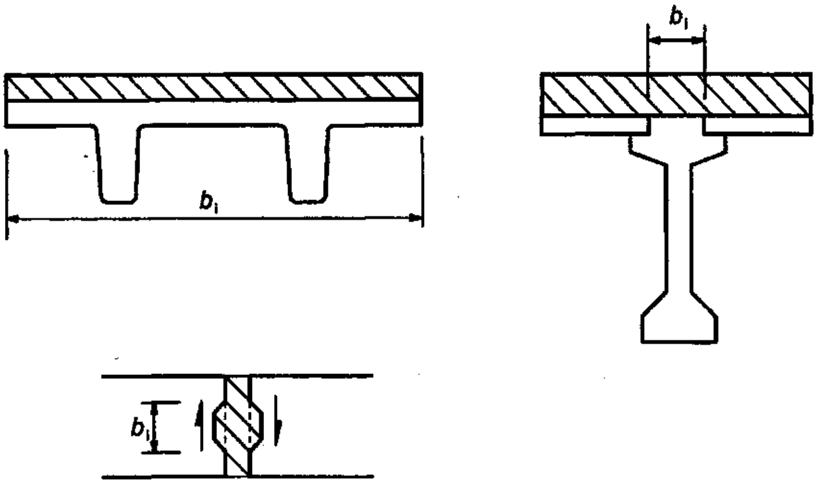
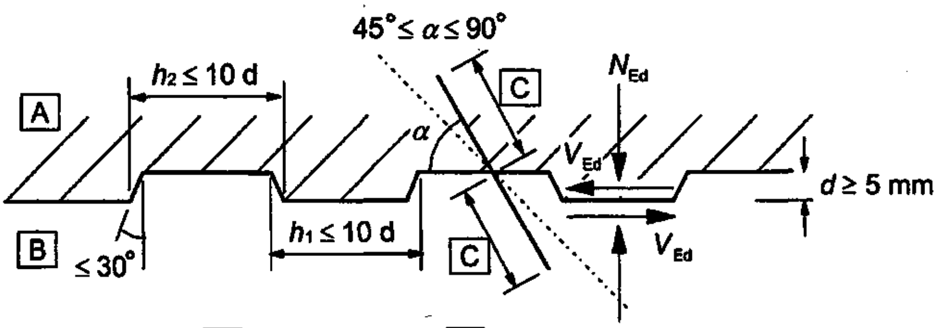



**Figure 6.8: Examples of interfaces**

$A_s$ is the area of reinforcement crossing the interface, including ordinary shear reinforcement (if any), with adequate anchorage at both sides of the interface.
$A_i$ is the area of the joint
$\alpha$ is defined in Figure 6.9, and should be limited by $45° \leq \alpha \leq 90°$
$\nu$ is a strength reduction factor (see 6.2.2 (6))




A - new concrete, B - old concrete, C - anchorage

**Figure 6.9: Indented construction joint**

(2) In the absence of more detailed information surfaces may be classified as very smooth, smooth, rough or indented, with the following examples:

- AC1) Very smooth: a surface cast against steel, plastic or specially prepared wooden moulds: $c$ = 0,025 to 0,10 and $\mu$ = 0,5
- Smooth: a slipformed or extruded surface, or a free surface left without further treatment after vibration: $c$ = 0,20 and $\mu$ = 0,6
- Rough: a surface with at least 3 mm roughness at about 40 mm spacing, achieved by raking, exposing of aggregate or other methods giving an equivalent behaviour: $c$ = 0,40 and $\mu$ = 0,7 (AC1
- Indented: a surface with indentations complying with Figure 6.9: $c$ = 0,50 and $\mu$ = 0,9

(3) A stepped distribution of the transverse reinforcement may be used, as indicated in Figure 6.10. Where the connection between the two different concretes is ensured by reinforcement

To prevent crushing of the compression struts in the flange, the following condition should be satisfied:

$$v_{Ed} \leq \nu f_{cd} \sin\theta_f \cos\theta_f \tag{6.22}$$

**Note:** The permitted range of the values for cot $\theta_f$ for use in a country may be found in its National Annex. The recommended values in the absence of more rigorous calculation are:

$1{,}0 \leq \cot\theta_f \leq 2{,}0$ for compression flanges ($45° \geq \theta_f \geq 26{,}5°$)

$1{,}0 \leq \cot\theta_f \leq 1{,}25$ for tension flanges ($45° \geq \theta_f \geq 38{,}6°$)

(5) In the case of combined shear between the flange and the web, and transverse bending, the area of steel should be the greater than that given by Expression (6.21) or half that given by Expression (6.21) plus that required for transverse bending.

(6) If $v_{Ed}$ is less than or equal to $kf_{ctd}$ no extra reinforcement above that for flexure is required.

**Note:** The value of $k$ for use in a Country may be found in its National Annex. The recommended value is 0,4.

(7) Longitudinal tension reinforcement in the flange should be anchored beyond the strut required to transmit the force back to the web at the section where this reinforcement is required (See Section (A - A) of Figure 6.7).

### 6.2.5 Shear at the interface between concrete cast at different times

(1) In addition to the requirements of 6.2.1- 6.2.4 the shear stress at the interface between concrete cast at different times should also satisfy the following:

$$v_{Edi} \leq v_{Rdi} \tag{6.23}$$

$v_{Edi}$ is the design value of the shear stress in the interface and is given by:

$$v_{Edi} = \beta V_{Ed} / (z\, b_i) \tag{6.24}$$

where:

- $\beta$ is the ratio of the longitudinal force in the new concrete area and the total longitudinal force either in the compression or tension zone, both calculated for the section considered
- $V_{Ed}$ is the transverse shear force
- $z$ is the lever arm of composite section
- $b_i$ is the width of the interface (see Figure 6.8)
- $v_{Rdi}$ is the design shear resistance at the interface and is given by:

$$v_{Rdi} = c\, f_{ctd} + \mu\, \sigma_n + \rho\, f_{yd}\, (\mu \sin\alpha + \cos\alpha) \leq 0{,}5\, \nu\, f_{cd} \tag{6.25}$$

where:

- $c$ and $\mu$ are factors which depend on the roughness of the interface (see (2))
- $f_{ctd}$ is as defined in 3.1.6 (2)P
- $\sigma_n$ stress per unit area caused by the minimum external normal force across the interface that can act simultaneously with the shear force, positive for compression, such that $\sigma_n < 0{,}6\, f_{cd}$, and negative for tension. When $\sigma_n$ is tensile $c\, f_{ctd}$ should be taken as 0.
- $\rho$ $= A_s / A_i$