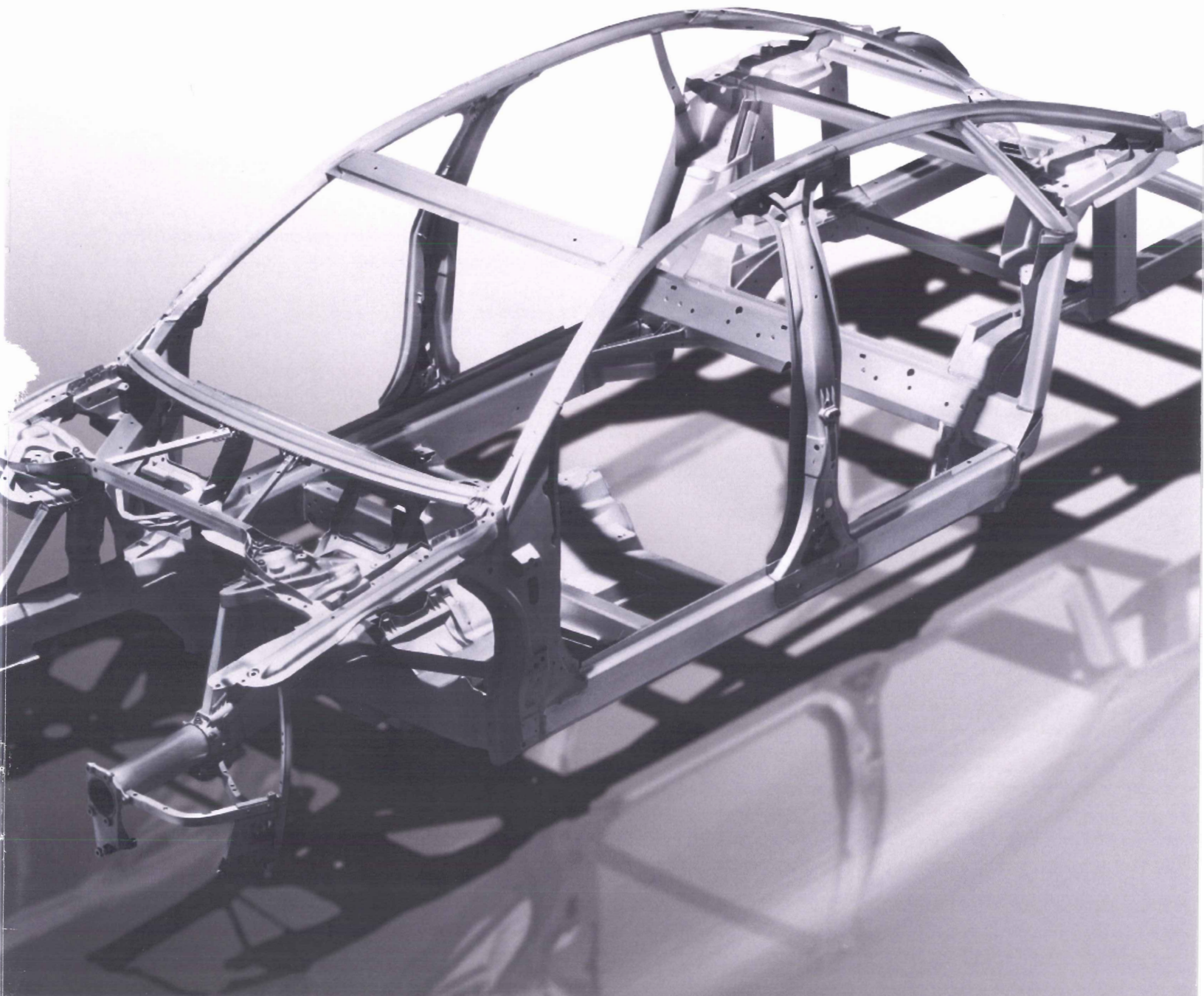


## Audi Collision Frame Technology Guide

**Note:** This communication is for internal use only.



## Introduction

The *Audi Collision Frame Technology Guide* is designed to serve the following reference needs:

**Audi Authorized Collision Repair Facilities** will use the guide to identify the components and procedures required for each repair. This information is critical to ordering the correct parts and repair materials, using the correct equipment (welders, bench systems, etc.) and making accurate estimates based on this criteria.

**Insurance estimators** will find the guide invaluable for verifying the accuracy of estimates and recognizing the unique qualifications of Audi Authorized Collision Repair Facilities in effecting safe, structurally sound and aesthetically satisfying repairs.

***NOTE:***

*This guide is NOT a repair manual and is intended for informational purposes only.*

## Contents

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## Technical Service Bulletins

Topic	00 Structural body damage or body dimensions differ from Repair Manual specifications
Market area	United States 444 Volkswagen of America, Inc. (6444), Canada 999 Volkswagen Canada Inc (6999)
Brand	Audi
Transaction No.	2022005/1
Level	EH
Status	Approval
Release date	

### Customer codes

ID	Component group	Damage group	Broad code	General code	Detail code
041012	Body	excessive wear/consumption/damage	Interior - pillars	*	*

### New customer code

Object of complaint	Complaint type	Position
Body -> Structure	Dimensional accuracy	

### Vehicle data

All Audi

### Sales types

Type	MY	Brand	Designation	Engine code	Gearbox code	Final drive code
*	2005	A		*	*	*
*	2006	A		*	*	*
*	2007	A		*	*	*
*	2008	A		*	*	*
*	2009	A		*	*	*
*	2010	A		*	*	*
*	2011	A		*	*	*
*	2012	A		*	*	*
*	2013	A		*	*	*
*	2014	A		*	*	*
*	2015	A		*	*	*

### Documents

\*True technical bulletin

Document name
master.xml



### Condition

Structural body damage or deviations from the body dimensions specified in the Repair Manuals are suspected and/or there is visible damage to structural components.

### Technical Background

AUDI AG has defined structural damage as follows:

Damage (dent, crack, buckling) and/or change in the position of a structural component of the vehicle body. Structural components refer to all components of the body except body shell components or components that are bolted on. However, bolted longitudinal members in aluminum vehicles are structural components.

### Repair Information

Use the contacts below to access information that can aid you in the estimating and repair processes.

### Online Resources

- ▶ ElsaWeb is the online resource for Audi Dealers
- ▶ Collision repair centers must use ErWin

### Service

The vehicle must be placed on a repair bench system approved by AUDI AG and measured. For a list of approved frame benches, refer to the *Audi Authorized Collision Repair Facilities Required Tools and Equipment Guide*.



### Warranty

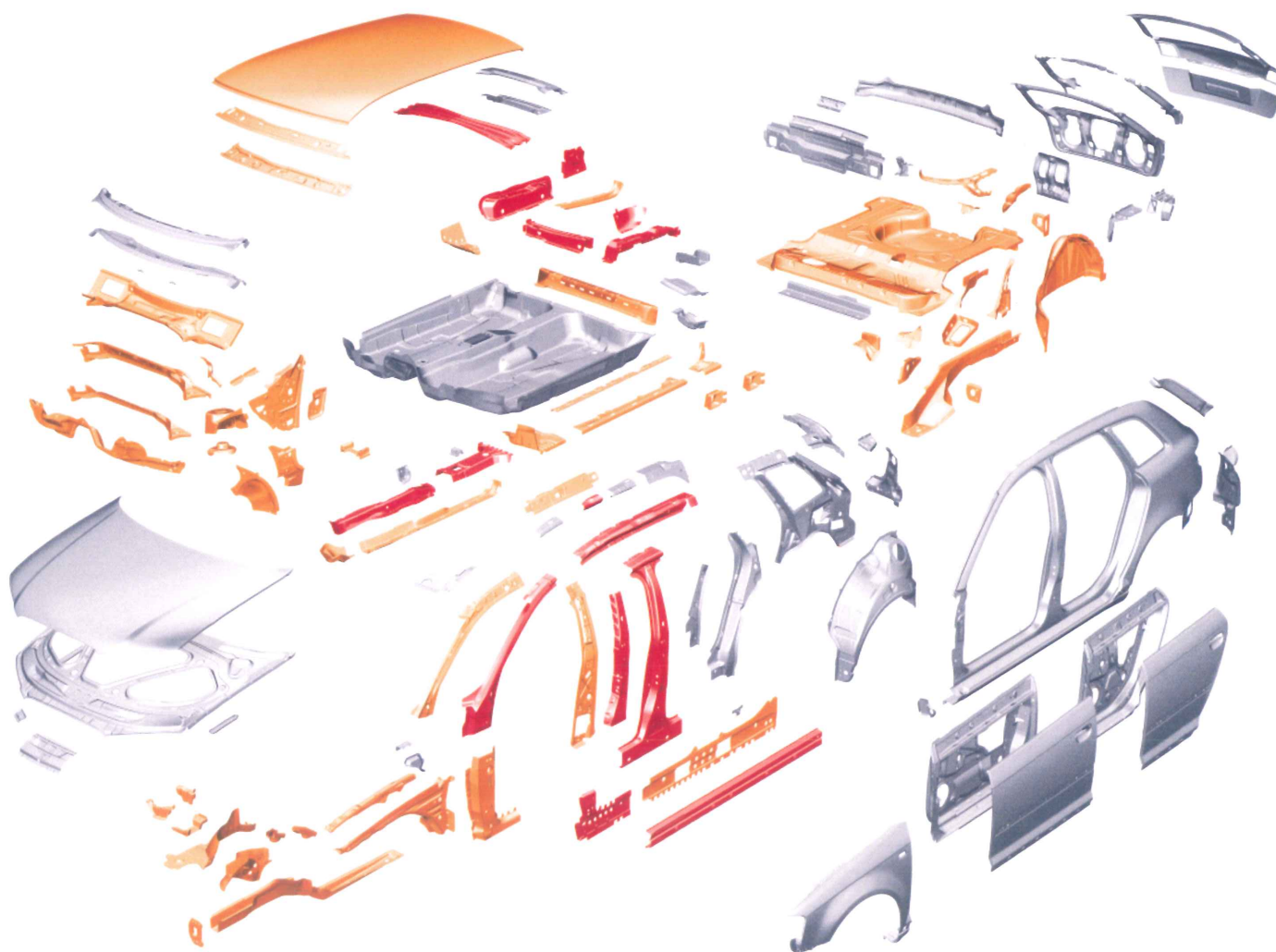
This TSB is informational only and not applicable to any Audi warranty.

### Additional Information

All parts and service references provided in this TSB are subject to change and/or removal. Always check with your Parts Department and Repair Manuals for the latest information.

## Optimized Body

-  High-strength steel  
 Ultra-high-strength steel



## Joining Techniques

### **Spot Welding**

Crash-relevant and rigidity-defining joints are spot weld-bonded using a high-strength structural adhesive.

