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Transportation Technology Center, Inc., a subsidiary of the Association of American Railroads



Field Repairs vs. M-214

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& Craig Mayhew**

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- ◆ **This presentation will cover the requirements for Field Repairs of Side Frames and Bolsters and will also cover the requirements for M-214 Reconditioning of Side Frames and Bolsters**
- ◆ **Wedge Rise Height Gages may be called “Moustache” or “Yoke” gages.**

PRIOR TO DISSASSEMBLING INSPECTION



- ◆ **Checking Friction Casting heights with the proper moustache gage.**
- ◆ **Measuring between Gib and Column Guide both inner and outer.**
- ◆ **Inspection of Friction Casting wear indicators, Friction Casting Wear Plates wear, and wear on Bolster pockets (i.e. mushrooming, & cracks).**
- ◆ **Collection of EHMS data for (THD) Truck Hunting Detection and (TPD) Truck Performance Detection.**



◆ Four required Rule 1 moustache gages

- SK-1546-1
- SK-1546-2
- 70, 100, & 125 ton (Grade C) Ride Control
- Super Service Ride Control



If other types of trucks are present at your facility you need to have the proper moustache gage to determine if the shoe heights are within the limits.

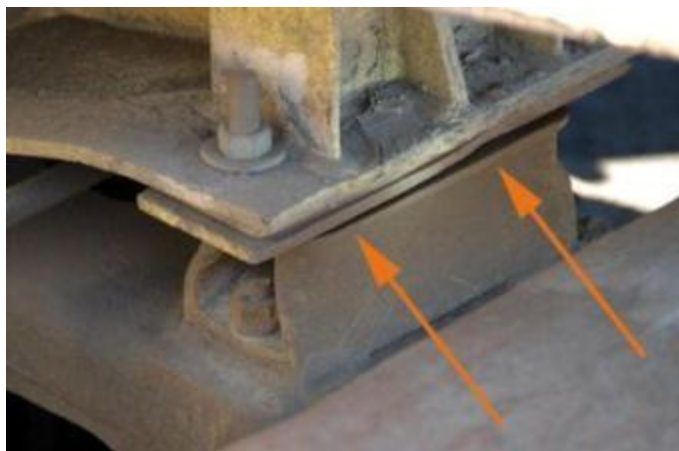
- ◆ Rule 46.A.2.d Column guides (when wheels are changed or trucks disassembled, wear on truck side frame columns and bolster gibs must be measured before disassembly). Measure both inside and outside of gib to column guide. If measurement combined is 1 ½ inches or more attention is required.

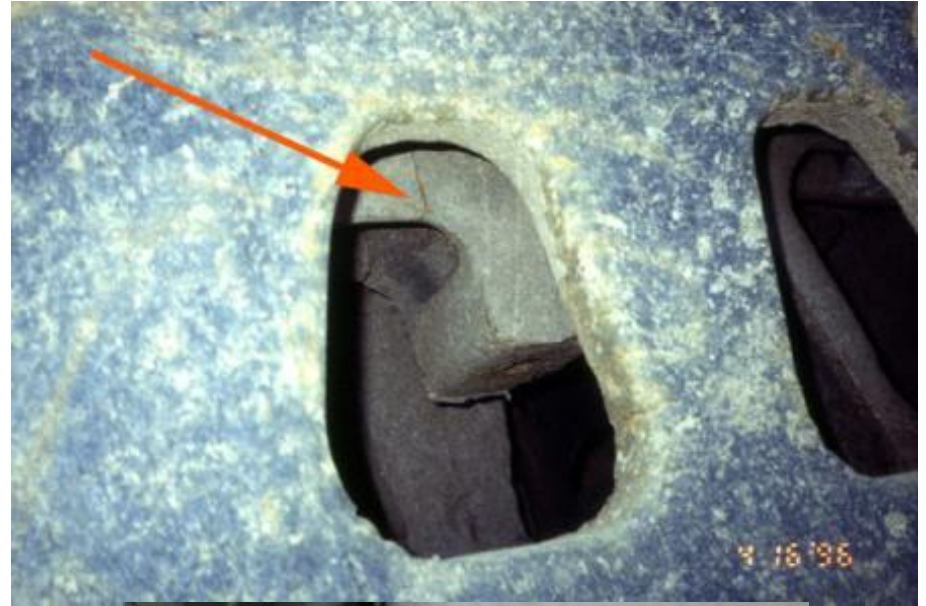


WORN
GIB



- ◆ In the event no individual condemnable components are visible contact car owner for disposition.





- ◆ **Rule 60.A.1.c (Condemnable at any time)**
 - Vertical distance between truck bolster center bowl rim and body center plate is less than 1/16 inch at any location.

- ◆ **Rule 60.B.2.b (Condemnable When car is on Shop or Repair Track for any Reason)**
 - Vertical distance between truck bolster center bowl rim and body center plate is less than 1/8 inch at any location.



EHMS DATA



- ◆ **Rule 46.B.7 Condemnable trucks detected by a Truck Hunting Detector must have the following addressed by the car owner.**
 - Trucks to be inspected and repaired to Field Manual requirements.
 - Condemnable friction castings replaced.
 - If truck has constant contact, resilient or spring element are to be replaced.
 - Roller side bearings replaced with long travel side bearings.
 - Side bearings adjusted or replaced per Rule 62.
- ◆ **Rule 46.E.3 Disposition from owner must be obtained for cars with a truck exceeding condemning limits detected by a hunting detector. The car owner is to be advised that home shop disposition is for exceeding the truck hunting index. Use DDCT Incident Type Rule 1 for truck hunting to request shop disposition from owner.**
- ◆ **Rule 46.E.4 Window of Opportunity – When car is in home shop inspect trucks per Rule 46 A.1, A.2, & Rule 62**



- ◆ **Rule 46.B.8 Condemnable trucks detected by a wayside Truck Performance Detector must have the following addressed by the car owner.**
 - Car body lifted and center plate cleaned of debris and re-lubricated. If non-metallic bolster bowl no lubrication is needed.
 - Trucks inspected and repaired per Field Manual requirements.
 - Condemnable friction castings replaced.
 - Condemnable side bearing heights adjusted.
 - Roller side bearings are to be replaced with long travel constant contact.
 - Side bearings adjusted and components replaced per Rule 62.
- ◆ **Rule 46.E.5 Disposition from owner must be obtained for cars with a truck exceeding condemning limits detected by a truck performance detector. The car owner is to be advised that home shop disposition is for exceeding the truck performance criteria. Use DDCT Incident Type Rule 1 for truck performance to request shop disposition from owner.**

◆ Condemnable at any time.

