SECTION : 501-31 Body Welding and High Strength Steel

VEHICLE APPLICATION : 2008.0 Falcon

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DESCRIPTION AND OPERATION

Safety

All normal workshop safety practices should be observed. Protective clothing, adequate ventilation and proper firefighting equipment are essential when performing any welding operation.

The recommendation welding method for fitment of replacement panels is resistance spot welding or MIG puddle or plug welding. For weld type and location, refer to the interpretation of weld symbols in the previous chapters.

Oxyacetylene fusion welding may be used for butt welds except where high strength steels are being welded.

Precautions

1. Under no circumstances should the battery be shorted to earth.
2. When disconnecting the battery, always remove the earth lead first, connect in the reverse order.
3. Never start the engine without securely connecting the battery terminals, and never disconnect the battery whilst the engine is running or the ignition is turned on.
4. Never disconnect or reconnect the wiring harness plug of an electrical control unit with the ignition turned on.
5. Be certain that all plugs of the wiring harness are properly connected before connecting the battery.

Welding

Before welding work is performed on a vehicle body, all safety measures for the protection of people, modules, air bags and electrical components must be observed.

NOTE: Before beginning the work, please refer to the safety instructions and warnings above. For additional information refer to Section 501-25a. Please also note the warnings of the respective equipment manufacturer.

In body construction, the main type of welding used is resistance spot welding. In the course of repair work, this must be restored accordingly.

However, there are also fields of application for MIG welds.

MIG Welding

Fields of application

- Any joins that are MIG welded in production must also be replaced by MIG welds.
- Puddle welding may be used in certain cases, if there is insufficient access.

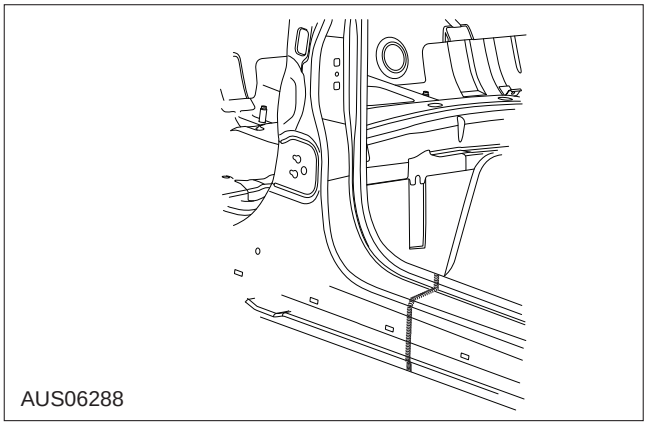
NOTE: The increased application of heat during MIG welding destroys the corrosion protection layers over a much larger area than during resistance spot welding. For this reason, greater care must be taken when applying the corrosion protection afterwards.

Welding repairs can only be carried out properly if the equipment is set up correctly and all welding-related preparations are complied with accurately.

- Please note the instructions of the respective welding equipment manufacturer.
- The hose assembly must be untwisted.
- The core must be free of abraded rod particles.
- The gas and current nozzles must be free of slag and scale residue.
- Pay attention to the quality of the welding rod and the through put of gas.
- Ensure that the joint surface is correctly prepared.
- Prepare a bare metal joint surface.
- Maintain the correct gaps (root formation).
- Produce a test weld.

Full seam

A welded joint with a full seam is suitable for joining highly profiled body parts. Pillar and sill areas are typical application areas.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Before the welding process, you must carry out the following operations:

- Both parts of the panel must be bare on both sides over a width of 5 mm.
- Align the parts precisely with clamps.
- To prevent the panel from warping, tack longer joints before welding them.

DESCRIPTION AND OPERATION (Continued)

Interrupted weld seam - intermittent seam

The intermittent seam is used for offset joint surfaces or for butt joints with a metal insert. This form of seam is mainly used on the external panel area for sectional repairs.

Please note the following welding parameters:

- Weld gap.
- Spot weld interval.
- Apply alternate tack welding across the entire length of the seam. This keeps warping to a minimum.

Puddle weld.

Puddle welding is used as a substitute if no spot welding equipment that is sufficiently powerful for the thickness of the panel is available. This welding method is also used if the welding position cannot be accessed with a spot welding gun.

NOTE: A test weld should always be carried out to ensure that the welded joint is not just a surface connection.

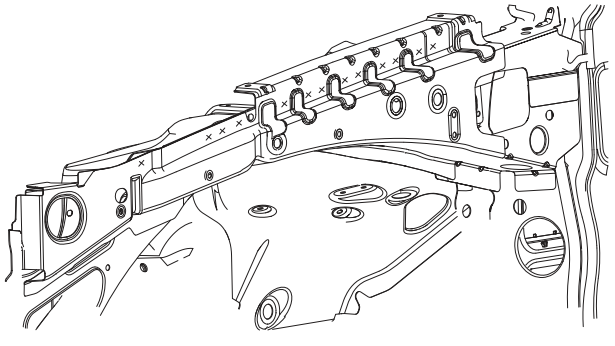
Please note the following welding parameters:

- The panels to be joined must lie perfectly flat to one another.
- The panel flanges must be bare at the welding position. Treat other areas with corrosion protection.
- Prepare the holes depending on the thickness and number of the panels. The hole size should be 6-10 mm, or match the original weld spot.
- Start the welding procedure on the panel at the bottom so that the hole is filled completely.

Resistance Spot Welding

The basic principle for repair welds is to restore the original welded joint as far as possible.

NOTE: Before starting the work, please refer to the safety instructions at the begin of this chapter. For additional information, refer to Section 501-25A.



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The repair welds must have the same number of weld spots with correct diameter as originally manufactured.

This requires that:

- The panels to be welded overlap
- The weld spot is accessible on both sides for the electrodes.
- The shape and alignment of the weld electrodes is correct.
- The resistance welding equipment is powerful enough to reproduce the spot weld diameter used in production.

NOTE: The welding equipment settings and the adjustment of the individual parameters are to be made in accordance with the device manufacturer's specifications.

Well-prepared welding flanges are a prerequisite for a problem-free welded joint. This means:

- The welding flanges must lie perfectly flat to one another
- The welding flanges must be clean and free of oil or grease on both sides.
- Welding primer (zinc-coated and conductive) must be applied as corrosion prevention.

Only in limited cases can welding errors in resistance spot weld joints be detected from the outside. Therefore, a test weld should be carried out before each repair weld. The peel test carried out after the welding gives information on the quality of the welding. The spot weld must not flake off.

Body Work Caution

Increased use of comfort and safety electronics in modern motor vehicles also requires the greatest attention to be paid during body work.

Overvoltages produced during welding and in alignment work during bodyshell rectification may cause electronic system to be damaged. In particular, the safety instructions for performing welding work on vehicles with airbags must be adhered to.

NOTE: After disconnecting the power supply and before performing further work, a wait time of 15 minutes must be maintained.

Work on airbag systems may only be performed by persons who have a relevant certificate of competence.

DESCRIPTION AND OPERATION (Continued)

Pay attention to the following points:

- Disconnect the battery negative clamp and cover the terminal.
- Disconnect the electrical connector at the airbag control module.
- If welding is to be performed directly near a control module, it must be removed beforehand.
- Never connect the negative cable of the welder near an airbag or a control module.
- Connect the negative cable of the welder close to the location of the weld.

Steels

There are a number of different types of steels used in the body and frame panels. In most cases the material can be repaired or welded in the same manner as normal mild steel panels. The exception to this is the heat sensitive high strength steels.

WARNING: ⚠ The RGOR must be replaced if damaged. It MUST NOT be straightened or panel beaten.

