TECHNICAL REPORT

I-CAR NEW ZEALAND

SAVE THAT E-COAT!

Describing the E-Coat process and why it should be retained wherever possible, when repairing collision-damaged vehicles.

E-Coat or “Electrodeposition Coating” is a process used extensively by manufacturing industries around the world to provide a high level of corrosion protection on metal surfaces, with the added benefits of high productivity and cost efficiencies.

The auto industry almost universally incorporates E-Coating as a surface protection primer in the manufacturing of vehicle bodies – and as we know, this coating is found on virtually all new replacement body parts and panels from the OEM.

The original electrocoat was an anodic product developed around 1957 by Dr George Brewer of the Ford Motor Company. This technology did however, present some drawbacks – It was in 1973 that PPG Industries introduced the first cathodic E-Coat system for autobodies that vehicle-makers use to this day.

E-Coating is often compared to powdercoating for metal protection, as in simple terms, both processes rely on an electrical current to provide adhesion (electrodeposition – E-Coat), or application (electrostatic – Powdercoat) to the substrate, and require high temperature baking for curing.

The coating chemistries are :

- Waterborne, epoxy-urethane resins for E-Coat.
- Options of polyester, polyurethane, polyester-epoxy, straight epoxy and acrylics for powder coating.

The main difference is that E-Coat is a “wet immersion” process, as opposed to powder-coating which is “sprayed on” as a dry powder.

Both have advantages and disadvantages.

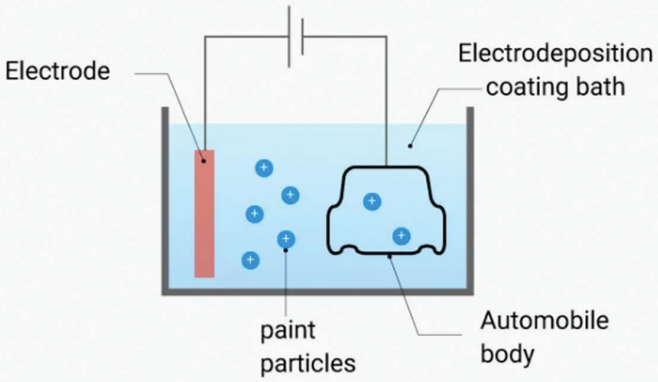
For automotive applications, E-Coat is the coating of choice for several reasons :-

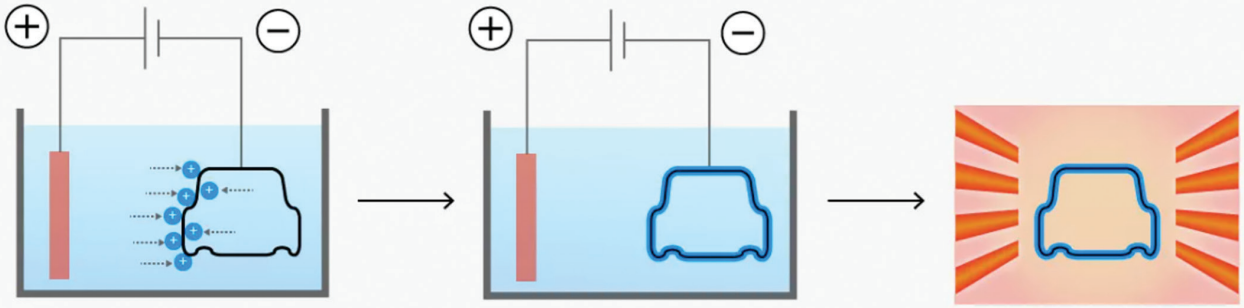
- Controlled immersion in a liquid bath is far more effective at getting into all of those cavities and hard to reach places that present in the vehicle body shell.
- The wet coating provides for a relatively thin film build (compared to powdercoating) and can be further controlled by adjusting the amount of electrical current supplied.

Coating mechanism

Using the principle of "electrophoresis"

Carried by the flow of electricity, charged paint particles cover both front and back sides and all parts of an automobile body.

