In-Depth Look at Chevrolet Performance's LSX Cylinder Heads

by **Chris Demorro** on August 27, 2012

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The LS family of engines have always been known for their well-designed cylinder heads, and when you start with something that's already good it's easy to make it even better. Chevrolet Performancehas done just that, by taking their expertise and using it to expand their line of LSX cylinder heads to include something for everyone from the full-time racer to the budget LSX builder. We had a chance to talk with the man himself, Mr. Rocko Parker, GM's lead cylinder head designer at Chevrolet Performance Parts to find everything you need to know about their latest LSX aluminum cylinder heads for racing and street applications.

Many From Few

"All of our new LSx heads come from one of four different castings," Rocko says. "One casting we use for both the LSX-DR drag racing heads, and the LSX-CT circle track racing heads. We actually based this design on the C5R heads, but with some important differences." One of the biggest changes was raising the ports 10 mm from the original C5R casting. This small change actually improves air flow, but also makes the heads a bit taller. These heads have a 6-bolt attachment, and Chevrolet Performance sells both a CNC version for those who want to bolt on a new head, and a non-CNC version "…for the pros who want to make their own port configuration."

All of the new Chevrolet Performance LSX heads come from one of four different castings. -Rocko Parker

The second casting design is simply a copy of the LS7 cylinder head, but with a 6-bolt attachment. "Chevrolet Performance actually has four separate part numbers for this type of head," says Rocko. "A bare head without CNC ports, a bare head with a CNC program for ports, a fully assembled head with LS7 valves and unique springs for the higher cam lift of the LSx 454 engine with non CNC ports, and a fully assembled LS7 cylinder head *with* CNC ports."

Get all of that? Good, because there are still two other castings that Chevrolet Performance bases their aftermarket cylinder heads on. There's a casting based on a version of the LS3 head with 6-bolt per cylinder attachment, and Chevrolet Performance sells two particular versions of this casting. "They are both cast ports and combustion chambers," says Rocko. "But one uses the valves and springs of the LS3, and the other uses the lighter valves of the LS9."

Finally, there is a second casting, also based on the LS3 cylinder head, but with a smaller combustion chamber and smaller LS1 valves. This head is "designed to have the intake configuration of a LS3 head, but fit the smaller bore blocks of the LS1 and LS6 engines."

Hardest of the Hardcore: LSx-DR – Part Number **19166979**

Huge CNC'd intake ports, huge valves, and huge power potential all define the LSX-DR heads.

CNC LSX-DR 4.155"	Lift Intake
66.5	.100"
155.9	.200"
232.7	.300"
302.3	.400"
358.1	.500"
400.3	.600"
426.5	.700"
435.9	.800"
	.900"
	Exhaust
56.4	.100"
111.3	.200"
155.6	.300"
196.9	.400"
220.5	.500"
235.9	.600"
245.8	.700"
252.1	.800"
	.900"

LSX-DR Specs:

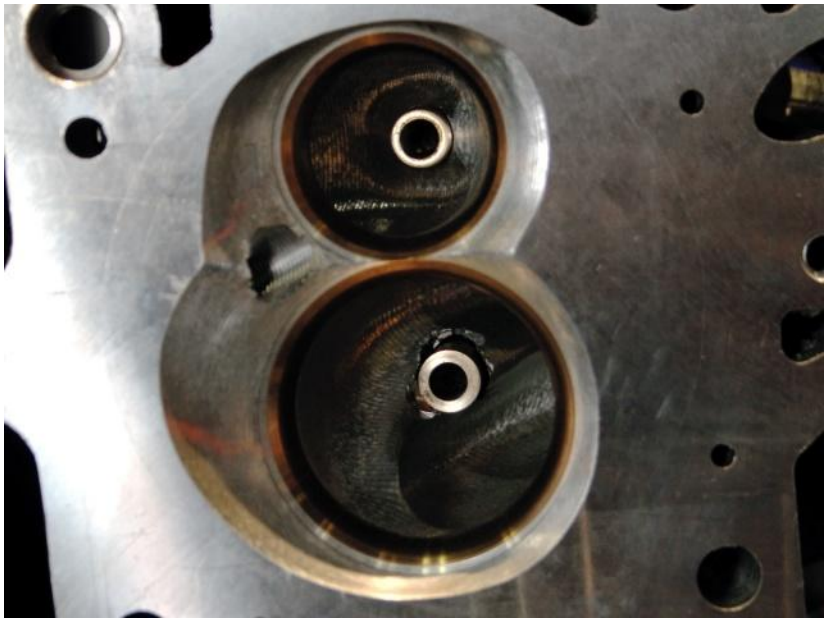
- 356-T6 aluminum racing head
- 11 degree valve angle (same as C5R head)
- Accommodates up to 1.660″ diameter valve springs
- Raised rocker rails
- 9 degree intake manifold angle – requires new LSX DR or LSX CT intake manifolds
- Unique LSX-CT/DR exhaust bolt pattern
- 5/8″ thick deck