This is critical for correct function of the crash severity sensor which plays a major part in activating the front airbags in a crash.

High Strength and Ultra High Strength Steels

To reduce the vehicle weight while maintaining structural strength, Ford Motor Company has used high strength steels.

Whilst these steels appear to be the same as other steels, high strength steels are thinner and they have a low alloy content which makes them heat sensitive. The location of panels made from high strength steel are shown in the following pages.

NOTE: The door beam (side intrusion bar) fitted to side doors is manufactured from ultra high strength steel and must not be heated or straightened under any circumstances. These parts are critical to driver/passenger safety in both side impact and steering column rearward displacement. If a door beam is damaged, fitment of a new door shell is necessary.

Heating High Strength and Ultra High Strength Steel

Cold working is best for straightening bent parts. The application of heat may anneal (soften) high strength steel and should be avoided.

If heat must be applied to relieve stress in structural components, the steel must not be heated over 400ºC (dull red) and this temperature can only be applied for 3 minutes. A temperature sensitive crayon must be used for marking when heating this material, including all welding, cutting, grinding and buffing operations.

If heating or cold working of high strength steel with in prescribed procedures does not return components back to original shape and performance, they must be replaced.

It is recommended to replace assemblies of high strength components rather than seperate panels to restore the vehicle to original performance.

Welding Gear

As in the past, the dominant process in body construction is resistance welding, in particular spot welding. Depending on the body type, upto 5000 spot welds are applied, either by welding robots or in the multi-point welding machine.

During repairs the resistance spot welds used in production must be re-created accordingly.

NOTE: If a suitably powerful welding machine is not available and multi-layer panel joints with a total thickness of over 3 mm need to be made, puddle welding must be used.

Although in principle high-strength panels are adequately- or well-suited to resistance spot welding, problems may arise, especially where large panel thicknesses or three layers of panel need to be welded together in the workshop, but these problems can be overcome.

In particular, older welding equipment does not have the latest welding technology nor welding power and therefore cannot reliably join panel thicknesses greater than 3 mm.

Modern equipment with inverter technology allows better spot weld quality because of a constant high welding current. In addition the high welding current makes shorter welding times possible and the electrodes therefore have a longer working life.

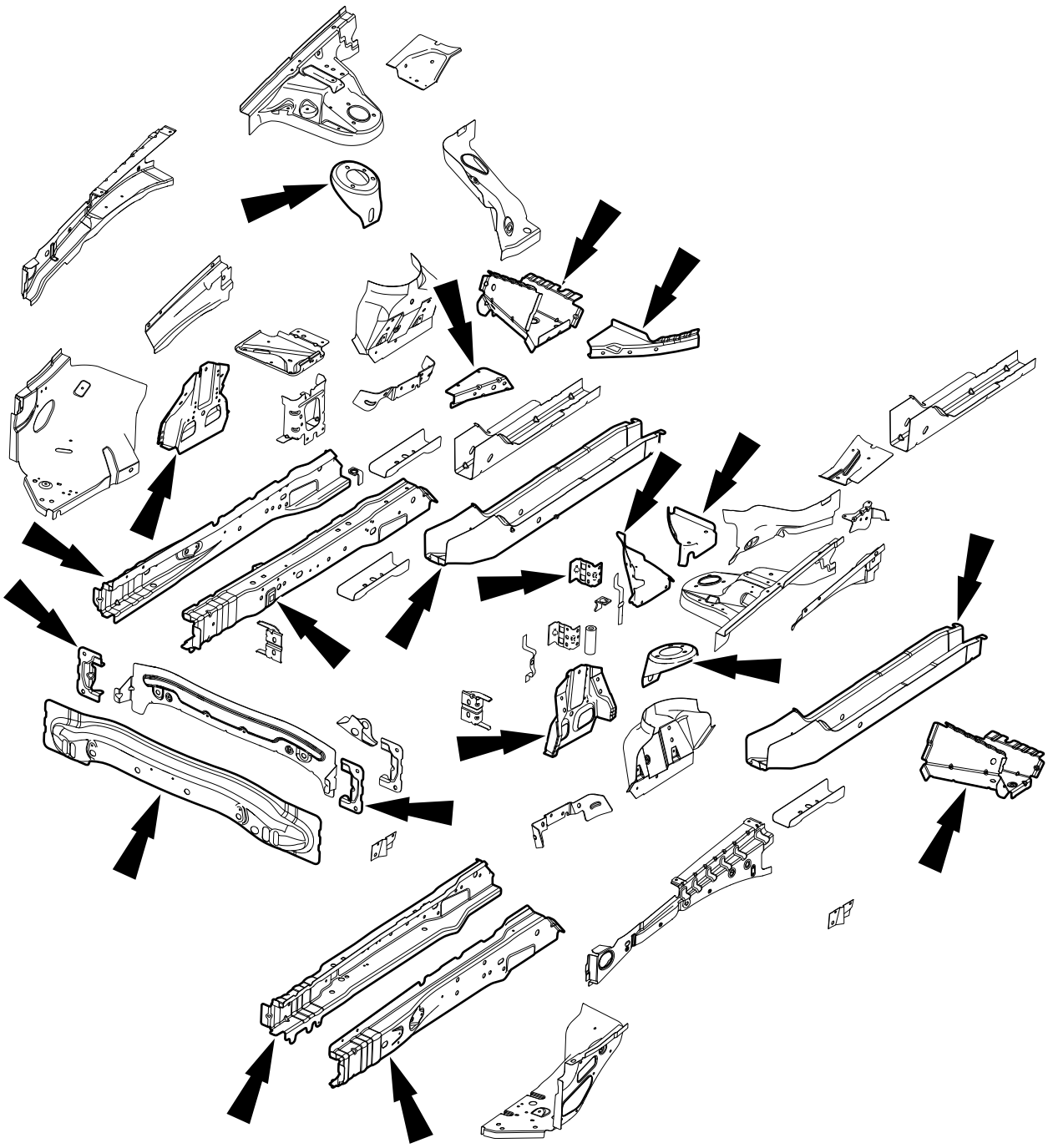
DESCRIPTION AND OPERATION (Continued)

In the case of resistance spot welded connections, faults in the weld are difficult to see from the outside. It is therefore absolutely vital to know the particular properties of the welding machine being used. A test weld with subsequent peeling test will provide information on the quality of the weld. The spot weld itself must not separate, it must tear away leaving a hole.

In the production of vehicle bodies, MIG welding plays a minor role as a joining technique. It is used for components subject to high demands, such as threaded plates for axle mountings, or at locations which cannot be spot welded for access reasons.