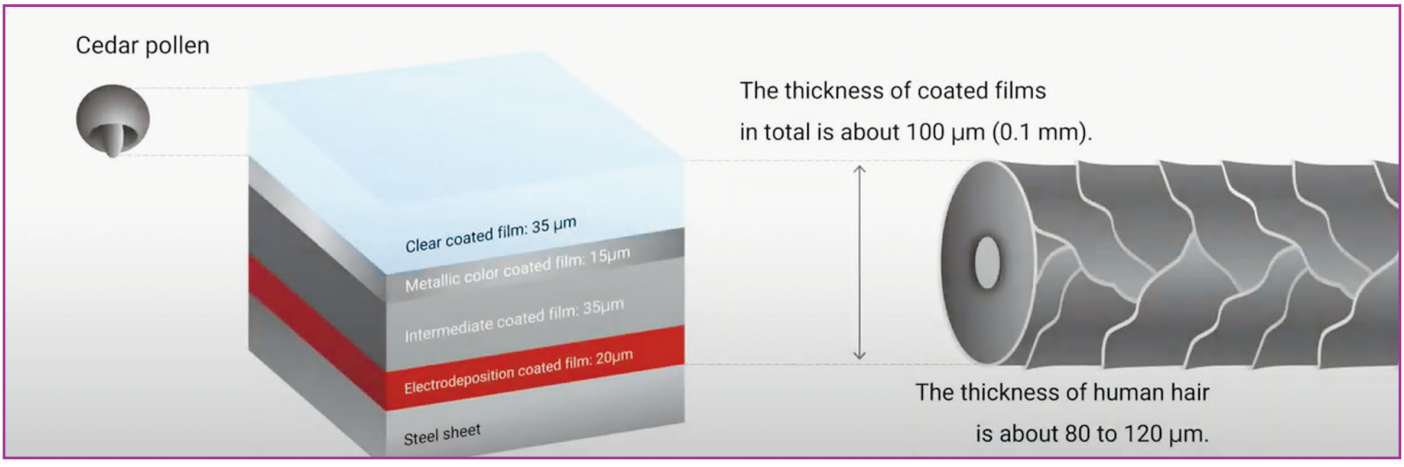




An automobile body is immersed in an E-coat bath in which current passes.

Paint particles are precipitated as coating films on all parts of the body.

Wet film turns into dry flat film by baking process.



The average film build of E-Coat primer is 20 microns (µm = Micron) (that's around a fifth the thickness of a human hair!!)

Disadvantages of E-Coat include:

- Low quality finish / appearance
- Poor UV stability.

Both of these weaknesses are over come by topcoating with modern paint systems and chemistries (including powder-coating for certain applications).

Generally speaking, the collision repair industry tends to under-estimate the value of retaining E-Coat when preparing parts for fitting / welding / attachment. As highlighted above, long-lasting effective corrosion protection is provided by E-Coat, and for collision repairs, cannot be replaced once removed.

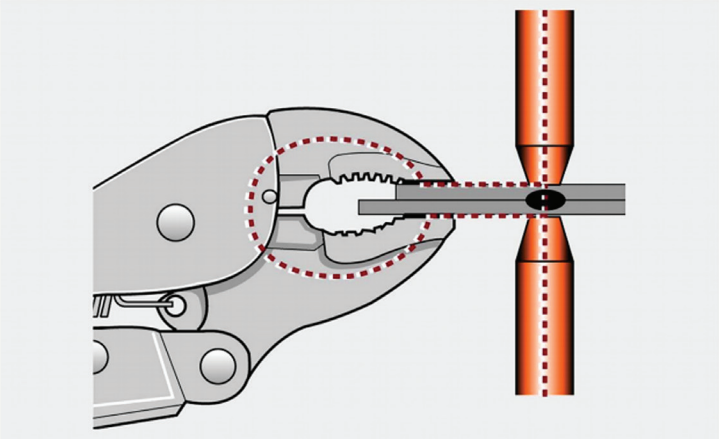
Typically, epoxy primers are used for initial surface protection, and in the case of welded flanges, removed E-Coat is often replaced with a zinc rich, weld-thru primer.

