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Replacing GB 15308-1994, GB 17427-1998, GB 13463-1992

Foam extinguishing agent

(ISO 7203, Fire extinguishing media - Foam concentrates, NEQ)

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Foreword

Chapter 4 of this Standard is mandatory, while the rest are recommended.

Consistency BETWEEN this Standard AND ISO 7203-1:1995(E) "Extinguishing Agent - Foam Concentrate - Low-expansion Foam Concentrate Used for Water-insoluble Liquid Fuel Top Application", ISO 7203-2:1995(E) "Extinguishing Agent Foam Concentrate - Medium and High-expansion Foam Concentrate Used for Water-insoluble Liquid Fuel Top Application" and ISO 7203-3:1999(E) "Extinguishing Agent Foam Concentrate - Low-expansion Foam Concentrate Used for Water-insoluble Liquid Fuel Top Application" are non-equivalent.

This Standard replaces GB 15308-1994 "General Specification for Foam Extinguishing Agents", GB 17427-1998 "Aqueous Film Forming Foam Extinguishing Agent", and GB 13463-1992 "Alcohol Resistant Foam Extinguishing Agent".

Compared with GB 15308-1994, the main changes of this Standard are as follows:

- Add technical requirements and test methods of "Foam Extinguishing Agent for Foam Extinguishers";
- Add technical requirements and test methods of "corrosion performance" and "freezing point";
- Add the definitions of "lowest useful temperature", "characteristic values", "25% drainage time", "50% drainage time", "expansion", "foam", "foam solution", "sediment", "spreading coefficient" and "anti-burning time";
- Delete the definition of "temperature-sensitive foam solution";
- Add Annex A "small fire fighting test for foam performance and fire extinguishing performance quality control" and Annex B "viscosity test method".
- Add the division of disqualification types of items;
- Revise fire extinguishing test procedures and dividing the grades of fire extinguishing performances of foams.

GA 31-1992 "High-expansion Foam Extinguishing Agent" and GA 219-1999 "Protein Foam Concentrate and Fluoroprotein Foam Concentrate" shall be abolished, from the date of implementation of this Standard.

Annex B to this Standard is normative; Annex A is informative.

This Standard was proposed by Ministry of Public Security of the People's Republic of China.

This Standard shall be under the jurisdiction of Third Branch Technical Committee of National Fire Fighting Standardization Committee.

Drafting organizations of this Standard: Tianjin Fire Research Institute, Ansul, Ningbo Nenglin Fire-fighting Equipment Co., Ltd. AND Yangzhou Jiangya Fire Extinguishing Agents Co., Ltd.

Main drafters of this Standard: Liu Yuheng, Jin Hongbin, Dai Huihong, Song Yang, Zhang Guobi, Zhang Yulin, Tong Xiangyou and Liu Jinsheng.

The previous versions replaced by this Standard are as follows:

- GB 13463-1992;
- GB 15308-1994;
- GB 17427-1998.

Foam Extinguishing Agent

1 Scope

This Standard specifies definition, requirements, test methods, inspection rules, marks and other contents of foam extinguishing agent.

This Standard applies to low, medium and high foam extinguishing agent and foam extinguishing agent for fire extinguisher.

This Standard does not apply to chemical extinguishing agent.

2 Normative references

The articles contained in the following documents have become part of this document when they are quoted herein. For the dated documents so quoted, all subsequent modifications (including all corrections) or revisions made thereafter do not apply to this Standard. However, the parties who reach an agreement according to this Standard are encouraged to study whether the latest versions of these documents may be used. For the undated documents so quoted, the latest versions (including all modification sheets) apply to this document.

~~GB 4351-1997 General specifications for portable fire extinguishers~~ [Deleted by Modification Sheet No.1, (2009)] [Translator note: The text in BLUE indicates the CHANGES of Modification Sheet No.1 (Approved on March 10, 2009, by National Standardization Authority). Hereafter the same.]

GB 4351.1-2005 Portable fire extinguishers. Part 1: Performance and construction [Added by Modification Sheet No.1, (2009)]

GB/T 6003.1-1997 Test sieves of metal wire cloth (eqv ISO 3310.1:1990)

GB/T 6026 Acetone for industrial

GB/T 6682-1992 Water for laboratory use; Specifications (eqv ISO3696:1987)

~~GB 15368-1994 Portable foam fire extinguishers~~ [Deleted by Modification Sheet No.1, (2009)]

SH 0004 Petroleum solvents for rubber industry

3 Terms and definitions

Following terms and definitions apply to this Standard.

