

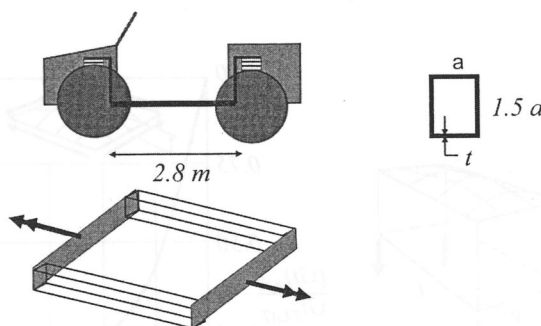
**Exercise 5.1**

### 5.2 Rocker sizing: Torsion load for convertible

The torsional requirement for this convertible is 680 KNm/rad.

Determine the rocker size,  $a$ ,  $t$ , to meet the stiffness requirement and the requirement that the section will just begin to buckle under a maximum torque of 8.0 KNm. Do this for two different assumptions regarding the bulkheads.

- The bulkheads shown are very flexible, i.e., they apply no bending moments to the rocker.
- The bulkheads are very rigid and constrain the rocker to have zero slope at either end.

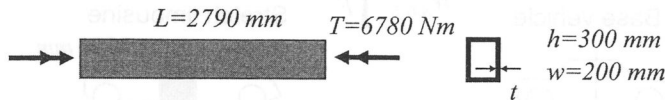


**Exercise 5.2**

### 5.3 Body torsion: Backbone structure

For the steel back-bone structure of Exercise 4.2, the twist ditch torque is 6780 Nm with an allowable shear stress of  $\tau_{DESIGN} = 86 \text{ N/mm}^2$ . Also, the stiffness requirement for torsion is 12,000 Nm/° as measured between the axles ( $L=2790 \text{ mm}$ ).

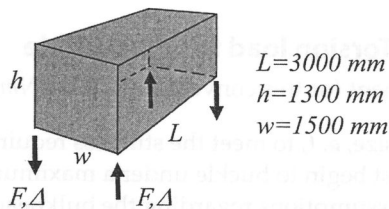
- Compute the required thickness to meet the twist ditch strength requirement.
- Compute the required thickness to meet the torsional stiffness requirement.
- Which is the dominant requirement?



Exercise 5.3

#### 5.4 Van box model for torsion

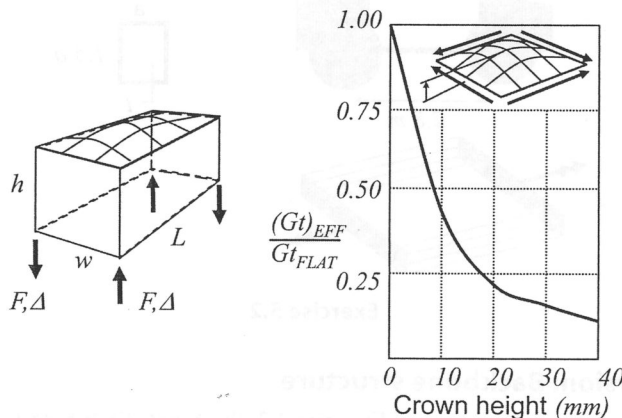
- Determine the shear loads in each panel when  $F=8000\text{ N}$ .
- What is the torsional stiffness if all panels are perfectly flat steel panels  $1\text{ mm}$  thick?



Exercise 5.4

#### 5.5 Torsional stiffness of van with crown roof panel

The van in Exercise 5.4 now has a roof with 20-mm crown height. Determine the van torsional stiffness with this crown panel.



Exercise 5.5