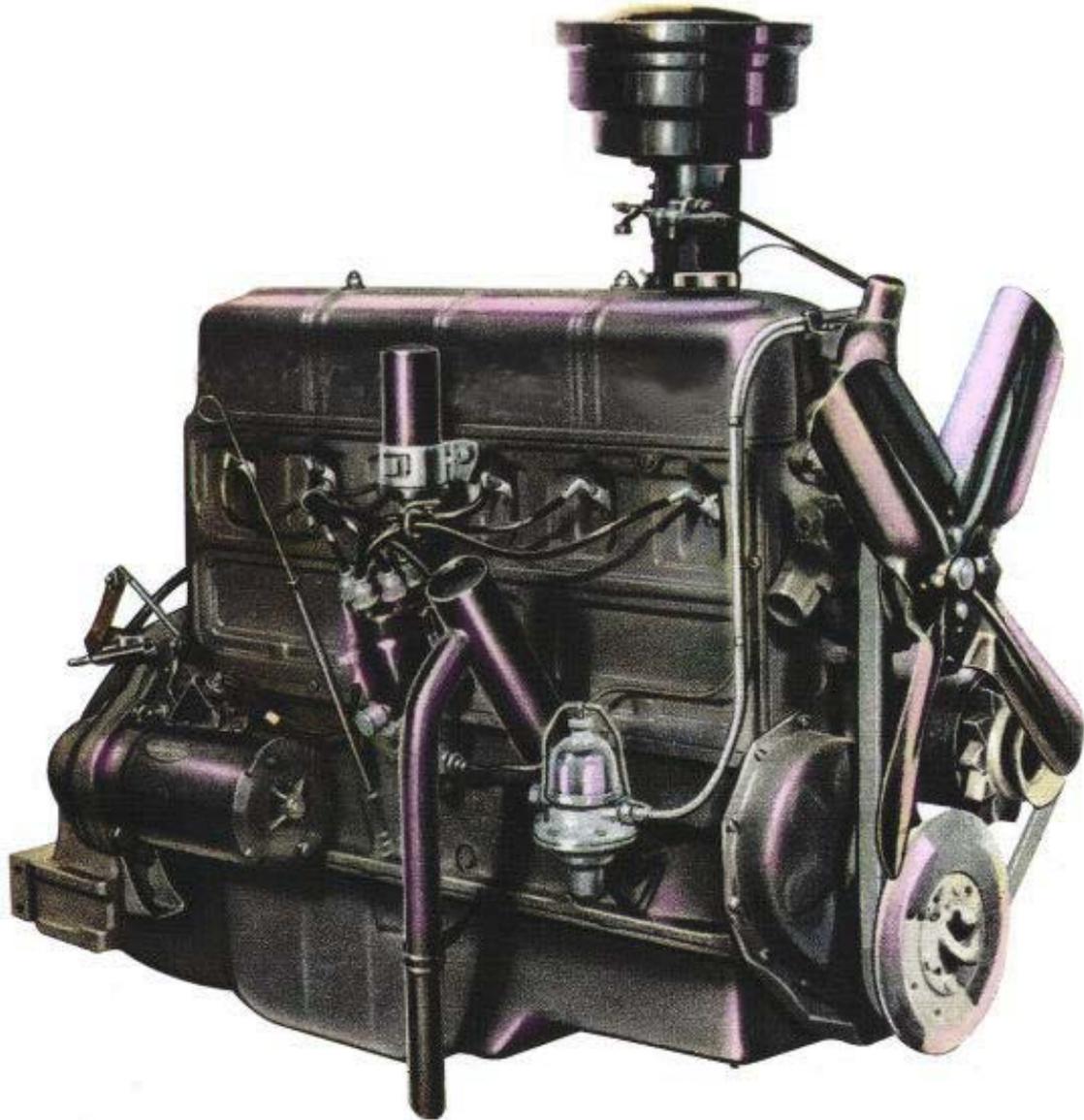


Here is some History on the 6 cylinder inline Chevy straight six engines. The Chevrolet inline 6 started with the stovebolt engine & developed to the high performance 292 Chevrolet 292 L6 engine



*First Generation*

Type inline-6  
Production 1929 - 1936  
Bore 3.3125 in (84.1 mm)  
Stroke 3.75 in (95.3 mm)  
Displacement 194 cu in (3.2 L)  
Power output 50 hp (37 kW)

The first mass-produced GM inline-6 was introduced in 1929 on Chevrolet cars and trucks, this engine replaced the inline-4. The straight six stovebolt engine was produced from 1929 to 1936.

