



**PRODUCT MANUAL FOR  
FOAM CONCENTRATE FOR PRODUCING MECHANICAL FOAM  
FOR FIRE FIGHTING  
ACCORDING TO IS 4989: 2018**

*This Product Manual shall be used as reference material by all Regional/Branch Offices & licensees to ensure coherence of practice and transparency in operation of certification under Scheme-I of Bureau of Indian Standards (Conformity Assessment) Regulations, 2018 for various products. The document may also be used by prospective applicants desirous of obtaining BIS certification licence/certificate.*

1.	<b>Product</b>	:	IS 4989: 2018
	<b>Title</b>	:	FOAM CONCENTRATE FOR PRODUCING MECHANICAL FOAM FOR FIRE FIGHTING
	<b>No. of Amendments</b>	:	NIL
2.	<b>Sampling Guidelines:</b>		
a)	<b>Raw material</b>	:	NA
b)	<b>Grouping guidelines</b>	:	Please refer ANNEX – A
c)	<b>Sample Size</b>	:	15 litres
3.	<b>List of Test Equipment</b>	:	Please refer ANNEX – B
4.	<b>Scheme of Inspection and Testing</b>	:	Please refer ANNEX – C
5.	<b>Possible tests in a day:</b>		
	(i) Visual examination (Clause 4.2, Table 1)		
	(ii) pH and specific gravity (original) (Clause 4.2, Table 1)		
	(iii) Pour point (Clause 4.2, Table 1)		
	(iv) Sludge content (Clause 4.2, Table 1)		
	(v) Surface tension (Clause 4.2, Table 1)		
6.	<b>Scope of the Licence:</b>		
	“Licence is granted to use Standard Mark as per IS 4989:2018 with the following scope:		
	Name of the product	Foam Concentrate for Producing Mechanical Foam for fire fighting	
	Class and Type of foam concentrate		

**ANNEX- A****Grouping Guidelines**

1. IS 4989: 2018 covers Foam Concentrates for Producing Mechanical Foam for Fire Fighting which are classified as under:

a) Suitable for top application:

<b>Class</b>	<b>Type</b>	<b>Fuel for fire performance</b>	<b>Class of fire</b>
AFFF	1,3 and 6	Non-polar	Class A and Class B
PF	3,6	Non-polar	Class A and Class B
FP	3,6	Non-polar	Class A and Class B
FFFP	3,6	Non-polar	Class A and Class B
SF	1,3,6	-	Class A
AR-AFFF	3/3 and 3/6	Both non-polar and polar	Class A and Class B
AR-FFFP	3/3 and 3/6	Both non-polar and polar	Class A and Class B
AR-FP	3/3 and 3/6	Both non-polar and polar	Class A and Class B

b) For base injection system for storage tanks, a special requirement can be put separately by users.

2. Considering the above, following grouping guidelines is developed for GoL/CSoL:

- One sample from each Class of Foam Concentrate of lowest Type (for eg., 1 from 1, 3 and 6 or 3/3 from 3/3 and 3/6) shall be tested for all requirements to cover all Types of Foam Concentrates of that particular Class of Foam Concentrate in the scope of licence.
- Foam Concentrates intended for base injection system for storage tanks shall be tested separately to cover that variety in the scope of licence.

3. The firm shall declare the varieties of Foam Concentrate they intend to cover in the licence. The scope of the Licence may be restricted based on the Manufacturing and Testing capabilities of the Manufacturer.

4. During the operation of the licence, BO shall ensure that all the varieties covered in the Licence are tested in rotation to the extent possible.

**ANNEX B****List of Test Equipment***Major test equipment required to test as per the Indian Standard*

<b>Sr. No.</b>	<b>Tests used in with Clause Reference</b>	<b>Test Equipment</b>
1	Visual examination (Clause 4.2, Table 1)	a) Glass beaker with stirrer b) Conditioning chamber for maintain $27 \pm 5^{\circ} \text{C}$
2	Freezing and thawing (Clause 4.2, Table 1)	a) Conditioning chamber for maintaining temperature of $60^{\circ} \text{C}$ b) Deep freezer to maintain temperature $0^{\circ} \text{C}$ and $-20^{\circ} \text{C}$ c) Glass bottle or non-reactive polyethylene container
3	pH – Original and ageing (Clause 4.2, Table 1)	a) Standard pH electrometer with glass electrodes b) Conditioning chamber for maintaining temperature of $60^{\circ} \text{C}$ c) Deep freezer to maintain temperature $0^{\circ} \text{C}$ and $-20^{\circ} \text{C}$
4	Specific gravity – Original and ageing (Clause 4.2, Table 1)	a) Hydrometer or specific gravity bottle b) Conditioning chamber for maintaining temperature of $60^{\circ} \text{C}$ c) Deep freezer to maintain temperature $0^{\circ} \text{C}$ and $-20^{\circ} \text{C}$
5	Miscibility with distilled water, (Clause 4.2, Table 1)	a) Distilled water b) Synthetic sea water c) Glassware like beakers, stoppered graduated measuring cylinders etc.
6	Viscosity (Clause 4.2, Table 1)	a) Cannon-Fenske Viscometer (for opaque liquids) b) BS U Tube Modified Reverse Flow Viscometer c) Water Bath with temperature controller d) Thermometer e) Stopwatch. f) Any liquid of known viscosity for calibrating viscometer.
7	Pour point (Clause 4.2, Table 1)	a) Apparatus for pour point test as per clause E-1 and Fig. 1 of IS 4989:2018

