

# Examining brazing and soldering engineering essay



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Brazing and soldering was the joining process, it similar like are welding process. The result in the name of the joining are being interchanged and confused. The welding society like an American society was selected the arbitrary temperature, example 800 °F as a line derarkation between two processes.

Brazing is joining process that similar soldering except that the joining takes place at temperatures above 800 °F. Definition brazing is a metal joining process by using a filler metal is heated above and distributed between two or more close fitting parts by capillary action. The filler metal is brought slightly together, it melting temperature while to protected and by a suitable atmosphere with usually a flux. It then flows over the base metal and is then cooled to join the workpieces together. It was similar to soldering, except the temperatures using to melt the filler metal is above 842 °F. The filler metals are distributed between closely fitted surfaces of the joint by capillary attraction. Brazing is call really braze-welding, wherein, a nonferrous filler metal is applied. Brazing alloys was much stronger than solder alloys. The brazed joint not requires as much depth to achieve the strength as the soldered joint. To achieve the strength, filler metal must be alloy with the base metal. The filler metal must combine with the base metal properly. The brazing condition was very good if the combination very properly. They are eight basic steps in making capillary metallurgical joints like step 1 is Cutting and sizing the parts to be joined, step 2 is Cleaning, step 3 is Fluxing, step 4 is Assembling and supporting or jiggling. For step 5 is heating, step 6 was applying filler metal, step 7 is cooling and last step was Post-cleaning.

Several of brazing process must to added operations for cooling and post-

cleaning. These steps may require for more operations in order to prevent further action by using the flux. The basic procedures must follow and the correct filler alloys are used, to having a successful joining.

The joining design must be suitable capillary for the molten filler when the joint elements are properly aligned. The flow of filler must need to enable and assure coverage. Filler metal must melt at a lower temperature at the base material of allow the flow, substrate wetting, and interdiffusion. This means that some component of the filler metal must be soluble in the substrate solvent . To allow the brazing, heat can apply at the joint or to the entire assembly to be brazed. In this case, a temperature must be reached at the joint to allow the filler metal to melt, wet, and flow. Temperature must at least in the joint to prevent uneven or incomplete filling. Protective shielding is required during brazing process to prevent oxidation of cleaned joint on the surfaces during heating and until completed the braze flow. This can be accomplished with another a chemical flux or an inert atmosphere. Sometimes the flux or atmosphere can be required to clean and chemically can be active the surface at the brazed.

To have a high quality brazed joint, the base metals and part must be closed, exceptionally clean and free from the oxides. In these cases, the joint clearances must be from 0. 03 to 0. 08mm because that clearance was the best capillary action and joint strength. However, some brazing process is not uncommon to have joint clearances around 0. 6 mm. The brazing surfaces are very importance, as any contamination also can cause poor wetting. They have two main methods to cleaning parts, prior to brazing are chemical cleaning and mechanical cleaning. Mechanical cleaning is very <https://assignbuster.com/examining-brazing-and-soldering-engineering-essay/>

importance to maintain at surface to force the wetting on a rough surface occurs more readily than on a smooth surface on the same geometry.

Effect of temperature and time on the quality of brazed joints cannot be overlooked. Temperature of the braze alloy can be increased because the alloying and wetting action of the filler metal increases very well. The brazing temperature must select above the melting point of the filler metal. However, there factors that influence the joint designer's temperature selection. Must choice the best temperature as to be the lowest possible braze temperature, minimize any heat effects on the assembly, keep filler metal or base metal interactions to a minimum, and must maximize the life of any fixtures or jigs used. Some of cases, may can allow selected a higher temperature for other factors in the design. The effect on the brazed joint primarily affects the extent to which the aforementioned effects are present; however, in general most production processes are selected to minimize brazing time and costs. The most important is the non-production settings; time and cost are secondary to other joint attributes for example like strength and an appearance.

Brazing process not contained within an inert atmosphere environment, fluxes are required to prevent oxides from forming from the metal in heated. The flux can clean any contamination on the brazing surfaces. Flux can be apply in any number of forms including flux paste, liquid, and powder or pre-made brazing pastes that combine flux with filler metal powder. The flux can also been like brazing rods with a coating of flux, or another name call flux core. In this case, the flux flows into the joint when the process to heat the joint and displaced by the molten filler metal to entering the joining. Excess <https://assignbuster.com/examining-brazing-and-soldering-engineering-essay/>

flux must be removed when the cycle is completed because flux left at the joint can lead to become corrosion and prevent further surface finishing of brazing process. When the joining copper to copper can contain the brazing alloy can be self-fluxing. Generally, the flux can select base on their performance on particular base metals. The flux must be chemically compatible with the base metal and the filler metal brazing process. Self-fluxing phosphorus filler alloys can produce brittle phosphides if the material was iron or nickel. As a rule, a type cycles brazing should use less active fluxes for short brazing process.

