



MAINTENANCE INSTRUCTION

DRAFT GEAR ASSEMBLIES

DESCRIPTION

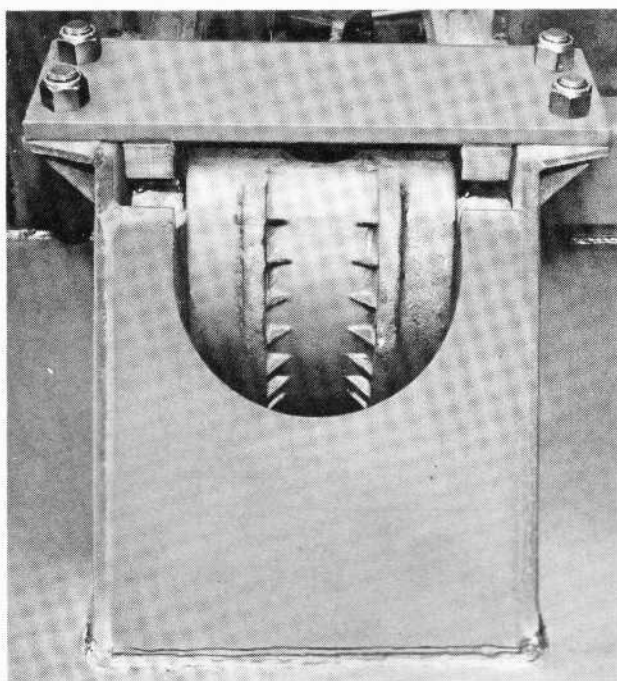
The powerful force exerted by the locomotive to pull its train is applied through the draft gear assembly and coupler of the locomotive. The draft gear must not only withstand the entire pulling power of the locomotive, but in addition, it must be capable of absorbing the impact shock during coupling and starting, and be sufficiently flexible to conform to the small fluctuations of load during operation.

Since rubber is recognized as one of the best materials for cushioning vibration and shock, the

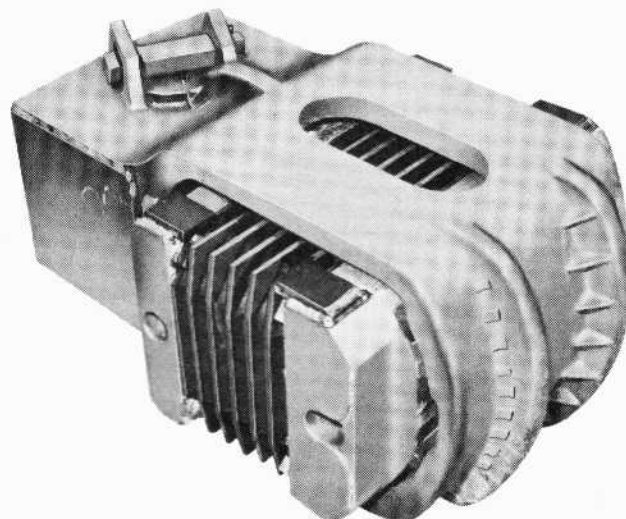
current design rubber draft gear is best suited for the severe service of modern railroads. A current design rubber draft gear and its application in the draft gear pocket is shown in Fig. 1.

Although there are a number of different designs of rubber draft gears outlined in this instruction, they all operate on the same principle, differing primarily in size and capacity. The original selection of the draft gear is determined basically by the number of power units that will operate together and the kind of service in which the locomotive will operate.

The draft gear assembly consists of the draft gear and its yoke, Figs. 2 and 3, to which the coupler is



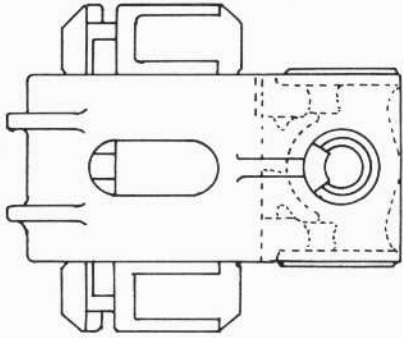
17576



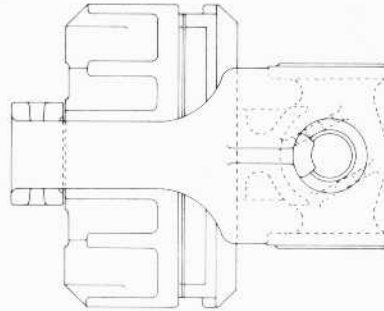
17577

Fig.1 - Typical Draft Gear And Application

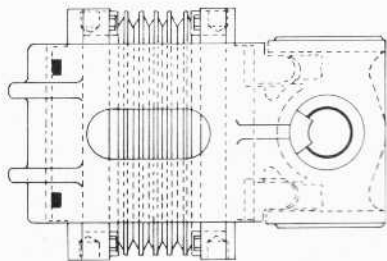
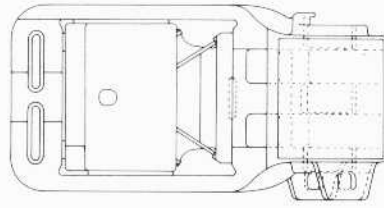
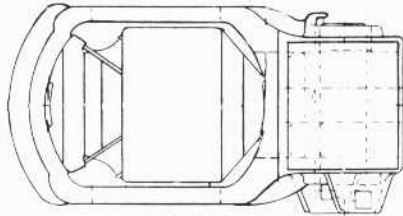
*This bulletin is revised and supersedes previous issues of this number.



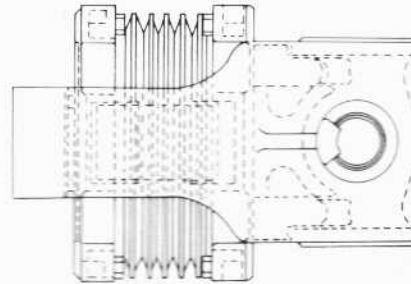
M-380-A
M-380-B



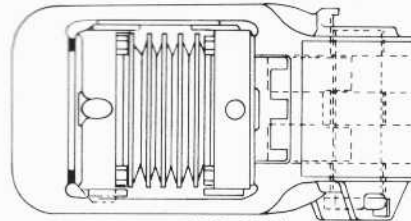
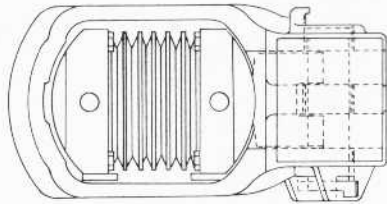
M-381
M-381-A



NC-390

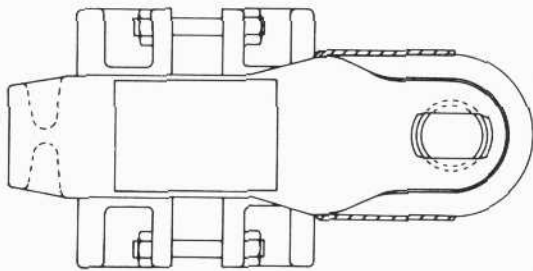


NC-391
NC-393



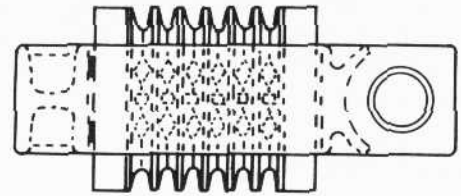
25446

Fig.2 - Draft Gear To Yoke Application



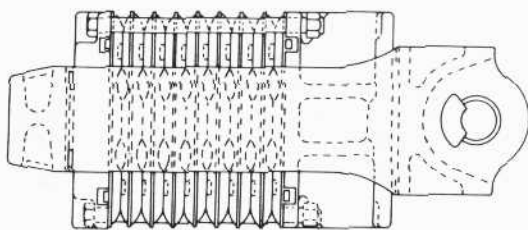
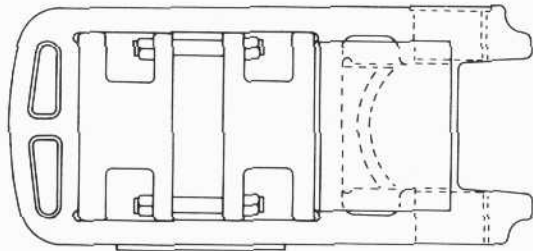
DR-6

14544



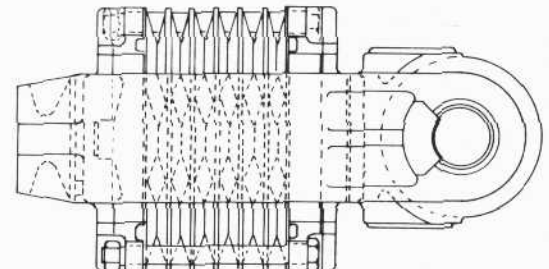
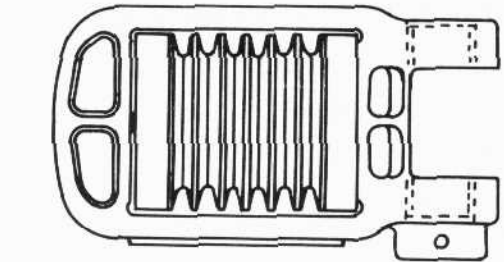
MI-225-6A

14543



MS-485-6A And MF-491-B

14542



MS-488-6A

25431

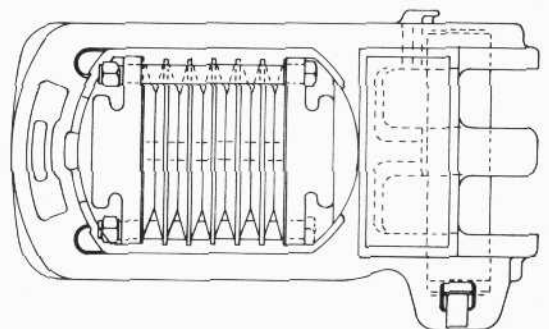
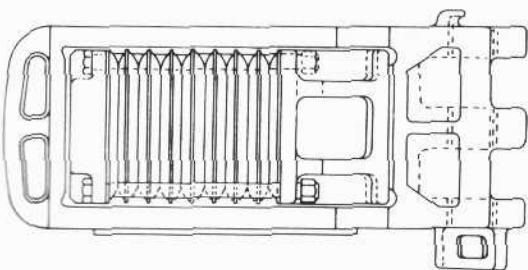


Fig.3 -Draft Gear Details

pinned. When the locomotive is exerting force, the force is transmitted through the draft gear pocket to the draft gear, then through the yoke to the coupler. The draft gear then is interposed between the draft gear pocket, which is an integral part of the locomotive underframe, and the yoke which is connected to the locomotive coupler.

MAINTENANCE

To ensure satisfactory service, the draft gear assemblies should be maintained according to the following recommendations and in compliance with Federal Railroad Administration regulations.

NOTE

Clearance and dimensional limits used in this instruction are defined as follows:

1. New limits are those to which new parts are manufactured (drawing tolerances).
2. Rebuild limits are dimensions which should not be exceeded at the time of rebuild, in order to ensure satisfactory service until the time of the next scheduled overhaul.
3. Condemning limits are dimensions beyond which satisfactory operation cannot be assured. Parts having clearance and/or dimensional measurements beyond these limits should not be used.

Where extremely low wear rates are normally experienced or where wear is not a highly critical factor, the rebuild limits and condemning limits may be identical.

INSPECTION ON LOCOMOTIVE

The draft gear should be inspected to see that it is tight in the proper length pocket and that its appearance indicates the gear has been functioning properly.

CHECKING LATERAL DISPLACEMENT ON COUPLER WITH ALIGNMENT CONTROL DRAFT GEAR

Draft gears with alignment control can be checked for wear of the alignment control mechanism by measuring the coupler lateral movement, as shown in Fig. 4. The alignment control normally provides a free lateral movement of the coupler of 51 mm (2") either side of the center measured at the coupling centerline, or a total movement of 102 mm (4"). The maximum allowable lateral movement is 102 mm (4") to each side of the coupling centerline, or a total

movement of 203 mm (8"). The following method should be used to determine the amount of coupler movement.

