

NABI 40 LFW: Front Understructure Repair



Prepared by: Kalman Takacs - Field Service Engineer

Approved by: Dan Allen – Chief Engineer

Property name: MBTA

Model: NABI 40LFW-24

Top Bus Model: 81000

NABI 40 LFW: Front Understructure Repair



Affected buses: As required. Buses with repairable cracks in the understructure in areas near the radius rod attachment.

Estimate Repair: 2-6 hours per bus, depending on repairs needed.

Parts:

Gusset for curbside radius rod bracket	Part #: NPN	1 / bus if required
Gusset for street side radius rod bracket	Part #: NPN	1 / bus if required
Gusset for curbside longitudinal member	Part #: NPN	1 / bus if required
Plate, 14 gauge, carbon steel, 2 nd Xmb	Part #: NPN	1 / bus if required
Denatured Alcohol	Part #: NPN	1 / 10 buses
Industrial Primer	Part #: NPN	1 can / 5 buses
Rubberized Undercoating	Part #: NPN	1can / 5 buses
Welding Wire, ER70-S6, Dia. 0.035"	(see details on the WPS-Welding Procedure Specification sheets)	

Shielding Gas: 82% Ar + 18% CO₂

Tools:

Angle Grinder, Wire Wheel, 36G abrasive disc,
De-Burr Bits
1/8" and 3/8" size drill bits
Drill
MIG Welding machine
Wire Brush
Cloth



Work instruction number: L3/FSV-137
L4/QUA-003

Revision: Initial

Date: 02/04/2013
Revision: Initial

SAFETY PRECAUTIONS MUST BE FOLLOWED ACCORDING TO ACCEPTED INDUSTRY STANDARDS AND LOCAL/PROPERTY REQUIREMENTS.

1. GENERAL INFORMATION:

- Read and understand this work instruction before start repairing buses.
- Repair tryout/training should be conducted with technical oversight and supervision.
- Check the repaired environment before starting the repair.
- Before starting the repair, make certain all tools, protective equipment and parts are available.
- Departure from this work instruction without notification is not allowed.
- Maintain repair records. Document the number of repaired buses, date of repair, and the name(s) of the certified welder(s).

2. PREPARATION FOR REPAIR:

- Turn off the battery disconnect switch(es).
- Tag and disconnect the battery cables.
- Disconnect the ECU of engine, transmission, ABS. Disconnect the destination signs. Turn off and disconnect the PA system.
- Lift the bus and place jack stands underneath the official jacking pads.
- Protect repaired area from damage, grinding spark and welding splatter.



Protect
the lift
with
welding
blanket

- Remove coating material and primer from welded surfaces by 36G abrasive wheels and wire wheels. Primary condition of good quality weld is a full clean metal surface.
- Degrease cleaned areas with alcohol.

3. Repair and Install Gussets as Required:

General Welding Instructions:

The structural elements of NABI MBTA 40-LFW buses (tubes, profiles) are made from low carbon steel (Trade Name: S235J2G3 according to EN 10025) material. Considerations:

- 3.1 Weld just a full clean surface! Grind surfaces with grinder disk suitable for carbon steel material.
- 3.2 To prevent gas defects of the weld joints welding should be performed only in closed production area protected from currents of air.
- 3.3 Welding parameters according to the attached WPS sheets.
- 3.4 Weld joints should be 100% visually inspected (VT), penetration (PT) if necessary.
- 3.5 Protect surrounding area from damage during welding.

Crack Repair:

- Find the end of the crack (use magnifier or penetrate as needed).



- Drill a 1/8" size hole at both ends of the crack.



- Bevel the crack profile 2x30° for single "V" butt (groove) weld.
- Clean the welding surface area with 36G abrasive disc, wire wheel and de-burr bits as required.
- Degrease the surface with alcohol or industrial degreaser.
- Weld the cracked along the bevelled line with continuous weld per **WPS NABI-R02-CS**.



- Grind the weld surface until the same height as the parent metal.
- Check the welds by Visual Test and/or Penetrate Test. Prep and re-weld if required.

