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Title: MaxxForce 7 Internal/External Coolant Leak Diagnostics and Repair

Applies To: ALL MaxxForce 7

CHANGE LOG

06/12/2015 - Added additional pictures of failure mode
06/01/2015 - Added Navistar and Belzona letter of repair approval
04/08/2015 - Added steps for repairing an external coolant leak, linked SRT to the proper manual for repair
03/20/2015 - ADDITIONAL CLEANING STEPS TO HELP ADDRESS FAILURES DUE TO BLOCK CLEANLINESS
02/16/2015 - Initial Article Release

DESCRIPTION

This document will guide the user through internal/external coolant loss diagnostics and block repair steps for the MaxxForce 7. For demonstration purposes the passenger side of a 2010 MaxxForce 7 was used in this document. If the repair is required on the drivers side of the engine disassemble as necessary to access the repair area.

This document replaces/retires: IK1201218 - *2010 V-8 Internal Coolant Leak Diagnostics*

Belzona Reforming and Protective Materials for Engines and Castings (Testimonials)

Navistar and Belzona Letter of Repair

Block Corrosion Images and Epoxy Representation

SYMPTOMS

Diagnostic Trouble Code(s) & Dashboard Indicator Light(s):

2007-2009 MaxxForce 7

DTC/Light	SPN/Light	Description
SPN 2323 FMI 1	SPN 111 FMI 1	ECL below Warning / Critical Level
SPN 2321 FMI 0	SPN 110 FMI 0	Engine Coolant System above Critical Temperature
SPN 2322 FMI 7	SPN 110 FMI 7	Engine Coolant System above Warning Temperature

2010-2013 MaxxForce 7

SPN/Light	Description
SPN 111 FMI 1	ECL below Warning / Critical Level
SPN 110 FMI 0	

	Engine Coolant System above Critical Temperature
SPN 110 FMI 15	Engine Coolant System above Warning Temperature
SPN 110 FMI 16	Engine Coolant System Above OBD Maximum Temperature
SPN 110 FMI 17	Engine Coolant System below OBD monitoring temperature
SPN 110 FMI 18	Engine Coolant System below closed loop minimum temperature

Customer Observations or Concerns:
- Coolant loss
- Coolant consumption
- Coolant in the oil
- Engine over-heat

SPECIAL TOOLS / SOFTWARE

Tool Description	Tool Number	Comments	Instructions
EZ-TECH OR POCKETMAXX			
BORESCOPE		LOCALLY	**REQUIRED.** RECOMMEND: SNAP-ON BORESCOPE BK6500
COOLANT MANAGEMENT SYSTEM (CMT)	KL5007NAV		
SMALL ABRASIVE FLAP DISC		LOCALLY	No larger than 20mm in diameter
NOZZEL SLEEVE SEATING BRUSH	ZTSE4391		For scrubbing coolant cavity
PRESSURE TESTER	ZTSE2384		
10MM SOCKET		LOCALLY	
13MM SOCKET		LOCALLY	
8MM HEX BIT SOCKET		LOCALLY	
PUNCH		LOCALLY	
HAMMER		LOCALLY	
PRY BAR		LOCALLY	
PLYERS		LOCALLY	
HEAT GUN		LOCALLY	**REQUIRED**
HAND VACUUM GUN		LOCALLY	
ABRASIVE DISC (SCOTCH-BRITE)		LOCALLY	Removing paint from block (External)
FREEZE PLUG INSTALLER	ZTSE4509		
STANDARD PLUG		LOCALLY	
DISPOSABLE MEASURING SPOON (1 TABLESPOON - 15 mL)		LOCALLY	MUST BE 1 TABLESPOON (FUTURE KITS MAY CONTAIN)

SERVICE PARTS INFORMATION

Kit Description	Part Number	Quantity Required	Notes
1KG BELZONA 1391 HT CERAMIC EPOXY	2514564C1	150 grams	Kit comes in 1kg quantities, dealer must divide epoxy appropriately for each repair (5-6 repairs per container)
KIT, MXF7 BLOCK REPAIR (MECHANICALS)	2514509C91	1 Per Repair	Kit Contents (Click Here)
BREATHER, ASSY IMPACTOR	7085773C92	As Needed	Follow article diagnostics (2010-2013 MF7)
INTERNATIONAL T-442 RTV SILICONE RUBBER	1830858C1	As Needed	

DIAGNOSTIC STEPS

Step	Action	Decision
1	**Initial checks** Obtain vehicle health report using EZ Tech or Pocketmaxx Has vehicle health report been obtained and uploaded?	**Yes**. Proceed to Step 2

Step	Action	Decision
2	**External Leak Inspection** Using tool ZTSE2384 - Radiator Pressure Test Kit, pressurize the cooling system per procedure listed in *Engine Diagnostic Manual*and inspect for leaks. Is there a coolant leak external, coming from the engine block under cylinder #7 or #8 freeze plug near the HEX Plug?	**Yes.** Proceed to the Repair Steps section of this document **No.** Step 3.

Step	Action	Decision
3	**Internal Leak Inspection** Remove the engine oil pan per instruction is the *Engine Service Manual* Using tool ZTSE2384 - Radiator Pressure Test Kit, pressurize the cooling system per procedure listed in the *Engine Diagnostic Manual* and inspect for leaks near cylinder 7. Is there a coolant leak present near cylinder 7?	**Yes.** Proceed to the Repair Steps section of this document **Leaks but Not Near Cylinder 7.** Step 6 - NOTE: Repairing the engine may still be directed but in a different location. **No Leaks.** Follow Coolant System symptom section of the *Engine Diagnostic Manual*

Step	Action	Decision
4	**Post Repair Diagnostics - Crankcase Pressure** **Perform the following: Crankcase Pressure Test at engine operating temperature of 158°F (70°C) or higher.** 1. Ensure the oil level is not above the full mark. 2. Remove the oil level gauge from the dipstick tube. Attach 11/16" hose with clamps and 1/4" pipe adapter to magnahelic gauge on gauge kit ZTSE4409. 3. Start engine and run at high idle (no load) RPM. Allow reading to stabilize, before recording reading. Refer to the Diagnostic Manual. **Specification:** at High Idle, Below 24" of H_2O	Document Result - Step 5

Step	Action	Decision
5	**Post Repair Diagnostics - Blow-By** **Perform the following: Blow-By Test at engine operating temperature of 158°F (70°C) or higher.**	**Crankcase Pressure:** In Spec **Blow-By:** In Spec No action necessary, complete any other required work and release unit to the customer.

	1. Ensure the engine oil level is not above the full mark and the oil level gauge is secured. 2. With engine OFF, remove oil fill cap. 3. Install crankcase pressure test adapter ZTS4284 to oil fill tube. 4. Connect orifice ZTSE4146A to crankcase pressure test adapter ZTSE4284. 5. Connect a line from the orifice ZTSE4146A to the magnahelic gauge on the gauge kit ZTSE4409. 6. Using a standard plug, block off the road draft tube, located on the bottom right side of the engine. 7. Run engine at high idle (no load) RPM. Monitor magnahelic gauge and record high idle blow-by pressure. Refer to the Diagnostic Manual. **Specification:** at High Idle, Below 9" of H20	**Crankcase Pressure:** Out of Spec **Blow-By:** In Spec **Remove Crankcase Breather:** Part Number 7085773**C92**: Clean breather of sludge or debris. If uncleanable or no sludge resent replace the breather. Part Number 7085773**C91**: Replace Breather with 7085773**C92** **Blow-By: Out of Spec** Step 6

Step	Action	Decision
6	**Engine iApproval Process** Open an engine replacement iApproval using the Service Portal be sure to include the following information 1. Fill out a detail description of the issue. 2. List any active & Inactive DTCs 3. Attach images of the leak and if the repair was attempted pictures of the cleaned galley and epoxy in the galley 4. Obtain and attach the engine parameter file 5. Note any other details observed (over-heat, over-speed, etc.)	**Follow *Navistar's Technical Support Teams* directions. This may include following through with the remainder of this article.**

REPAIR STEPS

WARNING
To prevent personal injury or death, read all safety instructions in the "Safety Information" section of the diagnostic manual.

