GREAT DESIGNS IN STEEL

2021 ACURA TLX

Jeremy Lucas
Honda Body Design Project Leader
Honda Development & Manufacturing of America

HDMA Focus

Development

Sales

Manufacturing
North American Auto Development Center Campus

- Location: Raymond, Ohio
- Size of Building: +1.6 million sq. ft.
- Number of Associates: 1,600+
- Began operations in current building: 1993
- Started operations in Ohio: 1984
Grand Concept

**DESIGN**
NEAR-EXOTIC STANCE AND PROPORTION

**EXPERIENCE**
ADVANCED SPORT COCKPIT

**PERFORMANCE**
EMOTIONAL DYNAMICS AND TYPE S

IMMEDIATE WOW

IMMEDIATE PLEASURE

IMMEDIATE EXCITEMENT
**Emotional STANCE**

- Low & Wide
- Large, Powerful Shoulders
- Large Wheels / Tires

- Performance Inspired Long Dash to Axle
- Sleek Personal Cabin

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**Dual Personal Space**

- Front: 1625 (+30)
- Rear: 1640 (+40)
- Total: 3265 (+70)

**Long Hood**

- Front: 2869 (+94)
- Rear: 1063 (-2)
- Total: 3932 (+92)

**Low & Wide**

- Front: 1910 (+55)
- Rear: 1010 (+5)

**OAD +15**

- Front: 4942 (+97)

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Dimensions in millimeters.
Exclusive Sport Sedan Platform

- Improved Weight Distribution
- Ultra-Stiff Body Rigidity
- 4th-Generation Super Handling All-Wheel Drive
- NSX-Derived Electro-Servo Brake
- Double Wishbone Front Suspension
- 2.0 Turbo L4
- 3.0 Turbo V6
## Platform Packaging Items

<table>
<thead>
<tr>
<th></th>
<th>Electro-Servo Brake</th>
<th>Double Wishbone Front Suspension</th>
<th>AWD System Mounts</th>
<th>Rigidity</th>
<th>ACE™ Body Structure</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2.0T FWD</strong></td>
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<tr>
<td><strong>2.0T SH-AWD</strong></td>
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<td>○+</td>
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<tr>
<td><strong>3.0T SH-AWD</strong></td>
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<td>○</td>
<td>○</td>
<td>○++</td>
<td>○</td>
</tr>
<tr>
<td><strong>Type S</strong></td>
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</tbody>
</table>
Exterior Challenges

- Side Panel Manufacturability
- Aluminum Hood Sharp Radius
- Laser Braze Roof
Exterior Challenges

- Side Panel Manufacturability
- Aluminum Hood Sharp Radius
- Laser Braze Roof
Styling Impact on Design

- Overall body width increased
- Depth and hip increased
- Rear fender angle is 30.3° from horizontal
- With only 4 stages in the SPO die, the styling created challenging fuel fid forming
Styling Impact on Fuel Lid

- Styling Angle caused fuel lid clearance issues during stroke
- Required pull cam / drop cam on a move unit
- Part of rough trim became final trim to allow for water drainage

Typical Acura Manufacturing Process

2021 Acura Manufacturing Process
Laser Braze Roof

ACURA FIRST

+ Appearance
+ Manufacturing Efficiency
+ Quality
+ Durability

Previous TLX
Molding

2021 TLX
Laser Brazing
Laser Braze Roof

Manufacturing Efficiency

- Honda-original 2-beam laser tool
  - **Front Beam**: Preheating to remove GA layer (cleans)
  - **Rear Beam**: Braze with Cu alloy filler material
- **Process time**: 44 seconds/unit (1000 UPD/line)
Laser Braze Roof

Quality

- Seam tracking system with Servo Robot
- Welding heat control
- 2 pass polishing with Active Contact Flange (ACF) to apply constant pressure
- No pre-cleaning of flanges

