

	SURFACE VEHICLE RECOMMENDED PRACTICE		J1706 FEB2012
		Issued	1988-10
		Revised	2012-02
		Superseding J1706 JUN1995	
(R) Production, Handling, and Dispensing of SAE J1703 Motor Vehicle Brake Fluids and J1704 Borate Ester Based Brake Fluids			

RATIONALE

The changes to this document include:

Title changed to include SAE J1704

Scope changed to include SAE J1704

2. changed to include SAE J1704

2.1 changed to include SAE J1704, revised last line to read ERBP as it relates to Figure 1

2.1 Added Figure 2 water contamination effect on low temperature viscosity

1. SCOPE

This SAE Recommended Practice is intended to provide basic recommended practices for aid in the development and use of safe and efficient practices for all operations involving the production, handling, and dispensing of SAE J1703 Motor Vehicle Brake Fluids and SAE J1704 Borate Ester Based Brake Fluids.

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2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue of SAE publications shall apply.

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

SAE J75 Motor Vehicle Brake Fluid Container Compatibility

SAE J1703 Motor Vehicle Brake Fluid

SAE J1704 Borate Ester Based Brake Fluids

SAE J1707 Service Maintenance of SAE J1703 and SAE J1704 Brake Fluids in Motor Vehicle Brake Systems

3. CONTAMINATION

SAE J1703 and SAE J1704 brake fluids are susceptible to various types of contamination which can be detrimental to the safe and efficient performance of brake actuating systems.

3.1 Water Contamination

SAE J1703 and SAE J1704 brake fluids are hygroscopic and absorb moisture when exposed to the atmosphere. The degree of moisture absorption is dependent upon a number of variables. Among these are the relative hygroscopicity of the brake fluid, the area of the surface exposed to the atmosphere, the time of exposure, and the temperature and relative humidity of the atmosphere. Water contamination can also occur from condensation resulting from atmospheric temperature changes or the mechanical entrance of the free water. This water contamination will lower the Equilibrium Reflux Boiling Point (ERBP) (see Figure 1) and increase the Low Temperature Viscosity (see Figure 2) and impact inhibition of corrosion and elastomer compatibility performance.

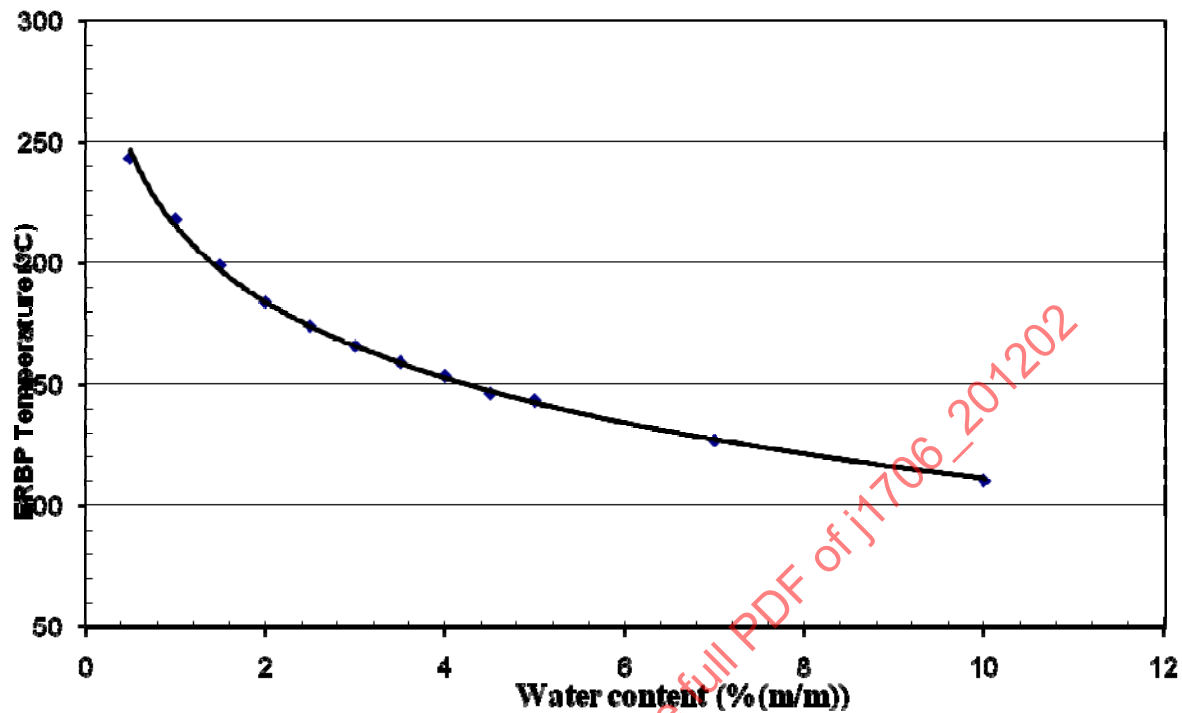
Equilibrium Reflux Boiling Point (ERBP) Performance of RM-66-06 brake fluid versus Water content