- Prohibited per Rule 90
- Broken, cracked, missing, bent, wrong size
- Worn or corroded, where any section is reduced 25%, except friction pockets, which can be reduced by a maximum of 40%. Does not apply to defects specified elsewhere in this section
- Bolster friction casting wear plate missing (except by design), broken, loose, or worn through

- ◆ **Rule 47.B.5 Whenever bolsters are removed from the car for other than field repairs, the work must be done in full compliance with Specification M-214. The following field repairs may be performed.**
 - Repair or replacement of gibs.
 - Replacement of cast integral horizontal lever support.
 - Repair of cracks in bowl rims, provided the cracks do not extend below the top horizontal surface of the adjacent bolster body.
 - Replacement of vertical wear liners or repair of existing vertical wear liner welds. Vertical liners must be replaced in kind. Replacement liners must meet the requirements of AAR Standard S-306 (or other material approved by the AAR).
 - Replacement of pocket wear plates and inserts. Repair of existing pocket wear plate or insert welds. If pocket was not originally equipped with wear plates, they may not be applied. Sloped pockets may not be restored.
 - Side bearing cages may be secured by welding if originally secured by welding.
 - Repair of cracked or broken cast integral cages. Removal or replacement of cast integral cages is not considered a field repair.

FIELD REPAIRS FOR BOLSTERS (Continued)

- ◆ Rule 47.B.4 Welding is permitted only in the lined areas of Figure B.

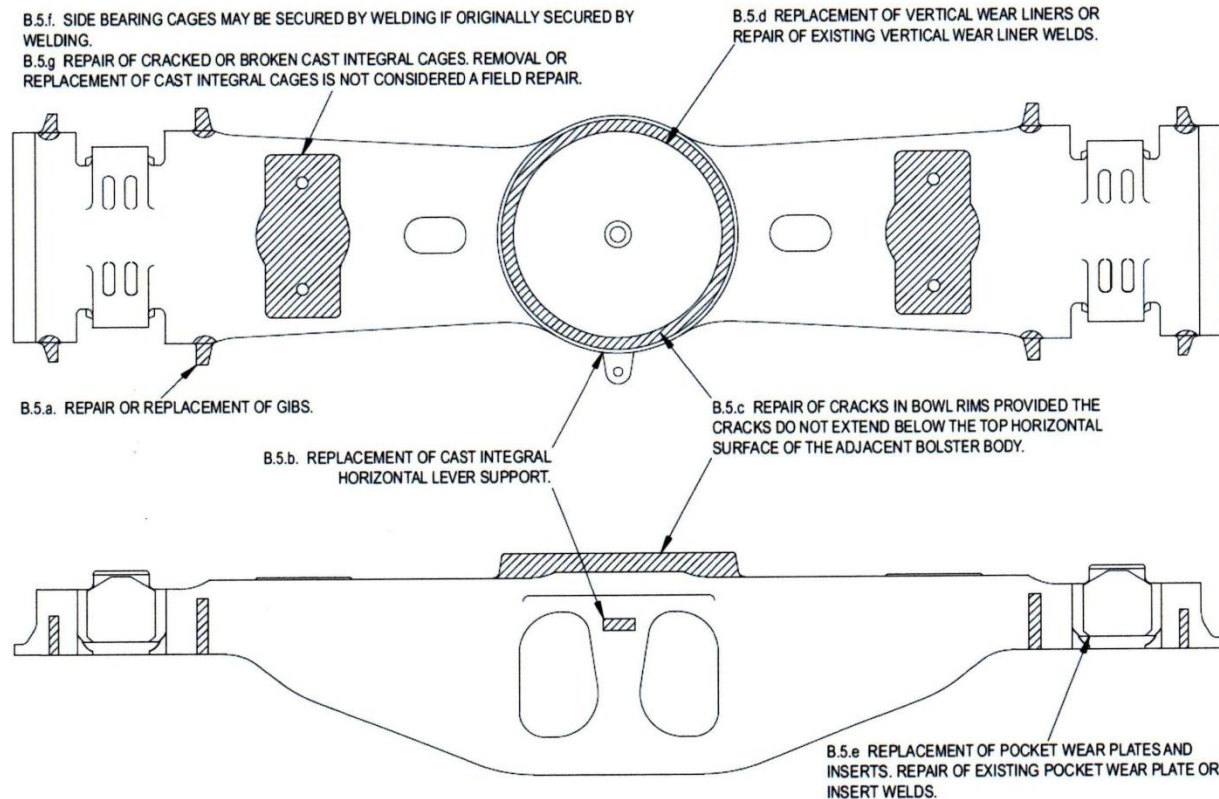


Figure B

Permissible Welding Related Field Repairs of Grade B, B+, or C Truck Bolsters

RULE 48-TRUCK SIDE FRAMES, TRANSOMS AND SPRING PLANKS



◆ Condemnable at any time.

- Prohibited per Rule 90
- Broken, cracked, missing, bent, wrong size
- Worn or corroded more than 25% in any section of the side except on specific areas mentioned elsewhere in Section A of this rule
- Weld-on pedestal roof liners missing or broken
- Clip-on-type pedestal roof liner broken such that it no longer provides a full bearing surface for the bearing adaptor crown to rest against
- Unit brake beam guide bracket broken, bent, or worn such that the brake beam end extension cannot move freely
- Spring plank or transom with welding that is not of original construction weld
- Truck side frame friction casting wear plate missing, broken, or worn through





FIELD REPAIRS FOR SIDE FRAMES



- ◆ **Rule 46.B.5 Whenever side frames are removed from the car for other than field repairs, the work must be done in full compliance with Specification M-214.**
- ◆ **The following field repairs may be performed.**
 - Replacement of weld-on type pedestal roof wear liners (per MSRP S-327).
 - Replacement of side frame column wear plates or repair of existing wear plate welds provided no weld buildup on the column face is required. Column wear plates should be replaced in accordance with Rules 74 and/or 82.
 - Weld repair of column guides.
 - Empty/load sensor contact – plate attachment welds. Transverse welds are prohibited.
 - Rule 46.B.8 Repair pedestal roofs and replace pedestal roof liners per MSRP S-327.



