

# Moulding the Future of Composite Crash Structures

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# Crash Structure Development



## Material Characterisation

- 4m Drop test rig - up to 8m/s and 19kJ

## Crash Structure Development

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- **Esprit and Elite Composites**  
Crash Development 1975 -->
- **Material Characterisation**



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# Crash Structure Development

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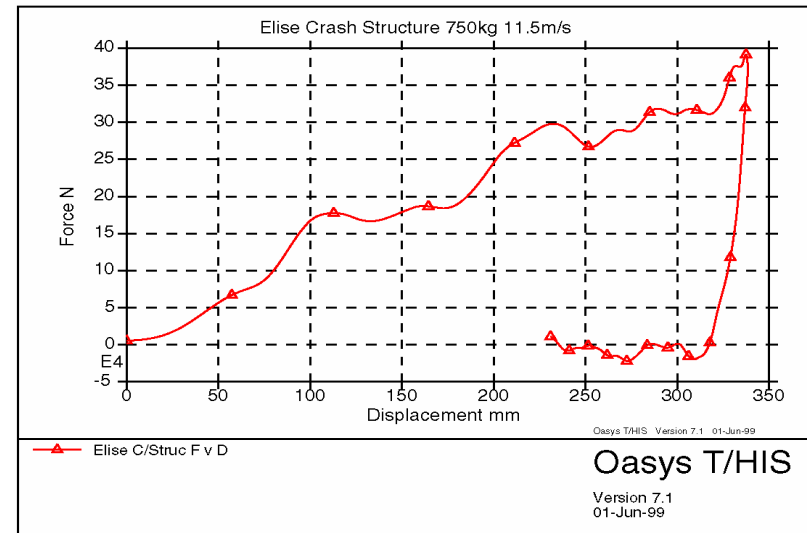
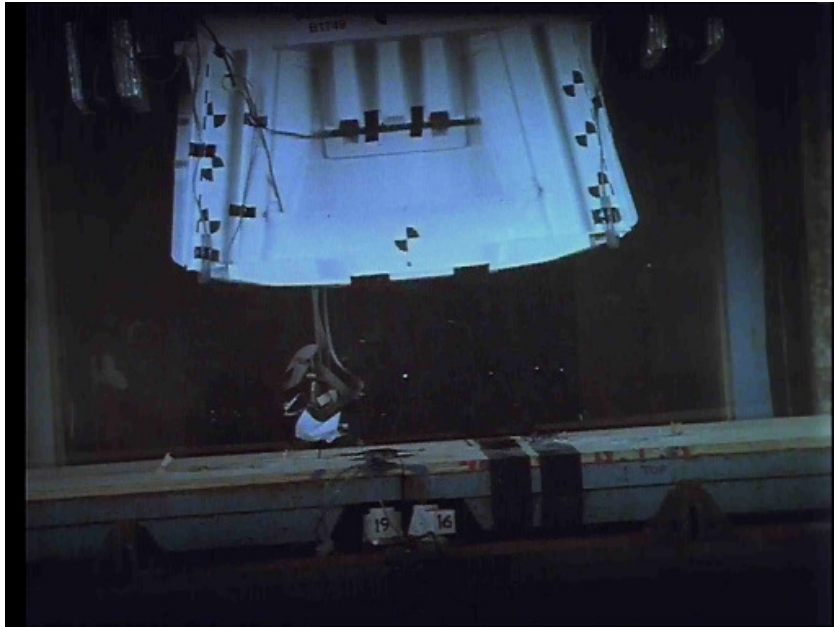
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Elise**



