# MATERIAL AND EQUIPMENT STANDARD

# FOR

# VALVES, REELS, HOSES, NOZZLES

# AND

# MONITORS FOR FIRE FIGHTING

## CONTENTS :

PAGE No.

## SECTION V



## APPENDICES:



## FIGURES :

## 0. INTRODUCTION

This material Standard is prepared for the use and guidance of authorities charged with purchasing and operating fire fighting equipment in order that such equipment will function as intended throughout its life.

Nothing in this Standard is intended to prevent the use of new methods or equipment, provided sufficient technical data are submitted to the company's technical authority of fire & safety to demonstrate that new methods or equipment are equivalent in quality, effectiveness and durability to that prescribed by this Standard. It may be necessary for those charged with the purchasing and approving of the equipment to consult with an experienced fire protection engineer competent in this field to foresee the requirement and select the best quality of materials.

## 1. SCOPE

This Standard specification covers the minimum requirements for physical properties and performance of fire fighting equipment to be used and / or purchased in Iranian oil, gas and petrochemical industries. It includes only the necessary essentials to make the standard workable in the hand of those skilled in this field. This standard is divided in five sections as follows:

**Section I Fire Service Valve**

**Section II Fire Fighting Hose Reels**

**Section III Fire Service Hose and Couplings**

**Section IV Fire Fighting Nozzles**

**Section V Fire Fighting Monitors (Cannon)**

## 2. REFERENCES

In preparation of this Standard, the following Codes and Standards have been referred to or considered. The latest edition of these Standards and codes to the extent specified herein, shall form a part of this Standard.

### 2.1 Fire Fighting Valves

**BSI (BRITISH STANDARD INSTITUTION)**

| | |
|---|---|
| BS 903 Part A2 (1989) | "Determination of Tensile Stress-Strain Properties" |
| BS 1400 (1985) | "Copper Alloy Ingots and Copper Alloy Castings" |
| BS 3076 (1989) | "Specification for Nickel and Nickel Alloy Bar" |
| BS 336 (1989) | "Specification for Fire Hose Couplings" |
| BS 5146 (1974) | "Inspection and Test of Valves" |
| BS 5159 (1974) | "Cast Iron and Carbon Steel Ball Valves" |

**ASTM (AMERICAN STANDARD FOR TESTING OF MATERIALS)**

| | |
|---|---|
| ASTM-D 429 (1988) | "Rubber Property-Adhesion to Rigid Substracts" |
| ASTM-D 2240 (1986) | "Rubber Property-Durometer Hardness" |
| ASTM-A 105 (1978) | "Specification for Forging Carbon Steel for Piping Components" |
| ASTM-B 148 (1985) | "Specification for Aluminum Bronze Casting" |
| ASTM-A 216 (1984) | "Specification for Steel Casting Carbon Suitable for Fusion Welding for High Temperature Service" |
| ASTM-D 1418 (1985) | "Specification for Rubber Lattices Nomenclatures" |
| ASTM-D 3677 (1983) | "Rubber Identification by Infrared" |

**DIN (DEUTSCHE INDUSTRIE NORMEN)**

| | |
|---|---|
| DIN 50049 (1986) | "Documents on Materials Testing" |

### 2.2 Fire Hose and Couplings

**BSI (BRITISH STANDARD INSTITUTION)**

| | |
|---|---|
| BS 443 (1990) | "Specification for Testing Zinc Coating on Steel Wire and for Quality Requirement" |
| BS 1154 (1986) | "Specification for Natural Rubber Compound" |
| BS 2752 (1990) | "Specification for Chloroprene Rubber Compound" |
| BS 3592 (1986) | "Specification for Metallic Coated Steel Wire for the Bonded Reinforcement by Hydraulic Hoses" |
| BS 3734 (1978) | "Specification for Dimensional Tolerances of Solid Moulded and Extruded Rubber Product" |
| BS 5173 (1977) | "Method of Test for Rubber and Plastic Hoses and Hose Assemblies" |

