

By Bill Senefsky

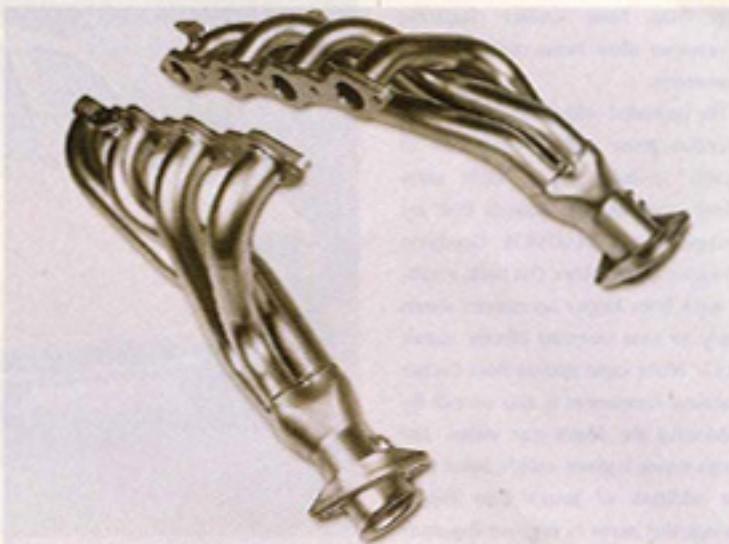
Heads Up on Headers

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The First Step Toward High Performance?

Since the early '60s, exhaust headers have been offered by the automotive aftermarket as one of the first basic and logical steps for improved engine performance. After all, the reduction of exhaust backpressure offers impressive performance gains for your engine. Although the function of headers is fairly straightforward, the technology includes a lot of physics. Simply put, aftermarket headers are part of an energy flow path, which also includes the intake system, exhaust ports, catalytic converter, after-cat exhaust pipe(s), and tailpipe(s). Some performance enthusiasts even consider the camshaft as part of the equation. Each component throughout this flow path contributes to the exhaust system's overall effect on vehicle performance.

While all exhaust system components are essential to performance, header upgrades are often the first step taken. Automakers have taken note in recent years; increased mileage and emission requirements have forced serious changes in established exhaust management systems. Although cast-iron manifolds were always easier and cheaper to man-



facture, peak engine performance is now a prime consideration. Add heat, weight, and packaging issues to the equation, and you quickly understand header popularity, even at the OEM level.

CLEAN AIR AND THE LAW

Emission control laws also forced changes in traditional thinking with regard to header usage and installation. Decades ago, environmental issues with regard to improved performance upgrades were rarely considered. Technology has advanced to the point that the end user can have both — improved performance and clean air. Emission controls are now designed as part of original factory equipment. The government has also approved through CARB a wide variety of aftermarket components to improve today's SUV platforms.

HEADER MANUFACTURE

Headers have been constructed with the same basic parts for years. Before purchasing a set of aftermarket headers, buyers should be aware of their component parts.

From the engine-mounting end, the flange is the flat plate that bolts to the engine's exhaust ports. Flanges are

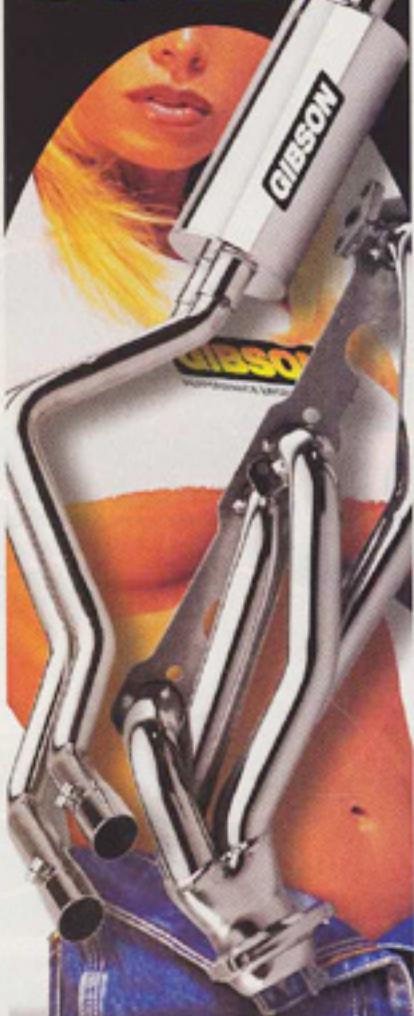
usually constructed from steel plate with a thickness range of 1/4- to 3/8-inch. The thicker the flange the better the quality. Thicker flanges eliminate warping and can end exhaust leakage problems. This plate is also considered to be part of the exhaust port of the cylinder head, so the inside of the plate opening should be machine-matched to your exhaust ports.

