Estimating Today's Vehicles

Technical Committee
July 21,2011
Salt Lake City, Utah

A 2010 Toyota XB with Damage to the Driver's Side

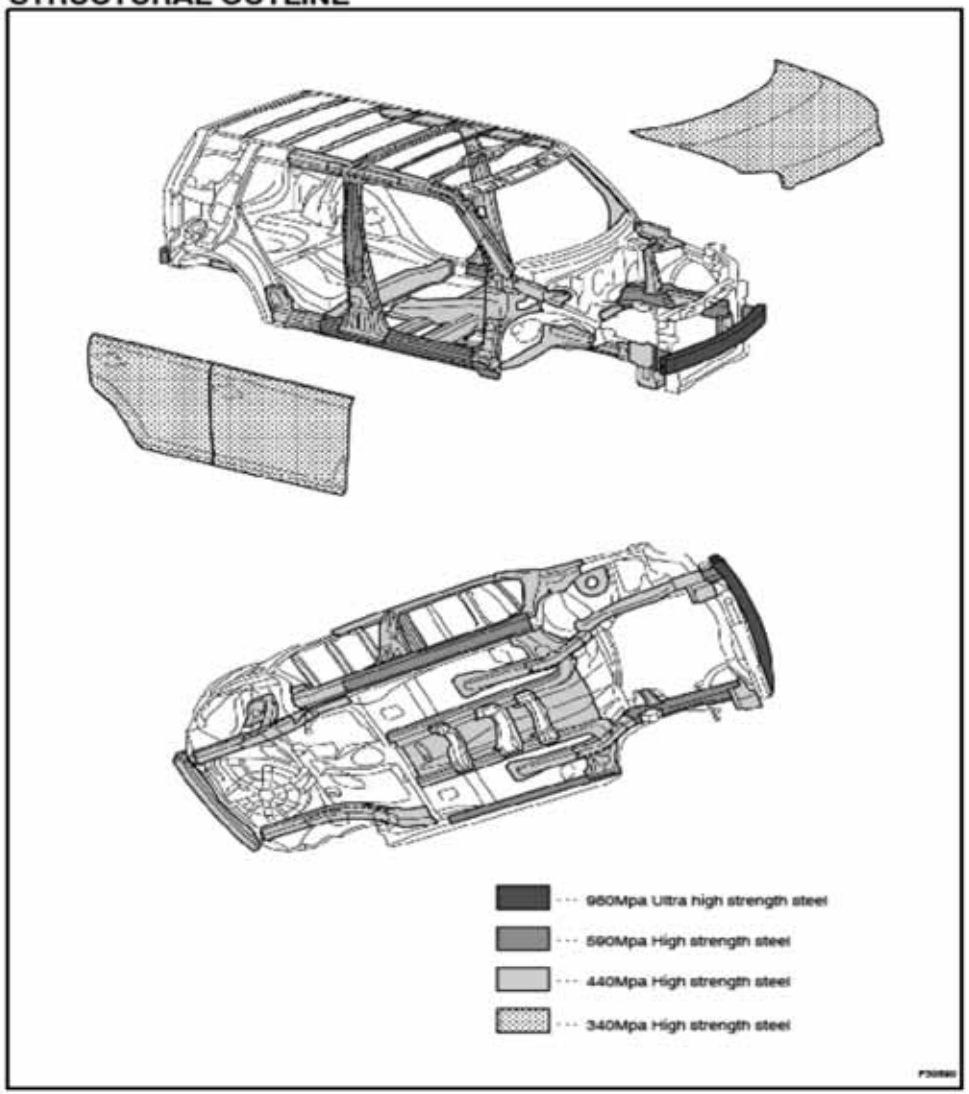
There is damage to the rocker & outer “B” pillar-lower section

Let’s Write the sheet

- Set up frame machine & measure
- Replace Left FT Door
- Replace Left RR Door
- Pull Rocker to for repair
- Pull Center Post for repair
- Repair Rocker after pull
- Repair Center Post after Pull
- Replace Corrosion Protection
- Replace left quarter panel