FIELD REPAIRS FOR SIDE FRAMES (Continued)

- ◆ No welding permitted except in cross-hatched areas shown in Figure C.

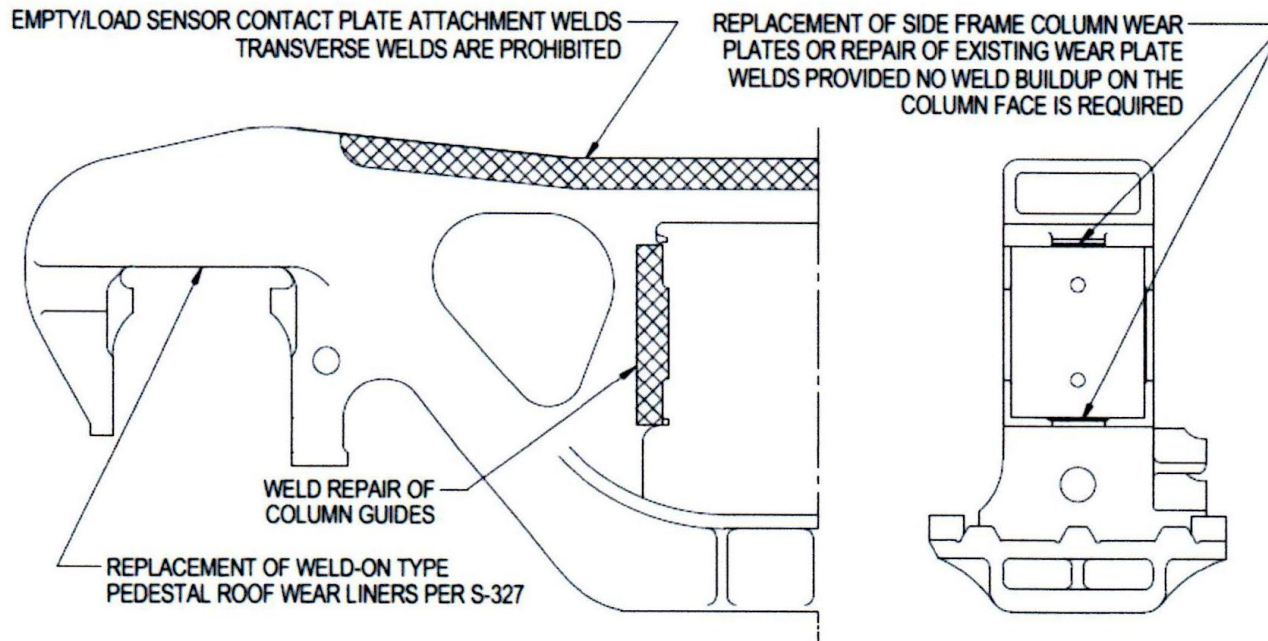
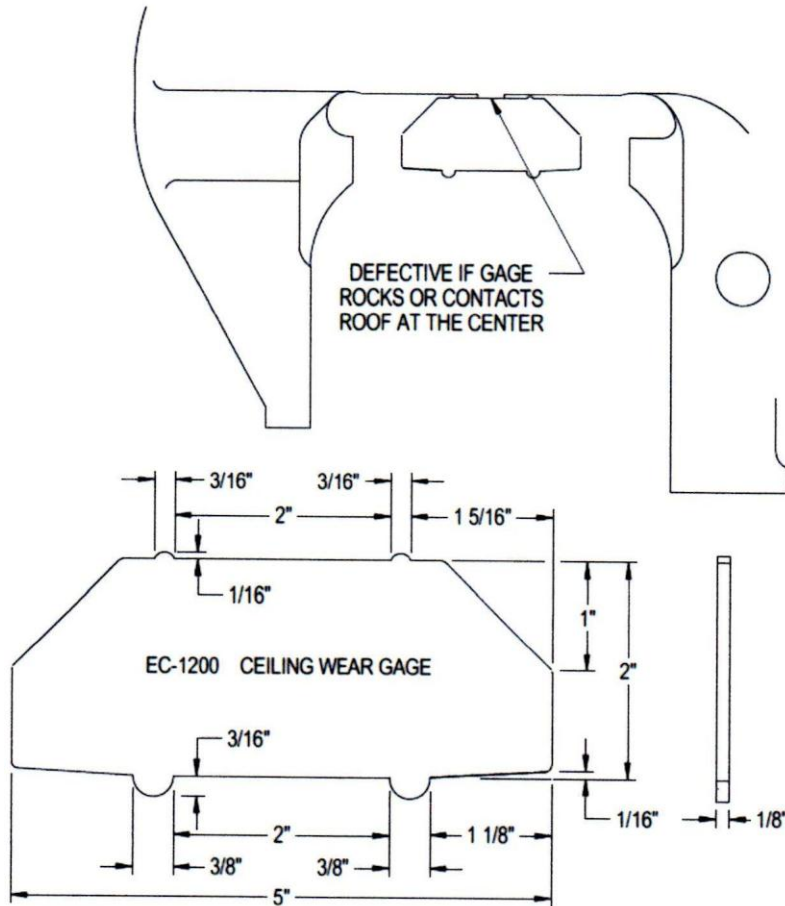


FIGURE C

FIELD REPAIRS FOR SIDE FRAMES (Continued)

FIGURE A



Pedestal roof, when the wheel set is removed at that location for any other reason, if gage EC-1200 rocks or contacts roof at the center as shown in Figure A.