Brazing Length 2.9m/unit
Laser Braze Roof

Durability

- **Structural braze** improves body rigidity

Brazing Length
2.9m/unit
Platform Architecture
Platform Architecture

Unique Acura Sedan Platform
Support dynamic concept

High-Rigidity Body
Make best use of double wishbone front and multi-link rear suspension setups

Powertrain Flexibility
Support 2.0T & 3.0T engines
Support FWD & SH-AWD drivetrains
Carryover Technologies

One-Piece Hot Stamp Door Ring

Magnesium Steering Hanger Beam

Factory Spray Foam of Body Cavities
Front Damper Housing Casting

Multi-Layer Galvanic Corrosion Protection

E-Coat Applied Prior to SPR
Primary isolation between dissimilar materials

Dust sealer at both sides of the joint and SPR heads
Barrier to water entry

Multi Material Joint Construction for Direct Water Splash Area

1. E-Coat (before joined)
2. Dust Sealer
3. Dust Sealer On SPR Head
4. SPR Coating
5. Adhesive

Cast Aluminum
- 590MPa or Above
- 270MPa
Front Damper Housing Casting

Mechanical Fastening

54 Self-Piercing Rivets (SPR) per damper housing
- 3 SPR lengths
- 2 and 3 sheet stacks

Nut plates hold mechanical fasteners
- Steel nut plates applied with blind rivets
- Nut plates are e-coated before assembly

SPR Locations

- Cast Aluminum
- 590MPa or Above
- 270MPa
Improved Mechanical Fastener Accuracy

Mechanical fasteners attached to castings by nut plates attached with blind rivets

Pilot weld nuts ensure high accuracy positioning directly off machined casting hole

Tolerance absorbed on blind rivet hole

- Al Casting
- Steel Stamping
- Projection welded Nut
- Pop Rivet
- DWB Suspension Arm
- Al Casting
- Projection Welded Nut with Pilot
- Pop Rivet
- Steel Stamping
Front-End Architecture

Next-Generation ACE™ Body Structure

**Cast-Aluminum Front Damper Mount**
- Bonded to a steel structure

**Front Side Frame**
- Lower load path to floor and door ring

**Upper Frontal Structure**
- Upper load path to door ring

**Deep Center Tunnel**
- with upper reinforcements
  - Impact Performance
  - Body Rigidity

**Cross-Car Load Path**
- for oblique frontal impact
  - 980MPa center
  - 1500MPa hot stamp integrated into outer shear plate
Floor Architecture combines high rigidity with crash load control & dispersion.

Top View

- Full Cross-Car Load Paths
- High, Rigid Center Tunnel
- Full Connection to Mid Floor

Legend:
- Crash Longitudinal
- Crash Cross Car
- Body Rigidity
Floor Architecture combines high rigidity with crash load control & dispersion.
Floor Architecture combines high rigidity with crash load control & dispersion.
Floor Architecture combines high rigidity with crash load control & dispersion.

SH-AWD Bottom View

Mid Floor Cross Member Internal Reinforcement

Front

Rear

Crash Longitudinal
Crash Cross Car
Body Rigidity
Bolt-On Bracing
Body Material Usage

Composition %

Previous TLX

- Al Extrusion – 6XXX: 4.4%
- Al Sheet – 5XXX: 2.2%
- Al Sheet – 6XXX: 8.3%
- Al Casting: 34.1%
- Mild Steel: 46.8%

2021 TLX

- Al Extrusion – 6XXX: 2.6%
- Al Sheet – 5XXX: 1.3%
- Al Sheet – 6XXX: 9.5%
- Al Casting: 32.2%
- Mild Steel: 17.0%

Composition %

- Press Hardened Steel: 34.1%
- High Strength Steel: 4.2%
- Advanced High Strength: 8.3%
- Mild Steel: 46.8%

mild steel -> 270; high strength -> 340,440,590; advanced -> 780,980; press hardened -> 1500
Body Rigidity
Body Rigidity

Equivalent Dynamic Performance Trend With Changing Weight

Increasing Dynamic Performance Trends and Changing Weight
Body Rigidity

**Previous TLX**

**Bolt-On Gussets**
- Higher weight and investment at an equivalent performance level
- Lower rigidity
- Restricted cargo pass-through area

