AUTOMOTIVE Youth Educational Systems YES The Passport to a Rewarding Automotive Career

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Modern Automotive Technology Chapter 51

Engine Top End Service

North Montco Technical Career Center

Learning Objectives

- Check for cylinder head damage.
- Describe how to correct worn valve guides, warped cylinder heads, damaged valve seats, and other troubles.
- Grind valve seats and valves.
- Assemble a cylinder head.
- Inspect, test, and service valve train assemblies.
- Adjust engine valves.
- Describe safety practices that must be followed while performing engine top end service.

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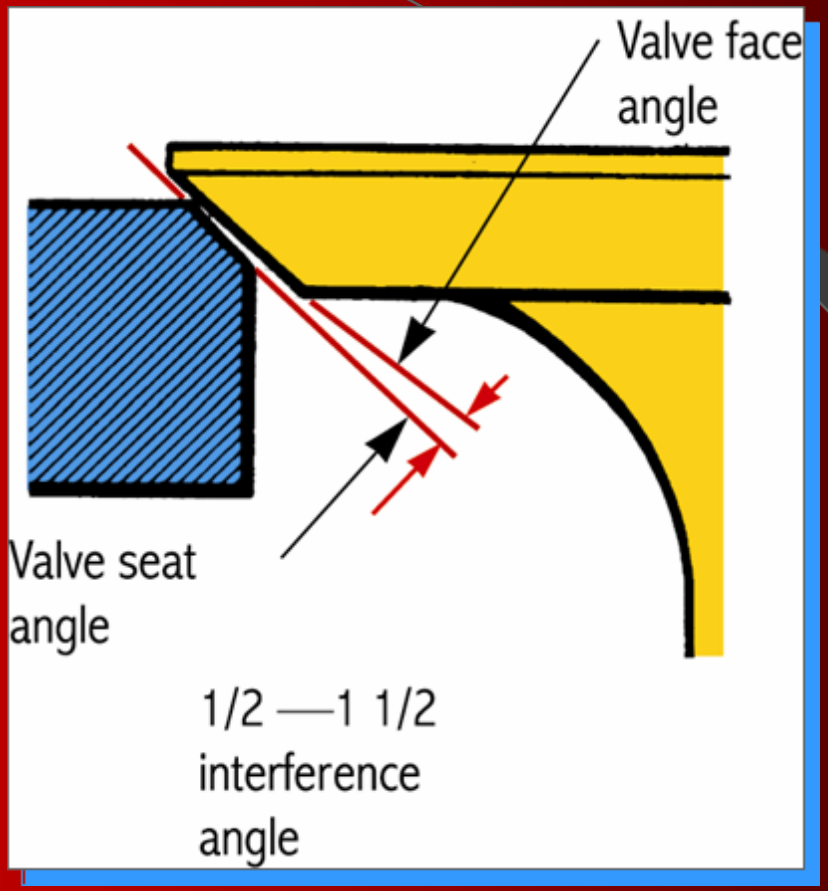
1. Interference Angle is set on the valve grind machine.

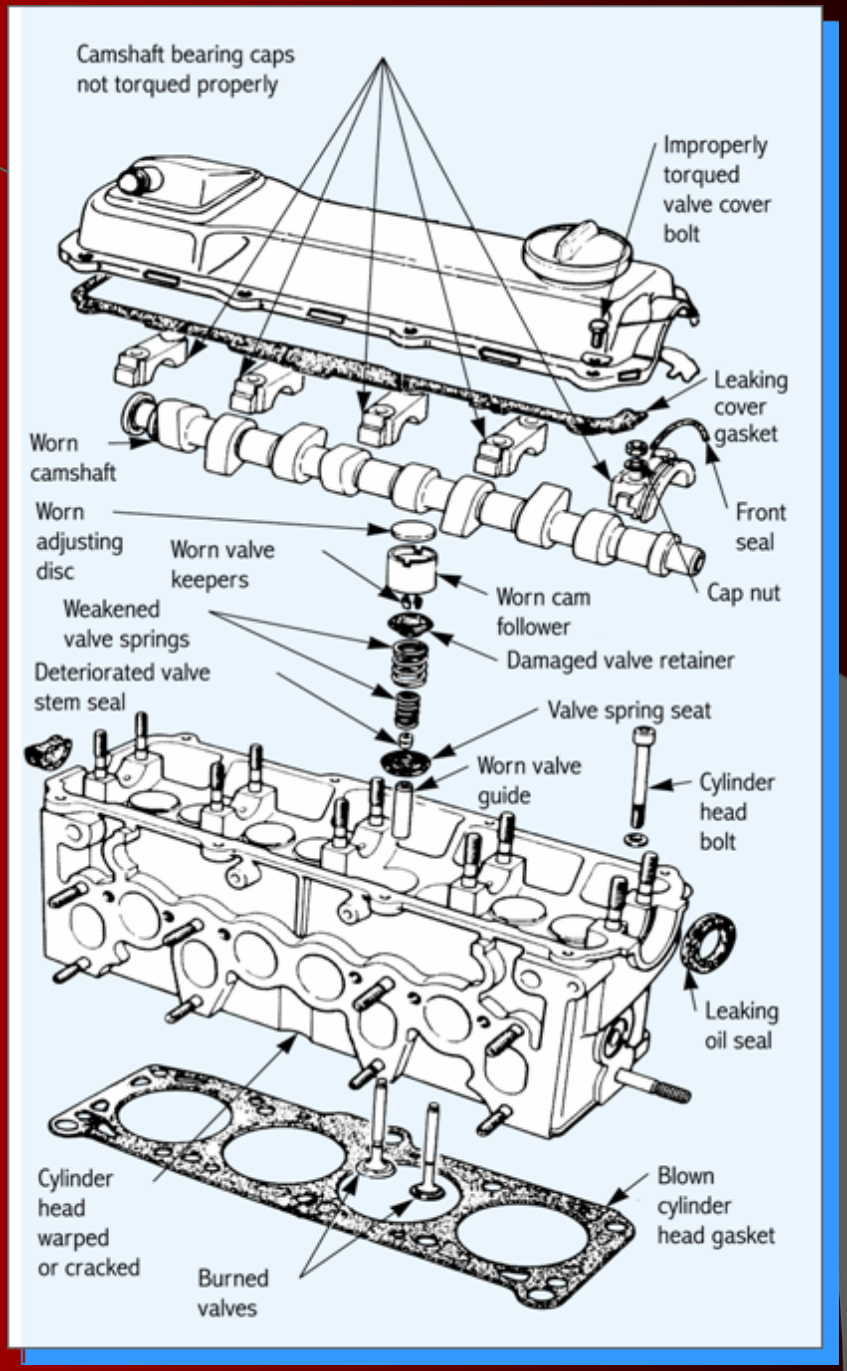
2. Valve Train Noise (either a Tapping or clattering noise) is caused by the rockers striking the valve stems.

Interference Angle



Valve is ground one degree less than the valve seat to aid seating and sealing

Top End Assembly



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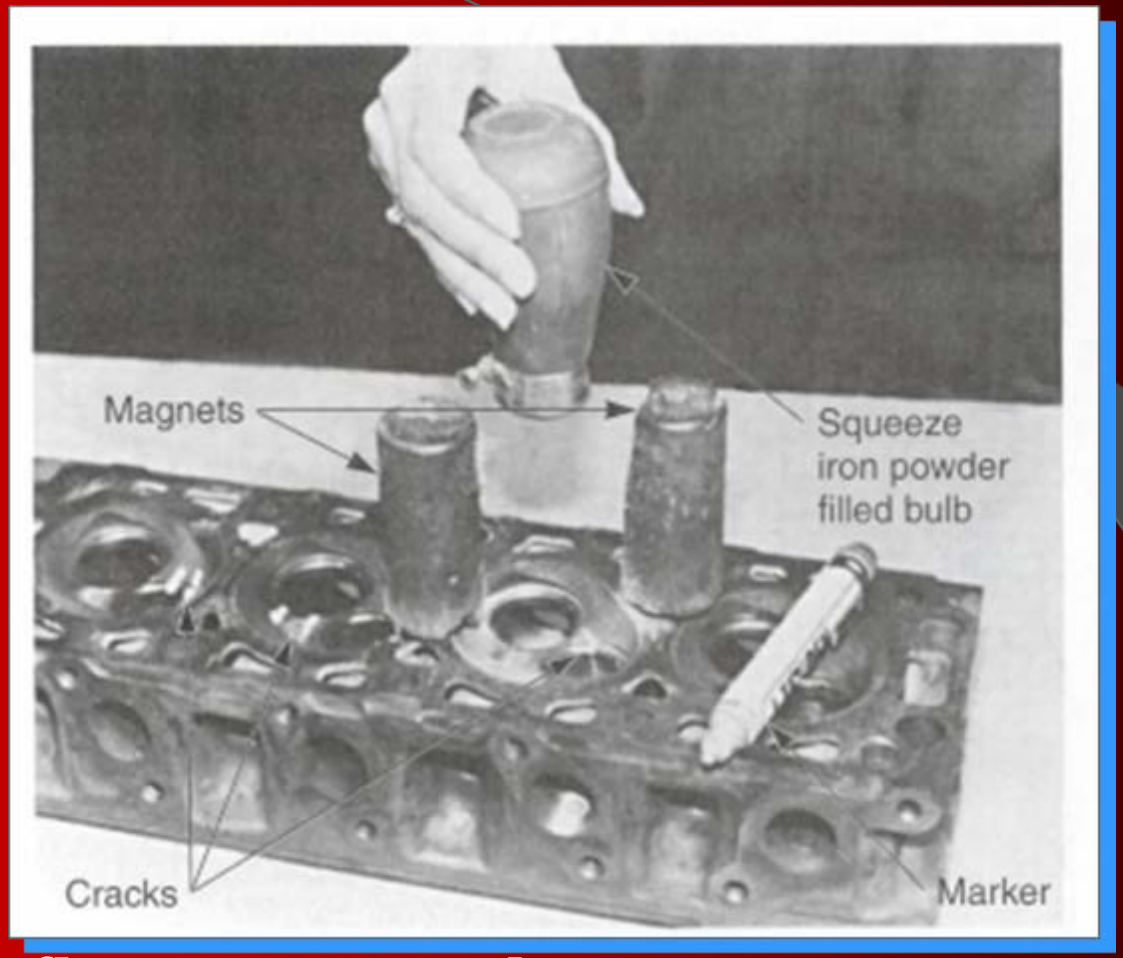
3. Magnafluxing is the process used to find cracks in cast iron parts.