3.1 Characteristic values

Physical and chemical performance values of foam concentrate and foam solution provided by suppliers.

3.2 25% drainage time

Time required for drainage of liquid that accounts for 25% of its mass.

3.3 50% drainage time

Time required for drainage of liquid that accounts for 50% of its mass.

3.4 Expansion

Ratio of foaming volume to the volume of foam solution that constitutes foam.

3.5 Low-expansion foam concentrate

Foam concentrate that applies to foam generation of 1~20 times.

3.6 Medium expansion foam concentrate

Foam concentrate that applies to foam generation of 21~200 times.

3.7 High-expansion foam concentrate

Foam concentrate that applies to foam generation of 201 times or more.

3.8 Foam (fire fighting foam)

Air-filled bubbles formed by foam solution.

3.9 Foam concentrate

Concentrated liquid that may be mixed with water to form foam solution based on suitable concentration, also known as foam concentrated solution.

3.10 Foam solution

Solution prepared with foam concentrate and water based on a predetermined concentration, also known as foam mixed solution.

3.11 Protein foam concentrate (P)

Foam concentrate prepared with protein-containing raw materials by partial hydrolysis.

3.12 Fluoroprotein foam concentrate (FP)

Protein foam concentrate with fluorocarbon surfactant.

3.13 Synthetic foam concentrate (S)

Foam concentrate prepared with surfactant mixture and stabilizer as base stock.

3.14 Alcohol-resistant foam concentrate (AR)

Foam concentrate that may resist the destructive effect on foam when foam generated is applied to the surface of alcohols or other polar solvents.

3.15 Aqueous film-forming foam concentrate (AFFF)

Foam concentrate with hydrocarbon surfactants and fluorocarbon surfactants as base stock, which may form a water film on the surface of certain hydrocarbons.

3.16 Film-forming fluoroprotein foam concentrate (FFFP)

Fluoroprotein foam concentrate that may form a water film on the surface of some hydrocarbon.

3.17 Forceful application

Foam supply mode that foam is directly applied to the surface of liquid fuel.

3.18 Gentle application

Foam supply mode that foam is indirectly applied to the surface of liquid fuel by baffle, tank wall or other surface.

3.19 Sediment

Insoluble solid matters in foam concentrate.

3.20 Spreading coefficient

Measuring the capacity that one liquid freely spreads on the surface of another liquid.

3.21 Anti-burning time

Time required from burning anti-burning tank to igniting certain fuel surface.

3.22 Lowest useful temperature

Temperature that is 5°C higher than freezing point.

4 Requirements

4.1 General requirements

4.1.1 If foam concentrate is applicable to seawater, the concentration of foam solution

- c) If supplier declares that samples are affected by freeze-thaw, samples are treated only according to b).

5.2 Anti-freezing and thawing performance

5.2.1 Equipments

- Freezing chamber: Meeting the temperature requirements in 5.2.2 b);
- Grinding mouth solidifying point determination pipe;
- Semiconductor solidifying point measuring equipment: Temperature control accuracy $\pm 1^{\circ}\text{C}$;
- Thermometer for condensation point: Division value 1°C .

5.2.2 Test procedures

- a) Determinate freezing point of sample according to 5.2.3.
- b) Adjust freezing chamber temperature to $10^{\circ}\text{C} \pm 1^{\circ}\text{C}$ lower than sample freezing point.
- c) Load samples that conform to the requirements in 5.1.1 into plastic or glass container; seal and put into freezing chamber; keep at the temperature prescribed in b) for 24h; after refrigeration is completed, take out samples and place at $20^{\circ}\text{C} \pm 5^{\circ}\text{C}$ for 24 h to 96 h. Repeat for three times and carry out four freeze thaw cycles treatment.
- c) Observe whether samples have delamination or heterogeneous phenomenon.

