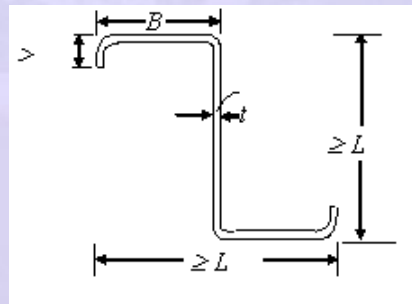


## 5.9 Empirical methods

Some commonly used members such as Z purlins are sometimes designed by time-tested empirical rules; such rules are employed when theoretical analysis may be impractical or not justified and when prototype tests data are not available. (Members designed by proven theoretical methods or by prototype testing need not comply with the empirical rules). As an illustration the empirical rules permitted by BS 5950, Part 5 is explained below.



**Fig.5.19 Z Purlins**

### 5.9.1 Z Purlins

A Z purlin used for supporting the roofing sheet is sketched in Fig. 5.19. In designing Z purlins with lips using the simplified empirical rules the following recommendations are to be complied with:

- Unfactored loads should be used for designing purlins
- Imposed loads should be taken to be at least  $0.6 \text{ kN /mm}^2$
- Claddings and fixings should be checked for adequacy to provide lateral restraint to the purlin and should be capable of carrying the component of load in the plane of the roof slope.

- The purlin should be considered to carry the load normal to roof slope (and a nominal axial load due to wind or restraint forces)
- These rules apply to purlins up to 8 m span in roof slopes up to  $22\frac{1}{2}$
- Antisag bars should be provided to ensure that laterally unsupported length of the purlin does not exceed 3.8 m. These should be anchored to rigid apex support or their forces should be transferred diagonally to main frames.
- Purlin cleats should provide adequate torsional restraint.

### 5.9.2 Design rules

The following design rules apply with reference to Fig. 5.19

- The overall depth should be greater than  $100t$  and not less than  $L/45$ .
- Overall width of compression flange / thickness ratio should be less than 35.
- Lip width should be greater than  $B/5$
- Section Modulus  $\geq \frac{WL}{1400} \text{ cm}^3$  for simply supported purlins and  $\geq \frac{WL}{1400} \text{ cm}^3$

for continuous or semi rigidly jointed purlins.

In the above,

$L$  = span of the purlin (in mm)

$W$  = Normal component of unfactored (distributed dead load + imposed load)

in kN

$B$  = Width of the compression flange in mm

$T$  = thickness of the purlin in mm.

- The net allowable wind uplift in a direction normal to roof when purlins are restrained is taken as 50% of the (dead + imposed) load.

