DESIGN CONSIDERATION FOR WELDING

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Introduction

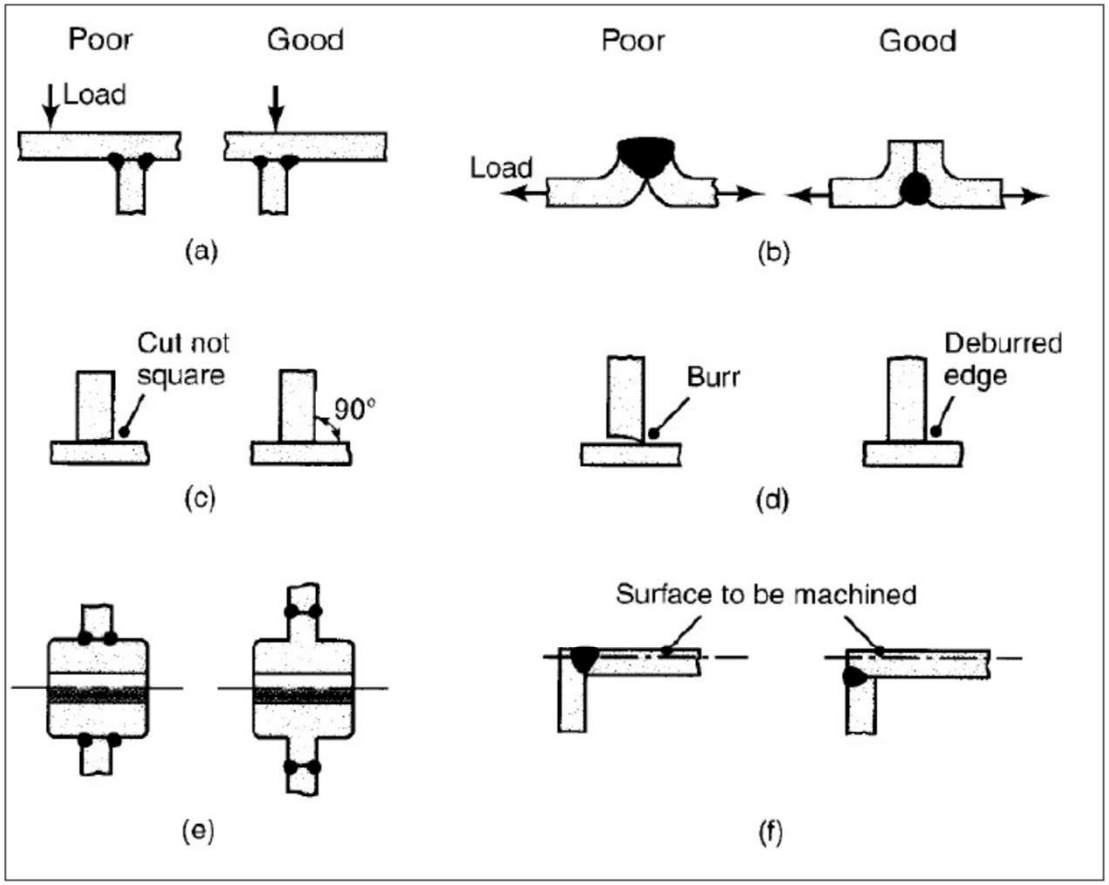
- Arc welding can be used to weld almost any kind of assembly.
- Commonly produced devices by arc welding are tube fittings, storage tanks, pressure vessels, machine frames, structures for industrial equipment, railroad cars etc.

Design guidelines for welding

- Welded assemblies should have **few parts**.
- Weld joints should be placed in such a way that there is **easy access of the welding nozzle**.
- Provide minimum amount of **weld filler**, with respect to both **fillet size and length** that meets functional requirements of the assembly.
- Welding should be done **horizontally**, with the stick or electrode holder pointing downward during welding

