

GREAT DESIGNS IN **STEEL**

TRAILBLAZER BODY STRUCTURE

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CONTENTS

- Trailblazer Introduction
- Architecture
- **Body Structure**
 - ❖ BIW Weight Overview & Structure Efficiency
 - ❖ Material Optimization
 - ❖ Engineered Blanks
 - ❖ Adhesive & Sealing
 - ❖ High Efficiency Body Structure Design
 - ❖ Crashworthiness Design
- **Manufacturing specific features**
 - ❖ Resistance Projection Weld for Perceptual Quality Improvement
 - ❖ Application of Roof Laser Brazing

TRAILBLAZER INTRODUCTION



TRAILBLAZER INTRODUCTION

- Increased size
 - ❖ Wheelbase : +85mm
 - ❖ Overall length : +170mm
 - ❖ Width : +35mm



2,555
4,255



2,640 **+85mm**
4,425 **+170mm**



1,541
1,775



1,540
1,775



1,553 **+13mm**
1,810 **+35mm**



1,570 **+30mm**
1,810 **+35mm**

1,660

TRAILBLAZER INTRODUCTION

- New Styles

LT



RS



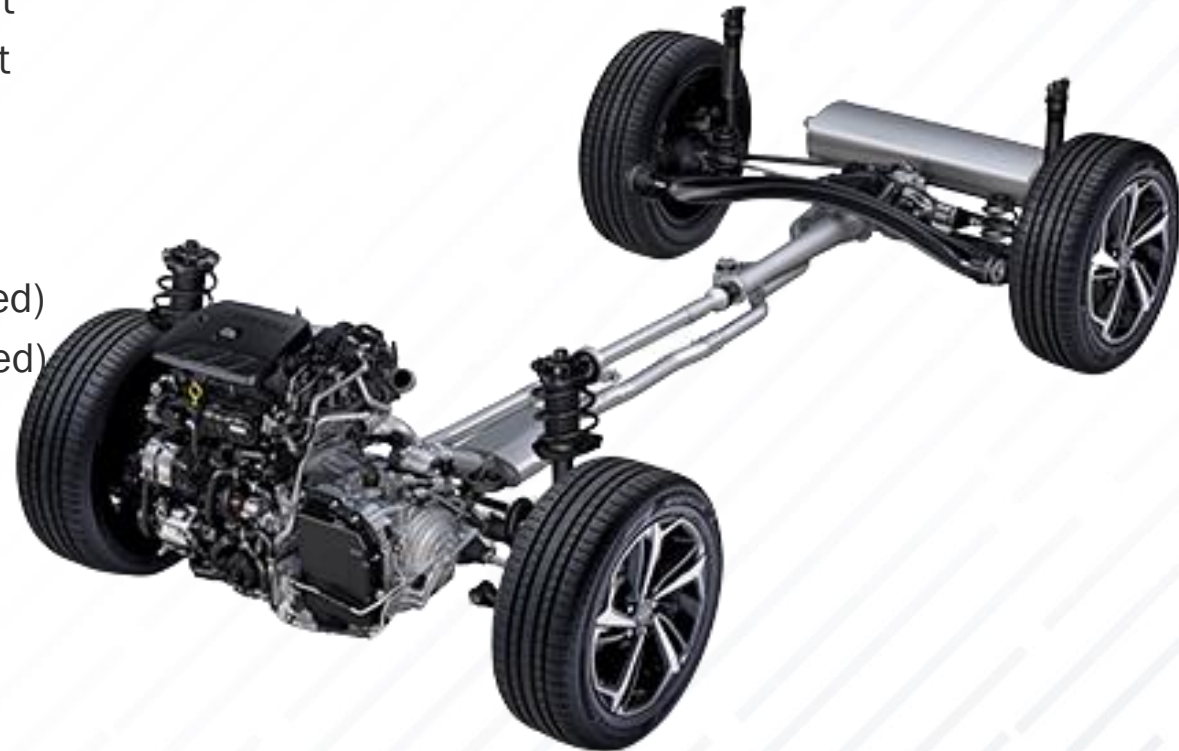
ACTIV



TRAILBLAZER INTRODUCTION

Powertrain

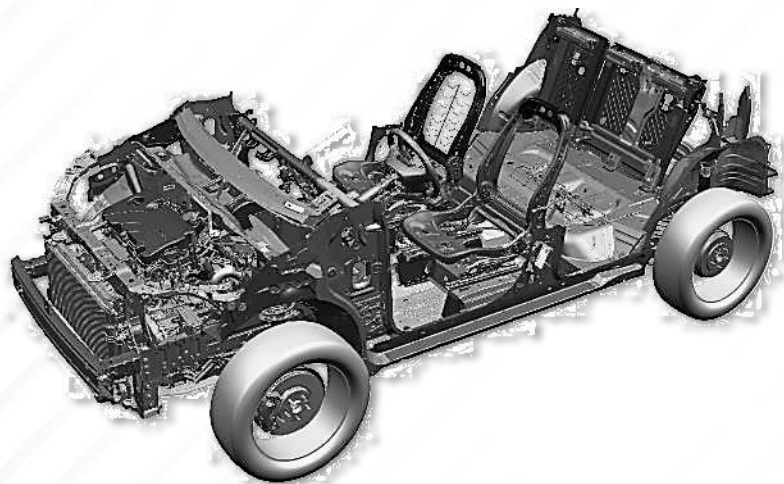
- Engine options
 - ❖ 1.2 Liter Turbo 3-cylinder: 137 HP | 162 lb-ft
 - ❖ 1.3 Liter Turbo 3-cylinder: 155 HP | 174 lb-ft
- Fuel economy
 - ❖ 1.3 Liter Turbo 3-cylinder: 31 MPG (Combined)
 - ❖ 1.2 Liter Turbo 3-cylinder: 29 MPG (Combined)
- Transmission options
 - ❖ CVT (FWD only 1.2L & 1.3L)
 - ❖ 9 Speed Automatic (AWD Only 1.3L)



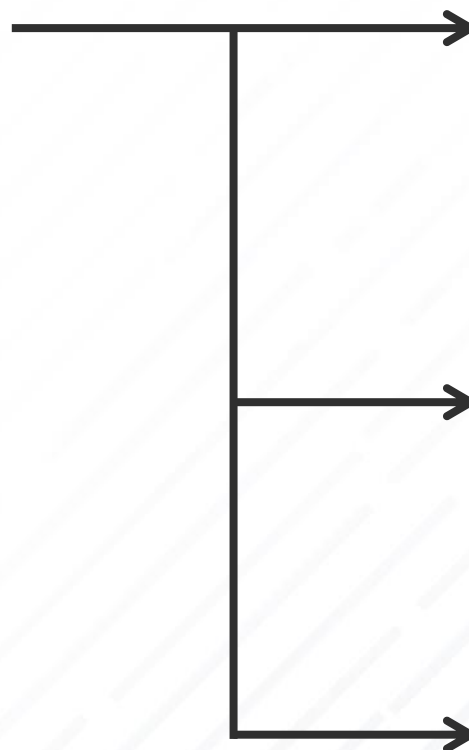
TRAILBLAZER FROM NEW ARCHITECTURE

- **Brand New Modular Architecture**

- ❖ Flexibility to deliver a family of vehicles, developed as Front, Center and Rear compartments



- *Range of Dimensional Flexibility*
- *A Common Set of Interfaces*
- *A Common Set of Components*
- *A Common Manufacturing System*



Buick SUV Encore GX



Chevy SUV - Trailblazer



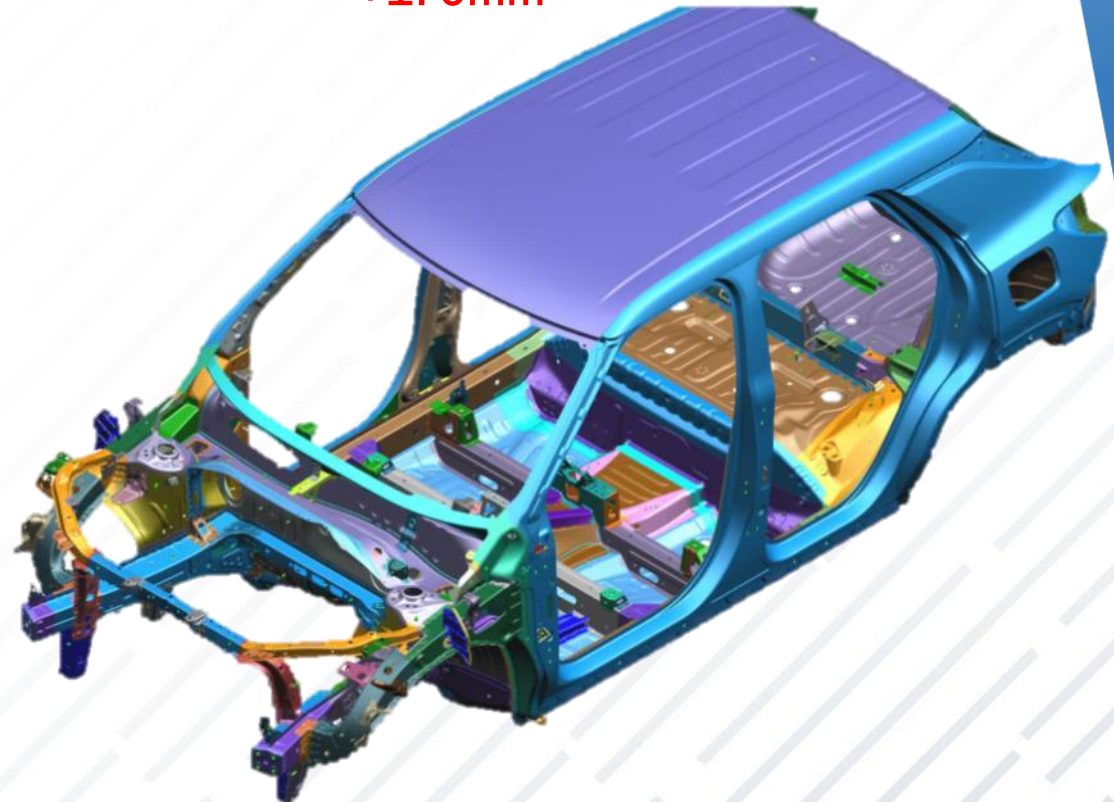
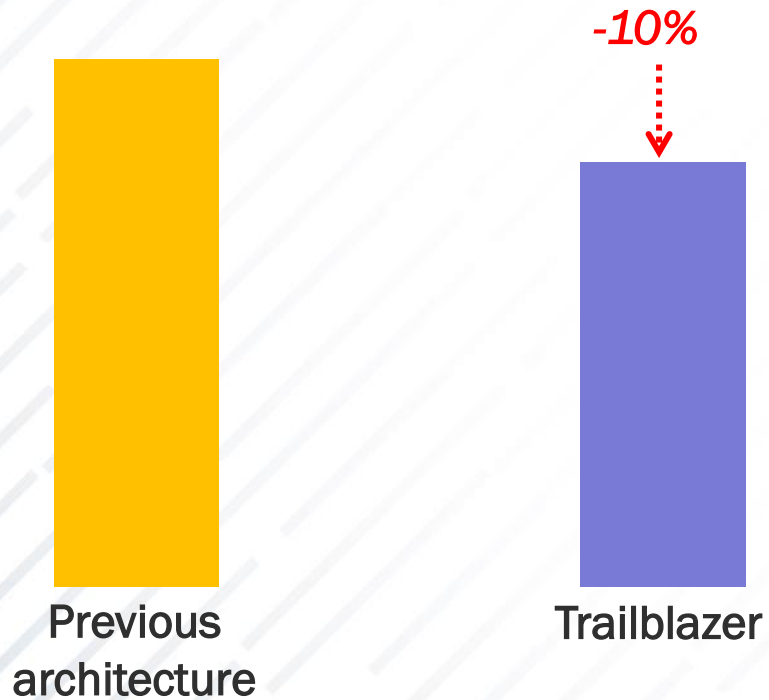
Buick SUV Encore GX (China)

