

**State of Nevada
Department of Transportation
Materials Division**

METHOD OF TEST FOR STABILOMETER VALUE OF BITUMINOUS PAVING MIXTURES

SCOPE

This method covers the procedure for determining the stabilometer value (stability) of a bituminous mixture by measuring the transmitted horizontal pressure that is developed in a compacted test specimen under a given vertical pressure. This indicates the relative ability of the pavement to resist plastic deformation under the action of traffic.

PART I. PREPARATION OF MATERIALS FOR STABILOMETER TEST

A. APPARATUS

1. Drying and preheating ovens capable of maintaining temperatures up to 350°F (177°C), with forced air circulation.
2. Balance, 11 kg capacity, accurate to ± 0.1 g.
3. Sieves, U.S. Standard, sizes 1 in. (25.0 mm), 3/4 in. (19.0 mm), 1/2 in. (12.5 mm), 3/8 in. (9.5 mm), Nos. 4 (4.75 mm), 10 (2.0 mm), 16 (1.18 mm), 40 (425 μm), 50 (300 μm), 100 (150 μm) and 200 (75 μm).
4. Sample splitter for aggregates and / or bituminous mixtures, riffle type.
5. Pans, 16 in. (406 mm) x 17 in. (432 mm) x 2 in. (51 mm) deep.
6. Pans, 11 in. (279 mm) x 7 in. (178 mm) x 1 in. (25 mm) deep.
7. Pans, 10 in. (254 mm) x 6 in. (152 mm) x 3 in. (76 mm) deep.
8. Pans, 9 in. (229 mm) diameter x 3 in. (76 mm) deep.
9. Thermometers, 100°F (38°C) to 400°F (204°C).
10. Metal scoop.
11. Graduated cylinder, 100 mL.
12. Metal containers, 6 oz. (177 mL) covered cylindrical seamless, with an approximate diameter of 2 3/4 in. (70 mm) and depth of 1 7/8 in. (48 mm).
13. Spatulas, 10 1/2 in. (267 mm) x 1 in. (25 mm).

14. Mechanical mixing machine(s).
15. Gloves, insulated and heavy cotton.
16. Stopwatches / timers.
17. Plastic containers with lids, 6 1/2 in. (165 mm) diameter x 4 in. (102 mm) deep.

B. CONTROL

1. Maximum mixing temperatures for mixtures using paving grade asphalts shall be 350°F (177°C).

Maximum mixing temperatures for mixtures using liquid asphalts shall be in accordance with Section 401.02.02 of the Standard Specifications.

The temperature of the aggregate at the time of mixing shall be the same as the utilized asphalt temperature.

2. For mixtures that will not be mixed in a hotplant during construction, the temperature of the aggregate at the time of mixing shall be room temperature, $77 \pm 9^\circ\text{F}$ ($25 \pm 5^\circ\text{C}$).

C. PREPARATION OF AGGREGATE SAMPLES

1. Initial preparation of aggregate samples, including such phases as sieve separation, weighing, removing of aggregate coatings, breaking down of soil lumps, and reducing down to test sample size, shall be performed as specified in Test Method Nev. T203.
2. Samples submitted for aggregate tests consist of the following:
 - a. Bin or windrow.
 - b. Stockpile.
 - c. Pit or quarry.
3. The following methods shall be used in preparing the materials for testing:

- a. Aggregate samples from bins or windrows:

These samples represent aggregates after all processing has been completed just prior to the addition of bitumen. Thus, these samples shall be tested in as near the as-received condition as possible.

- b. Aggregate samples from stockpiles:

Stockpile samples shall be treated in the same manner as bin samples, provided there is no further processing in the field prior to addition of bitumen.

c. Aggregates from pits or quarries:

Pit or quarry preliminary samples are processed in various manners. Normally, the sampler will furnish instructions as to whether oversize is to be crushed or rejected. If crushing is to be employed, scalp the material on the sieve designated and crush the retained material in such a manner that when blended back with its natural component it will conform to the grading requirements of the project. Remove coatings from coated coarse aggregates and reduce soil lumps to passing the No. 4 (4.75 mm) sieve size. This is necessary in order that all fine material will be accounted for in the sieve analysis and included in the sample when tested.

4. Use the sieve analysis (Nev. T206) of the sample or samples and design the mix to conform to the specified grading limits by blending or adjusting. Designing to a smooth grading curve approximating the middle of a specified range is desirable, but not always essential. General practice is to produce the best possible grading within the specification limits with the material on hand. Scalping out oversize, wasting portions other than oversize, and combining are methods used to attain desired grading.

The following methods may be used for adjusting gradings when the as-received grading is to be changed:

a. Samples requiring scalping only.

If existing material is to be used and grading requirements are not specified, all that is required in preparation for testing is to screen the material through a 1 in. (25.0 mm) sieve (the maximum size that may be tested in the stabilometer). Then adjust the grading so correct surface area computations may be obtained.

All gradings shall be wash gradings.

The following example shows a grading before and after screening to 1 in. (25.4 mm) maximum:

As-received percent passing		Screened and Adjusted percent passing
1 1/2 in. (37.5 mm) sieve	=	100
1 1/4 in. (31.5 mm) sieve	=	95
1 in. (25.0 mm) sieve	=	90
3/4 in. (19.0 mm) sieve	=	80
3/8 in. (9.5 mm) sieve	=	70
No. 4 (4.75 mm) sieve	=	60
		$\frac{100}{90} \times 90 = 100$ $\frac{100}{90} \times 80 = 89$ $\frac{100}{90} \times 70 = 78$ $\frac{100}{90} \times 60 = 67$

The remainder of the grading for the portion passing the No. 4 (4.75 mm) sieve is computed in the same manner.

- b. Samples requiring grading adjustment to comply with specification requirements.

Samples of aggregate that are to conform to a specific grading requirement and fail to do so on certain sieve sizes can in many cases be adjusted to conform to the grading requirement by wasting certain portions of the sample. Any adjustment of the grading shall be such that it can be duplicated under actual field conditions.

