MATERIAL SPECIFICATION

ISS	BY WRITTEN	APPROVED C.A.C.	APPROVED R.A.A.F.	CORK/ SYNTHETIC RUBBER PACKING MATERIAL - AROMATIC FUEL RESISTING.	SPEC. No.
B	SEP' 52 AP	HEA	EKDeC.		CA.491(
C	JUN' 54 AP	[illegible]	[illegible]		

1. DESCRIPTION:

This specification covers one type of aromatic fuel resisting cork and synthetic rubber packing suitable for use as gasket material. It is available for use in three grades as follows:

CA.491-50	- Soft Grade.
CA.491-70	- Medium Grade.
CA.491-80	- Firm Grade.

2. QUALITY:

2.1. The material shall consist of granulated cork uniformly dispersed in a synthetic rubber compound and properly vulcanised to meet the detail requirements of this specification.

2.2. The cork shall be clean and free from hardback. The particles of cork shall be of such size that they will pass through a tin mesh screen and not less than 20 per cent shall be retained by a 20 mesh screen.

2.3. The binder shall consist of a synthetic rubber type product containing no new or crude rubber, so compounded with the other necessary agents to insure compliance with the requirements of this specification.

2.4. The gaskets and sheet gasket material shall have a sanded or slit finish and shall be as smooth as possible consistent with the coarse character of the work. A slit finish is the finish obtained with a cut from heavier gauge mats. Both finishes shall expose a cork surface.

2.5. The material shall not have a corrosive effect on other materials when exposed to conditions normally encountered in service. Discoloration of metal shall not be considered objectionable.

3. TOLERANCES:

The thickness of the sheet at any point shall not differ from the normal thickness by more than 1/64 inch.

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4. PHYSICAL PROPERTIES:

4.1. As Received.

The material shall possess the physical properties shown in Table I.

TABLE I.

Grade	Hardness (Durometer "A")	Specific Gravity	Comp Set. (% max)	Compressibility (%)	Recovery (% min.)
CA.491-50	45 - 55	Not limited	80	35 ± 5	95
CA.491-70	65 - 75	but to be reported	80	30 ± 5	95
CA.491-80	75 - 85		55	15 ± 5	95

Test Methods.

Hardness.

All hardness tests required by this and succeeding clauses shall conform to ASTM. D676 (latest issue).

Compression Set.

All compression set tests shall conform with ASTM D395 (latest issue) with the following conditions.

Time of heating 22 hours.

Temperature of test 70 ± 1°C (158 ± 2°F).

Compressibility and Recovery.

All compressibility tests required by this and succeeding clauses shall conform with D.1147 (latest issue) with the following conditions.

Grade.	Load to be applied.
Soft.	200
Medium	300
Firm	300

4.2. Oven Ageing.

Specimens shall be subjected to accelerated ageing by placing them in a dry circulating air oven for 70 ± 1 hours at 100 ± 1°C. They shall then comply with the requirements of Table II.

4. PHYSICAL PROPERTIES. (cont'd.)

4.2. Oven Ageing. (cont'd.)

TABLE II.

Grade.	Change In.		
	Shore Hardness (pts.)	Weight % max.	Flexibility (180^{o} bend.)
CA.491-50	+15 to -0	-10	No cracking.
CA.491-70	+10 to -0	-10	No cracking.
CA.491-80	+10 to -0	-10	No cracking.

4.2.1. Test Methods.

4.2.2. Change in Weight.

Change in weight shall be determined in duplicate on specimens approximately 1 x 2 1 1/16 inch in size. The specimens shall be held overnight in a desiccator and weighed to the nearest milligram before oven ageing. After removal from the oven specimens shall be cooled in a desiccator and weighed again. The percent change based on the initial weight shall be calculated.

4.2.3. Bending after Oven Ageing.

Specimens 1 inch by 6 inches shall be taken from each direction of the material and subjected to bending 180 degrees around a mandrel of a diameter equal to 10 times the least thickness of the material. Any indication of cracking shall be considered cause for rejection.

4.3. Fluid Immersion Tests.

4.3.1. Water Immersion.

Specimens 1 x 2 x 1/16 inch shall be subjected to water immersion for 1 hour $\pm$ 5 minutes at 100^{o}C.

