

Seals—Bond Test Fixture and Procedure

Foreword—If the actual environment of a bonded radial lip seal is examined, the following facts become clear:

With few exceptions, the greatest stress that most radial lip seals experience is the physical installation into the application.

Once the seal is installed, other minor stresses to the bond are elastomer oil swell, differential thermal expansion between elastomer and metal, torque imparted by shaft rotation, shaft dynamics, and system pressures less than 275 kPa.

Certain applications such as medium to high pressure (690 to 12 400 kPa) power steering seals as well as bonded clutch and servo pistons do require an extremely high quality bond.

1. **Scope**—Bond, as it relates to elastomeric seals, is defined as “The adhesion, established by vulcanization, between two cured elastomeric surfaces, or between one cured elastomeric surface and one nonelastomeric surface.”¹ Vulcanization refers in this case to chemical bonding. Good bond is essential to the function of elastomeric radial lip seals and other precision bonded parts.

This SAE Recommended Practice describes a universal bond test fixture developed by the RMA that can be mounted to a conventional tensile test machine. This will allow a quantitative evaluation of bond rather than a merely qualitative one.

2. References

- 2.1 **Applicable Publication**—The following publication forms 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 PUBLICATION—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

SAE J111—Terminology of Radial Lip Seals

1. SAE J111 Terminology of Radial Lip Seals

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3. *Bond Test Fixture Design*

3.1 Objective—The primary objective was to develop a test fixture and procedure with the following qualities:

- 3.1.1 **UNIVERSAL**—Develop a fixture for bond evaluation that does not require special tooling for each part size to be evaluated.
- 3.1.2 **QUANTITATIVE EVALUATION**—The past method was qualitative. The equipment and procedure must provide numbers to eliminate operator judgment.
- 3.1.3 **REPEATABLE**—The fixture and procedure must be capable of producing repeatable results. This is essential to the long-term tracking of bond quality.

3.2 Description—Figures 1 through 5 are illustrations of the fixture developed based upon the objectives in 3.1. Drawings of the fixtures and components are included in the Appendix of this document. The fixture is designed to be used with standard tensile test equipment.

