



CAMPAIGN 000-051

Transport Canada Recall Number: 2024004

NHTSA Recall Number: 24V059 for 33'

NHTSA Recall Number: 24V092 for 35'

Vicinity Motor Corp.

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| REVISION | DATE | AUTHOR | DESCRIPTION | PAGE(S) |
|----------|------------|-------------|---------------|---------|
| 2.0 | 2024-01-03 | Gurpreet P. | Final Release | 23 |

| CAMPAIGN NUMBER | DESCRIPTION | CHARGE TO | | TIME |
|-----------------|---|-----------|-------|------|
| | | LABOR | PARTS | |
| 000-051 | CNG Tank Repair and Cradle Interim Adjustment | VMC | VMC | 5 HR |

| RELEASE DATE | EXPIRY DATE | VENDOR | DISPOSE/RETURN PARTS |
|--------------|-------------|----------------------|----------------------|
| 2024-02-02 | 2025-02-02 | Vicinity Motor Corp. | N/A |

| VIN AFFECTED (LAST 6 DIGITS) | | |
|------------------------------|---------------|---------------|
| 098147-098161 | 098217 | 098344-098348 |
| 098351 | 098353-098354 | 098372 |
| 098445-098450 | 098467-098472 | 098480-098514 |
| 098624-098652 | 098681 | |

| PARTS REQUIRED | | |
|----------------|---|----------|
| PART NUMBER | DESCRIPTION | QUANTITY |
| DVC 14250 | COMPOUND AHESIVE, EPOXY 5 MIN. (C/I 2 X 1OZ TUBES) | A/R |
| 1001-0540 | CNG TANK RUBBER SHIELD WITH ADHESIVE STRIP | 2 |
| N/A | NYLON PLASTIC ZIP TIES – 12" LONG,0.19" WIDE, 0.05" THICK | A/R |

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Required Tools & Equipment

| DESCRIPTION | QTY |
|--|-----|
| FLASHLIGHT | 1 |
| TORQUE WRENCH | 1 |
| VERNIER CALIPER | 1 |
| MEASURING TAPE | 1 |
| PLYWOOD SHEET | 1 |
| CNG CRADLE DRIVER TOOL (2X4) | 1 |
| DEADBLOW HAMMER | 1 |
| FALL ARREST SAFETY HARNESS | 1 |
| SLED STYLE DIAL GAUGE WITH SHARP/POINTY TIPS | 1 |
| ½" OR 3/8" METRIC SOCKETS | A/R |
| ½" OR 3/8" RATCHET | 1 |
| SIDE CUTTERS | 1 |
| DISPOSABLE PUTTY KNIFE | 1 |

Disclaimer

All procedures outlined in this Campaign Document must be performed by a qualified (ticketed and/or licensed) CNG inspector or technician.

Background

It has come to VMC's attention that a select number of buses within the VIN range as listed in front page have interference between the roof mounted CNG Fuel Tanks and the tank support mounting Cradle, and the CNG clamshell restraint cables rub into the top of CNG tanks. The instructions listed below will be a guide in the inspection and repair procedure if necessary.

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1 Inspection

1. Ensure the CNG fuel tanks are FULL before vehicle is shut down (IGN OFF, master battery disconnect OFF), and the vehicle is safely parked. Also ensure the main CNG supply valve is shut OFF.
2. Begin with an inspection of the CNG tanks, on the roof of the vehicle beneath the clam shell. Ensure the tanks are completely **full**. For consistency the tanks shown in the Figure 1 below are labeled and should be referred to as such on any WO created. Any findings during the inspection stage should be recorded on an inspection sheet.

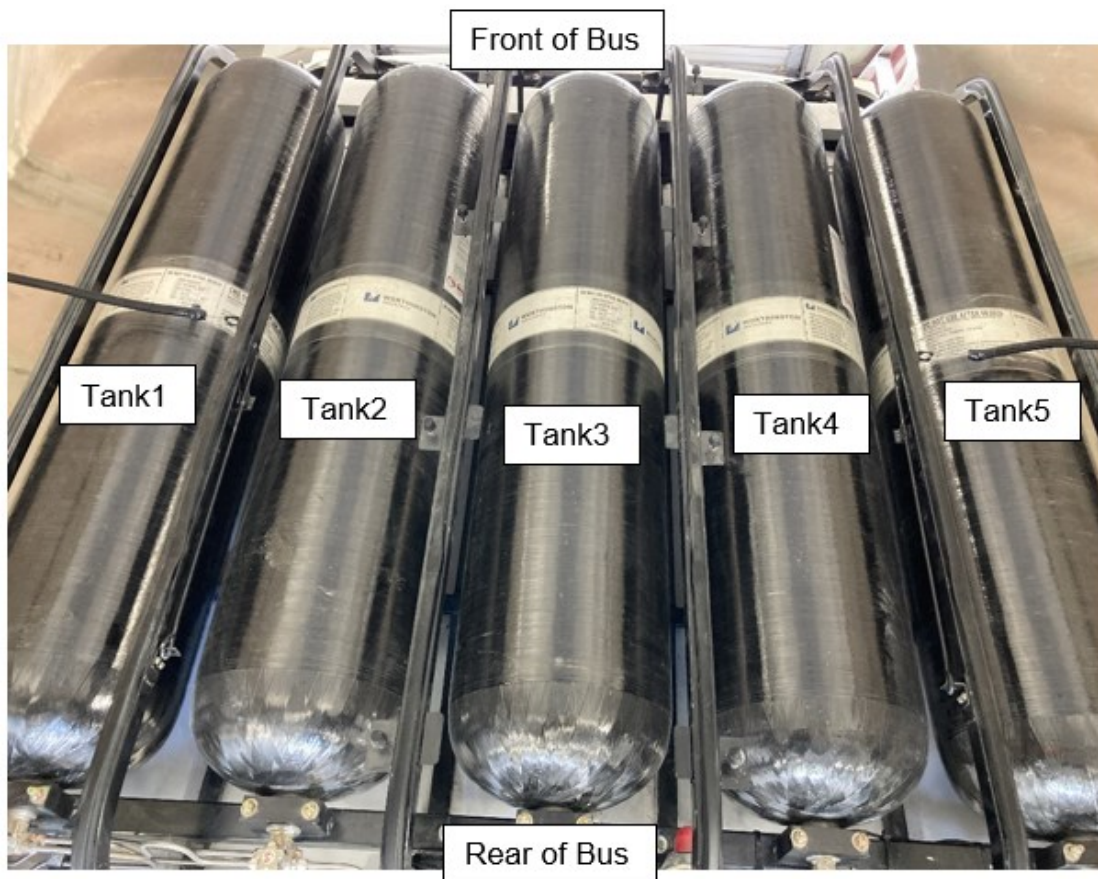


Figure 1 - CNG roof Mounted Tank Sequence.

