

DET Supplemental Document

FB2-2 Front Bumper Reinforcement

RB2-1 Rear Bumper Reinforcement

Condition



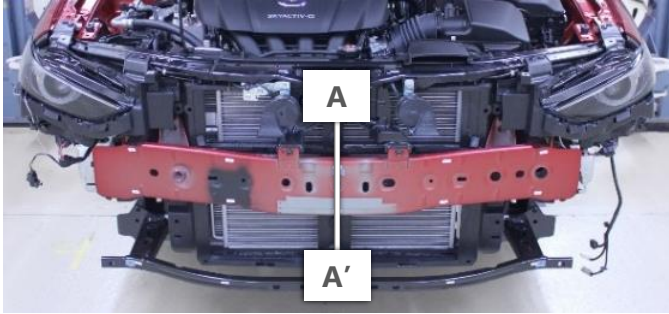
- Vehicle : All vehicles
- Part and Structure : Bumper Reinforcement



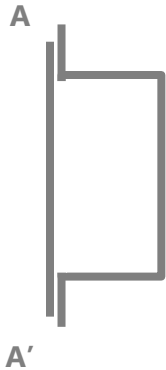
Reinforcements with tensile strength of less than 980MPa are excluded from this evaluation



Criteria



The Bumper Reinforcement (BR) should have a section modulus as following that provides sufficient strength suitable for the vehicle weight.



- For the BR with the tensile strength of **1500 MPa or greater**, the section modulus (mm^3) should be **at least 5.0 times the vehicle weight (kg)**
- For the BR with tensile strength of **lower than 1500 MPa or unknown**, the section modulus (mm^3) should be **at least 7.5 times the vehicle weight (kg)**

チェック内容の解説

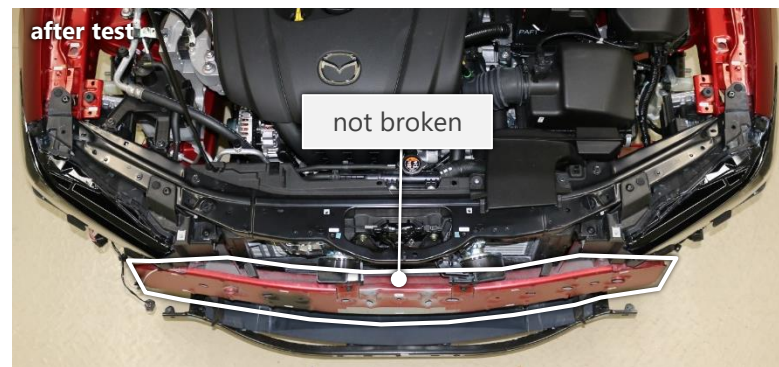
When the BR has a sufficient section modulus suitable for the vehicle weight, the BR is less likely to break in the Bumper test and the penetration depth is reduced. This helps prevent damage to the expensive peripheral parts*.

*Front part : Headlamp, Hood, Fender, Condenser, Radiator, etc.