It was 194 cubic inches (3.2 L) in size and produced 50 hp (37 kW). This engine used a forged steel crankshaft with three bearings and cast iron pistons. Bore and stroke was 3.3125 in (84.14 mm) by 3.75 in (95.25 mm). The 194 was shared with Chevrolet and GMC trucks for 1935 and 1936.

A balanced crankshaft was introduced for 1932, while a higher (5.2:1) compression ratio upped output to 60 hp (45 kW). A new cylinder head two years later pushed output to 80 hp (60 kW).

A 181-cubic-inch (3.0 L) version was used by Chevrolet and GMC trucks in 1935 and 1936.

A 207-cubic-inch (3.4 L) variant was used by Chevrolet and GMC trucks in 1934, 1935 and 1936.

The 2nd inline six produced by Chevrolet was introduced in 1937 & was made until 1963. This engine was also used in Chevrolet trucks.

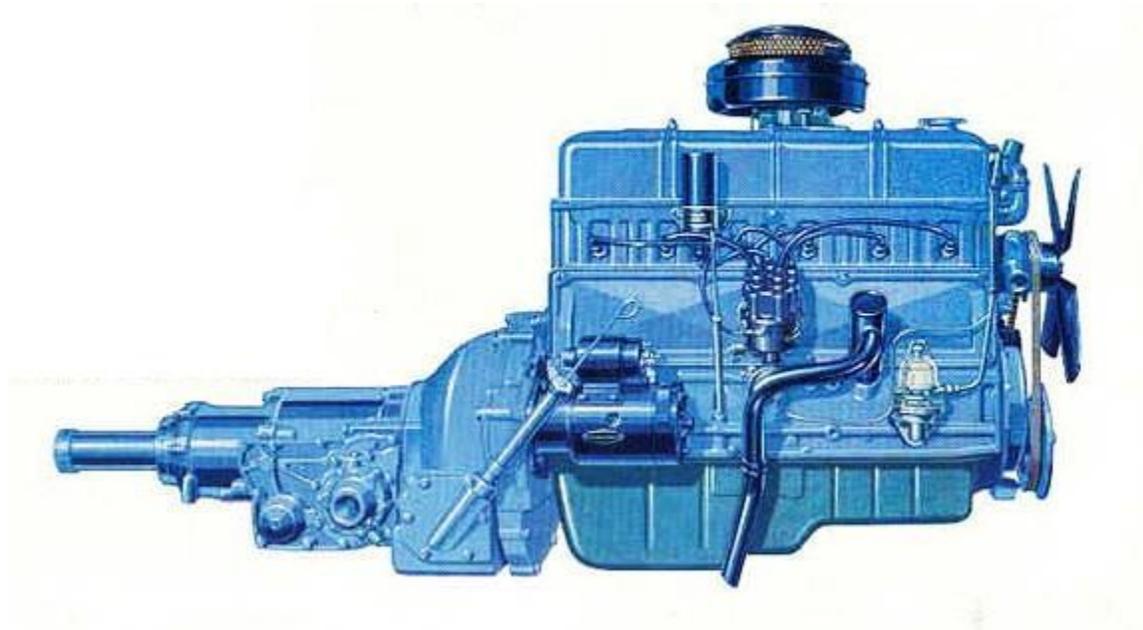
The New Chevy 6 was larger again with 216-cubic-inch (3.5 L) it boasted a 3.500" (88.90mm) bore and a 3.750" (95.25 mm) stroke. A four main bearing crankshaft & a raise to 6.5:1 compression the new engine produced 85 hp (63 kW). Chevrolet developed a new cylinder head in 1941 the new cylinder head increased hp to 90 hp (67 kW) . In 1949 the compression was raised to 6.6:1 gave an extra 2hp to boost the output to 92 hp (69 kW).

