWS A5.1	E80T5-Ni2			
		E70T-5			
		E71T1-Ni2			

Series 14 Alloys and Plate

SMAW		FCAW		GMAW	
E308-16	per AWS A5.4	ER308	per AWS A5.9	ER309	per AWS A5.9
E309-16	per AWS A5.4	Stoody Nicro-Mang		E309L	per AWS A5.9
E310-16	per AWS A5.4	McKay Vertiwear			
Stoody Nicro-Mang					
Stoody Trackwear					

*Continued on the next page.*

# ESCO Alloy Welding Specifications continued

## Preheat and Interpass Temperatures

Alloy	Minimum Preheat Required	Maximum Interpass Allowed	Post Weld Heat Treatment Required
12C Adapters	177°C / 350°F	260°C / 500°F If welding in cold conditions, 5°C / 40°F or less, preheat between 175-205°C / 350-400°F. Check temperature with a Tempilstik.	If surrounding air temperature is above 5°C / 40°F, post heating after welding is not necessary. If surrounding temperature is less than 5°C / 40°F, postheat the entire part uniformly between 4 and 24 hours, at 175-205°C / 350-400°F then air cool.
All other Series 12 Alloys	120°C / 250°F		
All Alloy 14 Series	Do Not Preheat	120°C / 250°F	

**Note:** Whenever fabrication involves a combination of castings and plate material, those preheat and interpass temperatures applicable to the alloy of the casting involved shall be observed, regardless of the type or section thickness of the plate material.

Material	Thickness Preheat Required	Minimum Interpass Allowed	Maximum
ASTM A514 or EN 10137	1" or less	20°C / 70°F	260°C / 500°F
	1"-2"	65°C / 150°F	
	Over 2"	120°C / 250°F	
AR Plate	1" or less	20°C / 70°F	
	Over 1"	177°C / 350°F	
Mild Steel Plate	2" or less	20°C / 70°F	
	Over 2"	95°C / 200°F	

**\*Note:** For thin sections of 1" or less, at ambient temperature of 70° and greater, no pre-heat is required, however burning the moisture off the surfaces is still considered good welding practice to eliminate the possibility of hydrogen problems.

Whenever fabrication involves welding plates of different grades to one another, use the higher pre heat requirement.



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ESCO Corporation is the preferred provider of technically rich metal components and wear solutions for industrial applications. ESCO has over 40 locations and affiliates worldwide.

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## **ESCO Construction Products Usage & Maintenance**

Ultralok<sup>®</sup>, Super V<sup>®</sup>, Vertalok<sup>®</sup>, and Helilok<sup>®</sup> Tooth Systems; Weld-on, Bolt-on, Zipper Lip<sup>®</sup>, and Horn-Style Adapters; Zipper Lip and Horn-Style Lip Rebuild Instructions; and Ripper System Maintenance

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*The purpose of this manual is to provide detailed instructions on the use and maintenance of ESCO construction ground engaging tools. Please read the Safety Instructions section prior to performing any work in this manual.*



## Safety and Warnings

### General/Safety Information

The safety practices described in this manual are meant as guidelines for safe operation under most conditions and are meant to supplement any safety rules and/or laws that may be in force in your area. Your safety and the safety of others results from putting into practice your knowledge of the correct operating procedures.

### Signal Words

Throughout this manual are statements preceded by a special attention symbol: ▲The symbol is used with the following signal words to attract your attention to information of special priority. Read the paragraphs carefully and make sure you understand their significance, especially the possible causes of injury.

**▲WARNING:** A statement preceded by **“WARNING”** is information that should be acted upon to prevent serious injury.

**▲CAUTION:** A statement preceded by **“CAUTION”** is information that should be acted upon to prevent machine or equipment damage.

Additional signal words that are not preceded by the attention symbol are:

**IMPORTANT:** A statement preceded by the word **“IMPORTANT”** is information that possesses special significance.

**Tip:** A statement preceded by **“Tip”** is information that is handy to know and may make your job easier.

### Personal Safety

**▲WARNING:** When performing the work described in these instructions, always work safely and use proper safety equipment to help avoid injury. Always wear hard hat, gloves, safety shoes, eye protection, hearing protection and fall protection per regional, national and site requirements (e.g., OSHA, MSHA) when performing maintenance work. To avoid injury to others, keep bystanders well out of the way.



## Welding Instructions

### ESCO Alloys

ESCO Series 12 alloys are used to provide strength and hardness to a variety of ESCO mining, construction, industrial and dredging tools. They have been developed for toughness, with hardness ranging from 229-550 BHN. Most ESCO teeth, adapters, rippers, blades and end bits are made of durable Series 12 alloys. Some are weldable and some are not.

ESCO Series 14 alloy castings are manganese steels which work-harden on impact and thus maintain surface hardness and wear resistance. ESCO Series 14 alloys are used in select bucket applications, such as shovel dipper doors, lips and fronts, bushings, and other applications.

By following the welding instructions in this brochure you should have no difficulty welding and maintaining ESCO products. If questions arise that are not fully answered here, please contact your ESCO dealer or call ESCO direct at one of the locations listed on the back of this brochure.

### Acceptance Standard

The following requirements apply to any one layer of weld, including root and final. One layer is generally intended to mean a single plane of weld stringer beads, but suitable interpretation must be used if the shape results in a curving layer.

### Linear Discontinuity

No cracks, including crater cracks, are allowed in welds or heat affected zones. No other linear discontinuity in these areas shall exceed 6mm/0.25in. in length.

### Porosity

Porosity shall not exceed (4) holes in every 100mm/4.00in. of length of a single weld bead. No single void shall exceed 1.50mm/0.06in. in diameter.

### Slag

No visual slag in any layer is allowed.

### Undercutting

Undercutting shall not exceed 1.50mm/0.06in. for material over 13mm/0.50in. in thickness.

### Rollover

Rollover or weld overlap shall not exceed 1.50mm/0.06in. beyond the fusion line of the weld.

### Weld Spatter

No bead of weld spatter shall exceed 0.8mm/0.03in. in diameter. The scatter density of beads of acceptable size shall not exceed 25 per 230 sq. cm./36 sq. in.

### Grinding

Grinding requirements shall be as specified on the applicable drawing. If grinding must be performed in only certain directions, these requirements will also be specified on the drawing.

### Overlay Plate Attachment

Overlay plate can be an effective method of prolonging the life of some ESCO products in certain applications. However, improper design, installation, and/or maintenance of the overlay plate may contribute to premature failure of any adjacent ESCO product.

**▲WARNING:** *When performing the work described in these instructions, always work safely and use proper safety equipment to help avoid injury. Always wear hard hat, gloves, safety shoes, eye protection, hearing protection and fall protection per regional, national and site requirements (e.g., OSHA, MSHA) when performing maintenance work. To avoid injury to others, keep bystanders well out of the way.*



## Welding Instructions

Refer to and follow the recommendations of the specific overlay plate manufacturer for proper overlay plate design, installation, and maintenance. Cases may exist where the recommendations of the overlay plate manufacturer conflict with ESCO requirements or procedures. If a conflict exists, follow the ESCO requirements.

### Uses for ESCO Series 12 Alloys

Alloy	Weldability	Product Applications
12E (low hardness)	Good	Bucket lips and structural components
12E (high hardness)	Fair	Bolt-on or shank type adapters
12F (low hardness)	Good	Bucket lips and structural components
12F (high hardness)	Fair	Bolt-on or shank type adapters
12C	Good	Front end loader weld-on adapters
12H	Not Recommended	Large points and adapters
12K	Not Recommended	Points and wearparts
12M (low hardness)	Good	Structural parts for smaller buckets
12M (high hardness)	Not Recommended	Bolt-on adapters and wearparts
12S	Not Recommended	Points and wearparts
12T	Very Good	Structural parts for larger buckets

### How to Weld ESCO Series 12 Alloys

Certain Series 12 alloys are not meant to be welded. See chart above. Welding can destroy the heat treatment given these parts, and cause inferior performance or failure.

As a rule, ESCO points should never be welded, repaired, or hardfaced. They are manufactured as hard as possible.

ESCO alloys 12E, 12C, 12M and 12T have excellent weldability. They are used for weld-on adapters, as well as structural parts such as dragline bucket lips, cheeks and arches; shovel dipper beams, lips and fronts; and dredge cutter arms, rings and hubs.

Structural parts in these alloys can be hardfaced, but this is generally unnecessary because of wear shrouds that ESCO provides to protect high wear areas.

The alloy type is prominently marked on all ESCO cast parts: 12S, 12K, etc. In cases where extreme wear has obliterated the markings, Series 12 alloys can be identified by their magnetism; Series 14 manganese alloys are nonmagnetic.

### Recommended Welding Procedures for Series 12 Alloys

Follow these procedures for best results when welding the weldable Series 12 alloys together or to other low alloy castings, carbon steel castings, forgings, or plate.

Use filler material as specified in the table on the back page:

- Control the moisture in low hydrogen electrodes by purchasing electrodes in 4.5kg/10lb. sealed packages. Larger packages invite moisture contamination which can result in inferior welds.
- Bake previously opened packages of electrodes in a ventilated oven at 260°C/500°F for two hours before using.
- Remove only one hour's supply at a time. Keep the remainder in a ventilated holding oven at 65°C/150°F.
- Electrodes taken from cardboard boxes or non-airtight containers should also be heated to 260°C/500°F for two hours in a ventilated oven. Then they should be placed in a ventilated holding oven set at 65°C/150°F while still warm. Remove only one hour's supply at a time.
- Any electrode exposed to the air for more than one hour should be rebaked per the instructions above.
- Preheat and interpass temperatures are in the table in the back of this booklet.
- When welding, use short stringer beads and remove slag after each pass.
- Bevel joints to get 100% weld penetration, when possible.



## Welding Instructions

### Dot Hardfacing ESCO Series 12 Alloys

ESCO does not recommend hardfacing ESCO Series 12 alloys. However, if hardfacing is performed, dot hardfacing is recommended over other methods.

Dot welding is faster, uses less material, and costs less than continuous beads or solid overlays. It also reduces the chance of cracking and weld failure that is common with other methods.

- Apply dots about 10-12mm/0.38-0.50in. in diameter welded in rows about 25-37mm/1.00-1.50in. apart.

- Dots serve as good wear indicators. Reweld them before they are completely worn off.
- Use Stooddy 31 or equivalent electrodes for hardfacing.
- Always rebuild worn areas to the original contour with an appropriate base filler material before hardfacing. If wear is very deep or excessive, buildup with low alloy steel plate to original contour, then use the dot hardfacing method described above.

### ESCO Alloy Welding Specifications

#### Series 12 Alloys and Plate

SMAW		FCAW		GMAW	
E7016	per AWS A5.1	E70T-5	per AWS A5.20  Wire must be certified by either the supplier or the manufacturer to deposit weld metal with less than 5 ml/100g diffusible hydrogen	ER70S-6	per AWS A5.18
E7018	per AWS A5.1	E71T-1		ER80S-Ni2	per AWS A5.28
E7018-C1	per AWS A5.1	E71T-1 H4			
E8018-C1	per AWS A5.1	E80T5-Ni2			
		E70T-5			
		E71T1-Ni2			

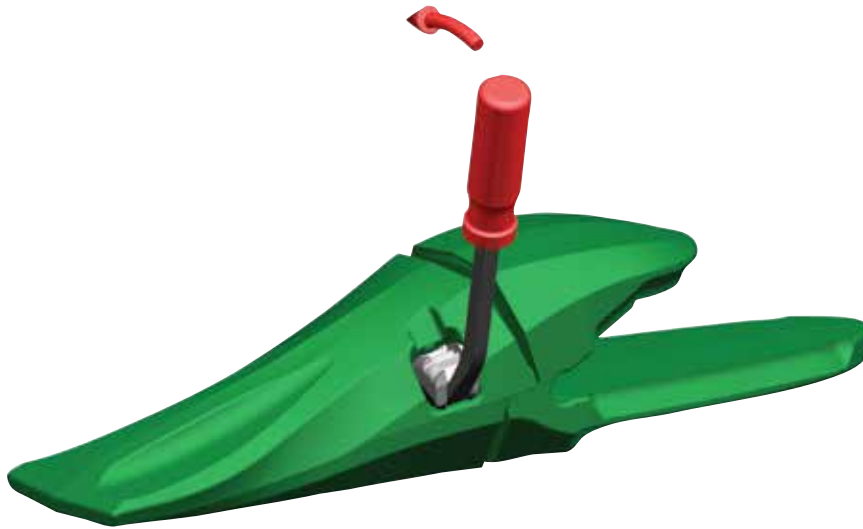
#### Preheat and Interpass Temperatures

Alloy	Minimum Preheat Required	Maximum Interpass Allowed	Post Weld Heat Treatment Required
12C Adapters	150°C/300°F	260°C/500°F If welding in cold conditions, 5°C/40°F or less, preheat between 175-205°C/350-400°F. Check temperature with a Tempilstik.	If surrounding air temperature is above 5°C/40°F, post heating after welding is not necessary. If surrounding temperature is less than 5°C/40°F, post-heat the entire part uniformly between 4 and 24 hours at 175-205°C/350-400°F, then air cool.
12C Whisler Plus™ Components	120°C/250°F		
All other Series 12 Alloys	120°C/250°F		
All Series 14 Alloys	<b>Do Not Preheat</b>	120°C/250°F	

**Note:** Whenever fabrication involves a combination of castings and plate material, those preheat and interpass temperatures applicable to the alloy of the casting involved shall be observed, regardless of the type or section thickness of the plate material.

**⚠WARNING:** When performing the work described in these instructions, always work safely and use proper safety equipment to help avoid injury. Always wear hard hat, gloves, safety shoes, eye protection, hearing protection and fall protection per regional, national and site requirements (e.g., OSHA, MSHA) when performing maintenance work. To avoid injury to others, keep bystanders well out of the way.

## Ultralok® Tooth System Installation & Removal



### General/Safety Information

The practices described in this manual are meant as guidelines for safe operation under most conditions and are meant to supplement any safety rules and/or laws which may be in force in your area. Your safety and the safety of others results from putting into practice your knowledge of the correct operating procedures.

**IMPORTANT:** ESCO's warranty is void when points and adapters have been weld-repaired or hardfaced.

### Ultralok Tooth System Removal

---

The Ultralok tooth system is designed for quick and easy replacement of teeth in the field. Just follow these step-by-step instructions to remove old teeth, inspect the nose and install new teeth. If you have any questions, please contact your ESCO representative.



**Step 1** – Clean the lock cavity of fines on the top and bottom of the lock.



**Step 2** – Insert the pry bar into the top side of the lock and rotate the pry bar upward and toward the centerline of the point. Clean the fines from the second groove in the lock that is now exposed.



**Step 3** – Insert the pry bar into the second groove and again push the pry bar toward the centerline of the point until all three grooves are visible. **The lock will still be attached to the point.**

## Ultralok® Tooth System Removal Continued



**Step 4** – In some applications, packed fines may inhibit point removal. Use the pry bar at the rear shoulder of the point to work it loose from the fines.



**Step 5** – Once the point is loose on the nose, slide the point off.



**Step 6** – Clean the nose of fines and dirt. After cleaning, inspect the nose for excess wear and peening. If necessary, weld-repair or replace the adapter to ensure trouble free performance.

## Ultralok Tooth System Installation



**Step 1** – Install the new point onto the nose. Make sure the lock is in the unlatched position before installing.



**Step 2** – Insert the pry bar into the lower side of the lock and the point wall. Push the pry bar toward the centerline of the point until the lock clicks into place. The distinctive click ensures the lock is properly installed.



**Step 3** – In the fully locked position, the lock face will be recessed from the surface of the point.

**Note:** Once all of the points are replaced, double-check to be sure all locks are fully installed.

**⚠WARNING:** When performing the work described in these instructions, always work safely and use proper safety equipment to help avoid injury. Always wear hard hat, gloves, safety shoes, eye protection, hearing protection and fall protection per regional, national and site requirements (e.g., OSHA, MSHA) when performing maintenance work. To avoid injury to others, keep bystanders well out of the way.

## Weld Rebuild of the Ultralok® Nose

The ESCO Ultralok tooth system is a hammerless system designed to operate with some movement of the point on the nose. However, movement may become excessive after extensive service because of nose wear. ESCO recommends replacement of worn adapters. If circumstances do not allow replacement, it is possible to weld rebuild a worn nose as described in these instructions. Refer to Figure 1 for a description of the Ultralok nose.

### Recommended Materials:

1. Wire brush
2. Pre-heating device (i.e. gas torch, induction blanket)
3. Arc welder
4. Filler material/electrodes
5. Grinder
6. Aerosol stencil ink or white spray paint
7. New Ultralok point and lock

**⚠CAUTION:** ESCO weld-on Ultralok adapters are hardened typically to around 400 BHN. In order to eliminate cracking commonly associated with welding steel at these hardness levels, follow these procedures carefully and use ESCO recommended welding techniques and practices.

**Note:** For additional information on welding ESCO alloys, refer to ESCO Welding Procedures, P6000GEN. To obtain this document please see your ESCO representative.

### Rebuild Procedure

**Step 1** – Clean all dirt, grease, paint and other foreign materials from the nose.

**Step 2** – Preheat nose to approximately 150°C/300°F before welding. During welding, the interpass temperature of the nose should not exceed 260°C/500°F. These temperatures should be determined by the use of a Tempilstik, infrared digital thermometer, or some other temperature reading device.

**Step 3** – Weld a layer of material approximately 3mm/0.12in. thick on the end of the nose as shown in Figure 2. Higher tensile strength filler material is recommended, such as E9018 or equivalent. At a minimum E7018 electrode or equivalent should be used.

**Step 4** – Carefully grind the welded material, a little at a time, until the new point can be installed and the lock snapped in place. Stencil Ink or white spray paint may be used to identify high spots for grinding.

