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ASSEMBLY - 7th session  
Agenda item 8

IMPROVED PROVISIONAL GUIDELINES ON TEST  
PROCEDURES FOR PRIMARY DECK COVERINGS

RESOLUTION A.214(VII)  
adopted on 12 October 1971

THE ASSEMBLY,

NOTING Article 16(i) of the Convention on the Inter-Governmental Maritime Consultative Organization concerning the functions of the Assembly,

NOTING ALSO Regulations 41 and 54 and proposed Regulation 105 of Chapter II of the International Convention for the Safety of Life at Sea, 1960, concerning deck coverings,

NOTING FURTHER Recommendation 11 of the International Conference on the Safety of Life at Sea, 1960, concerning fire test procedures,

RECALLING Resolution A.165(ES.IV) by which it adopted Provisional Guidelines for Test Procedures on Deck Coverings,

DESIRING to improve these Provisional Guidelines,

HAVING CONSIDERED the Recommendation by the Maritime Safety Committee at its twenty-second session,

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ADOPTS the Improved Provisional Guidelines on Test Procedures for Primary Deck Coverings as set out at Annex to this Resolution, which supersede the Provisional Guidelines adopted by Resolution A.165(ES.IV),

INVITES all governments concerned to take appropriate steps to give effect to the Improved Provisional Guidelines as soon as possible,

REQUESTS the Maritime Safety Committee to continue its study on this subject,

AUTHORIZES the Maritime Safety Committee to amend the Guidelines if necessary in the light of such study.

#### ANNEX

#### IMPROVED PROVISIONAL GUIDELINES ON TEST PROCEDURES FOR PRIMARY DECK COVERINGS

##### Foreword

1. The present specification is intended to provide information to Administrations, laboratories and other interested bodies concerning the assessment of requisite properties of primary deck coverings. The work of the Organization in this field has not yet been finalized, and there are certain difficulties in the interpretation of relevant provisions of the 1960 Safety Convention. These guidelines provide improved test procedures for deck coverings and supersede those previously formulated in Resolution A.165(ES.IV), but are still of provisional character.
2. The fire resistance aspects of deck coverings or primary deck coverings are mentioned in Chapter II of the International Convention for the Safety of Life at Sea, 1960, in three distinct situations, namely:

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- (a) in cargo ships over 4,000 gross tons (Regulation 54(c));
- (b) in passenger ships (Regulation 41);
- (c) in future passenger ships (Regulation 105(h)).

3. The test method described in this document is intended to provide guidelines for qualifying primary deck coverings as acceptable with respect to the above referenced requirements. The method described is only applicable to situations in which a fire occurs in the compartment below the deck.

4. When doubts exist relative to the fire hazard characteristics of the upper exposed surface of permanently attached deck coverings, Administrations are encouraged to apply such flammability and other test methods considered necessary for their evaluation.

#### Application

5. The following considerations should be recognized in application of the described test:

- (a) The test is only required when the thickness of the material applied directly to the steel plate is equal to or exceeds 5 mm. Thin paint films and bonding agents are exempted from consideration as the material directly applied to the steel plate.
- (b) In general only the first layer should be tested. However, in case an Administration considers that some substantial difference of fire performance may result from the application of successive layers then the Administration may consider it desirable to perform qualification tests on the complete assembly.



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- (c) The test is required where the fire insulation to be installed is no more than the minimum specified in parts D and H of Chapter II of 1960 Safety Convention. If additional insulation is provided the Administration may consider the possibility of acceptance of deck coverings on the basis of a complete fire resistance test in which case a separate test for deck coverings need not be superimposed. In any case the test considered here should be conducted without the use of insulation below the steel plate specimen.

6. The test equipment and procedures described below are intended for determining whether or not deck coverings "readily ignite", release excessive smoke and/or exude gases which are toxic or combustible. The methods described are not intended for evaluating the effectiveness of the deck coverings as a portion of the required insulation of an A or B Class division. For this purpose the fire resistance test is required.

