The LX BIW Structure
A
Great "Steel" Design

Thomas N. Seel
DaimlerChrysler

LX BIW Structure
A
Great "Steel" Design

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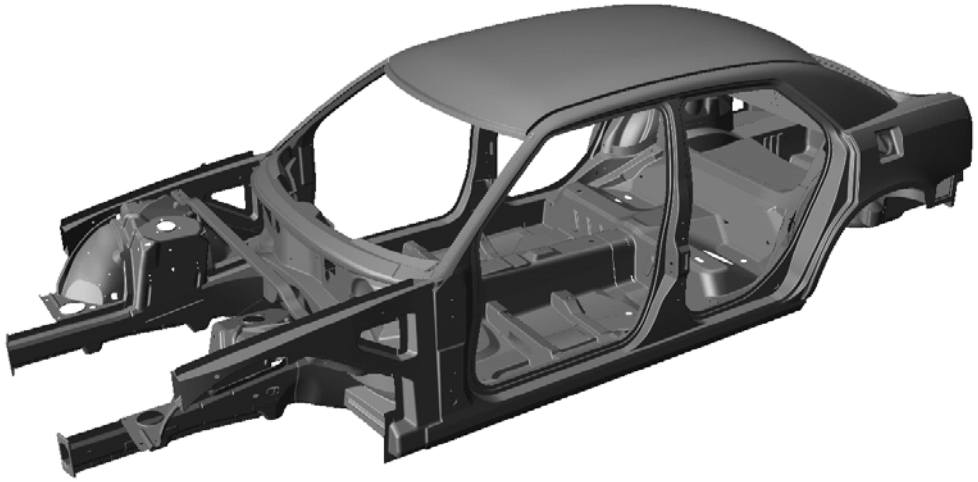
DaimlerChrysler

What Defines a "Great BIW Design"

- **Looks (Styling)**
- **Light Weight (materials/construction)**
- **Structural Performance**
- **Flexible Manufacturing Process**
- **Low Cost ($)**



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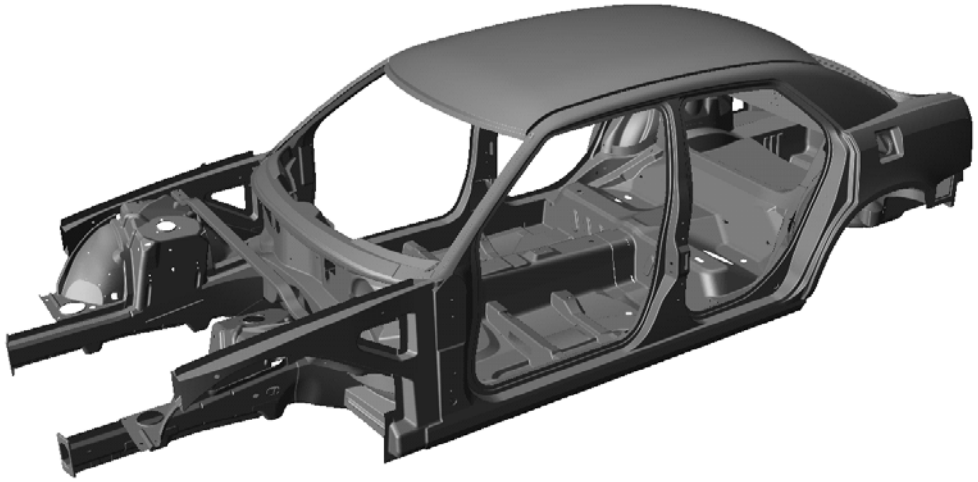

Looks (Styling) : The all new Chrysler 300

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A new Classic Proportion for Chrysler

1955 C300 ——— *50 years* ———→ **2005 300C**

300 C	**5.7L Hemi V8 (340hp)**
300 Touring	**3.5L V6**
300	**2.7L V6**

Start of Production: February 2004, in showroom: April 2004

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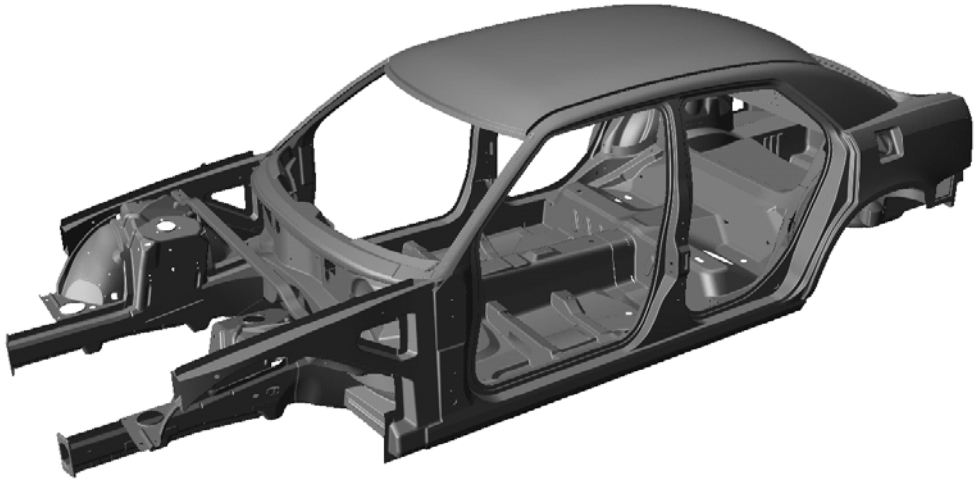
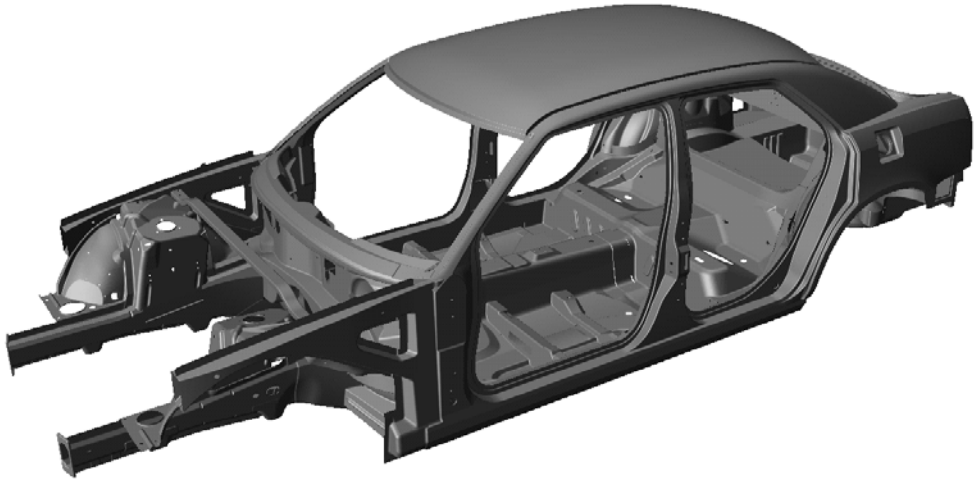
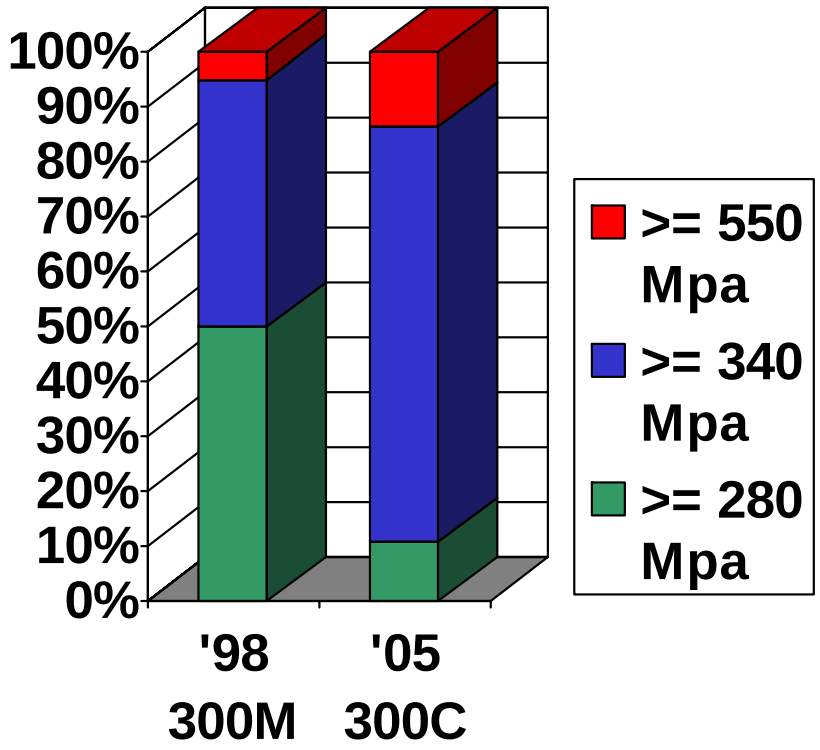