Weld Gussets (as required) to the Radius Rod Bracket:

Install 12 gauge carbon steel (like A36) gussets only if the base metal is corroded and the gap can't be closed by simple welding. This gusset has to be welded between the square block (that holds the radius rod bolt) and the nearby structural tubes. This gusset is intent to provide a strong connection between these structural components and not just to cover the hole. Considering this follow the instructions below:

- o Clean the surface at the welding area with 36G abrasive disc, wire wheel and de-burr bits as required.

**Gusset Shown for Street
Side radius rod bracket (curb
side is similar)**



- o Place and set the gussets in position (see pictures below).
- o Check the position, gap and if necessary, bend/cut/grind the part as required.



- o Weld the gusset all around with continuous weld according to the WPS NABI-R02-CS.
- o Clean welded area with wire wheel or brush.
- o Check the welds by Visual Test and/or Penetrate Test. Prep and re-weld as required.



Longitudinal Member and Second Crossmember Repair:

- Locate the end of the crack (use magnifier or penetrate if required).



- Drill a 1/8" size hole at both ends of the crack.



- Bevel the crack profile 2x30° for single "V" butt (groove) weld.
- Clean the surface at the welding area with 36G abrasive disc, wire wheel and de-burr bits as required.
- Degrease surface with alcohol or industrial degreaser.
- Weld the cracked along the bevelled line with continuous weld per **WPS NABI-R02-CS**.
- Grind the weld surface until the same height as the parent metal.
- Check the welds by Visual Test and/or Penetrate Test. Prepare and re-weld as required.

Welding the Gussets (as required) to the Longitudinal Member:

- Install 12 gauge carbon steel (A36 or equivalent) gusset only if the base metal is corroded and the gap can't be closed by simple welding. This gusset, if needed, is welded between the longitudinal structural tube and the second crossmember and is intended to provide a structural repair between these components. Follow the instructions below:



- Clean the surface at the welding area with 36G abrasive disc, wire wheel and de-burr bits as required.
- Place and fix the gusset in the right position (see pictures below).



- Check the position, gap etc., if necessary bend/cut/grind the part as required.

- Weld the gusset along the green lines only (shown on picture below) with continuous weld according to the **WPS NABI-R02-CS**. Note the $\frac{1}{2}$ " long welds at the corners. **Do not cross-weld the tubes just max $\frac{1}{2}$ " as picture shows below!**

Turn $\frac{1}{2}$ "
at these
corners
without
interrupt
the weld



- Clean welded area with wire wheel or wire brush.
- Check the welds by Visual Test and/or Penetrate Test. Prep and re-weld as required.
- Prep the surface for seal and paint per paragraph 4. Apply Sikaflex 221 sealer along the edges where no welds were applied.

Second Crossmember Repair:

The second crossmember in front of the curbside wheel is an assembly of square steel tubes welded together and sheet metal that covers this tube frame. Corrosion on the sheet metal doesn't affect the structural integrity of the second crossmember assembly. If repair is required, follow the process below:



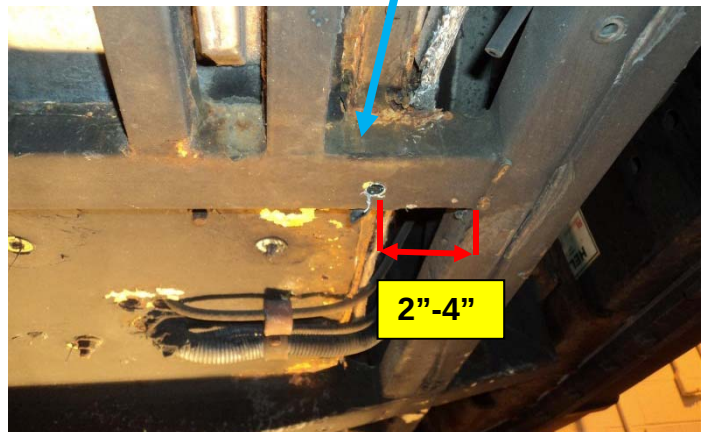
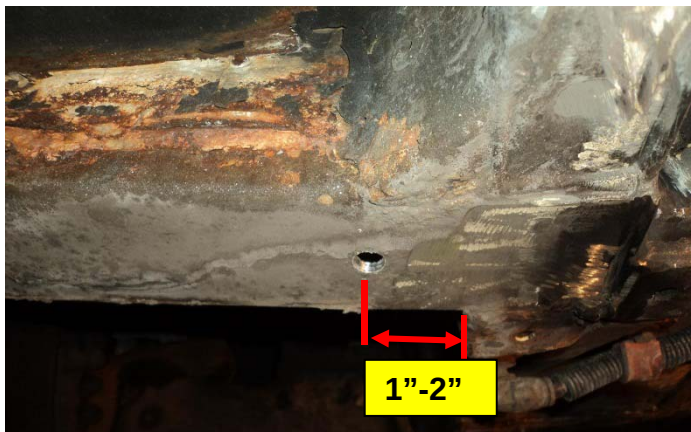
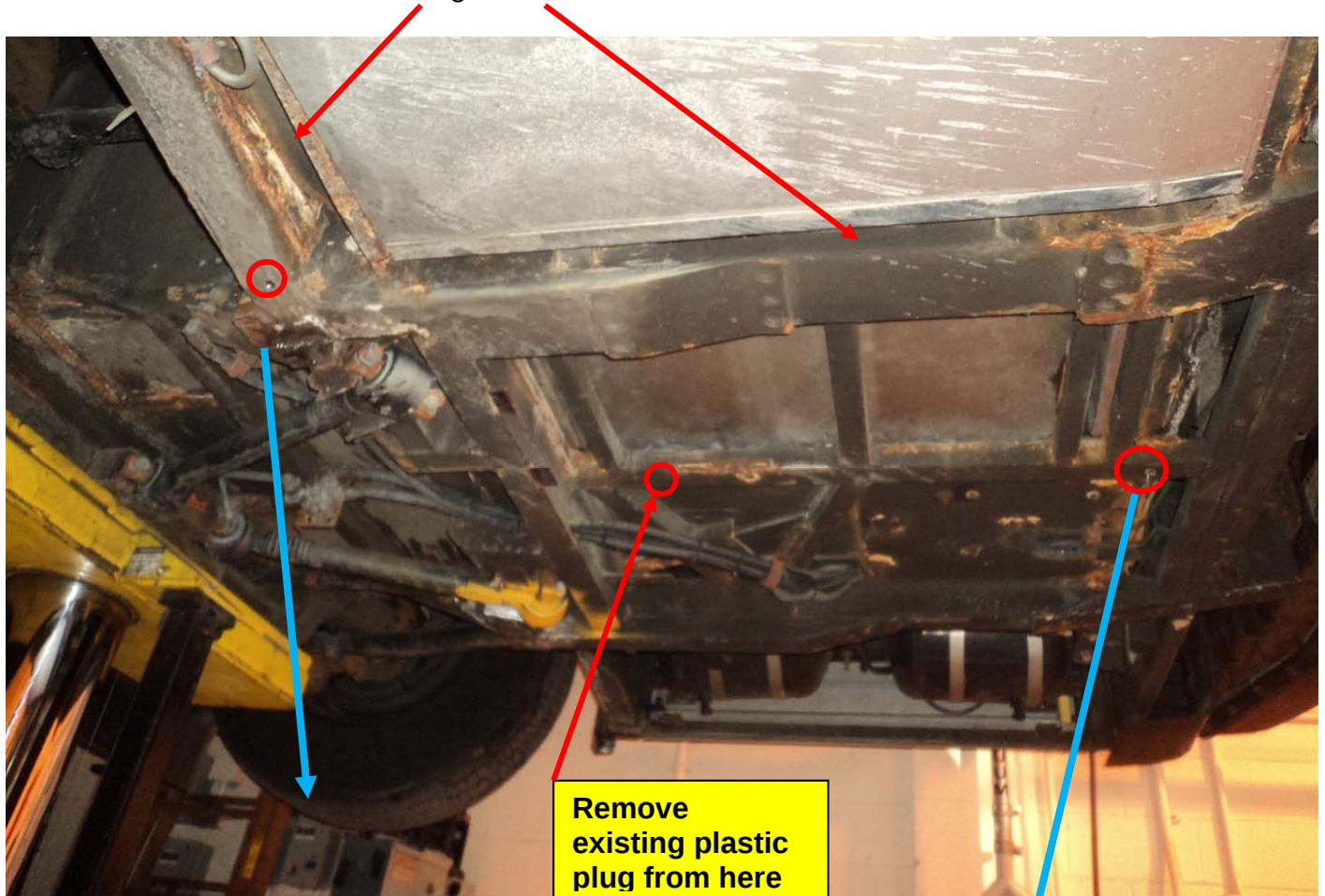
- Cut the corroded sheet metal section out. **Take caution not damage or disturb the structural tubes.**
- Clean the welding surface area with 36G abrasive disc, wire wheel and de-burr bits as required.
- Install a 14 gauge carbon steel (A36) sheet metal piece flush against the existing sheet metal.
- Stitch-weld (1" weld - 2" gap) the new piece onto the existing sheet metal and to the structural tube according to the photograph below.