GENERAL PROCEDURES

High Strength and Ultra High Strength Steel Location - Front End



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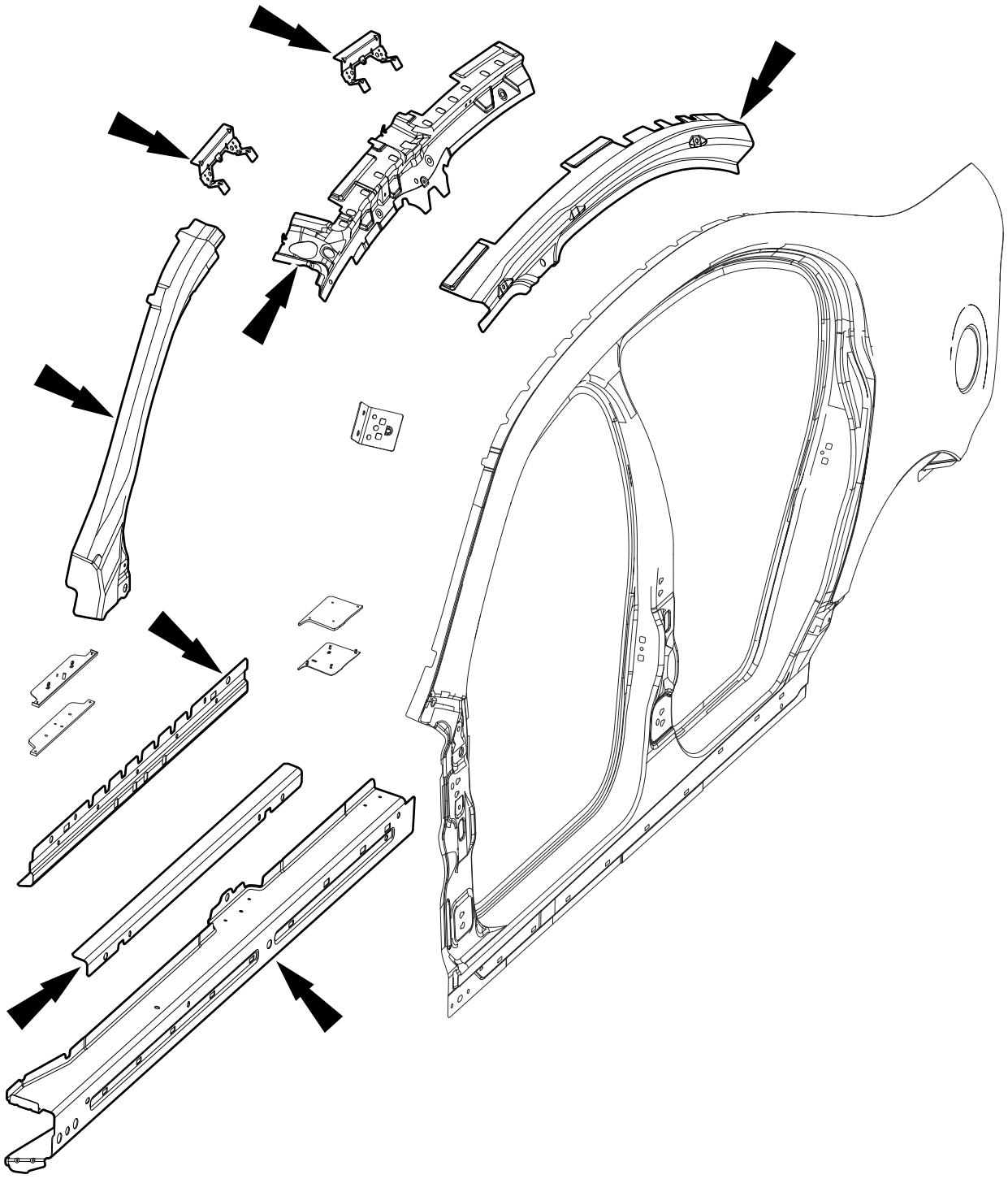
High Strength and Ultra High Strength Steel Location - Side Section



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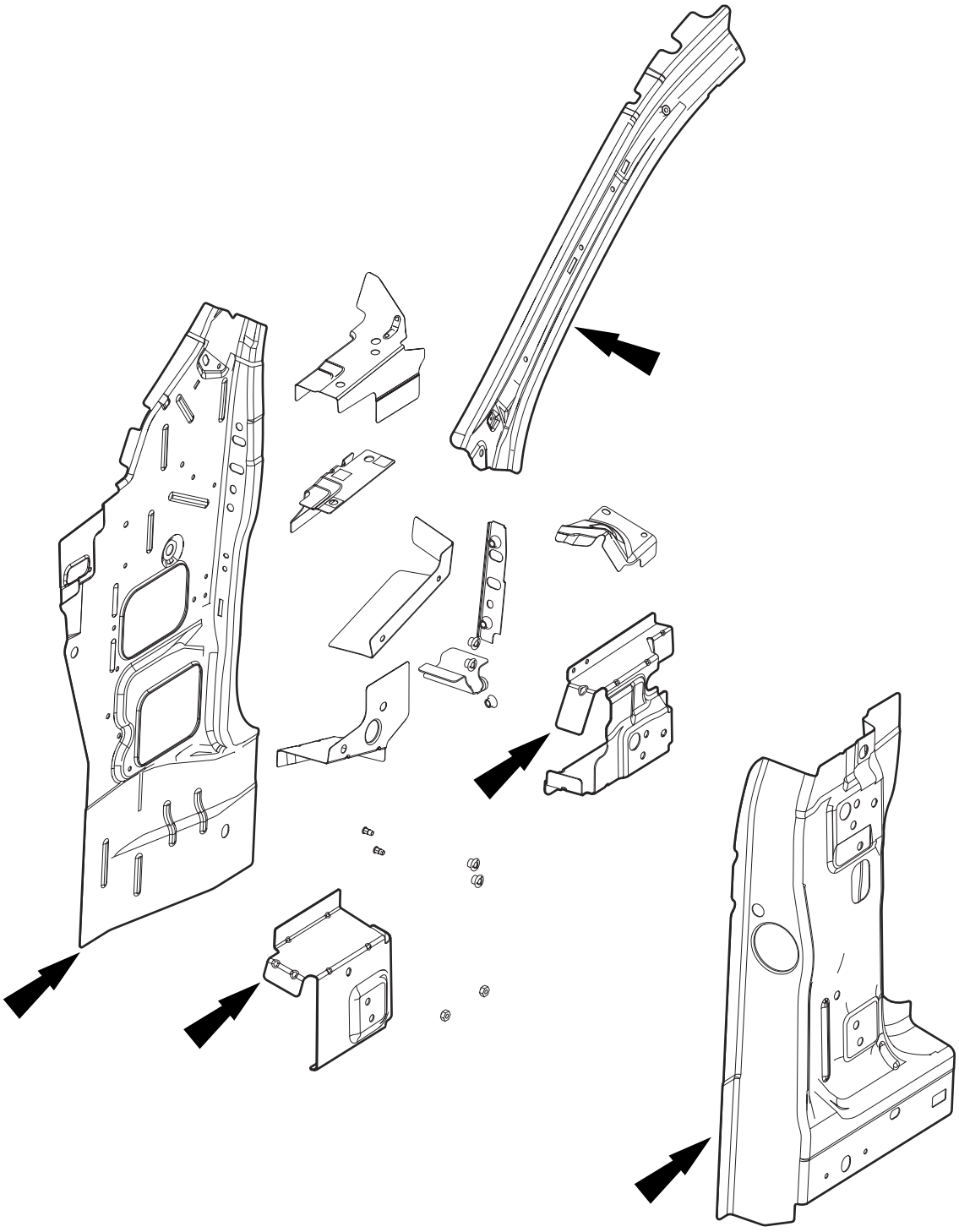
High Strength and Ultra High Strength Steel Location - A-Pillar