OVERVIEW BODY WEIGHT

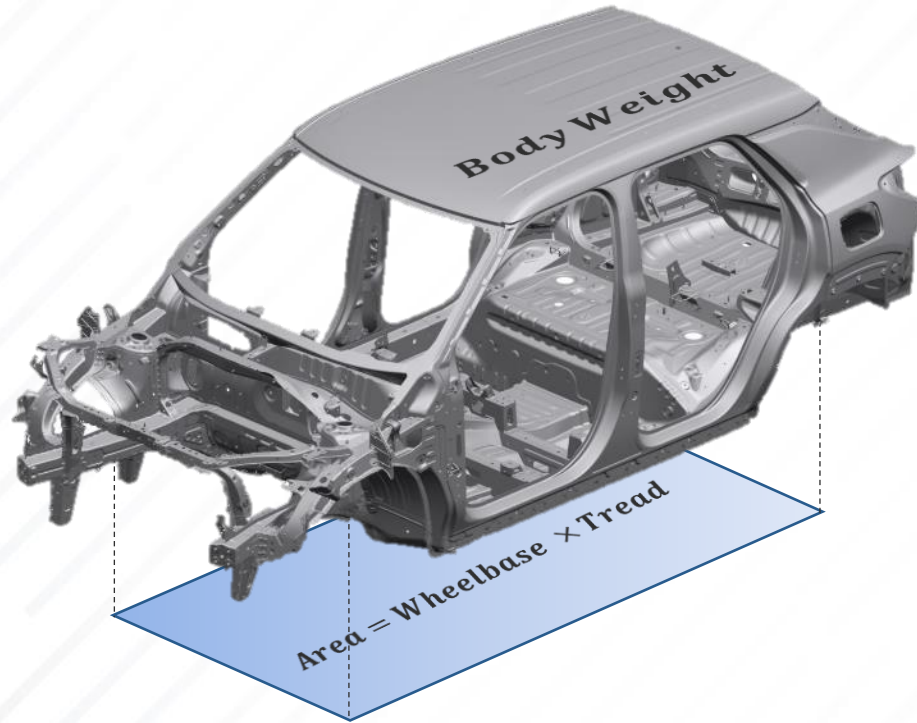
*Larger Body,
Lower Weight*



Body in White Mass

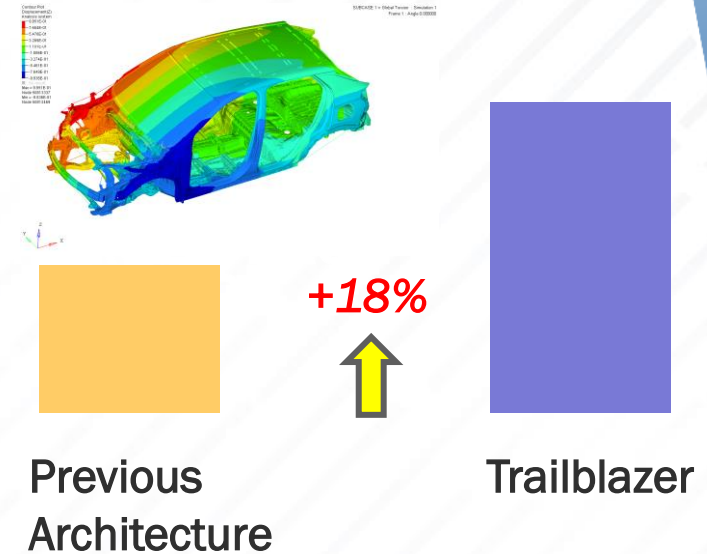


BODY STRUCTURE EFFICIENCY

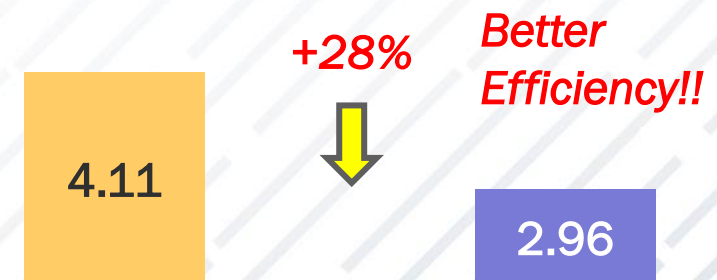


$$\frac{\text{Body weight (kg)}}{\text{Area (m}^2) \times \text{Torsional Stiffness } \left(\frac{\text{kN} \cdot \text{m}}{\text{deg}}\right)}$$