8	Sludge content (Clause 4.2, Table 1)	<ul style="list-style-type: none"> <li>a) Electric oven/Water Bath with thermostat capable of maintaining at least 80 ° C</li> <li>b) Centrifuge with 2000 rpm capacity</li> <li>c) Graduated glass centrifuge tube of 50/100 ml.</li> <li>d) Desiccator with suitable drying agent</li> <li>e) Weighing balance.</li> </ul>
9	Surface tension (Clause 4.2, Table 1)	<ul style="list-style-type: none"> <li>a) Distilled water, Cyclohexane with min 99% purity (AR Grade)</li> <li>b) Du Nouy precision tensiometer</li> </ul>
10	Spreading coefficient (Clause 4.2, Table 1)	<ul style="list-style-type: none"> <li>c) Platinum ring of 4 or 6 cm circumference</li> <li>d) Glass container of 6 cm diameter</li> <li>e) Alcohol lamp</li> </ul>
11	For maintaining ambient temperature during various tests	<ul style="list-style-type: none"> <li>a) Air Conditioner</li> </ul>
12	Expansion at $27 \pm 5^\circ \text{C}$ (Clause 4.2, Table 2)	<ul style="list-style-type: none"> <li>a) Collecting vessel of <math>1600 \pm 100</math> ml, equipped with bottom discharge facility as per Fig 5 of IS 4989: 2018</li> <li>b) Measuring cylinder of 100 ml with 5 ml L.C</li> </ul>
13	25 percent drainage time at $27 \pm 5^\circ \text{C}$ (Clause 4.2, Table 2)	<ul style="list-style-type: none"> <li>c) Foam collector of stainless steel/Aluminium/ Brass/Plastic as per Fig 6 of IS 4989: 2018</li> <li>d) Foam making nozzles as per Fig 2 &amp; 3 of IS 4989: 2018</li> <li>e) Foam solution vessel connected to the nozzle.</li> <li>f) Stopwatch</li> </ul>
14	Fire test on hydrocarbon fires (non-polar) (Clause 4.2, Table 2)	<ul style="list-style-type: none"> <li>a) Circular steel tray with total base area of <math>4.52 \text{ m}^2</math>, depth <math>200 \pm 10</math> mm, thickness minimum 2.5 mm</li> <li>b) Adjustable stand to hold the nozzle</li> <li>c) Stopwatch</li> <li>d) Commercial heptanes with specifications as per CI 8.1 of IS 4989:2018</li> <li>e) Torch to ignite <i>n</i>-heptane</li> <li>f) Steel Burn back pot with 1.5 mm nominal thickness, <math>300 \pm 10</math> mm diameter and <math>250 \pm 10</math> mm depth</li> <li>g) Potable water and synthetic sea water</li> <li>h) Anemometer</li> </ul>
15	Fire test on polar solvent fire (Clause 4.2, Table 2)	<ul style="list-style-type: none"> <li>a) Circular steel tray with total base area of <math>1.73 \text{ m}^2</math>, depth <math>150 \pm 10</math> mm, thickness minimum 2.5 mm</li> <li>b) Adjustable stand to hold the nozzle</li> <li>c) Stopwatch</li> <li>d) Commercial grade isopropyl alcohol with 98 % purity</li> <li>e) Torch</li> </ul>

		<ul style="list-style-type: none"> <li>f) Steel Burn back pot with 1.5 mm nominal thickness, 300 ± 10 mm diameter and 250 ± 10 mm depth</li> <li>g) Potable water and synthetic sea water</li> <li>h) Adjustable back board of 1000 mm width and height designed to be fixed and removed with the fire tray</li> <li>i) Anemometer</li> </ul>
16	Foam Generating equipment (Clause 4.2, Annex- H)	<ul style="list-style-type: none"> <li>a) Foam making nozzle as per per clause H-1 of IS 4989: 2018</li> <li>b) Arrangement for generating foam as per clause H-2 of IS 4989: 2018</li> <li>c) Foam generation equipment as per clause H-4 and Fig 4 of IS 4989: 2018</li> </ul>

*The above list is indicative only and may not be treated as exhaustive.*

**ANNEX C**

**Scheme of Inspection and Testing**

**1. LABORATORY** - A laboratory shall be maintained which shall be suitably equipped (as per the requirement given in column 2 of Table 1) and staffed, where different tests given in the specification shall be carried out in accordance with the methods given in the specification.