ABOUT THIS VEHICLE

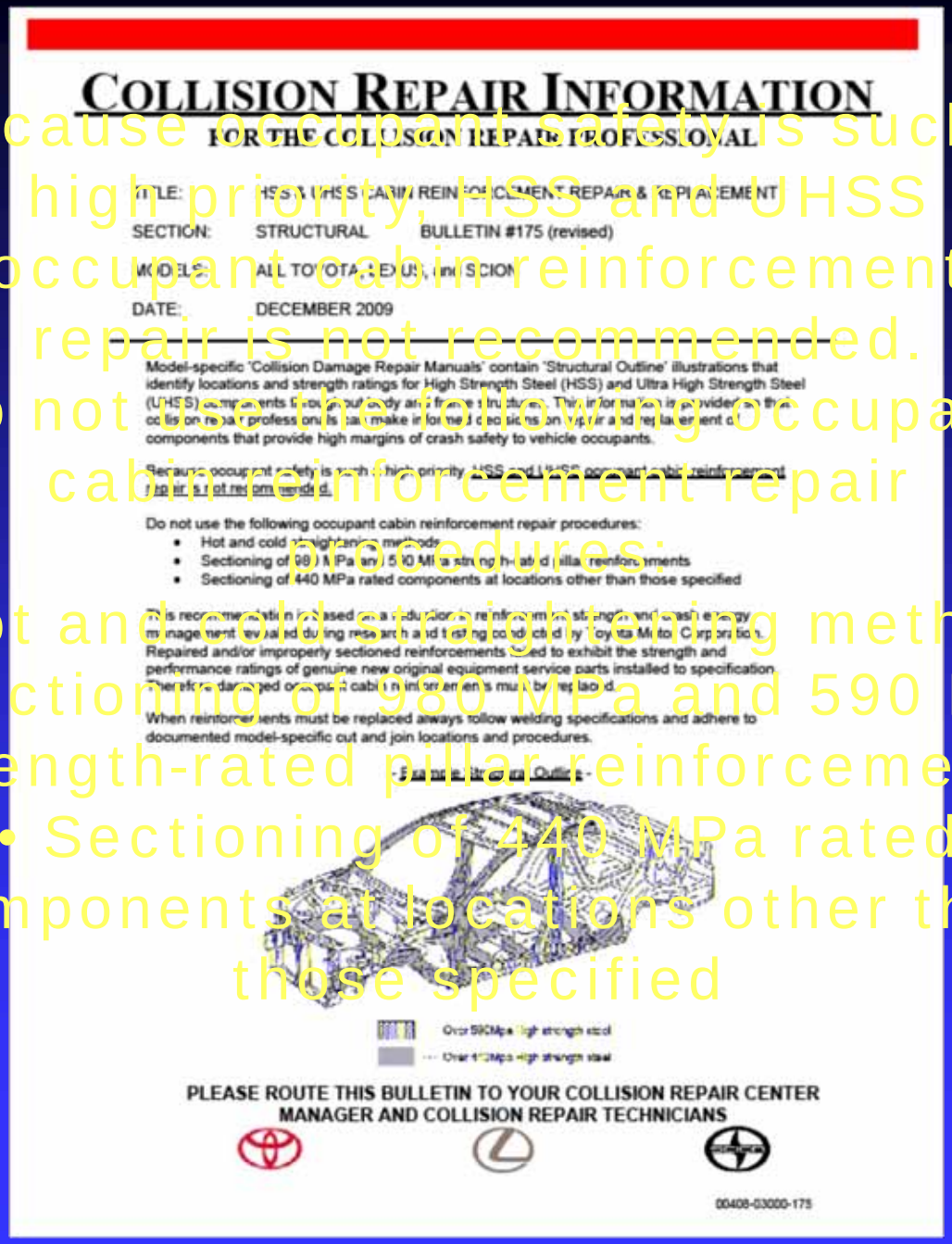
STRUCTURAL OUTLINE



Because occupant safety is such a high priority, HSS and UHSS occupant cabin reinforcement repair is not recommended.

Do not use the following occupant cabin reinforcement repair procedures:

- Hot and cold straightening methods
- Sectioning of 980 MPa and 590 MPa strength-rated pillar reinforcements
- Sectioning of 440 MPa rated components at locations other than those specified



COLLISION REPAIR INFORMATION

FOR THE COLLISION REPAIR PROFESSIONAL

TITLE: HSS/UHSS STEEL REINFORCEMENT REPAIR & REPLACEMENT

SECTION: STRUCTURAL BULLETIN #175 (revised)

MODELS: ALL TOYOTA, LEXUS, and SCION

DATE: DECEMBER 2009

Model-specific 'Collision Damage Repair Manuals' contain 'Structural Outline' illustrations that identify locations and strength ratings for High Strength Steel (HSS) and Ultra High Strength Steel (UHSS) components throughout body and frame structures. This information is provided so the collision repair professional can make informed decisions on repair and replacement of components that provide high margins of crash safety to vehicle occupants.

Because occupant safety is such a high priority, HSS and UHSS occupant cabin reinforcement repair is not recommended.

Do not use the following occupant cabin reinforcement repair procedures:

- Hot and cold straightening methods
- Sectioning of 980 MPa and 590 MPa strength-rated pillar reinforcements
- Sectioning of 440 MPa rated components at locations other than those specified

This recommendation is based on a reduction in reinforcement strength and crash energy management levels found during research and testing conducted by Toyota Motor Corporation. Repaired and/or improperly sectioned reinforcements failed to exhibit the strength and performance ratings of genuine new original equipment service parts installed to specification. Therefore damaged occupant cabin reinforcements must be replaced.

When reinforcements must be replaced always follow welding specifications and adhere to documented model-specific cut and join locations and procedures.

Structural Outline

Over 590Mpa High strength steel

Over 440Mpa High strength steel

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00408-03000-175

COLLISION REPAIR INFORMATION

FOR THE COLLISION REPAIR PROFESSIONAL

TITLE: SEALING HEM FLANGES & BODY SEAMS

SECTION: EXTERIOR BULLETIN #169

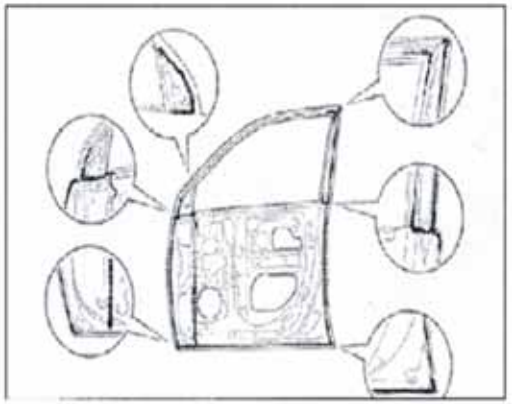
MODELS: ALL TOYOTA, LEXUS and SCION

DATE: FEBRUARY 2009

To assure factory corrosion prevention measures are replicated during body repairs, always use a first-kind and quality automotive grade sealer on hem-flanges and body seams. During manufacturing specialized materials are used however, aftermarket materials are readily available to match factory quality, application, and purpose. OE replacement body components are not supplied with seam sealer.

If replacement body components are not seam sealed, or if poor quality materials are used; the Toyota new car corrosion warranty may be voided on the affected components and adjoining parts and systems which are caused to fail or rust by these components. Refer to CPS-Toyota/Scion Policy 4.17 and CPS Lexus Policy 4.15 for details on what is not covered by the new vehicle limited warranty.

Refer to model-specific Collision Damage Repair Manuals for Body Panel Sealing Area specifications, available from the Technical Information System (TIS) at (www.techinfo.toyota.com). The following door sealing illustration is supplied as an example.