4. A Valve Job involves the service of the cylinder head and valve train.

Crack Detection

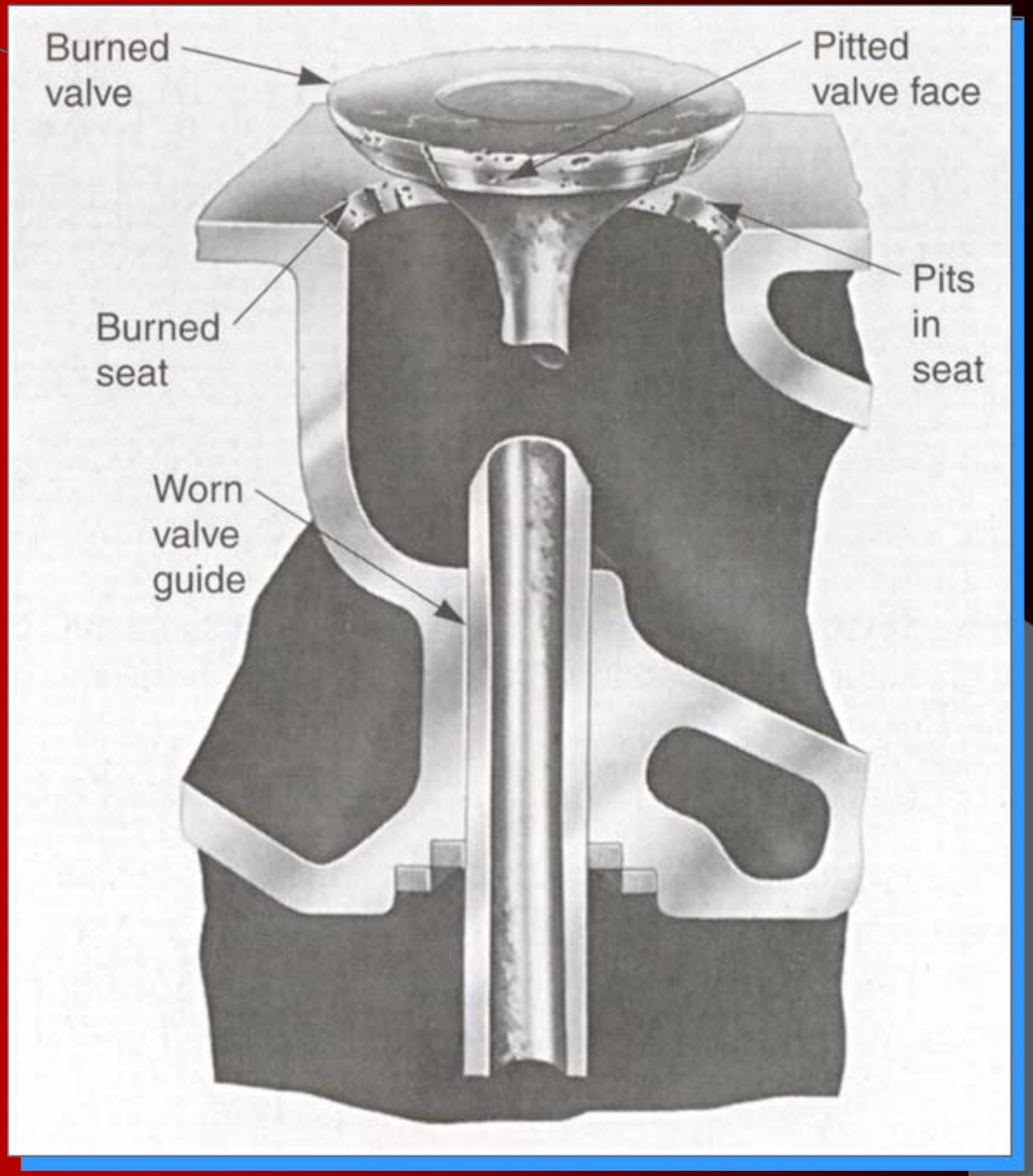
Dye penetrant is used on aluminum–dye penetrant is sprayed on the part, then developer is sprayed on, turning cracks red.

Crack Detection



Magnafluxing is used on cast iron parts–uses magnetism and metal powder to highlight cracks

Common Valve Problems



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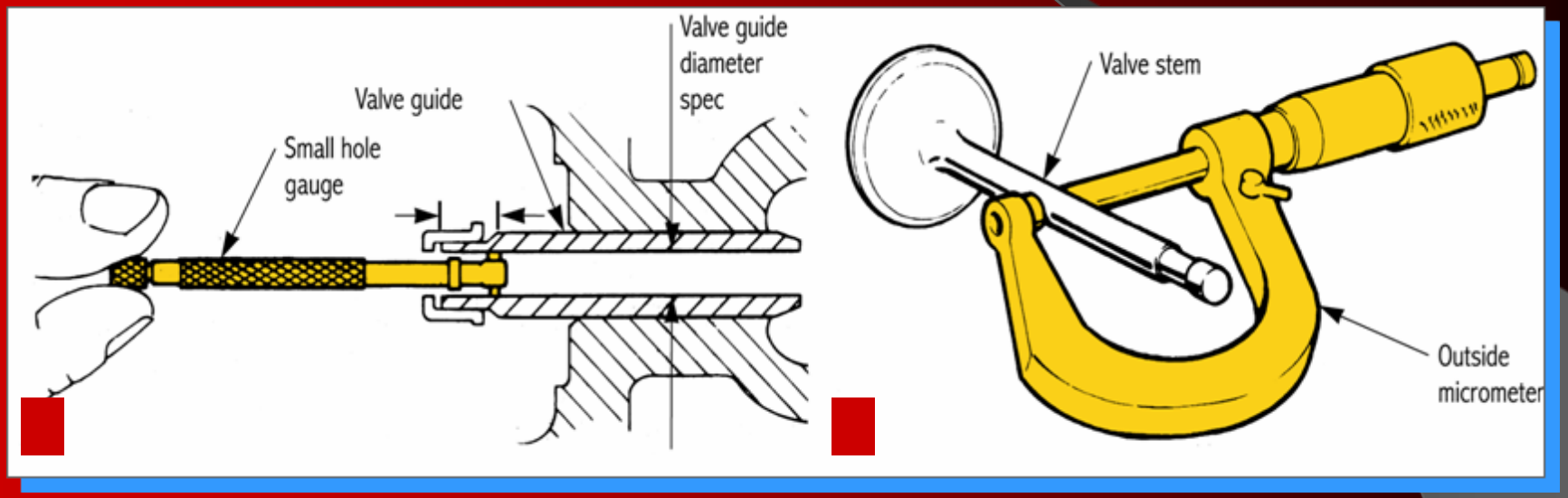
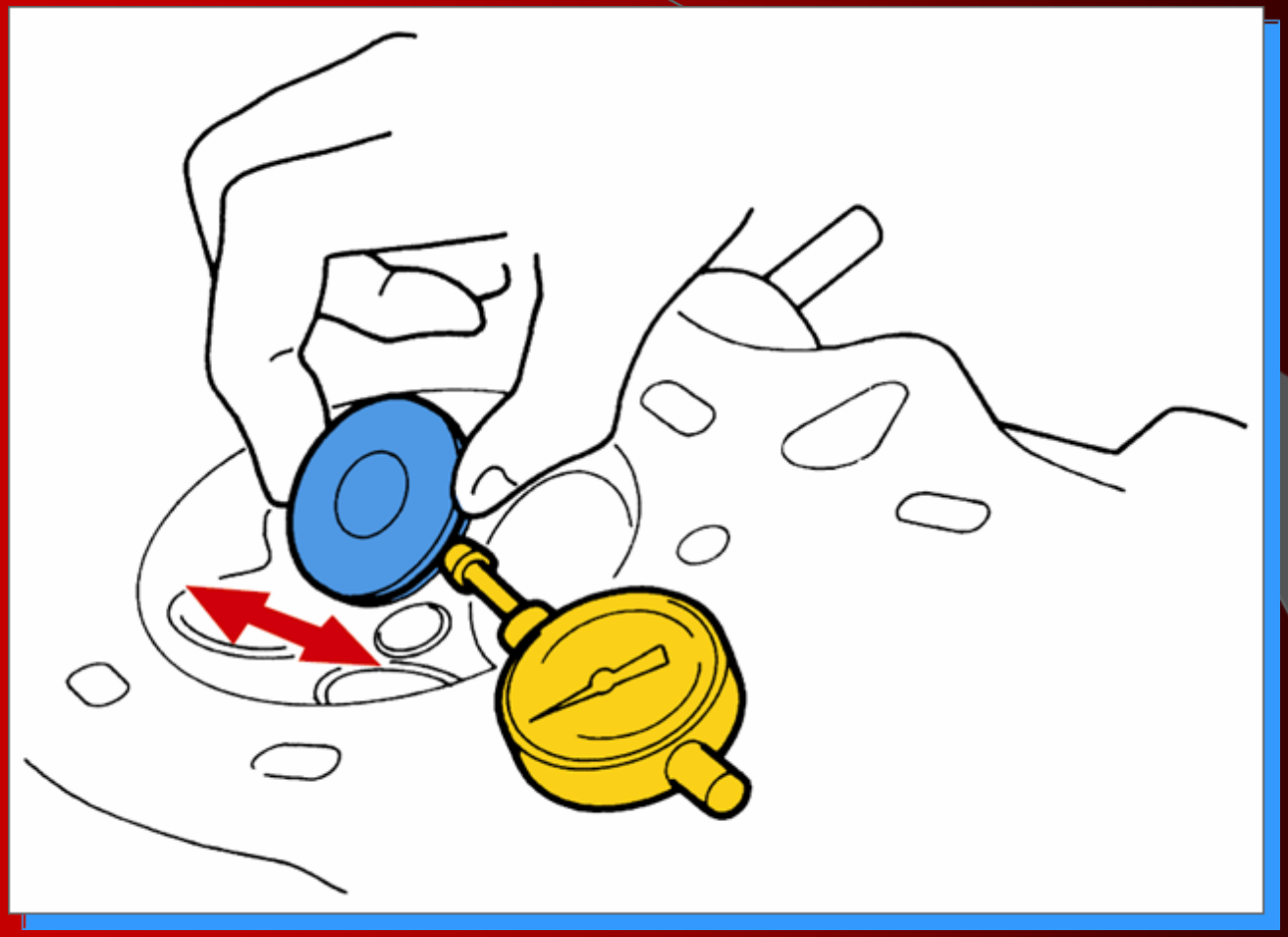
5. Knurling a Valve Guide is a Machine shop operation used to press indentations in the guide to reduce its inside diameter.