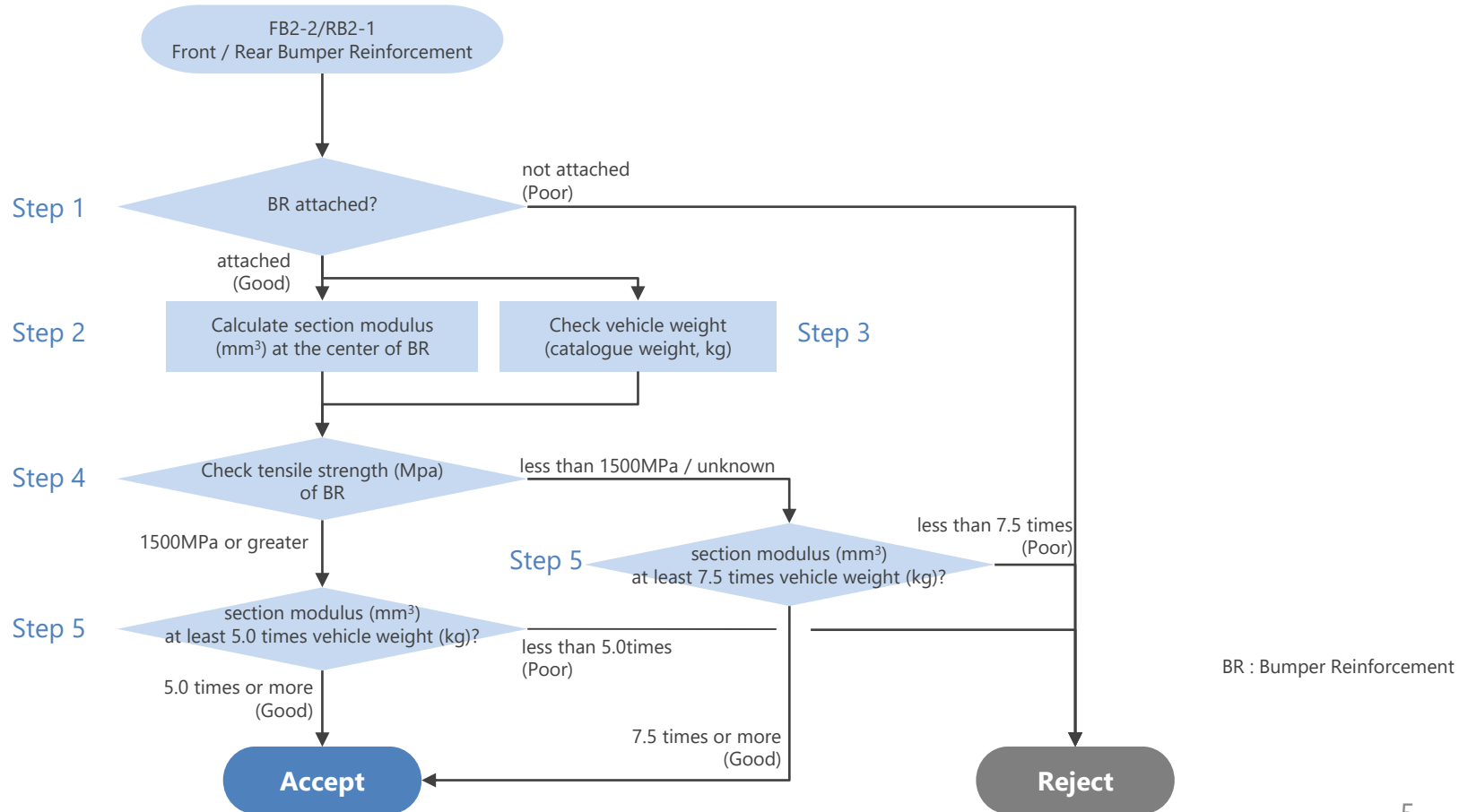
Rear Part : Backdoor, Back Panel, etc.

