Choosing Crack Seal Material

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The Topics

- 1). Terminology and Definitions
- 2). ASTM & ASHTO Tests
- 3). Why So Many Sealants
- 4). Choosing a Sealant

D 6690 TYPE I

TEST	SPEC. LIMITS
Cone Penetration @77F	90 Max.
Softening Point	176 Deg F (80C) Min.
Bond 0 F (-18C)	Pass 5 Cycles
50% Extensions	
Asphalt Capability	Pass

D 6690 TYPE II

TEST	SPEC. LIMITS
Cone Penetration @77f	90 Max.
Softening Point	176 Deg. F (80C) Min.
Resilience	60% Min.
Bond -20F (29C)	Pass 3 Cycles
50% Extension	
Asphalt Compatibility	Pass

SPECIFICATION TERMINOLOGY

- Cone Penetration
- Flow
- Bond
- Resilience
- Ductility
- Softening Point
- Viscosity
- Flexibility

LAB MELTER

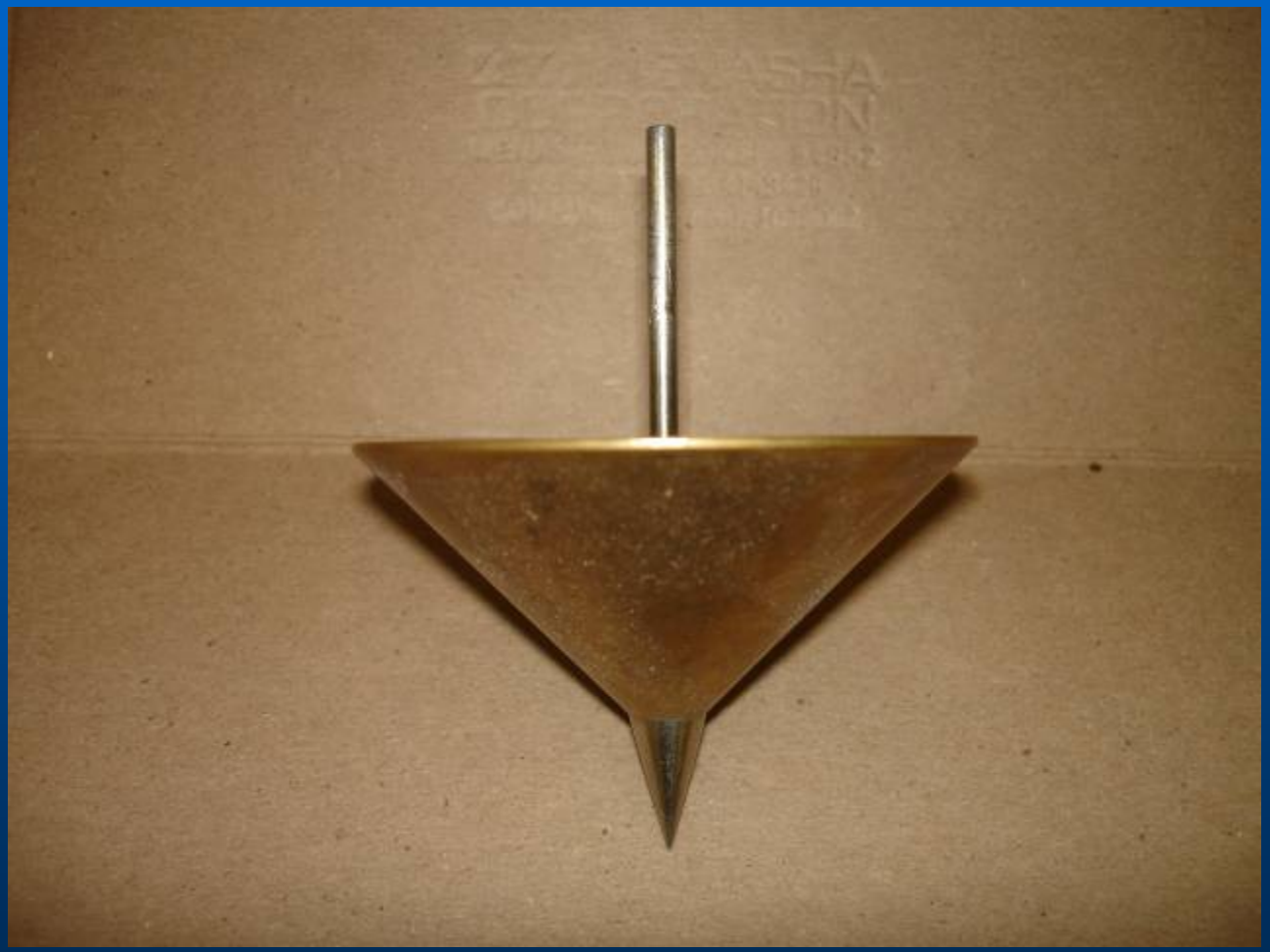
Conditioning Bath

Test Methods – Cone Penetration

A lab test using a cone device pressing into a sample of the crack sealer product. It is an indication of the softness or hardness of the material after it is cured at the given temperature of the test. The higher the penetration, (example: 90 maximum), the softer the material is upon curing. A lower penetration (example: 45 maximum), is harder, or stiffer, and is good for wider cracks and foot-traffic areas and warmer climates.

Penetration Needle For Asphalt

Penetration Cone For Sealants



Cone Penetration

Test Methods – Flow

A lab test where a sample of the material is placed on a metal plate and placed at an angle of 75 degrees in an oven at 140 degrees F for at least 5 hours. It is a good determining factor to avoid tracking of the material. The requirements for different crack sealer materials usually range from 0 mm flow, or movement, up to an allowance of 10 mm.