**Step 5** – Once the end of nose weld rebuild is complete, weld a layer of material 3mm/0.12in. thick around the perimeter of the nose as shown in Figure 3. Repeat grinding as described in Step 4 until the new point can be installed and the lock snapped in place.

The installed point should have a snug fit and the nose is now ready for service.

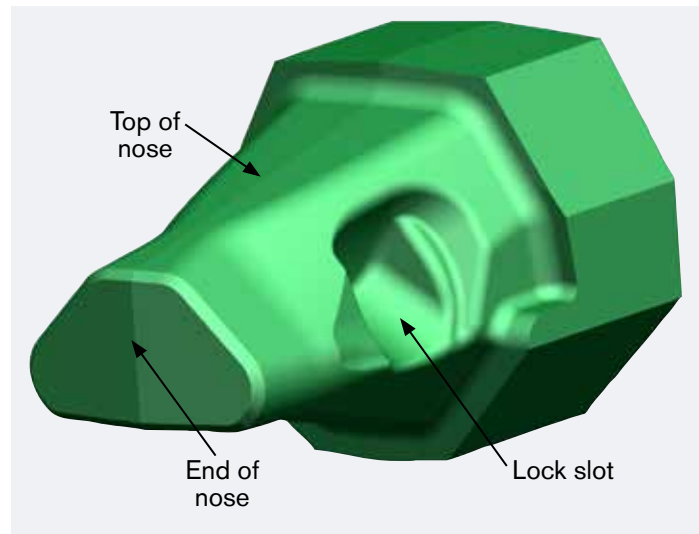


Figure 1

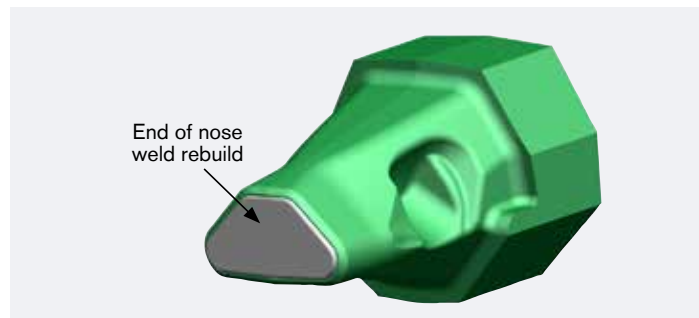


Figure 2

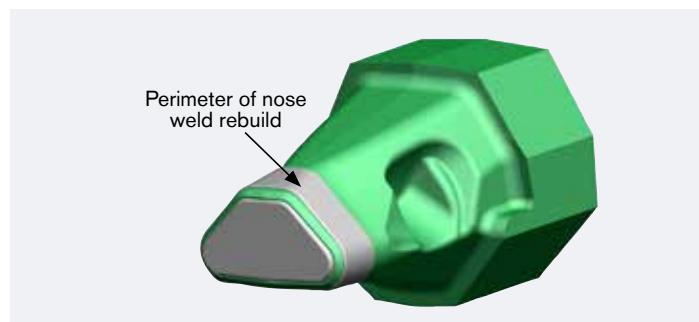


Figure 3

## Installing a Continuous Edge with the Ultralok® System

A continuous edge can be useful in applications when it is necessary to finish with a smooth surface or to increase capacity of the bucket. Welding on ESCO points is not recommended. However, if a continuous edge is necessary for the application, the following welding practices should be used.

A continuous edge should only be welded onto two or three parallel tooth positions. If too many positions are welded, point/edge removal may become difficult. Do not weld to corner positions if they are canted outward.

To avoid cracking commonly associated with welding steel at the hardness level of Ultralok points, it is critical that the preheat and interpass temperatures are followed as noted in the recommended welding parameters listed below.

### Recommended Welding Parameters

Process		SMAW	GMAW	FCAW
Filler Material	AWS (USA)	E309-16 per AWS A5.4	ER309 per AWS A5.9	E309 T1 per AWS A5.22
	ISO/DIS	3581A E22 12 3581B ES309	14343A 22 12 H 14343B SS309	17633B TS309
	AS/NZS (Australia/New Zealand)	1553.3 E309	–	2717.3 ES309
	GB/T (China)	983 E309	17854 H1Cr24Ni13	17853 E309T
	JIS (Japan)	Z3221 D309	Z3321 Y309 Z 3324 Y309	Z 3323 YF 309
	GOST (Russia)	10052 Э-10X25H13Г2	2246 СБ-07Х25Н13	–
	CEN (Europe)	EN1600 E22 12	EN12072 22 12 H	EN12073 T 23 12L
	Shielding Gas	–	98% Ar + 2% O <sub>2</sub>	75% Ar + 25% CO <sub>2</sub>
Preheat	175°C/347°F	175°C/347°F	175°C/347°F	
Interpass Temperature	250°C/482°F Maximum	250°C/482°F Maximum	250°C/482°F Maximum	

### Installation Procedure

**Step 1** – Position the continuous edge across the teeth to determine where welds should be placed. Please note: even the points which are not welded provide support to the continuous edge. Refer to Figure 1 for recommended weld locations.

**Step 2** – Clean all dirt, grease, paint and other foreign materials from the points where the edge will be welded in position.

**Step 3** – Reposition the continuous edge on top of the points. All points should be in position before welding to ensure alignment.

**CAUTION:** Remove the lock assembly so that the rubber is not destroyed during welding.

**Step 4** – Preheat as indicated in the Recommended Welding Parameters chart.

**Step 5** – Alternate weld passes between positions to minimize distortion, and monitor interpass temperature as indicated in the Recommended Weld Parameters chart.

**Step 6** – Once all welding is complete, reinstall the locks that were removed. Replace the locks if they are damaged. The continuous edge assembly is now ready to operate.

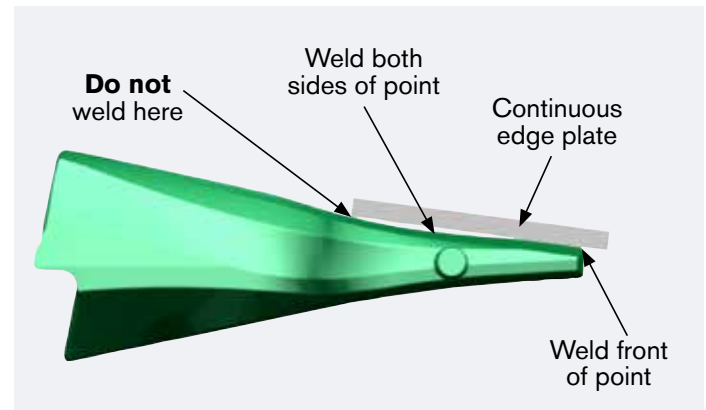


Figure 1: Typical continuous edge assembly

**WARNING:** When performing the work described in these instructions, always work safely and use proper safety equipment to help avoid injury. Always wear hard hat, gloves, safety shoes, eye protection, hearing protection and fall protection per regional, national and site requirements (e.g., OSHA, MSHA) when performing maintenance work. To avoid injury to others, keep bystanders well out of the way.

## Installing ESCO Weld-on Adapters

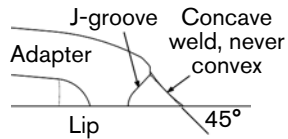
**⚠CAUTION:** ESCO weld-on adapters are hardened typically to 415 BHN. In order to eliminate cracking commonly associated with welding steel at these hardness levels, follow these procedures carefully and employ good welding techniques and practices.

### Summary of Welding Specifications

See weld recommendations on page 5.

- **Electrodes:** E7016 or E7018 low hydrogen (keep dry!)
- **Wires:** E70T-5, E71T-1, or E70T-1 with CO<sub>2</sub> gas.
- **Preheat:** 95°C/200°F (175-205°C/350-400°F if air temperature is 5°C/40°F or lower.)
- **Interpass:** Maintain interpass temperature less than 260°C/500°F.
- **Post-heat:** If air temperature is 5°C/40°F or lower, post-heat 175-205°C/350-400°F, then let air cool.
- Remove slag after each pass and peen each bead.

Welds should fill J-grooves to a 45° angle. If an adapter does not have a J-groove, apply fillet welds according to the following:



Bucket Size (volume)		
Meter <sup>3</sup>	Yards <sup>3</sup>	Fillet Size
1.8	2	13mm/0.50in.
2-4.6	2.25-5	16mm/0.63in.
5-11	5.5-12	19mm/0.75in.
above 11	above 12	25mm/1.00in.

Additional welding information can be found on page 5 of this book.

### Weld-on Adapter Installation

1. Locate the adapters on a clean bucket. Tack-weld them in place, followed by a root layer all the way around. Peen weld after each pass. Do not weld to leading edge of lip.
2. Blend welds concave to remove stress concentrations as shown in Figure 1.
3. Turn the bucket over.

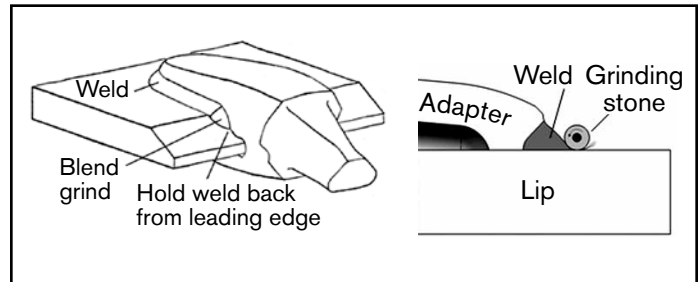


Figure 1

**⚠CAUTION:** To prevent cracking, welds should never be extended to the leading edge of the lip. Terminate, and blend grind, the ends of the upper leg weld at the end of the J-groove weld prep. Refer to Figure 1.

4. For one-leg Flushmount Adapters, a fillet weld of equal size to the leading edge thickness of the lip should be applied. Grind the ends smooth at weld junctions. If a lightener cavity extends forward of the lip leading edge, cover the opening with weld. Maintain a full fillet width on the entire weld shown in Figure 2.

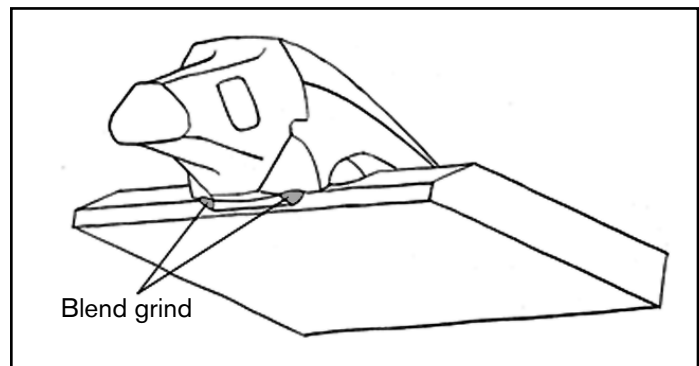


Figure 2

Continued on the next page.

## Installing ESCO Weld-on Adapters, Continued

### Weld-on Corner Modification and Installation

Protection of the corner of your bucket will increase its life. Adapters can be modified to provide protection by cutting to fit bucket side plates. **A bucket should never be cut to fit an adapter!**

The corner adapter should be positioned so the point cuts clearance for the bucket.

If a clean trench is desired, corner adapters can be mounted so points are positioned flush with the outside of the bucket.

When modifying an adapter, **never remove more than 50% of the adapter top leg.** The edges of the cuts should be chamfered 13mm/0.50 in. x 30° for weld preparation as shown in Figure 3.

Follow welding procedures described above in **Adapter Installation.**

Install points according to **ESCO Point Installation and Removal Instructions.**

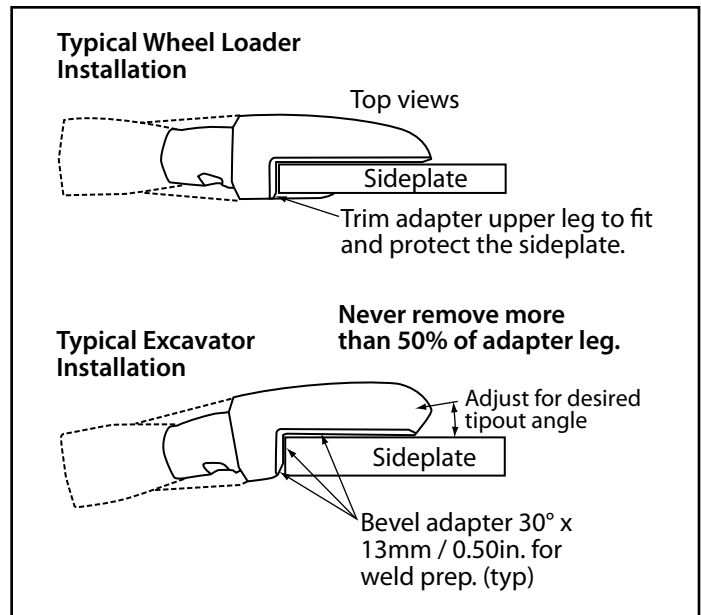


Figure 3

**▲WARNING:** When performing the work described in these instructions, always work safely and use proper safety equipment to help avoid injury. Always wear hard hat, gloves, safety shoes, eye protection, hearing protection and fall protection per regional, national and site requirements (e.g., OSHA, MSHA) when performing maintenance work. To avoid injury to others, keep bystanders well out of the way.

## Installing ESCO Bolt-on Adapters

### Recommended Hardware

- Grade 8 bolts
- Grade 8 ESNA lock nuts
- Hardened steel washers (used on adapters with elongated bolt holes).

### General Procedures

- Adapters must fit onto the lip easily; they should never be forced on.
- There should be a **maximum** clear gap of **3mm/0.12in.**, between the adapter leg and the bucket lip (cutting edge).
- When in position on the lip and with bolts installed, adapters must contact the lip leading edge (lip blunt) or the lip bevel, depending on the adapter style, see Figure 1.
- Bolts should be installed so their heads fit into recesses cast in the adapter legs, see Figure 2.
- Tighten bolts securing an adapter alternately. Then apply final torque, rear bolt first, front bolt(s) last. The correct tightening sequence is important because the front bolt may loosen if the rear bolt is brought to final torque last. Check torque values in chart below.

**CAUTION:** Retorque bolts after approximately four hours of service.

- Periodically check bolt torque. Insufficient adapter bolt torque can result in adapter failure in heavy-duty applications.

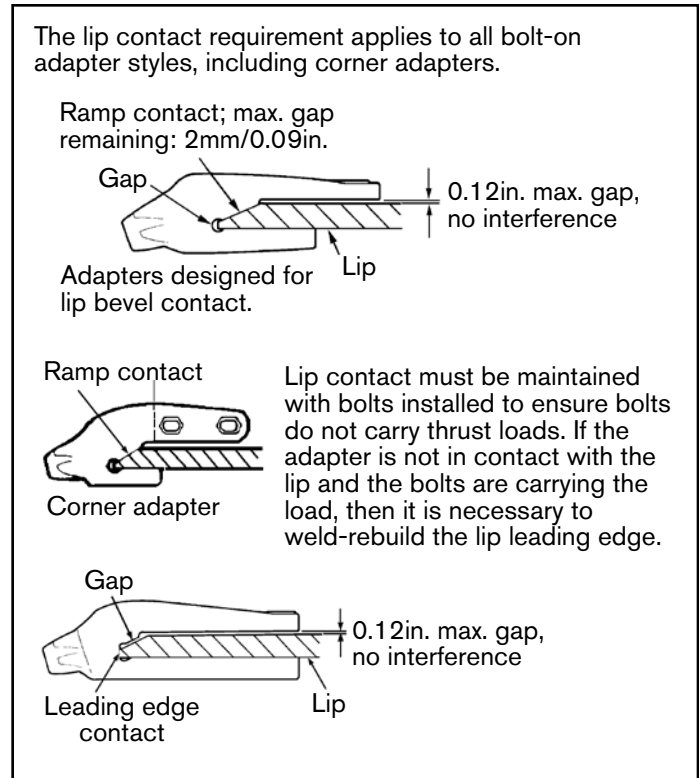


Figure 1

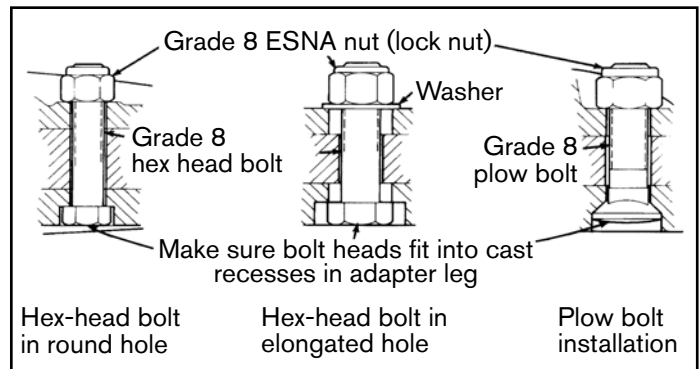


Figure 2

### Torque Values, kg-m/ft-lb

Bolt Dia. mm/in.	Coarse Thread		Fine Thread	
	Dry kg-m/ft-lb.	Lubricated kg-m/ft-lb.	Dry kg-m/ft-lb.	Lubricated kg-m/ft-lb.
13/0.50	15-16/106-117	11-12/80-88	17-18/120-132	12-14/90-99
14/0.57	21-23/153-168	16-18/115-127	24-26/171-188	18-19/128-141
16/0.62	29-32/212-233	22-24/159-175	33-36/240-264	25-27/180-198
19/0.75	52-57/376-414	39-43/282-310	58-64/420-462	43-48/315-347
22/0.88	84-92/606-667	63-69/455-501	92-101/668-735	69-76/501-550
25/1.00	125-138/909-1000	94-104/682-750	137-151/995-1096	103-113/746-821
1.12/28	178-196/1288-1417	133-147/966-1063	199-219/1445-1590	143-165/1038-1191
1.25/32	251-276/1817-1999	188-206/1360-1496	278-305/2012-2213	208-229/1509-1660

## How to Install Weld-on Noses

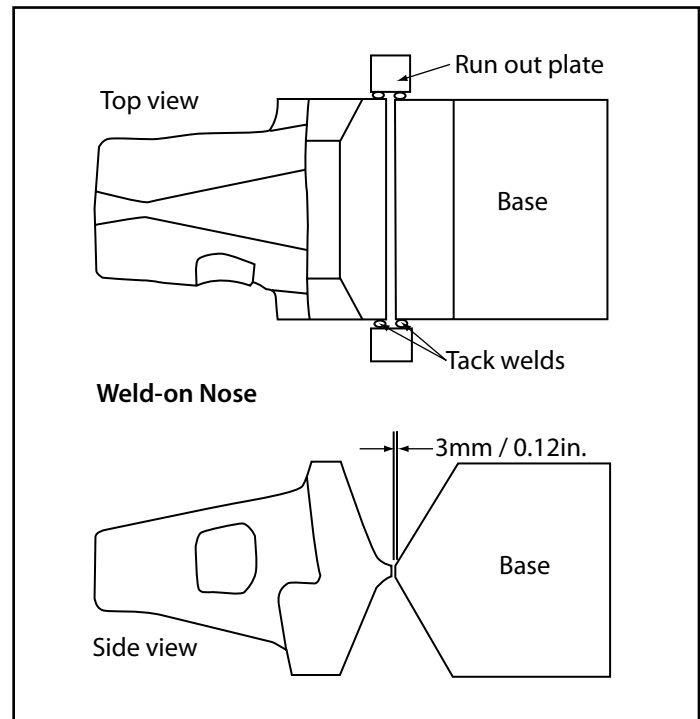
When a nose is worn out it is recommended that the adapter be replaced. There are instances where using a weld-on nose is a viable alternative. For instance, buckets with cast corners. Another example is an old machine that adapters are no longer available and the customer wishes to convert to a newer system.