Good example of BR with sufficient section modulus suitable for vehicle weight

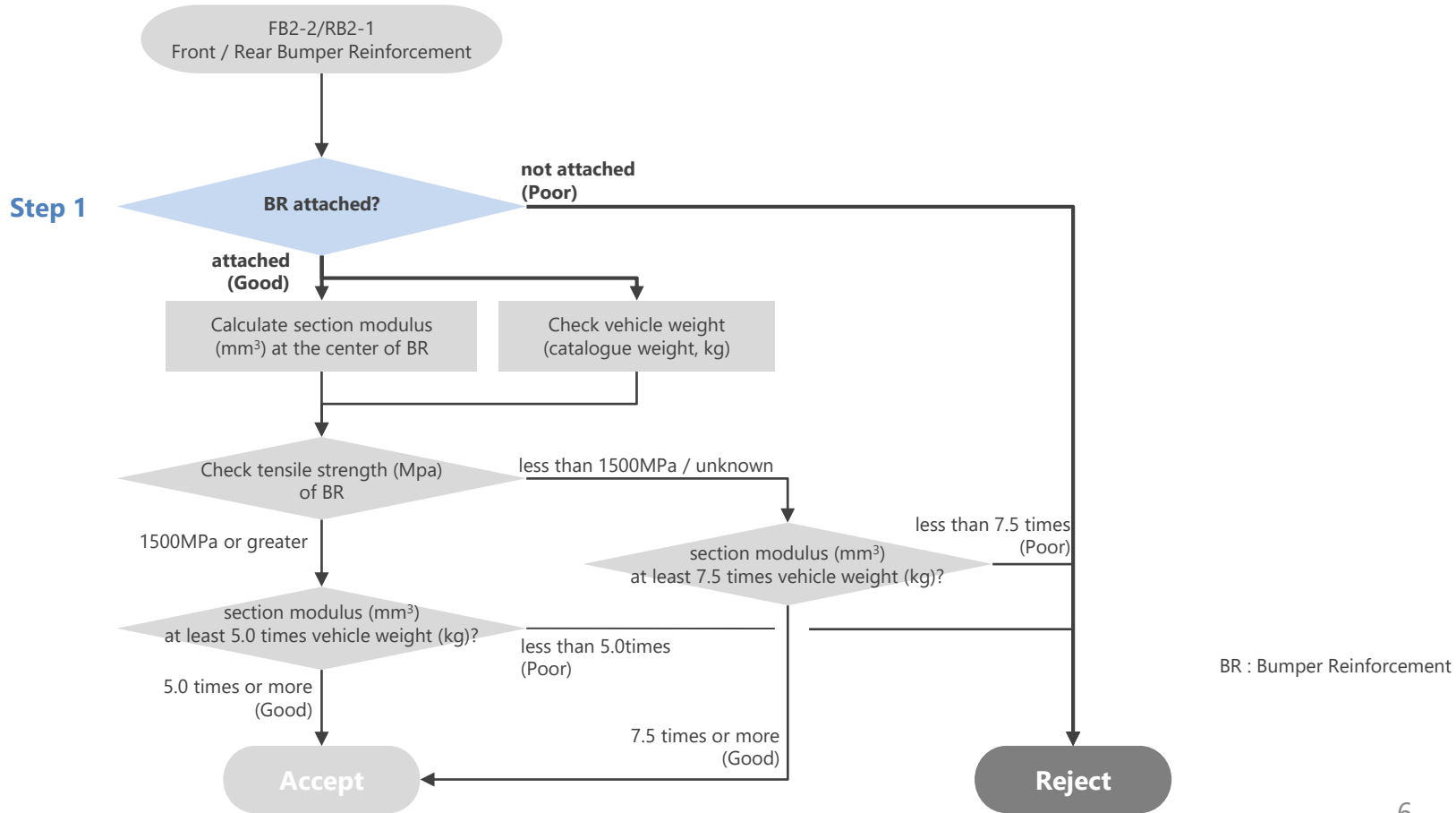
BR was not broken in Bumper Test and shew less penetration. This helped prevent damage to the peripheral parts.



Check Flow



Check Flow – Step 1



Check – Step 1

Check if the vehicle has the BR.
(Check the Front BR for FB2-2, the Rear BR for RB2-1)

【Determination】

Good



☞ When the vehicle has the BR, it is determined as Good.

