

AMTRAK EQUIPMENT MAINTENANCE DEPARTMENT

STANDARD MAINTENANCE PROCEDURE

SMP NO. : 46603
ISSUE DATE : 3-15-81
REVISION DATE :
TITLE : PROCEDURE FOR RECLAIMING PASSENGER CAR
CAR TRUCK EQUALIZERS
EQUIPMENT TYPE: ALL AMTRAK CARS

All equalizers which are worn or defective shall be reclaimed to the attached procedure, and the appropriate forms completed to show the condition and the extent of the areas to be reworked as described in the reclamation procedure. Forms are not to be submitted for any equalizers which do not require rework after being inspected. Equalizers worn beyond reclamation limits shall not be returned to service nor repaired without receipt of written authority from this office.

Please arrange to have this attached procedure and forms distributed to all concerned with equalizer maintenance and reclamation. Completed forms shall be sent to the following address:

Mr. F. Abate
Chief Mechanical Officer
National Railroad Passenger Corporation
400 N. Capitol St., NW
Washington, DC 20001

Attn: D. M. Boria
Manager, Equipment Engineering

I. Inspection

- (a) Sandblast entire equalizer.
- (b) Visually inspect for cracks, gouges and wear.
- (c) Magnetic particle test entire equalizer to detect surface cracks.

PROCEDURE-FOR RECLAIMING PASSENGER CAR CAR TRUCK EQUALIZERS (CONT)

- (d) Heat treat all equalizers as specified in Section III (e) & (f), except for equalizers of A-1 Steel. If equalizers require rework, heat treat after reclamations are completed.
- (e) Take Brinell Hardness Readings at the locations as indicated on CMO Forms #14 and #15. The Brinell Reading to be made on a smooth spot developed by grinding 1/32" to 1/16" below the surface. (See Section III).
- (f) CMO Forms #14 or #15 as applicable, shall be submitted to the Chief Mechanical Officer, Attn: Manager-Equipment Engineering, Washington, D.C., on all equalizers found to be cracked or with gouges or indentations beyond dimensions given for wear limits in Section IV, and for equalizers with Brinell Hardness values outside of the specified range. Exact size, depth and location of each defect shall be shown with dimensions on the applicable form. Accurate measurements of the remaining metal thickness at each defect area shall also be indicated on the form.
- (g) Inspect equalizers that are found with defects for evidence of previous reclamation. If they are found to have been reworked previously, the reworked areas shall be shown on the CMO Forms. Also, show the extent of any previously welded areas giving size and location.

II. Marking

- (a) All equalizers after inspection and/or reclamation shall be stamped with 3/8" or 1/2" high letters at locations shown on attached figures. The stamping shall indicate the shop, month, and year at which the equalizer was inspected and/or reclaimed using shop abbreviation letters indicated below.

SHOP ABBREVIATIONS

AL - Auto Liner Corporation
 BG - Beech Grove (PC)
 CO - Como (BN)
 MT - Mechtron
 PS - Pullman Standard
 RM - Rocky Mount (SCL/(INCO)
 RO - Rail Systems, Inc.
 TS - Topeka
 WC - Woodcrest (IC)

PROCEDURE-FOR RECLAIMING PASSENGER CAR CAR TRUCK EQUALIZERS (CONT)

III. Brinell Test

- (a) Each equalizer removed from trucks must be Brinell Tested after visual and magniflux inspection and also after any heat treatment. This reading is to be made on a smooth spot developed by grinding 1/32" to 1/16" below the surface at locations indicated on CMO Forms 14 and 15.
- (b) Bar Type Equalizers - Medium carbon steel - The Brinell Hardness Reading must be in the range of 163 minimum - 212 maximum.
- "I" Beam Type Equalizers - The Brinell Hardness Reading must be in the range of 229 minimum - 227 maximum.
- T-1 Steel Bar Type Equalizers - The Brinell Hardness Reading must be in the range of 229 minimum - 293 maximum.
- (c) When hardness readings are below the minimum allowable, the equalizer may be re-normalized and tempered, after which it must be re-Brinell tested. This procedure may be repeated once. If readings are still below the allowable minimum, the equalizer must be set aside for further handling, and this office notified.
- (d) When hardness readings are above the allowable maximum, the equalizer may be re-tempered, after which it must be re-Brinell Tested. This procedure may be repeated once. If readings are still above the allowable maximum, the equalizer must be set aside for further handling, and this office notified.
- (e) Normalizing - (All Equalizers, except for T-1 Steel Bar Type) Heat in a closed furnace to 1650°F and hold at this temperature for approximately one hour per inch of maximum thickness of equalizer. Remove from furnace and cool in still shop air, free from drafts.
- (f) Tempering - (All Equalizers, except for T-1 Steel Bar Type) Heat in a closed furnace to 1150°F and hold at this temperature for approximately one hour per inch of maximum thickness of equalizer. Remove from furnace and cool in still shop air, free from drafts.

PROCEDURE-FOR RECLAIMING PASSENGER CAR CAR TRUCK EQUALIZERS (CONT)

- (g) When heating or cooling equalizers, they are not to be stacked on top of one another so as to permit uniform heating and cooling otherwise distortion may result.
- (h) Equalizers requiring Normalizing shall be heated to the specified temperature at a rate not exceeding 500°F, temperature increase per hour.
- (i) T-1 Steel Bar Type Equalizes are not to be heat treated. If Brinell Readings are outside of specified range, they shall be held for further disposition and this office notified.