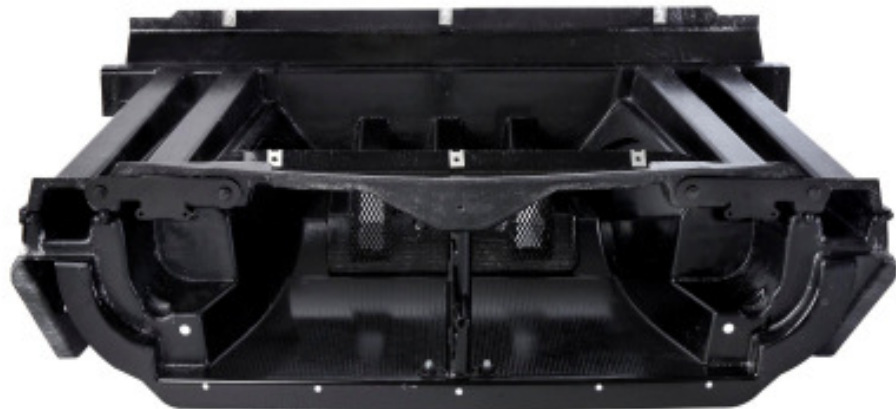
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# Elise Crash Structure



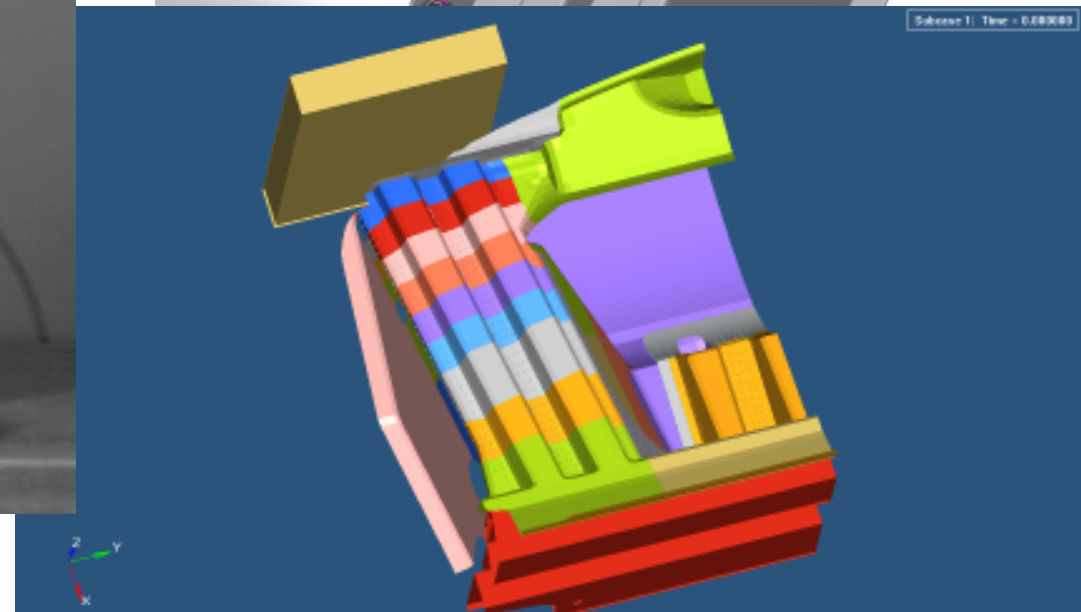
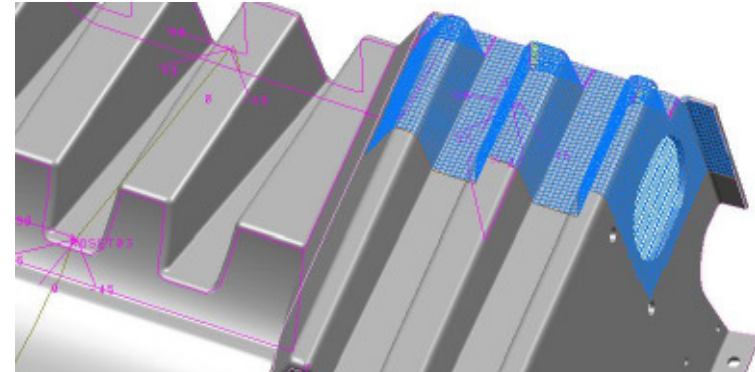
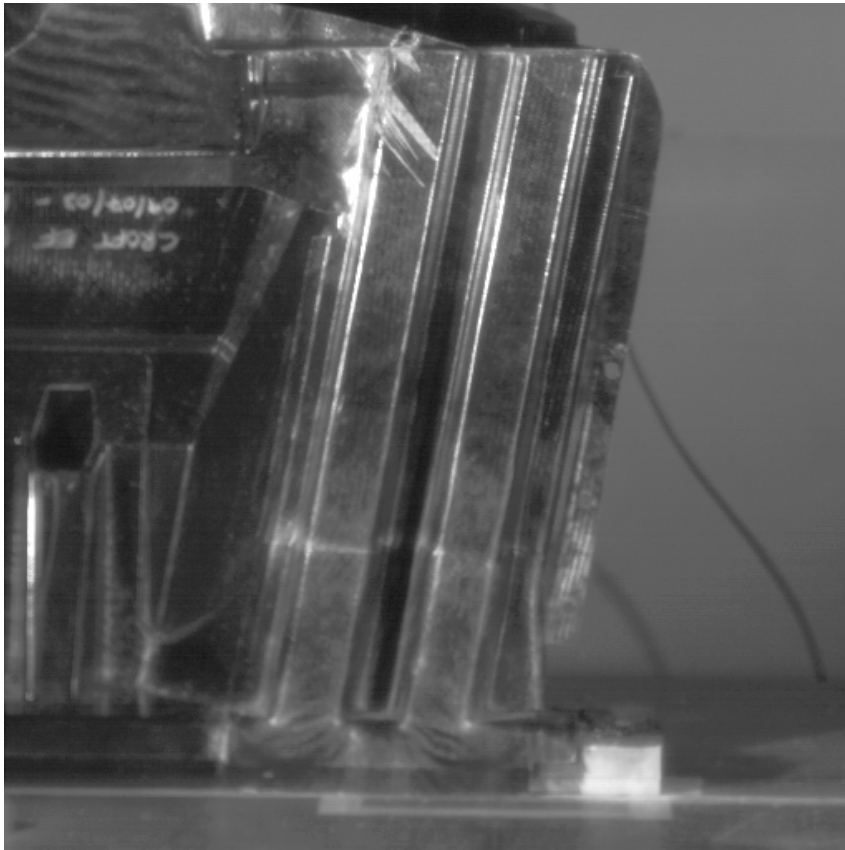
- Energy dissipation of up to 75kJ