- Cast-in down-nozzle bosses (not machined)
- Designed for 2.280″ intake and 1.620″ exhaust valves (4.165″ minimum bore)
- Fully CNC-ported
- 313cc CNC’d intake ports
- 116cc CNC’d exhaust ports
- 50cc CNC’d combustion chambers
- Minimum 4.125″ bore
- Uses shaft-mount rockers (P/N 19201808)

With companies like Trick Flow, All-Pro, and RHS making serious racing cylinder heads for LSx engines, it was time for Chevrolet Performance to add their own racing heads to their aftermarket cylinder head offerings. New to the lineup is the LSx-DR, or “drag racing” head. This cylinder head is potentially the most potent in Chevy’s arsenal, evolving from the first casting we covered which was designed before Rocko joined GM, during the heyday of the Corvette C5R’s racing.

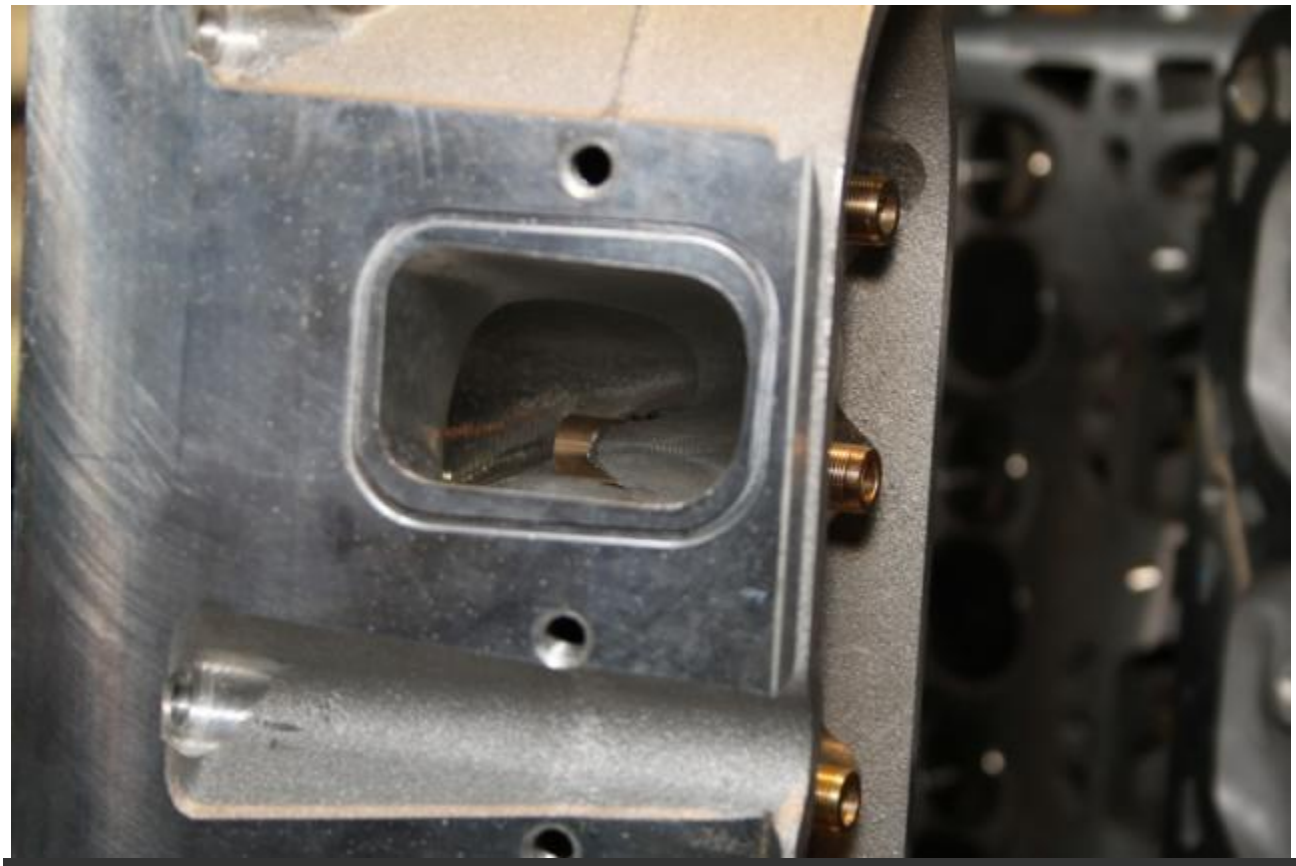

The LSX-DR heads are designed to be used with shaft mounted rockers.

“The LSx-DR head is based on the C5R head, which was designed around a class that dictated engine displacement, so the C5R heads were maximized for a particular engine configuration,” says Rock. “The LSx-DR head is more of an open class head, and with the introduction of the LSx block, larger bores can be produced.” Larger bores mean more displacement which means the need for more air and fuel. To that end, the LSx-DR heads come with fully CNC’d intake and exhaust ports. The intake ports are 313cc and flow up to 435 cfm at 0.800”, while the 116cc exhaust ports flow 250 cfm at 0.800”. Compare that to the circle track cylinder heads that come from the same C5.R casting, which flow *just*400 cfm at .800” intake and a similar 255 cfm at .800” on the exhaust side.