7. It is felt that the attention of Administrations should be specially drawn to the nature of the test which simulates a deck with no protection underneath. It is important that Administrations should determine the validity of this procedure before applying it to other situations. When determining the ignitability of deck coverings from a fire source from above a different technique will be required: a simple ignitability or flame spread test would be suitable for this purpose.

Description of specimen

8. The primary deck covering as intended to be tested should be applied to a mild steel plate of a nominal thickness of 5 mm. The overall size of the steel plate should be such that it exceeds the opening of the furnace by 25 mm  $\pm$  5 mm on all sides. Three specimens should be prepared for test on each type of deck covering.

Conditioning of specimen

9. The test specimens should be conditioned to equilibrium with an atmosphere of relative humidity between 40-70 per cent at a temperature of  $20 \pm 5^{\circ}\text{C}$ .

Description of furnace

10. The tests should be performed on a furnace with a rectangular horizontal opening with sides measuring  $600 \text{ mm} \pm 100 \text{ mm}$  internally. The internal depth of the furnace should be such as to prevent the direct impingement of flames if any to the underside of the specimens, the depth should not be less than 100 mm in any case.

Measurement of furnace temperature

11. The temperature condition within the furnace during a test should be determined by means of at least three rapid response thermocouples positioned, within the opening along one diagonal, one at the centre and the other two at quarter points. The furnace should be calibrated to ensure as uniform heating as possible. The hot junctions of the thermocouples should be approximately 50 mm from the underside of the deck specimen.

Furnace control

12. The furnace temperature should be continuously controlled so as to follow the standard time/temperature curve starting at room temperature and defined by a smooth curve drawn through the following points:

At the end of the first 5 minutes	$538^{\circ}\text{C}$
" " " " " " 10 "	$704^{\circ}\text{C}$
" " " " " " 15 "	$760^{\circ}\text{C}$
" " " " " " 30 "	$843^{\circ}\text{C}$

The accuracy of the furnace control should be such that the area under the curve of the mean furnace temperature should not vary by more than  $\pm 10$  per cent of the area under the standard curve.



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Test flame

13. A test flame, 15-20 mm in length, should be used to measure the ignitability of the deck covering. A possible arrangement for a test flame is shown in figure 1. The flame should be of luminous type produced by the combustion of a hydrocarbon gas. Other suitable means may be employed for the ignition of the gases emitted by the deck covering.

Smoke collection canopy

14. A chamber or canopy for collection of smoke and gases above the specimen should be constructed of steel as defined by the drawings shown in figures 2 and 3. The number and size of holes as well as the dimensions indicated should be closely complied with. This canopy may be finished with any heat and corrosion resistant finish desired.

Measurement of light obscuration

15. A photometer for measurement of light transmission through the gases collected by the canopy should be constructed as shown by drawings in figures 2 and 4. The dimensions shown for the light source and detector should be considered typical rather than critical. It is, however, highly recommended that the baffle with an aperture of not larger than 5 mm diameter be used as shown. This device serves to greatly reduce the effects of extraneous light causing errors in transmission measurements. Both the light source and detector enclosures should be constructed in such a manner that smoke cannot accumulate within them.

16. Figure 5 shows the circuit diagram for connexion of the electrical parts of the system. One suitable type of light detector used can be of the vacuum photo emissive type with a spectral response roughly corresponding to that of the human eye

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(an RCA 1P39 tube has been found suitable). As indicated in figure 5 the resistive load of this detector may be either a circuit component or a part of the measuring instrument but should remain constant for all ranges of instrument sensitivity.

17. The measuring instrument, not shown, should preferably be of the recording type with provision for rapid easy change of measuring voltage sensitivity over three decades. A recording vacuum tube voltmeter with full scale sensitivity variable in three steps from 0.1 to 10 volts would be adequate for this purpose.

18. The lamp used should be operated at approximately its design voltage although small changes in supply voltage may be made to permit adjustment of full scale indication of the measuring instrument in the absence of smoke. Initial coarse adjustment of output of the photometer circuit may be accomplished either by changes of battery voltage or resistance of the photo detector load circuit.