Global Torsional Stiffness

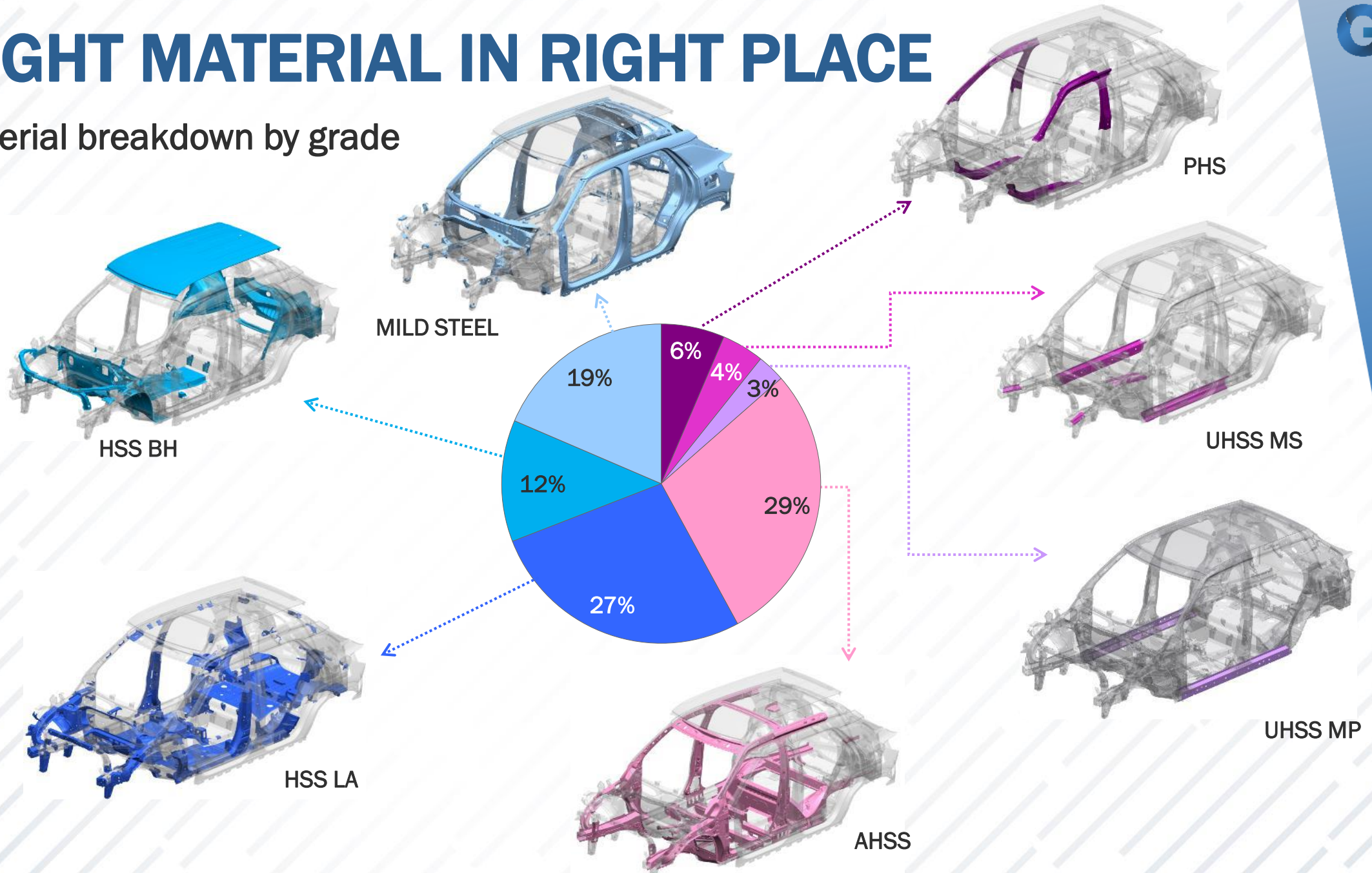


Body Structure Efficiency



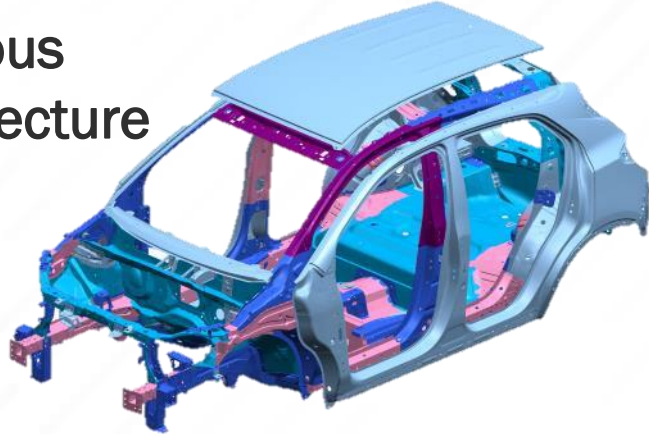
RIGHT MATERIAL IN RIGHT PLACE

- Material breakdown by grade

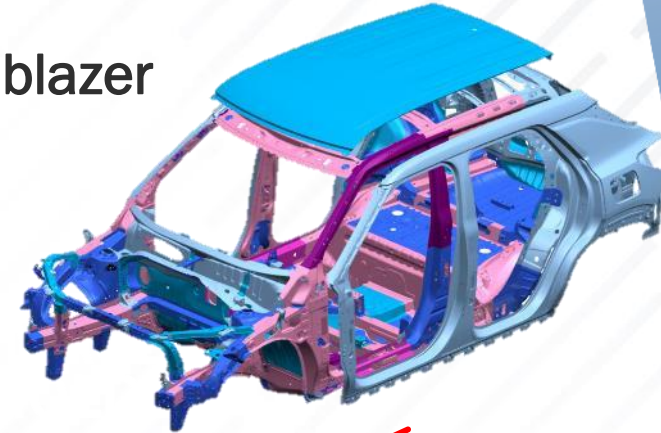


STEEL GRADES COMPARISON

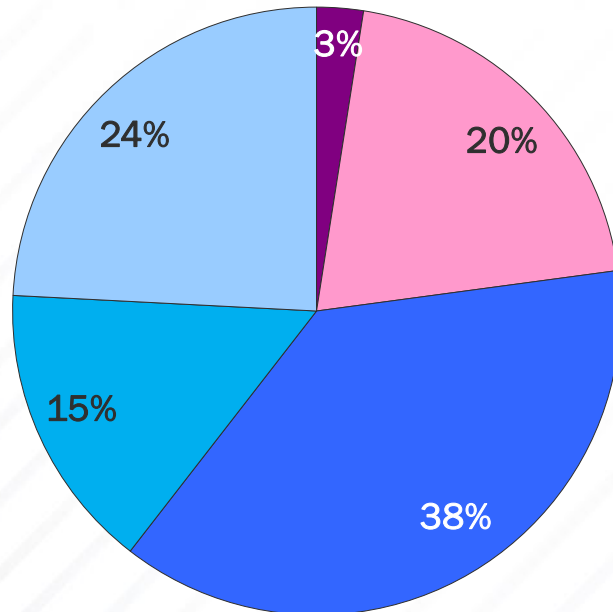
- Previous Architecture



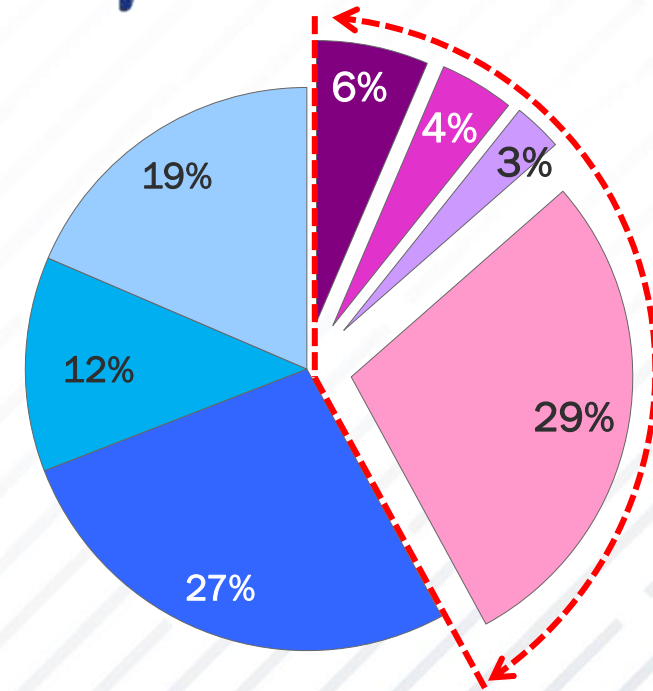
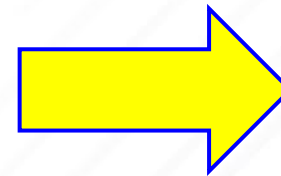
- Trailblazer



Grade	Legend
PHS	
UHSS MS	
UHSS MP	
AHSS	
HSS LA	
HSS BH	
Mild Steel	



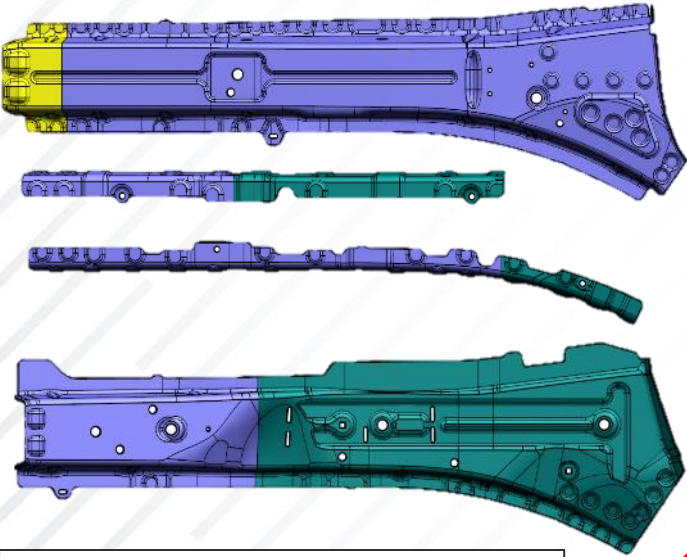
**AHSS Doubled
23% → 42%**



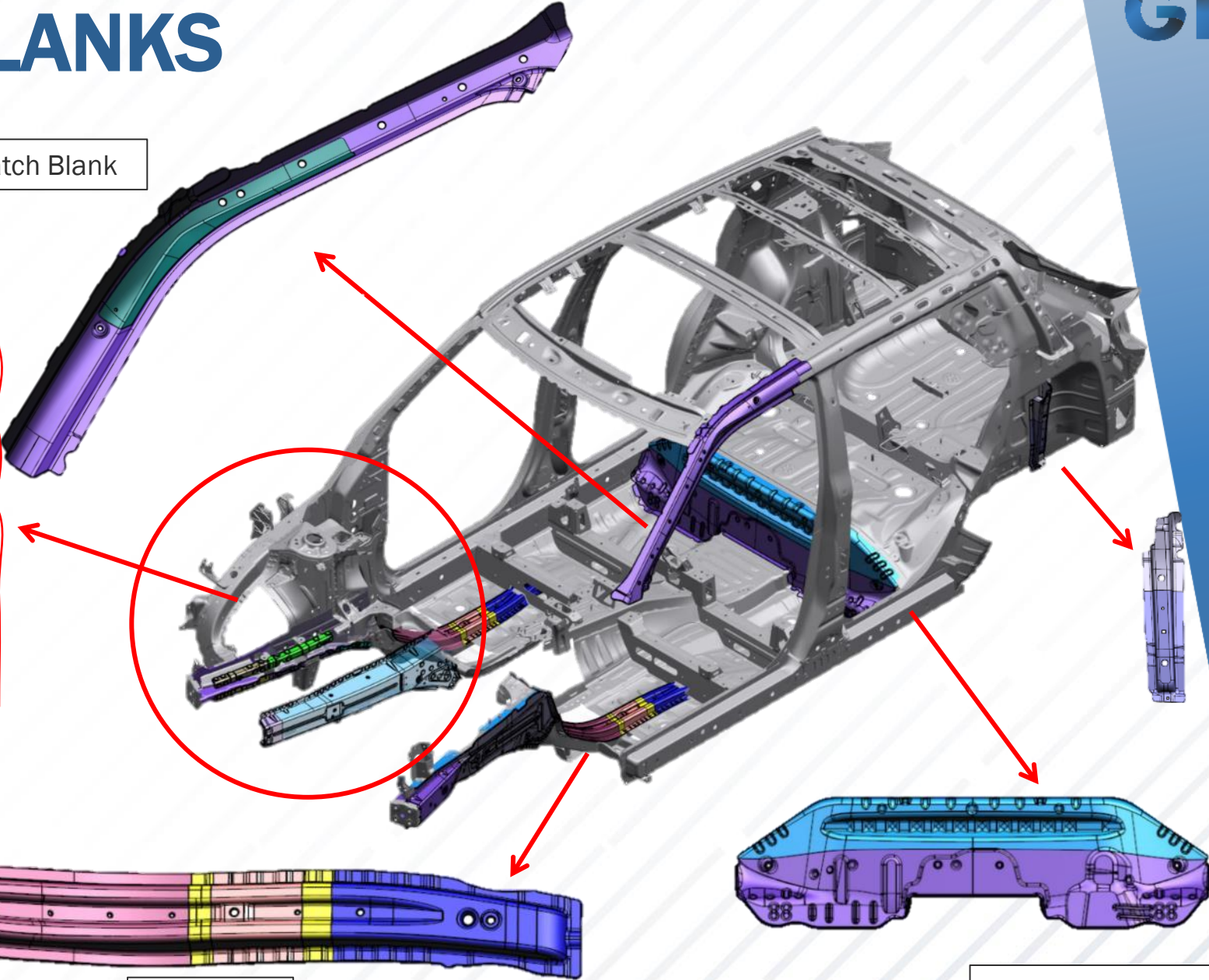
ENGINEERED BLANKS

PHS, Patch Blank

420LA DP800 MP1000



Multi-material and gauge parts TWB



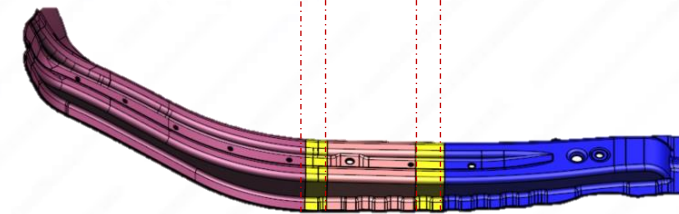
PHS, TRB

Multi Gauge, TWB

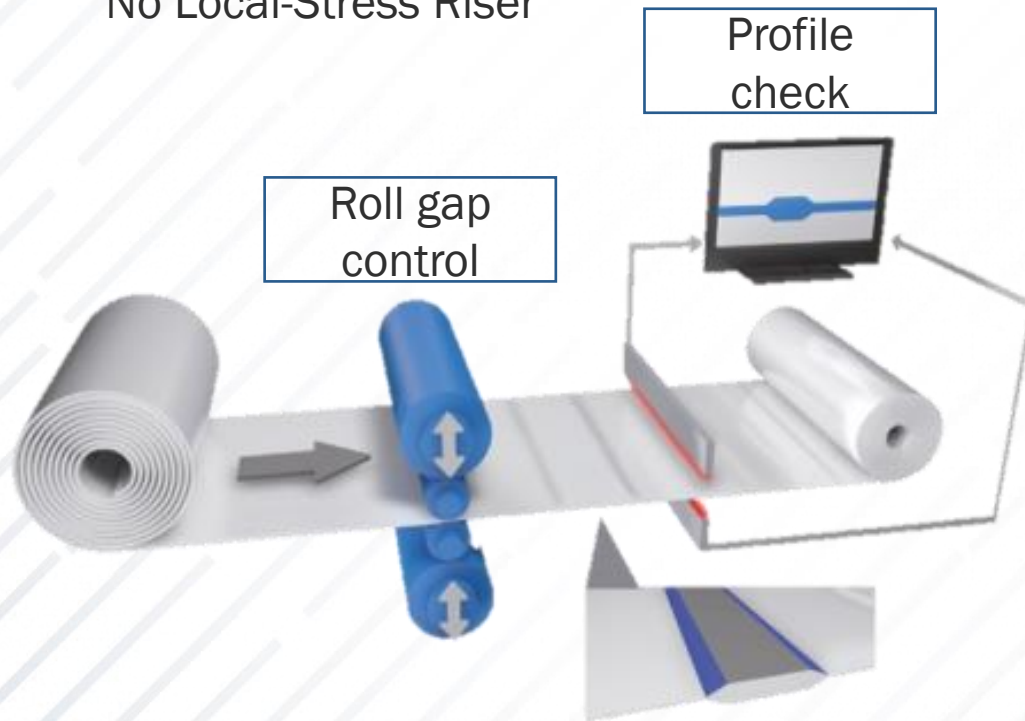
ENGINEERED BLANK

- Tailored Rolled Blanks

- ❖ Optimized Thickness vs. Load
- ❖ No Weld Seams
- ❖ Gradual Transition Compared to Laser Welding
No Local-Stress Riser