**UL (UNDERWRITER LABORATORIES)**

| | |
|---|---|
| UL 236 (1982) | "Couplings for Fire Hose" |

### 2.3 Fire Fighting Nozzles

**UL (UNDERWRITER LABORATORIES)**

| | |
|---|---|
| UL 401 (1989) | "Portable Hose Nozzles for Fire Protection" |

### 2.4 Fire Fighting Monitors

**BSI (BRITISH STANDARD INSTITUTION)**

| | |
|---|---|
| BS 1134 Part 1 (1988) | "Method for Assessment of Surface Texture" |
| BS 1615 (1982) | "Method for Specifying Anodic Oxidation Coating on Aluminum and its Alloy" |
| BS 5599 (1978) | "Specification for Hard Anodic Oxide Coating for Aluminum for Engineering Purpose" |

**ASTM (AMERICAN STANDARD FOR TESTING OF MATERIALS)**

| | |
|---|---|
| ASTM-A 276 (1988) | "Specifications for Stainless and Heat-Resisting Steel Bar" |
| ASTM-B 179 (1986) | "Specification for Aluminum Alloy in Ingot Form" |

## 3. DEFINITIONS AND TERMINOLOGY

For the purpose of this Standard, the following definitions apply:

### 3.1 Fire Service Valves

#### 3.1.1 Fire water hydrant

A device with suitable valves by which water is discharged from a water main.

### 3.1.2 Pipe size

The international nomenclature diameter nominal-written as DN. 15-25-40-50-65-75-80 etc. shall be used for pipe size (internal diameter).

### 3.1.3 Pressure rating

The international nomenclature pressure nominal-written as PN 20-50-68-100-150 etc. shall be used for flange rating in this Standard. (See Appendix B).

### 3.1.4 Vendor-supplier

## 3.2 Hose Reel

### 3.2.1 Manual fire hose reel assembly

Fire fighting appliance consisting generally of a reel, inlet pipe and manual valve, hose, shut-off nozzle and where required a hose guide.

### 3.2.2 Automatic fire hose reel assembly

A fire fighting appliance consisting essentially of a reel, inlet pipe and automatic valve, hose, shut-off nozzle and where required a hose guide.

### 3.2.3 Spindle

The load-bearing axle on which the reel rotates.

### 3.2.4 Reel and valve subassembly

That part of the hose reel comprising the reel, inlet valve and the connection to the reel, but excluding the hose, shut-off nozzle and connectors or couplings.

## 3.3 Fire Hose and Couplings

### 3.3.1 Fire hose

A woven jacketed lined flexible conduit for conveying water for fire fighting.

### 3.3.2 Hard suction hose

A rubber reinforcement contains a rigid helix to resist collapse under vacuum.

### 3.3.3 Soft suction

Collapsible hose used to supply water from hydrant to fire pump.

## 3.4 Fire Fighting Nozzles

### 3.4.1 Class C nozzle

A nozzle that produces a spray having a minimum cone angle of 30 degrees.

### 3.4.2 Constant flow (gallonage) spray nozzle

An adjustable pattern nozzle in which the flow is delivered at a designed nozzle pressure. At the rated pressure the nozzle will deliver a constant gallonage from straight stream through a wide spread pattern. This is accomplished by maintaining a constant orifice size during flow pattern adjustment.

### 3.4.3 Constant/select flow (gallonage) feature

A feature of a nozzle that allows on-site manual adjustment of the orifice to change the flow rate to a predetermined flow. The flow remains constant throughout the pattern range of pattern selection from straight stream to wide spray.

### 3.4.4 Constant pressure (automatic) spray nozzle

An adjustable pattern nozzle in which the pressure remains constant through a range of flows. The constant pressure provides the velocity for an effective stream to reach at various flow rates. This is accomplished by means of a pressure activated self-adjusting orifice.

### 3.4.5 Dead man control

A control that shut-off or significantly reduces water flow when force is released from it.

### 3.4.6 Spray tip

The primary adjustable pattern and flow appliance without a permanently attached shutoff butt. When used with fire hose mounted on standpipe systems, it may or may not have a shutoff capability.