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# Elise Crash Structure



- FE Simulation



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# Crash Structure Development

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**AML  
Vanquish**



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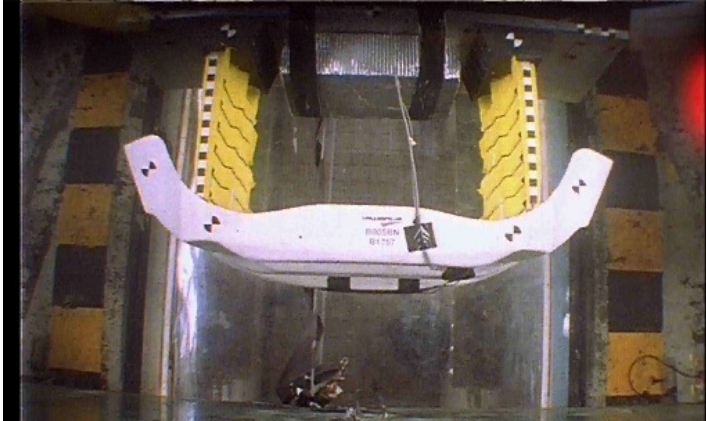
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Elise**



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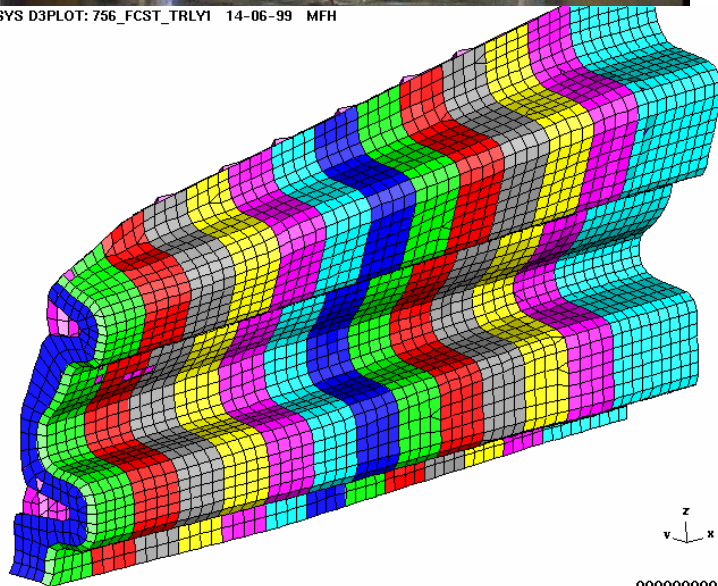
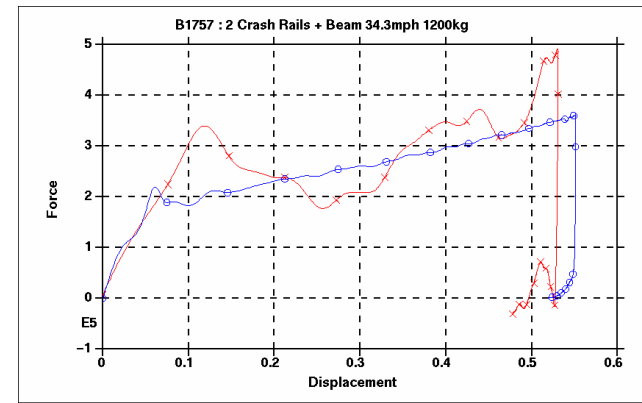
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# AML Vanquish Crash Structure



OASYS D3PLOT: 756\_FCST\_TRLV1 14-06-99 MFH

- Rails and Bumper Beam Assembly
- 0 ° Rigid 1200kg 34.3mph =141.2kJ
- Federal and European Markets



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- FE Simulation



# Crash Structure Development

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**AML  
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**BMW  
M3**