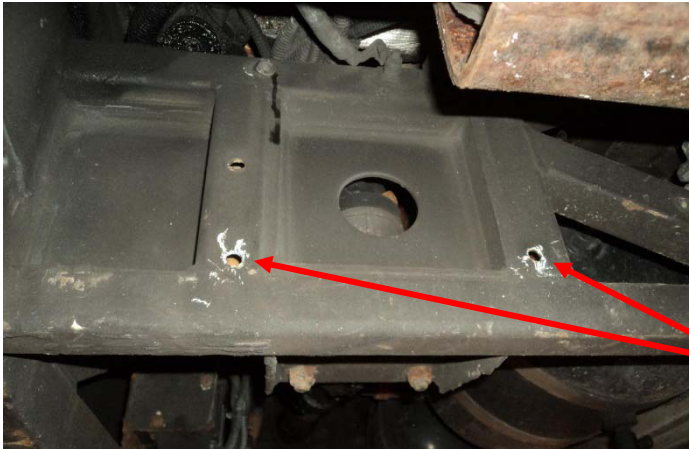


- Grind the welds to provide a smooth surface.
- Surface preparation is according to Step 4 (see page 14).

Drill and Clean Drain Holes:

Drill 3/8" size holes to the following locations:

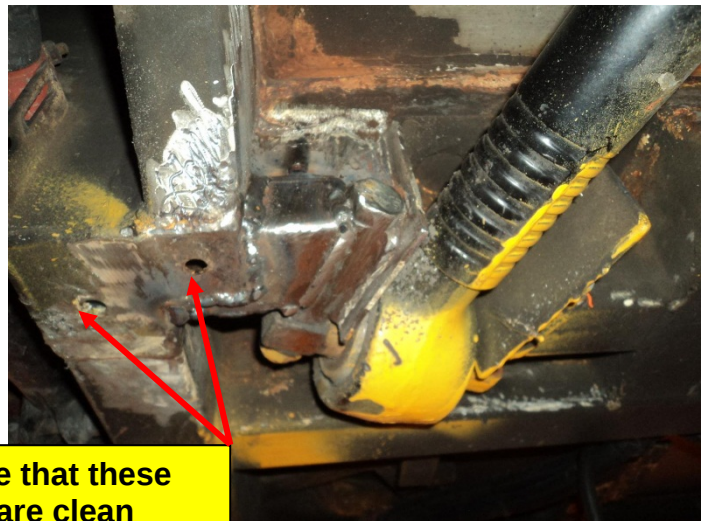




This is the street side 1st crossmember (in front of the miter box). Mark the center of the vertical tubes $\frac{1}{2}$ " above the horizontal welds. Drill $\frac{3}{8}$ size holes at the marks as picture shows. This way there will be a $\frac{1}{8}$ " gap between the bottom of the hole and the weld. Do not drill the welds!