PLEASE ROUTE THIS BULLETIN TO YOUR COLLISION REPAIR CENTER MANAGER AND COLLISION REPAIR TECHNICIANS

If replacement body components are not seam sealed, the Toyota Corrosion warranty may be voided on affected components

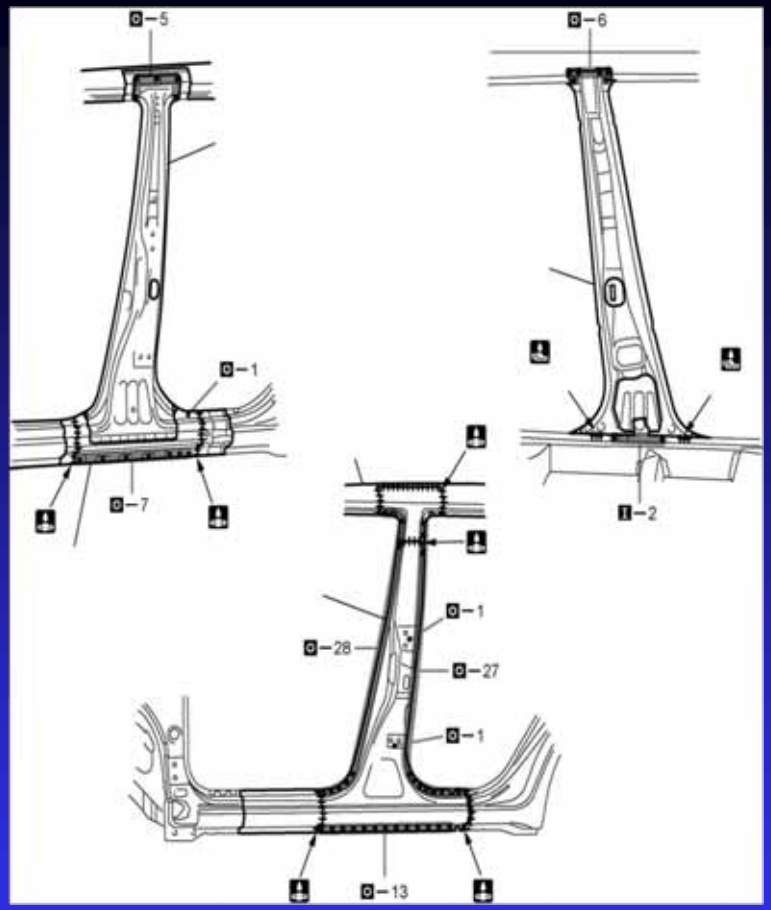
New Toyota Door Shell Detailing the lack of Seam Sealer on the hem.

Hem w/o
Seam sealer

After reviewing the CRIB, pulling for repairs is out of the question. You can pull for replacement only.

Let’s Write the sheet

- Set up frame machine & measure
- Replace Left FT Door
- Replace Left RR Door
- Pull Rocker for repair
- Pull Center Post for repair
- Repair Rocker after pull
- Repair Center Post after Pull
- Replace Corrosion Protection
- Pull Center Post for Replacement
- Pull Rocker for Replacement
- Replace Center Post & Rocker



INSTALLATION POINT

1 Inspect the fitting of the related parts around the new parts before welding. This affects the appearance of the finish.

2 Temporarily install the new parts and measure each part of the new parts in accordance with the body dimension diagram. (See the body dimension diagram)

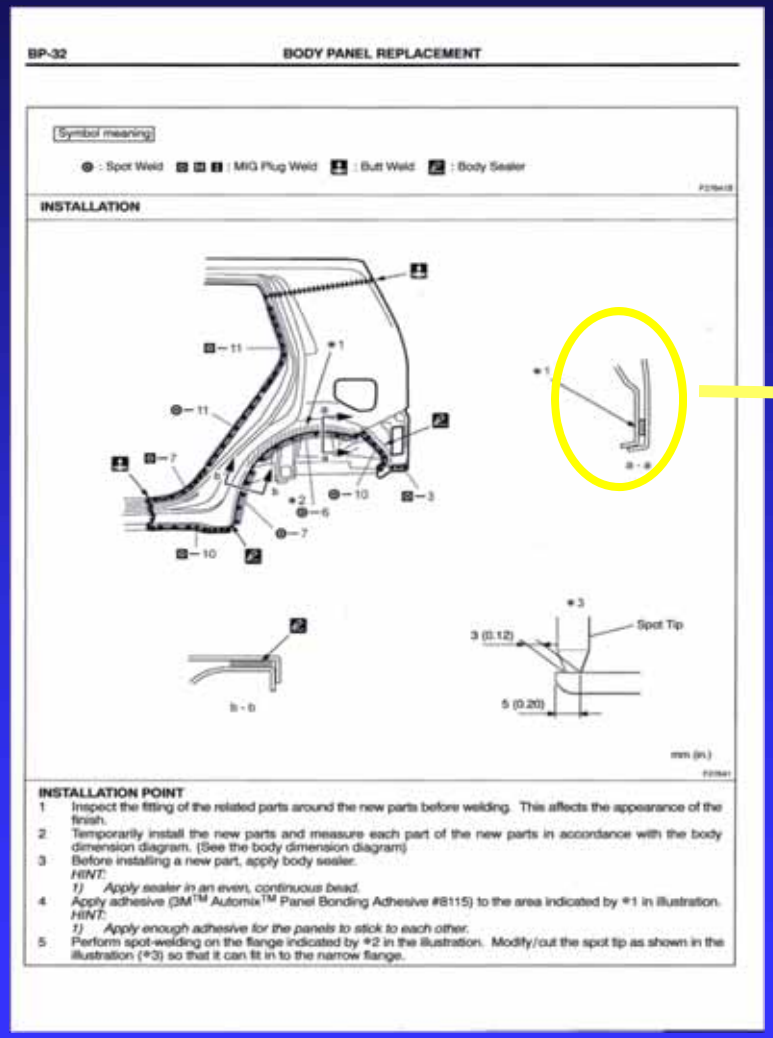
3 After welding the rocker outer reinforce, center body pillar reinforcement and center body pillar lower reinforce to the vehicle side, install the rear body front outside panel and roof side rail.

