VE Commodore Body Structure

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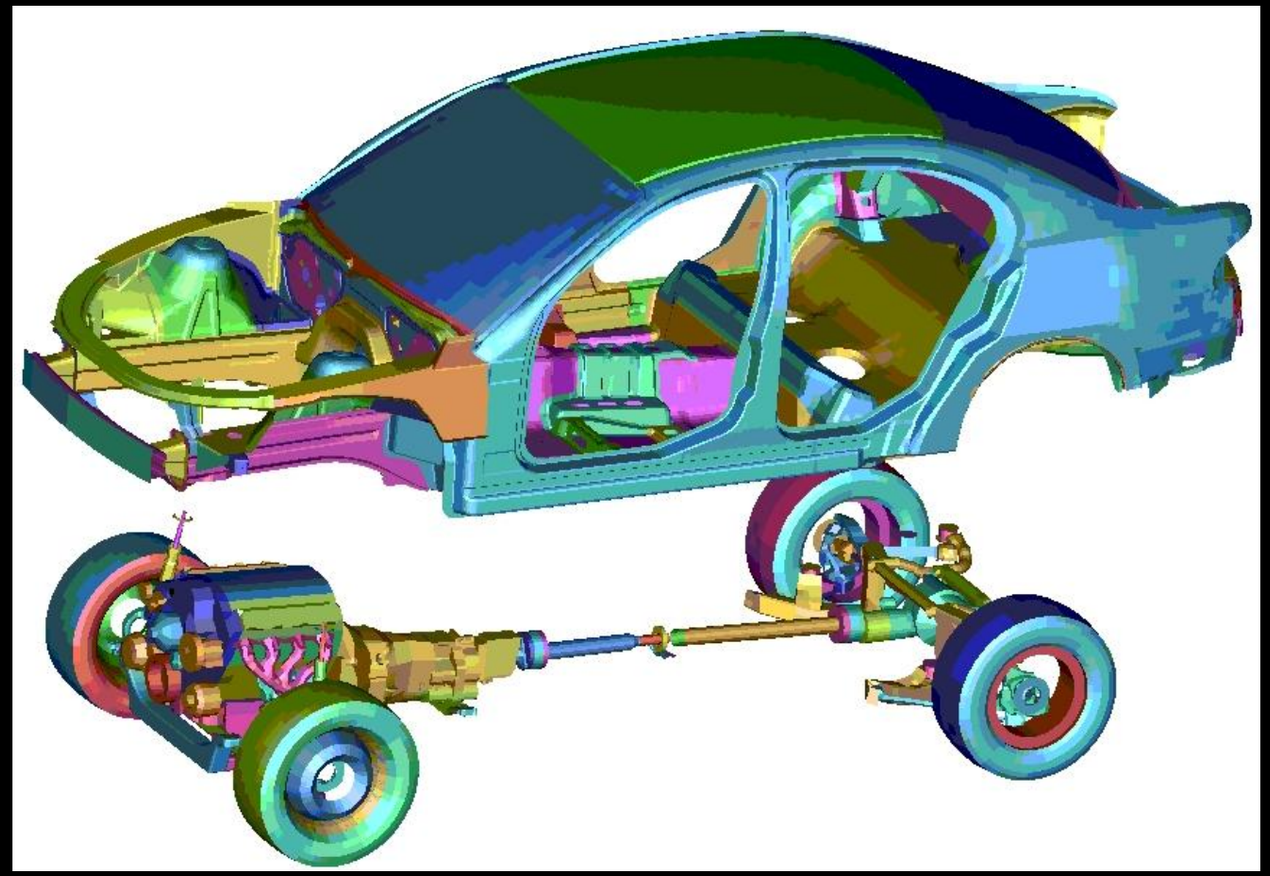
Introduction

- VE and WM sedans launched 2006
- Ute launched 2007
- Wagon launched 2008
- Most comprehensive body in white program ever
- Stiff body structure ranks among best large cars
- Crash performance, N&V improvements, occupant safety – biggest wins
- High strength steels – significant increase in usage

Introduction

- Entire architecture program done virtually
- Crash and durability modelling used extensively
- Accuracy, cost efficiency and speed to market
- Concept and feasibility studies began in 1999
- Benchmarks included Mercedes, Audi and BMW



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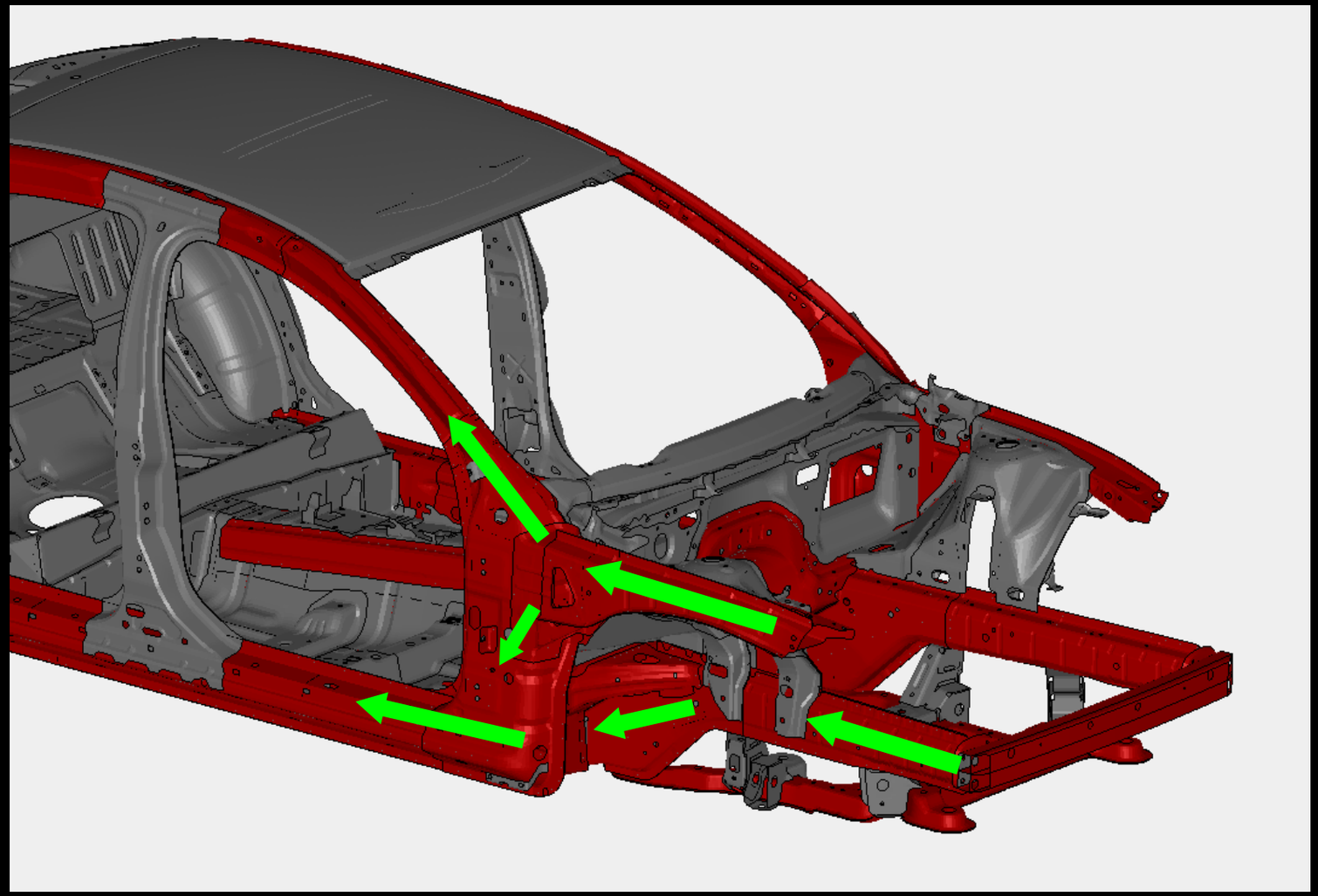
Crash performance

- Met offset frontal, full frontal, rear and side impact requirements
- 5 star ANCAP rating
- Met front crash requirements despite reduced crush space
- Use of high-strength steels
- Careful design of front rail section and joints
- Clearly defined load paths

