WA Technology

Rear Muffler Panel "Rust"

A forum poster asked about the brown stain he observed on the rear panel of his mufflers (red circle picture left.) I recalled seeing the same brown stain in a number of areas on my C7. I responded to his post indicating I used a product called Rust-Olium Rest Reformer to change the brown, "rust" black (the picture right is a similar area I coated 6 months ago.) These products have been sold for many years. They convert iron oxide (rust) to iron titanate using tannic acid and pH adjusters. This product also contains barium sulfate and a future rust inhibitor.

Similar Problems Posted

Several others posted even greater amounts of rust and were planning to add a an exhaust cover plate so it wasn't visible. The picture right shows the origianl posted brown spot and those posted by others. In fact, I recall this issue was brought up when the orignal fleet of test C7's were observed. I even saw some rust on rear panel on the first C7's I saw, at Laguna Seca in August of 2013. The back panel has a lot of press forming that may thin the aluminized surface. It also has large pipe welds and weld spatter that no doubt melted the thin aluminized surface exposing uncoated places of 409 stainless that quickly starts to rust.

409 Stainless

The C7 Corvette Order Guide mentions the Stingray exhaust is made from aluminized stainless steel. However unlike an 18% chrome 8% nickel stainless steel, which stays relatively shiny, most OEM mufflers and exhaust pipes are made from a less expensive 409 stainless steel. The 409 stainless contains about 12% chrome but no nickel. It is more resistant to oxidation (forming rust) than plain carbon steel but dos not retain a silver color surface as the higher 18% chrome 8% nickel containing stainless steels. Depending on the environment, aluminized 409 stainless steel provides a superior, rust resistant surface for a much longer time than the same material without an aluminized surface.

What To Do

The rust is only visible on the rear muffler panel. With four, 4 inch OD 304 polished stainless muffler tips filling the center opening there is not much visibility behind them. I considered painting the parts black, in fact bought an 8 ounce can of black high temperature barbeque paint. However looking at the access, unless the rear bumper was removed, it would very difficult to paint. Also, my experience with painting exhaust systems indicated if not applied very thinly it can peel. Using a spray can is not possible without removing the bumper.

A better solution was to use a rust converter or rust reformer. I purchased an 8 ounce container at Walmart for just over $5.00. This product is not like paint. It has the consistence of milk and is applied very simply. It only changes the brown rusted areas to a dull black. It does not affect areas that are not rusted. If the material has loose flaky rust, it should be removed with a wire brush. But the tight rust on the 409 did not need prior cleaning.

The most heavily rusted areas were the welds and the weld spatter on the back panel. These, of course, are not aluminized. The exhaust supplier probably used a 409 welding wire so the welds will not rust any more than an uncoated 409 steel. However the aluminized material remains rust free much longer.

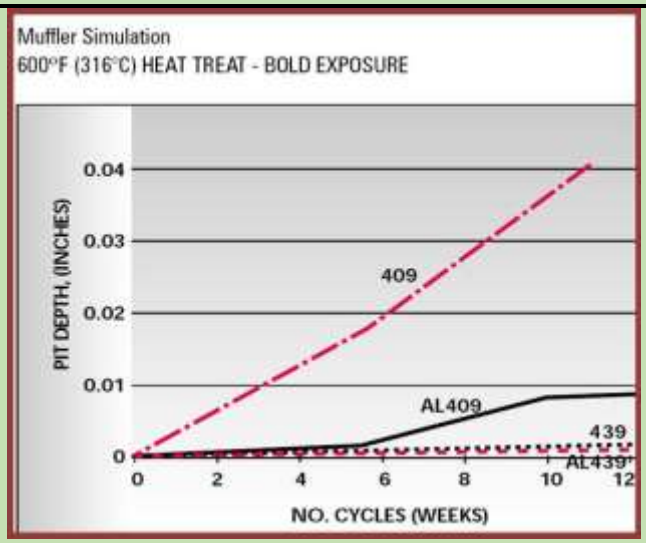
Although not readily visible from the rear, when looking under the car I did notice significant rust on the welds attaching the exhaust tip pipes to the back panel. The photo right shows one of these rusted welds on my C7.