4 After welding, apply polyurethane foam to the corresponding parts. (See the paint.coating)

5 After welding, apply body sealer and undercoating to the corresponding parts. (See the paint.coating)

The correct repair procedure is to cut a “T” section out of the roof to expose the upper part of the reinforcement.

Quarter Panel Replacement on a Toyota XB



BP-32 BODY PANEL REPLACEMENT

Symbol meaning

● : Spot Weld ■ ■ ■ : MIG Plug Weld ▲ : Butt Weld ◪ : Body Sealer

INSTALLATION

INSTALLATION POINT

1 Inspect the fitting of the related parts around the new parts before welding. This affects the appearance of the finish.

2 Temporarily install the new parts and measure each part of the new parts in accordance with the body dimension diagram. (See the body dimension diagram)

3 Before installing a new part, apply body sealer.
HINT:
1) Apply sealer in an even, continuous bead.

4 Apply adhesive (3M™ Automix™ Panel Bonding Adhesive #8115) to the area indicated by *1 in illustration.
HINT:
1) Apply enough adhesive for the panels to stick to each other.

5 Perform spot-welding on the flange indicated by *2 in the illustration. Modify/cut the spot tip as shown in the illustration (*3) so that it can fit in to the narrow flange.

Did you know that Toyota wants all outer Wheelhouse panels bonded to the quarter panel for corrosion protection?

Toyota's CRIB #158

COLLISION REPAIR INFORMATION

FOR THE COLLISION REPAIR PROFESSIONAL

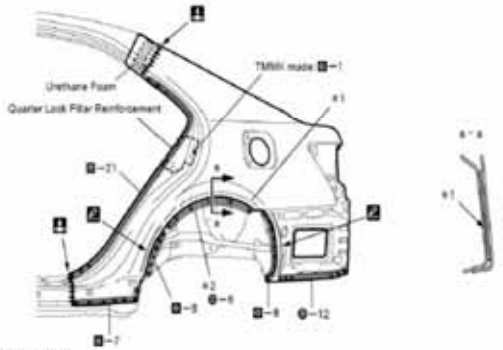
TITLE: PANEL ADHESIVE

SECTION: EXTERIOR BULLETIN #158

MODELS: ALL TOYOTA, LEXUS, and SCION

DATE: OCTOBER 2007

The application or use of panel adhesive is limited to the approved procedures published in Toyota, Lexus, and Scion model-specific Collision Damage Repair Manuals. The following illustration is an example of specifications that include the use of adhesive. Please review collision repair manuals (www.techinfo.toyota.com) for complete instructions and symbol translations.



INSTALLATION POINT

- Apply adhesive (3M™ Automix™ Panel Bonding adhesive #8115) to the area indicated by *1.
- Perform spot-welding on the flange indicated by *2.

Note: Panel-bonding and weld-bonding are not approved procedures.

Definitions:

- Panel-bonding is a substitution of any specified welds with adhesive material.
- Weld-bonding is squeeze-type resistant spot-welding through adhesive.