Table 1

Thrust Lug Wear Limits

Side Frame	Journal Size	Nominal	Remove If Over
Most side frames	6 × 11 or 6 × 8	7 1/4	7 7/16
	6 1/2 × 12 or 6 1/2 × 9	7 3/4	7 15/16
	7 × 12 or 7 × 9	8 3/4	8 15/16
Shear pad design with letter "B" in the 7th position of side frame 9-digit code	6 × 11 or 6 × 8	7 7/16	7 5/8
	6 1/2 × 12 or 6 1/2 × 9	7 15/16	8 1/8
	7 × 12 or 7 × 9	8 15/16	9 1/8

Rule 48.A.3.c Thrust lugs, when trucks are disassembled and wear exceeds limits shown in Table 1.

◆ **Field Repair/Running Repair**

- Those repairs performed on repair tracks to correct specific defects for the safe operation of the car.

◆ **M-214 Classification/Repair (Used and Reconditioned)**

- Repairs made to restore service life into the castings. Whenever castings are removed from the car for reconditioning, the work must be done in full compliance with M-214.

- ◆ **Facilities must be an M-1003 certified facility.**
- ◆ **Repairs must be done by trained personnel (i.e. – both function specific training and applicable work experience).**
- ◆ **Repairs must be done by qualified welders using approved welding procedures.**
- ◆ **Welding wire and/or electrodes must meet M-214 5.1.7 for the Grade of castings that are being reconditioned.**
- ◆ **Castings and pre-heat temperature must meet M-214 5.1.6 for the Grade of castings that are being reconditioned.**

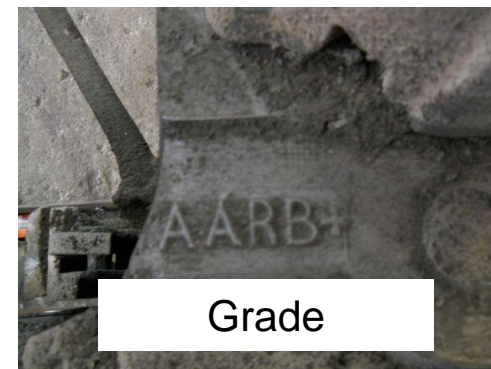
PUBLICATIONS FOR M-214 RECONDITIONING



- ◆ **MSRP Section S Standard M-214**
- ◆ **MSRP Section SII**
 - S-325 – Side Frame – Narrow Pedestal – Limiting Dimensions
 - S-327 – Side Frame – Roof Repair
- ◆ **MSRP Section D**
 - S-306 – Center Bowl Vertical Bowl Liner
 - S-307 – Center Bowl Horizontal Wear Liner
 - S-308 – Center Bowl Wear Liner Application
 - RP-323 – Stop Lugs for Clip-on type Pedestal Roof Liners Application
- ◆ **Maintenance Manuals**
 - ASF
 - Standard Car Truck
 - Swing Motion
 - Buckeye
- ◆ **M-214 Manual**



- ◆ Inspect Bolsters and Side Frames for cracks, gouges, and bent.
- ◆ Inspect Bolsters and Side Frames for pattern numbers, casting date, grade, and interchange numbers.



- ◆ **All used side frames and bolsters removed from service must be classified before reapplying to a car other than the one from which removed.**
- ◆ **Side frames and bolsters must be removed from the truck for inspection and classification.**
- ◆ **Parts must be clean and free of dirt, paint, rust, and scale that will interfere with gaging and inspection.**
- ◆ **Side frames and bolster castings over 30 years old, based on cast date, may be reconditioned but may be applied only with the permission of the car owner.**

- ◆ **The following side frames and bolsters cannot be reconditioned.**
 - Side Frames and Bolsters listed in Field Manual Rule 90 or Rule 47 must not be classified they must be scrapped.
 - Parts with any crack, nick, gouge, or scrape in the unlined or uncrosshatched areas shown in Figure D.1 must be scrapped, except as follows:
 - Side frames with nicks, gouges, and scrapes of any size in the spring seat support ribs, as shown in Fig. D.1 or side frames with nicks, gouges, and scrapes not exceeding 1/8" depth and not exceeding 6" in length lateral to the side frames, or not exceeding 20% of original thickness and 3" in aggregate width with no limit on length longitudinal of the side frame.
 - Bolsters with nicks, gouges, and scrapes in the unlined and uncrosshatched areas that are not more than 1/8" deep and that are either 1) transverse to long axis of bolster and no more than 6" long; or 2) parallel to long axis of bolster and of any length.
 - Parts not having pattern numbers, manufacturer's marking, date cast, and either and AAR ID number or code number.