- c. Combining samples.

The procedure for blending two or more individual aggregate samples in combination to produce a final grading conforming to certain requirements consists of trying various percentages of each in combination until a satisfactory grading is produced.

5. Weighing procedure for testing specimens.

- a. The cumulative weights required for the 1200 g specimens normally used are derived by multiplying the cumulative percent as used (from the grading of the aggregate) by 12; in cases when adjustment of the grading is necessary, cumulative weights are obtained on the adjusted grading.
- b. An example of the computation required is shown below.

As-Used Grading

Sieve size	Percent passing
1 in. (25.0 mm)	100
3/4 in. (19.0 mm)	89
3/8 in. (9.5 mm)	78
No. 4 (4.75 mm)	67

The cumulative weights are obtained as follows:

Passing	Retained	
1 in. (25.0 mm)	3/4 in. (19.0 mm)	$(100-89) \times 12 = 132$
3/4 in. (19.0 mm)	3/8 in. (9.5 mm)	$(100-78) \times 12 = 264$
3/8 in. (9.5 mm)	No. 4 (4.75 mm)	$(100-67) \times 12 = 396$
No. 4 (4.75 mm)		$(100-0) \times 12 = 1200$

Note: For aggregates with high specific gravity, specimens may need to be greater than 1200 g, adjust quantities as needed.

- c. To prepare submitted aggregates (either stockpile samples submitted from commercial sources, state aggregates pits or otherwise) for the above 1200 g "batching" method, the following procedure is to be followed:

A 100 lb. (45360 g) "batch" is usually prepared. This amount will yield enough aggregate to batch together all the individual batches required to perform a complete mix design. If, for

example, three stockpiles have been submitted (coarse, intermediate, and fines) and the bin percentages are 30% coarse, 45% intermediate and 25% fines, then 30 lbs. of coarse, 45 lbs. of intermediate and 25 lbs. of fines are then blended together. The combined aggregate is then shaken through the Gilson with the following screens in place: 1 in. (25.0 mm), 3/4 in. (19.0 mm), 3/8 in. (9.5 mm), No. 4 (4.75 mm) and minus No. 4 (pan). 1200 g batches are then prepared using the above procedure.

If hydrated lime is required the following method is used:

Weigh out individual lime batches in small tins (18 grams in each tin for 1 1/2 percent hydrated lime by dry weight of aggregate). Place individual 1200 g aggregate batch in mixing bowl; add enough moisture (water), using a 100 mL graduated cylinder to thoroughly dampen the sample. This amount will vary depending on several factors including aggregate porosity and surface area. Three to six percent (36 mL to 72 mL) moisture has been found to be sufficient in most cases. Mix the sample with the water for two minutes, at which time add 18 grams (1 1/2 percent) hydrated lime and continue mixing for an additional 3 minutes, for a total of 5 minutes. For standard addition of lime (no wet cure) place "limed" mixture into a small 11 in. (279 mm) x 7 in. (178 mm) x 1 in. (25 mm) deep pan, place in 230°F (110°C) oven, and dry until all moisture is removed (overnight has been found to be sufficient). For aggregate mixtures that are to be marinated (48 hour wet cure) place the limed mixture in a plastic container and seal with lid for 48 hours, then dry as stated above.

6. Mixing of Aggregate and Asphalt.

- a. Normally, six stabilometer specimens are sufficient for evaluating a sample. Each one is mixed in 1/2 percent increments, ranging from dry (not enough asphalt) to rich (excessive amount of asphalt), e.g. 5.0%, 5.5%, 6.0%, 6.5%, 7.0% and 7.5%, by dry weight of the aggregate.
- b. The mechanical mixer consists of steel bowls having hemispherical shaped bottoms into which mechanically driven stirring paddles are inserted. The paddle is shaped to fit the bottom of the bowl and is rotated at a speed of 30 RPM. Spatulas are also inserted into the bowl in order to aid in the agitation of the mixture. Preheat the aggregate and asphalt to the required mixing temperature prior to placing in the mixer and maintain the temperature during the mixing period by infrared lamps focused on the bottom of the mixing bowls. See Figure I.
- c. Place a preheated or room temperature (see Section B. Control for temperatures) 1200 g batched aggregate sample on the scale tare pan. Arrange the aggregates so that there is a "hollow" or depression in the center to keep the hot asphalt cement from either running over or soaking through the aggregate batch. Pour the correct weight of bitumen into the depression. While holding the mixing bowl at an angle (about 45 degrees) with the mixing paddle inserted in the bowl, quickly and carefully pour the aggregate and bitumen into the mixing bowl. Place the mixing bowl with lid onto the mechanical mixing machine, then place a spatula through the slot in the mixing bowl lid and mix for 5 minutes. When mixing is completed, transfer the mixture to a suitable flat pan, 11 in. (279 mm) x 7 in. (178 mm) x 1 in. (25 mm) and cure for 15 ± 3 hours in a forced air oven at a temperature of $140^{\circ}\text{F} \pm 5^{\circ}\text{F}$ ($60^{\circ}\text{C} \pm 3^{\circ}\text{C}$). The mixture is then ready for the compaction procedure. (See part II).

D. PREPARATION OF BITUMINOUS MIXTURE SAMPLES

1. Samples submitted for bituminous tests consist of the following:
 - a. Uncompacted (paving grade asphalt) mixture, dense and open graded.
 - b. Compacted (paving grade asphalt) mixture, dense graded only.
 - c. Uncompacted (liquid grade asphalt) mixture.
2. The following methods shall be used in preparing the materials for testing:

- a. Uncompacted (paving grade asphalt) mixture, dense graded:

Samples should consist of approximately 7000 g and should be placed in sealed 6 in. (152 mm) x 12 in. (305 mm) single use test cylinders.