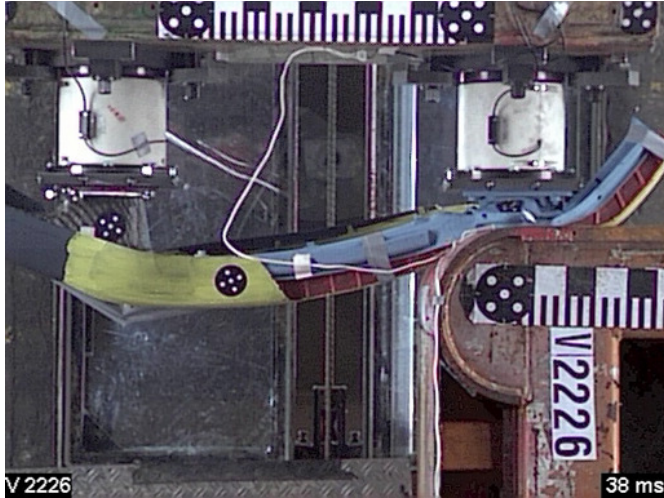


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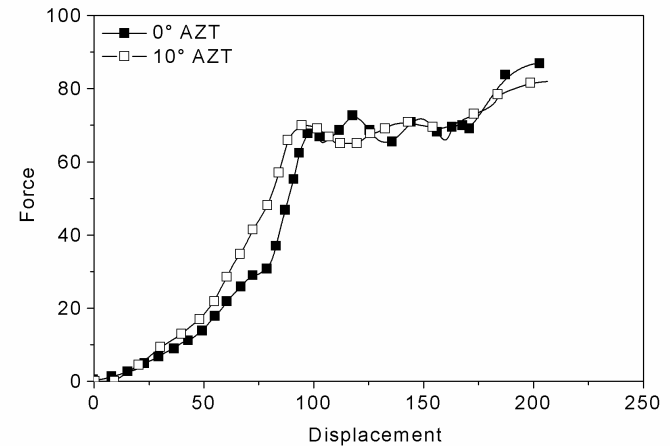
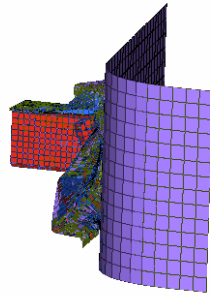
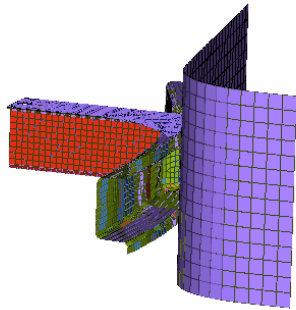
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# BMW M3 Bumper Beams



- Up to 60% weight reduction
- Fulfilled Requirements for AZT, Pendulum, Barrier, Towing
- Same component for all markets
- Benefit from lower insurance premiums



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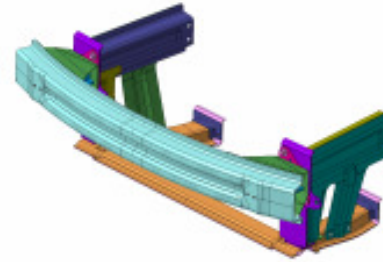
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# Crash Structure Development

**AML  
Vanquish**



**ECOLITE Front  
End Structure**



**Crash Structure Development**

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Elise**



**BMW  
M3**



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# Ecolite Front End Module - Thermoplastic

**Lotus Elise**



High speed crash management

**Thermoset Composite**

**AML Vanquish**



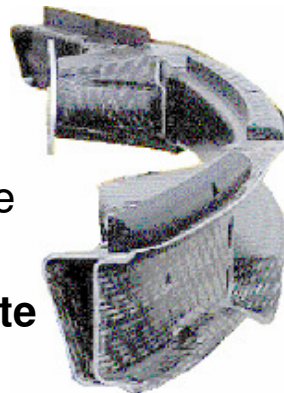
High speed crash management for world car requirements.

**Thermoset Composite**

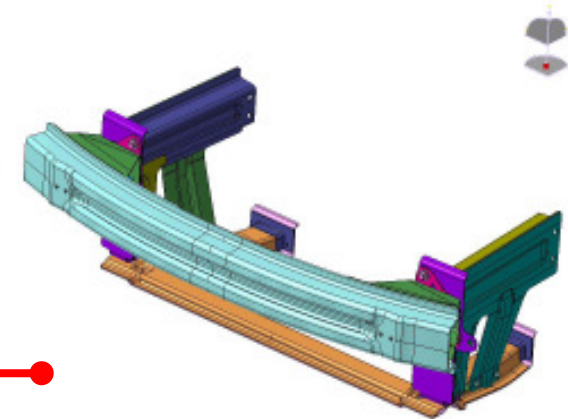
**BMW M3**

Low speed crash management. Recyclable solution

**Thermoplastic Composite**



**Ecolite Structure**



Complete integration of low and high speed crash management, in a single recyclable module for world car requirements