- **Light Weight (Materials/ Construction)**
  - **HSS Steel**



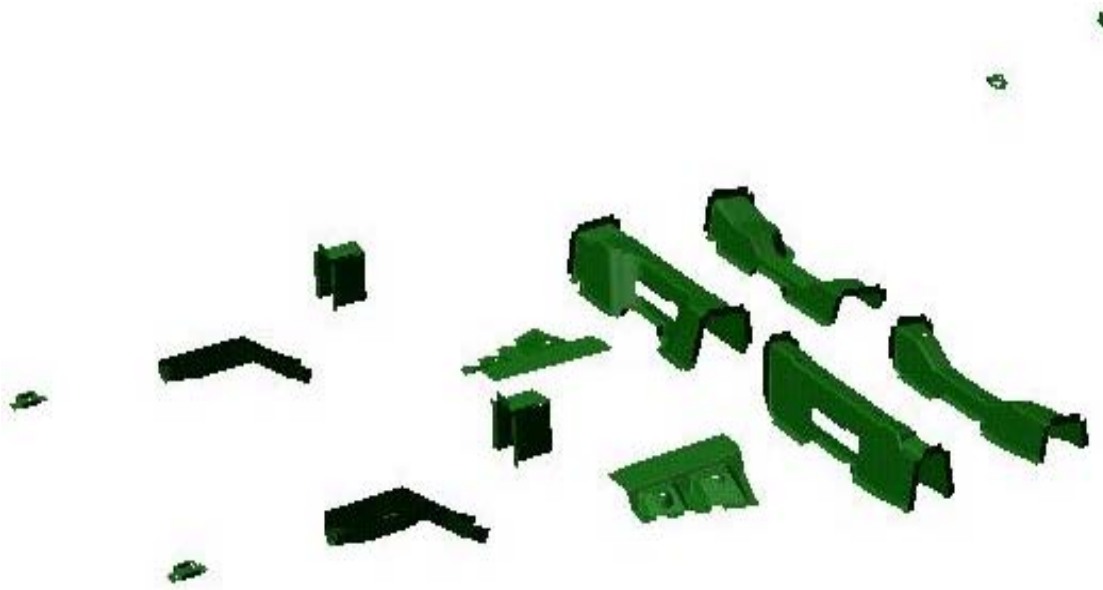
Light Weight : Materials / Construction

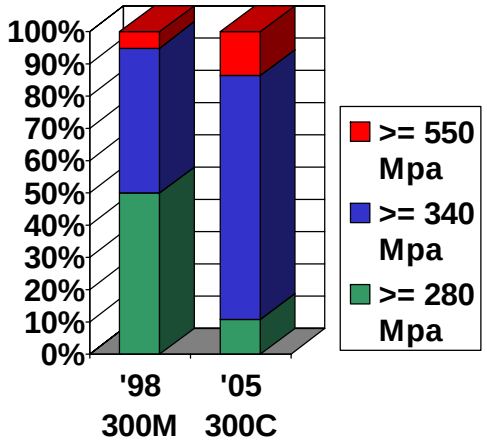
- Near Double Parts with High Strength Steel (HSS)
  - ’98 20% HSS
  - ’05 37% HSS
- Dual Phase Steel for Front Rails



Light Weight : Materials / Construction

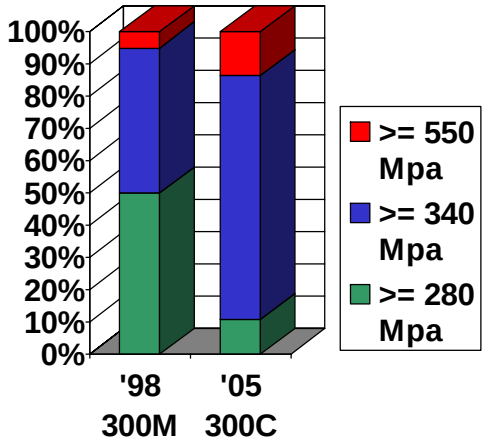
05 LX HSS Part <= 280 MPa Yield





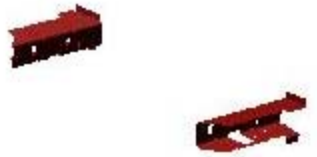
Light Weight : Materials / Construction

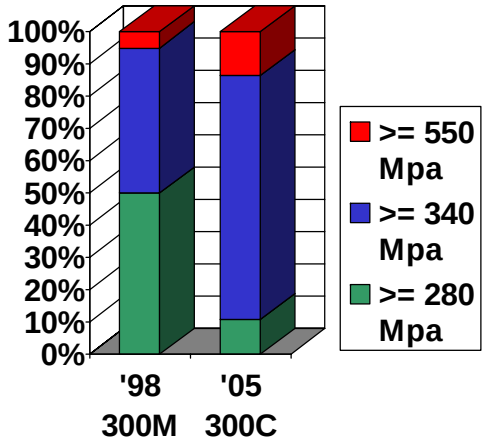
05 LX HSS Parts >= 340 MPa Yield



Light Weight : Materials / Construction

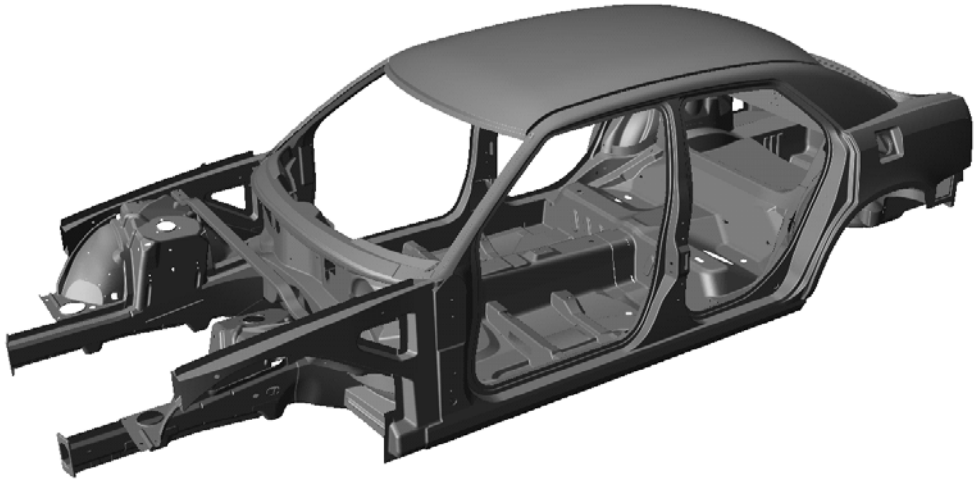
05 LX HSS Parts >= 550 MPa Yield





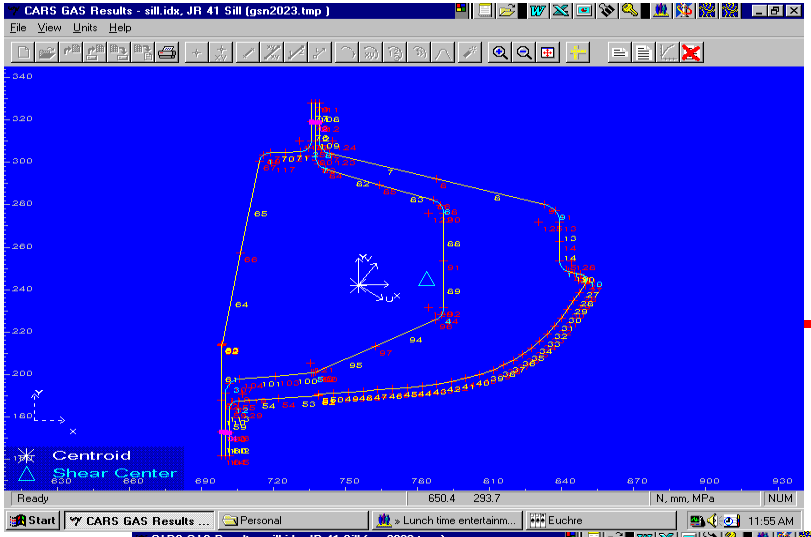
Light Weight (Materials/ Construction)