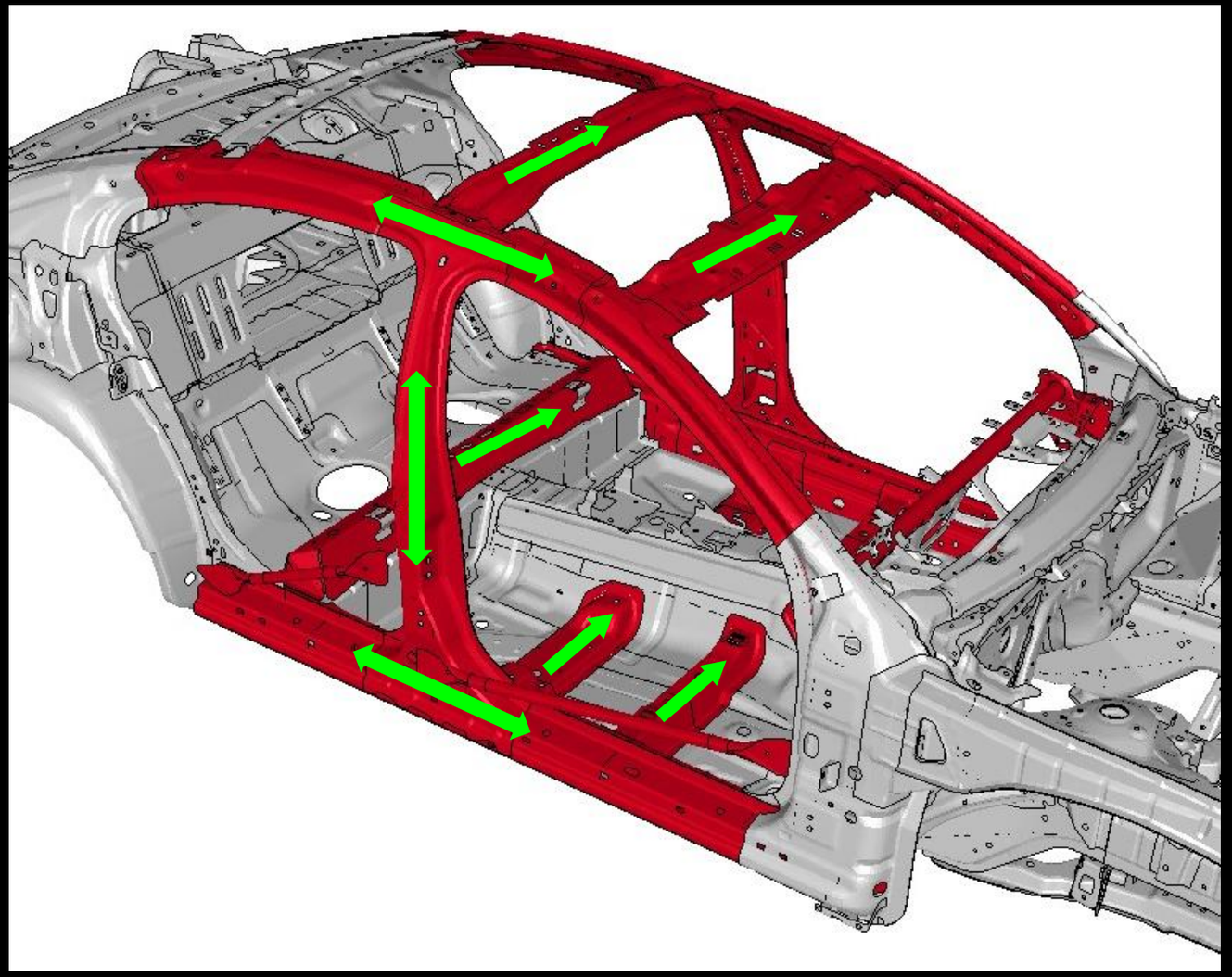
Crash performance

- For frontal impact, three load paths created through upper rails, longitudinal rails and engine cradle



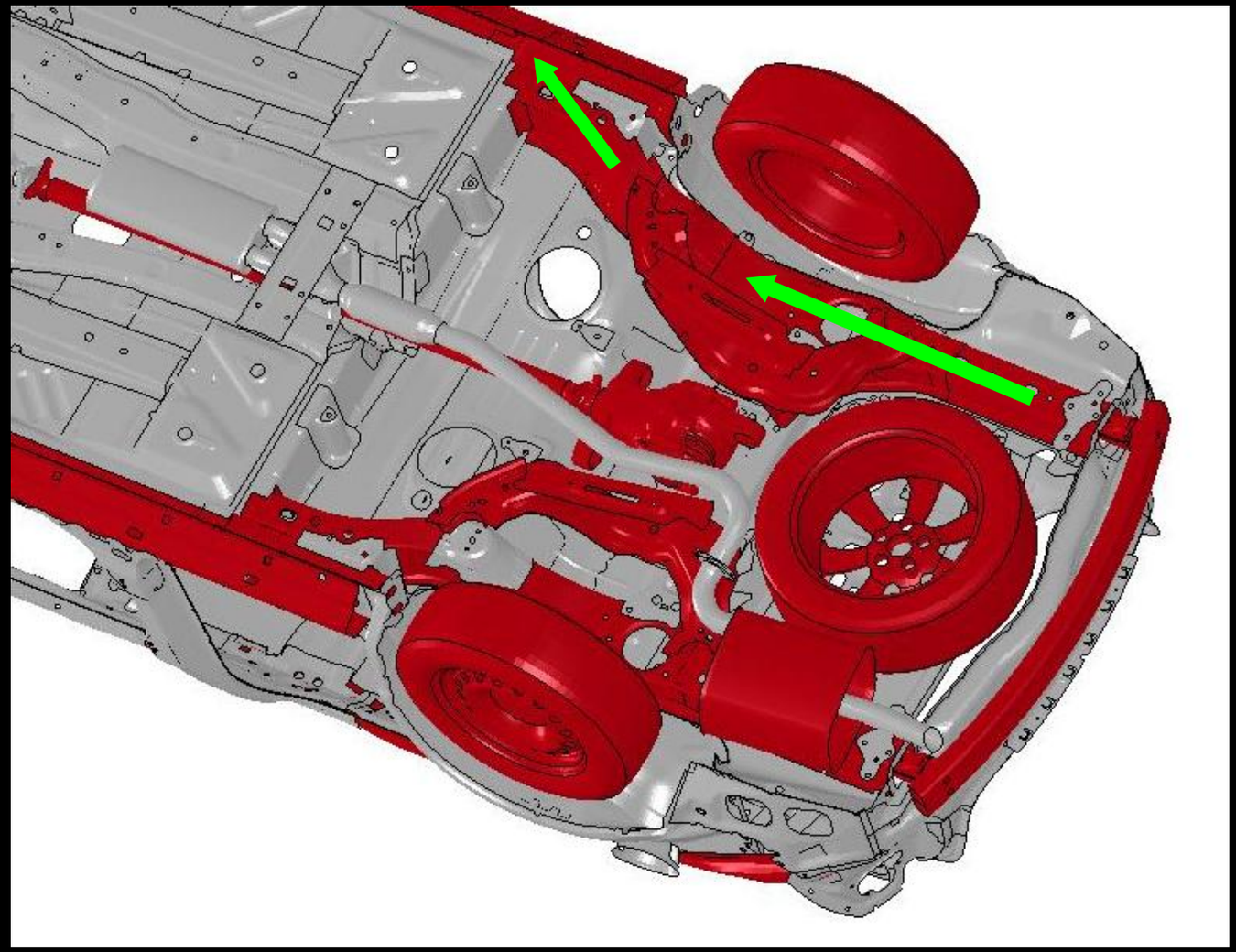
Crash performance

- For side impact, load paths include B pillar, IP cross-beam, three floor cross-members, rocker, door intrusion beam, structural roof bow design



Crash performance

- For rear impact, strategy involved rear longitudinal rail, rocker and C pillar brace design
- Fuel tank relocated to be forward of rear wheels



Material utilisation and body stiffness

- Weight a key issue
- Achieved a very high level of body stiffness
- Torsion and bending modes increased enormously – excellent structural feel, sense of safety and solidity
- One-piece body side outer
  - biggest Holden has ever produced
- Delivers quality improvements
  - better fit and finish

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Automotive steels used in VE

1. Low strength
   - mild steel & interstitial-free (IF) steel, used for skin panels, small brackets
2. Medium strength
   - bake hardening, used for door skins
3. Conventional high strength
   - HSLA / High Strength Low Alloy, used for structural members
4. Advanced high strength
   - dual phase (DP), recovery annealed, used for rockers, cross-members
5. Ultra high strength
   - hot stamped / press-hardened, used for Centre Pillar, door beams