5.2.3 Freezing point

- a) Open semiconductor solidifying point measuring equipment and make cold trap temperature stabilized at $+10^{\circ}\text{C} \sim -30^{\circ}\text{C}$ (or 10°C lower than sample freezing point). Load outer pipe of condensation point determination pipe into cold trap. Depth of outer pipe into cold trap shall not be less than 100mm.
- b) Inject foam sample to be measured into clean dry inner tube of solidifying point determination pipe; height of liquid level in tube is about 50mm.
- c) Fix solidifying point to the center of inner tube with cork or rubber stopper through thermometer; lower end of capillary of thermometer shall be immersed 3mm to 5mm under liquid level.
- d) Load inner tube of solidifying point determination pipe into outer tube.
- e) Start to observe the flow of samples when temperature of samples in inner tube drops to 0°C ; observe once for each decrease of 1°C . The observation methods is

taking inner tube out of outer tube and immediately tiling; if samples still flow, put back into outer tube immediately (each operation time shall not exceed 3s) and continue to cool for next observation. When sample drops to certain temperature, take out inner tube and immediately make inner tube in a horizontal direction when observation proves that samples no longer flow; if samples still do not flow within 5 s, record the temperature, which is deemed as freezing point of sample.

- f) Each sample is tested twice; difference value between results of the two tests shall not exceed 1°C, whichever is higher adopted as test results. If the difference value exceeds 1°C, a third test shall be carried out.

5.3 Sediments

5.3.1 Equipment

- Electric centrifuge: Centrifugal acceleration is $(6\,000 \pm 600) \text{ m/s}^2$.
- Graduated centrifuge tube: Capacity is 50mL, minimum division value is 0.1mL;
- Sieve: Conforming to requirements in GB/T 6003.1-1997, pore diameter is 180μm;
- Electric thermal blowing dry box: Temperature control accuracy is $\pm 2^\circ\text{C}$;
- Stopwatch: Division value is 0.1s;
- Washing bottle.

5.3.2 Sampling

Take two samples before temperature treatment; one is for direct test, while the other is tested again after aging test and cooling.

Aging conditions: Seal the sample; keep at $(60 \pm 3)^\circ\text{C}$ for $(24 \pm 2)\text{h}$ and then cool to room temperature.

5.3.3 Rest procedures

Place each sample into two mL graduated centrifuge tube; put into centrifuge symmetrically and centrifuge at $(6\,000 \pm 600) \text{ m/s}^2$ for $(10 \pm 1) \text{ min}$.

Remove graduated centrifuge tube; read the volume of sediments and convert into volume percentage. Take the average value of two test tube readings as determination result.

Flush sediments to sieve with washing bottle; observe whether all sediments pass through the sieve

5.4 Ratio liquidity

tank from liquid temperature (T_2) at outlet is no greater than 1°C.

- b) Liquid storage tank: Minimum capacity 10L; samples may be maintained at the lowest useful temperature (5°C higher than freezing point of sample) and discharged through pressure adjustment. Stainless steel pipe and liquid storage tank are connected through stainless steel pipe and pipe fittings that have an inner diameter of 20 mm±2 mm.

-- Pressure gauge: Precision 0.001 MPa;

-- Thermometer: Division value 0.5°C;

-- Electronic balance: Precision 1 g;

-- Stopwatch: Precision 0.1 s;

-- Standard reference solution: Aqueous solution of glycerol with a mass percentage of 90%. Density of 90% aqueous solution of glycerol at 15°C is 1.2395 g/mL.

5.4.2 Calibration

- a) Fill the tank with standard reference solution and cool it to the temperature prescribed in d).
- b) Adjust the pressure in tank and stabilize it at (0.050±0.002)MPa; open the valve; collect the discharged liquid when the deviation of liquid to be tested from T_2 is less than 1°C, collect the discharged liquid; collection time is about 60 s; record temperature T_1 , collection time and liquid mass and calculate flow rate in L/min.
- c) Repeat the test once and take the average value of two test results as determination result.
- d) Repeat above procedures and determinate the flow rates of standard reference solution at 10 °C, 5°C, 0°C, -5°C, -10°C, -15°C and -20°C. Draw standard curve based on flow rates of standard reference solution at different temperatures.

5.4.3 Test procedures

- a) Respectively carry out a second test for foam concentrate before and after temperature treatment according to test procedures in 5.4.2; sample temperature (T_1) shall be controlled at freezing point plus 5°C; take average value of its flow rate as determination result.
- b) Compare determination result of foam concentrate with standard curve of standard reference solution to determine ratio liquidity of sample.