- HSS Steel
- **Construction : Section Design**



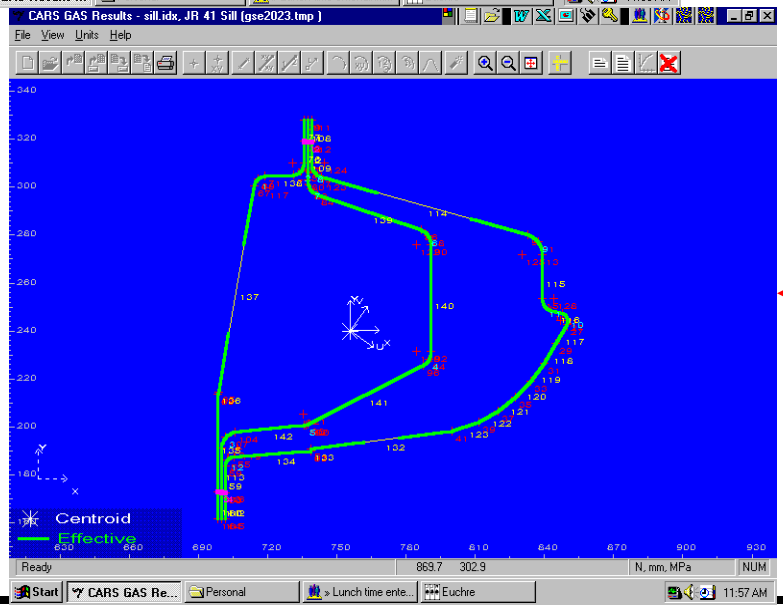
Light Weight : Materials / Construction

Nominal
Ip1:2.299 X10^6 mm^4
Ip2:1.351 X10^6 mm^4
A :888 mm^2



ASPP
CARS/GAS

Delta %
Ip1: 7.2%
Ip2: 8.0 %
A: 8.0%



Effective
Ip1: 2.132 X10^6 mm^4
Ip2:1.243 X10^6 mm^4
A: 817 mm^2

Light Weight : Materials / Construction

Variable Section Kick-Up C/M

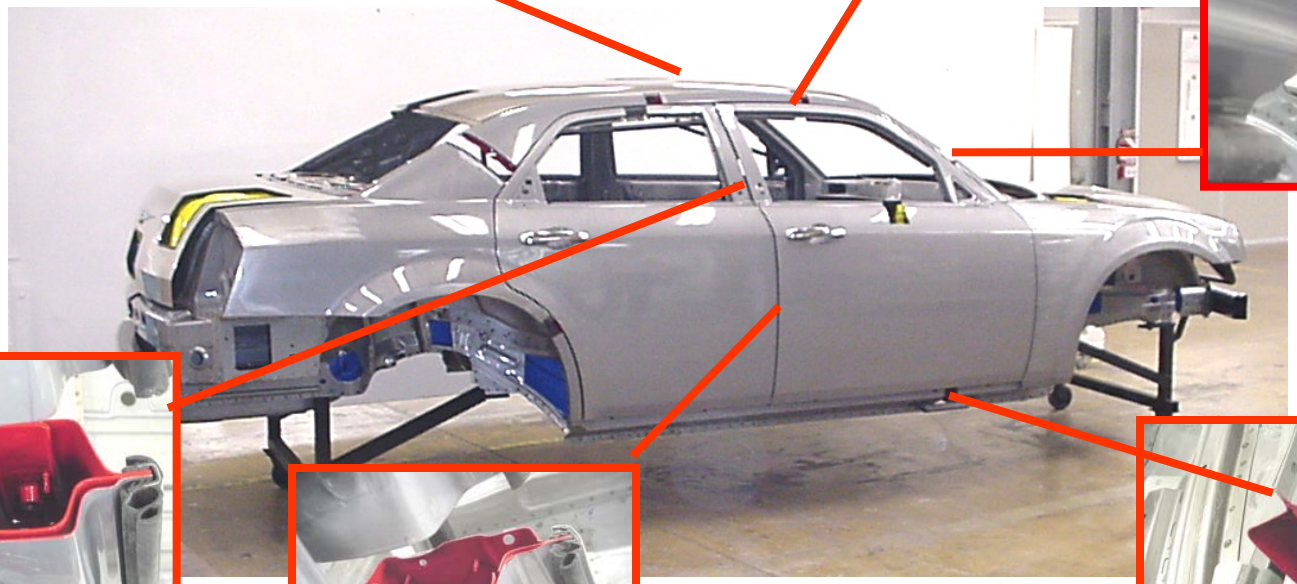
Octagon Shape Front Rail

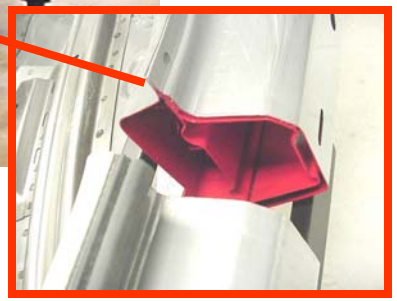
Double C-Section Rear Rails

Light Weight : Materials / Construction

Load Bearing Roof Bow

3 Layer Body Side Sections

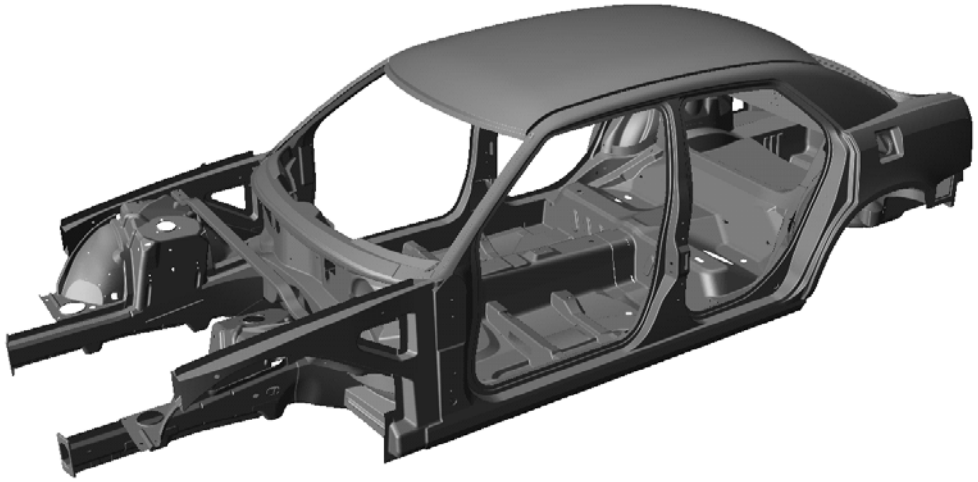




Constant Moment B-Pillar

Internal Shear Plate Sill

- **Light Weight (Materials/ Construction)**
  - HSS Steel
  - Construction : Section Design
  - **New Technology**

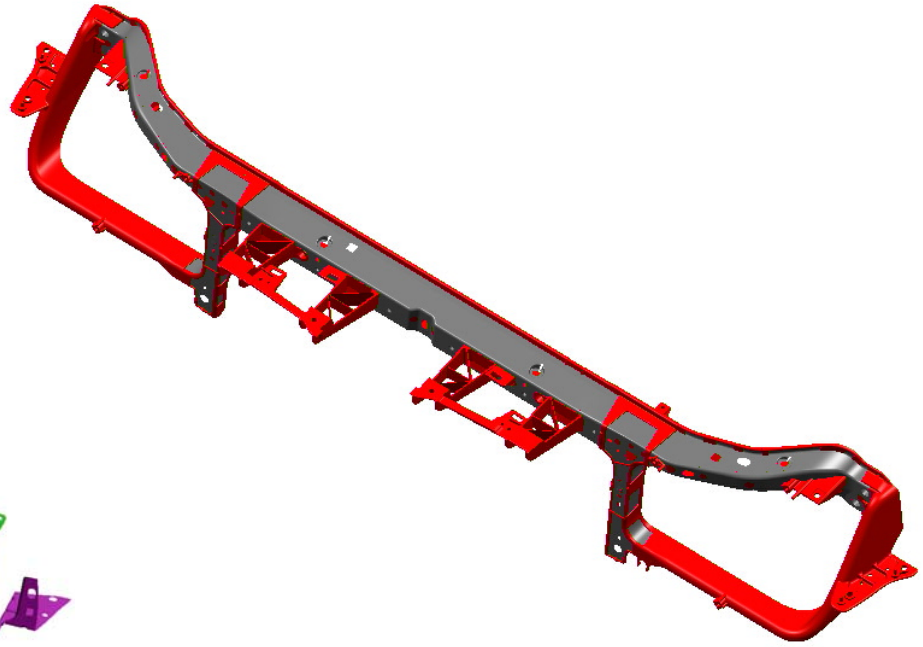


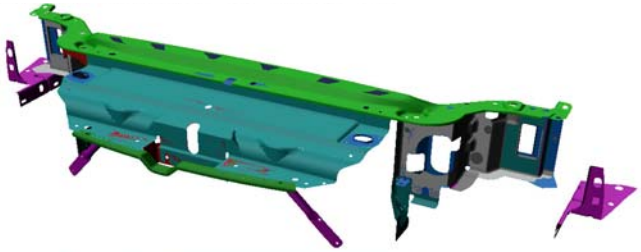
Light Weight : Materials / Construction

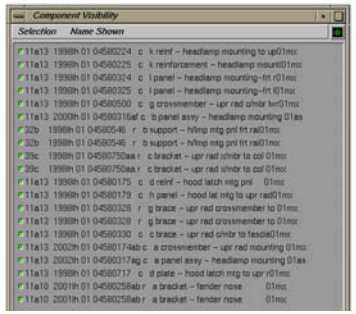
05LX Headlamp Mounting Crossmember (HMC)

Metal / Plastic Hybrid
Weight = 16 lbs. savings

Variable cost neutral
Investment = $6.8M savings
Improved Build Tolerances

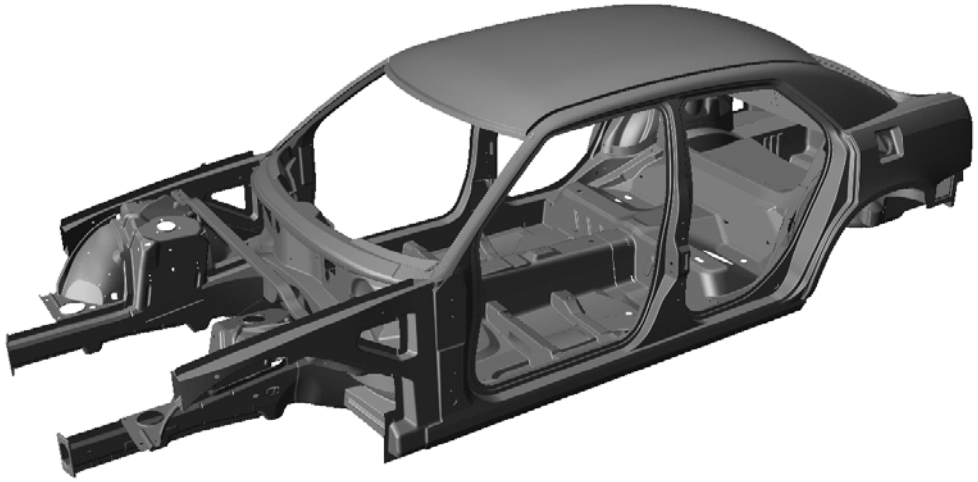






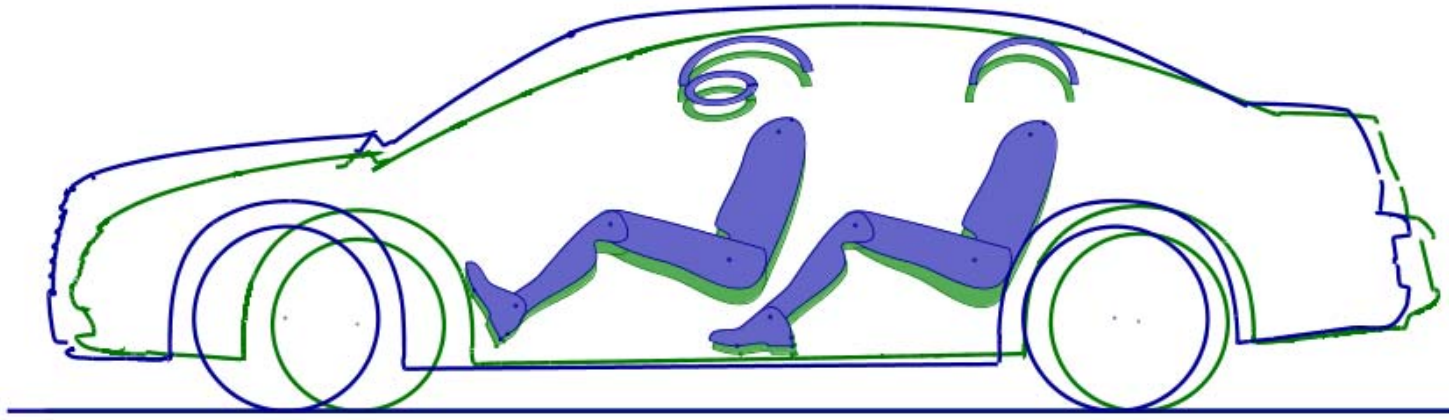
What Defines a "Great BIW Design"