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00408-03000-158

FOR SAFER CARS

EURO NCAP

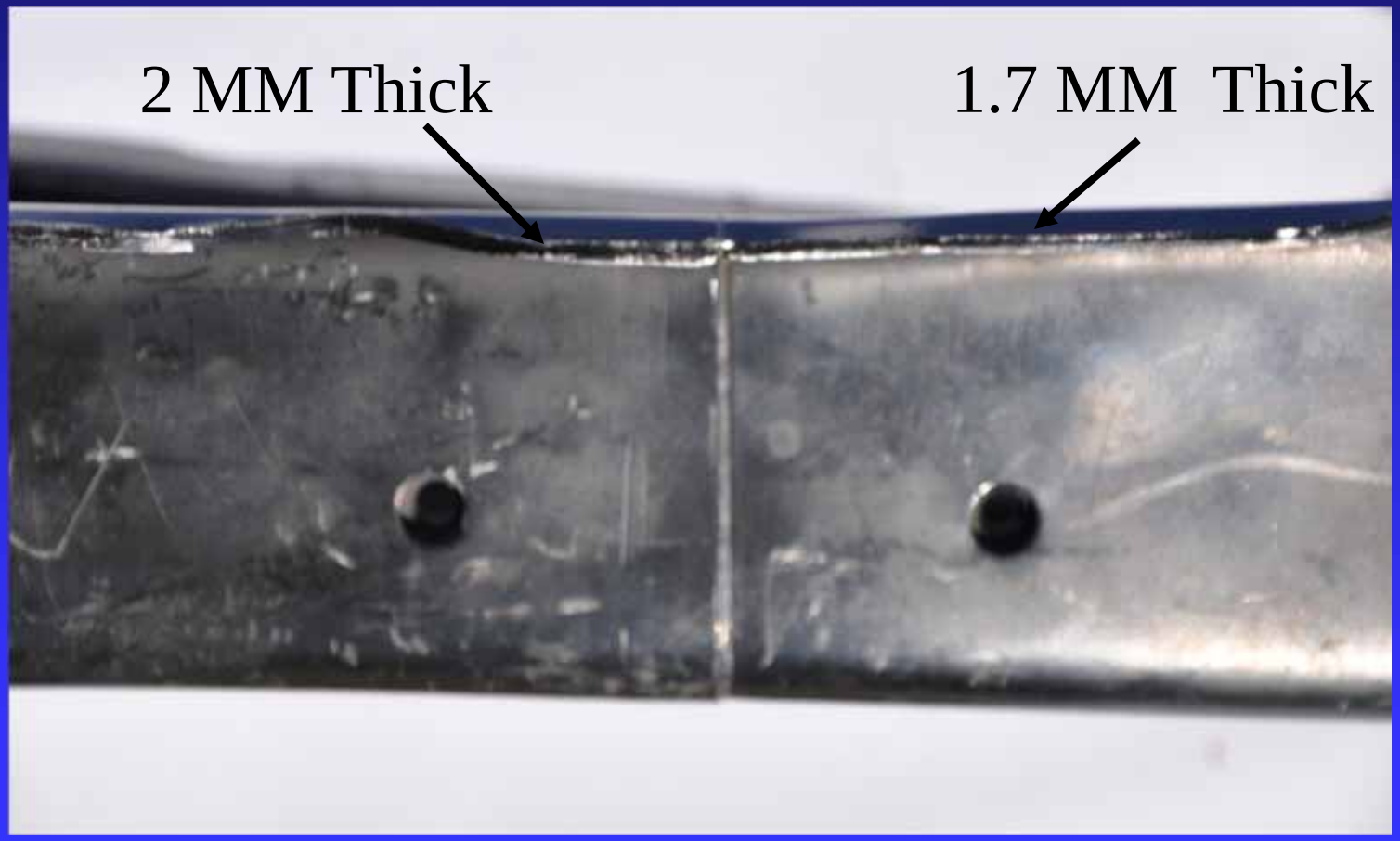
www.euroncap.com

Front Inner Frame Rail on a Toyota Camry

What are these lines?

These are laser welds

These laser welds joint different thicknesses of metal



Let's assume there is damage to front portion of the rail & heat is applied to repair the part. Question—How much heat & how long can it be applied for?

866 degrees F for 2 minutes

745 degrees F for 1min-30 sec

900 degrees F for 1min

HEAT REPAIR FOR BODY AND FRAME COMPONENTS IS PROHIBITED

High strength steel is used for structural body, and frame components. These components are repaired with heat the crystalline structure changes, causing a significant decrease in strength. Heat also damages the zinc coating reducing corrosion resistant properties.

COLLISION REPAIR PRECAUTIONS

FOR THE COLLISION REPAIR PROFESSIONAL

TITLE: COLLISION DAMAGE REPAIR PRECAUTIONS

SECTION: STRUCTURAL BULLETIN #16

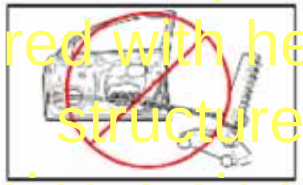
MODELS: ALL TOYOTA, LEXUS, and SCION

DATE: JANUARY 2006

The following collection of precautions is intended to reinforce Toyota's position on some key collision repair topics, and should not be considered all inclusive or a substitute for training. For more information on these and other important collision repair topics, please to attend Collision Repair & Refinish Training. Visit the CREF website www.crefinish.com for schedule and registration information.

HEAT REPAIR FOR BODY AND FRAME COMPONENTS IS PROHIBITED

High strength sheet steel is used for structural body, and frame components. These components are repaired with heat the crystalline structure changes, causing a significant decrease in strength. Heat also damages the zinc coating reducing corrosion resistant properties.



INTRUSION BEAM REPAIR IS PROHIBITED

Intrusion beams are designed to absorb, channel, and dissipate collision energy, and perform at 100% strength in their original shape. However, if they are damaged and repaired they will no longer perform as intended. Damaged intrusion beams require complete door replacement.

BUMPER REINFORCEMENT REPAIR IS PROHIBITED

Bumper reinforcements are designed to absorb, channel, and dissipate collision energy, and perform at 100% strength in their original shape. However if they are damaged and repaired, they will no longer perform as intended. Damaged bumper reinforcements require replacement.

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00408-03000-161

The strength of the front Toyota Camry rail is 450 MPas

Next I heated the rail to approximately 1000 degree Fahrenheit.

I retested the strength of the rail after it was heated.

The results were the heated part of the rail ranged from a low of 230 Mpa’s to a high of 320 Mpa’s.

COLLISION REPAIR INFORMATION

FOR THE COLLISION REPAIR PROFESSIONAL

TITLE: WELDING ULTRA HIGH STRENGTH STEEL

SECTION: STRUCTURAL BULLETIN #174

MODELS: 2010 PRIUS -

DATE: AUGUST 2009

Toyota has incorporated the use of Ultra High Strength Steel (UHSS) for rocker panel reinforcements in the body construction of the 2010 Prius. UHSS increases occupant cabin strength and rigidity. The strength rating for these UHSS components is 980 MPa (Mega Pascal), which has unique replacement welding requirements.

Welding specifications and steel strength ratings are documented in model-specific Collision Damage Repair Manuals. Because the use of UHSS is on the increase, always refer to vehicle-specific 'Structural Outlines' for locations of UHSS body components.

The following is an excerpt from repair manual recommendations on this topic.

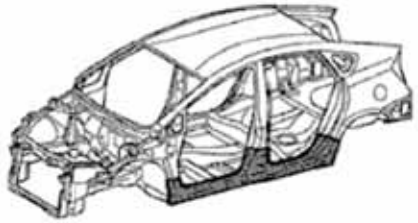
#1: For welding 980 MPa Ultra High Strength Steel when two panels are joined.

Squeeze-Type Resistance Spot Welding	Pressure	294 daN (660 lbf)
	Weld Current	10,000 Amps
	Weld Time	16 Cycles (0.27 Seconds)
Gas Metal Arc/Metal Inert Gas Plug Welding	Hole Diameter	10 mm (0.39 in.)
	Wire Type	AWS A5.18 ER70S-3
	Shielding Gas	75-80% Argon - 25-20% CO2

#2: For plug welding 980 MPa Ultra High Strength Steel when two or more panels are joined.

Gas Metal Arc/Metal Inert Gas Plug Welding	Plug Diameter	10 mm (0.39 in.)
	Wire Type	AWS A5.18 ER70S-3
	Shielding Gas	75-80% Argon - 25-20% CO2

Since some variations may be necessary, consult STRSW technical manual and fine-tune welders with visual and destructive tests for specific application.



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00408-03000-174

COLLISION REPAIR INFORMATION

FOR THE COLLISION REPAIR PROFESSIONAL

TITLE: APPROVED COLLISION REPAIR METHODS

SECTION: STRUCTURAL BULLETIN # 176 (revised)

MODELS: ALL TOYOTA, LEXUS, and SCION

DATE: DECEMBER 2009

During collision repair straightening operations it is often necessary to stress-relieve metal components to return them or attached components to original shape, alignment, and strength. It is also often necessary to replace or section damaged weld-on components. The following information is intended to provide an overview of approved repair methods and repair methods that are not recommended for these operations. This information also reinforces specific precautions currently published in Collision Repair Information Bulletins (CRIBs), and those covered in instructor-facilitated hands-on training.