6. Valve Seat Runout occurs when the seat is not centered around the valve guide.

Measuring Valve Guide

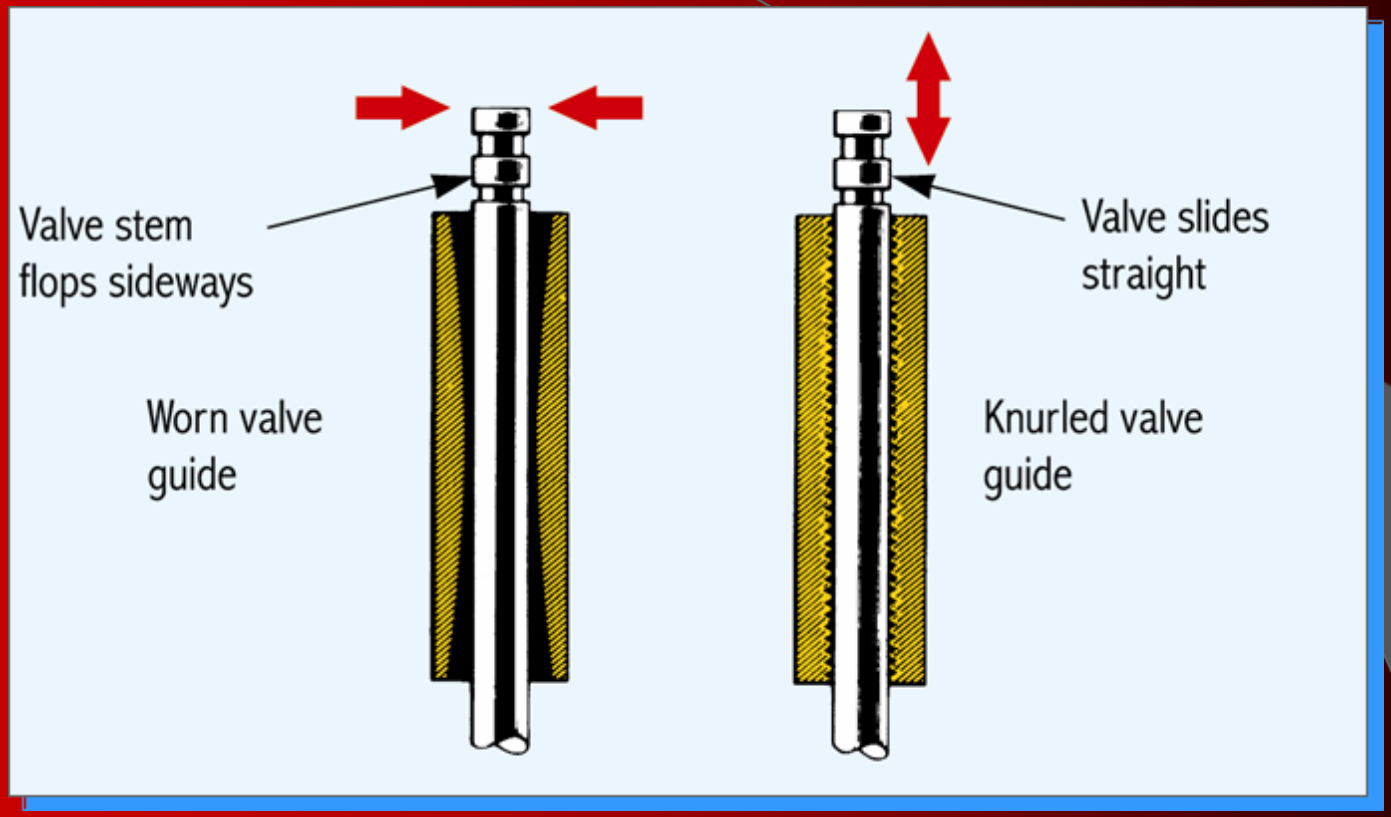


Valve Stem Clearance



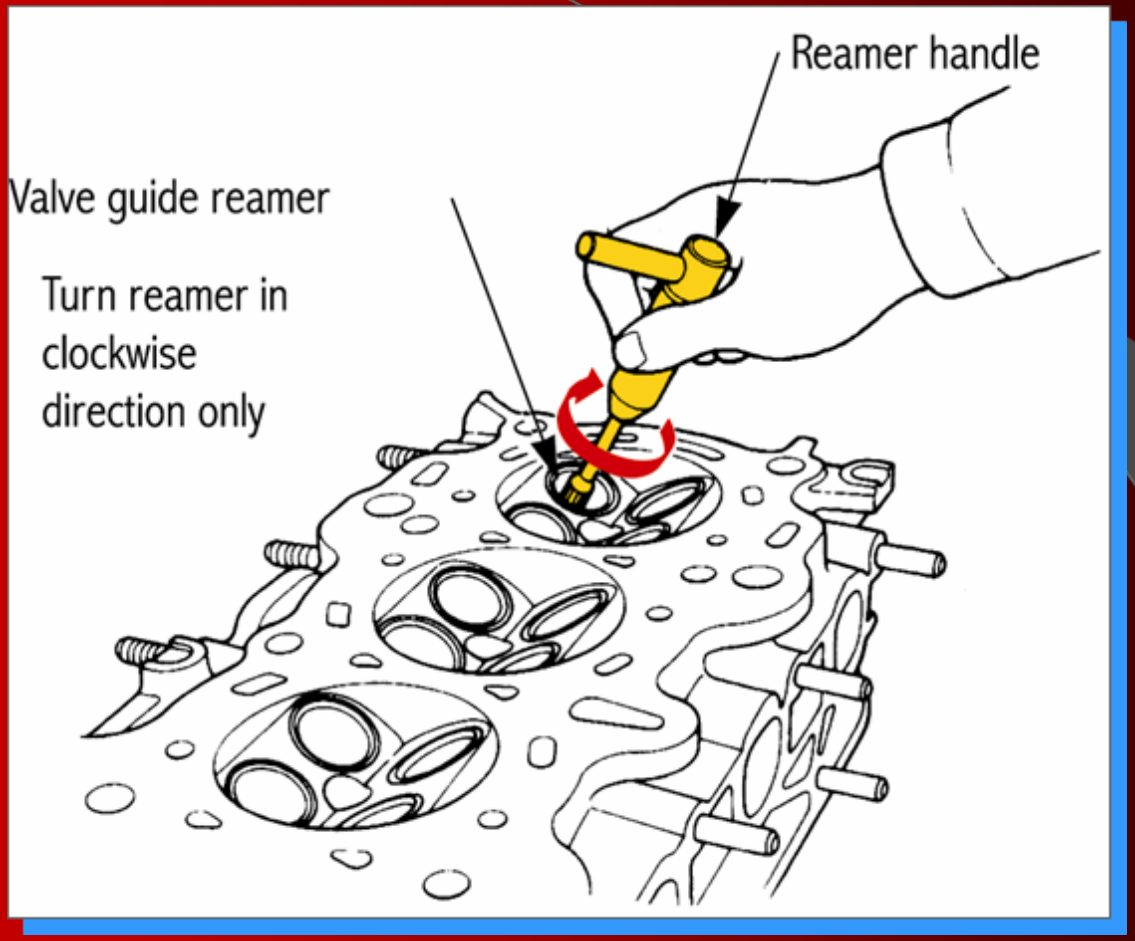
Dial indicator can be used to measure clearance

