EQUIPMENT

1. LOADING FRAME: consists of
   a) two sample supports ..... ____
   b) blunt-nosed shaft applies load to mid point of specimen ..... ____
   c) load cell mounted on loading shaft ..... ____
      i) constant load ability ..... ____
      ii) zero load adjustment ..... ____
      iii) deflection measuring transducer ..... ____
2. LOADING SHAFT: spherical contact point 6.25 (± 0.30) mm ion radius, continuous with load cell capable of applying
   a) contact load 35 ± 10 mN ..... ____
   b) test load of 980 ± 50 mN ..... ____
   c) load rise time < 0.5 s, (from 35 ± 10 mN contact load to 980 ± 50 mN test load) ..... ____
   d) during rise time load dampened to 980 ± 50 mN ..... ____
   e) between 0.5 & 5.0 s test load is within ± 50 mN of average load, ± 10 mN for remainder ____
3. SAMPLE SUPPORTS: two stainless steel (or other metal), specified dimensions, alignment pins ..... ____
4. LOAD CELL: minimum capacity 2,000 mN, minimum resolution 2.5 mN, mounted on shaft and above fluid ..... ____
5. LINEAR VARIABLE DIFFERENTIAL TRANSDUCER (LVDT): resolution ≤ 2.5 µm, minimum range >6 mm ..... ____
6. CONTROLLED TEMPERATURE BATH: temperature range - 36 to 0°C, within ± 0.1°C; max. fluctuation ± 0.2C ..... ____
7. BATH AGITATOR: for maintaining temperature homogeneity with minimum mechanical noise ..... ____
8. DATA ACQUISITION SYSTEM:
   a) resolves loads to nearest 2.5 mN ..... ____
   b) resolves beam deflection to nearest 2.5 µm ..... ____
   c) resolves temperature to nearest 0.1°C ..... ____
   d) records load and deflection at 0.0, 0.5, 8.0, 15.0, 30.0, 60.0, 120.0 and 240.0 s ..... ____
   e) all readings are an average of 3 or more points within ± 0.2 s from loading time ..... ____
9. TEMPERATURE MEASURING EQUIPMENT: calibrated temperature transducer Capable of measuring ..... ____
   a) temperature to 0.1°C over range of -36 to 0°C ***(records)*** ..... ____
   b) within 50 mm of midpoint of test specimen ..... ____
10. TEST BEAM MOLDS:
    a) aluminum, to yield 6.35 ± 0.05 mm by 12.70 ± 0.05 mm by 127 ± 2.0 mm ..... ____
    b) end spacer thickness does not vary by more than 0.05 mm ..... ____
11. STAINLESS STEEL BEAMS: ***(records)***
    a) thin beam for compliance check; 1.3 ± 0.3 mm thick, 12.7 ± 0.1 mm wide and 127 ± 5 mm long ..... ____

i) manufacturer's certificate supplies thickness to nearest 0.01 mm and width to nearest 0.05 mm ..... ____
ii) manufacturer reports elastic modulus to 3 significant figures ..... ____

b) thick beam of dimensions 6.4 ± 0.1 mm thick, 12.7 ± 0.1 mm wide and 127 ± 5 mm long for;
i) measuring system compliance ..... ____
ii) calibration of load cell ..... ____

12. STANDARD MASSES:
a) one or more totaling 100.0 g ± 0.2 g and two 2 ± 0.2 g for calibration verification of load cell ..... ____
b) four masses, each of known mass ± 0.2 g equally spaced in mass (load cell calib.) ..... ____
c) accuracy of masses verified at least every 3 years **(records)** ..... ____
13. CALIBRATED THERMOMETER: liquid-in-glass partial immersion, subdivisions 0.1°C ..... ____
a) thermometer calibrated at least once per year (ASTM E77) **(records)** ..... ____
14. THICKNESS GAUGE: stepped gauge for verifying calibration of displacement ..... ____
15. FREEZER OR ICE BATH: for chilling specimens ..... ____

MATERIALS

1. PLASTIC SHEETING: clear plastic sheeting, 0.12 ± 0.04 mm thick ..... ____
2. PETROLEUM BASED GREASE: to hold plastic strips to aluminum molds ..... ____
3. BATH FLUID: ethanol, methanol or glycol-methanol-water (60/15/25 %) mixtures ..... ____
4. TEST BEAM MOLDS: made to specified dimensions from aluminum stock ..... ____

STANDARDIZATION

1. DISPLACEMENT TRANSDUCER (LVDT): displacement verified with stepped gauge block of known dimensions 100 g ± 2 g dead mass; measurements do not differ by more than ± 5 µm ***(demo & records)*** ..... ____
2. LOAD CELL: calibration verified using 2 standard dead masses; within 10% ***(records)*** ..... ____
3. TEMPERATURE DETECTOR: calibration verified using a calibrated thermometer; within ± 0.1°C ***(demo & records)*** ..... ____
4. LOADING SYSTEM: compliance determined using stainless steel beam, 6.35 mm thick, of known elastic modulus; data acquisition system result is in range of 2 to 5 µm/N ..... ***(demo & records)*** ..... ____
5. AIR BEARING OPERATION: free operation using thin steel beam of know elastic modulus **(demo)** ..... ____
6. CONTACT LOAD: ***(demo & records)***
a) shaft resting on 6.4 mm compliance beam ..... ____
b) 20 ± 10 mN load applied using zero load regulator ..... ____
c) 2 ± 0.2 g mass placed on loading platform; display show increase of 20 ± 5 mN ..... ____
d) a second 2 ± 0.2 g mass placed on loading platform; display show increase of 20 ± 5 mN ..... ____
7. TEST LOAD: ***(demo & records)***
a) Shaft resting on compliance beam ..... ____

b) 20 ± 10 mN load applied using zero load regulator ..... ____
c) 100 g mass placed on loading platform; load display shows increase of 981 ± 5 mN ..... ____