APPROVED REPAIR METHODS	METHODS NOT RECOMMEDED
Cold Straightening: Pushing-Pulling-Hammering	Stress Relief: Heating HSS and UHSS
Weld-On Pulling Aids	Stress Relief: Holes or Access Windows
Sectioning at Specified Locations	Sectioning at Non-Specified Locations
Open Butt Joint	Butt Joint With Backing (Sleeve)
Installing Genuine OEM Parts	Installing Aftermarket and Recycled Parts
Adhesive Use Where and How Specified	Panel Bonding and Weld Bonding

Instructor facilitated hands-on training information is available at www.crrtraining.com. All pertinent collision repair specifications and precautions are covered in-depth during the following training courses:

- Course #301 Non-Structural Body Repair Training
- Course #460 Structural Body Repair Training

Collision Repair Information Bulletins can be accessed at www.techinfo.toyota.com. Refer to the following bulletins for more detailed information on applicable collision repair topics and precautions:

- CRIB #122 Full Body Sectioning
- CRIB #155 Body & Frame Sectioning
- CRIB #157 Collision Parts Position Statement
- CRIB #158 Panel Adhesive
- CRIB #161 Collision Damage Repair Precautions
- CRIB #172 Bumper Component Repair
- CRIB #174 Welding Prius UHSS
- CRIB #175 HSS & UHSS Occupant Cabin Reinforcement Repair & Replacement

PLEASE ROUTE THIS BULLETIN TO YOUR COLLISION REPAIR CENTER MANAGER AND COLLISION REPAIR TECHNICIANS

00409-03000-176

Where is the training?

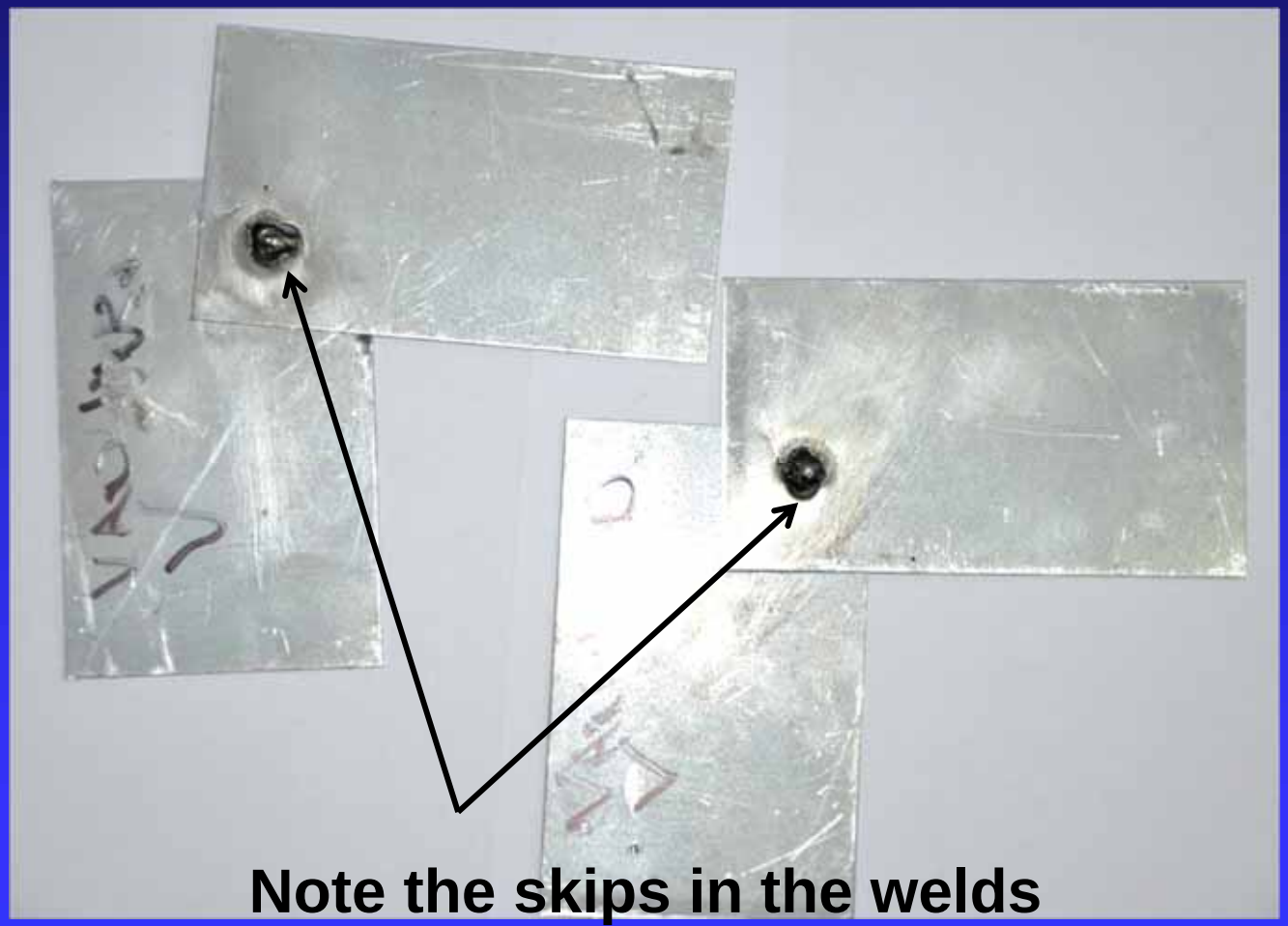
Toyota University
- Non Structural Class & Structural Class

I-CAR
- TOY 01, WCS 04, MIG Qualification Test
- POP 01, FOM 01, SPS 07, DAM 08 & CPS 01

