

## **fDISCUSSION:** Build Headers BETTER Than ANY You Can Buy!

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*We would like to present a point of view about headers that we don't believe has ever been put forth in a magazine — the possibility that **any** person — even in the garage behind his house — can build a header **BETTER** than any he might buy. No magazine would ever present this point of view as it would obviously offend all of its “header” advertisers as well as many others in the header industry.*

*While there have been many articles written about header “building” over the years, they always seemed to be presented in the context “if you can't buy something that will fit your vehicle, than this is what you can do”. These articles often presented a somewhat misleading discussion as they discussed only the construction side of headers but never seemed to present the **POSITIVE** side (or advantages) of what one might **GAIN** by building his own headers.*

The advantages of one building his own headers are manifold (pun intended). Maximizing Performance is certainly one of them but preventing potential problems, personal satisfaction, obtaining exactly what one wants as a specific header design (or tube layout), etc. are other advantages to be considered as well.

## **MAXIMIZE PERFORMANCE**

If one just looks at what the header industry is basically providing most of its customers, maximizing performance no longer seems to be one of its concerns.

The descriptive term “Equal Length” cannot be applied to most headers. Tube and collector sizes are often selected more by “marketing types” to maximize sales — rather than maximize performance. “Bean counters” (accountant types) figure out that shorter headers are cheaper and easier to build so headers get shorter and shorter (so potential bottom end and mid-range power gains diminish or disappear). Optimum collector shaping — to maximize flow from the individual header tubes through the collector taper to the collector outlet — is basically ignored. Header port shapes are often more related to ease of header construction than the shape and size of an exhaust port in a cylinder head (often resulting in headers whose ports block exhaust flow to some degree).

Fellows **buying** headers are often buying what may be called “least worst” headers — not the **best** headers (because they can't find them) but, instead, are buying headers that, in their opinion, have the **least number of faults**.

In contrast, fellows **building** their own headers don't deal with other's lack of concern or lack of availability — they just build what they want! Building your own headers allows you to end up with **EVERYTHING** you want and the only limitation on the outcome is self-imposed by your patience and skill.

### **Maximizing Performance**

Maximizing Performance is accomplished through correct selection of a header's performance design parameters. These are:

- Tube Size;
- Tube Length;
- Collector Size;
- Collector Length;
- TRUE Equal Length header tube design;
- Efficient Collector Shaping;
- Efficient Port Matching.

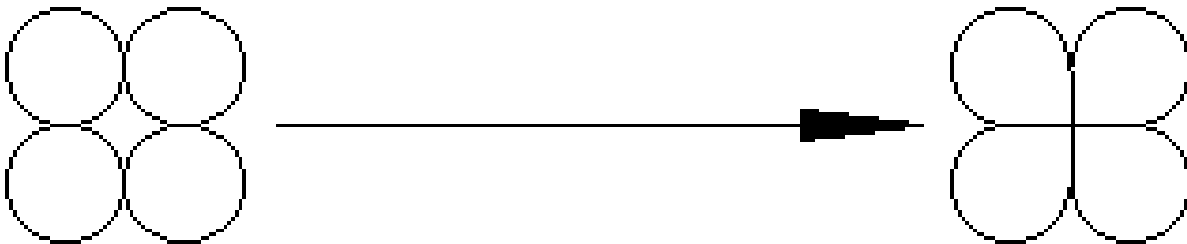
**TUBE and COLLECTOR SIZES.** The **header builder** can select almost any tube and collector size he wants — for whatever purpose. The racer can pick the sizes that will give him the most power at high rpms or to accelerate the hardest off of a corner. The street user can pick the sizes that will produce the greatest overall power gains over the entire rpm range of use or to further maximize bottom end and mid-range performance (optimizing overall drivability, towing usage, gas mileage, etc.).

**TUBE and COLLECTOR LENGTHS.** The **header builder** can select almost any tube and collector length he wants — to maximize performance in whatever part of his engine's rpm range he so desires. By building longer headers (tube lengths at least 34") he can improve bottom and mid-range performance or by building shorter headers (tube lengths between 28-32") he can emphasize top end power. In competition, with the collectors open, the **header builder** can pick the collector lengths that will maximize engine performance. (Even better, the **header builder** can setup his headers to allow EXPERIMENTATION with different collector extension lengths AND diameters to FURTHER improve performance.)