1. Pry draft gear and yoke from underneath the locomotive until the front face of the draft gear is contacting the front yoke pocket surface, as shown in Fig. 4a.
2. Pry coupler toward locomotive to take up any wear in the coupler-yoke connecting pins and bushings, as shown in Fig. 4b.
3. Gently move coupler to one side where contact is made with the alignment plunger and the coupler wing, as shown in Fig. 4c. Use a 3.2 mm (1/8") round rod between the coupler and coupler carrier to facilitate movement of the coupler.

CAUTION

Do not move coupler after plunger and coupler wing make contact, as the coupler will move forward, taking up any clearance between the pin and bushing, causing an erroneous reading.

4. Mark the location of coupler by using a plumb bob suspended from the coupler pulling face and mark on the ground or other convenient surface.
5. Swing the coupler to the other extreme position with the same caution used in Step 3 and mark the location.
6. The straight line distance between the two marks indicates the total coupler free swing. If this exceeds 203 mm (8") total or 102 mm (4") from the coupler centerline to either extreme, as shown in Fig. 4c, the plunger castings and/or coupler alignment wings require maintenance.

CHECKING FREE SLACK

The draft gear, yoke and coupler on the locomotive should also be inspected for total free slack. If the total free slack of these parts is found to be 12.7 mm (1/2") or more, the draft gear and coupler should be removed and reconditioned to maintain the slack within the 12.7 mm (1/2") limit.

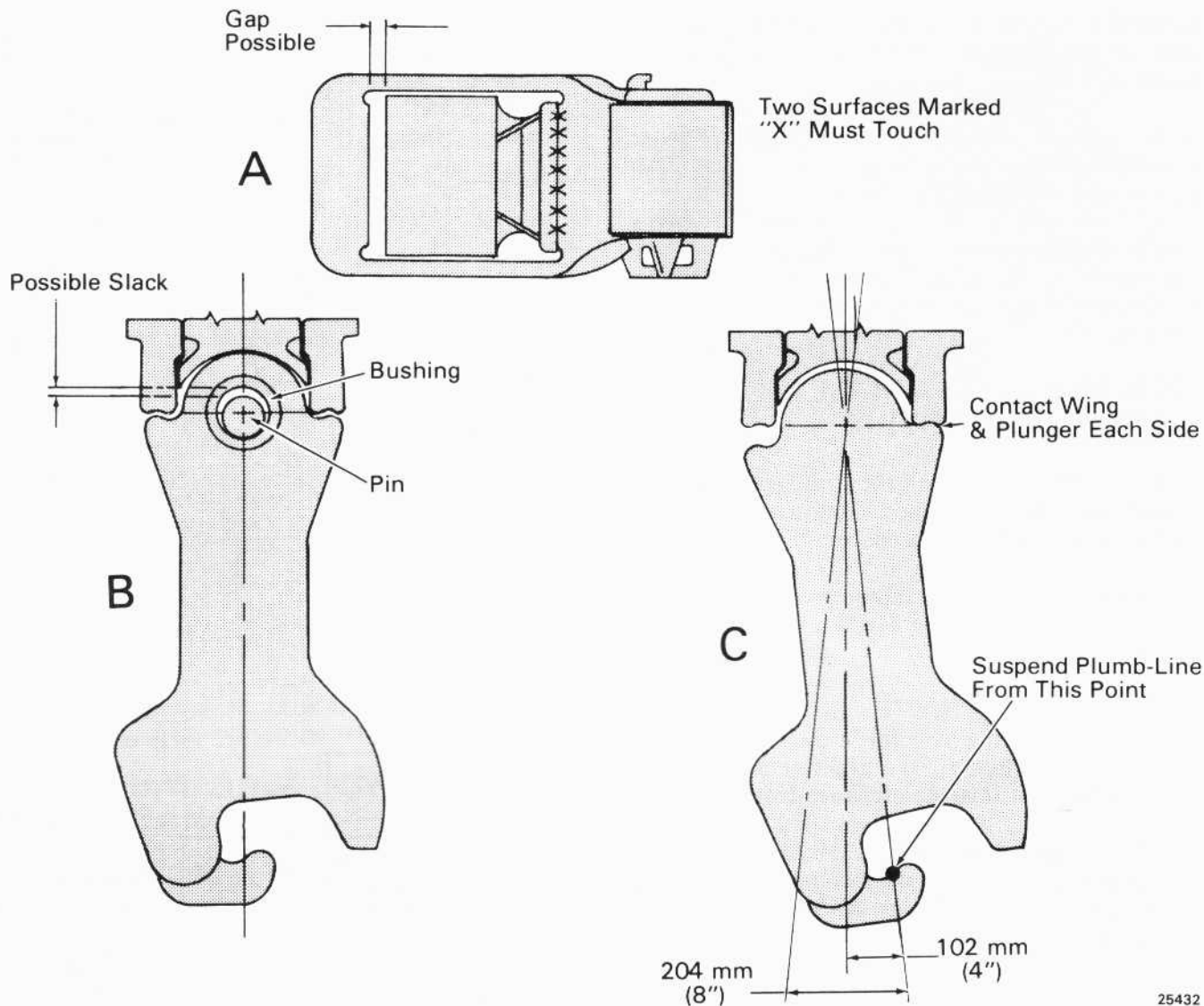


Fig.4 - Alignment Control

The total free slack may be determined as follows:

1. Bar the coupler and draft gear "in" as far as possible.

NOTE

This should be done manually so the draft gear will not be compressed. Using another locomotive to push the coupler "in" or pull the coupler "out" is not recommended as this would compress the draft gear which would give an incorrect slack indication.

2. After the coupler is pushed "in," measure from a point on the coupler to the end sill of the locomotive.
3. Bar the coupler and draft gear assembly "out" as far as it will go after taking the measurement in Item 2.

4. With the coupler and draft gear assembly "out" as far as it will go, take another measurement, using the same reference points as used in the Item 2 measurement.

5. The difference between the Item 2 and Item 4 measurement is the total free slack.

If either the total lateral movement of the coupler is more than 203 mm (8") in the case of alignment control assemblies or the total free slack is more than 12.7 mm (1/2"), the entire assembly should be removed to permit reconditioning.

RUBBER PAD INSPECTION

Visual inspection of the draft gear rubber pads can be misleading. Separation of the rubber from the steel plates and the rubber cracking and breaking off

in small pieces or shredding is a natural condition and occurs when the draft gear is subjected to heavy-duty service.

If upon inspection the rubber is completely loose from the steel plate, it will not be necessary to remove the draft gear immediately. The draft gear may be retained in service as cushioning capacity is still available. However, the gear pads should be changed out at the earliest convenient time since the steel plates, previously bonded to the rubber, have a tendency to creep out of the wedge block.

REMOVING DRAFT GEAR FROM LOCOMOTIVE

The method of removing the draft gear from the locomotive varies with the locomotive model. The following is a typical procedure:

1. Remove coupler by removing yoke pin retainer from bottom of yoke head and removing yoke pin.

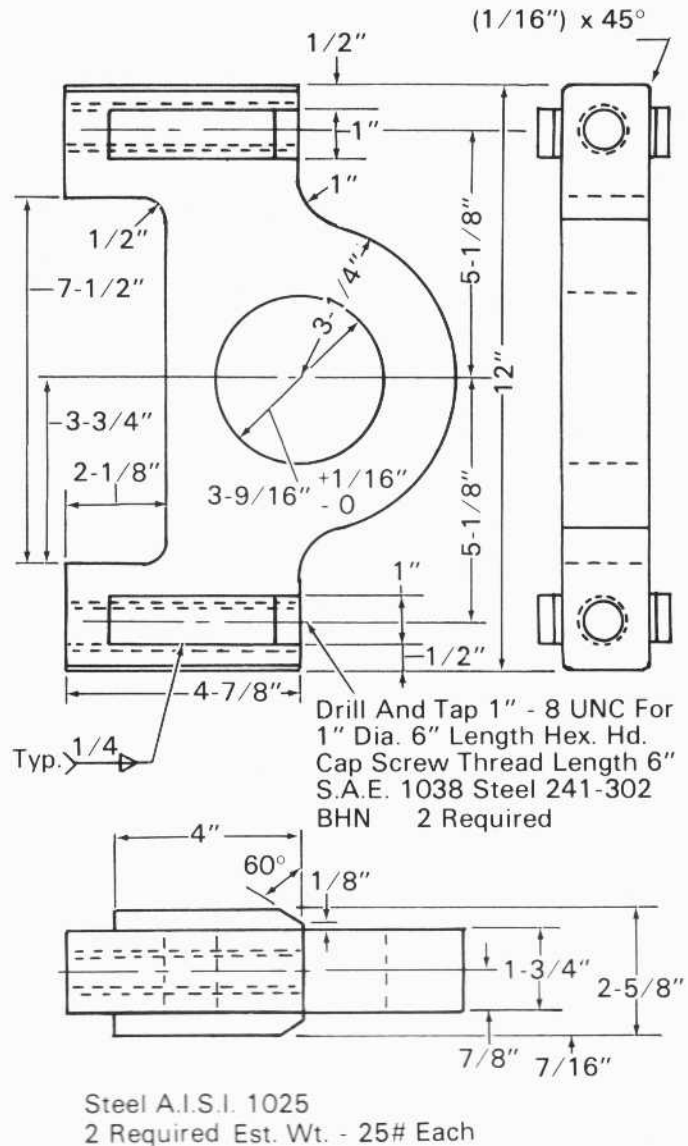
NOTE

To remove spring assembly from the yoke of the NC-393 model, see alignment control paragraphs of this Maintenance Instruction.

2. If rubber pads have taken considerable set, the gear will be loose in the locomotive pocket. In this case, gear and yoke can be easily lowered from locomotive when yoke support is removed.
3. If the locomotive has not been removed from trucks, check the clearance below the draft gear. It may be necessary to jack the locomotive off the trucks.
4. The draft gear is removed by placing extended jacks under the draft gear, removing the carrier irons and jacking the draft gear down, out of the draft gear pocket. The draft gear should come out of the pocket by its own weight.
5. The draft gear may then be removed from its yoke.

Removal of the NC-390, 391, and 393 draft gear models may require the jacking fixture shown in Fig. 5. Place jacking fixture in yoke head as shown in Fig. 6, using yoke pin to hold fixture.

Compress gear with fixture by tightening bolts sufficiently to place blocks between front of gear and yoke.



METRIC CONVERSION CHART			
in.	mm	in.	mm
1/16"	1.6	2-5/8"	66.7
1/8"	3.2	3-1/4"	82.6
1/4"	6.4	3-9/16" ^{+1/16} / ₋₀	90.5 ^{1.6} / ₋₀
7/16"	11.1	3-3/4"	95.3
1/2"	12.7	4"	101.6
7/8"	22.2	4-7/8"	123.8
1"	25.4	5-1/8"	130.2
1-1/4"	31.8	7-1/2"	190.5
2-1/8"	54	12"	304.8

Fig.5 - Jacking Fixture For NC-390, 391 And 393

25433

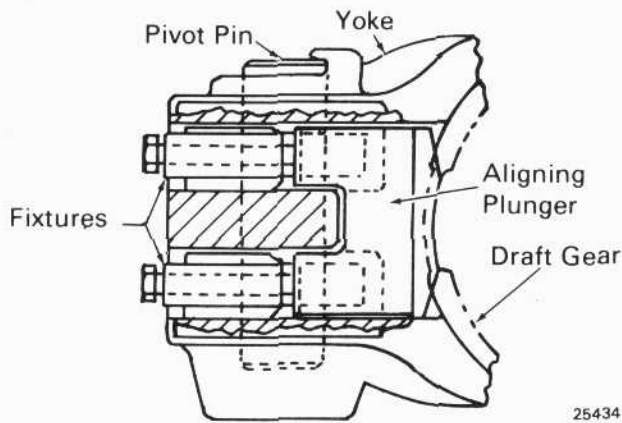


Fig.6 - Jacking Fixture Applied
And Gear Compressed

Remove fixture from yoke head unless locomotive structure provides enough clearance for removal of yoke with fixture in place. In this case, omit application of preshortened blocks.