### Procedures

1. Hold the weld-on nose in place along side the nose to be replaced. With the end of the noses lined up, mark the spot where the weld groove of the weld-on nose is located relative to the nose to be replaced. Cut the old nose off at this location, angled back from where the weld-on nose weld prep contacts the surface. This allows a little extra room to get the welding rod in at the proper angle. If the nose is cut off with a torch or air arc, be sure to grind the surface down to clean parent metal, removing all foreign materials.
2. If replacing only one nose, tack weld a straight edge to the adjacent nose to assist in properly locating the new nose. If replacing all the noses, it is best to tack weld a straight edge across the outside positions, remove the center noses and weld the new noses in place. Then tack weld the straight edge to the center noses, cut off the outside noses and replace using the straight edge to insure proper location.

**Note:** Digging performance can be greatly affected by improper nose angles so it is important to maintain the original nose position.

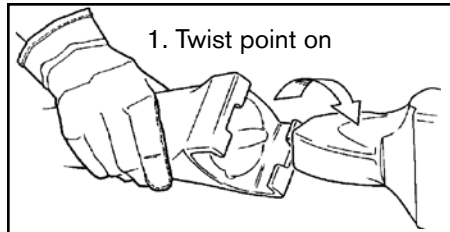
3. After the old nose is removed and the surface prepped, tack weld starter plates to the outside of each end of the weld prep. Then use the run-out plates to tack weld the nose in place to the base (see illustrations), leaving about a 3mm/0.12in. gap between the weld prep and the base. Check to be sure the weld-on nose is lined up to the adjacent noses.
4. Preheat the assembly to 177°C/350°F to 204°C/400°F. Check with Tempilstick before welding. Preheat before starting any additional welding if the castings have cooled.
5. Apply weld bead across the length of the weld prep, starting and stopping on the run-out plates. After a few passes, peening between each pass, turn the bucket over and grind the root pass to remove any impurities, cleaning down to solid weld material. Again, apply several weld beads across the length, starting and stopping on the run-out plates, and peening between each pass. Alternate running several weld passes from side to side until the weld area is filled.
6. Burn off the run-out plates and grind the entire weld surface smooth and as close to the original contour as possible.



**⚠WARNING:** When performing the work described in these instructions, always work safely and use proper safety equipment to help avoid injury. Always wear hard hat, gloves, safety shoes, eye protection, hearing protection and fall protection per regional, national and site requirements (e.g., OSHA, MSHA) when performing maintenance work. To avoid injury to others, keep bystanders well out of the way.

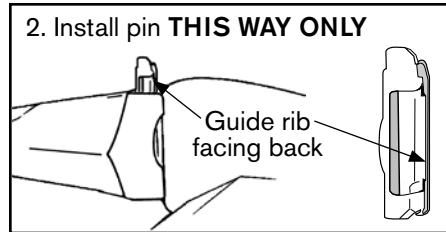
## Installing Super V® Points and Pins

### For V13-17PN, V23PN, V29PN, V33PN, V39PN, and V43PN Installation



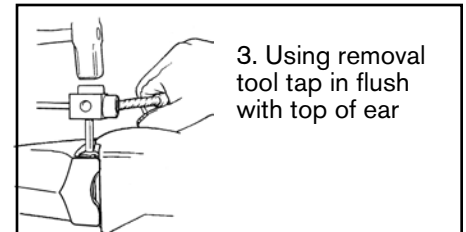
1. Twist point on

- Slide the point in place on the adapter nose. Install the point with a clockwise quarter turn. The bottom of the point cavity must fit solidly against the end of the nose.



2. Install pin **THIS WAY ONLY**

- Place the pin into the nose and point ear opening as shown.



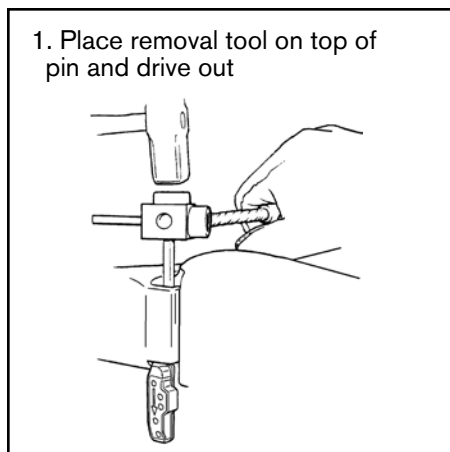
3. Using removal tool tap in flush with top of ear

- Drive the top of the pin flush with the top of the point ear using moderate taps from a hammer (see Hammer Size chart below for correct size). The pin lock plug will compress as it passes the top of the ear and then snap into the ear lock recess. To assure proper engagement of the lock plug with the ear lock recess, do not over or under drive the top of the pin.

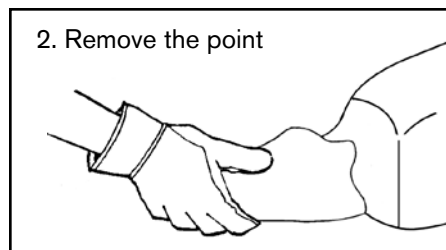
**Note:** V13 and V17 points are non-twist and slip directly onto the nose.

**Note:** Super V pins can only be used with Super V points and adapters.

## Removal



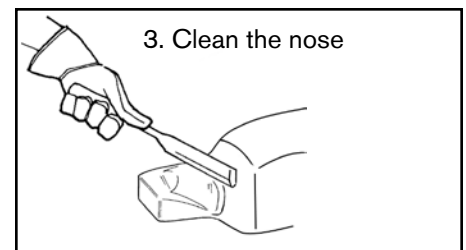
1. Place removal tool on top of pin and drive out



2. Remove the point

**Note:** Refer to the Removal Tool chart to the right and follow Safety Warnings.

**Note:** V13-V23 pins should not be reused. V29-V43 pins may be reused, inspect per instructions at right.



3. Clean the nose

### Removal Tool

Sizes	Removal Tool
V13-V33	V13-V33RT
V39-V61	V39-V61RT
V69-V81	PDE49873-1 Short PDE49873-2 Long

### Hammer Size

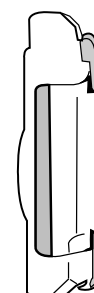
SUPER V Size	Hammer Wt. kg/lb.
V13-V43	1-2/2-4
V51-V61	2-4/4-8
V69-V81	2-4/4-8

**⚠WARNING:** The bucket should be level or with teeth slightly upward to prevent the teeth from falling off after pin removal.

**⚠WARNING:** Never hammer on an edge or a corner of the point. Doing so could produce flying shards of metal.

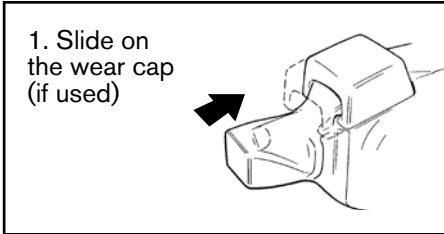
## Inspecting the Pin for Reuse

### End Wear or Bending

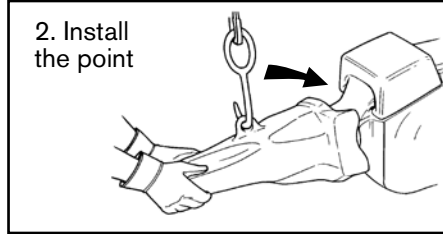


**IMPORTANT:** If the pin is bent more than 3mm/0.12in. or is obviously deformed, it should be replaced. Comparing to a new pin is the best way to determine if the pin should be replaced. If pin is excessively peened or mushroomed, dress before use.

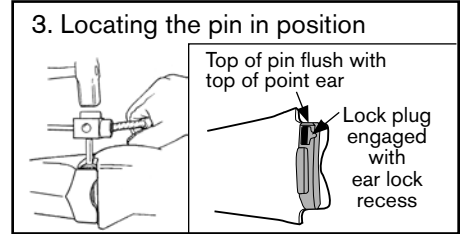
## For V51PN, V59PN, and V61PN Installation



1. Slide on the wear cap (if used)



2. Install the point



3. Locating the pin in position

Top of pin flush with top of point ear  
Lock plug engaged with ear lock recess

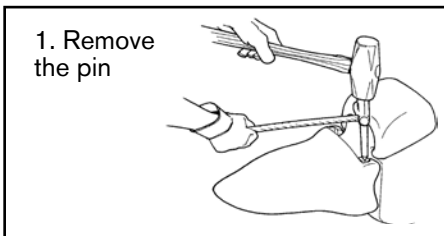
1. If a wearcap is to be installed, slide it in place in the slots on the adapter's upper surface.

**Note:** Super V pins can only be used with Super V points and adapters.

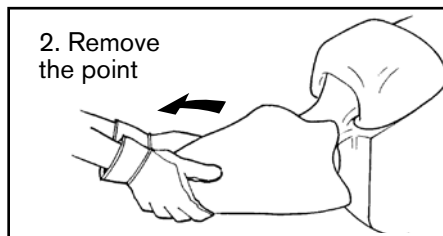
2. Install the point with a clockwise quarter turn. The bottom of the point cavity must fit solidly against the end of the nose. Before reusing a pin as follows in step 3, the pin should be inspected as shown below.

3. Place the pin into the nose and point ear opening. Drive the top of the pin flush with the top of the point ear using moderate taps from a 2-4 kg/4-8 lb. hammer. The pin lock plug will compress as it passes the top of the ear and then snap into the ear lock recess. To assure proper engagement of the lock plug with the ear lock recess, do not over or under drive the pin.

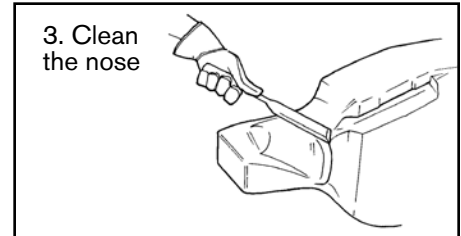
## Removal



1. Remove the pin



2. Remove the point



3. Clean the nose

1. Drive out the pin. ESCO recommends using a Pin Removal Tool (refer to the chart below for the correct size). Begin the removal with the short shaft of the tool, then finish with the long shaft. If a Removal Tool is not available, use a punch or a drift pin.

2. Remove the point with a counterclockwise quarter turn. It may be necessary to tap the side of the point to loosen impacted fines. Use a brass or rubber mallet. Slide off the wearcap if it is to be replaced.

3. Clean the nose so the new point will fit in place solidly and completely. If a wearcap is to be installed, make sure the wearcap slots are clean. Reversible wearcaps should be rotated with each tooth change to balance wear and to keep from becoming wedged.

*Inspecting the Pin for Reuse on the next page.*

### Removal Tool

Sizes	Removal Tool
V51-V61	V39-V61RT
V69-V81	PDE49873-1 Short
V69-V81	PDE49873-2 Long

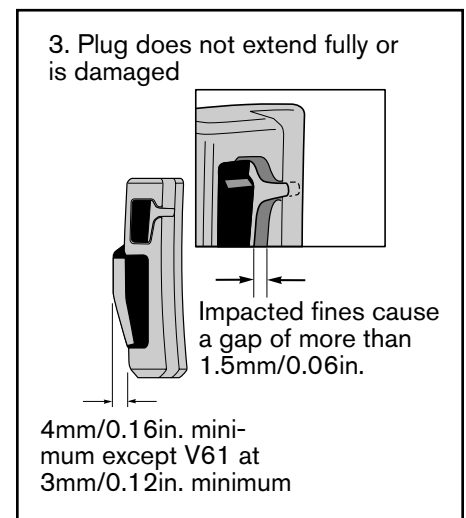
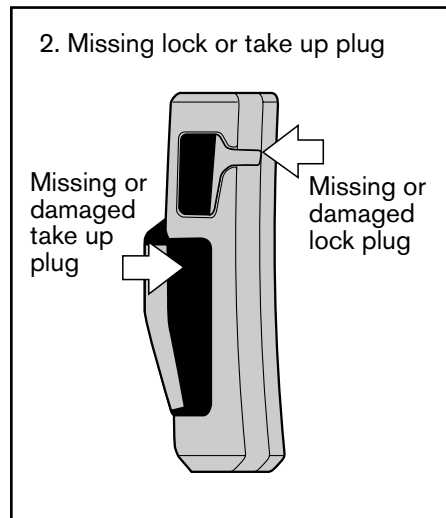
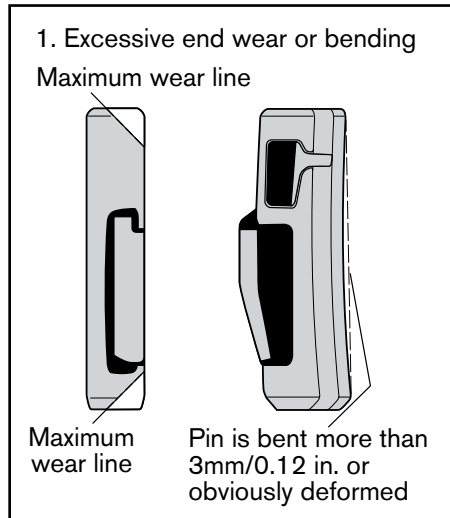
**▲WARNING:** When performing the work described in these instructions, always work safely and use proper safety equipment to help avoid injury. Always wear hard hat, gloves, safety shoes, eye protection, hearing protection and fall protection per regional, national and site requirements (e.g., OSHA, MSHA) when performing maintenance work. To avoid injury to others, keep bystanders well out of the way.

## Installing Super V® Points and Pins, Continued

### For V51PN, V59PN, and V61PN

#### Inspecting the Pin for Reuse

The Super V pin can be reused unless one of the unacceptable conditions shown exists.



**Note:** If the pin is bent more than 3mm/0.12 in. or is obviously deformed, it should be replaced. Comparing to a new pin is the best way to determine if the pin should be replaced. If pin is excessively peened or mushroomed, dress before use.

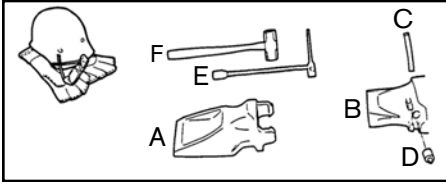
#### Pin Kits

Nose Side	Pattern Number	Description
V51	V51-59TR/Kit	Take up rebuild kit
	V51LR/Kit	Lock rebuild kit
V59	V51-59TR/Kit	Take up rebuild kit
	V59-61LR/Kit	Lock rebuild kit
V61	V61TR/Kit	Take up rebuild kit
	V59-61LR/Kit	Lock rebuild kit

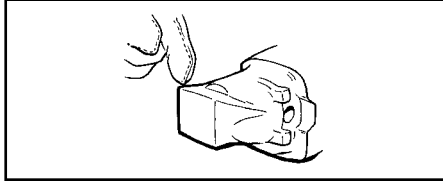
**Note:** Each kit comes with components to rebuild 10 pins!

# Helilok® Tooth System Installation & Removal

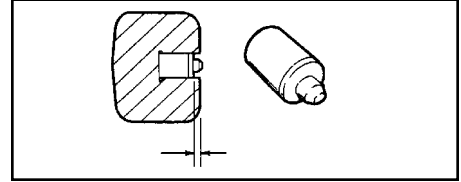
## On Sizes 27V, 37V, 47V, and 57V Vertalok® Adapters Installation



1. The Helilok point (A) twists onto the adapter (B) and is secured by the pin (C) and plug (D). The plug (D) is inserted into the adapter, and the pin (C), is driven in from the top. The recommended tools for installation and removal are a removal tool (E) and a hammer (F) of the appropriate weight, as follows: For nose sizes 27V, 37V, 47V, use a 1-2 kg/2-4lb. hammer. For nose size 57V use a 2-3 kg/4-6 lb. hammer.