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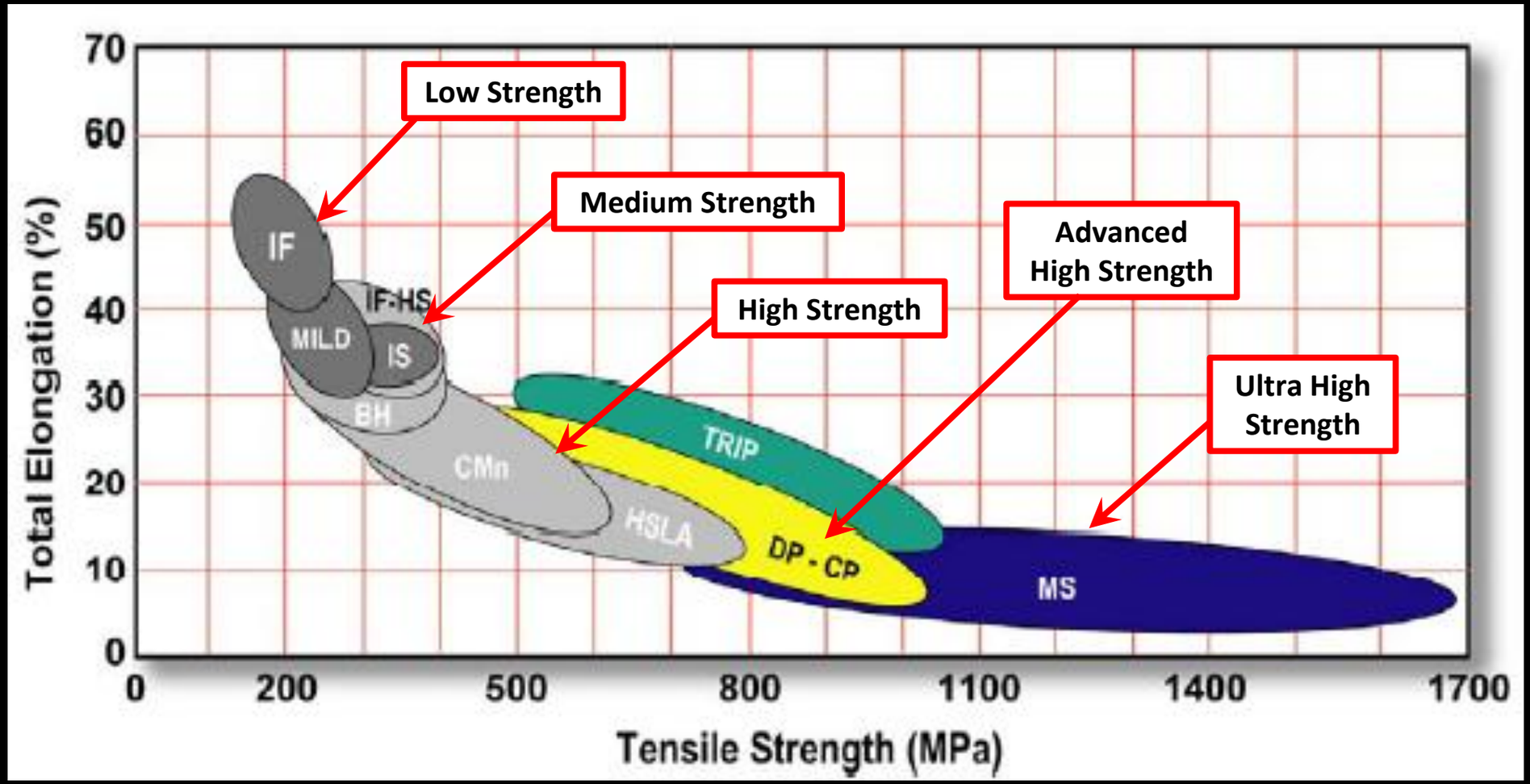
Automotive steels used in VE



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Automotive steels – mechanical properties

Grade	Yield Strength (MPa)	Tensile Strength (MPa)	Elongation (%)
Low Strength	140-180	270-330	40
Medium Strength	180-300	300 min	32
High Strength	340-400	400 min	22
Advanced High Strength	550-700	980 min	10
Ultra High Strength	950-1100	1200 min	8

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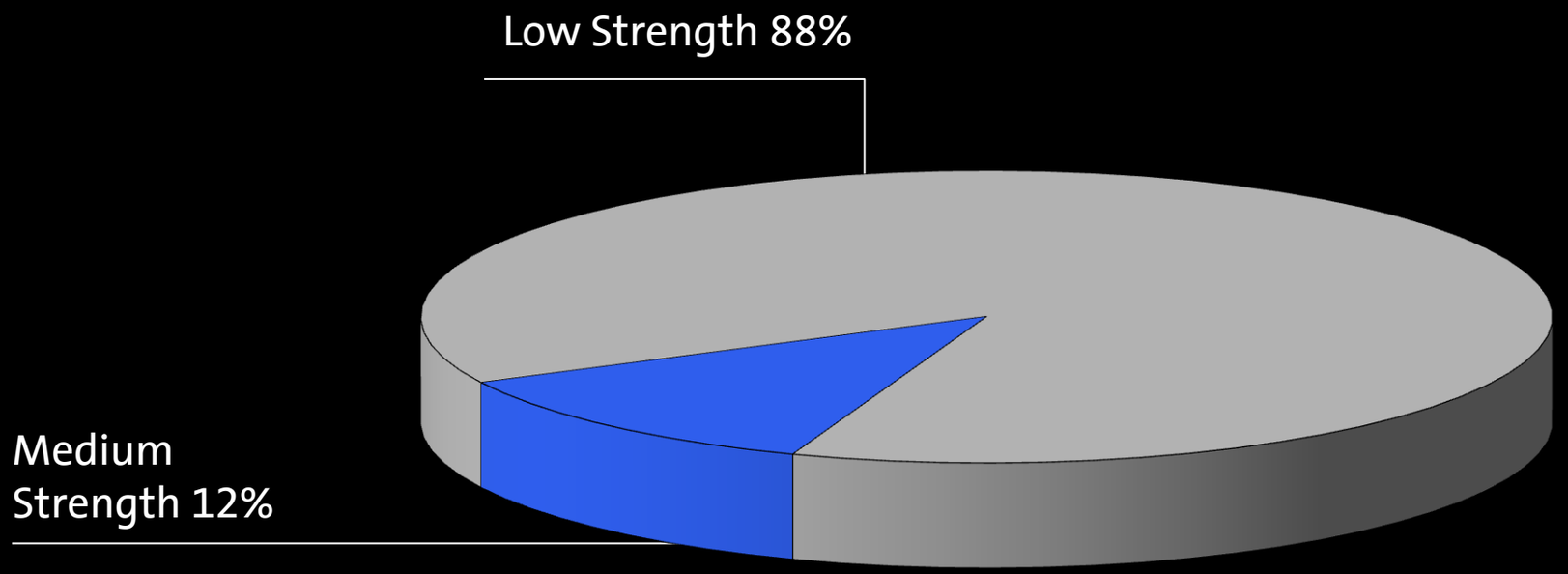
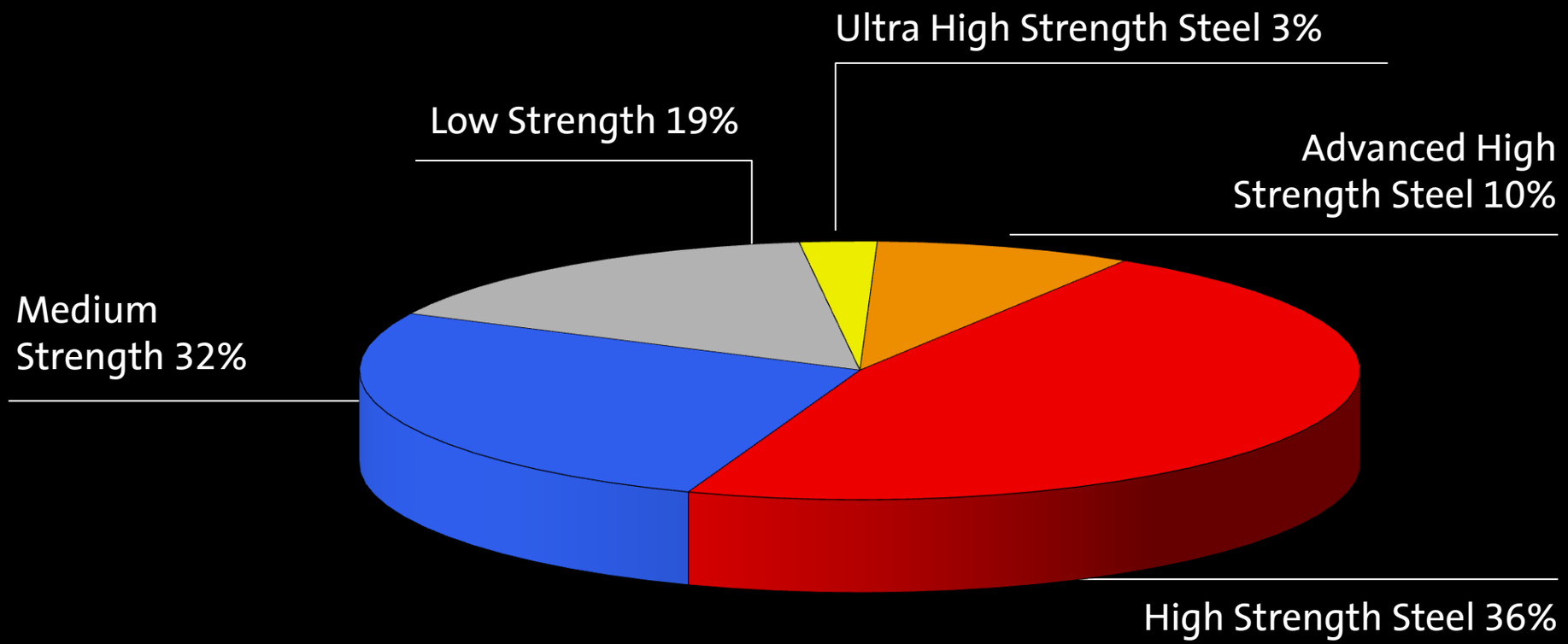
Steel Usage – VT to VZ