FIELD REPAIRS

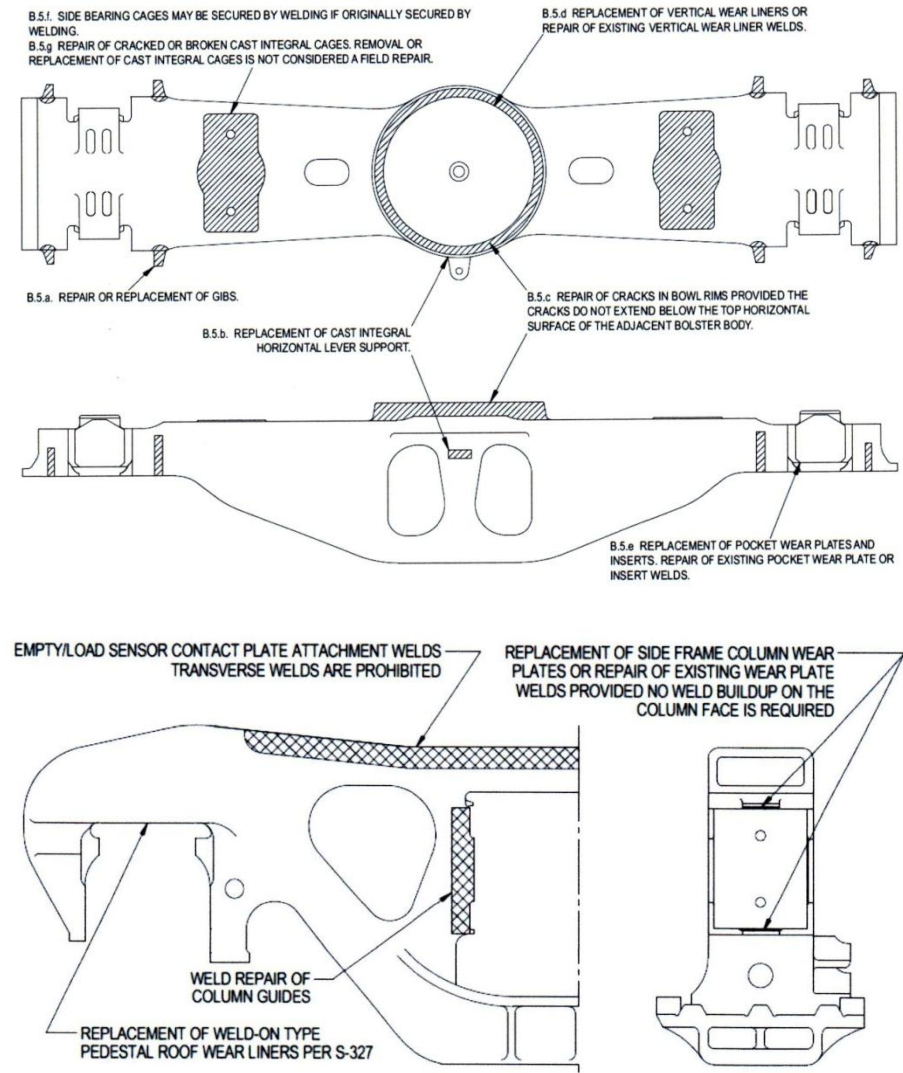
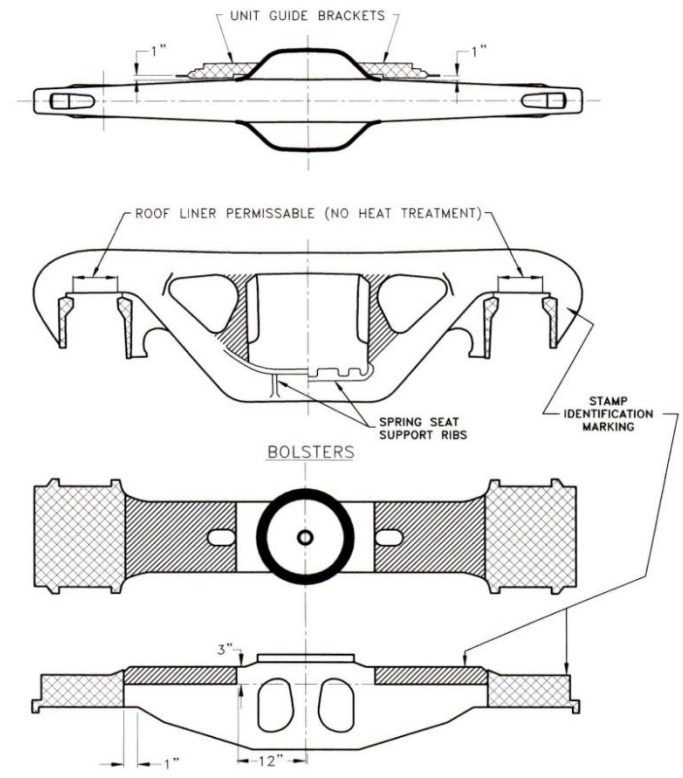


FIGURE C

M-214

SIDE FRAMES



Weld and heat treatments in specified side frame and bolster areas

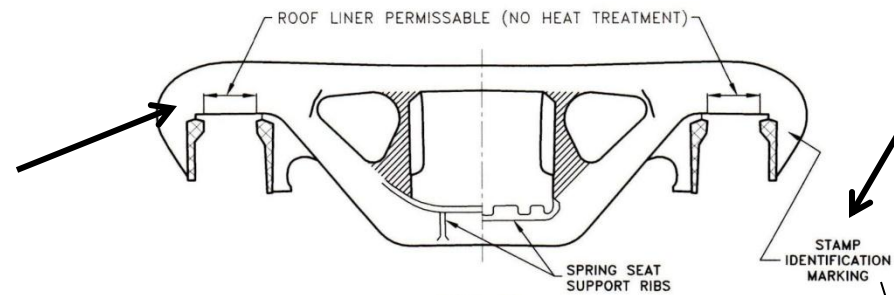
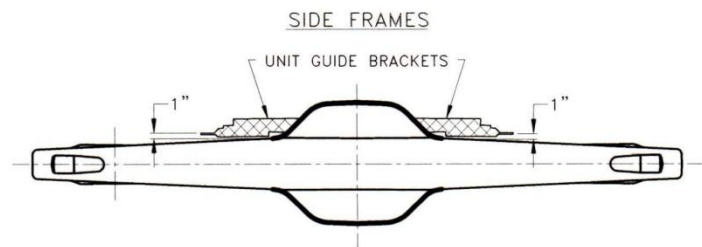
Grade Steel	B and B+	C
Welds in lined area	Two or more equal passes—no heat treatment required	Temper (localized or furnace temper)
Welds in crosshatched area	Heat treat optional	Heat treat optional

NOTES:
 1. REPAIR IS RESTRICTED TO THE LINED AND CROSS-HATCHED AREAS.
 2. THE REPAIR, REMOVAL, AND ADDITION OF SIDE FRAME SPRING RETAINERS IS ALLOWED AND IS LIMITED TO THE FLAT PORTION OF THE SPRING SEAT.