NOTE: The hardness values are based on the Brinell Hardness Test 3000 kg.

IV. Limits of Wear

- (a) The following limits of wear, from original equalizer drawing dimensions, will apply to all equalizers for cars receiving inspection at any Shops or Terminals. Equalizers, if worn in excess of the following limits, are to be held for repairs at authorized locations, as specified in Section V. The Office of the Chief Mechanical Officer is to be notified of any equalizers being held for further repairs and in return will receive instructions on Where and How the equalizers are to be repaired.
- (b) Bottom surfaces of Equalizer feet may be restored by machining to remove score marks or other irregularities, provided this can be done with a maximum reduction of 1/8" vertically. When bottom feet are worn in excess of 1/8" vertically, they shall be reclaimed by welding, provided this can be done by rebuilding a maximum of 1/4"
- (c) When Equalizers with wear plates welded on bottom feet of equalizer are worn up to 1/8", they shall be ground smooth or replaced with new plates.
- (d) Bar Type Equalizers that are 1 - 3/4" or less in Thickness (Fig. 1)
 - 1. When the sides of the foot are worn to a total of 3/32". This may occur over the entire area of the side of the foot or it may be in a small area where the equalizer has contacted the pedestal liner.

PROCEDURE-FOR RECLAIMING PASSENGER CAR CAR TRUCK EQUALIZERS (CONT)

2. When the foot face of the equalizer is worn $1/8"$.
3. Indentations, scars, corrosion, etc., in any portion of the equalizer more than $3/32"$ in depth.
4. The area of the equalizer under the spring seat when worn to $3/32"$.

(e) Bar Type Equalizer Greater than 1 - $3/4"$ in Thickness (Fig. 2)

1. When worn $1/8"$ total on the sides of the foot face.
2. Indentations, scars, corrosion, etc., in any portion of the equalizer more than $1/8"$ in depth.
3. The limits or wear under the spring seat shall be $1/8"$.
4. When the foot face of the equalizer is worn $1/8"$.

(f) Canton "I" Beam Equalizer (Fig. 3)

1. Indentations, scars, corrosion, etc., in any portion of the equalizer more than $1/8"$ in depth.
2. If either side of the foot is worn $1/8"$.
3. When the foot face is worn $1/8"$.
4. When worn $3/16"$ on either side, where it contacts the pedestal of the truck frame of $1/4"$ total wear on both sides.
5. When worn under the spring seat more than $3/32"$.

NOTE: Equalizers which are worn but wear is less than dimensions indicated above, may be reapplied after worn areas, indentations, scars, corrosion, etc., have been ground out within the permitted limits. Edges should be ground out within the permitted limits. Edges should be ground to at least a $3/16"$ smooth radius and all ground areas blended so as to leave no abrupt change in section. All grinding to be done parallel and not transverse to equalizer. Care must be taken to avoid frictional discoloration of the surface when grinding. (Refer to Fig. 7).

PROCEDURE-FOR RECLAIMING PASSENGER CAR CAR TRUCK EQUALIZERS (CONT)

V. Reclaiming by Welding (Refer to Fig. 4, 5 & 6)

- (a) No welding is permitted of cracks or fractures in any part of the equalizers. Where worn all equalizers can be restored to original dimensions under the following procedures, providing the material remaining in the equalizer is not less than as specified in Section V (b), however, written authority must be obtained from our Equipment Engineering Office prior to proceeding with welding repairs, except for rework by authorized shops for repairs within the limits in this procedure. Any equalizers with defects over the limits in Section V (b) will be held for further disposition.
- (b) Welding limits for reclamation
- 1) Equalizers less than 1 - 3/4" thick - 1/4" beyond wear limits.
 - 2) Equalizers greater than 1 - 3/4" thick - 3/8" beyond wear limits.
 - 3) Canton "I" Beam Equalizers - 3/8" thick beyond wear limits in flange and necks, 3/16" beyond wear limits in web area.
- (c) Surface to be welded shall be thoroughly cleaned before welding.
- (d) Where restoration is made by welding, the manual arc process using American Welding Society Class E-9016 or 9018 Electrodes shall be used (Except as Follows): When welding AISI 9840 steels and T-1 Steel use AWS Class E11016 or 11018 Electrodes.
- (e) Prior to welding with manual arc electrodes, all equalizers except T-1 Steel Bar Type, shall be pre-heated to a temperature of 400 to 500°F and should not be allowed to cool below 400°F during welding.
- (f) All worn areas shall be filled by running weld bead parallel and not transverse to equalizer whenever possible. Extreme care must be taken to to arc-burn any part of the equalizer.

PROCEDURE-FOR RECLAIMING PASSENGER CAR CAR TRUCK EQUALIZERS (CONT)

- (g) Finish all welded surfaces by grinding or machining, making sure that all scars and undercutting have been removed. All edges must be rounded leaving a smooth radius. Finish grinding must not be transverse to section and care must be taken to prevent frictional discoloration of the surface. (Refer to Fig. 7)
- (h) After welding all equalizers, except T-1 Steel Bar Type, must be normalized and tempered.

- 1) Equalizers requiring Normalizing shall be heated to the specified temperature at a rate not exceeding 500°F, temperature increase per hour.

Equalizers must not be placed initially in furnace if the furnace temperature exceeds 700°F. Furnace temperature for heat treating must effectively regulated and preferably be measured by use of a recording pyrometer.

- 2) Normalizing (All medium carbon steels - "Bar" Type, and AISI 9840 steel equalizers).