- **Light Weight (Materials/ Construction)**
  - **Bottom line ?**



Light Weight : Materials / Construction

LX 300C vs LH 300M



EXTERIOR HARD PTS mm (in)	Chrysler 300C	Chrysler 300M
Length.	5,001 (196.9)	5,023 (197.8)
Width	1,881 (74.1)	1,892 (74.5)
Height	1,483 (58.4)	1,422 (56.0)
Wheel Base	**3,048 (120.0)**	**2,870 (113.0)**
Frt Track	**1,600 (63.0)**	**1,573 (61.9)**
Rr Track	**1,603 (63.1)**	**1,565 (61.6)**
Frt Over Hang	876 (34.5)	1,054 (41.5)
Rr Over Hang	1,078 (42.4)	1,100 (43.3)

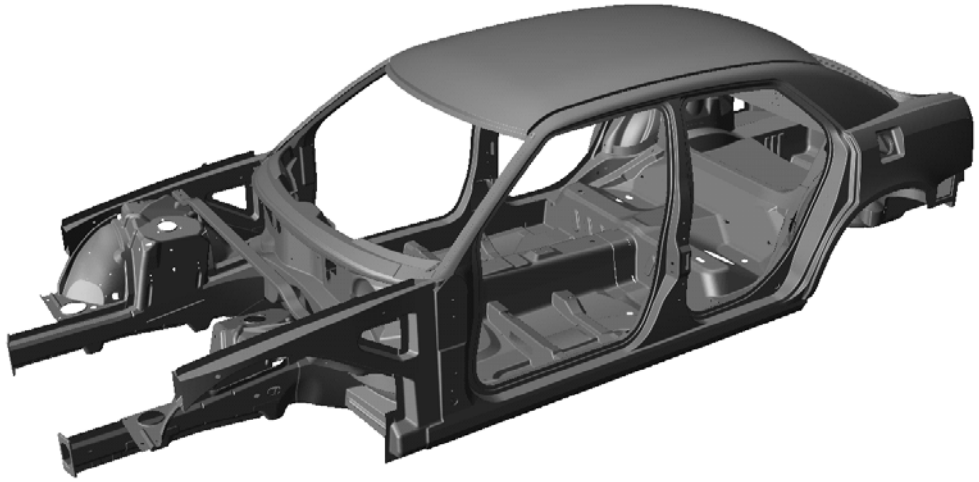
7” longer WB
1.5” wider track
RWD vs. FWD
Improved Safety Cage
Upgraded NVH

Light Weight : Materials / Construction

	LX		Benchmark #1 RWD	Benchmark #2 FWD
Body Shell Weight lbs.	914.8		880.0	829.0
Interior Volume ft^3	118.8		114.8	110
Weight/Interior Volume	7.7		7.7	7.5

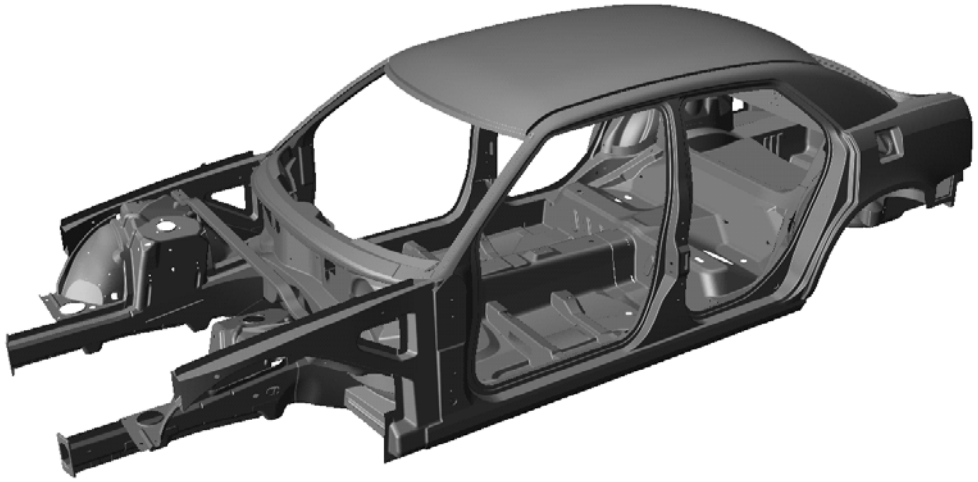
What Defines a "Great BIW Design"

- Looks (Styling)
- Light Weight (Materials/Construction)
- **Structural Performance**

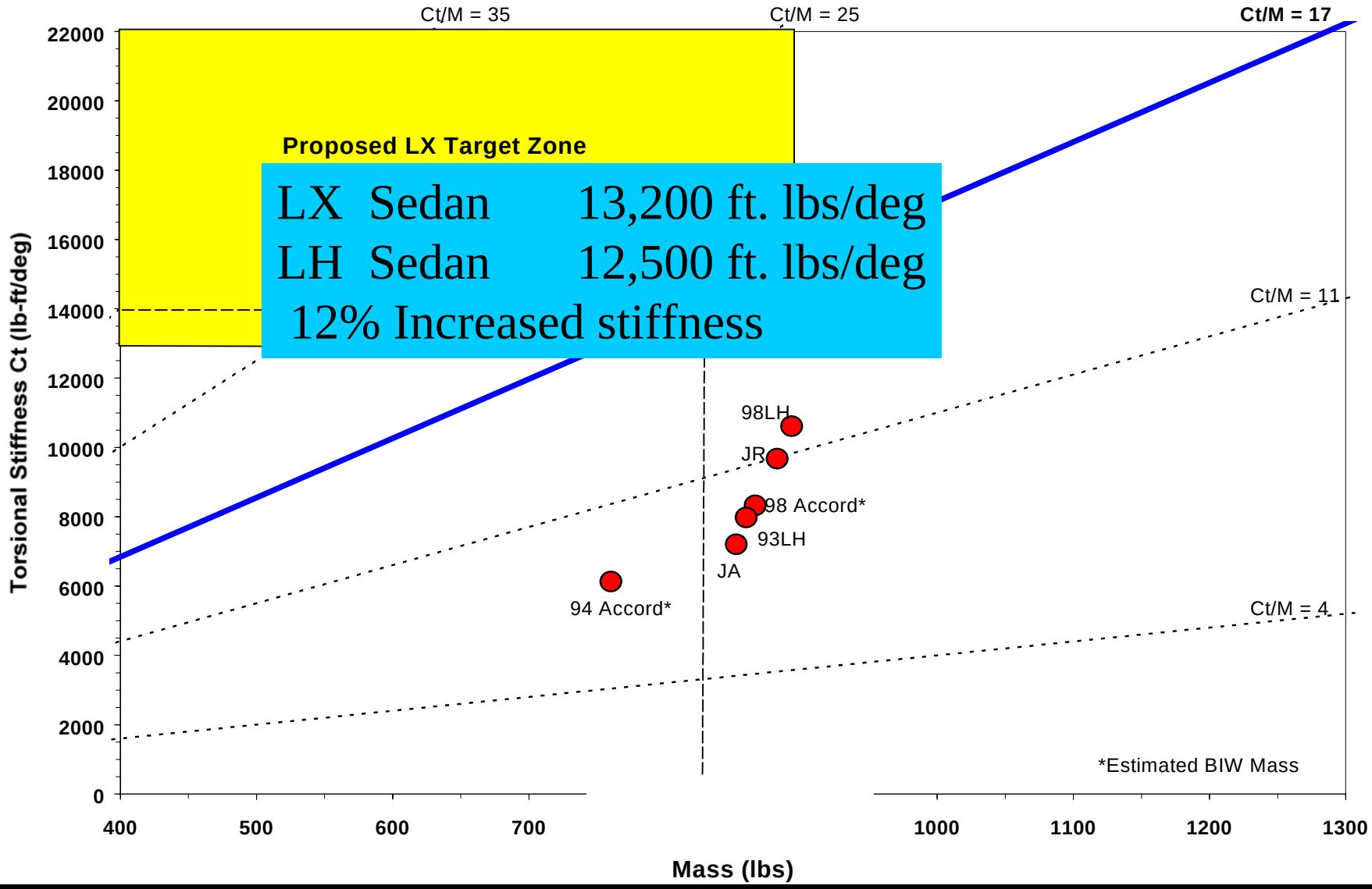


What Defines a "great BIW Design"

- **Structural Performance**
  - **Torsional Stiffness**

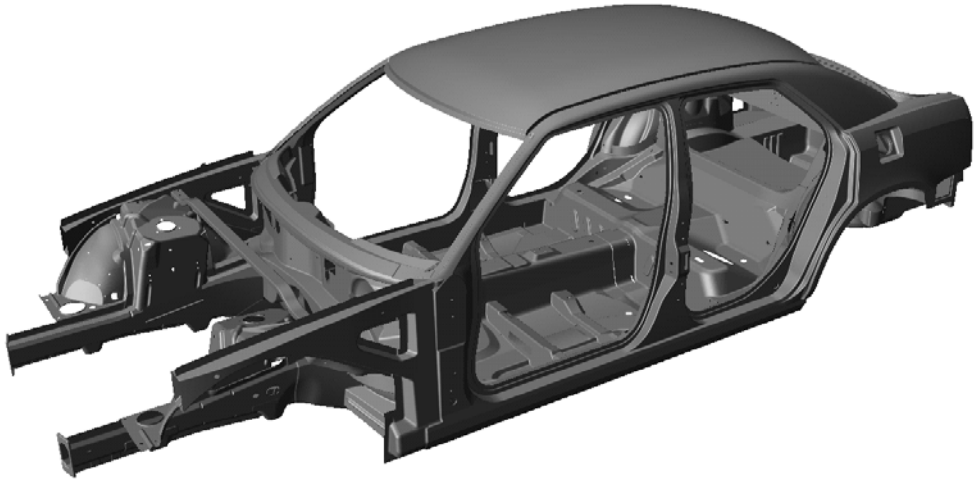


Structural Performance: Torsional Stiffness



What Defines a "great BIW Design"