Fig. D.1 Prohibited service crack and weld repair areas and identification marking locations

- ◆ **The results of inspection and gaging will determine if part is suitable for secondhand classification, may be reconditioned, or must be scrapped.**
- ◆ **Secondhand Classification – Side Frame**
 - Apply friction casting wear plates per S-320 or S-3003 & shims, buildup to column face per 3.2.1.1 & 3.2.1.1.1.
 - Buildup column guides per 3.2.2.1.1 & 3.2.2.1.2.
 - Grinding of pedestal roof per S-327.
 - Application of pedestal roof liners per S-327.
 - Transverse nicks, scrapes, and gouges longer than 1” must be blended smooth with adjacent surfaces by grinding in a direction parallel to the long axis of the side frame per 3.2.1.5.
 - Check buttons using pairing gage. It cannot be classified secondhand if it does not meet.
- ◆ **Secondhand Classification – Bolster**
 - Buildup of bolster gibs and lands with wear per 3.3.2.1.1. & 3.3.2.1.2
 - Apply bolster bowl wear ring and liners as long as wear is not severe enough as mentioned in 3.3.2.2 if so it must be classified as reconditioned not secondhand per 3.3.1.1.
 - Apply bolster pocket wear plates per manufacturer’s maintenance manual per 3.3.1.2.
 - Transverse nicks, scrapes, and gouges longer than 1” must be blended smooth with adjacent surfaces by grinding in a direction parallel to the long axis of the bolster per 3.3.3..

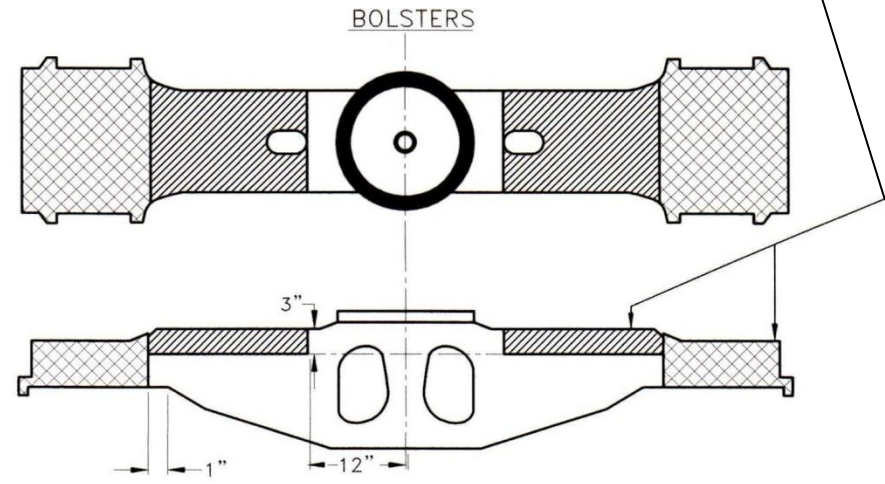
SECONDHAND MARKING



Side Frame wheel base is to be stamped by buttons

Side Frame and Bolster must be stenciled with
Company Marks: ABS
Shop ID Symbol: AV
Date: 3-14

Area must be cleaned by grinding or other means & must not be covered by subsequent painting of component.



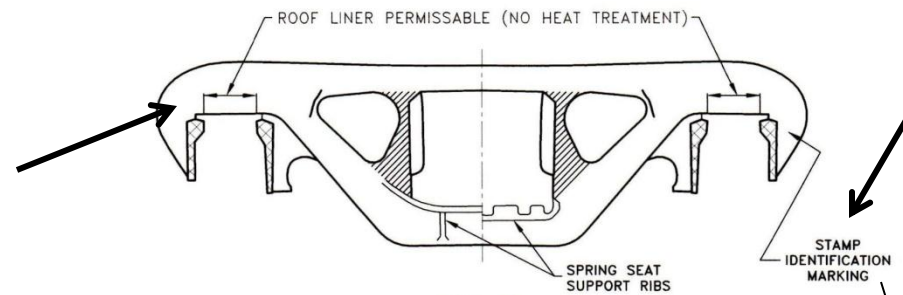
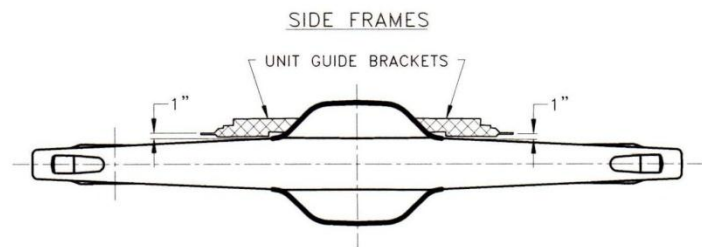
◆ Reconditioned Classification – Side Frame

- Apply friction casting wear plates per S-320 or S-3003 & shims, buildup to column face per 4.2.2.1.1.
- Buildup column guides per 4.2.3.1.
- Grinding of pedestal roof per S-327.
- Application of pedestal roof liners per S-327.
- Repair of cracks in Grade B & B+ provided the cracks are not transverse to a load carrying member and are 1" or less in length. Two or more equal weld passes are required. Stress relief is not required per 4.2.1.3.
- Repair of cracks in Grade C provided the cracks are not transverse to a load carrying member and are 1" or less in length. Preheat per 5.1.6 is required. Stress relief per 6.1.5 of Specification M-210 is required 4.2.1.4.
- Transverse nicks, scrapes, and gouges longer than 1" must be blended smooth with adjacent surfaces by grinding in a direction parallel to the long axis of the side frame per 4.2.7.
- Buildup of pedestal thrust lugs 4.2.6 per S-325.
- Remove or apply buttons as needed using pairing gage per 4.2.5 S-378.
- Items that are bent or twisted cannot be reconditioned per 4.2.4.

◆ Reconditioned Classification – Bolster

- Buildup of bolster gibs and lands with wear per 4.3.3.1.
- Apply bolster bowl wear ring and liners as long as wear is not severe enough as mentioned in 4.3.2.1.1 & 4.3.2.1.2.
- Apply bolster pocket wear plates or weld buildup to bolster slopes can be performed as long as wear is $\frac{1}{4}$ " or less per manufacturer's maintenance manual per 4.3.2.2.
- Repair of cracks in Grade B & B+ provided the cracks are not transverse to a load carrying member and are 1" or less in length. Two or more equal weld passes are required. Stress relief is not required per 4.3.1.3.
- Repair of cracks in Grade C provided the cracks are not transverse to a load carrying member and are 1" or less in length. Preheat per 5.1.6 is required. Stress relief per 6.1.5 of Specification M-210 is required per 4.3.1.4.
- Transverse nicks, scrapes, and gouges longer than 1" must be blended smooth with adjacent surfaces by grinding in a direction parallel to the long axis of the bolster per 4.3.1.9.
- Side bearing attachment, if originally secured by welding, does not require heat treatment unless it is Grade C. Which requires local heat treatment per 5.1.6. per 4.3.1.6.
- Heat treatment must not be performed with wear plates applied. They must be removed before heat treatment per 4.3.1.8.
- Items that are bent or twisted cannot be reconditioned per 4.3.4.