WARNING
Park vehicle on hard flat surface, turn the engine off, set the parking brake, and block the wheels to prevent the vehicle from moving in either direction. Failure to do so may result in property damage, personal injury, and / or death.

WARNING
To prevent personal injury or death, make sure the engine has cooled before removing components.

WARNING
To prevent personal injury or death, do not let engine fluids stay on your skin. Clean skin and nails using hand cleaner and wash with soap and water. Wash or discard clothing and rags contaminated with engine fluids.

WARNING
This procedure may require the usage of an open flame and flammable materials. Please use extreme caution and ensure full dissipation of flammable substances before using an open flame.

WARNING
Always wear safe eye protection when performing vehicle maintenance. Failure to do so may result in personal injury and / or death.

FAILURE CONCLUSIONS:

Coolant leaks were a result of perforation due to corrosive attack.

TEST/ANALYSIS RESULTS:

Internal coolant leaks; all of the failures occur only in a low spot of the water jacket of Cylinder #7 near the coolant plug shown in Figure 1. Notable amounts of debris can also be found in the coolant passage. The failures were cavities of varying size as shown in Figure 1. When a failure occurs, a cavity would grow large enough to perforate the wall separating the coolant and oil, allowing coolant from the water jacket to enter the oil passage.

External coolant leaks; occur on either side of the engine but mainly on the driver's side about the starter. When a failure occurs, a cavity would grow large enough to perforate the wall on the outside of the engine, allowing coolant from the water jacket to leak externally.

SUMMARY

Filling the effected area with Belzona 1391 HT Ceramic Based Epoxy prevents coolant leakage and further corrosion of the block. Click here to see additional pictures and a complete repair epoxy representation.

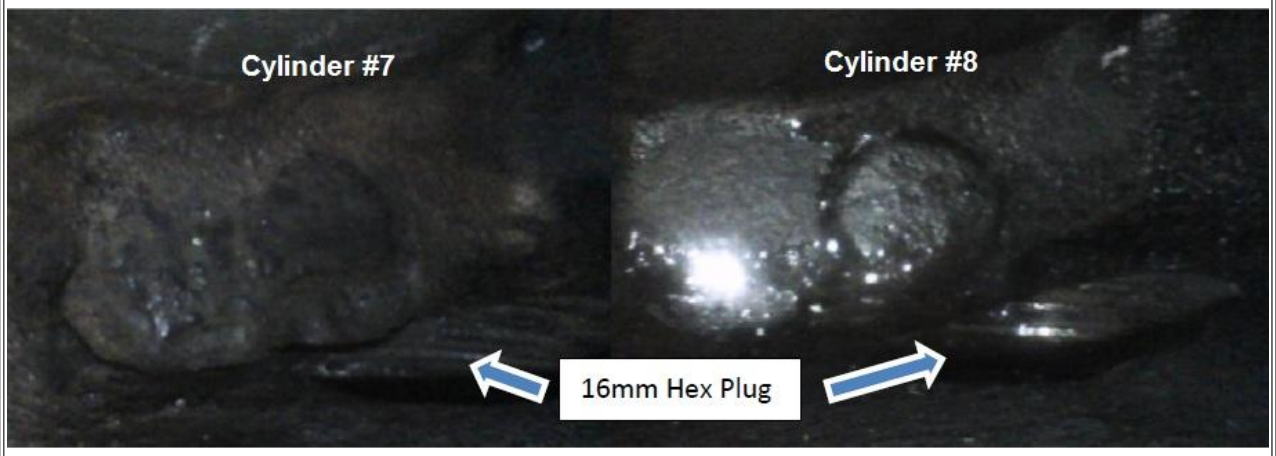

Figure 1: Coolant Jacket Comparison Cylinders #7 and Cylinder #8

Before You Begin
The coolant cavity has to be clean and dry for the epoxy to adhere to the surface. Please do not guess or assume the cavity is clean, be diligent with the prep work. This repair works; failures occur by not following the cleaning and inspecting steps and

the customer's truck will be down again for a short block engine replacement with even more time lost. All repair failures will be looked at by Navistar to determine the root cause of the repair failure.

Repair Failure Examples

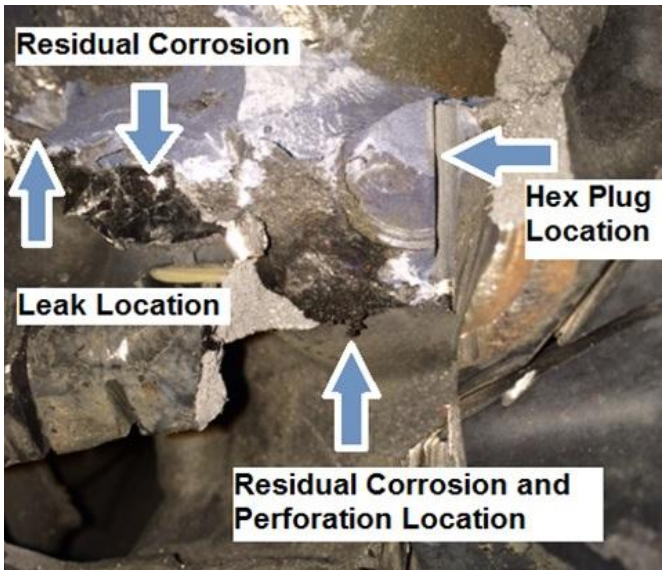

Figure 2: Failure due to improper corrosion removal

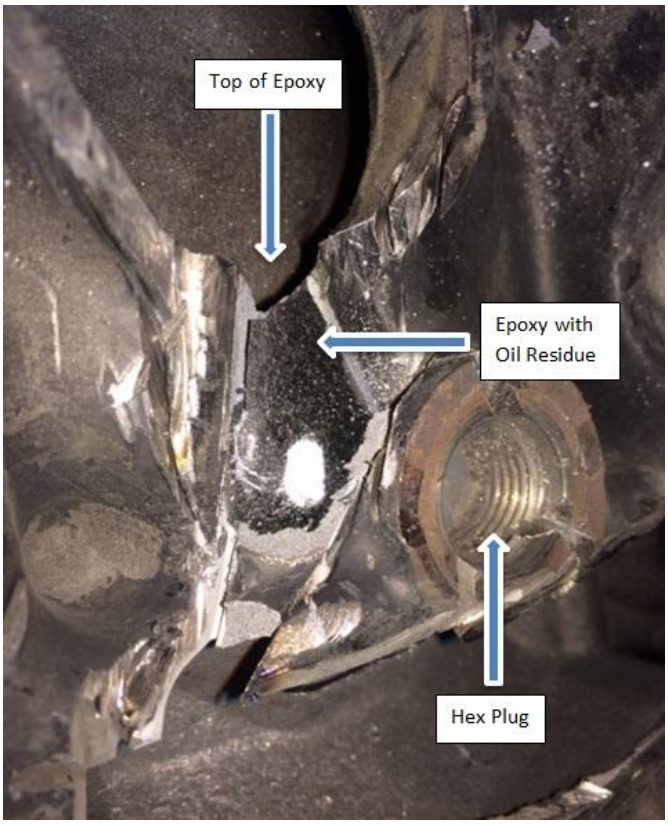

Figure 3: Failure due to oil contamination

REPAIR PROCEDURE:

Figure 4: Coolant Management Tool Pressure Module

1. Install coolant management tool Cap Adapter (KL5004NAV), Pressure Module (KL5006NAV), and 20 Gallon Tank/Cart Assembly (KL5003NAV). Attach shop air to the Pressure Module. (If necessary change out the drain cock to the quick coupler)

Figure 5: Coolant Management Container Valve

2. Position the valve to "DRAIN VEHICLE" on the coolant cart and open the valve on the Pressure Module allowing the pressure to force the coolant to fully drain, shut off the pressure, allow the pressure to finish releasing, and close the coolant cart valve. Inspect the drained coolant for heavy oil contamination, if contaminated return to diagnostic STEP 6. Trace amounts of oil are ok.