Spray tip for fire department use operates from a wide spray pattern to a straight spray tip may or may not include a twist type pattern adjustment or shutoff.

### 3.4.7 Spray nozzles/spray nozzle assembly

A nozzle that has a water flow control that will provide a capability of full flow to completely shutting off the flow through the nozzle. This control device may be a permanently mounted valve or a break-apart shutoff butt assembly.

### 3.4.8 Nozzles discharge rating

A valve expressed as an observed flow rate at a preselected pressure for example 2250 LPM at 7 bar.

### 3.4.9 Foam branches

Portable devices which are hand held during use. A vide variety of foam branches are made available in the market.

## 3.5 Fire Fighting Monitors

### 3.5.1 Monitor

Fire fighting cannon which is capable of discharging large amount of water/foam, or dry chemical for cooling or extinguishing fires.

### 3.5.2 Portable monitor

Portable monitors are fixed with portable base stabilizer assembly. The support legs of stabilizer assembly are remarkable for convenient storage and for mounting the base onto fire truck or trailer.

### 3.5.3 Mobile monitor

Monitor mounted on a trailer with 2 or more 65 mm hose instantaneous male connections. The unit with hose storage bin is towed and carried to the scene of fire.

### 3.5.4 Oscillating monitor

A self contained sweep protection water powered or electric powered monitors.

### 3.5.5 Remote control monitor

Monitor equipped with hydraulic motor to provide remote control of the monitor to traverse vertical and horizontal.

## 4. UNITS

This Standard is based on International System of Units (SI), except where otherwise specified.

## SECTION I

# 5. FIRE SERVICE VALVES

## 5.1 General

Hydrants and isolating valve installed on the main water lines, and other types of valves utilized in plant units and industrial areas are designed for fire fighting and fire protection systems specifically manufactured where quick operation and reliability are the main factors.

In this Section the following types of fire service valves are discussed:

**a)** Underground Hydrant Valve
**b)** Aboveground Hydrant Hose Valve
**c)** Aboveground Butterfly Valve (Rubber Lined)
**d)** Ball Valve used on Fire Trucks and Foam System
**e)** Check Valve (non-return) used in Fire Protection Systems

## 5.2 Underground Fire Hydrant (See Figs. 1 to 5)

### 5.2.1 Classification

Underground Fire Hydrants shall be of the following types:

**a)** Wedge Gate (Fig. 1)
**b)** Screw-Down (Fig. 3)
**c)** Butterfly Type (Figs. 6, 7)

**5.2.1.1** Wedge gate valve shall comply with the requirement of BS 5163 for PN 16 and material for duckfoot bends shall be chosen from grey cast iron (CI) or spheroidal graphite cast iron (SG).

#### 5.2.1.2 Screw-Down

The flange thickness shall not be less than 17 mm at position of any bolt hole and material shall be chosen as 5.2.2.

**5.2.1.3** For butterfly valve see 5.3.1.

### 5.2.2 Materials

**5.2.2.1** The Hydrant shall be fitted with captive valve and the following materials shall be used:

**a)** For threaded part which engages with the spindle; Gun metal or high tensile brass.

**b) For the Body**

Grey cast iron (CI) or spheroidal graphite cast iron (SG)

**c) Body Seating**

Gun metal or high tensile brass

**d) Spindle**

High tensile brass or stainless steel

**e) Screwed Outlet**

Gun metal, die cast brass or high-tensile brass

**f) Spindle Cap**

Cast iron

**g) Surface base and frame**

Grey cast iron or spheroidal graphite cast iron.

### 5.2.3 Manufacture and workmanship

All cast units shall be cleanly cast and shall be free from air holes, sand holes, cold shuts and chill. They shall be neatly dressed and carefully fettled. All castings shall be free from voids, whether due to shrinkage, gas inclusions or other causes.

### 5.2.4 General requirement

**5.2.4.1** Screwed Outlet: Shall be provided with the cap to cover the outlet threads. It shall be securely attached to the hydrant outlet by a chain.