19. The smoke measurements are reported in terms of optical density. This property is defined as  $\log_{10} \frac{100}{T}$  where T is the percentage fraction of the incident light that is received by the photo detector. The optical density may be obtained directly by plotting the transmission on the chart figure 6 and interpolating linearly between the indicated optical density shown.

Test procedure

20. The specimen should be placed to close the furnace opening with the deck covering uppermost. Precautions should be taken to prevent escape of gases around the edges of specimen.

21. In arranging the canopy and photometer on the upper surface of the specimen the photometer should be placed to lie across the width or length of the specimen whichever most nearly corresponds to a dimension of 550 mm.



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22. Since draughts blowing across the surface of the specimen during a test would seriously influence smoke measurements, precautions should be taken to ensure that such conditions do not occur during a test.

Test of ignitability

23. Two specimens should be tested without using the smoke collection canopy and each test should be of 15 minutes' duration. The test flame specified in paragraph 13 should be applied to the top of the deck covering before the commencement of heating and then at one minute intervals from the first evidence of the evolution of gases from the specimen surface. During each application, the test flame or the other device for the same purpose should be moved over the whole surface of the specimen.

Test for smoke production

24. One specimen should be tested and the test should be of a thirty minute duration. The smoke collection canopy shown in figures 2 and 3 should be placed in position on top of the specimen. The sensitivity range of the measuring instruments should be changed during the test to maintain the meter deflection at a value greater than 10 per cent of the full scale.

Test for toxic products

25. Spot checks should be made during the tests in paragraph 23 to determine the nature of the toxic products given off. During the course of the test in paragraph 24 samples of gases should be taken at intervals from the central top opening of the canopy. These may be analyzed directly by colorimetric gas indicators or by other suitable gas analysis methods.

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Observations during test

26. The following observations and records should be made during the tests as appropriate:

- (a) Time of occurrence of any flaming and its characteristics such as location, duration, height, etc.
- (b) A record of the variation of light transmission through the canopy during the test. The data should be plotted as optical density on a graph as in figure 6.
- (c) A record should be kept of the concentration of toxic products measured during the test.

Assessment of performance

27. The performance of the specimens should be indicated under the following headings:

(a) Ignitability

The deck covering should be classified as "not readily ignitable" if with neither specimen is there any continuous flaming during the 15 minutes' test. Any flaming continuing for 10 seconds or more after the local application of the test flame should be considered as continuous flaming.

(b) Smoke

Time of occurrence and duration for which the optical density exceeds values of 1.0 and 2.0 should be given.

(c) Toxic gases

Type of gases and their concentration should be plotted as a function of time.