Heat the sample to approximately 200°F (93°C) for workability. Thoroughly mix and quarter the sample, either by mechanical or hand quartering method, into amounts needed for the following tests:

1 - Stabilometer value:	1200 to 1400 g
2 - Rice specific gravity:	1200 g minimum
3 - Extraction:	2000 to 2500 g
4 - % moisture:	500 g minimum

Place the material for the stabilometer and Rice gravity in suitable flat pans 11 in. (279 mm) x 7 in. (178 mm) x 1 in. (25 mm), and cure for 15 ± 3 hours in a forced air oven at a temperature of 140°F ± 5°F (60°C ± 3°C). The samples are then ready for compaction. (See part II).

- b. Uncompacted (paving grade asphalt) mixture, open graded:

Samples should consist of approximately 7000 g and should be placed in sealed 6 in. (152 mm) x 12 in. (305 mm) single use test cylinders.

Heat the sample to approximately 200°F (93°C) for workability. Thoroughly mix and quarter the sample, either by mechanical or hand quartering method, into amounts needed for the following test:

1 - Extraction:	1500 to 1600 g
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Occasionally, there will be specific need or reasons for other tests to be conducted on open graded asphalt concrete samples. Adjust submitted quantities and test quantities as needed.

- c. Compacted (paving grade asphalt) mixture, dense grade:

Compacted samples usually consist of 8 in. (203 mm) x 8 in. (203 mm) slabs or 4 in. (102 mm), 6 in. (152 mm) and 8 in. (203 mm) diameter cores that have been cut from the pavement.

1. 8 in. (203 mm) x 8 in. (203 mm) slabs:

Heat the slabs in a 230°F (110°C) oven until soft enough to be broken down into pieces of sufficient size for the following tests:

1 - Recompacted stability:	1200 to 1400 g
2 - Rice specific gravity:	1200 g minimum
3 - Extraction:	2000 to 2500 g

2. 4 in. (102 mm), 6 in. (152 mm) and 8 in. (203 mm) diameter core samples:

For 4 in. (102 mm) cores in excess of 2 1/2 in. (64 mm) in height trim the core with a diamond saw to a 2 1/2 in. (64 mm) height for the in-place stabilometer test. In-place density values may also be obtained from these samples.

For 6 in. (152 mm) and 8 in. (203 mm) core samples, heat in a 200°F (93°C) thermostatically controlled oven until the core sample can be sufficiently broken down (prior to breaking sample down, remove all cut rock from exterior of sample) for the following tests:

1 - Recompacted stability:	1200 to 1400 g
2 - Rice specific gravity:	1200 g minimum
3 - Extraction:	2000 to 2500 g

Place the material for the stabilometer and Rice gravity in suitable flat pans 11 in. (279 mm) x 7 in. (178 mm) x 1 in. (25 mm), and cure for 15 ± 3 hours in a forced air oven at a temperature of 140°F ± 5°F (60°C ± 3°C). The samples are then ready for compaction. (See part II).

d. Uncompacted (liquid grade asphalt) mixture:

Samples should consist of approximately 7000 g and should be placed in sealed 6 in. (152 mm) x 12 in. (305 mm) single use test cylinders.

Heating samples for workability is not typically necessary (although if the liquid grade asphalt mixture is excessively stiff some heating (maximum 160°F (71°C)) may be required). Thoroughly mix and quarter the sample, either by mechanical or hand quartering method, into amounts needed for the following tests:

1 - Stability value:	1200 to 1400 g
2 - Rice specific gravity:	1200 g minimum
3 - Extraction:	2000 to 2500 g
4 - % moisture:	500 g minimum

Place the material for the stabilometer and Rice gravity in suitable flat pans 11 in. (279 mm) x 7 in. (178 mm) x 1 in. (25 mm), and cure for 15 ± 3 hours in a forced air oven at a temperature of 140°F ± 5°F (60°C ± 3°C). The samples are then ready for compaction. (See part II).

PART II. METHOD OF COMPACTING MATERIALS FOR STABILOMETER TEST

A. APPARATUS

1. California kneading compactor, mechanical kneading compactor designed to consolidate by a series of individual or roving "kneading action" impressions made by a ram having a face shaped as a sector of a 4 in. (102 mm) diameter circle. The compactor must be capable of exerting forces of 250 psi (1.72 MPa) and 500 psi (3.45 Mpa) under the tamper foot. See Figure II.
2. Compactor accessories; 4.000 ± 0.005 in. (101.60 ± 0.13 mm) in inside diameter by 5 in. (127 mm) high steel molds, and a mold holder; 4 in. (102 mm) paper disks.
3. Testing machine, a compression testing machine having a minimum capacity of 50,000 lbf (222.4 kN) capacity. See Figure V.
4. Two followers: one 3.985 ± 0.005 in. (101.2 ± 0.11 mm) in diameter by 5 1/2 in. (140 mm) high and the other 3.985 ± 0.005 in. (101.2 ± 0.11 mm) in diameter by 1 1/2 in. (38.1 mm) high.
5. Oven, forced air circulation, capable of maintaining temperatures of 140°F (60°C) and 230°F (110°C).
6. Mechanical spader (optional), designed to prevent segregation of coarse and fine material or the formation of rock pockets in the test specimen by introducing the mixture into the compaction mold from an endless belt at the same time imparting a spading action with four mechanically operated 1/2 in. (13 mm) diameter by 23 in. (584 mm) long round nose steel rods. See Figure III.
7. Special feeder trough 4 in. (102 mm) wide by 16 in. (406 mm) minimum in length and a round nose steel rod 3/8 in. (9.5 mm) in diameter by 16 in. (406 mm) long, that may be used in lieu of mechanical spader.
8. Miscellaneous apparatus, thermometers, towels, spatulas, metal balance scoop and gloves.
9. 8 in. diameter, 1/2 in. (12.5 mm) sieve.
10. Balance, 11 kg capacity, accurate to ± 0.1 g.
11. Suitable device for measuring height of test specimens to nearest 0.01 in. (0.254 mm).

B. CONTROL

1. Control of the compaction pressure shall be in accordance with the Method of Operation and Calibration of the Mechanical Compactor (California Test 101).
2. Compaction temperatures shall be carefully controlled to $\pm 5^\circ\text{F}$ ($\pm 3^\circ\text{C}$).