FLOW TEST

Flow

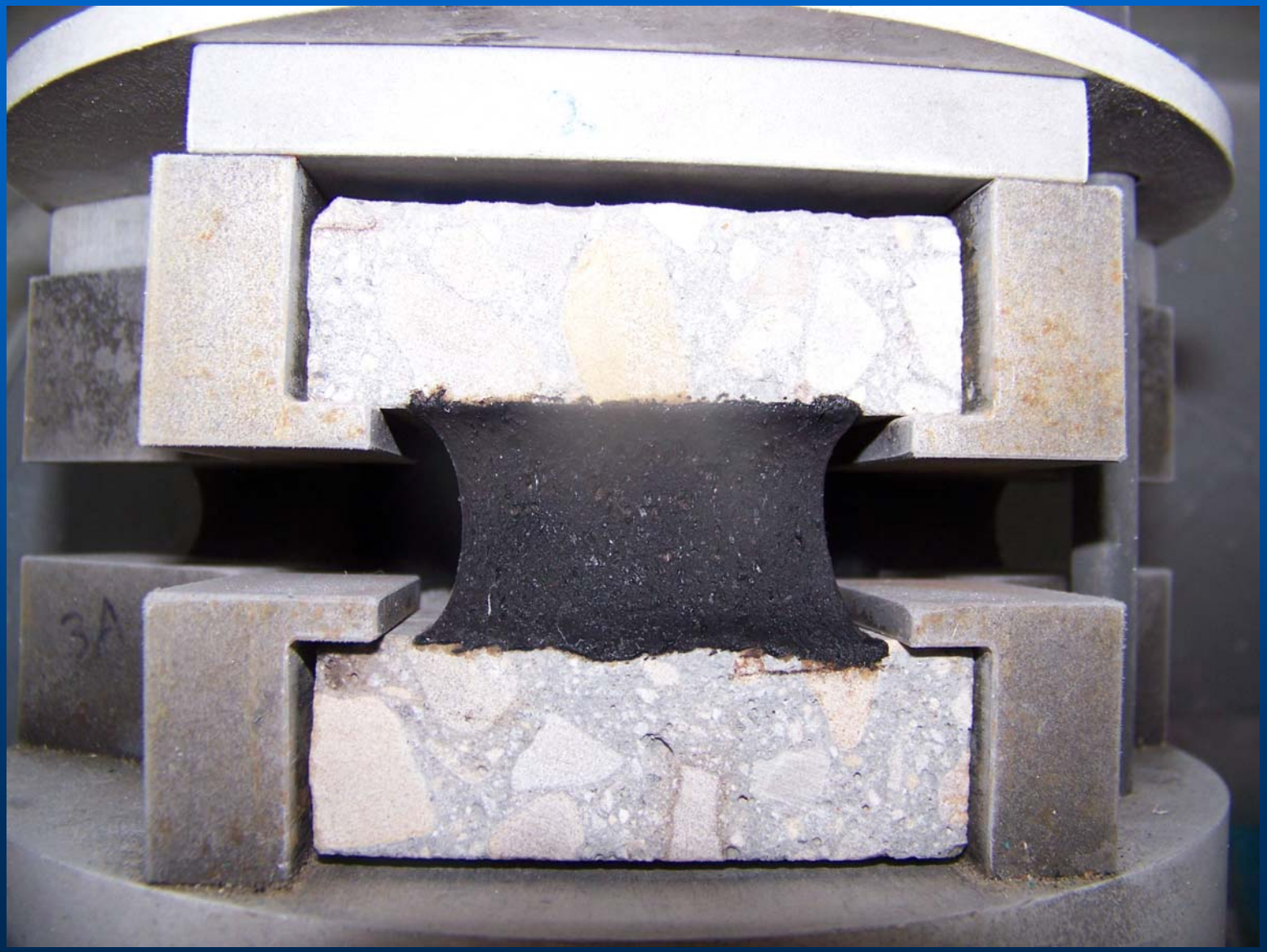
Test Methods – Bond

A lab test where a sample of material that is about 2 x 3 inches in size is placed between two small cement blocks and is then conditioned to a temperature of from 10 degrees F down to -40 degrees F, depending on the requirements of the test being run, and is then slowly stretched at a controlled rate per minute to a distance of from 50% up to 200% extension, depending on the requirements of the test being run. It is then allowed to return to its original form. For example, a test requiring a 100% extension would be a specimen of material that is ½ inch thick stretched to a distance of one inch. The test is usually performed from 3 to 5 times, or “cycles”. The bond test is a good indicator of how adhesive the material will be under different climatic temperatures and conditions.

BOND TEST

Bond

Bond



Test Methods – Resilience

A lab test where the material is compressed and then allowed to go back to its original position. It indicates the ability of the material to retain its form. For concrete joint sealing, resilience can be used to determine a sealant's ability to keep incompressible materials out of the joint.