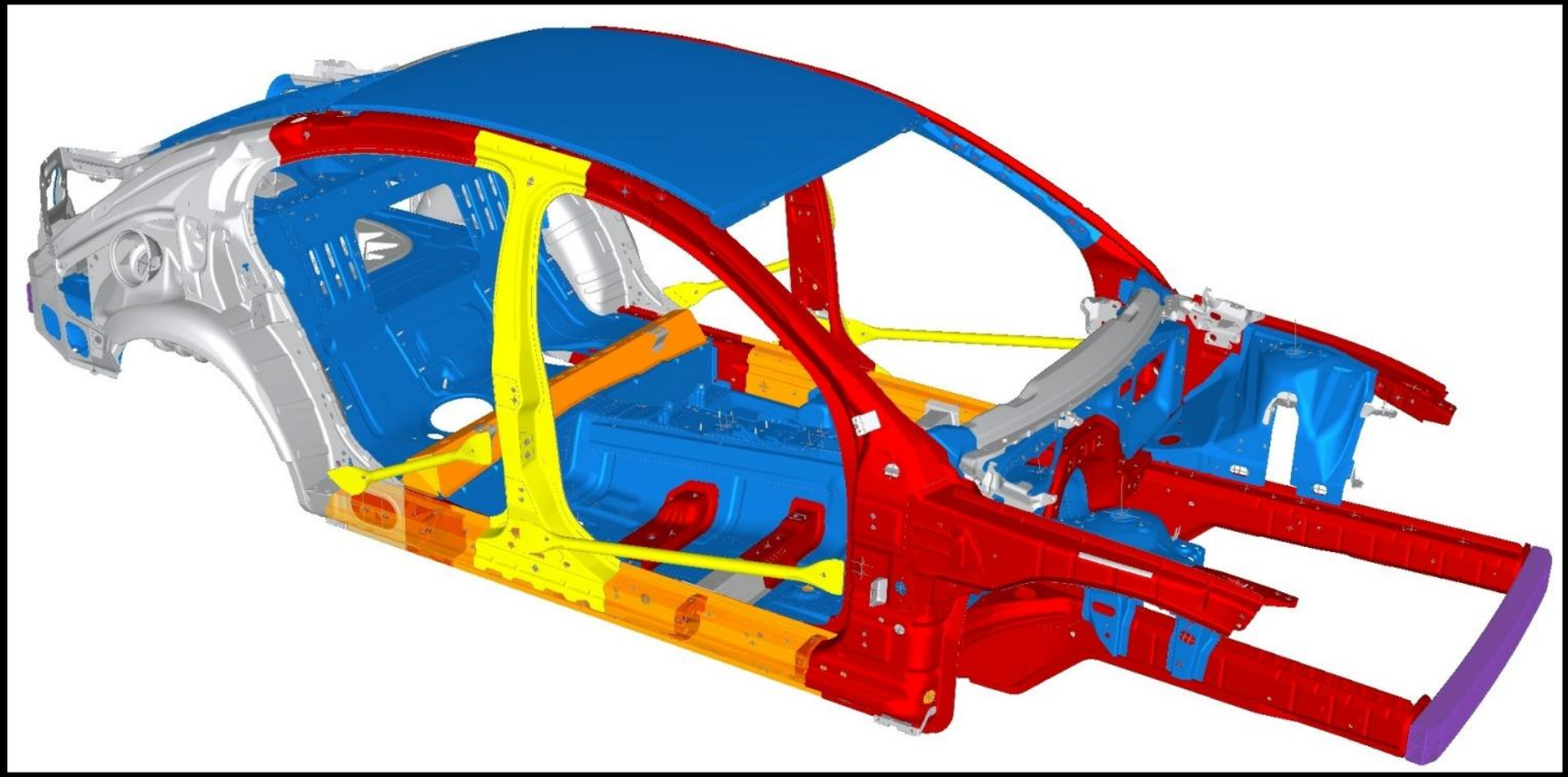


Steel Usage – VE

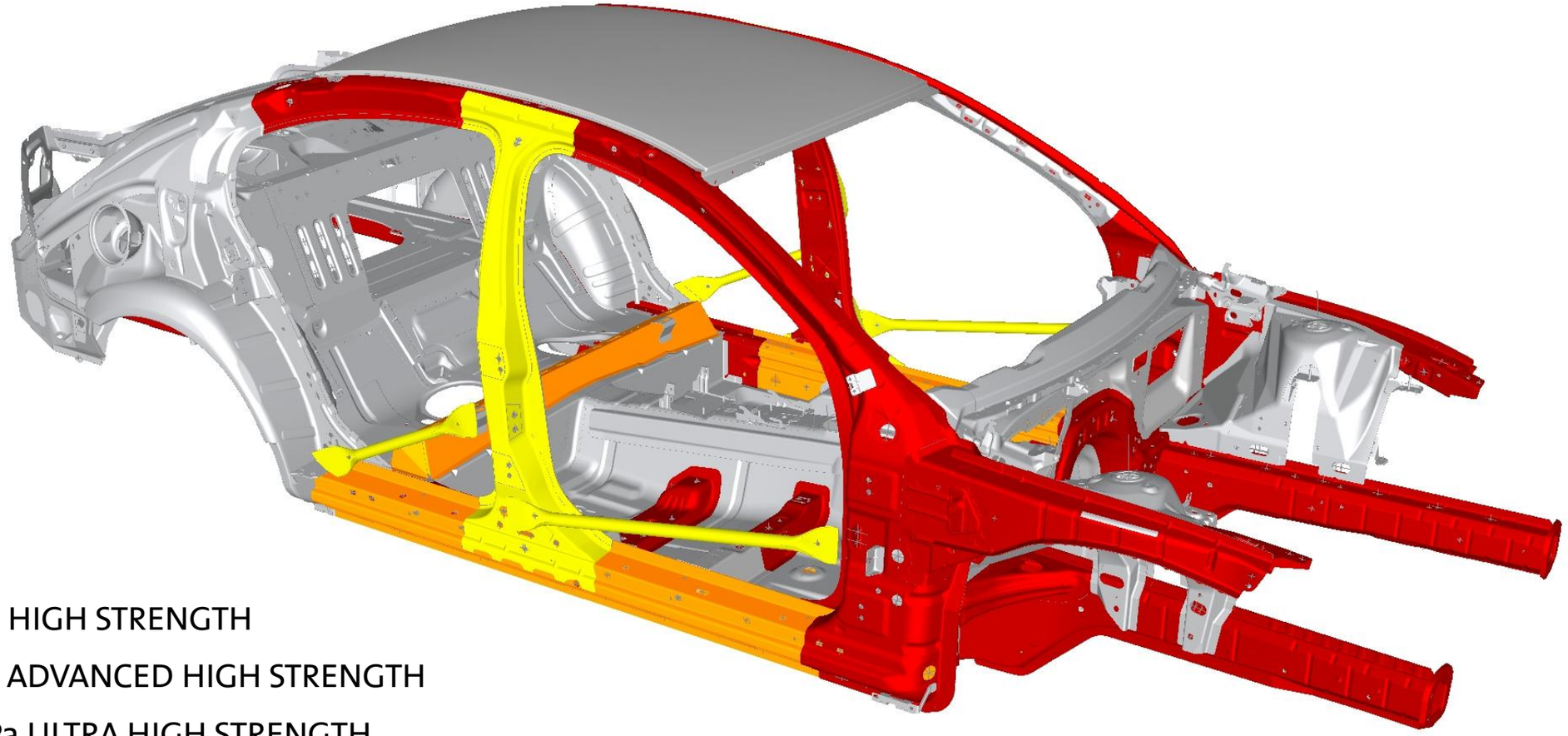


Steel Usage

- Low Strength
- Medium Strength
- High Strength
- Advanced High Strength
- Ultra High Strength
- Aluminium