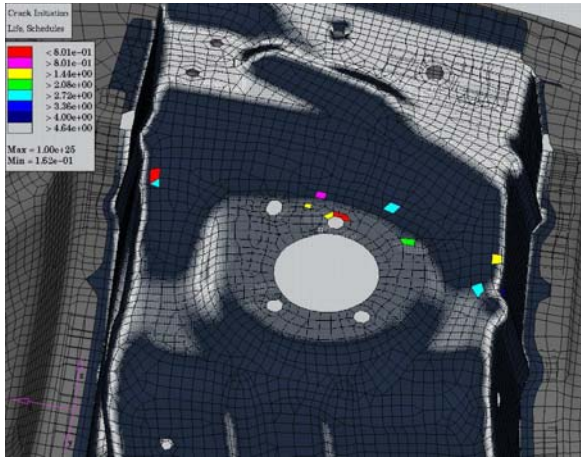
- **Structural Performance**
  - **Torsional Stiffness**
  - **React Chassis Inputs**

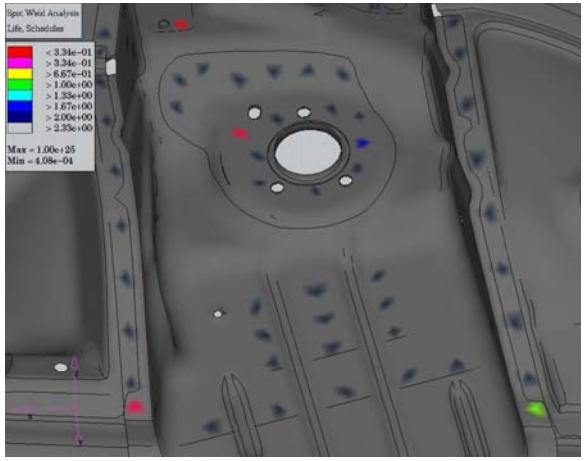


Structural Performance: React Chassis Inputs

Design Tools

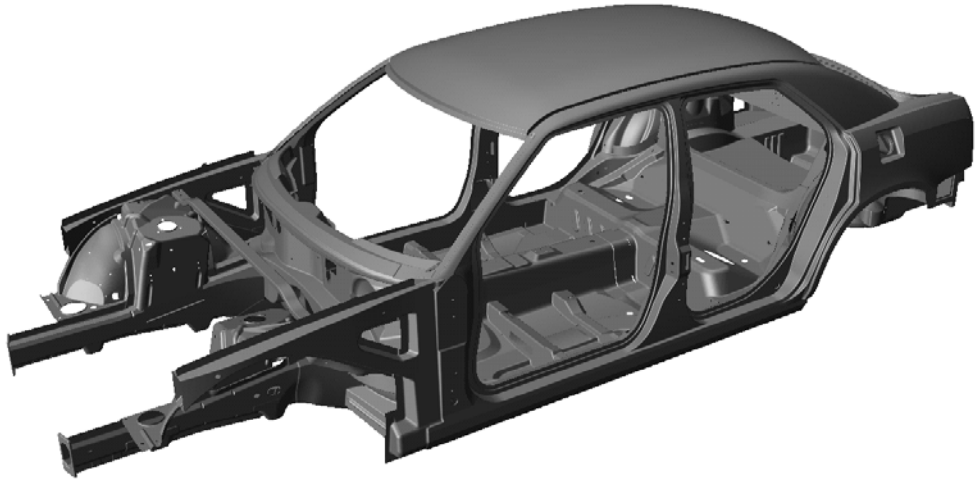
- FEA: Finite Element Analysis
- Lab & Shaker Testing: Components & Assembly tests
- Proving Grounds: On Road Testing
- RTS: Road Test Simulation





What Defines a "great BIW Design"

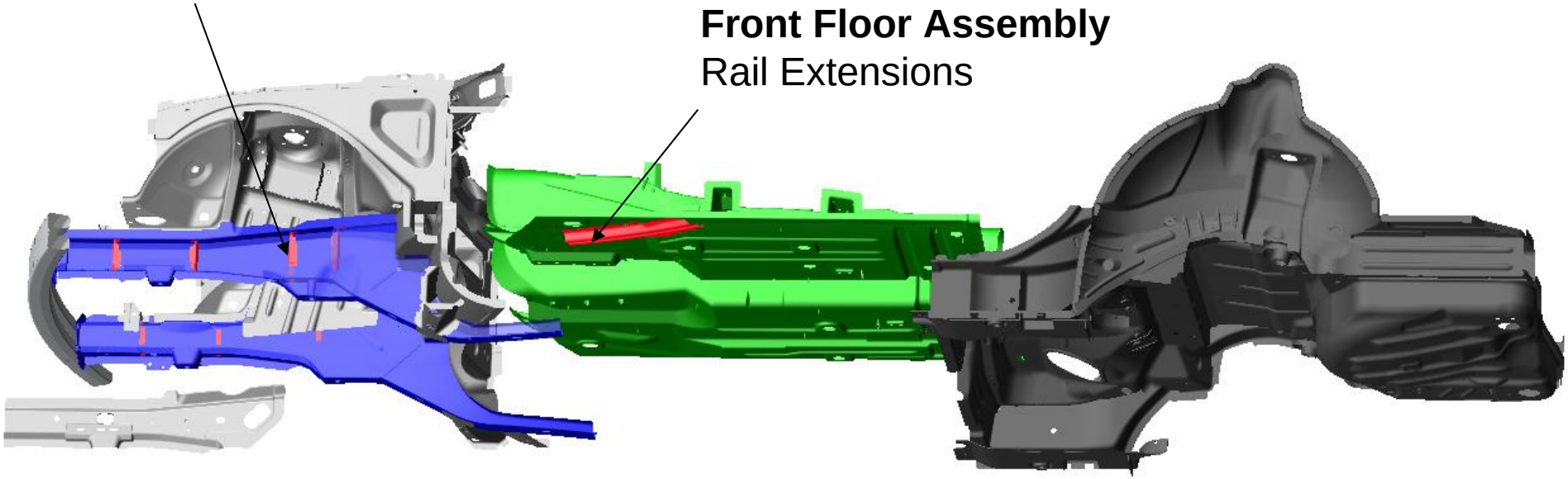
- **Structural Performance**
  - Torsional Stiffness
  - React Chassis Inputs
  - **Noise Attenuation / Shake Control**