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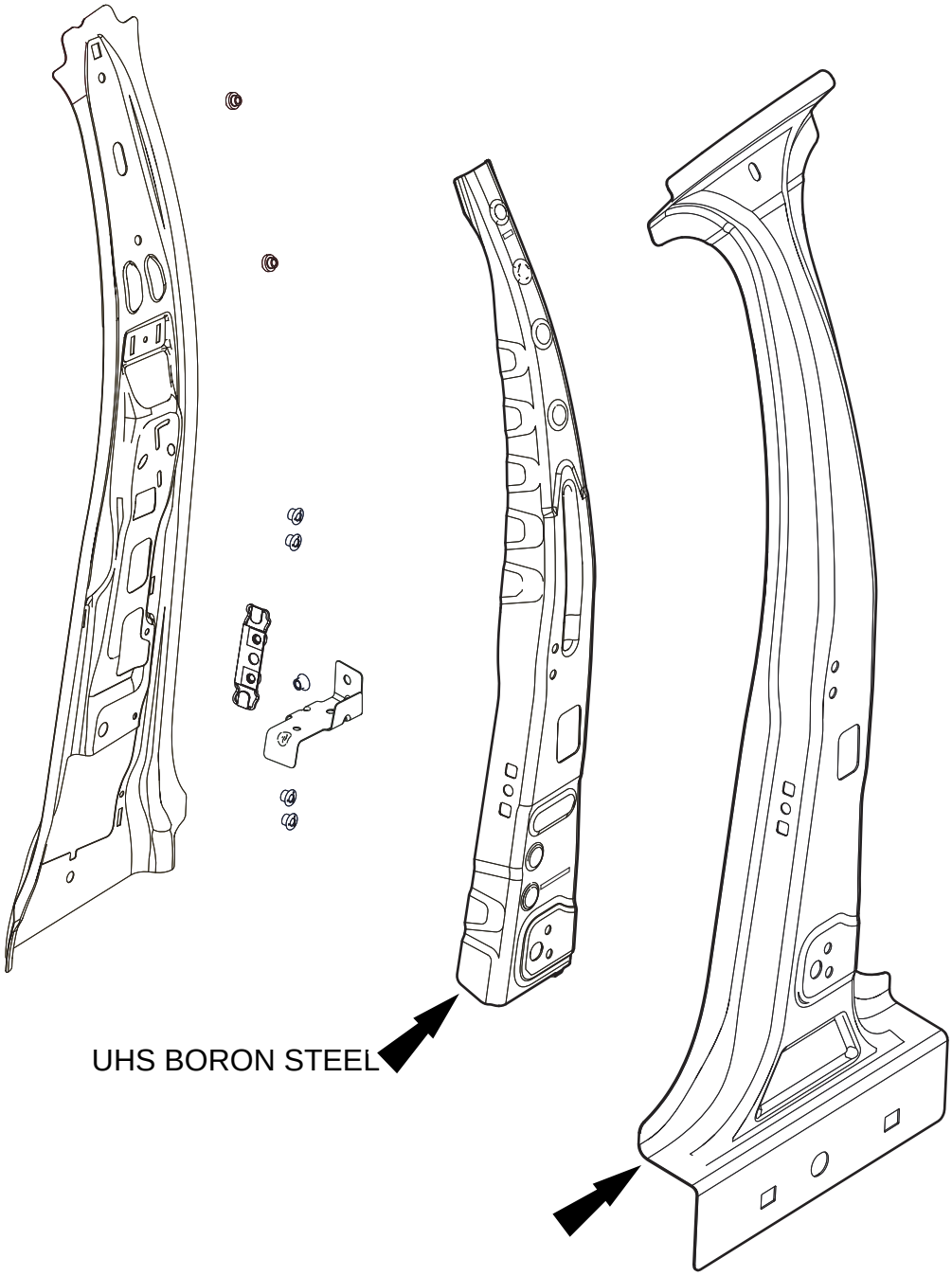
High Strength and Ultra High Strength Steel Location - B-Pillar



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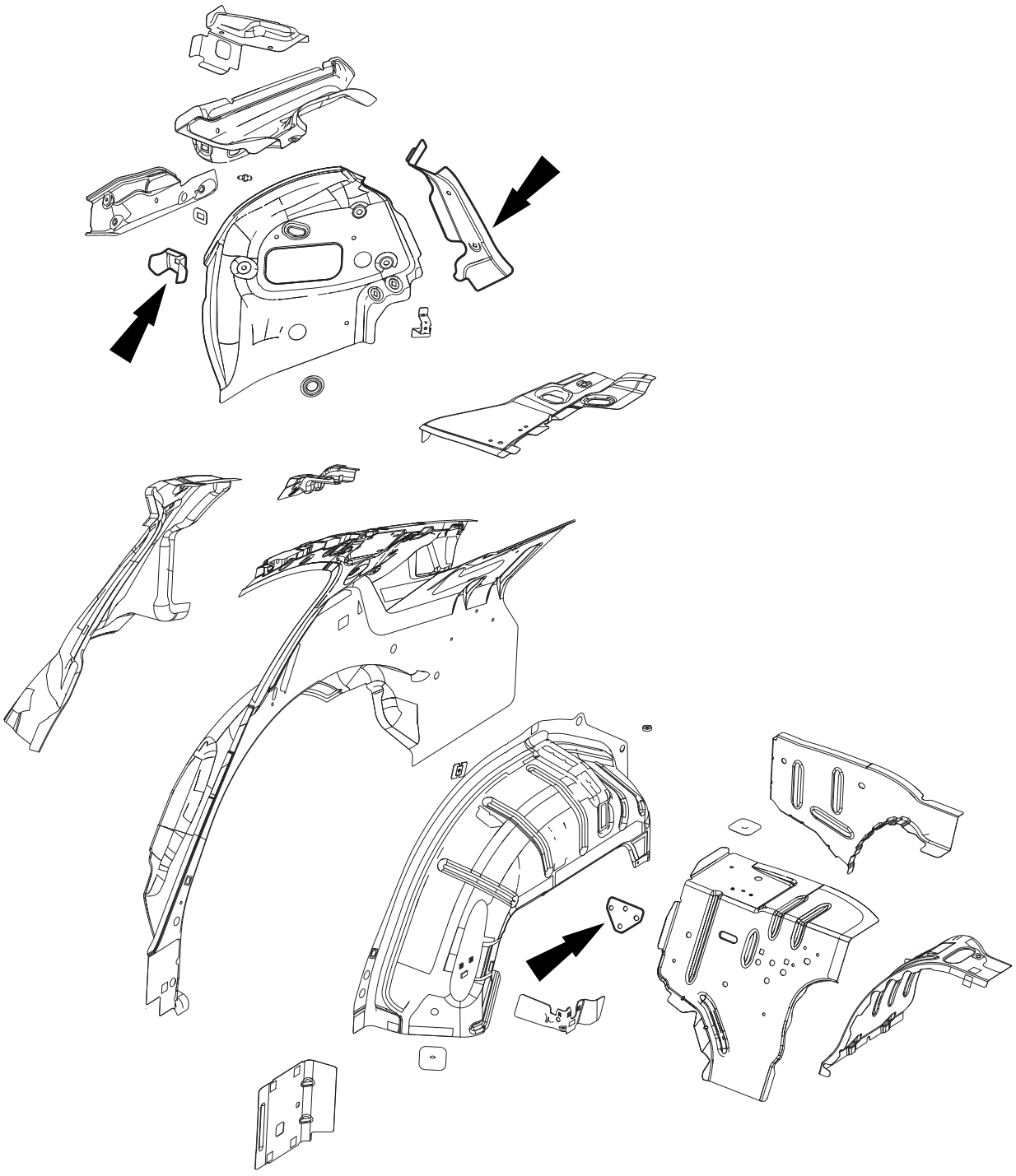
High Strength and Ultra High Strength Steel Location - Quarter Structure