High Strength Steel Usage



YS=340-400 MPa HIGH STRENGTH

YS=550-700 MPa ADVANCED HIGH STRENGTH

YS=950-1100 MPa ULTRA HIGH STRENGTH

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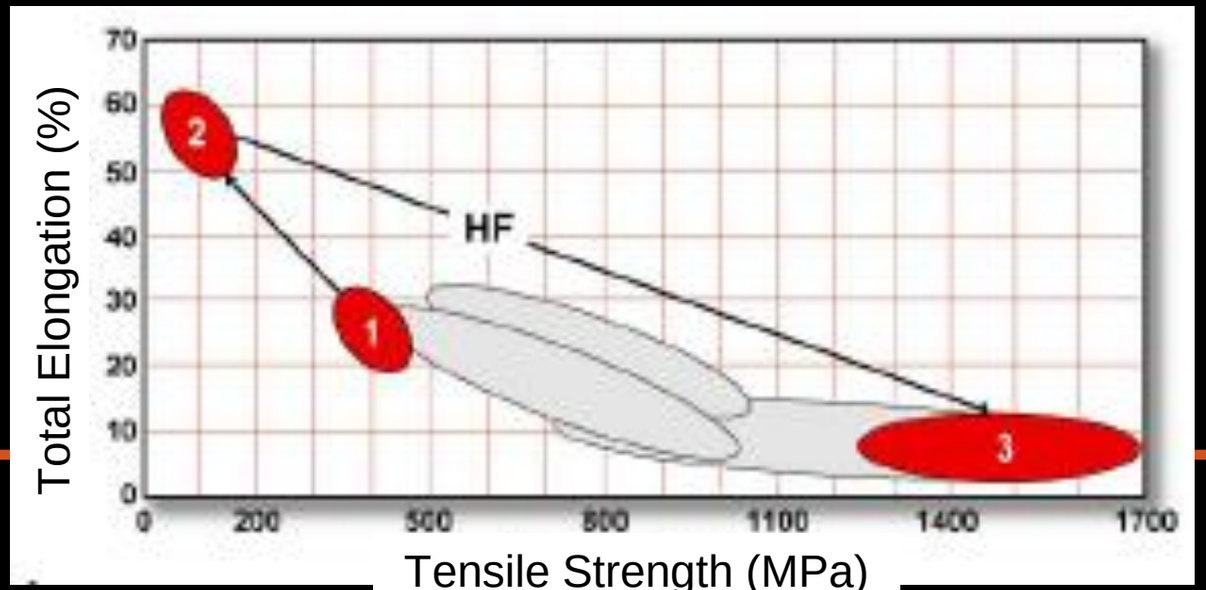
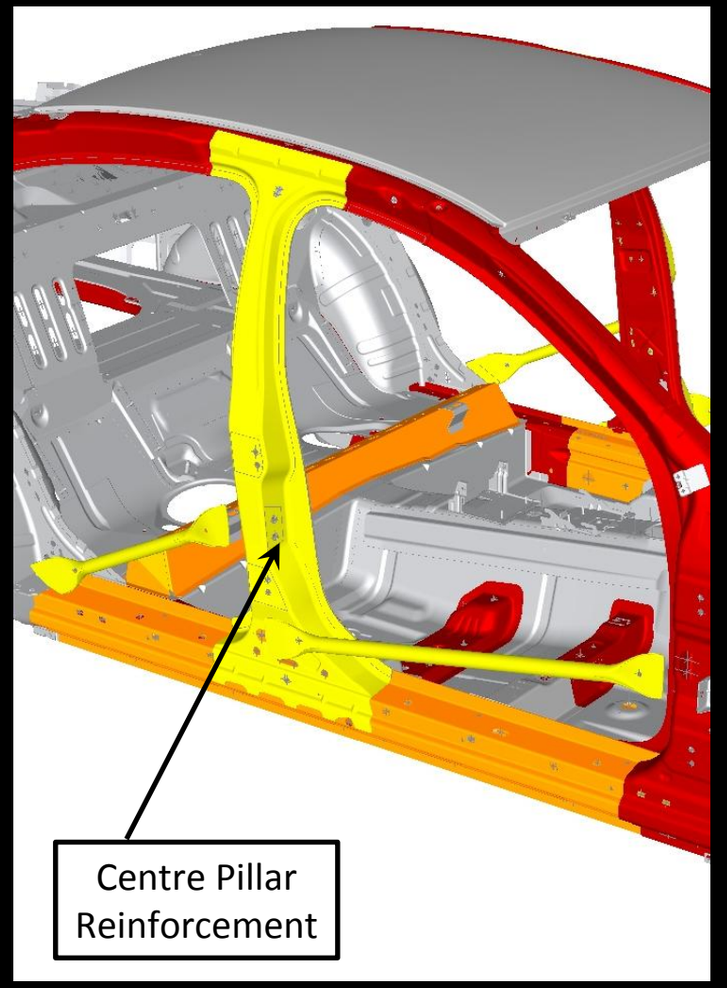
Steel Usage – Press Hardened / Hot Stamped

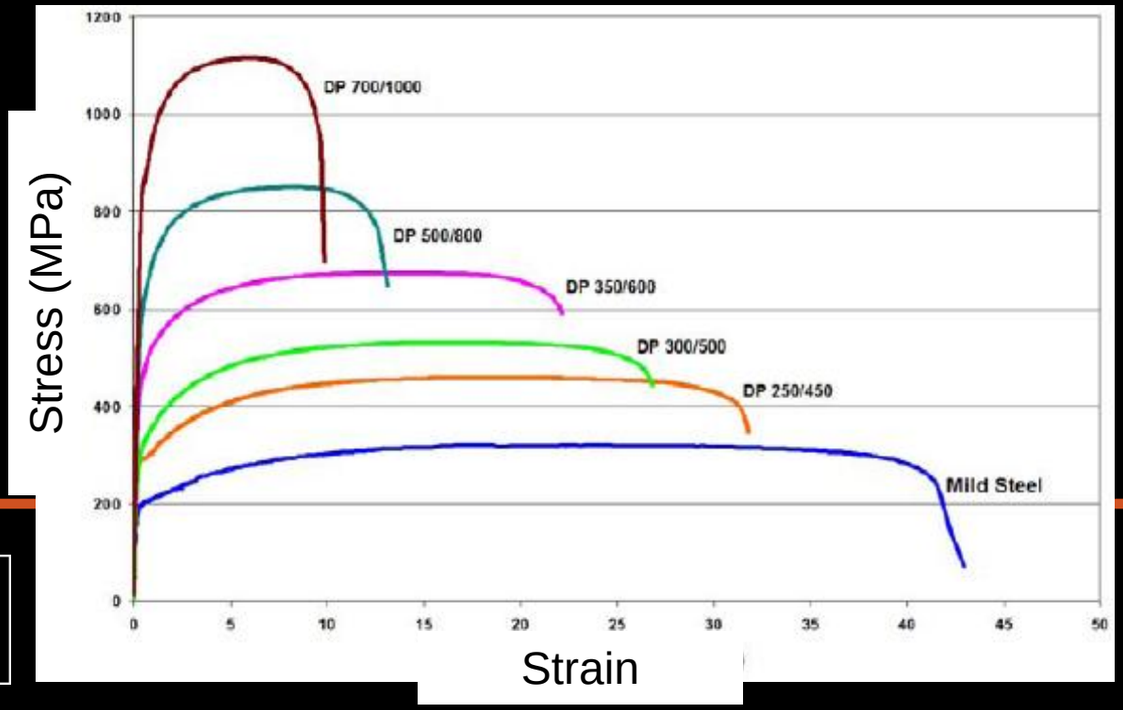
- Ultra high strength steel
- Centre Pillar Reinforcement
- YS = 950MPa, TS = 1200MPa
- Blank is heated above 900˚C, stamped, quenched
- Enables complex geometry, little springback
- Process video