### **Laser Welding**

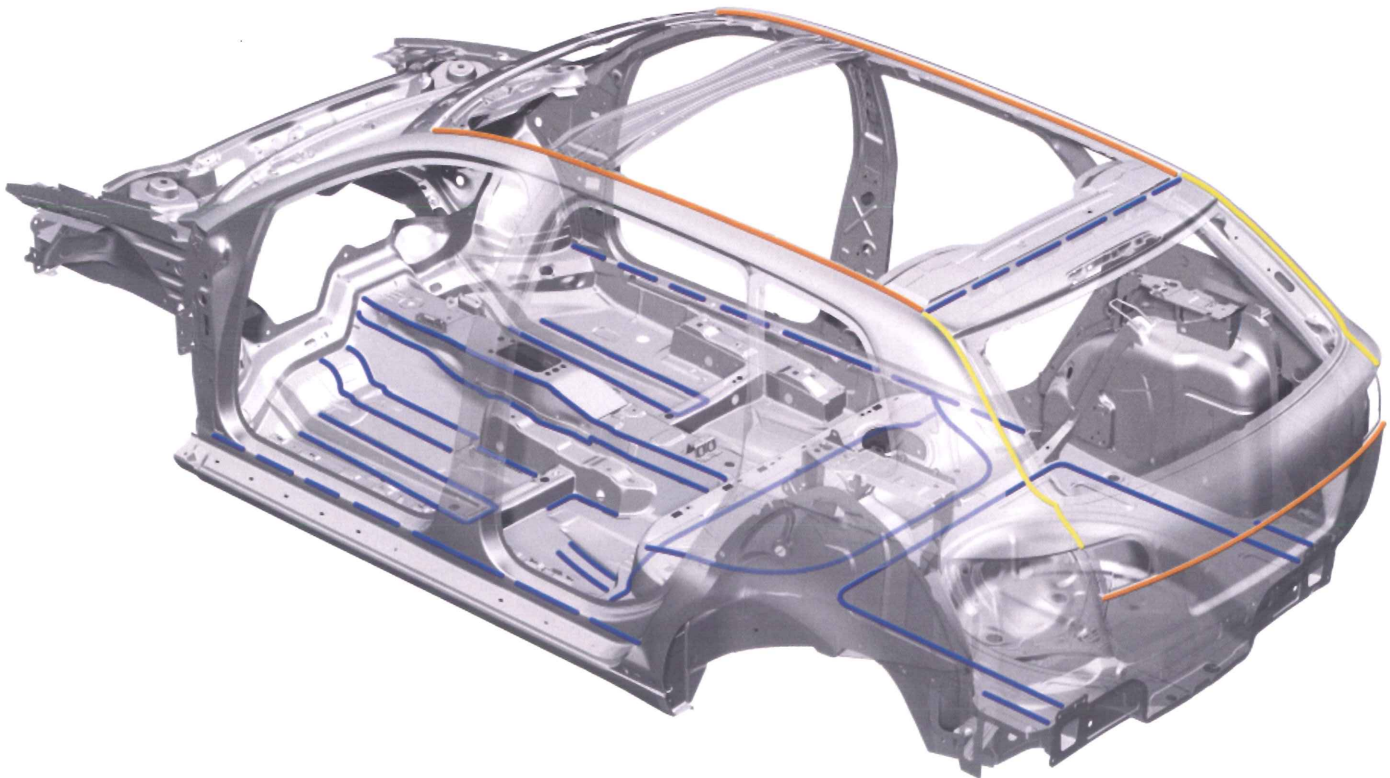
Laser welding is used in areas which are not easily accessible. It increases chassis strength and rigidity while reducing deformation of the sheet metal.

### **Laser Soldering**

Laser-solder joining achieves a better design and higher rigidity in the area of the invisible joint and trunk lid.

### **Plasma Soldering**

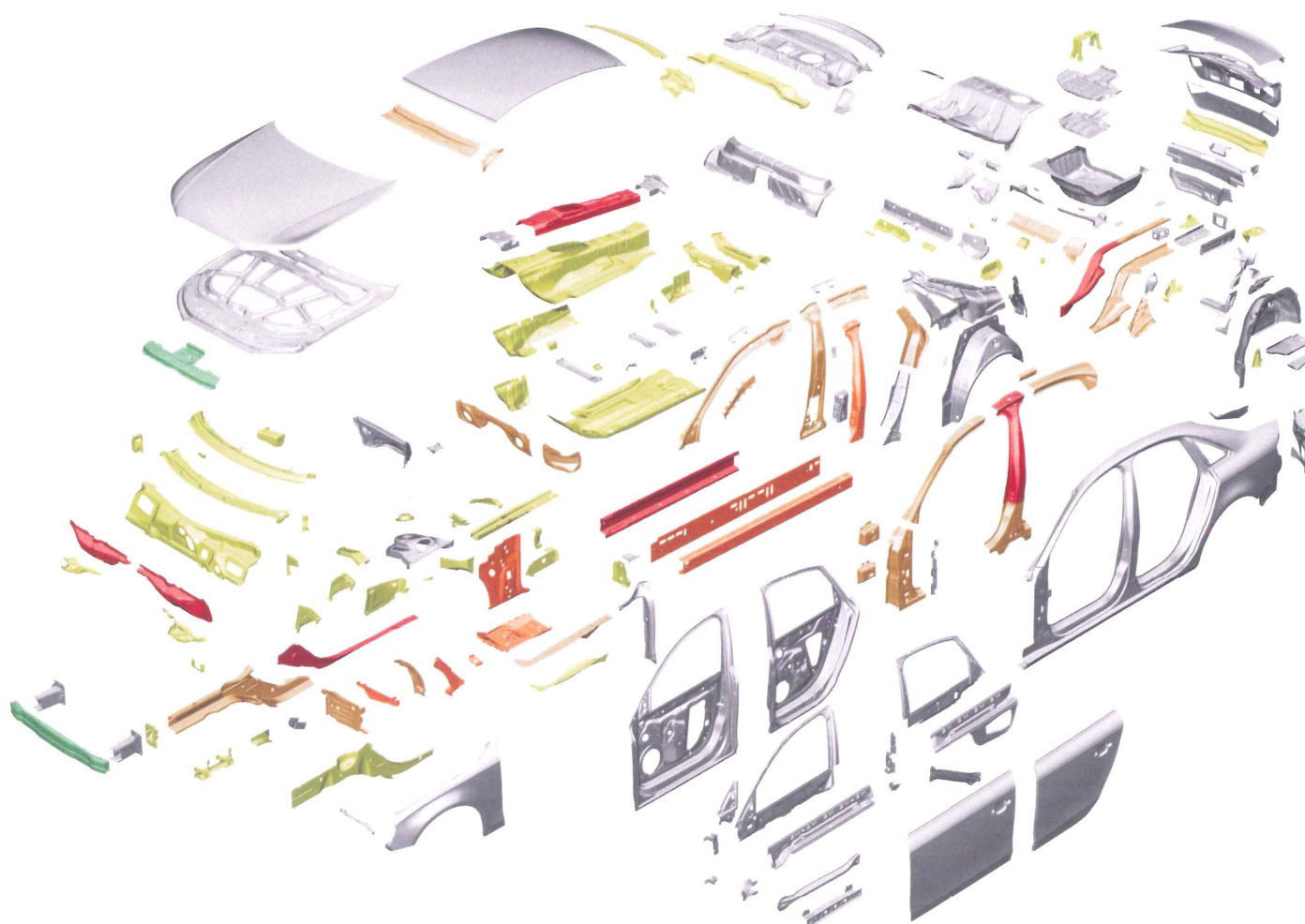
To ensure high rigidity and optimal design for the water channel, materials are joined by plasma soldering.



## Materials

Mild steel  
 High-strength steel  
 Higher-strength steel

Ultra-high-strength steel  
 Hot-formed (die-quenched) steel  
 Aluminum





## Materials

■ Mild steel  
■ High-strength steel  
■ Higher-strength steel

■ Ultra-high-strength steel  
■ Ultra-high-strength hot-formed steel  
■ Aluminum



### Repair



#### A5/S5 repair considerations

New techniques are required for the repair of ultra-high-strength hot-formed steel. Straightening and reshaping of even minor deformations are not possible due to the high-tensile yield strength and the rebound effect of hot-formed steel. A damaged component must be completely cut out and/or partially replaced in accordance with the manufacturer's specifications.

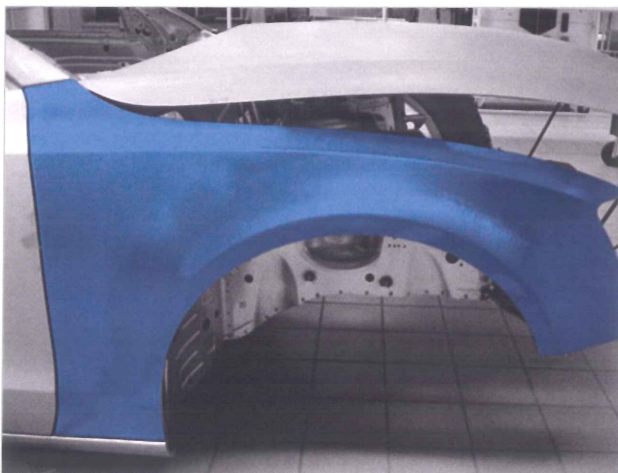
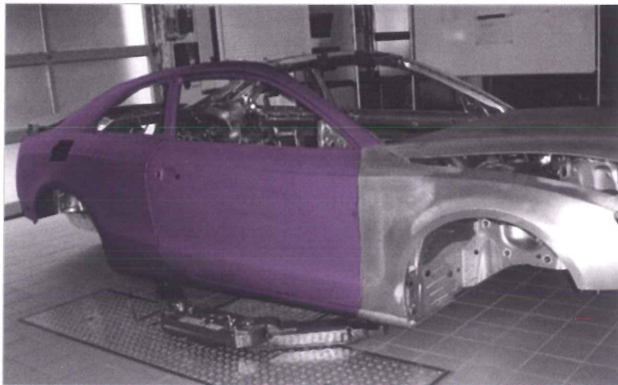
The use of butt welding to repair ultra-high-strength hot-formed steel can cause weakness in the repair because of micro-structural changes arising from heating the steel during the welding process. To help ensure optimum repair integrity, suitable service solutions were incorporated during the development of the body structure that allow affected components to be replaced wholly or partially in special parting sections (depending on energy flow).

#### Ultra-high-strength hot-formed steel

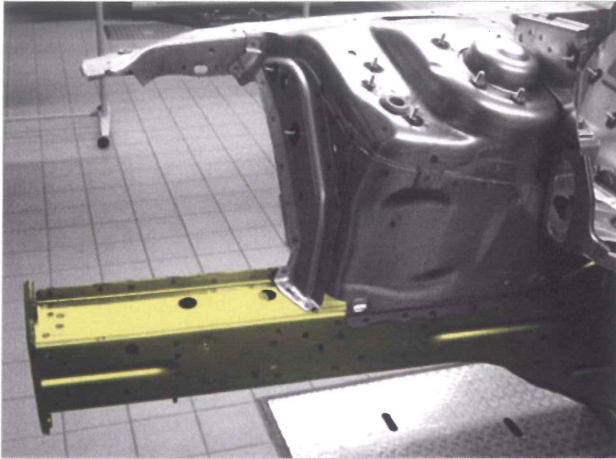
This innovative material addresses the lightweight build and structural rigidity requirements of the new Audi line. It is used for the first time in multiple applications on the Audi A5/S5. Existing joining techniques have been modified to easily integrate the material into the vehicle production and repair processes. You will see it used even more extensively in future Audi vehicles.