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Figure 2 - Plywood frame support and CNG Driver Tool

3. Try to use the plywood sheet (as shown in Figure 2) possible when moving around on the tanks, when it is not possible to use the plywood sheet, keep your weight on the frame rails running above the tanks instead on the tanks. Also shown is the “CNG DRIVER TOOL” (2x4) – used to adjust the frame.

4. Open the clamshell on the roof of the bus and inspect the tanks for damage from the rubbing of the clamshell cable and its bracket on the surface of the tank. See Figure 3 for areas of interest. The cables and brackets circled are what is responsible for rubbing on the tank.

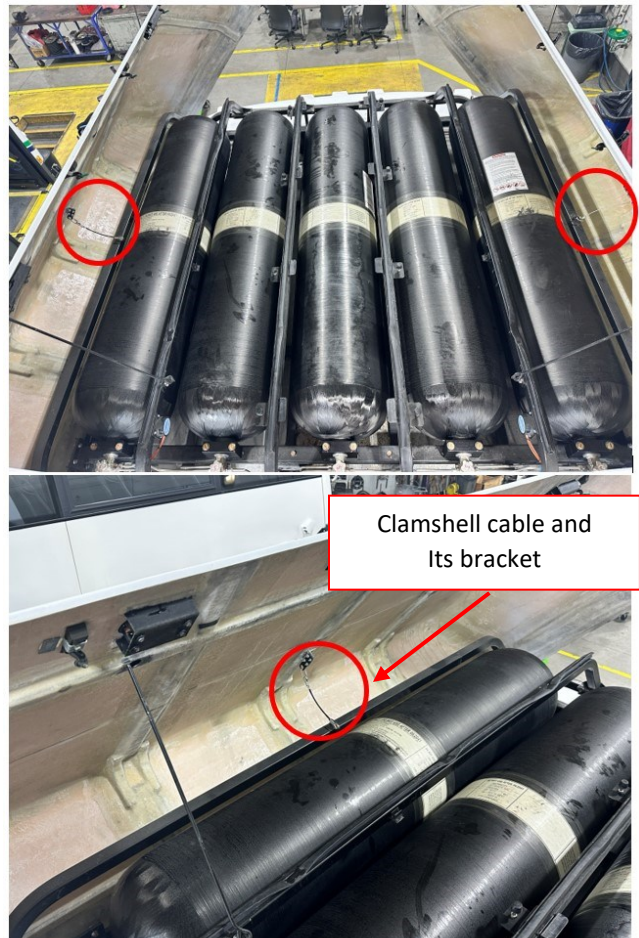


Figure 3 - Clamshell cables and brackets.

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5. Below are two examples of what the damage can look like. (Please see Figure 4).

If damage is found, use a sled style dial gauge with pointy tips (as shown in Figure 5) to assess the depth of the abrasion. Record the depth in the inspection sheet along with the tank number. (**This must be done by a certified CNG tank personnels**)

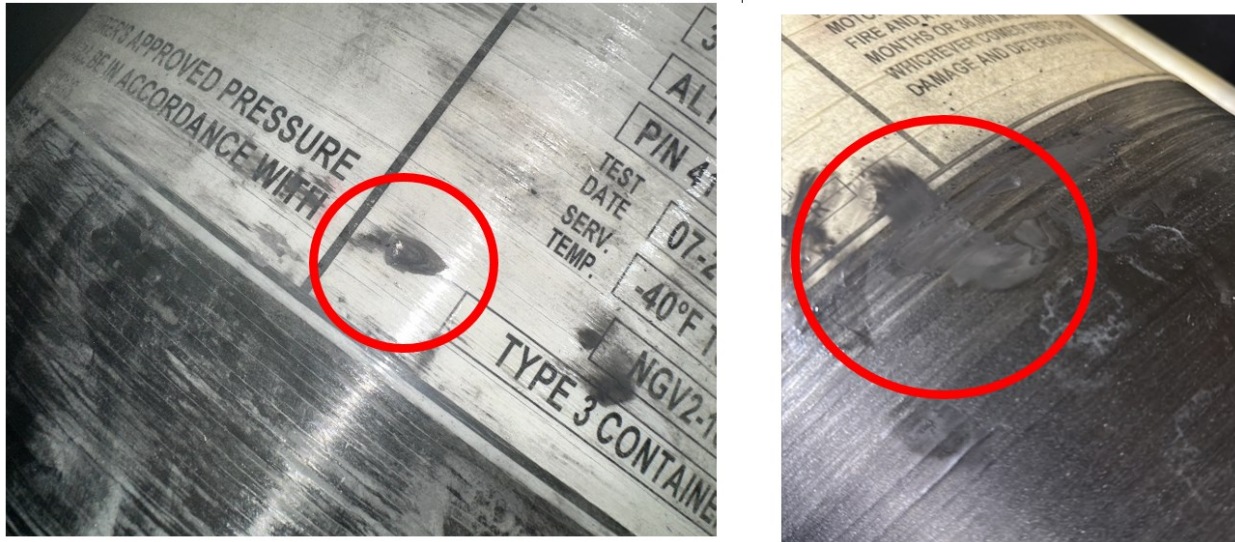


Figure 4 - Examples of cable rubbing into CNG tanks.

Allowable damage for repair is as follows:

- a) Any abrasion between 0.01" (0.254mm) and 0.03" (0.762mm) deep and less than 1.0 sq.in. (645.16mm²) in area.¹
- b) Any number of flaws of any length between 0.01" (0.254mm) and 0.03" (0.762mm) deep. OR one single flaw between 0.03" (0.76mm) and 0.05" (1.27mm) deep and less than 1.0" (25.4mm) long.¹



Figure 5 - Damage being measured with a dial indicator gauge.