Heat in closed furnace to 1650°F and hold at this temperature for approximately one hour per inch of maximum thickness of equalizer. Remove from furnace and cool in still shop air, free from drafts.

- 3) Tempering - (All Equalizers, except for T-1 Steel Bar Type) - heat in a closed furnace to 1150°F and hold at this temperature for approximately one hour per inch of maximum thickness of equalizer. Remove from furnace and cool in still shop air, free from drafts.

NOTE: Equalizers having only attached wear pads built up by welding, do not require reheat treatment if the Brinell Hardness of the equalizer is within the specified range of BHN-163 to 212, or Canton. "I" Beam Type 229 - 227.

PROCEDURE-FOR RECLAIMING PASSENGER CAR CAR TRUCK EQUALIZERS (CONT)

- (i) When heating or cooling equalizers, they are not to be stacked on top of one another and are to be properly supported so as to permit uniform heating and cooling otherwise distortion may result.
- (j) All equalizers are to be Brinell Hardness Tested after Heat Treatment. (Refer to Section III).
- (k) After Treatment and Brinell Hardness testing, the equalizers shall be magnetic particle tested.
- (l) Before welding T-1 Steel Bar Type Equalizers written authority must be obtained from our Equipment Engineering Office prior to proceeding with any welding repairs.
- (m) Equalizers which are found to be cracked or fractured are to be scraped. These equalizers are to be painted with the letter "X" at various locations by the inspector with yellow paint. Also the equalizers must be cut and mutilate to prevent their being returned to service.

NOTE: Only the locations listed below are authorized to perform welding repairs on equalizers.

Beech Grove (Amtrak)
 Woodcrest (ICG)
 Topeka (AT & SF)
 Rocky Mount/INCO (SCL)
 Como (BN)
 Metal Weld Inc./Drever Co. (Mechtron)
 Rail Systems/J.P. Ross/Cal-Doran (RSI)

Additional locations will be authorized to perform welding repairs by written notification from this office.

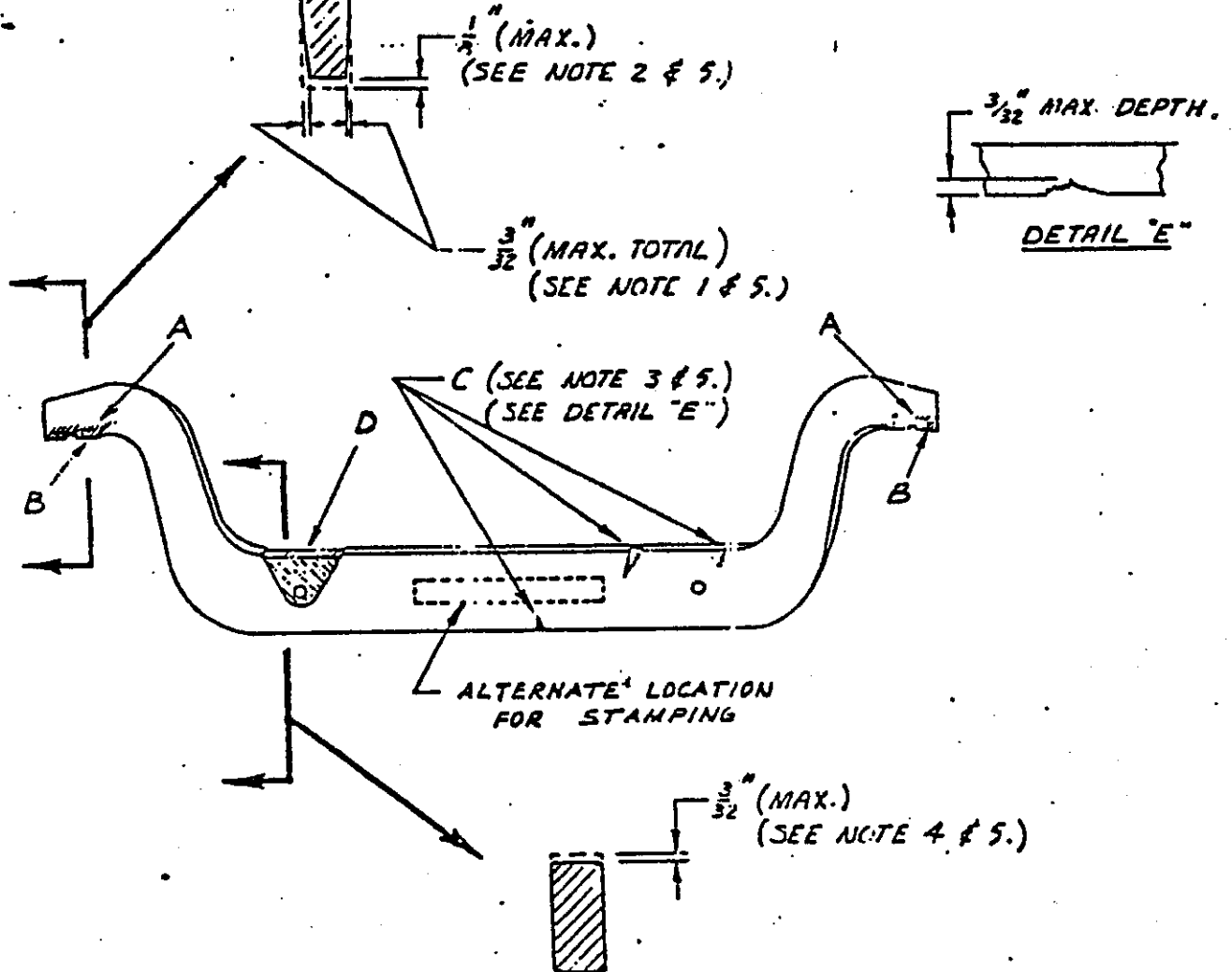
- (n) All weld operators shall be qualified and re-qualified on a six (6) month basis according to the ASME Boiler and Pressure Vessel Code or other testing and qualifying procedures presently in use by the authorized facilities to perform Welding repairs. These procedures shall be reviewed and approved by Amtrak.