The LSx-DR heads are designed for serious drag racing applications, thus the huge valves and raised intake runners. Also, the LSx-DR's small 50cc combustion chamber is optimized for naturally-aspirated or nitrous combinations and allows a high compression ratio without the need for a domed piston.

"The combustion chamber is 50 cc's, so high compression can be created with a flat top piston," says Rocko. This is a smaller combustion chamber that results in a higher compression and a more complete burn, making these heads ideal for a naturally aspirated setup. "These heads are designed for a shaft-mounted rocker system, which we sell a version for them which has roller tips and a roller fulcrum." These drag racing heads can hold huge valves, up to 2.28" intake valves and 1.62" exhaust valves. The valve angle is 11 degrees, and is machined for 1.660″ valve springs. A single LSx-DR cylinder head carries a market price of around $1,700.



The 313 cc ports for the LSx-DR cylinder heads promote maximum air flow of up to 435 cfm

With the raised intake ports, these heads require either the LSx-CT (circle track) or LSx-DR intake manifolds, but are capable of producing 900 horsepower naturally aspirated. Yes, you read that right, 900 horsepower, naturally aspirated. In other words folks, these are serious heads. However, because of emissions regulations and the small combustion chamber, these cylinder heads are best suited to off-road, naturally aspirated or nitrous applications.

For Your Forced Induction Needs: LSx-LS7 – Part Number 19201806

While the production LS7 engine is known for being GM's top naturally-aspirated powerplant, the LSx-LS7 head has some detail changes to make it a great choice for boost or nitrous.