Penetration Ball
For Resiliency Test

Resilience

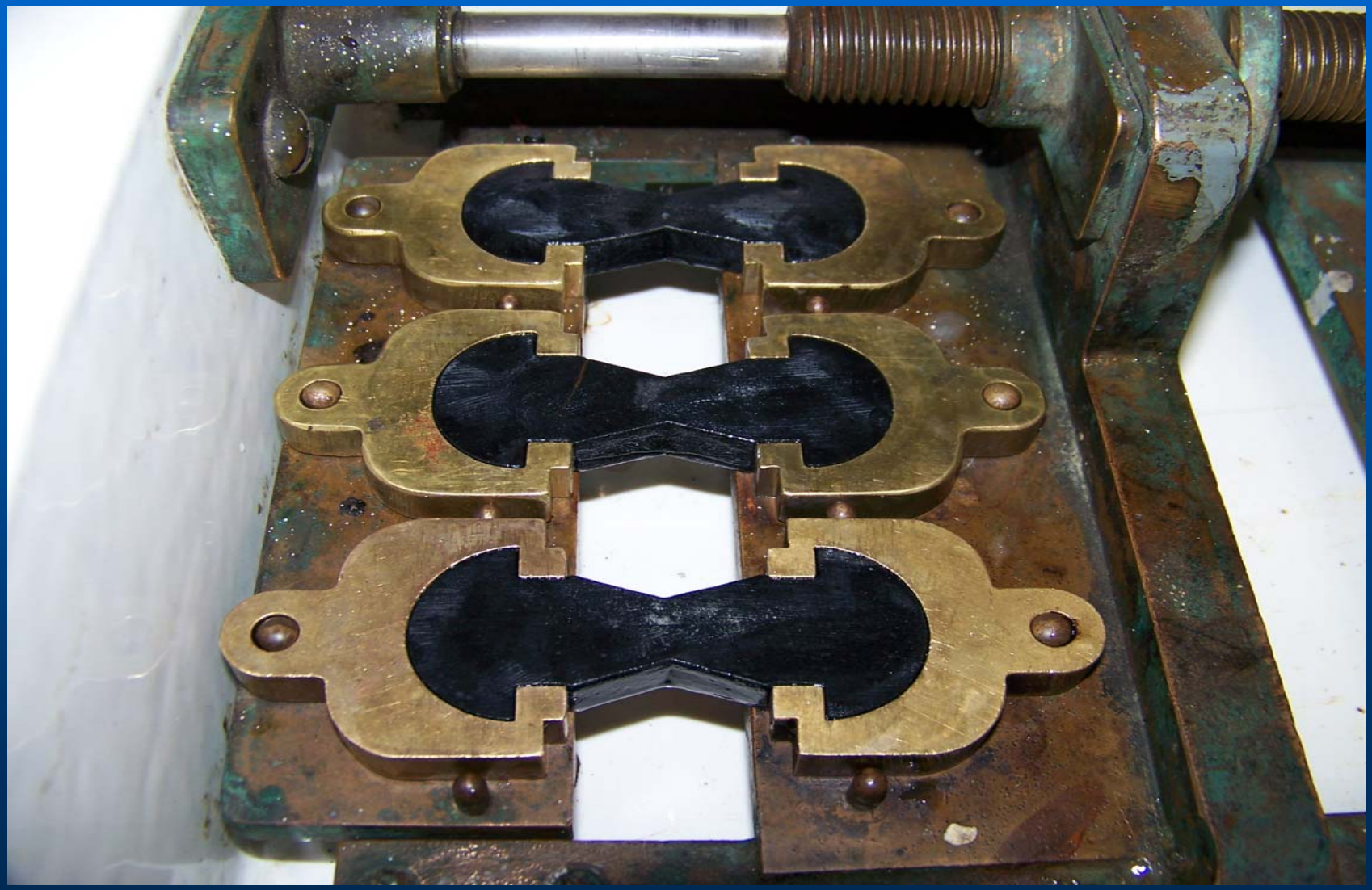
Resilience

Resilience

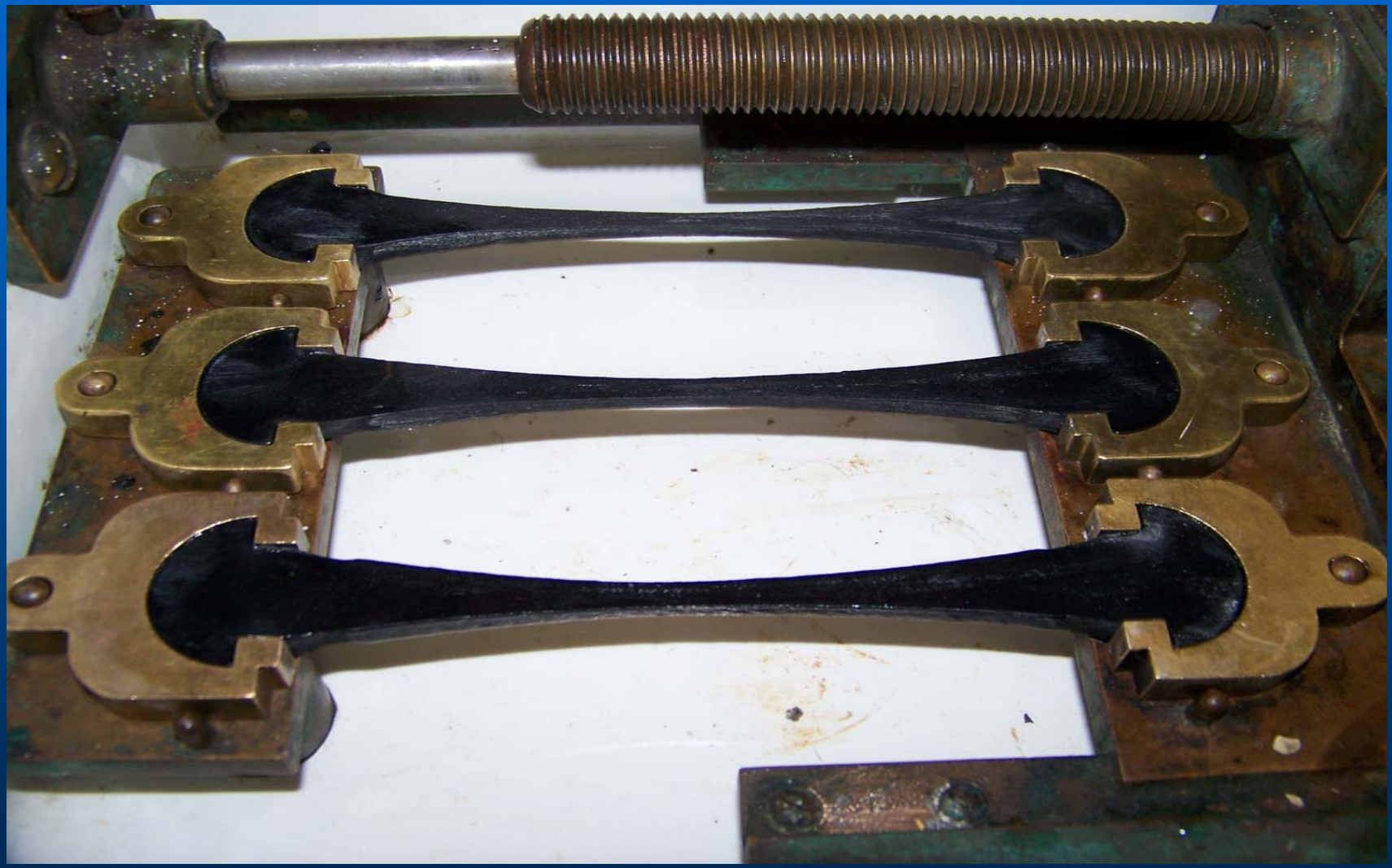
Test Methods – Ductility

A lab test that stretches the sample of material at a controlled distance per minute and at a controlled temperature. It indicates the elasticity, or stretching properties of the material and helps determine the cohesive properties of the material.