**5.2.4.2** Bolting: The dimension of bolting shall comply with the requirement of the appropriate ISO metric Standard.

**5.2.4.3** Corresponding part of hydrants of the same design and manufacture shall be interchangeable.

**5.2.4.4** Valve shall be closed by turning the spindle in a clockwise direction when viewed from above.

**5.2.4.5** All cast iron parts shall be thoroughly cleaned, and coated before rusting.

**5.2.4.6** Spindle sealing shall be of the following types.

**a)** Stuffing box and gland type
**b)** Toroidal sealing ring (O) ring

Where spindle sealing is of toroidal type, two of such seals shall be used. The packing and seals of all types shall be capable of being replaced with the valve under pressure.

**5.2.4.7** When fitted with Standard round thread outlet the hydrant shall deliver not less than 2000 L/min at constant pressure of 1.7 bar at the inlet to the hydrant.

### 5.2.5 Test requirement

#### 5.2.5.1 General

A single set of tests only is required to ascertain that the hydrant design meets the stated requirements of this clause.

#### 5.2.5.2 Hydrostatic pressure

**a) Wedge gate**

**Hydrant valve and seating**. The valve shall comply with the requirements of Clauses 18 and 19 of BS 5163: 1986 when tested in accordance with the methods of that clause.

**Duckfoot bend**. There shall be no visible sign of leakage from the duckfoot bend when tested.

**b) Screw-Down type hydrants**

**Hydrant seating**. There shall be no visible sign of leakage past the valve when the hydrant is tested.

**Complete hydrant**. There shall be no visible sign of leakage from the hydrant when tested.

**Screwed outlets**. There shall be no visible sign of leakage from the screwed outlet when tested. If the screwed outlet is supplied and attached to the hydrant then it shall be tested either integrally with it or after removal from the hydrant.

#### 5.2.5.3 Hydrostatic test certificate

Provision shall be made for a certificate to be made available which certifies that the hydrant has complied with the requirements.

### 5.2.6 Marking

**5.2.6.1** Each hydrant valve, duckfoot bend and outlet shall be clearly marked, either integrally with the stated components or on a plate of durable material securely fixed to that component, as follows:

**a)** The direction of valve opening on the gland or upper part of the hydrant.
**b)** The material designation for grey cast iron 'CI', or for spheroidal graphite cast iron 'SG'.
**c)** The manufacture name and trade mark.

### 5.2.7 Coatings

Units shall be thoroughly cleaned and dried before being given a short term coating of:

**a)** Hot applied coal tar or bitumen based coating material.
**b)** Cold applied black bitumen solution.

### 5.2.8 Clear opening-frame and cover

**5.2.8.1** The minimum clear opening in surface box frames shall be:

**a)** For wedge gate 220-500 mm max.
**b)** For screw down 230-380 mm max.

**5.2.8.2** The depth of the frame shall not be less than 100 mm for grade Wedge gate and 75 mm for grade screw down. The minimum bedding width of the frame shall be 50 mm.

**5.2.8.3** Surface box frames and covers shall be designed so that the top of the cover is flush with the top of the frame (Fig. 4).

**5.2.8.4** Surface box covers shall be clearly marked by having the words 'FIRE HYDRANT' in letters not less than 30 mm high, or the initials 'F.H.' in letters not less than 75 mm high, cast into the cover.

### 5.2.9 Operating key (Fig. 2)

Hydrant valve shall be operated by a T-key or a ring key.

## 5.3 Above Ground Hydrant Valve

Above ground hydrant valves are generally in two types:

**a)** Rubber lined butterfly valve
**b)** Hose valve

### 5.3.1 Rubber lined butterfly valve (Fig. 8)

**Note:**

**This type of valve is designed and used in cold climate.**

#### 5.3.1.1 Valve design specification

The butterfly valves shall be designed in accordance with:

- British Standard BS 5155
- The description in Appendix A2
- The additional design requirements in 5.3.1.2

All valves shall have a pressure rating of PN 16 which is the pressure rating for fire water systems. The aboveground valves shall be wafer type with wrench and the underground valves shall be single-flange or lug type with gear.