The A5/S5 body construction is a testimony to the experience of Audi in lightweight design and its knowledge of innovative welding and joining techniques. The benefits of these technologies is evident:

- ▶ 38.8-lb. weight savings by using hot-formed steel
- ▶ Component-specific joining techniques were developed
- ▶ Tailored blanks of various wall thicknesses help increase overall body rigidity
- ▶ Aluminum wings



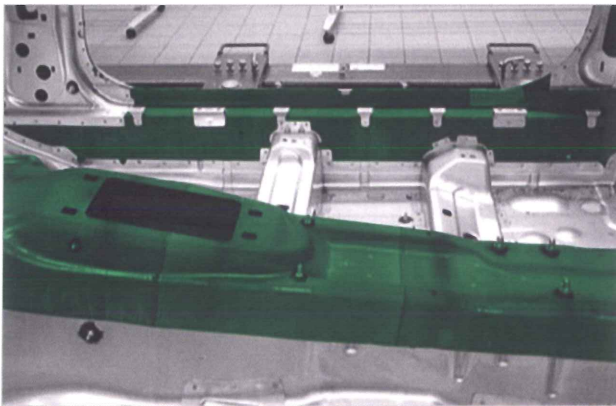




### Rewarding results

These efforts have produced very high rigidity in addition to low body weight and a well-balanced axle load distribution.

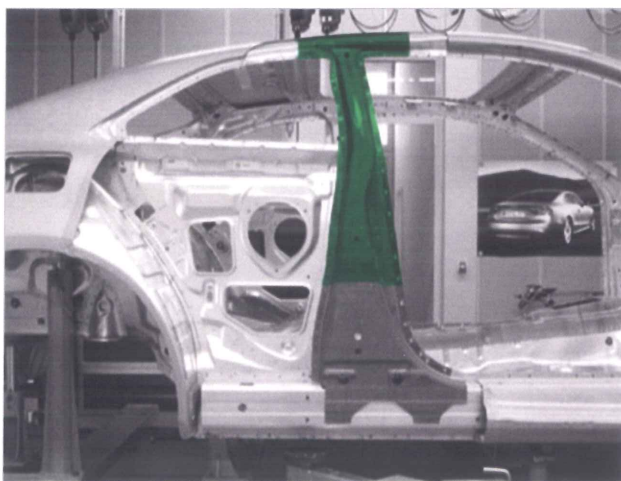
For the occupants of the Audi A5/S5, this means a marked improvement in safety, agility and driving dynamics. Body vibration has also been reduced, bringing a further noticeable improvement in driving comfort.



### Repair concept of hot-formed steel

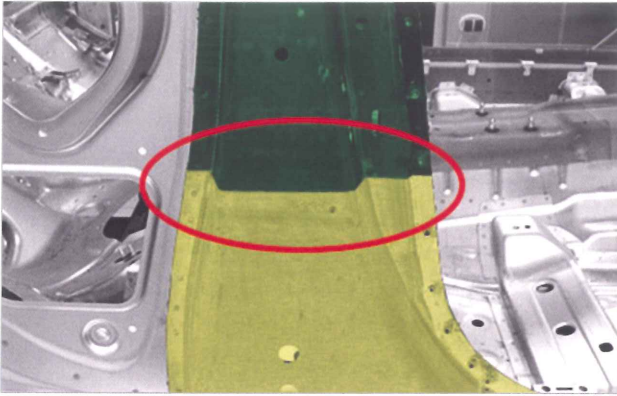
Hot-formed steel is used in the following areas:

- B-pillar
- Rear inner sill
- Rear longitudinal beam
- Tunnel reinforcement
- Tunnel bridge
- Longitudinal beam reinforcement



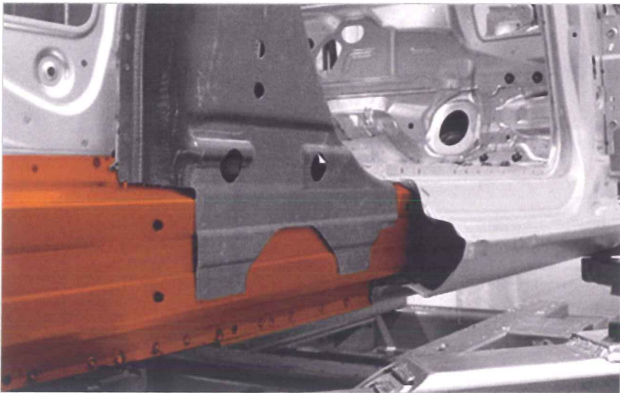
### Upper B-pillar

If the upper B-pillar (green) is damaged, the entire B-pillar must be replaced. Dealers should consult ElsaWeb, and collision repair centers should consult the ErWin Workshop Manual for replacement procedures. Special tools and workshop equipment are required.



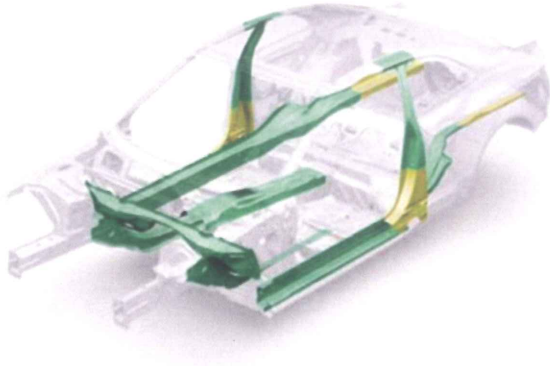
### Lower B-pillar

Repair is possible using a service part. The parting cut (circled) must be made as described for dealers on ElsaWeb and for collision repair centers in the ErWin Body Repair Manual.



### Lower area of B-pillar and rear inner sill panel

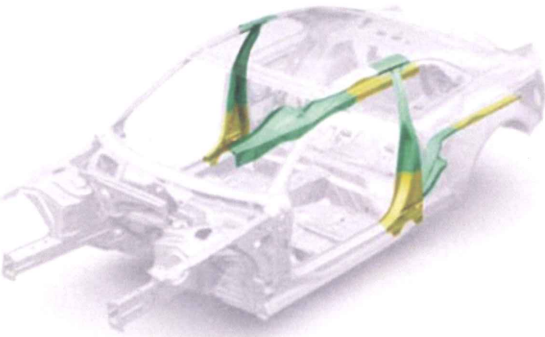
Dealers should review repair procedures on ElsaWeb, and collision repair centers should consult the ErWin Workshop Manual. The extensive use of high-strength hot-formed steel requires special welding equipment as well as welding accuracy. Material overheated in the welding process could fail in a future collision.



### Rear longitudinal beam

“Tailored blanks” are panels manufactured to size with different material thicknesses. As a tailored blank component, the rear longitudinal member was designed so that the ultra-high-strength section will only deform if major damage occurs to the surrounding body structure and straightening and reshaping are no longer possible.

- High-strength steel
- Ultra-high-strength hot-formed steel

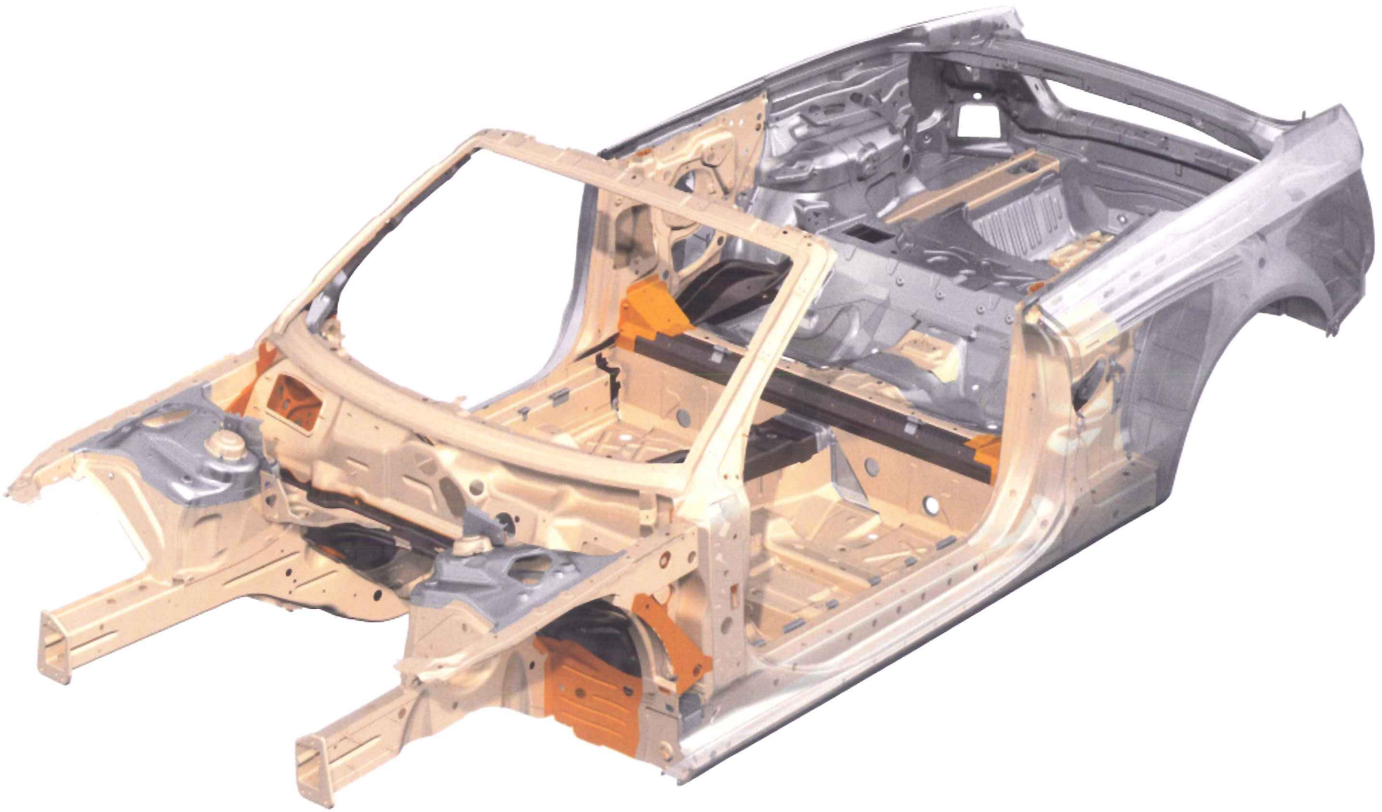


Partial replacement of the rear longitudinal beam is possible. The parting cut must be made as described in the Workshop Manual on General Body Repairs.