The following picture story shows some of the rust and the simple steps I took to turn the brown rust to a dull black finish with rust reformer. It also helps reduce further oxidation.

Photo Sequence

A manufacturer of aluminized 409 stainless made this muffler to show a comparison between aluminized 409 stainless steel (right) and non-aluminized material (left.) The muffler was exposed to accelerated exposure. This appears to be a sever exposure such as a salt water environment, simulating salted roads. The aluminizing process is done on the sheet material, welds, which occur after manufacture, are not coated.

This is a graph provided by the aluminized stainless steel manufacturer showing what they referred to as bold exposure. It quantifies corrosion by measuring and plotting the depth of pits that form over the exposure time. Note the aluminized 409 stabilized at under 0.01 inch deep pits while the uncoated material progressively formed deeper pits. Plan carbon steel would be significantly worse.



This is a picture of my C7. Note the discoloration on the panel and the rusted welds joining the pipes going to the shiny stainless tips. Since these welds are probably made robotically (*one of our large Gas Saver Systems customers makes OEM exhausts and has 126 MIG robot welders.***) With the two pipe welds probably made one after the other or simultaneously with two robots, the area between them no doubt got very hot, affecting the quality of the aluminized coating. Also note the fine weld spatter that not only rusts but probably melts the aluminized surface it hits.**

This is what was I used to gain brush access to the back muffler panels and welds. A small metal handle disposable brush was taped to a small rod so access to the rusted areas could be made mostly from the rear. No reason to jack up the car just lay on your side. A small amount of Rust Reformer was placed in a paper cup. You don't need much. It is indicated the product has a shelf live and it should be not used after about a year.

This picture was taken after a few brush strokes were made over the rusted area. Two areas are marked in yellow. The milk like, somewhat foamy reformer looks light blue in this picture as well as the one below. It is best to put on some light coats than come back and repeat in a few minutes.

This is the appearance when the product is fully applied. I saturated the brush and just pushed in into the rusty and discolored areas. It will not leave a brush stokes so it is just important to coat the all rusted areas. I put on several coats until it was all covered. The container indicates it dries in less than an hour. Note, it has no effect on none rusted areas so there is no need to coat the entire surface. That is one reason, for prior car and truck exhaust systems, I found a recoat of muffler and pipe welds was needed about each year.

This is a before (lower picture) and after 2 hours of being coated (upper picture.) All rusted areas are now a dull black.

My past experience with this type product indicates it may have to be repeated yearly to coat newly rusted areas. However the process, unlike painting, is very quick.

The finished appearance is matt somewhat mottled black. It does not change the aluminized finish on the none rusted materials.

	Muffler Steels		
Alloy	409 Stainless	439 Stainless	304 Stainless
Carbon	0.08	0.03	0.07
Chrome	10.5	18.0	18.0
Nickel	0.5	0.5	8.0
Manganese	0.01	1.0	2.0
Titanium	0.4	0.4	

This table shows the typical chemistry of 409 stainless steel. Type 439 is also used for mufflers and with the higher chrome will be more rust resistant (and more expensive!) 304 stainless, is the silver color rust resistant material most think of as a stainless appearance. Folks like Borla use this more expensive stainless.

	Welding Wire	
Alloy	409 Stainless	307 Stainless
Carbon	.04	0.07
Chrome	12.5	18.0
Nickel	0.0	8.0
Manganese	0.7	6.0
Titanium	0.90	

Perhaps Chevy should consider requiring 307 type welding wire for back panel welds to have more rust free deposits.

It will cost somewhat more!

