Butt Welds

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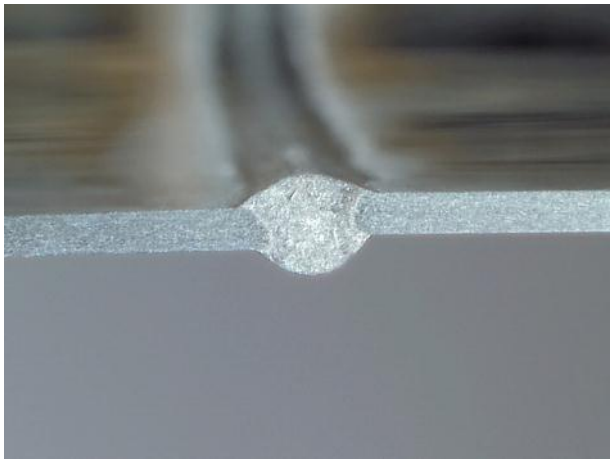
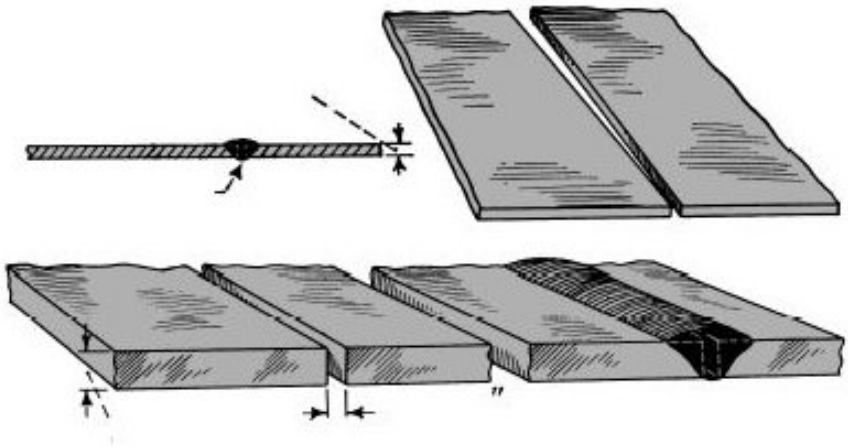


A Butt weld joins 2 plates that are butted up next to each other. Penetration is important, so thicker plates need to be prepared (bevels).

In our calculations, we simply assume a butt weld to be some proportion of the strength of the original plate. E.g. 90%, 70%, 50% etc, which depends on weld quality.

Ivanoff assumes 90%
(Note: this is pretty high compared to a bolted joint).



Weld joint preparation depends on plate thickness.