The volume change for all grades shall not be greater than # 15 per cent or less than -10 per cent.

4.3.2. Oil Immersion.

Specimens 1 x 2 x 1/16 inch shall be immersed under reflux in D.Eng. R.D.2472 C/O oil (Aniline Point 124 $\pm$ 1^{o}C) for 70 $\pm$ 1 hours at 100 $\pm$ 1^{o}C. At the completion of this time the specimens shall be removed from the test liquid and immediately immersed in fresh oil at room temperature for 30 $\pm$ 5 minutes.

4. PHYSICAL PROPERTIES. (cont'd.)

4.3.2. Oil Immersion. (cont'd.)

The specimens shall then be wiped, and dipped rapidly in alcohol, blotted lightly with filter paper and tested immediately.

The specimens shall comply with the requirements of Table III.

TABLE III.

Grade.	Change In.		
	Shore Hardness (pts.)	Volume (% max.)	Compressibility.
CA.491-50	± 15	± 15	No rupture.
CA.491-70	± 10	± 15	No rupture.
CA.491-80	± 10	± 15	No rupture.

Test Methods.

Compressibility.

As detailed in Clause 4.1. The specimen shall not rupture under the specified pressure.

4.3.3. Aromatic Fuel Immersion.

Specimens 1 x 2 x 1/16 inch shall be immersed in MIL-H-3136 Type II fuel for 24 ± ¼ hours at 24 ± 3°C. The test specimens shall be removed from the fuel, dipped rapidly in alcohol, blotted lightly with filter paper and tested immediately.

The specimens shall comply with the requirements of Table IV.

TABLE IV.

Grade.	Change in.		
	Shore Hardness (pts.)	Volume (% max)	Compressibility.
CA.491-50	+0 to -20	+20	No rupture.
CA.491-70	+0 to -20	+20	No rupture.
CA.491-80	+0 to -20	+20	No rupture.

4. PHYSICAL PROPERTIES. (cont'd.)

4.4. Low Temperature Resistance.

By means of a suitable testing machine the load to compress by 25 per cent a block material specimen with a surface area of one square inch at 24 ± 3°C (75 ± 5°F) shall be determined. At least four equal weights shall be added at one minute plus or minus two second intervals until at least 25 per cent compression is obtained. The test shall be run in triplicate and the results averaged. Three similar specimens shall be each in turn conditioned at -40 ± 1°C (-40 ± 2°F). for 5 ± ¼ hours. At the end of this period the load which compressed the material 25 per cent at room temperature shall be applied to the test specimen in the cold chamber and the amount of compression recorded. At least four equal weights shall also comprise this load with the weights added at one minute plus or minus two second intervals. Low temperature resistance shall be calculated as follows.

$$\text{Low Temperature Resistance (per cent.)} = \frac{\text{\% compression at } -40^{\circ}\text{C under load which produced 25\% Compression at } 24^{\circ}\text{C.}}{25} \times 100.$$

When so tested the Low Temperature Resistance shall not be less than 10 per cent.

5. IDENTIFICATION:

Unless otherwise specified each sheet shall be marked to show the manufacturers name and/or trademark, this specification number (CA.491-50, -70 or -80 as applicable.) batch number and date of manufacture.

6. PACKAGING AND MARKING:

6.1. Packaging shall be accomplished in such a manner as to ensure that the material will not be permanently distorted or compressed, or be exposed to undue weakening or harmful materials of any kind.

6.2. Marking.
Each packaging shall be permanently and legibly marked to show the following information:
Specification Number.
Manufacturer's Name or Trademark.
Number of Parts or Size of Material.
Batch Number.
Order Number.
Date of Manufacture.

7. RELEASE NOTES:

Release Notes shall be supplied to Commonwealth Aircraft Corporation Pty. Ltd. in triplicate covering each delivery of material showing this specification number (CA.491-50, -70 or -80 as applicable) batch number, order number, quantity of material and indicating compliance with the requirements of this specification.