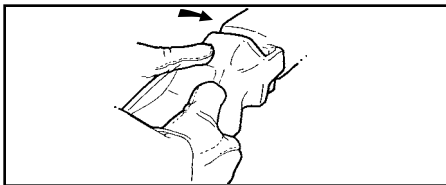
2. Clean the adapter nose to make sure the point will fully seat.



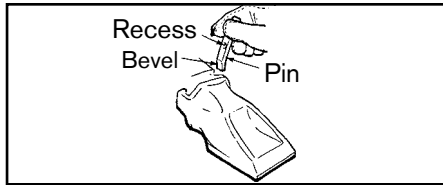
3. Check used plugs for torn, cracked or separated rubber.

**Note:** Plugs for Hot Slag applications are not encased in rubber.

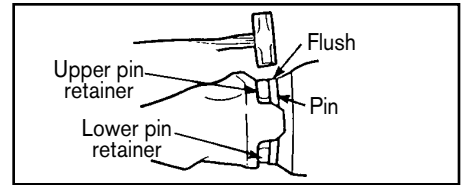
Replace the plug if damage is discovered. With fines removed from the hole, insert the plug, making sure it seats fully on the bottom of the hole. The shoulder of the plug should be no deeper than the depth shown in Figure 3 at the following dimensions: For nose sizes 27V, 37V, 47V, maximum allowable depth is 3.2mm/0.12 in. For nose size 57V, maximum allowable depth is 4.8mm/0.19 in.



4. Twist the point on with a quarter turn to contact the end of the adapter nose. Check the lock groove to be sure the plug remains fully seated.



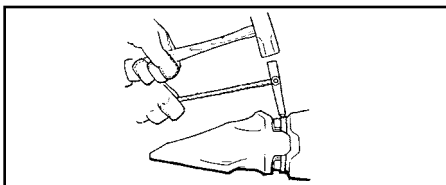
5. Inspect the top of used pins. It should be free of sharp edges due to wear or peening. If there are sharp edges, replace the pin: Also replace the pin if the recess is distorted or the pin has flattened out (compare to a new pin). Both may cause premature pin ejection. Insert the pin with the bevel down and the recess to the inside so the recess can engage the plug tip.



6. Start the pin with a swift, sharp blow with the hammer. If the pin becomes crooked after the first blow, straighten it before proceeding. Drive the pin in until the top is flush with the top of the upper pin retaining ear (located on the adapter nose on 27V, 37V, 47V, and 57V sizes).

**IMPORTANT:** The pin is marked with an arrow which must point downward.

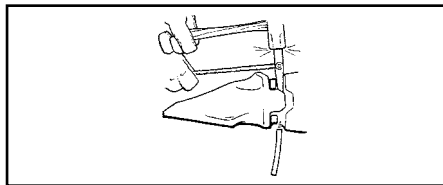
## Removal



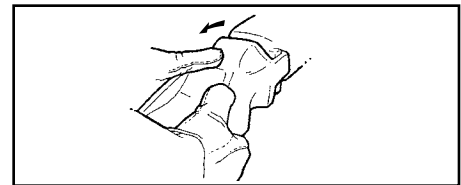
1. Place the small end of the Removal Tool on the top of the pin and start the drive with the hammer. It may take a few solid blows.

**WARNING:** The bucket should be level or with teeth slightly upward to prevent the teeth from falling off after pin removal.

**WARNING:** Never hammer on an edge or a corner of the point. Doing so could produce flying shards of metal.



2. Complete the drive with the long end of the Removal Tool until the pin comes out the bottom. When removing the Tool from the groove, be careful not to dislodge the point.



3. Remove the point by twisting counter-clockwise. Make sure the plug is fully seated so the point ear can pass. May require a few taps with a brass or rubber mallet to loosen impacted fines.

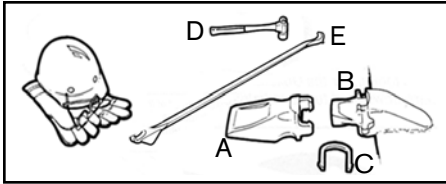
### Vertalok pin Removal Tool

Pattern Number	Wt. kg/lb	Description
CD18436#2	1.5/3.2	Tool for 27V Series
37V/57V	2.0/4.5	Tool for 37V, 47V, and 57V Series

# Helilok® Tooth System Installation & Removal, Continued

## On Sizes 21, 27, 37, 47, and 57 Helilok Adapters Installation

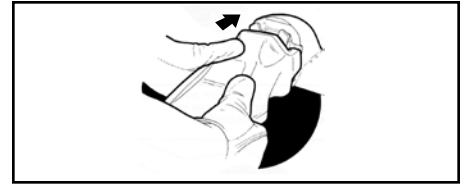
Helilok tooth installation and removal is a matter of technique rather than use of great force or heavy hammers.



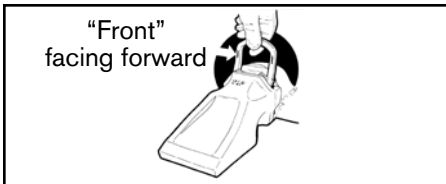
1. The Helilok point (A) threads onto the adapter (B) and is secured by the U-shaped Quadrilok® (C). The tools required for installation and removal are a 4 lb. hammer (D) and ESCO Quadrilok removal tool (E).



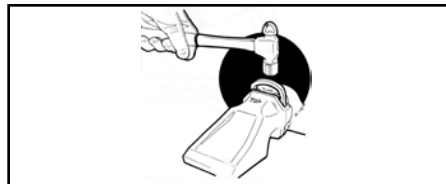
2. Clean the adapter nose to make sure the point will seat fully.



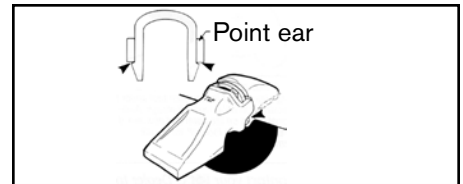
3. Twist the point on with a quarter turn to contact the square end of the adapter nose.



4. Insert the Quadrilok with the side marked "FRONT" facing the front of the point. Always use a new Quadrilok when changing points.

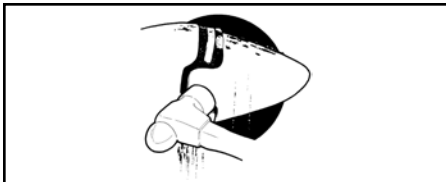


5. Center the Quadrilok between the point ears. Then tap the top of the U-shaped lock to seat it fully into the groove.



6. To complete installation, check that the hooks on both legs of the Quadrilok are fully secured under the point ears.

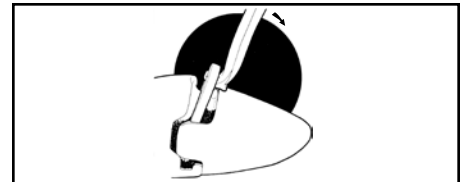
## Removal



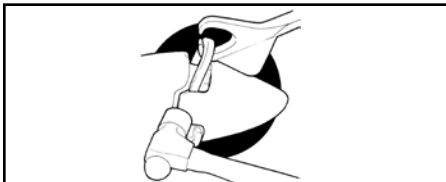
1. Tap the sides of both point ears with a brass or rubber mallet to loosen impacted fines.



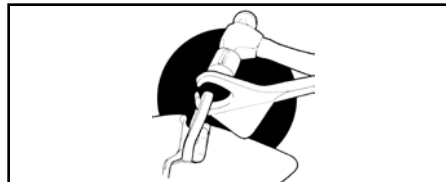
2. Use a screwdriver to clean the recess slot in the center front of the Quadrilok.



3. Insert the small hooked end of the removal tool under the Quadrilok and apply a sharp downward tug to initiate removal.



4. At mid-point of lock removal, insert the large jaw end of the removal tool under the Quadrilok to obtain extra leverage. Additional blows on the point and downward pressure on the tool will aid in lock removal.



5. If the Quadrilok binds, complete the removal by tapping the lock on both sides while maintaining pressure.



6. Remove the Quadrilok. Complete removal by pulling the point off the adapter with a 1/4 twist.

**▲WARNING:** The ESCO removal tool is designed only for use with Helilok points and adapters.

**▲WARNING:** Never hammer on an edge or a corner of the point. Doing so could produce flying shards of metal.

Quadrilok Removal Tools for Helilok Adapters

Pattern No.	(L) Length mm/in	Weight kg/lb	Comments
27/21 (long)	787/31.0	2.3/5.0	Tool for 21 & 27 Series
27/21S (short)	648/25.5	1.9/4.2	Tool for 21 & 27 Series
552512 (long)	1016/40.0	4.1/9.0	Tool for 37, 47, & 57 Series
552803 (short)	864/34.0	3.8/8.3	Tool for 37 & 47 Series

## Installing & Removing Horn-Style Adapters

1. Before installing the adapter, make sure all mating surfaces between the adapter and lip are clean.
2. Fit the new adapter in place on the lip and check clearances. The adapter must bear fully on the tapered surfaces of the tooth horns (Surface A), equally top and bottom, see Figure 1.

The gap between the end of the tooth horn and the adapter Gap B should be 3-9mm/0.12-0.38in., Gap C should be about 0.8mm/0.03in. top and bottom. Gap D should be at least twice Gap B top and bottom. See Figure 1.

If these clearances are not achieved, tooth horn rebuilding may be needed. Refer to the instructions following this section.

3. Insert the fluted spool into the forward end of the keyslot with the larger lug down and facing forward. See Figure 2.
4. Insert the fluted wedge behind the spool with the large end up. Drive the wedge until it moves no further after repeated solid blows with a hammer. Use 1.8 kg/4 lb. on C19 size, and 3.6 kg/8 lb. on C29 size and larger, see Figure 2.

**▲ CAUTION:** There should be a slight clearance between the rear of the wedge and the keyslot Gap E to ensure proper adapter take-up and system tightness. If not, weld-rebuilding may be needed. See Figure 2.

**▲ CAUTION:** To prevent loosening during normal bucket use, burn off any portion of the wedge (or key) that extends below the lip.

5. Retighten wedges 2 to 4 hours of operation after initial installation, to compensate for any "seating-in" of components. Repeat this retightening each 2 to 4 hours during the first shift of bucket operation.

**▲ CAUTION:** Check tightness of the adapter locks regularly because looseness can lead to adapter loss or premature failure.

6. ESCO supplies oversize wedges that can be used to compensate for wear. Initial installation of a new adapter on a new or reconditioned lip is accomplished with a standard W1 wedge. When retightening, drives the W1 nearly flush with the top of the lip, replace it with a W2 wedge. Use a W3 when the W2 drives flush. See Figure 3.

**▲ CAUTION:** When a W3 drives flush with the top of the lip, tooth horn weld-rebuilding should be done promptly to avoid lip damage.

7. To remove an adapter, drive the wedge up and out from the bottom with a hammer and ESCO pin removal tool.

### Weld-rebuilding Tooth Horns

1. When a tooth horn wears to an extent that an oversize wedge no longer tightens the adapter to the lip, weld-rebuilding may be needed. The object of weld-rebuilding is to restore a worn lip to its original profile. See Figure 4.
2. Tooth horns should be rebuilt by welding and grinding until the dimensions shown in Figure 1 are achieved. Be sure to use a new adapter and locks for gauging the fit.

**Note:** See instructions for welding ESCO alloys on page 5.

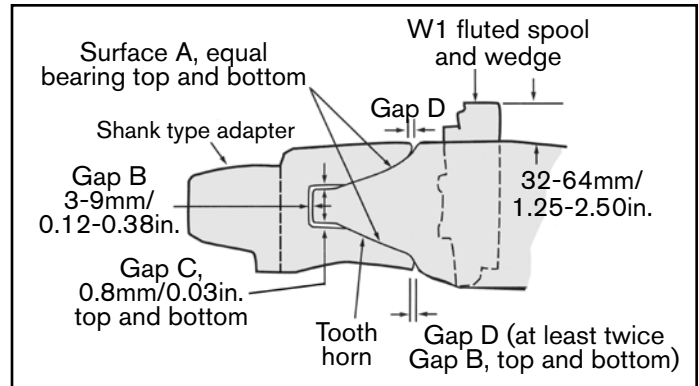


Figure 1

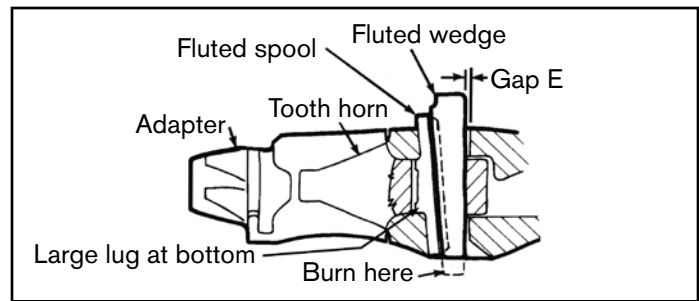


Figure 2

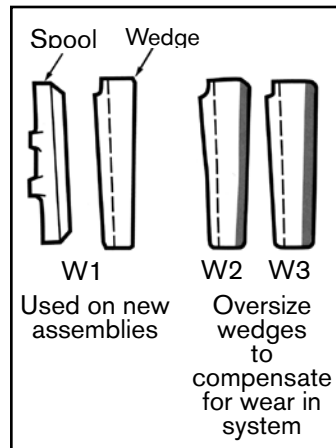


Figure 3

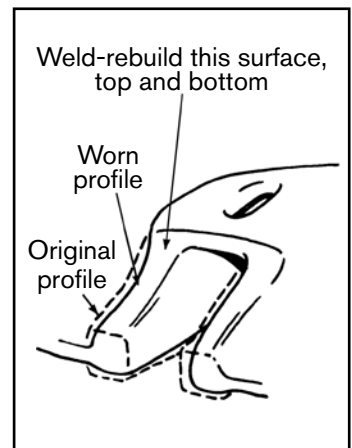


Figure 4

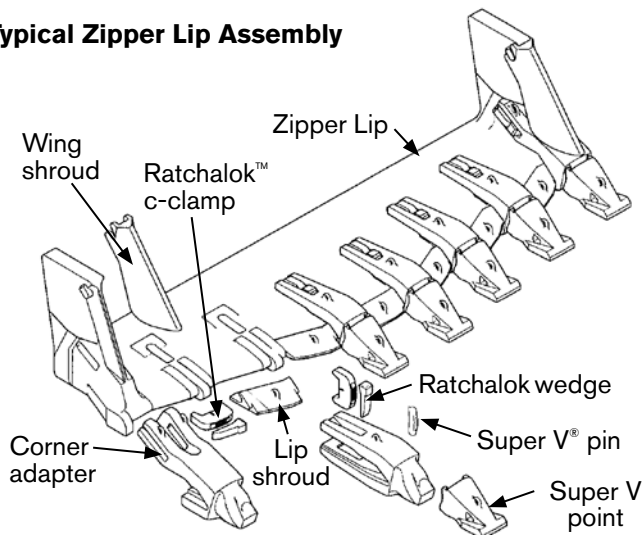
**▲WARNING:** When performing the work described in these instructions, always work safely and use proper safety equipment to help avoid injury. Always wear hard hat, gloves, safety shoes, eye protection, hearing protection and fall protection per regional, national and site requirements (e.g., OSHA, MSHA) when performing maintenance work. To avoid injury to others, keep bystanders well out of the way.

## Installing & Removing Zipper Lip® Adapters & Shrouds

The Zipper Lip assembly is a fully mechanical system where the components work together for part retention and strength. Installation and removal of the components is easy by using the following procedure.

The lip and wing shrouds are held on by the adapters, and the adapters are held on by c-clamps and wedges. The standard offering is the Ratchalok c-clamp and wedge. An option is the fluted c-clamp and wedge. Instructions for both are included in this literature piece. There is a third type, the ratchet style that is rarely used. If the ratchet style is used, refer to maintenance piece M/ZIP-500.

### Typical Zipper Lip Assembly



### Installation & Removal with Ratchalok System

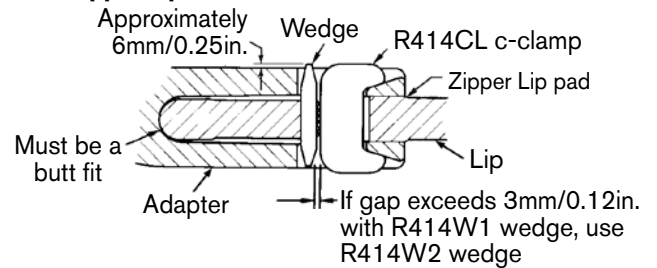
The Ratchalok system secures each adapter to the Zipper Lip with a c-clamp and wedge arrangement. The c-clamp contains a spring loaded ratchet that mates with the ratchet teeth of the wedge to keep the locking system in place, Figure 1. Install and secure an adapter according to the following procedures:

1. Slip the adapter in place onto the lip, making sure there is a butt fit between the adapter and the leading edge bearing pad of the Zipper Lip.
2. Insert the c-clamp into the rear of the adapter keyslot with the arms of the "c" facing away from the lip front.
3. Insert the tapered end of the wedge into the top of the keyslot in front of the c-clamp with the ratchets facing the c-clamp. Drive the wedge downward with a 1.8 kg/4 lb. hammer until the dimensions shown in Figure 1 are achieved. No further adjustment or wedge burn-off is required.

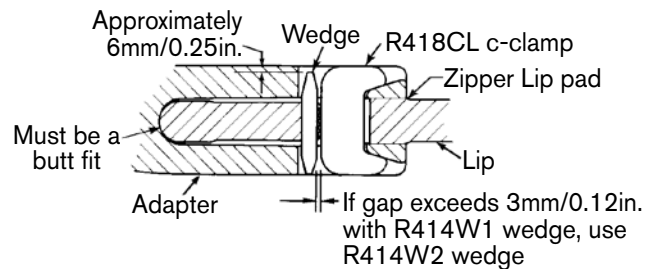
**⚠CAUTION:** During operation, periodically check the gap between the wedge and c-clamp. If the gap exceeds those specified in Figure 1, install a W2 (oversize) wedge.