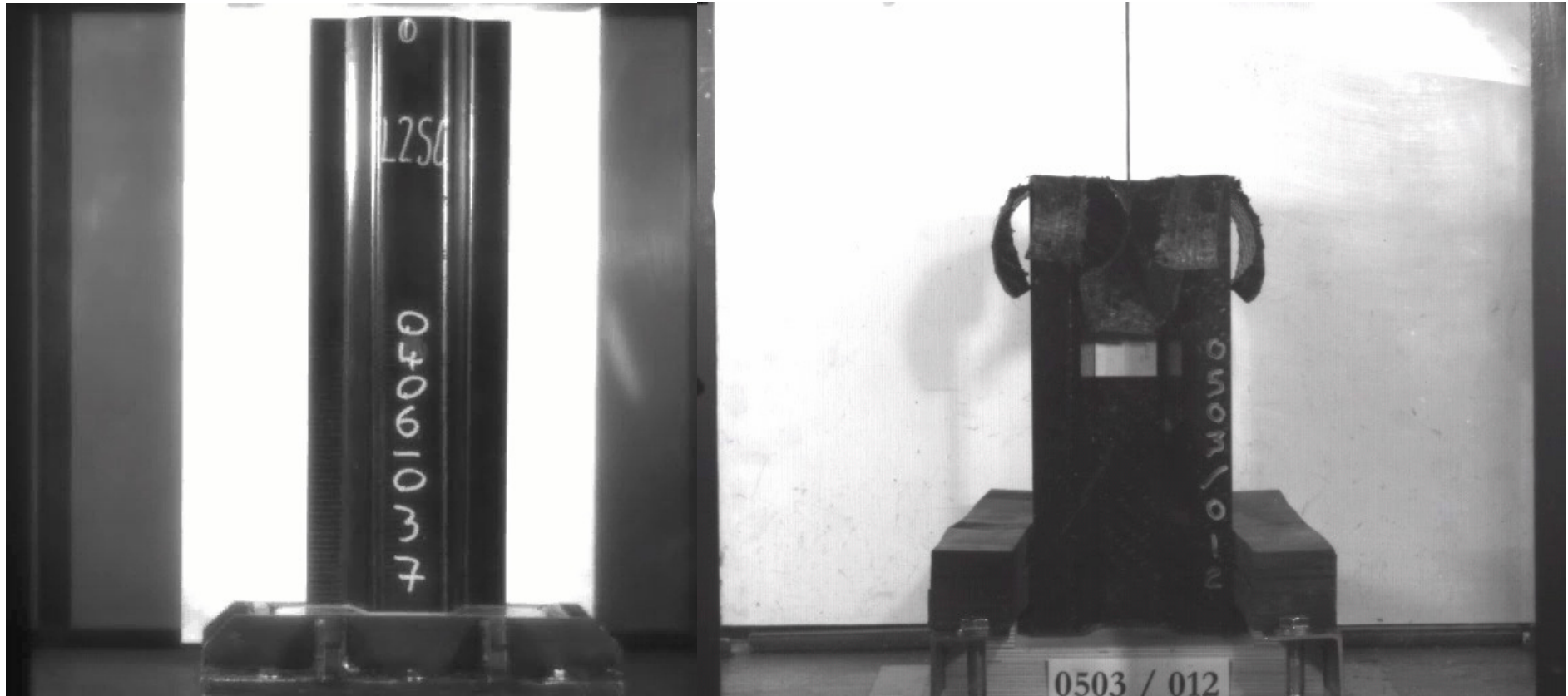
**Thermoplastic Composite**



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# Comparison - Thermoset v Thermoplastic



Thermoplastic performance  
comparable with Thermoset



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# Composite Components in High Speed Impact