8. REJECTION OF MATERIAL:

Material not conforming to this specification or modifications specified on the drawing or purchase order is subject to rejection. Rejected material will be charged back to the manufacturer and will be held at his risk for a reasonable time awaiting shipping instructions, the manufacturer to pay all charges.

9. APPROVED ALTERNATIVE SPECIFICATIONS:

Notwithstanding any of the requirements of this specification, material conforming to the undermentioned specifications and accompanied by satisfactory certificates as to compliance with the requirements of such a specification will be accepted by Commonwealth Aircraft Corporation Pty. Ltd. as satisfying the requirements of this specification.

MIL-G-6183 Class I, Soft Grade equivalent to CA.491-50.
" " Medium " " " CA.491-70.
" " Firm " " " CA.491-80.

10. APPROVED MATERIAL SUPPLIERS:

Materials to the above specification have been supplied by

Armstrong Cork Company,

Lancaster, Pennsylvania. U.S.A.

These suppliers have been approved by Commonwealth Aircraft Corporation Pty. Ltd., alternative suppliers can only be approved by Engineering Department, Commonwealth Aircraft Corporation Pty. Ltd. Melbourne.
The suppliers shall not change material or method of manufacture from that used in their sample material without prior notice to, and approval by, the Engineering Dept, Commonwealth Aircraft Corporation Pty. Ltd. Melbourne.

MATERIAL SPECIFICATION

ISS	DATE	WRITTEN	APPROVED C.A.C.	APPROVED R.A.A.F.	CORK/ SYNTHETIC RUBBER PACKING MATERIAL - AROMATIC FUEL RESISTING.	SPEC. No.
	Sept 58					CA.491C Amendment 1:

Delete clause 10 and replace with the following:-

Clause 10 Approved Material Suppliers

Materials to the above specification have been supplied by -
Armstrong Cork Company
Lancaster Pennsylvania U.S.A.
Sole distributors -
Associated Power Seals Pty. Ltd.
Melbourne.

C.A. Specification	Suppliers Identification
CA.491-50	NC.709
CA.491-70	NC.710
CA.491-80	NC.711

Clause 11 Inspection and Rejection

The listing of proprietary products does not necessarily waive inspection requirements. Commonwealth Aircraft Corporation Pty. Ltd., reserve the right to carry out tests according to this specification and part or all of a delivery may be rejected if test results are not satisfactory.

NOTE: Other proprietary products may be submitted for examination and approval. As other products are approved they will be listed on reissues of this specification.

M1009B

NO. CA491

COMMONWEALTH AIRCRAFT CORPORATION LIMITED

MELBOURNE VICTORIA

MATERIAL SPECIFICATION

TITLE

CORK/SYNTHETIC RUBBER PACKING MATERIAL - AROMATIC FUEL RESISTING

ISSUE	DATE	APPROVAL				
		WRITTEN BY	C.A.C.	QUALITY	R.A.A.F.	
D	7 Sept 82	G. Smith				

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1. DESCRIPTION

This specification covers one type of aromatic fuel resisting cork and synthetic rubber packing suitable for use as gasket material. It is available for use in three grades as follows:-

CA.491 - 50 Soft Grade

CA.491 - 70 Medium

CA.491 - 80 Firm

2. QUALITY

2.1 The material shall consist of granulated cork uniformly dispersed in a synthetic rubber compound and properly vulcanised to meet the detail requirements of this specification.

2.2 The cork shall be clean and free from hardback. The particles of cork shall be of such size that they will pass through a 10 mesh screen and not less than 20 percent shall be retained by a 20 mesh screen.

2.3 The binder shall consist of a synthetic rubber type product containing no new or cured rubber, so compounded with the other necessary agents to insure compliance with the requirements of this specification.

2.4 The gaskets and sheet gasket material shall have a sanded or slit finish and shall be as smooth as possible consistent with the coarse character of the cork. A slit finish is the finish obtained with a cut from heavier gauge mats. Both finishes shall expose a cork surface.

2.5 The material shall not have a corrosive effect on other materials when exposed to conditions normally encountered in service. Discoloration of metal shall not be considered objectionable.