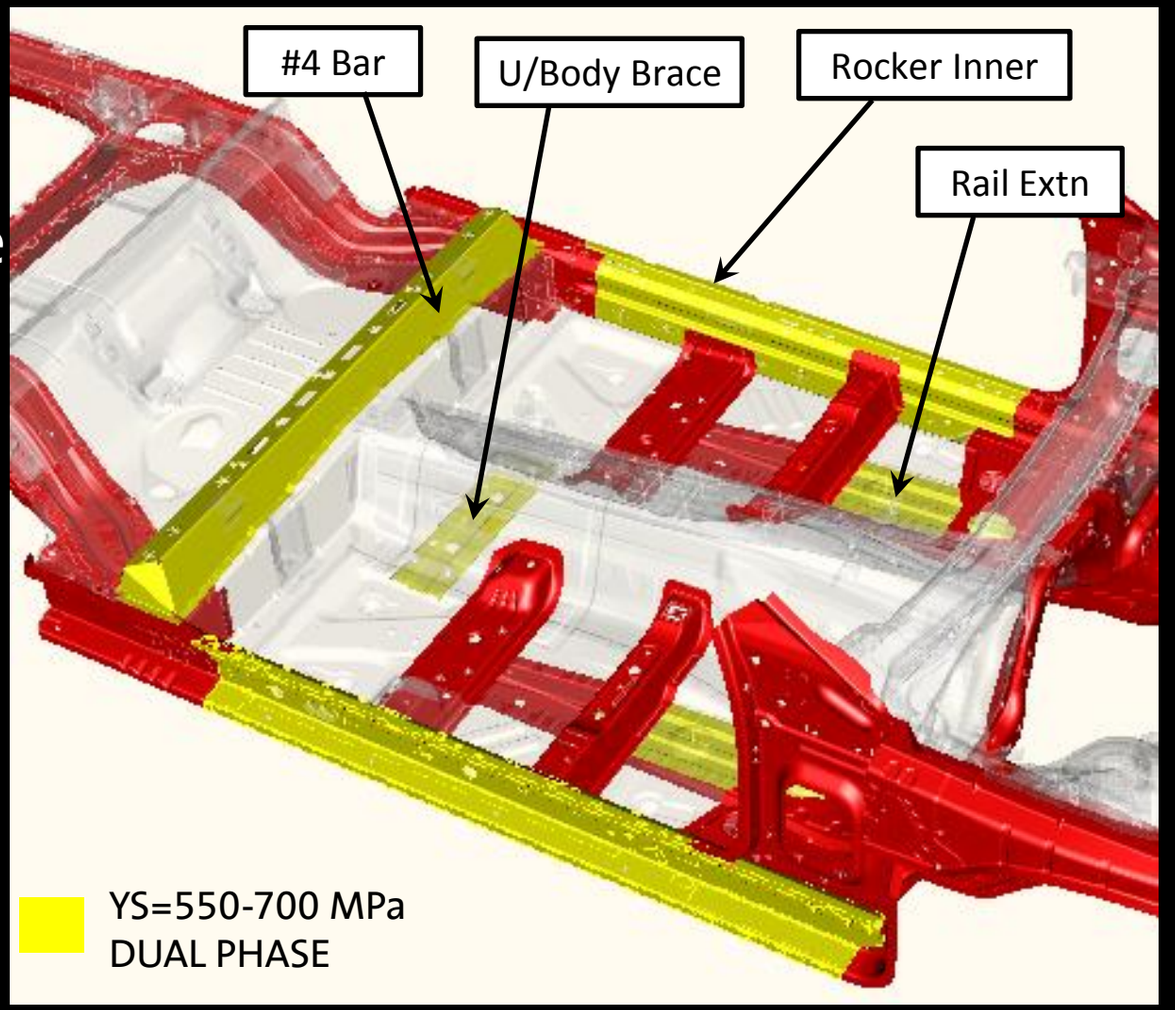




Steel Usage – Dual Phase

- Advanced high strength steel
- Rocker Inner, #4 Bar, Rail Extn, U/B Brace
- YS = 650MPa, TS = 980MPa
- Folding, bending, simple stampings





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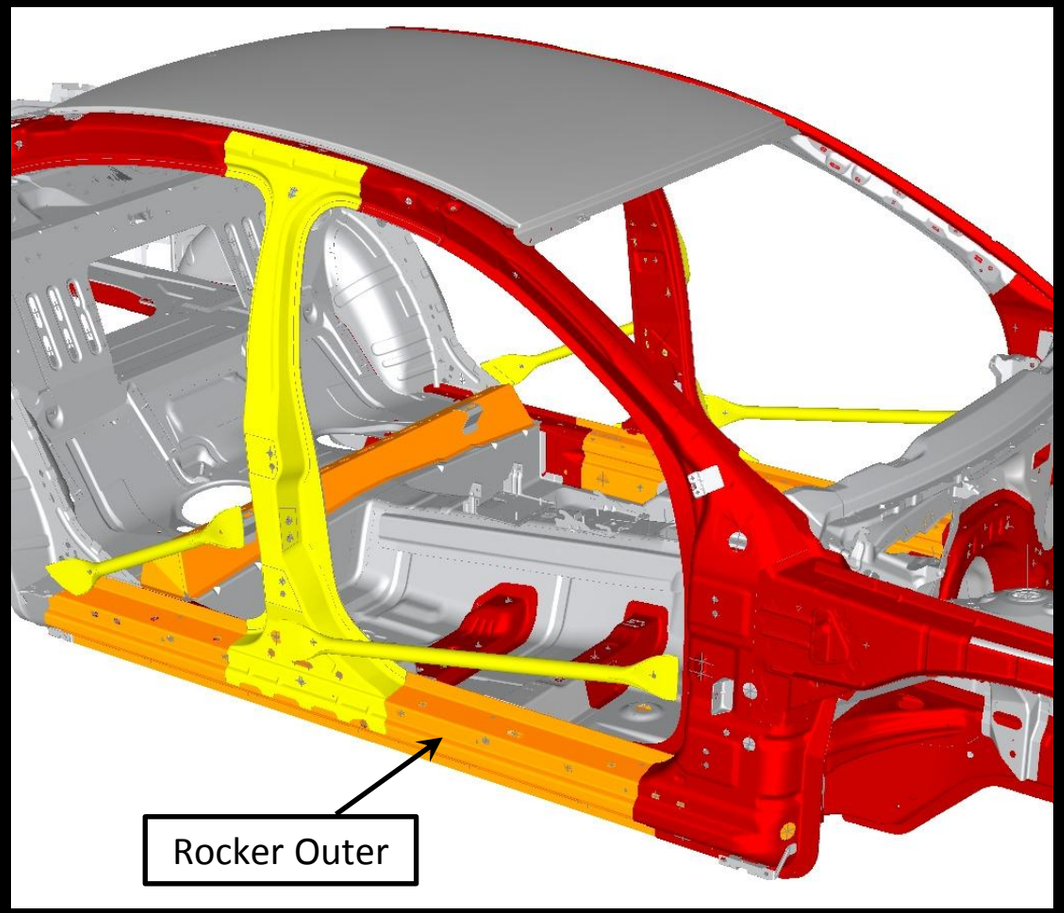
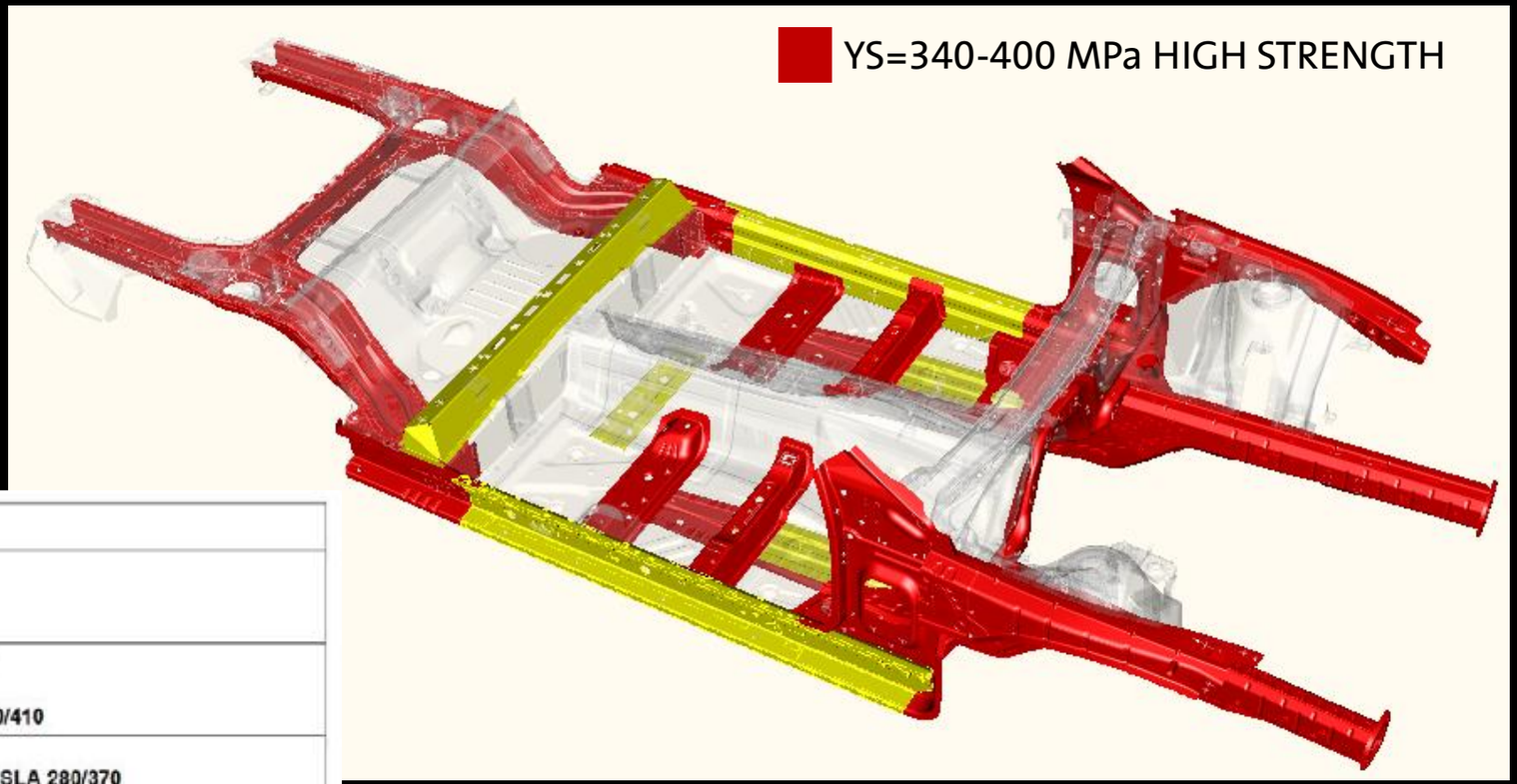
Steel Usage – Recovery Annealed