5.5 pH value

5.5.1 Instruments and reagents

- Acidity meter: Accuracy 0.1 pH;
- Thermometer: Division value 1.0 °C;
- pH buffer agent.

5.5.2 Test procedures

- a) Use pH buffer solution to calibrate acidity meter.
- b) Take 30mL of foam concentrate respectively before and after temperature treatment and inject into a 50 mL clean dry beaker; immerse electrode into foam concentrate and determinate pH value at (20 ± 2) °C.
- c) Repeat the test once and take average value of two test results as determination result. Difference between two test results is no greater than 0.1.

5.6 Surface tension, interfacial tension and spreading coefficient

5.6.1 Instruments and reagents

- Surface tension meter: Division value is 0.1 mN/m;
- Thermometer: Division value is 1.0 °C;
- Cyclohexane: Purity is 99%;
- Measuring cylinder: 100 mL, division value is 10 mL; 10 mL, division value is 0.1 mL.

5.6.2 Test procedures

5.6.2.1 Surface tension

- a) Take foam concentrate respectively before and after temperature treatment and inject into a clean dry beaker; prepare foam concentrate with Grade-3 water (conforming to GB/T 6682-1992) based on the concentration recommended by supplier.
- b) Determinate surface tension when foam solution temperature is at (20 ± 1) °C.
- c) Repeat the test once and take the average value of two test results as determination result.

5.6.2.2 Interfacial tension

- a) After surface tension determination is completed, apply cyclohexane (5~7)mm thick at (20 ± 1) °C to foam solution and test surface tension after (6 ± 1) min.

- 9 - Conduit;
- 10 - Bolt;
- 11 - Mesh;
- 12 - Nut;
- 13 - Inspection cover.

Figure 8 High-expansion foam generator

5.9.2.2 Temperature conditions

The test shall be conducted under the following conditions:

- Ambient temperature: (15~25)°C;
- Temperature of the foam solution: (15~25)°C.

5.9.2.3 Test steps

- a) Before and after being processed at specified temperatures, the samples shall be separately prepared into foam solution with fresh water according to the applied concentration, if the foam concentrate is applicable for sea water, it shall be prepared with sea water meeting requirements of 5.10.3.
- b) Use an adhesive tape to block the drainage hole at bottom of the foam collector. Wet inner wall of the foam-receiving tank, clean and weigh it (m_1). Start the foam generating system, adjust entrance pressure of the foam generator as (0.5±0.01) MPa.
- c) Collect the foam into the collector, start the stopwatch when the foam is filled for half of the collector. When the collector is completely filled with the foam, we shall stop collecting foam; level the foam along upper edge of the foam-receiving tank. And weigh mass of the collector at this time (m_2). Calculate the expansion according to Formula (1).
- d) Calculate volume of 50% separated liquid according to Formula (3);
- e) Place the foam collector on a support, remove the adhesive tape at the drainage hole, and collect the foam separated into the measuring cylinder. There shall be no foam in the separated liquid.
- f) When volume of the separated foam solution is V_3 , stop the watch and record 50% of separating time.

5.10 Extinguishing performance

In view of that the test needs a lot of property and time, this test shall be conducted at last, if the items inspected above have been given unqualified judge, the test of extinguishing performance need not to be conducted.

- a) For the temperature-sensitive foam concentrate, the sample processed according to the temperature indicated in 5.1.2 shall be used for the extinguishing performance test.
- b) For the non-temperature-sensitive foam concentrate, the sample meeting requirements of 5.1.1 shall be used for the extinguishing performance test.

5.10.1 Test sequence

- a) The foam concentrate that is not suitable for sea water shall be prepared with fresh water, and which shall be tested for three times according to extinguishing levels stated by the supplier, if the first two times are successful, the foam concentrate is treated as qualified. If both of the first two times are successful or failed, the third needs not to be conducted.
- b) For the foam concentrate suitable for sea water, in the first test, the foam concentrate shall be prepared with fresh water, in the second test; the foam concentrate shall be prepared with sea water meeting 5.10.3. If both of the first two tests are successful or failed, the test shall be terminated. If the first test is failed, the test shall be repeated. If the first repeated test is successful, the second repeated test shall be conducted, or the test shall be terminated. If the foam concentrate meets one of the following cases, we believe extinguishing performance of the foam concentrate is qualified:

-- Both of the first two tests are successful;

-- One of the first two tests is successful, and both of the repeated tests are successful.