C. FABRICATION OF STABILOMETER SPECIMENS

1. Place a mold of the correct temperature on the mold holder base. Place a metal shim, 1/4 in. (6.4 mm) thick x 3/4 in. (19 mm) wide x 2 1/2 in. (64 mm) long under the mold adjacent to the portion of the mold holder that extends up into the mold so that the mold is spaced up by the shim. Place a 4 in. (102 mm) diameter paper disk into the mold on top of the mold holder base, then place the entire assembly into position on the mechanical spader.
2. Weigh out the amount of mix, which has been brought to the proper compaction temperature, that is required to produce a test specimen 2 1/2 in. (64 mm) high. This amount will vary between different material sources and the amount of asphalt in each mixture. Generally, add another 10 g of mix for each 1/2 percent increase in bitumen ratio. For example, if the first mix used 1120 g to obtain a compacted briquette 2 1/2 in. (64 mm) high, and was mixed with 5.0 percent asphalt, then 1130 g should probably be the correct amount for 5.5 percent asphalt.

Compaction Temperatures:

Asphalt mixture with liquid grade asphalts:	140°F (60°C)
Asphalt mixture with paving grade asphalts:	230°F (110°C)

3. Separate the coarse and fine material of each weighed mixture by screening it through a 1/2 in. (12.5 mm) sieve. Place the retained plus 1/2 in. (12.5 mm) aggregate mix into a parallel row in the mechanical spader feeder trough. Carefully place the remainder minus 1/2 in. (12.5 mm) mix directly on top of the plus 1/2 in. (12.5 mm) aggregate mix so that the fine material completely and evenly covers the coarse aggregate. This procedure is intended to prevent unwanted rock or air void "pockets" in the compacted briquette.
4. Start the mechanical spader, and when enough mix has been introduced to completely cover the paper disk in the bottom of the compaction mold, lower the tamping rods. The spader should be set to operate for 1 minute.

Note: In lieu of the mechanical spader described above, a specially constructed feeder trough 4 in. (102 mm) wide and 16 in. (406 mm) in minimum length, may be used for introducing the mix into the mold. Weigh out the correct amount of mixture, then carefully place the material into the trough which has been preheated to the correct compaction temperature. Place a mold of the correct temperature into position on the mold holder and place a paper disk in the mold. Use a paddle, shaped to fit the feeder trough, to push one half of the material into the mold.

Rod the material 20 times in the center of the mass and 20 times around the edge with a round nosed steel rod 3/8 in. (9.5 mm) in diameter and 16 in. (406 mm) long. Then push the remainder of the sample into the mold and repeat the rodding procedure. Perform these operations as rapidly as possible to prevent cooling of the sample. If two feeder troughs are available, the work can be expedited by preparing another sample while one is being compacted. The extra trough containing the sample is kept in the oven until ready for compaction.

5. Place mold holder containing the mix and mold into position in the mechanical compactor.

6. Start the compactor and adjust the pressure on the compactor foot to 250 psi (1.72 MPa). Keep the tamper foot hot enough to prevent the mix from adhering to it (approximately 230°F (110°C)).
7. Apply approximately 25 tamping blows of 250 psi (1.72 MPa) pressure to accomplish a semi-compacted condition of the mix so it will not be unduly disturbed when the full load is applied. The exact number of blows required to accomplish the semi-compaction shall be determined by observation. The number of blows may vary between 10 and 50, depending upon the type of material.
8. Remove the 1/4 in. (6.4 mm) shim and release the tightening screw to allow free side to side movement of the mold. Raise the compaction pressure to 500 psi (3.45 MPa) and apply 150 tamping blows to complete the compaction in the mechanical compactor.
9. Place the molds with the compacted mixtures in the 140°F (60°C) oven for the following minimum length of time prior to applying a 12,566 lbf (1000 psi) 55.9 kN (6.89 MPa) leveling off load:

1 hour if compacted at 140°F (60°C)

1 1/2 hours if compacted at 230°F (110°C)

The head speed of the testing machine used for the leveling off load shall be 0.25 in. (6.4 mm) per minute. Apply the leveling-off load by the double plunger method, in which a free fitting plunger is placed below the sample as well as on top. Measure the height of the specimen to the nearest 0.01 in. (0.254 mm), record the measurement, and return the specimen to the 140°F (60°C) oven to retain temperature for testing.

D. DEFINITIONS

Visual observations of samples after compaction.

Tender: During the compaction process the mix shoves and deforms under the load of the laboratory compactor foot and may or may not develop sufficient strength to stabilize.

Unstable: During the compaction process the mix shoves and deforms under the laboratory compactor foot and fails to develop sufficient strength to stabilize. The test results obtained from a tender and/or unstable mix are variable, and it is often difficult, or not possible, to get a smooth curve for Hveem values and/or air voids.

Slight Sweat: The appearance of free asphalt on the surface of the specimen during compaction. The asphalt appears as a slight sheen on the surface.

Moderate Sweat: Compacted specimen has sufficient free asphalt on the surface to cause paper to stick, but no distortion of the surface is noted.

Heavy Sweat: Compacted specimen has a slight compactor foot impressions and free asphalt may lie on the surface in a continuous phase.

Pump: After the material has stabilized during compaction, the material in the mold begins to deform / move under compactor foot loadings. The compactor foot leaves an impression

in the finished compacted briquette.

E. PRECAUTIONS

To insure proper particle orientation in the test specimen it is quite important that the operator exercise particular care in placing the mix on the feeder belt of the mechanical spader. Indiscriminate screening and placing of the mix may produce test specimens having considerable segregation of the aggregate with resulting inaccurate test results.

Caution must be exercised in the operation of the compactor to prevent any object, other than the sample itself, from interceding between the compactor foot and the mold at any time while the ram is in motion. The clearance between the edge of the mold and the compactor foot is approximately 1/16 in. (1.6 mm). The applied shearing force exerted could cause severe injury to body extremities or damage to equipment.