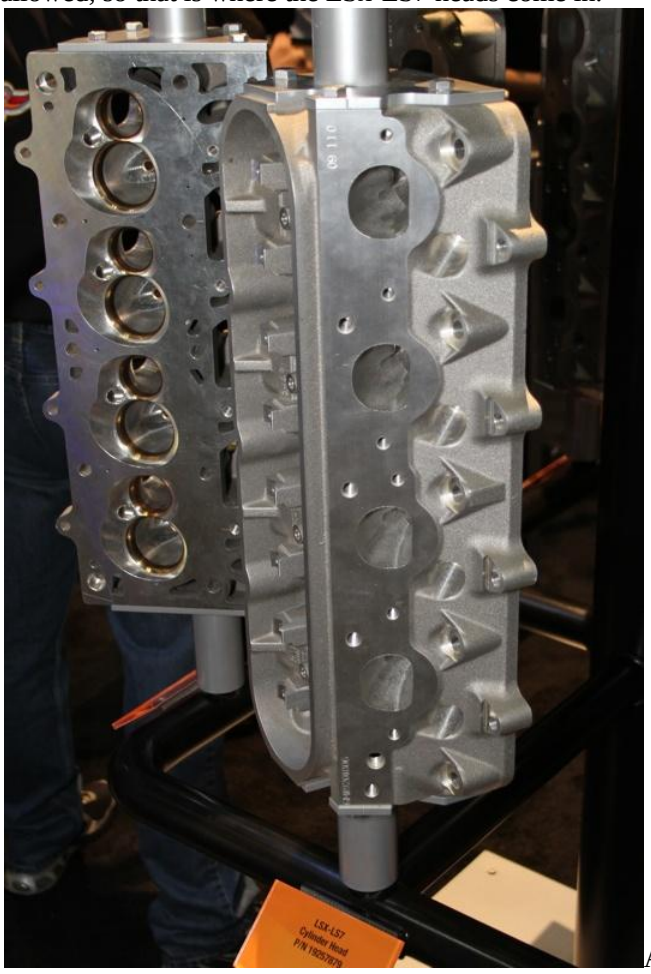
CNC LSX-LS7 4.185"	Lift
Intake	
84.4	.100"
142.4	.200"
234.5	.300"
290.0	.400"
350.0	.500"
371.3	.600"
366.8	.700"
370.6	.800"
	.900"
Exhaust	
69.4	.100"
109.3	.200"
165.0	.300"
199.0	.400"
238.7	.500"
252.2	.600"
263.5	.700"
268.1	.800"
	.900"

LSX-LS7 Specs:

- 6-bolt per cylinder bolt pattern
- LS7 style rectangle port design
- Assembled with 2.200″ titanium intake and 1.610″ sodium-filled exhaust valves
- 12 degree valve angle
- Minimum 4.100″ bore

- 270cc “as-cast” intake ports, 85cc “as-cast” exhaust ports
- 70cc “as-cast” combustion chambers
- Handles .650″ lift with premium springs
- Uses LS7 rocker arms/LS7 bolts
- Available fully CNC’d

The LSx-DR heads are great for all-motor drag racing, but applying any kind of forced induction can totally change the dynamics of your engine. Chevrolet Performance is well aware that many racers compete in classes where forced induction isn’t allowed, so that is where the LSx-LS7 heads come in.



As the name might suggest, the LSx-LS7 heads are based off of the production LS7 heads found on the Corvette Z06. “There are some changes [to the LSx-LS7 head] for high boost or nitrous oxide, which production heads do not have to deal with,” Rocko says. The LSx-LS7 heads have evolved quite a bit from the grandfather of the LS-series of engines, the LS1.

“They differ in several ways,” says Rocko. “They have the rectangular ports (same as the production LS7 but non-CNC), titanium intake valves, hollow/sodium PAC high-lift springs and a little thicker deck surface for improved head gasket seal.”

The LSx-LS7 cylinder heads were the first of this new aftermarket breed to come out, and with good reason. These cylinder heads were part of the no-holds barred LSx-454 crate engine project, which was sort of Chevrolet’s gift to its performance engineers to build the biggest, meanest all-aftermarket parts small block/big displacement motor in the Chevrolet Performance catalog.