Poor

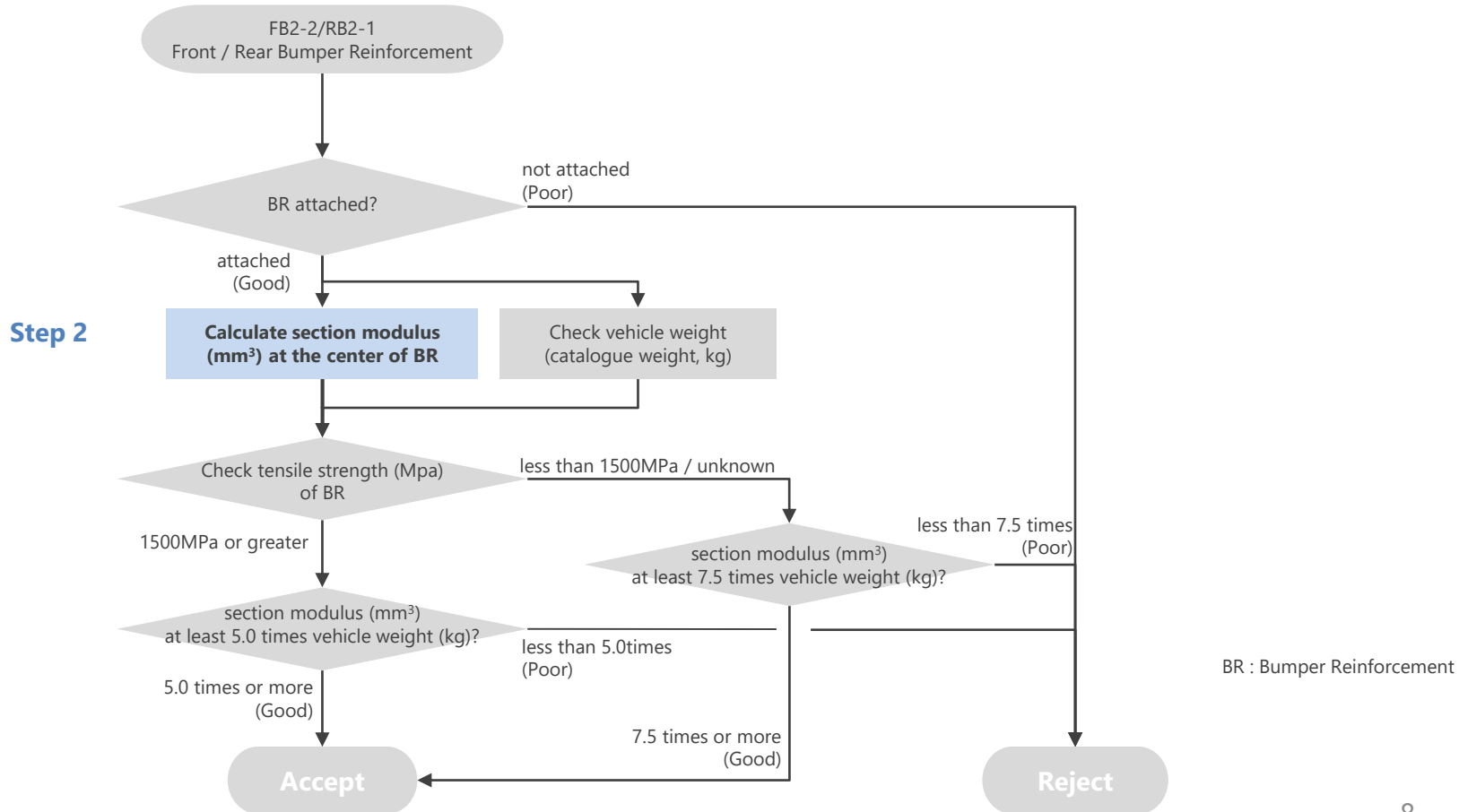


☞ When the vehicle no BR, it is determined as Poor

and

Reject

Check Flow – Step 2



Check – Step 2

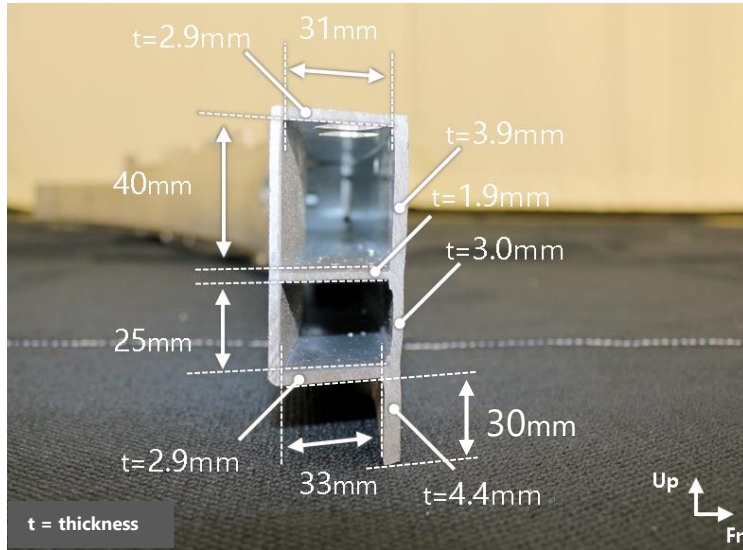


Calculate the section modulus of the BR at the center.