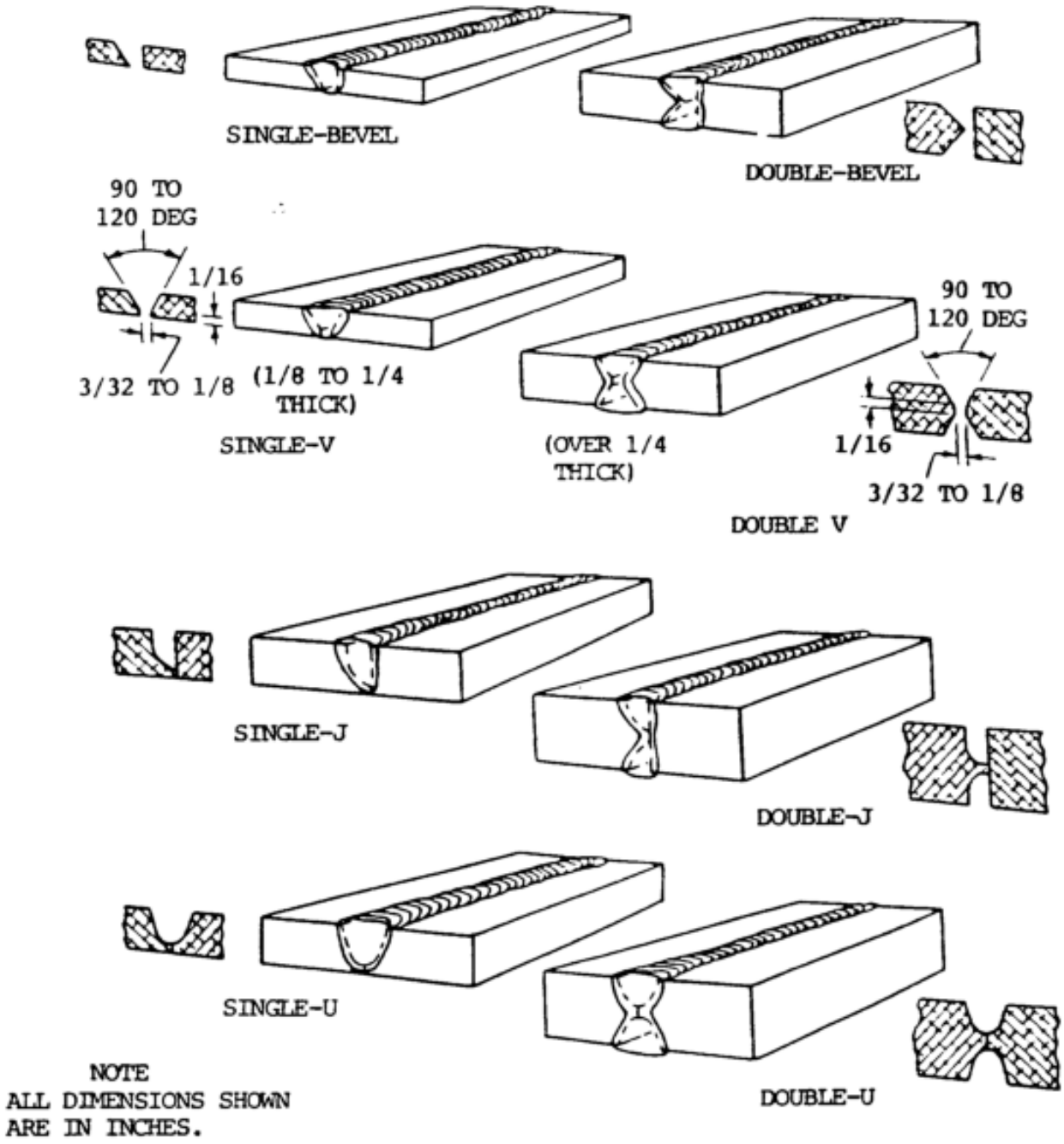


Figure 6-27. Types of groove welds.

