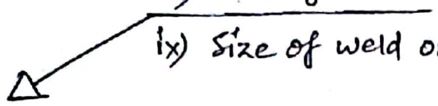
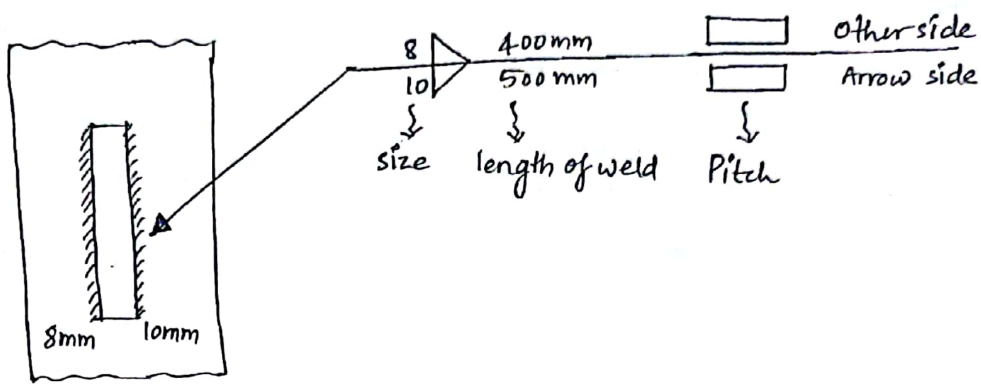
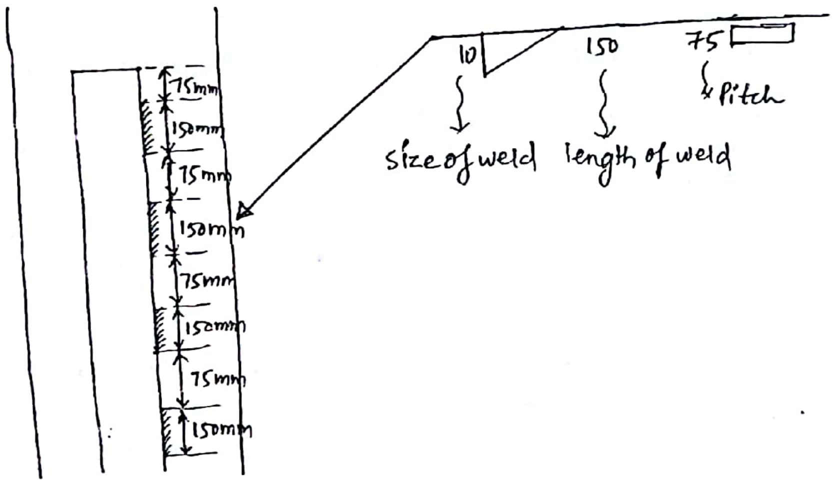
vii)  → field weld



Ex:-



Ex:-



⇒ **Design of Butt weld ;**

- The design strength of groove weld in Tension (or) Compression is governed by yield.

$$T_{dw} = \frac{f_y \, l_w \, t_e}{\gamma_{mw}}$$

where; f_y → minimum of yield strength of weld (f_{yw}) (or) yield strength of parent -metal (f_y)

l_w → effective length of weld

t_e → effective throat thickness

→ for complete penetration 't_e' is the thickness of thinner plate. If there is Partial penetration then t_e is taken as the thickness of the weld common to the two plates. However if this value is not given then for partial penetration;

$$t_e = \frac{5}{8} \times \text{thickness of thinner plate}$$

- γ_{mw} → Partial safety factor

$\gamma_{mw} = 1.25$ → for shop weld

$= 1.5$ → for field weld.

→ The design strength of Butt weld in shear is also governed by yield.

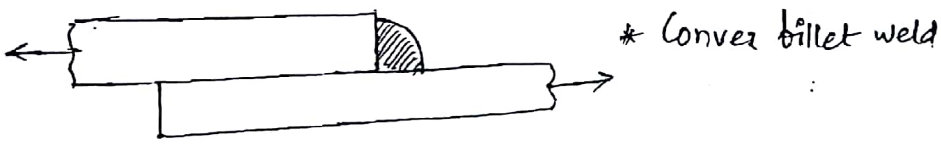
$$V_{dw} = \frac{f_y \, l_w t_e}{\sqrt{3} \, \gamma_{mw}}$$

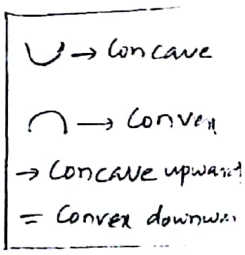
Note :-

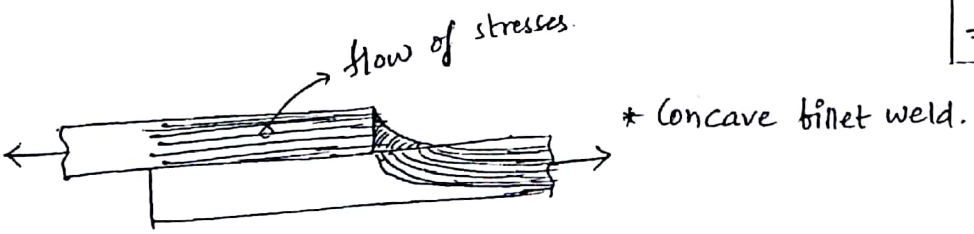
→ IS: Code does not mentioned the strength formula for butt weld, it simply says that butt weld shall be treated as parent metal with thickness equal to throat thickness and stress shall not exceed those permitted in the Parent metal.