For a further description of the design and materials, see Figs. 6, 7, 8.

#### 5.3.1.2 Additional design requirements

- The design shall include a separate stem seal, even if the primary seal is accomplished by the lining.

- The valves shall be designed such that they can be locked in the open position.

- The weatherproof gearbox shall be provided with an indicator to show the 'open' and 'close' position visible from all positions at a distance of 15 m.

- The assembly of valve and gearbox shall not allow of the indicator showing the position of the disc incorrectly.

- The outer barrel of the extension for the underground valve shall have a diameter of not less than 60 mm, and a thickness of not less than 5.5 mm and shall be made from carbon steel pipe.

- The shaft shall be made from Monel alloy k-500 when exposed to the medium.

When the shaft is isolated from the medium by means of a lining, it may be made from stainless steel material.

- The shaft extension may be made of carbon steel.

#### 5.3.1.3 Valve size and type selection

The nominal size and type of the valves to be tested shall be determined after consultation between the purchaser and the manufacturer.

For the selected item(s), the following shall be stated in writing:

**By the Purchaser**

- valve size
- class rating
- valve type: wafer, single flange or lug type.

**By the Vendor**

- drawing and specification numbers
- lining material
- body and extension material
- make of gear and material

#### 5.3.1.4 Specific requirement of materials

##### 5.3.1.4.1 Lining

**a)** The rubber lining shall not have surface defects such as blisters, cracks, porosity or other imperfections.

Repair of the lining is not acceptable.

**b)** The lining shall be classified in accordance with ASTM D 1418.

To verify that the lining applied by the valve manufacturer is the type that has been specified, an identification test is required in accordance with the method described in ASTM D 3677. or BS 903.

**c)** The thickness of the lining shall conform within ±10% to the thickness that has been specified by the manufacturer. A minimum of three measurements shall be taken.

**d)** The hardness of the rubber shall conform to the value specified for the type or grade applied.

A minimum of three hardness tests shall be performed on the lining. The hardness reading shall be expressed in Durometer A or Durometer D in accordance with ASTM D 2240 and shall be within ±5% of the specified value.

##### 5.3.1.4.2 Tests

###### a) Adhesion test

To test the adhesion, samples shall be prepared from the same material as the lining as well as the body material.

The adhesion shall be tested in accordance with the ASTM D 429, method B.

The adhesion value can be calculated from the load at failure, the original bonded area and the values shall not be less than those specified by the manufacturer.

###### b) Other tests

The following tests shall be carried out by manufacturer:

**1)** Leakage test for seat and seal
**2)** Body strength test
**3)** Disc and shaft strength test
**4)** Cycling operation test
**5)** Torque test
**6)** Capacity valve test
**7)** Torque test in dry condition.

##### 5.3.1.4.3 Documents and drawings

**a)** Two copies of construction drawings and valve design specifications shall be presented to the purchaser for approval.

**b)** After approval of the construction drawings, the purchaser will decide whether additional testing by an approved testing laboratory is required for further appraisal. The purchaser will inform the manufacturer accordingly in writing.

#### 5.3.1.4.4 Certificates

Material certificates in accordance with DIN 50049-3.1 B with physical properties and chemical analyses shall be provided for the valve body, shaft and disc.

A certificate with the physical properties of the rubber lining material shall be provided by the rubber manufacturer and a statement from the valve manufacturer that the certified material has been applied for the valve.

### 5.3.1.5 Marking

Valves shall be marked with the following information shown on a corrosion resistant nameplate permanently attached to the valve: Manufacturer's name, catalogue reference number, size, class, differential pressure rating and material identification, including body and times.

### 5.3.1.6 Packaging

Valves package should be palletized, or packed in cartons, boxes, or crates.

### 5.3.1.7 Shipment

Openings-valve ends shall be fully blanked to protect the sealing surfaces and valve internals during shipment and storage.