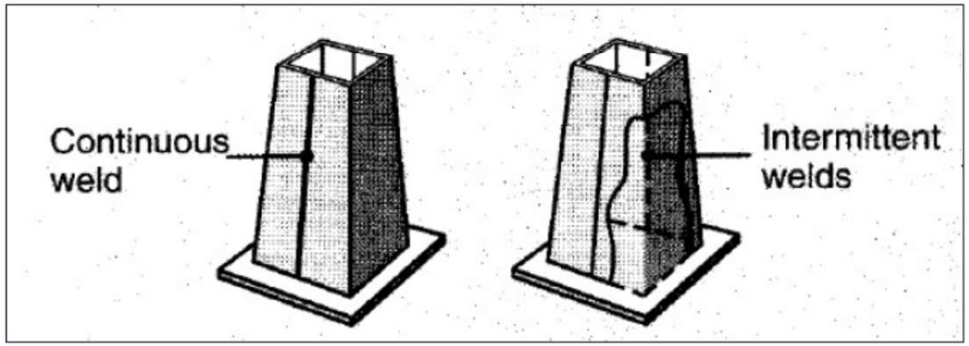
Design guidelines for welding

- Product design should **minimize the number of welds** because, unless automated.
- Weld location should be selected so as to avoid **excessive stresses or stress concentrations** in the welded structure and for appearance.
- Components should **fit properly** prior to Welding. The method used to prepare edges, such as sawing, machining, or shearing, also can affect weld quality.
- The need for **edge preparation** should be avoided or minimized.
- **Weld-bead size** should be as small as possible, While maintaining the strength of the joint, to conserve Weld metal and for better appearance


Poor
Good
Load
(a)
Poor
Good
Load
(b)
Cut not square
90°
(c)
Burr
Deburred edge
(d)
(e)
Surface to be machined
(f)

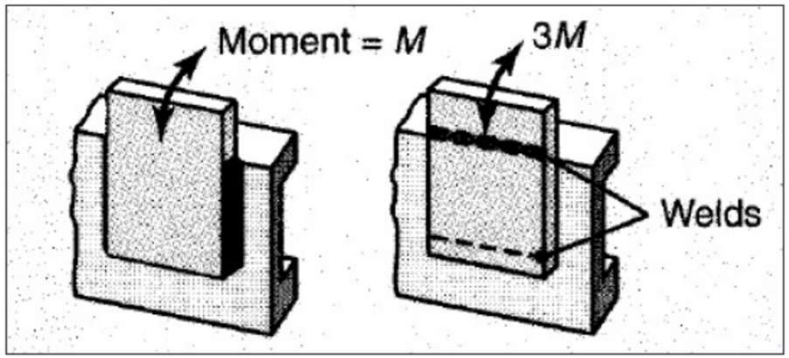
Design guidelines for Welding

- The two vertical joints can be welded either externally or internally.
- Full-length external welding will take considerable time and will require more weld material than the alternative design, which consists of intermittent internal welds.



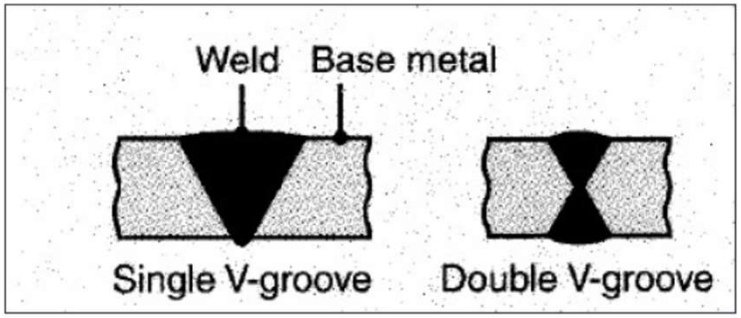
Design Guidelines for welding

- Design on the right can carry 3 times the moment 'M' of the one on the left.
- Both designs require the **same amount of weld metal and Welding time.**