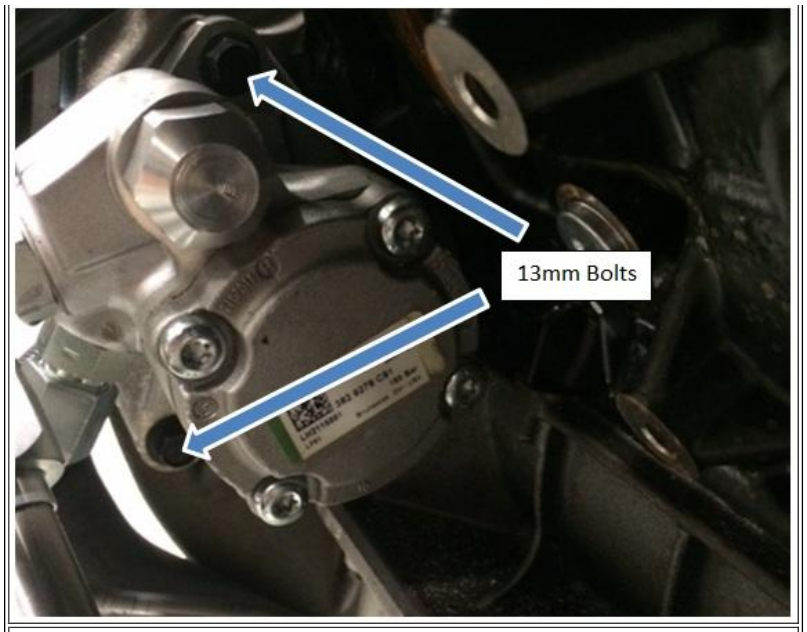

Figure 6: Power Steering Pump Bolts

3. If on the passenger side of the engine remove the Power Steering Pump (2007-2009 MaxxForce 7 - Power Steering/Fuel Pump). If on the drivers side on the engine remove the starter and wiring from the repair area.

NOTE: 2010-2013 MaxxForce 7: Do not drain the power steering system, it is not required.