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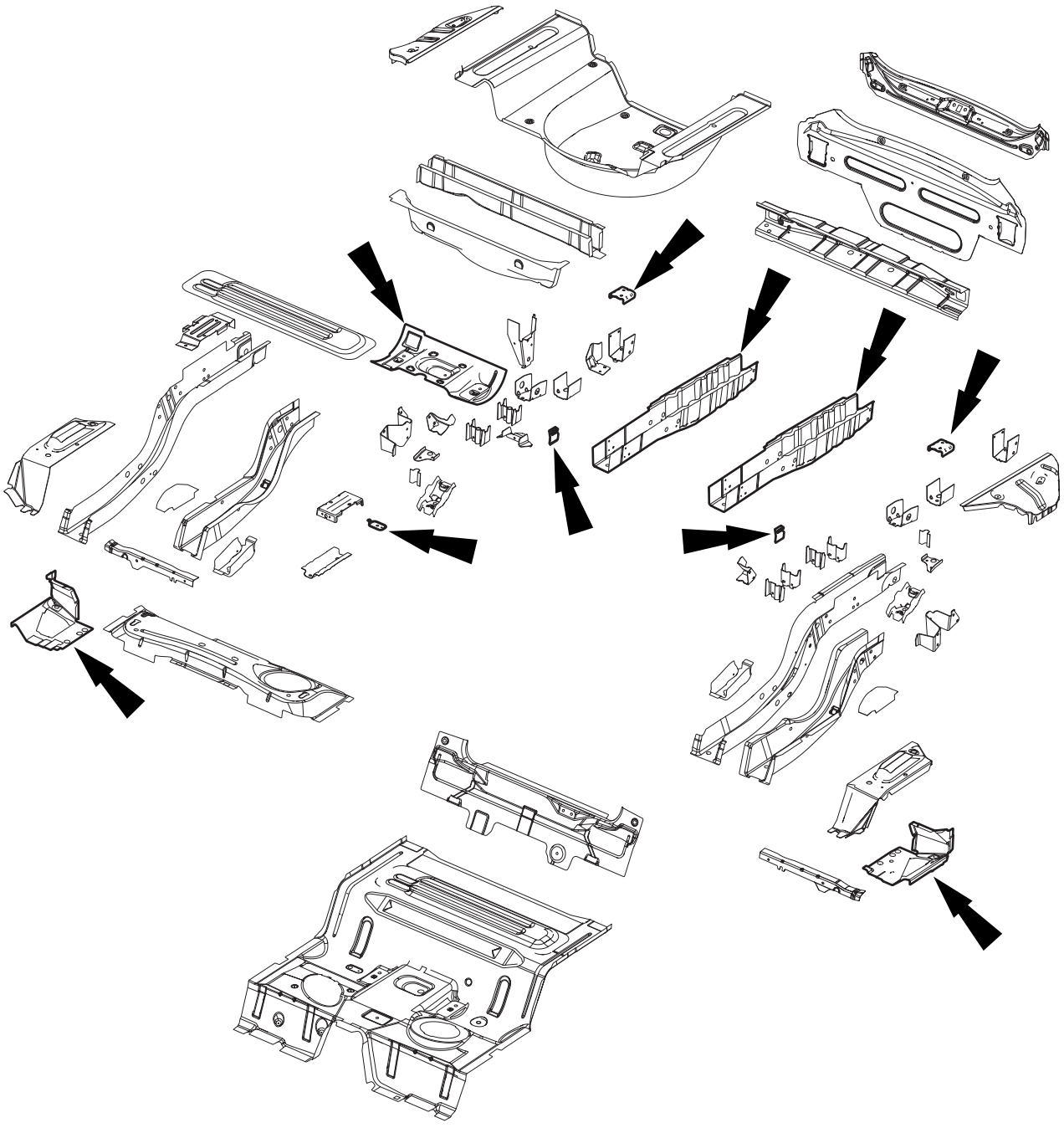
High Strength and Ultra High Strength Steel Location - Sedan Rear Section - Petrol



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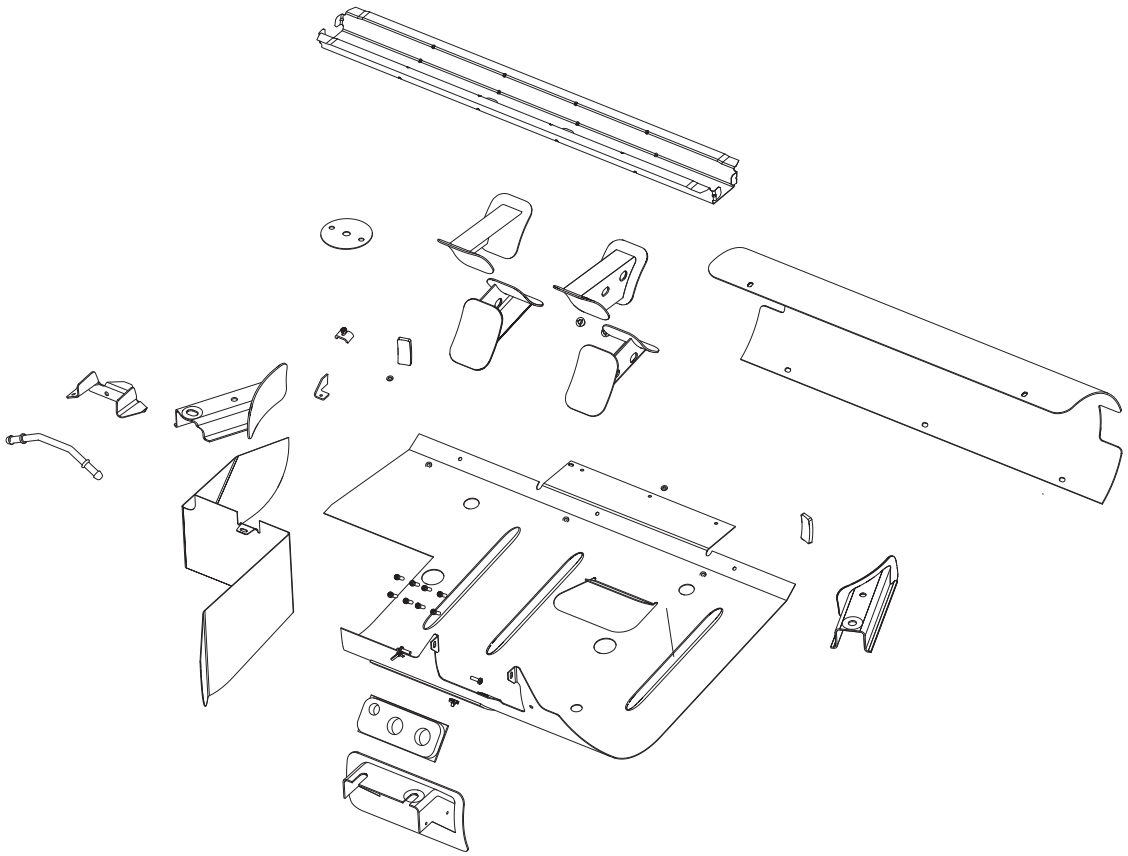
High Strength and Ultra High Strength Steel Location - Sedan Rear-LPG