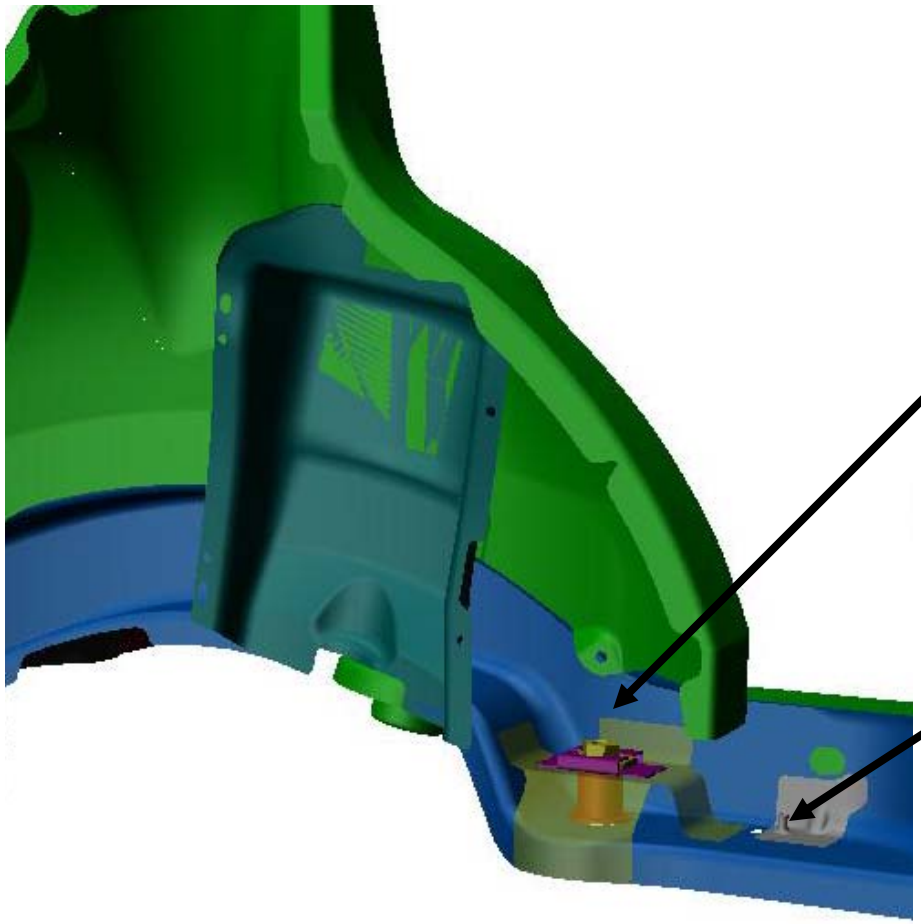
Structural Performance: NVH

Front Rail Assembly
Bulk heads

Front Floor Assembly
Rail Extensions



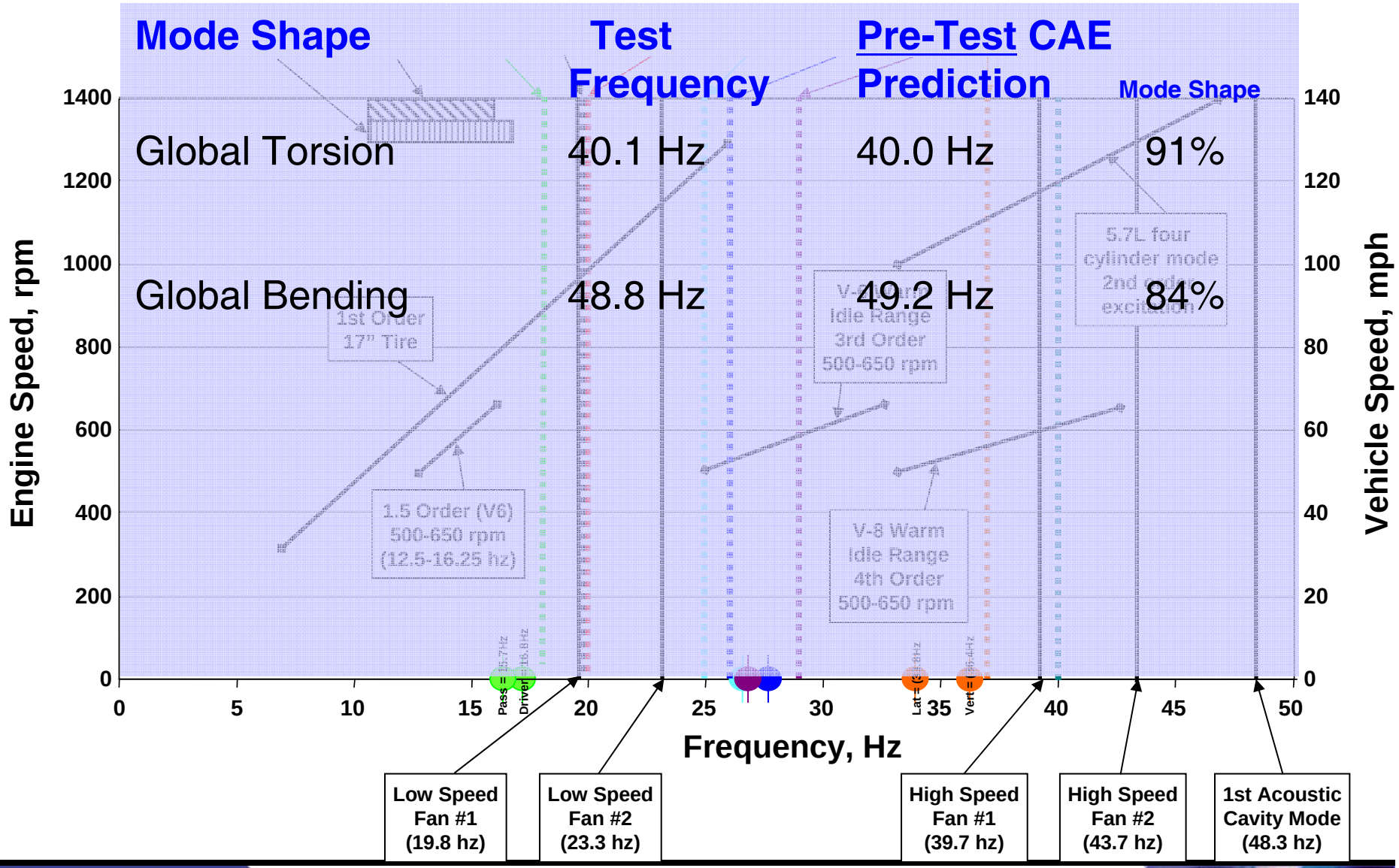
Structural Performance: NVH



Double Shear Suspension Attachments

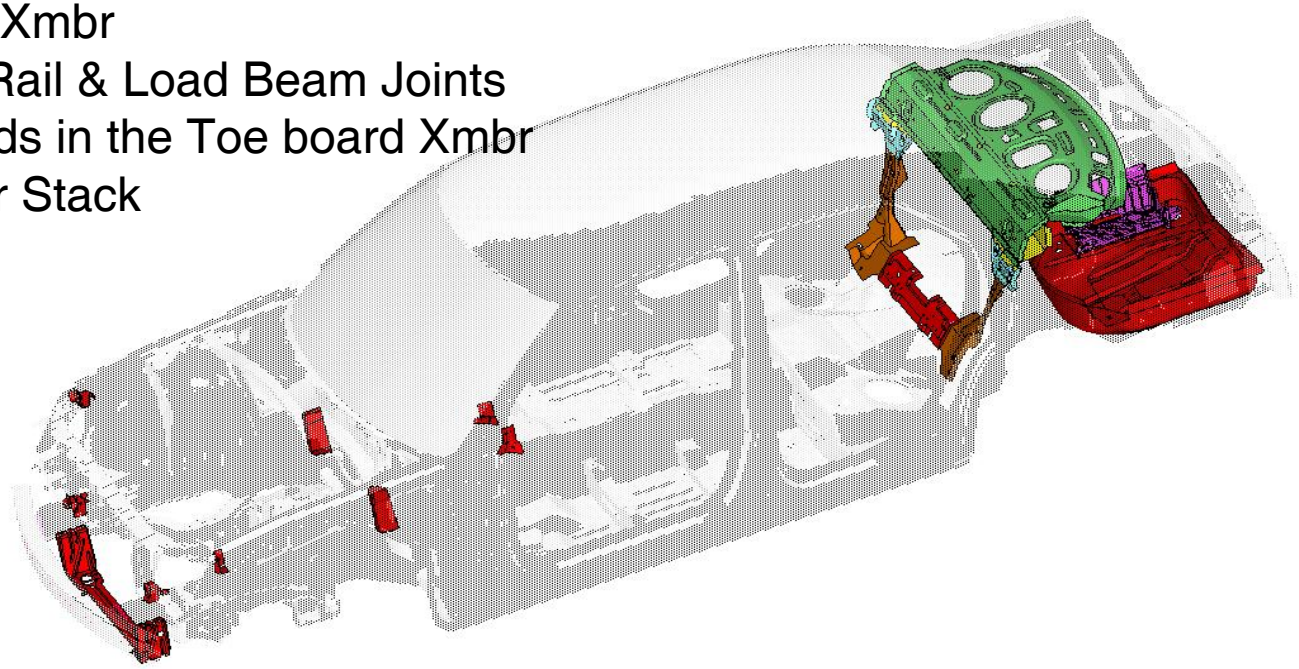
Tuned Exhaust Attachments

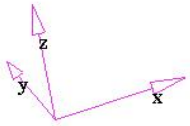
Structural Performance: NVH



CAE Optimization for Low Frequency NVH Performance

- Four Bolt Bumper Attachment
- Radiator Xmbr
- HMC to Rail & Load Beam Joints
- Bulk heads in the Toe board Xmbr
- IP Center Stack

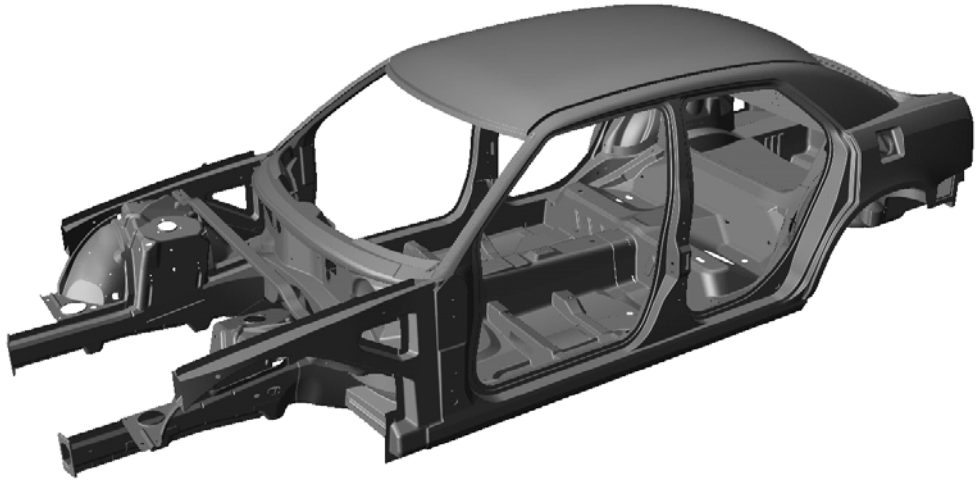




- Shelf Panels
- Shelf Gussets
- Beading of the Rear Floor Pan & battery Tray design

What Defines a "Great BIW Design"

- **Structural Performance**
  - **Torsional Stiffness React Chassis Inputs**
  - **React Chassis Inputs**
  - **Noise Attenuation / Shake / Control**
  - **Superior Occupant Safety Cage**

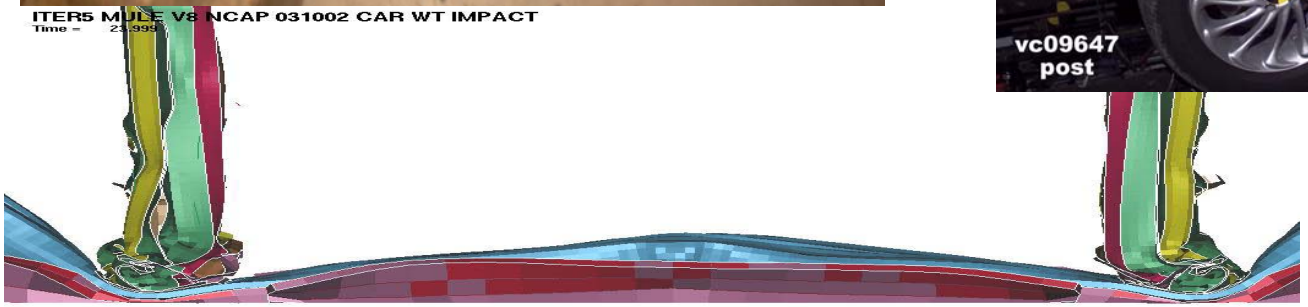


Structural Performance: Safety Cage

Safety Cage: Enginebox

- Dual phase DP 590 octagon shape front rails with defined crush zones
- Dash panel toe-board crossmember, end rail extensions and rail extension to sill to limit intrusion