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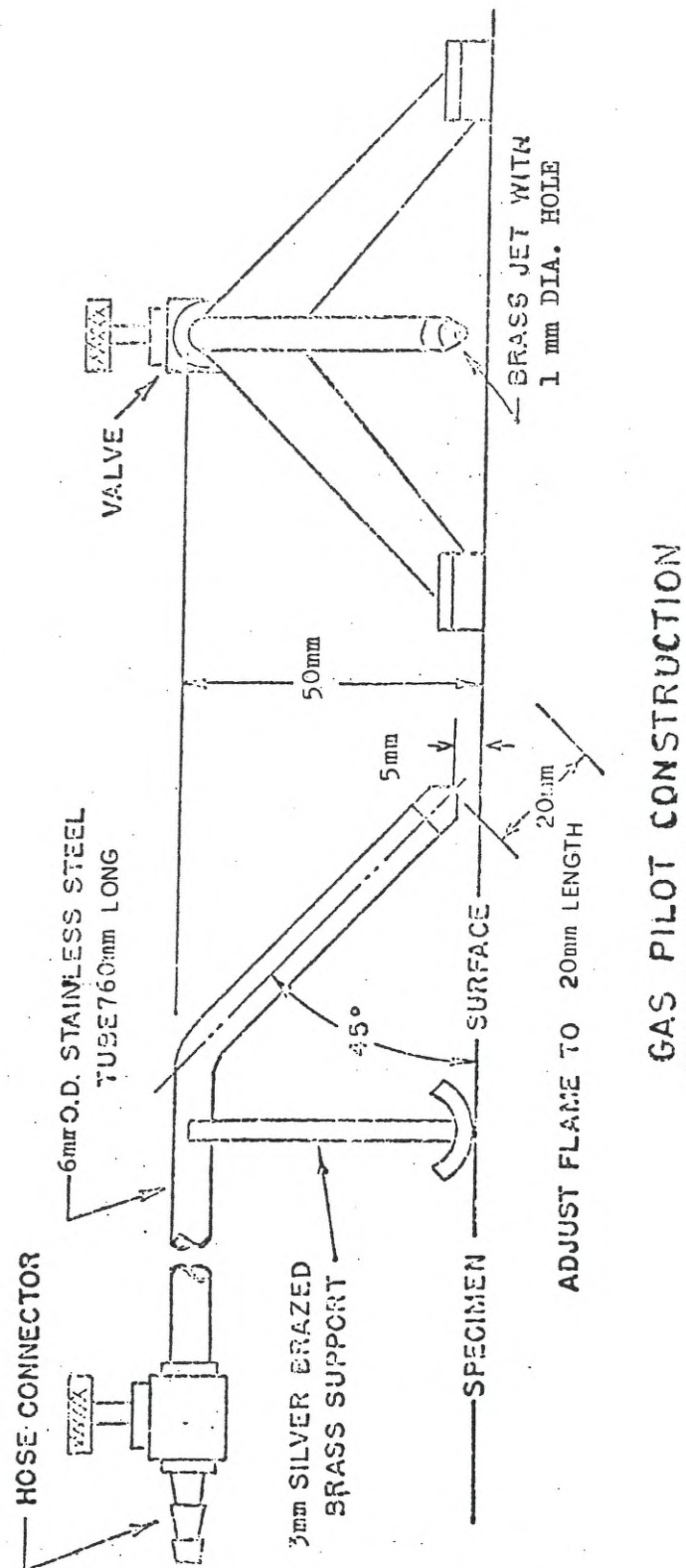
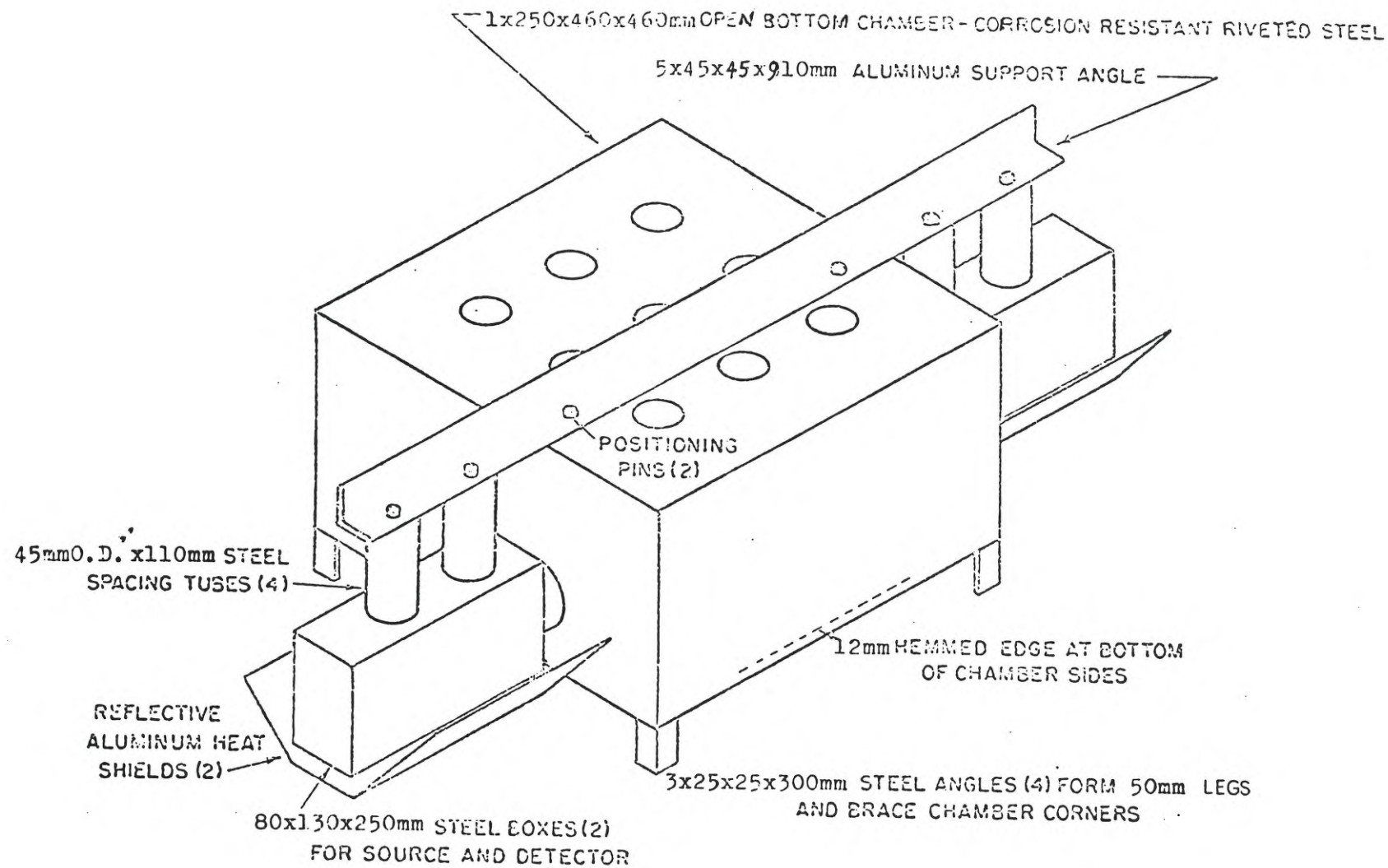