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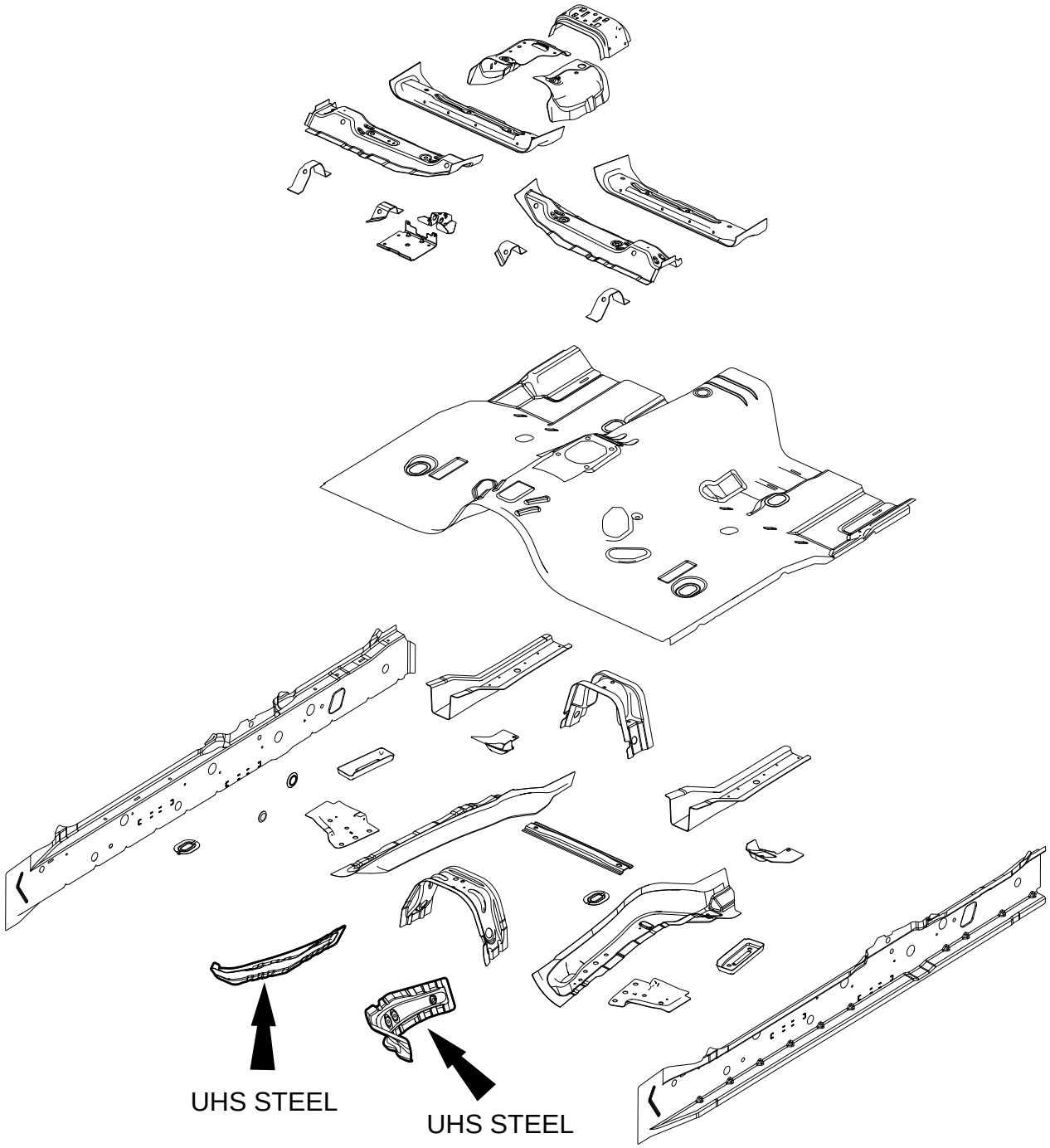
High Strength and Ultra High Strength Steel Location - Sedan Floor and Members



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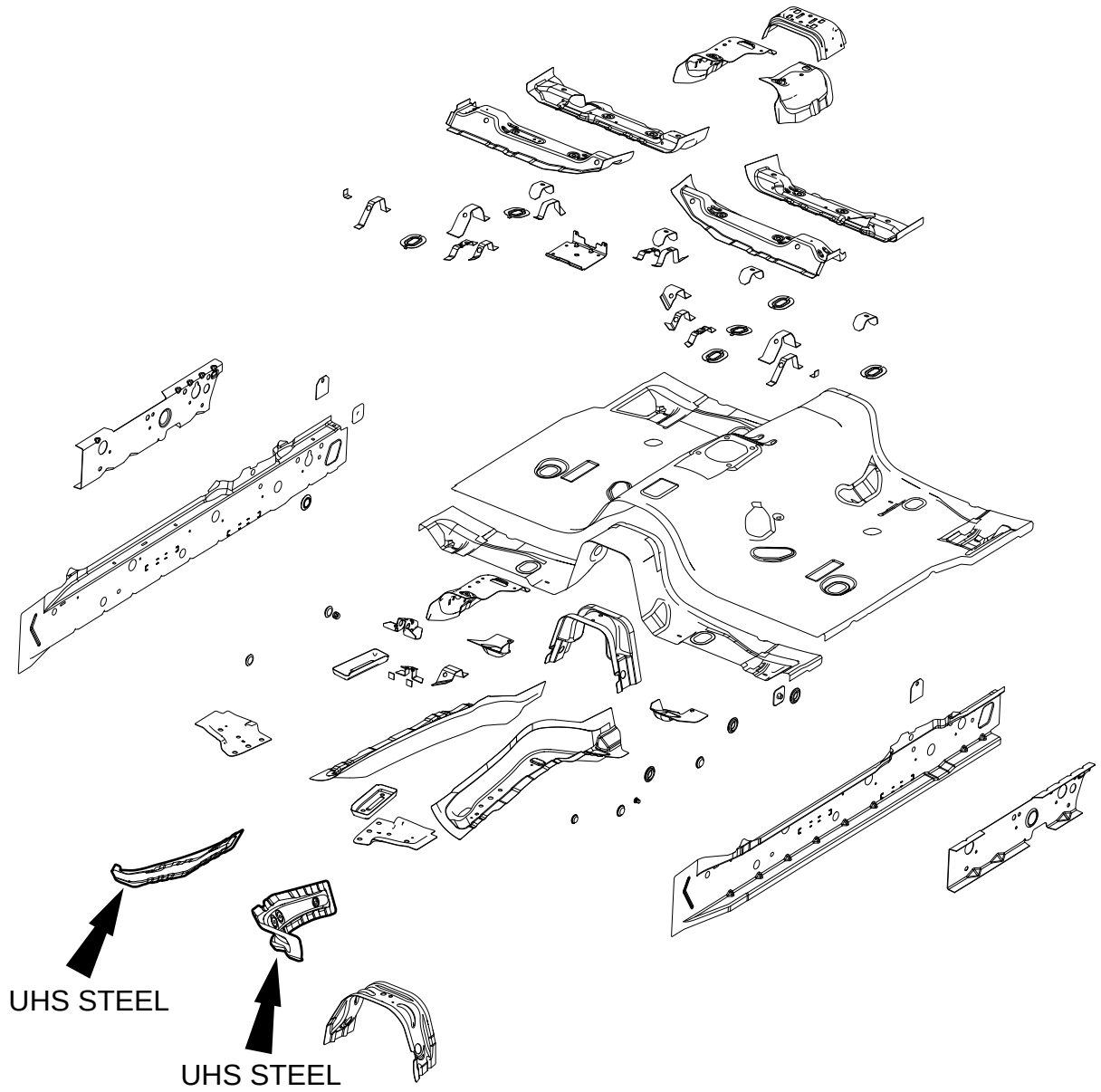
High Strength and Ultra High Strength Steel Location - Ute Floor and Members