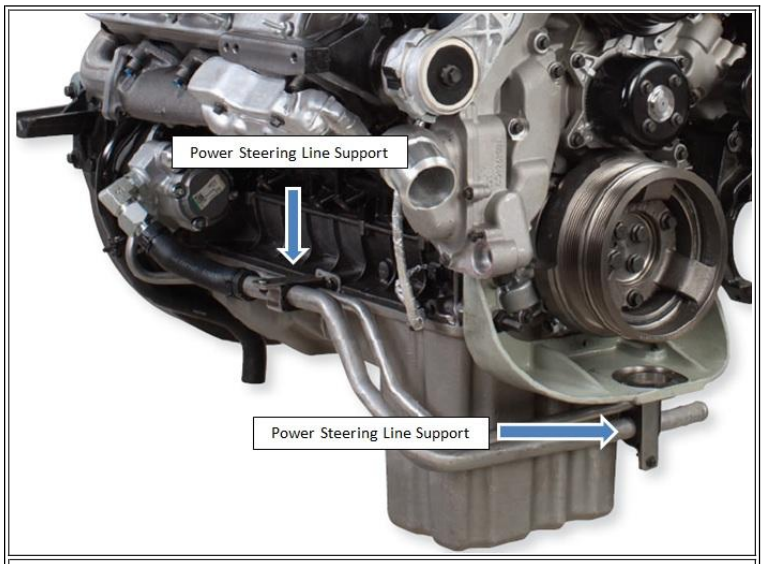

Figure 7: Power Steering Line Support Brackets

4. Remove the Power Steering Line Support Brackets to free the pump.

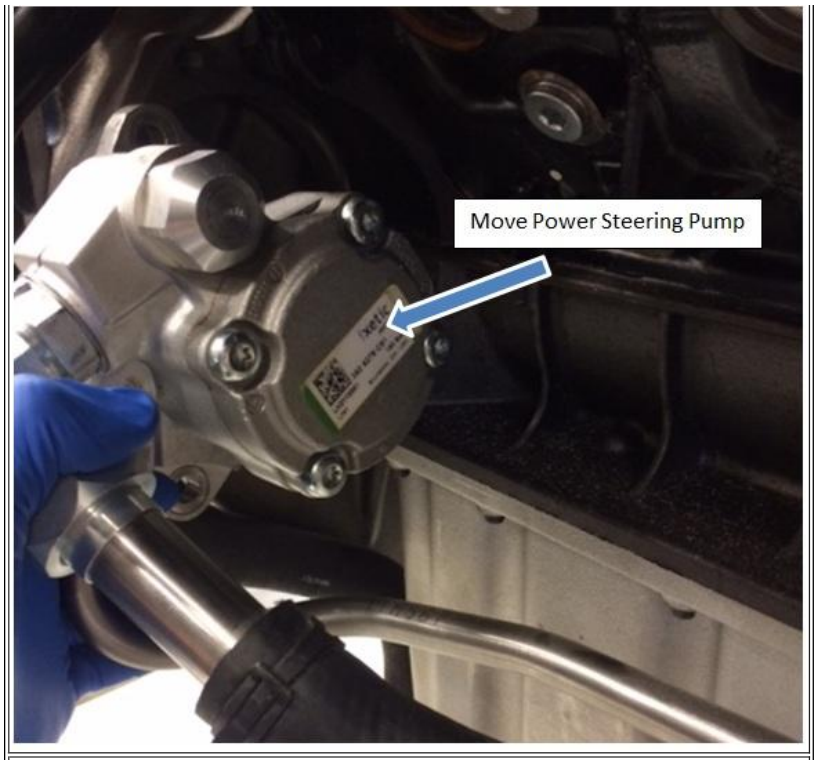

Figure 8: Move Power Steering Pump Away from Working Area

5. Swing the Power Steering Pump out of the repair area.

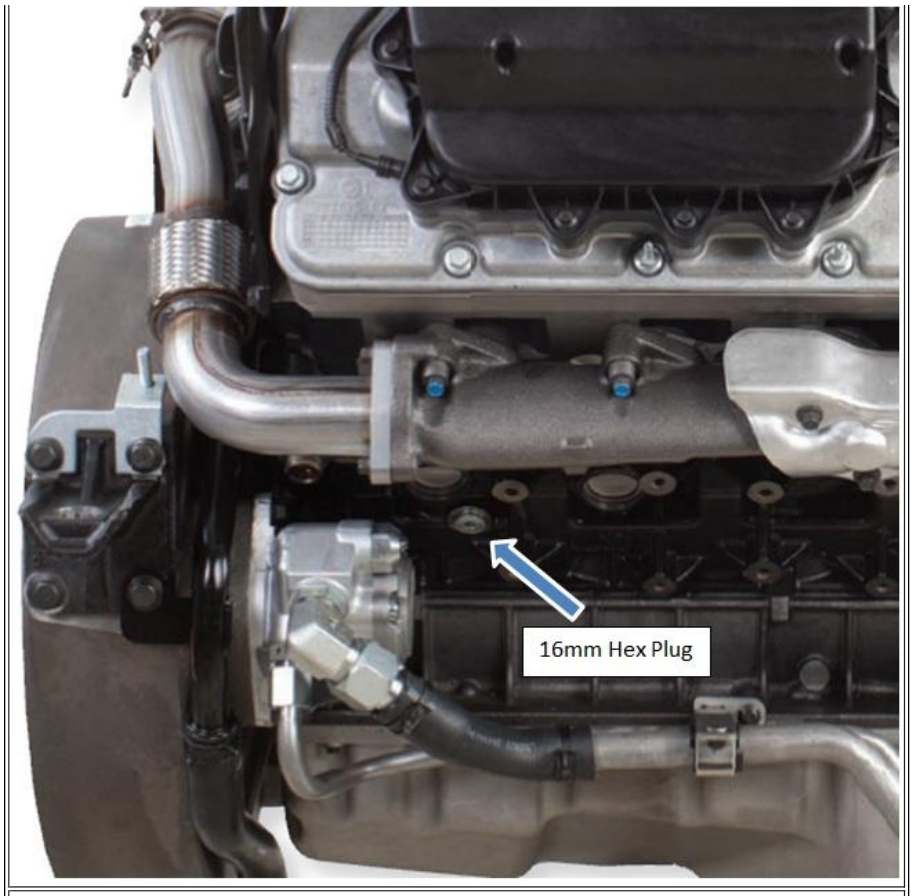

Figure 9: 16 mm Hex Plug Location

6. Using a 8mm Hex Bit Socket remove the 16mm Hex Plug from the engine block.

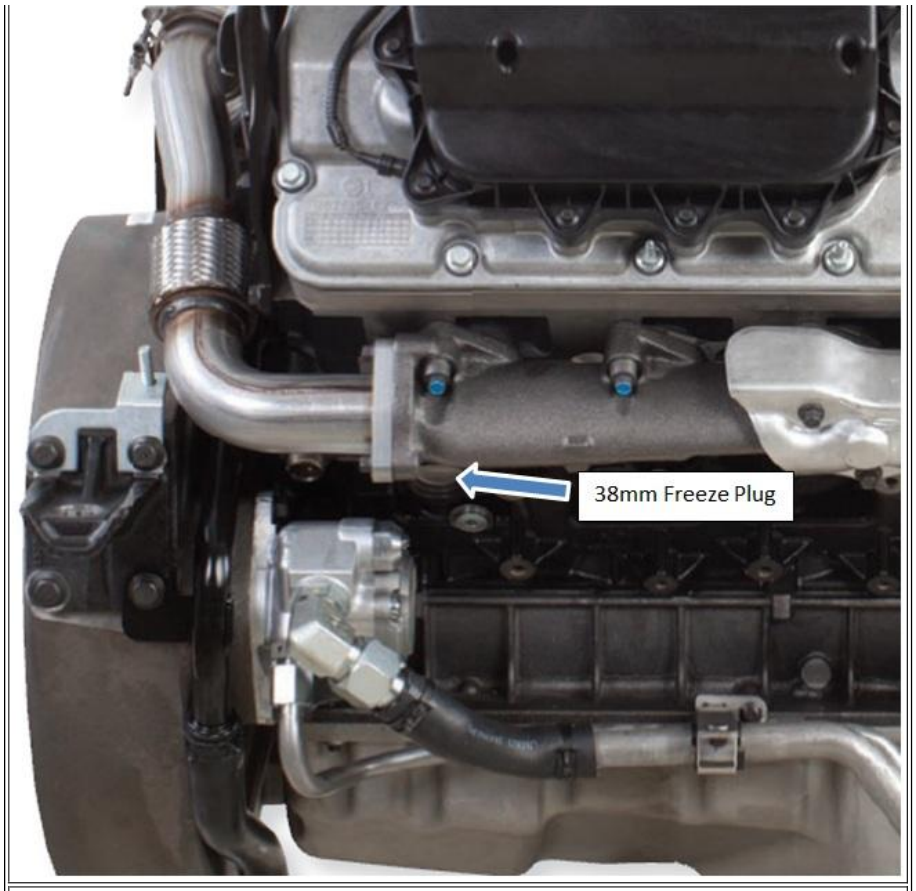

Figure 10: 38mm Plug Location

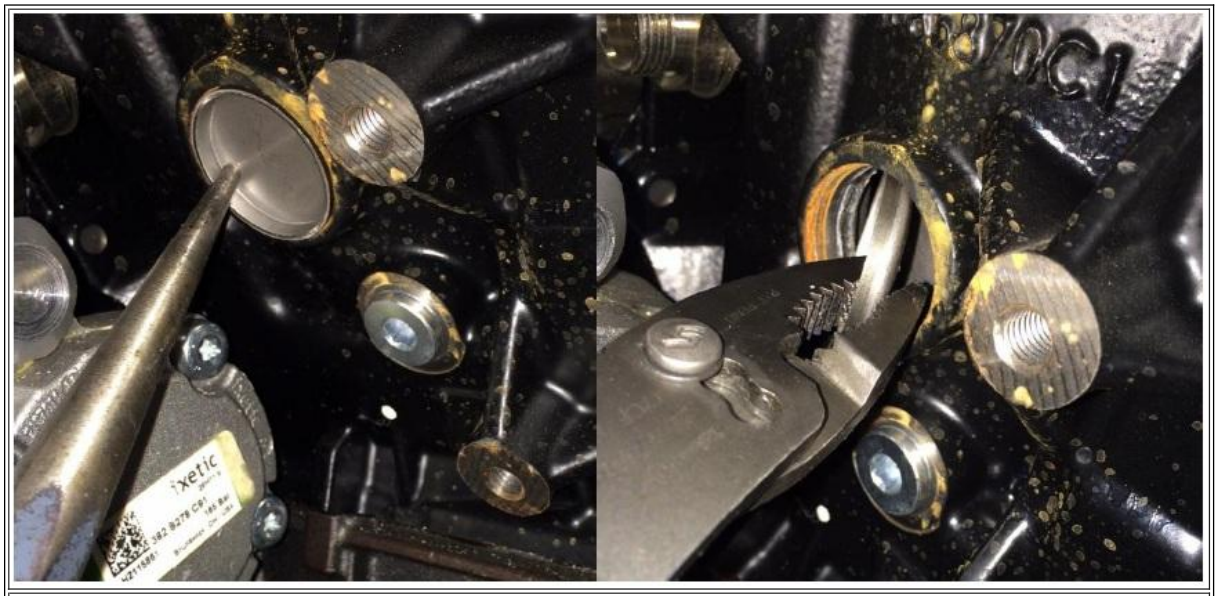

Figure 11: Freeze Plug Removal

7. Using a small hammer and punch remove the 38mm Freeze Plug from the block. Strike the plug near one of the edges, the freeze plug should spin sideways allowing for removal with pliers. (Note: In some instances the plug may push all the way into the block. To retrieve, fetch by hand and pull to the opening, grasp with the pliers and pull it out.) After pulling the 16mm Hex plug and the 38mm freeze plug, if oil/coolant mixture pours out of the plug attempt an initial flush of the area, if oil and coolant continues to pour into the repair area return to diagnostic STEP 6.