3. TOLERANCES

3.1 The thickness of the sheet at any point shall not differ from the normal thickness by more than 0.4 mm (0.016 inch).

4. PHYSICAL PROPERTIES

4.1 AS RECEIVED (Reference Table 1)

4.1.1 Hardness

Specimens shall meet the requirements of ASTM D2240 (latest issue) All hardness testing shall be to Shore 'A'.

4.1.3 Compression Set

All compression set tests shall conform with ASTMD395 (latest issue) with the following conditions:- (Refer Appendix 1)

Time of heating - 22 hours

Temperature of test - 70±1°C (158 ±2°F)

4.1.4 Compressibility and Recovery

All compressibility and recovery tests shall conform to ASTM F36 (latest issue) with the following conditions:-

GRADE	Total Load to be Applied Kg. (lb)
Soft	91 (200)
Medium	136 (300)
Hard	136 (300)

Note:- The weight of the penetrator shall constitute the preload to be applied. (Refer Appendix 1)

4.2 OVEN AGEING (Reference Table 2)

4.2.1 Oven Ageing Test Method

Specimens shall be subjected to accelerated ageing by placing in a dry circulating air oven for 70±1 hours at 100±1°C. The oven aged specimens shall then be tested for compliance with the following sub clauses and the results recorded.

4.2.1.1 Hardness Change

Specimens shall be tested to ASTM D2240 (latest issue). The percent hardness change based on the As Received Shore 'A' Hardness shall then be recorded. (reference Table 1)

4.2.1.2 Weight Change

Change in weight shall be determined in duplicate on specimens nominally 1.6 x 25 x 50 mm (0.063x1 x 2 inch) in size. The specimens shall be held overnight in a desiccator and weighed to the nearest milligram before oven ageing. After removal from the oven specimens shall be cooled to ambient in a desiccator and weighed again. The percent change based on the initial weight shall then be recorded.

4.2.1.3 Flexibility (Bending after Oven Ageing)

Specimens nominally 25 x 150 mm (1 x 6 inch) shall be tested to ASTM F147 (latest issue) except that the mandrel shall be ten (10) times the minimum thickness of material. Any cracking shall be cause for rejection (see Table 2)

4.3 WATER IMMERSION (Refer Table 2)

4.3.1 Water Immersion Test Method

Specimens 1.6 x 25 x 50 mm (0.063 x 1 x 2 inch) shall be subjected to water immersion for 60±5 mins at 100°C. They shall then be allowed to cool to ambient and shall then be tested for compliance with the following clause. The results of these tests shall be recorded.

4.3.1.1 Volume Change

Specimens shall be measured and the percent volume change based on initial size shall be calculated (reference clause 4.3.1)

4.4 OIL IMMERSION (Refer Table 2)

4.4.1 Oil Immersion Test Method

Specimens 1.6 x 25 x 50 mm (0.063 x 1 x 2 inch) shall be immersed under reflux in D. Eng. RD2472 c/o oil (Aniline point 124±1°C) for 70 hours at 100±1°C. They shall then be allowed to cool to ambient and shall then be tested for compliance with the following sub clauses. The results of these tests shall be recorded.

4.4.1.1 Hardness Change

Specimens shall be tested to ASTM D2240 (latest issue). The percent hardness change based on the As Received Shore 'A' hardness shall then be recorded. (reference Table 1).

4.4.1.2 Volume Change

Specimens shall be measured and the percent volume change based on initial size shall be calculated. (reference clause 4.3.1)

4.4.1.3 Compressibility

Compressibility tests shall conform to the following conditions. (see also clause 4.1.4)

GRADE	Total Load to be applied Kg. (lb)
Soft	91 (200)
Medium	136 (300)
Hard	136 (300)

The specimens so tested shall not rupture.

4.5 AROMATIC FUEL IMMERSION (refer Table 2)

4.5.1 Aromatic Fuel Immersion - Procedure

Specimens 1.6 x 25 x 50 mm (0.063 x 1 x 2 inch) shall be immersed in TT-S-735 Type 11 fuel for 24±¼ hours at 24±3°C. The test specimens shall be removed from the fuel, dipped rapidly in alcohol, blotted lightly with filter paper and tested immediately. The specimens shall then be tested for compliance with the following sub clauses and the results recorded.