Ductility



Ductility

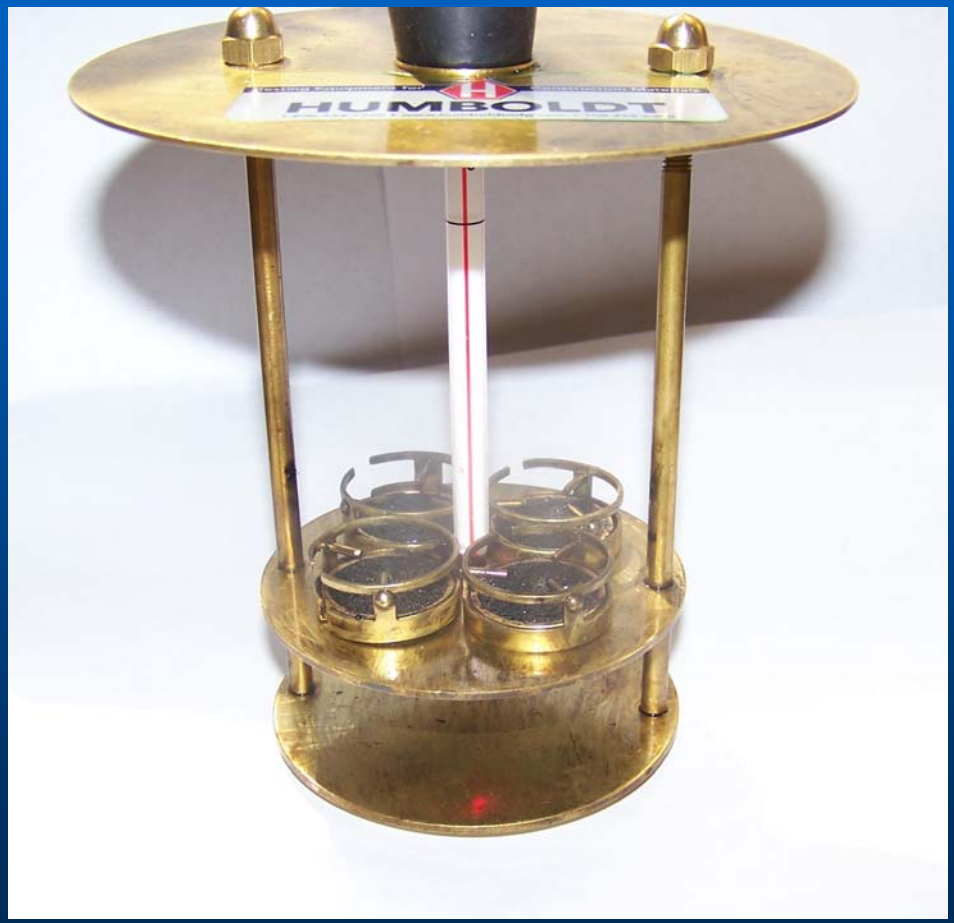


Ductility

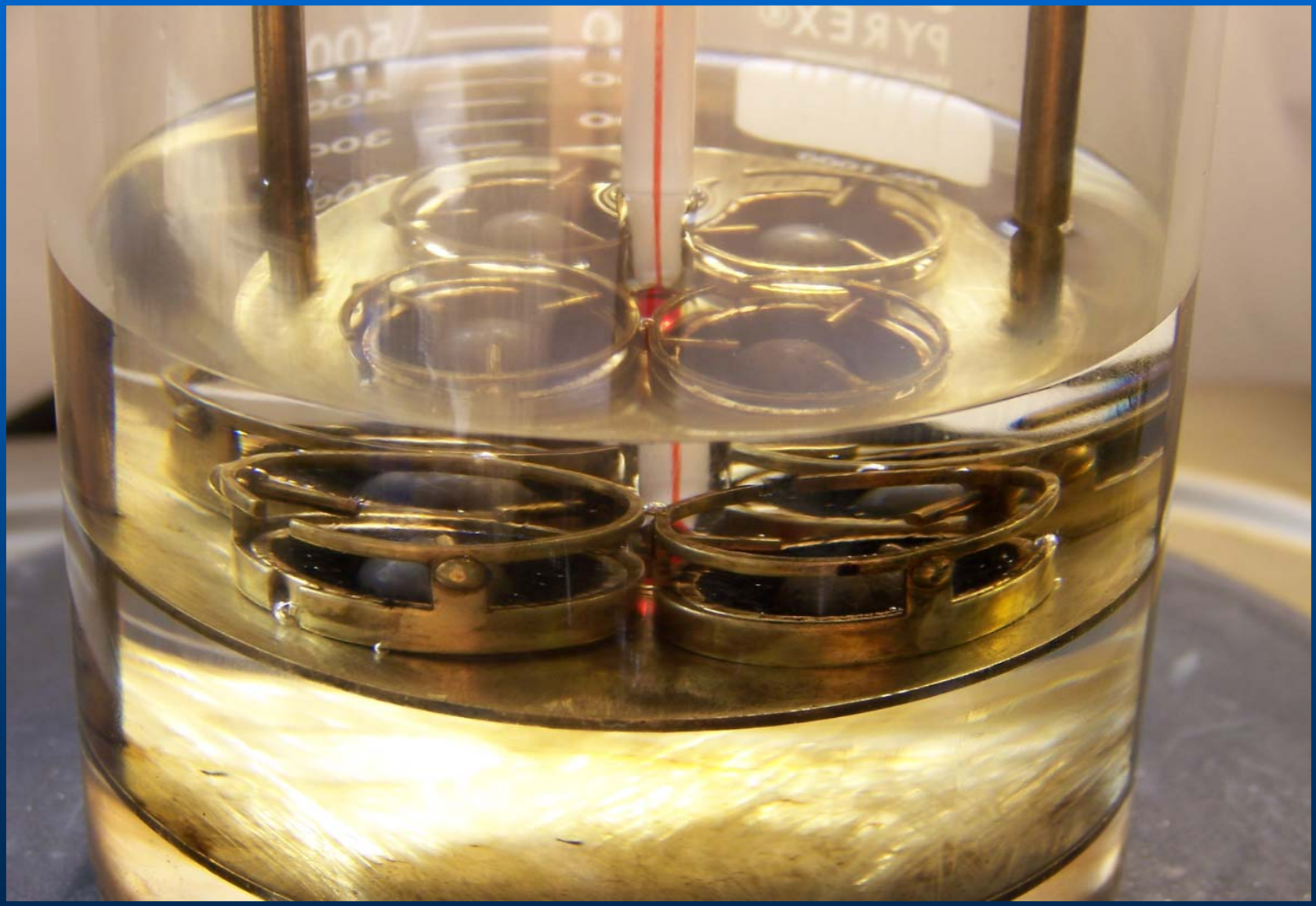
Test Methods – Softening Point

A lab test that is sometimes referred to as the "ring and ball" test. A ring is filled with material and a steel ball is placed on top of it. The controlled temperature is gradually raised until the ball falls through the crack sealer material. This test is a good determination of how the material will perform at different climatic temperatures. The higher the temperature reached in the testing procedure, the better the material should perform for higher climatic temperatures.