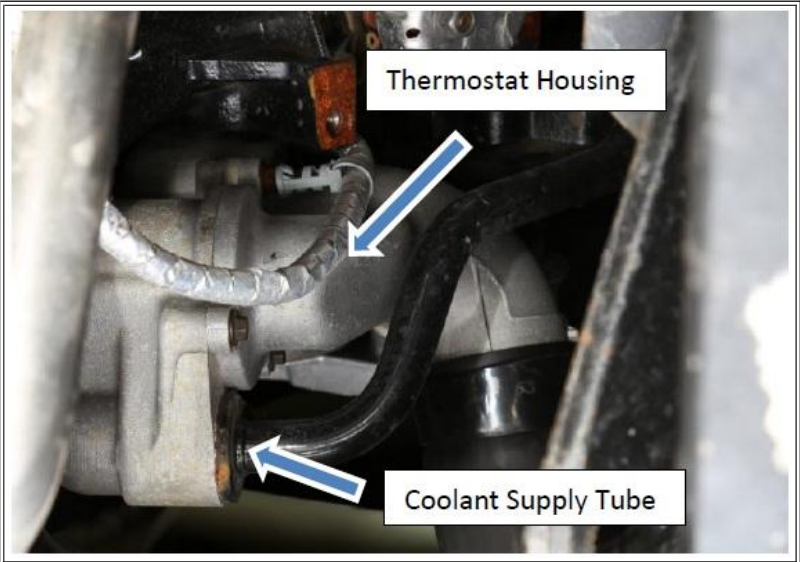

Figure 12: Front Cover Heater Supply Line

8. Using a catch pan, remove the coolant supply tube next to the thermostat housing from the bottom passenger side of the front cover to allow further coolant drainage.

Figure 13: Coolant Management Tool Pressure Module

9. Using the CMT pressure regulator, reopen the valve to blow air through the entire block. Allow the air to continue flowing during the entire block preparation portion of this repair.

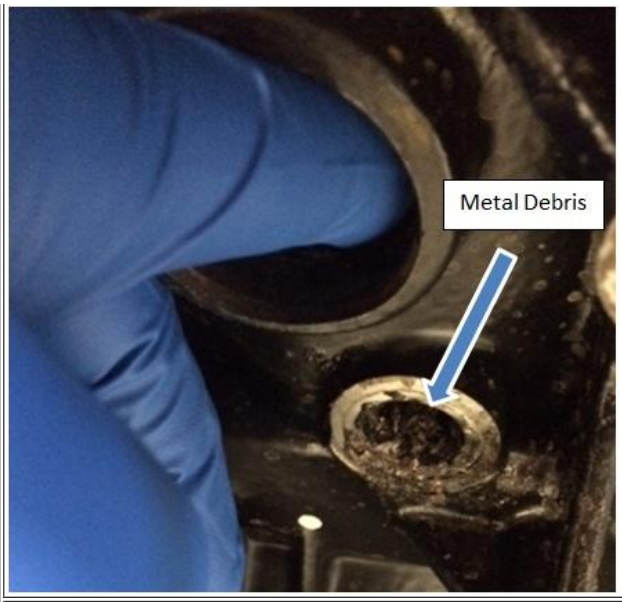

Figure 14: Metal Debris Removal

10. Going through the 38mm freeze plug opening, clear any debris in the galley by pushing, flushing, and blowing it out of the 16mm hole (Using your hand will be required to clear the area of debris).

Figure 15: Brake Cleaner Straw

11. Use aerosol powered brake cleaner to flush galley and remove any oily deposits. Bending the provided Brake Cleaner straw in an arc may be required to blow downward into the cavity when going through the 38mm freeze plug opening. It is also necessary to spray upward (Left right and middle) in the block to draw down any coolant resting above the galley.

EXTERNAL COOLANT LEAK ADDTIONAL STEPS - If repairing an internal coolant leak only, please continue past this section.

WARNING
Do not perform unless repairing an external coolant leak failure. All external leaks can be different and may be in a different location than displayed.

External Figure 1: External Leak Paint Removed

External Leak Step 1. Buff down and clean block surface around the perforation to remove the paint and expose the metal (This may cause the hole to increase in size, this is OK). Do not grind the block, grinding creates deep grooves which may not seal properly allowing coolant to leak past the epoxy. If the block surface is extremely smooth/glossy the epoxy may also not adhere properly, use sanding material to roughen the surface.

External Leak Step 2. Use aerosol powered brake cleaner remove oily deposits on the engine block surface. Spray the cleaner into the perforation hole to flush out deposits. Continue with the cleaning procedure as follows for the internal coolant cavity. After all steps are performed blow through the perforation hole using compressed air to remove fluids or debris. This hole must be clear for the repair to be successful.

INTERNAL REPAIR CONTINUED....

Figure 16: Using ZTSE4391 to scrub the cavity

12. Using ZTSE4391 scrub the cavity (If necessary degrease and clean the brush before using). Spray a small amount of WD-40 into the cavity to further break down the corrosion build-up and aid in the scrubbing process.

Figure 17: Wiping the cavity clean

13. Using a clean rag or a clean paper towel wipe the inside of the cavity to remove deposits that could not be flushed. Repeat steps 12 and 13 until no more debris can be removed. Once acceptable, degrease the cavity again with brake cleaner to remove the WD-40 deposits, make sure to wipe it dry several times, preferable with a non-shedding rag.

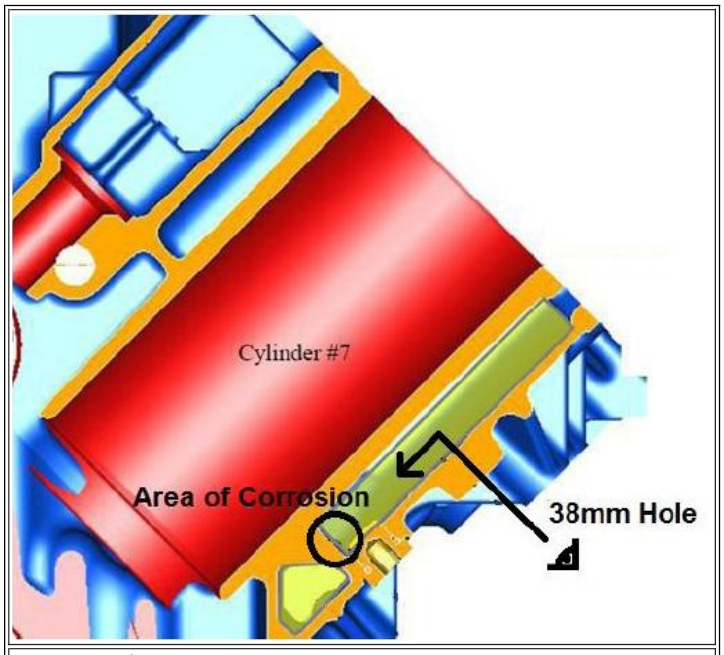

Figure 18: Corrosion Location

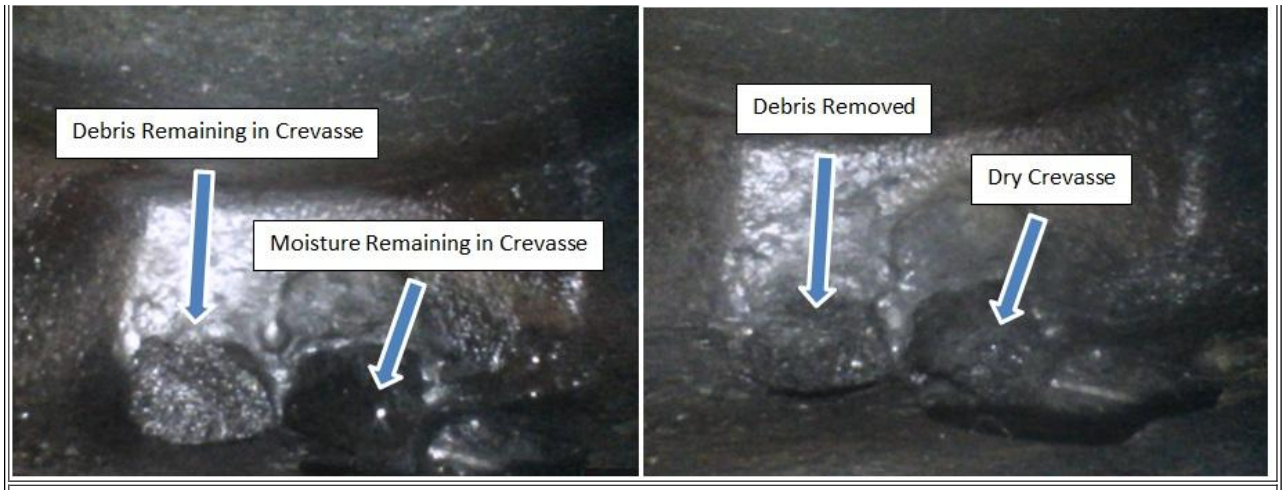

Figure 19: (LEFT) Coolant Galley with Moisture and Missed Debris (RIGHT) Coolant Galley After Cleaning and Drying

14. **REQUIRED:** Use a bore scope to visually inspect for remaining debris and fluids. If a notable amount of rust or corrosion deposits are remaining on the galley walls use a pick, or if possible an abrasive pad to clear as much as possible off the walls, rinse and inspect again. If no bore scope is available one must be borrowed or purchased for inspection of the galley. **Once the galley is acceptable please take a picture with the bore scope for documentation.** Failure to do so may result in this repair failing; causing excessive down time for the customer. This step is REQUIRED.

