DESIGN AND ENGINEERING

V8 Vantage’s unique architecture was designed from the outset as a front-mid mounted engine, rear mounted transmission, two seat sports car. This enabled Aston Martin to adopt minimal compromises in its approach to the design and engineering while achieving the following key objectives:

- Minimising the weight of the car
- Positioning the weight within the wheelbase as far as possible
- Ensuring even weight distribution

BODY IN WHITE

LIGHT AND RIGID STRUCTURE

V8 Vantage’s VH (Vertical Horizontal) architecture is the backbone of the car – the structure to which all other components are mounted. It is constructed from lightweight aluminium extrusions, pressings and castings bonded with aerospace standard adhesives.

Aston Martin believes this to be one of the most structurally efficient body frames in the motor industry, making it key to:

- A stable and rigid platform from which the suspension can control the vehicle effectively
- Delivering a feeling of control to the driver
- Enabling the passenger module to better protect the occupants in the event of a collision
- Providing a lightweight architecture – aiding performance and handling

LIGHTWEIGHT, HIGH TECHNOLOGY MATERIALS

- Aluminium – VH Architecture, bonnet and roof
- Steel – Body Sides
- Composites – Wings, tailgate and sills

ADVANCED TECHNOLOGY

Aerospace Standard Adhesives:

- Bonding is stronger and less prone to cracking than conventional welding
- Adhesive is applied by the first ever robot at Aston Martin
- Curing is computer controlled, ensuring the highest standards of accuracy and repeatability

Ultrasonic Welding:

- Uses sound waves as opposed to conventional heating methods
- Forms a bond at molecular level
- 90% stronger than a conventional weld
- 5% of the energy needed for a conventional weld
- None of the adverse distortion associated with a normal weld

DESIGNED FOR SAFETY

V8 Vantage has three zones which make up the crash-structure:

- Front crumple zone
- Strong central passenger module
- Rear crumple zone

The front crumple zone is designed to crush sequentially through its three stage system to maximise energy absorption. Longitudinal members within the under floor structure are connected to the front crumple zone to direct impact energy under the car and away from the occupants.

The power train is also designed to detach from the car on heavy impact, allowing the body structure to dissipate energy. A ‘yoke’ also helps to aid safety in the event of a high speed collision.

The side impact performance of the V8 Vantage is class leading, owing to large sill sections, strong A and B pillars, a rigid face and foot well structure and two side impact beams manufactured from 6000 high-strength aluminium.

CRASH TESTING

Aston Martin has access to the extensive testing resources within the Ford Motor Company, enabling engineers to develop leading safety standards for the V8 Vantage.
V8 ENGINE

All alloy quad overhead camshaft 32 valve, 4.3 litre V8.
Variable Inlet Camshaft Timing. Dry sump lubrication system. Fully catalysed stainless steel exhaust system with active bypass valves.

- Maximum Power: 380 bhp (283kW) @ 7300 rpm
- Maximum Torque: 302 lb.ft (410 Nm) @ 5000 rpm
- Bore: 89 mm (3.504 in)
- Stroke: 86 mm (3.386 in)

Compact and lightweight – 600 mm long and weighing 204 kgs.

Produced at Aston Martin Engine Plant in Cologne, the Aston Martin V8 has been designed to provide a balance of power, performance and usability.

INTER-BAY BREATHING
The V8 Vantage engine is bored with passageways which allow the air below the piston to move from cylinder to cylinder, as the piston is moving up and down. This avoids any adverse air compression and consequent power losses.

CRANKSHAFT AND PISTONS
The crankshaft and connecting rods are manufactured from forged steel to combine high strength with low mass inertia. The pistons are cast aluminium with a motorsport derived polymer coating to reduce friction.

INLET MANIFOLD
The V8 Vantage inlet manifold has been specially engineered to provide a balance of top end performance and excellent throttle response.

VARIABLE INLET CAMSHAFT TIMING
The V8 Vantage engine takes particular advantage of the "Helmholtz resonances" which take place within the induction system. This resonating effect creates pressure waves inside the inlet manifold which build with increasing engine speeds. Varying the inlet camshaft timing allows the engine to take advantage of the pressure waves at all engine speeds to force more air into the combustion chambers.

EXHAUST SYSTEM
The exhaust manifold has a 4-2-1 arrangement. As the pipes leave the 4 cylinders, they merge into 2 pipes and then into 1. This arrangement allows the pipes to be made of equal length helping to draw the exhaust gasses out of the combustion chamber – resulting in a more efficient combustion process.

The exhaust manifolds are made from double skinned hydro-formed stainless steel which reduces heat loss, allowing the latest emissions standards to be met. The design is unique to Aston Martin and a patent has been applied for.

V8 Vantage is equipped with electronic bypass valve systems which open and close at set engine speeds to include or exclude the final silencer box from the system. When the valves are open the back pressure within the system is reduced, offering the following benefits:

- Engine power is increased due to the pressure reduction, allowing the exhaust gasses to exit the system more freely
- The lower pressure reduces the load on the exhaust valves and system, heightening the durability of the powertrain

DRY SUMP LUBRICATION SYSTEM
Conventional engines use an "oil bath or Wet Sump" at the bottom of the engine to store the oil, prior to it being re-circulated.