LIMITS OF WEAR ON EQUALIZERS

BAR TYPE EQUALIZERS THAT ARE $1\frac{3}{4}$ " OR LESS IN THICKNESS

1. WHEN THE SIDES OF THE FOOT "A" ARE WORN TO A TOTAL OF $\frac{3}{32}$ ". THIS MAY OCCUR OVER THE ENTIRE AREA OF THE SIDE OF THE FOOT OR IT MAY BE IN A SMALL AREA WHICH EQUALIZER HAS CONTACTED THE POSTAL LINER.
2. WHEN THE FOOT FACE "B" OF THE EQUALIZER IS WORN $\frac{1}{8}$ ".
3. INDENTATIONS, SCARS, CORROSION, ETC, "C" IN ANY PORTION OF THE EQUALIZER MORE THAN $\frac{3}{32}$ " IN DEPTH.
4. THE ARCH OF THE EQUALIZER "D" UNDER THE SPRING SEAT WHEN WORN TO $\frac{3}{32}$ ".
5. ALL WEAR LIMITS ARE BASED ON THE ORIGINAL DRAWING DIMENSIONS INCLUDING THE MINIMUM TOLERANCE.

STAMP SHOP INITIALS,
MONTH AND YEAR
INSPECTED ON TOP
SURFACE. USE $\frac{3}{8}$ "
HIGH LETTERS

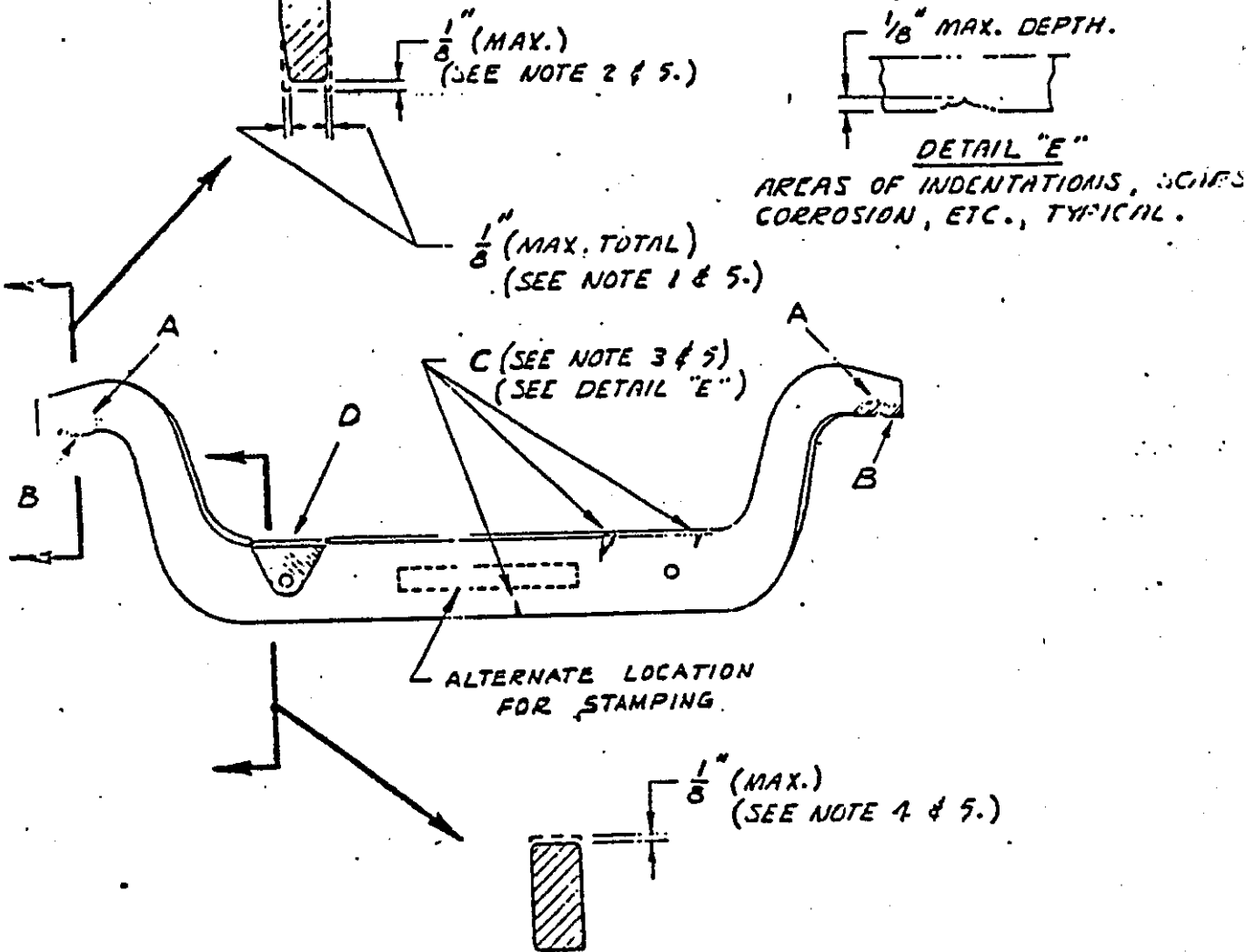


LIMITS OF WEAR ON EQUALIZERS

BAR TYPE EQUALIZERS GREATER THAN $\frac{3}{4}$ " IN THICKNESS

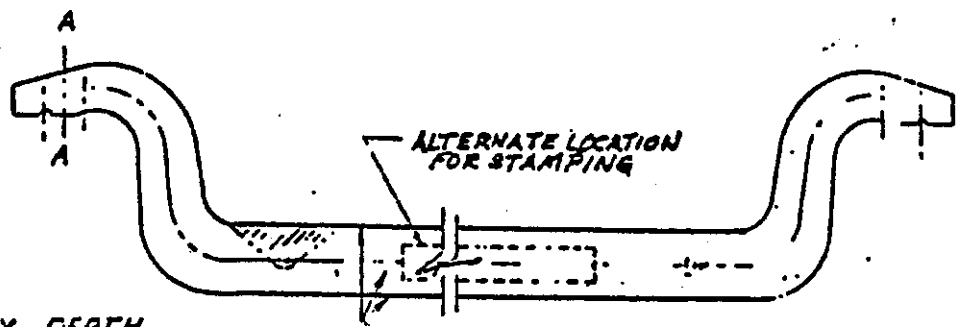
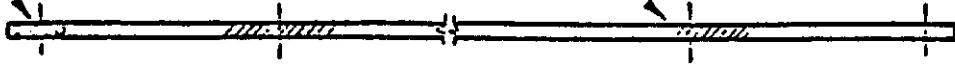
1. WHEN THE SIDES OF THE FOOT "A" ARE WORN TO A TOTAL OF $\frac{1}{8}$ " THIS MAY OCCUR OVER THE ENTIRE AREA OF THE SIDE OF THE FOOT OR IT MAY BE IN A SMALL AREA WHERE EQUALIZER HAS CONTACTED THE PEDESTAL LINER.
2. WHEN THE FOOT FACE "B" OF THE EQUALIZER IS WORN $\frac{1}{8}$ ".