⇒ **Design of Fillet weld** ;

→ usually Concave (or) Convex shape fillet welds are provided







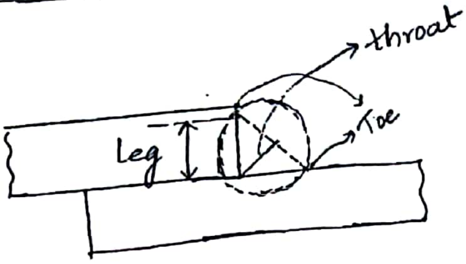
→ Convex weld have larger throat thickness and penetration, therefore it is stronger even-though it may have less deposited metal.

→ Concave weld are most suitable under alternating stresses because it offer smooth Path for the flow of stress.

In Concave fillet weld there is a chance of cracking on cooling hence they are made in two (or) more passes the first slightly Convex and the other passes are builtup to form a Concave fillet weld.

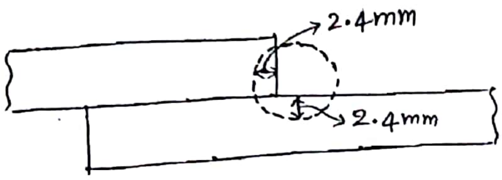
→ **Specifications ;**

· **Size ;**



· The largest right angled triangle that can be inscribed is found out and for normal fillet weld the weld size is taken as the minimum leg length of the weld.

→



S+2.4mm

→ For deep penetration weld where the depth of penetration beyond the root run is minimum 2.4mm, the size of weld is taken as 2.4mm + minimum leg size

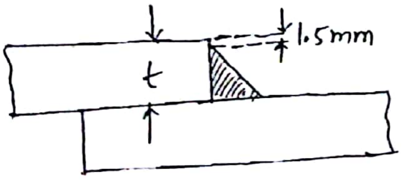
→ **Maximum size of fillet weld ;**

· for square edge the maximum size is $t-1.5mm$

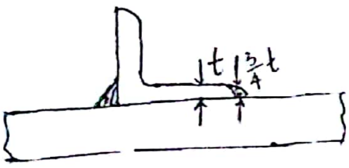
Where, $t \rightarrow$ thickness of thinner part being jointed.

· for round edge the maximum size is $\frac{3}{4}t$

where, $t \rightarrow$ thickness of round edge



$t-1.5mm$ → Square edge



$\frac{3}{4}t$ → Round edge

Note :-

→ this specification limits the size of the fillet weld, so that total strength may be developed without overstressing the adjacent metal and also prevents washing down of the exposed edges.

b) Minimum size of fillet weld : (remember)

other than this (**)
everywhere thinner

Thickness of thicker member	minimum size
(**) 1. 0 – 10mm	3mm
(**) 2. 10mm – 20mm	5mm
3. 20mm – 32mm	6mm
4. 32mm – 50mm	8mm first run, 10mm final

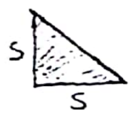
(**) → For thickness > 50mm, special precautions like preheating should be taken.

→ The minimum size of weld should not exceed the thickness of the thinner part being jointed.

→ the weld size closer to minimum size is generally adopted for the following reasons;

i) Large size welds require more than one run of welding, hence the cost increases because of chipping & cleaning which will be required for proper bond of successive weld runs.

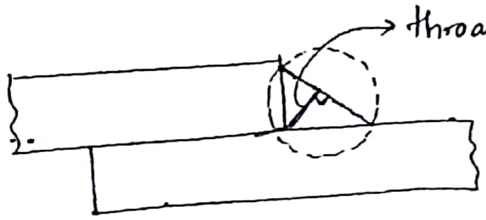
ii) A smaller size weld will be cheaper than a larger one for the same strength, since lesser volume of welding is required.

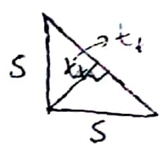


Ex:- for 300mm of size 5mm ⇒ $V = \frac{1}{2} \times 5 \times 5 \times 300 = 3750\ mm^3$

for 150mm of size 10mm ⇒ $V = \frac{1}{2} \times 10 \times 10 \times 150 = 7500\ mm^3$

2. Effective throat thickness ; (t_t)





$t_t = KS$

S → size of weld

$t_t = \frac{S}{\sqrt{2}} = 0.7S$