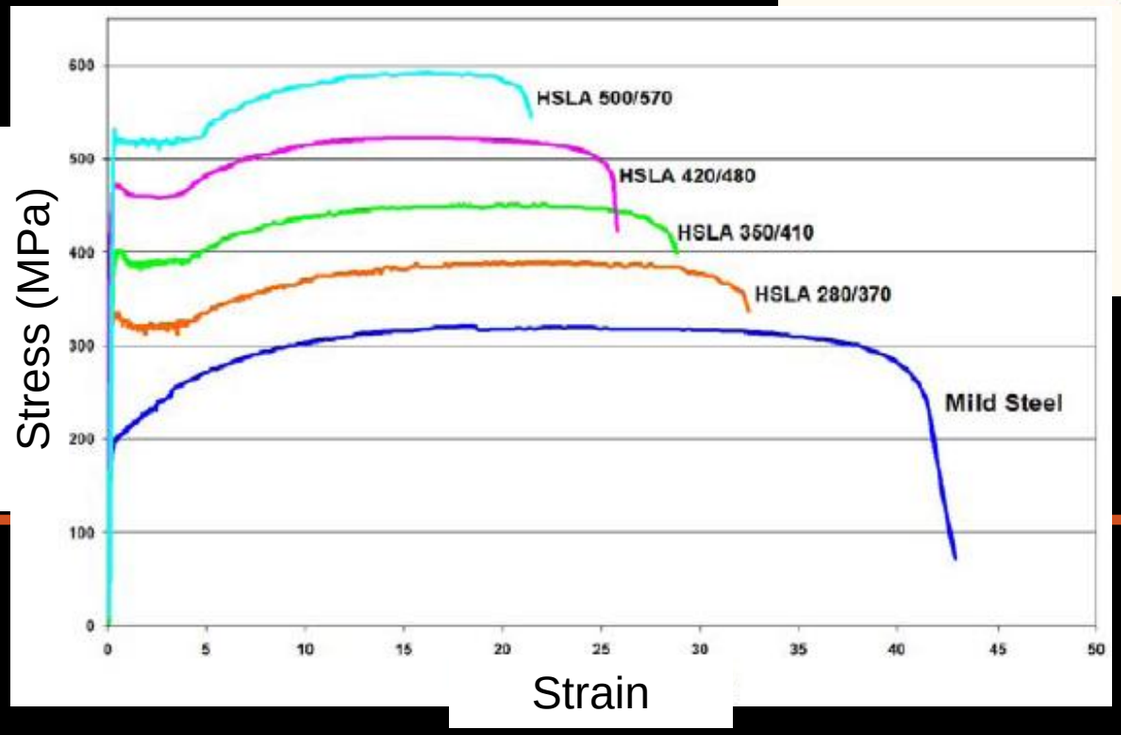
- Advanced high strength steel
- Rocker Outer
- YS = 700MPa, TS = 900MPa
- Roll-forming



Steel Usage – HSLA

- Many underbody panels
- Yield strength = 340-400MPa
- Tensile strength > 400MPa
- Stamping process





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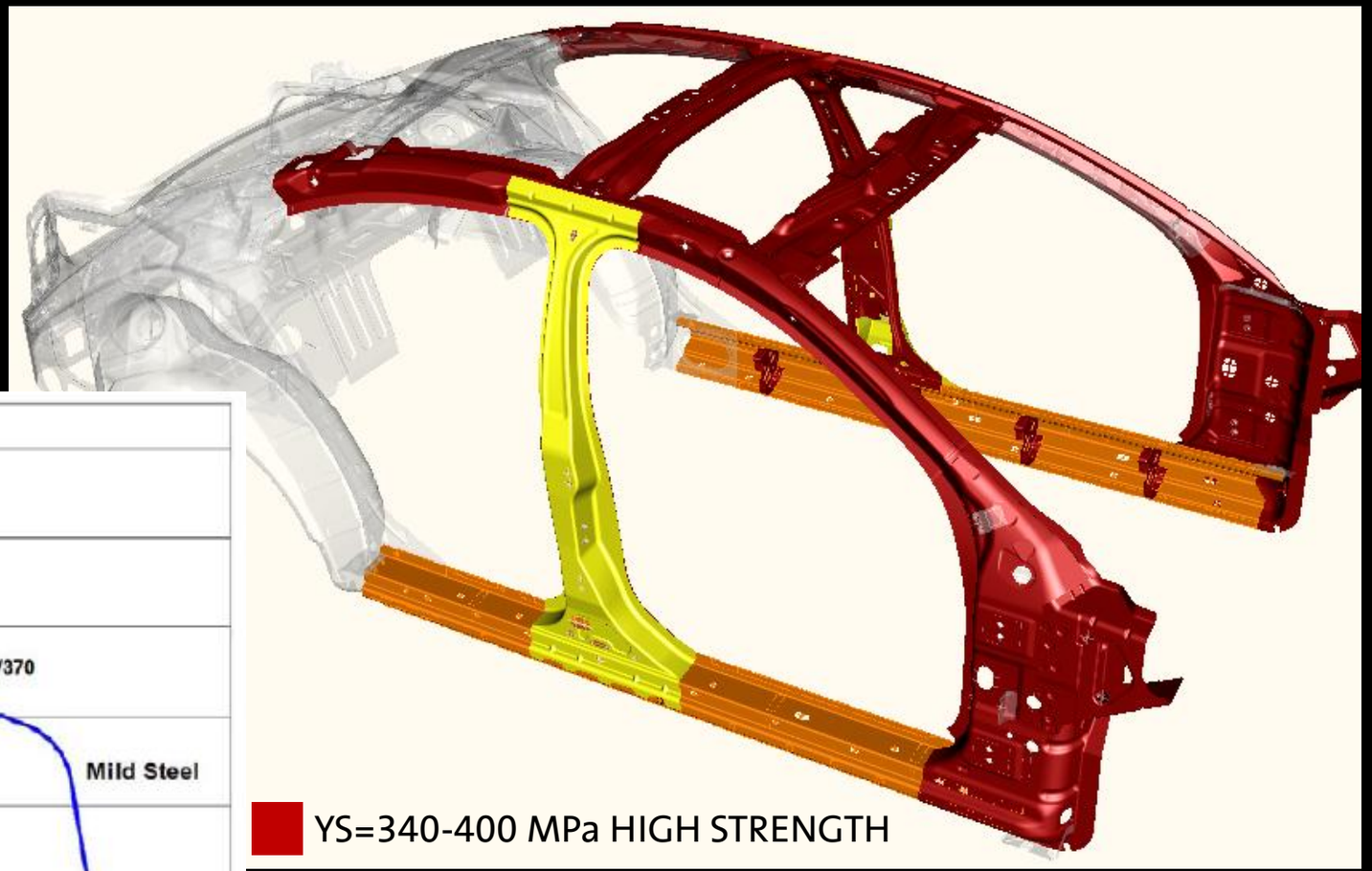
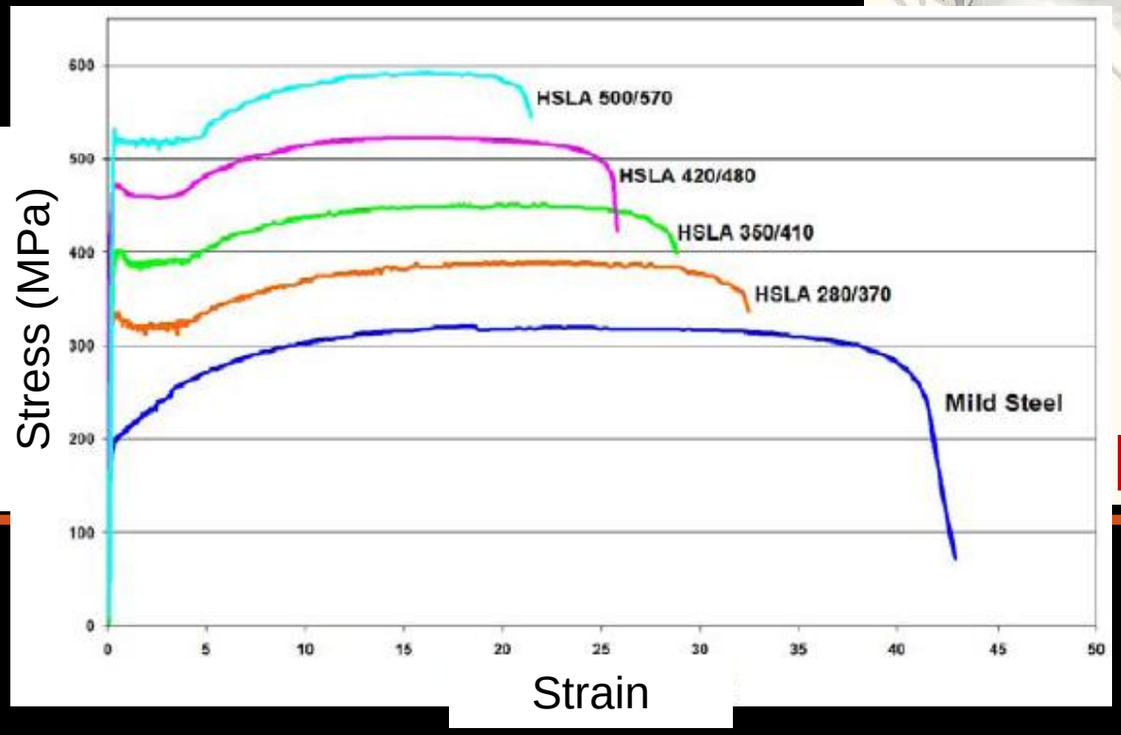
Steel Usage – HSLA