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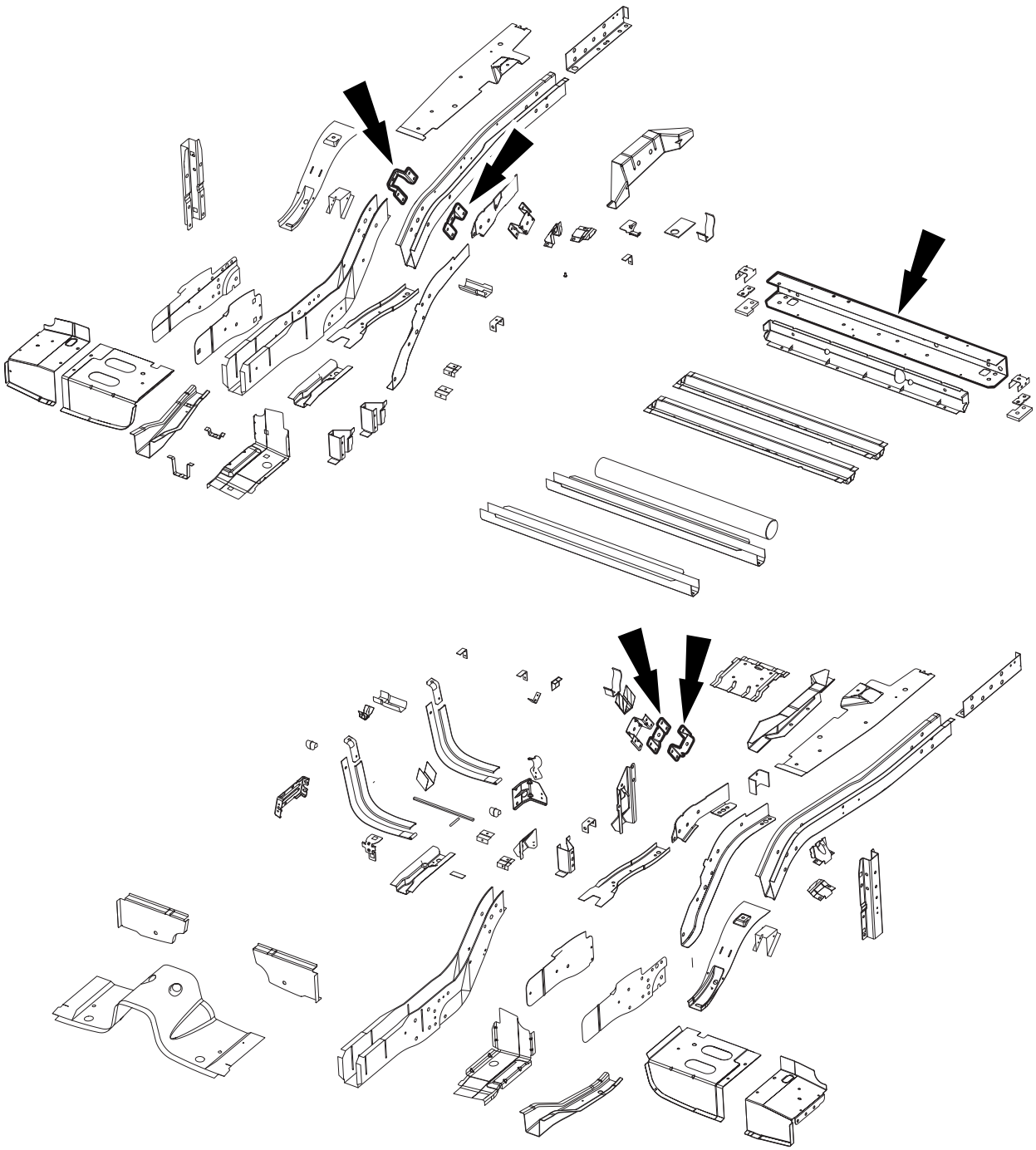
High Strength and Ultra High Strength Steel Location - Ute Rear and Members - Petrol



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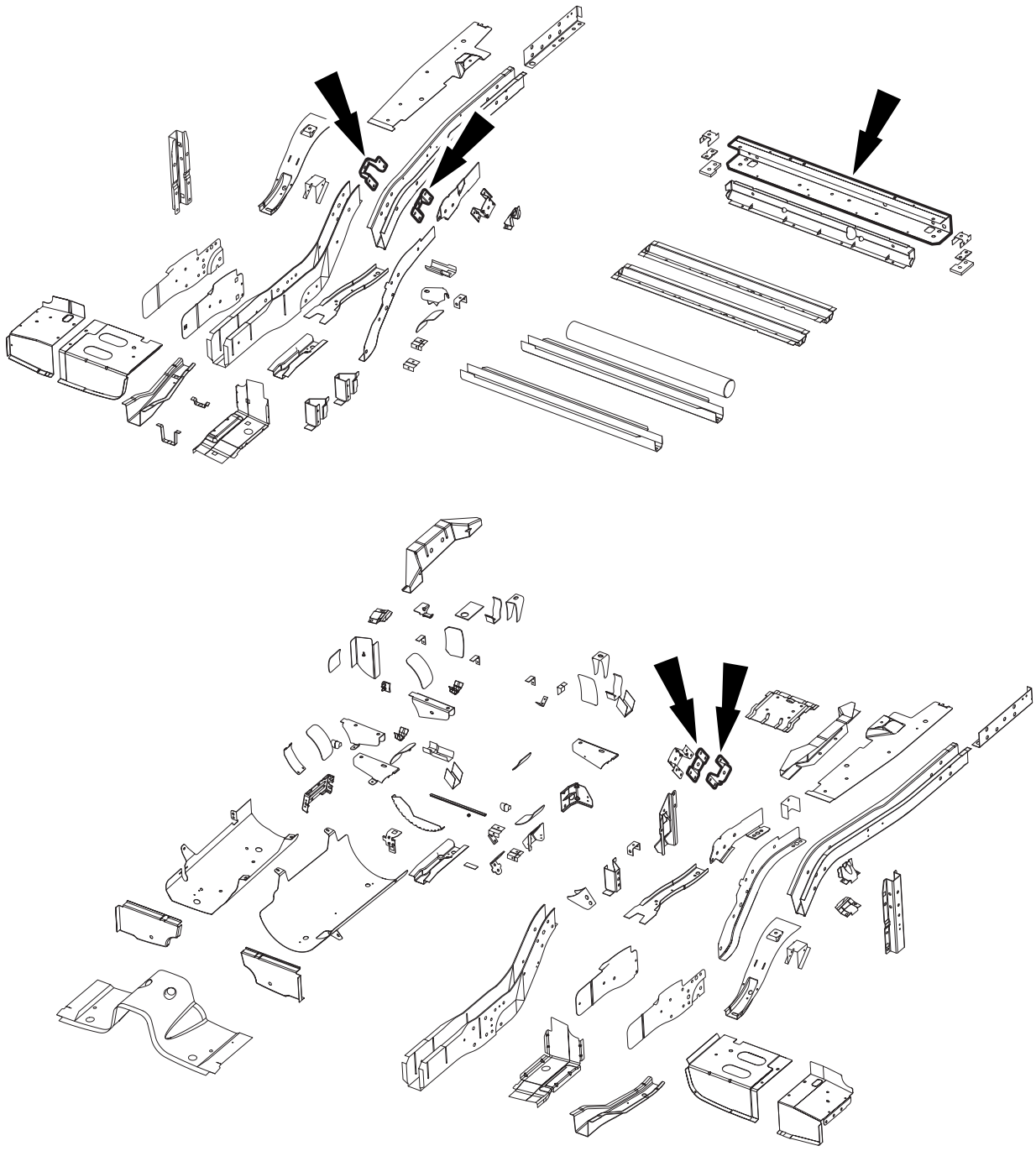
High Strength and Ultra High Strength Steel Location - Ute Floor and Members - LPG