31mm 40mm

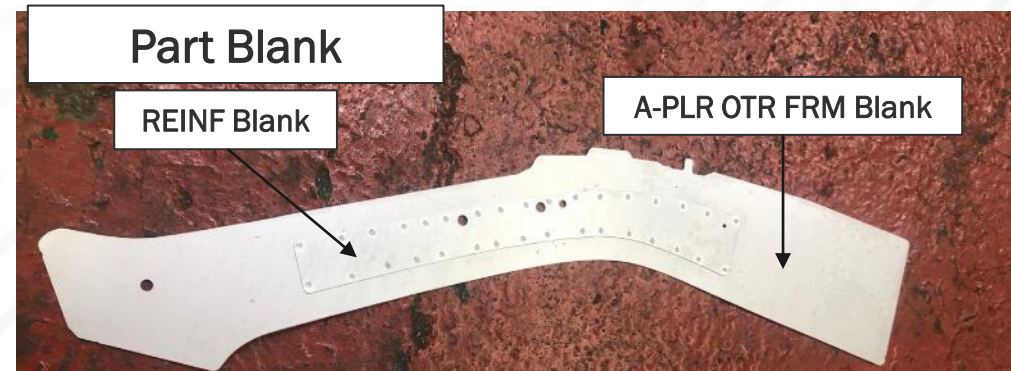
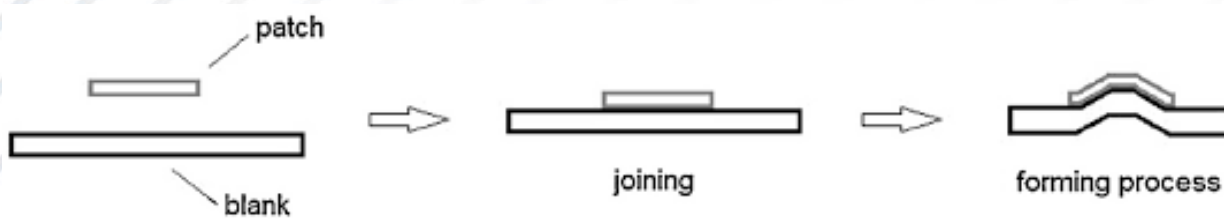
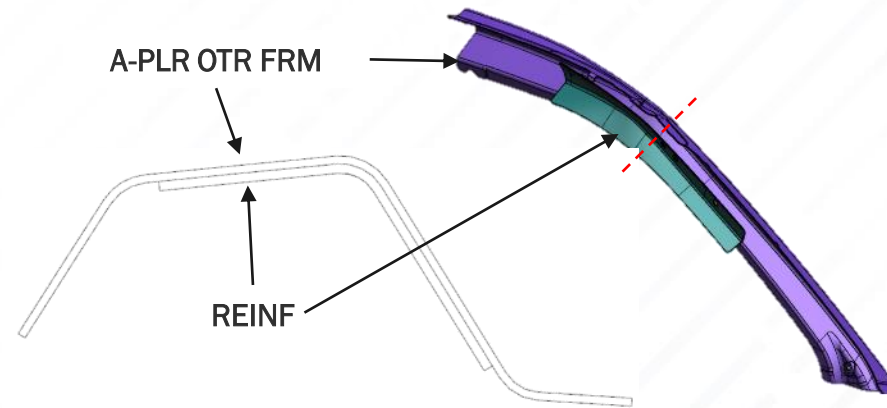
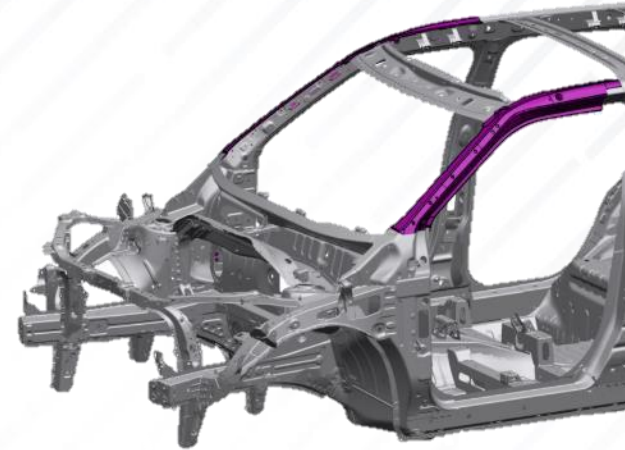


2.0	1.8	1.4
2.0	1.8	1.4

ENGINEERED BLANK

- Patch Blank

- ❖ Multiple Gauge Application
- ❖ 2 Blanks Joined Before Stamping
- ❖ Co-formed in the Die
- ❖ Flexible Patch Location
- ❖ Cost Saving in Tooling



STRUCTURAL ADHESIVE

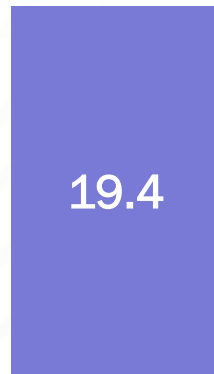
- *Better Torsional Stiffness, Crash Performance*