RECOMMENDATION
SNAP-ON Bore scope Item BK6500 has a forward and side viewing camera which allows for easy viewing of the affected area.

ATTENTION
THIS AREA MUST BE COMPLETELY CLEAN, DRY AND REMAIN DRY BEFORE APPLYING THE EPOXY. ANY MOISTURE THAT COMES INTO CONTACT WITH THE EPOXY WILL INHIBIT THE CURING EFFECT. SEE FIGURE 16 ABOVE.

ATTENTION
IN MANY CASES A SMALL AMOUNT OF COOLANT MAY LEAK BACK INTO THE CAVITY IF THE EPOXY IS INJECTED OVER A TRAIL OF COOLANT, THIS TRAIL WILL CREATE A GAP BETWEEN THE EPOXY AND BLOCK SURFACE ALLOWING THE COOLANT TO LEAK BACK INTO THE CAVITY

15. Shut off the valve on the CMT tool to cease air flow through block. If coolant is stirred back into the cavity Brake Cleaner will need to be used again to remove coolant residue. A heat gun may also be used to assist with drying the area cycling it between both openings. Wait 10 minutes, scope the area again for signs of moisture. Another method of drying is to use a very clean shop rag and stuff it in the area to absorb moisture. If coolant continues to run into the pocket, stuffing a rag above, to the left, and to the right of the cavity should prevent coolant run-back long enough for epoxy injection and preliminary curing. (NOTE: If repairing an external coolant leak blow through the perforation to clear any moisture out of the hole).

WARNING
DO NOT LET THE RAG SIT IN THE AREA TO BE EPOXIED. THE RAG SHOULD BE STUFFED AROUND THE CAVITY, SURROUNDING IT TO SOAK UP MOISTURE. IF RAGS ARE USED, REMOVE ALL OF THEM FROM THE BLOCK ONCE THE EPOXY HAS CURED.

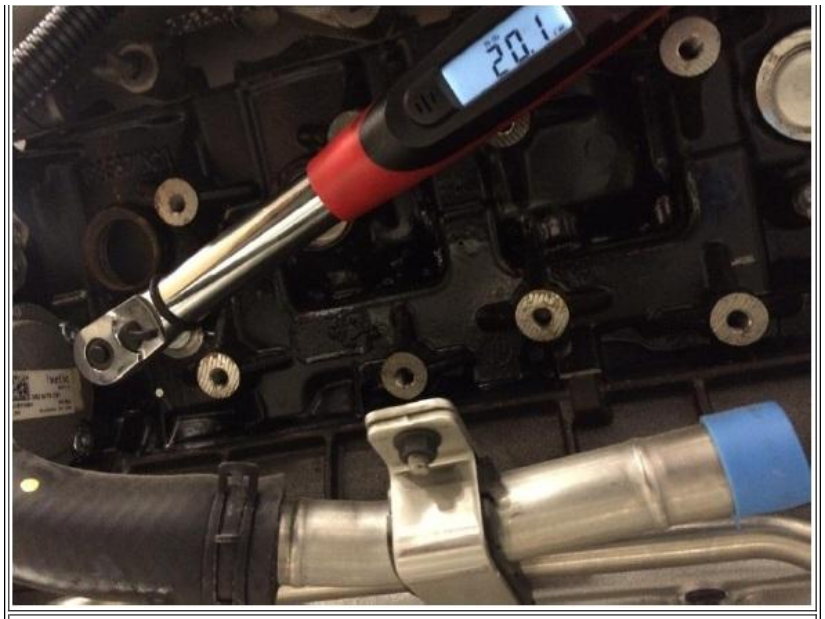

Figure 20: Install and Torque New Hex Plug

16. Install the new 16mm Hex Plug provided in the repair kit and torque to 20 ft-lb.

ATTENTION

FOR BEST RESULTS

Do not apply when:

i) The temperature is below 50°F (10°C) or the relative humidity is above 90%.
ii) The substrate temperature is less than 5°F (3°C) above dewpoint.
iii) Rain, snow, fog or mist is present.
iv) There is moisture on the metal surface or is likely to be deposited by subsequent condensation.
v) The working environment is likely to be contaminated by oil/grease from adjacent equipment or smoke from kerosene heaters or tobacco smoking.

Figure 21: Belzona 1391 Epoxy Mixing Supplies

17. Gather the kit 2514509C91 for mixing the Epoxy (Belzona 1391 Base and Solidifier, Gloves, Mixing Cup, Mixing Stick, and 1 Tablespoon (Obtained Locally)).

WARNING

READ THE ENTIRE MIXING AND INJECTION SECTION BEFORE MIXING THE EPOXY. ONCE THE EPOXY HAS BEEN MIXED IT MUST BE INJECTED INTO THE BLOCK IMMEDIATLEY. FAILURE TO DO SO WILL RESULT IN THE EPOXY NOT SETTLING PROPERLY AND FAILURE OF THIS REPAIR.

ATTENTION

MIXING SMALL QUANTITIES

For mixing small quantities of **Belzona® 1391** use:
5 parts Base to 1 part Solidifier by volume
13 parts Base to 1 part Solidifier by weight.

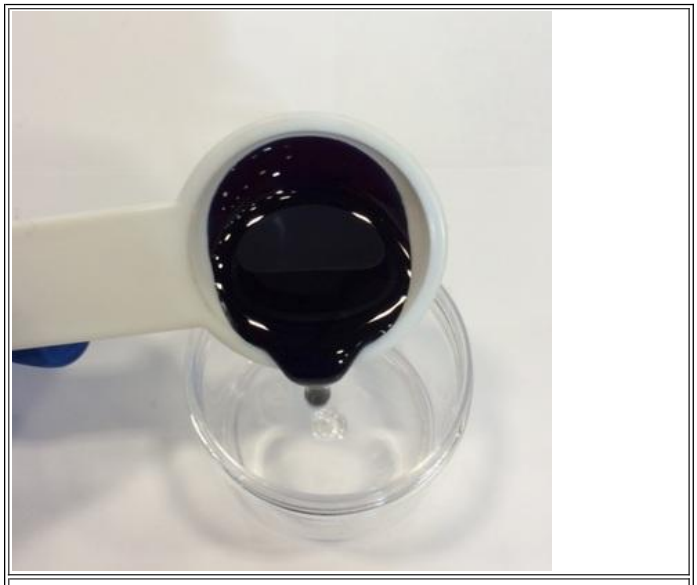

Figure 22: Belzona 1391 Solidifier (0.6 of a Tablespoon)

18. Measure out 0.6 of a Tablespoon (Just over half of the tablespoon) of the blue solidifier and pour it into the mixing cup. If measuring by weight this is equivalent to 9.1 grams of the solidifier.