4. To remove an adapter, drive the wedge downward (upward on a 220R) and out to remove the c-clamp.

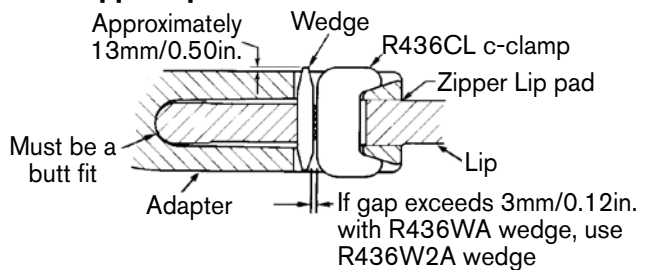
#### 126R Zipper Lip



#### 152R and 160R Zipper Lip



#### 190R Zipper Lip



#### 220R Zipper Lip

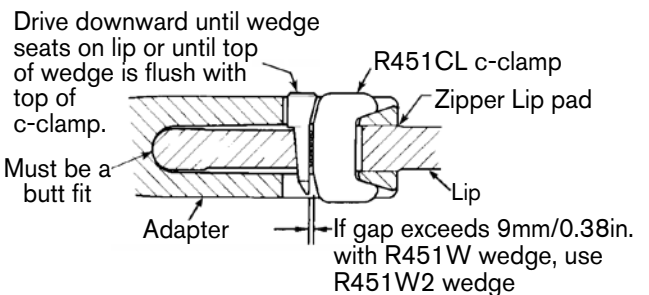


Figure 1

### Lip and Wing Shroud Removal & Installation

The lip and wing shrouds are secured to a Zipper Lip by the adapters. If a lip wear edge must be replaced, only one adjacent adapter must be removed. If a wing shroud must be replaced, only the corner adapter must be removed. After the new shroud has been installed, reinstall the adapter per the above procedure.

When wear edges are installed and adapters secured, the wear edges should be slightly loose on the lip.

## Adapter Installation & Removal with the Fluted C-Clamp & Wedge

A fluted c-clamp and wedge locking system secures an adapter to the Zipper Lip system by the friction produced between the mating flutes of the two components.

Install a fluted c-clamp and wedge according to the following, see Figure 2:

1. Fit the adapter in place onto the Zipper Lip system, making sure there is a butt fit between the adapter and the leading edge bearing pad of the Zipper Lip base.
2. From the inside of the bucket, insert the C-clamp into the rear of the keyslot with the flutes forward and the narrow end up.
3. Insert the wedge into the keyslot, narrow end down. The flutes of the wedge must mate with those of the c-clamp.
4. Drive the wedge in place with a 4.5-6.8 kg/10-15 lb. hammer. As the wedge seats, hit it from the front to make sure the c-clamp/wedge assembly does not rotate or bind in the keyslot. Continue driving the wedge alternately downward and rearward until the wedge no longer moves when struck from the front. The wedge is now seated.
5. Burn off any portion of the wedge that extends below the adapter.
6. After 2 to 3 hours of operation, check the wedge for tightness. Burn off any portion of the wedge that extends down after reseating.
7. When tightening is no longer required, the c-clamp and wedge may be tack welded together for additional security, see Figure 2.
8. If a W1 (standard) wedge drives flush with the adapter, install a W2 (oversize) wedge. If a W2 wedge drives flush with the adapter or when adapters have excess side-to-side movement (more than 13mm/0.50in.), weld-repair of the lip is needed. Refer to the next section for recommended weld-repair procedures.

**Note:** Adapter support on all Zipper Lip series except 160R is provided by tabs that extend forward of the lip leading edge. Adapter support on 160R Zipper Lips only is provided by parallel rails that flank the adapter legs, see Figure 3.

**IMPORTANT:** When wear edges are installed and adapters secured, the wear edges should be slightly loose on the lip.

9. When wear edges have excessive side-to-side movement (more than 13mm/0.50in.) on an individual wear edge or more than (9mm/0.38in.) on all wear edges, weld-repair to the Zipper Lip system is recommended. Refer to the next section for recommended weld-repair.

## Periodic Maintenance

The Zipper Lip wear parts are cast from alloys that provide maximum strength and wear life. As parts wear out, they should be replaced with new ones; welding wearparts is not recommended (refer to warranty).

**Note:** For recommended welding procedures and materials, refer to page 5.

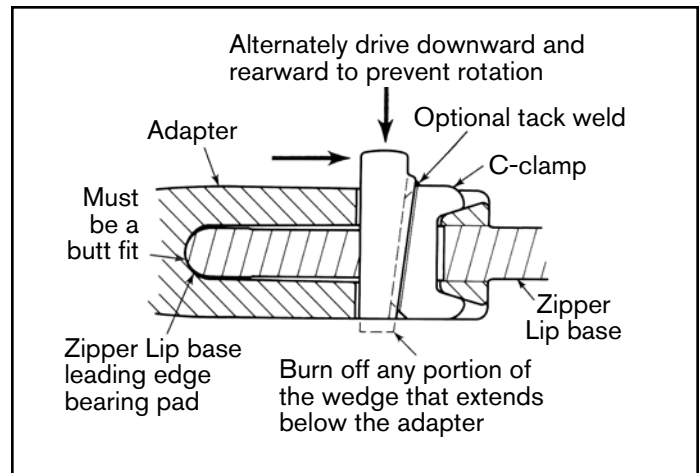


Figure 2

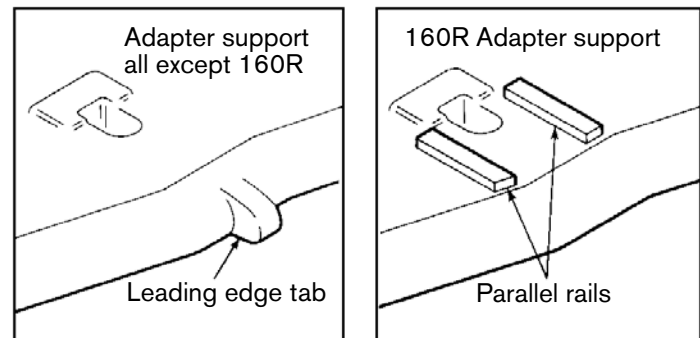


Figure 3

**⚠WARNING:** When performing the work described in these instructions, always work safely and use proper safety equipment to help avoid injury. Always wear hard hat, gloves, safety shoes, eye protection, hearing protection and fall protection per regional, national and site requirements (e.g., OSHA, MSHA) when performing maintenance work. To avoid injury to others, keep bystanders well out of the way.

## Weld-repair for Zipper Lip® Systems

1. Obtain a weld-repair template from your dealer and set against the lip at the adapter location, Figure 4. If a weld-repair template is not available, use a new adapter as a guide. Locate worn areas A, B, and C.

Part #	Description
WRT110	Zipper Lip 110R and 115R
WRT126	Zipper Lip 126R and 50R
WRT60	Zipper Lip 160R, 152R, and 60R
WRT85	Zipper Lip 190R and 85R
WRT100	Zipper Lip 220R and 100R

2. Build up worn areas, then grind back until the adapter fits securely in place.
3. The scribe lines on the weld-repair template locate the forward end of the keyslot. Weld and grind back area D, so that the keyslot aligns with the template scribe lines. Grind the keyslot surface smooth and straight, making sure its radius matches that of the wedge as closely as possible. If using a new adapter and standard wedge W1 as a guide, wedge height should be as shown below.

### For Fluted W1 Wedges

If using a Ratchalok™ system, refer to the following chart.

Zipper Lip Model	Gap Between C-clamp & Wedge	
	Minimum	Maximum
All (except 100R, 220R)	0.0mm/0.0in	1.5mm/0.06in
100R, 220R	3mm/0.12in	5mm/0.19in

### For Ratchalok W1 Wedges

Zipper Lip Model	Wedge Height Above Adapter	
	Minimum	Maximum
110R, 115R	28mm/1.12in	57mm/2.25in
50R, 60R, 126R, 152R, 160R	32mm/1.25in	64mm/2.50in
100R, 220R	44mm/1.75in	76mm/3.00in

4. Keyslots for corner adapters should also be rebuilt using the procedures described in Step 3. Use a new corner adapter as a guide. The weld-repair template indicates the width of the keyslot pad area C, Figure 4.

### Adapter Stabilization Weld-repair

When there is excessive side movement of adapters, weld-repair of the adapter stabilization features is recommended per the following.

There are two types of adapter stabilization features. Stabilizing tabs and stabilizing rails, Determine the type by referring to Figure 5.

#### Stabilizing Tabs

On Zipper Lip systems where adapters are stabilized by tabs extending forward of the lip, rebuild the sides of the stabilizing tabs, then grind back so the adapters fit snugly side-to-side and still butt fit on the lip leading edge. Be sure to check corner positions.

#### Stabilizing Rails

Stabilizing rails on Zipper Lip systems whose adapters are stabilized by parallel rails, Figure 5.

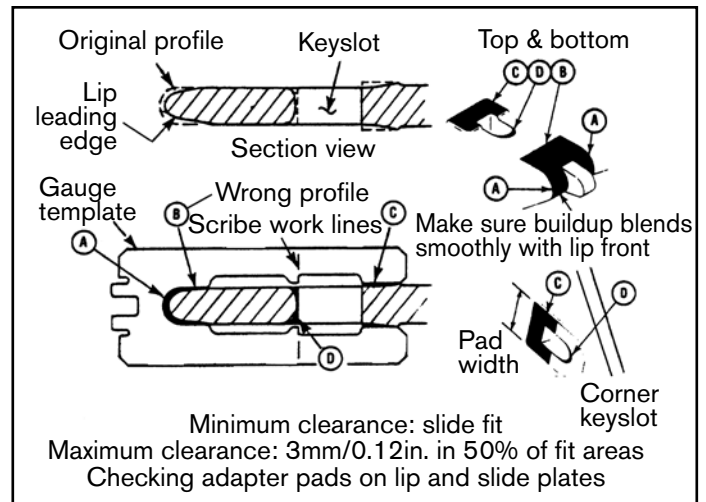


Figure 4

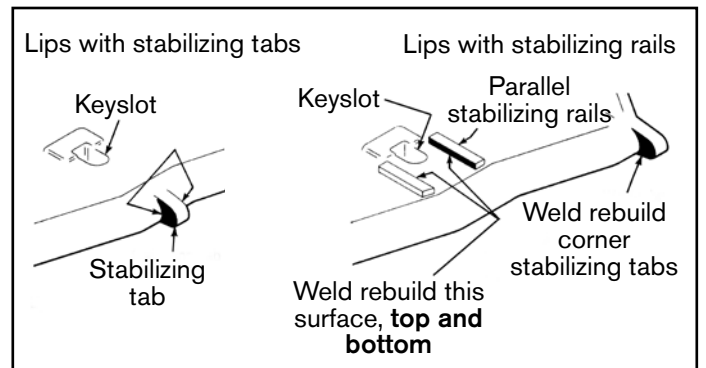


Figure 5

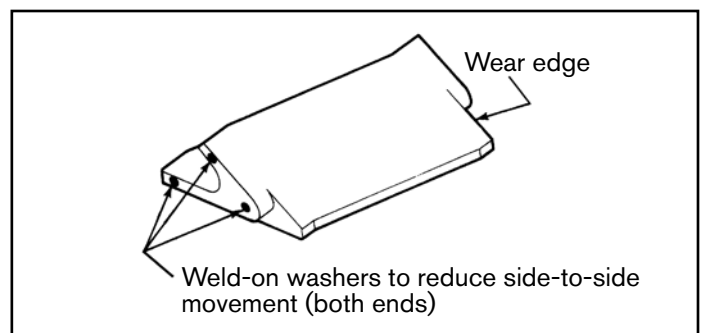


Figure 6

Rebuild the inside of the rails (top and bottom), then grind back so the adapters fit snugly side-to-side and still butt fit on the leading edge of the lip. Also, rebuild the tabs for corner adapters. Sides at the rails should be square.

#### Loose Wear Edge

Wear edges provide additional side-to-side support for adapters. Even though wear edges are not worn out, it may be necessary to tighten the assembly to reduce side-to-side movement. Accomplish this tightening by welding washers to the ends of the wear edges where they contact the adapters, Figure 6. When assembled, each rebuilt wear edge should shift no more than 6mm/0.25in. side-to-side.

## Installing ESCO Rippers and Rip-A-Pak™ Kits

### Ripper Nomenclature Guide

#### Point Installation

The mining ripper point is held in place by a single Uni-Lok™ pin. Before installing the point, clean the nose and pin hole thoroughly with a wire brush. Next install the point onto the nose and align the pin holes. Finally insert the pin into the pin hole on the point and drive the pin in until it is flush using a 2-4 lb. hammer.

Construction rippers use a pin and a snap ring (RC style) or bushing (R style). For construction rippers, place the snap ring in the recess on the side of the nose (RC style) or insert the bushing in the nose pin hole (R style).

To remove the point from the nose, drive the existing pin out of the nose using the ESCO removal tool and remove the point.

**Note:** Pins **ARE NOT** designed to pull points or shrouds tight on shank.

#### Shroud Installation

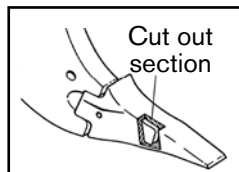
The shroud is held in place by two Uni-Lok pins. Install the shroud by driving in the lower pin first, using a 2-4 lb. hammer.

Remove the pins with a pin removal tool and a 2-4 lb. hammer.

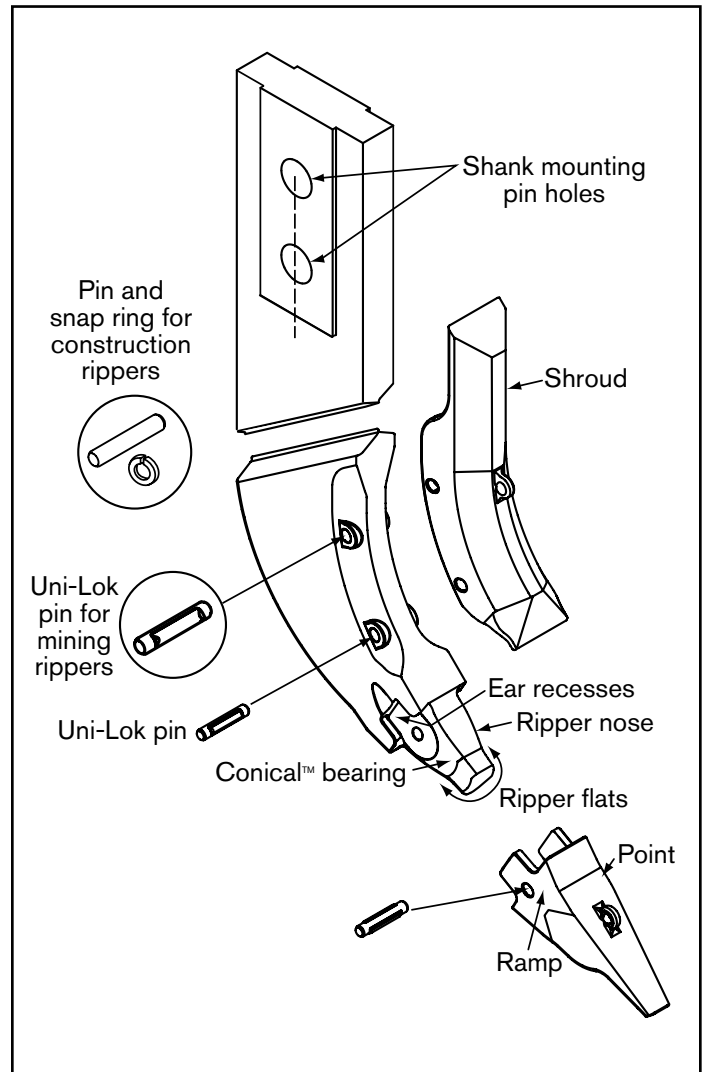
#### Check for Nose Wear

Check the nose for wear periodically to help prevent point loss and breakage. The best way to do this, is to cut a window into the side of a new point as shown.

Hold this cutaway point on the nose and check the flats at the end of the nose, as well as the ear recesses for wear. Also, check to see that the conical nose surfaces bear against the box section of the point. Make sure the point does not butt up against the rear shoulder of the nose.



When wear on the flats are 3mm/0.13in. as measured between the new point and the worn nose or if the bearing is on the rear shoulder of the nose instead of the conical surfaces, the nose should be replaced.



*Continued on the next page.*

**▲WARNING:** When performing the work described in these instructions, always work safely and use proper safety equipment to help avoid injury. Always wear hard hat, gloves, safety shoes, eye protection, hearing protection and fall protection per regional, national and site requirements (e.g., OSHA, MSHA) when performing maintenance work. To avoid injury to others, keep bystanders well out of the way.

# Installing ESCO Rippers and Rip-A-Pak™ Kits, Continued

## Maintenance & Performance Problems

### Shank breakage

1. Check to see if the clevis pocket is properly maintained and the shank is securely attached. Wear should not leave a gap of more than 6mm/0.25in. per side. Shim or weld buildup as needed.
2. Has the shank been misused, such as backing up while ripping or side slipping on a hill?
3. Has the machine been turning while the ripper is engaged in the ground?

### Shroud breakage

1. Check to see if shroud is worn out.
2. Has the proper ESCO point been used with the shroud?
3. Change shrouds before the center part wears through or the sides wear too thin to protect the shank.

### Point breakage or loss

1. Is the nose worn beyond reasonable use?
2. Do ripping conditions require a shorter point?
3. Is the ESCO point being used with the proper shroud?
4. Is the machine backing up or turning while the ripper is in the ground?