Figure 1



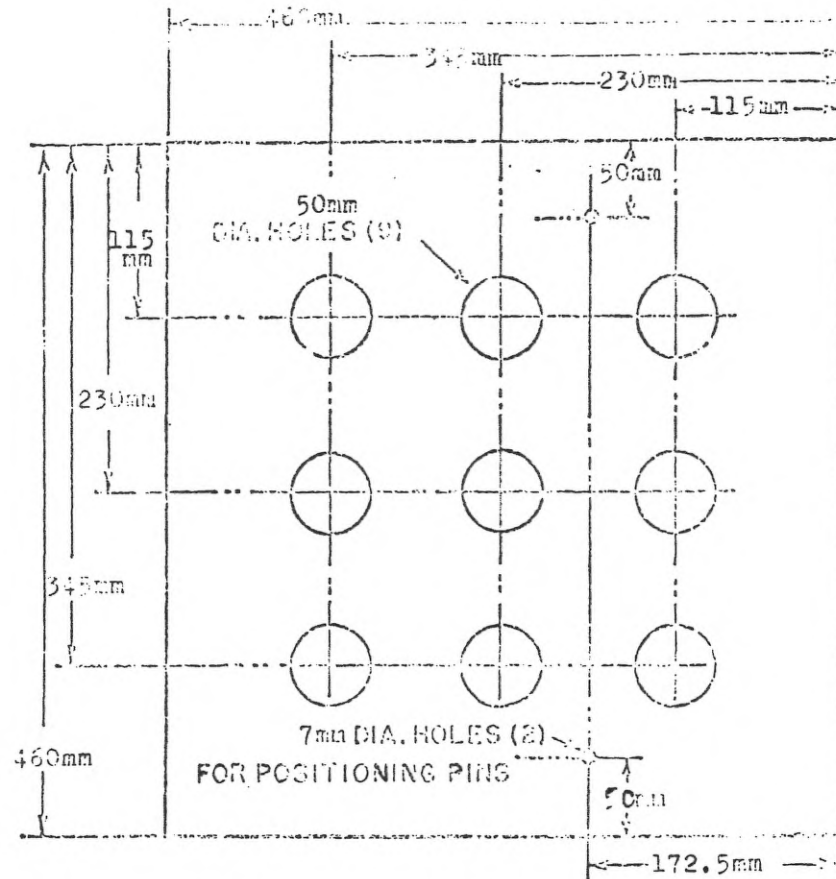


ASSEMBLED SMOKE MEASUREMENT DEVICE

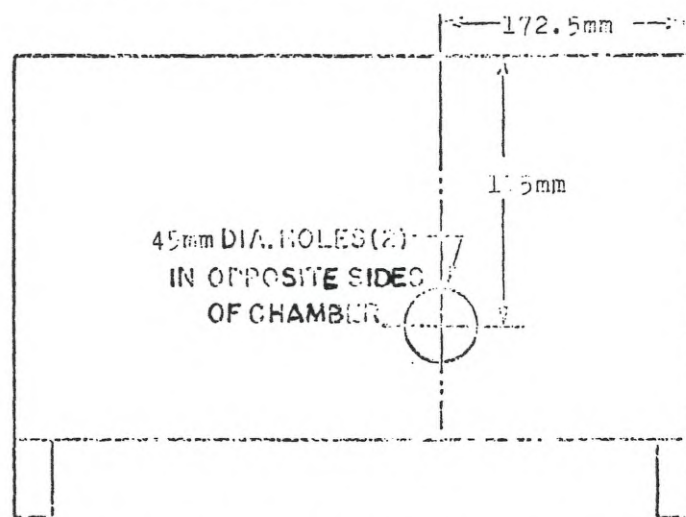
Figure 2

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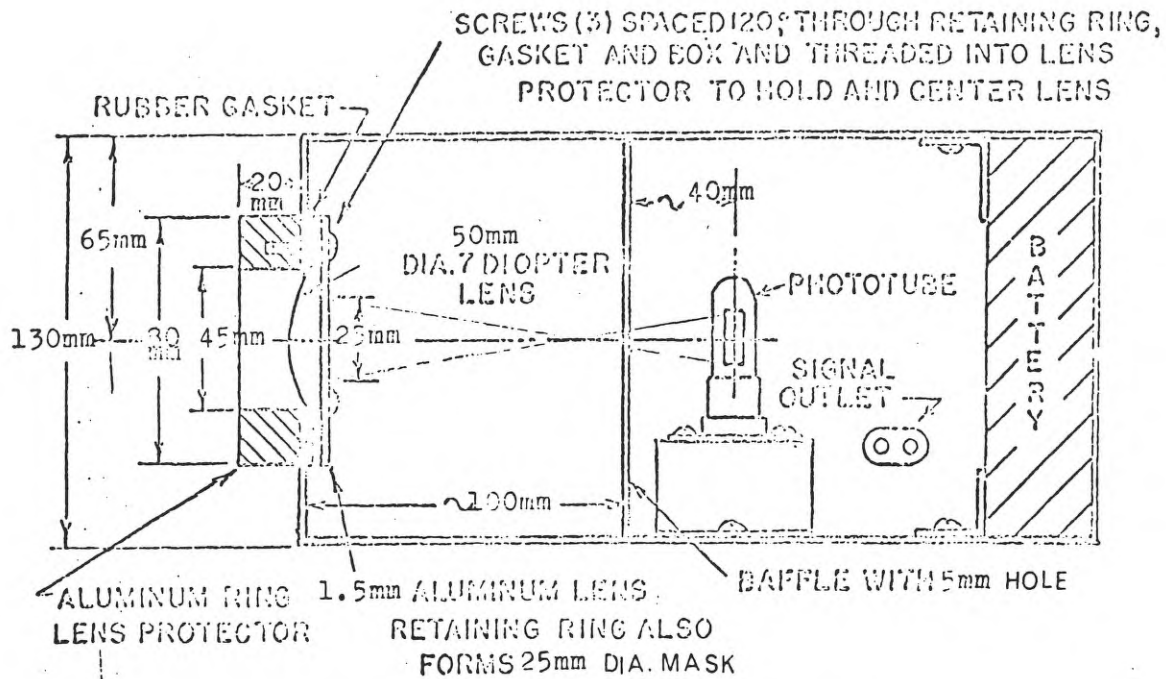
LAYOUT FOR HOLES IN CHAMBER TOP