8. FRONT TO BACK ALLIGNMENT OF LOADING SHAFT: checked ***(records)*** ..... ____
9. DAILY SYSTEM CHECK: checked using 1.3 ± 0.3 mm thick stainless steel beam of known modulus and
   a) 1st 100.0 ± 0.2 g mass applied to seat load ..... ____
   b) 2nd 100.0 to 300± 0.2 g mass is applied and modulus calculated is within 10% of the known modulus ***(demo & records)*** ..... ____
10. OVERALL SYSTEM CHECK: carried out daily before any testing undertaken ..... ____
11. STEPPED THICKNESS GAUGE: ***(records)*** ..... ____
12. DEAD MASSES: verified at least every 3 years ***(records)*** ..... ____
13. THERMOMETER: liquid-in-glass and verified at least once per year ***(records)*** ..... ____

PREPARATION OF MOLDS AND TEST SPECIMEN

1. MOLDS:
   a) grease applied to side and bottom aluminum strips ..... ____
   b) plastic strips placed on mold faces (all bubbles under plastic strips removed) .....
   c) end pieces with inside surface coated with glycerol-talc mixture ..... ____
   d) mold assembled using rubber O-rings ..... ____
   e) mold assembly kept at room temperature until asphalt is poured ..... ____
   f) inside faces of end pieces coated with glycerol and talc ..... ____
2. BINDER: unaged, TFOT or PAV samples heated to minimum pouring temperature (normal max . Temp. 165 °C) ..... ____
2. MOLDING: sample poured from one end to other in single pass, slightly overfilled, cooled to room temperature and trimmed with a hot spatula 45 - 60 min ..... ____
4. DEMOLDING: mold cooled in separate location (freezer or ice bath) to - 5°C ± 5°C for 5 to 10 minutes, demolded without distortion and immediately placed in the testing bath at prescribed temperature (M320) for 60 ± 5 minutes ..... ____
5. Testing scheduled to is completed within four hours of casting ..... ____

PROCEDURE

1. SYSTEM CHECK: contact and test load adjustments checked immediately prior to testing ____
2. TEST BEAM (binder): cooled in ice bath (-5 ± 7°C) for 5 to 10 minutes prior to demolding . ____
   a) demolded beam placed in testing bath and maintained at test temperature ± 0.1°C for 60 ± 5 min. prior to testing ..... ____
3. SPECIMEN IDENTIFICATION: all appropriate information entered into computer ..... ____
4. AUTOMATIC TEST SYSTEM: to proceed as follows:
   a) seating load: 980 ± 50 mN applied for 1 ± 0.1 second and reduced to 35 ± 10 mN for 20.0 ± 0.1 sec (transparent to operator) ..... ____
   b) test load: 980 ± 50 mN applied and maintained constant to ± 50 mN for 5 sec and maintained at ± 10 mN during test ..... ____
   c) check load: returns to 35 ± 10 mN at initial seating and at end of test ..... ____

REPORT

1. TEST BATH TEMPERATURE: max. and min. during 240 min. to nearest 0.1°C at 1.0 sec interval..... ____
2. DATE & TIME WHEN LOAD APPLIED: ..... ____
3 FILE NAME AND TEST DATA: ..... ____
4. NAME OF OPERATOR:..... ____
5. SAMPLE IDENTIFICATIN NUMBER:..... ____
6. TIME OF BEAM IN BATH: ..... ____
7. ANY FLAGS ISSUED BY SOFTWARE:..... ____
8. CORRELATION COEFFICIENT: R^2, for log stiffness vs log time, to nearest 0.000001..... ____
9. ANECDOTAL COMMENTS: ..... ____
10. REPORT CONSTANTS: A, B and C to three significant figures ..... ____
11. DIFFERENCE BETWEEN MEASURED (M) AND ESTIMATED (E) STIFFNESS: 100*(E-M)/M..... ____
12. LOAD AND DEFLECTION: report for time at 0.0 and 0.5 sec..... ____
13. REPORT FOLLOWING DATA FOR TIME INTERVALS OF 8.0, 15.0, 30.0, 60.0, 120.0 and 240.0:
    a) LOADING TIME: to nearest 0.1 sec..... ____
    b) LOAD: TO NEAREST 1.0 mN..... ____
    c) BEAM DEFLECTION: to nearest 1 µm ..... ____
    d) MEASURED STIFFNESS MODULUS (M): MPa to three significant figures..... ____
    e) ESTIMATED STIFFNESS MODULUS (E): MPa to three significant figures ..... ____
    f) DIFFERENCE BETWEEN (M) AND (E): IN PERCENT ..... ____
    g) ESTIMATED m-VALUE: to nearest 0.001..... ____
21. REGRESSION COEFFICIENT AND LEAST SQUARE FIT: R^2 value ..... ____

22. EQUIPMENT MANUFACTURER: _____

23. MODEL: _____

REMARKS:

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