5.10.2 Test conditions

-- Ambient temperature: (10~30)°C;

-- Temperature of the foam: (15~20)°C;

-- Temperature of the fuel: (10~30)°C;

-- Wind speed: Not larger than 3m/s (the position near the oil receiver).

5.10.3 Preparation of the foam solution

The foam solution shall be prepared according to usage concentration of fresh water. If the foam solution is applied for sea water, the foam solution shall be also prepared manually. The concentration shall be the same with that of fresh water. Manual sea water shall contain the following components (the chemical reagent used for preparing manual sea water is chemically pure):

The following substances shall be added into one L of fresh water:

25.0g (NaCl);

11.0g ($\text{MgCl}_2 \cdot 6\text{H}_2\text{O}$);

1.6g ($\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$);

4.0g (Na_2SO_4).

5.10.4 Records

In test process, the following parameters shall be recorded:

- a) Indoors or outdoors;
- b) Ambient temperature;
- c) Temperature of the foam;
- d) Wind speed;
- e) 90% of fire-control time;
- f) 99% of fire-control time;
- g) Extinguishing time;
- h) 25% anti-burning time;
- i) 1% anti-burning time (only suitable for medium expansion foam concentrate).

5.10.5 The extinguishing test for low-expansion foam concentrate non-water-solubility liquid

5.10.5.1 Slow-release extinguishing test

5.10.5.1.1 Equipment, materials

- a) Steel oil receiver: The area is about 4.52m^2 , inner diameter: $(2400 \pm 25)\text{mm}$; depth: $(200 \pm 15)\text{mm}$, and wall thickness: 2.5mm ;
- b) Steel damper: Length: $(1000 \pm 50)\text{mm}$; height: $(1000 \pm 50)\text{mm}$;
- c) Foam nozzle and foam generating system: Same as 5.8.1;
- d) Steel anti-burning tank: Inner diameter $(300 \pm 5)\text{mm}$; depth $(250 \pm 5)\text{mm}$, wall thickness: 2.5mm ;
- e) Anemometer: Precision is 0.1m/s ;
- f) Stopwatch: Division value is 0.1s ;

g) Fuel: Solvent oil used for rubber industry, meeting the requirements of SH 0004.

5.10.5.1.2 Test steps

Place the oil receiver on the ground and keep it in level, place the oil receiver in downwind direction of the foam nozzle, add 90 L of fresh water to completely cover the bottom. Place the foam nozzle in level, and which shall be (1 ± 0.05) m higher than level of the fuel, so that the center of the foam's jet flow contacts the central axis of the damper and is (0.5 ± 0.1) m higher than the fuel level.

Add (144 ± 5) L of fuel, so that the height of the free receiver wall is 150mm, add fuel and light the oil receiver within 5min, pre-burn for (60 ± 5) s, begin to provide foam, and record the extinguishing time. The conditions for successfully extinguishing shall be as follows:

- a) For level-III foam concentrate, all flames are extinguished.
- b) For level-II and level-III foam concentrates, the residual flames are reduced to one, or there only few flames within 0.1m of the receiver edge, the height shall not be 0.15m higher than upper edge of the oil receiver, there is one focused flame front (that is, under the conditions of ignoring any distance between flames, total length of the flame along the receiver's edge shall not be larger than 0.5m), and intensity of the flame is not increased within the pending period before anti-burning test.

The foam supplying shall be stopped after (300 ± 2) s, wait for (300 ± 10) s, place an anti-burning tank with (2 ± 0.1) L of fuel at the center of the oil receiver and light it. When 25% of fuel area in the oil receiver is lit, then record the 25% anti-burning time.

5.10.5.2 Strong-release extinguishing test

5.10.5.2.1 Equipment and materials

The equipment and materials used are as 5.10.5.1.1, except for that the oil receiver is not equipped with steel damper.

5.10.5.2.2 Test steps

Place the oil receiver in downwind direction according to the method indicated in 5.10.5.1.2, position of the foam nozzle shall ensure that the central jet flow of the foam falls onto surface of the fuel at (1 ± 0.1) m away from the remote receiver wall.