The materials for alloys are used as filler metals for brazing depend on application method. Braze alloys made up of 3 or more metals to form an alloy with the considered necessary properties. The filler metal can be chosen on its ability to: wet the base metals, melt at a lower temperature than the base metals or at a very specific temperature and withstand the service conditions required. Braze alloy been use in form as rod, ribbon, powder, paste, cream and wire. Depending on the application, the filler material can be pre-placed at the desired location or applied during the heating cycle. Wire and rod forms are generally used as they are the easiest to apply while heating in manual brazing process. In the case of furnace brazing, using material alloy can placed beforehand since the process is usually highly automated. The have many types of filler metals used are aluminium silicon, copper, copper phosphorus, brass, gold-silver, nickel alloy and silver. The high temperatures, oxidation of metal surfaces occurs in oxygen containing atmosphere from the brazing process. They may use other environment than air. The commonly used from the atmosphere like

air, noble gas, and vacuum and combusted fuel gas. For combusted gas is nitrogen, hydrogen, carbon monoxide and oxygen.

Torch brazing is used because the most common method of mechanized brazing. They are three types of torch brazing in use for example like manual, machine and automatic torch brazing. Manual torch brazing is a procedure where the heat is using a gas flame on the joint. The torch can be on hand held or held in a fixed position depending on if the process is completely manual or has some level of automation. Machine torch brazing was use a repetitive braze process is being carried out. This method is a mix from automated and manual process with an operator often placing brazes material, flux and jigging parts on the machine mechanism carries out the actual brazing. The advantage by using machine torch brazing method is that it reduces the high labour and skill requirement was better than manual brazing. Automatic torch brazing is a method use the eliminates in brazing operation, except for loading and unloading of the machine. The advantages by using this method is had a high production rate, reduced operating cost and uniform braze quality.

In this process, they have advantages and disadvantage. For advantages, brazing process was not melting the base metal of the joining, the brazing allows much tighter control over tolerances and produces a clean joint. Dissimilar metals and non-metals can be brazed. In general, brazing also produces less thermal distortion with another welding process. The process is complex and multi-part assemblies can be brazed cost-effectively. The brazing can be coated for protective purposes and easily to adapt on mass production. For disadvantages on the brazing process is the lack of joint  
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strength as compared with another welding process was the softer filler metals is using. The strength of the joint is less that of the base metal but is greater than the filler metal. The brazing joints easily damaged on high temperatures.

## **SOLDERING**

Soldering is definite a process combine two or more metal items are joint into one by melting and flowing a filler metal into the joining. The filler metal had a relatively low melting point. The soldering was soft characterized by the melting point of the filler rod and the temperatures are 752 °F. They call solder in this process and by using the filler metal. Soldering was distinguished from brazing by use of a lower melting-temperature filler metal, it similar with the brazing. In a soldering process, they heat is on the parts of the joint, it causing the solder to melt and drawn into the joint. After the metal on cools, the resulting joints can see that not as strong as the base metal, but have adequate strength, water-tightness and electrical conductivity are good. The metallurgy of solders is presented some detail for the representative and predominant tin-lead system to overviews for important but less often used systems. The physical on solders are then described. The critical role of fluxes, their compositions and their physical forms are then described.

Soldering can apply for assembling electronic components to printed circuit boards (PCBs). Another application is to joints the sheet metal objects for example food cans, roof flashing, rain gutters and automobile radiators.

Jewellery are assembled and repaired by applying soldering process. Small mechanical parts are often soldered as well. Soldering can join lead came, <https://assignbuster.com/examining-brazing-and-soldering-engineering-essay/>

copper foil in stained glass work and semi-permanent patch for a leak in a container or cooking vessel. Soldering can consider that the temperatures was so low, a soldered joint was limited service at elevated temperatures. Generally, the strength was should not be used for load-bearing members. For examples soldering applications include tin-lead, tin-zinc for joining aluminium, lead-silver for strength at higher than room temperature, cadmium-silver for strength in high temperatures, zinc-aluminium for aluminium and corrosion resistance, and tin-silver and tin-bismuth for electronics.

The capacity material in soldering filler was many different alloys for differing applications. In electronics assembly, it was using the eutectic alloy of 63% tin and 37% lead. Other alloys are used for plumbing, mechanical assembly, and other applications. A eutectic formulation had advantages for soldering, the coincidence of the liquidus and solidus temperature. For quicker wetting as the solder heats up and quicker as call the solder cools. Additionally, the eutectic formulation had the lowest possible melting point, can minimize heat stress on electronic components during soldering. The solder was used in a soldered joint is selected to provide good wetting, spreading or flow, and joint penetration in the actual soldering operation and the desired joint properties in the finished product. A flux is intended to enhance the wetting of the base metal by the solder from precleaned surfaces and preventing the reformation of oxide or tarnish during the soldering operation. The selection was depends on the ease with which a material can be soldering. Chemically was not aggressive or mild fluxes are used with solderable base metals.