¹ Luxfer Gas Cylinder Manual. G-Stor Carbon Composite Cylinder User Manual Alternative Fuel Cylinders. See section 6 for references.

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- Inspect the tank ends to ensure there is no contact of the tanks against the frame. Check both the front and rear of the frame below the tank mounting blocks. Ensure the tanks are full before performing the inspection.

Note: The tank spacing at the front of the bus only needs to be a minimum of 2 mm (*When tank is full*) to pass inspection. Record any tanks that are touching in the inspection sheet provided in Section 5.3.

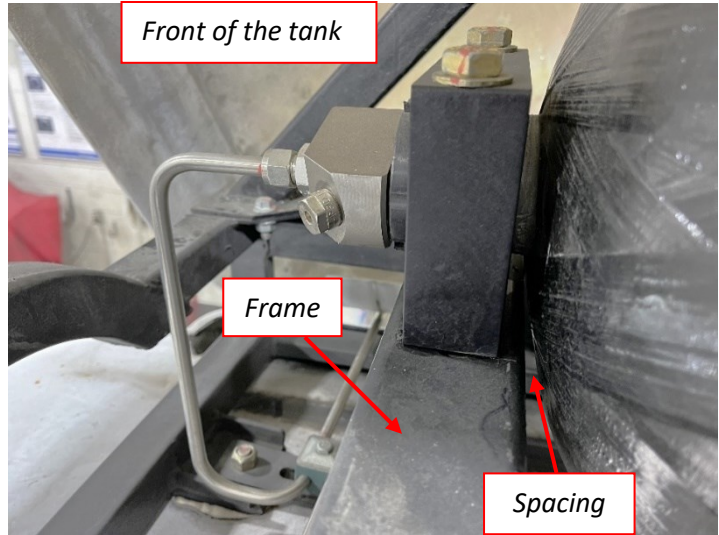


Figure 6 - Spacing between CNG tank and cradle (Front).



Figure 7 - Spacing between CNG tank and cradle(rear).

If the tanks are touching at the front, you will need to complete Section 2.1 of these instructions. If the tanks are touching at the rear or further clearance is needed at the front, you will need to complete Section 2.2 of these instructions.

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7. Inspect the C-Channels for signs of damage or cracks. The C-Channels are located at the front and rear of the CNG mounting structure. Front C-Channels are shown in Figure 8 below. If any cracks are found, the C-Channel will need to be replaced.

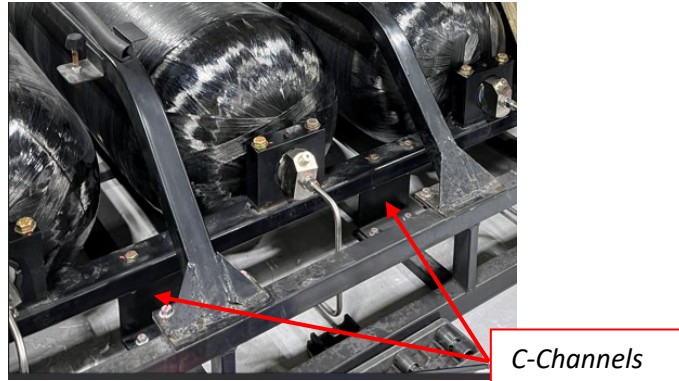


Figure 8 - C-Channels under Cradle.

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2 Tank Adjustments

Note: Before proceeding with this section, please ensure the C-Channels have been replaced if damage was found.

Adjustments are outlined below:

Section 2.1 Tanks contacting at the front frame. Must be performed fully fueled.

Section 2.2 Tanks contacting at the rear frame, or if further clearance is needed at the front. Must be performed fully defueled.

2.1 Tanks Contacting at the Front Frame

This will require adjusting the horizontal cross member at front side. The cross member that needs adjustment is the beam that holds the tank blocks. It is located on the C-Channels. Please see Figure 9.

1. Check the ends of the tank for any signs of damage if they were contacting the frame before the frame adjustment. If damage is found contact your VMC representative for next steps.

All affected tanks must be defueled and removed to be inspected since measuring the tank's damage is inaccessible while tank is mounted on the frame.

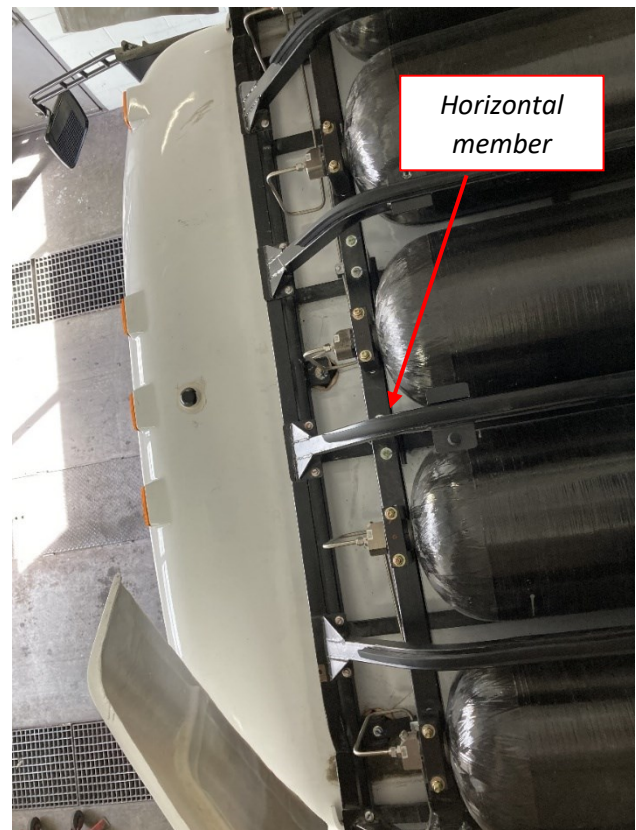


Figure 9 - Horizontal frame member.

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2. Start by loosening all bolts specified, do not completely remove the bolts. Start with the sides of the horizontal frame member – 4 bolts on each side need to be loosened. Please see Figure 10.