3. INDENTATIONS, SCARS, CORROSION, ETC., "C" IN ANY PORTION OF THE EQUALIZER MORE THAN $\frac{1}{8}$ " IN DEPTH.
4. THE AREA OF THE EQUALIZER "D" UNDER THE SPRING SEAT WHEN WORN TO $\frac{1}{8}$ ".
5. ALL WEAR LIMITS ARE BASED ON THE ORIGINAL DRAWING DIMENSIONS INCLUDING THE MINIMUM TOLERANCE.

STAMP SHOP INITIALS,
MONTH AND YEAR
INSPECTED ON TOP
SURFACE. USE $\frac{3}{8}$ "
HIGH LETTERS.



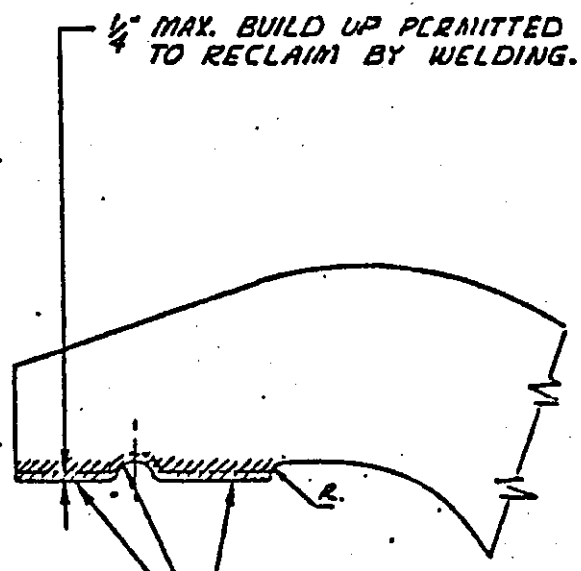
STAMP SHOP INITIALS, MONTH AND YEAR RECLAIMED ON TOP SURFACE. USE $\frac{3}{8}$ " HIGH LETTERS.

WORN EQUALIZER SPRING SEAT AREA SHALL BE BUILT UP AND GROUND TO ORIGINAL DIMENSIONS.



DETAIL "B"
INDENTATIONS OR SCORED AREAS SHALL BE GROUND AS SHOWN.

WELDING IS PERMITTED AT ALL LOCATIONS OF EQUALIZER PER SECTION V OF RECLAMATION INSTRUCTIONS. CRACKS OR FRACTURES SHALL NOT BE WELDED. LIMIT PERMITTED FOR RECLAMATION BY WELDING SHALL BE PER SECTION V (b). INDENTATIONS SHALL BE BUILT UP AND GROUND SMOOTH, EXCEPT WHEN WITHIN WEAR LIMITS PER FIGURE N^o 1, THEY SHALL BE GROUND AS SHOWN IN DETAIL "B".



SECTION "A-A"

WORN AREAS ON SIDES OF EQUALIZER FEET SHALL BE BUILT UP & GROUND FLUSH WITH SURFACE. LIMIT OF WEAR PERMITTED FOR RECLAMATION BY WELDING SHALL BE $\frac{1}{4}$ " ON EITHER OR BOTH SIDES.