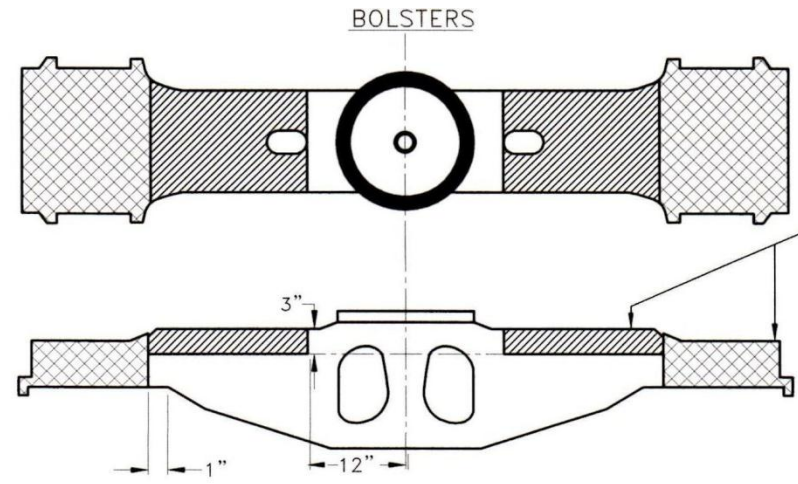
RECONTIONED MARKING



Side Frame wheel base is to be stamped by buttons

Side Frame and Bolster must be stamped with a minimum 3/8" stamps
Company Marks: ABS
Shop ID Symbol: AV
Date: 3-14

Area must be cleaned by grinding or other means & must not be covered by subsequent painting of component.



RECONDITIONING OF GIBS

Check both inner and outer gib spacing with proper gage. Gage goes towards the inner gib.



Barber



Ride Control

RECONDITIONING OF BOLSTER POCKETS



RECONDITION OF BOLSTER POCKETS

- ◆ Applying an insert in a Barber Bolster side wall must be straight not angled.



RECONDITIONING OF BOLSTER LANDS & SIDE WALL



Barber & RC Lands



Barber Side Wall

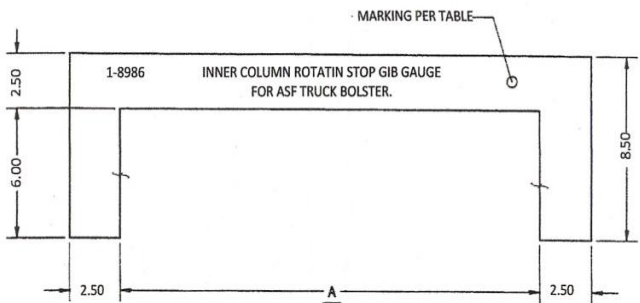
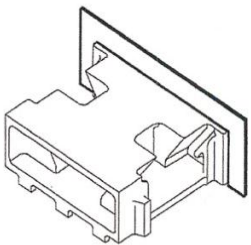


RECONDITIONING OF INNER ROTATIONAL STOPS & OUTER GIB



Inner Column Rotation Stop Gib Gauge

AAR STANDARD M-214 ACCEPTANCE:
DISTANCE ACROSS INNER GIBS "A" $\pm 1/16"$
AAR REF.: EC-1150



TYPE OF TRUCK		A	MARKING	LINE NO.
RIDE CONTROL	70 TON LEVEL 5'-1" WHEELBASE	17.062	70 TON RIDE CONTROL LOW LEVEL 5'-1" WHEELBASE	1
	70 TON - ALL DESIGNS 70 TON LOW LEVEL 5'-3" WHEELBASE	20.438	70 TON RIDE CONTROL	2
	100 TON - 7 & 8 COIL 125 TON - GRADE "C" ONLY WITH STANDARD ROTATION STOP LUGS PER AAR S-318	19.688	100 TON - 7 & 8 COIL & 125 TON GRADE "C" RIDE CONTROL	3
	100 TON 9 COIL	20.188	100 TON - 9 COIL RIDE CONTROL	4 ‡
70 & 100 TON SUPER SERVICE RIDE CONTROL	EXCEPT BASE PATTERNS 22444 (-L,-P,-R), 498, 22472, & 472	20.188	SUPER SERVICE RIDE CONTROL EXCEPT BASE PATTERNS 22444 (-L,-P,-R), 22472, AND 472	5 ‡
	FOR BASE PATTERNS 22444 (-L,-P,-R), 498, 22472, & 472	NOT REQUIRED		6