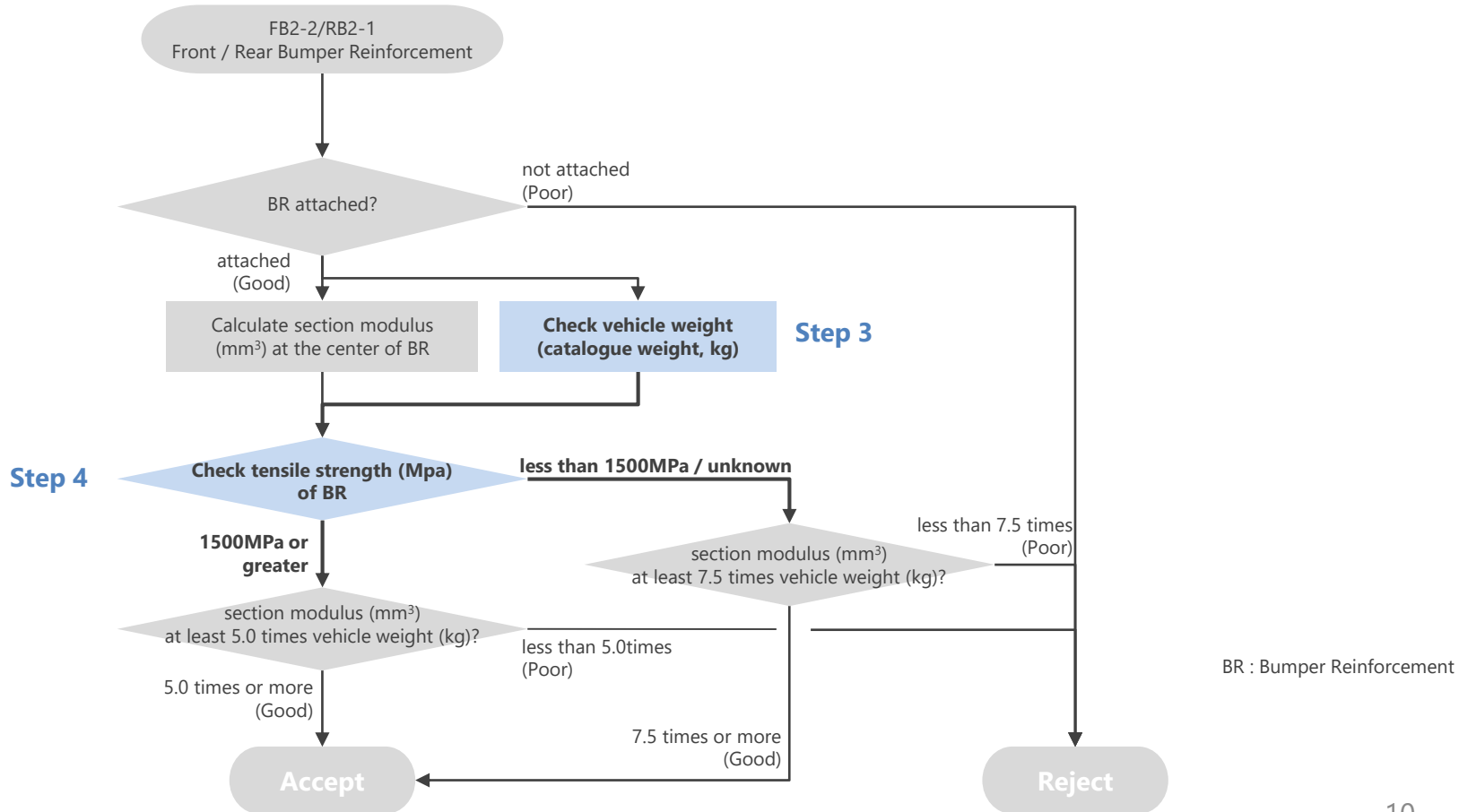


Calculate the section modulus of outside* of the BR according to the cross section at the center of the BR.