RESTORE TO ORIGINAL CONFIGURATION.

REV. 2-10-75

AA/RAK C.M.O. 12/5/74

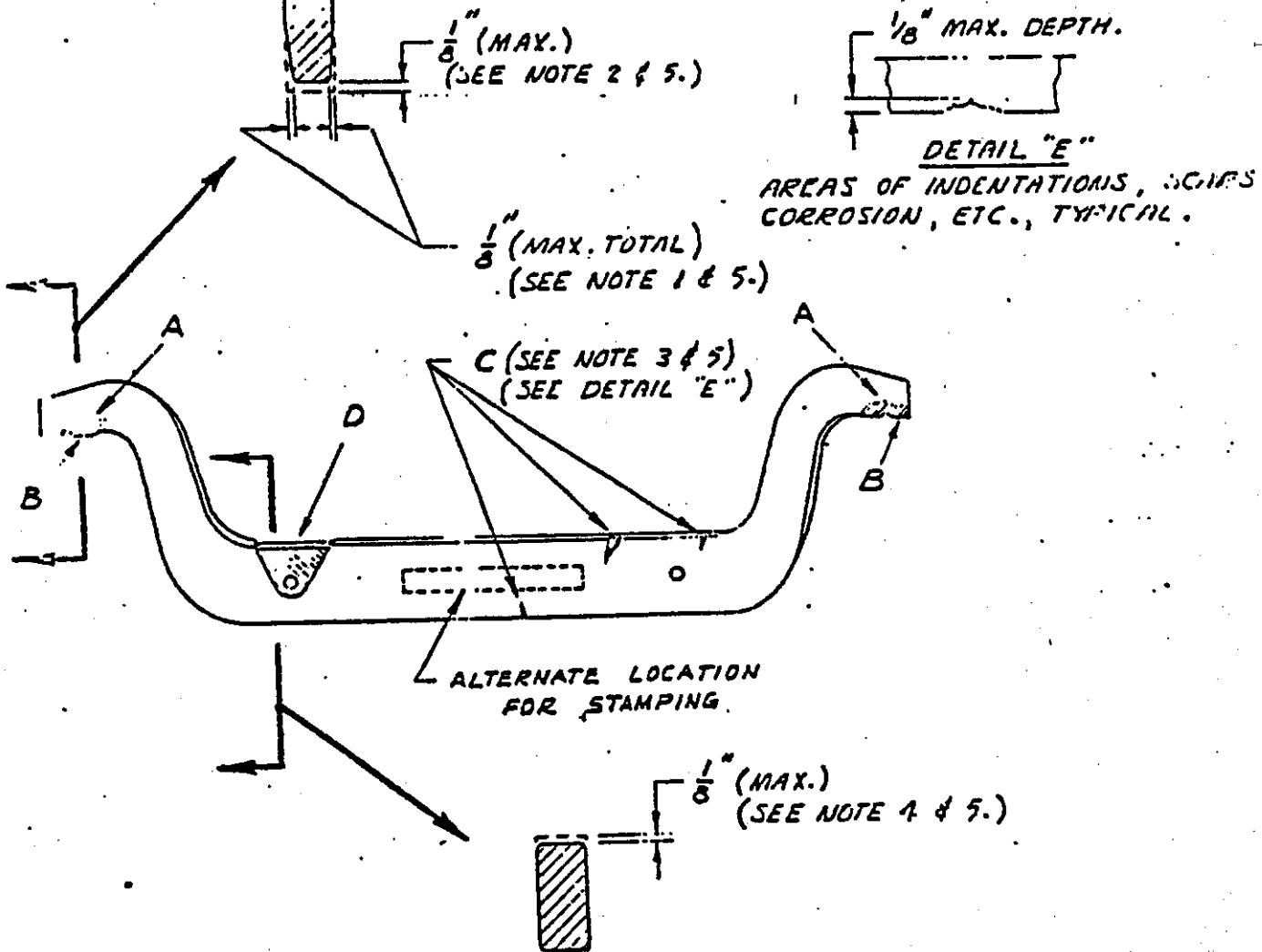
FIGURE N^o 4
WELDING RECLAMATION OF EQUALIZERS $1\frac{3}{4}$ " OR LESS IN THICKNESS WHICH EXCEED WEAR LIMITS SPECIFIED IN FIGURE N^o 1.

