FIGURE 55.1 Brake fluid can absorb moisture from the air, even through plastic, so many experts recommend that brake fluid be purchased in metal containers, typically.

CHART 55.1

<table>
<thead>
<tr>
<th>DOT 3</th>
<th>DOT 4</th>
<th>DOT 5.1</th>
<th>DOT 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry boiling point</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>°F</td>
<td>401</td>
<td>446</td>
<td>520</td>
</tr>
<tr>
<td>°C</td>
<td>205</td>
<td>230</td>
<td>220</td>
</tr>
<tr>
<td>Wet boiling point</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>°F</td>
<td>254</td>
<td>311</td>
<td>356</td>
</tr>
<tr>
<td>°C</td>
<td>123</td>
<td>165</td>
<td>180</td>
</tr>
</tbody>
</table>

Chart showing the type of brake fluid and the wet and dry boiling temperatures for each rating.
Brake fluid absorbs moisture from the air at the rate of about 2% per year. As the brake fluid absorbs water, its boiling temperature decreases.

DOT 5 brake fluid is used mostly in motorcycles because if spilled, it will not hurt painted surfaces.

Both rubber sealing cups were exactly the same size. The cup on the left was exposed to mineral oil. Notice how the seal greatly expanded.
If the brake fluid is black in color, it should be replaced.

![Image of brake fluid test strip]

(a) A brake fluid test strip is being used to test the condition of the brake fluid. (b) The color of the test strip is then compared with a chart on the package, which indicates the condition and if the fluid should be replaced.

An electronic tester that measures the boiling temperature of the brake fluid is useful to help determine if the brake fluid needs to be replaced.
The master cylinder piston seals are usually constructed from EPDM rubber, and the diaphragm of the vacuum power brake booster is usually made from SBR.

Cross-sectional view of a typical drum brake wheel cylinder. Most wheel cylinder boots and cups are either SBR or EPDM rubber.
FIGURE 55.10 Exploded view of a typical disc brake caliper. Both the caliper seal and dust boot are constructed of EPDM rubber.

FIGURE 55.11 Steel brake tubing is double walled for strength and plated for corrosion resistance.

FIGURE 55.12 Because of the slight difference in flare angle, double flare fitting seals cause a wedging action.
FIGURE 55.13 An ISO fitting.

FIGURE 55.14 Double flaring the end of a brake line. (a) Clamp the line at the correct height above the surface of the clamping tool using the shoulder of the insert as a gauge. (b) The insert is pressed into the end of the tubing. This makes the first bend. (c) Remove the insert and use the pointed tool to complete the overlap double flare. (d) The completed operation as it appears while still in the clamp.

FIGURE 55.15 Making an ISO flare requires a special tool. (a) Use the gauge, which is part of the tool, to position the brake line at the specified distance from the base of the tool. (b) The ISO flaring tool will create the perfect “bubble” or ISO flare.
Whenever disconnecting or tightening a brake line, always use the correct size flare-nut wrench. A flare-nut wrench is also called a tube-nut wrench or a line wrench.

The coils in the brake line help prevent cracks caused by vibration.

Armored brake line is usually used in the location where the line may be exposed to rock or road debris damage. Even armored brake lines can leak, and a visual inspection is an important part of any brake service.
Brake Fluid and Lines

FIGURE 55.19 A tube bender being used to bend the brake line.

FIGURE 55.20 A tubing cutter is the preferred tool to use to cut brake lines because it leaves a clean edge.

FIGURE 55.21 Flexible brake hoses are used between the frame or body of the vehicle and the wheel brakes. Because of suspension and/or steering movement, these flexible brake lines must be strong enough to handle high brake fluid pressures, yet remain flexible.
FIGURE 55.22 (a) Typical flexible brake hose showing the multiple layers of rubber and fabric. (b) The inside diameter (ID) is printed on the hose (3 mm).

FIGURE 55.23 Typical flexible brake hose faults. Many faults cannot be seen, yet can cause the brakes to remain applied after the brake pedal is released.

Flexible brake hose should be carefully inspected for cuts or other damage, especially near sections where the brake hose is attached to the vehicle. Notice the crack and cut hose next to the mounting bracket.