The 235.5-cubic-inch version was released in 1949 it was used in large trucks. Chevrolet increased the bore (3.5625" or 90.49mm) and stroke (3.9375" or 100.01mm). The 235-cubic-inch (3.9 L) was introduced in 1950 to give a bit more power for the new 2 speed Powerglide auto transmission, In 1953 Hydraulic lifters were added & a pressurized oiling system for cars ordered with the Powerglide auto trans. The 216-cubic-inch (3.5 L) continued to be standard powerplant for cars with the 3 speed manual transmission until 1954 when the 235-cubic-inch (3.9 L)

became the standard powerplant on all its cars. Two versions were used in 1954 cars - a solid-lifter version with 123 hp (92 kW) for standard transmissions and the hydraulic-lifter 136 hp (101 kW) version (The Blueflame) for Powerglide use.

From 1954 to 1963, the high-pressure 235-cubic-inch engine with mechanical valve lifters was used in trucks. From 1956-1962, all 235-cubic-inch engines used in cars had hydraulic lifters.

The 1953 Corvette engine had the high-pressure 235-cubic-inch engine equipped with mechanical lifters. A 150 hp 235 engine was used in the 1954 Corvette and into 1955. The 235 ci Corvette used the same highlift camshaft as used in the 261 truck engine and triple side draft Carter carbs & a Powerglide transmission & a dual outlet exhaust manifold. The 235 and 261 truck engines were also used by GMC for truck in Canada.



Third member of the Chevrolet inline 6 family was introduced in 1962 to 1988. The new engine was lighter and had a different bell housing bolt pattern. Both auto & manual bell housings & starter motors became interchangeable with Chevy small block and big block V8s.

Other changes on the 3rd generation engine was the crankshafts now had 7 main bearings not 4 like the earlier straight six, Chevrolet decreased the stroke from 3.9375" to 3.25 to produce a 230 ci engine. A new wedge type combustion chamber like the V8 was also used. The valve train was changed from a shaft type & an increase from 1.5 to 1 ratio was increased to 1.75 to 1 like the big block chevys used, Chevrolet passenger cars used the new style engine until 1977, In the Camaro, Chevy Nova & full size trucks it was used until 1979. These vehicals

previously used the Stovebolt sixes. In the mid-1970s, the V6 engine like the Buick V6 231 & later the 200 ci & in the 1980 the 229 3.8 V6 Chevy to over from the inline six in passenger car. GM continued to use the inline 6 in trucks and vans until 1988. Brazil used the straight six in the Chevrolet Opala from 1969 to 1992. The inline Chevy six were converted for marine use by Volvo Penta & Mercruiser & were also used to run power generation & used in forklifts.

In 1970 GM made the inline 6 the base engine with the Chevy II/Nova with either a 230 or 250 ci engine, Applications:

1962-1969 Chevy II  
1967-1971 Postal Jeep  
1968-1992 Chevrolet Opala (Brazil)

### **194 Chevy straight six**

194 was used in both Chevrolet and GMC trucks.

1962-1967 Chevy II  
1964-1967 Chevrolet Chevelle  
1965-1966 Studebaker Commander, Daytona 1966 only, Cruiser and Wagonaire

### **230 Chevy straight 6**

The 230 Replaced 235 cubic inches (3.9 L). It was also used by Chevrolet and GMC trucks, primarily the half-tons. It produced 140 hp (100 kW). The 230 had a firing order of 1-5-3-6-2-4 rotating clockwise. This engine was used on the following vehicles:

1964 Chevrolet Chevelle  
1965-1968 Checker Marathon  
1965 Chevrolet El Camino  
1966-1970 Chevrolet Nova  
1966 Studebaker Commander, Wagonaire, Daytona and Cruiser  
1967 Chevrolet Chevelle  
1967 Chevrolet Camaro  
1968 Chevrolet Chevelle Malibu  
1969 Chevrolet Camaro  
1969 Chevrolet Chevelle

### **3.8 Pontiac L6**

The Pontiac 3.8 was a special SOHC version of the standard 230-cubic-inch (3.8 L) I6. An optional W53 version on the Firebird produced 215 hp (160 kW).