Lower gear and yoke from locomotive pocket. This assembly weighs about 5000 kg (1100 lbs).

Remove jacking fixture, if still applied. Draft gear is now loose in yoke and can be removed easily.

INDIVIDUAL DRAFT GEAR MAINTENANCE

MODELS M-380-A, M-380-B, M-381 AND M-381-A

The wedge type draft gear, Fig. 7, is the most common type used on EMD locomotives. The M-380-A, M-380-B, M-381, and M-381-A are similar in function, but vary in size and shape.

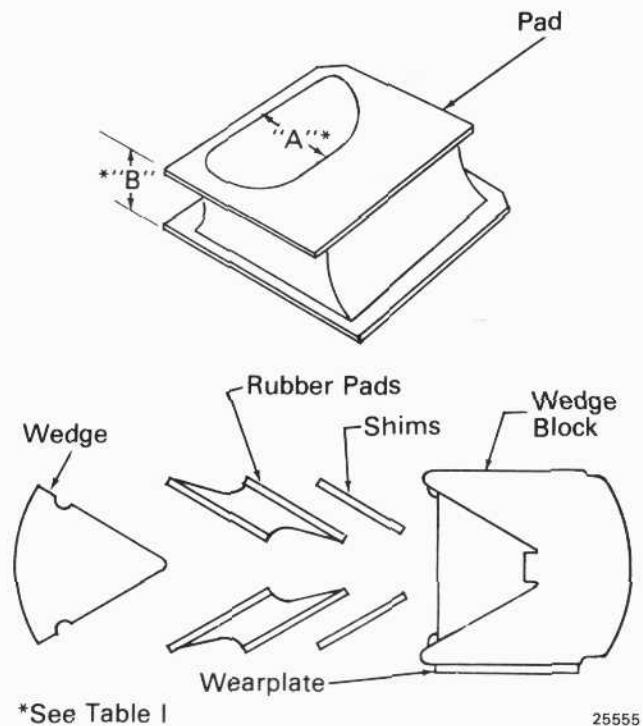
DISASSEMBLY

Special clamps may be made to hold the draft gear compressed to aid in removal or application of the draft gear to its yoke. See Fig. 8 for details of construction and application of the draft gear clamps.

1. Using suitable press or other means, compress the draft gear to enable application of the holding clamps as shown in Fig. 8.
2. After the clamps are applied, remove the draft gear from its yoke. Apply compression pressure to the gear, remove the clamps and slowly remove the holding pressure.
3. After removal of the clamps, the individual parts of the draft gear can be removed.



9836



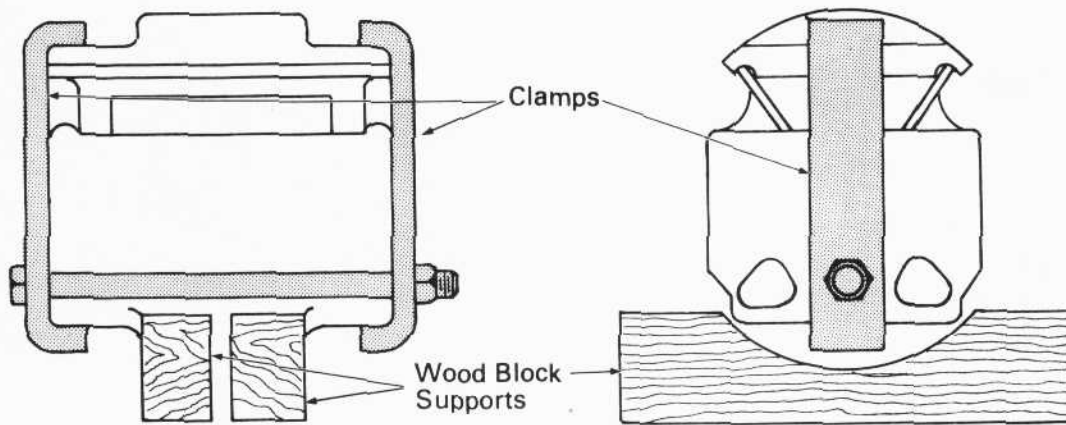
25555

Fig.7 - Wedge Type Draft Gear Details

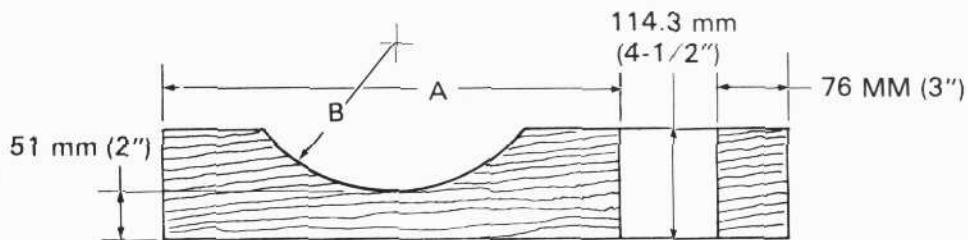
INSPECTION

WEDGE

Using a magnaflux procedure, inspect the wedge for cracks. Magnaflux gray powder provides a good contrast. If any cracks are found, the wedge should not be used. (Any magnaflux machine such as KRH2D capable of providing 600-700 amperes may be used.)

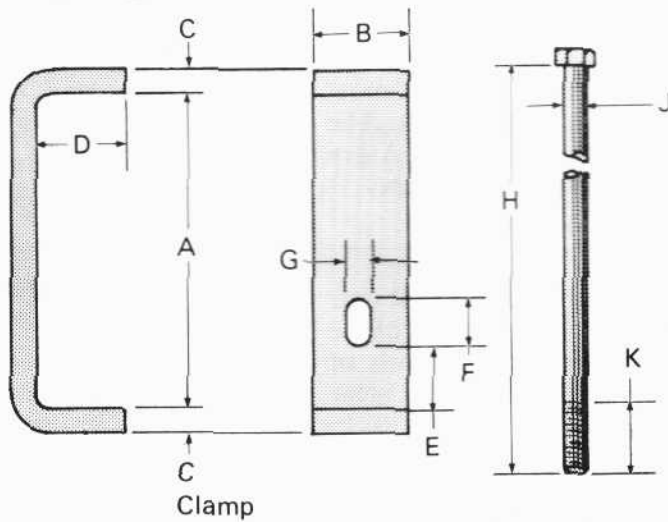


APPLICATION OF CLAMPS



Wood Block Support - 2 Req'd Per Gear

Gear Type	A	B
M-380-A & M-380-B	381 mm (15")	213 mm (8-3/8")
M-381 & M-381-A	Has a flat bottom	



Steel-2 Req'd Per Gear

Steel-1 Req'd Per Gear

Gear Type	A	B	C	D	E	F	G	H	J	K
M-380-A & M-380-B	336.6 mm (13-1/4")	102 mm (4")	28.6 mm (1-1/8")	95.3 mm (3-3/4")	69.9 mm (2-3/4")	51 mm (2")	25 mm (1")	711 mm (28")	22.2 mm (7/8")	63.5 mm (2-1/2")
M-381 & M-381-A	336.6 (13-1/4")	102 mm (4")	28.6 mm (1-1/8")	95.3 mm (3-3/4")	69.9 mm (2-3/4")	51 mm (2")	25 mm (1")	711 mm (28")	22.2 mm (7/8")	63.5 mm (2-1/2")

Fig.8 - Draft Gear Clamps And Supports

WEDGE BLOCK

Also magnaflux inspect the wedge block for cracks. The wedge block should not be used if any evidence of cracks is found.

If the wedge block is equipped with wear plates, examine the plates for excessive gouging, scuffing and washboard type wear; that is, wear of a wavy pattern, or wear to 3.2 mm (1/8") thickness or less. If any of these items are apparent, replace the wear plates with new plates of proper thickness.

Inspect the shims, if used, in the wedge block to determine that they are secured in place at about 102 mm (4") intervals along their length by suitable tack welds of about 25 mm (1") length. (It may be necessary to replace shims during assembly of the draft gear to maintain correct heights.) Shim sizes for the draft gears are shown in Table I in the Service Data.

RUBBER PADS

The rubber pads, Fig. 7, should be inspected for condition of the rubber, to see that they are not oil soaked. Oil soaked pads, although of correct thickness (dimension "B"), have no cushioning capacity and should be replaced. If oil soaked pads are found, the source of the oil on the locomotive should be located and stopped.

The rubber pads should be checked for the amount of bonding to both plates. This can be measured by placing a thin metal scale between the rubber and the steel plate at about 25 mm (1") intervals at each side of the pad. The depth to which the scale enters may be measured at the edge of the steel plate and this measurement marked on top of the plate using chalk. By connecting these marks, an outline of the bonded area may be shown on top of the plate, as indicated on the pad shown in Fig. 7, having the "A" dimension.

The dimension of the bonded area should be measured as shown by dimension "A" on the pad in Fig. 7. If this dimension is less than the required amount given in Table I in the Service Data, the pad should be replaced. If the pads have sufficient bonding and no deep cracks are found, they may be reapplied.

The pads should also be inspected for the thickness dimension "B" as shown on the pad in Fig. 7. If the "B" dimension is less than the figure given in Table I, the rubber pad should be replaced.

When replacing rubber pads the following rules should be noted:

1. Rubber pads should be renewed in complete sets, new and old pads should not be used together.
2. Old pads are not interchangeable between draft gears.
3. Both natural and synthetic rubber are used in draft gears. The shear-compression pads as used in the M-380-A and M-381 arrangement are made of natural rubber and can be identified by the steel plates having one of their corners cut off 15.9 mm (5/8") x 15.9 mm (5/8") or by the part number 28537 embossed on the short side of the rubber.
4. The M-380-B and M-381-A draft gear assemblies use higher compression pads than the M-380-A and M-381 assemblies. The pads are made of natural rubber and can be identified by the number 47801 embossed on the long side of the pads or by the yellow paint on the long side of the metal plate.

ASSEMBLY

After all components of the draft gear have been inspected and found to be satisfactory for reuse or replaced by new parts, the gear may be assembled again for application to its yoke.

1. As shown in Fig. 9, place the wedge block on the two cradle blocks. Install the rubber pads and apply the pad wedge on top of the rubber units. Position the wedge so that it is centered in the block.
2. Measure, as outlined under "Yokes," dimension "A," Fig. 23, to determine if the yoke qualifies to be reused. See Table II in the Service Data.
3. After the parts of the draft gear have been assembled together, press the assembly to settle the parts, then release. Measure the overall height, as shown in Fig. 10.

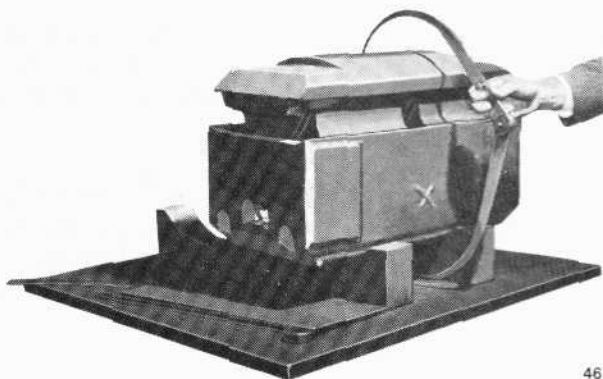
The total overall height of the draft gear should be 3.2 mm (1/8") to 4.8 mm (3/16") greater than its corresponding yoke new diameter if old rubber pads are reapplied, and 4.8 mm (3/16") to 6.4 mm (1/4") greater if new rubber pads are used.