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Resistance Welding

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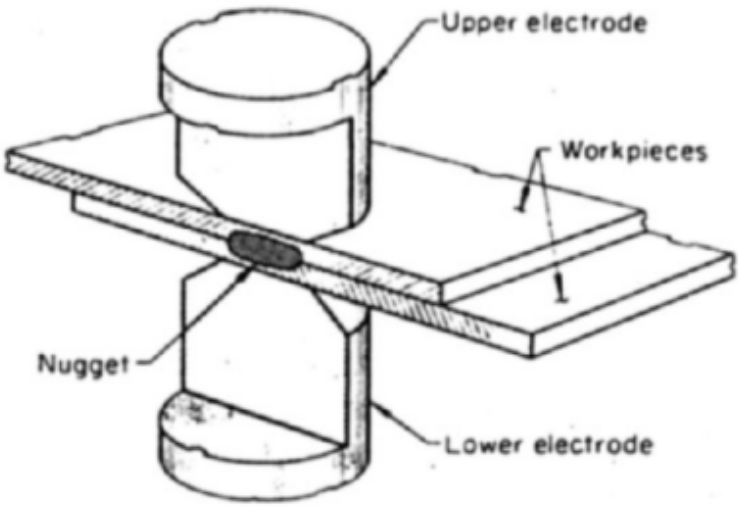
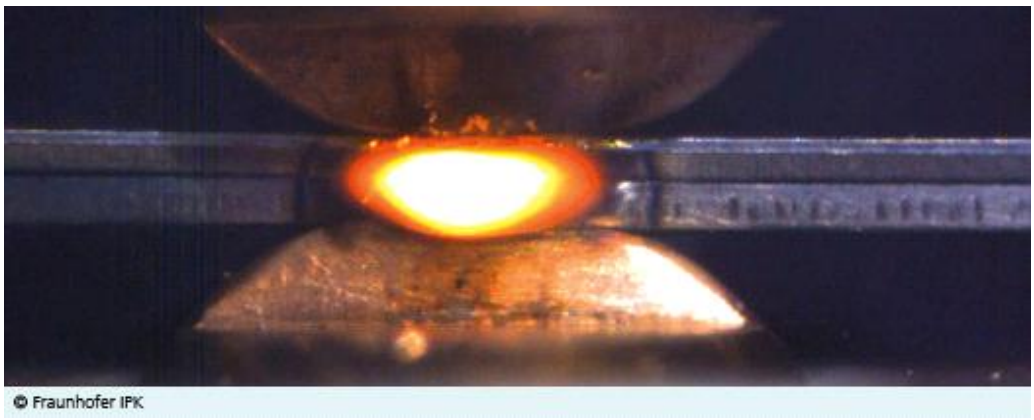
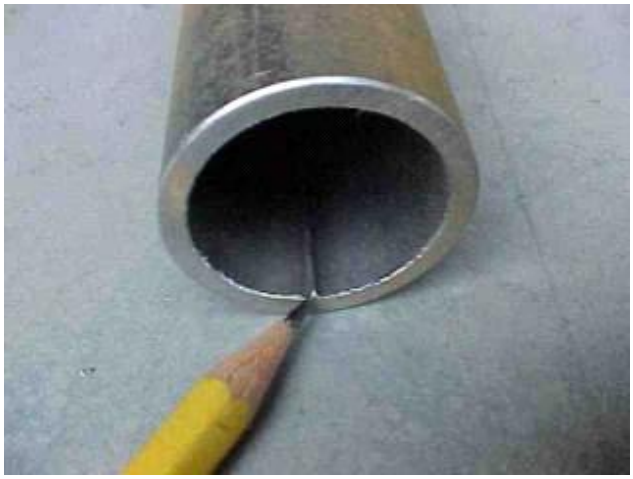
Another type of weld is the spot weld, where electricity heats the metal until it melts together.







There are many other variations of electrical resistance welding.

Example:
ERW tube = Electro Resistance Welded tube.