Knurling a Valve Guide



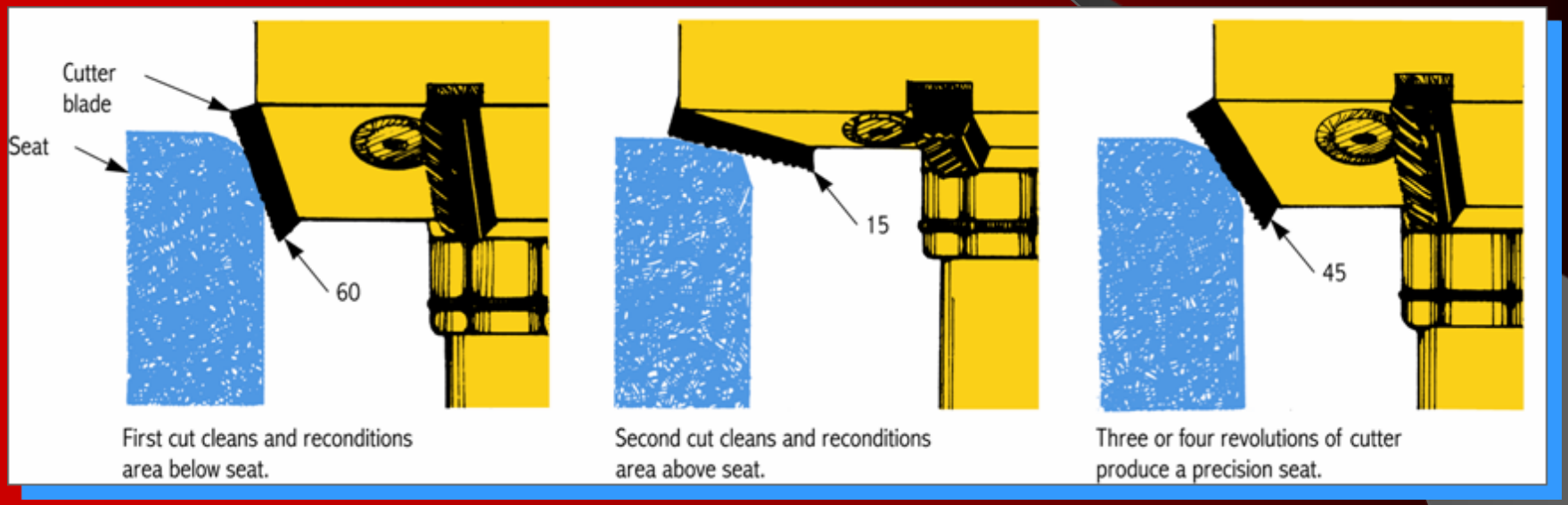
Reduces guide inside diameter to restore proper stem-to-guide clearance

Reaming a Valve Guide



Enlarges guide for an oversize valve stem

Three-Angle Valve Job

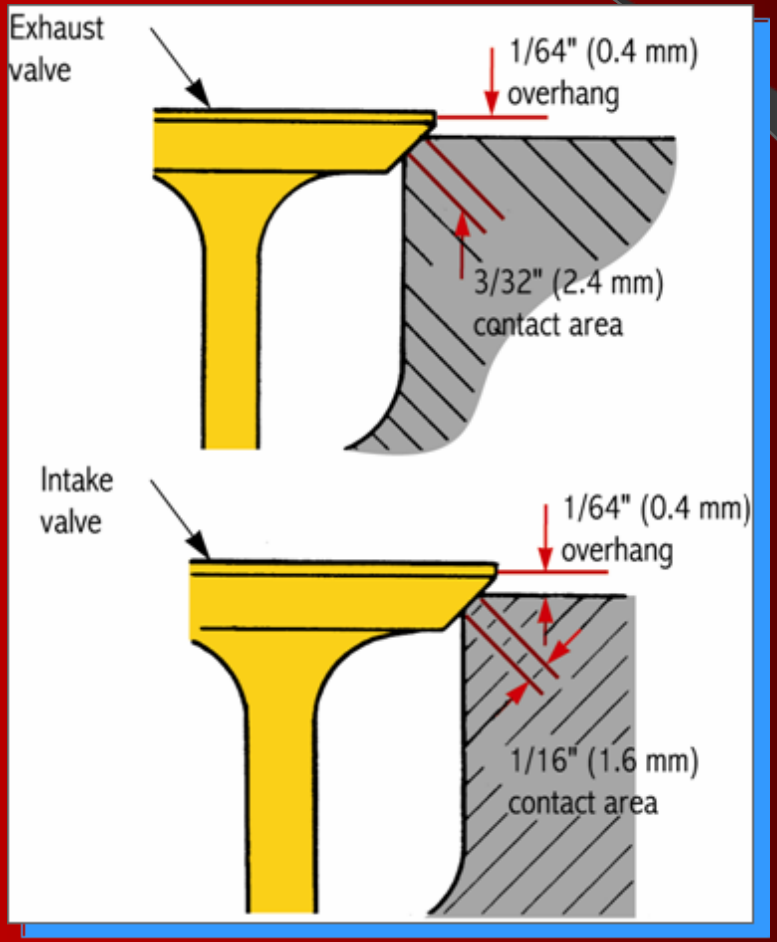


First cut cleans and reconditions area below seat.

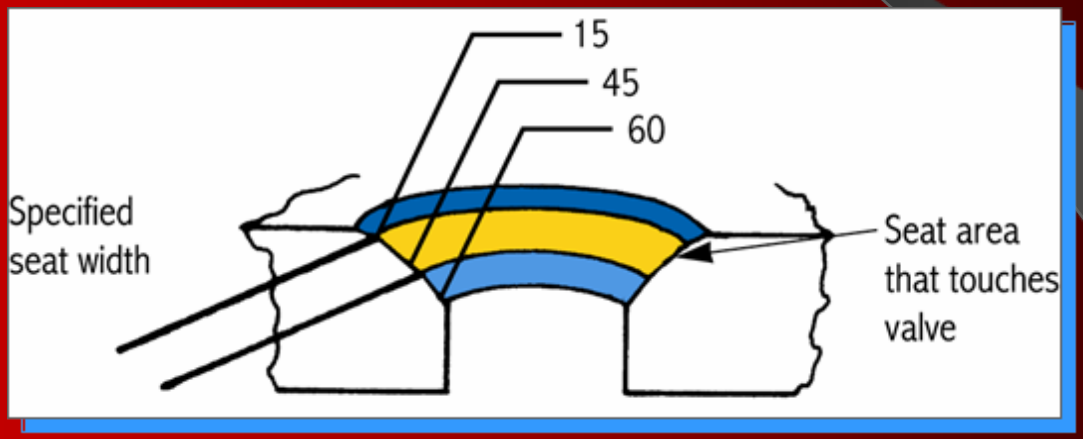
Second cut cleans and reconditions area above seat.

Three or four revolutions of cutter produce a precision seat.