Total : 19.4 m

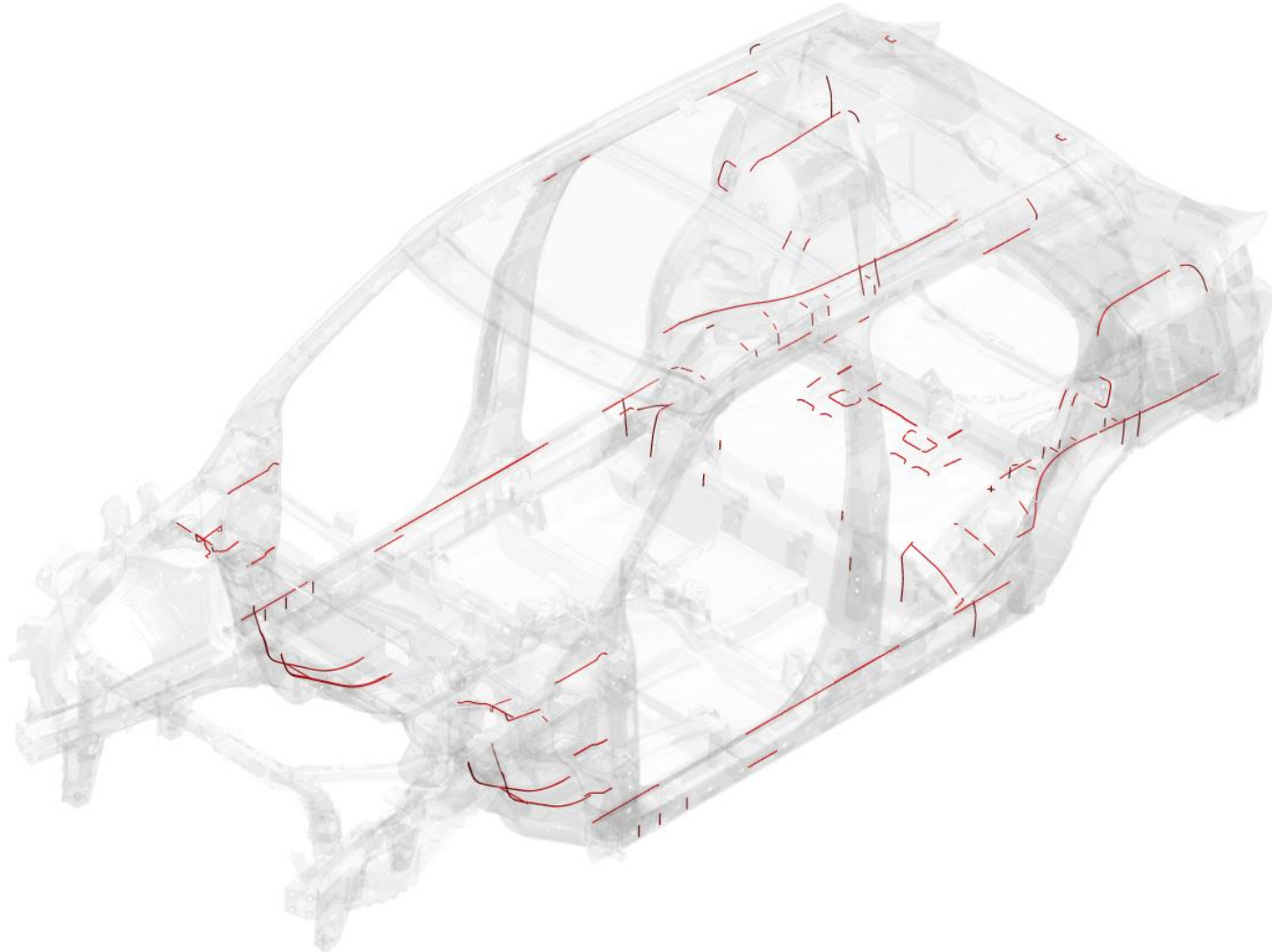
160% Increase



Previous
Architecture

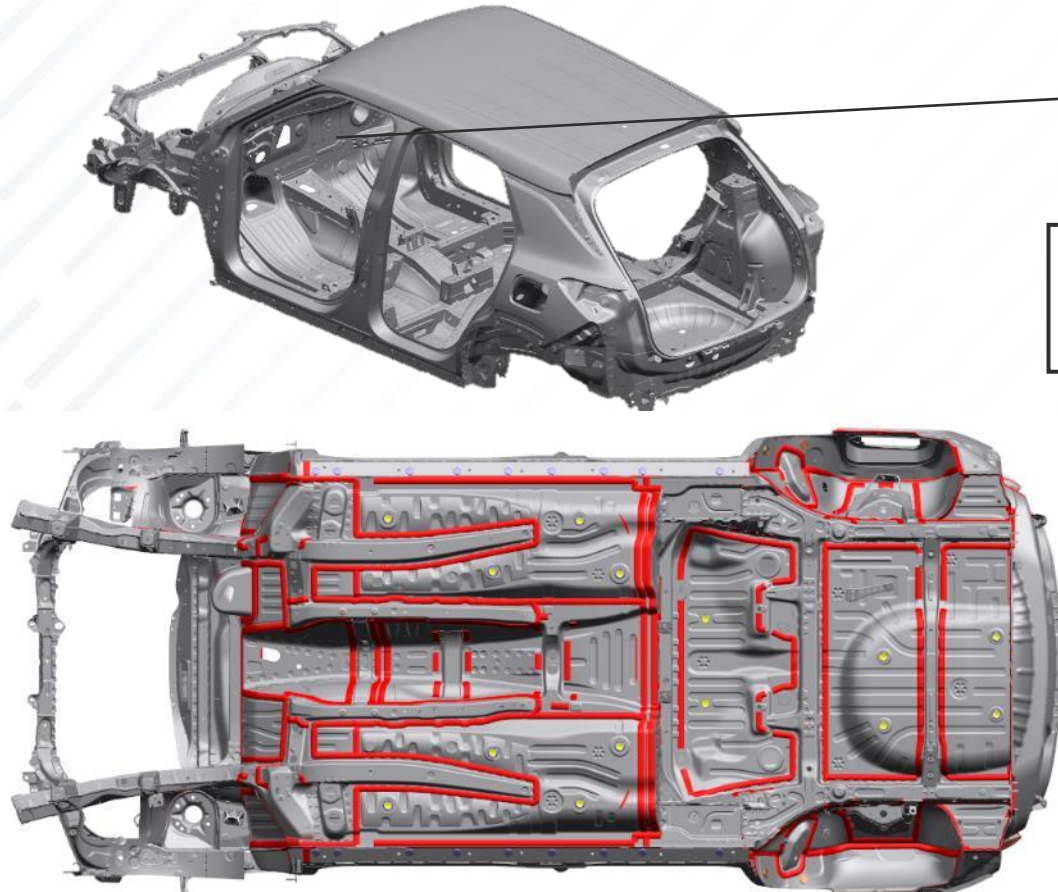


Trailblazer

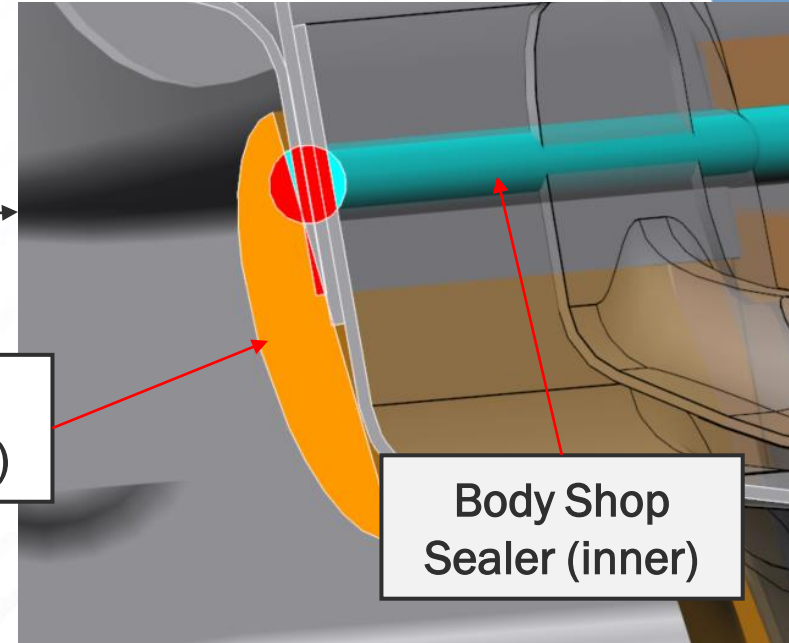


DOUBLE SEALING

- Body Sealing : *Improved Corrosion Protection*
 - Double Sealing : Dash and Tunnel Area
 - Extensive Use of Paint Shop Sealer on Underbody



Paint Shop Sealer (outer)



Body Shop Sealer (inner)

Typical Double Sealed Joint

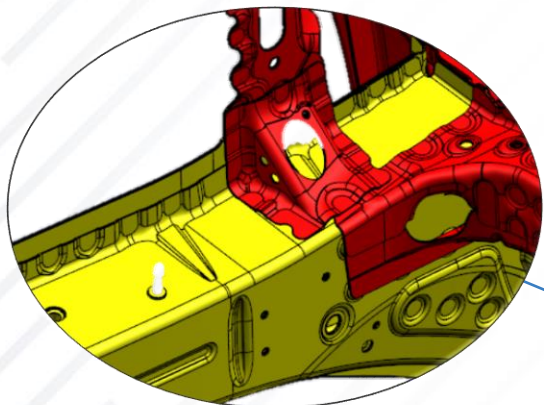
HIGH EFFICIENCY BODY STRUCTURE DESIGN

- **Advanced Structure Construction**
 - ❖ Box to Box Connection (3D joint)
 - ❖ Ring Structure
- **Panel Gauge Optimization**
 - ❖ Significant Mass and Cost Reduction
- **High Efficiency Design for Crash Performance**

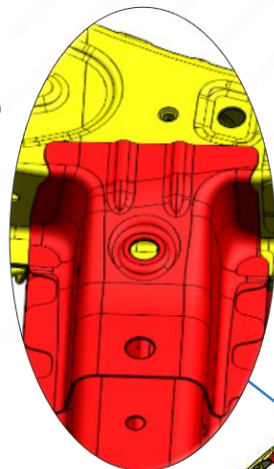
HIGH EFFICIENCY JOINTS

Box to Box Connection (3D joint)

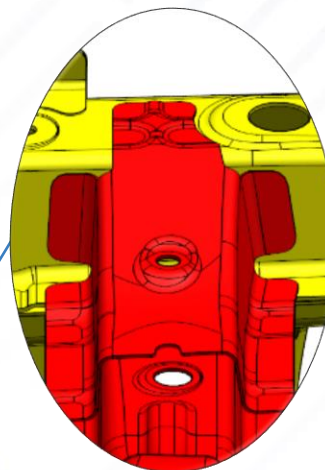
A-Ring to Front Rail



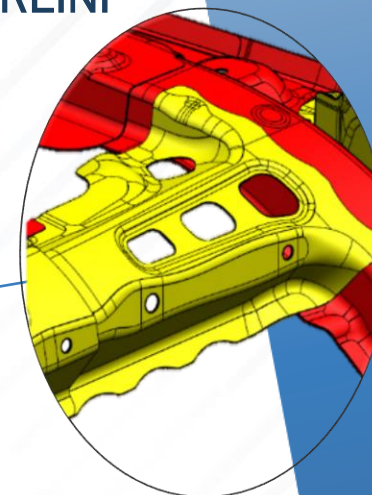
#5 Bar to Rear Rail



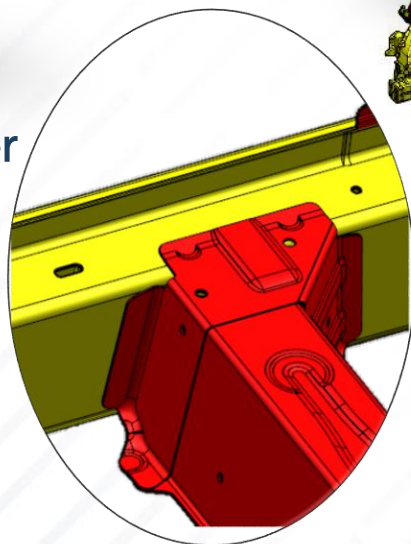
#6 Bar to Rear Rail



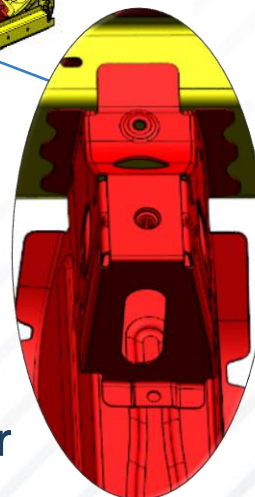
Roof Side Rail to Rear REINF



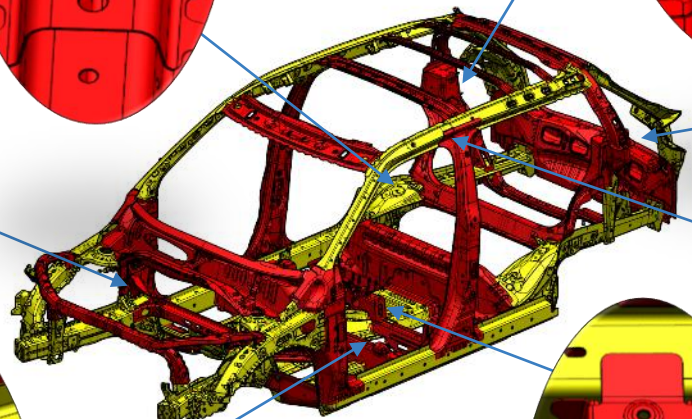
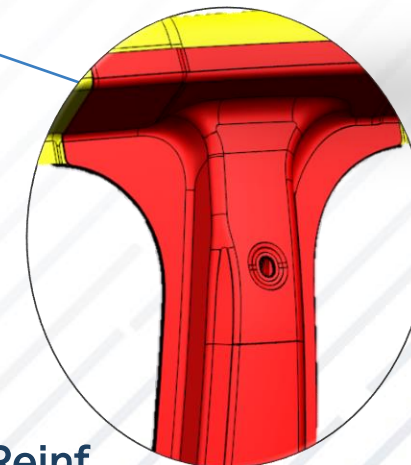
#2 Bar to Rocker



