Why DeWitt's makes a better radiator…

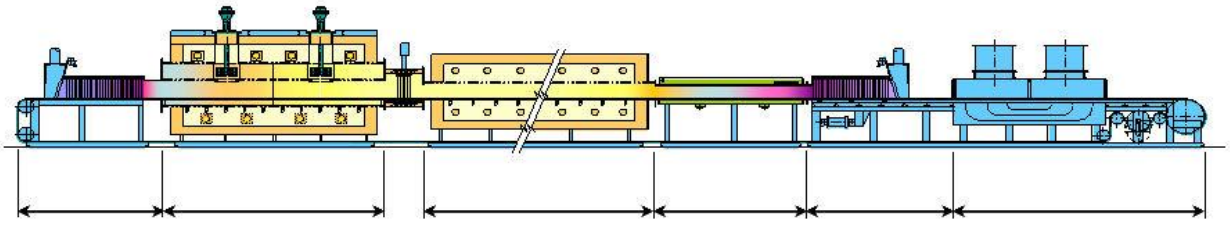
Anyone can make aluminum radiators. All you need is a shear to cut the material, a brake to bend the material into a box, and a welder to attach the box tanks to the core. With the popularity of aluminum radiators and the minimal investment for the equipment shown below, dozens of individuals have started making radiators and selling them on the internet.

Most of these guys have really impressive websites or auction stores and it's hard to tell the difference between a real business and an individual working out of his garage. Some dealers may not even make the radiators at all but instead buy them from overseas, which typically means from China. Many Chinese companies are producing complete aluminum radiators but they also sell radiator cores.

The term "core" is commonly misused as reference to the rows of tubes used in the core. There really is no such thing as a 4-core, it's just something that has been handed down from generation to generation and will be misused forever.

A "core" is really the sum of a group of parts. This includes the headers which is a multi-slotted plate that all the tube ends are brazed into. The stack up of tubes, fin, and side channels make up the remainder of the core. It is the core and the core alone that dictates the effectiveness of the radiator in which it is used.

Aluminum radiator cores are brazed in a furnace to join the tubes, fin, and headers. This brazing process is commonly referred to as CAB (Controlled Atmosphere Brazing) or Nocolok® for the name of the flux used in the process.



A typical CAB furnace is made up of multiple sections that are bolted together to create a large single system. This assembly can measure 75-150 feet long and cost as much as one million dollars.

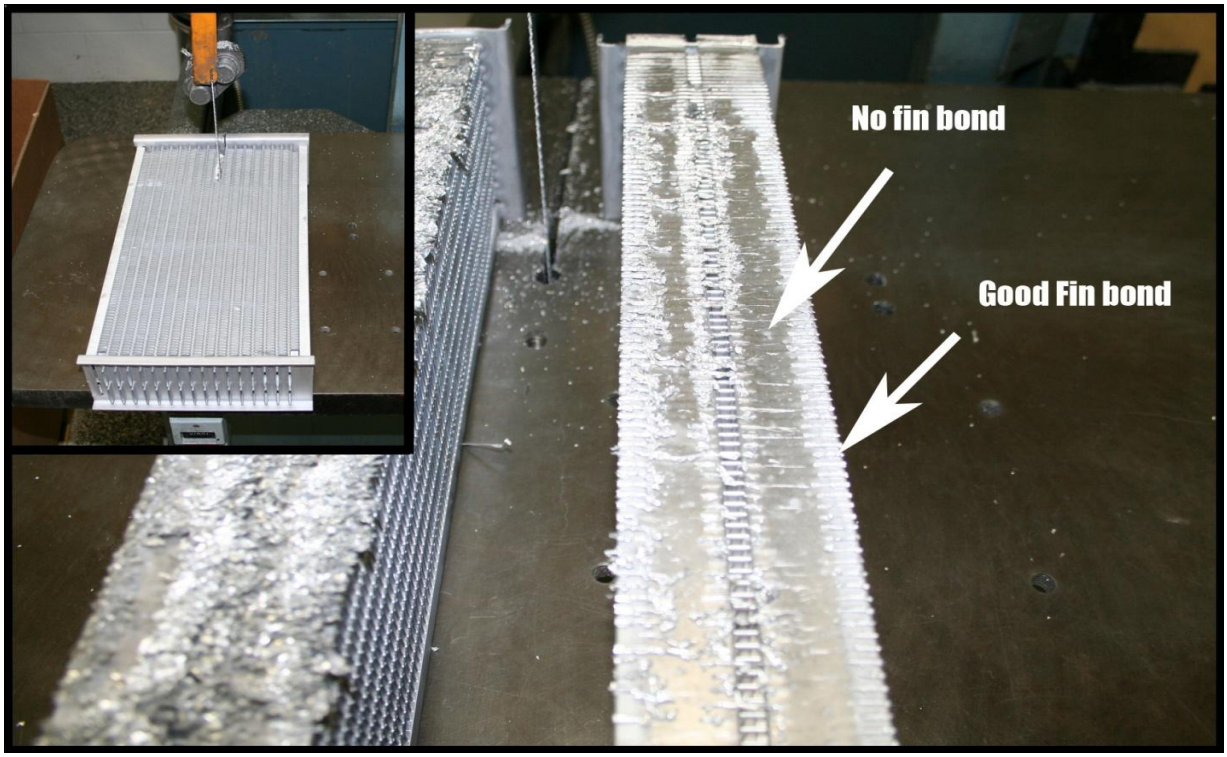
Prior to brazing the cores, they must be cleaned and fluxed. The most common way to apply the flux is to mix the flux with water and spray it onto the core. A flux machine typically has multiple zones including a spray application zone, air blower zone, and dryer section. The flux machine must be fabricated with stainless steel material to prevent rusting. A conveyor belt mechanism is use to transfer the part through the three zones and out to the dehydration oven. A separate tank with an agitation motor is used to keep the water/flux slurry mixed. Special diaphragm pumps are used to transfer the mixture.