This engine was used on the following vehicles:

1967 Pontiac Firebird  
1967 Pontiac Tempest Sprint coupe

### **250 Chevy inline six**

The stroked 250 version produced 155 hp (116 kW) for Chevrolet and GMC. Between 1975 - 1984, an integrated cylinder head was produced, with one-barrel intakes for passenger cars, and two-barrel intakes for trucks after 1978. Passenger car use of the 250-cubic-inch (4.1 L) engine was discontinued after the 1979

This engine was used on the following vehicles:

1966-1984 Chevrolet (passenger cars to 1979, trucks/vans to 1984)  
1968-1976 Pontiac Firebird  
1968-1970 Pontiac Tempest  
1968-1976 Pontiac LeMans  
1968-1969 Buick Special  
1968-1972 Oldsmobile F-85  
1975-1976 Oldsmobile Cutlass  
1971-1975 Pontiac Ventura  
1968-1971 Buick Skylark  
1968-1979 Chevrolet Camaro  
1969-1979 Checker Marathon  
1968-1992 Chevrolet Opala (Brazil)

### **L22 6 cylinder Chevy**

The L22 was a 250-cubic-inch (4.1 L) I6 engine produced from 1967 to 1979. The '78 Camaro had 105 horsepower (78 kW) and 190 ft·lbf (260 N·m) of torque with the 250.

### **LD4 Chevrolet 6 cylinder**

The LD4 was a 250-cubic-inch (4.1 L) I6 engine produced strictly in 1978.

### **LE3 6 cylinder Chevrolet**

The LE3 was a 250-cubic-inch (4.1 L) I6 engine produced from 1979 to 1984.

### **292 C.I Chevrolet 6 cylinder**

The 292 was only used in Chevrolet and GMC trucks; the block deck is taller, along with a relocated passenger-side engine mount. These were produced between 1963 to 1990; production of the engine shifted to Mexico after 1984.

### **L25 Chevrolet 6 cylinder**

The L25 was GM's "last" pushrod straight-6 engine, produced from 1977 to 1988.

It was used in Chevrolet trucks, displaced 292 cubic inches (4.8 L) and produced 115 hp (86 kW) and 215 ft·lbf (292 N·m).

The Chevrolet straight six has been used from the early days in sedans & trucks, It became popular with many hot rodders & racers. Over the years there have been many brands of headers, aluminum cylinder heads, hotter grind camshafts, 2 & 4 barrel manifolds + a huge range of multi carb intakes from speed equipment companies both large & small. Many back yard & home work shop creations have also been invented.

Pictures below show the Chevy Blue flame straight six inlet & exhaust manifold compared to the later Chevy straight six engine. Note the blueflame manifold has round exhaust ports. The later L6 has rectangular ports.



classic chevy inline 6 intake manifold



235,250,292 chevrolet inlet manifolds

## **Chevy Straight six engine specs bore and stroke sizes**

194: 3.563x3.25  
215: 3.750x3.25  
230: 3.875x3.25  
250: 3.875x3.53  
292: 3.875x4.125

### **firing order**

1-5-3-6-2-4

Chevrolet straight six engine were available in many body styles.

Chevy Nova  
Chevrolet Camaro  
Buick Apollo  
Buick skylark  
Pontiac Firebird  
Tempest, LeMans  
Chevelle/Malibu  
Buick Special/Grand Sport  
Biscayne/Bel Air/Impala/Caprice  
Chevy Blazer  
Chevy pickup trucks  
GMC trucks

**Chevy straight six crankshaft strokes.**

Straight six Chevrolet crankshafts from these engines will interchange. There are 3 basic crank types.

**194/230 (3.25" stroke)**

**250 (3.53" stroke)**

**292 (4.125" stroke)**

The 292 cubic inch straight six engine has a different conrod journal diameter. When swapping cranks it is recommended both crank & rods be swapped as an assembly.

**Some parts that will & wont interchange between Chevy engines  
starter motors,**

Most chevy sixes run a through bell housing starter motor

**harmonic balancers,**

Do not interchange with small block or v6 chevys as the pulley on the balancer is integrated with the balancer, bolt on pulleys are used to run air con, power steering & air pumps.

**Push rods,**

The pushrod length on the chevy six is a length of its own & will not interchange with small or big block Chevrolets

**Conrods & rod bearings,**

Due to rod length & big end sizes they do not interchange with v8 engines.