#3 Bar to Rocker



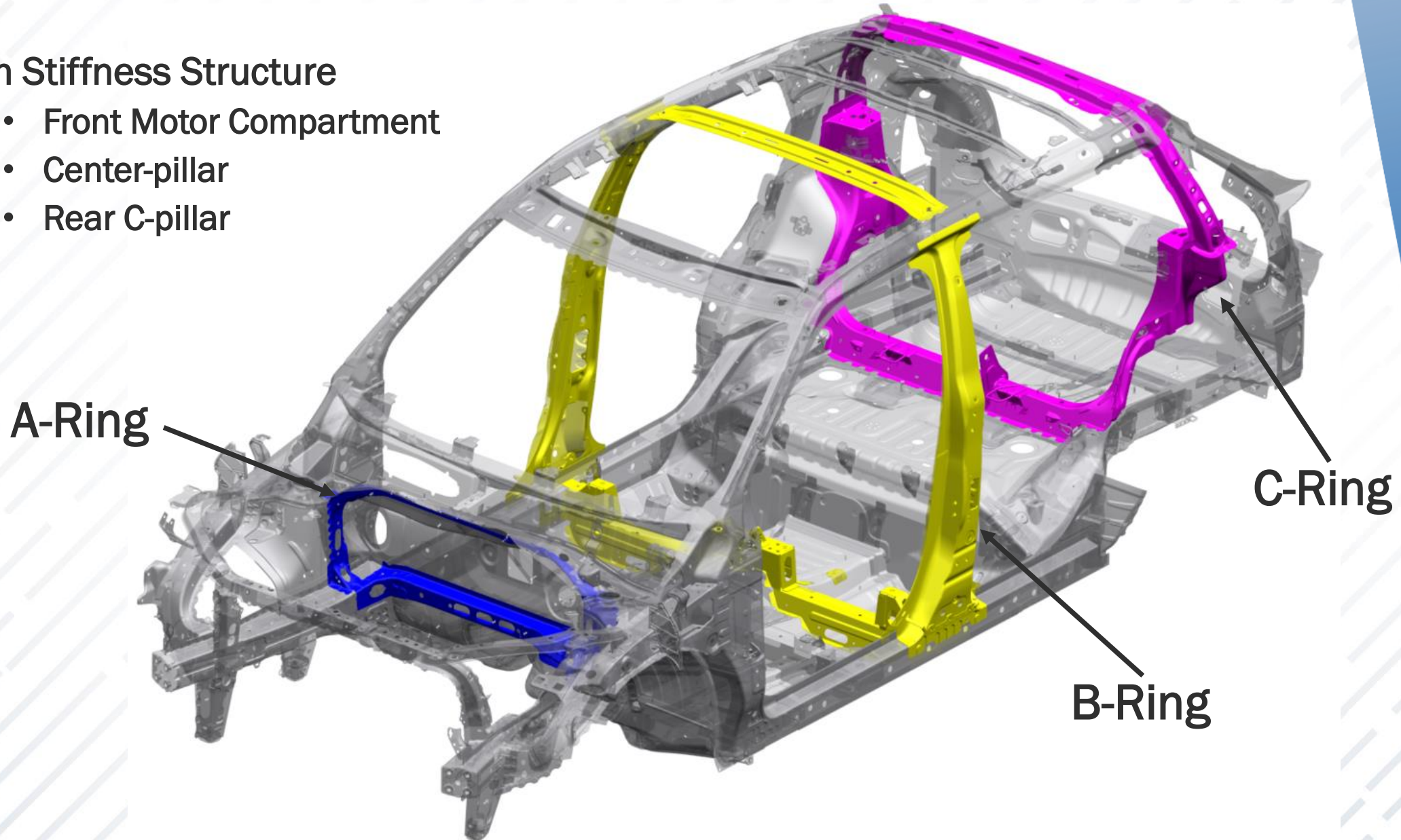
B Pillar Reinf to Roof Rail



RING STRUCTURE

High Stiffness Structure

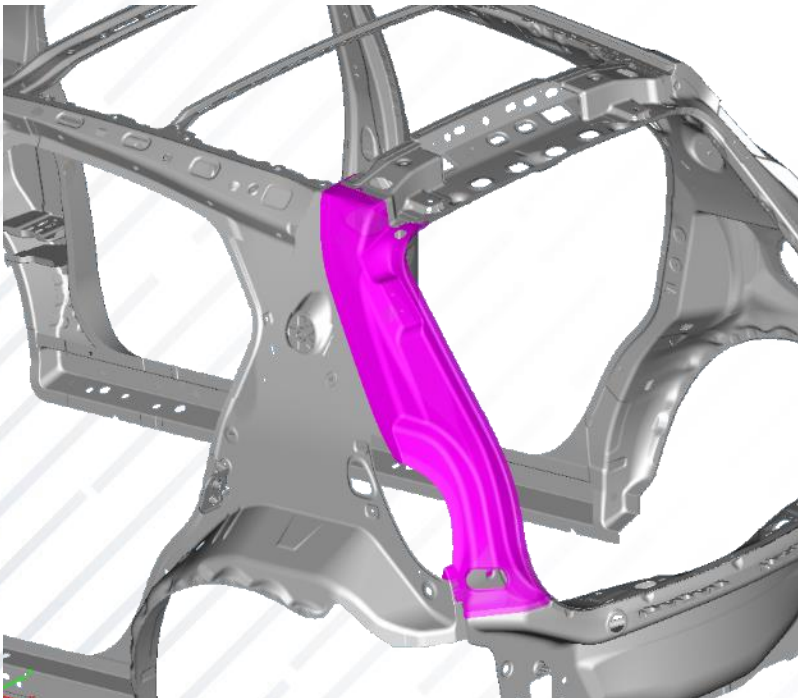
- Front Motor Compartment
- Center-pillar
- Rear C-pillar



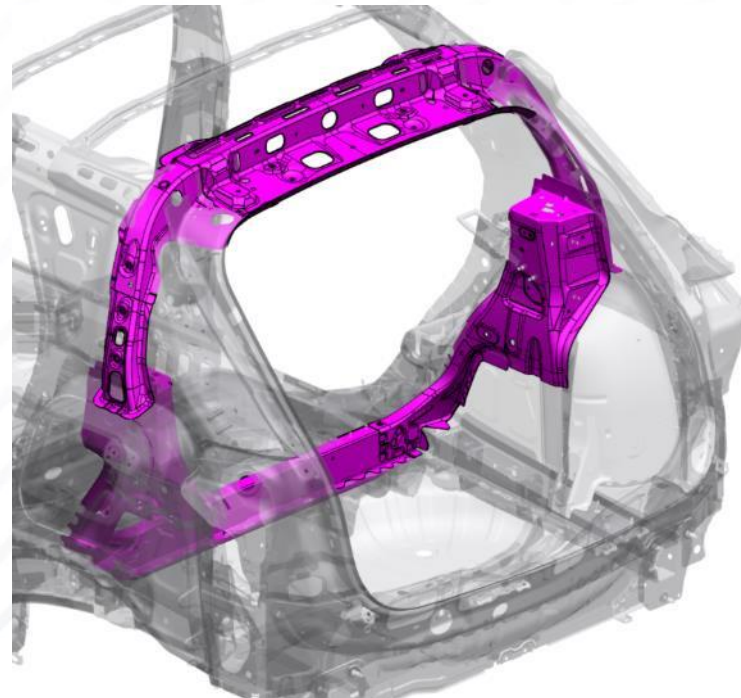
RING STRUCTURE

- Early Design
 - ❖ D-ring Box Structure
 - ❖ Upperbody Structure Only
- Improved Design
 - ❖ C-ring Box Structure
 - ❖ Integrates Uppers to Lower
 - ❖ Improved Stiffness
 - ❖ **Reduced Mass by -8.8 kg**

D-ring



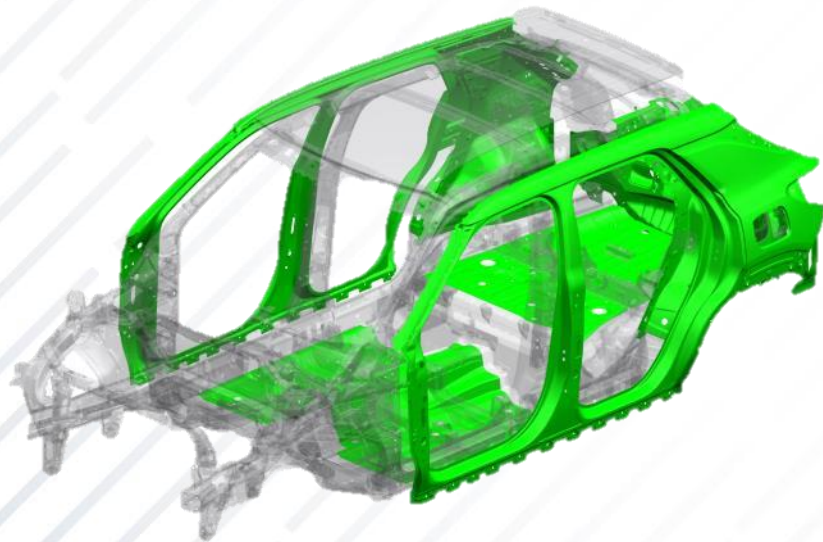
C-ring (Final Design)



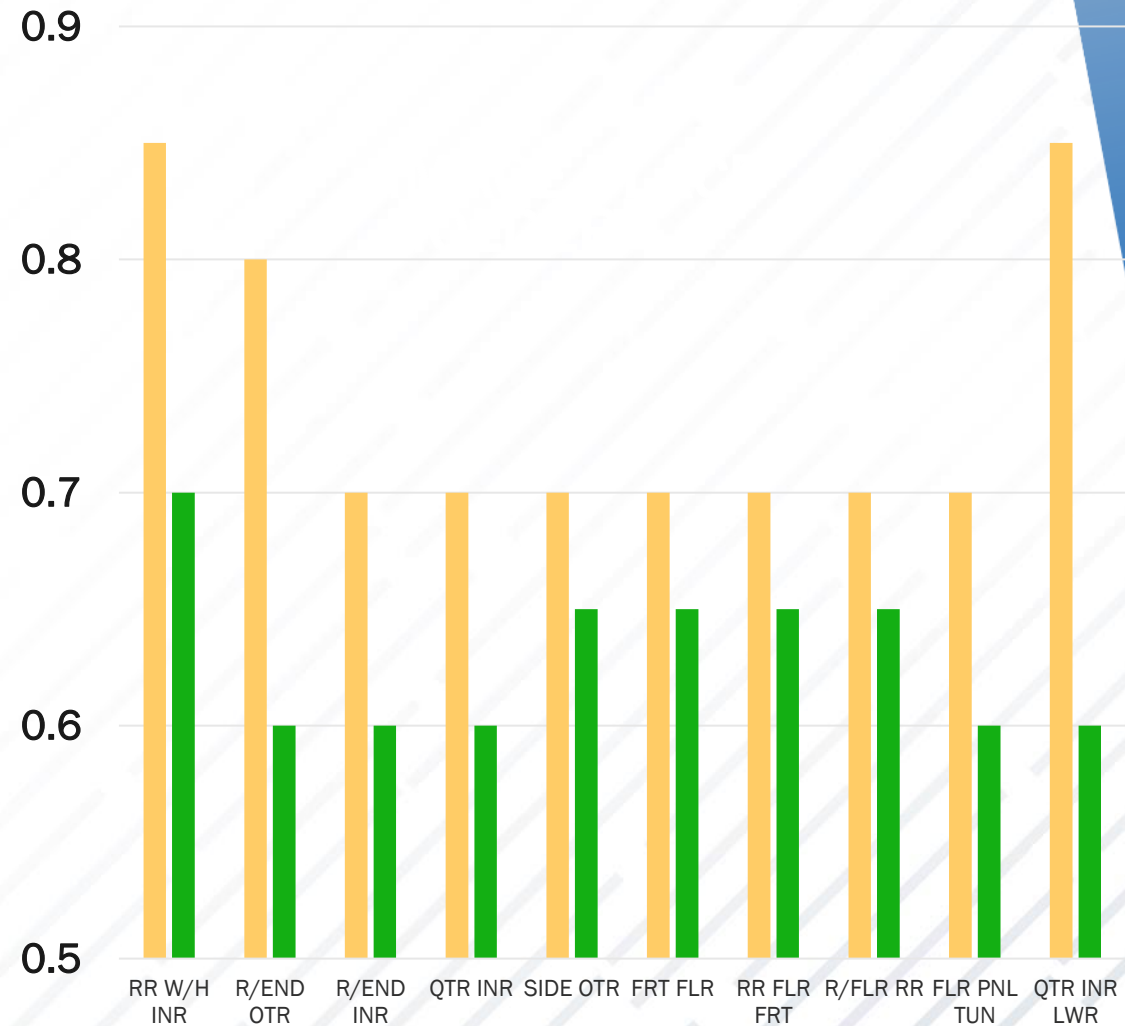
PANEL GAUGE REDUCTION

- Material Optimization
 - ❖ Multi-Disciplinary Optimization
(Best Material Grades & Gauge Selection)
 - ❖ Intensive CAE Formability Iterations
 - ❖ Large Panels Significantly Reduced in Gauge with No Performance Loss

Weight Reduction : -13.6kg



Thickness Comparison



CRASHWORTHINESS DESIGN

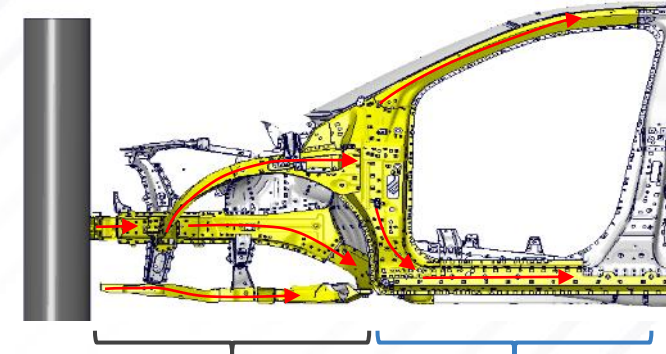
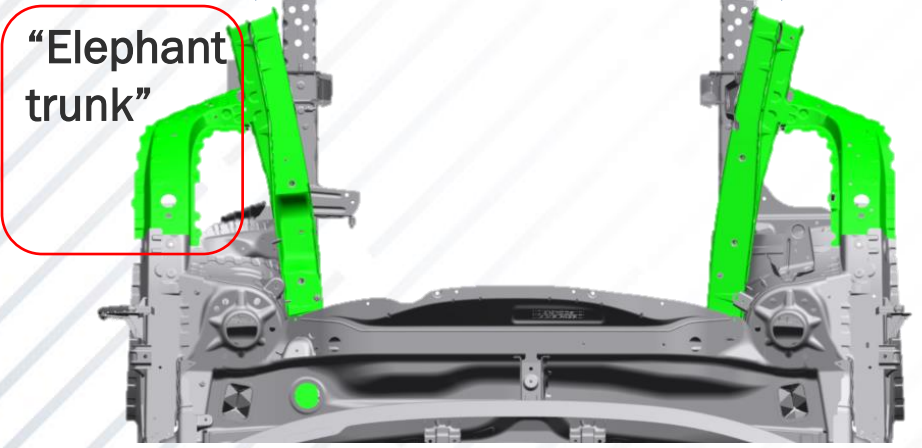
- Design Optimization