FIGURE 1 - EQUILIBRIUM REFLUX BOILING POINT

Experimental Design**I. Equilibrium Reflux Boiling Point (ERBP): Performance of RM-66-06 brake fluid versus Water content**

Various amounts of water were added to RM-66-06 brake fluid. The composition of this brake fluid is a blend of six proprietary brake fluids shown in the SAE J1703 and SAE J1704 standards. The Equilibrium Reflux Boiling Point (ERBP) temperature on each sample was determined by the method described in the SAE J1703 standard. ERBP temperature values were plotted graphically versus Water content. All work was performed by ABIC Testing Laboratories, Inc.

The actual ERBP values and water contents are shown below.

% Water	ERBP (°C)
0.50	243
1.00	218
1.50	199
2.00	184
2.50	174
3.00	166
3.50	159
4.00	153
4.50	146
5.00	143
7.00	127
10.00	110

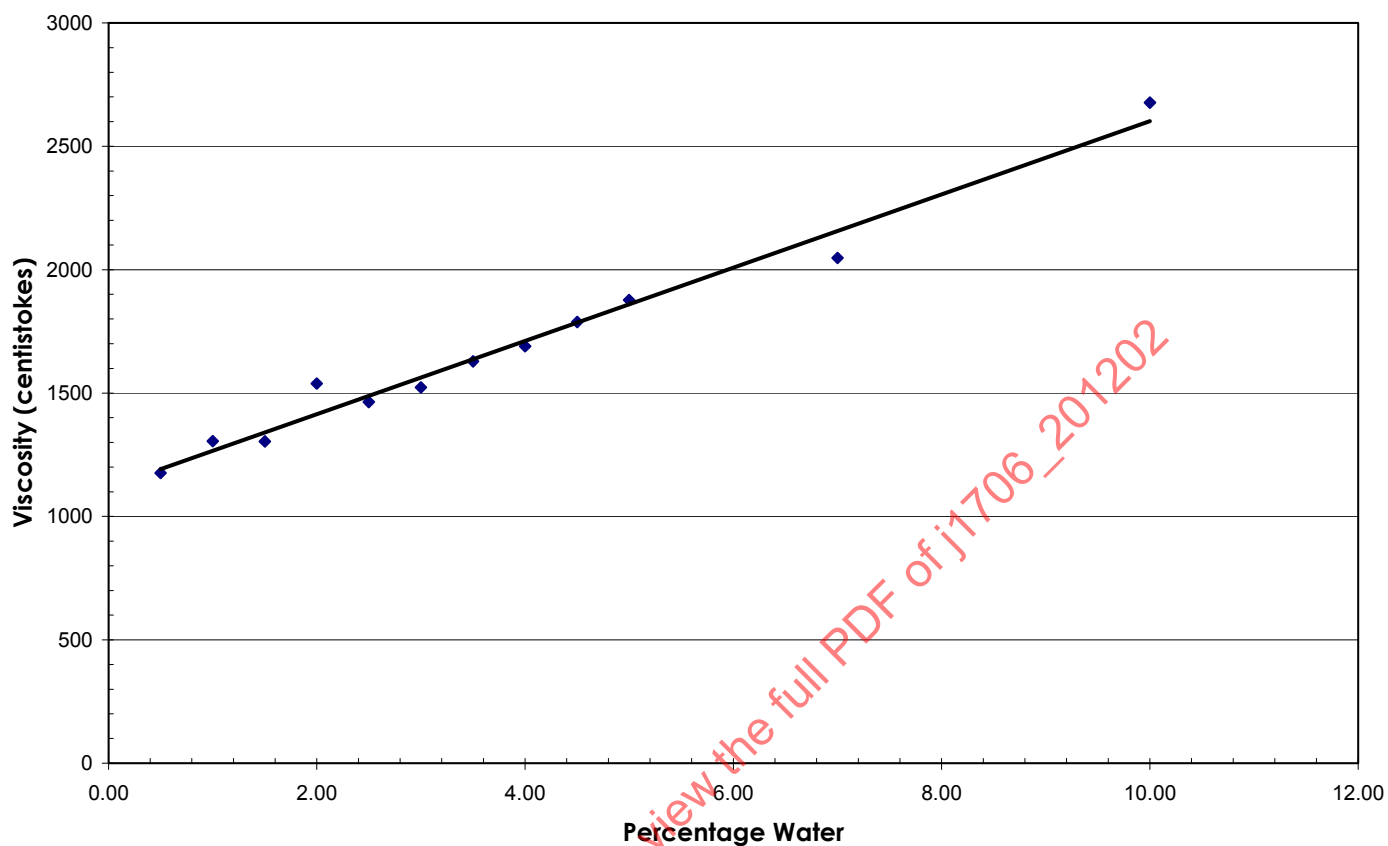
SAE RM-66-06 Brake Fluid Viscosity at -40C(F) versus Percent Water Content