The welding wire mostly used to weld 409 has a similar chemistry. In fact, one of the engineers in the R&D lab I managed had a patent in conjunction with one of our suppliers for a 409 welding wire! It utilized a significant amount of titanium in the composition to maintain a desirable ferritic metallurgical structure. The higher titanium level covered in the patent than used in plate is required because some is oxidized as it is melted by the very hot arc.

Even better than 409 welding wire is a heavily alloyed wire called 307. It not only has 18% chrome and 8% nickel it contains high manganese, 6%. This keeps the deposit ferritic so it can be used to weld 409 or 304. It can be also be used to weld 409 to 304 stainless steel or even carbon steel. This alloy is more commonly used in Europe, where it is considered the gold standard for welding muffler steels.

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Other Stingray PDF's Available:

Some 37 items discuss improvements or information about the Stingray function and/or esthetics. Some are minor and others, like the genuine carbon fiber side skirts, include detailed install information.

Below are the PDF's available. Click on picture (may need Ctrl pressed.) Or just copy and paste the PDF info (Blue type) into your browser. Or email me at GUttrachi@aol.com **and state the title desired, shown in Yellow:**

Rusty C7 Muffler ***Why the C7 muffler is rusted and a simply way to make rust turn matte black.*** ***Bottom pic rusted, top pic treated*** **http://netwelding.com/Muffler_Rust.pdf**	
Change C7 Oil ***WHY change your own oil and HOW to do it*** ***Revised, includes C7 Lifting Methods*** **http://netwelding.com/Changing_Oil.pdf**	
Latch Hatch ***Window Valet Helps 2014/2015 Latch*** ***Includes M7 Crazy Seat Memory Recall*** **http://netwelding.com/Hatch_Latch.pdf**	

 GUttrachi@aol.com

C7 Carbon Fiber Side Skirts

How to install side skirts with jacking information for DIY's without lifts

http://netwelding.com/Side_Skirts.pdf

Carbon Fiber Splitter w/End Plates

How to install Splitter & Nylon bra fit

http://netwelding.com/CF_Splitter.pdf

Removing GM Plastic Film

How To Remove The Rocker Panel Film

http://netwelding.com/Rocker_Panel_Film.pdf

C7 Mirrors 2 3/8" Wider Than C6

Device assists with 8 foot garage door

http://netwelding.com/Narrow_Garage_Device.pdf

Mirror Proximity Alarm

Limit switch alarm warns when passenger mirror is too close to door frame

http://netwelding.com/Mirror_Proximity_Alarm.pdf

Making Jacking Pads for C7

Jacking Pads must 2 1/2 inch max OD. Made four. Also Hockey Puck pad and 2 1/2 inch OD x 2 inch high pads bought after installing side skirts.

http://netwelding.com/Jacking_pads.pdf

C7 Radar Power

The C7 cannot tap the mirror or sun visor for power !

http://netwelding.com/Radar_Detector_Power.pdf

C7 Belt Rattle

Passenger seat belt rattles against the seat back. The solution, add a shoulder belt pad.

http://netwelding.com/Eliminate_Rattle.pdf

Aluminum C7 Chassis and Weld Repair

The C7 has an all aluminum chassis, made from 117 welded pieces

http://netwelding.com/Aluminum_Chassis.pdf

Carbotech Ceramic Brake Pads

The Z51 has very dusty brakes. These pads help!