Probably the biggest difference though is the aforementioned deck thickness. On the production LS7 cylinder head, the deck thickness is merely 0.400”, whereas the LSx-LS7 cylinder heads, are 0.625” thick. This thicker deck height is shared between between all of Chevrolet’s LSx aftermarket cylinder heads. The LSx-LS7 heads also come with a 6 bolt attachment, versus the 4-bolt attachment of the production LS7 head. “Although smaller, the placement of the six bolts produces 30 percent more clamping force to reduce head gasket blowouts when adding boost,” says Rocko. “To take full advantage of the 6 bolts per cylinder head setup requires the use of the LSX block.” You didn’t think they just added two extra bolts for no reason, did you?

Combined with the thicker deck, you've got a cylinder head that is much better at standing up to high boost applications than the standard production version. As mentioned earlier, Chevrolet Performance offers both a CNC-machined and as-cast LS7 style heads, and the differences between the flow numbers are rather telling. The max flow rate for an as-cast LS7 cylinder head comes at .550" of lift, where max air flow tops out at 327 cfm. Which is damn good for a box-stock cylinder head. But once it's received that crucial CNC machine work, the flow jumps to 397 cfm at .700". Exhaust flow also jumps from .204" at .700" to 234 cfm at .700" lift, getting those nasty exhaust gases out of the cylinder head faster than the production heads.
Bigger intake and exhaust valves (2.20 intake and 1.61 exhaust, vs. the 2.165 intake and 1.59 exhaust of your standard LS3) also help out with the better flow numbers, making the LSx-LS7 heads ideal for many forced induction applications. The valve angle on these heads is 12 degrees, and can accommodate valve springs up to 1.55″ in base diameter, though they can be machined to accept larger springs. The going rate for an assembled head is about $1,300 each.

The L92-style cylinder heads arguably offer the best "bang for your buck" in terms of horsepower gains and cost

L92	Lift
	Intake
79.2	.100"
153	.200"
225	.300"
276	.400"
309.6	.500"
332.2	.600"
330	.700"
317	.800"
	.900"
	Exhaust
57.8	.100"
114.4	.200"
147.2	.300"
170.3	.400"
183.1	.500"
189.5	.600"
192.6	.700"
195.8	.800"
	.900"

L92 Specs:

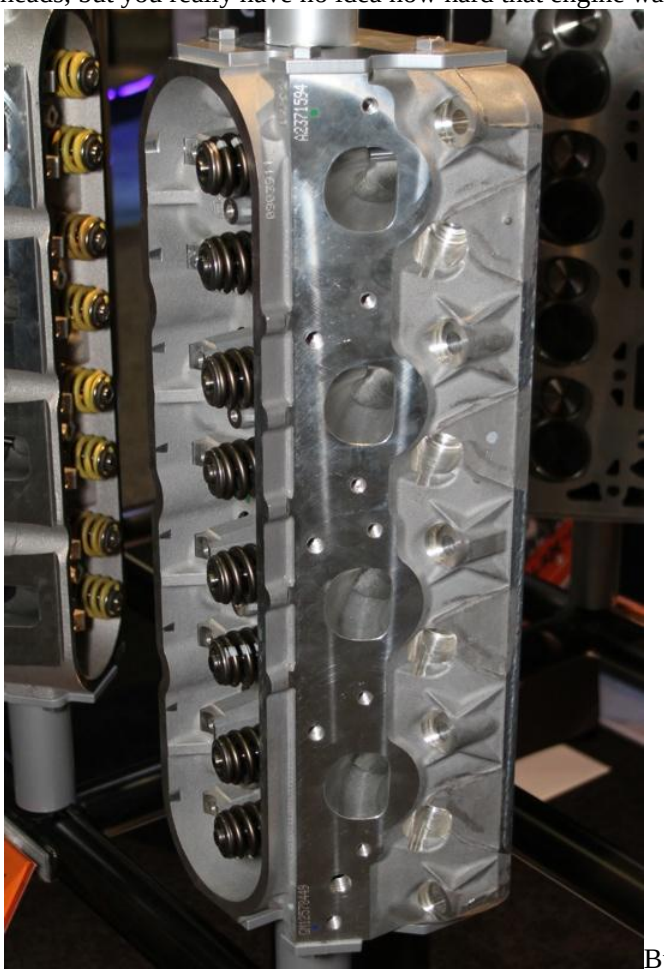
- 2.165″ solid stem intake valves
- 1.59″ solid stem exhaust valves
- .510″ max valve lift with stock springs
- 15 degree valve angle
- As-cast L92 style intake ports
- D-shaped exhaust ports
- As-cast combustion chambers
- Requires 4.00″ bore or larger
- Requires LS3/L76/L92 style intake manifold