In previous technical articles, we have pointed out that OEM's are providing a lot more detail on correct corrosion protection in the Body Repair Manual (BRM). Obviously, corroded parts will not perform or behave as they are supposed to in the event of a future collision, and additionally, are likely to compromise the structural integrity of the vehicle.

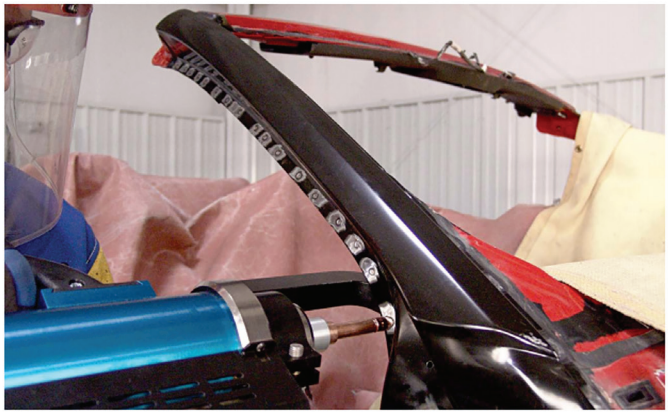
In many instances, E-Coat will certainly need to be removed (examples would include bare-metal adhesive bonding / weld-bonding / rivet – bonding and GMA, MIG /MAG welding).

STRSW (spotwelding), on the other hand, can be performed effectively on mating flanges without removing the E-Coat : -

Most of the E-coat on the mating surfaces can be preserved when replacing a part with STRSW through the use of a shunting clamp. The E-coat only has to be removed on the outside surfaces. The shunting clamp is positioned at the first weld site and the first spot weld is made at the adjacent site

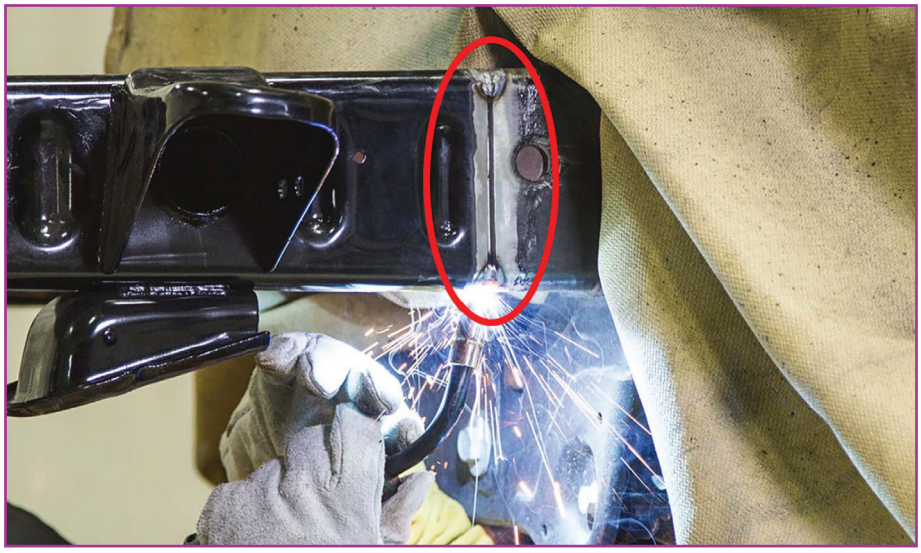


By using shunting, a spot weld can be made even though there is a coating on the mating surfaces.