Figure 10 - Bolts to be loosened not removed.

3. Next loosen the bolts (4 X M10 bolts) only on the bottom on the C-Channels and loosen the bushing screws (5 X ¼" screws). (Do not completely remove the bolts or screws. Loosening the screws will allow the bushing slid easily inside the tank mounting blocks). Please see Figure 11.

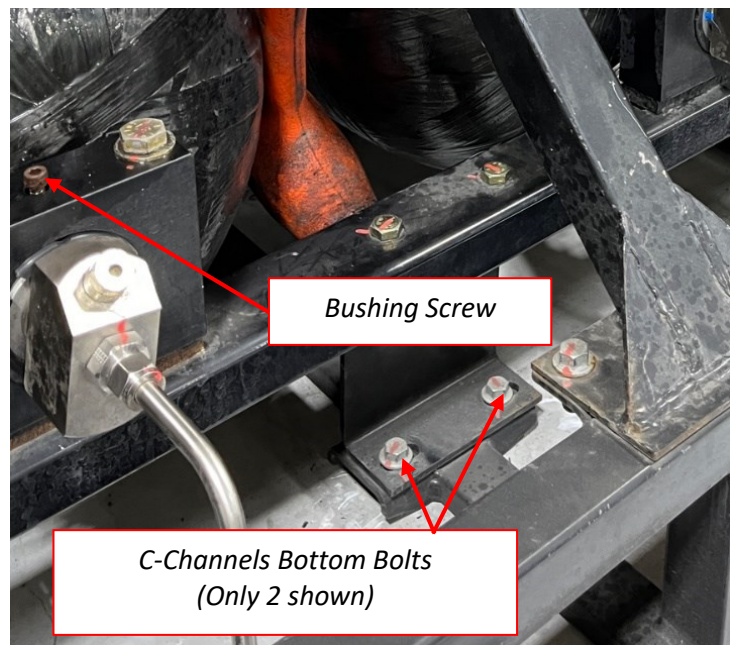


Figure 11 - Loosen bolts and Bushing screw.

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- Once the bolts are loose, use a 2x4 and a mallet to push the frame forward with small strikes until the required clearance is achieved. Perform this operation on both sides of the frame. As mentioned previously, the front end of the tanks requires a minimum clearance of 2 mm between the tank and frame member. The bushing must protrude a minimum of 6 mm out of tank mounting block. Please see Figure 12.



Figure 12 - Cradle being pushed with CNG Tank Tool.

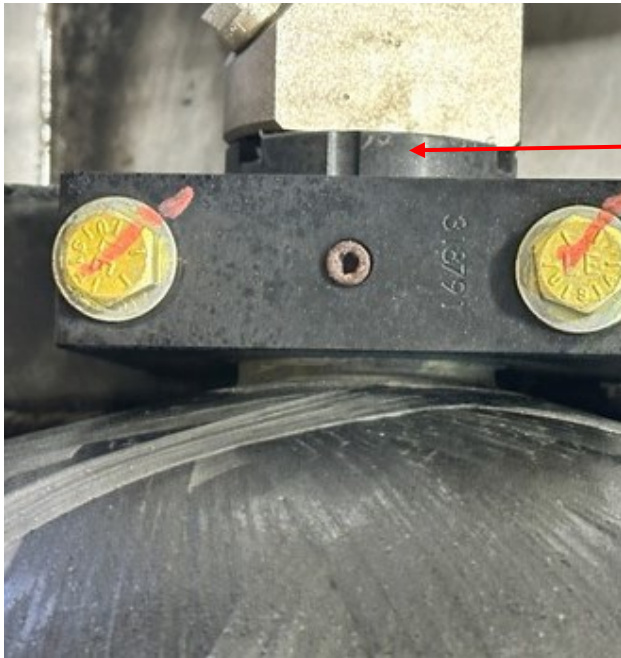


Figure 13 - Bushing amount to be exposed.

Note:

Minimum 6 mm of bushing left exposed (when CNG tank is FULL)

This is when the minimum 2 mm clearance between tank and mounting frame member at front is achieved.

When pushing the frame forward ensure you leave engagement of the block on the bushing. Do not push the block past the bushing end when adjusting the tank frame clearance. Please see Figure 13.

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5. Once the frame has been pushed forward as much as possible while keeping the full bushing engagement as mentioned during Step 4 on Page 10, torque all fasteners that were loosened during Steps 2 and 3 on Page 9. Torque values for all hardware outlined can be found in Section 5.1.
6. If the tanks are still contacting the front of the frame after performing this adjustment procedure, proceed to Section 2.2 to potentially gain more space by moving the tanks back.

Ideal state is shown in the diagram below:

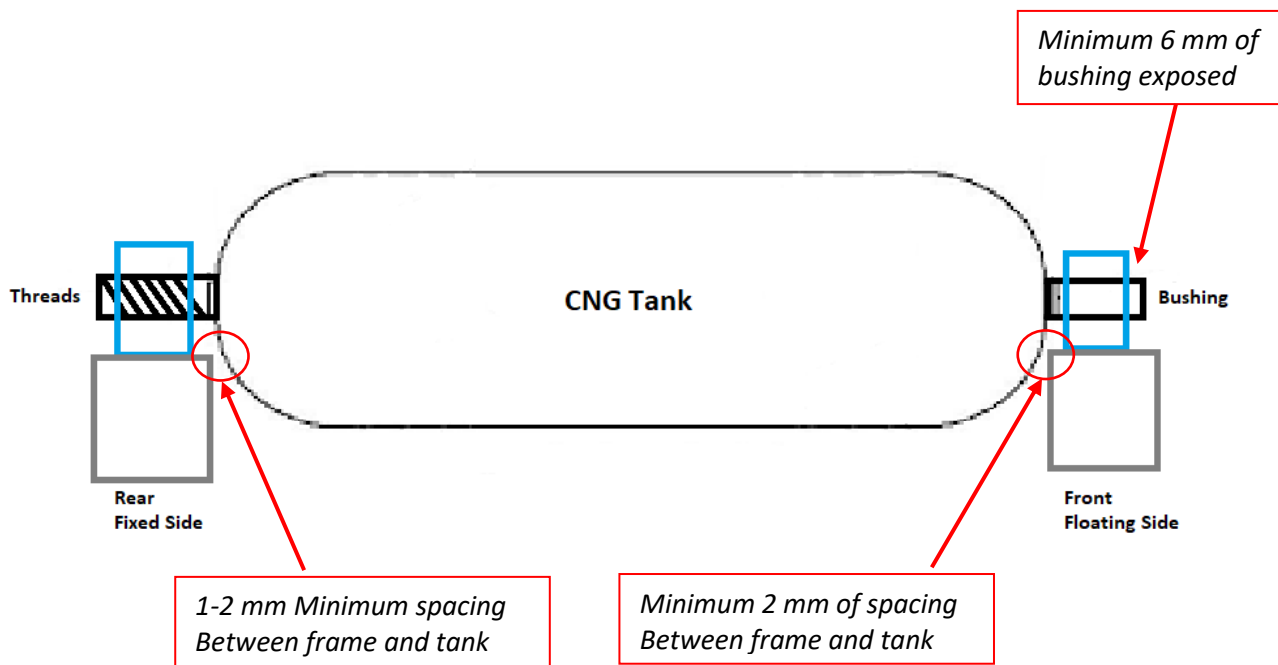


Figure 14 - For a Full Cylinder - Full Expansion Diagram

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2.2 Tanks Contacting at the Rear Frame

CAUTION: Before proceeding with this section, the tank that is to be adjusted will need to be **defueled** and isolated from the rest of the system. Do not attempt this section with a fueled cylinder.

Note: The tanks have a dry weight of 180 lbs. (82 kg) each.

This section will involve lifting the tank and adjusting the clearance to the frame by spinning the threaded block to move it closer or further away from the tank.

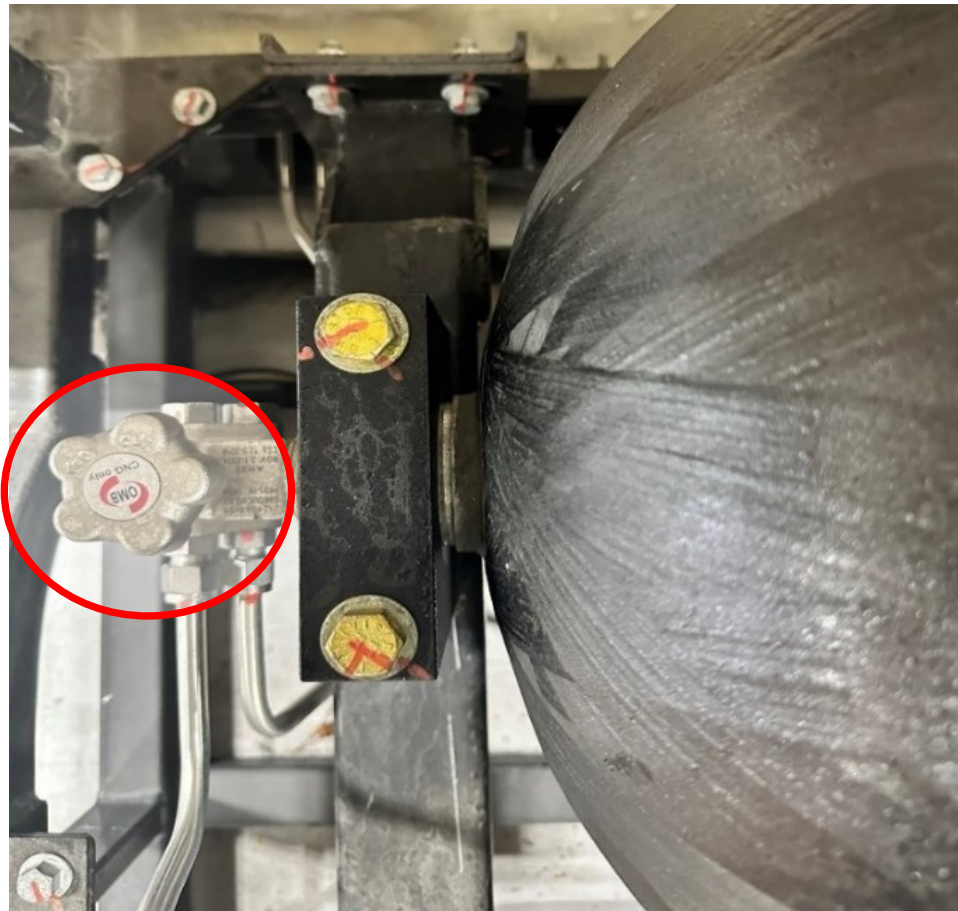


Figure 15 - Tank valve to be turned off.

1. Ensure all valves are closed except for the tank you intend to work on. It can be helpful to run the bus to ensure all the CNG is out of the cylinder. See Figure 15 above for a picture of the valve.

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2. Disconnect the lines from the valve. Also remove the large bolts from the top of the threaded block. Please see Figure 16 on the right.



Figure 16 - Lines and bolts to be removed.

3. Loosen the bolts on the mounting block at the **front** of the frame near the front of the bus with the sliding bushing (See Figure 17). The bolts should not be completely removed, but they need to be able to accommodate the next step which is lifting one side of the tank.

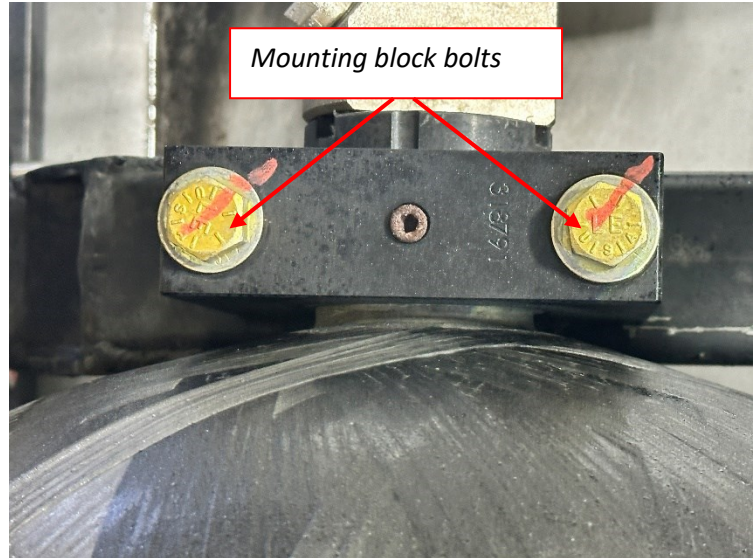


Figure 17 – Mounting Block Bolts

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4. Position a ratcheting strap below the tank near the rear of the frame and secure it to the frame rails as shown in Figure 18. Lift the rear side of the tank until it is high enough to spin the threaded block. Only the block needs to spin, not the tank. Please see Figure 19.