**TRUE EQUAL LENGTH DESIGN.** The **header builder** can actually control the overall accuracy of the tube lengths in his headers. If he wants the tube lengths to be exact, he spends the time to make them so. If absolute perfection is not important but performance still is, he can compromise a little on tube length accuracies yet still end up with an overall design much better than what he might buy. (We have helped thousands of fellows build headers over the years and many have told us they have been able to build, with minimal difficulty, headers with all tube lengths held to under a 4" range — from longest to shortest tube. While not a perfect header in tube length, one must also consider that over the years we have measured hundreds of sets of manufactured headers and have found very few that have tube length range errors that are under 4". In fact, tube length errors of 8-12" (or more!!) seem to be normal(?) in headers manufactured at this time so the **header builder** who builds a header with 4" or less in tube length error is, by comparison, actually building a very good header — one MUCH BETTER than most headers being manufactured today.

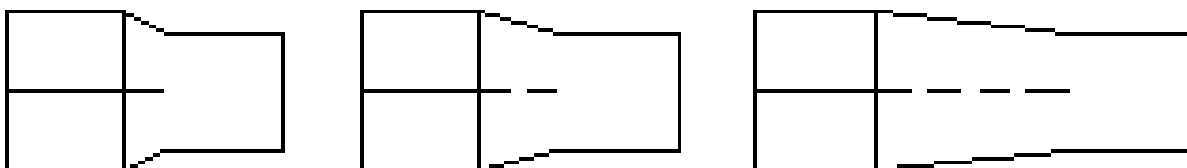
**EFFICIENT COLLECTOR SHAPING.** The **header builder** can further optimize the performance characteristics of the headers he builds by selecting a collector "design" that is shaped efficiently to maximize flow from the individual header tubes through the tapered collector transition and then to the outlet.

There are three ways to maximize flow through a collector: **One**, by selecting a collector whose inlet shape very accurately matches the outer shape of the header tubes that enter it (i.e., the collector must have very deep external creases), all exhaust gas expansion is controlled/minimized. **Two**, by reshaping the header tubes — where they enter the collector — in the center by heating that area red-hot and forming the tubes into a cross pattern (+), the gas expansion and attendant excessive turbulence that occurs where the gases try to fill in the center area is essentially eliminated.



Heat center area **RED HOT**, then reshape into cross pattern.

**Three**, by selecting a collector whose taper length is at least 4" or, even better, 5" long as opposed to designs that have taper lengths of 2 1/2" or shorter, the restrictive nature of the shorter taper is completely eliminated. (For what it's worth, the collector taper lengths - as short as 1" - to BE AVOIDED are typically found in block-hugger headers and shorty headers - types of headers that a lot of people are actually buying. Isn't this a good example of MANY PEOPLE DOING SOMETHING WRONG?)



**AVOID**  
(most restrictive)

**INEFFICIENT**  
(less restrictive)

**EFFICIENT**  
(minimally restrictive - maximum flow)

**Efficient Port Matching.** The **header builder** can pick from whatever header flange designs he can find — port shapes and sizes, even different material thickness. If he has ported his heads or has aftermarket heads with different port shapes, sizes, and/or locations, he can grind the header flange ports to match. The **header builder** does NOT have to deal with headers whose ports are too small in some way, overlap the exhaust ports, and reduce exhaust flow!

## MINIMIZE DIFFICULTIES

Besides maximizing his vehicle's performance, the **header builder** can also minimize or even prevent entirely a number of difficulties or problems that people often suffer through with manufactured headers.

To name a few:

- (1) Tuning problems;
- (2) Lack of performance gain;
- (3) Poor header fit;
- (4) Exhaust leaks;
- (5) Spark plug accessibility issues;
- (6) Melting spark plug wires;
- (7) Ground clearance issues.

While NEVER mentioned in magazines, unequal length headers often create tuning problems due to their negative affect on air/fuel mixture distribution in the intake manifold. These problems often show up initially as part of a great disappointment with how the vehicle is performing and, later on, the realization that all of the attempts to retune the engine to make it perform better did not seem to work. The **header builder** avoids these problems by making the header tubes accurate in length.