So we've covered the drag racing-inspired LSx-DR heads, and the tremendously important and powerful LSx-LS7 heads, which form the cornerstone of the LSx-454 crate engine. But how about something for those budget engine builders? You know, the shade-tree mechanics who don't have deep pockets but do have a lot of creativity and flexibility when it comes to engine builds. Well Chevrolet has something just for them, in the form of the L92 truck heads.

The L92 heads are actually the same casting as the LS3 head. The LS3 heads just have a hollow stem valve intake and stronger valve springs that allow for more lift.

Now hold on a second. Truck heads? On a performance engine? That doesn't rightly add up, does it? But turns out these heads have performance roots. As we've already covered, Chevrolet uses one of four different castings for its LSx cylinder heads.

“The L92 heads are actually the same casting as the LS3 head. The LS3 heads just have a hollow stem valve intake and stronger valve springs that allow for more lift. Other than that, the L92 and LS3 heads are pretty much the same” says Rocko Parker. These relatively small differences result in a huge price difference, making the inexpensive L92 type cylinder head very popular with budget engine builders. Sure, you could always dig through a junkyard for a wrecked LS3 engine just for the cylinder heads, but you really have no idea how hard that engine was run or if the heads are even any good.



But the L76/L92 castings offer a remarkable value for the flow numbers and horsepower potential locked within this budget casting. You could easily save over $1,000 by opting for a pair of assembled, ported L92 heads over the LSx-LS7 head, as the going rate of a single L92 head is just over $900 . And while the LS7 head certainly has its advantages (namely being able to run a bigger camshaft) the money saved on L92 heads can go towards a number of other upgrades or options.

“We assumed these heads would take off once you see the flow values and costs.” With massive rectangular intake ports measuring 250 cc, and 85 cc exhaust ports, these heads can flow 320 cfm of air right out of the box at .700 lift. That’s not too far behind the LS7 heads, but for a whole lot less money. The L92 heads have a 15 degree valve angle, and can fit valve springs with an up to 1.29″ base diameter. These L92 heads are superior to stock LS1 and LS6 heads right out of the box, though not quite as race-ready as the LSx-Dr or LS7 heads. For many budget engine builders out there, these are the go-to cylinder head choices. If you’re looking to make the most power and money is no object though, perhaps the LSx-DR or LS7 heads are a better option. After all, that’s what they were built for.

Something for Everyone: Small-Bore LS3 – Part Number 19201807

LSX	Lift
Small bore	
4.000"	Intake
67.4	.100"
144.2	.200"
183.8	.300"
223.9	.400"
258.2	.500"
280.8	.600"
269.5	.700"
	.800"
	.900"
	Exhaust
51.4	.100"
95	.200"
119.7	.300"
139.6	.400"
156.4	.500"
169.6	.600"
179.4	.700"
	.800"
	.900"

Small-Bore LS3 Specs:

- L92 style rectangle port design
- 2.00-inch intake valves; 1.555-inch exhaust valves
- 15 degree valve angle
- Constructed of 356-T6 aluminum
- 5/8-inch-thick deck
- 250cc intake ports and 80cc exhaust ports
- 280-cfm at 0.600-in. lift, intake; 180-cfm at 0.700-in. lift, exhaust
- Beehive-type valve springs
- Requires L92/LS3-type rocker arms
- Requires L92/LS3-type intake manifold
- Requires a minimum 3.890″ bore for valve clearance

The small bore LSx heads are designed for older LS-based engines (and those of us lacking a LSx engine block).