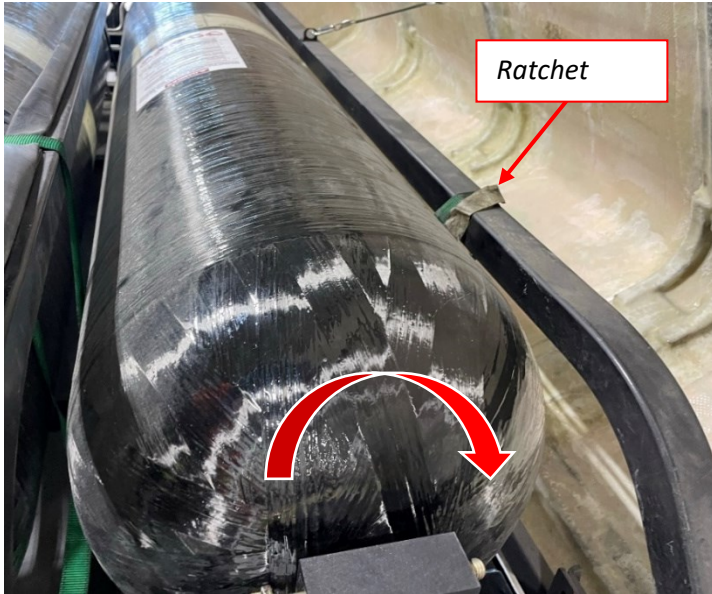


Figure 18 - Ratchet strap to be installed under the tank.

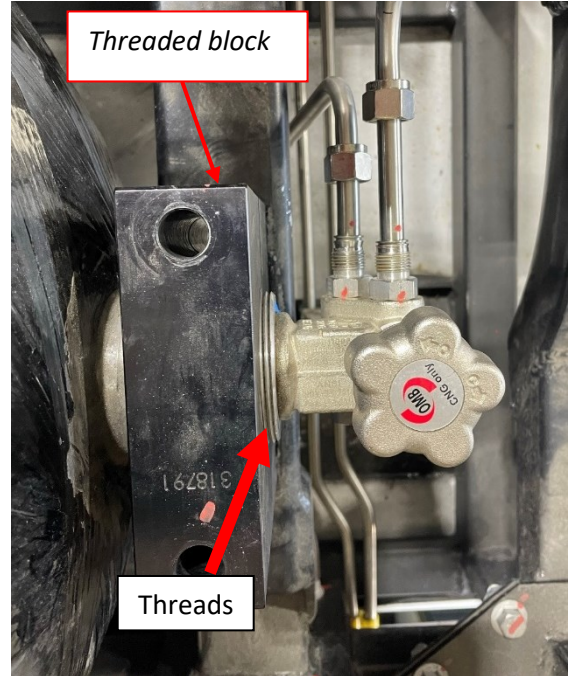


Figure 19 - Block to be spun either clockwise or counterclockwise.

5. The direction you spin the block will depend on if you are trying to move the tank back because it is making contact at the front or if you are trying to move that tank forward because it is making contact at the rear frame.

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- After you have created space by moving the tank at the rear frame make sure you recheck your clearances at the front frame again. You will want to tighten all the bolts back down to confirm the spacing, please see Figure 20 below. See Section 5.1 for torque values.

If you still do not have adequate spacing after adjusting the front and rear of the frame, *The bus needs to be put out of service and front mounting frame needs to be replaced with new designed frame* (Contact your VMC representative).

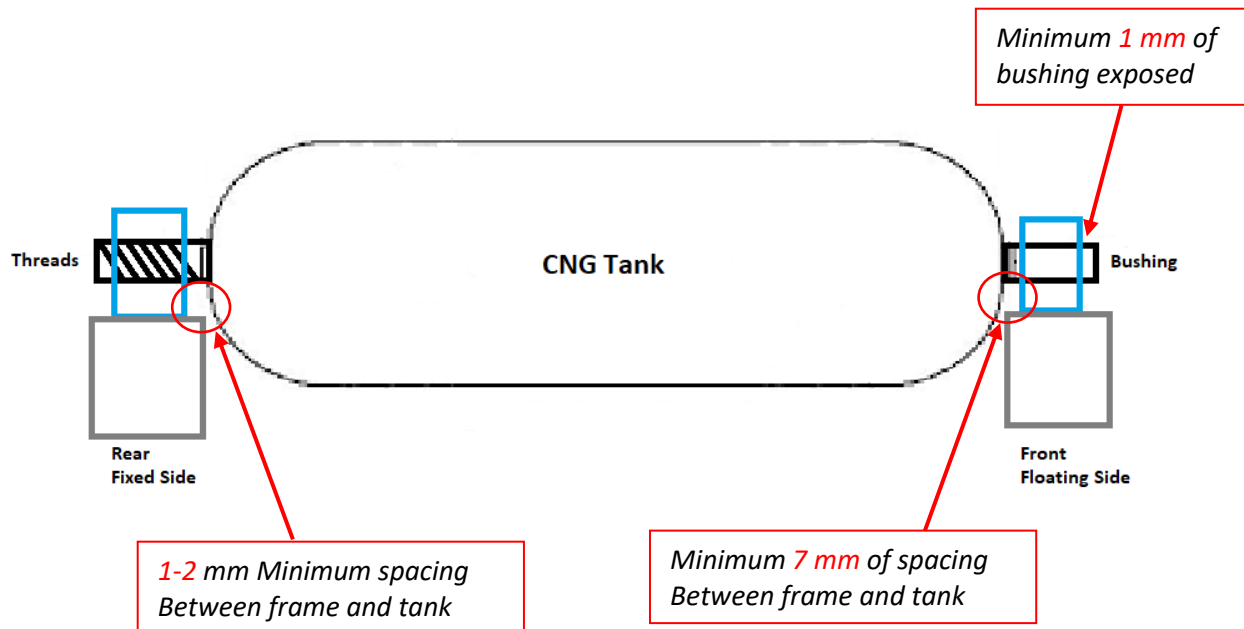


Figure 20 - For a Defueled Cylinder – Fully Contracted Diagram

- Ensure that you also check the ends of the tanks for any signs of damage and record them in the inspection sheet provided in Section 5.3.
- Retighten the CNG lines and fill the tank. Recheck the Full Expansion clearances, referring to Figure 14 on Page 11.
- Ensure you use a gas sniffer to check for any leaks before you return the unit to service.