LAYOUT FOR HOLES IN CHAMBER SIDES

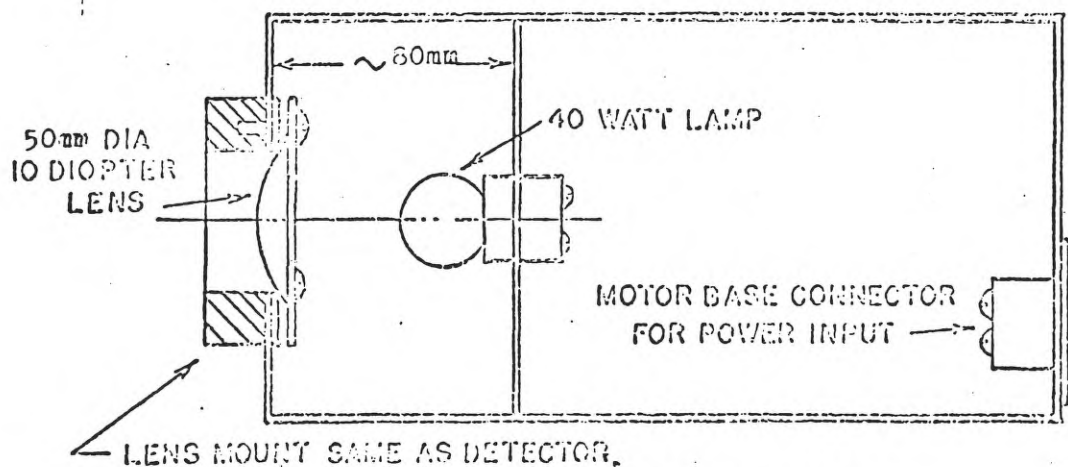
Figure 3

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### DETECTOR CONSTRUCTION

BOX TO BE DUST TIGHT AND PAINTED FLAT BLACK INSIDE



### LIGHT SOURCE CONSTRUCTION

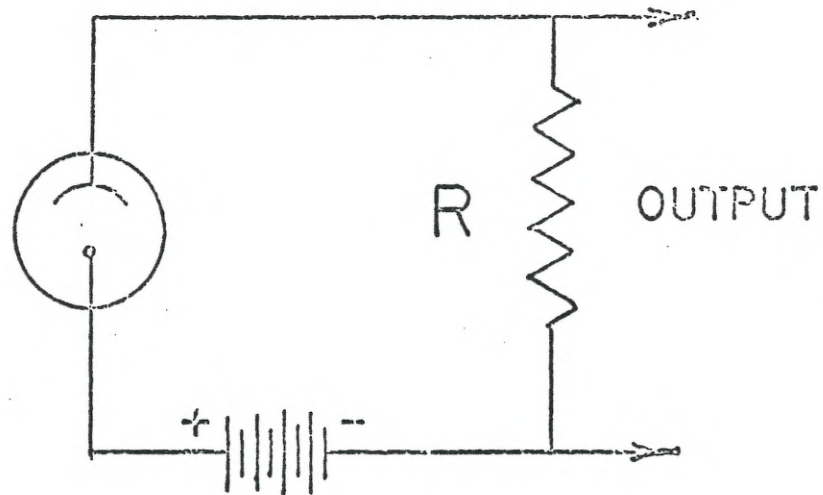
BOX TO BE DUST TIGHT

Figure 4



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R- CONSTANT RESISTANCE LOAD EITHER  
A CIRCUIT ELEMENT OR THE INPUT  
RESISTANCE OF THE MEASURING INSTRUMENT