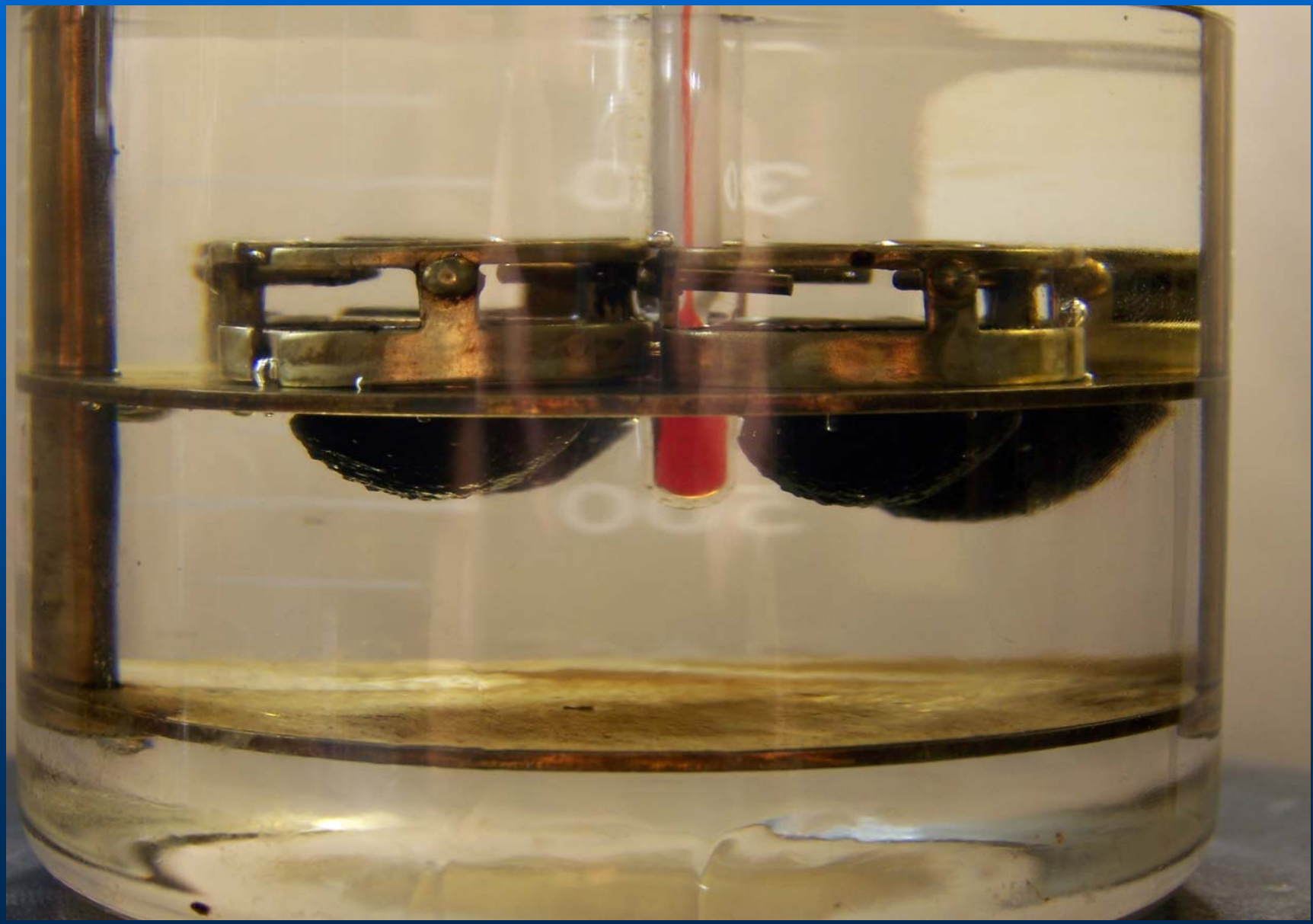
Softening Point



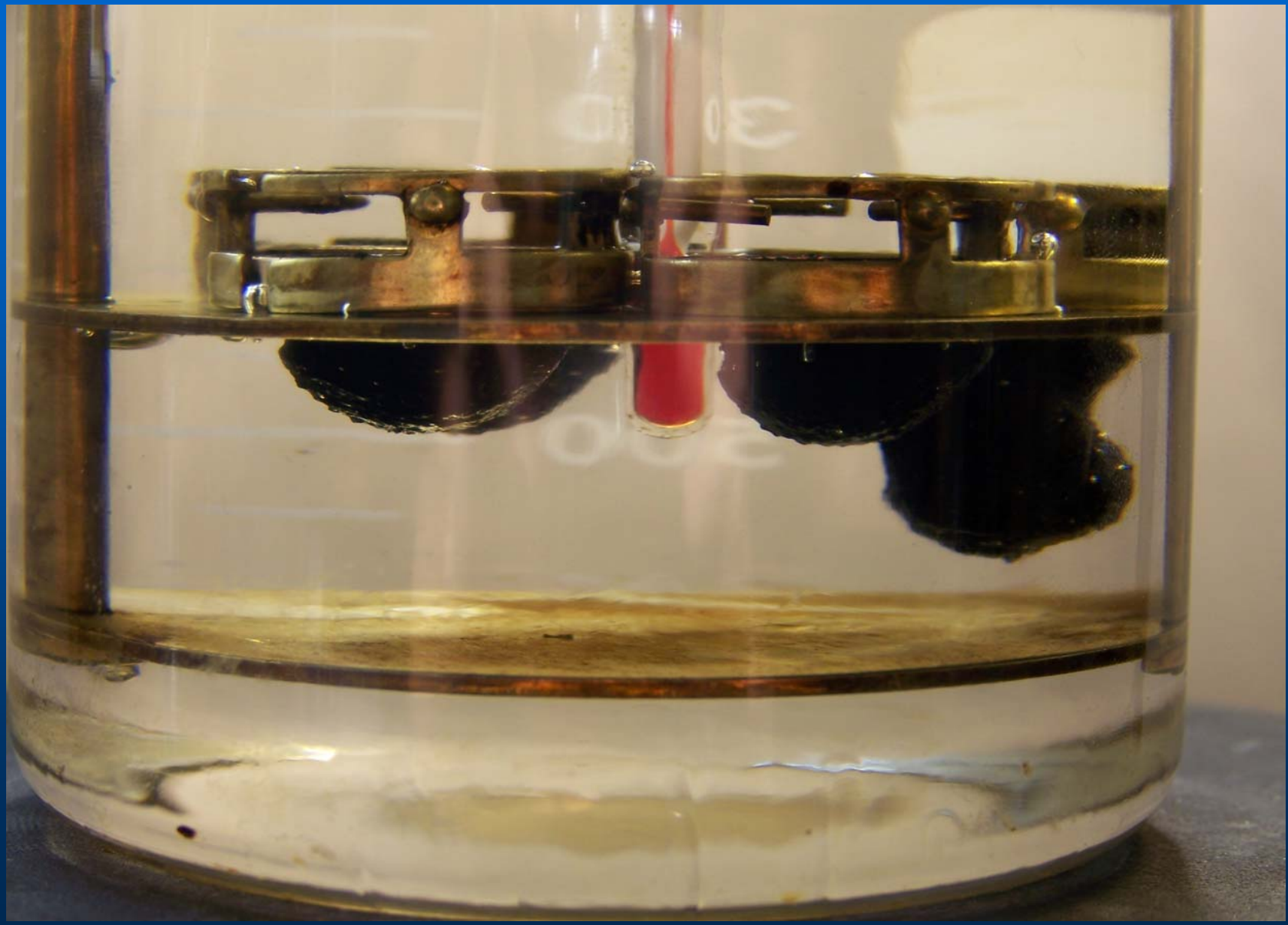
Softening Point



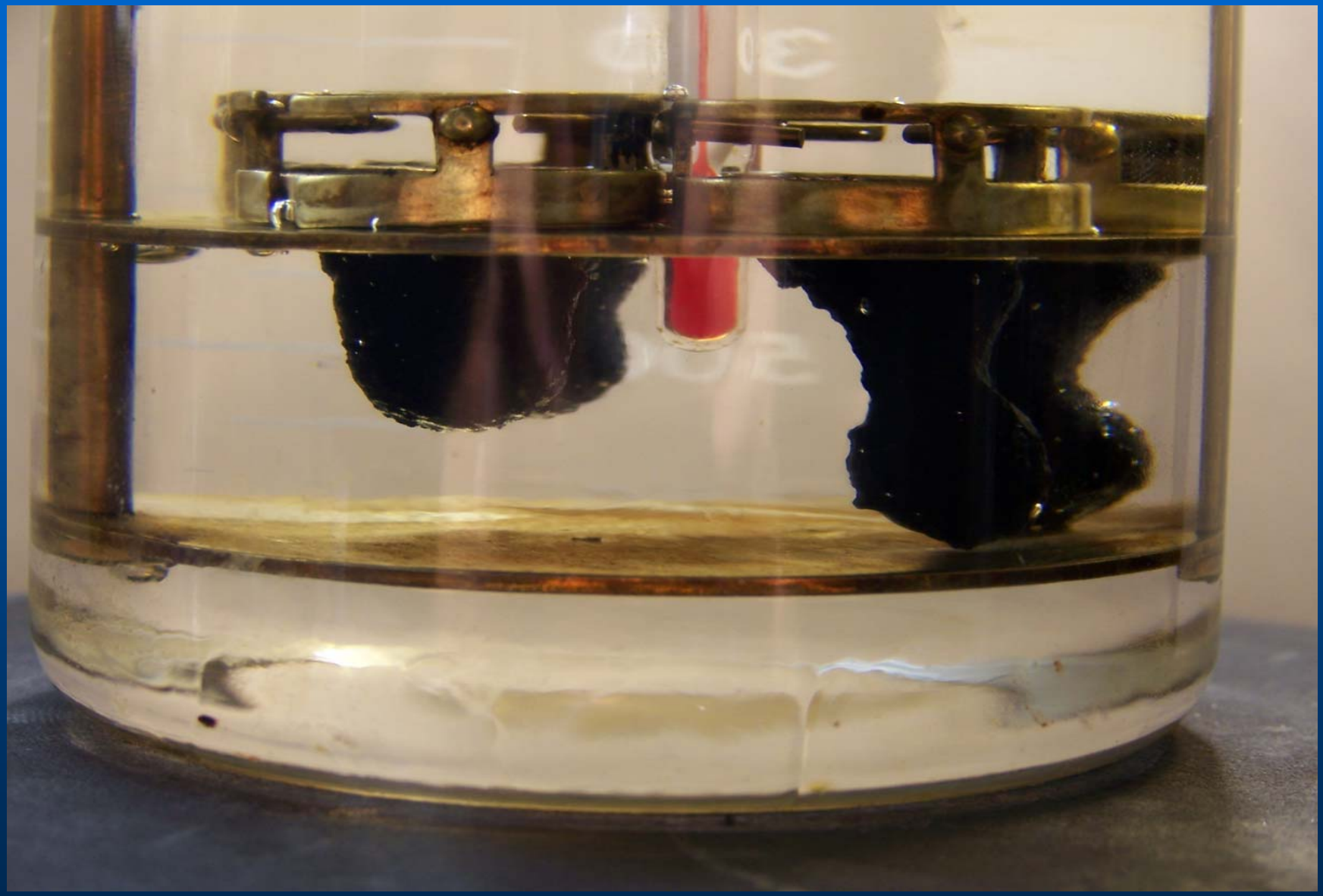