## Materials

■ Mild steel  
■ High-strength steel

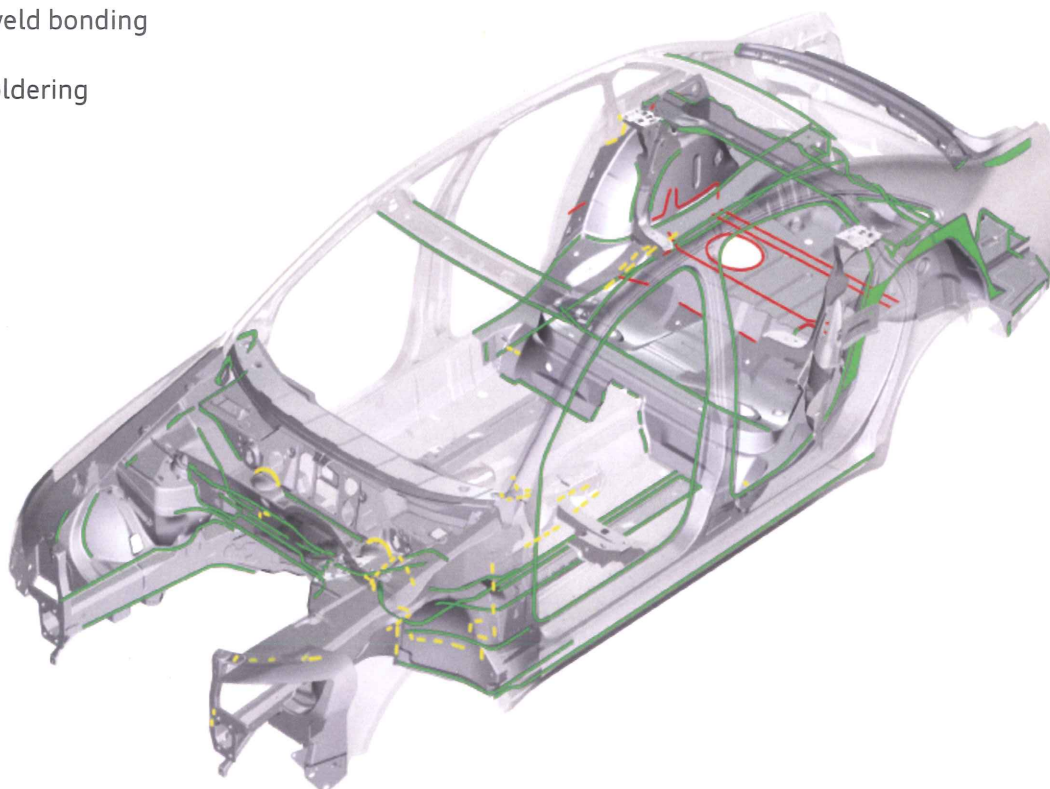
■ Advanced high-strength steel  
■ Ultra-high-strength hot-formed steel





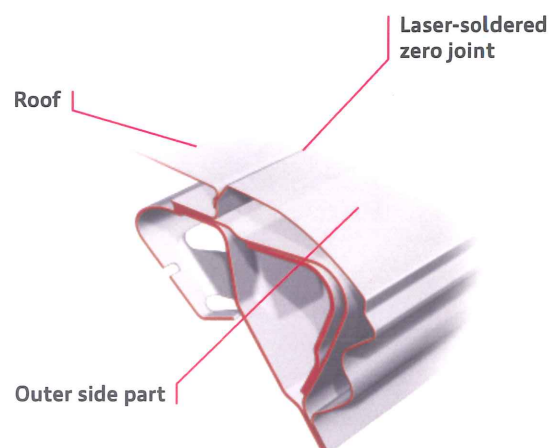
## Body

- Spot-weld bonding
- Laser
- MIG soldering



In addition to classic resistance spot welding, the following connecting techniques are used on the 2005 Audi A6 body shell:

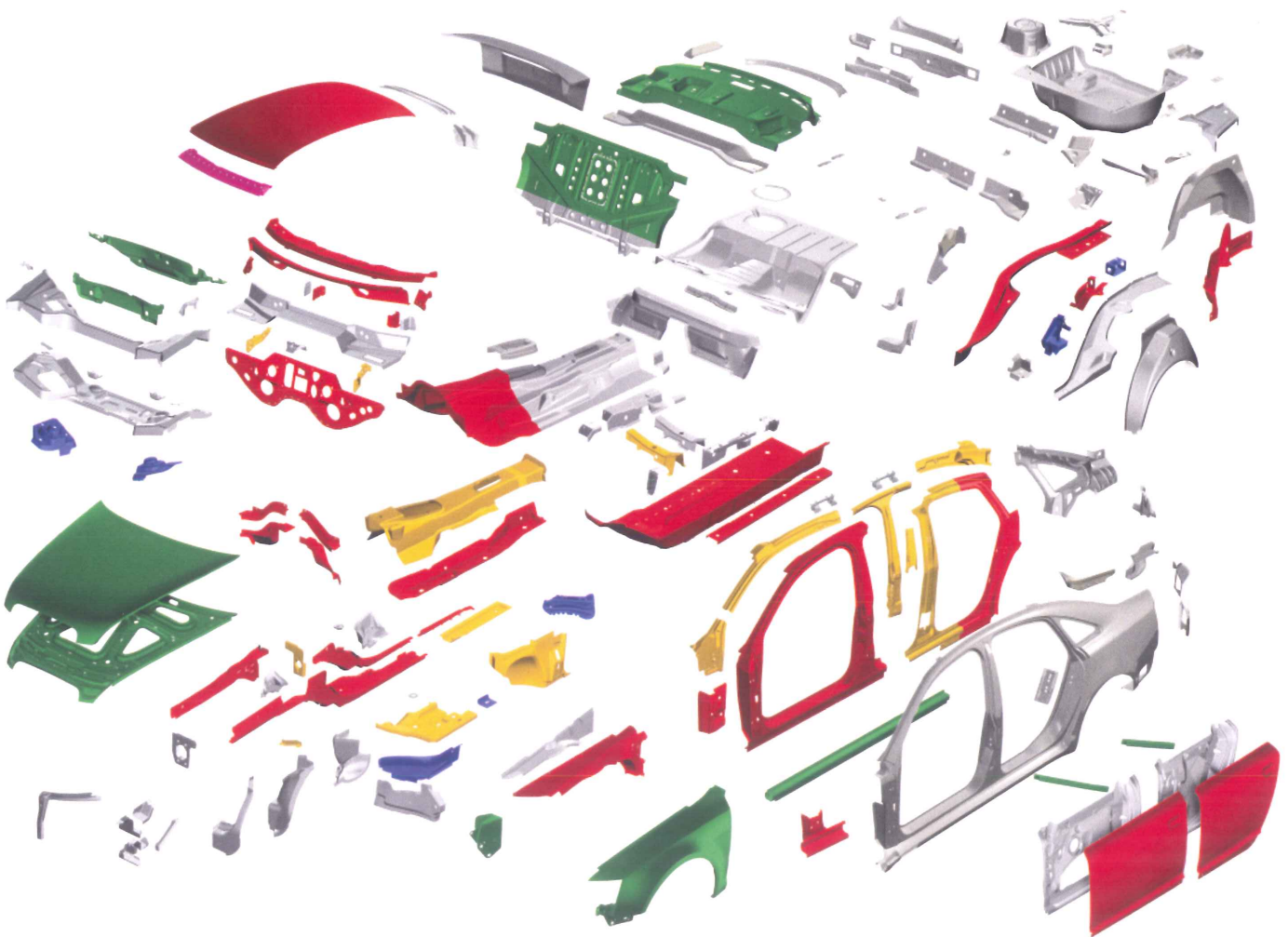
- Spot-weld bonding
- Punch riveting
- Clinching (hood and trunk openings)
- Laser soldering
- Laser welding
- MIG soldering



## Body


- High-tensile steel (180 - 300 N/mm<sup>2</sup>)
- Dual-phase steel (340 - 500 N/mm<sup>2</sup>)
- Special steel (600 - 900 N/mm<sup>2</sup>)

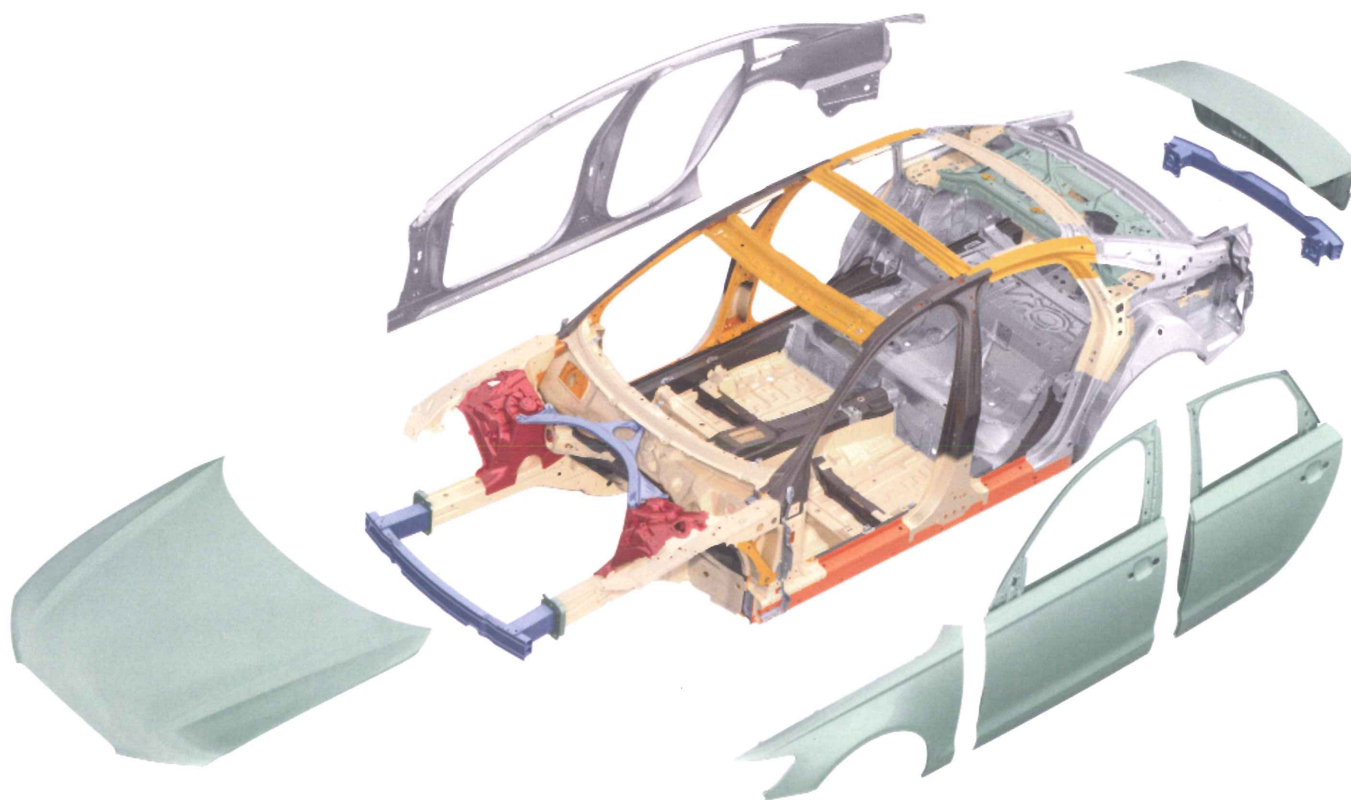
- Aluminum
- Hybrid component





## Body

	Mild steel		Ultra-high-strength hot-formed steel
	High-strength steel		Aluminum sheet
	Modern high-strength steel		Aluminum casting
	Ultra-high-strength steel		Aluminum extrusion