- ❖ Splayed Front Rail
- ❖ “Elephant Trunk” Upper to Lower Rail
- ❖ Bulkheads in Sections for Localized Stiffness and Buckling Resistance

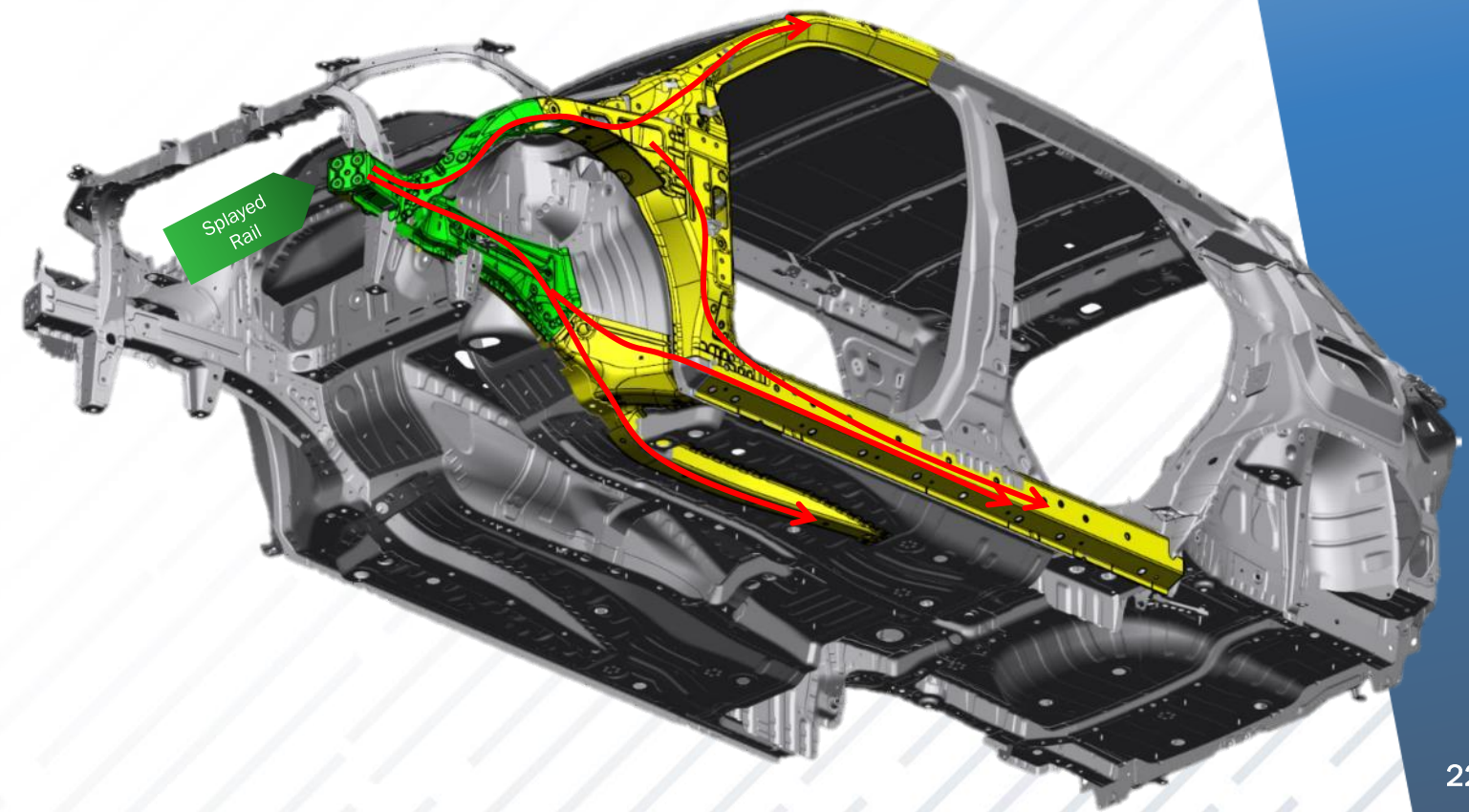
- Material Optimization

- ❖ Tailored Rolled Blank Part
- ❖ Tailored Welded Blank Part
- ❖ UHSS MP1180, MS1500

← Splayed Rails →



Energy absorption zone Protection zone



ENERGY ABSORPTION ZONE DESIGN

- Design Optimization

- ❖ Splayed Front Rail

Better Engagement For Small Offset

Multi bending points

- ❖ Elephant Trunk

Continuous Connection

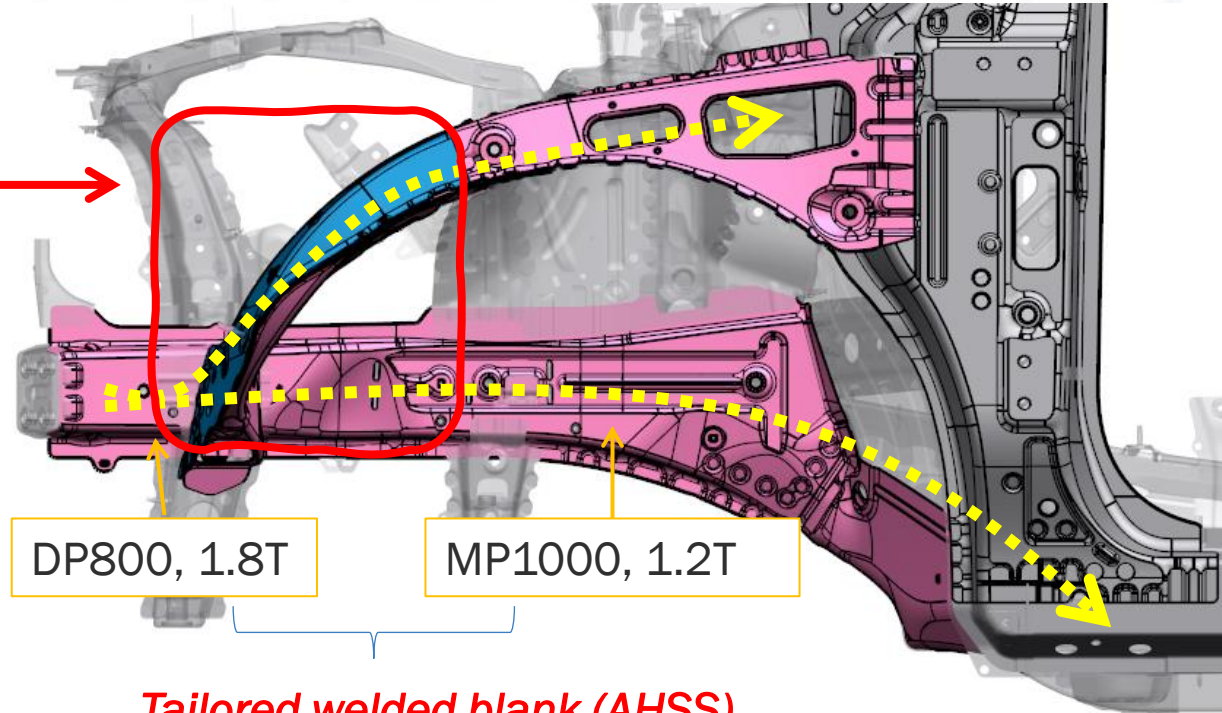
New Load Path to Upper Rail

Increased Stiffness

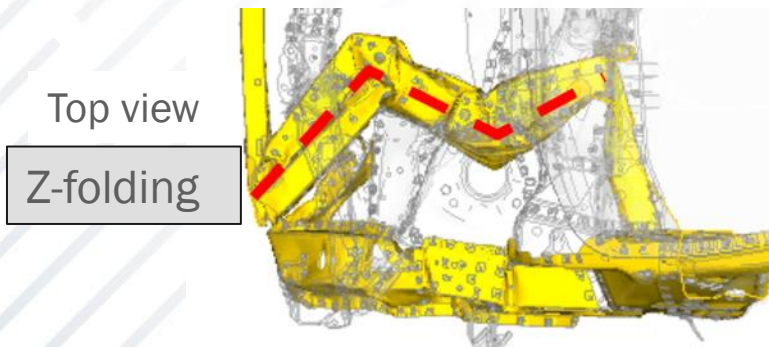
- Material Optimization

- ❖ Engineered Blank

TWB : Multi Grade and Thickness



Tailored welded blank (AHSS)