### Check for worn pins

The one-piece locking pins for shrouds are reusable, but should be inspected every time you change shrouds. If the rubber bonding is loose or the metal inserts are bent or become dislodged from the pin, install a new pin.

## Rip-A-Pak Kit Installation

**Note:** Use welding rod AWS E-7016 or E-7018 5mm/0.19in. diameter. Be sure rod is completely dry. Refer to Welding Instructions on page 5.

1. Place shank to be repaired on side, draw a line through the centerline of the shank mounting pin holes (see illustration on previous page). If the pin holes are not on centerline of the shank body and shank is badly worn back 50mm/2.00in. or more from original contour, rebuild worn areas.

2. After the rebuild or if shank is not overly worn, place the Rip-A-Pak replacement nose so back edges are lined up. Mark the shank with a burn-off line using the Rip-A-Pak replacement nose as a guide or select the proper burn-off angle from the chart below, see Figure 1.
3. Burn off broken section of the shank and burn weld bevel on each side, see Figure 2. Make a lip with weld beads along the point of bevel.
4. Align the weld-on nose so the bevel of the shank and nose piece have a 3mm/0.13in. gap between them and the forward edges are in line. Tack weld as shown in Figure 2.
5. Preheat the assembly to 177°C/350°F, 204°C/400°F. Check with Tempilstick before welding. Preheat before starting any additional welding if castings have cooled.
6. Run a root bead the length of gap. Be sure to get 100% penetration. Remove all slag. Peen each bead lightly. Turn the shank over, grind the root of the weld clean to sound metal.
7. Weld 2-3 beads on one side, removing slag and peen after each bead. Turn shank over and repeat until job is completed. This procedure is necessary to keep nose piece in proper alignment with the shank. Use stringer beads only and weave not more than 3 times the electrode diameter. **DO NOT USE WIDE WASH BEADS!**
8. Remove porous metal that has accumulated at either end of the weld by burning or grinding to solid metal. Remove all notches or pockets in the metal, see Figure 3.
9. Grind or burn-off the rebuilt area until a smooth transition from shank to nose piece is obtained. The finished surface should be as smooth as possible since stresses concentrate at any depressions or irregularities.
10. Dye-check all exposed weld to detect cracks. All cracks must be ground to remove dye-check indications. Reweld, using outlined procedure.
11. Torch heat the weld and areas adjacent to weld on both sides of shank to 177°C/350°F-204°C/400°F. Allow to air cool slowly. Repeat Steps 7 and 8, if necessary.

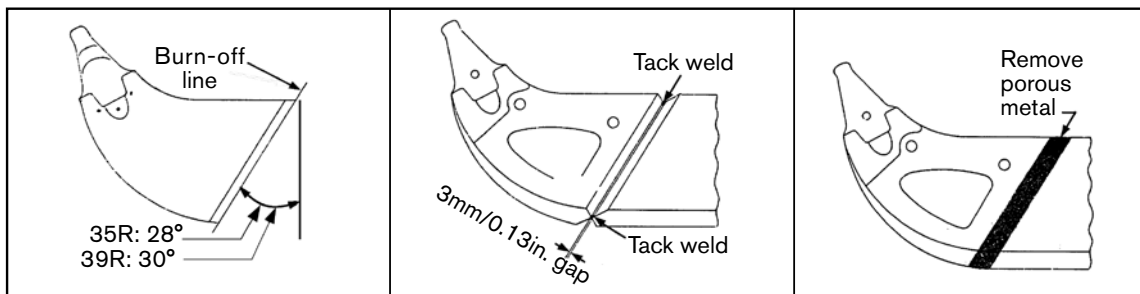


Figure 1

Figure 2

Figure 3

### Rip-A-Pak Kits

35-6R WNS		39-5R WNS1		39-5R WNS2		39-5R WNS3		49-5R WNS		59-5R WNS	
Nose Angle	Burn-Off Angle	Nose Angle	Burn-Off Angle	Nose Angle	Burn-Off Angle	Nose Angle	Burn-Off Angle	Nose Angle	Burn-Off Angle	Nose Angle	Burn-Off Angle
28°	31.6°	30°	35.5°	30°	35.7°	30°	35.7°	30°	35.6°	30°	34.7°

## Installing ESCO Toolbox Rippers

### Size / Break Out Force

**V33** / 23,000 lb. or less

**V39** / 30,000 lb. or less

**V51** / 30,000–45,000 lb.

**V59** / 45,000–64,000 lb.

### Locating Rippers

**Note:** Illustration shows details as described below.

Single toolbox rippers should be mounted on the bucket's centerline. Dual or multiple rippers should be mounted symmetrically about the centerline with corner installations no closer to the edge of the bucket than 13mm/0.50in. Also, multiple rippers should be installed with the attachment pins aligned to ease their installation and removal.

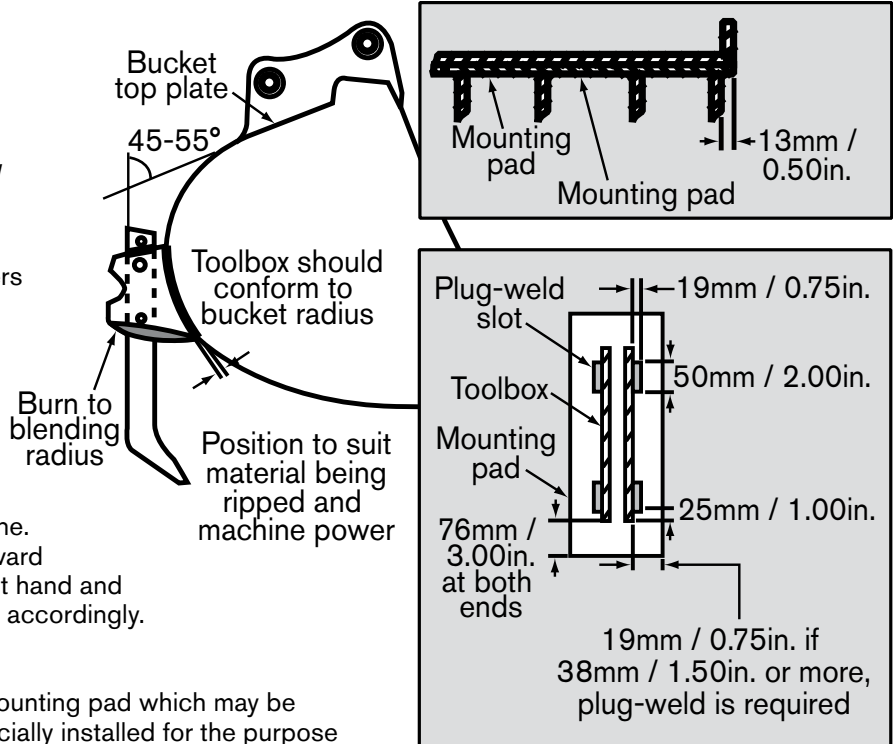
Generally, all rippers should be installed so that shanks are parallel to the bucket centerline. However, corner rippers may be pitched outward slightly to provide additional ripping width; left hand and right-hand toolbox alterations will be required accordingly.

### Mounting Pads

Each toolbox ripper should be welded to a mounting pad which may be either an existing bottom runner or a pad specially installed for the purpose (mounting pads are not required on ESCO SHDC buckets).

Special mounting pads should be as thick as the runners, should extend at least 76mm/3.00in. above and below the toolbox, and should be formed to match the bucket's profile. In addition, each pad should extend at least 19mm/0.75in. beyond each side of the toolbox.

If the toolbox is to be mounted to a runner, material may have to be added adjacent to it in order to achieve this 19mm/0.75in. minimum. An ideal pad will fit snugly between runners. Install pads by welding both sides with a full-depth groove weld and both ends with 13mm/0.50in. fillet weld.



*Continued on the next page.*

**▲WARNING:** When performing the work described in these instructions, always work safely and use proper safety equipment to help avoid injury. Always wear hard hat, gloves, safety shoes, eye protection, hearing protection and fall protection per regional, national and site requirements (e.g., OSHA, MSHA) when performing maintenance work. To avoid injury to others, keep bystanders well out of the way.

## Installing ESCO Toolbox Rippers, Continued

### Plug Weld Slots

If, for any reason, a mounting pad extends **beyond** 38mm/1.50in. on either side of the toolbox (whether the pad is an existing runner or a special pad), the pad should be plug welded in four places to provide needed additional strength.

To prepare plug-weld slots, position the tool box in place and trace its outline on the mounting pad. Remove the toolbox and burn four slots through the mounting pad 19mm/0.75in. wide by 50mm/2.00in. long. The slots should be 25mm/1.00in. from the ends of the toolbox.

### Preparing the Toolbox

The ripper toolbox is cast from ESCO alloy 12M steel and is heat-treated to low hardness to ease burning.

The toolbox should be positioned so that the ripper shank(s) provides the desired depth and that the angle between the ripper shank and the bucket top plate is 45-55°.

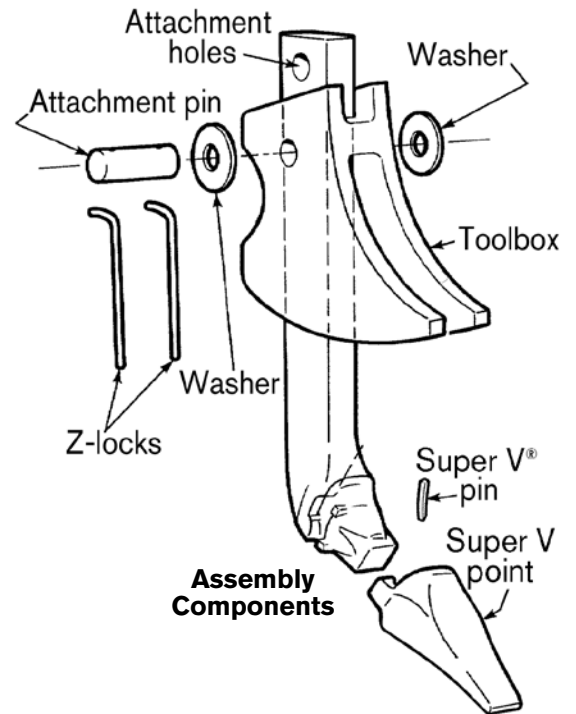
Burn the tool box to match the appropriate bucket profile. Any gap between the tool box and the bucket should be no more than 3mm/0.12in. Grind burned edges to remove carbon and slag.

### Final Installation

Reposition the ripper assembly and weld the toolbox in place with a 16mm/0.63in. fillet weld all around.

As a final step, burn off the toolbox lower gusset to a blending radius, as shown by the diagram.

Additional welding information can be found on page 5 of this book.





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# **CAST LIP OWNER'S MANUAL**

## **HYDRAULIC SHOVELS**

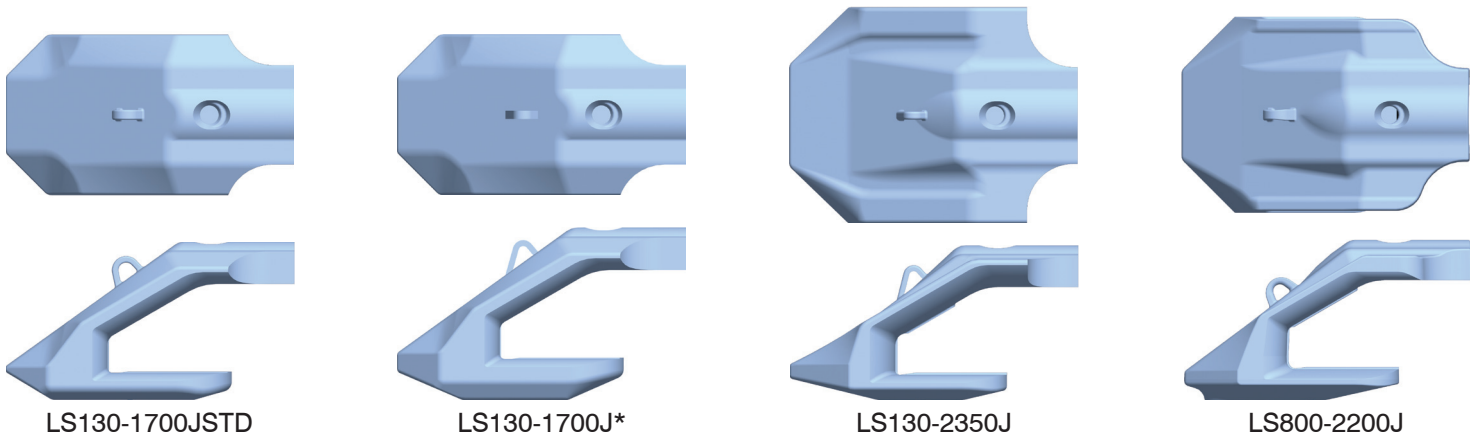


### **J-BOLT LIP & WING SHROUDS**



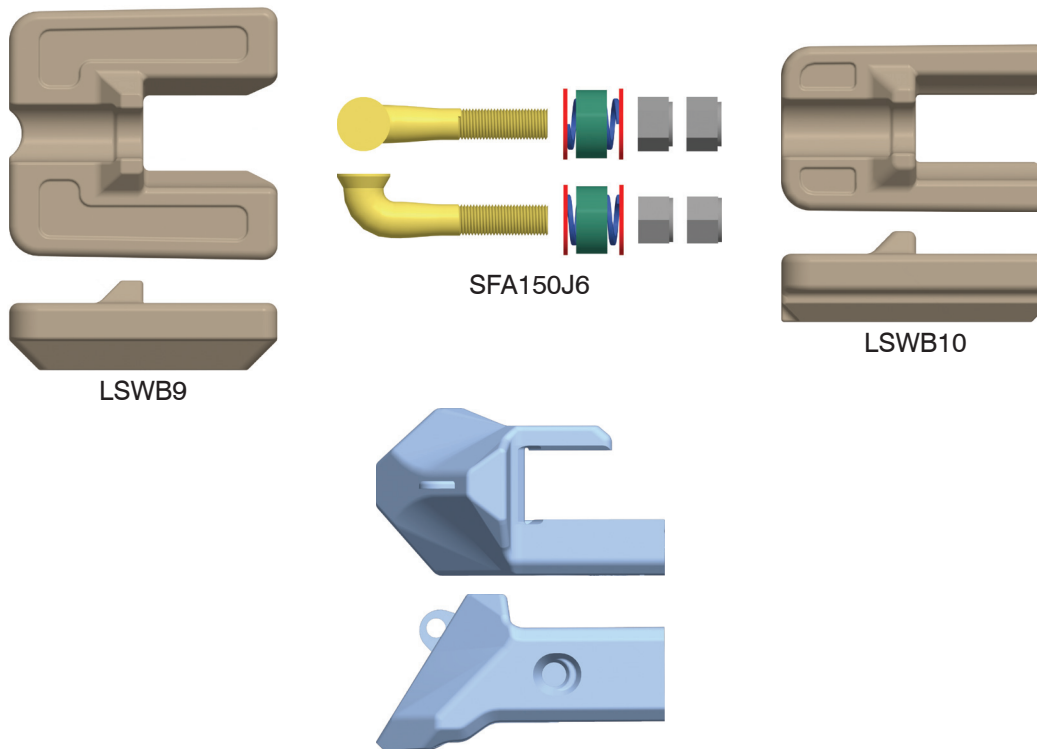
**MARCH 2011**  
VERSION 1

# J-BOLT LIP & LOWER WING SHROUD PARTS



LIP SHROUDS				
PART NO.	WELD BASE	J-BOLT ASSEMBLY	WEIGHT	
			LBS.	KGS.
LS130-1700JSTD	LSWB9	SFA150J6	735.0	333.7
LS130-1700J*			840.0	381.4
LS130-2350J			895.0	406.3
LS800-2200J			962.0	436.7

\*optional heavy duty shroud

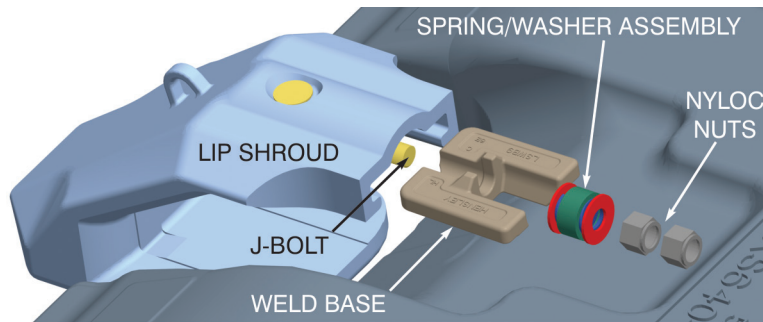


WS135L (LH shown) WS135R (RH opposite)

LOWER WING SHROUDS						
PART NO.	WELD BASE	J-BOLT ASSEMBLY	SIDE PLATE THICKNESS		WEIGHT	
					LBS.	KGS.
WS135L	LSWB10	SFA150J6	5.32 IN.	135 MM	280.0	127.0
WS135R					280.0	127.0

# J-BOLT LIP SHROUD INSTALLATION

**BEFORE STARTING INSTALLATION, BE SURE TO READ ALL INSTRUCTIONS THOROUGHLY!**



## STEP 1

### NEW INSTALLATION

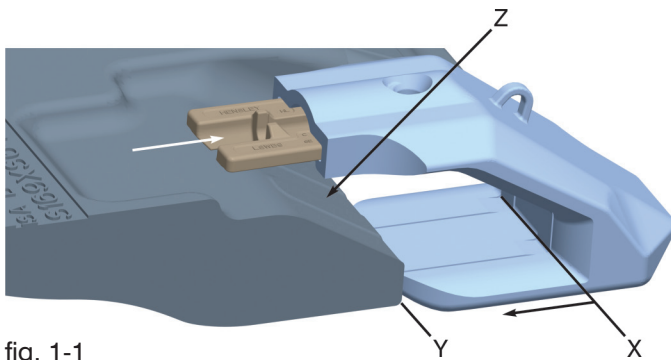


fig. 1-1

1 a) Slide weld base into back of lip shroud.  
1 b) Position the shroud on the cast lip making sure that the **blunt** throat surface of the shroud "X" contacts the **blunt** front surface of the lip "Y". There should be **no** contact between the bevel of the shroud and area "Z" of the cast lip (fig. 1-1).

