

# ALUMINUM EXTRUDED SHAPES

## LIGHTWEIGHT ALUMINIUM ALLOYS

The role of aluminium alloys in reducing the vehicle's weight to less than one tonne

We explore the development of the 7000-series high-strength aluminium alloy bumper reinforcement used for the Mazda MX-5, which pursues the driving performance of a light weight sports car.

### Front bumper for MX-5 (ND) made from aluminium Alloy: 4.2kg

The 7000's high-strength extruded aluminium alloy bumper reinforcement has excellent crash energy absorption properties and is extremely light. However, due to the two middle pillars, extrusion process is difficult and requires a high level of technical capabilities to manufacture.



In order to meet increasingly stringent crash safety standards, the performance requirements of front bumpers are becoming more demanding.

For the MX-5 (ND), a further reduction in weight was required while ensuring the highest level of safety performance.

Reducing the weight of components that are furthest from the vehicle's center of gravity contributes not only to improved fuel economy but also to enhanced driving performance.

Mazda and UACJ conducted a zero-based review of everything from material properties to construction methods to maximize the advantages of aluminium alloys.

Mazda's choice was to use 7000's high-strength aluminium alloy hollow extruded shapes.

The extruded bumper reinforcement is thicker in areas where high strength are required, and medium thicker in areas where medium strength are sufficient, to achieve the optimum cross-sectional shape for significant weight reduction.

In addition, the welding characteristics were improved and the related parts were welded together to increase the strength.

The next challenge was to fit the MX-5's beautiful front design.

Extruded bumper reinforcements are usually straight.

It is not easy to shape 7000's high-strength aluminium extruded shapes into a smooth curved surface to match the MX-5 front design.

To meet this challenge, we adopted the new method called the 'stretch-bend' method, developed and built the new automated production lines specifically for the MX-5, and succeeded in creating the shape that blends in with the beautiful front design.

The original function of the front bumper was to

provide high crash safety performance.

The bumper is joined to a cross-sectional crash boxes made of aluminium alloy, which deforms into bellows shape to absorb the collision energy.

The optimum design and manufacture of these shapes requires know-how that integrates simulation, materials technology and processing technology.

UACJ Group had an integrated system from material and processing technology development to manufacturing.



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