If the gear does not come up to the required height with used pads, remove any shims which may



4676

Fig.9 - Assembly Of Draft Gear



4677

Fig.10 - Measuring Draft Gear

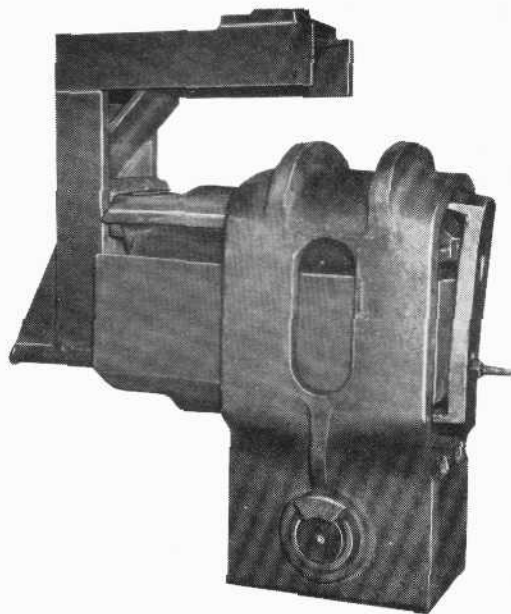
already be in the gear and apply one steel shim of proper thickness to each of the two pad bearing surfaces in the wedge block. (It should be noted that the wedge will be raised a height equal to about twice the shim thickness used.) The thickness of the shim is not to exceed 4.8 mm (3/16") and both shims must be of equal thickness. If the overall height of the gear cannot be obtained using shims of 4.8 mm (3/16") maximum thickness, new rubber pads and shims of suitable thickness must be applied.

When the proper overall height is obtained, the gear should be placed under a press and compressed

sufficiently to permit application of the clamps or other means to hold the gear compressed so as to permit application to the yoke.

APPLICATION OF DRAFT GEAR TO YOKE

After the assembly of the draft gear and application of its clamps, the draft gear is applied to its yoke with the block at the coupler end as shown in Fig. 11.



4681

Fig.11 - Draft Gear To Yoke Application

The gear should be compressed sufficiently to enable free entrance into the yoke. This will provide a clearance between the yoke and the draft gear which should be held to enable easy application of the draft gear and yoke assembly to the draft gear pocket. To hold this clearance, apply two phenolic blocks about 9.5 mm (3/8") thick between the draft gear and its yoke, then release the draft gear compression. If phenolic blocks are not available, two 9.5 mm (3/8") nuts may be used.

A lifting fixture, shown in Fig. 11, to facilitate draft gear to yoke application, may be made according to construction details shown on print 8107525 which is available upon request.

MODELS NC-390 AND NC-391

Models NC-390 and NC-391 draft gears, Fig. 12, consist of pads made of steel plates with a rubber cushion bonded to each side. End pads have rubber only on one side of the plate. The pads are kept in relative position by a rubber protrusion on the side of the pad which fits into a slot on the adjacent pad. The pads are held together by the pressure applied by the yoke.

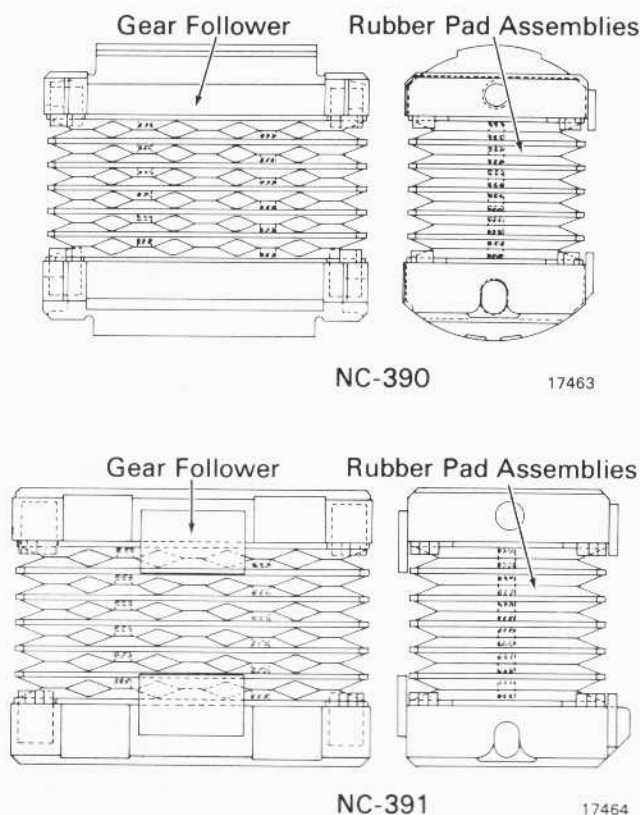


Fig.12 – NC-390 And NC-391
Draft Gear Assemblies

DISASSEMBLY

Do not disassemble this gear unless it is apparent that one or more of the pads are damaged. The pads can be pulled apart when the draft gear is removed from the yoke.

CAUTION

When storage of the synthetic rubber pads is required, be sure to store them where they are not exposed to direct sunlight or damage may occur.

INSPECTION

The pads should be inspected to see that they are firmly bonded to the plates. Check that the pad location protrusions are intact and not broken off. Pads which are not securely bonded or have the locating protrusions broken off should not be used. A good used pad which has taken a set should replace a pad in a group of pads which have likewise taken a set. A new pad should not be used with old pads.

The follower block surfaces should be inspected for any roughness or gouging and smoothed down.

ASSEMBLY

The draft gear assembly in the free state (not compressed in any way) should always be at least 12.7 mm (1/2") to 19.1 mm (3/4") larger than the yoke pocket in which it is to be used. During use the individual pads take a set, the amount depending upon length of service and forces applied. After use, the set stabilizes and reaches a point where any further set is unlikely to occur. The capacity of the draft gear is not affected by the set as long as the individual pads are in otherwise good condition. Therefore, a draft gear having used pads needs only be slightly larger than the opening in which it is to fit.

If the free length of the used draft gear is slightly less than the yoke pocket in which it is to be used, steel shims may be applied to the inside surface of the follower block to lengthen the assembly. The shims should be at least 3.2 mm (1/8") thick and should be securely held in place by tack welds on the vertical edge of the follower.

As stated under "Inspection," used pads from another assembly may be added to other used pads in a gear to give the needed compression for gear application to the yoke. It may also be required to use a combination of used pads and/or shims to obtain a free height of the gear greater than the yoke pocket in which it is to be applied. If the assembly cannot satisfactorily be made up using shims and/or other used pads, a new gear assembly should be applied.

In either case, after assembly the gear should be put in a press to force the pads together.

APPLICATION OF DRAFT GEAR TO YOKE

1. Remove banding from gear (if used) but do not allow the pads and followers to separate.

NOTE

Before applying draft gear to yoke, two assembly clamps must be made, as shown in Fig. 13; and a 68 tonne (75 ton) press with an opening height of 914 mm (36") must be obtained.

2. Place draft gear in the press and compress it enough to apply the assembly clamps. Release press slowly so that clamps hold gear in a preshortened state.
3. Place yoke head down in press with both alignment control plungers installed.

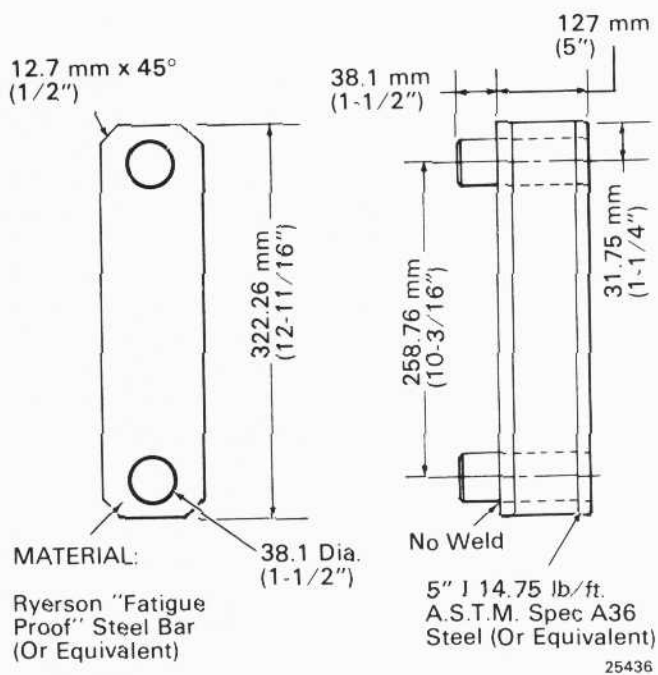


Fig. 13 - NC-390 Or NC-391 Assembly Clamp

- Slide clamped gear into yoke so that gear projects equally on each side of yoke.

NOTE

Check draft gear for labels indicating proper orientation.

- When applying gear in the yoke, the top of the gear must be toward the top of the yoke. The top of the NC-391 gear has two central wear plates which must make contact with the inside top strap wear plate of the yoke. The four small follower corner wear plates of the NC-390 gear must be toward the bottom of the yoke.

NOTE

The NC-390 followers should not be touching either yoke strap or the cylindrical surfaces of the followers and yoke will not seat.

- With the gear properly placed in the yoke, and the yoke head down in the press, place two blocks on the gear rear follower on either side of the yoke butt, as shown in Fig. 14.
- Place four fibre preshortening blocks on the rear follower as shown in Fig. 14.
- Compress gear and remove assembly clamps, then release press slowly to allow preshortening blocks to seat properly between rear follower and yoke butt. Gear is now preshortened for application to the locomotive.

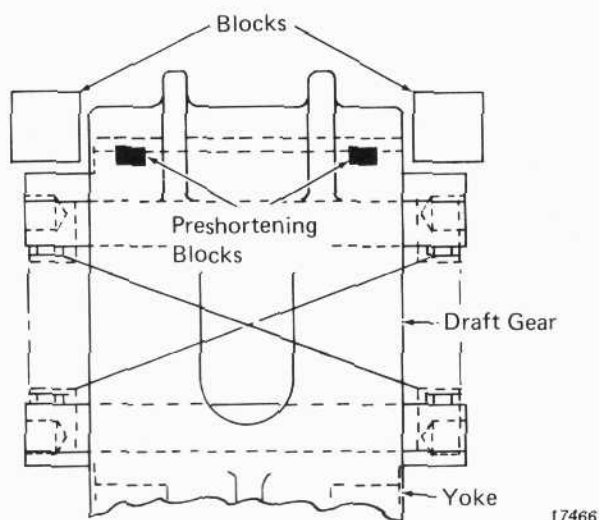


Fig. 14 - Application Of Compression Blocks

MODEL NC-393

Model NC-393 draft gear, Fig. 15, consists of pads made of steel plates with a rubber cushion bonded to each side. End pads have rubber only on one side of the plate. The pads are kept in relative position by a rubber protrusion on the side of the pad which fits into a slot on the adjacent pad. The pads are held together by the pressure applied by the yoke.