* The following procedure was, at one time, allowed to be used to consolidate tender and unstable material that would not satisfactorily stabilize in the cylinder mold under the initial 10 to 50 blow compactive effort. Due to modern, ever increasing traffic volumes and loads, as well as many other factors, it becomes apparent that bituminous mixtures displaying this type of instability are undesirable for use on the majority, if not all, public roads. Therefore the following procedure has been eliminated from this test method. It is included here for informational purposes only:

"In some instances where sandy or unstable material is to be compacted, it may not be possible to accomplish the compaction in the mechanical compactor because of undue movement of the mixture under the compactor foot. In these instances use a 40,000 lbf (177.93 kN) static load applied by the double plunger method, in which a free-fitting plunger is placed below the sample as well as on top to complete the compaction. When compacting the first sample of a set, and it is found that the material will not consolidate under the full tamper load, subject the remainder of the set only to the 40,000 lbf (177.93 kN) static load."

PART III. METHOD OF TEST FOR STABILOMETER VALUE

A. APPARATUS

1. Oven, capable of maintaining a temperature of $140^{\circ}\text{F} \pm 5^{\circ}\text{F}$ ($60^{\circ}\text{C} \pm 3^{\circ}\text{C}$).
2. Hveem stabilometer, with accessories, including adjustable base, assembly tool, steel follower: 3.985 in. (101.2 mm) diameter by 5 1/2 in. (140 mm) high, steel calibration cylinder 4 in. \pm 0.005 in. (101.6 mm \pm 0.13 mm) in outside diameter by 5 1/2 in. (140 mm) high, and rubber bulb for introducing air into the stabilometer. See Figure IV.
3. Testing machine, a compression testing machine having a minimum capacity of 50,000 lbf (222.4 kN) capacity. See Figure V.
4. Test specimen push-out device, a lever device, attached to the press, to push the specimen out of the mold. See Figure V.

B. CONTROL

1. Test all specimens at a temperature of $140^{\circ}\text{F} \pm 5^{\circ}\text{F}$ ($60^{\circ}\text{C} \pm 3^{\circ}\text{C}$).
2. Calibrate the displacement of the stabilometer by the following procedure:
 - a. Adjust the bronze nut on the base of the stabilometer so that the distance from the bottom of the upper tapered ring to the top of the base is 3.5 in. (89 mm).
 - b. Prior to calibrating the stabilometer with the steel calibration sleeve, warm it up by placing the preheated 140°F (60°C) steel follower into the stabilometer. Turn the pump handle so that about 25 psi shows on the stabilometer dial and allow it set for about 5 minutes. Remove the steel follower and return it to the 140°F (60°C) oven and place the preheated 140°F (60°C) steel calibration sleeve in place in the stabilometer. Turn the pump handle from 0 to 100 psi (0 to 689.5 kPa) and back to 0 again about twenty repetitions then turn the pump handle so that a pressure of exactly 5 psi (34.5 kPa) is indicated on the stabilometer dial. Tap the stabilometer dial lightly with the fingers in order to be sure that the needle is resting on exactly 5 psi (34.5 kPa). Adjust the turn indicator dial to zero. Turn the pump handle at approximately two turns per second until the stabilometer dial reads 100 psi (689.5 kPa). The turn indicator dial should then read 2.00 ± 0.05 turns. If it does not, the air pressure in the cell must be adjusted by means of the rubber bulb, and the displacement measurement must be repeated after each air pressure change (this time only about 5 repetitions from 0 to 100 psi (0 to 689.5 kPa) and back to 0 is required) until the proper number of turns is obtained. Remove the steel calibration sleeve. The stabilometer is now ready to test specimens.
 - c. Adjust the testing machine to give a constant movement of 0.05 in. (1.3 mm) per minute with no load applied. The hydraulic machines shall be run approximately 30 minutes prior to testing to insure the oil warms sufficiently to maintain a constant speed.

C. DETERMINATION OF STABILITY VALUE

1. Test specimens at $140^{\circ}\text{F} \pm 5^{\circ}\text{F}$ ($60^{\circ}\text{C} \pm 3^{\circ}\text{C}$).
2. Transfer test specimen from mold to the stabilometer by placing the mold containing the specimen on top of the stabilometer, then use the plunger, hand lever and special fulcrum attached to the testing machine to force the specimen out of the mold and into the stabilometer. Make sure that the specimen goes into the stabilometer straight with the tamped end up and that it is firmly seated on the base.
3. Place the steel follower on top of the specimen and adjust the pump handle to give a horizontal pressure of exactly 5 psi (34.5 kPa). (The 5 psi (34.5 kPa) should be exact as a deviation of only 1 psi (6.89 kPa) has a considerable effect on the final value).
4. Start the vertical movement of the testing machine base plate at a speed of 0.05 in. (1.3 mm) per minute, and record the stabilometer gauge readings when the vertical pressures are 500 lbf (2.22 kN), 1000 lbf (4.45 kN), 2000 lbf (8.90 kN), 3000 lbf (13.34 kN), 4000 lbf (17.80 kN), 5000 lbf (22.24 kN), and 6000 lbf (26.69 kN) total load.
5. Stop vertical movement at exactly 6000 lbf (26.69 kN) and immediately reduce the load to 1000 lbf

(4.45 kN). Turn the displacement pump so that the horizontal pressure is reduced to exactly 5 psi (34.5 kPa). This will result in a further reduction in the vertical load reading which is normal and for which no compensation need be made. Set the turns displacement dial to zero. Turn the pump handle at approximately two turns per second until the stabilometer gauge reads 100 psi (689.5 kPa). During this operation the vertical load registered on the testing machine will increase and in some cases exceed the initial 1000 lbf (4.45 kN) load. As before, these changes in the gauge readings are characteristic and no adjustment or compensation is required.

6. Record the number of turns indicated on the dial as displacement of the specimen. The turn indicator dial reads in 0.001 in. (0.025 mm) increments, and each 0.1 in. (2.5 mm) is equal to one turn. Thus, a reading of 0.250 in. (6.35 mm) indicates that 2.5 turns were made with the displacement pump. This measurement is known as turns displacement of the specimen.

