RC 1-way Ribbed Slabs

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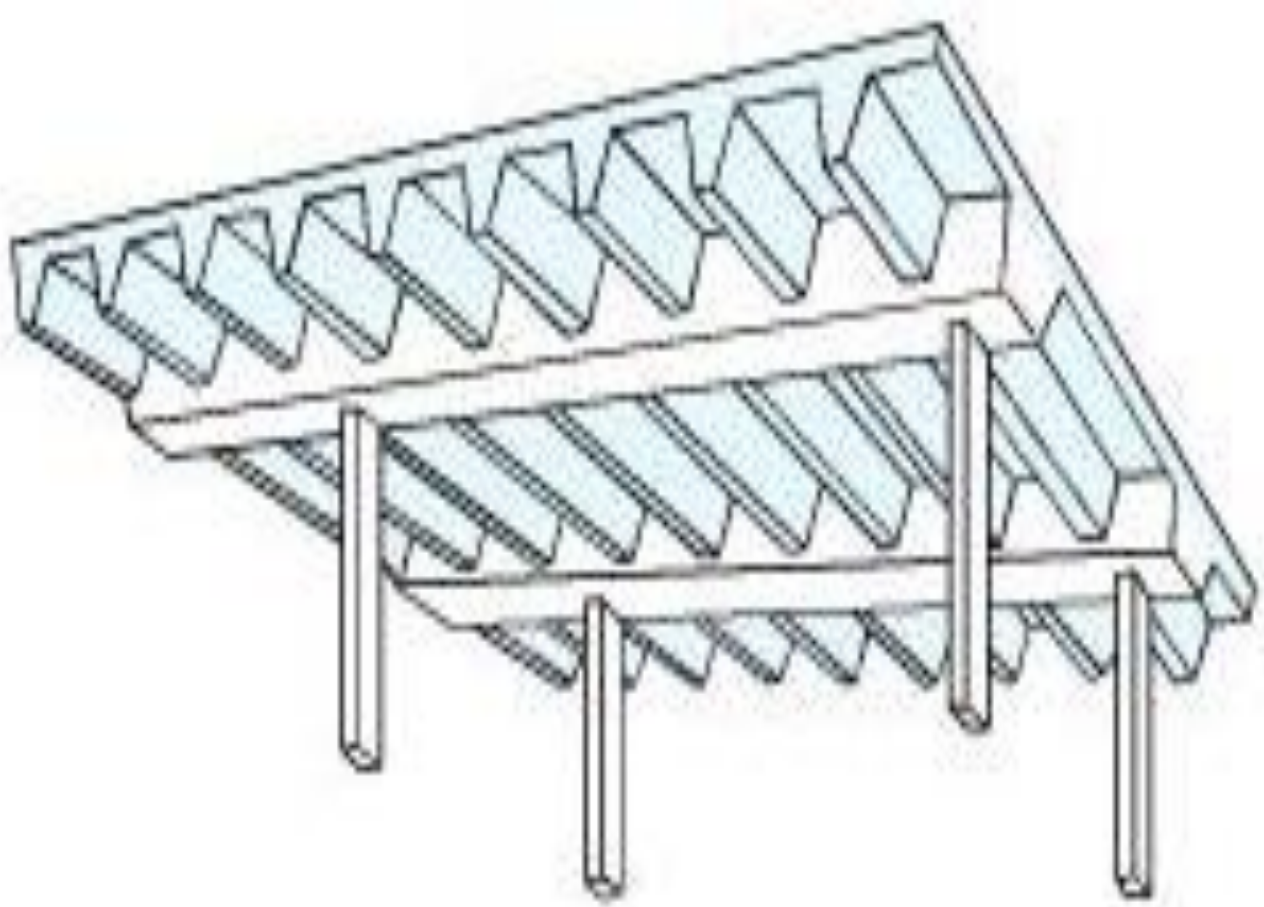
Meaning of the word "RIB"