LIMITS OF WEAR ON EQUALIZERS

BAR TYPE EQUALIZERS GREATER THAN $\frac{3}{4}$ IN THICKNESS

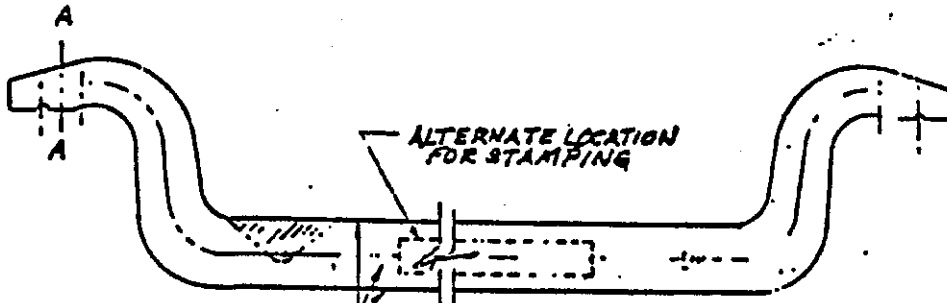
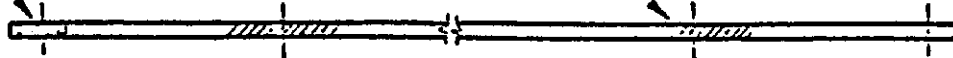
1. WHEN THE SIDES OF THE FOOT "A" ARE WORN TO A TOTAL OF $\frac{1}{8}$ " THIS MAY OCCUR OVER THE ENTIRE AREA OF THE SIDE OF THE FOOT OR IT MAY BE IN A SMALL AREA WHERE EQUALIZER HAS CONTACTED THE PEDESTAL INNER.
2. WHEN THE FOOT FACE "B" OF THE EQUALIZER IS WORN $\frac{1}{8}$ ".
3. INDENTATIONS, SCARS, CORROSION, ETC., "C" IN ANY PORTION OF THE EQUALIZER MORE THAN $\frac{1}{8}$ " IN DEPTH.
4. THE AREA OF THE EQUALIZER "D" UNDER THE SPRING SEAT WHEN WORN TO $\frac{1}{8}$ ".
5. ALL WEAR LIMITS ARE BASED ON THE ORIGINAL DRAWING DIMENSIONS INCLUDING THE MINIMUM TOLERANCE.

STAMP SHOP INITIALS,
MONTH AND YEAR
INSPECTED ON TOP
SURFACE. USE $\frac{3}{8}$ "
HIGH LETTERS.



STAMP SHOP INITIALS, MONTH AND YEAR RECLAIMED ON TOP SURFACE. USE $\frac{7}{8}$ " HIGH LETTERS.

WORN EQUALIZER SPRING SEAT AREA SHALL BE BUILT UP AND GROUND TO ORIGINAL DIMENSIONS.



$\frac{1}{2}$ " MAX. DEPTH

GRINDING LINE

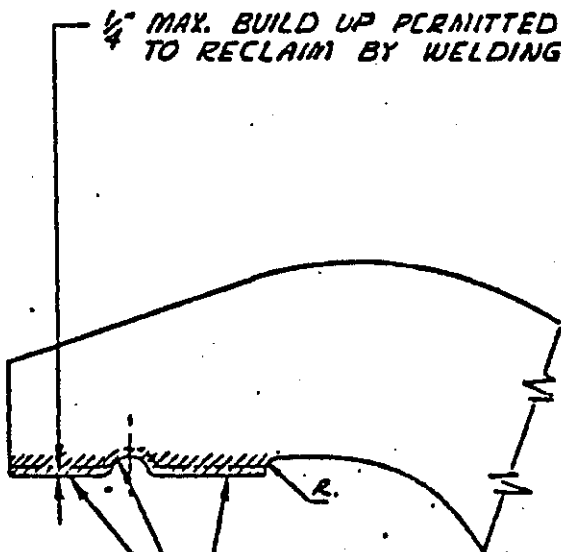


DETAIL "B"

INDENTATIONS OR SCORED AREAS SHALL BE GROUND AS SHOWN.

WELDING IS PERMITTED AT ALL LOCATIONS OF EQUALIZER PER SECTION V OF RECLAMATION INSTRUCTIONS. CRACKS OR FRACTURES SHALL NOT BE WELDED. LIMIT PERMITTED FOR RECLAMATION BY WELDING SHALL BE PER SECTION V (B). INDENTATIONS SHALL BE BUILT UP AND GROUND SMOOTH, EXCEPT WHEN WITHIN WEAR LIMITS PER FIGURE N°1, THEY SHALL BE GROUND AS SHOWN IN DETAIL "B".

$\frac{1}{4}$ " MAX. BUILD UP PERMITTED TO RECLAIM BY WELDING.



WORN AREAS ON SIDES OF EQUALIZER FEET SHALL BE BUILT UP & GROUND FLUSH WITH SURFACE. LIMIT OF WEAR PERMITTED FOR RECLAMATION BY WELDING SHALL BE $\frac{1}{4}$ " ON EITHER OR BOTH SIDES.



SECTION "A-A"

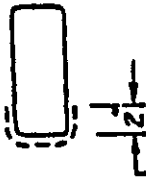
RESTORE TO ORIGINAL CONFIGURATION.

REV. 2-10-75

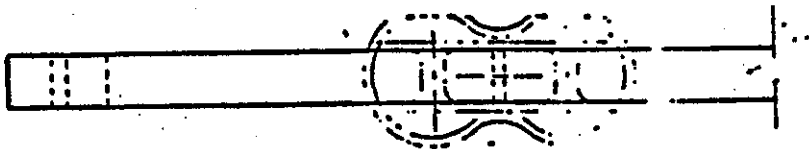
AMTRAK C.M.O. 12/5/74

FIGURE N° 4
WELDING RECLAMATION OF EQUALIZERS $1\frac{3}{4}$ " OR LESS IN THICKNESS WHICH EXCEED WEAR LIMITS SPECIFIED IN FIGURE N° 1.

PASSENGER CAR TRUCK EQUALIZER RECLAMATION PROCEDURE (CONT.)



HAND GRIND 4 CORNERS ALL AROUND
& UP 2" FROM BASE AS SHOWN. SEE
GRIND NOTES 1 & 3.



GRIND SMOOTH
& TRUE TO ORIGINAL
DRAWING DIMENSIONS

TOP & SIDE SURFACES
GRIND SMOOTH & TRUE
IN THIS AREA. GRIND
SIDE IF NECESSARY.

