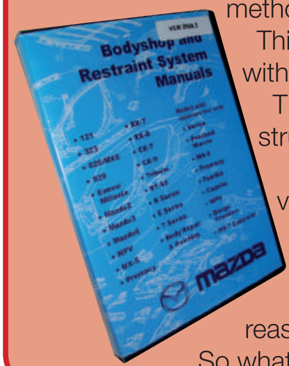
I-CAR NEW ZEALAND technical report

Let's look at Mazda



This is not the manufacturer's repair specification of a current model as we generally do, but a look at some assembly methods used for a new model Mazda being introduced later this year.

This new design developed by Mazda is a reminder that technology and assembly concepts change with each new model released, this is not just with Mazda but with all vehicle makers.

The following information looks at some of the new technology used to build the vehicle's body structure and will hopefully serve as awareness for you if one appears in your shop.

We don't yet know what the repair methods will be, but I'm sure this will be available before the vehicle is released.

Mazda NZ has developed a collision repair CD featuring any repair specifications available for all Mazda models released in NZ. This CD includes any information available for early models plus the more recent and current vehicles. This CD is available at your local dealership at a very reasonable price.

So what are these new technologies developed by Mazda?

SKYACTIV-Body

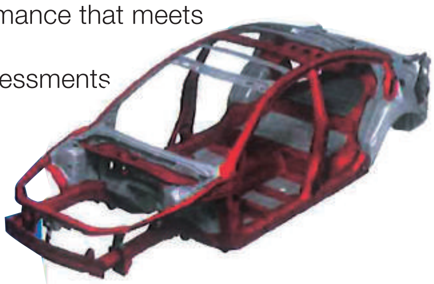
Excellent rigidity supporting Mazda's fun-to-drive feel, with a lightweight body to achieve outstanding crash safety performance.

1. Features of SKYACTIV-Body

(1) Superior body rigidity creating true driving pleasure (rigidity improved by 30% compared with current models)

(2) Crash safety performance that meets the top criteria for crash safety assessments in all markets (US-NCAP, Euro-NCAP, IIHS, JNCAP, etc)

(3) Lightweight body-in-white, 8% lighter than current models



2. Technical Aims & Concept

(1) Combination of superior rigidity with reduced weight

(2) Achievement of world's best crash safety performance together with weight reduction

To deliver on its "Sustainable Zoom-Zoom" commitment, Mazda worked relentlessly in pursuit of the world's best environmental and safety performance together with driving pleasure, and successfully achieved a superior balance between world-class crash safety performance, significantly improved rigidity, and weight reduction.

In its development work, they went back to square one in their reviews of the car's functionality, while at the same time creating the ideal body structure and optimising our engineering processes (bonding methods). It also selected the best materials and sheet thicknesses. Through multiple iterations of this process it achieved the targeted weight reductions and outstanding body rigidity.

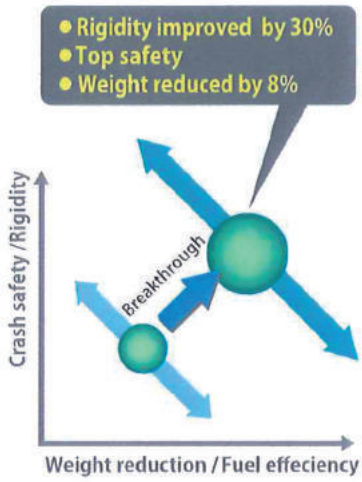


Fig.2-33 Aim of SKYACTIV-Body

3. Key Technologies

(1) Body Structure

1) Straight and continuous basic framework

In terms of structure, it revisited the basic principles. For the basic framework, it adopted the concepts of 'straightening', and a 'continuous framework' in which each section functions in a coordinated manner with the other sections of the framework. The important thing when creating a light yet strong framework is to ensure that the structure disperses force widely throughout the entire framework, rather than receiving the force on only specific sections of the vehicle.

For the underbody area, curves were removed as much as possible to create a straight frame in a continuous configuration from the front to the rear. For sections of the frame that still require some curvature, Mazda implemented continuous bonding with the horizontal frame to make the structure a closed section, thus contributing significantly to weight reduction while at the same time achieving rigidity.