The fuel shall be lit within 5min after being added, and the foam shall be supplied after pre-burning for (60 ± 5) s, the foam supplying shall last for (180 ± 2) s; If the flame is completely distinguished, the extinguishing time shall be recorded; if the flame is not extinguished yet, wait and observe whether all the residual flames can be completely distinguished, and record the extinguishing time. When foam supplying is stopped, wait for (300 ± 10) s, place the anti-burning tank with (2 ± 0.1) L of fuel at center of the oil receiver and light it. Record the period from lighting the anti-burning tank to that 25% fuel area of the oil receiver is lit, that is, 25% anti-burning time.

5.10.6 Medium expansion foam concentrate

5.10.6.1 Equipment and materials

- a) Steel oil receiver: The area is about 1.73m^2 , diameter: $(1480\pm 15)\text{mm}$; depth: $(150\pm 10)\text{mm}$, wall thickness is 2.5mm;
- b) Foam generating system: Same as 5.9.1.1;
- c) Steel anti-burning tank: Diameter: $(150\pm 5)\text{mm}$; height: $(150\pm 5)\text{mm}$, wall thickness is 2.5mm, with one support which can ensure that the tank can be directly hung outside of the oil receiver's edge;
- d) Anemometer: Precision is 0.1m/s;
- e) Thermometer: Division value is 1°C ;
- f) Stopwatch: Division is 0.1s;
- g) Fuel: 120# solvent oil used for rubber industry, meeting requirements of SH 0004.

5.10.6.2 Test steps

- a) Place the oil receiver on the ground and keep it in level, add 30 L of water and $(55\pm 2)\text{L}$ of fuel, so that the free receiver wall's height is 100mm. Hang the anti-burning tank with $(0.9\pm 0.1)\text{L}$ of fuel in downwind direction of the oil receiver. The medium expansion foam generator shall be installed as Figure 9, which shall be horizontally installed in upper-wind direction of the oil receiver. And then the oil receiver shall be lit within the fuel being added for 5min. When the whole fuel surface is full of flame for 45s, we shall install the foam generator.
- b) When the pre-burning time is up to $(60\pm 5)\text{s}$. The foam supplying shall last for $(120\pm 2)\text{s}$.
- c) The recorded interval from beginning of foam-supplying to that the flame is distinguished is distinguishing time.
- d) When the foam supplying is over, flame inside the anti-burning tank shall last burning, until there is suspended flame on foam layer inside the oil receiver, the recorded interval shall be 1% of anti-burning time.
- e) In the foam-supplying process, if the foam overflows so that flame inside the anti-burning tank is distinguished, the flame shall be re-lit immediately.

- Steel oil receiver: The area is 1.73m^2 , inner diameter: $(1480\pm 15)\text{mm}$, depth $(150\pm 10)\text{mm}$, wall thickness is 2.5mm ;
- Steel damper: Height: $(1000\pm 50)\text{mm}$; width: $(1000\pm 50)\text{mm}$; And wall thickness: 2.5mm ;
- Anti-burning tank: Inner diameter $(300\pm 5)\text{mm}$; depth $(250\pm 5)\text{mm}$, and wall thickness is 2.5mm ;
- Fuel: The industrial acetone with purity of not less than 99% (Meeting GB/T6026, not less than grade-one product);
- Others are the same as 5.10.5.1.1.

5.10.8.2.2 Test steps

Place the oil receiver on the ground and keep it in level, place the oil receiver in downwind direction of the foam nozzle, place the foam nozzle in level, and which shall be $(1\pm 0.05)\text{m}$ higher than level of the fuel, so that the center of the foam's jet flow contacts the central axis of the damper and is $(0.5\pm 0.1)\text{m}$ higher than the fuel level.

Add $(125\pm 5)\text{L}$ of fuel, so that the height of the free receiver's wall is about 78mm . Light the oil receiver within 5min after the fuel being added, the pre-burning period shall be $(120\pm 5)\text{s}$, then supply the foam and record the distinguishing time.

The foam supplying shall last for $(180\pm 2)\text{s}$ (for the foam with level of distinguishing performance of level-I); or $(300\pm 2)\text{s}$ (for the foam with level of distinguishing performance of level-II), stop supplying of foam, wait for $(300\pm 10)\text{s}$, and then place the anti-burning tank with $(2\pm 0.1)\text{L}$ of fuel at the center of the oil receiver and light it. Record the 25% anti-burning time.