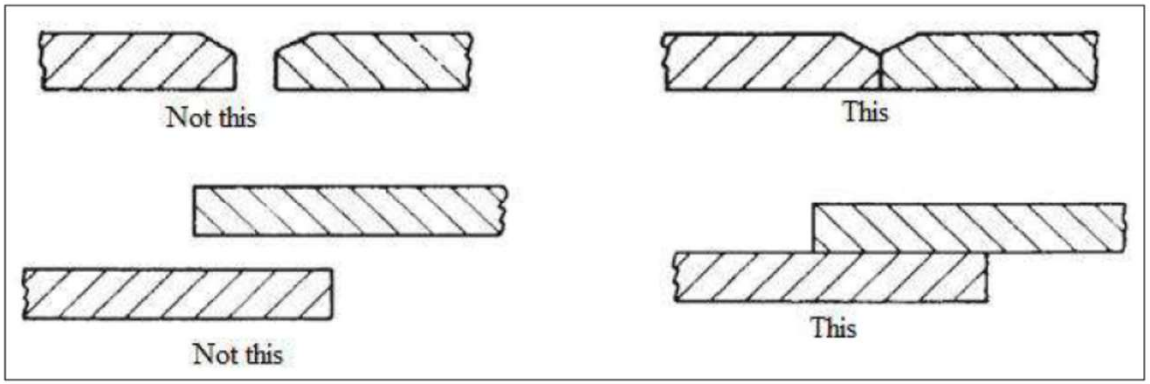
Design guidelines for welding

- Left side welding - **weld metal is twice** the amount of weld material than welding on the right.
- **Edge preparation** for left side weld requires more time than on right side because of more material



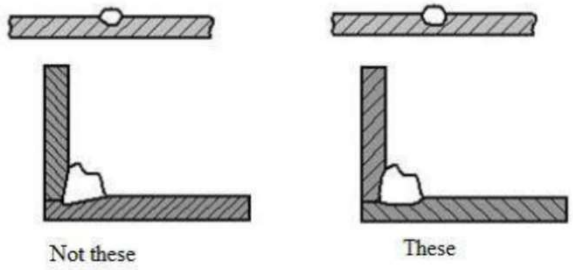
Design guidelines for welding

- The designer should be aware of **poor and good fit-up** of parts at the weld joint. It is essential not only for welding speed but also for minimizing distortion of the finished weldment.

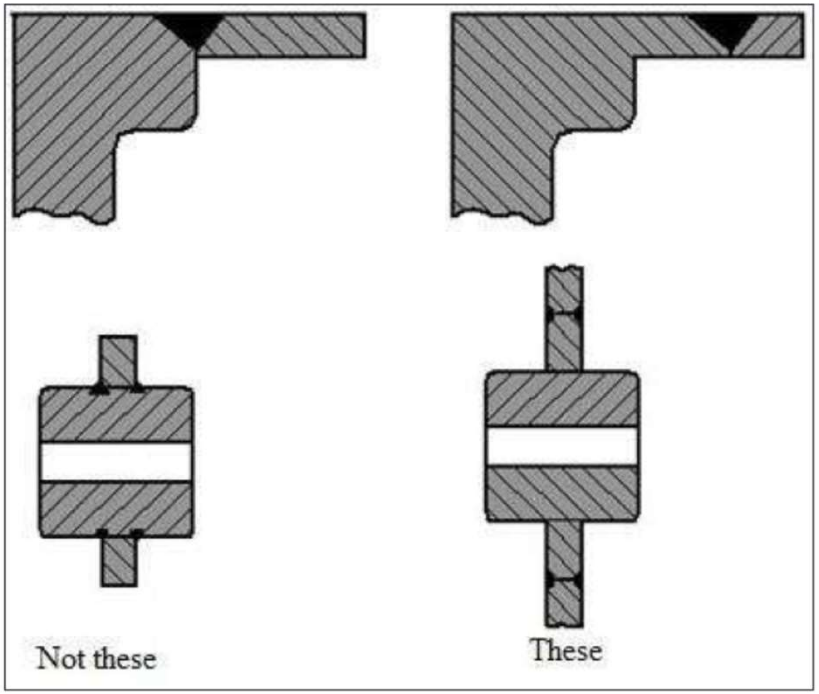


Design guidelines for welding

- The **build-up of weld fillets** should be kept to a minimum as it doesn't add **significant strength** to the joint
- If Forgings or castings are part of a welded assembly, one should ensure good fit-up of the parts to be welded. For example **untrimmed parting-line areas shouldn't be included in the welded joint.**
- In the **cast part the wall thickness** of both parts to be joined should be equal at the joint.