4.5.1.1 Hardness Change

Specimens shall be tested to ASTM D2240 (latest issue). The percent hardness change based on the As Received Shore 'A' hardness shall be recorded. (reference Table 1)

4.5.1.2 Volume Change

Specimens shall be measured and the percent volume change based on initial size shall be calculated.

4.5.1.3 Compressibility

Compressibility tests shall conform to the following conditions (see also clause 4.1.4)

GRADE	Total Load to be Applied Kg. (lb)
Soft	91 (200)
Medium	136 (300)
Hard	136 (300)

The specimens so tested shall not rupture.

4.6 LOW TEMPERATURE RESISTANCE (Refer Table 3)

4.6.1 Low Temperature Resistance Test Method

Specimens with a nominal surface area of 645 square mm (one square inch) shall be loaded into a suitable testing machine such that at least 25% compression can be obtained. The compression shall be produced by the application of at least four equal weights added at 1 minute ±2 secs until 25% compression is obtained. The total weight producing this compression shall then be recorded.

Further specimens shall be conditioned at $-40\pm1^{\circ}C$ for $5\pm\frac{1}{4}$ hours. At the end of the conditioning the above 'total weight' shall be applied to the test specimens in the cold chamber and the amount of compression so produced shall be recorded.

The test shall be run in triplicate and results averaged. The Low Temperature Resistance shall then be calculated via the following formula:

$$\text{Low Temp Res.} = \frac{\%\text{ compression at } -40^{\circ}C \text{ under the 'total weight' which produced 25\% compression at Room Temp}}{25} \times 100\%$$

4.6.2 Low Temperature Resistance Test Results

Specimens tested in accordance with clause 4.6.1 of this specification shall be checked for compliance with the requirements of Table 3.

5. IDENTIFICATION

Unless otherwise specified each sheet shall be marked to show the manufacturers name and/or trademark this specification number (CA.491-50, -70 or -80 as applicable.) batch number and date of manufacture.

6. PACKAGING AND MARKING

6.1 Packaging

Packaging shall be accomplished in such a manner as to ensure that the material will not be permanently distorted or compressed, or be exposed to undue weakening or harmful materials of any kind.

6.2 Marking

Each packaging shall be permanently and legibly marked to show the following information:

Specification Number:
Manufacturer's Name or Trademark.
Number of Parts or Size of material.
Batch Number
Order Number
Date of Manufacture.

7. RELEASE NOTES

Release Notes shall be supplied to Commonwealth Aircraft Corporation Ltd. in triplicate covering each delivery of material showing this specification number (CA.491-50, -70 or -80 as applicable), batch number, order number, quantity of material, and indicating compliance with the requirements of this specification.

8. REJECTION OF MATERIAL

Material not conforming this specification or modifications specified on the drawing or purchase order is subject to rejection. Rejected material will be charged back to the manufacturer and will be held at his risk for a reasonable time awaiting shipping instructions, the manufacturer to pay all charges.

9. APPROVED ALTERNATIVE SPECIFICATIONS

Not withstanding any of the requirements of this specification, material conforming to the undermentioned specifications and accompanied by satisfactory certificates as to compliance with the requirements of such a specification will be accepted by Commonwealth Aircraft Corporation Ltd. as satisfying the requirements of this specification.

9. APPROVED ALTERNATIVE SPECIFICATIONS (cont)

MIL-C-6183 Class 1, Grade A (soft) equivalent to CA.491-50

MIL-C-6183 Class 1, Grade B (medium) equivalent to CA.491-70

MIL-C-6183 Class 1, Grade C (Firm) equivalent to CA.491-80.

10. APPROVED MATERIAL SUPPLIERS

Materials to the above specification have been supplied by -
Armstrong Cork Company
Lancaster Pennsylvania U.S.A.
Sole distributors -
Associated Power Seals Pty. Ltd.
Melbourne

C.A Specification	Suppliers Identification
CA.491-50	NC.709
CA.491-70	NC.710
CA.491-80	NC.711

11. INSPECTION AND REJECTION

The listing of proprietary products does not necessarily waive inspection requirements. Commonwealth Aircraft Corporation Ltd. reserve the right to carry out tests according to this specification and part or all of a delivery may be rejected if test results are not satisfacory.