D. CALCULATIONS

Determine the stabilometer value of the specimen as follows:

$$S = \frac{22.2}{[P_h \cdot D / (P_v - P_h)] + 0.222}$$

where:

S = stabilometer value

D = displacement on specimen

P_v = vertical pressure (typically 400 psi (2.76 MPa) = 5000 lbf (22.24 kN) total load)

P_h = horizontal pressure, = stabilometer pressure gauge reading taken at the instant P_v = 400 psi (2.76 MPa) or 5000 lbf (22.24 kN) total load

E. PRECAUTIONS

1. Every effort should be made to fabricate test specimens having an overall height between 2.4 in. (61 mm) and 2.6 in. (66 mm); however, if for some reason this is not possible, the stabilometer value should be corrected for the actual height of the specimen as indicated on attached chart. See Figure VI.
2. Adhere strictly to the temperature control requirement.
3. Daily or prior to testing, calibration of the stabilometer should be made, as temperature change has considerable effect upon the pressure exerted within the hydraulic system. This is especially true when changing from R-value testing to bituminous testing.
4. Close adherence to the 5 psi (34.5 kPa) initial horizontal pressure in step C3 above is necessary for accuracy of test results.
5. When setting 5 psi (34.5 kPa) horizontal pressure always drop below 5 psi (34.5 kPa) and gently tap dial, to remove slack in dial indicator gear, then return to 5 psi (34.5 kPa) before continuing.