**NOTE:** This contact must be maintained throughout the assembly process to insure the proper location of the weld base.

### REPLACEMENT INSTALLATION

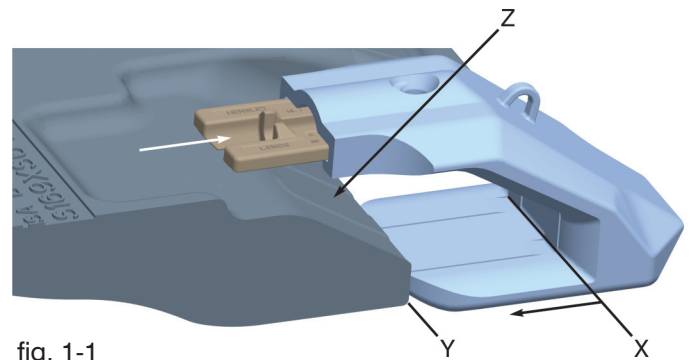


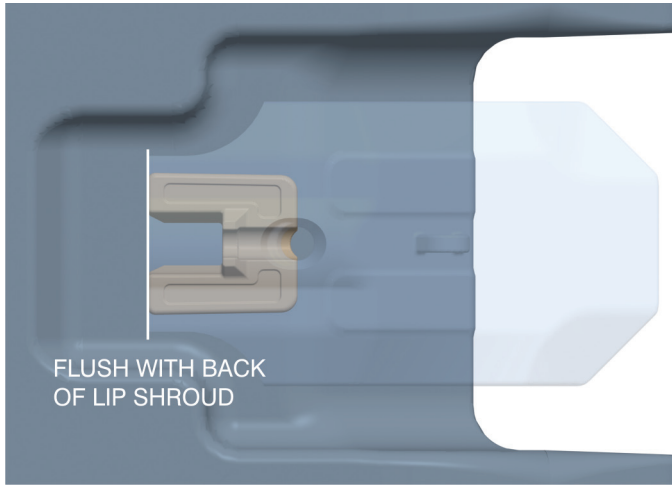
fig. 1-1

Grind the top surface of the lip material that will be affected by weld. Insure all carbon slag or other impurities from the removal of the old base are ground out. The use of non-destructive testing at this point will help determine if there are any cracks present in the base material. Repair base material as needed. (Now proceed as with new installation.)

1 a) Slide weld base into back of lip shroud.  
1 b) Position the shroud on the cast lip making sure that the **blunt** throat surface of the shroud "X" contacts the **blunt** front surface of the lip "Y". There should be **no** contact between the bevel of the shroud and area "Z" of the cast lip (fig. 1-1).  
**NOTE:** This contact must be maintained throughout the assembly process to insure the proper location of the weld base.

# J-BOLT LIP SHROUD INSTALLATION

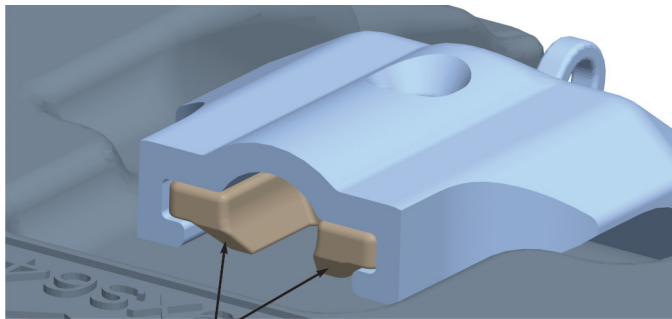
## STEP 2



Align the back of the Weld base so that it is flush with the back of shroud (fig. 2-1).

fig. 2-1

## STEP 3



After placement of weld base has been confirmed, and tack weld the base at the rear along weld prep surface "A" (fig.3-1).

WELD PREP SURFACE 'A'

fig. 3-1

## SPECIAL NOTES

**Recommended filler material:** AWS specification A5.1, class E7018 stick electrode. Stick electrodes should be kept in a heated rod oven at 250°F / 120°C prior to use.

**NOTE:** See manufacturer's recommended procedures for storage and preservation of low hydrogen electrodes.

**Recommended weld types:** Stringer beads are recommended for higher strength and less distortion. The use of weave or wash beads is **NOT** recommended and should not be used. Arc strikes should be avoided or ground down.

# J-BOLT LIP SHROUD INSTALLATION

## STEP 4

Remove the shroud and prepare to weld-out the base by establishing a preheat temperature of 300°F / 150°C to 450°F / 230°C for the base material (fig. 4-1). Maintain this temperature throughout the welding process.

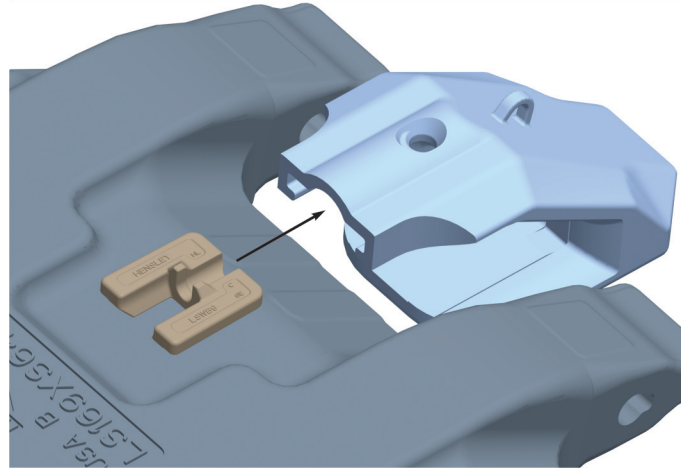


fig. 4-1

## STEP 5

Weld-out for the base should begin with the inner legs of base. A 1/2" (13mm) fillet weld should be deposited in this area (fig. 5-1).

**BE SURE THAT THE ENTIRE BOTTOM SURFACE OF THE WELD BASE MAINTAINS CONTACT WITH THE LIP DURING ENTIRE WELD-OUT PROCESS.**

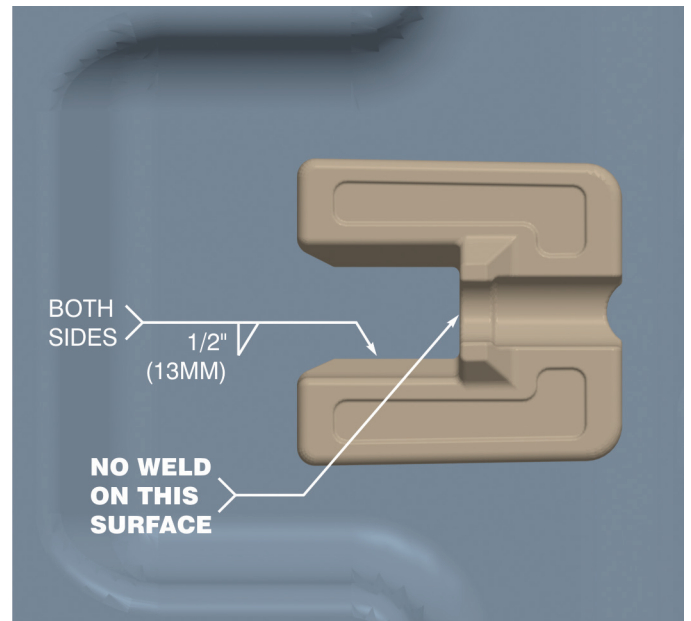


fig. 5-1

# J-BOLT LIP SHROUD INSTALLATION

## STEP 6

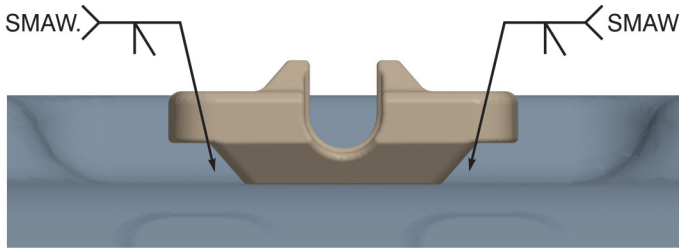


fig. 6-1

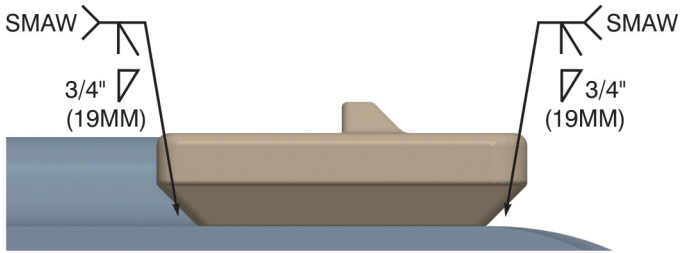


fig. 6-2

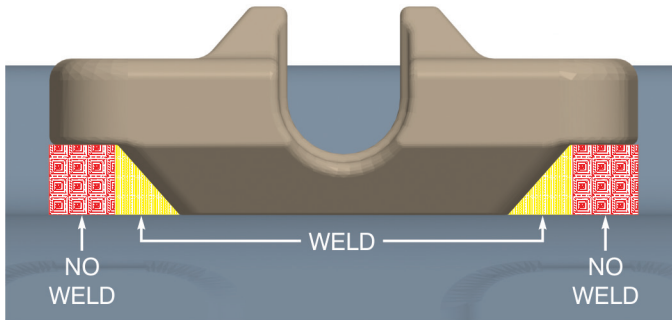


fig. 6-3

Apply weld to the base perimeter next. Utilizing groove welds, fill the 1.0" (25mm) weld groove on the base completely (fig. 6-1 & fig. 6-2). Care must be taken at this point not to add too much weld. If joint is over welded, the weld material can interfere with the lip shroud. The idea is to add as much weld as possible to the base without causing interference with the lip shroud (fig. 6-3). When the welding process has been completed, allow a slow cool down period to ambient temperature. A cool down rate of no greater than 35° per hour is recommended.

## STEP 7

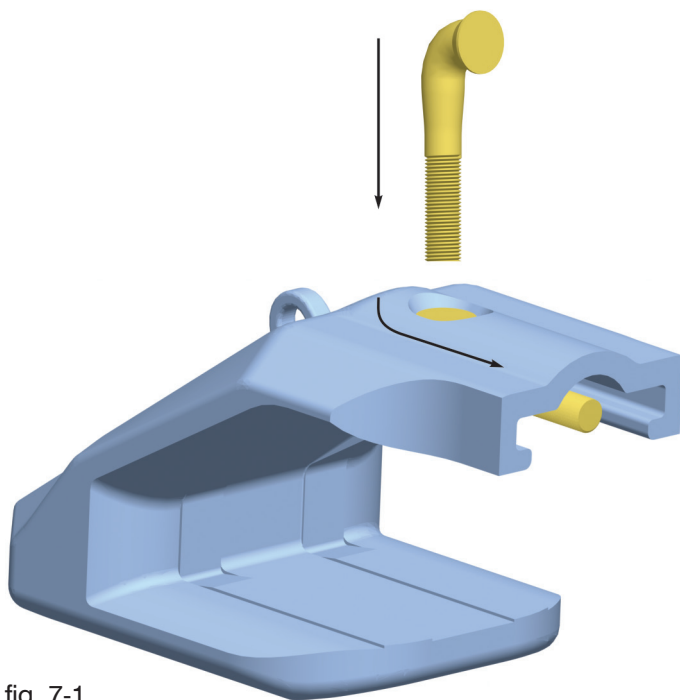


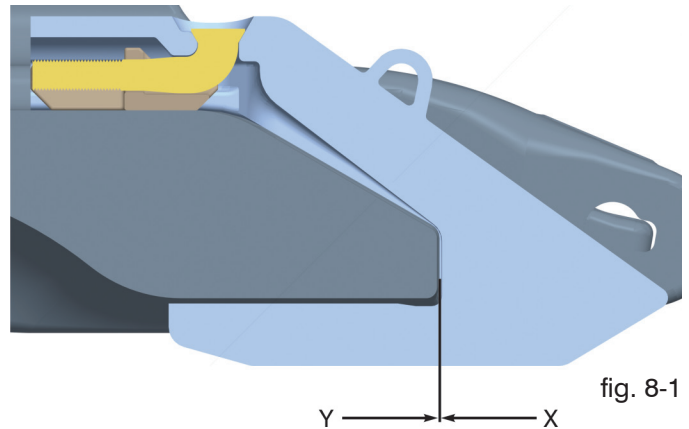
fig. 7-1

**Before** repositioning the shroud on the lip, insert the J-bolt into the shroud through the top hole (fig. 7-1). Rotate the bolt 90° so that the threaded end is facing the rear of the shroud.

# J-BOLT LIP SHROUD INSTALLATION

## STEP 8

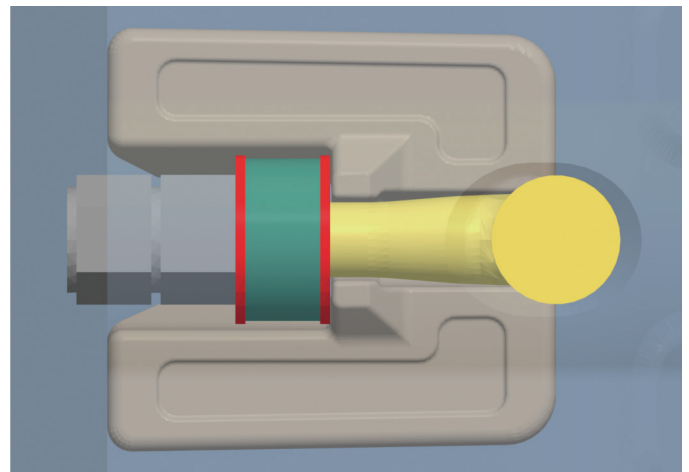
Reposition the shroud on the lip by sliding it onto the weld base as far as it will go, once again, making sure surface "X" contacts surface "Y" (fig. 8-1).



## STEP 9

Install the washer, spring collar assembly and the nuts in the order indicated for J-bolt assembly type J6 (fig. 9-1),  
Torque locking nuts to 300 ft. lbs / 407 Nm.

**[NOTE: the locking nut cannot be hand-threaded onto the J-bolt]**



**SPECIAL NOTE:** For best results, it may be necessary to re-torque all fastener components periodically depending on the application. Usually, re-torquing components after a few hours of machine operation will insure component security

## J-BOLT SHROUD SEATING AND MAINTENANCE INSTRUCTIONS

### SEATING FOR NEW INSTALLATION

It is normal that the shrouds migrate back slightly with the force of the machine. Therefore, it is recommended that the following procedure be followed to ensure proper seating of the shrouds.

Instructions:

1. Run machine for 10 non-production cycles.
2. Remove 2<sup>nd</sup> locking nut from shroud installation.
3. Re-tighten the 1<sup>st</sup> locking nut for any movement.
4. Re-install 2<sup>nd</sup> locking nut
5. Release machine for production.

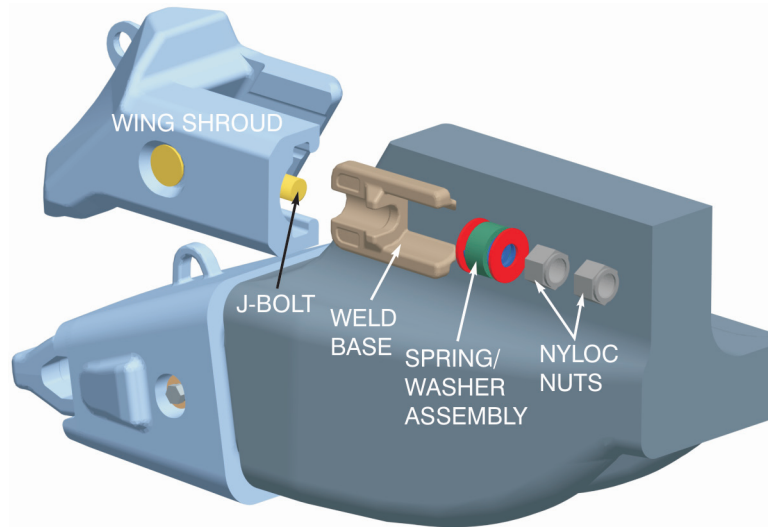
**Note:** if the first nut on any installation is excessively loose, then repeat this procedure.

### RETIGHTENING AND MAINTENANCE

Check and retighten the nuts after 6 hours of service, then after 24 hrs. Generally, nuts should be periodically checked after 750 to 1000 hrs. in extreme conditions, and 1500 to 2000 hrs. in moderate conditions, or by the frequency dictated by your specific application.