Figure 23: Clean Tablespoon to Measure Epoxy Base (3 Tablespoons)

19. Clean the tablespoon so it does not mix the Solidifier into the bulk Epoxy Base container. Failure to do so will result in curing and waste of the epoxy base.

Figure 24: Scrape Epoxy Base into Mixing Cup

20. Measure out 3 tablespoons of the epoxy base and add to the cup with the solidifier, scrape out as much from the spoon as possible. If measuring by weight this is equivalent to 119 grams of the base or a combined weight of 128 grams. You must discard the measuring spoon if it cannot be fully cleaned. DO NOT REUSE A DIRTY SPOON OR A SPOON WITH EPOXY RESIDUE.

Epoxy Working Life (NOTE THE SIGNIFICANT TEMPERATURE EFFECT)

Temperature	50F	68F	77F	85F	105F
Use All Material Within	80 mins.	40 mins.	30 mins	20 mins.	10 mins.

Figure 25: Fully Mixed Belzona 1391 Ceramic Epoxy

21. Using the provided mixing stick; thoroughly mix the epoxy until the blue solidifier is no longer visible and the epoxy has become a consistent color. Scraping the bottom and sides of the mixing cup will be required to fully mix the epoxy.

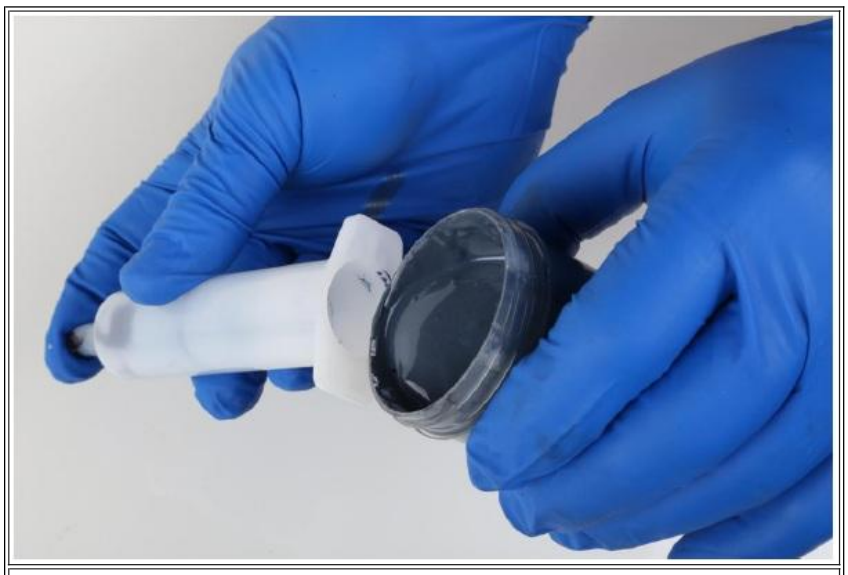

Figure 26: Pouring/Scraping Epoxy into Syringe

22. Pour and scrape the freshly mixed epoxy into the back of the clean syringe (You will be mixing more epoxy than necessary for this repair). Request assistance with this step if needed, the cup used will be different than displayed, the provided cup rim can be slightly bent into a spout for ease of pouring. This repair will require the usage of a nearly full syringe. (NOTE: If repairing an external coolant leak you will need to save the remaining epoxy in the cup for later use, do not throw away or contaminate, if epoxy becomes contaminated mix another small batch 5:1 by volume).

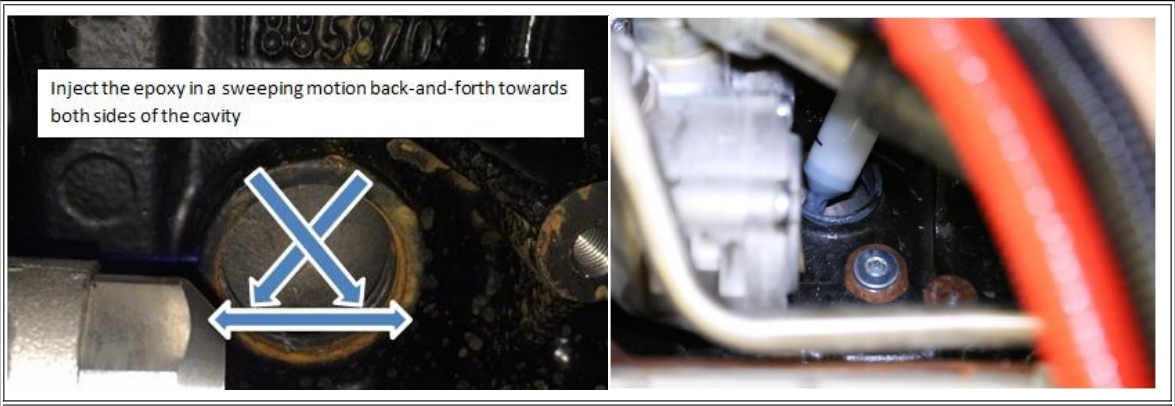

Figure 27: Injecting the Epoxy into the Block

ATTENTION
IF INJECTED WITHIN A REASONABLE AMOUNT OF TIME OF MIXINGTHE EPOXY IS SELF-LEVELING AND WILL RUN INTO THE OPEN CAVITIES OF THE CORRODED AREA. THE EPOXY MUST BE INJECTED INTO THE BLOCK SLOWLY TO ALLOW AMPLE SETTLING TIME.

23. Insert the opened end of the syringe into the 38mm opening facing downward as much as possible to the corroded area. Begin **very slowly** injecting the epoxy into the cavity allowing ample settling time. Inject the epoxy in a sweeping motion back and forth (left to right) and fill the entire cavity. A majority of the epoxy should be injected to the right of the opening. Fill the cavity all the way up to the freeze plug opening. If it does not fill all the way up, quickly mix more epoxy and inject it into the block.

24. Once injected, clean off the 38mm opening of any residual epoxy to prevent hardening and inability to install the new freeze plug. Depending on the volume of epoxy injected the opening may require multiple wipe downs. If the epoxy has not settled fully in the cavity, using a clean glove gently work the epoxy down into the galley to the left and right, limit touching the epoxy as much as possible to avoid contamination.

EXTERNAL COOLANT LEAK ADDTIONAL STEPS - If repairing an internal coolant leak only, please continue past this section.

WARNING
Do not perform unless repairing an external coolant leak failure. All external leaks can be different and may be in a different location than displayed.

External Figure 2: Hand Vacuum Gun

External Leak Step 3. If the external perforation is large enough allow some epoxy to seep out of the hole to fill it. If no epoxy seeps out, and if in a good location use a hand held vacuum gun, place the flexible tube opening over the perforation on the outside of the block and draw out a small amount of epoxy to fill the hole. If fluid or debris comes with the epoxy wipe it off the block so it does not contaminate the block's surface and prevent proper adherence of the epoxy to the outside of the block. In some cases the hole may be large enough to allow epoxy to continue to run out, if this is the case temporarily blocking the hole may be required to keep the epoxy in the cavity. Once the epoxy thickens enough the blockage may be removed.

External Figure 3: Paste epoxy on the outside of the engine block

WARNING
Wear protective equipment when applying, the epoxy may drip. Do not allow the epoxy to enter sensitive areas such as the eyes, ears, nose, or mouth.

External Leak Step 4. Using the left over epoxy, paste and press it into the perforation area using the mixing stick; if the epoxy is too thin, allow it to thicken in the ambient atmosphere. Continuously mix and monitor the epoxy to make sure it does not over cure not allowing for proper application. After application, allow the epoxy to cure for 30 minutes before applying the heat gun for final curing. When the epoxy is initially mixed, raising the temperature thins out the epoxy making it harder to work with and may cause it to run off the block.