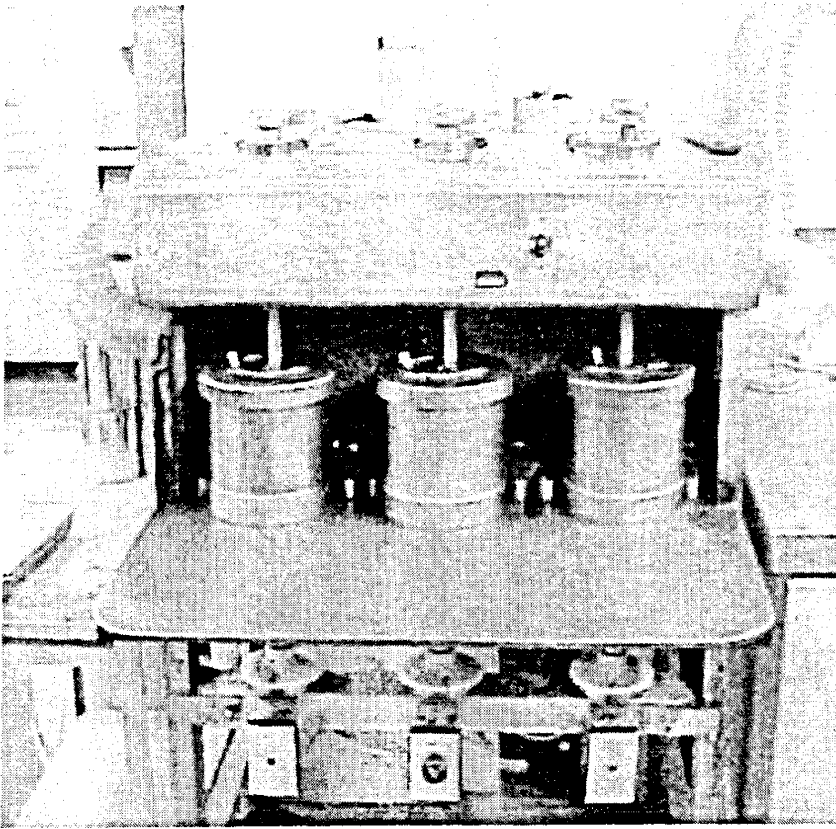


Figure I

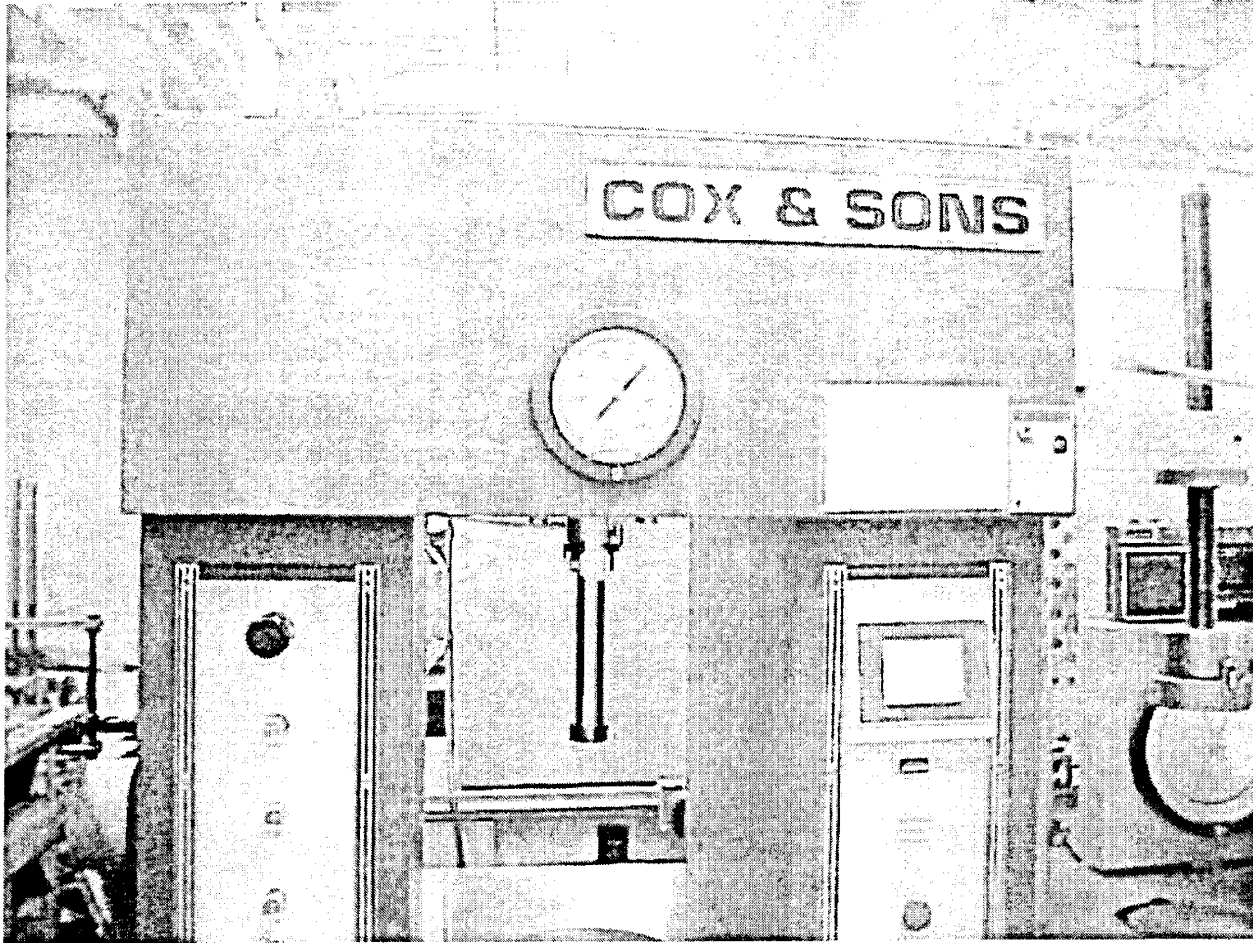


Figure II



Figure III

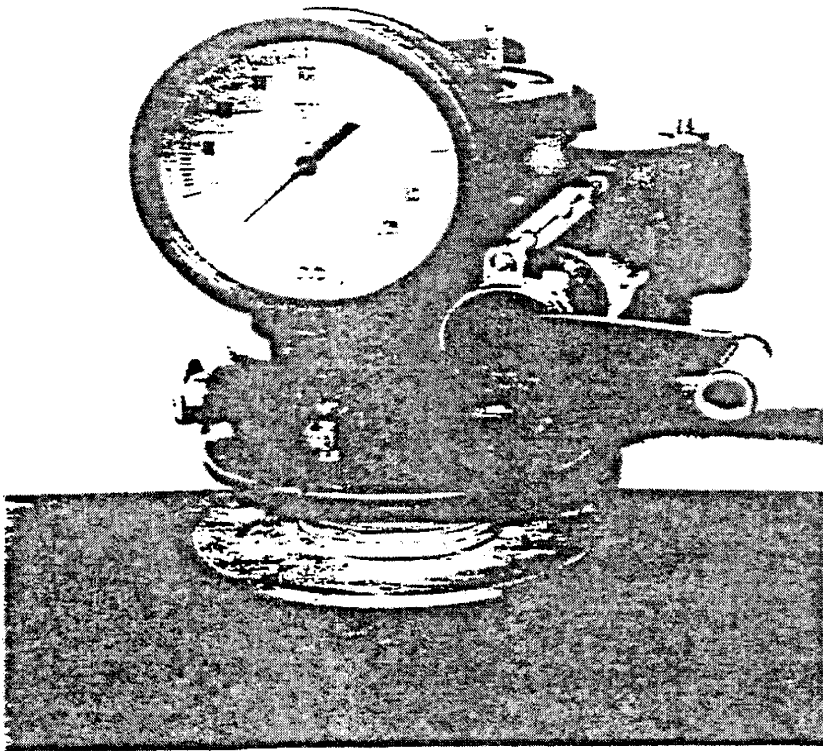
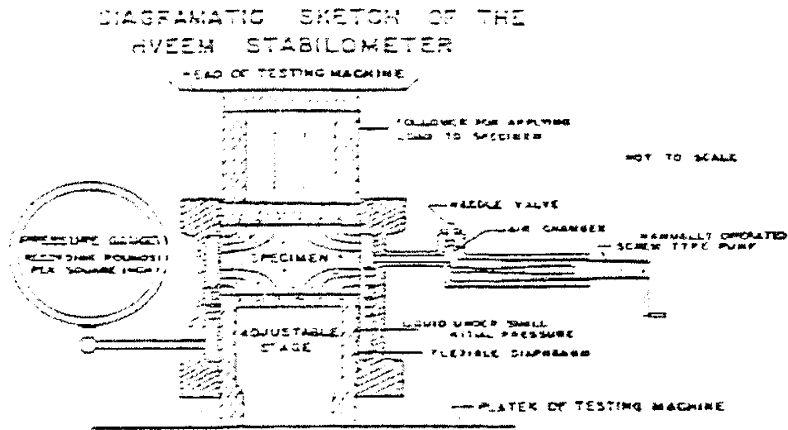