Irrespective of ability to weld through the E-Coat on the inner flange, spotweld and / or MIG plug weld site preparation should target the location of the replacement welds as the only areas where E-Coat is removed …

This includes sectioning joints to be welded –

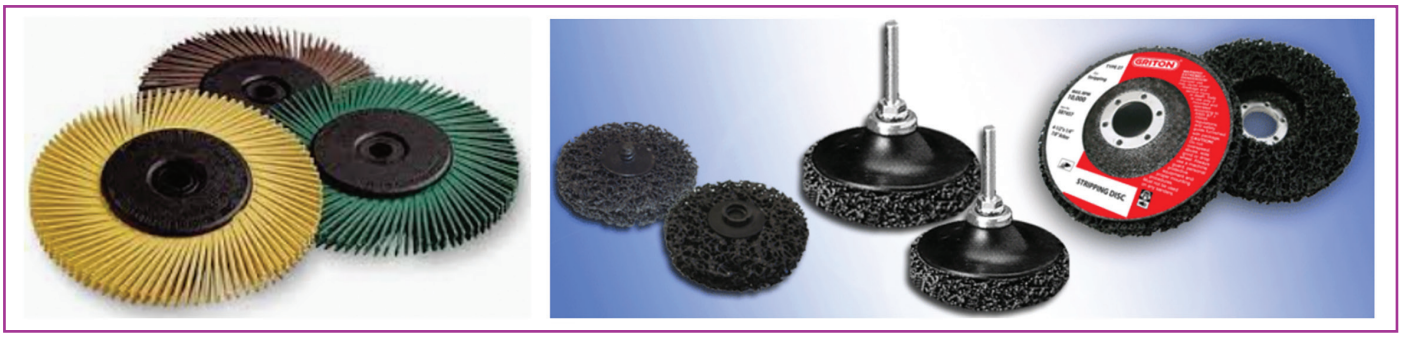


The other concern that becomes apparent with the indiscriminate removal of the E- Coating, is **thinning** of the base material from using inappropriate abrasive materials and tools that are too aggressive.

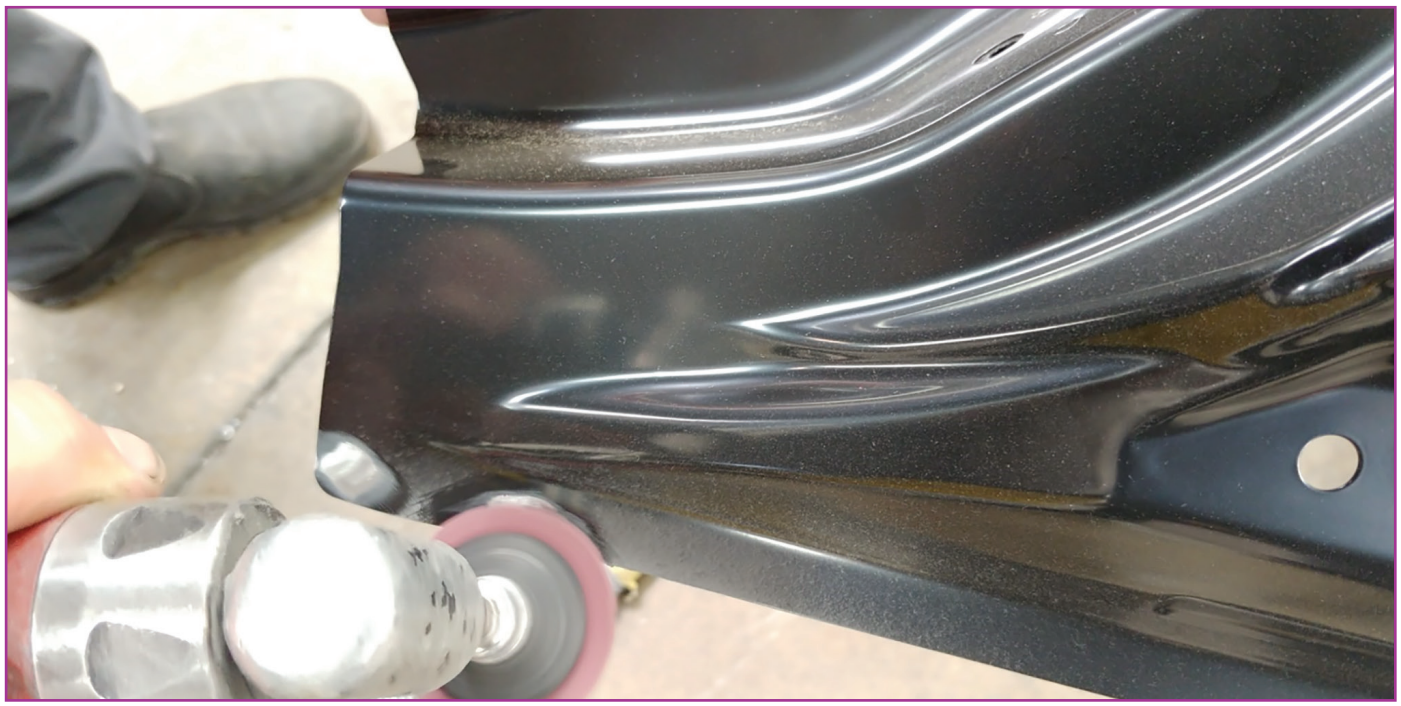
The gauge thickness of many exterior panels is now under 0.7mm, with most of these also being zinc coated (galvanised). Using coarse grit sanding discs and sanding belts tears through both the E-Coat and zinc layers very