Certain areas of the core require more flux than others but most companies will simply apply the same amount everywhere because it's easier. We choose to do it the hard way because the end result is clearly better. The photo (right) shows a 15% flux/water mixture is sprayed onto the core, flooding the tube and fin section. This insures that 100% of the internal components are coated with flux but in a lower percentage to minimize excess flux build up and fin clogging.

Following the machine fluxing, the cores are removed and a second application is applied to the tube and header area. This is the most critical area of the core and a higher (30%) concentration of flux/alcohol is used.

Aluminum brazing is a huge investment and the cost to run this machinery is very high. The only way for radiator builders to obtain cores is to buy them from someone that has this capability. The reality is CAB brazing is pretty rare and typically left to the larger automotive suppliers. There are dealers that sell cores however almost all of these units are imported and the quality is unknown. There are no quality controls, specifications, or standards to meet. Most of the time a leak is not detected until the radiator is complete and pressure testing reveals a core leak which is only repairable with epoxy.

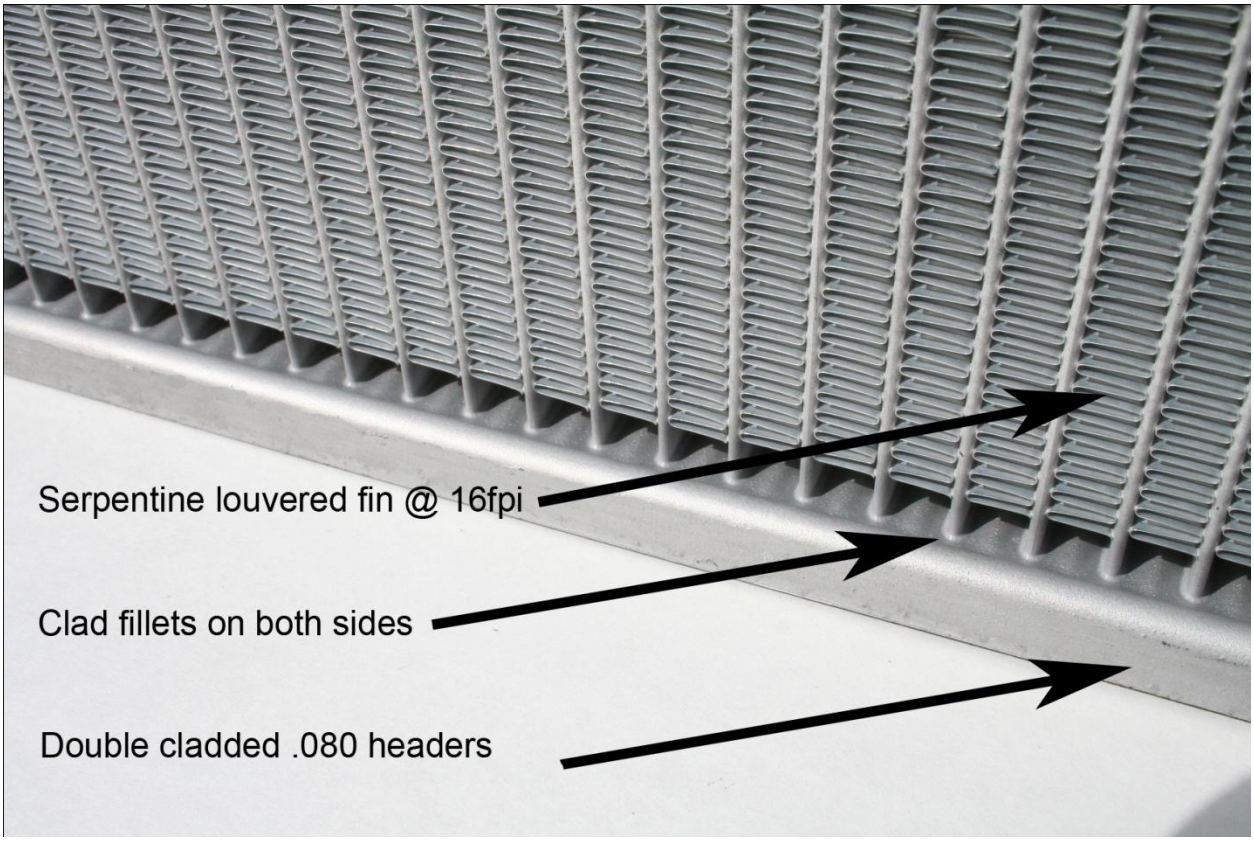
Core defects can be virtually eliminated with CAB if all of the processes are followed and quality controls are in place. All aluminum parts must be cleaned of all stamping oils prior to fluxing and brazing. Flux concentrations must be correct and adjusted on a regular basis. The brazing profile of the furnace (temperature settings and belt speed) must be correct for a given mass and the atmosphere must be oxygen free. If all these items are followed to the letter, the CAB process will produce