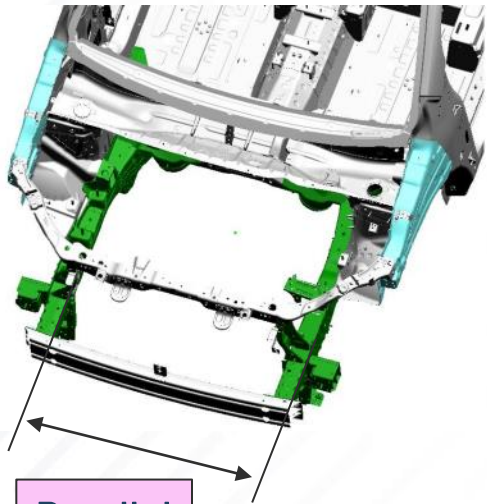


Top view

Z-folding

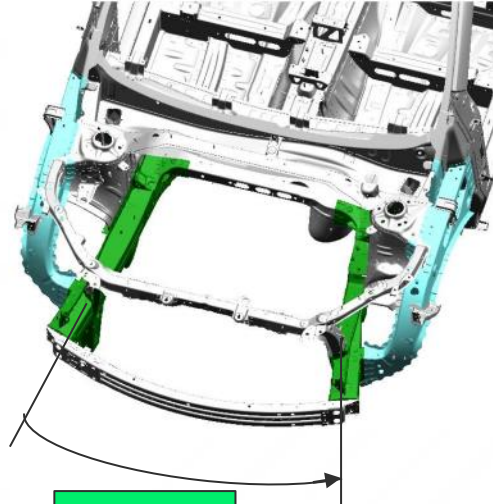
SMALL OFFSET PERFORMANCE

- *New Frontal Rail Design, Performance : Good !!!*



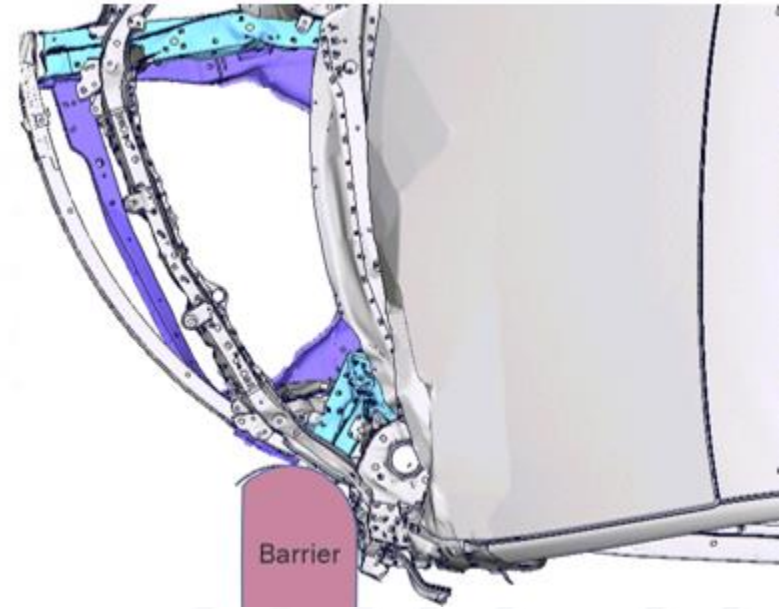
Parallel

Previous Architecture



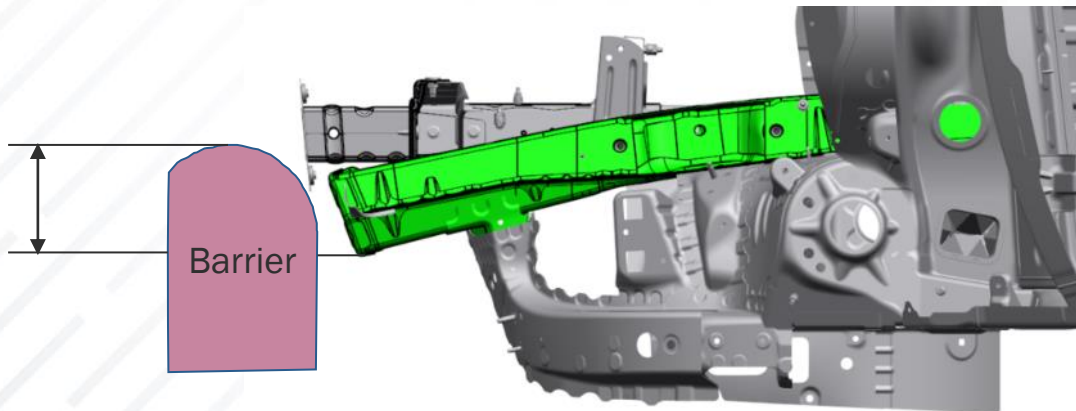
Splayed

Trailblazer



Barrier

Front Rail Engaging to Barrier



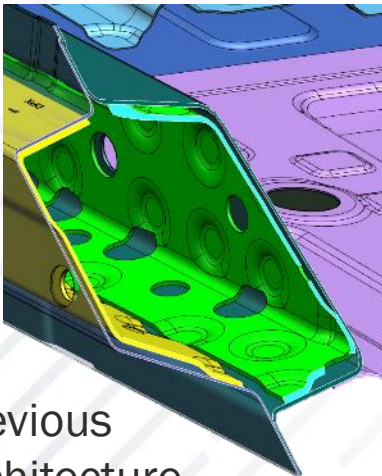
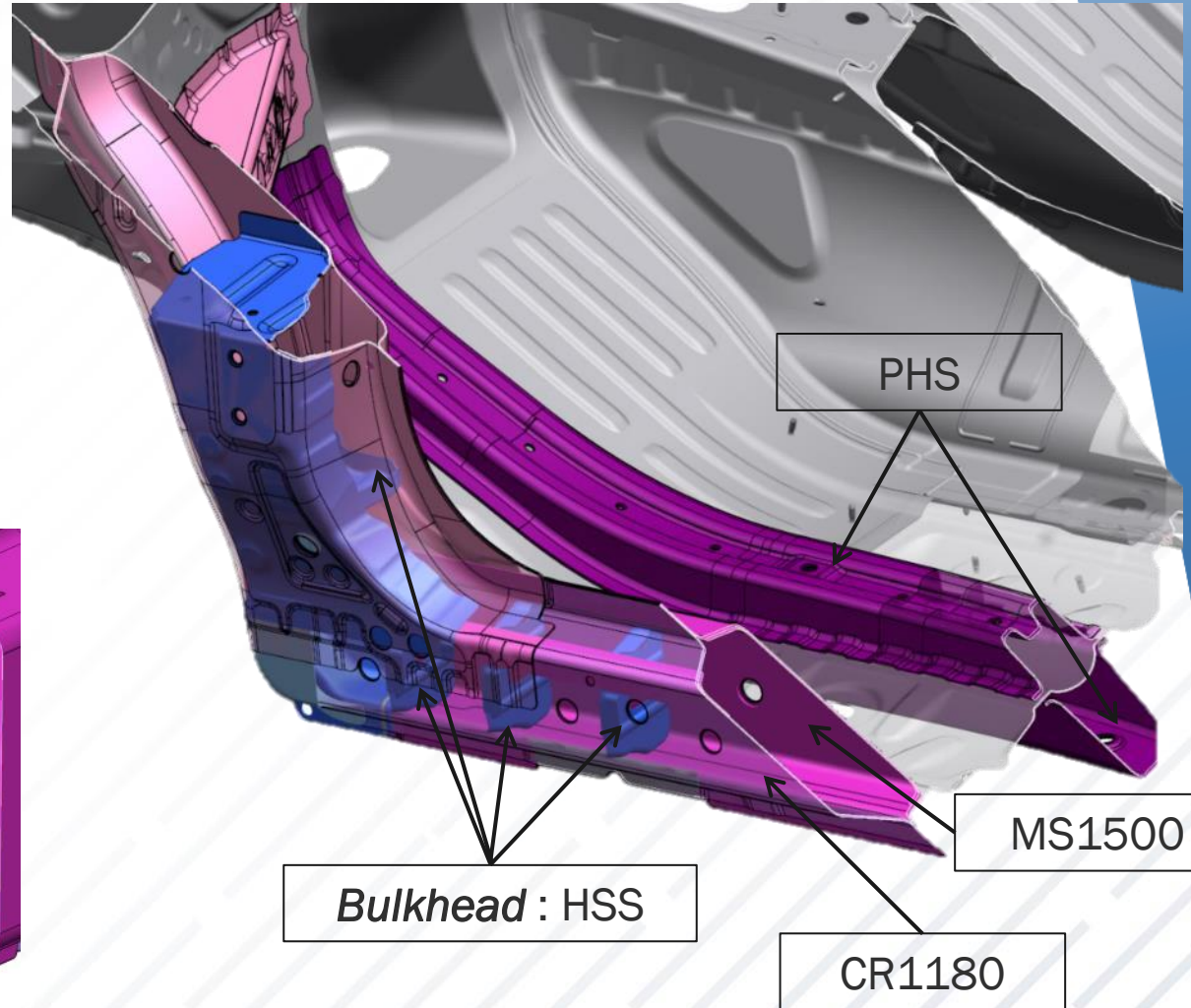
Barrier

PROTECTION ZONE DESIGN

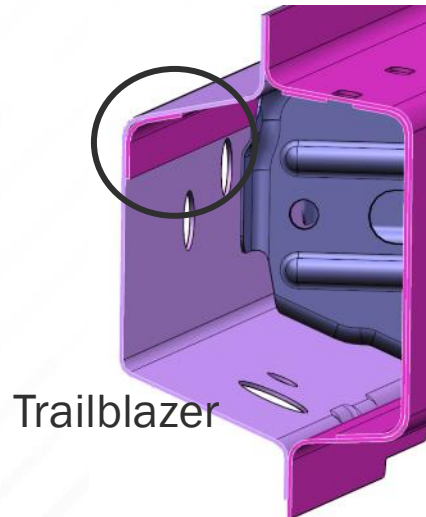


- Design Optimization
 - ❖ Bulkhead Structure: Sustains Sections
 - ❖ Strip Reinforcement: Stabilizes Corner
- Material Optimization
 - ❖ UHSS MP1180 & MS1500 for Rocker
 - ❖ TRB for Dash Lower REINF
 - ❖ Hinge Pillar Inner Upgrade

Weight Reduction : 11.22kg



Previous Architecture



Trailblazer

RESISTANCE PROJECTION WELDING

- Manufacturing process : New to GM Korea



Trailblazer

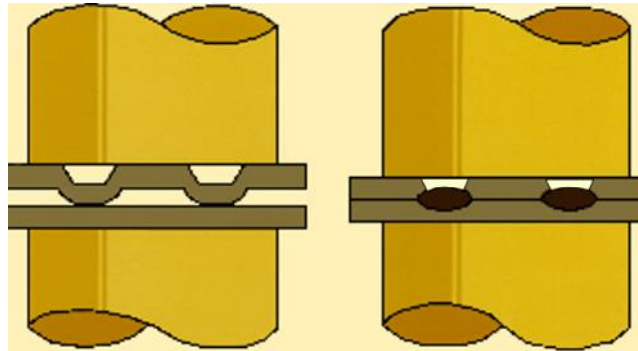
No Weld marks



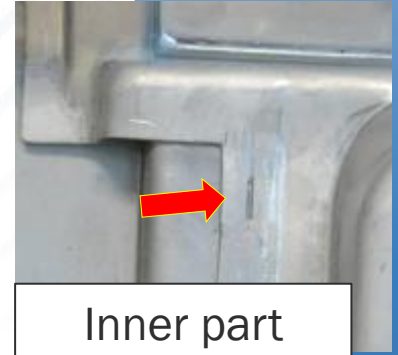
Previous Architecture

Exposed Spot Welds

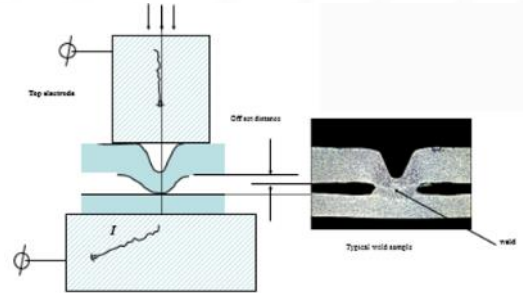
<Dimple>



Outer part



Inner part



<Welding>

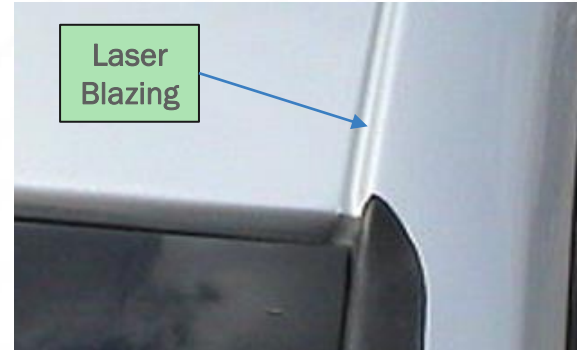


ROOF LASER BRAZING

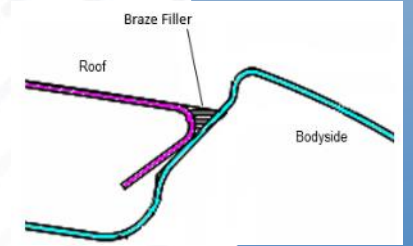
Clean, Aesthetically Pleasing Joint for Customers!!



Previous Architecture



Trailblazer



Manufacturing Process

Laser Brazing



Robotic Grinding



Inspection & Repair



TRAILBLAZER BODY STRUCTURE

- Summary

- ❖ Developed on New Modular Architecture
- ❖ Advanced Steel Grade Application Increased Over Previous Generation
- ❖ Engineered Blanks
- ❖ High Efficiency Joint Construction
- ❖ Optimized Panel Gauges
- ❖ New Frontal Crash Design Concept
- ❖ New manufacturing Processes : RPW, Laser Braze Roof



FOR MORE INFORMATION

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THANK YOU