Seat Contact Patterns

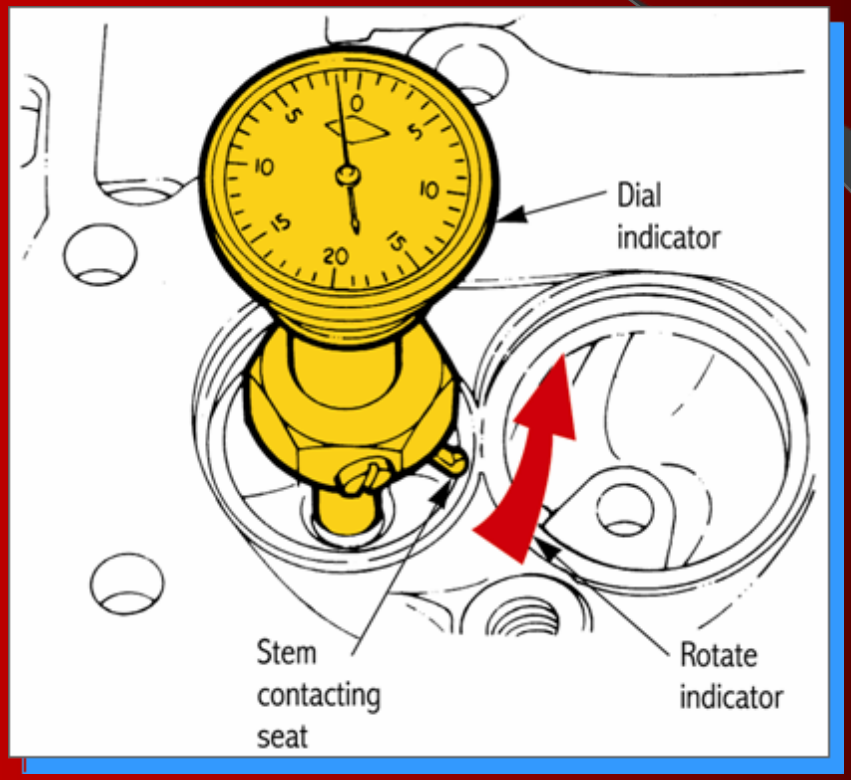


Adjusting Contact Area



60º cut narrows the seat and moves it up, while a 15º cut moves it down

Checking Seat Runout



Dial indicator reading equals runout

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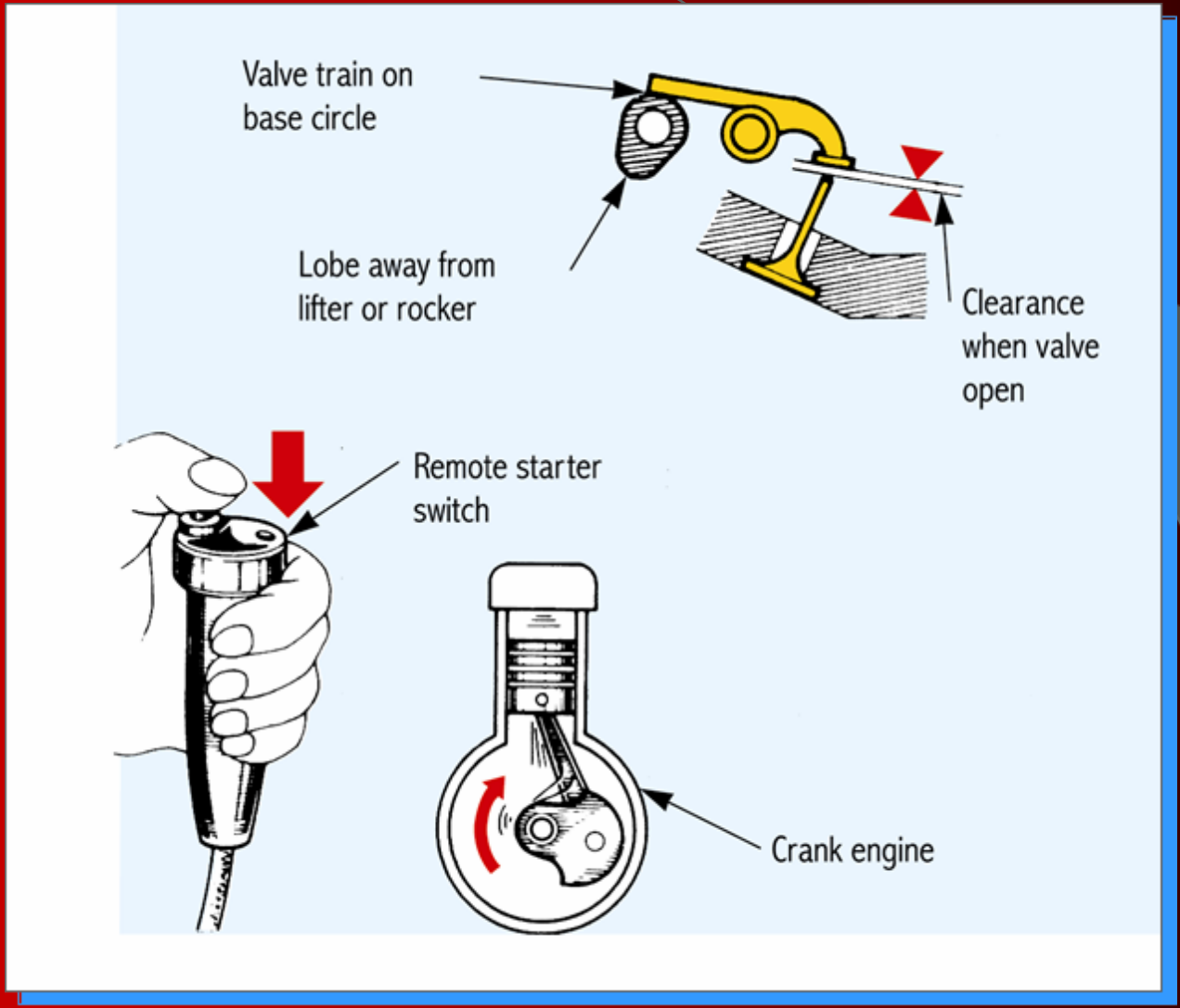
7. Valve Lifter-Down Rate is measured by timing how long it takes to push the plunger to the bottom of its stroke under controlled conditions.

8. Cylinder Head Milling is a machine shop operation done to correct head warpage.

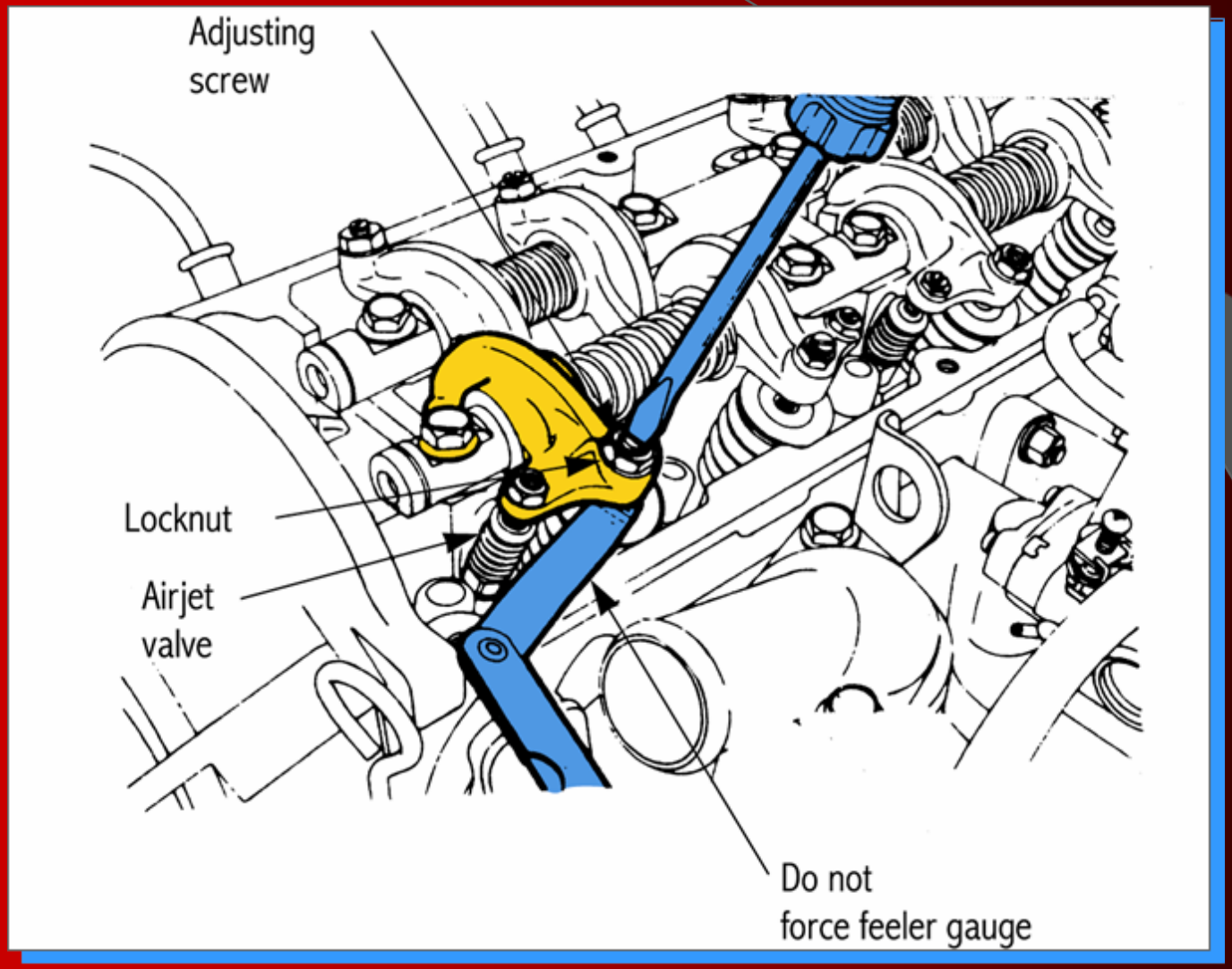
Valve Adjustment

- Adjustment is critical to performance and service life
- If a valve train is too tight, a valve may be held open, causing burning
- If a valve train is too loose, noise and damage may result