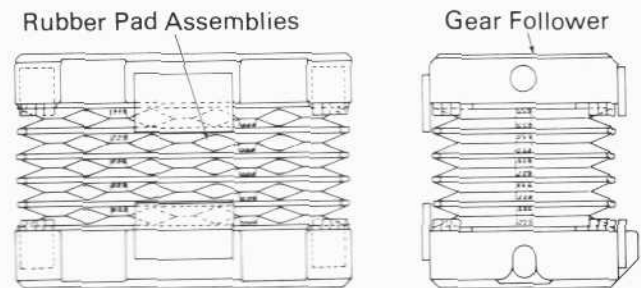
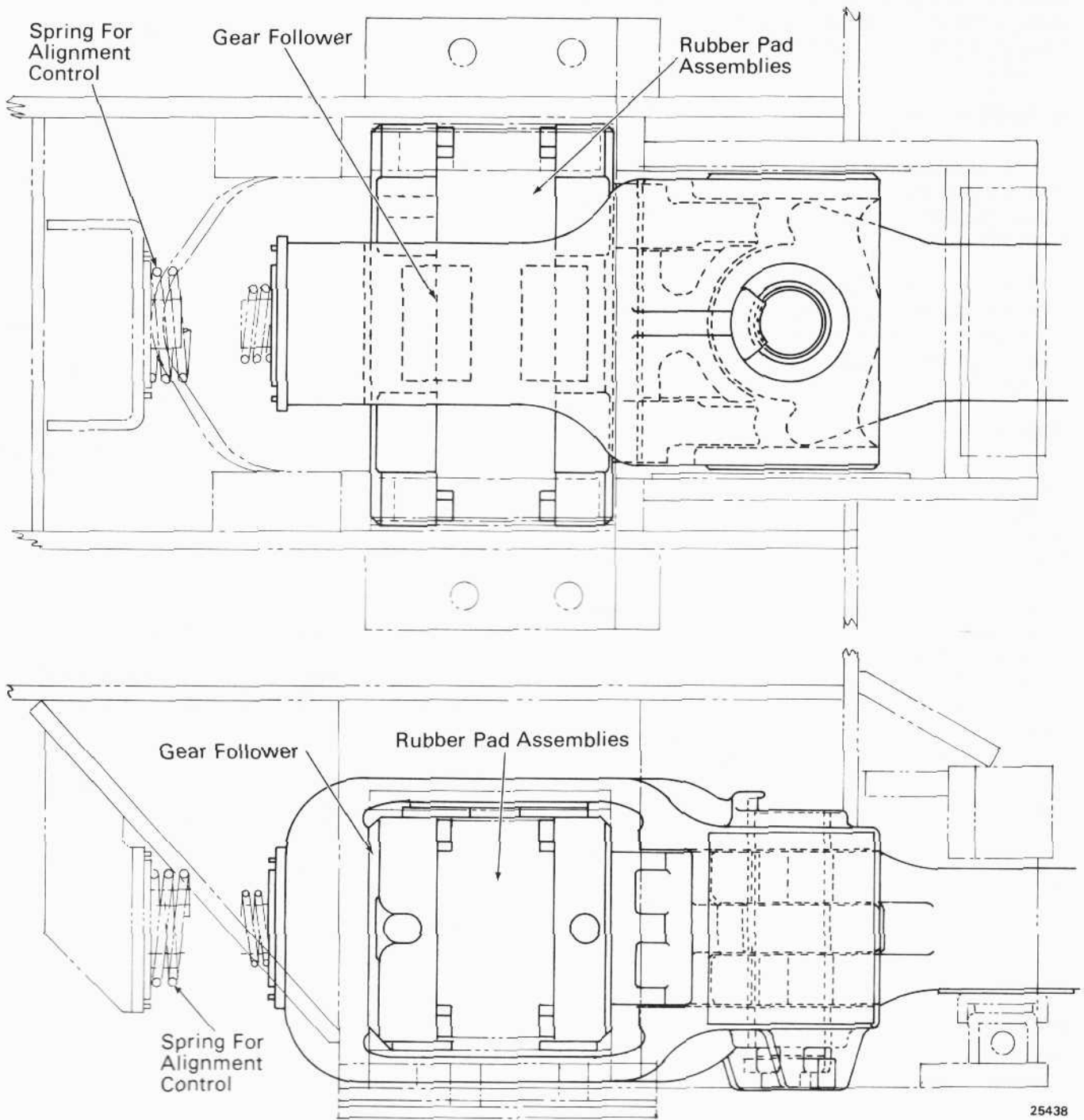


Fig. 15 - NC-393 Draft Gear Assembly

The NC-393 draft gear is designed to allow 19° free coupler lateral to either side of the locomotive centerline when coupler is not under buff load. The gear is applied in a 314.3 mm (12-3/8") long draft gear pocket. Yoke 43116-8 has a pocket length of 349.3 mm (13-3/4"), resulting in 34.9 mm (1-3/8") clearance between draft gear and yoke. Yoke has a spring seat on butt. A coil spring is applied between this spring seat and a stationary stop on the locomotive underframe, Fig. 16. This arrangement forces the yoke and coupler toward the end of locomotive creating a 34.9 mm (1-3/8") gap between gear front and front yoke stop (with preshortening blocks removed). When locomotive is in a buff condition, spring is further compressed and the yoke and coupler move rearward until the front of



25438

Fig.16 - NC-393 Draft Gear And Yoke Assembly
With Spring Application

the yoke pocket contacts the gear front follower allowing 4° normal coupler swing each side of center to engage the aligning plungers. When buff load is removed, the spring pushes the yoke and coupler forward allowing the 19° free coupler lateral.

DISASSEMBLY

Do not disassemble this gear unless it is apparent that one or more of the pads are damaged. The pads can be pulled apart when the draft gear is removed from the yoke.

CAUTION

When storage of the synthetic rubber pads is required, be sure to store them where they are not exposed to direct sunlight or damage may occur.

INSPECTION

The pads should be inspected to see that they are firmly bonded to the plates. Check that the pad *location protrusions are intact and not broken off*. Pads which are not securely bonded or have the locating protrusions broken off should not be used. A good used pad which has taken a set should *replace a pad in a group of pads which have likewise taken a set*. A new pad should not be used with old pads.

The follower block surfaces should be inspected for any roughness or gouging and smoothed down.

ASSEMBLY

The assembled draft gear in the free state is 339.7 mm (13-3/8") and is applied in a 314.3 mm (12-3/8") draft gear pocket. Note that the gear should be tight in the locomotive draft gear pocket and loose by about 34.9 mm (1-3/8") in the yoke pocket.

When handling rubber pads, take precautions to prevent oil or grease from contacting pads. These substances deteriorate rubber and shorten service life.

Place stack of rubber pads, without followers, on a flat surface. If pads become disarranged during handling, reassemble stacks of four full pads and two end pads (rubber on one side only) so that rubber dowels engage holes in pads.

Place a 21.8 kg (70 lb) to 45.4 kg (100 lb) weight on pad stack to insure that all pads are seated. Measure height of rubber pad stack taking an average of measurements on both ends.

If stack height is less than 142.9 mm (5-5/8"), the stack should be replaced with all new pads.

If stack height is 158.8 mm (6-1/4") or more, the stack may be reapplied without shimming, providing pads meet inspection requirements.

If stack height is between 142.9 mm (5-5/8") and 158.8 mm (6-1/4") and pads meet inspection requirements, a steel shim, each of 12.7 mm (1/2") maximum thickness should be applied between each end pad and its follower to restore stack height, with shims, to between 158.8 mm (6-1/4") and 174.6 mm (6-7/8").

Shims should be 285.8 mm (11-1/4") 514.4 mm (20-1/4") with each corner beveled 60.3 mm (2-3/8") x 60.3 mm to provide clearance for the guide lugs on the followers.

After assembly the gear should be put in a press to force the pads together. Holding bolts should then be applied at diagonal corners to hold assembly. The bolts should not be so tight as to compress the pads. After the bolts are applied, tack weld the nut to the bolt.

APPLICATION OF DRAFT GEAR TO YOKE

1. Remove banding from gear (if used) but do not allow the pads and followers to separate.

NOTE

Before applying draft gear to yoke, two assembly clamps must be made, as shown in Fig. 17; and a 68 tonnes (75 tons) press with an opening height of 914 mm (36") must be obtained.

2. Place draft gear in the press and compress it enough to apply the assembly clamps. Release press slowly so that clamps hold gear in a preshortened state.
3. Place yoke head down in press with both alignment control plungers installed.
4. Slide clamped gear into yoke so that gear projects equally on each side of yoke.

NOTE

Check draft gear for labels indicating proper orientation.

5. When applying gear in the yoke, the top of the gear must be toward the top of the yoke. The top of the NC-393 gear has two central wear plates which must make contact with the inside

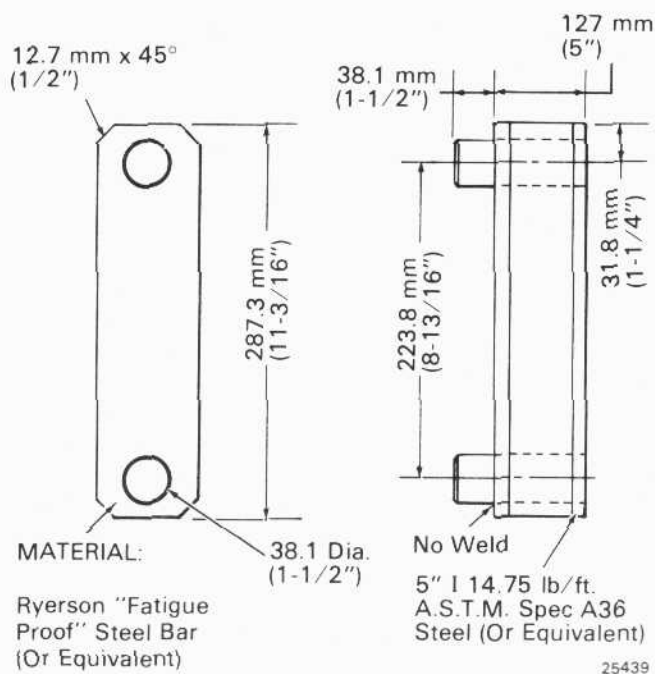


Fig.17 – NC-393 Assembly Clamp

top strap wear plate of the yoke. The four small follower corner wear plates of the NC-393 gear must be toward the bottom of the yoke.

NOTE

The NC-393 followers should not be touching either yoke strap or the cylindrical surfaces of the followers and yoke will not seat.

6. With the gear properly placed in the yoke, and the yoke head down in the press, place two blocks on the gear rear follower on either side of the yoke butt, as shown in Fig. 18.

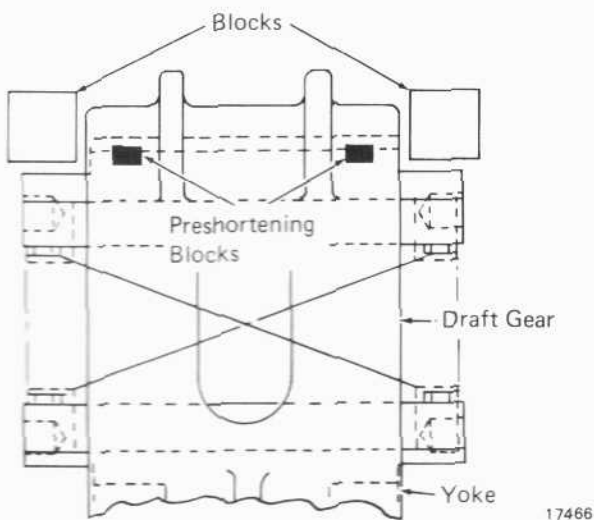


Fig.18 – Application Of Compression Blocks

7. Place four fibre preshortening blocks on the rear follower as shown in Fig. 11.
8. Compress gear and remove assembly clamps, then release press slowly to allow preshortening blocks to seat properly between rear follower and yoke butt. Gear is now preshortened for application to the locomotive.

MODEL MS-485-6A, MS-488-6A, AND MF-491-B

Model MS-485-6A, Fig. 19, MS-488-6A, Fig. 20, and MF-491-B, Fig. 21, draft gears consist of pads made of steel plates with a rubber cushion bonded to each side. End pads have rubber only on one side of the plate. The pads are kept in relative position by a rubber protrusion on the side of the pad which fits into a slot on the adjacent pad. The end pads have metal tabs which are bent into indentations in the follower blocks. The entire assembly is held together by two bolts located diagonally opposite and extending through both followers, Fig. 21. These bolts are not tight, but only serve to hold the pieces together as an assembly.