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3 Tank Repair

Ensure you have completed the inspection as outlined in Section 1 before proceeding with the steps below.

Allowable damage for a Level 2 repair is as follows:

- a. Any abrasion between 0.01" (0.254mm) and 0.03" (0.762mm) deep and less than 1.0 sq.in. (645.16mm²) in area.
- b. Any number of flaws of any length between 0.01" (0.254mm) and 0.03" (0.762mm) deep. OR one single flaw between 0.03" (0.76mm) and 0.05" (1.27mm) deep and less than 1.0" (25.4mm) long.²

If no tank damage is found, proceed to Section 4.

Repair tools needed are as follows:

Repair procedure from Luxfer Manual²

These tools are needed to repair Level 2 damage.

- a. 120-grit (fine) sandpaper.
- b. A receptacle for mixing epoxy resin, a resin applicator.
- c. Two-part epoxy resin (resin plus cure)
- d. A brush that may be needed for removing dust and debris.



Figure 21 - Epoxy and tools needed for tank repair.

Clean shop rags or heavy-duty paper towels are also useful. The epoxy is EPOXY 5-MINUTE DEVTUBE 25ML DEVCON.

² Luxfer Gas Cylinder Manual. *G-Stor Carbon Composite Cylinder User Manual Alternative Fuel Cylinders*. See section 6 for references.

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3.1 Repair Procedure

1. Clean and sand damaged area with 120 grit (fine) sandpaper.



Figure 21 - Tank being sanded.

2. Wipe off sanding dust.



Figure 22 - Tank being cleaned.

3. Mix epoxy resin in a separate container or plate.



Figure 23 – Mixing the epoxy.

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4. Apply resin to damaged area, ensuring that resin is worked fully into any damage. Allow to dry for at least 1 hr before proceeding to next step.

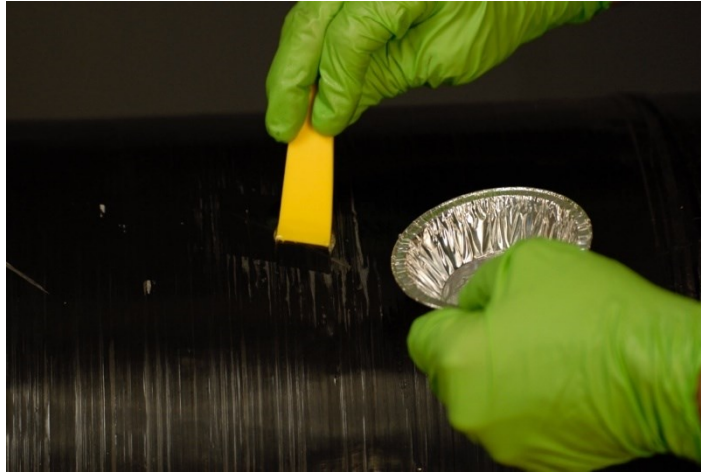


Figure 24 - Epoxy being applied on damaged surface.

The epoxy has a working time of 3-6 mins once mixed. The functional cure is achieved after 1 hr – after this waiting period you can move on to Section 5.

Note: The full cure time of the epoxy is 12 hours at room temperature.

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4 Tank Protective Padding Installation

A temporary Rubber Shield Kit (VMC PN# 1001-0540) is required to be fitted to protect Tanks #1 and #5. The pads are shown below.



Figure 25 - Rubber Shield Kit. (VMC PN# 1001-0540)

4.1 Installation Procedure

1. Clean the underside of the frame member (1 member in from the outermost) and peel the blue adhesive backing off the pad. Install the Rubber Shield on the underside of the frame member. Please see Figure 26.



Figure 26 - Rubber kit being installed.

2. Install the zip ties through the holes of the Rubber Shield and around the Frame member on both sides of the Rubber Shield. Ensure the head of the zip ties are not facing upwards. Trim off the excess. Please see Figure 27.



Figure 27 - Rubber kit installed.

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5 Appendix

5.1 Torque Values

See diagram below for torque values. These values apply to both sides of the tank and mounting structure (Front and Rear)