http://www.youtube.com/watch?v=77utCIwKSn4

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Fillet Welds

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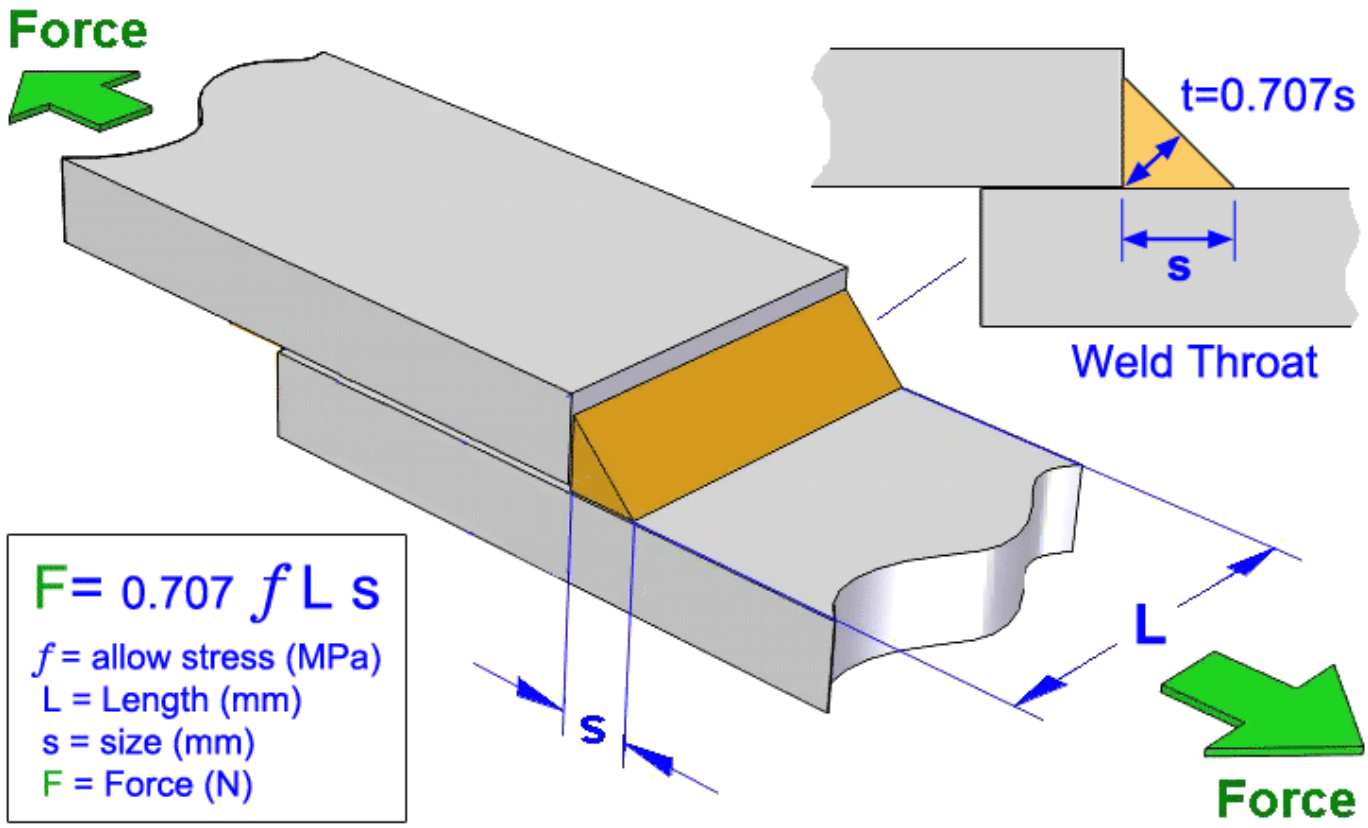
A fillet weld is a weld in a corner.
The smallest area of weld material under stress is; **A = Length x throat**
The throat is the thinnest section of the triangular weld (45º), and since we are ignoring the penetration of the weld, the area is; **A = Length x size * 0.707**
Note: What stress?
Ivanoff: Typ 410MPa nominal electrode strength, with FS=3,
so allowable stress = 136MPa



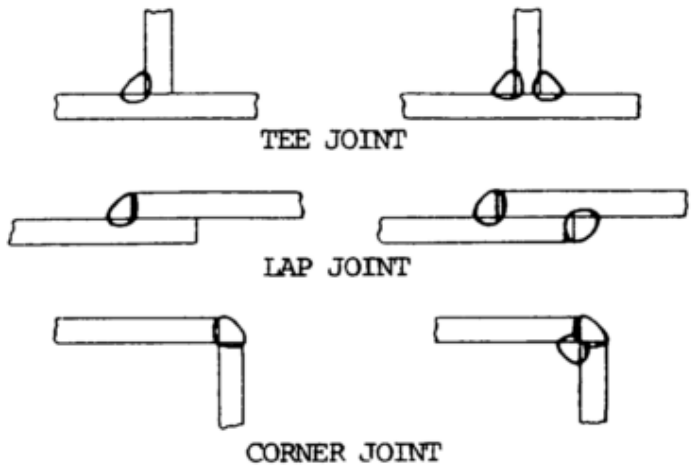


Figure 6-24. Applications of fillet welds--single and double.