Structural Performance: Safety Cage

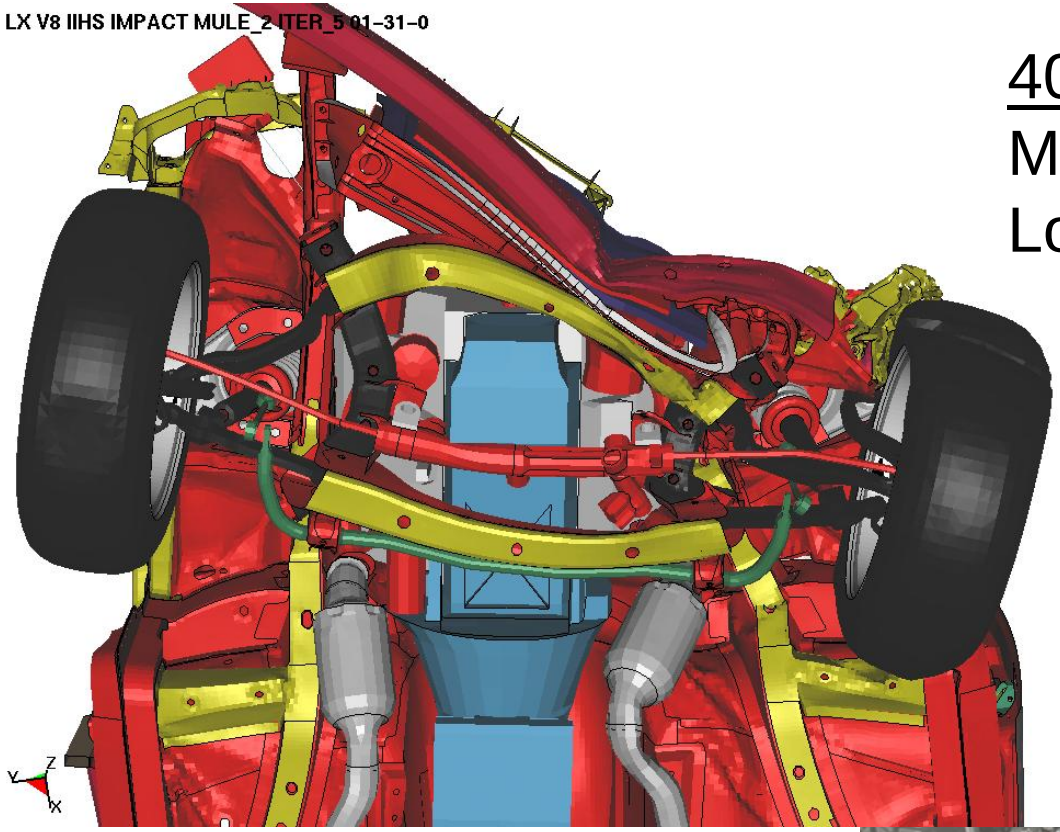


35 mph Flat Frontal

Rail Tip Multiple fold / crush

Low Intrusion

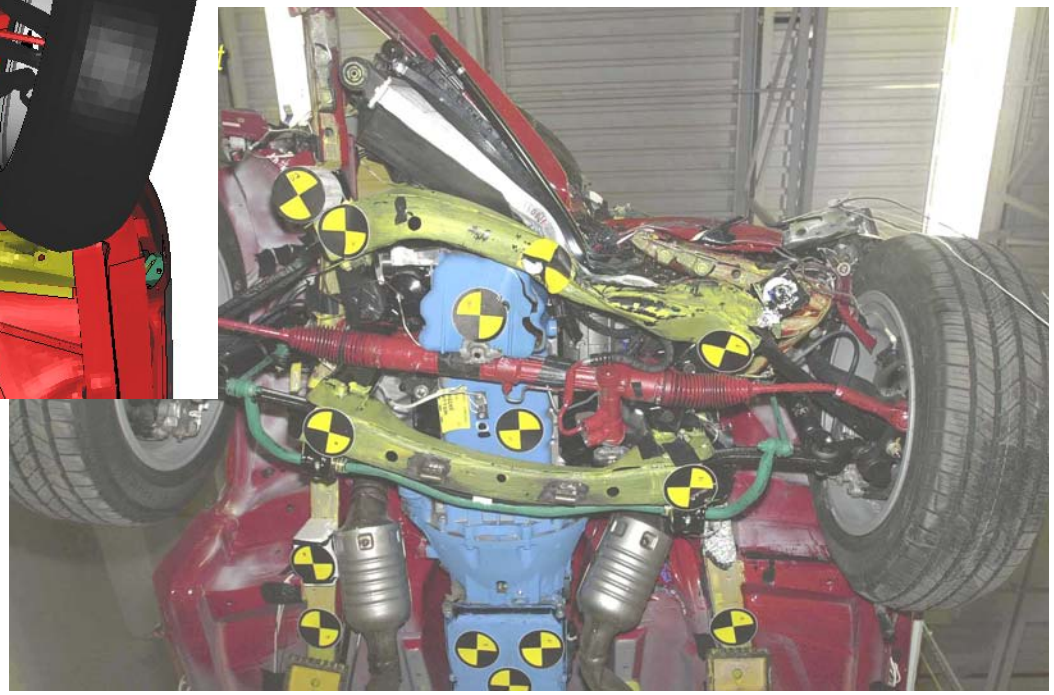
Structural Performance: Safety Cage



<u>40 mph Front Offset</u>

Mid Rail Body/Chassis Crush

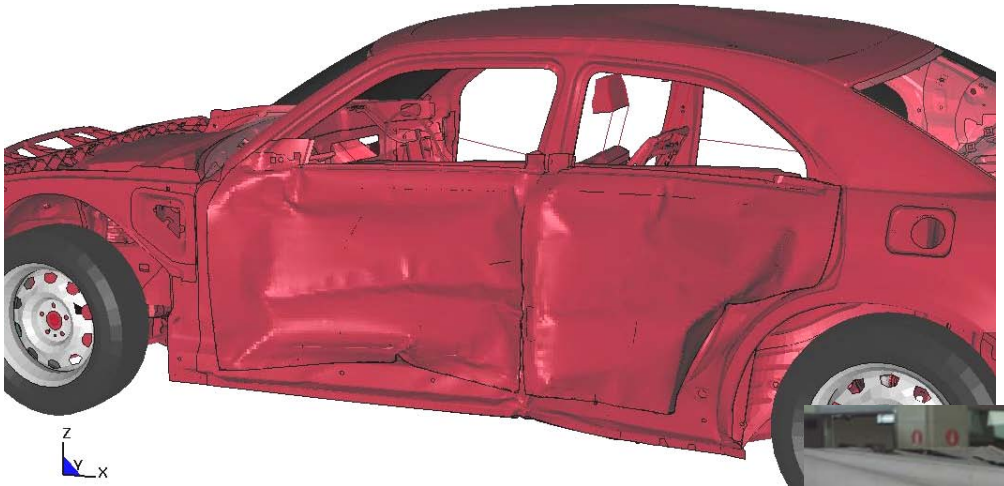
Low Intrusion



Safety Cage: Body Sides

- Cross car load bearing roof bow
- C pillar reinforcement rear occupant protection
- A pillar reinforcement for structural integrity for offset events
- Occupant friendly B pillar deformation zones

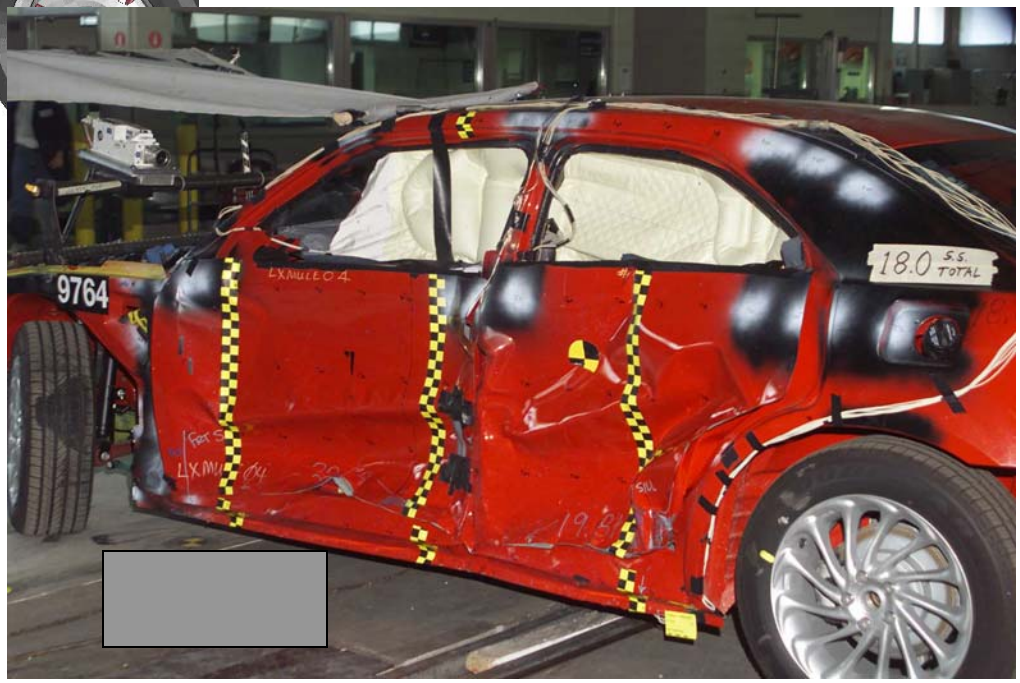
Structural Performance: Safety Cage



<u>38.5 mph Crabbed Side</u>

Sill / B pillar Engagement

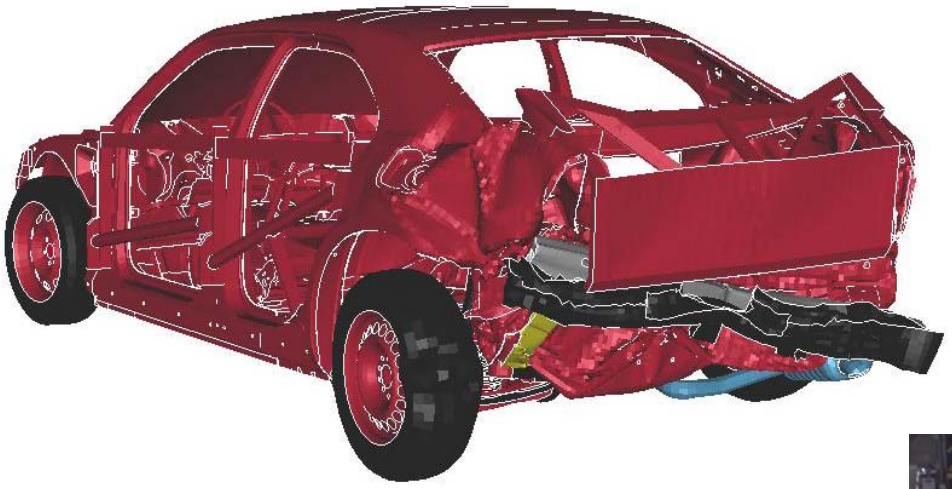
Low Intrusion



Safety Cage : Rear Underbody

- Double C section rear rail crush zones balance to rear cradle
- Rear tire tub with designed crush zones