Ensure that these holes are clean beside the front radius rod brackets.

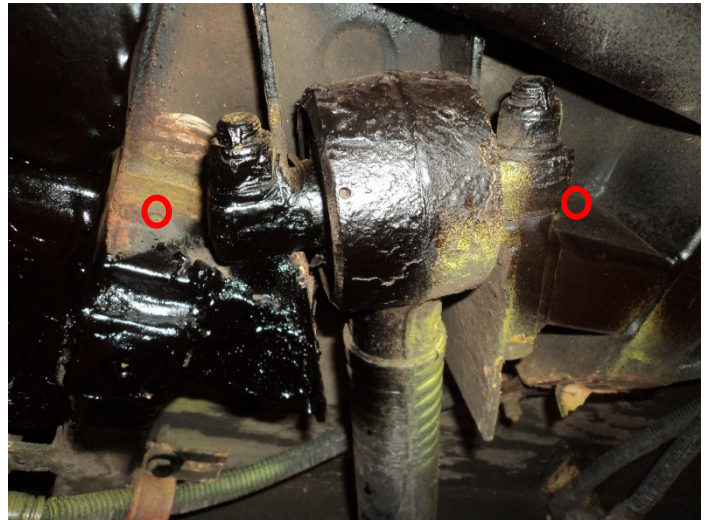
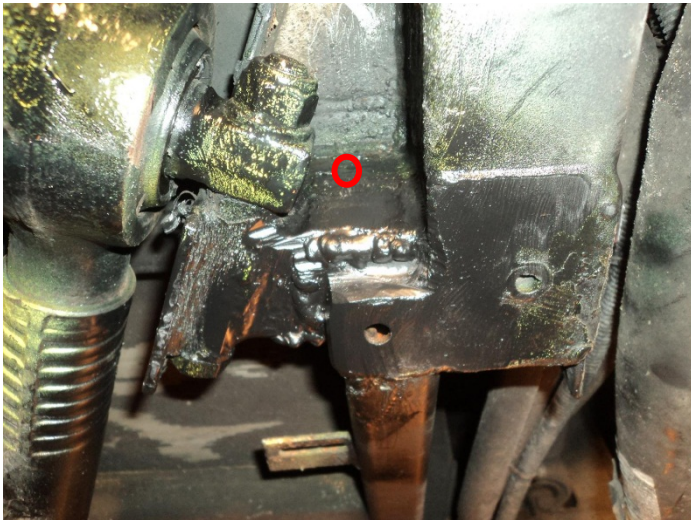


De-burr holes then spray primer and undercoating to around the bare edges of the holes.

Note: All of the drain holes of the entire chassis must be checked and cleaned as required every 6,000 miles.

4. FINAL OPERATIONS

- 4.1 Remove weld splatter.
- 4.2 Grind welding as required.
- 4.3 Restore surface treatment and under coating.
- 4.4 Surface protection instruction:
 - 4.4.1 Degrease all repaired area.
 - 4.4.2 Prime all crude surfaces with industrial primer.
 - 4.4.3 After two inspection (12,000 miles), apply rubberized undercoating material to the primed surfaces and spray undercoating inside the small tubes through the existing holes (see below).



- 4.5 Present final repair to the assigned inspector.
- 4.6 Reinstall removed accessories.
- 4.7 Remove jack stands from underneath the bus.
- 4.8 Lower the bus.
- 4.9 Reconnect the ECU of engine, transmission, and ABS. Reconnect the destination signs. Turn on and connect the PA system. Reconnect the battery cables.
- 4.10 Turn on the battery disconnect switch(es).
- 4. 11 Start the bus. Function test all electrical systems and components.
- 4.9 Document the repairs: Record bus number, mileage, date of repair, and the name of technician(s) who performed the repair.