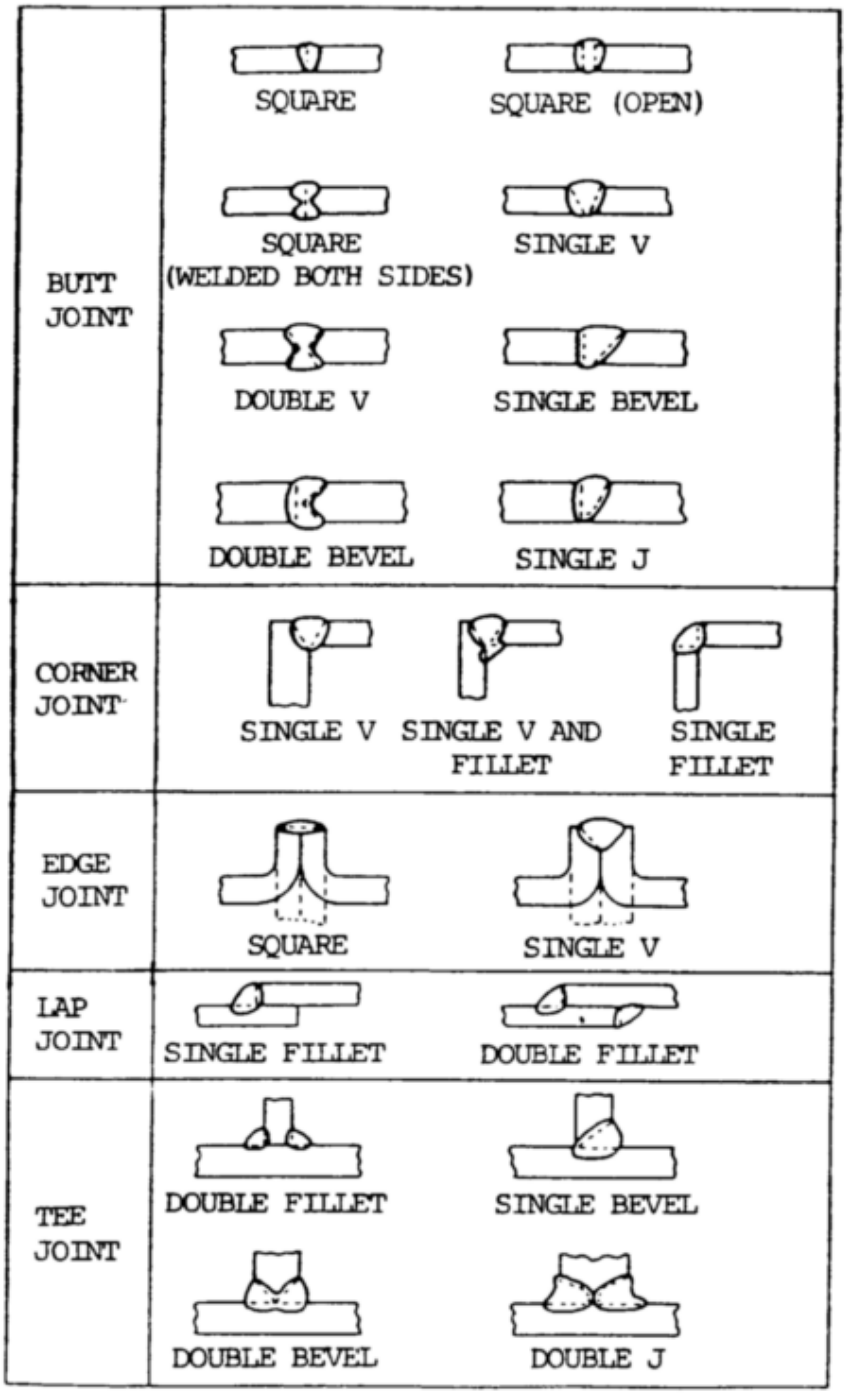


Figure 6-26. Typical weld joints

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Example Fillet Weld

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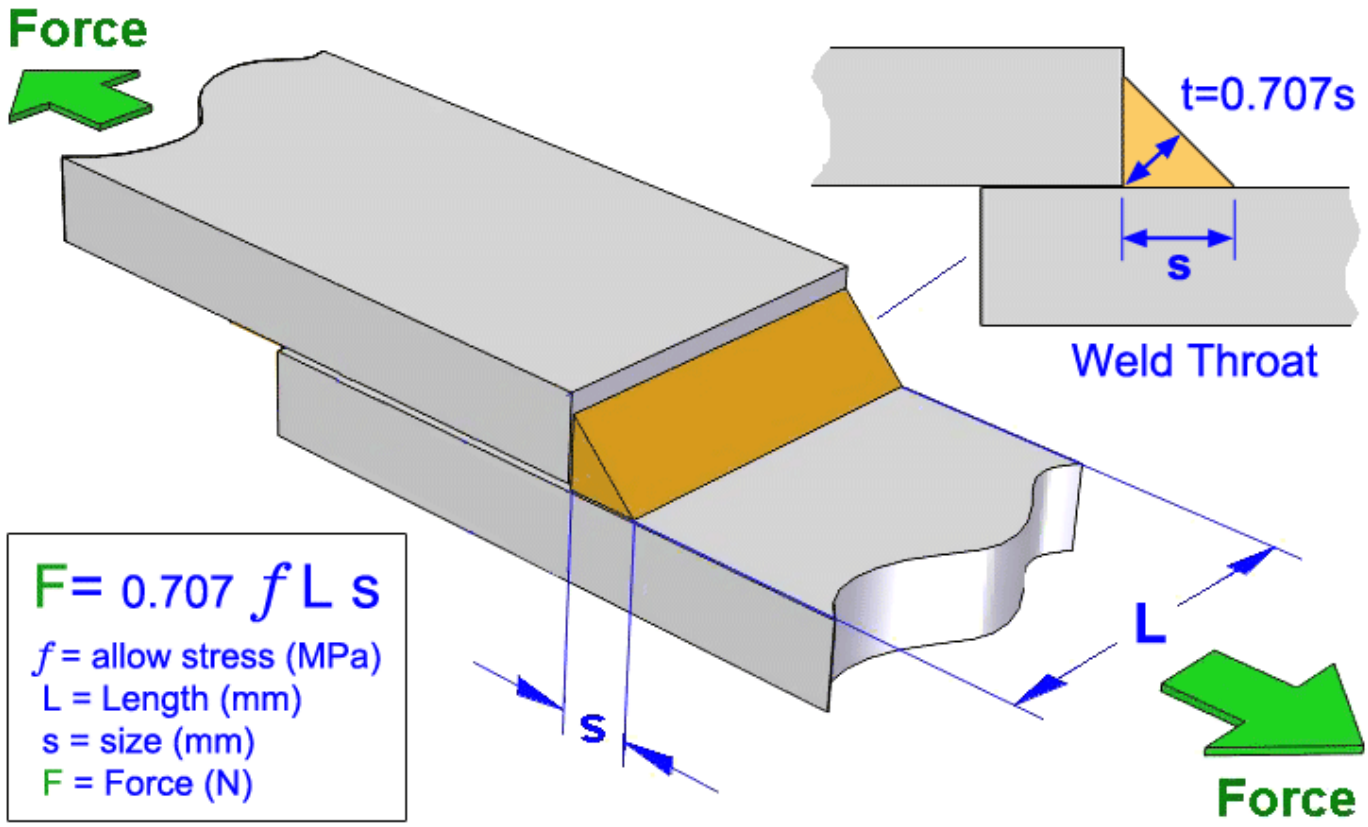

An 8mm fillet weld of length 100mm. What force can it take?
(We will assume a 410 electrode)
F =0.7071*S*f*L
F =0.7071*Size*Stress Rating*Length
F = 0.7071*8*(410/3)*100 = 77309.6 N (77.3kN)
*(All in mm, N and MPa)