**rocker arms & roller rockers,**

Despite having a ratio very similar the rocker length is not the same

**camshafts and timing gear sets,**

The 292 chevy six does not interchange with the smaller cube engines.

**Fuel pumps,**

292 Chevrolet straight six engines had the fuel pump switched to the other side of the engine block, The lobe on the camshaft that operates the fuel pump lever is not in the same location as the smaller cubic inch engines.

**Distributors**

from v6 Chevrolet, small or big blocks do not swap either

**Information that can also be useful.**

crankshaft tunnel alignment is very important when changing rotating assemblies .

Crankshaft weights on casting # 407/407N are 10 lbs lighter than crankshaft casting # 802 the conrod, piston, flywheel & harmonic balancer weights will also need to be matched if swapping cranks.

Cylinder heads can be shaved .060 to .080 without affecting the head face.

Head bolt bosses that run through the intake ports can provide more airflow if reduced and reshaped or removed & replaced with crush tubes

It is a known problem that the blocks can get cracks from the head bolt on the front drivers side to the water pump. This can be prevented by installing head studs when rebuilding,

Any straight six Chevy engine made before 1975 was not designed to run unleaded fuel. It is advised to fit hardened valve seats & higher grade exhaust valves to overcome future problems

Fiber camshaft timing gears run a lot quieter than steel or aluminum cam sprockets. The down side is they can strip at any time & is more prone in older engines. It is advised if you are changing your camshaft or hotting up your chevy

inliner that both cam & crank gears be replaced as they are designed to be run as a matched set.

This mad straight blown six cylinder powered flamed altered leaving the line...in a case like this "6 in a row is the only way to go"

Cylinder head torque settings on chevy inline 6 cylinder engines should be pulled down in 3 stages.

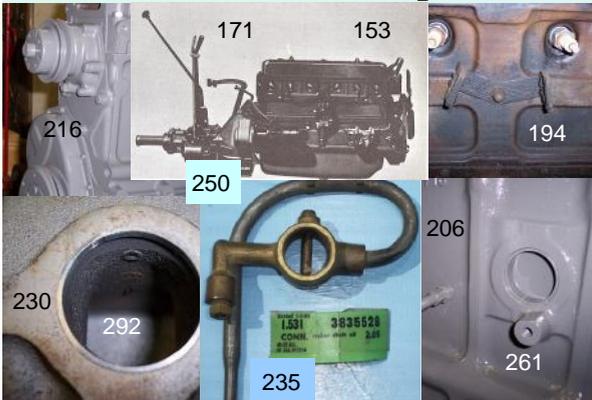
first stage 40 foot pounds

second stage 60 foot pounds

final stage 85 foot pounds on the 2 front cylinder head bolts & 95 foot pounds on all other head bolts except the front 2.it is recommended to install the water pump before doing up the head bolts

always start in the center & go from left to right & work out towards the ends.

# Chevrolet Engines



## CHEVROLET 6 CYLINDER ENGINES

**Splash and spray lubricated 3 main bearing 194 - 206 engines**  
Used from 1929 through 1936 - 8 years

**Spray lubricated 4 main bearing 216 - 235 engines**  
Used from 1937 through 1953 - 17 years

**Full pressure lubricated 4 main bearing 235 - 261 engines**  
Used from 1953 through 1963 - 11 years

**Full pressure lubricated 7 main bearing 194 - 230 - 250 - 292 engines**  
Used from 1962 through 1979 (much later on trucks) - 18 + years

### **Spray lubricated 216 engine**

1953 216s were only used in light trucks and sedan deliveries.



3

### **1950-52 spray lubricated 235 engine**

Used in heavy duty trucks and passenger cars with automatic transmission



4

## 1953 CHEVROLET ENGINES

### **Spray lubricated 216**

Light trucks, Sedan Deliveries

### **Spray lubricated 235**

Heavy Duty trucks  
Manual transmission passenger cars

### **Pressure lubricated 235**

Passenger cars with  
Powerglide transmission

5

The valve cover was held in place by 2 acorn nuts on the top of the valve cover on:

1929 - 1953 spray lubricated engines  
1953 full pressure 235 Powerglide engines



6

The valve cover was held in place by 4 small screws at the base of the cover on:

No spray lubricated engines  
1954 – 1963 all full pressure lubricated engines



7

A full engine side cover was used on:

1929 – 1953 spray lubricated 216 engines  
1941 – 1949 spray lubricated 235 engines

No full pressure engines



8

A short engine side cover was used on:

1950 – 1953 spray lubricated 235 engines  
1953 – 1963 full pressure engines



9

An oil distributor cover held in place by 3 screws is found on the driver's side of:

1940 – 1953 spray lubricated engines  
No full pressure engines



10

The cylinder head has 3 ribs between the first and second spark plugs on:

1953 spray lubricated engines  
1953 – 1963 full pressure engines



11

The cylinder head has a smooth contour between the first and second spark plug on:

1950 – 1952 spray lubricated engines  
No full pressure engines



12

When a full pressure engine is mounted in a 1937 – 1953 Chevrolet truck, the standard 1932 – 1954 truck front mount can be used.



13

When a full pressure engine is mounted in a 1937 – 1951 passenger car, the standard 1935 – 1951 passenger front mounts can be used.



14

A full pressure engine can be mounted in a 1931 – 1936 car or truck by using a 1938 – 1947 truck bellhousing. This matches the engine to the 1931 – 1936 passenger and truck transmission.



15

A short (high mount) water pump was used on:  
1941 – 1953 spray lubricated engines  
1953 – 1954 full pressure engines



16

A long water pump was used on :  
No spray lubricated engines  
1955 – 1963 full pressure engines



17

The 1955 - 1962 pump is shown at the right  
The 1941 - 1954 pump is shown at the left



18

The 1955 - 1962 block is shown at the left  
 The 1941 - 1954 block is shown at the right



19

The 1955 - 1962 pump is shown at the left  
 The 1941 - 1954 pump is shown at the right



20

When this plate is attached to a 1955 or later block,  
 it is ready to accept a 1941 - 1954 water pump



21

Adapter in place



22

The final product



23

1937- 48 valve cover no filler cap held by 2 acorn nuts  
 1949-53 held by 2 acorn nuts & oil filler in front  
 1954 held by 4 screws- 4 vent slots – filler at the front  
 1955 - 1958 No vents - filler at front  
 1959 - 1962 No vents - filler at center



24

235 engines have a larger throat diameter in the intake manifold ports than 216 engines



25

This manifold adapter can be used when it is desirable to use a 216 manifold on a 235 engine



26

235 carburetors have a larger throat diameter than 216 carburetors. In many cases, a 216 base can be used on a 235 carburetor.



27

The flywheel must be matched to the STARTER to be used. For 6 volt systems, a 1942 - 1954 flywheel must be used.



28

1937 – early 1954 engines used a FORGED camshaft with a narrow distributor drive gear.

Late 1954 – 1962 engines used a CAST camshaft with a wide distributor drive gear. The bearing journals are also larger.



29

If a 216 distributor is used in a late 1954 – 1962 engine, the drive gear on the distributor should be matched to the camshaft because of the different material of which the camshaft is made. The gear on the distributor used with forged camshafts is very hard and can barely be scratched with a file. The gear used with cast camshafts can easily be scratched.



30

If a 1960 – 1962 235 engine is used to replace a 216, the position of the throttle pivot must be changed



31

1953 – 1954 235 engines have oil pans with straight sides

1956 – 1962 oil pans have bulged sides



32

All full pressure engines have insert rod bearings and aluminum pistons

All spray lubricated engines have integral rod bearings and cast iron pistons

33

Except for the method of attaching the valve cover, all 1953 – 1962 235 heads are interchangeable. However the rocker arms must be matched to the BLOCK

In 1953 – 1958 engines, the flow of oil to the rocker arms is controlled in the block.

In 1959 – 1962 engines, the flow is controlled right at the rockers. These rockers are different from the ones used on 1953 – 1958 engines.

34

Probably the two most common problems with 235 engines were inadequate or excessive lubrication of the rocker arms and noisy valve lifters.

These problems were eliminated in the 194 – 230 – 250 engines by eliminating the rocker arm shaft and by oiling the rockers through hollow pushrods. The oil entered the pushrods through holes in the lifter seat. This arrangement allowed air to escape from the valve lifters along with the oil, and noisy lifters were rarely encountered

35