EXTRACTION OF ASPHALT FROM BITUMINOUS MIXTURES BY SOXHLET EXTRACTION
(An Arizona Method)

Scope

1. This procedure is designed to determine the bitumen content of bituminous mixtures by extraction of the asphalt. It may also be used in conjunction with ARIZ 511 − Recovery of Asphalt from Extraction Solution, when small amounts of asphalt are required for further testing.

Apparatus

2. The apparatus shall consist of the following:

(a) Soxhlet Extraction Apparatus, 100 mm inside diameter, assembled as shown in Figure 1. (Cal-Glass for Research, Inc. #LG-103/60 Soxhlet Extraction apparatus has been found suitable for...
this procedure.) The condenser and extractor must
be held individually in a fashion which allows the
condenser to be moved vertically 4 to 5 inches, and
the extractor to be removed and replaced with ease.
The Soxhlet Extraction Apparatus shall be used
under a functioning fume hood.

(b) Heating device with adjustment for temper-
ature, capable of maintaining a constant flow rate
of distillation, and able to hold the 3000 ml.
round bottom extraction flask. (Precision
Scientific, "Pul-Kontrol-750 watts", or similar is
required.)

c) Adjustable stand for heating device.

d) Water source with miscellaneous tubing
and clamps.

(e) Filter paper (Fluted, 50 cm., Grade 515)

(f) Methylene Chloride, Tech. Grade (Reclaim-
ed Methylene is NOT recommended when solvent is to
be subjected to ARIZ 511).

(g) Oven or hot plate capable of maintaining
a temperature of 230° ± 9° F.

(h) Balance, 5 kg. capacity, sensitive to
1 gram.

(i) Spoons, spatulas, pans, and miscellaneous
tools.

(j) 1000 ml. beaker.

Sample Preparation

3. (a) A representative 1250 to 1750 gram
sample of the bituminous mixture shall be obtained.
A representative 500 to 1000 gram sample shall also
be obtained for moisture determination (ARIZ 40Gb
-Moisture in Bituminous Mixtures)

(b) When cores are being tested, they shall
be heated and broken into small pieces.

Procedure

4. (a) Place a double layer of filter paper in
a tared 1000 ml. beaker.

(b) Record weight of filter paper to the
nearest gram as "b".

(c) Tare beaker with filter paper.

(d) Firmly place sample into filter paper
while in beaker so that it is filled to a maximum
of 1 inch below the top of filter paper. Record
the weight of the sample to the nearest 1 gram as
"i".

(e) Remove filter paper and sample from
beaker. Place in Soxhlet Extractor.

(f) Place extractor in holder, slide condens-
er in place into top of extractor.

(g) Place 8 to 12 boiling chips into the
3000 ml extractor flask.

(h) Add methylene chloride to extraction
flask until approximately 2/3 full.

(i) Place the flask on the heating device
and raise adjustable stand so that the top of
flask fits snugly into bottom of extractor.

(j) Turn on heat and control temperature so
that the solvent boils rapidly, and a constant rate
of distillation is maintained.

NOTE: Once the heat has been turned on, the
apparatus should not be left unattended for long
periods of time until extraction is complete. Dur-
ing the extraction process, the amount of methylene
chloride in the extraction flask should not be
allowed to fall below the 1/4 full level.

(k) The solvent normally will not syphon
automatically when the liquid level reaches the
syphon tube level. The addition of a few ml. of
solvent through the condenser should initiate the
action.

NOTE: Caution must be exercised to not exceed
3/4 of the capacity of the extraction flask due to
continued additions.

(l) Continue the recycling until the extrac-
tion liquor is clear, usually 8 or 10 cycles will
be sufficient.

(m) When extraction is complete, turn off
heat and allow apparatus and sample to cool.

(n) Lower extraction flask and remove from
heating device. If recovery of asphalt from
methylene chloride is desired, subject contents of
flask to ARIZ 511 - Recovery of Asphalt from Extrak-
tion Solution. If bitumen content and sieve analy-
sis of aggregate is all that is desired, discard
contents of flask.

(o) Raise condenser so that the extractor
which holds the sample may be removed.

(p) Transfer sample to clean tared pan for
drying. Place filter paper in pan also. Thoroughly
clean extractor, making certain all material is
transferred into drying pan.

(q) Allow excess methylene chloride to
evaporate under functioning fume hood, if desired
cover sample and filter paper with a piece of
aluminum foil which has been punctured 2-3 times,
and then dry in oven or on hot plate at 230° ± 9°
F., to constant weight.

NOTE: A micro-wave oven may be used to dry
materials, provided proper attention is given to
the use of apparatus; the intensity of heat
generated so that sample does not splatter, and the
ventilation of the exhaust fan. (If micro-wave oven
is used the aluminum foil covering sample is not
used.)
(r) Record weight of dried aggregate (being sure to remove clinging aggregate from filter paper into aggregate pan before weighing) to the nearest 1 gram, as "d".

(s) Weigh filter paper which will contain minus No. 200 material and record to the nearest gram as "a". Discard filter paper.

NOTE: Materials shall be weighed within 1/2 hour after removal from heat to assure moisture has not been absorbed.

Sieve Analysis of Extracted Aggregate

5. The extracted aggregate shall be subjected to ARIZ 201 - "Dry Preparation and Sieving of Coarse and Fine Graded Soils and Aggregates".

Calculation and Example

6. Calculations to determine bitumen content and other data necessary are shown on laboratory card in Figure 2, along with an example.

Report

7. Report all values as required on the Asphaltic Concrete Tabulation laboratory card as shown in Figure 2.
### ARIZ 413
Nov. 1981
Page 4

#### MATERIALS SERVICES

#### ASPHALTIC CONCRETE TABULATION

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<th>PURPOSE</th>
<th>LAB</th>
<th>SPEC</th>
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<td>14</td>
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#### RECEIVED DATE

- DATE
- TIME

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#### P = PIT

- E = EXC.
- RDWY
- STATION OR PIT NO.

#### PROJECT NUMBER

- IF MILEPOST, INPUT DECIMAL IN COL. 78

#### REMARKS

- USE CAPITAL LETTERS!

#### KEYPUNCH INSTRUCTIONS: Duplicate col. 3 thru 7 on all cards

#### EXAMPLE SHEET EXTRATION

**G 2**

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#### Abs. Visc. = 140°F

**21380**

### FIGURE 2

**LABORATORY, PROJECT SUPERVISOR, OR RESIDENT ENGINEER**