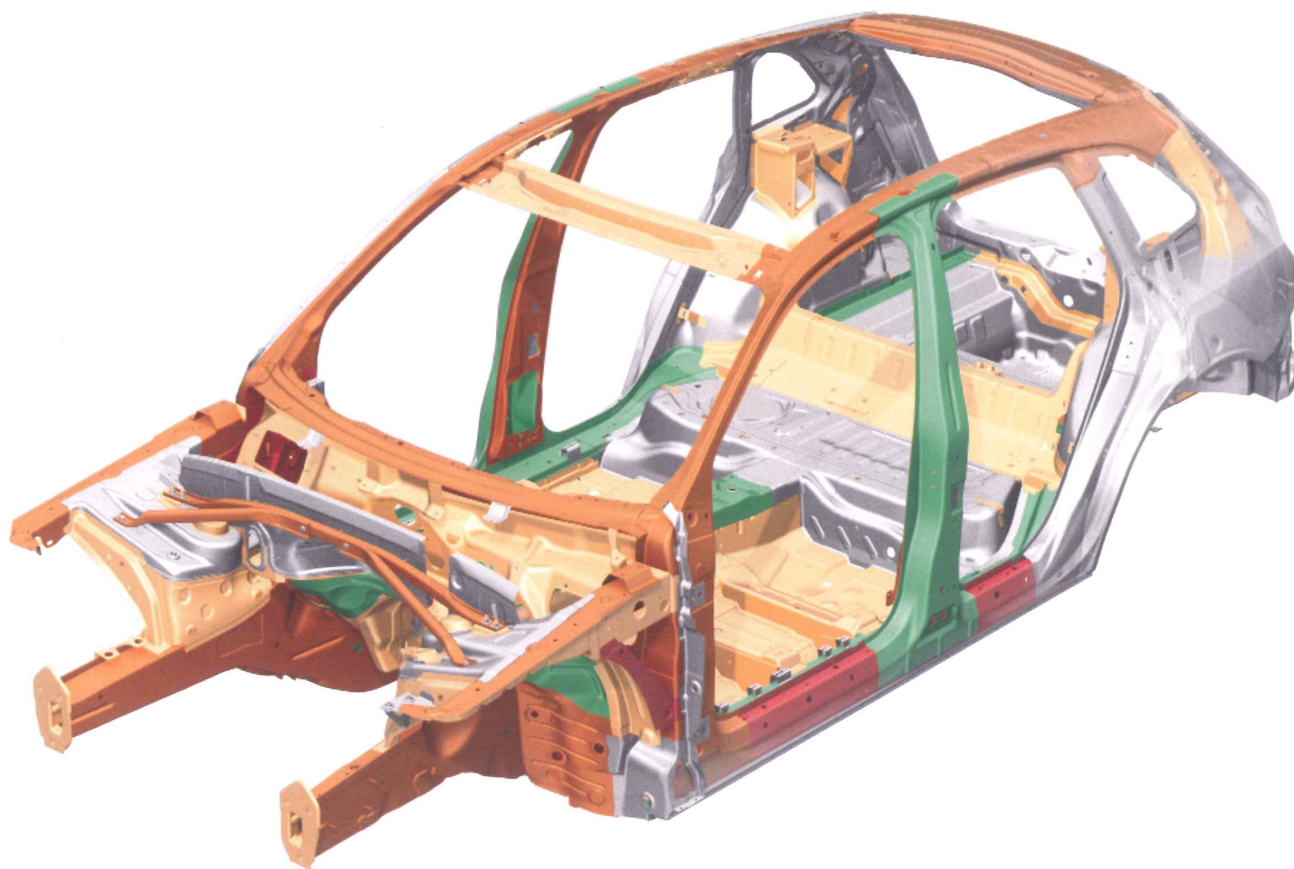


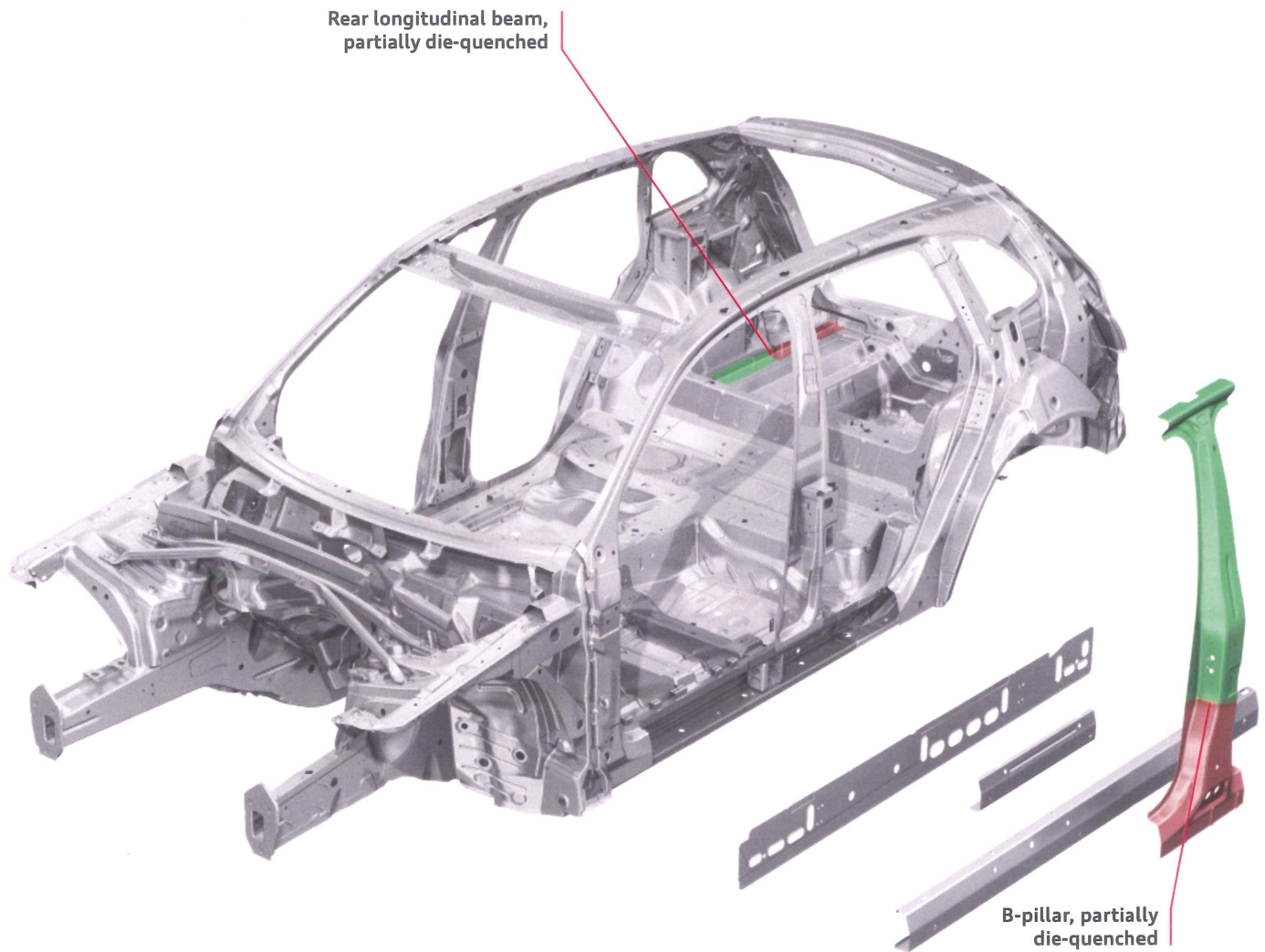
The body of the 2011 Audi A6 shares the same platform as the Audi A7, which is of hybrid construction. The sheet-steel parts are of high-strength steel and ultra-high-strength steel. The die-cast-aluminum strut mountings previously featured on the Audi A7 are used at the front end of the vehicle.

Like in the 2005 Audi A6, the parcel shelf in the 2011 Audi A6 is made of sheet aluminum. On the 2011 Audi A6, attachments such as the hood, wings, doors and trunk lid are also made of sheet aluminum.

## Materials

30.8% Mild steel	3.3% Ultra-high-strength steel
44.5% High-strength steel	9.1% Ultra-high-strength die-quenched steel
12.3% Advanced high-strength steel	



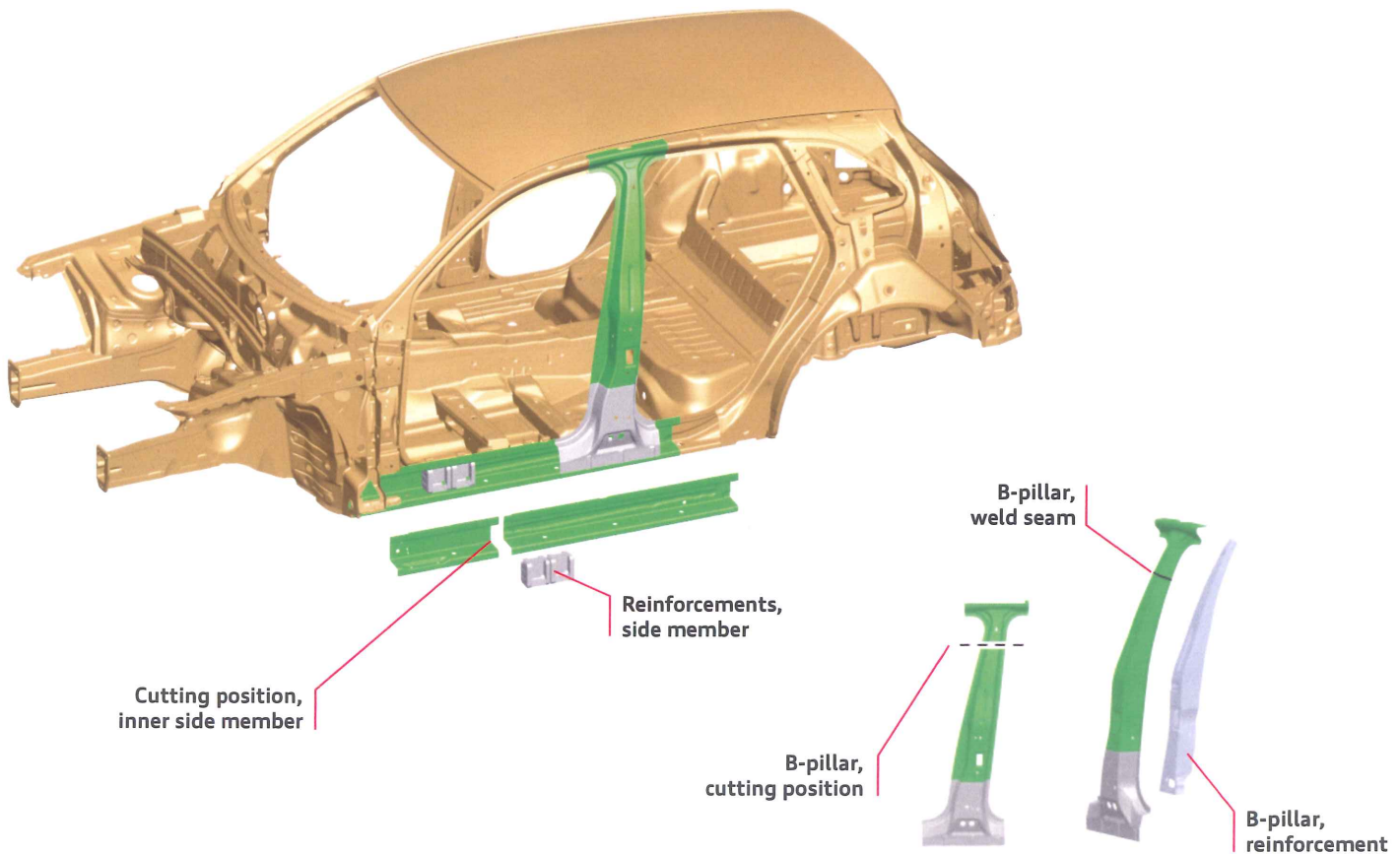


To optimize the performance of the B-pillar in a side-impact collision, it is important that the lower section be able to absorb more deformation energy than the upper section – which, ideally, should have a very rigid construction. This was made possible, for example, in the 2009 Audi A4, through the use of tailored blanks. The B-pillar in the Audi Q5 is partially heated and then

reshaped, as a result, the upper section of the pillar has properties of an ultra-high-strength die-quenched steel and the lower section those of an ultra-high-strength steel. This process is also applied to the rear longitudinal beams. Here, the rearmost section is able to absorb more deformation energy than the more rigid front section of this component.



