

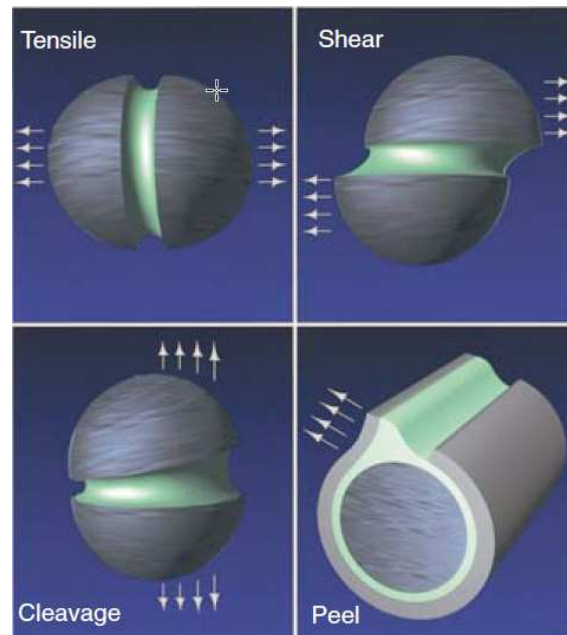
## Adhesive Selection Criteria : Stress Resistance & Joint Design

Adhesives bring to the manufacturing process, including stress resistance, simplification and economy.

One of the primary benefits of an adhesive is that it holds something together resisting the stress trying to pull it apart.

**Tensile stress** is exerted equally over the entire joint straight and away from the adhesive bond.

**Shear stress** is across the adhesive bond. The bonded materials are being forced to slide over each other.



**Cleavage stress** is concentrated at one edge and exerts a prying force on the bond.

**Peel stress** is concentrated along a thin line at the bond's edge. One surface is flexible. Most applications combine stresses.

### 5 Steps to Insure Optimum Performance

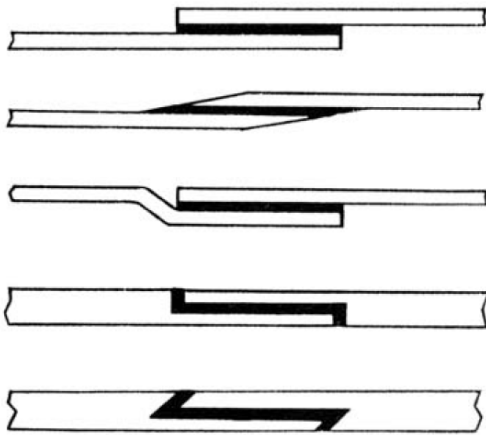
With either film or liquid, there are five considerations to make and steps to be taken to insure adhesive performance consistent with your specific requirements.

1. **Joint Design** - Proper design can maximise adhesive performance.
2. **Surface Preparation** - Amount of preparation should be consistent with your requirements.
3. **Application Methods** - Depends on adhesive tape.
4. **Heat Curing Equipment** - Many methods available.
5. **Pressure Equipment** - Must provide uniform pressure over entire bonded area.

# Specific Stress Resistance is a Major Consideration

Generally, joints should be designed so that basic stress is shear or tensile with cleavage and peel minimised. All of the bonded area should equally share the load. The following structural points and their advantages/disadvantages illustrate some typical design alternatives. They are not, of course, the limit of possible adhesive bonded joints.

## Lap Joints



Lap joints are most common. They are most practical and applicable in bonding thin materials.

**The simple lap joint** is off-set when using thin materials. This can result in cleavage and peel stress under load.

**A tapered single lap joint** is more efficient than a simple lap joint. The tapered edge allows bending of the joint edge under stress.

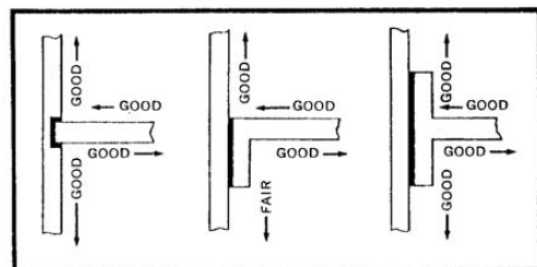
**The joggle lap joint** gives more uniform stress distribution than either the simple lap or tapered lap joint. The joint can be formed by simple metal forming operations. The curing pressure is easily applied.

The **double butt lap joint** gives more uniform stress distribution in the load-bearing area than the previously mentioned joints. This type of joint, however, requires machining which is not always feasible with thinner gauge metals.