**2021 TLX**

**Welded Ring Structure**
+ Saves 8kg (over Type S targets)
+ Higher rigidity
+ Increased cargo pass-through area
Super Handling Body Rigidity

Super-Handling Capability Realized with Dynamic-Focused Rigid Body Structure

Rear Damper Torsion
+90%

Rear Tire Patch Lateral
+100%

Body Rigidity Metrics

<table>
<thead>
<tr>
<th></th>
<th>% Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Front</td>
<td></td>
</tr>
<tr>
<td>Tire Patch Lateral</td>
<td>+129%</td>
</tr>
<tr>
<td>Damper Torsion</td>
<td>+15%</td>
</tr>
<tr>
<td>Floor Bending</td>
<td>+30%</td>
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<tr>
<td>Rear</td>
<td></td>
</tr>
<tr>
<td>Tire Patch Lateral</td>
<td>+100%</td>
</tr>
<tr>
<td>Damper Torsion</td>
<td>+90%</td>
</tr>
<tr>
<td>Damper Bending</td>
<td>+133%</td>
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</tbody>
</table>
Performance Body Structure

- **Shock tower bars**: Triangulated design increases rigidity by 17%.
- **Welded stiffener ring**: Enhanced rear torsional stiffness +10% larger trunk pass through.
- **Underbody Braces**: +7.9% rear torsional stiffness +4.6% rear bending stiffness.
- **Ultra-stiff center tunnel**: Type S levels of rigidity + collision safety performance.
- **Cast aluminum damper mounts**: Rigid foundation for DW suspension.
- **High-performance structural adhesive**: Most extensive application ever for Acura (29 meters).
Type S Body Rigidity

Exclusive Parts
Realized high body stiffness with minimum impact to standard TLX body and weight

Body Rigidity Metrics

<table>
<thead>
<tr>
<th>Part</th>
<th>21M vs 20M</th>
<th>Type S vs AWD</th>
<th>Type S vs 20M</th>
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</thead>
<tbody>
<tr>
<td>Tire Patch Lateral</td>
<td>+129%</td>
<td>+10%</td>
<td>+152%</td>
</tr>
<tr>
<td>Damper Torsion</td>
<td>+15%</td>
<td>+7%</td>
<td>+24%</td>
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<tr>
<td>Floor Bending</td>
<td>+30%</td>
<td>+5%</td>
<td>+37%</td>
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<tr>
<td>Tire Patch Lateral</td>
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<td>+2%</td>
<td>+104%</td>
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<td>Damper Torsion</td>
<td>+90%</td>
<td>+24%</td>
<td>+136%</td>
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<tr>
<td>Damper Bending</td>
<td>+133%</td>
<td>+4%</td>
<td>+141%</td>
</tr>
</tbody>
</table>
Safety
Advanced Safety Structure

ACE™ Body Structure
Frontal collision compatibility with vehicles of different sizes and ride heights

Ultra-high-strength dash lower & Dash crossmember
Improved crash-energy management for oblique-angle collisions

Increased floor rigidity with additional load path
Improved crash-energy management for oblique-angle collisions

MY 2021 TARGETS

GOOD all collision safety ratings
GOOD standard headlight rating
SUPERIOR front crash prevention
Vehicle-vehicle, vehicle-pedestrian

5-STAR overall vehicle score

High Strength Steel 340, 440, 590 MPa
Advanced High Strength Steel 780, 980 MPa
Press Hardened Steel 1500 MPa
ACE™ Body Structure

The new platform evolved the ACE body structure by efficient energy management while maintaining the core concepts:

- Self Protection
- Partner Protection

A-Pillar Load Capacity  +20%

Sill Load Capacity  +20%

Subframe Energy Absorption (New)
Conclusion
2021 Acura TLX
THANK YOU

Jeremy Lucas
Honda
Body Design Project Leader – 2021 Acura TLX