The primary tubes are next, which are welded to both the flanges at the engine and the collector at the outlet. They are designed to clear the variety of engine accessories, and are usually installed from underneath the vehicle. The gauge, or wall thickness, of header tubing generally varies from 14- to 16-gauge material. Stainless steel has also become more popular, as have header coatings in recent years. Keep in mind that thicker-gauge material always tends to emit less noise and has greater longevity. By design, header primary tubes serve another critical function: determining the peak power curve of your engine.

In the aftermarket, where there is a large variety of both manufacturers and performance claims, consumers should note the design, construction, and availability of the different brands



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for your particular application. Performance pros believe that an equal-length primary design guarantees cylinder efficiency. It's important to note, however, that equal length is not the goal, but rather equal flow through each primary tube. Equal length does not necessarily guarantee equal flow. The tube angles should be inspected at the flange as they leave the side of the head; any sharp bends equal restriction. Longer tubes with smooth bends always equal improved exhaust flow.

Generally, the buyer has a choice of either a larger or smaller-diameter primary tube design. Diameter can greatly affect your engine's rpm and the point peak torque; the smaller the diameter, the lower the torque.

Primary tube length is the second consideration because it is used to further improve the engine's torque curve to suit your particular application. Performance pros will tell you that longer primaries equal increased low-end torque, while shorter versions raise the power band to higher rpm.

Header collectors provide the end chamber for the primary tubes, capturing exhaust from each separate cylinder bank. These collectors are also tunable with regard to length and diameter and also affect the amount of torque produced. The larger the collector, the greater the low-end torque.

CONFIGURATION

By far, the most popular header configuration is the four-into-one equal-length, or equal-flow, design. This style allows the four primaries exiting the cylinder heads to be routed equally and dumped into a common collector. With today's powerplants, a four-cylinder would consist of only a one-bank design, with an inline-six adding two cylin-

ders, and a V-6, a three-into-one configuration on each side. The advantage of this design is the development of both a midrange torque curve and measured horsepower improvement.

Another header configuration is the Tri-Y design. Its claim to fame has been its ability to boost engine torque in the low- and mid-rpm ranges. This header differs in that its primaries are grouped into two collectors, combined with two secondary tubes, running from these into a single collector. The result is a product with a four-into two-into one setup. The primary tubes are constructed so that the exhaust pulses are routed into each collector and thus are routed as evenly as possible.

The advantage of this design feature is that the exhaust pulses from each cylinder will create a vacuum behind them and scavenge or siphon the charge from the system. Tri-Y headers are also used in cramped engine quarters.

Shorty headers are the most compact design, and are used in those instances where you want to take up minimal space inside the engine compartment and allow for the greatest ground clearance.

INSTALLATION

When in the market for a set of headers, a good starting point is to consult with others who own your particular brand of SUV. Speed shops, automotive retailers, and muffler installers should not be ignored. Since

they often specialize



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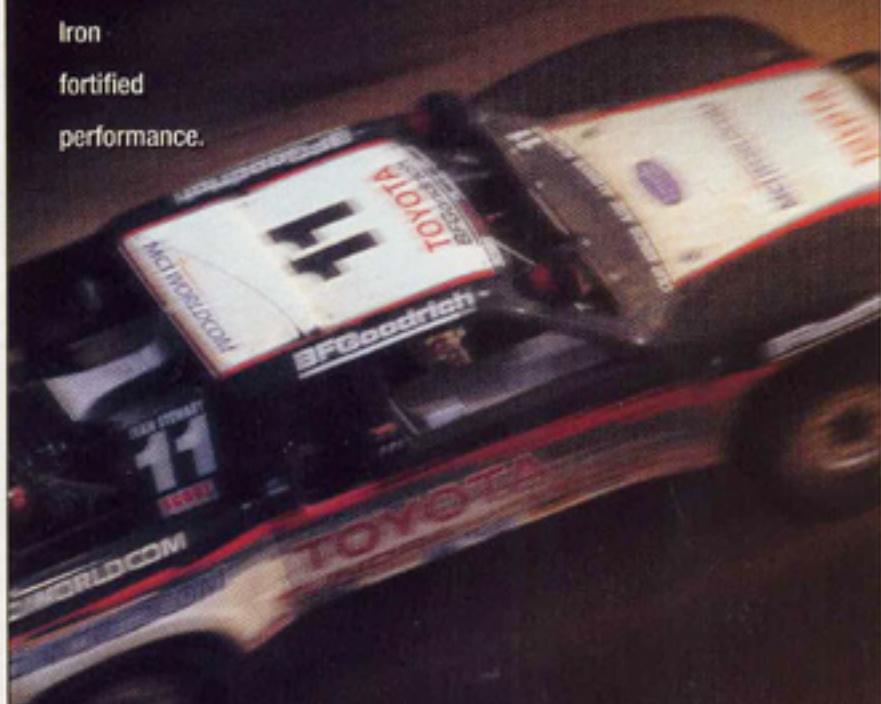
in this realm through a variety of applications and years of experience, they can certainly provide additional input to help make a final decision. Emission controls and laws also enter the picture. Find out if headers need to be 50-state legal in your state. Do your homework: research, interview, ask questions, and interview end users.