**Double scarf lap joints** have better resistance to bending forces than double butt joints. This type of joint however also requires machining.

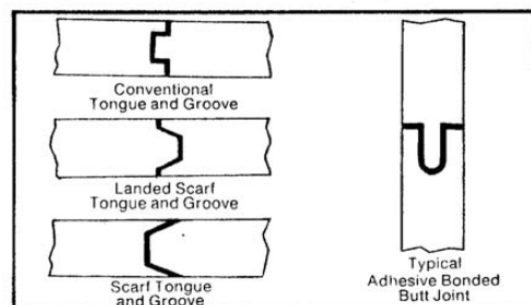
## Angle Joints

Angle joints give rise to either peel or cleavage stress depending on the gauge of metal. Typical approaches to the reduction of cleavage are illustrated.



## Butt Joints

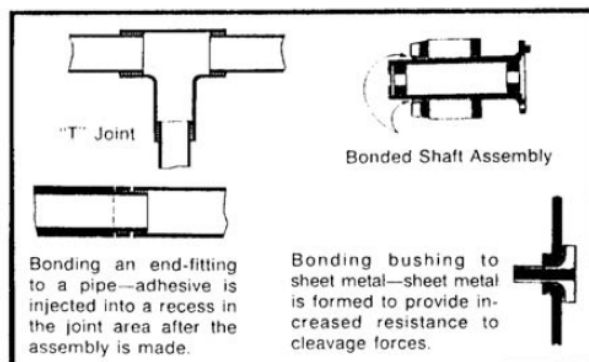
A straight butt joint has poor resistance to cleavage. The following recessed butt joints are recommended: landed scarf tongue and groove, conventional tongue and groove, and scarf tongue and groove.



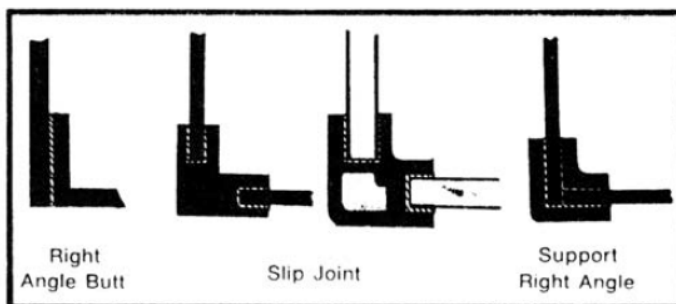
Landed scarf tongue and groove joints act as stops which can control adhesive line thickness. Tongue and groove are self-aligning during assembly and act as a reservoir for mastic type void filling adhesives.

## Cylindrical Joints

The joint and overlap slip joint are typical for bonding cylindrical parts such as tubing, bushings and shafts. With adhesive bonding, all available contact area contributes to carry the load. Adhesives also provide a joint with better appearance and eliminate distortion caused from high welding temperatures.



## Corner Joints - Sheet Metal



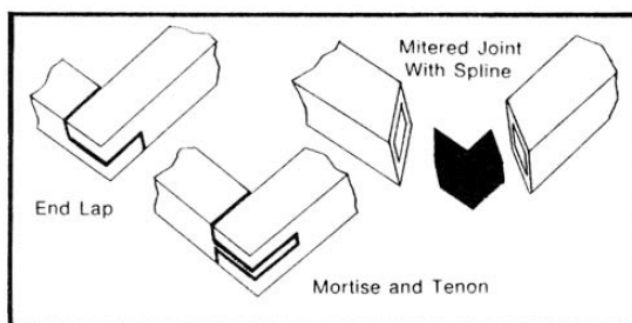
Corner joints can be assembled with adhesives by using simple supplementary attachments. This permits joint and sealing in a single operation. Typical designs are right angle butt joint, slip joints increase the structure's rigidity.

Void filling adhesives are most frequently used. Use of a heat curing adhesive depends on the heat resistance of the metal's being bonded. With this technique, thin gauge metals or sandwich panels can be easily formed into boxes, case, housing, vehicle bodies, metal boat hulls etc.

## Corner Joints - Rigid Members

Corner joints, as in storm doors or decorative frames, can be adhesive bonded. End lap joints are the simplest design type although they require machining.

Adhesives requiring pressure during cure may be utilised in such designs.



Mortise and tenon joints are excellent from a design standpoint but also require machining. Filtered joint with spline is best if members are hollow extrusions. In this case, a void filling adhesive is recommended.