Note; Other proprietary products may be submitted for examination and approval. As other products are approved they will be listed on reissues of this specificaition.

ISSUE	DATE	ISSUE	DATE
D	7/Sept/82		

PHYSICAL PROPERTIES

TABLE 1

GRADE	CONDITION	HARDNESS SHORE 'A' (SEE 4.1.1)	SPECIFIC GRAVITY (SEE 4.1.2)	COMPRESSION SET (SEE 4.1.3)	COMPRESS-IBILITY (SEE 4.1.4)	RECOVERY (% MIN) (SEE 4.1.4)
CA.491-50	AS RECEIVED	45-55	Not limited but to be recorded	80	35 ± 5	95
CA.491-70	AS RECEIVED	65-75		80	30 ± 5	95
CA.491-80	AS RECEIVED	75-85		55	15 ± 5	95

ISSUE	DATE	ISSUE	DATE
D	7/Sept/82		

PHYSICAL PROPERTIES

TABLE 2

GRADE	TEST CONDITION	SHORE 'A' HARDNESS	WEIGHT % MAX	VOLUME % MAX	FLEXIBILITY (180° BEND)	COMPRESSIBILITY
CA.491-50	OVEN	+15 to -0	-10	-	NO CRACKING	-
-70	AGEING	+10 to -0	-10	-	NO CRACKING	-
-80	(See 4.2)	+10 to -0	-10	-	NO CRACKING	-
CA.491-50	WATER	-	-	-10 to +15	-	-
-70	IMMERSION	-	-	-10 to +15	-	-
-80	(See 4.3)	-	-	-10 to +15	-	-
CA.491-50	OIL	±15	-	±15	-	No rupture
-70	IMMERSION	±10	-	±15	-	No rupture
-80	(See 4.4)	±10	-	±15	-	No rupture
CA491-50	AROMATIC	+0 to -20	-	+20	-	No rupture
-70	FUEL	+0 to -20	-	+20	-	No rupture
-80	IMMERSION (See 4.5)	+0 to -20	-	+20	-	No rupture

PHYSICAL PROPERTIES

TABLE 3

GRADE	TEST CONDITION	OBSERVATION (SEE 4.4)
CA491-50 -70 -80	LOW TEMPERATURE RESISTANCE (SEE 4.6)	The "Low Temperature Resistance"(%) shall not be less than 10% for all grades.

Appendix 1 - Explanation of Test Methods

1. Compression Set (ASTM D395 Method B, Type 1 or Type 2 Specimen)

Place specimens to be tested in test rig as indicated below. (FIG 1)
Select spacers as detailed in clause 9.3 of the above ASTM.

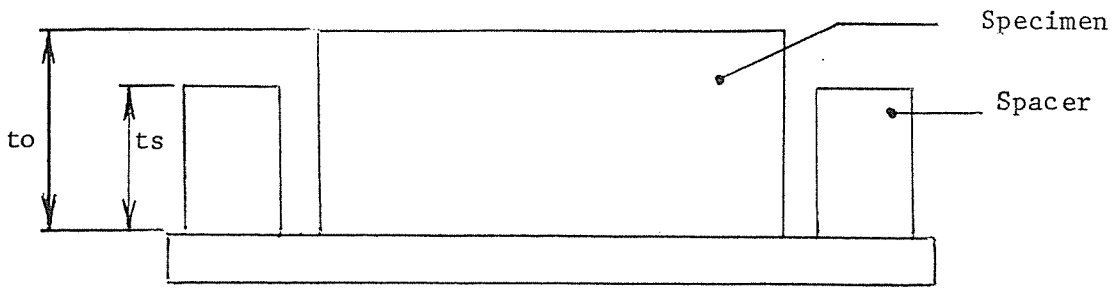

FIG. 1

Clamp specimen (reference FIG. 2) until top plate rests on the spacers, then heat in oven as per the given instructions (reference clause 11.3 of the ASTM) for the stated time.

