



Fig. 1 – BMW Sculpture 2016, F1, Le Mans & Mille Miglia cars

Goodwood Festival of Speed Sculptures

HOOBAN BAGHI – DIALES STRUCTURAL ENGINEER, EXPLORES THE ICONIC SCULPTURES OF GOODWOOD AND THE ENGINEERING AND ARTISTIC HEROES WHO BRING THEM TO LIFE EACH YEAR.

The Goodwood Festival of Speed was founded by Lord March in 1993, to bring motor racing back to the historic Goodwood circuit. Now with more than 100,000 visitors per day, it has become a huge outdoor motor show and historic hill climb event that draws automotive enthusiasts to the West Sussex estate from all over the world.

Each year at the Festival of Speed, a different manufacturer sponsors the central display feature in front of Goodwood House. Since the millennium, these sculptures have been conjured up from the theatrical imagination of

the renowned sculptor Gerry Judah.

Gerry's sculptures have become remarkable and outstanding iconic centrepieces in front of Goodwood House. Since 2005, a new association with a team of talented designers and engineers has allowed Gerry's sculptures to push the boundaries, to become more imaginative, more ambitious, and more spectacular. Three of the designers and engineers who formed the nucleus of that team, and have been the sole members since 2012, are working with us at Driver Group today.

This year's sculpture was created by Gerry and the team for BMW [Fig. 1].

Back left, hangs an upside down Brabham BT52 F1 car, designed for the Brabham team by long time Brabham designer Gordon Murray for the 1983 season and powered by the massively powerful BMW M12/13 turbocharged engine (producing 800bhp in qualifying trim). Front left, and nearly vertical, hangs a BMW V12 LMR Le Mans prototype, which took overall victory at the 1999 Le Mans 24 Hours. Finally, hanging perilously over



Fig. 2 Moving cars for Honda in 2005



Fig. 3 Racetrack for Audi in 2009

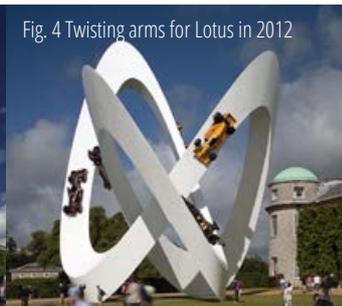


Fig. 4 Twisting arms for Lotus in 2012



Fig. 5 Leaning slender arrows for Porsche in 2013



[Fig. 6] Breathtaking bridge over Goodwood House for Mercedes-Benz in 2014



Fig. 7 Tall twisting DNA for Mazda in 2015



Fig. 8 – Porscheplatz, Stuttgart, Germany



Fig. 9 – Audi Chanchun, China



Fig. 10 – KIA Sculpture – South Korea

Goodwood House, is a classic BMW 328, 1938 class winner of the Mille Miglia, and similar to the car that took fifth overall and first in class in the 1939 Le Mans 24 Hours.

Credit must also go to metalwork specialists, Littlehampton Welding. Each year they collaborate with Gerry and the team, to produce these breathtaking central sculptures that provide

the support for a collection of iconic and, needless to say, priceless cars, and erect them on the front lawn of Goodwood House. The sculptures are a perfect fusion of art and engineering, constantly pushing the boundaries of physics, engineering, and manufacturing whilst being practical and safe focal points of a major public event.

Figs. 2-7 above, show previous spectacular sculptures that have thrilled the crowds which flock to what has become the world's largest motoring garden party.

After the 2013 event, Porsche commissioned a similar spectacular sculpture for the front of its corporate headquarters at Porscheplatz, near

Stuttgart, Germany [Fig. 8]. Similarly, some have commissioned entirely new sculptures, as Audi did to celebrate 1 million cars made in China [Fig. 9], and as KIA have done outside its plants in Seoul and Gwangju, South Korea [Fig. 10].

Our design and engineering team's experience of working, firstly with membrane structures for permanent and temporary applications, and thereafter developing those structural analysis techniques into steel monocoque structures, has led to an unrivalled understanding of structure, materials, fabrication, and construction processes. They have developed software to turn Gerry's highly complex ideas, shapes, and purity of form into elegant structures; where the surface you see is the structure. The sculptures are not made up of an external cladding applied over an internal structure. They are 98% hollow and would float in a swimming pool.

Building information modelling (BIM) is used between the geometry generating model and analytical 3D model. A hollow monocoque construction is a complex shape to analyse, but ideally suited to finite element and dynamic analysis. The developed software allows for the fine tuning of varying plate thicknesses to mirror the load distribution in the structure. However, none of this is visible from the outside, where all you see is the smooth, sinuous, double curvature, three-dimensional shapes.

The BMW sculpture of three interlocking crescents was constructed in 12 pieces, using 77 tonnes of steel, connected together at two critical and vital junctions. Each crescent is made of three steel plates welded together to form a triangular spike, varying in curve and dimension, with internal baffles and triangular stiffeners. Due to the large size of sculpture and transport restrictions, the design had to allow for fabrication in deliverable pieces of absolute precise geometry, so that all segments could be welded back together accurately on site. Existing ground restrictions in front of Goodwood House meant a small base grillage was designed to sit underneath the sculpture's narrow base-plate, buried just below ground level, to cater for lateral stability in wind. ■



Fig. 11 – Smooth sinuous 3D curved arm in fabrication

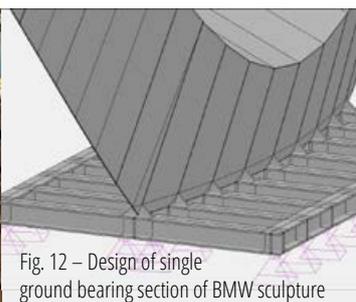


Fig. 12 – Design of single ground bearing section of BMW sculpture



Fig. 13 – Fabrication



Fig. 15 – Erection 2