easily, and it is difficult for the technician to control ingression into the base metal.

Fibre “Clean & Strip” discs control the removal of coatings more effectively than abrasives designed for rapid metal removal (grinding down / dressing welds) –



Another consideration is that many OEMs recommend retaining the galvanised (zinc) coating wherever possible, to provide additional corrosion protection.

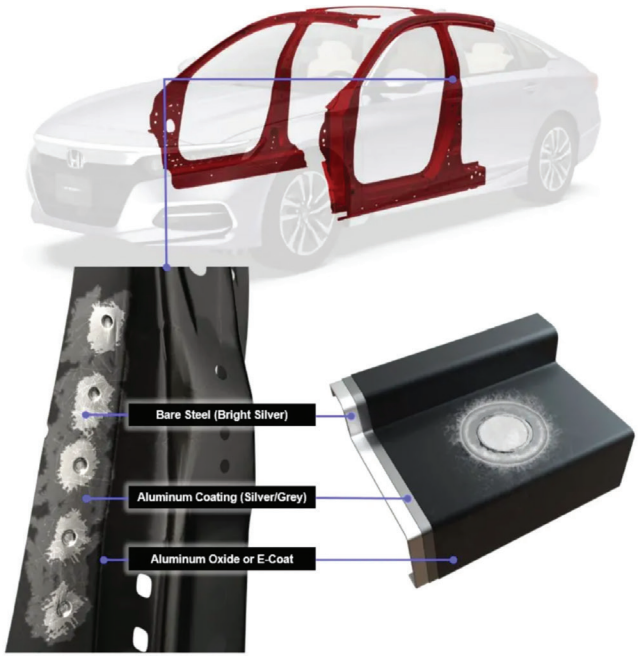


The opposite may be true for some OEMs -Honda have recently updated their recommendations when working with 1500 MPa tensile strength Hot Stamped Steels (targeting the “door ring”) – the protective aluminium sheet metal coating must be carefully removed (along with E-Coat), prior to welding…

Honda warns that repairers need to eliminate a thin layer of aluminum before welding here.

"1,500 Mpa hot stamp steel sheets have a 10-micron aluminum coating that must be removed (sanded off) from the weld zone of the panel before welding," Honda warned in the September 2019 Body Repair News. "Both exterior and mating surfaces requires the removal of coating. Failure to do so will create a weak weld and ultimately a failure of the joint."

Honda wrote that you only have to sand down the area being welded, not the entire piece of metal, and shared a handy diagram as an example.



So, the next time you pick up your belt sander to prepare the mating flanges and sectioning joints on that replacement quarter panel prior to welding on the car, take the time to "target" just how much of those protective coatings need to be removed and the equipment that you will be using to do it!!

These articles have been written by Martyn Lane: I-CAR Instructor, Weld Test Administrator and Technical Specialist to the auto body industry