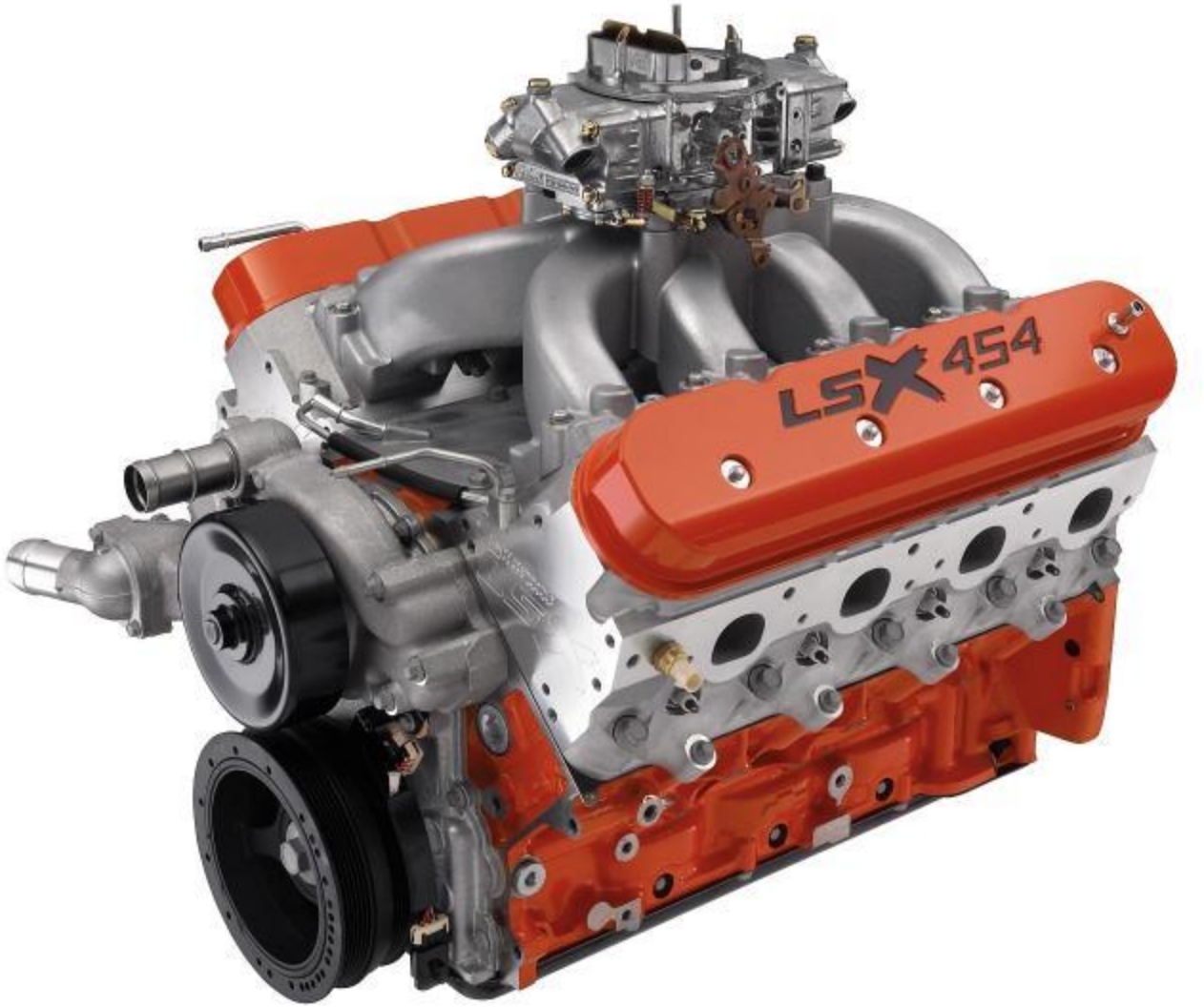
So maybe you've read this far, and you're like "That is all well and good, but I'm old school! I've got a LS1 engine and no LSX block, so all this six-bolt nonsense is no good for me." Fair enough, but GM has you covered as well with a small bore cylinder heads designed for LS1, LS3, and L92-based engines. These are for the guys who don't want to tear their whole engine down or buy a crate long block from Chevrolet Performance.