## Partial replacement of side member/sill at inner front (defined cutting position, reinforcing required)



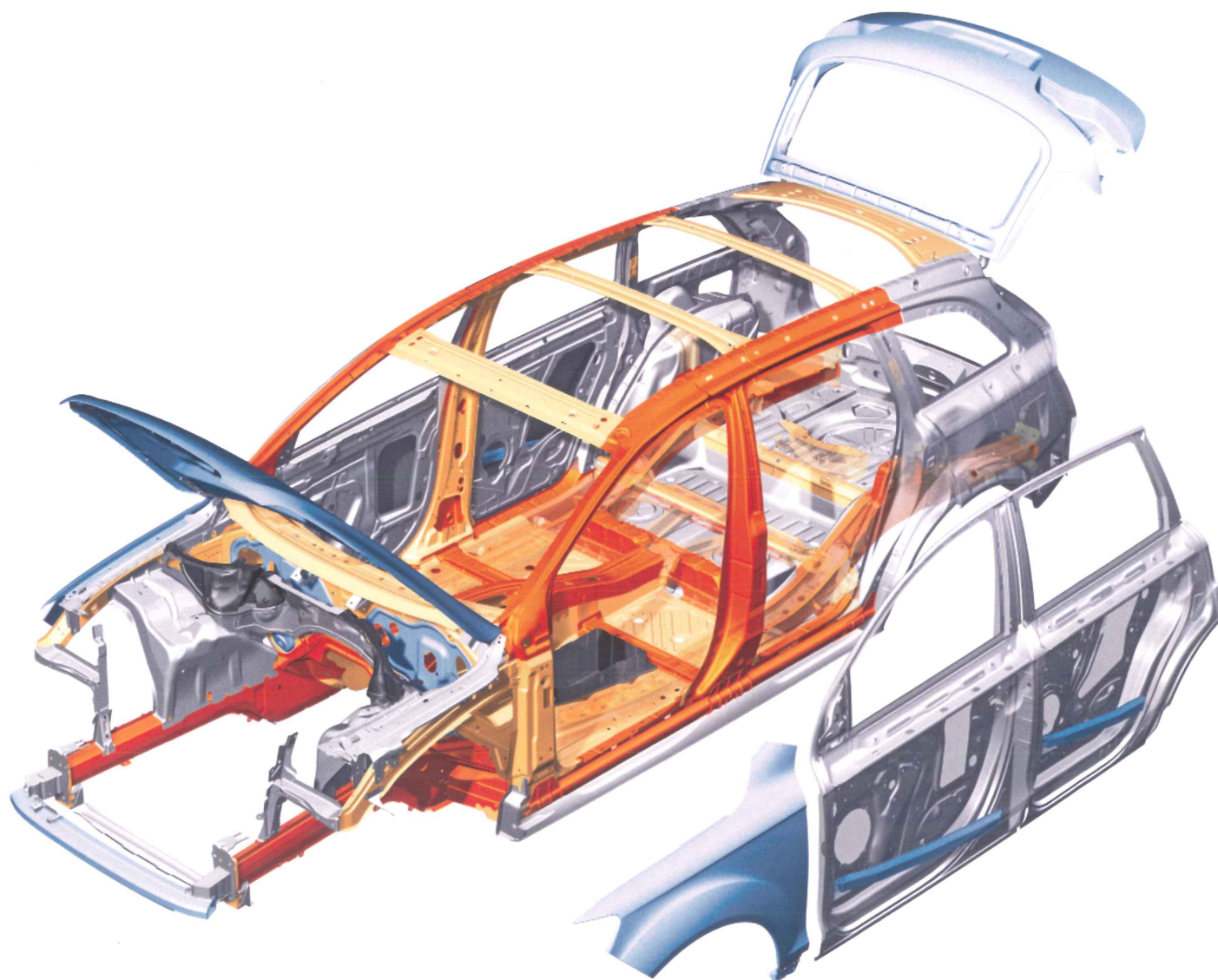
The increased use of ultra-high-strength steels necessitates the use of body repair methods adapted specially to suit the properties of the materials. High-heat-input welding will irreversibly compromise the strength and structure of the component due to microstructural changes in the material. A body structure thus welded cannot, therefore, reliably meet the requirements. It is important to apply a very high contact pressure and a precision-controlled electrical current during spot welding work on ultra-high-strength die-quenched steels.

Following extensive tests, modern spot-welding machines that meet precisely these requirements are now available through Workshop Equipment. MAG gas-shielded arc welding may only be performed on these high-grade steels in specific areas, on a case-by-case basis. They are described in the workshop literature. After miscellaneous tests and crash simulations on repaired ultra-high-strength die-quenched steel body parts of the Audi Q5, Audi has approved two repair points at which MAG welding is permissible.

## Materials

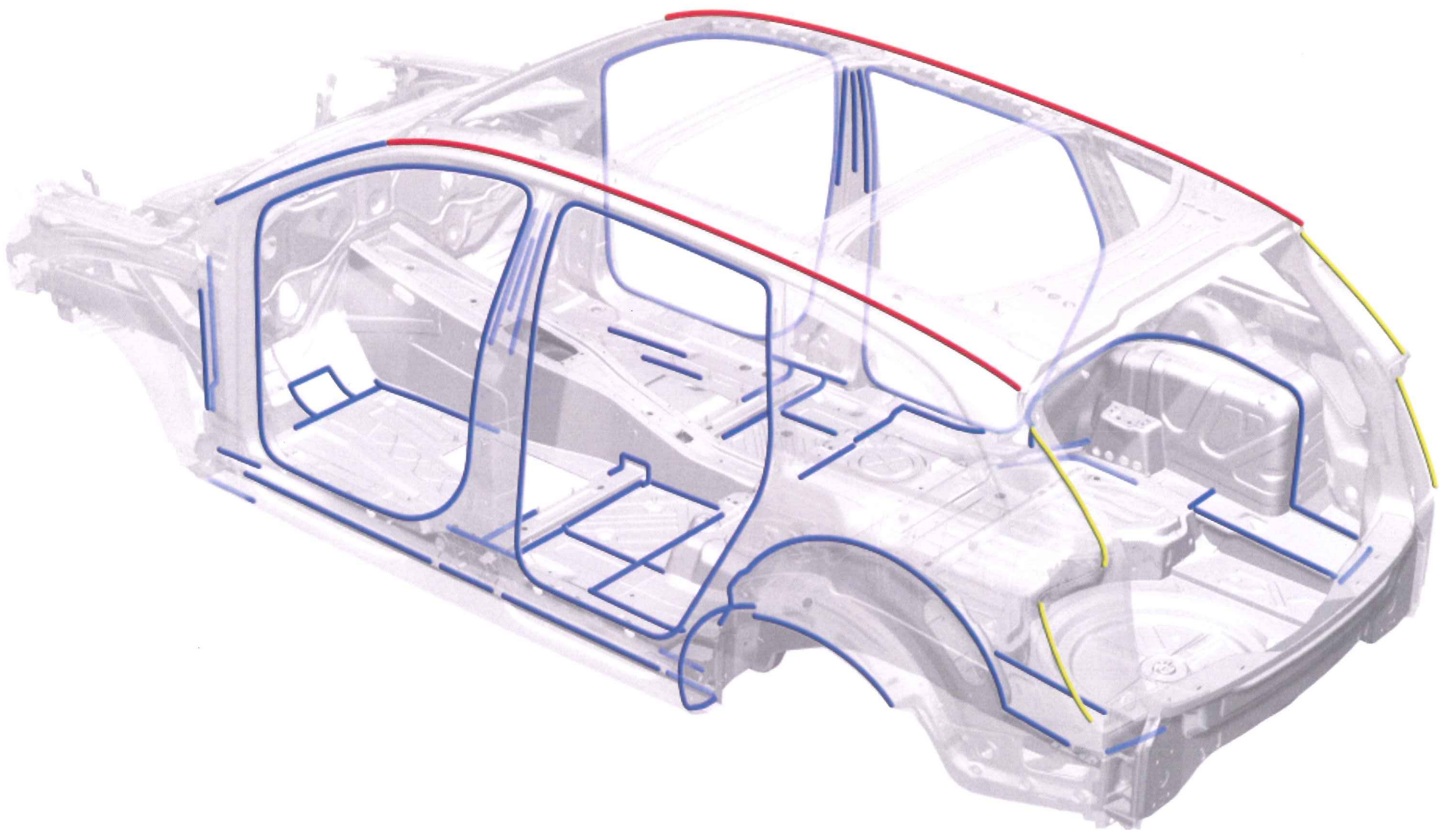
36% Mild steel  
26% High-strength steel

32% Higher-strength/ultra-high-strength steel  
6% Aluminum



## Joining Techniques

- Spot-Weld Bonding
- Plasma Soldering
- Laser Soldering





### **Body Shell**

The high-strength body shell is made up of numerous materials joined together with ultramodern joining processes. NOTE: Some joining processes cannot be duplicated during collision repair or panel replacement. Always reference the body repair manual whenever collision repair or panel replacement is required.

### **Squeeze-Type Resistance Spot Welding**

The most common type of panel attachment method is used throughout the vehicle. (Not shown.)

### **Spot-Weld Bonding**

Joining parts by spot welding through a layer of high-strength, electrically conductive structural adhesive. These areas are generally identified by a blue adhesive that can be seen behind the panel.

### **Laser Welds**

Used to make tailor-welded blanks on the front lower longitudinal members. NOTE: A laser weld cannot be duplicated during the repair process and should not be used as a sectioning location. (Not shown.)

### **Laser Soldering**

A low-heat panel-joining process that does not melt the base metal, only the filler material, which is distributed between the surfaces of the joint. Creates a smooth joint and avoids melting the zinc corrosion protection. Laser soldering can be found at the roof-panel-to-side-panel joint.


### **Plasma Soldering**

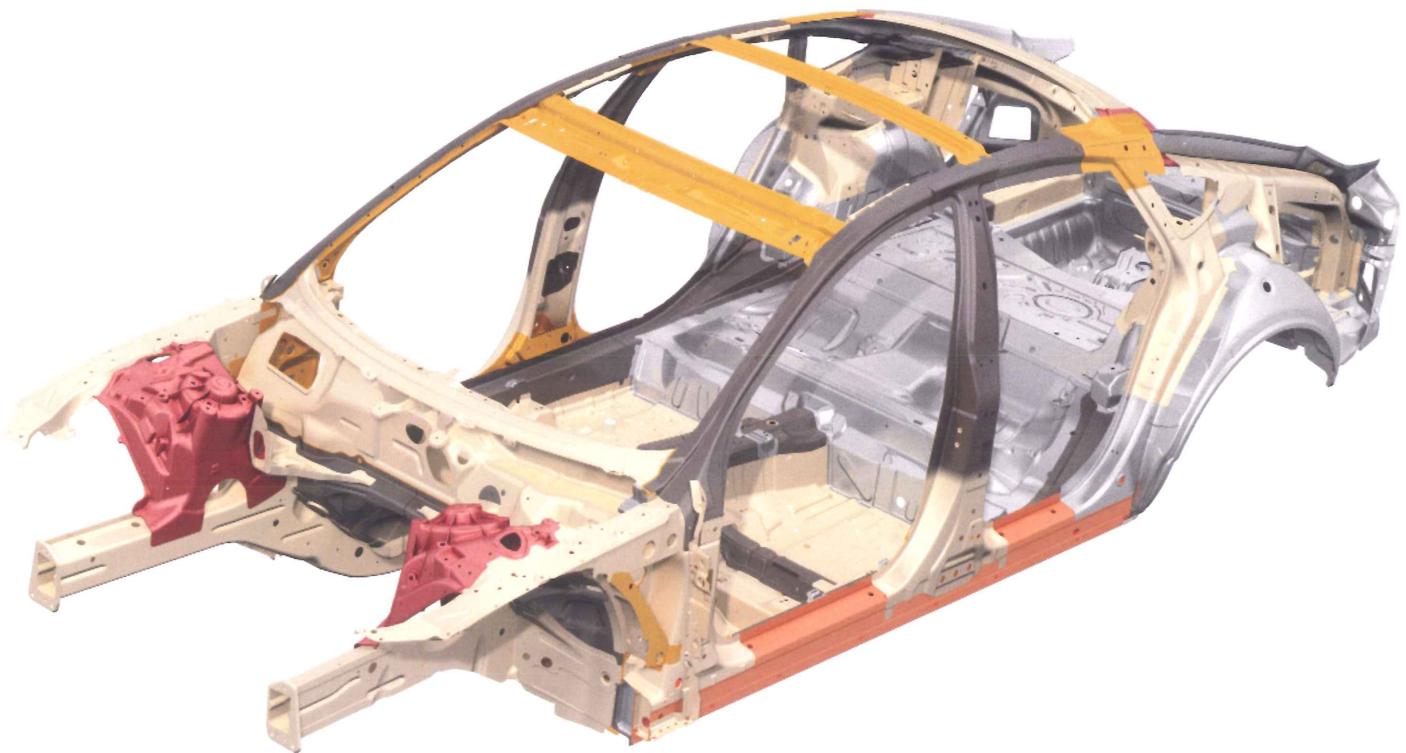
Uses silicon bronze as filler wire to create a high-quality joint. Like laser soldering, this is not a fusion process. It is more similar to adhesive bonding. Plasma soldering is used between the rain run channel and side panel.