leak free cores and excellent fin bond. Conversely if any one of these items is not done correctly defects will occur. These defects could be something obvious, such as loose fin or gaps in the tube-to-header joints. Dark spots or discolored areas might indicate poor washing or the presence of contamination and therefore a weak braze joint.



Unfortunately visual inspections are only part of the evaluation process and destructive testing should be done to determine the percentage of fin bond throughout the depth of the core. Once a braze profile has been established and a load of cores are brazed, a core is cut open to examine the inside fin bond. The above photo is an example of a poor flux application and fin bond was only established on the outside edges of the core. As a result, this core is only 50% efficient and this would not be detectable by visual inspection.

Your radiator supplier may tout to be the very best in the business for the quality of their welds or superior fabrication techniques but the core could be poor quality and they wouldn't even know it. The radiator with the most beautiful welds and polished tanks can look like a work of art but may not be performing as good it should. DeWitts radiator is the only aftermarket radiator company that owns and operates a CAB furnace. We control the whole process in house, insuring a quality made core. We roll our own fin, stamp our headers, and assemble the cores in modern core builders.

Every part of a core is important but the quality of the headers is an absolute must. The tube slots must be punched with a maximum of .002" clearance for a good tube fit. While others use single side clad material, DeWitts uses double side clad for all the headers. This provides a fillet joint around the tube on both sides of the header, doubling the strength of the joint.