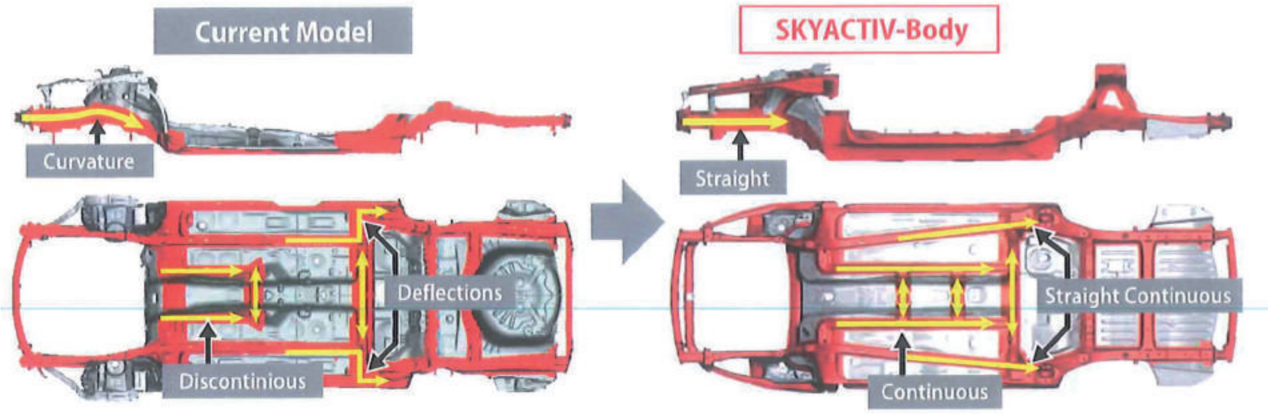


Fig.2-34 Straightening of basic framework and continious framework structure

The upperbody also functions as a constituent part of the continuously bonded framework. Specifically, the suspension mounting positions at the front and rear of the upperbody are directly bonded with the underbody framework as a "dual brace". In addition, by creating four ring structures for the upperbody that includes the roof rail and B-pillar, and the entire reinforcement area of the underbody, the overall rigidity of the body has been further enhanced. Further, Mazda renewed the structure of the cross member (suspension member), which not only improved local body rigidity, but also contributed to overall rigidity through optimisation of the body mount positions. It also focused on continuity at the most detailed levels of the structure, such as the connection points inside the wheel house.

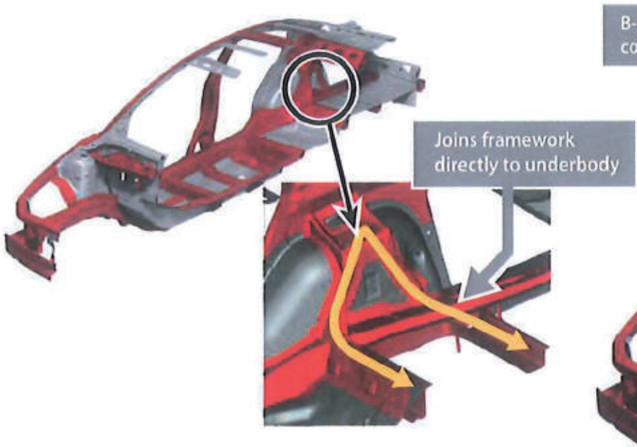


Fig.2-35 Dual brace

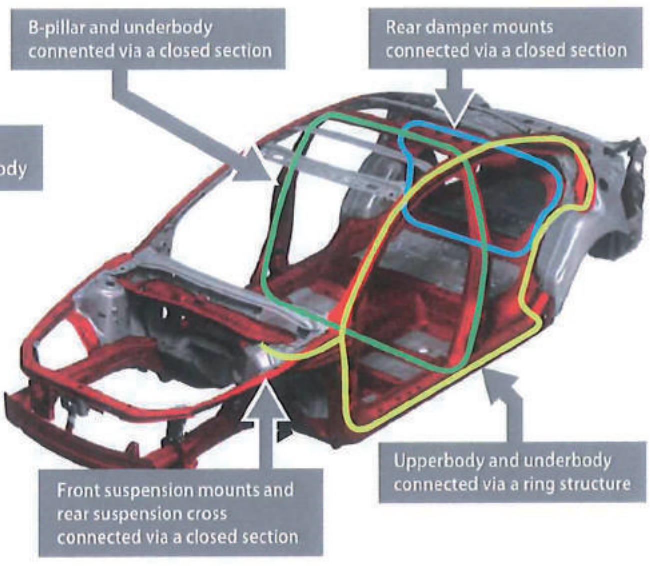


Fig.2-36 Ring structure

2) Multi-load path structure

To improve crash safety performance, Mazda adopted a multi-load path structure. The structure efficiently absorbs the load at the time of a crash by dispersing it in multiple directions. For example, energy received when a frontal collision occurs is absorbed by being dispersed along three continuous routes (paths): from the front frame to the B-frame, from the front frame to the side of the body, and from the front frame to the A-pillar. In particular, the upper branch frame, which diverts the load to the A-pillar, is a multi-functional part that also works to cancel the upward motion of the front frame. To create this kind of path, parts such as door hinges, which do not normally play any role in absorbing shock, are important elements in the design. Naturally, the multi-load path structure is adopted for lateral collisions and rear collisions as well to function in the same way, thus greatly improving safety performance. The multi-load path approach was also adopted for individual parts.