RIB	ضلع



راغدة

عرق

نكتة

زوجة

يضلع

One-way ribbed slab

Two-way ribbed slab
Waffle slab

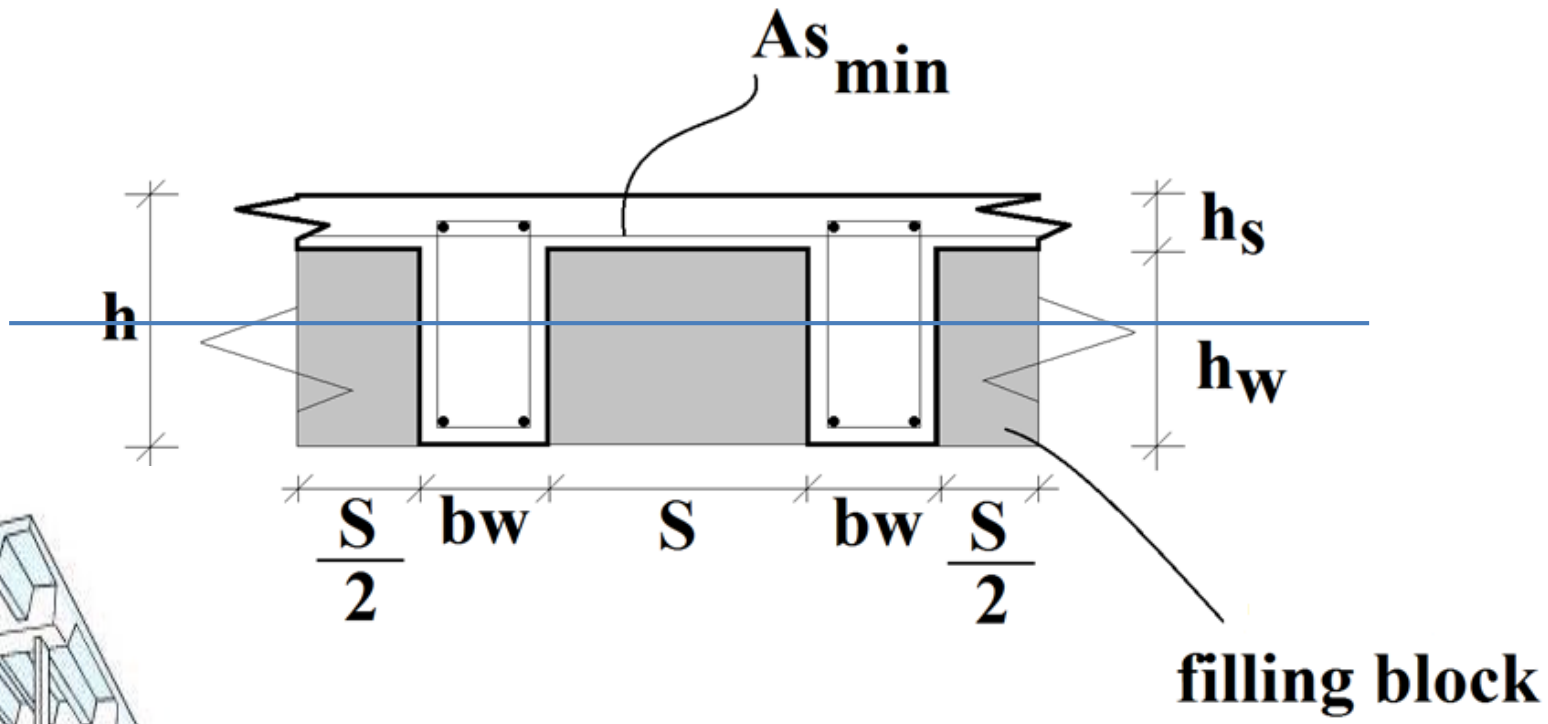
One Way Ribbed (joist) slabs

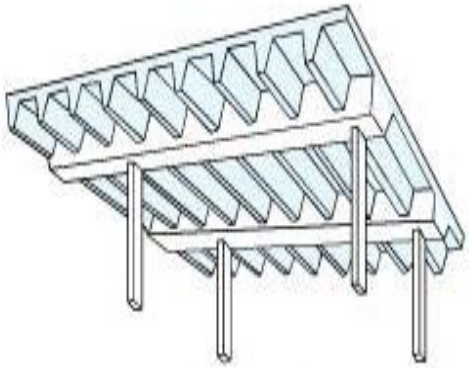
Removing unnecessary concrete (under the N.A.). Ribbed slabs are more economical than solid slabs for long spans;

Two principal methods of construction are;-

1- Ribbed slabs without permanent blocks.

2- Ribbed slabs with hollow or solid blocks.





9.3—Design limits

$h_{min}=h_s+h_w$

9.3.1 *Minimum beam depth*

9.3.1.1 For nonprestressed beams not supporting or attached to partitions or other construction likely to be damaged by large deflections, overall beam depth ***h*** shall satisfy the limits in Table 9.3.1.1, unless the calculated deflection limits of 9.3.2 are satisfied.