- Many upper structure panels
- Yield strength = 340-400MPa
- Tensile strength > 400MPa
- Stamping process





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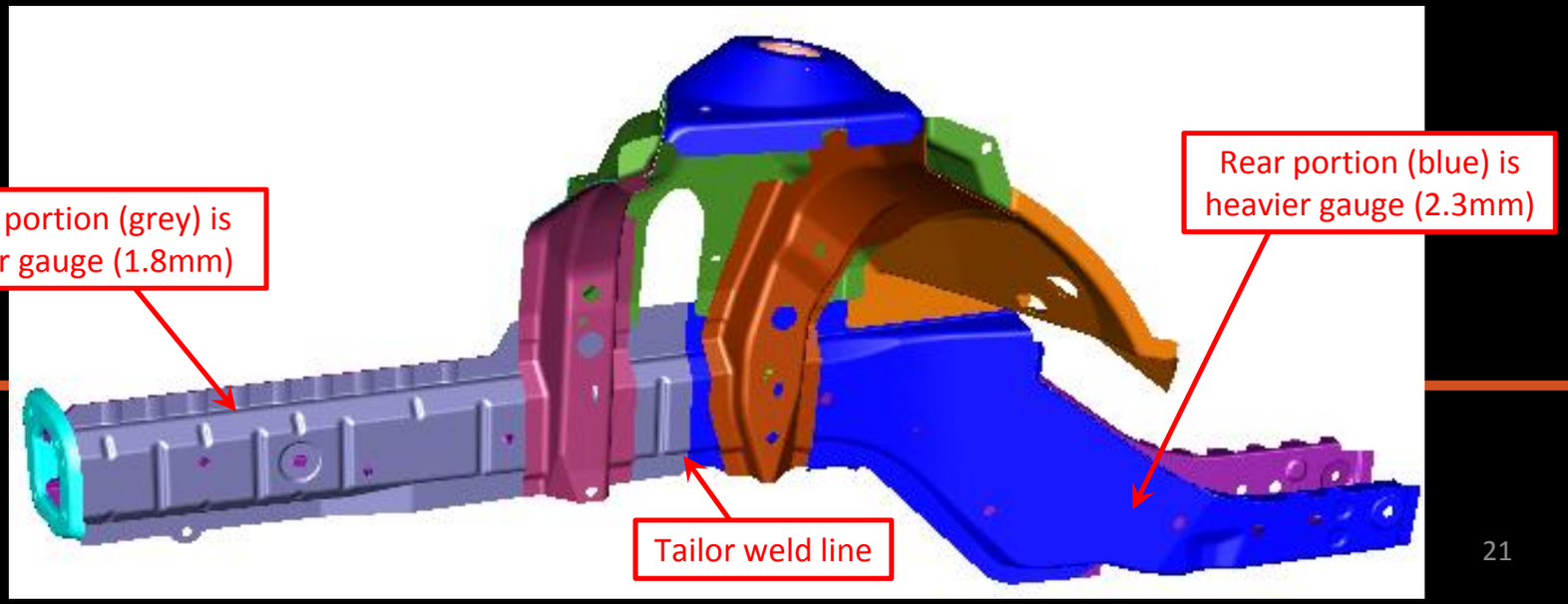
Steel Technology – Tailor Welded Blanks (TWB)

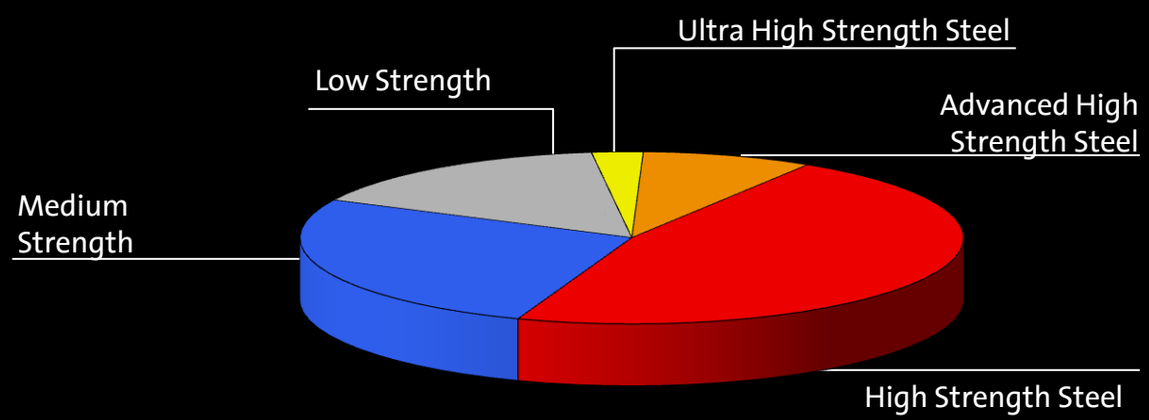
- Efficient way of combining different thickness or material grade into a single component
- Two blanks (flat sheets) are laser welded together
- Stamped as a single part in a single die
- Mass saving, get thickness or strength in the right area
- Used in front rails, #2 cross-bar, door inner



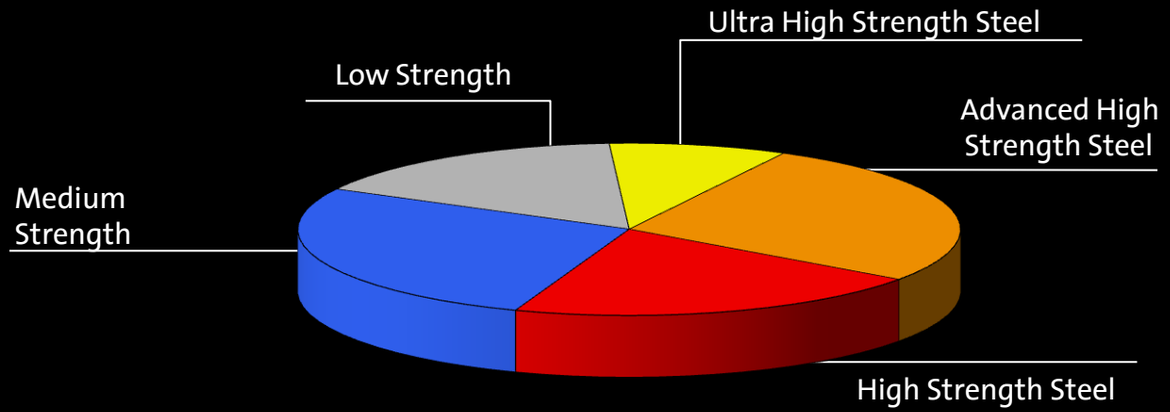
Composite wheel tub

- Lightweight spare wheel tub a GM first
- Composite – not steel
- Glued into steel body
- Delivered a weight saving of about 6kg

The Future



Current



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Conclusion

- Body structure – among best and stiffest in the world
- First use of high strength steels for Holden
- Next generation will use even more advanced steels

Questions?