Figure IV

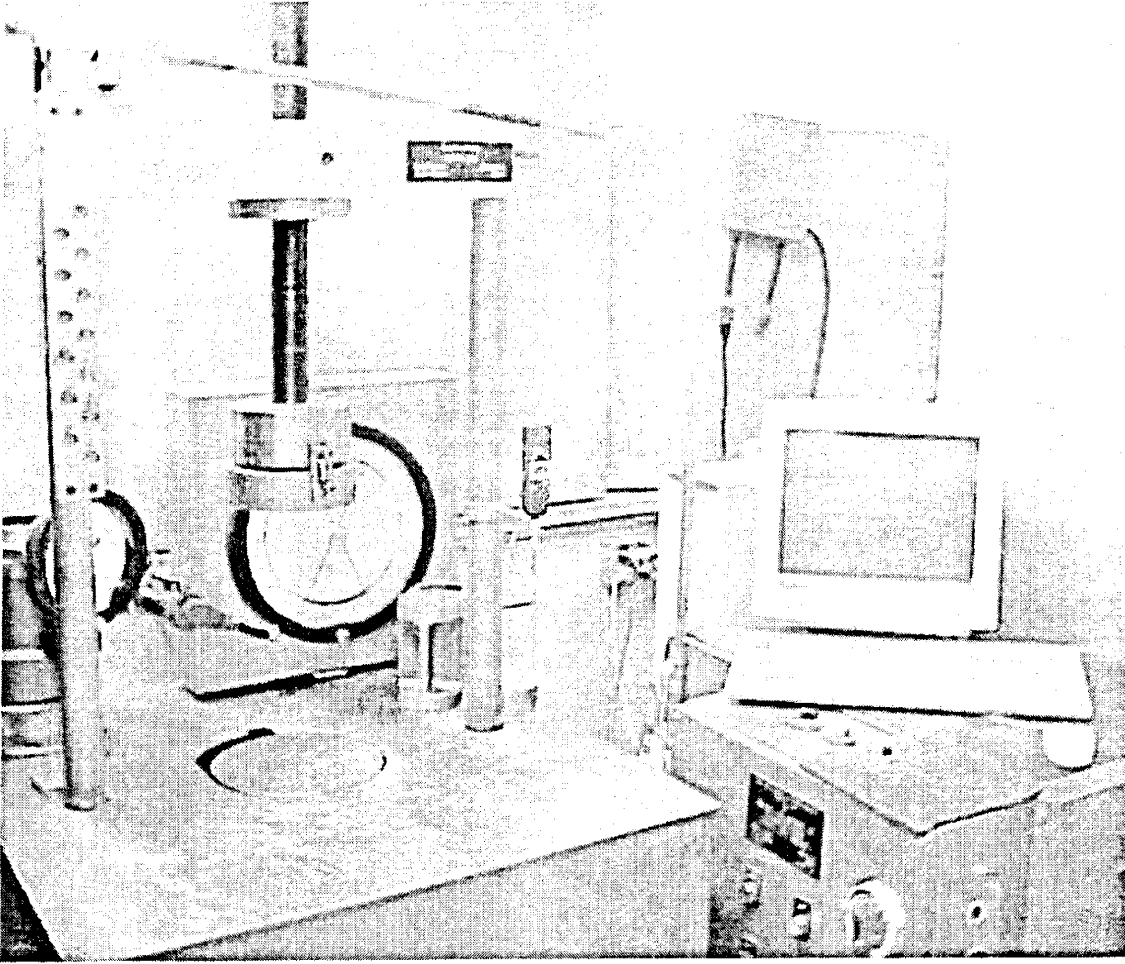


Figure V

CHART FOR CORRECTING STABILOMETER VALUES
 TO EFFECTIVE SPECIMEN HEIGHT OF 2.40

Height correction should be made using the table
 and chart below.

Example: Overall height of 2.74", effective height
 set at 2.6. Stabilometer value uncorrected = 35
 Stabilometer value corrected = 38

Overall Specimen Ht.	Effective Ht.
2.2" to 2.4"	2.2"
2.4" to 2.6"	2.4"
2.6" to 2.8"	2.6"
2.8" to 3.0"	2.8"

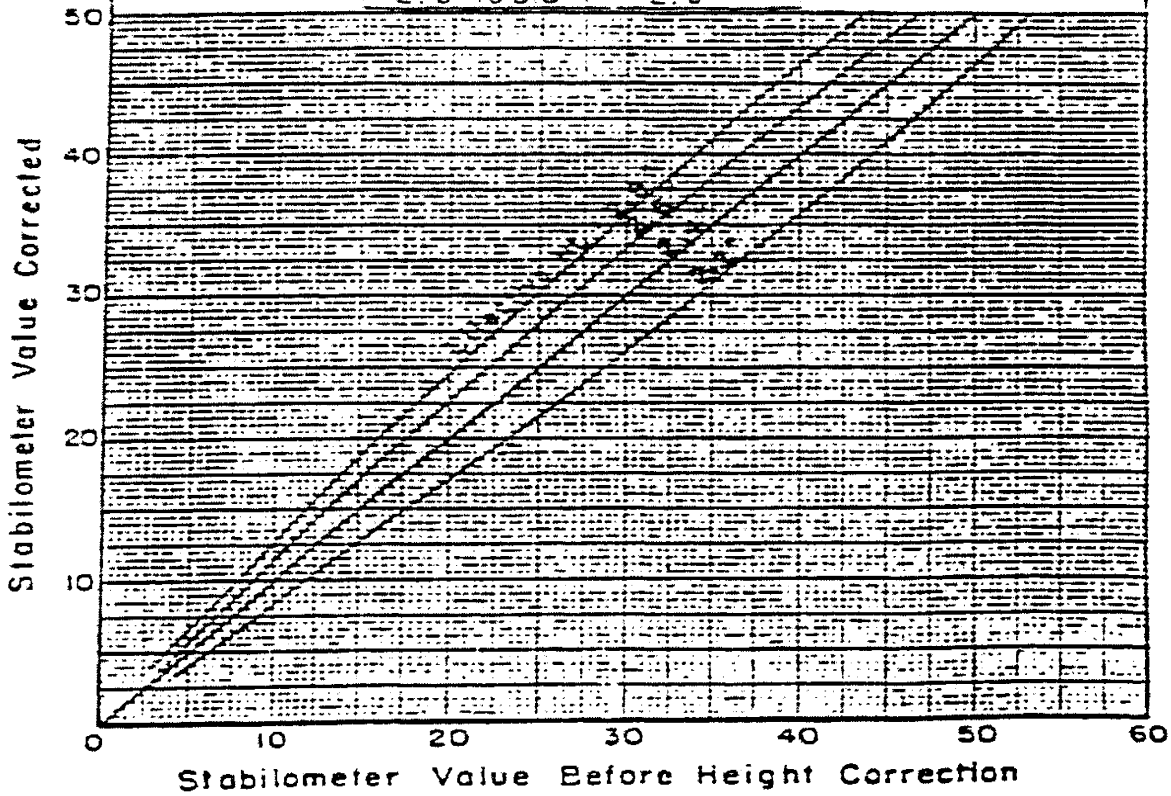


Figure VI