GREAT DESIGNS IN STEEL

TRAILBLAZER BODY STRUCTURE

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TRAILBLAZER INTRODUCTION

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

-10%

Previous architecture

Trailblazer

+85mm
+170mm
+35mm
BODY STRUCTURE EFFICIENCY

**Global Torsional Stiffness**

Previous Architecture

<table>
<thead>
<tr>
<th>Trailblazer</th>
<th>Better Efficiency!!</th>
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<tbody>
<tr>
<td>2.96</td>
<td>+18%</td>
</tr>
<tr>
<td>4.11</td>
<td>+28%</td>
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**Body Structure Efficiency**

\[
\text{Body weight (kg)} = \frac{\text{Area (m}^2\text{)} \times \text{Torsional Stiffness (}kN \cdot m\text{/deg)}}{}
\]
RIGHT MATERIAL IN RIGHT PLACE

- Material breakdown by grade

MILD STEEL

HSS BH

HSS LA

AHSS

UHSS MS

UHSS MP

PHS

Material breakdown by grade:
- MILD STEEL: 6%
- HSS BH: 4%
- HSS LA: 3%
- UHSS MS: 29%
- UHSS MP: 27%
- AHSS: 19%
- PHS: 12%
STEEL GRADES COMPARISON

• Previous Architecture

• Trailblazer

AHSS Doubled 23% → 42%
ENGINEERED BLANKS

PHS, Patch Blank

Multi-material and gauge parts
TWB

PHS, TRB

Multi Gauge, TWB

420LA DP800 MP1000
ENGINEERED BLANK

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

![Typical Double Sealed Joint](image)
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 Lowers
  - Improved Stiffness
  - Reduced Mass by -8.8 kg
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
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

“Elephant trunk”
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)
  - DP800, 1.8T
  - MP1000, 1.2T

Top view

Z-folding
SMALL OFFSET PERFORMANCE

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

- Parallel
- Previous Architecture
- Splayed
- Trailblazer
- 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
RESISTANCE PROJECTION WELDING

- Manufacturing process: New to GM Korea

Trailblazer

No Weld marks

Previous Architecture

Exposed Spot Welds

<Welding>

Outer part

Inner part

<Dimple>
ROOF LASER BRAZING

Clean, Aesthetically Pleasing Joint for Customers!!

- Manufacturing Process
  - Laser Brazing
  - Robotic Grinding
  - Inspection & Repair

Previous Architecture

Trailblazer
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
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