### **Gas Metal Arc (GMA) or Metal Inert Gas (MIG) Welding**

GMA (MIG) welding is used quite extensively on the Audi Q7 body shell. There are several locations where GMA (MIG) stitch welds are used to join structural parts together. (Not shown.)

## Materials

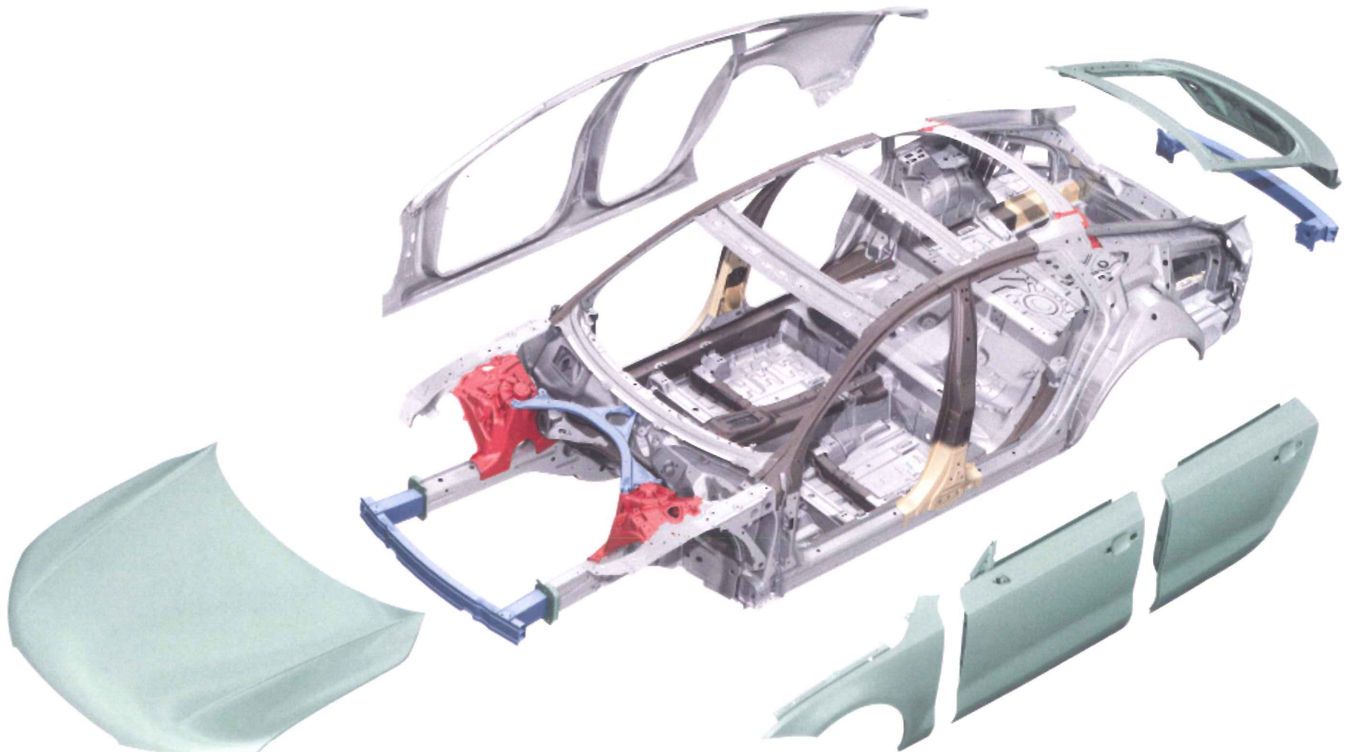
- |   |  |
|---|--|
|  Mild steel                   |  Ultra-high-strength steel            |
|  High-strength steel          |  Ultra-high-strength hot-formed steel |
|  Advanced high-strength steel |  Aluminum casting                     |



## Materials

- Aluminum sheet
- Aluminum casting
- Aluminum extrusion

- Mild steel
- High-strength steel in B-pillars and side members
- Ultra-high-strength hot-formed steel



### Body Structure

Ultra-high-strength hot-formed components improve rigidity and crash safety. These components and assemblies are made from ultra-high-strength steel:

- Front side member reinforcement
- Bulkhead
- A-pillar and roof frame side
- B-pillar
- Chassis rail (sill)
- Front-seat crossmember
- Tunnel reinforcement
- Rear longitudinal member

### Body Attachments

The front and rear bumper mounts, fenders, strut brace, doors and flaps are made of aluminum.

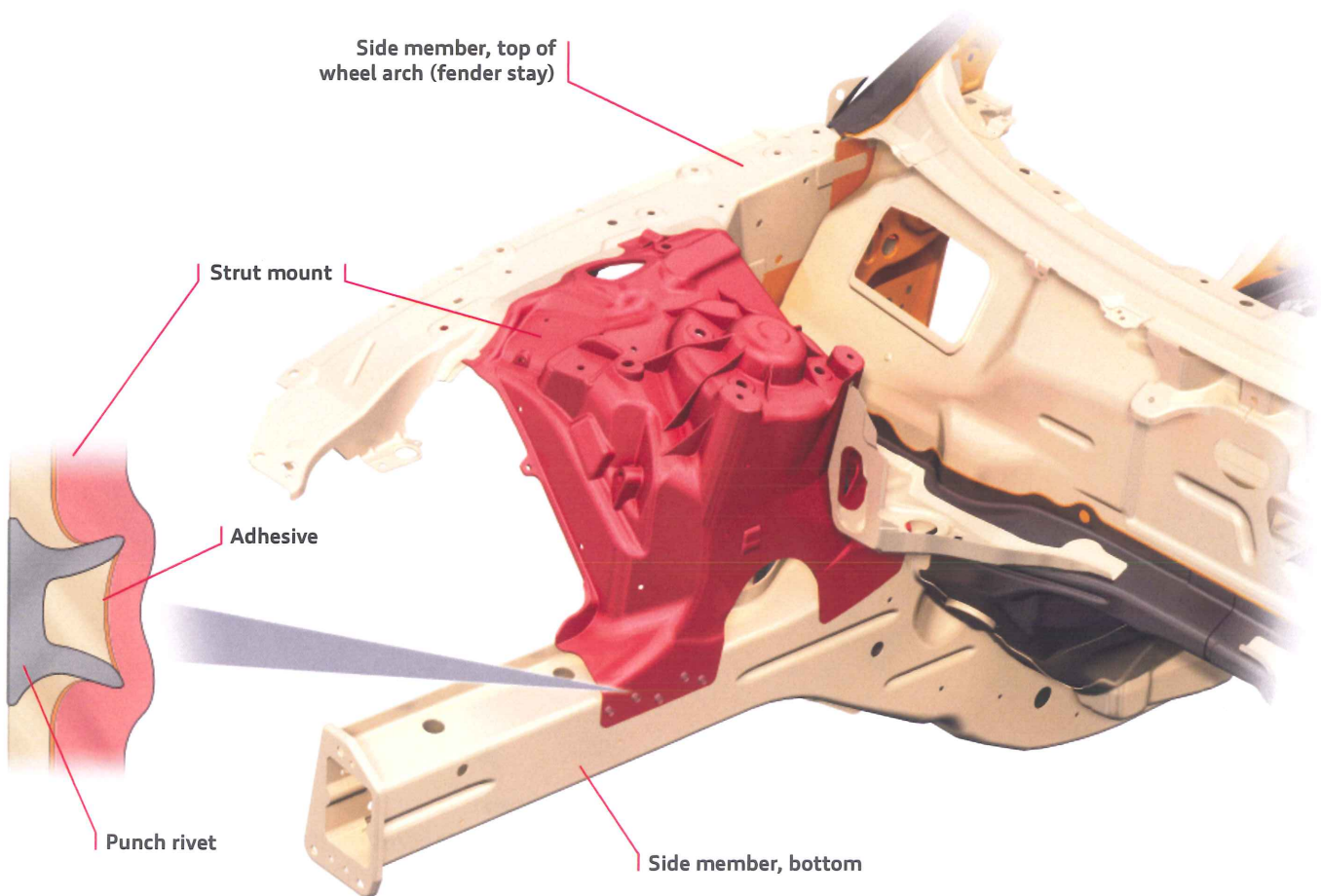
### B-Pillar

Its component assembly is very hard at the top end and softer below a narrow transition zone. This enables side-impact forces to be absorbed effectively.

### Side Member

Manufactured from two tailored blanks, the side member is high-strength sheet metal at the rear and ultra-high-strength hot-formed steel at the occupant cell. Both sheet metal blanks are butt-joined by a laser weld prior to forming.

## Structural integration of front end and strut mount



### Aluminum Castings

The aluminum castings in the vehicle structure are joined to adjacent parts with punch rivets and structural adhesive. The adhesive between these two materials also acts as an insulator and prevents contact corrosion. This method of joining was also used on the 2007 Audi TT and 2011 Audi A8. Specific repair procedures have been developed for repairing damage to the aluminum castings and adjacent

parts, as well as straightening or reshaping of steel components and aluminum castings, which may not be easily detected.