‡ SAME GAUGE DIMENSIONS

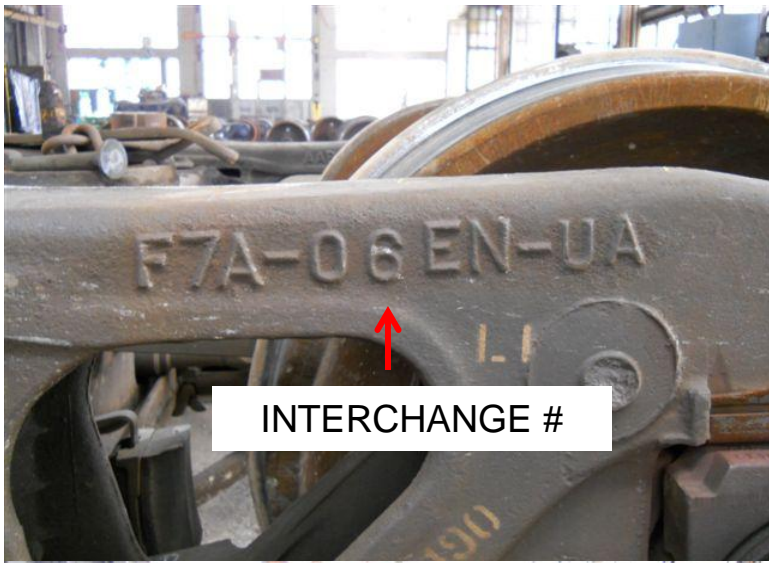




RECONDITIONING OF BOLSTER BOWLS



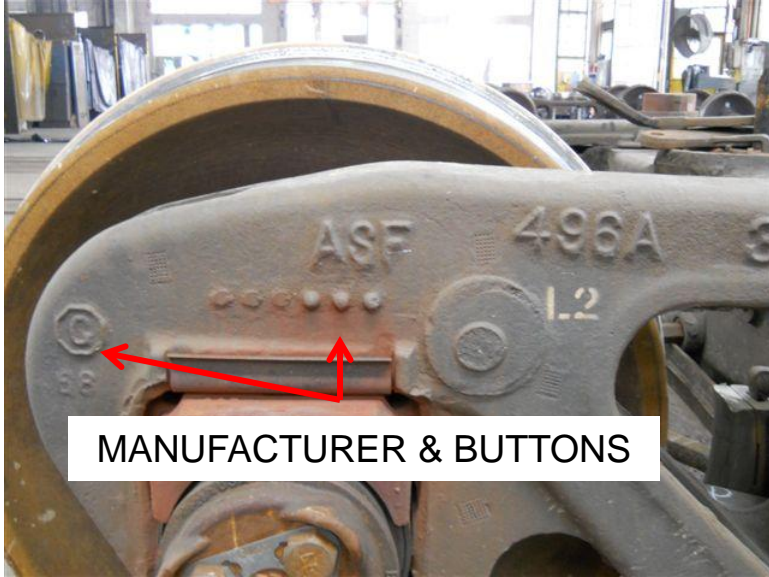
MARKINGS ON SIDE FRAMES



INTERCHANGE #



CAST DATE



MANUFACTURER & BUTTONS



GRADE

COLUMN GUIDES



ASF



BARBER

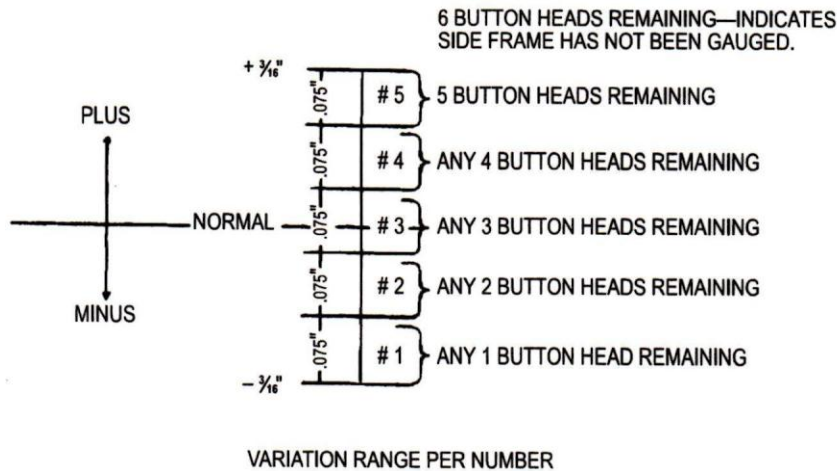
COLUMN WEAR PLATES



THRUST LUGS



- ◆ Side Frames on the same end of the car must only have one button difference.

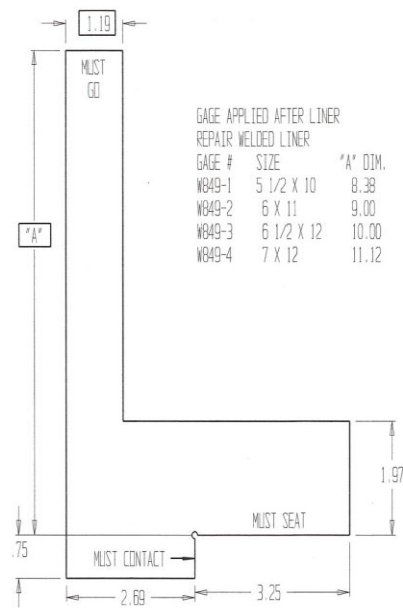


◆ MSRP SECTION SII S-327





PEDESTAL ROOF LINERS



GAGE APPLIED AFTER LINER
REPAIR WELDED LINER

GAGE #	SIZE	"A" DIM.
W849-1	5 1/2 X 10	8.38
W849-2	6 X 11	9.00
W849-3	6 1/2 X 12	10.00
W849-4	7 X 12	11.12

GAGE APPLIED BEFORE LINER
REPAIR SNAP-ON LINER

GAGE #	SIZE	"A" DIM.
W849-5	5 1/2 X 10	8.50
W849-6	6 X 11	9.12
W849-7	6 1/2 X 12	10.12
W849-8	7 X 12	11.25

TOLERANCE:
UNLESS OTHERWISE NOTED
FRACTIONS +/- .015"
.X +/- .015"
.XX +/- .010"
.XXX +/- .005"
ANGULAR: +/- 1.0 DEGREE

INFORMATION REQUIRED ON BOLSTER & SIDE FRAME



- ◆ **Effective 7/1/2013 Secondhand and Reconditioned Bolsters and Side Frames must have a CID label affixed to them per 3.1.3.1 & 4.1.6.1, and MSRP Section F S-920.**
- ◆ **The CID label must be registered into the EHMS system once applied to a car.**
- ◆ **Effective 7/1/2013 all Bolsters and Side Frames must have the AAR design feature code per MSRP Section SII S-312 or S-314. If they do not it must be added by one of the following ways:**
 - Pencil welding
 - Stamping directly onto the casting in an area smoothed by grinding
 - Stamping onto a steel plate that is then welded to the casting.
- ◆ **If you are reconditioning castings for the same car you must perform a manual registration into the EHMS system. They do not require the CID label to be applied.**





QUESTIONS?