Softening Point



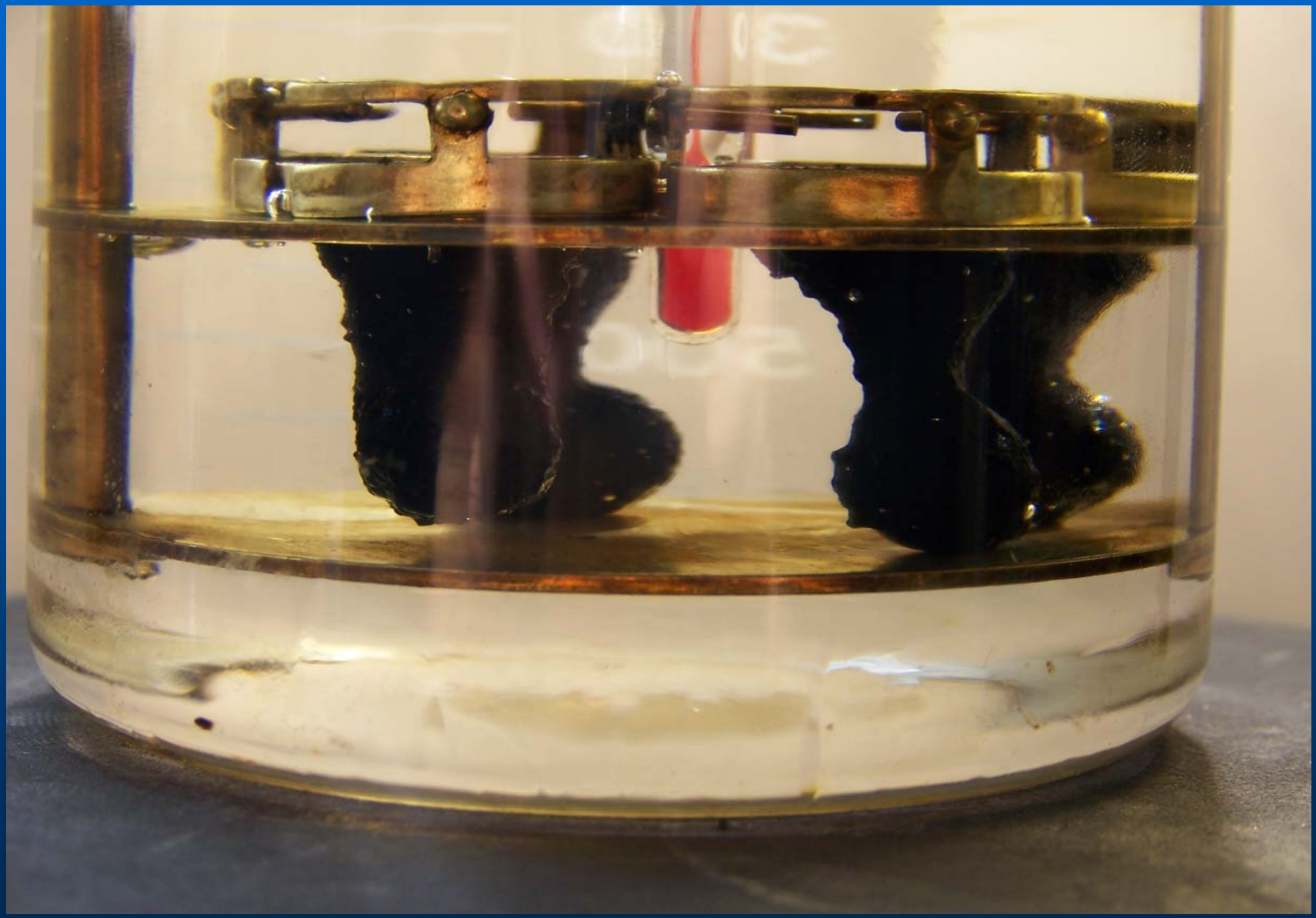
Softening Point



Softening Point



Softening Point



Test Methods – Viscosity

A lab test that helps determine how thick, or viscous the material is. It helps determine how the material flows at application temperature.