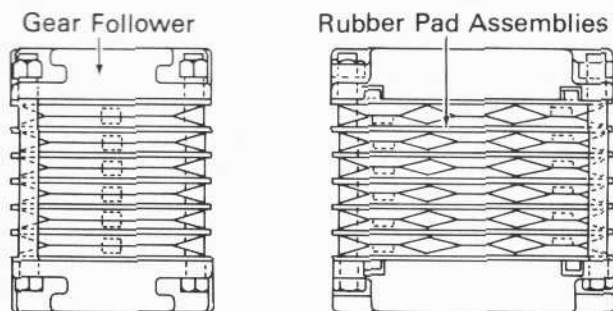


Fig.19 – MS-485-6A Draft Gear Details

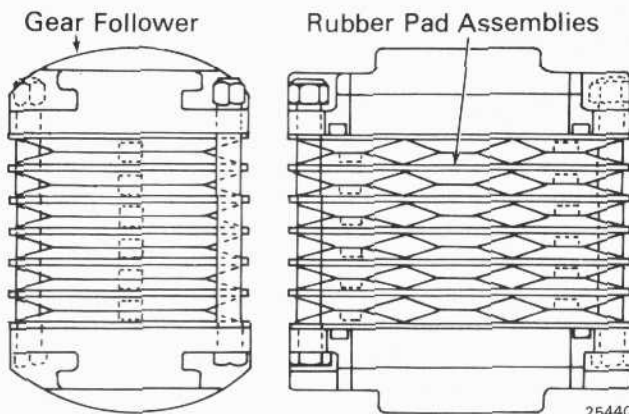


Fig.20 – MS-488-6A Draft Gear Details

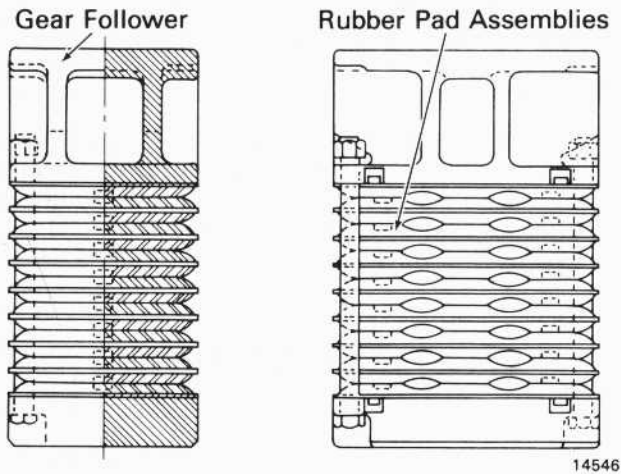


Fig.21 - MF-491-B Draft Gear Details

DISASSEMBLY

Do not disassemble this gear unless it is apparent that one or more of the pads are damaged.

The two bolts can be removed and the pads separated after the tack weld is removed from the nuts.

INSPECTION

The pads should be inspected to see that they are firmly bonded to the plates. Check that the pad location protrusions are intact and not broken off. Pads which are not securely bonded or have the locating protrusions broken off should not be used. A good used pad which has taken a set should replace a pad in a group of pads which have likewise taken a set. A new pad should not be used with old pads.

The follower block surfaces should be inspected for any roughness or gouging and smoothed down.

ASSEMBLY

The draft gear assembly in the free state (not compressed in any way) should always be at least 12.7 mm (1/2") to 19.1 mm (3/4") larger than the yoke pocket in which it is to be used. During use the individual pads take a set, the amount depending upon length of service and forces applied. After use, the set stabilizes and reaches a point where any further set is unlikely to occur. The capacity of the draft gear is not affected by the set as long as the individual pads are in otherwise good condition. Therefore, a draft gear having used pads need only be slightly larger than the opening in which it is to fit.

If the free length of the used draft gear is slightly less than the yoke pocket in which it is to be used, steel shims may be applied to the inside surface of the follower block to lengthen the assembly. The shims should be at least 3.2 mm (1/8") thick and should be securely held in place by tack welds on the vertical edge of the follower.

As stated under "Inspection," used pads from another assembly may be added to other used pads in a gear to give the needed compression for gear application to the yoke. It may also be required to use a combination of used pads and/or shims to obtain a free height of the gear greater than the yoke pocket in which it is to be applied. If the assembly cannot satisfactorily be made up using shims and/or other used pads, a new gear assembly should be applied.

In either case, after assembly the gear should be put in a press to force the pads together. Holding bolts should then be applied at diagonal corners to hold the assembly. The bolts should not be so tight as to compress the pads. After the bolts are applied, tack weld the nut to the bolt.

APPLICATION OF DRAFT GEAR TO YOKE

Place the assembled gear in a suitable press and reduce its height to the required dimension.

The compressed height can be retained by application of phenolic blocks of proper thickness between the nuts and the follower.

After installation in the yoke, place phenolic blocks between the follower block and the yoke to retain the clearance. The blocks should be placed at the top left and bottom right of the follower, diagonally opposite each other.

The blocks under the nuts should be removed, which will permit the gear to hold itself in the yoke. When the assembly is installed in the draft gear pocket, the phenolic blocks between the follower and the yoke will be released or disintegrated when the locomotive starts pulling.

MODEL MI-225-6A AND DR-6

Model MI-225-6A and DR-6 draft gears, Fig. 22, are similar in construction to MS and MF model draft gears. Model MI-225-6A draft gear pads are held together by the rubber protrusions on each pad and the pressure applied by the yoke. Model DR-6 pads are held together by a metal cap over each end which in turn is held together by four bolts, one at each corner.

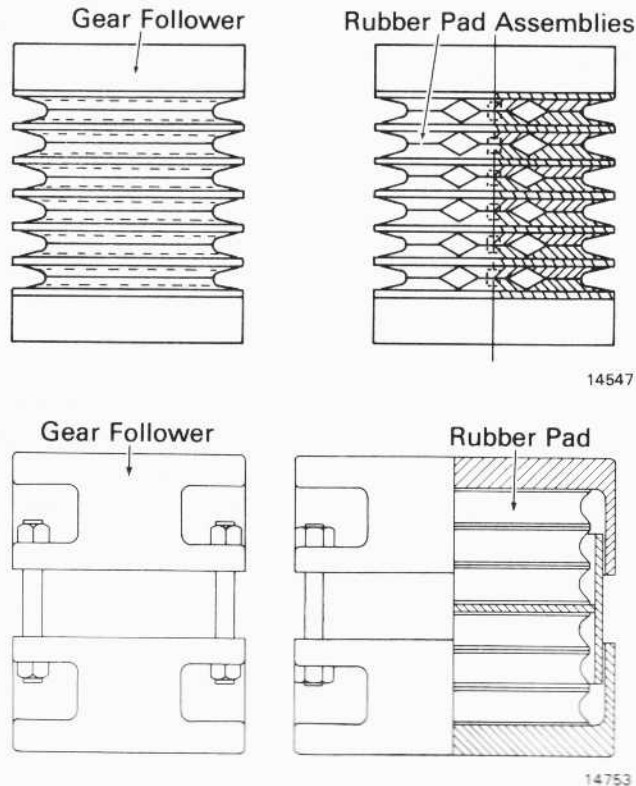


Fig.22 - MI-225-6A And DR-6
Draft Gear Details

DISASSEMBLY

Do not disassemble this gear unless it is apparent that one or more of the pads are damaged.

Disassemble the DR-6 gear by removing the nuts from the four corner bolts and lifting the metal end caps and pads apart. The pads that make up gear MI-225-6A will come apart when the draft gear is removed from the yoke.

INSPECTION

The pads should be inspected to see that they are firmly bonded to the plates. Check that the pad location protrusions are intact and not broken off. Pads which are not securely bonded or have the locating protrusions broken off should not be used. It should be noted that a good used pad which has taken a set should replace a pad in a group of pads which have likewise taken a set. A new pad should not be used with old pads.

The follower block surfaces should be inspected for any roughness or gouging and smoothed down.

ASSEMBLY

The draft gear assembly in the free state (not compressed in any way) should always be at least 12.7 mm (1/2") to 19.1 mm (3/4") larger than the yoke pocket in which it is to be used. During use the individual pads take a set, the amount depending upon length of service and forces applied. After use, the set stabilizes and reaches a point where any further set is unlikely to occur. The capacity of the draft gear is not affected by the set as long as the individual pads are in otherwise good condition. Therefore, a draft gear having used pads need only be slightly larger than the opening in which it is to fit.

If the free length of the used draft gear is slightly less than the yoke pocket in which it is to be used, steel shims may be applied to the inside surface of the follower block to lengthen the assembly. The shims should be at least 3.2 mm (1/8") thick and should be securely held in place by tack welds on the vertical edge of the follower. As stated under "Inspection," used pads from another assembly may be added to other used pads in a gear to give the needed compression for gear application to the yoke. It may also be required to use a combination of used pads and/or shims to obtain a free height of the gear greater than the yoke pocket in which it is to be applied. If the assembly cannot satisfactorily be made up using shims and/or other used pads, a new gear assembly should be applied.

In either case, after assembly the gear should be put in a press to force the pads together. On model DR-6 the metal end caps and bolts should then be applied to hold the assembly. The bolts should not be so tight as to compress the pads.

APPLICATION OF DRAFT TO YOKE

Place the assembled gear in a suitable press and reduce its height to the required dimension.

Model MI-225-6A has drilled holes provided in the follower block for application of suitable holding bars to retain the gear in the compressed position.

On model DR-6 the compressed height can be retained by application of phenolic blocks of proper thickness between the nuts and the follower.

After installation in the yoke, place phenolic blocks between the follower block and the yoke to retain the clearance. The blocks should be placed at the top left and bottom right of the follower, diagonally opposite each other.

Model MI-225-6A should have the holding bars removed and model DR-6 should have the blocks under the nuts removed. In either case, this will permit the gear to hold itself in the yoke. When the assembly is installed in the draft gear pocket, the phenolic blocks between the follower and the yoke will be released or disintegrated when the locomotive starts pulling.

YOKES

Details of the draft gear yokes are provided in Fig. 23. Table II in the Service Data provides information in relation to the dimensions shown in Fig. 23. The pockets of the respective yokes, shown in Fig. 23, should be inspected to the limits given in Table II according to their part numbers and particular dimension. If the yoke is worn to or past the maximum or minimum limit shown in Table II, the yoke should be reconditioned to the new dimension.

If required, shims not less than 3.2 mm (1/8") thick should be applied at areas marked "S," to bring the dimension back to the new dimension. The shims should be welded in place along both sides, the full length of the shim. Applied shims should not be transversely welded.

The wear plates on the yokes should be inspected for wear, excessive roughness or gouging of the metal, and for possible cracks in the weld holding the shims or wear plates. If the wear plate is worn beyond the minimum dimension shown in Table II, new wear plates should be applied. Roughness of the wear plates should be smoothed down by a power emery wheel. If cracks are found, they should be ground out and a new weld applied at the area. Cracks found in other parts of the yoke should also be ground out and repaired.

YOKE PLUNGER CASTINGS

The yoke plunger castings used on any draft gears with alignment control, should be checked for wear using the template illustrated in Fig. 24. With the template applied as shown in Fig. 25, the total amount of wear present must not exceed 3.2 mm (1/8") as indicated by the notch in the template. If the wear on either plunger casting exceeds 3.2 mm (1/8") both should be replaced with new castings.

YOKE COUPLER PIN BUSHINGS

The yoke coupler pin bushings should be measured at the time of yoke reconditioning. If the bushings are cracked, loose, scuffed in the inside diameter or broken in any way, they should be replaced. If the

bushings are otherwise in good condition, a measurement should be made of their inside diameter. If the inside diameter is worn to or exceeds the maximum diameter shown in Table III in the Service Data, the worn bushings should be removed and replaced with new bushings.

COUPLER PIN

The coupler pin should be inspected to see that its diameter is not less than the minimum diameter shown in Table III. All pins worn to the minimum diameter should be replaced. The date of removal and inspection of pins to be reused should be legibly marked on the head of the pin and all prior dates obliterated.

COUPLER BUSHING

In conjunction with the inspection of the yoke bushing and pin, the coupler bushing should be inspected.

As outlined for the yoke bushings, the coupler bushings should be replaced if they are broken, cracked, scuffed, or the inside diameter is worn to the maximum dimension as given in Table III.

NOTE

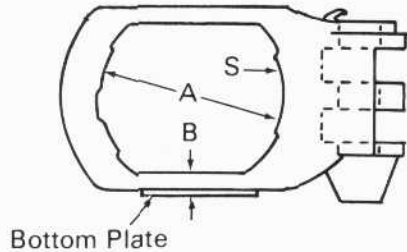
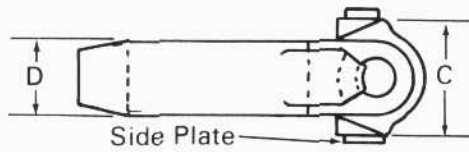
It should be noted that the total free slack between the coupler and yoke must not exceed 4.8 mm (3/16"). The individual parts, each worn to its condemning limit, would exceed this limit considerably. Therefore, it is necessary to check the clearance of each coupler and yoke assembly and if the free slack exceeds 6.35 mm (1/4"), replace some of the parts before they reach their condemning limit.