When chemically aggressive inorganic fluxes are usually used on metals are so difficult to wet, like stainless steels because of their Cr content.

Chemically was reducing the gaseous atmospheres can be used to clean and subsequently protect precleaned joint elements in an assembly to be soldered. The joints that are enable to soldered should be designed and to permit application of flux. Joining should be designed properly to clearance is maintained between joint elements during the heating and cooling stages of the soldering operation. To maintain the alignment of joint components during the process, special fixtures may be necessary or the units of the assembly can be crimped, clinched, otherwise held together mechanically or by " holding" adhesives. The surface was an unclean will prevent the molten solder from wetting and spreading, making soldering difficult or impossible and contributing to poor joint properties. Flux can consider should not substitute for precleaning. Precleaning may remove the organic contaminants like grease, oil, paint, pencil marks, lubricants, coolants, and dirt, as well as inorganic films like oxides and other tarnish layers.

Precleaning can involve any or all of the following three progressively vigorous methods for example like degreasing, pickling and mechanical cleaning. Precleaning can also be followed by a fourth step, precoating. All cleaning solutions can be thoroughly and remove before the soldering in progress. Precoating should be for metals that are difficult to solder because oxidize readily and, thus, can re-oxidize after precleaning if soldering is delayed too long. Precoating involves coating the base metal surfaces to be soldered with a more solderable and more oxidation-resistant metal or alloy before the soldering operation.

Soldering can be performed with hand tools, one joint at a time on a production line. Hand soldering or manual soldering is typically performed with a soldering iron, soldering gun, or a torch, or occasionally a hot-air pencil. In Sheet metal work was use traditionally with “ soldering coppers” directly heated by a flame, with sufficient stored heat in the mass of the soldering copper to complete a joint; torches or electrically-heated soldering irons are more convenient. All soldered joining required with the same elements of cleaning of the metal parts to be joined, fitting up the joint, heating the parts, applying flux, applying the filler, removing heat and holding the assembly still until the filler metal has completely solidified. It depending on the nature of flux material, the joints may be required after they have cooled. Distinction between soldering and brazing is arbitrary, based on the melting temperature of the filler material. Generally cannot achieve high enough temperatures for brazing. Practically speaking there is a significant difference between the two processes, for example the brazing fillers have far more structural strength than solders, and are formulated for this as opposed to maximum electrical conductivity. Brazed connections are often as strong or nearly as strong as the parts they connect.

“ Hard soldering” or “ silver soldering” was been performed with high-temperature solder containing up and it also often a form of brazing, since it involves filler materials with melting points in the vicinity. In silver soldering process was given a beautiful, structurally sound joint, especially in the field of jewellery. The power source of heat in induction soldering is heating by high-frequency AC current only. Some of metals are easier to solder than others like copper, silver, and gold. The more difficult material like iron and

nickel because of their thin, strong oxide films, stainless steel and aluminium are even little more difficult. Titanium, magnesium, cast irons, steels, ceramics, and graphite can soldering but it involves a process similar to joining carbides. They are first plated with a suitable metallic element that induces interfacial bonding.

Hand soldering tools include the electric soldering iron, the variety of tips available ranging from blunt to very fine to chisel heads for hot-cutting plastics, and the soldering gun, which typically provides more power, giving faster heat-up and allowing larger parts to be soldered. Soldering torches are a type of soldering device that uses a flame rather than a soldering iron tip to heat solder. Soldering torches are often powered by butane and are available in sizes ranging from very small butane/oxygen units suitable for very high-temperature jewellery work, to full-size oxy-fuel torches suitable for much larger work as copper piping. Common multipurpose propane torches, the kind used for heat-stripping paint and thawing pipes, can be used for soldering pipes and other fairly large objects either with or without a soldering tip attachment; pipes are soldered with a torch by directly applying the open flame. The soldering copper is a tool with a large copper head and a long handle that can be heated in a blacksmith's forge fire and apply heat to sheet metal for soldering. Typical soldering coppers had heads weighing between one and four pounds. The head provides a thermal mass, can store enough heat for soldering large areas between re-heating the copper in the fire. The larger the head, the longer the working time it affords.

## **Conclusion**

The Soldering was similar like brazing, enables solid materials to be joined by using molten filler to flow into and fill the space between properly joint facing surfaces and then to solidify without required and causing melting of the base material. The liquidus of the filler in soldering is below the solidus of the base materials and below 450°C (840°F), by convention. Wetting and spreading of the filler by capillary action are then critical to proper distribution of the solder. The strength arises from a combination of metallic or other primary bonding. The principal reasons for soldering are to provide electrical connectivity and conductivity or leaktightness or hermeticity, as opposed to providing mechanical strength. They have similar and difference soldering with brazing. The brazing was similar like one of type of welding process by using gases. The soldering not using gases, just using electrical or manual like pre heat the flux.