Structural Performance: Safety Cage



50 mph Rear Offset
Multiple Crush Zones
Protected Zone

What Defines a "Great BIW Design"

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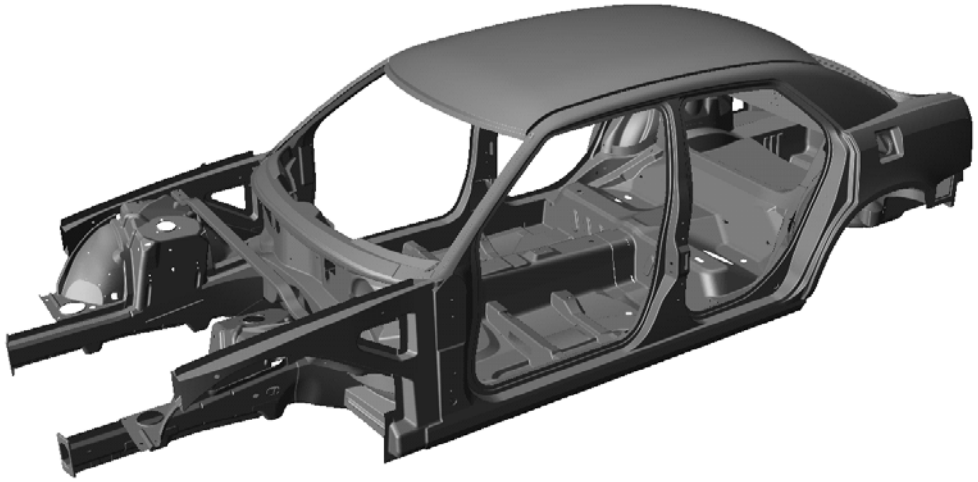
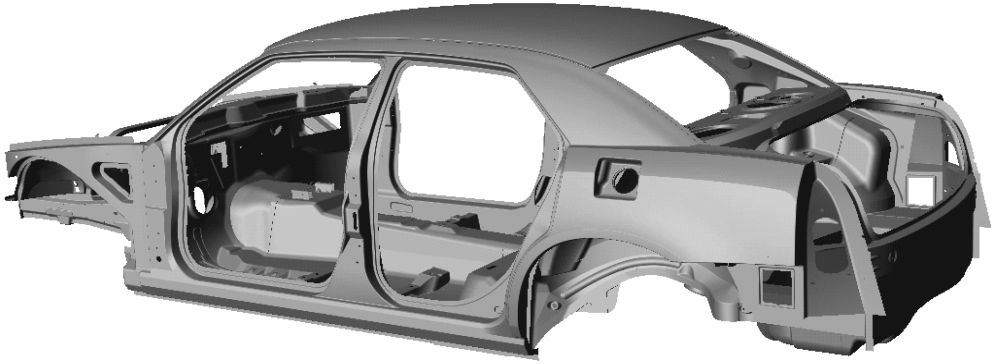
- Light Weight (Materials/Construction)
- Structural Performance
- **Flexible Manufacturing Process**

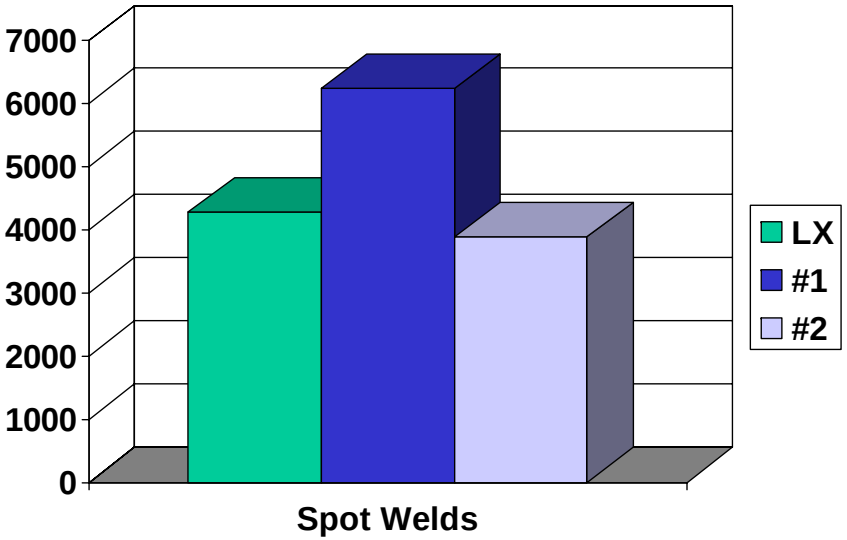


LX BIW Process

Underbody – 3 Sub Assemblies
Body Sides – Robot Framed



Assembly Plant Welds	2592
Purchase Sub Welds	1685
Total Spot Welds	4277
Adhesive C(mm)	22366
Drawn Arc Studs	23
Projection Weld	7



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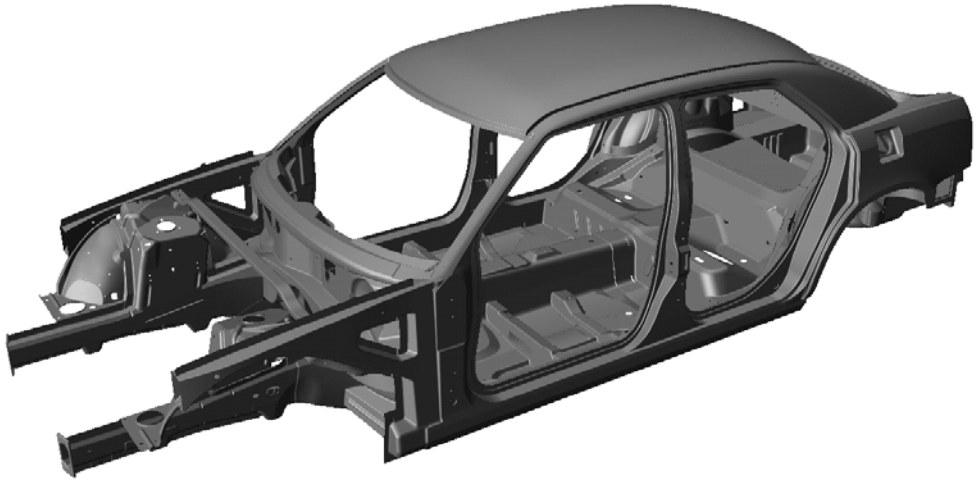
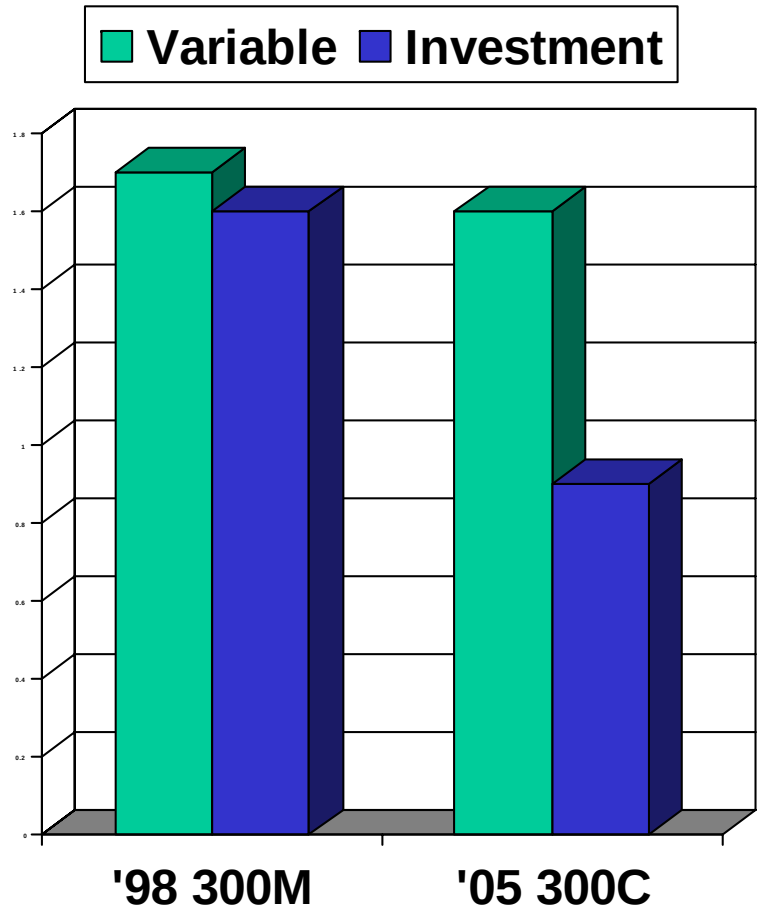
- Flexible Manufacturing Process
- **Low Cost ($)**



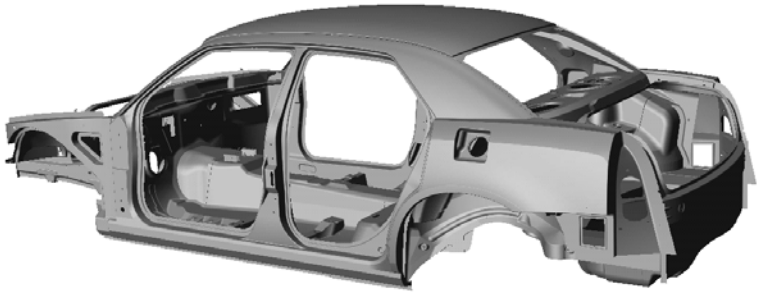
Low Cost $

- 15% reduction in equalized variable costs
- 40 % reduction in capital tooling



What Defines a "Great BIW Design"

- **Looks (Styling)**
  - **Wow!**
- **Light Weight (materials/construction)**
  - **Increased HSS Utilization/ Efficient Design Engineering**
- **Structural Performance**
  - **Stiffer / Stronger /Safe**
- **Flexible Manufacturing Process**
  - **Strategic use of sub-assemblies**
- **Low Cost ($)**



The LX Sedan BIW Structure Just The Beginning!