VISCOSITY TEST

Test Methods – Flexibility

A lab test bending a specimen of material to an angle of 90 degrees over a 1 inch mandrel, or rod. The material is usually conditioned to a temperature ranging from 10 degrees F down to -40 degrees F, depending on the requirement of the test being run. The material is bent at a controlled amount of time, usually from 2 seconds to up to 10 seconds. Normally, the longer the time is to bend the material, the less flexible the material is; and the lower the temperature at which the material passes, the more flexible it is. Lower climatic temperature ranges usually need a more flexible material.

Test Methods – Flexibility

SESSION 2

The Specs.

By: Greg Sharp

Crafco, Inc.

ASTM

American Society for Testing and Materials

AASHTO

American Association of State Highway and Transportation Officials

2 TYPES CRACK SEAL BUYERS

How Many Engineers?

Engineers tend to ask questions regarding specifications.

They tend to want to know about tests.

They want to know about all the terminology.

- Non Engineers tend to have their eyes glaze over with too many specifics.
- They tend to be more interested in how fast will the material set up on the street. How quickly can we get traffic back on the road.
- How much does it cost so we know how much our budget will allow us to buy.
- Will it still be there over time.

ASTM
5 specifications for Crack Seal

- ASTM D 5078
- ASTM D 6690 Type I
- ASTM D 6690 Type II
- ASTM D 6690 Type III
- ASTM D 6690 Type IV

D 5078

TEST	SPEC. LIMITS
Cone Penetration @ 77 F	70 Max.
Cone Penetration @ 39 F	39 Max.
Softening Point	150 Min.
Resiliency	30% Min.

D 6690 TYPE I

TEST	SPEC. LIMITS
Cone Penetration @77F	90 Max.
Softening Point	176 Deg F (80C) Min.
Bond 0 F (-18C)	Pass 5 Cycles
50% Extensions	
Asphalt Capability	Pass

D 6690 TYPE II

TEST	SPEC. LIMITS
Cone Penetration @77f	90 Max.
Softening Point	176 Deg. F (80C) Min.
Resilience	60% Min.
Bond -20F (29C)	Pass 3 Cycles
50% Extension	
Asphalt Compatibility	Pass

D 6690 TYPE III

TEST	SPEC. LIMITS
Cone Penetration @77F	90 Max.
Softening Point	176 Deg. F (80C) Min.
Resilience	60% Min.
Aged Resilience	60% Min.
Bond -20F (-29C) 50% Extension	Pass 3 Cycles
Immersed Bond	Pass 3 Cycles
Asphalt Compatibility	Pass

D 6690 TYPE IV

TEST	SPEC. LIMITS
Cone Penetration @77f	90-150 Max.
Softening Point	176 Deg F. (80C) Min.
Resilience @ 77 F (25 C)	60% Min.
Bond @ -20 F (29 C) 200% Extension	Pass 3 Cycles
Asphalt Compatibility	Pass

SESSION 3

Why So Many Different Sealants?

A Practical Guide To Choosing The Right Sealant.

By: Royal Ingebretsen
Special Asphalt Products

Cal Trans 5 Regions

- Cal Trans has defined 5 climate zones for the state.
- Each zone (region) requires a different sealant.
- Cal Trans developed their own specs for each zone, each spec was different from our current products slightly.
- This created 5 new part numbers.
- Other states have done similar.

- Difference between Joint Sealant and Crack Sealants.
- Specs can be identical except resilience number. (For example)

  Joint Sealants tend to have high resiliency

  Crack Sealants tend to have lower resiliency.

I----------Sealant Chart----------I

I-----A------I------B-----I----C------I

3 Different Sealant Ranges

A= Less than 60 Cone Penetration

B= 60 to 90 Cone Penetration

C= Above 90 Cone Penetration

Characteristics of Family A:

NOT SUITED FOR COLDER CLIMATES

Low Cone Penetration 10-50 (Stiffer).

High Softening Point 200 Deg F and Above.

Lower flexibility numbers.

Less chance of tracking. Quick Setting

Better suited for PG grades of 64-10 C and above and only for over band crack filling and not crack sealing.

Characteristics of Family B:

Medium cone penetration numbers 60-90. Sealants in the 60 – 75 range still very good over band crack fill products, even in cold climates.

Softening Points of between 176 to 200 Deg. F.

Still are not likely to track. Still set relatively quick.

They can have very good flexibility numbers.

They perform best up to 70 Deg. C on the high side to -28 Deg. C on the low side as a crack fill and -10 as a crack sealer.

Characteristics of Family C:

- High Cone Penetration numbers. Usually designed to be between 130 to 150 to meet Type IV specs.
- Low Softening point.
- Very high flexibility numbers.
- Made to pass extreme bond tests.
- Performs best at low high number and very low low number. 64-40 as a crack sealer and not shown as a filler.

- RUBBERIZED ASPHALT CRACK SEALANT- PREMIUM GRADE
- The product proposed shall meet the following requirements as specified. Each load upon delivery shall have a certificate of compliance. Winning bid prior to contract award shall submit an independent certified laboratory analysis of the below specifications.
- The product proposed shall conform to the following specifications:

TEST REQUIREMENTS	TEST PROCEDURE	TEST RESULTS
Cone penetration @ 77 deg. F	ASTM D5329	75 dmm Max.
Cone Penetration @ 122 deg. F	ASTM D5329	120 dmm Max.
Elongation @ 0 deg. F	ASTM D412	500% Min.
Elongation @ 77 deg. F	ASTM D412	1000% Min.
Flexibility 90 deg. Bend 1" mandrel, Min. 2 sec. test/sample 1/8" max.	ASTM D3111	Pass at – 20 Deg. F
Resilience	ASTM D5329	50% Min
Softening Point	ASTM D36	210 Deg F. Min.
Flash Point c.o.c.	ASTM D92	Min. 450 Deg. F
Weight per gallon at 380 deg F	ASTM D70	8.5 lbs/gal. Max.
Application Temperature Per Manufacture Recommendation		380 deg. F to 400 deg. F
Curing Time	Non-Tracking to moving traffic	60 minutes Max.