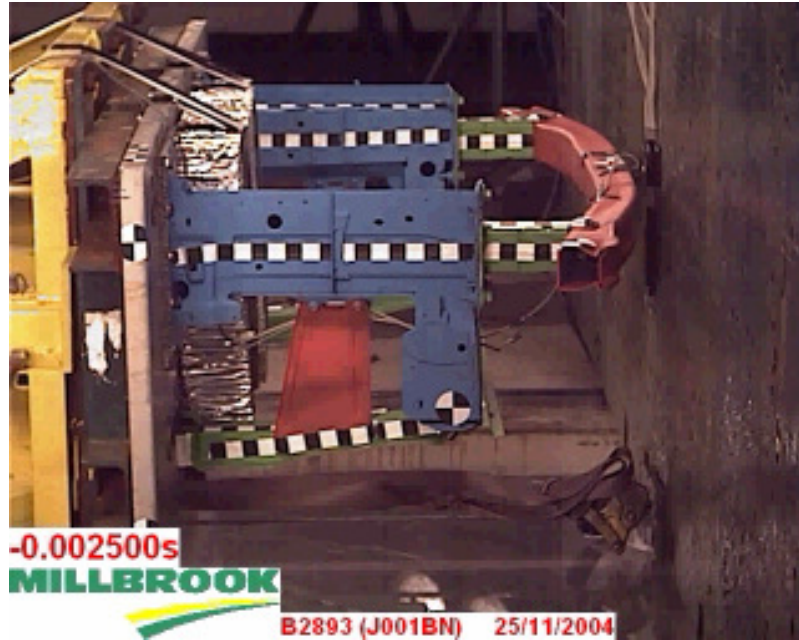
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Component	Process	Section	SEA (J/g)
Aluminium 6063 T7	Extrusion	Tube	15 – 20
Glass / Polyester	RTM	Rail	25 – 40
Carbon / Epoxy	RTM	Rail	35 – 80
Glass / Polyamide 6	Thermoformed	Rail	25 - 55