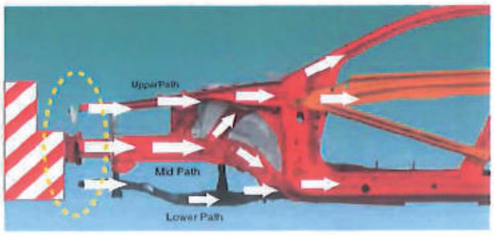


Fig.2-37 Multi-load path

Mazda focused on directing the crash energy mainly along the ridge lines of the parts, molding the front tip of the front frame into a cross shape. In a conventional square section, there are four ridge lines, but when a cross is created there are twelve ridge lines, and the shock is dispersed more widely.

By doing so, the energy is then absorbed more efficiently, the space in the engine room is more effectively used, and there is also greater freedom in exterior design.

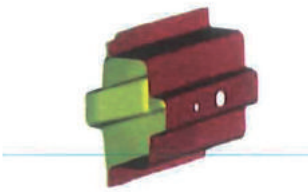


Fig.2-38 Front frame molded into a cross shape

(2) Engineering Method (bonding method)
Weld bonding and increased spot weld points

To create a circular structure for the reinforcement, weld bonding was used for the roof rail section. Previously, this structure was separated from the rear frame due to the body assembly process. To bond this section directly, Mazda adopted a method whereby the parts are bonded together in advance using the weld bonding method and then sent on to the assembly process as a bonded unit.

By adopting this method continuous bonding is achieved, at the same time greatly increasing the number of spot weld points, which contribute to the excellent body rigidity.

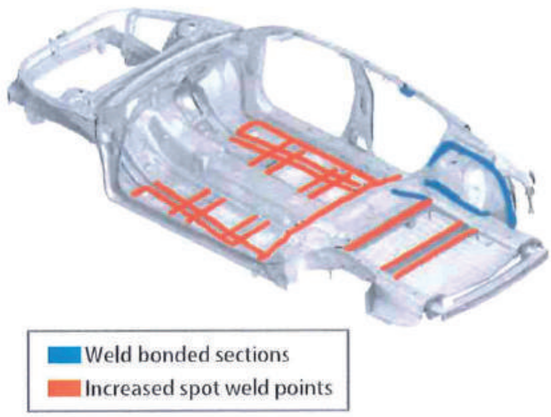
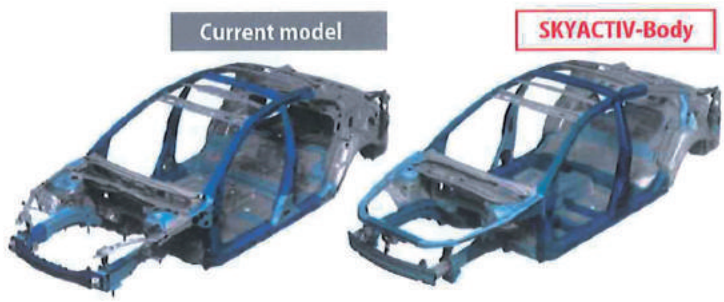
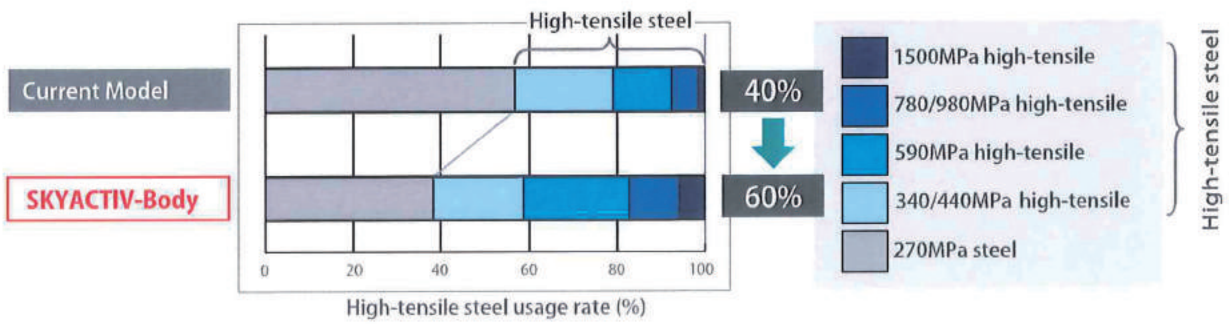


Fig.2-39 Weld bonding, increased spot welding

(3) Materials and Sheet Thickness
High-tensile steel

In terms of materials, Mazda has greatly increased its use of high-tensile steel, which is lightweight and has excellent strength and rigidity. In the next-generation body, high-tensile steel, the thinnest in its class, is used for most of the main parts, and this has resulted in significant weight reduction benefits.





Fug.2-40 High-tensile steel usage rate