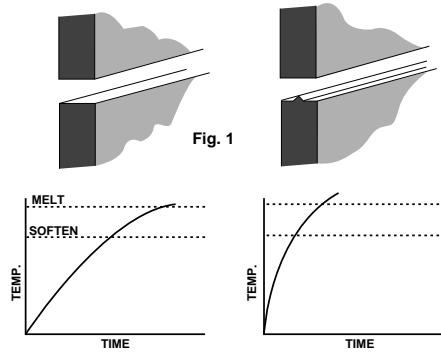
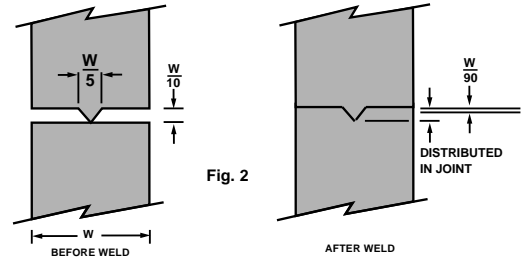


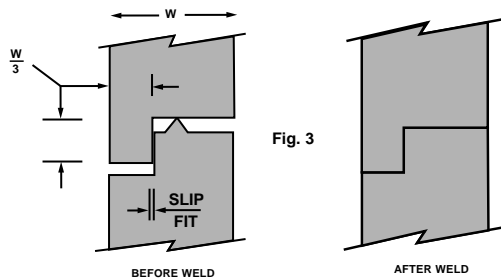
**Figure 1.** The diagrams show time temperature curves for a common butt joint and more ideal joint incorporating an energy director. This modified joint permits rapid welding while achieving maximum strength. The material within the director becomes the sealant which is spread throughout the joint area as indicated below.



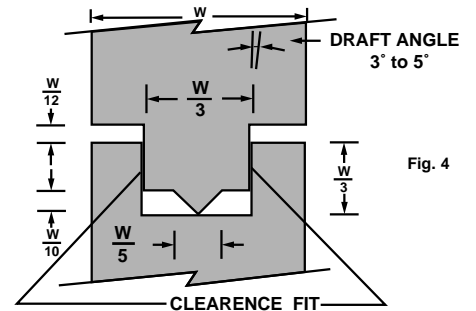
**Figure 2.** Shows a simple butt joint modified with energy directors showing desired proportions before weld and indicating the resultant flow of material. Parts should be dimensioned to allow for the dissipation of the material from the energy director throughout the joint area as illustrated.



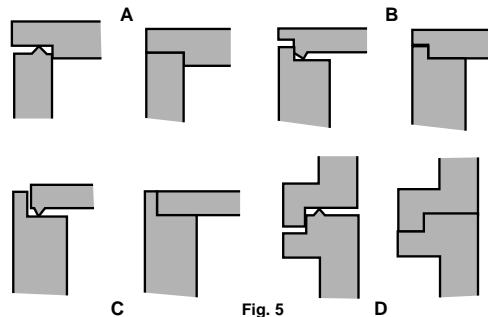
**Figure 3.** Illustrates a step joint used where a weld bead on the side would be objectionable. This joint is usually much stronger than a butt joint, since material flows into the clearance necessary for a slip fit, establishing a seal that provides strength in shear as well as tension.



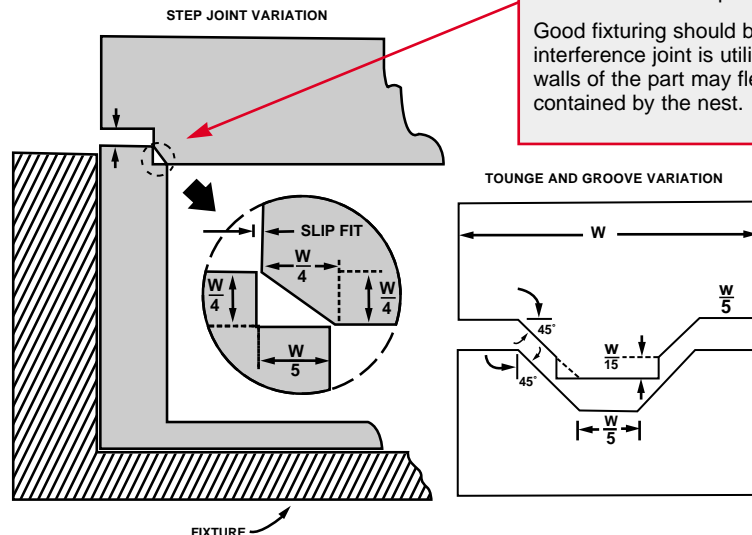
**Figure 4.** A tongue and groove joint usually has the capability of providing greatest strength. The need to maintain clearance on both sides of the tongue, however, makes this more difficult to mold. Draft angles can be modified concurrently with good molding practices, but interference between elements must be avoided.



**Figure 5.** Illustrates basic joint variations suitable for ultrasonic welding. These are suggested guidelines for typical joint proportions. Specific applications may require slight modification. Practical considerations suggest a minimum height of .005" for the energy director. Where height greater than .020" is indicated, two or more directors should be provided with the sum of heights equalling the formula dimensions.



**Figure 6.** Shows the interference joint used when a hermetic joint is needed for the crystalline thermoplastics (nylon, acetal, polyethylene, polypropylene). Since crystalline resins (such as acetal and nylon) have a tendency of being watery in the motion state, the adjoining surfaces remain cool when the energy director has become molten, resulting in little or no interaction of melted and unmelted surfaces. **See Note**



**Note:** When the interference joint is used, weld strength of crystalline materials approaches 95% of parent material strength, as opposed to 40-70% when energy director is used. The interference joint permits interaction between the two surfaces during the entire melt cycle by exposing more and more surface area as the two surface planes interfere under ultrasonic and clamp force.

Good fixturing should be used when the interference joint is utilized as the outer walls of the part may flex or distort if not contained by the nest.

Fig. 6