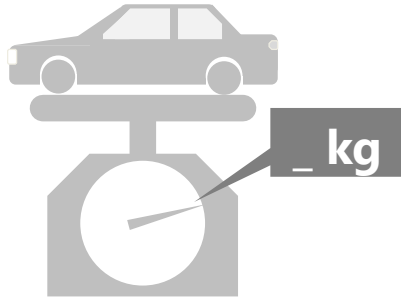
* Front side for the Front BR, Rear side for the Rear BR.



Check Flow – Step 3, 4



Check – Step 3, 4

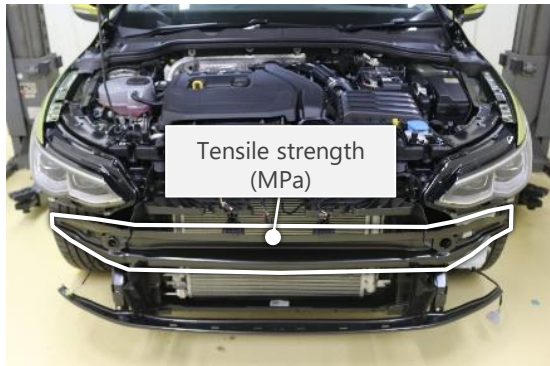


【Step 3】

Check the vehicle weight (kg).