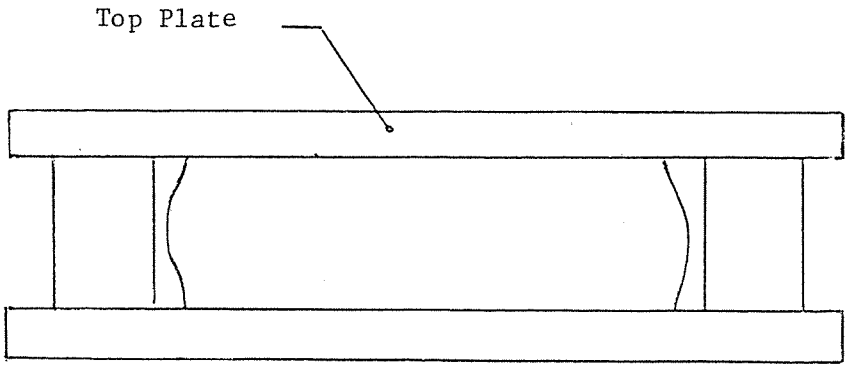

FIG. 2

Allow to cool on a thermally low conductive table (eg. wood) for 30 mins then note 'ti' as below (FIG 3)

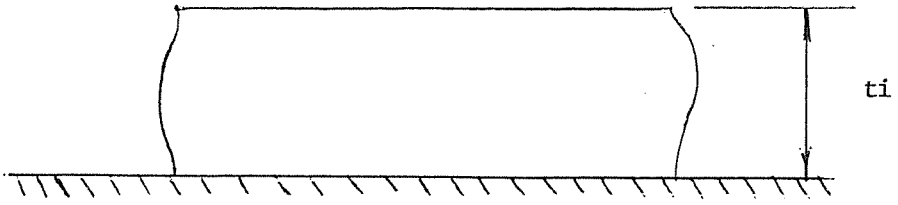

FIG. 3

Calculate Compression Set via the following formula:-

$$C = \frac{to - ti}{to - ts} \times 100\%$$

2. Compressibility and Recovery (ASTM F36)

Load specimens to be tested into test rig as indicated below (FIG. 4)

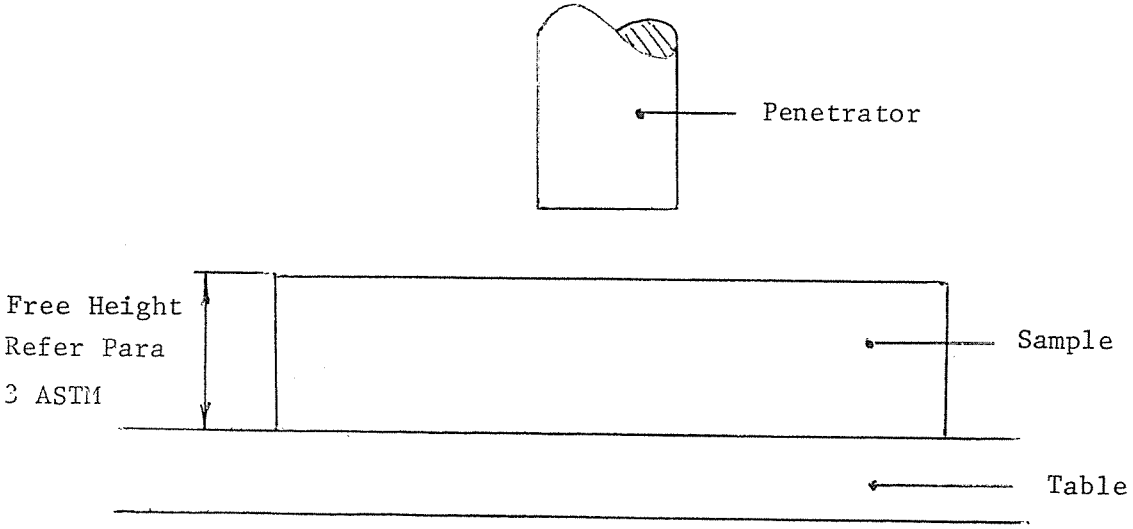

FIG. 4

Apply the given preload (The weight of the penetrator in this instance) for 15 sec then measure P. (refer FIG 5)