# LOWER J-BOLT WING SHROUD INSTALLATION

**BEFORE STARTING INSTALLATION, BE SURE TO READ ALL INSTRUCTIONS THOROUGHLY!**



## STEP 1

### NEW AND REPLACEMENT INSTALLATION

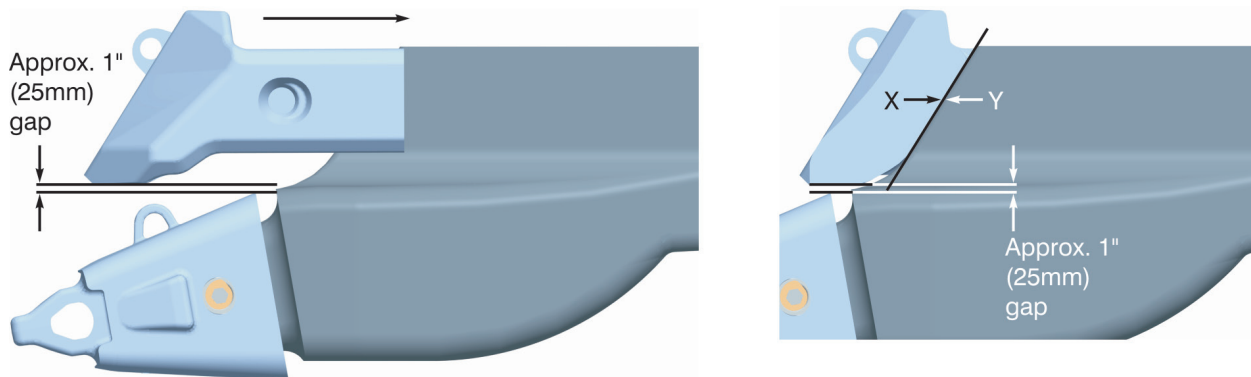


fig. 1-1

#### NEW INSTALLATION

Position the wing shroud on cheek plate portion of the cast lip making sure that the **blunt** throat surface of the shroud "X" contacts the **blunt** front surface of the cheek plate "Y". The shroud should be positioned so that there is approximately a 1" (25mm) gap between the bottom of the shroud and the intermediate adapter. (fig. 1-1).

**NOTE:** This contact and gap must be maintained throughout the assembly process to insure the proper location of the weld base.

**FOR 201" LIP -** The angle of the blunt front surface of the cheek plate "Y" differs from the 163" & 169" lips. The shroud should still be positioned so that there is approximately a 1" (25mm) gap between the bottom of the shroud and the intermediate adapter (fig. 1-1).

#### REPLACEMENT INSTALLATION

Grind the outside portion of the cheek plate area of the cast lip that will be affected by weld. Insure all carbon slag or other impurities from the removal of the old base are ground out. The use of non-destructive testing at this point will help determine if there are any cracks present in the base material. Repair base material as needed. (Now proceed as with new installation.)

Position the wing shroud on cheek plate portion of the cast lip making sure that the **blunt** throat surface of the shroud "X" contacts the **blunt** front surface of the cheek plate "Y". The shroud should be positioned so that there is approximately a 1" (25mm) gap between the bottom of the shroud and the intermediate adapter. (fig. 1-1).

**NOTE:** This contact and gap must be maintained throughout the assembly process to insure the proper location of the weld base.

# LOWER J-BOLT WING SHROUD INSTALLATION

## STEP 2

Insert the weld base as shown into the rear of the wing shroud until it is flush with the rear of the wing shroud (fig. 2-1 - fig. 2-2)

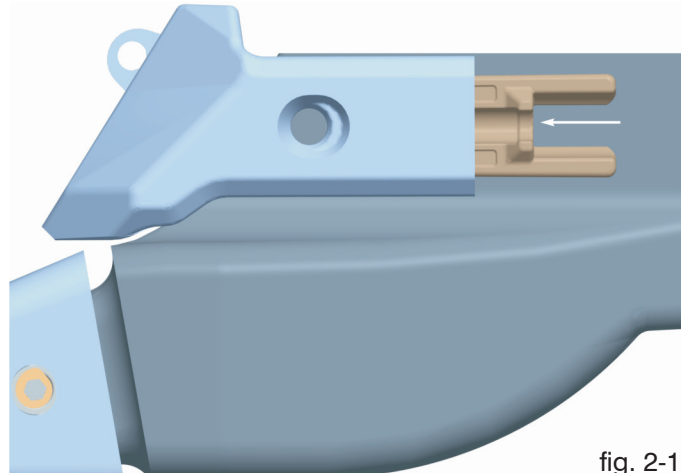


fig. 2-1

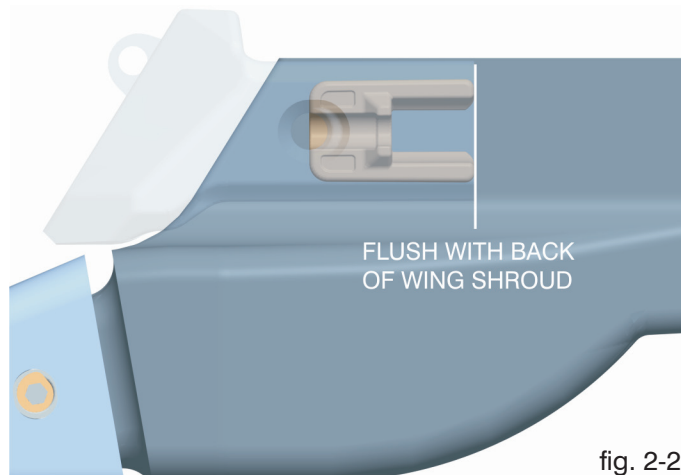


fig. 2-2

## STEP 3

After placement of weld base has been confirmed, Pre-heat the base material to 300°F / 150°C to 450°F / 230°C and tack weld the base at the rear along weld prep surface "A" (fig.3-1).

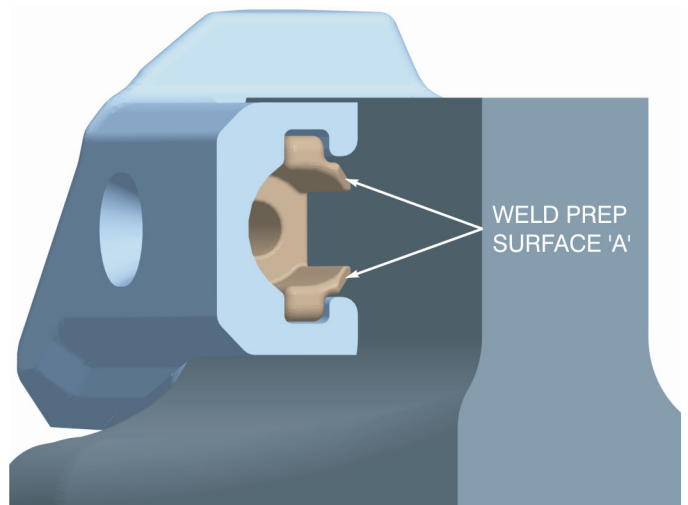


fig. 3-1

# LOWER J-BOLT WING SHROUD INSTALLATION

## SPECIAL NOTES

**Recommended filler material:** AWS specification A5.1, class E7018 stick electrode. Stick electrodes should be kept in a heated rod oven at 250°F / 120°C prior to use.

**NOTE:** See manufacturer's recommended procedures for storage and preservation of low hydrogen electrodes.

**Recommended weld types:** Stringer beads are recommended for higher strength and less distortion. The use of weave or wash beads is **NOT** recommended and should not be used. Arc strikes should be avoided or ground down.

### STEP 4

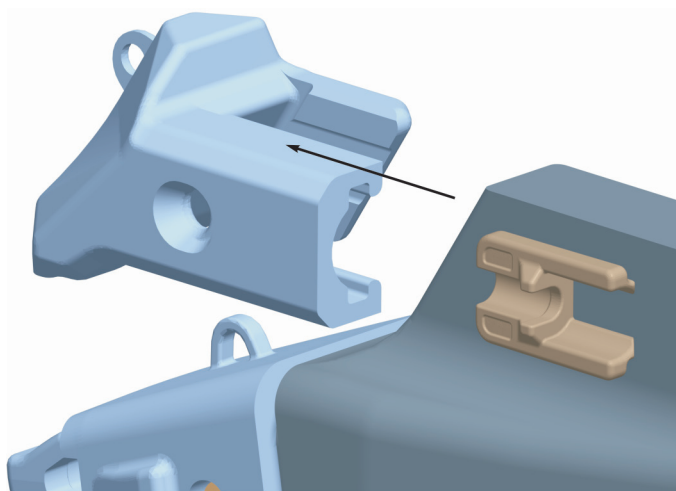


fig. 4-1

Remove the shroud and prepare to weld-out the base by re-establishing the preheat temperature of 300°F / 150°C to 450°F / 230°C for the base material (fig. 4-1). Maintain this temperature throughout the welding process.

### STEP 5

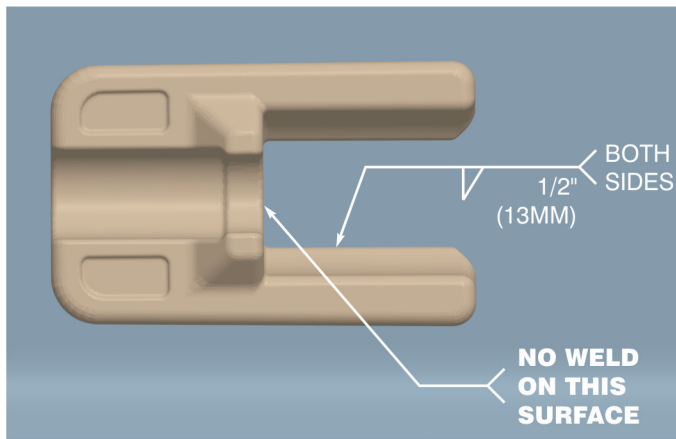


fig. 5-1

Weld-out for the base should begin with the inner legs of base. A 1/2" (13mm) fillet weld should be deposited in this area (fig. 5-1).

**BE SURE THAT THE ENTIRE BOTTOM SURFACE OF THE WELD BASE MAINTAINS CONTACT WITH THE CHEEK PLATE DURING ENTIRE WELD-OUT PROCESS**

# LOWER J-BOLT WING SHROUD INSTALLATION

## STEP 6

Apply weld to the base perimeter next. Utilizing groove welds, fill the 1.0" (25mm) weld groove on the base completely (fig. 6-1 & fig. 6-2). Care must be taken at this point not to add too much weld. If joint is over welded, the weld material can interfere with the lip shroud. The idea is to add as much weld as possible to the base without causing interference with the lip shroud (fig. 6-3). When the welding process has been completed, allow a slow cool down period to ambient temperature. A cool down rate of no greater than 35° per hour is recommended.

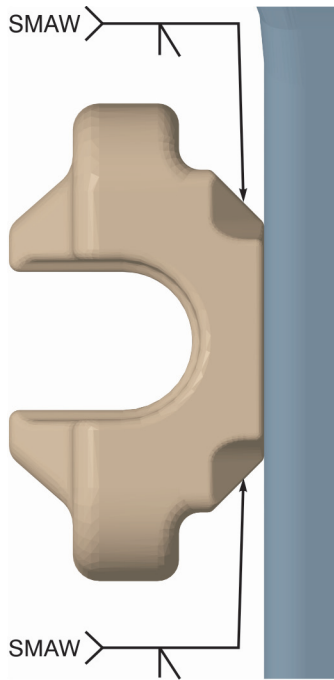


fig. 6-1

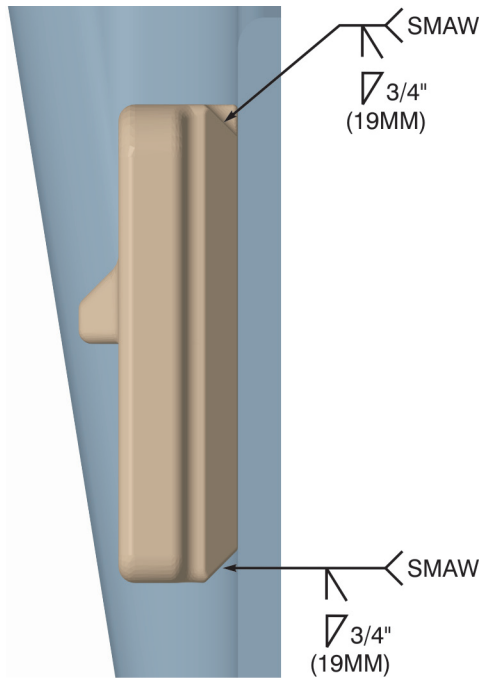


fig. 6-2

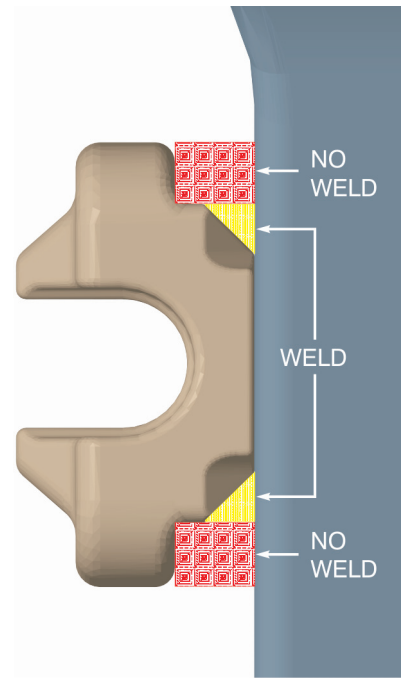


fig. 6-3

# LOWER J-BOLT WING SHROUD INSTALLATION

## STEP 7

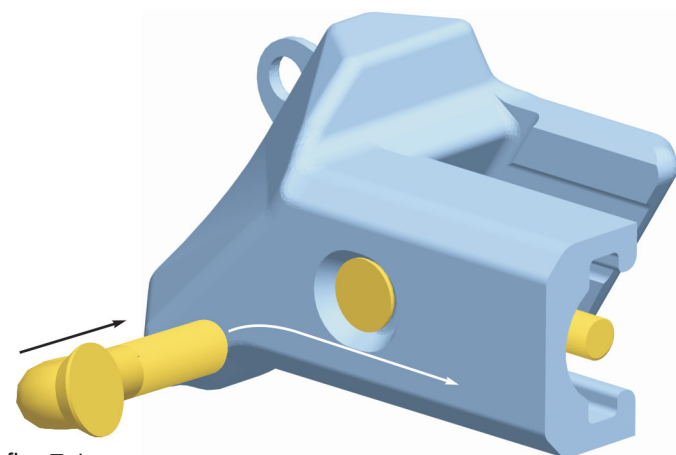


fig. 7-1

**Before** repositioning the shroud on the cheek plate, insert the J-bolt into the shroud through the top hole (fig. 7-1). Rotate the bolt 90° so that the threaded end is facing the rear of the shroud.

## STEP 8

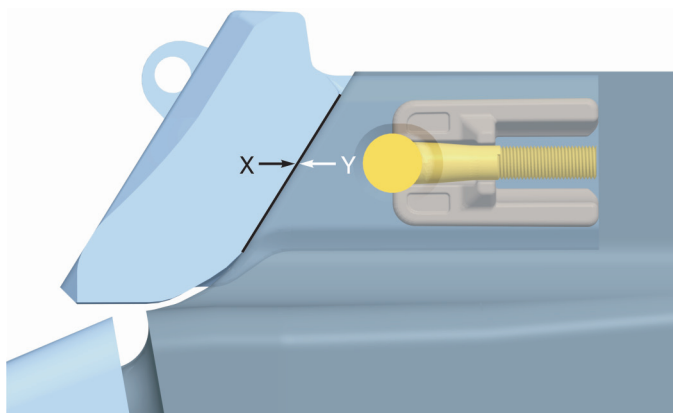


fig. 8-1

Reposition the shroud on the cheek plate by sliding it onto the weld base as far as it will go, once again, making sure surface "X" contacts surface "Y" (fig. 8-1).

## STEP 9

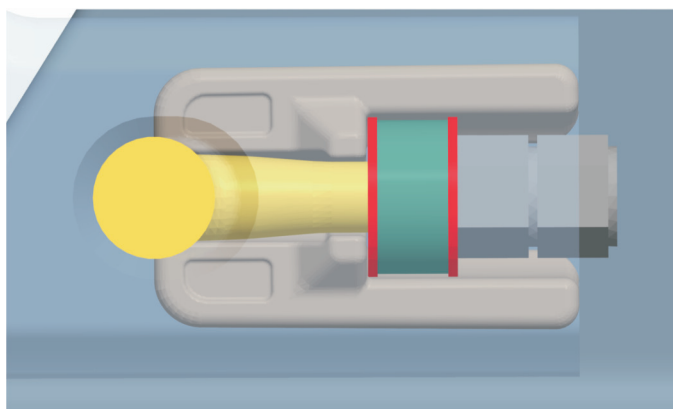


fig. 9-1

Install the washer, spring, collar assembly and the nuts in the order indicated for J-bolt assembly type J6 (fig. 9-1), Torque locking nuts to 300 ft. lbs / 407 Nm.

**[NOTE: the locking nut cannot be hand-threaded onto the J-bolt]**

**SPECIAL NOTE:** For best results, it may be necessary to re-torque all fastener components periodically depending on the application. Usually, re-torquing components after a few hours of machine operation will insure component security

# LOWER J-BOLT WING SHROUD INSTALLATION

## J-BOLT SHROUD SEATING AND MAINTENANCE INSTRUCTIONS

### SEATING FOR NEW INSTALLATION

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Therefore, it is recommended that the following procedure be followed to ensure proper seating of the shrouds.

Instructions:

1. Run machine for 10 non-production cycles.
2. Remove 2<sup>nd</sup> locking nut from shroud installation.
3. Re-tighten the 1<sup>st</sup> locking nut for any movement.
4. Re-install 2<sup>nd</sup> locking nut
5. Release machine for production.

Note: if the first nut on any installation is excessively loose, then repeat this procedure.

### RETIGHTENING AND MAINTENANCE

Check and retighten the nuts after 6 hours of service, then after 24 hrs. Generally, nuts should be periodically checked after 750 to 1000 hrs. In extreme conditions, and 1500 to 2000 hrs. In moderate conditions, or by the frequency dictated by your specific application.

**SAFETY FIRST:** Hensley recommends that you use a soft-faced hammer and ANSI-approved (Z87.1) eye protection while using our products.



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