FIGURE 2 - LOW TEMPERATURE VISCOSITY

Experimental Design**II. Kinematic Viscosity: Performance of RM-66-06 brake fluid versus Water content**

Various amounts of water were added to RM-66-06 brake fluid. The composition of this brake fluid is a blend of six proprietary brake fluids shown in the SAE J1703 and SAE J1704 standards. The Kinematic Viscosity on each sample was determined by the method described in the SAE J1703 standard. Viscosity values were plotted graphically versus Water content. All work was performed by ABIC Testing Laboratories, Inc.

The actual viscosity values and water contents are shown below.

Viscosity	
% Water	(mm²/s)
0.50	1176
1.00	1305
1.50	1304
2.00	1538
2.50	1464
3.00	1523
3.50	1628
4.00	1690
4.50	1788
5.00	1877
7.00	2047
10.00	2677

3.2 Contamination with Petroleum Products

Since motor vehicle brake fluids are handled and dispensed under conditions where contamination with petroleum products can occur, specific precautions must be taken to prevent contamination. Motor vehicle brake fluids contaminated by petroleum products will cause excessive swelling and softening of brake system rubber parts, resulting in brake system failure.

3.3 Particle Contamination

Specific precautions must be taken to prevent contamination of motor vehicle brake fluids with particles or solid material of any sort which could interfere with the proper operation of the braking system components. In particular, abrasive particles will cause scuffing and wear of the pistons and cylinders and can damage the elastomer seal materials.

4. RECOMMENDATIONS

4.1 Material Control - Raw Materials

- Material specifications should be established for all ingredients of the brake fluid formulation.
- Purchase specifications should include required chemical and physical tests to be performed on each lot of material.
- Inbound inspection and testing requirements are to be identified with pass and fail limits.
- Certificate of Analysis to be forwarded before or with each delivery.
- Inbound receipts are to be quarantined until inbound testing and / or review of Certificate of Analysis is completed and product is approved for production.
- Chemical and physical tests may be required to ensure that specifications are met.
- Finished product reports should report lot numbers of each component.