**1.1** The manufacturer shall prepare a calibration plan for the test equipments.

**2. TEST RECORDS** – The manufacturer shall maintain test records for the tests carried out to establish conformity.

**3. LABELLING AND MARKING** – As per the requirements of IS 4989: 2018.

**4. CONTROL UNIT--** Foam concentrate of same type produced as a batch per charge shall constitute a control unit.

**5. LEVELS OF CONTROL** - The tests as indicated in column 1 of Table 1 and the levels of control in column 3 of Table 1, shall be carried out on the whole production of the factory which is covered by this plan and appropriate records maintained in accordance with paragraph 2 above.

**5.1** All the production which conforms to the Indian Standards and covered by the licence should be marked with Standard Mark.

**6. REJECTIONS** – Disposal of non-conforming product shall be done in such a way so as to ensure that there is no violation of provisions of BIS Act, 2016. However, the disposal mechanism should be as eco-friendly as possible.

**TABLE 1**

(1)				(2)	(3)		
Test Details				Test equipment requirement R: required (or) S: Sub-contracting permitted	Levels of Control		
CI No	Requirement	Test Method			No. of Sample	Frequency	Remarks
		Clause	Reference				
4.1	General	4.1	IS 4989	R	All	-	-
4.2 Table 1	<b>Characteristics - Physical and Chemical requirement</b>						
i)	Visual examination	A-1 of Annex- A	IS 4989	-	Each control unit	-	-
ii)	Freezing and thawing	A-2 of Annex- A	IS 4989	R	Each type of foam concentrate	Once in a month	#
iii)	pH – Original	Annex- B	IS 4989	R	One	Each control unit	-
	pH – Ageing	Annex- B	IS 4989	R	Each type of foam concentrate	Once in a month	#
iv)	Specific gravity – Original	Annex- C	IS 4989	R	One	Each control unit	-
	Specific gravity – Ageing	Annex- C	IS 4989	R	Each type of foam concentrate	Once in a month	#
v)	Miscibility with distilled water	Annex- D	IS 4989	R	Each type of foam concentrate	Once in a week	-
vi)	Viscosity	SI No (iv) of Table 2	IS 1206 (Part 3)	R	One	Each control unit	-
vii)	Pour point	Annex- E	IS 4989	R	One	Each control unit	-
viii)	Sludge content	Annex- F	IS 4989	R	Each type of foam concentrate	Once in a month	-
ix)	Surface tension	Annex- G	IS 4989	R	One	Each control unit	-
x)	Spreading coefficient	Annex- G	IS 4989	R	One	Each control unit	-

4.2 Table 2	Characteristics – Fire performance						
i)	Expansion at $27 \pm 5^\circ \text{C}$	Annex- J	IS 4989	S	Each type of foam concentrate	Once in six months	-
ii)	25 percent drainage time at $27 \pm 5^\circ \text{C}$	Annex- J	IS 4989	S	Each type of foam concentrate	Once in six months	-
iii)	Fire test on hydrocarbon fires (non- polar)	Annex- K, Clause 8.1	IS 4989				
	a) Fire control time	Annex- K	IS 4989	S	Each type of foam concentrate	Once in six months	-
	b) Fire extinction time	Annex- K	IS 4989	S	Each type of foam concentrate	Once in six months	-
	c) Seal ability / Film forming	Annex- K	IS 4989	S	Each type of foam concentrate	Once in six months	-
	d) Burn back	Annex- K	IS 4989	S	Each type of foam concentrate	Once in six months	-
iv)	Fire test on polar solvent fires (Polar)	Annex- M, Clause 8.2	IS 4989				
	a) Fire control time	Annex- M	IS 4989	S	Each type of foam concentrate	Once in six months	-
	b) Fire extinction time	Annex-M	IS 4989	S	Each type of foam concentrate	Once in six months	-
	c) Seal ability / Film forming	Annex- M	IS 4989	S	Each type of foam concentrate	Once in six months	-
	d) Burn back	Annex- M	IS 4989	S	Each type of foam concentrate	Once in six months	-

# For type test with same formulation, cycle of conditioning as specified in A-2 shall be followed.

Note-1: Sub-contracting is permitted to a laboratory recognized by the Bureau or Government laboratories empanelled by the Bureau.

Note-2: Levels of control given in column 3 are only recommendatory in nature. The manufacturer may define the control unit/batch/lot and submit his own levels of control in column 3 with proper justification for approval of BO Head.