V8 Vantage uses a dry sump system which collects the oil before rapidly pumping it away into a swivel pot and then oil storage tank before going back into the engine.

This provides the following benefits:

- The bottom of the engine is much shallower allowing the engine to sit lower in the car, providing a better centre of gravity
- The oil pressure is maintained regardless of the intensity of use
- Greatly reduces oil aeration at high engine speeds preventing power loss and better protecting the engine
- Eliminating "oil surge" under cornering, braking and acceleration
POWER TRAIN

SUSPENSION
The V8 Vantage features all-round double wishbone suspension, providing an outstanding balance of ride and handling.

Sub frame: The front suspension is mounted on an all-aluminium sub frame. In V8 Vantage this component is an integral part of the body structure, serving to increase torsional rigidity, as well as acting as forming part of the crash structure.

Lower Control Arms and Roll Bars: The lower control arms are made from forged aluminium for light weight and strength. The roll bars are unusual because they are made from tubular steel rather than solid steel effectively providing the same strength for less weight.

Upper Control Arms: Completing the second part of the double wishbone suspension is the upper control arm. Both control arms fit within the diameter of the wheel improving camber stiffness and resulting in better handling.

Steering Rack: The steering rack is mounted ahead of the wheels, providing enhanced control under heavy steering and braking. Solid mounting provides a more direct feel for the driver.

Anti-Squat / Anti-Lift Geometry: The rear suspension has been designed with anti-lift and anti-squat geometry. The overall effect is that the driver will feel more “at one” with the car and have greater appreciation of how the car is behaving.

TRANSMISSION
V8 Vantage is equipped with a 6-speed manual transmission. The gearbox incorporates the final drive and limited slip differential within its casing. It was designed to Aston Martin’s specification with gear ratios chosen to optimise performance. The gearbox uses a single plate clutch.

REAR SUB FRAME
The rear sub frame accommodates the transaxle transmission, whilst also carrying the rear suspension. This sub frame is made of steel for strength.

V8 Vantage’s sub frame is mounted on six solid mounts which, in conjunction with the VH Architecture, works to improve the rigidity of the car. The result is a sharper steering response.

BRAKES

Discs: V8 Vantage’s discs are grooved and ventilated. The discs measure 355 mm at the front and 330 mm at the rear.

The benefits of grooved, over cross-drilled discs are:
- Greater efficiency at preventing brake-pad dust build up
- Sharper edges allowing a greater abrasive effect on the pad leading to a clearer and more effective pad

Calipers: The V8 Vantage uses 4 piston monobloc calipers. Manufacturing the caliper from a single casting makes it inherently stronger and less likely to flex under high braking loads.

Brake pads: V8 Vantage uses brake pads derived from a racing compound. They provide powerful braking force and a consistent brake pedal feel.

TORQUE TUBE

The Torque Tube connects the engine to the transmission casing and aids the strength and rigidity of the power train. A carbon fibre propeller shaft runs through the centre of the tube, delivering power from the engine to the transmission. The use of a carbon fibre shaft in this manner, is an industry first, delivering benefits in terms of strength, performance and refinement.
The aluminium under frame Monocoque chassis for the V8 Vantage is constructed in a dedicated area at Gaydon due to the fact that the construction method requires stringent cleanliness. The process uses high strength structural adhesives to bond lightweight aluminium and composites into an extremely rigid chassis and the design incorporates 150 aluminium extrusions, castings, sheet sections and superformings.

Each chassis takes around 24 hours to construct and demands continuous working over 3 shifts as the process cannot be halted once stated.

1. Components are selected and loaded into 20 ‘kitting pallets’ at the start of the process.
2. Self piercing rivets and rivnuts are fitted to the aluminium panels. These will eventually support wiring and fixing points in the vehicle. The rivets are located by precision made masks aided by a laser pointer and camera.
3. A vision system incorporating eight cameras scans each component on the pallet, checking the correct parts have been loaded and that the rivets and studs are correctly fitted. This is repeated in the construction process.
4. All the components are placed in an oven and heated to 185°C for 15 minutes in order to remove any surface contamination and moisture.
5. Two robots dispense the toughened structural epoxy adhesive. The robots are able to apply the adhesive precisely and consistently.
6. All bonded components await the assembly process on pallets.
7. Sub-assemblies are made in fixtures which set the part geometry. At this stage the parts are held together with rivets whilst the adhesive is cured.
8. The sub-assemblies are loaded onto a large pallet on which the final chassis is produced. This pallet moves through two larger geometry fixtures where the under frame assembly is completed.
9. Adhesive joints are checked thoroughly and excess adhesive is removed by hand.
10. The chassis moves to the main oven for curing. The chassis is pre-heated then cured at 185°C for 30 minutes before being allowed to cool and continue assembly.
11. The under frame moves to where the composites are fitted. All of these components are bonded to the under frame using a different adhesive which is cured with ‘heat lamps’.
12. The chassis is inspected using a fully automated co-ordinate measuring machine. This checks approximately 300 points on every under frame.
13. Finally the approved chassis moves to the Body In White area.