1. M10:
 - a. 44 ft-lbs.
 - b. 60 Nm

2. M12:
 - a. 74 ft-lbs.
 - b. 100 Nm

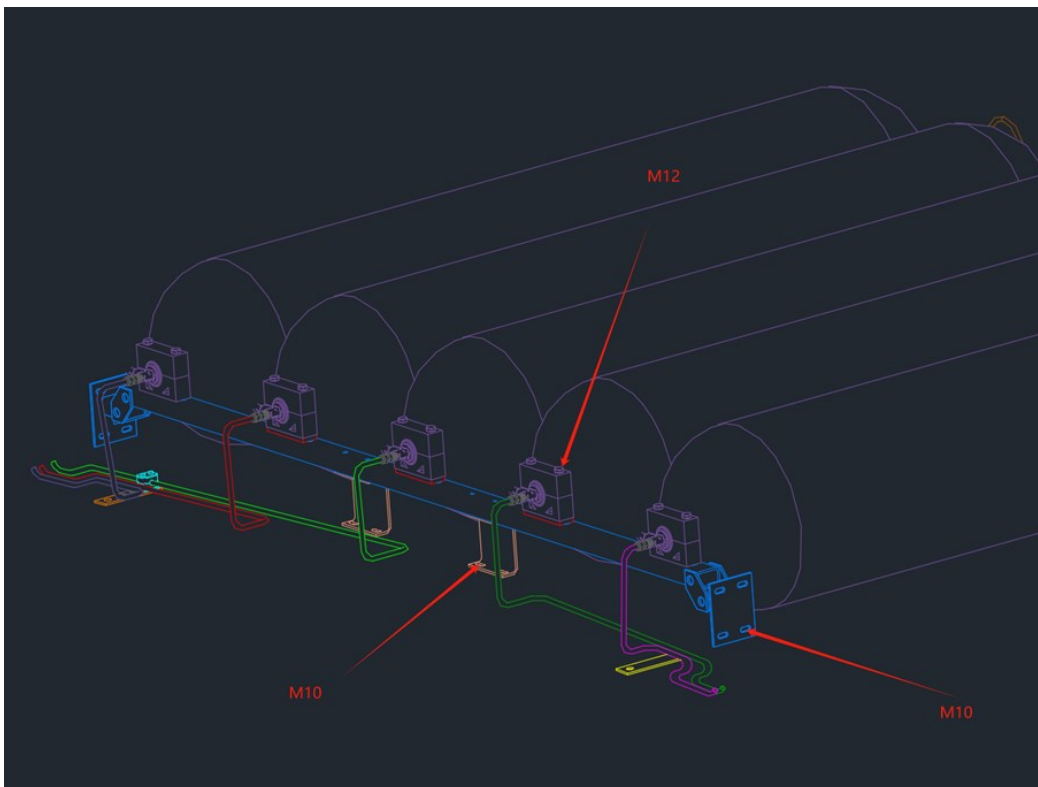


Figure 28 – CNG Mounting Structure Torque Values

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5.2 Epoxy Data Sheet



A brand of **ITW** Polymers Adhesives North America

Technical Data Sheet

3/16/2012

5 Minute® Epoxy

| | | |
|-------------------------------------|--|------------------------------------|
| Description: | A rapid-curing, general purpose adhesive/encapsulant. | |
| Intended Use: | Bonds metals, fabrics, ceramics, glass, wood, and concrete (in combinations) | |
| Product features: | 100% reactive, no solvents Good solvent resistance Bonds metals, fabrics, wood, and concrete | |
| Limitations: | None | |
| Typical Physical Properties: | <i>Technical data should be considered representative or typical only and should not be used for specification purposes.</i> | |
| | Cured 7 days @ 75° F | TESTS CONDUCTED |
| | Adhesive Tensile Lap Shear[GBS] | 1,900 psi @ 0.005" bondline |
| | Dielectric Strength | 490 volts/mils |
| | Gap Fill | Good |
| | Impact Resistance | 5.5 ft.lb./in.(2) |
| | Service Temperature | Dry, -40 °F to 200 °F |
| | Shore Hardness | 85 Shore D |
| | Solids by Volume | 100 |
| | Specific Volume | 25.1 in.(3)/lb. |
| | Tensile Elongation | 1% |
| | Teel | 2-3 pli |
| | Uncured | |
| | Color | Light Amber |
| | Fixture Time | 10-15 min. @ 72 °F |
| | Full Cure | 12 hr. @ 72 °F |
| | Functional Cure | 3/4 - 1 hr. @ 72 °F |
| | Mix Ratio by Volume | 1:1 |
| | Mix Ratio by Weight | 1:1 |
| | Mixed Density | 9.17 lbs./gal.: 1.10 gm/cc |
| | Mixed Viscosity | 10,000 cps |
| | Working Time | 3-6 min. (28 gm @ 72 °F) |
| Surface Preparation: | Clean surface by solvent-wiping any deposits of heavy grease, oil, dirt, or other contaminants. Surface can also be cleaned with industrial cleaning equipment such as vapor phase degreasers or hot aqueous baths. If working with metal, abrade or roughen the surface to significantly increase the microscopic bond area and increase the bond strength. | |
| Mixing Instructions: | <p>---- Proper homogenous mixing of resin and hardener is essential for the curing and development of stated strengths. ----</p> <p>25 ML DEV-TUBE</p> <ol style="list-style-type: none"> Squeeze material into a small container the size of an ashtray. Using mixing stick included on Dev-tube handle, vigorously mix components for one (1) minute. Immediately apply to substrate. <p>50 ML/400ML/490 ML CARTRIDGES</p> <ol style="list-style-type: none"> Attach cartridge to Mark V™ [50ml] 400ml manual or pneumatic dispensing systems. Open tip. Burp cartridge by squeezing out some material until both sides are uniform (ensures no air bubbles are present during mixing). Attach mix nozzle to end of cartridge. Apply to substrate. | |

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5.3 Tank Inspection Record Sheet

NOTE: TRACKING SHEET MUST BE SUBMITTED WITH W.O

| | | | | | |
|--|---|---------------|---------------|---------------|---------------|
| Bus Unit # | | | | | |
| Inspector Name | | | | | |
| Date | | | | | |
| Fuel Pressure Gauge reading | | | | | |
| | Tank 1 | Tank 2 | Tank 3 | Tank 4 | Tank 5 |
| Tank Serial # | | | | | |
| | <i>If damage is noted - record in the box below in thou or mm (be sure to record unit type)</i> | | | | |
| Tanks Touching Front? (Y/N) | | | | | |
| Tanks Touching Rear? (Y/N) | | | | | |
| Damage found at front of tank? (Include measurement) | | | | | |
| Damage found at rear of tank? (Include measurement) | | | | | |
| Damage found on top of tank from cable chaffing? (Include measurement) | | | | | |
| All Repairs Completed? (Y/N) | | | | | |

Table 1 - Tank Inspection Record Sheet

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5.4 References

NOTE: The tanks on the VMC buses are branded Worthington, which are made by SCI. Luxfer is now the parent company of Worthington. Hence, the Luxfer manual is referenced in these instructions. Luxfer has confirmed that the provided manuals, specifications, and diagrams are correct for this model of CNG tanks.

Manuals

- Luxfer Gas Cylinder Manual. *G-Stor Carbon Composite Cylinder User Manual Alternative Fuel Cylinders.*
Section 6 Inspection. Subsection 6.5 Types of Damage & 6.7 Table of Damage Levels.
Section 7 Repair
- Worthington Type 3 Cylinder Maintenance and Inspection Manual.

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