# Ecolite Front End Structure

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- FE Simulation

**Baseline Metallic Structure = 22.5kg**

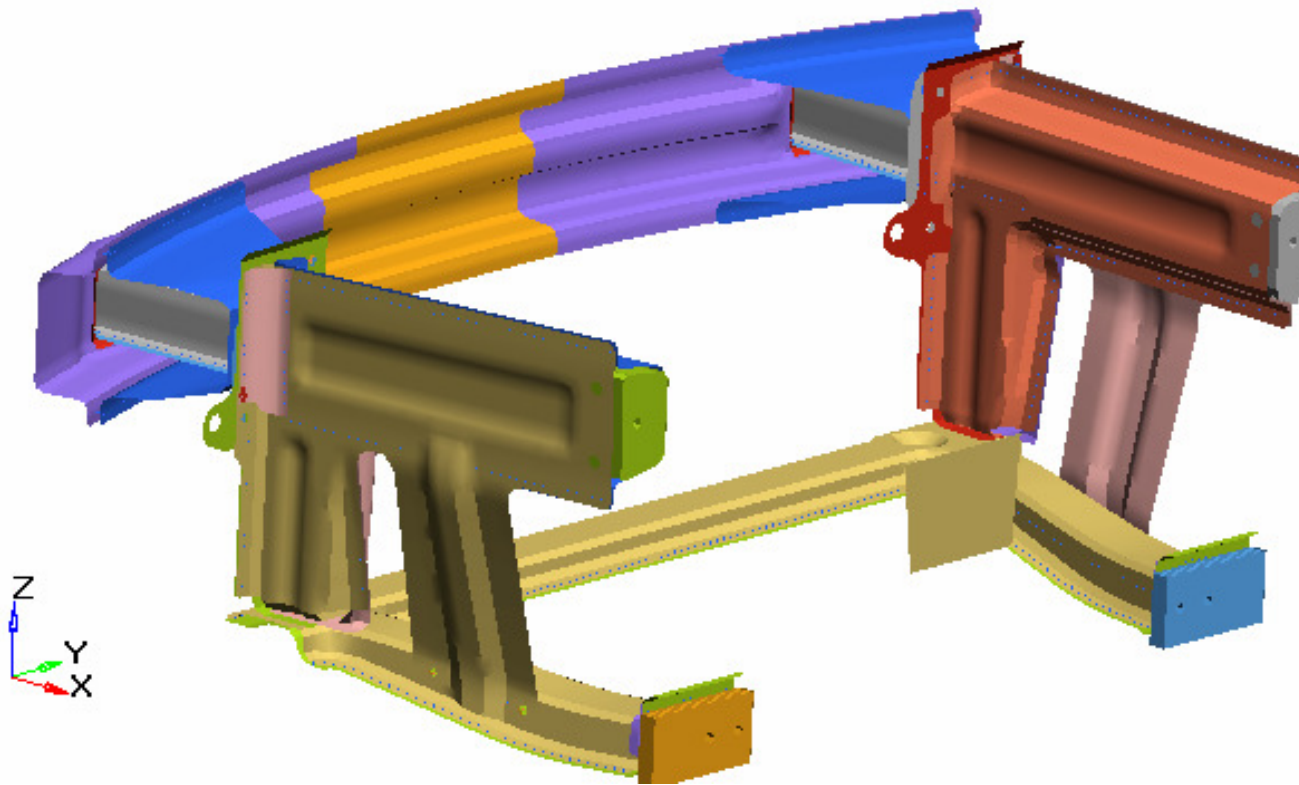


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# Ecolite Front End Structure

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**Ecolite Thermoplastic/Glass Structure = 16kg**

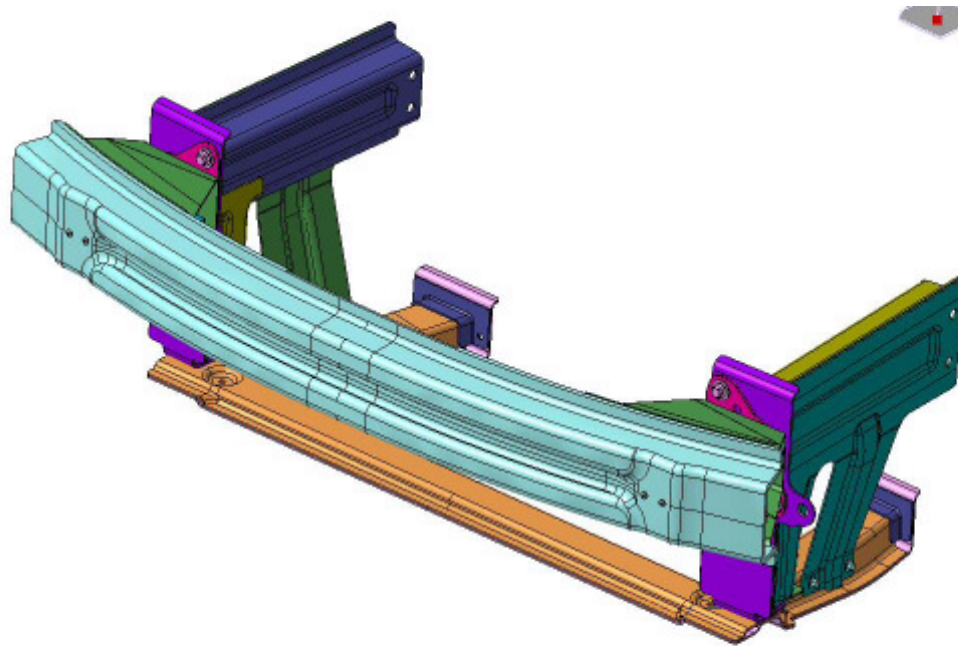


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# Ecolite Front End Structure

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- **Stable tuneable crush**
- **High and low speed**
- **Federal and European**
- **High Specific Energy Absorption**
- **Low residual crush length - package benefits**
- **Improved Thatcham / Danner rating**
- **30% saving in weight versus the steel equivalent structure**
- **Part integration / Reduces complexity**
- **50% reduction in tooling investment**
- **Competitive piece cost allowing realistic business cases at 30,000 units per year**
- **Recyclable**



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