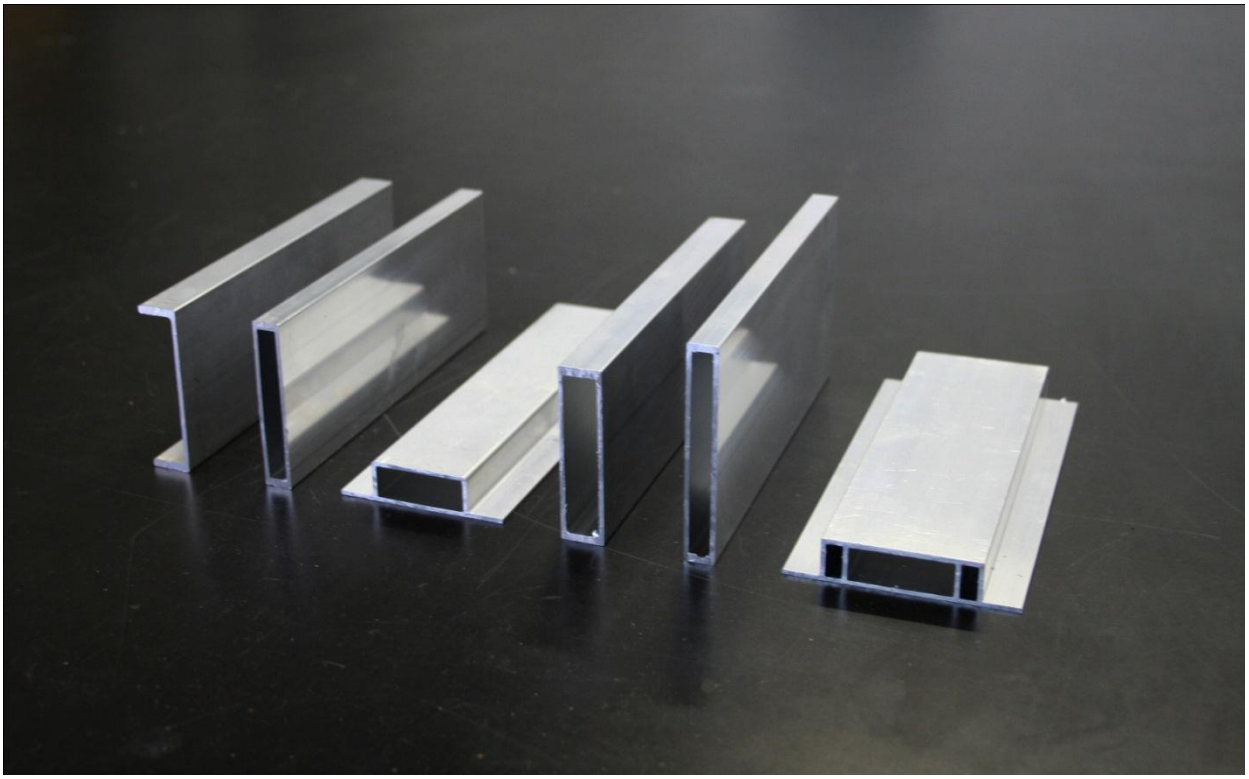


You simply cannot build a better, stronger core. The use of .080 double cladded material and extruded side channels provides a core strong enough to handle over one million pressure cycles without a tube-to-header joint failure.

Standard radiator side channels are formed in a U shape. These channels are very weak and tend to bend and crush the fin with very little force. DeWitts Radiator cores use extruded structural tubing for all side channels. Not only does the extrusion process allow for multiple shapes but it creates a core that is three times stronger than the fabricated sheet.

Extruded side channel
(Holds 150 pound man)

Sheet fabricated side channel
(Folds with one foot applied)



Open U shape, rectangles, and GM type hat channels are available

Brazing profiles are created for each core based on the total mass weight. The furnace temperatures and belt speeds are adjusted based on feedback from a data recorder. The recorder is stored in a special stainless steel “hotbox” and thermocouples are attached directly to the core to insure the material reaches the optimum brazing temperature for clad flow. The results are then downloaded to the computer for analysis and adjustments are made if necessary.

These extra steps and quality control measures are done long before the process of creating a radiator. We started making our own cores in house because that was the only way to know for sure it was done correctly and defects were eliminated. Now that we have a quality core, we can start making a radiator.

The cores are moved to our fabrication department where end tanks will be welded on and configured with inlet and outlet tubes.

DeWitts has invested into custom press forming dies to produce seem free end tanks. Unlike the standard box formed tanks which requires multiple corner welds and stress areas, our tanks are one piece. They often include ribs to strengthen the tank and provide an original OE look.

The term “Direct Fit” is not just an adjective for us, it's our trademark. Every radiator we make will fit your Corvette, without modification guaranteed. DeWitt’s is the only company that specializes in Corvette radiators and we have been doing it for 20 years. Doesn’t your Corvette deserve the best?

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