Quality, fit, and longevity are your primary concerns with street applications. When you've decided to purchase headers, from whatever source, pull the product from its carton and inspect it closely. If you discover open or damaged shipping boxes, product dents, abrasions, rust, or poor weld quality, ask to inspect another set. Regardless of whether you do the install or not, check the welds for possible leaks. Inspect the product by lighting a welding torch and passing it behind the backside of the weld, observing from the front. If you see flame, don't panic. The header can be brazed to fill the affected areas.

With regard to flange areas, their backsides need to be closely inspected for nicks, cracks, uneven surfaces, and flatness around the port openings. They may need to be filled and trued. When doing the install, you can use the old trick of securing the gaskets to the headers with common sewing thread through the end holes on the flange area. This material is strong enough to hold them in place during the process but will burn away quickly with heat and will not create

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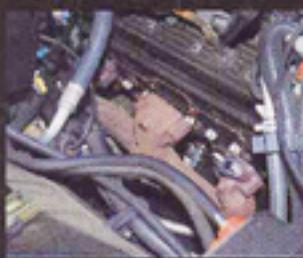
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The Inside Look

To illustrate how a set of headers is installed, we offer this quick look at the replacement process on a 2000 Cadillac Escalade. In this case, a set of Gibson shorty headers was installed in place of the stock units.



The aftermarket Gibson headers (bottom) are shown compared to the stock unit (top).



Removing the old nuts is simply a matter of unbolting the spark plug wire looms, removing the EGR base, and unbolt the nuts from the stock piece.



A thin coating of high-temp sealant is applied to both sides of the gasket in preparation of bolting on the new header.



The first step of the installation process is to bolt the new header into place.



Final steps involve putting the wire looms and EGR base back into place and torquing down the header bolts.

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future exhaust leaks. A wide range of header bolts with smaller head diameters are available to help if you encounter wrench accessibility problems. If nothing else, you can modify an older wrench on the grinder to gain access.

If the header bolts are secure, but you still encounter exhaust leakage, choose either a thicker header gasket or a high-temp silicone combination. Most leakage is the result of uneven metal surfaces, and these areas may have to be refinished. When doing the assembly, if you have to unbolt headers for any reason, never do it when they are hot. Aside from the safety issue, the mounting flanges will warp and create leakage.

As you might expect, several main-line companies offer the bits and pieces necessary to fabricate a spe-

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cial configuration. Remember, however, that engine basics remain, and the system approach has and always will be the correct path. What goes in has to come out, so replacing only one area of your total power system will probably leave you wanting more. If total performance and efficiency is what you are after, then expect to spend the time and the money for the complete project. Headers, combined with a complete exhaust system, will deliver noted improvement. Larger performance gains require internal engine work.

FINAL TOUCHES

With custom installation, appearance does matter. New, highly finished exhaust headers draw attention to any engine compartment, but the trick is to keep them looking new,

and that literally is the rub.

Anything that surrounds high temperature equals component disaster without proper care, and for this reason a variety of special coatings have been developed to withstand the high temperatures surrounding daily header usage. Today's special materials can easily outlast the designed life of your SUV. In fact, more than a few owners have saved money with the purchase of used equipment. Several companies have made a good living in recent years coating new and used headers for durability and appearance. Several offer pick-up and delivery, as well as mail order service. The cost is usually several hundred dollars, so it's wise to shop for both the coating material and the desired application method. •

At A Glance Performance Goals

Sharp Bends = Restriction

Smooth Bends = Improved flow

**Larger-Diameter Primary Tubes =
More torque**

**Smaller-Diameter Primary Tubes =
Higher rpm powerband**

**Longer Primary Tubes =
More low-end torque**

**Shorter Primary Tubes =
Higher rpm powerband**

**Larger Collector =
Increased low-end torque**

**Smaller Collector =
Higher rpm power band**

HANDLING THE ROAD

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