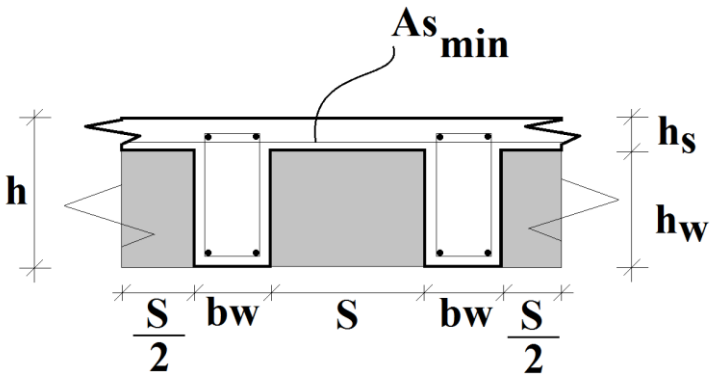


Table 9.3.1.1—Minimum depth of nonprestressed beams

Support condition	Minimum h[1]
Simply supported	ℓ/16
One end continuous	ℓ/18.5
Both ends continuous	ℓ/21
Cantilever	ℓ/8

[1]Expressions applicable for normalweight concrete and Grade 420 reinforcement. For other cases, minimum h shall be modified in accordance with 9.3.1.1.1 through 9.3.1.1.3, as appropriate.

← Note:

Minimum h should be multiplied by:

- $(1.65\text{-}0.0003\gamma_c) \geq 1.09$
  when γ_c<2300kg/m³
- $(0.4+\frac{fy}{700})$
  $when\ fy \neq 420MPa$

8.8.1.2 Width of ribs shall be at least 100 mm at any location along the depth.

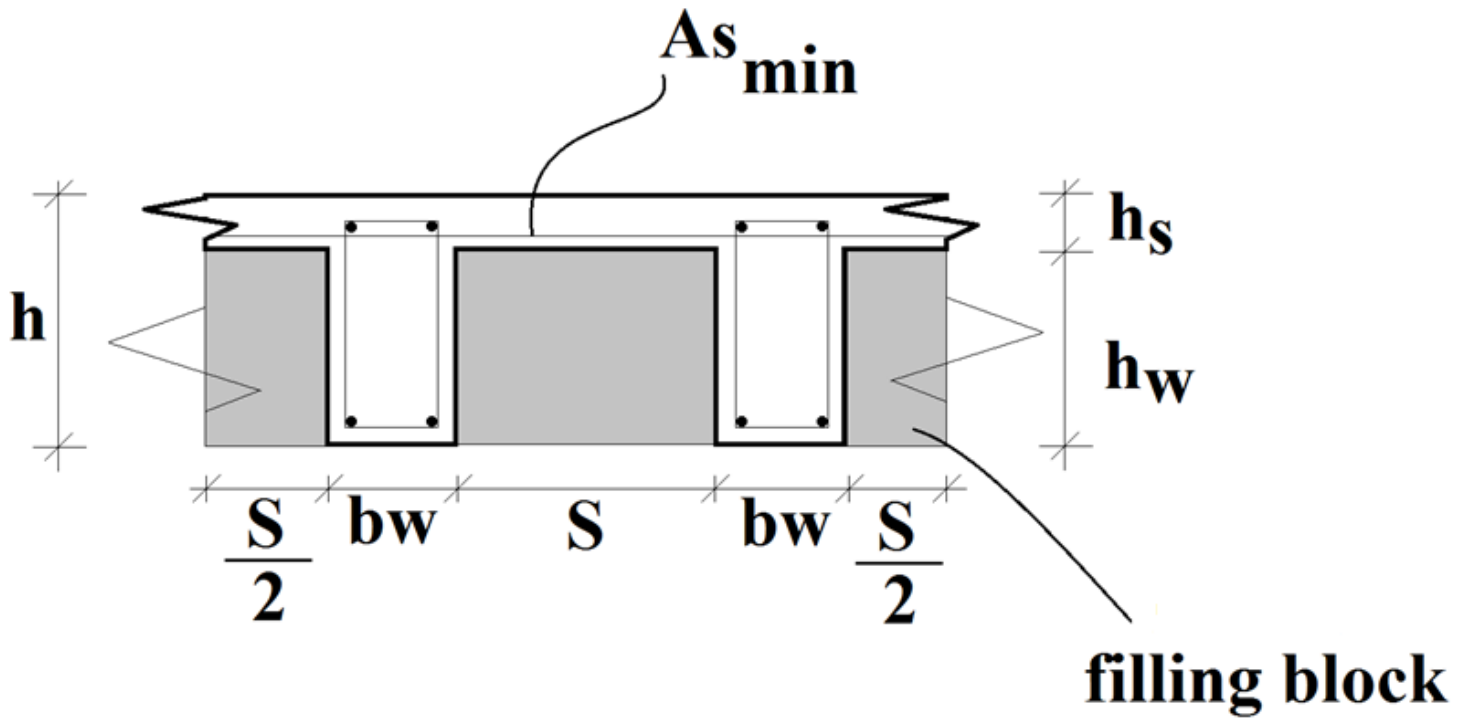
$$bw \geq 100mm$$

8.8.1.3 Overall depth of ribs shall not exceed 3.5 times the minimum width.

$$hw \leq 3.5\ bw$$

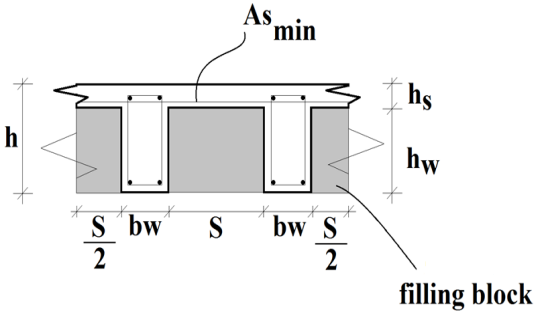
8.8.1.4 Clear spacing between ribs shall not exceed 750 mm.

$$S \leq 750mm$$



when S > 750mm, it should be designed as a 1-way slab.