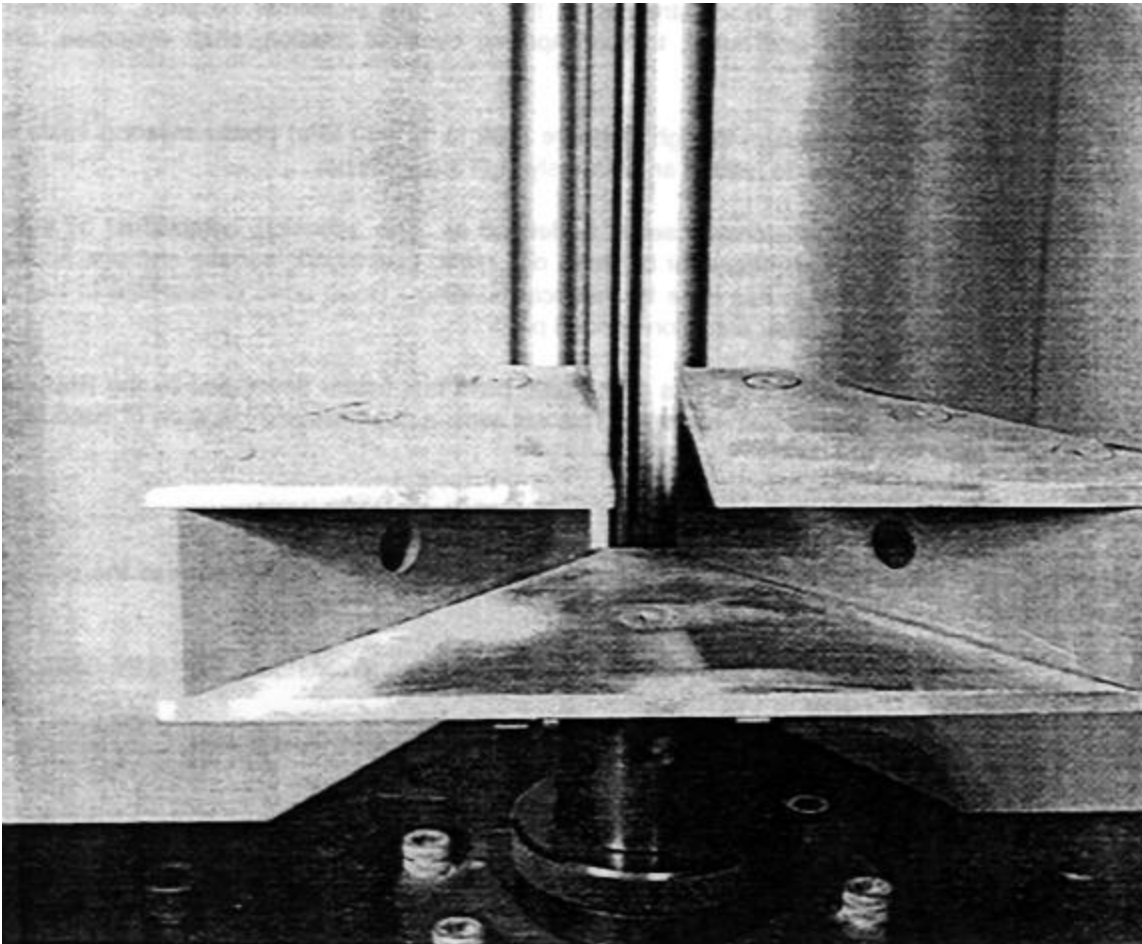


FIGURE 1—UNIVERSAL LOWER FIXTURE



FIGURE 2—JAWS FOR AIR CHUCK CLAMP—PARTIALLY INSTALLED (UPPER FIXTURE)

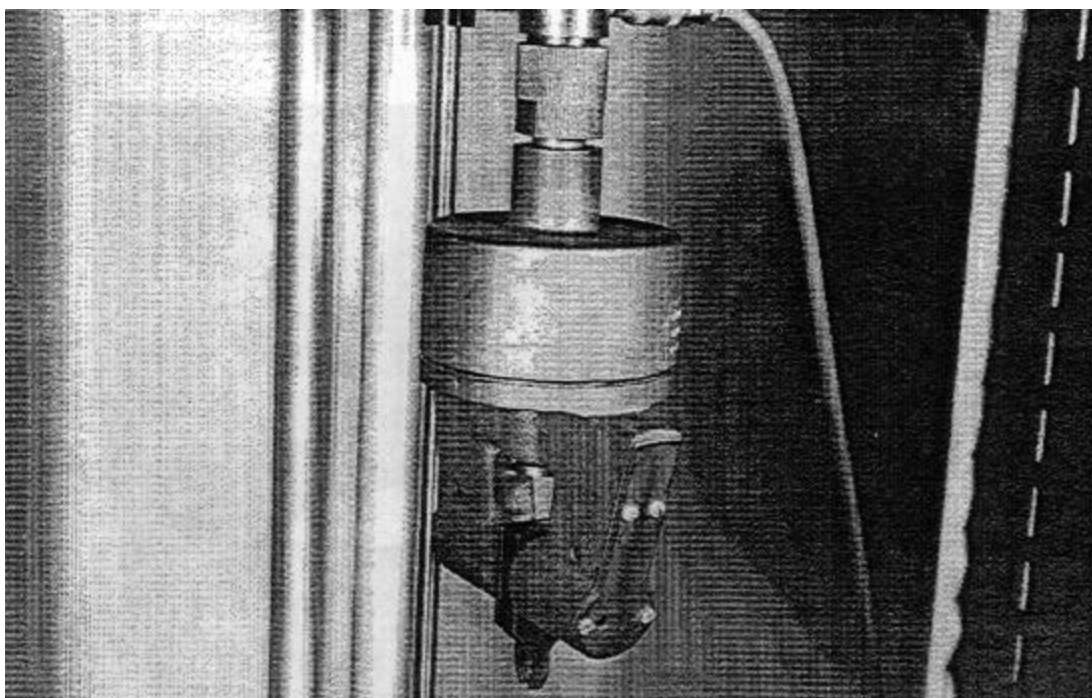


FIGURE 3—AIR CHUCK CLAMP (UPPER FIXTURE)