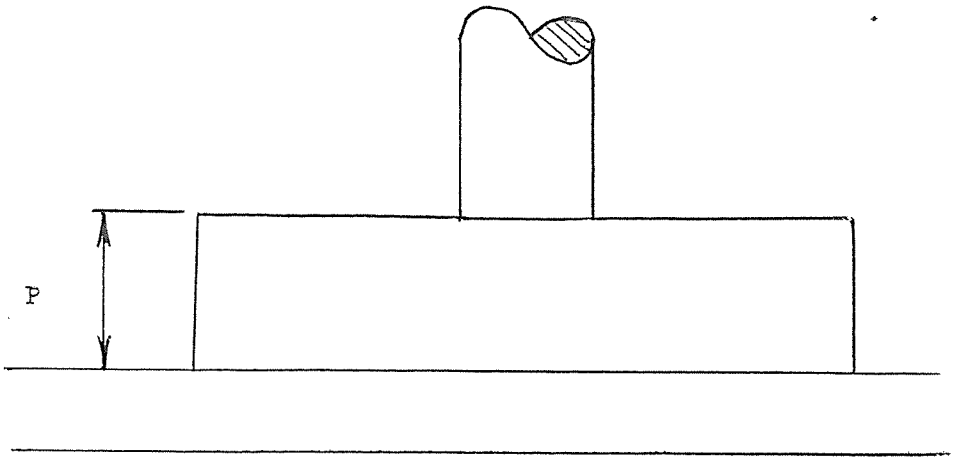

FIG. 5

Add, progressively, the given total load as defined in clause 4.4.1.3 and 4.5.1.3 to this preload within 10 sec and maintain for 60 sec, then measure M(reference FIG 6a). Completely release penetrator then measure R after a further 60 sec. (reference FIG 6b).

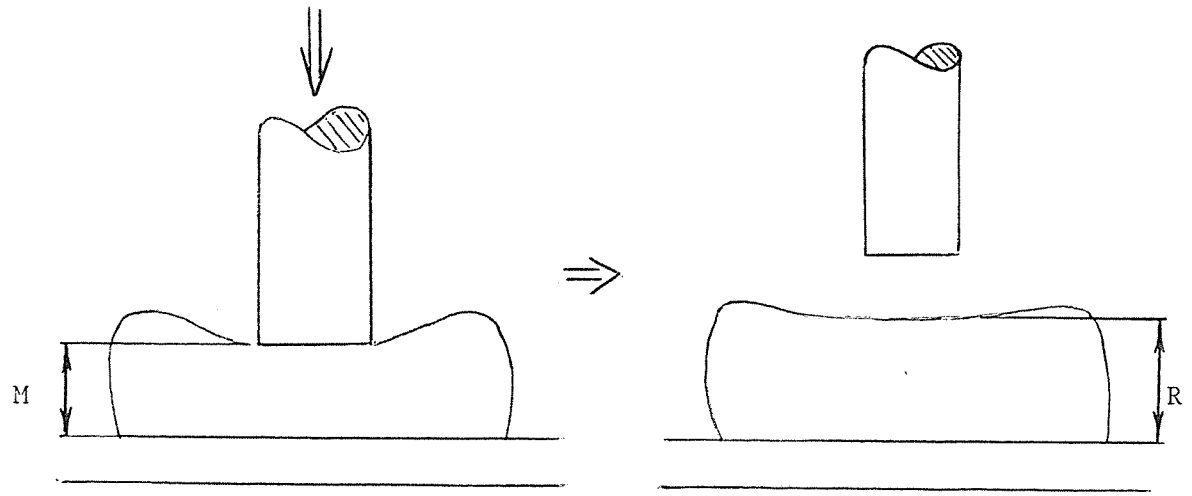

FIG 6(a) FIG 6(b)

Calculate Compressibility and Recovery as follows:-

$$\text{Compressibility} = \frac{P - M}{P} \times 100\%$$

$$\text{Recovery} = \frac{R - M}{P - M} \times 100\%$$

3.0 Further Explanations

For any other required explanations refer to the relevant ASTM.