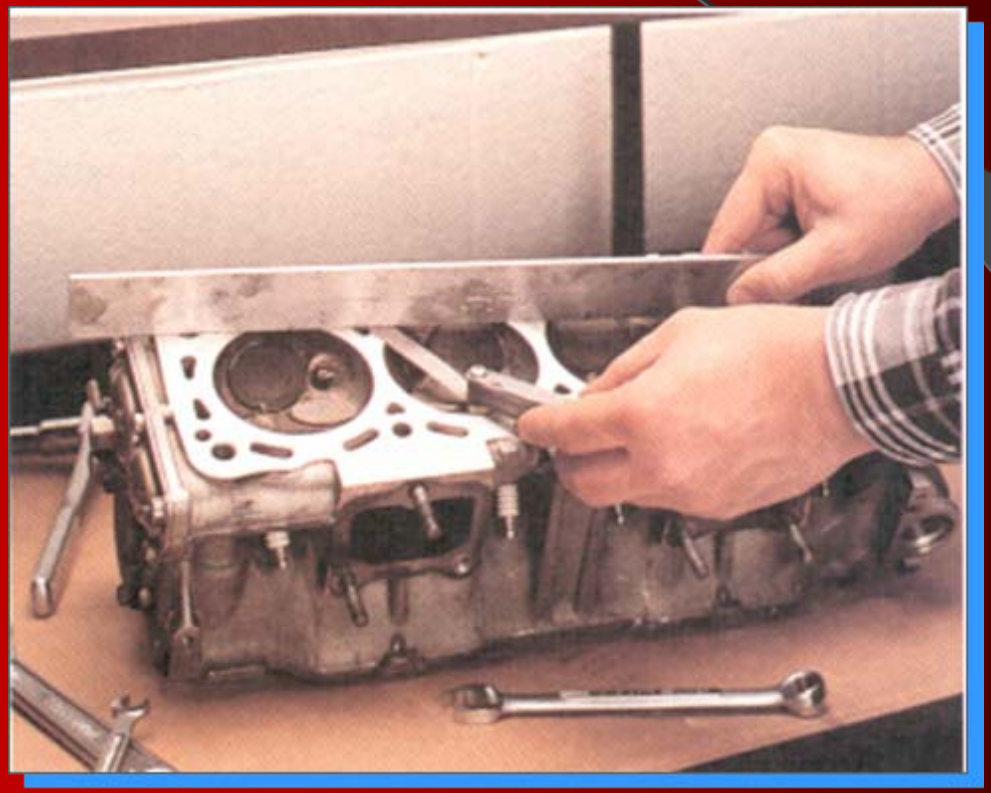
Adjusting Hydraulic Lifters– Engine Off



Adjusting Mechanical Lifters

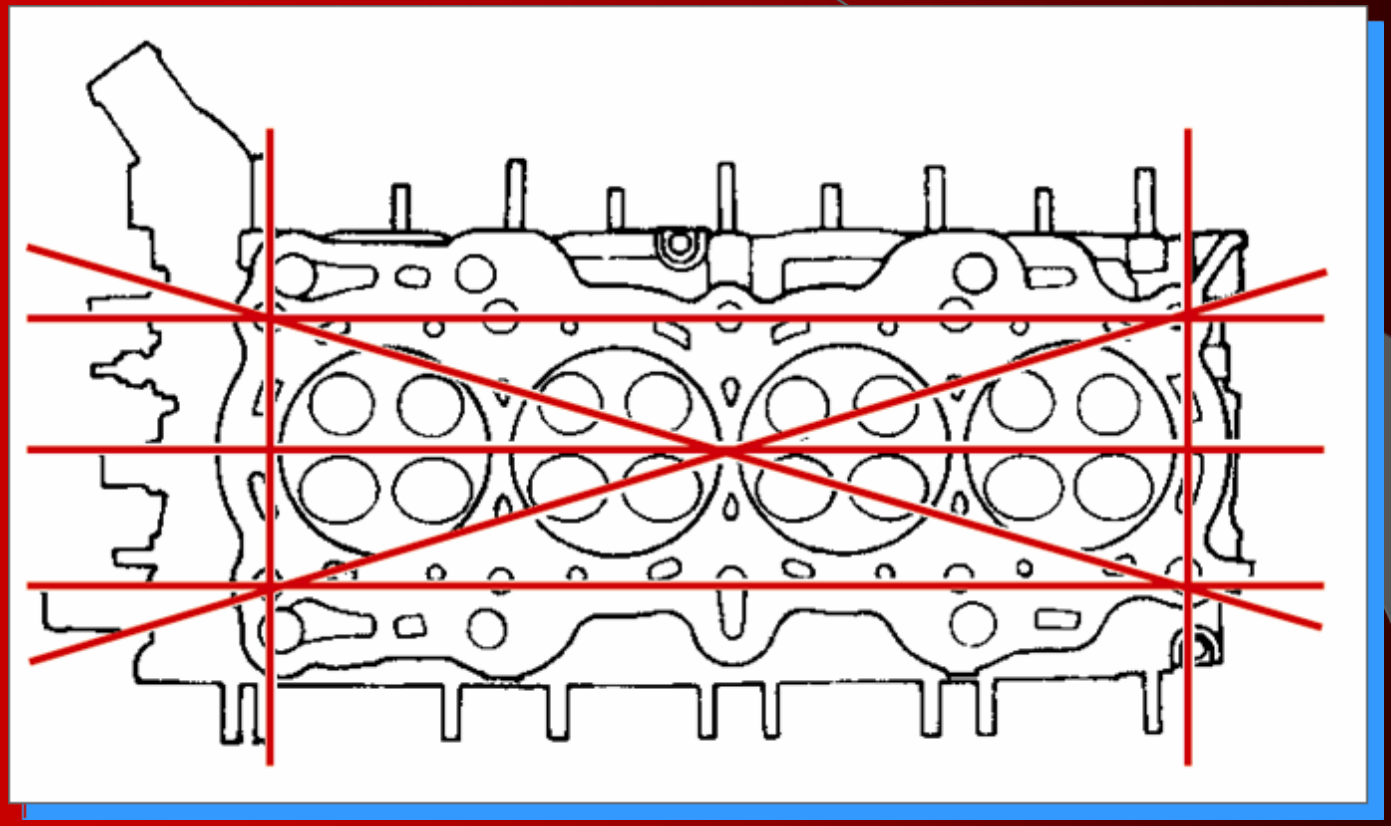


Measuring Cylinder Head Warpage



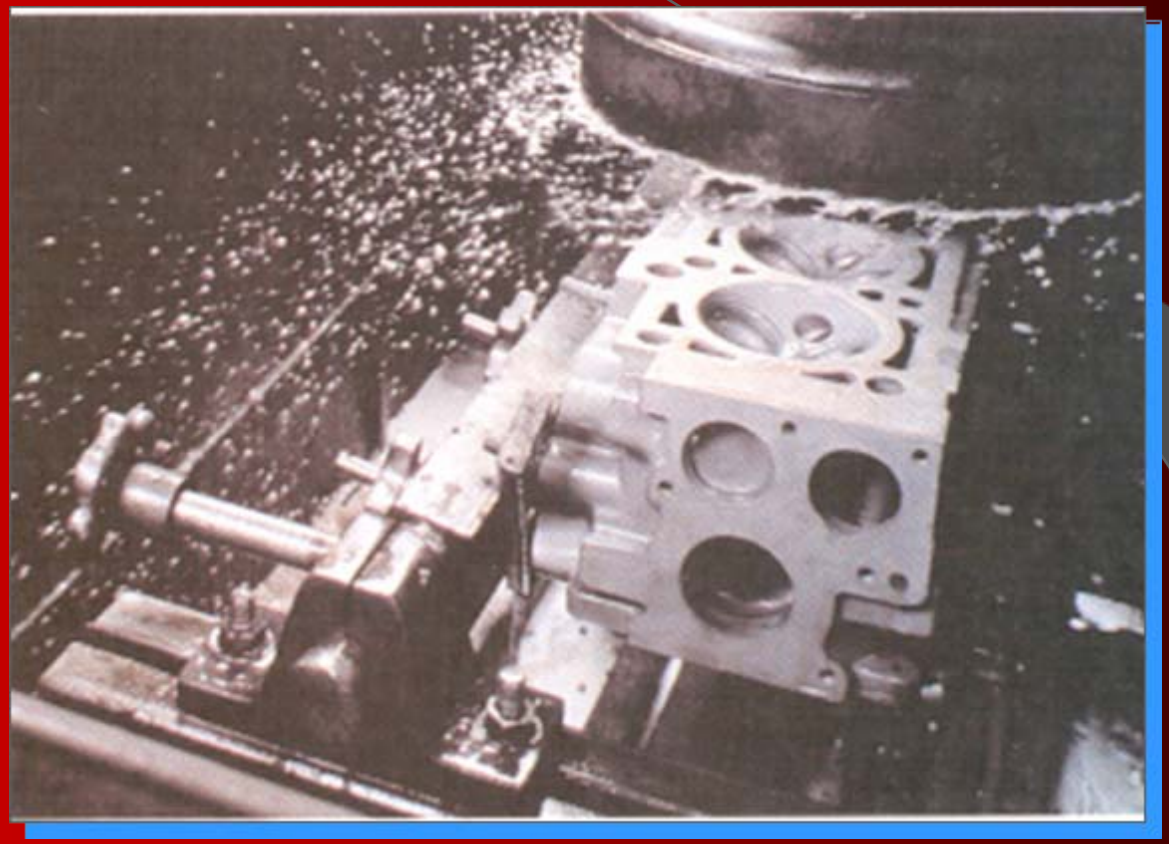
Thickness of feeler gauge that fits under straightedge equals warpage