http://netwelding.com/Ceramic_Pads.pdf

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C7 License Plate Frame; **Must Meet South Carolina Law** **http://netwelding.com/License_Plate_Frame.pdf**	
Manage C7 Spilled Gas ***Protect the side of the C7 when filling up with gas*** **http://netwelding.com/Manage_Spilled_Gas.pdf**	
C7 License Plate & Cargo Lights ***LED license plate light & cargo area bulbs are brighter and whiter*** **http://netwelding.com/License_Plate_Light.pdf**	
C7 Rear Cargo Area ***Rear cargo area needs storage device and rear protector*** **http://netwelding.com/Rear_Cargo_Area.pdf**	
C7 Door Panel Protector ***protector plate added to prevent scuffing of door when exiting*** **http://netwelding.com/Door_Panel_Protector.pdf**	
C7 Improved Cup Holder ***A solution to the cup holder spilling under hard braking or shape turns.*** **http://netwelding.com/Improved_cup_Holder.pdf**	
C7 Wheel Chatter/Hop ***Why sharp, low speed turns with cold tires causes the front tires to chatter/hop.*** ***http://netwelding.com/Wheel_Chatter.pdf***	
Carbon Fiber Grille Bar ***Install genuine carbon fiber grille bar overlay*** ***http://netwelding.com/CF_Grille_Bar.pdf***	
Jacking a C7 Vette ***Safely jacking either front only or back and front*** ***http://netwelding.com/Jacking_A_C7.pdf***	

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Deer Whistle Installed on C7 ***Do they work? Plus Install Info*** ***http://netwelding.com/Deer_Whistle.pdf***	
C7 Battery Issues ***Even after using a GM type charger and showing fully charged, voltages were still low!*** **http://netwelding.com/Battery_Issues.pdf**	
C7 Splash Guards ***GM offers splash guards for the C7 Corvette. An easy DIY installation.*** ***http://netwelding.com/Splash_Guard.pdf***	
C7 Blind Spot Mirror ***Smaller rear and side windows cause C7 blind spots. Small "blind spot mirrors" help*** **http://netwelding.com/Blind_Spot.pdf**	
C7 Skid Pad Protector ***After the air dam, the aluminum "skid pad" hits driveway ramps etc. Plastic protector helps.*** **http://netwelding.com/Skid_Pad_Protector.pdf**	
C7 Wheel Locks ***Wheel locks, torqued to required 100 ft-lbs, help protect your expensive wheels from theft.*** **http://netwelding.com/Wheel_Locks.pdf**	
C7 OnStar Lights ***The OnStar LED's in the rear view mirror, at a quick glance, look like a police car flashing light! This is a fix.*** **http://netwelding.com/OnStar_Lights.pdf**	
C7 Skip Shift Eliminator ***Skip Shift Eliminator install with suggestions on jacking a C7.*** **http://netwelding.com/Skip_shift_Eliminator.pdf**	

 GUttrachi@aol.com

C7 Catch Can & Clean Oil Separator

Direct inject engines like the LT1, are particularly subject to "coking." What is Coking and how to reduce the potential?

http://netwelding.com/Catch_Can.pdf

C7 Round Shift Knob

A round shift knob shortens throw.

http://netwelding.com/Shift_Knob.pdf

C7 Stingray Sill Plate

Stingray sill plate replaces original.

http://netwelding.com/Sill_Plate.pdf

C7 Nylon Bra

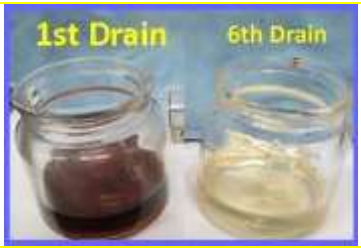
Nylon Bra Stops Bugs on Front and Grill.

http://netwelding.com/Nylon_Bra.pdf

C7 Clutch Fluid Change

Clutch fluid after 3000 miles gets dirty

http://netwelding.com/Clutch_Fluid.pdf



Carbon Fiber Hood Vent

Replaces Plastic Hood Vent

http://netwelding.com/Hood_Vent.pdf

Cold Air Intake

Low Restriction Air Filter & Duct

http://netwelding.com/Cold_Air_Intake.pdf

May Be Of Interest:

Engineering a ProStreet Rod

How Our '34 ProStreet Rod Was Designed and Built 8.2 Liter Engine, 4 Wheel Disk Brakes & Coilover

http://netwelding.com/Engineering%20Street%20Rod%203-08.pdf

GUttrachi@aol.com