Example Fillet 2

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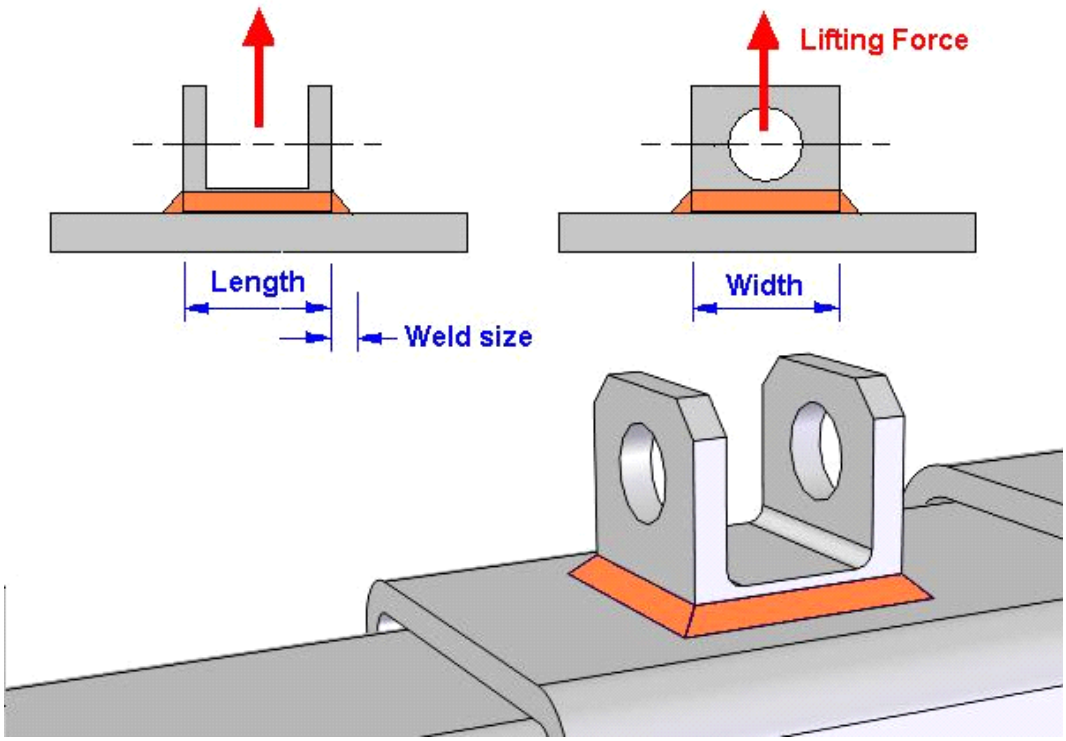
Q7: Length=Width=37 mm, lifting force is 59 kN, and allowable weld stress is 120 Mpa. Find minimum weld size.



Note that this weld is in TENSION, but we can assume fillet welds to act in shear (shear is usually the lowest stress). No need to work out whether in pure tension / shear / compression, or a mixture. Just *shear*.

We are trying to find weld size s:
F = 59000N, L = 4*37mm, f = 120 MPa
F = 0.707 f L s
so s = F / (0.707 f L) = 59000 / (0.707*120*37*4) = 4.6988 mm
(Of course, we would round this off to a larger (nominal) weld size like 5mm or 6mm, but keep the original number for the quiz…)

Example: Pipe Flange

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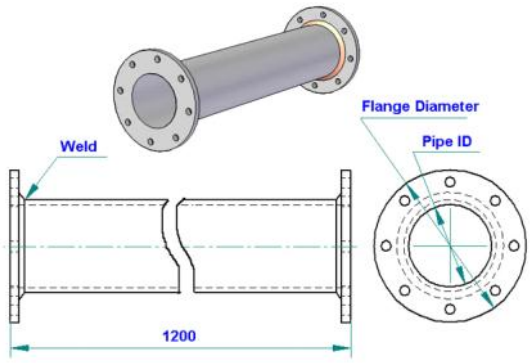

Q12: A 7mm weld attaches these flanges to a 320 mm diameter pipe. With a pressure of 2 MPa, find the shear stress in the weld.

Force of fluid under pressure pushes flange/plate Outwards…
P= F/A.
F = PA = 2*pi*160^2 = 160850 N
Find stress in weld...
F = 0.707 f L s
L = pi*D = pi*320 = 1005.3 mm
F = F/(0.707Ls) = 160850/(0.707*1005.3*7)
= 32.3302 MPa

Now do using AXIAL STRESS formula.
F = PD/4t = 2*320/(4*0.707*7) = 32.3298 Mpa
So the axial stress formula uses area of fluid divided by circumference * thickness. (The Pi's cancel out)