Measuring Cylinder Head Warpage



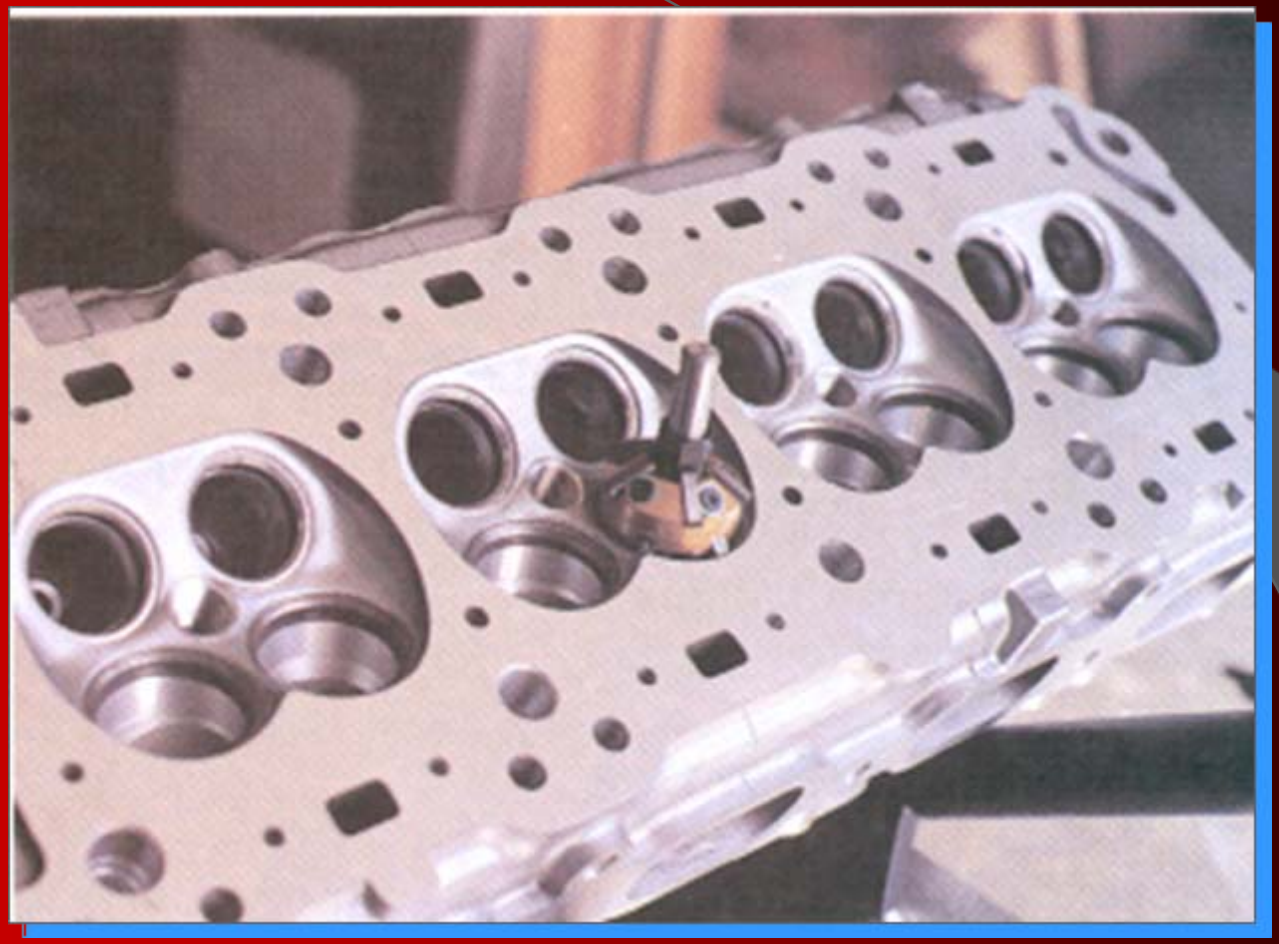
Check across the head at these angles

Milling a Cylinder Head



Machining operation removes metal from the deck to correct warpage

Milled Cylinder Head



Allows for good head gasket sealing

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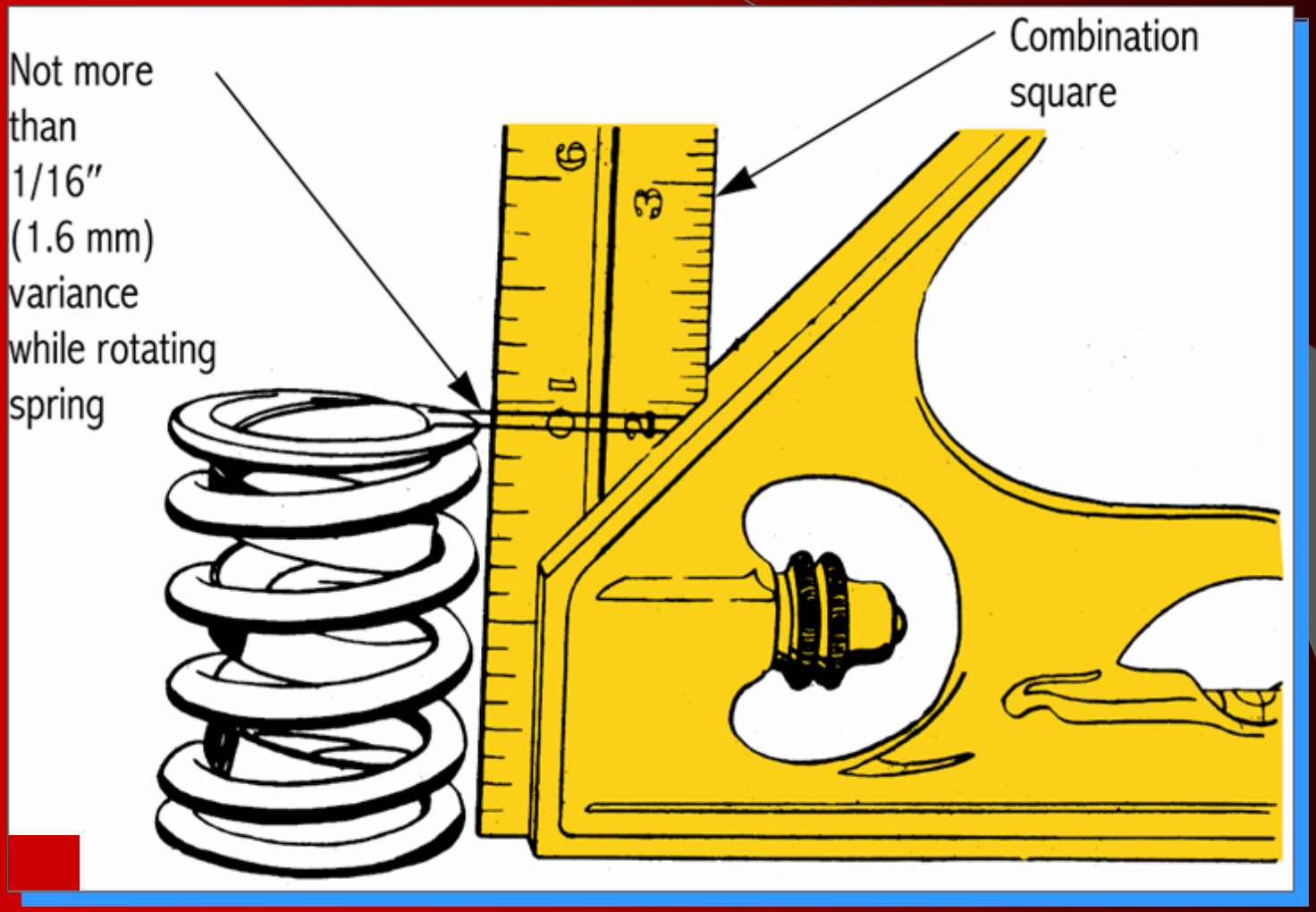
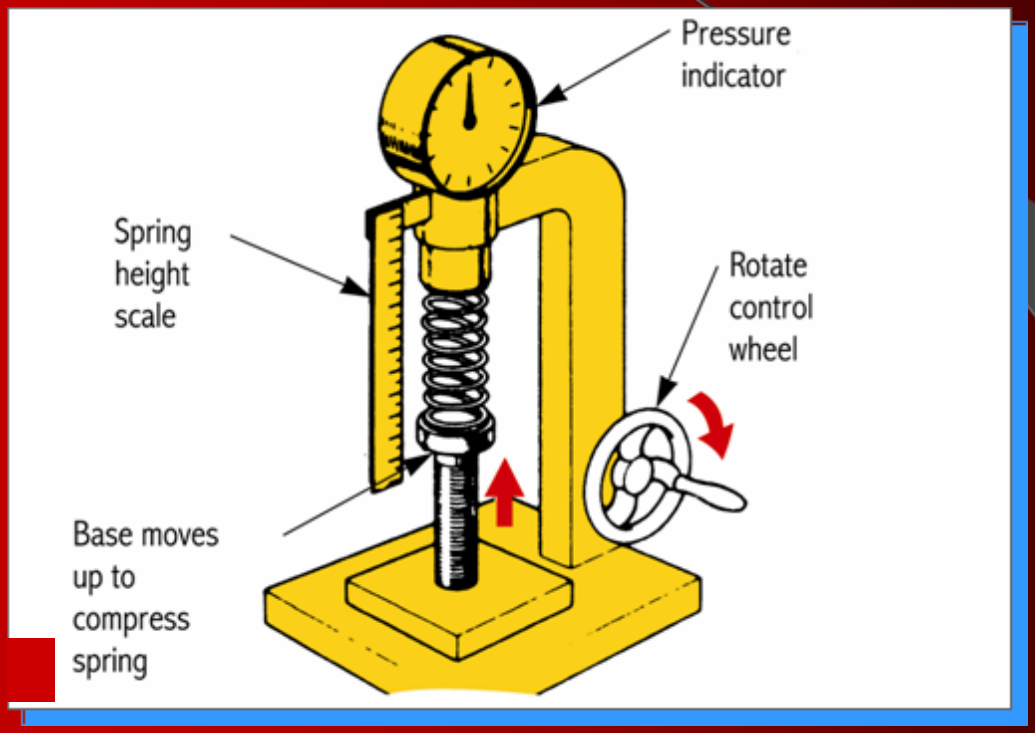
9. Valve Spring Shims are used to maintain correct tension when the springs are installed on the cylinder heads.