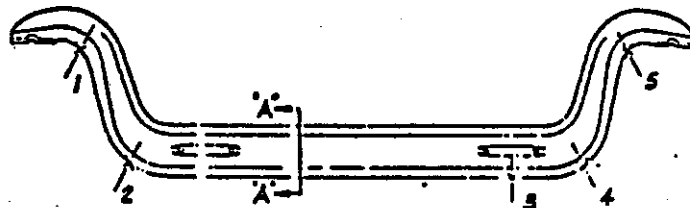
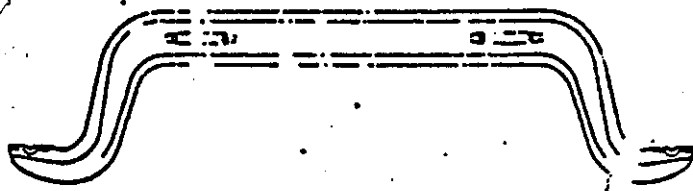
GRIND NOTE 2.

GRIND NOTE 3.

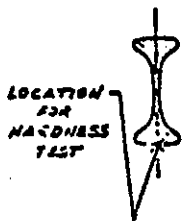
GRIND NOTES:

1. HAND GRIND 4 CORNERS TO $\frac{3}{16}$ " R. APPROX. ALL AROUND.
2. HAND GRIND TOP SURFACE MARKED -----
3. HAND GRIND BOTTOM SURFACE MARKED -----
4. ALL GRIND MARKS TO RUN LONGITUDINALLY.
5. ALL GRINDING TO BE DONE WITH N° 60 TO 80 GRIT
6. DO NOT OVERHEAT OR CAUSE FRICTIONAL DISCOLORATION
WHEN GRINDING.

FIGURE N° 7
EQUALIZER GRINDING PROCEDURE



- NOTES:
- 1) GIVE ALL IDENTIFYING MARKS THAT ARE STAMPED OR CAST ON EQUALIZER.
 - 2) SHOW EACH DEFECT AND IDENTIFY AS TO WHAT DAMAGE, CRACK, ETC.
 - 3) GIVE LENGTH, WIDTH, & DEPTH OF EACH DEFECT.
 - 4) GIVE LOCATION OF DEFECT FROM EACH END OF EQUALIZER.
 - 5) GIVE LOCATION OF DEFECT FROM CENTER LINE OF EQUALIZER AT EACH NUMBERED POINT.
 - 6) GIVE HARDNESS TEST TO BE TAKEN AT CENTER LINE OF EQUALIZER AT EACH NUMBERED POINT.



SECTION-A-A

TAG No. _____

SHOP OR YARD: _____

ANTRAK CAR No. _____

TRUCK FRAME CASTING No. _____

INSPECTED BY: _____

DATE: _____

INSPECTION REPORT
EQUALIZER, I-BEAM TYPE
 CMO - 14

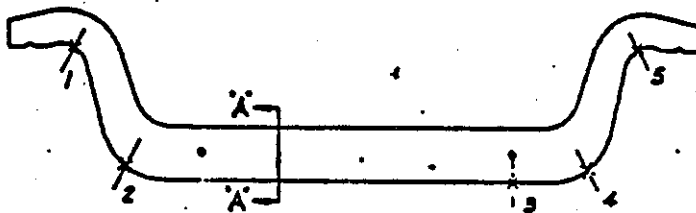
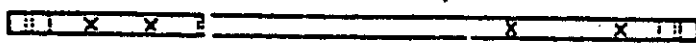
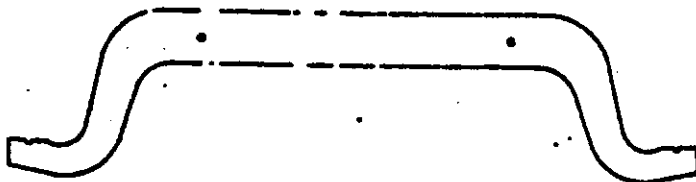
TO BE FILLED OUT BY EQUIPMENT ENGINEER

Lot No. _____

TRUCK Dwg. No. _____

EQUALIZER Dwg. No. _____

DISPOSITION: _____



- NOTES:
- 1) GIVE ALL IDENTIFYING MARKS THAT ARE STAMPED OR CAST ON THE BAR.
 - 2) SHOW EACH DEFECT AND IDENTIFY AS TO WHAT DAMAGE, CRACK, ETC.
 - 3) GIVE LENGTH, WIDTH, & DEPTH OF EACH DEFECT.
 - 4) GIVE LOCATION OF DEFECT FROM EACH END OF BAR.
 - 5) GIVE LOCATION OF DEFECT FROM CENTER LINE OF BAR AT EACH NUMBERED POINT.
 - 6) GIVE HARDNESS TEST TO BE TAKEN AT CENTER LINE OF BAR AT EACH NUMBERED POINT.



SECTION-A-A

TAG No. _____

SHOP OR YARD: _____

ANTRAK CAR No. _____

TRUCK FRAME CASTING No. _____

INSPECTED BY: _____

DATE: _____

INSPECTION REPORT
EQUALIZER, BAR TYPE
 CMO - 15

TO BE FILLED OUT BY EQUIPMENT ENGINEER

Lot No. _____

TRUCK Dwg. No. _____

EQUALIZER Dwg. No. _____

DISPOSITION: _____