Few people who buy manufactured headers ever get the full performance potential of their vehicle realized because the design of their headers never fully match the requirements of their engine as well as the intended usage of their vehicle. Some people who buy headers get no gain at all and some even lose performance because their headers represent such a design mismatch that they can't beat the factory exhaust manifold! Unless he gets bad design advice, the **header builder** entirely avoids the possibility of having minimal or no performance gains from the headers he created.

While one can buy a header that will run through a starter, a frame, clutch linkage, etc., the **header builder** cannot build a header that badly as it is physically impossible for him to do so.

Because he can select the header flanges he wants (which includes their thickness), the **header builder** seldom experiences header leaks. If he does, this is more due to a craftsmanship problem than a design problem. But if he takes the time to grind the header flanges correctly (no weld beads left protruding above the flange surface causing the flange to bend) his headers won't leak.

In the past, we've seen too many headers that offered such poor spark plug accessibility that we've wondered if the "designer" ever put the spark plugs in the head when he was figuring out the headers! But more recently we have seen entirely new spark plug accessibility problems come about because of design differences in aftermarket cylinder heads where the spark plugs are installed at different angles and/or locations. In some cases, the changes are so radical that there are NO headers that will work on these heads. The **header builder** shouldn't have any of these accessibility issues as long as he has spark plugs in the heads during the construction process. He shouldn't have any spark plug wire melting issues either (if he keeps that in mind as he builds his headers).

It is a fact of life that some headers hang too low under a car. Oftentimes this is due to designer error, but sometimes this is due to chassis problems that dictate that type of a design. The header builder can often reduce or prevent these problems from occurring by simply paying attention to them while he is building the headers.

## BETTER CONSTRUCTION METHODS

One way that one can construct a header BETTER than a manufactured header is to externally braze the header tubes where they enter the header flange. Brass has a much higher thermal conductivity than steel so brazing causes the header tubes to be cooler nearer header flange which leads to longer header life. A side benefit is that the added brazing also makes the header noticeably quieter.

Another way that one can construct a header BETTER than a manufactured header is to use tube flanges wherever the header has to come apart to ease installation or go around some chassis part. Header manufacturers usually use slip-type connections when they design a header that must come apart because it is a cheap way of doing so plus assembly line construction difficulty is minimized. Unfortunately, slip-type connections often leak and then eventually rust together so the headers can become impossible to remove from the vehicle at a later date without destroying them. In contrast, the **header builder** can build his headers with tube flanges (and gaskets), enjoy a leak-free design and still take his headers apart years later!

## MAXIMIZE SATISFACTION

While definitely a challenge, building one's own headers can represent quite an accomplishment — leading to considerable satisfaction (as well as performance gained).

## MINIMIZE RISK

While many seem to feel that it is beyond their ability to build a GOOD header, the facts don't back up that opinion. Right now some of the worst headers we've ever seen (too short, not equal length, collectors with extremely short tapers that are also poorly shaped, poor port match, etc.) are being sold. *Building a much better header often means simply **NOT repeating these same mistakes!***

Another factor to consider is that we've been helping others build headers for almost forty years and, because of that, we feel that we are uniquely qualified to help others build better headers. (Look at our [HEADER QUESTIONNAIRE](#) to see how we can help you through our HEADER DESIGN ADVICE SERVICE!)

While there are a few companies that sell header parts, they usually sell whatever they use in their own headers. We are very much different than that as we offer many parts that we don't even use but we know are needed. For example, we offer header flanges, for over 100 engines and cylinder heads with ALL flanges available with different port sizes and three different thickness. Many header flanges for more popular engines are even made available with different port shapes as well. We offer two styles of collectors—one style made by machine that is cheaper and another style that is made by hand but in over 200 varieties. We carry up to 12,000 mandrel bends IN STOCK from 1" OD through 4" OD for all types of header and exhaust system construction — so nobody is limited by not having the right bends to use. We also offer straight tubing, tube and collector flanges to match almost all of the tube sizes we carry, Oxygen sensors, bulk gasket material, etc.— one of the most complete selection of header parts around. PLUS—the BEST advice to minimize risk!

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