ALIGNMENT CONTROL COUPLER CONTOUR SURFACES

When the contour surfaces of the shank loops or the shank aligning lugs are worn a minimum of 3.2 mm (1/8"), they should be restored to ensure continued efficiency of the alignment control. The method of determining the amount of wear and the procedure for reconditioning when the limit is reached is as follows:

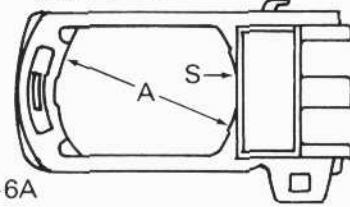
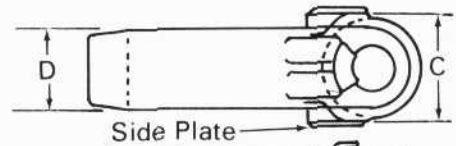
1. Apply gauge illustrated in Fig. 26 to the top and bottom surfaces of the shank with stop block on gauge held in contact with the edge of the pin hole as shown in Fig. 27.

TYPE I



M-380-A
M-380-B
NC-390

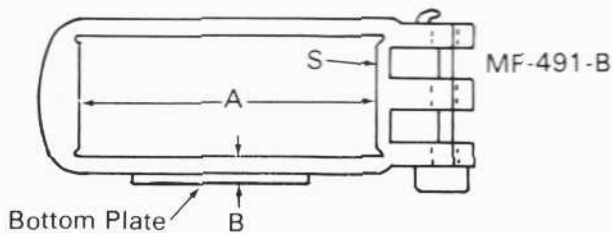
8034302 And 6915380



MS-488-6A

8309358

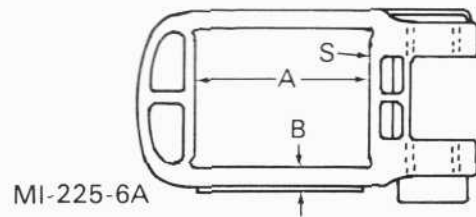
TYPE II



MF-491-B

8366733

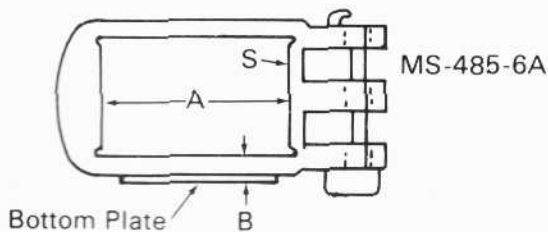
TYPE III



MI-225-6A

8263361

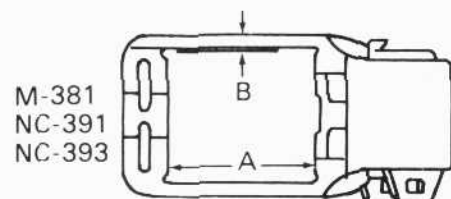
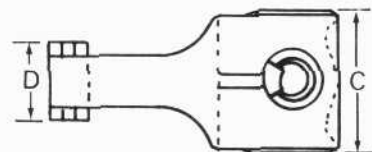
TYPE IV



MS-485-6A

8191279

TYPE V



M-381
NC-391
NC-393

8314758

25441

Fig.23 - Draft Gear Yoke Details

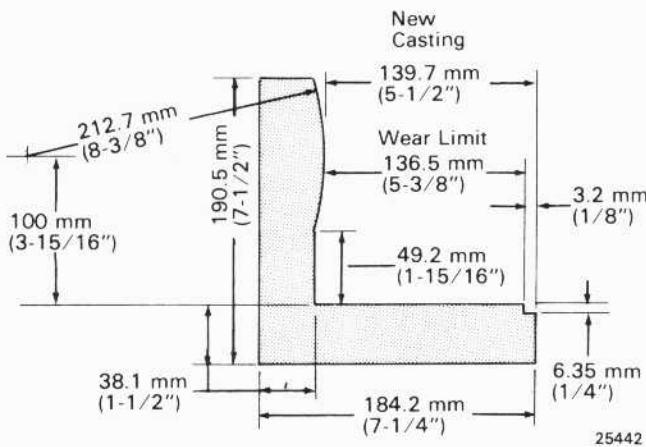


Fig. 24 - Plunger Casting Template

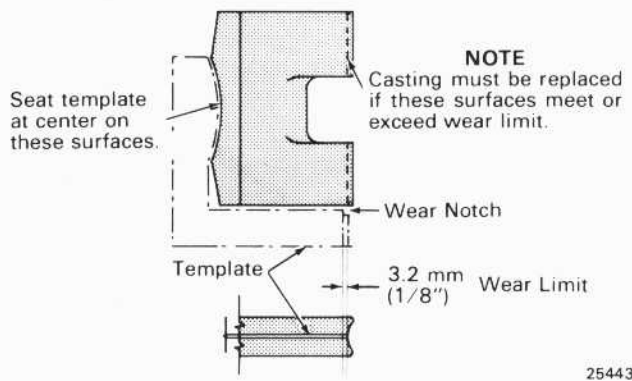


Fig. 25 - Application Of Plunger

2. The gauge is made to conform with the normal contour of the shank and is provided with legs as shown to determine the amount of wear at these locations. With the gauge properly positioned the wear limit has been reached or exceeded when a 3.2 mm (1/8") shim can be inserted between the leg or legs of the gauge and the adjacent casting contour.

NOTE

Manufacturing tolerances permit, and may show, 1.6 mm (1/16") clearance at points "X," Fig. 27, with gauge applied to new coupler. This clearance is not detrimental and ensures satisfactory pivot pin application when coupler is applied to yoke.

3. To restore these worn surfaces they should be built up to the contour of the gauge by welding.

In checking for alignment control on the NC-393 model, it will be necessary to remove spring assembly No. 8483318, Fig. 16, from behind the yoke. Remove the spring assembly from behind the yoke as follows:

1. Use a 25.4 mm (1") diameter bolt with a minimum thread length of 241.3 mm (9-1/2").
2. Apply a suitable nut to the bolt and screw the nut towards the bolt head so that at least 178 mm (7") of thread length remains beyond nut.
3. Slide a 25.4 mm (1") I.D. flat washer over the bolt threads until it seats against the nut.
4. Insert bolt (holding washing against nut) through rear of locomotive retaining bracket, plate, and springs.
5. Screw bolt into threaded boss on plate assembly at rear of yoke.
6. Turn nut until springs are compressed, allowing spring assembly to be removed. The locomotive bracket has an inverted u-shaped slot which allows compressions.

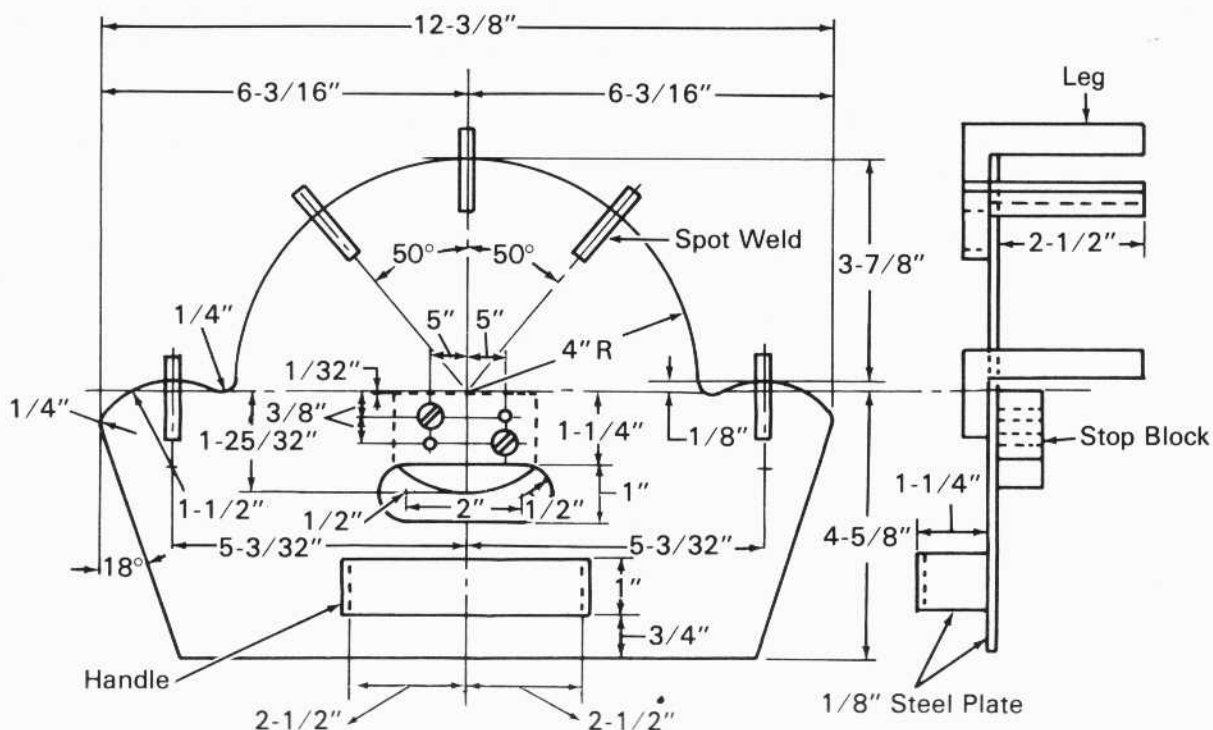
Once the spring is removed, the yoke must be pushed rearward (probably with another locomotive) until a 1-3/8" gap exists, as shown in Fig. 4. When the yoke and coupler are in their most rearward position, then the alignment control may be checked as outlined in instructions for checking alignment control draft gear.

DRAFT GEAR POCKETS

Shown in Fig. 28 are representative outline drawings of the three types of draft gear pockets. Table IV in the Service Data shows the draft gear which may be used with the type of pocket shown in Fig. 28, as well as governing dimensions affecting the draft gear pockets.

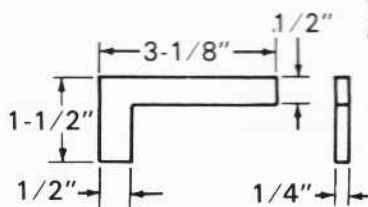
Inspect the wear areas of the pocket for roughness or galling. Using an emery wheel or equally effective means, smooth up any roughness.

Measure the draft gear pocket as shown in Fig. 28, where wear would occur. Compare the measurement to the respective limit shown in Table IV for the particular dimension. If the measurement shows wear beyond the rebuild limit given in Table IV, the area should be reconditioned to bring the dimension to the "new" dimension given for that location. If required, shims should be applied to the draft gear pocket at the areas marked "S" to bring the dimension to the "new" limit. The shims applied should be at least 3.2 mm (1/8") thick and securely held in place by a number of tack welds along the top and bottom of the shim.

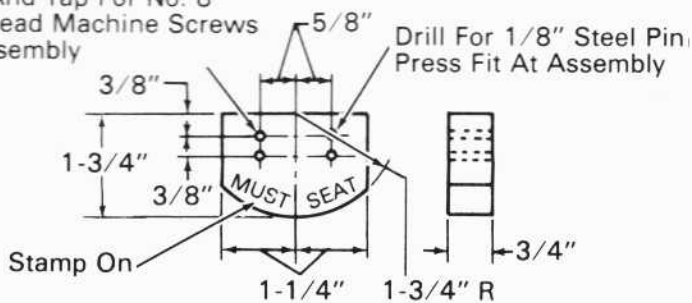


Shank Wear Limit Gauge

Drill And Tap For No. 8 Flat Head Machine Screws At Assembly



Leg (Steel 5 Req'd.)



Stop Block (Steel)

METRIC CONVERSION CHART					
in.	mm	in.	mm	in.	mm
1/32"	8	1"	25.4	3-1/8"	79.4
1/8"	3.2	1-1/4"	31.8	3-7/8"	98.4
1/4"	6.4	1-1/2"	38.1	4"	101.6
3/8"	9.5	1-3/4"	44.5	4-5/8"	117.5
1/2"	12.7	1-25/32"	45.2	5"	127.0
5/8"	15.9	2"	50.8	5-3/32"	129.4
3/4"	19.1	2-1/2"	63.5	6-3/16"	157.2
				12-3/8"	314.3

Fig.26 - Coupler Shank Limit Gauge

These surfaces to be restored when wear limit has been reached.