Kent Automotive
- Seam Sealer Class (I-CAR Alliance)
- Corrosion Protection (I-CAR Alliance)

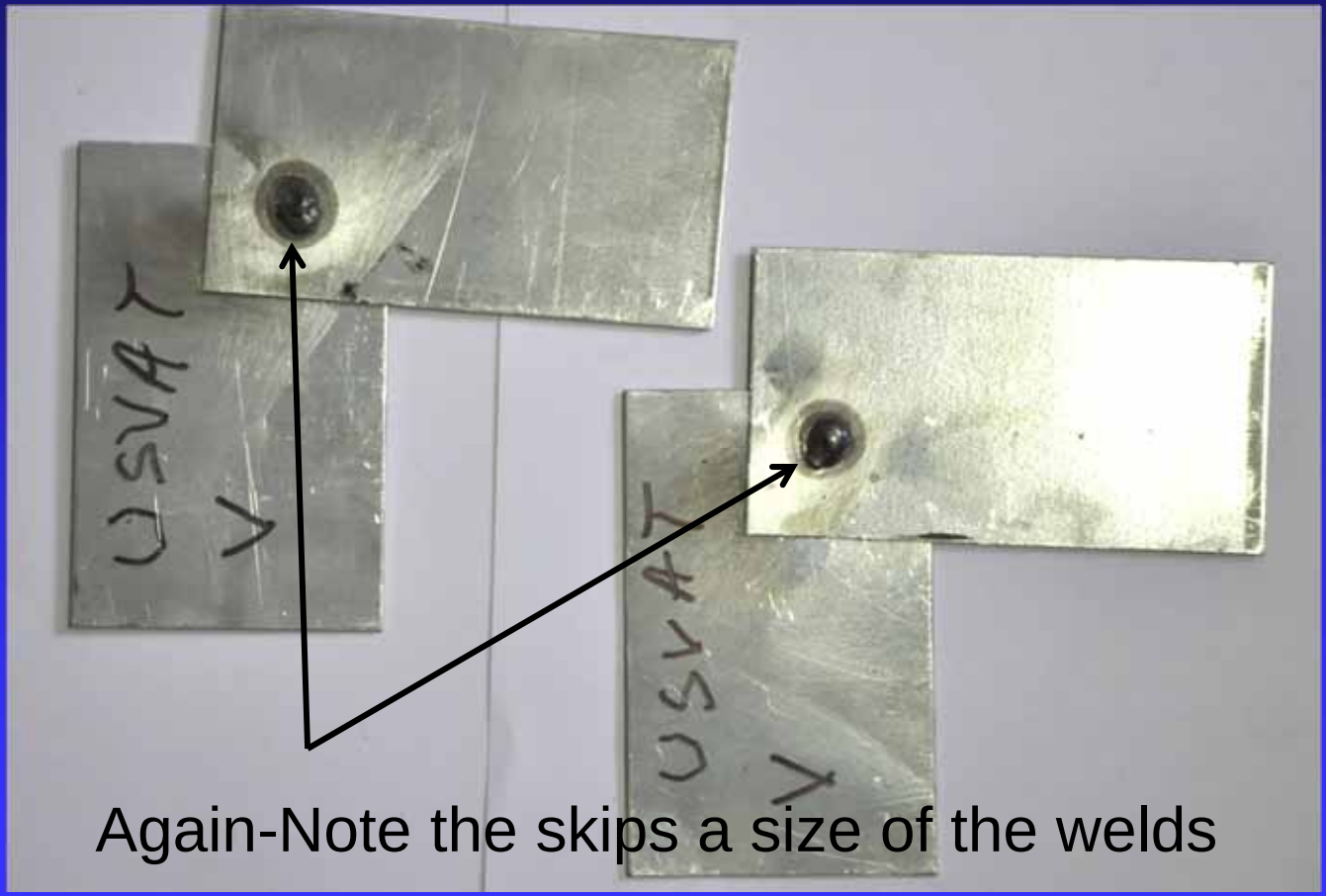
3M
- Seam Sealer & Corrosion Protection (I-CAR Alliance)

Plug Welds prior to taking the I-CAR Mig Qualification Tests



Note the skips in the welds

Plug Welds prior to taking the I-CAR Mig Qualification Tests



Again-Note the skips a size of the welds

The first practice welds after 1 hour of theory training & demos .

The Crash Test of the VW Passat

Vehicle after a 30MPH Crash

Note: "B" pillar reinforcement & upper door apperature Is made ultra high strength steel (1000 MPa)

Description of the repair process after the crash

NON-PROFESSIONAL REPAIR

The damaged car was repaired with an older spot welding machine with fixed pressure and 6.4 kA maximum current.

Note: It is recommended that an Inverter type welding machine is used with 10 kA maximum current

and a variable pressure (maximum 10 bar) to join the high strength steel safely. The deformed inner sill, made from ultra high strength steel, was re-shaped and partially replaced on a bench then re-fitted using a MAG welding process. Figures 6 to 9 show the non professional repair being carried out.

Note: The “Professional” repair would include complete renewal of the B-Pillar and other deformed structures with components made from high strength steel. A partial repair of such steels is not acceptable, as the structure and therefore the strength of the material will be severely degraded while welding and reforming.

The vehicle being repaired using older repair methods not approved for this year vehicle.

CRASH TEST 2

After completing the repair the car was crashed again under the same condition as the first test in order to make a fair assessment on equal terms. It was immediately evident that there was a substantial difference, with far more comprehensive deformation of the car body after the second impact. The B pillar had

noticeably higher intrusion into the passenger compartment in comparison with the first crash, especially at the lower part at the connection with the sill (Figures 10 and 11). Note: Later measurement of the car body confirmed there was 60 mm more intrusion after the second test, compared to the first crash. Other differences were noticeable at the cant rail/roof and the transmission tunnel

which both displayed severe deformation not seen in the first crash. It seems that the load paths were quite different in the second crash. It was also notable that the top

damaged in the second crash, further indication of changed load paths. These evident that a change of load paths and therefore of the energy dissipation was due to the unprofessional repair.