5.10.9 Foaming and distinguishing performance of the foam distinguishing agent used for the extinguisher

The test shall be conducted at last, if the performance tests above are judged as unqualified, this test needs not to be conducted.

5.10.9.1 Apparatus and equipment

- Stopwatch: Division value is 0.1s ;
- Balance: Precision is 1g ;
- Measuring cylinder: Division value is 10mL .
- MJPZ6 standard portable mechanical foam distinguisher: Volume is $(8\pm 0.2)\text{L}$; height is the cylinder is $(510\pm 10)\text{mm}$; outer diameter of the cylinder is $(150\pm 5)\text{mm}$; inner diameter of the spraying tube is $(12\pm 2)\text{mm}$; Length of the spraying tube is $(420\pm 5)\text{mm}$; nozzle sees Figure 11; volume of the extinguisher: $(6\pm 0.2)\text{L}$; the

The test model, test conditions, test steps as well as test appraisal shall be conducted according to ~~6.3 of GB 4351-1997~~ Clause 7.3 in GB 4351.1-2005. But the test fuel shall be rubber industrial solvent oil meeting SH 0004.

b) Distinguishing test with acetone

The round oil receiver is made of steel, thickness of the steel plate is 2mm~3mm, depth of the oil receiver shall not be larger than 200mm, width of the reinforced edge along the opening shall not be larger than 50mm. The fuel is 99% acetone, thickness of the fuel layer shall not be less than 50mm, and no clean water shall be added. Pre-burning time of the distinguishing test shall be (120±5)s.

Other tests shall be conducted according to the methods in ~~6.3.2; 6.3.3; and 6.3.4 of GB 4351-1997~~ 7.3.2; 7.3.3.3; and 7.3.4 of GB 4351.1-2005.

6 Inspection rules

6.1 Sampling

The sample shall be representative; the sample shall be consistent with the integral-source. For the barrel products, before sampling, products inside the barrel shall be shaken well; for the tank products, the sample can be divided into three parts, and sampled respectively from upper, medium and lower parts of the tank, and then mix the sample evenly. Number of the samples shall not be less than 25kg; ~~the pre-mixed foam distinguishing agent shall not be less than 75kg.~~ When the sampling is re-conducted before each performance test, the sample shall be shaken evenly.

6.2 Exit-factory inspection

Each batch of products shall be conducted for exit-factory inspection. For low-expansion foam liquid, the exit-factory inspection items shall be: solidifying point, pH value, sediments, foam expansion, 25% drainage time, distinguishing performance (the test can be conducted according to Annex A); for medium and high-expansion foam liquid, the exit-factory inspection items shall be: solidifying point, pH value, sediments, foam expansion, 25% drainage time (only for medium-expansion foam liquid), 50% drainage time; for foam distinguishing agents used for extinguishers, the exit-factory inspection items shall be: solidifying point, pH value, surface tension (modeling), ~~foam expansion, 25% drainage time distinguishing performance.~~ Inspection items can be added according to expected purposes (if necessary).

6.3 Type test

All technical indexes of corresponding distinguishing agents listed in Chapter 4 of this Standard are the items of type test. If there is one of the following cases, the type test shall be conducted, and specify that base-number of the products sampled shall not be less than 2 in the period of type tests.

- a) When the new products are tested, and the old products are produced in other factory;
- b) In formal production, if the raw materials, technology and formula are changed significantly;
- c) The products are re-produced after being stopped for more than one year;
- d) The production has been conducted normally for two years, or accumulative output of batch production is up to 800t;
- e) When national quality supervision agency proposes type tests;
- f) When the exit-factory inspection result is significantly different from the last type test.

6.4 Judgment of inspection results

6.4.1 Judgment of exit-factory test results

The results are judged by the manufacturer according to the inspection rules.

6.4.2 Judgment of type test's results

If the batch of products meet one of the following conditions, this batch of products are qualified, otherwise they are judged as unqualified:

- a) All the indexes meet corresponding requirements of distinguishing agents in Chapter 4 of this Standard;
- b) Number of class-C unqualified items shall not exceed 2, other items meet corresponding requirements in Chapter 4 of this Standard.

7 Package, marking, transport and storage

7.1 Package

The foam concentrate shall be sealed inside plastic barrels, or stored in iron barrels whose internal have been conducted anti-corrosion processing. The minimum package shall be 25kg.

7.2 Marking

Package container of the foam concentrate shall be identified clearly and firmly.