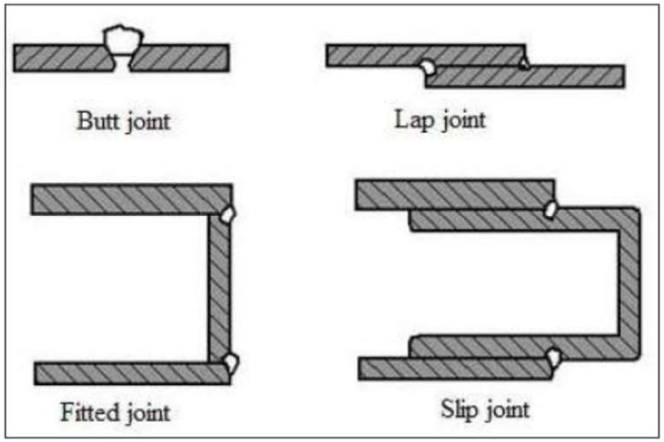


Design guidelines for welding



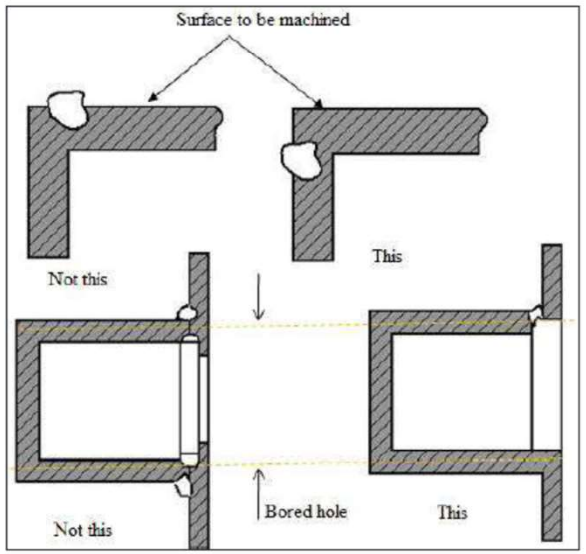
Design guidelines for welding

- The joint should be designed so that it **requires minimal edge preparation**. For this, one should use **slip or lap joints** in welded assemblies to avoid the cost of close edge preparation and to simplify fit-up problems.



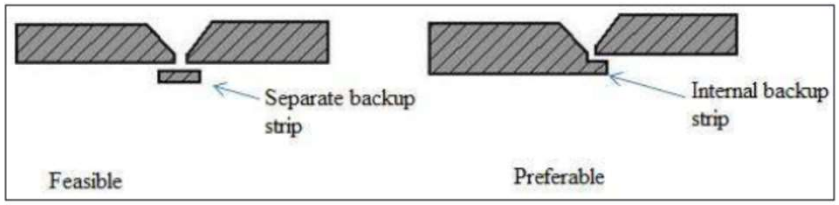
Design guidelines for welding

- If machining after welding is required, it is advisable to place welds away from the material to be machined to avoid machining problems.
- In the second figure the welded portion on right side is not desirable because the hole to be bored will be difficult.

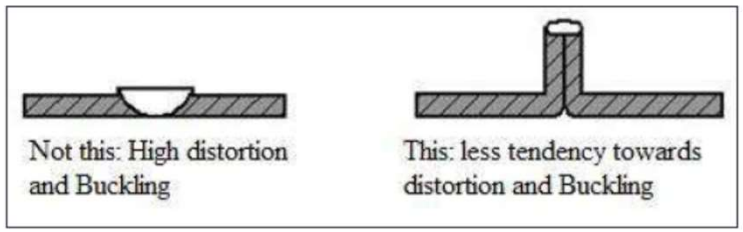


Design guidelines for welding

- Sometimes it is advantageous to include a **weld backup** strip as an integral part of one of the component to be welded.



- Short flanged **butt joints are preferable to join thin materials**. Unless joints have good supports long sections of thinner material, when welded together, are apt to distort and buckle.



Design guidelines for welding

- If possible, place **welds opposite** one another to reduce distortion.
- If sections of **unequal thickness** are to be welded, distortion can be reduced by equalizing wall thickness at the joint by machining a groove in the thicker piece adjacent to the weld joint