Nitrogen oxides (NOₓ) create a red-brown haze that often lingers over major cities.

When the EGR valve opens, the exhaust gases flow through the valve and into passages in the intake manifold.
Figure 84-3: Back pressure in the exhaust system is used to close the control valve, allowing engine vacuum to open the EGR valve.

Figure 84-4: Typical vacuum-operated EGR valve. The operation of the valve is controlled by the PCM by pulsing the EGR control solenoid on and off.

Figure 84-5: An EGR valve position sensor on top of an EGR valve.
Figure 84-6  Digital EGR valve as used on some older General Motors engines.

Figure 84-7  A General Motors linear EGR valve.

TECH TIP: Find the Root Cause
Excessive back pressure, such as that caused by a partially clogged exhaust system, could cause the plastic sensors on the EGR valve to melt. Always check for a restricted exhaust whenever replacing a failed EGR valve sensor.
Figure 84-8 - The EGR valve pintle is pulse-width modulated and a three-wire potentiometer provides pintle-position information back to the PCM.

Figure 84-9 - A typical Ford DPFE sensor and related components.

Figure 84-10 - An OBD-II active test. The PCM opens the EGR valve and then monitors the MAP sensor and/or engine speed (RPM) to verify that it meets acceptable values.
TECH TIP: Watch Out for Carbon Balls!

EGR valves can get stuck partially open by a chunk of carbon, and the valve or solenoid will test as defective. When the valve (or solenoid) is removed, small chunks or balls of carbon often fall into the exhaust manifold passage. When the replacement valve is installed, the carbon balls can be drawn into the new valve again, causing the engine to idle roughly or stall.

To help prevent this problem, start the engine with the EGR valve or solenoid removed. Any balls or chunks of carbon will be blown out of the passage by the exhaust. Stop the engine and install the replacement EGR valve or solenoid.

REAL WORLD FIX: The Blazer Story

The owner of a Chevrolet Blazer equipped with a 4.3-L, V-6 engine complained that the engine would stumble and hesitate at times. Everything seemed to be functioning correctly, except that the service technician discovered a weak vacuum going to the EGR valve at idle. The vehicle was equipped with an EGR valve and an EGR control solenoid, called an electronic vacuum regulator valve (EVRV) by General Motors Corporation. The EVRV pulses to control the intake of the EGR valve. The technician checked the service manual for details on the workings of the system. The technician discovered that vacuum should be present at the EGR valve only when the gear selector indicates a drive gear (drive, low, reverse). Because the technician discovered the vacuum at the solenoid to be leaking, the solenoid was obviously defective and required replacement. After replacement of the solenoid (EVRV), the hesitation problem was solved.

NOTE: The technician also discovered in the service manual that blower-type exhaust hoses should not be connected to the tailpipe on any vehicle while performing an inspection of the EGR system. The vacuum created by the system could cause false EGR valve operation to occur.

TECH TIP: The Snake Trick

The EGR passages on many intake manifolds become clogged with carbon, which reduces the flow of exhaust and the amount of exhaust gases in the cylinders. This reduction can cause spark knock (detonation) or an increase in emissions of oxides of nitrogen (NOx) (especially important in areas with enhanced exhaust emissions testing).

To quickly and easily remove carbon from exhaust passages, cut an approximately 1-foot (30-cm) length from stranded wire, such as garage door guide wire or an old speedometer cable. Flare the end and place the end of the wire into the passage. Set your drill on reverse and turn it on, and the wire will pull its way through the passage, cleaning the carbon as it goes, just like a snake in a drainpipe. Some vehicles, such as Hondas, require that plugs be drilled out to gain access to EGR passages. 

SEE FIGURE 84–11.
Figure 84-11 Removing the EGR passage plugs from the intake manifold on a Honda.