Figure 5

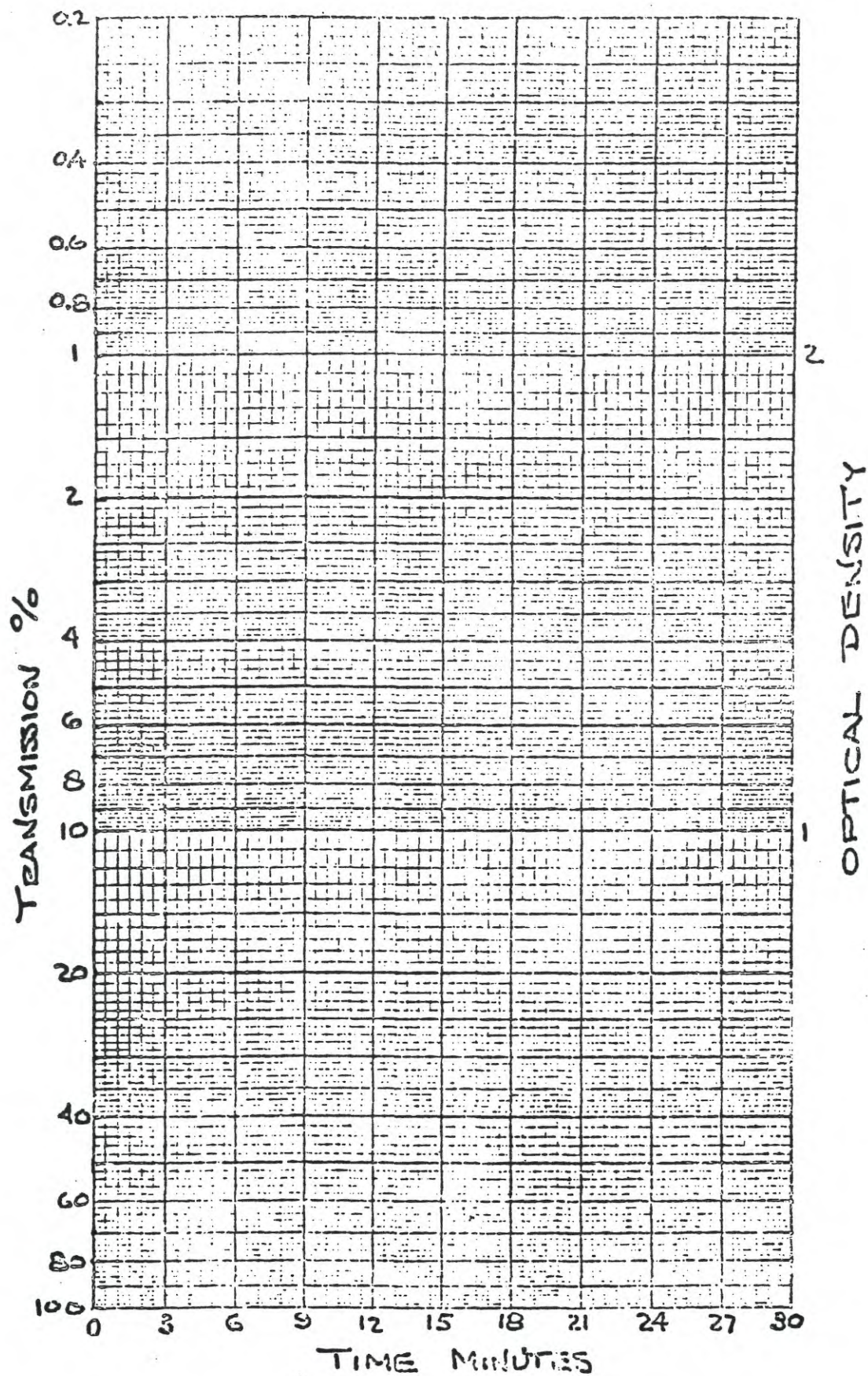


Figure 6