8.8.2 *Joist systems with structural fillers*



8.8.2.1 If permanent burned clay or concrete tile fillers of material having a unit compressive strength at least equal to f_c' in the joists are used, 8.8.2.1.1 and 8.8.2.1.2 shall apply.

8.8.2.1.1 Slab thickness over fillers shall be at least the greater of one-twelfth the clear distance between ribs and 40 mm.

$$h_s \geq \begin{cases} S/12 \\ 40\ \text{mm} \end{cases}$$

8.8.2.1.2 For calculation of shear and negative moment strength, it shall be permitted to include the vertical shells of fillers in contact with the ribs. Other portions of fillers shall not be included in strength calculations.

8.8.3 *Joist systems with other fillers*

8.8.3.1 If fillers not complying with 8.8.2.1 or removable forms are used, slab thickness shall be at least the greater of one-twelfth the clear distance between ribs and 50 mm.

$$h_s \geq \begin{cases} S/12 \\ 50\ \text{mm} \end{cases}$$

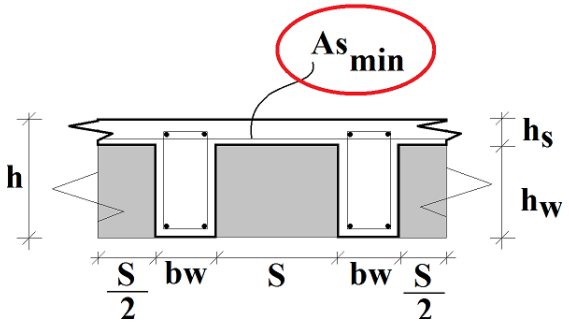
8.8.1.5 V_c shall be permitted to be taken as 1.1 times the values calculated in 22.5.

$$V_c = 1.1(0.17\sqrt{f'_c}\,.b_w.d)$$

8.8.1.6 For structural integrity, at least one bottom bar in each joist shall be continuous and shall be anchored to develop f_y at the face of supports.

8.8.1.7 Reinforcement area perpendicular to the ribs shall satisfy slab moment strength requirements, considering load concentrations, and shall be at least the shrinkage and temperature reinforcement area in accordance with 24.4.

When fy < 420 MPa, 0.002 Ag

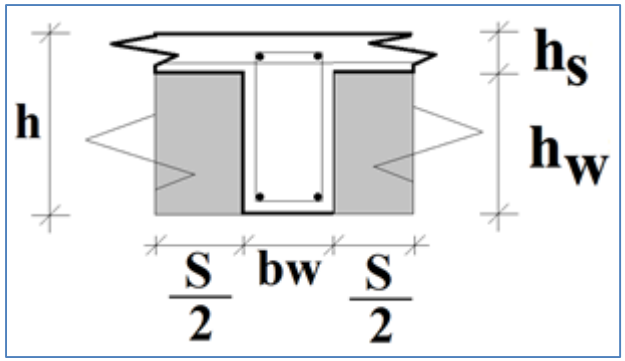


fy ≥ 420 MPa, 0.0018 (fy/420) Ag

≥ 0.0014 Ag

Keep in mind:

1. In **positive moment**; the section taken as T-section flange of ($\frac{S}{2}$+b_w+$\frac{S}{2}$). Therefore, check if it is a T-sec or a rectangular one.
2. In **negative moment**; the section is taken as rectangular ($b_w . d$).
3. The cocn. cover in ribs is $20mm$
4. TIP: Do not make ribs that are longer than six meters, and if necessary, divide the ribs with an intermediate beam girder.



$$\rho_{max} = 0.85 * \beta_1 \frac{f'c}{fy} \frac{\epsilon}{\epsilon + 0.004}$$

Note:

$\beta_1 = 0.85 \;\; if \; f'c \leq 30 \; MPa$ or

$\beta_1 = 0.85 - \frac{0.05}{7}(f'c - 30) \geq 0.65 \;\; if \; f'c > 30 \; MPa$

$$\rho_{min} = max\left\{\frac{1.4}{fy} \; or \; \frac{\sqrt{f'c}}{4 * fy}\right\}$$