10. A Valve Grind Gasket Set typically includes a head gasket(s),intake and exhaust manifold gaskets, and valve seals.

Valve Spring Squareness

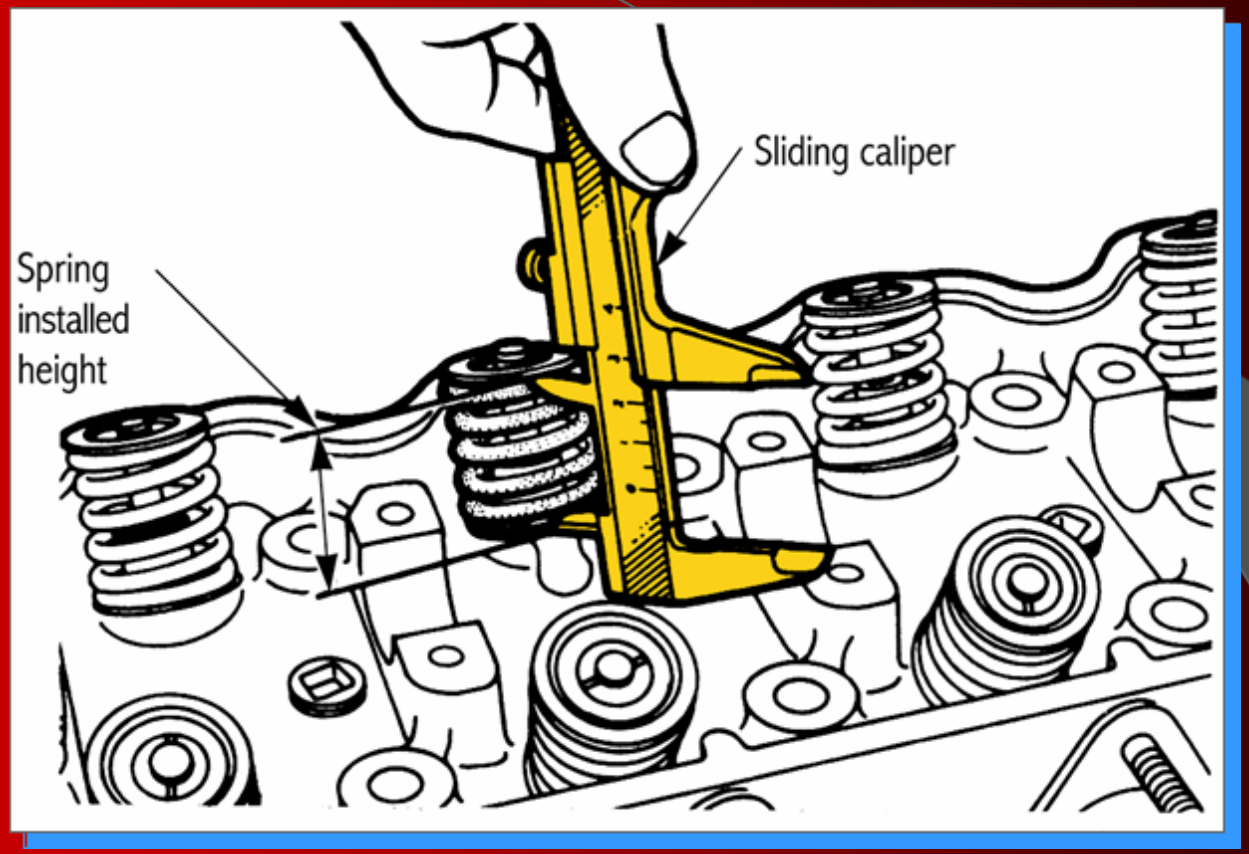


Valve Spring Free Height and Tension



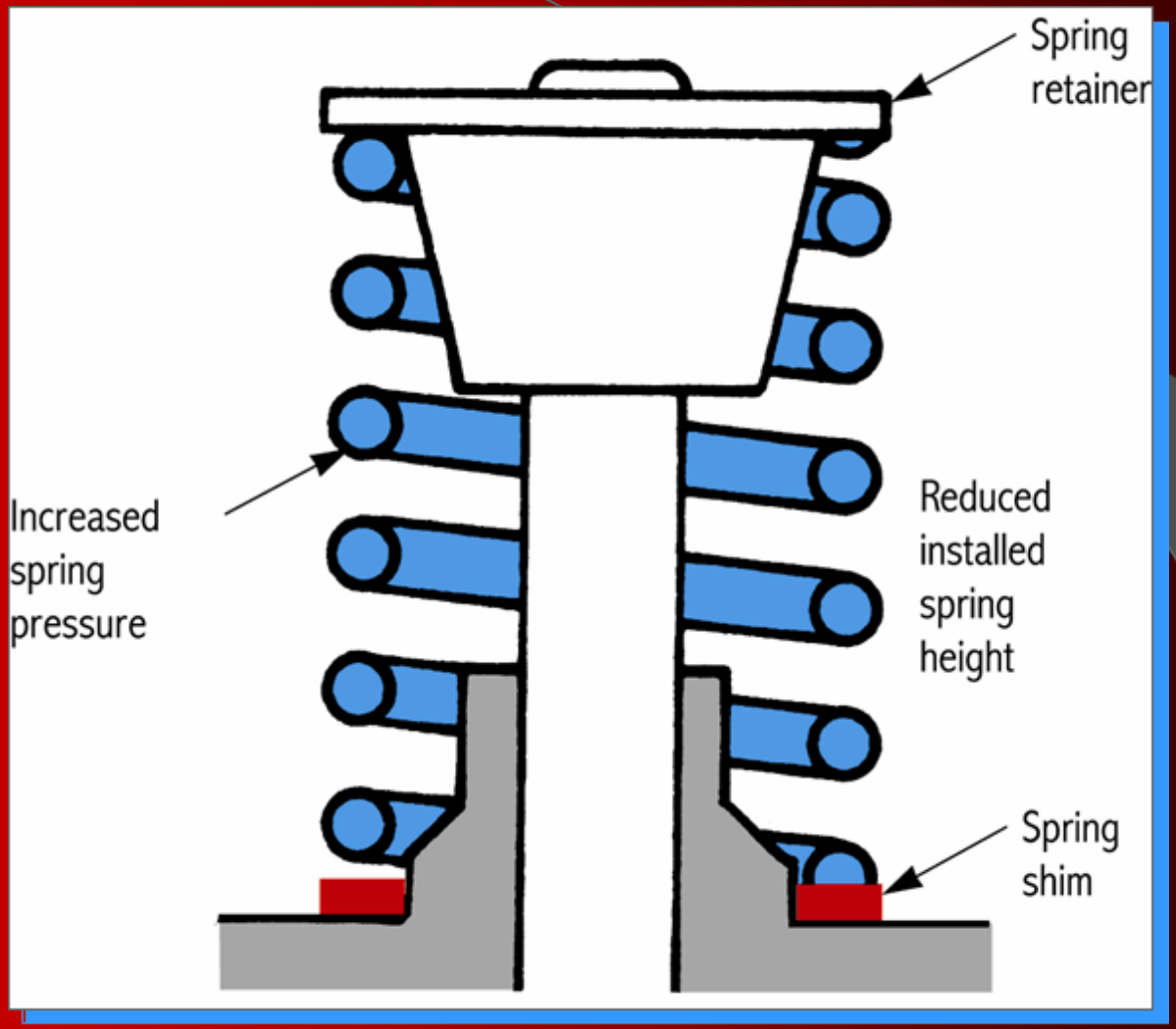
Measure the length of each spring with no pressure, then compress to specified height and read pressure scale

Spring Installed Height



Distance from the top of the spring to the bottom, when installed on the head. If reading is too high, “shim” the valve

Valve Spring Shim



Restores spring pressure, preventing valve float

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