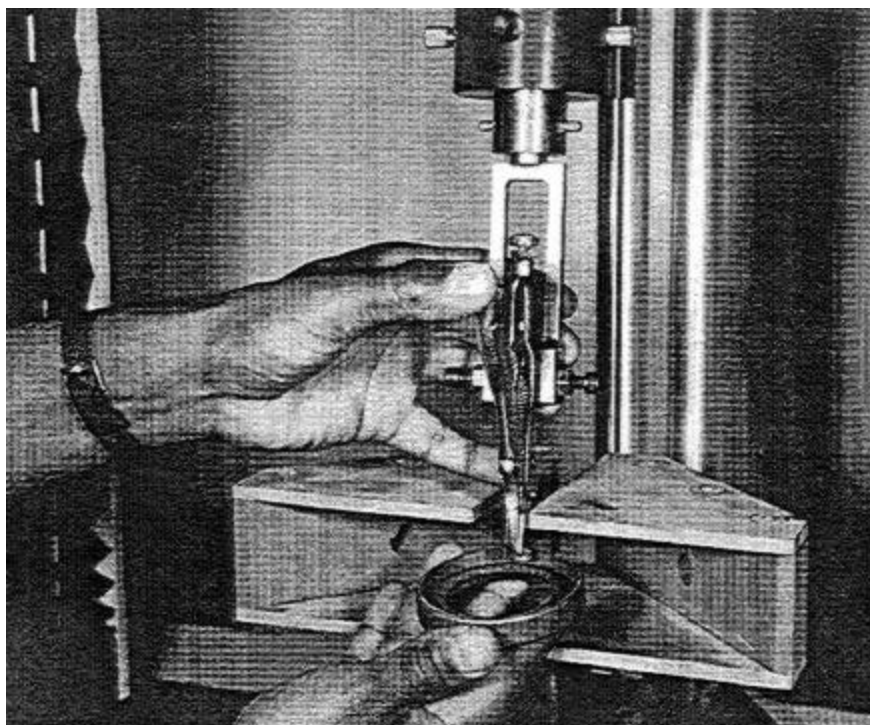


FIGURE 4—MECHANICAL CLAMP ALTERNATIVE (UPPER FIXTURE)

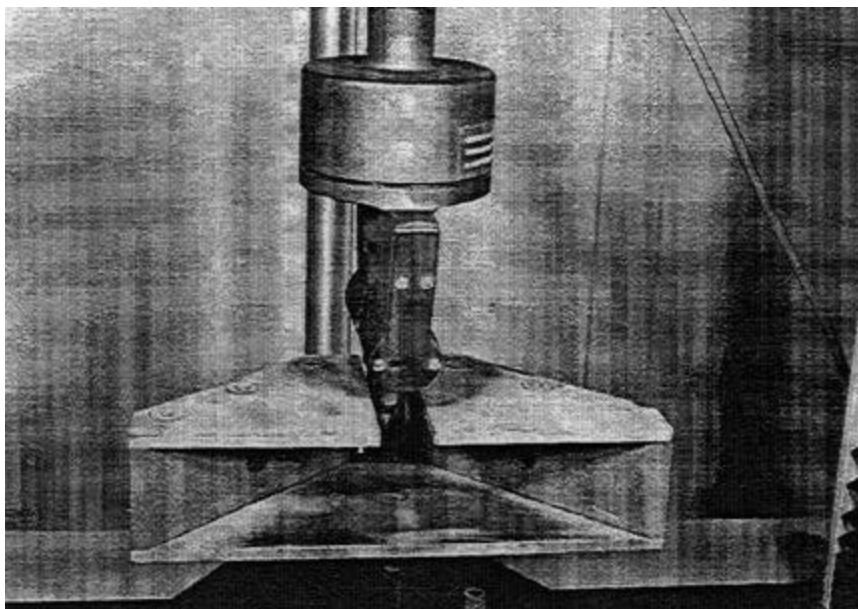


FIGURE 5—UPPER FIXTURE JAWS—EXTENDED WELL INTO LOWER FIXTURE