Figure 28: Use a Heat gun to Cure the Epoxy

INTERNAL REPAIR CONTINUED....

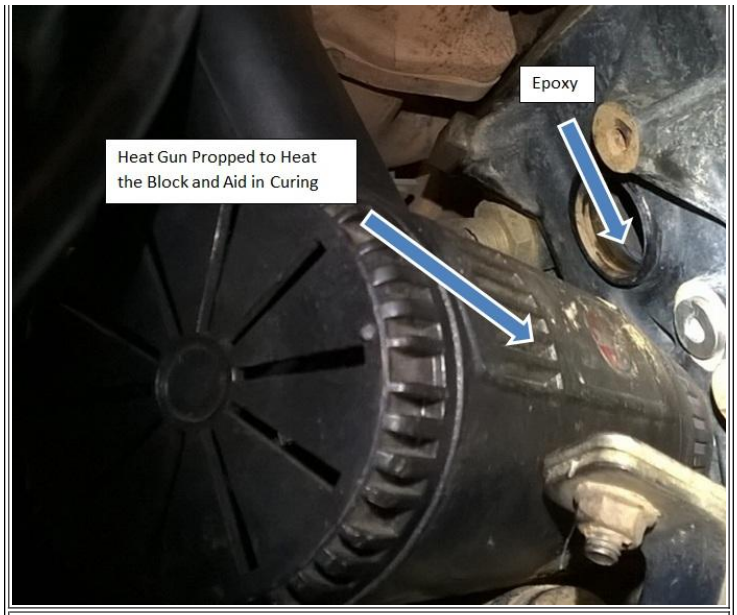

Figure 28: Use a Heat gun to Cure the Epoxy

ATTENTION

TEMPERATURE HAS A LARGE EFFECT ON EPOXY CURING. IF ALLOWED TO DROP BELOW 50°F THE EPOXY WILL NOT CURE PROPERLY. USE A HEAT GUN TO KEEP THE AREA HOT DURING CURE TIME (PERFERRABLY ABOVE 100°F). THE USE OF A HEAT GUN IS REQUIRED TO MEET THE SRT CURING TIME OF 3 HOURS. IF A HEAT GUN IS NOT USED THE EPOXY MUST CURE FOR 8 HOURS ABOVE 60°F.

WARNING

WHEN DEALING WITH HEAT SOURCES USE PROPER PRECAUTIONS TO PREVENT DAMAGE TO VEHICLE, COMPONENTS, OR PERSONAL INJURY.

25. Allow the epoxy to cure with the heat gun continuously applying heat for 3 hours (Warranty will pay for the 3 hours of bay usage), if curing is in question feel the epoxy for rigidity in the mixing container and in the block. If no heat gun is available cure time will take a **minimum of 8 hours** and temperatures must remain above 60°F.

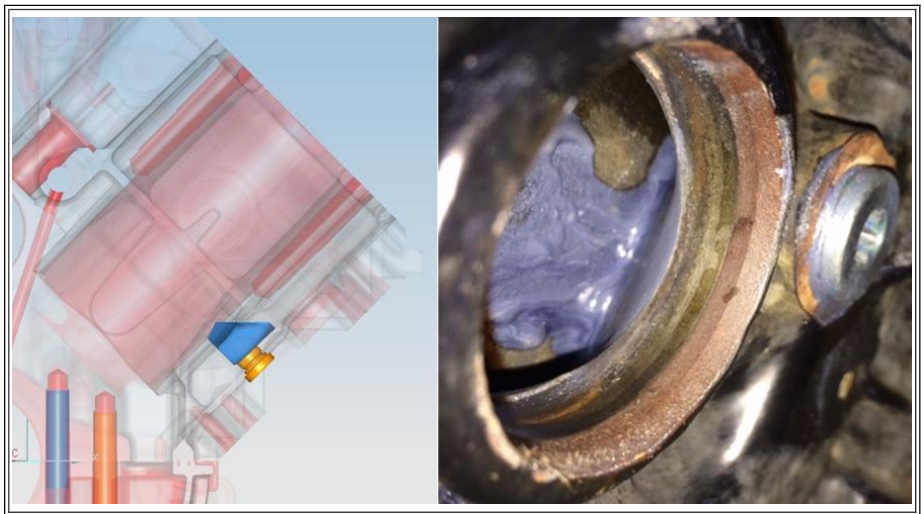

Figure 29: Completed Repair

Figure 30: Flap Disc

26. Once cured, clean off the freeze plug opening with a flap disc to remove any residual epoxy and rust. Once cleaned, install the new 38mm freeze plug using ZTSE4509 with a thin layer of RTV on the rim of the cup. A 24mm socket may be used in substitution if unavailable, note it will be more difficult to align the cup.

27. Pressure test the cooling system, use soapy water to confirm the freeze plug does not leak. If it passes, continue to the next step. If the engine fails the pressure test, fill with water and check for leakage from the repair location, if found in the same location remove the freeze plug and take a bore scope image of the epoxy. Return to diagnostic STEP 6 and attach the image of the cleaned galley and of the epoxy in the galley for warranty purposes. If no leak is found, search for the source of pressure loss.

WARNING

IN SOME INSTANCE OIL MAY HAVE EXITED THE ENGINE COVERING COMPONENTS AND MANIFOLDS IN OIL. THIS OIL MUST BE CLEANED OFF BEFORE ENGINE OPERATION, FAILURE TO DO SO MAY RESULT IN FUME IGNITION RESULTING IN SEVERE PERSONAL INJURY, DEATH, AND/OR EQUIPMENT DAMAGE.

28. Upon passing the pressure test, the cooling and oil system may require flushing with a cleaner for contamination. To flush the cooling system please follow IK1201248. Only flush the oil system if required, mix by volume kerosene OR diesel fuel (5 Quarts or 1.25 Gallons) with 15 Quarts of oil. Run the engine at 1500 rpms for 20 minutes.

29. If this repair was an external coolant leak, you may paint the external epoxy black to match the block and an added layer of protection from the elements. This is not required though.

30. Once complete 2007-2009 MaxxForce 7 release to customer; 2010-2013 MaxxForce 7 return to diagnostic STEP 4.

WARRANTY INFORMATION

Warranty Claim Coding:

Group:	12000 - Engine
Noun:	051 - Crankcase

Standard Repair Time(s):

Step	Description	Engine	SRT	Hours
ELECTRONIC ENGINE PERFORMANCE, DIAGNOSE	Inspections	All	MANUAL	0.2
OIL PAN AND/OR GASKET REPLACE	See manual for proper coding	All	MANUAL	2.2
INTERNAL BELZONA REPAIR PROCESS	Power steering pump, cooling system drain, Block prep, injection, and curing	All	A20-1011X	1.3
EXTERNAL LEAK ADDITIONAL STEPS	External block block prep and apply epoxy application	All	T-TIME	1.0
BELZONA CURING TIME	Epoxy cure time	All	A20-1011X-20	3.0
CRANKCASE BREATHER HOUSING ASSEMBLY, REPLACE	See manual for proper coding	EPA10 MF7	MANUAL	0.6
ENGINE OIL AND FILTER, CHANGE	Claim twice for flushing	All	A12-1889A	0.4
OIL SYSTEM, FLUSH	Time for flushing	All	T-TIME	0.3
CRANKCASE PRESSURE TEST	Crankcase pressure	EPA10 MF7	MANUAL	0.2
BLOW-BY TEST	Engine blow-by	EPA10 MF7	MANUAL	0.3

Special Requirements:

Engine Replacement Requires an iApproval

OTHER RESOURCES

Master Service Information Site

Belzona Reforming and Protective Materials for Engines and Castings (Testimonials)
Belzona 1391 Product Data
Belzona 1391 Instructions for Use
Belzona 1391 Product Specification Sheet

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Feedback Information

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No Feedback Found

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