

Valve springs are one of the most critical and most overlooked components in your engine. They must be matched to your cam in order for the engine to reach its full potential. It does absolutely no good to install a cam that will RPM to 8000 if you do not have the correct springs.

Using the wrong valve springs is one of the most common causes of engine failure. Another is the incorrect installation of the valve springs.

To that end, we have compiled a checklist that provides a general checklist as well as other useful spring information.

1. Use only the valve springs that gives the recommended spring pressure with the valve both on the seat and at maximum lift.
2. COMP Cams® has matched each set of springs for load consistency. A variance of + or -10% is acceptable for new springs.
3. The outside diameter of the recommended valve spring may require that the spring pocket of the head be machined to a bigger size.
4. One of the easiest and sometimes most costly mistakes made in racing engines is not positively locating the spring. A valve spring that "dances" around on the cylinder head or retainer causes harmful harmonics and excessive wear. A spring that is forced onto a retainer is likely to fail at that coil. That is why we have such a large selection of steel and titanium retainers, hardened steel spring seat cups, and inner spring seats to better match our springs. A spring that is contained properly at the retainer and the cylinder head will offer the longest possible service life.
5. With the springs removed from the heads, you are ready to check the installed spring height (See Diagram A). This is the distance from the bottom of the retainer to the surface where the spring rests on the head. This distance is what the spring sees when the valve is on the seat. The valves, retainers and valve locks will be used in this step. First install the valve in the guide, then install the retainer and valve locks. Pull the retainer tightly against the valve locks while holding the valve assembly steady. Measure the distance between the spring seat and the outside step of the retainer using your height micrometer (part #4928 or 4929) or a snap gauge and a pair of calipers.

Repeat this procedure for all the valves and record your information. After you have measured all the valves, find the shortest height. This will become the springs installed height on your heads. If your combination includes a dual or triple spring assembly, it will be necessary to allow for the inner steps of the retainer.

6. Once you have determined the shortest installed height, it will be necessary to use shims to obtain this installed height ($\pm .005$ " is acceptable) on the remaining valves. These are available through our catalog or at any of your local COMP Cams® dealers.

7. Before removing the retainers, measure the distance from the bottom of the retainer to the top of the valve seal. (See Diagram A). This distance must be greater than the lift of the valve. If not, the guide must be machined. This is a very common cause of early camshaft failure.

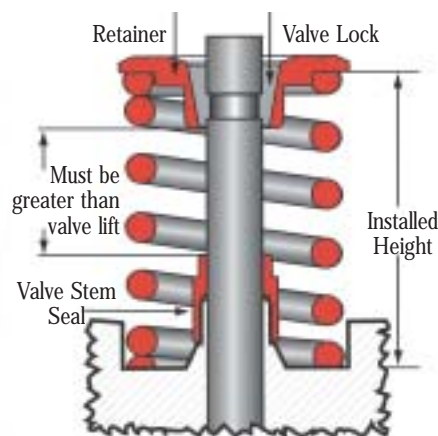
8. Once the valve springs have been installed, it is important to check for coil bind. This means that when the valve is full open there must be a minimum of .060" clearance between the coils of both the inner and outer springs. If this clearance does not exist you must change either the retainer or the valve to gain more installed height, or change to a spring that will accommodate more lift or machine the spring seat for extra depth.

9. When installing the springs you must make sure that the correct retainer is used. The fit between the retainer and the spring may be snug, but excessive pressure should never be used to install the retainer.

10. Always check for clearance between the retainer and the inside face of the rocker arm. This will be most evident while the valve is on the seat. Rocker arms are designed to clear specific spring diameters, so you should check to see that you have the proper rocker arm/retainer combination. This situation can also be the result of improper rocker geometry, and may be corrected with different length pushrods or a different length valve.

11. It is important for new springs to take a heat set. Never abuse or run the engine at high RPM when the springs are new. Upon initial start-up, limit RPM to 1500 to 2000 until the temperature has reached operating levels. Shut off the engine and allow the springs to cool to room temperature. This usually will eliminate early breakage and prolong spring life. After the spring has been "broken-in", it is common for it to lose a slight amount of pressure. Once this initial pressure loss occurs, the spring pressure should remain constant until the spring becomes overstressed. Then the springs must either be replaced or shimmed to the correct pressure.

Diagram A



SPRING RATE CALCULATION

Spring rate is calculated using the following formula.

$$K = \frac{\text{open load} - \text{closed load}}{\text{Installed height} - \text{open height}}$$

K=Stiffness
(Calculation will be in lbs./in.)