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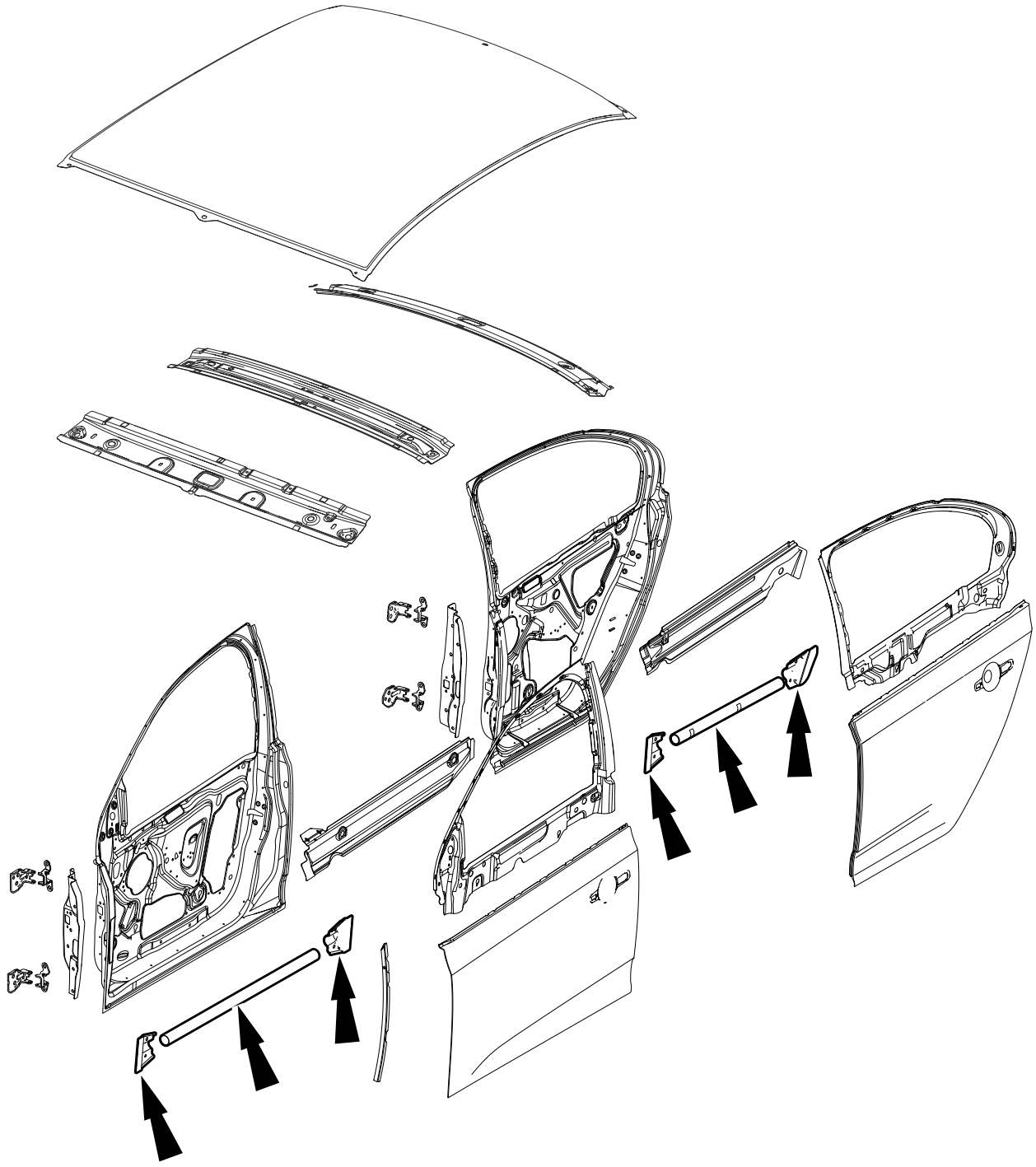
High Strength and Ultra High Strength Steel Location - Doors



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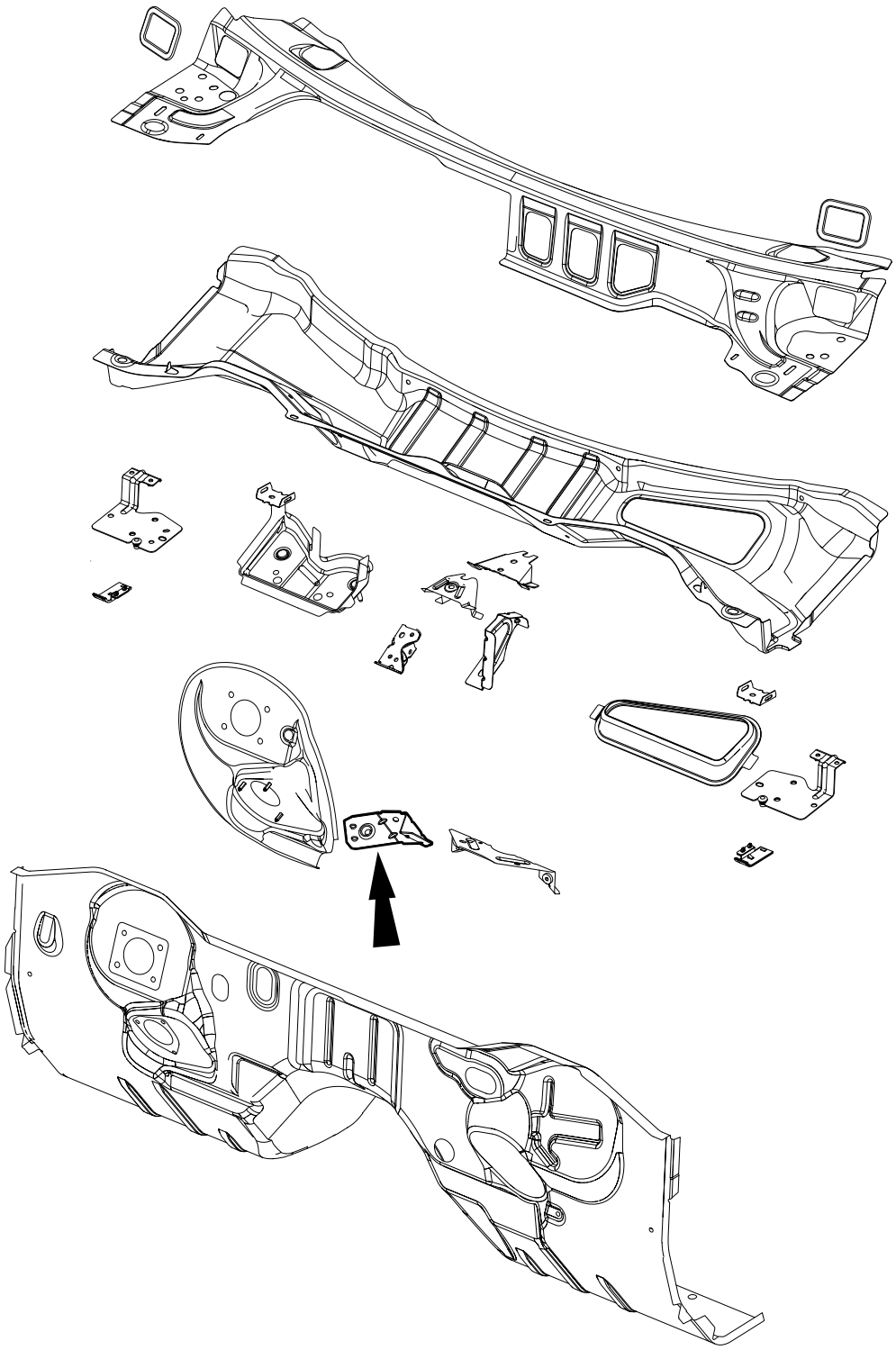
High Strength and Ultra High Strength Steel Location - Dash and Cowl



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