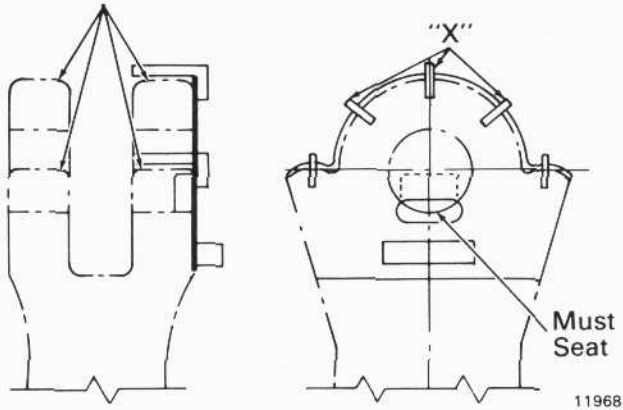
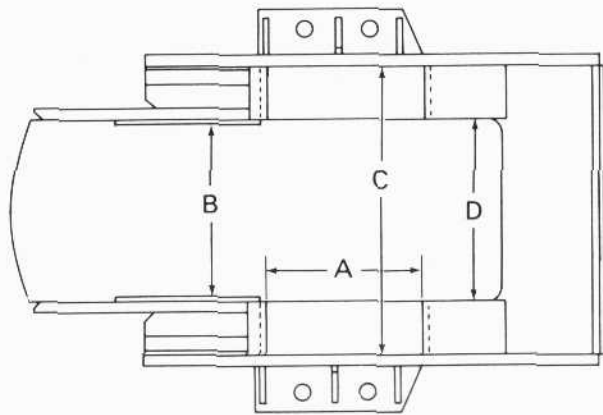


Fig.27 - Application Of Coupler Shank Limit Gauge

INSTALLING DRAFT GEAR ASSEMBLY IN LOCOMOTIVE

Jack the draft gear assembly into the draft gear pocket and locate it in its proper place. Install the carrier irons and bolt them securely in place.

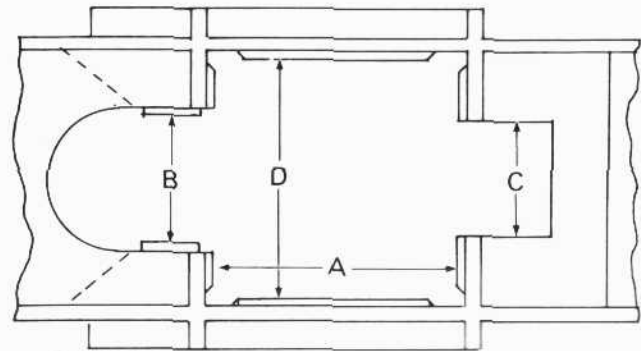
After the draft gear is installed in the pocket, the coupler, coupler pin and retaining key can be installed.



M-380-A
M-381-A

TYPE I

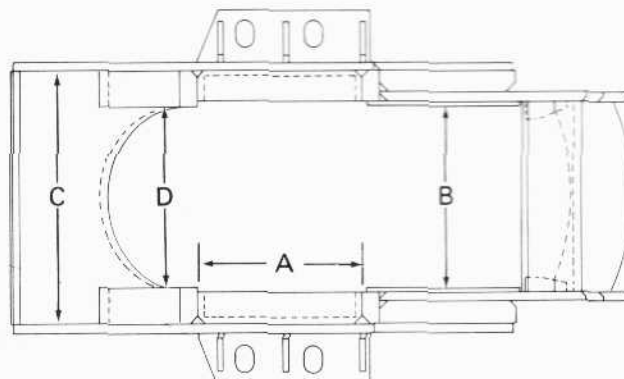
25444



MI-225-6A
MF-491-B
MS-485-6A
EX-(Mexico) 7078-G12

TYPE II

25445



NC-390
NC-391
NC-393

TYPE III

17467

Fig.28 - Draft Gear Pocket Details

SERVICE DATA

SPECIFICATIONS

TABLE I

Draft Gear Model	Draft Gear Part No.	Pad Part No.	Pad "A" Dim. Min.	Pad "B" Dim.		Pads Used	Shim Size
				New	Min.		
M-380-A & M-380-B	8247906	8034316	108 mm (4-1/4")	63.5 mm (2-1/2")	58.7 mm (2-5/16")	4	203 mm x 273.1 mm (8" x 10-3/4")
M-381 & M-381-A	8314757	8034316	108 mm (4-1/4")	63.5 mm (2-1/2")	58.7 mm (2-5/16")	4	203 mm x 273.1 mm (8" x 10-3/4")

TABLE II

Draft Gear Model	Yoke	Type	Draft Gear Yoke Dimensions									
			A			B		C		D		
			New	"R" ^{**}	"C" ^{**}	New	Min. "C" ^{**}	New	Min. "C" ^{**}	New	Min. "C" ^{**}	
M-380 M-380 or NC-390	8034302 6915380	I	425.5 mm (16-3/4")	427.8 mm (16-27/32")	431 mm (16-31/32")	31.8 mm (1-1/4")	28.6 mm (1-1/8")	381 mm (15")	374.7 mm (14-3/4")	362 mm (14-1/4")	356 mm (14")	
MF-491-B	8366733	II	470 mm (18-1/2")	473.1 mm (18-5/8")	476.3 mm (18-3/4")	38.1 mm (1-1/2")	34.9 mm (1-3/8")	215.9 mm (8-1/2")	209.6 mm (8-1/4")	152.4 mm (6")	146.1 mm (5-3/4")	
MI-225-6A	8263361	III	273.1 mm (10-3/4")	276.2 mm (10-7/8")	279.4 mm (11")	34.9 mm (1-3/8")	31.8 mm (1-1/4")	127 mm (5")	120.7 mm (4-3/4")	127 mm (5")	120.7 mm (4-3/4")	
MS-488-6A	8309358	I	339.7 mm (13-3/8")	342.1 mm (13-15/32")	345.3 mm (13-19/32")	31.8 mm (1-1/4")	30.2 mm (1-3/16")	215.9 mm (8-1/2")	209.6 mm (8-1/4")	152.4 mm (6")	146.1 mm (5-3/4")	
MS-485-6A	8455706 8191279	IV	295.3 mm (11-5/8")	298.5 mm (11-3/4")	301.6 mm (11-7/8")	38.1 mm (1-1/2")	34.9 mm (1-3/8")	215.9 mm (8-1/2")	209.6 mm (8-1/4")	152.4 mm (6")	146.1 mm (5-3/4")	
M-381 or NC-391 NC-393	8314758 8455706	V	349.3 mm (13-3/4")	351.6 mm (13-27/32")	354.8 mm (13-31/32")	38.1 mm (1-1/2")	34.9 mm (1-3/8")	381 mm (15")	374.7 mm (14-3/4")	209.1 mm (8-1/4")	203.2 mm (8")	

**"R" - Rebuild Limits, "C" - Condemning Limits.

TABLE III

Yoke	Yoke Bushing, Coupler Bushing And Pin Diameter					
	Yoke Bushing Dia.		Pin Dia.		Coupler Bushing Dia.	
	New	Max.	New	Min.	New	Max.
8191279 8366733	58.7 mm (2-5/16")	63.5 mm (2-1/2")	57.15 mm (2-1/4")	54 mm (2-1/8")	58.7 mm (2-5/16")	63.5 mm (2-1/2")
8263361	65.1 mm (2-9/16")	69.8 mm (2-3/4")	63.5 mm (2-1/2")	60.3 mm (2-3/8")	65.1 mm (2-9/16")	69.8 mm (2-3/4")
8305983	77.8 mm (3-1/16")	82.6 mm (3-1/4")	76 mm (3")	73.0 mm (2-7/8")	77.8 mm (3-1/16")	82.6 mm (3-1/4")
8034302 8314758 8455706	90.5 mm (3-9/16")	95.3 mm (3-3/4")	89.7 mm (3-17/32")	86.5 mm (3-13/32")	90.5 mm (3-9/16")	95.3 mm (3-3/4")

TABLE IV

Draft Gear Model	Draft Gear No.	Pocket Type	Draft Gear Pocket Dimensions					
			A			B		
			New	"R"*	"C"*	New	"R"*	"C"*
M-381 M-380-A	8314757 8247906	I	349.3 mm (13-3/4")	351.6 mm (13-27/32")	354.8 mm (13-31/32")	384.2 mm ^{+3.2} ₋₀ (15-1/8" ^{+1/8} ₋₀)	393.7 mm (15-1/2")	393.7 mm (15-1/2")
MI-225-6A	8263360	II	273.1 mm (10-3/4")	276.2 mm (10-7/8")	279.4 mm (11")	130.2 mm ^{+3.2} ₋₀ (5-1/8" ^{+1/8} ₋₀)	136.5 mm (5-3/8")	136.5 mm (5-3/8")
DR-6 MS-485-6A MS-488-6A	8229465 8253666 8309358	II	295.3 mm (11-5/8")	298.5 mm (11-3/4")	301.6 mm (11-7/8")	222.3 mm ^{+3.2} ₋₀ (8-3/4" ^{+1/8} ₋₀)	228.6 mm (9")	228.6 mm (9")
MF-491-B	8366732	II	469.9 mm (18-1/2")	473.1 mm (18-5/8")	476.3 mm (18-3/4")	222.3 mm ^{+3.2} ₋₀ (8-3/4" ^{+1/8} ₋₀)	228.6 mm (9")	228.6 mm (9")
NC-390 NC-391	8420235 8420237	III	349.3 mm (13-3/4")	351.6 mm (13-27/32")	354.8 mm (13-31/32")	384.2 mm ^{+3.2} ₋₀ (15-1/8" ^{+1/8} ₋₀)	393.7 mm (15-1/2")	393.7 mm (15-1/2")
NC-393	8482051	III	314.3 mm (12-3/8")	316.7 mm (12-15/32")	332.6 mm (13-3/32")	384.2 mm ^{+3.2} ₋₀ (15-1/8" ^{+1/8} ₋₀)	393.7 mm (15-1/2")	393.7 mm (15-1/2")
Draft Gear Model	Draft Gear No.	Pocket Type	Draft Gear Pocket Dimensions					
			C			D		
			New	"R"*	"C"*	New	"R"*	"C"*
M-381 M-380-A	8314757 8247906	I	641.4 mm (25-1/4")	-	-	403.2 mm (15-7/8")	409.6 mm (16-1/8")	409.6 mm (16-1/8")
MI-225-6A	8263360	II	130.2 mm ^{+3.2} ₋₀ (5-1/8" ^{+1/8} ₋₀)	136.5 mm (5-3/8")	136.5 mm (5-3/8")	238.1 mm (9-3/8")	244.5 mm (9-5/8")	244.5 mm (9-5/8")
DR-6 MS-485-6A MS-488-6A	8229465 8253666 8309358	II	158.8 mm ^{+3.2} ₋₀ (6-1/4" ^{+1/8} ₋₀)	165.1 mm (6-1/2")	165.1 mm (6-1/2")	342.9 mm (13-1/2")	349.3 mm (13-3/4")	349.3 mm (13-3/4")
MF-491-B	8366732	II	158.8 mm ^{+3.2} ₋₀ (6-1/4" ^{+1/8} ₋₀)	165.1 mm (6-1/2")	165.1 mm (6-1/2")	342.9 mm (13-1/2")	349.3 mm (13-3/4")	349.3 mm (13-3/4")
NC-390 NC-391	8420235 8420237	III	533 mm (21")	-	-	381 mm (15")	387.4 mm (15-1/4")	387.4 mm (15-1/4")
NC-393	8482051	III	533 mm (21")	-	-	381 mm (15")	387.4 mm (15-1/4")	387.4 mm (15-1/4")

*"R" - Rebuild Limits, "C" - Condemning Limits.