And even though they're "smaller" in every way, these cylinder heads still manage a max flow rate of 330 cfm at .787" at the intake and 259 cfm at .827" on the exhaust side. Like the L92 heads, the LSx-LS3 heads have a 15 degree valve angle, and accommodate valve springs with a base diameter of up to 1.55″. And on top of that, Chevrolet is developing a CNC-machined LS3 cylinder head for small bore, 4-bolt engines (not the LSx block). But don't expect too much more in the way of LSx cylinder heads to be coming out soon.

"To be honest, a lot of the engineers are working on the next-generation of engines, and that is all I can say about that," explains Rocko. Fair enough, though Rocko did share with us another project they are working on, the LSx-454R crate engine.

Brutal Legend: The LSx 454 – Part Number 19244611

In fact, lets take a second to chat about the LSx 454 engine block, which is the first 100% aftermarket crate engine offering from Chevy Performance. General Motors built an automotive empire out of the idea of sharing parts and platforms across multiple lines of vehicles. They even carried this over into their aftermarket performance parts offerings, with many parts built or bred for use on production cars. But Chevrolet broke away from this technical philosophy with the C5.R heads that came to underpin the LSx-DR heads mentioned above, both of which are race only and have no production car underpinnings.



The LSx-454: The Ultimate Crate Engine?

The LSx 454 engine is the whole shebang, with no parts carried over from production models and no limits to what can be done. From the cast iron block to the forged internals and aggressive camshaft, the LSx-454 crate engine can make over 600 horsepower on pump gas right out of the box. Add some boost or nitrous and you're easily talking about over 800 horsepower, and the LSx-LS7 heads are a huge part of that. Even with their huge 70 cc combustion chambers, this engine still manages to create an 11:1 combustion ratio. Not enough, you say? Perhaps you'd prefer the LSx 454R.

"This is a race-only version of the LSx-454, and its designed to make big power, only more so," Rocko says. It shares a lot in common with the standard LSx-454 engine; same block, same internals, much of the same long block. The biggest difference comes from a mechanical camshaft and the LSx-DR cylinder heads, rather than the LSx-LS7 cylinder heads. The smaller combustion chamber on the LSx-DR cylinder heads bump compression up to even crazier numbers, from 11:1 to 13:1."

"With the better flowing heads and more aggressive camshaft, we're talking about an engine in the 750 to 800 horsepower range," says Rocko. "We already sold the first of these engines at auction, and we're still working on getting the 454R certified." That means a lot of time on the engine dyno. The engine will make around 600 dyno passes where the motor runs its whole RPM range to ensure everything is up to snuff, and the power output is where they want it to be. Of course this extra horsepower will come at an extra price, and while the LSx-454 engine is a veritable bargain, expect the 454R to cost a substantial amount more (those LSx-DR cylinder heads aren't cheap.)

In Conclusion…

That just about wraps it up in a neat little bow. We're just about at the peak of LS-series engine performance, with a new line of performance V8 engines just around the corner from the General. Right now engine builders have more options than ever before when it comes to buying the right cylinder head for their purse and purpose. From the all-out power potential of the LSx-DR

heads to the value of the L92 castings to the amazing versatility of the LSx-LS7 design, there are plenty of Chevrolet Performance cylinder heads suited for your next project.