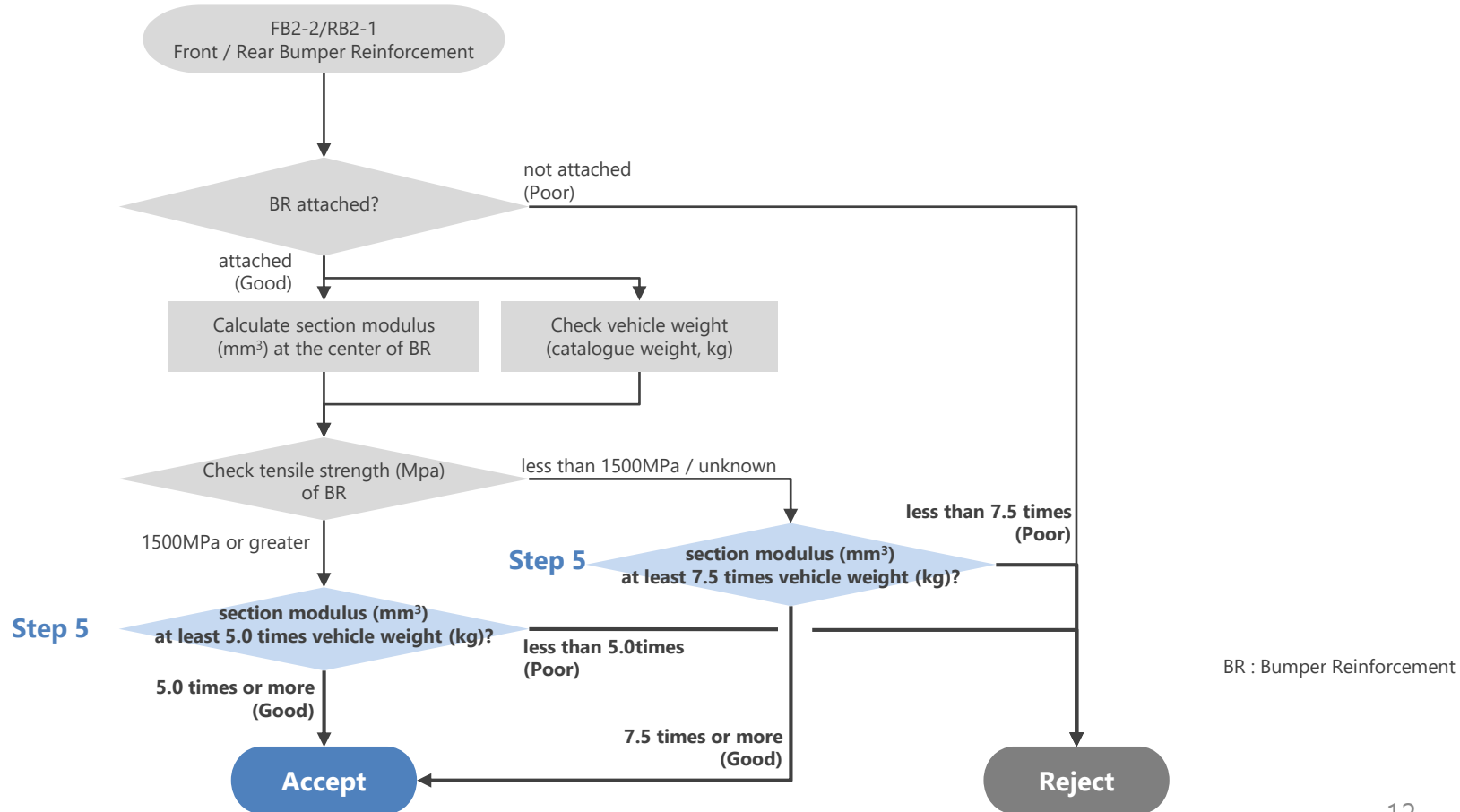
【Step 4】

Check the tensile strength (MPa) of the BR in the repair manual and so on.



- ☞ Check if the tensile strength of the BR is 1500 MPa or greater / less than 1500 MPa / unknown.
- ☞ The condition of the least tensile strength is 980 MPa.
The BR with the strength lower than that is not the subject of this evaluation.

Check Flow – Step 5



Check – Step 5

Check if the section modulus satisfy following conditions with the values derived from Step 2, 3, and 4.

【Determination】



For the BR with the tensile strength of **1500 MPa or greater**;

When the section modulus (mm^3) is **at least 5.0 times the vehicle weight (kg)**, it is determined as Good and **Accept** .

When the section modulus is less than 5.0 times, it is determined as Poor and **Reject** .

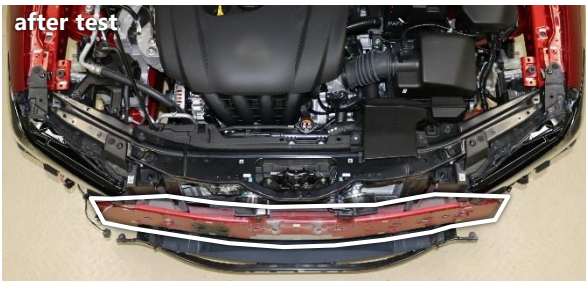


For the BR with the tensile strength of **lower than 1500 MPa or unknown**;

When the section modulus (mm^3) is **at least 7.5 times the vehicle weight (kg)**, it is determined as Good and **Accept** .

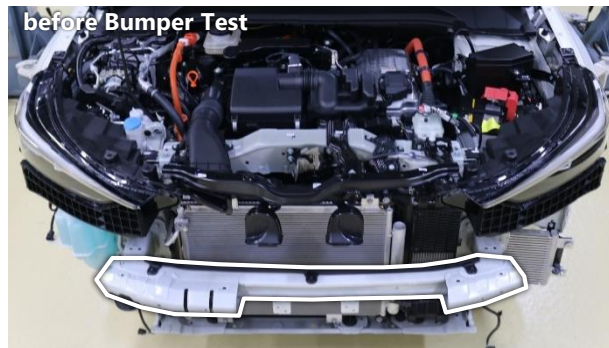
When the section modulus is less than 7.5 times, it is determined as Poor and **Reject** .

Examples of Accept/ Reject



Accept

The vehicle had the BR with section modulus 11 times of the weight, which satisfied the criteria. The BR showed less penetration on the Bumper Test and helped prevent damage to the Headlamp or the Radiator.



Reject

The vehicle had the BR with section modulus 1.5 times of the weight. The BR showed deep penetration on the Bumper Test, which resulted in damaging to the Headlamp or the Radiator.