- a) Name, model, and concentration used;
- b) If the foam concentrate is suitable for sea water, indicate "suitable for sea water";

Annex A

(Informative)

The Small-type Tests Used for Controlling Foaming Performance and Distinguishing Performance

A.1 Overview

This foam nozzle adopted in this Annex is different with the standard foam nozzle adopted in 5.8.1, therefore, the foam expansion, drainage time and distinguishing performance obtained from two kinds of foam nozzles can't be compared directly. The test methods given in this Annex is applicable for controlling the foaming and distinguishing stability of foam concentrate in normal production process.

A.2 Performance test of the foams

A.2.1 Test conditions

- Ambient temperature: (15~25) °C;
- Temperature of the foam: (15~20) °C;
- Indoors.

A.2.2 Apparatus and equipment

- Stopwatch: Precision is 0.1s;
- Thermometer: Division value is 1°C;
- Balance: Precision is 1g;
- Measuring cylinder: Division value is 10mL;
- Drainage measuring equipment (see Figure 5);
- Foam generating system (see Figure 2) is consisted of: 5L/min foam nozzle [see Figure A.1, it shall meet the following conditions: The pressure is (0.7 ± 0.03) MPa, the flow rate of water is (5.0 ± 0.1) L/min], level-1.5 (0~1) MPa pressure gauge, liquid storage tank and air-compressor.

A.2.3 Test steps

- a) Prepare the samples into foam solution with fresh water according to applied concentration, if the foam concentrate is applicable for sea water, it shall be prepared with sea water meeting 5.10.3, to control temperature of the foam

f) 100% anti-burning time.

A.3.5 Test steps

Apply (0.7 ± 0.03) MPa to the foam concentrate tank; adjust the 7mm flow adjustment-head, so that the corresponding foam flow is $(725 \sim 775)$ g/min (using the 6s spraying volume to determine the flow).

Adjust position of the foam nozzle, so that the nozzle is horizontal and is 150mm higher than upper edge of the oil receiver; the foam falls onto center of the oil receiver. Use water to wash the oil receiver; add 9L of fuel; and add 1L of fuel into the anti-burning tank; then place the tank in a safe position. Open the ventilation unit. Add fuel and light the oil receiver within 5 min; pre-burn for (60 ± 5) s; then supply the foam. Record 90% fire-controlling time (the period from beginning of foam supplying to that the height of the flame is reduced to 0.3m~0.4m), and distinguishing time (the period from foam supplying to all flames are distinguished). Supply the foam for (180 ± 2) s; wait for (60 ± 5) s; place the anti-burning tank with 1 L of fuel at the center of the oil receiver, and light it. Record the 100% anti-burning time.

Annex B

(Normative)

Test Method of Viscosity

B.1 Overview

This Annex provides a method using the rotation viscometer to measure dynamic viscosity of the foam concentrate, and further determine mobility. That is, under different temperatures, use the rotator and RPM to measure viscosities of standard reference liquid; draw them into standard curve; and, under the minimum using temperature, measure minimum viscosity of the sample; compare the measured results with standard curve for determining the mobility.

B.2 Requirements

Viscosity of the foam concentrate shall not be larger than viscosity of standard reference liquid.

B.3 Test methods

B.3.1 Apparatus and equipment

- Rotation viscometer: Precision is $\pm 5\%$;
- Thermostatic water bath equipment: Precision: $\pm 1^\circ\text{C}$;
- Low temperature cold trap: Precision is $\pm 1^\circ\text{C}$;
- Thermometer: Precision is $\pm 1^\circ\text{C}$;
- Stopwatch: Precision is 0.1s.

B.3.2 Test steps

B.3.2.1 Draw a standard curve containing temperature of standard reference liquid (horizontal axis)-viscosity (vertical axis) according to the data given by Table B.1

Table B.1

Temperature/ $^\circ\text{C}$	10	6	0	-5	-10	-15	-20
Rotator	3	3	3	3	3	3	4
RPM/r/min	60	30	30	30	12	6	12
Viscosity/mPa $\cdot$ s	740	1140	1560	2940	5560	16640	36400

B.3.2.2 Place a beaker with appropriate sample into thermostatic water-bath or low-temperature cold trap; cool the sample to minimum using temperature of the foam concentrate. According to the minimum using temperature of the foam concentrate,

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