The pyrotechnic protection/restraint systems (Front and rear passenger side airbags and the front passenger belt pre-tensioner) were correctly the

passenger side curtain airbag failed to operate.

Observe the greater of the intrusion in crash test 2.

Crash test 1

Crash test 2

Observe that the side curtain deployed in the crash test 1, but failed in crash test 2.

Observe that the rocker and B pillar has moved further into the vehicle in crash test 2

Observe that damage to the passenger seat in crash test 2

After removing all the seats and necessary trim the deformation of the transmission tunnel after the second test was clear to see. The cross-member which supported the front seat had pushed into the transmission tunnel, distorting it severely. In comparison, there were no measurable changes at the transmission tunnel during the first crash test.

Crash Test 1

Crash Test 2

OEM information was not used during the repair after the first crash. These are positions where the inappropriate spot welding machine was used. The disconnection between inner sill and floor panel shows that the spot welds have not withstood the impact and were destroyed. The spot welds need to have a minimum diameter of 4.9 mm at a sheet thickness of 1.5 mm The optimum would have been 6.7 mm diameter. It is clear that the spot welds were inadequate.

The connection of the B-pillar with the inner sill was joined with MAG welding. The structure of the high-strength steel parts was changed by the welding process and re-shaping. The welded seam was totally broken after the second crash, being unable to withstand the stress and the distortion.

2011 Nissan Versa with rear damage.

2011 Nissan Versa with rear damage.

2011 Nissan Versa with rear damage.

2011 Nissan Versa with rear damage.

OEM & Diamond Standard Front Bumper Reinforcement for a 2003-2008 Toyota Corolla

Metal Analysis test on Diamond Standard Bumper Reinforcement

The analyzer reading is 35.1 or UHSS

Metal Analysis test on a OEM Front Bumper Reinforcement

The analyzer reading is 50.1 or UHSS

Aftermarket & OEM Hyundai Bumper Reinforcements.

Testing the metal thickness of Aftermarket & OEM Bumper Reinforcement.

A/M .93mm

OEM 1.42mm

Question: Like, Kind & Quality?

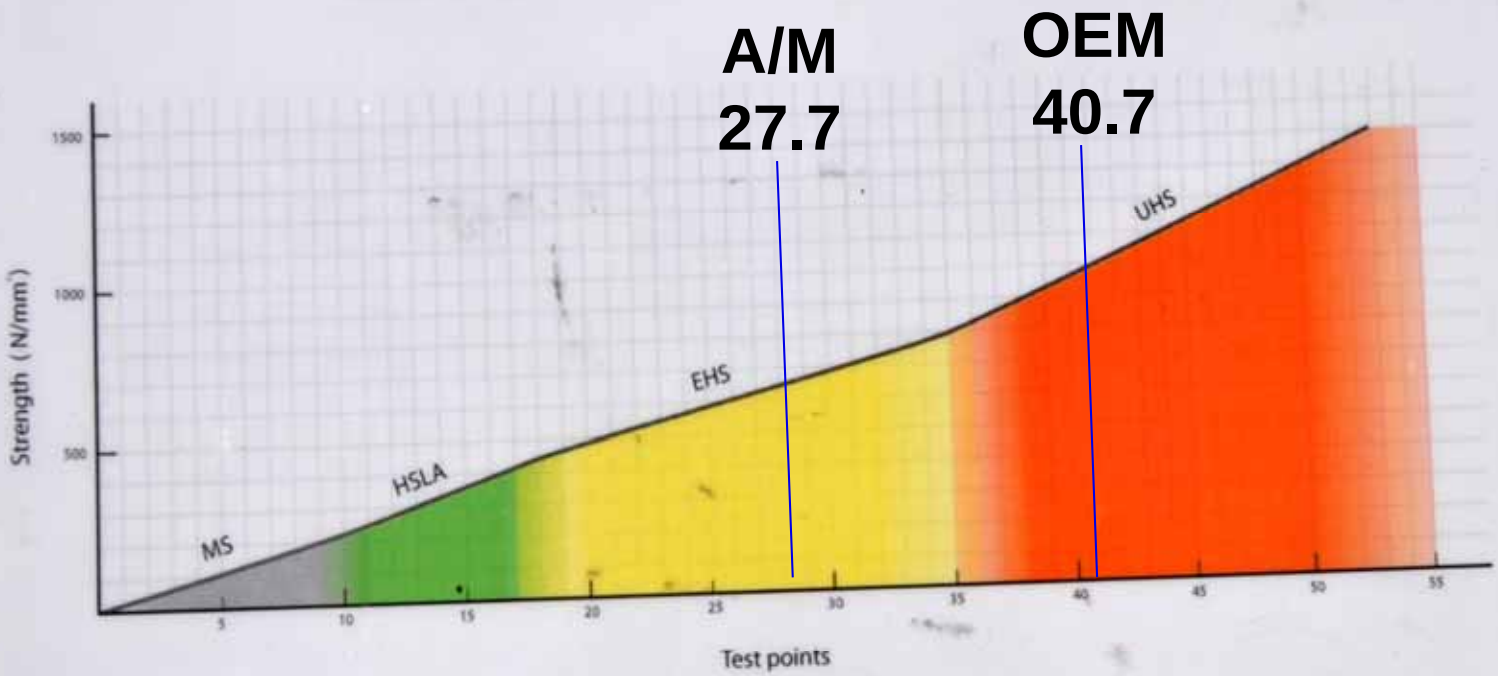
Testing the hardness of the A/M & OEM Bumper Reinforcements

A/M 27.7

OEM 40.7

Again, I ask the Question: Like, Kind & Quality?

BOR-ON™
AUTOBODY ANALYSER



Quick guide material test points

MS	Mild steel
HSLA	High strength low alloy steel
EHS	Extra high strength steel (Dual Phase, Trip, etc)
UHS	Ultra high strength steel (Boron or higher)

Test Points ©

0–10
10–18
18–35
35–