### Reference

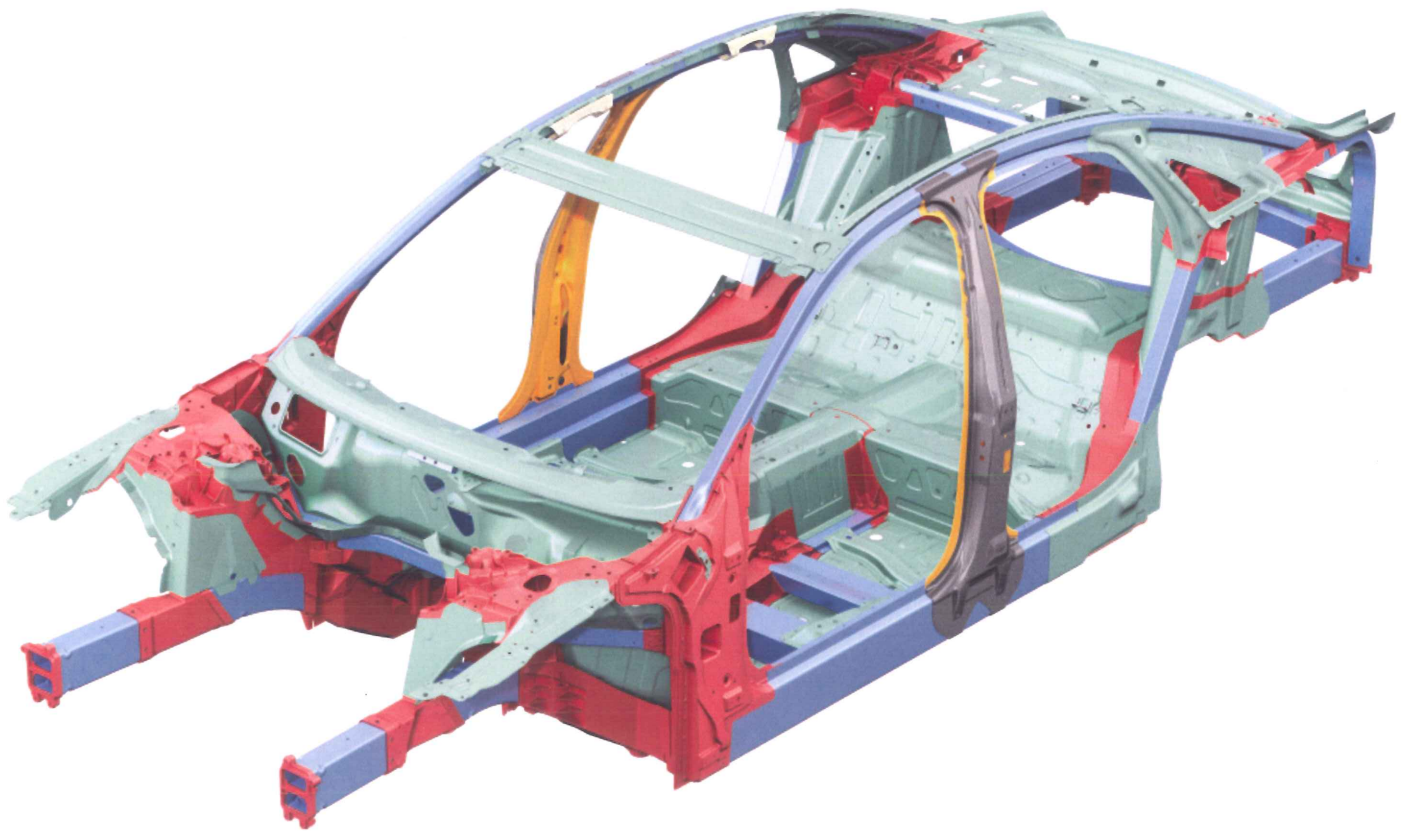
For further information about punch riveting, refer to Self-Study Program 994703, *The 2008 Audi TT Body*.



### Materials

Aluminum sheet  
Aluminum casting  
Aluminum extrusion

Advanced-high-strength steel  
Ultra-high-strength hot-formed steel



#### ASF Body

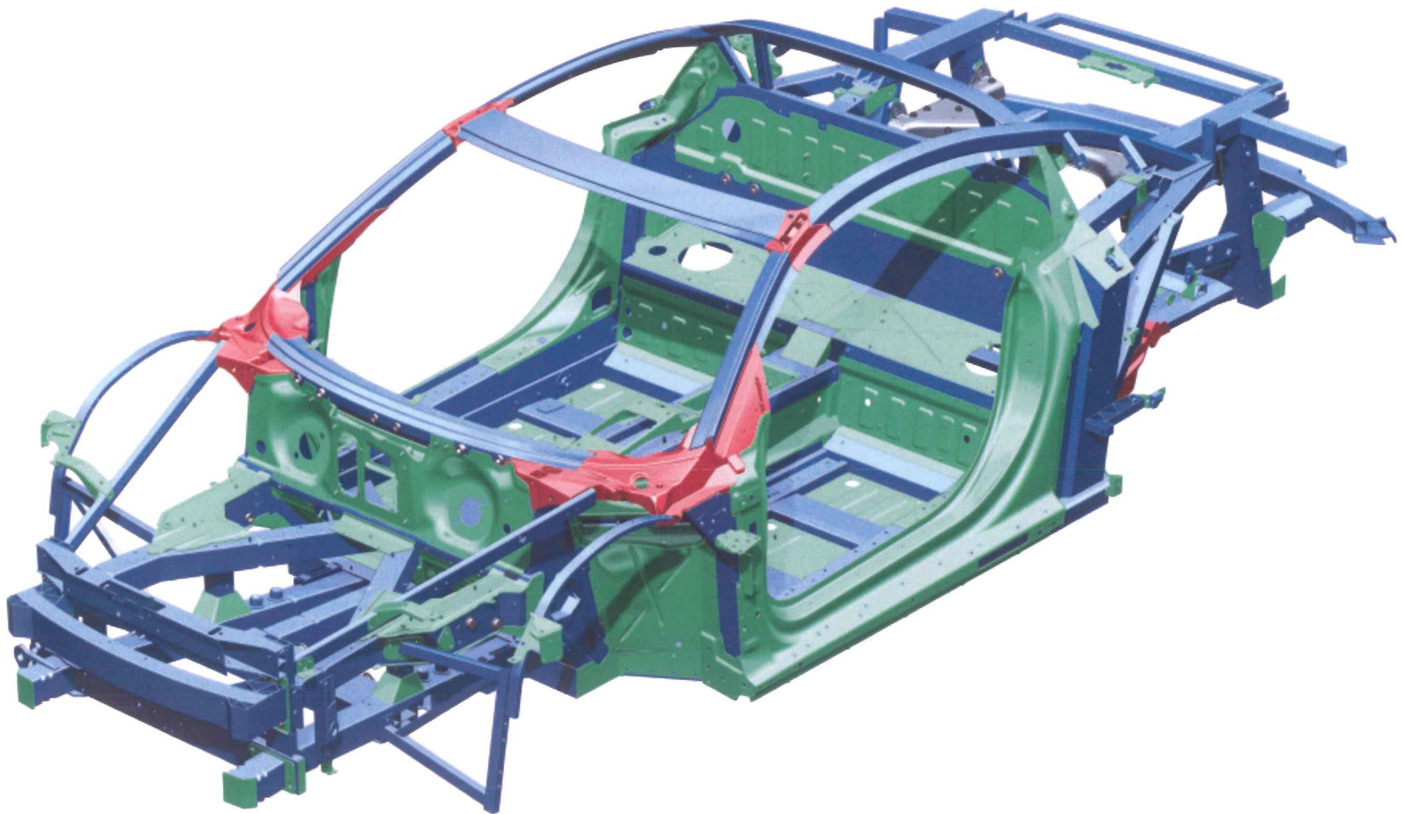
The body of the 2011 Audi A8 employs the proven Aluminum Space Frame (ASF) design. The structure is a composite of aluminum extrusions, aluminum castings, and aluminum sheet components.

Audi uses 13 different grades of aluminum and several different grades of ultra-high-strength and advanced high-strength steel in the 2011 A8.

## Materials

■ Aluminum sheet  
■ Aluminum casting

■ Aluminum extrusion  
■ Magnesium

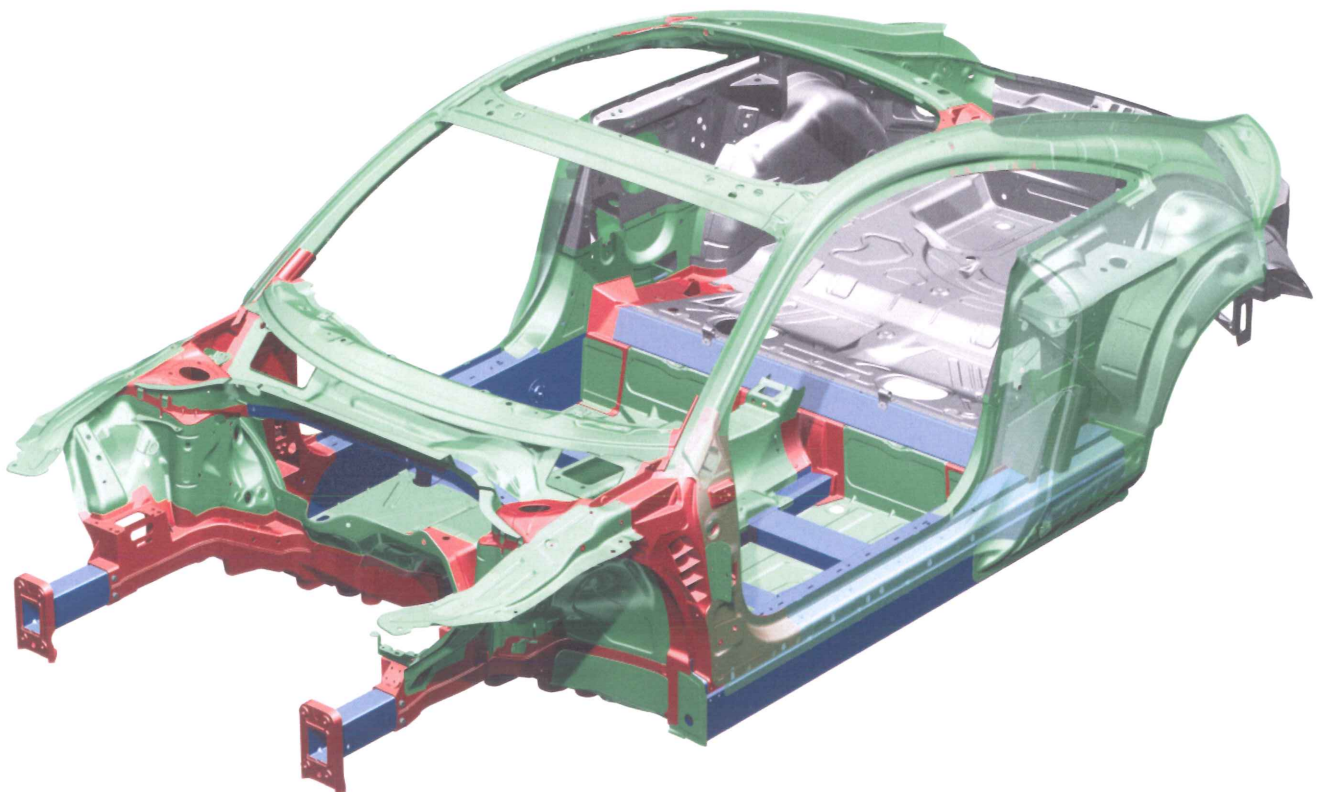




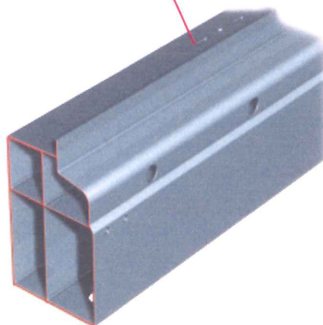
## Materials

■ Aluminum sheet  
■ Aluminum casting

■ Aluminum extrusion  
■ Steel sheet (galvanized)



Sill section Audi TT  
 Four-chamber extruded section



Sill section Audi A8  
 Three-chamber extruded section