## 5.3.2 Hose valve (Figs. 9 to 11)

### 5.3.2.1 General

These requirements cover angle-pattern and straightway-pattern hose valves intended for use on standpipes, fire pumps, and hydrants supplying water for fire protection service.

### 5.3.2.2 Design construction

Hose valves covered by these requirements include.

#### 5.3.2.2.1 Type and size

**a)** Angle (90 degree) pattern type for use on stand-pipe having inlet and outlet opening of the same size or the inlet larger than the outlet (outlet coupling 65 mm (2½ inch)).

**b)** Angle (90-120 degree) pattern type for use on inlet pipe sprinkler equipment having 40 to 65 mm nominal outlets.

**c)** Straightway pattern type for use on fire pumps and hydrant having inlet and outlet opening of the same nominal 65 mm (2½ inch) size.

**d)** Straightway pattern type for use on Stand-pipes having inlet and outlet opening of the same size or with the inlet larger than the outlet opening of 65 mm (2½ inch).

#### 5.3.2.2.2 Working pressure

Hose valves shall be constructed for a minimum working pressure of 12 bar for all types.

#### 5.3.2.3 Materials

**a) Intention of use**

Hose valve intended for use on stand-pipes and fire pumps shall be made entirely of brass and bronze except for the hand wheel and for the valve seal. Hose valve intended for use on hydrants and assembled by bolting the valve to the outside of the hydrant barrel may have the cast iron body and bonnet intended to be bolted together.

The remaining valve parts shall be made of brass, bronze or other materials having equivalent corrosion resistant properties.

**b) Casting**

Casting shall be smooth and free from scale, humps, cracks, blisters, holes and defects which could impair its intended use.

**c) Direction to open**

A hose valve shall open by turning the handwheel to the left (counter clockwise) as viewed from the top.

**d) Seat ring**

The seat ring shall be made of brass, bronze or other equivalent corrosion resistant material.

**e) Outlet and attachment**

A hose valve intended for use on fire pump and standpipe shall be fitted at the outlet with female instantaneous coupling 65 mm (2½ inch) (BS 336).

Hose outlet blank cap shall be made of brass or equivalent corrosion resistant material. The blank cap shall be of male instantaneous with brass chain attachment (BS 336).

**f) Stuffing box and seals**

- A valve shall include a stuffing box, or other means for sealing, so that there shall be no leakage at the valve stem. The bearing surface provided in a stuffing box gland or seal retainer for the stem shall be made of material having corrosion resistance equivalent to brass or bronze.

- A stuffing box shall include a gland or follower with a packing nut. There shall be no threads within the stuffing box.

- The stuffing box shall have sufficient width to contain packing so that there is no leakage around the stem and shall have sufficient space for entrance of packing removal tools.

- The stuffing box bottom and the end of the gland shall be beveled.

- A rubber ring, such as an "O" ring, used to provide a stem seal shall be made of vulcanized natural rubber or synthetic rubber compound having uniform dimensions. A ring shall have the properties of A.B.C item 13.5 UL 668.

- A valve shall be constructed to permit repacking of the stuffing box or replacement of at least one seal ring when the valve is fully open and under rated working pressure. A stem seal formed rubber rings shall include at least two rings and stem seals using "O" rings shall include at least one ring.

- In a cast iron valve, the entire stuffing box shall be made of brass or bronze, and the stem opening through the bonnet shall be brass or bronze bushed.

**g) Handwheel**

Handwheel shall not have a diameter of not less than 100 mm.

**h) Seat ring-angle pattern**

- The seat ring when finished shall not extend into the valve interior beyond the near side of the outlet opening.

- The seat seal holder shall be free to turn on its stem so that the seal may seat without any rotary as scraping action likely to damage the seal.

- The means for securing a locknut used to secure a seal holder to its stem shall give securement equivalent to that provided by the use of a pin.

- A rubber part used to provide a seat seal shall (1) be made of vulcanized natural rubber or a synthetic rubber compound, and (2) have uniform dimensions. A seat seal material shall have the properties as item 15.6 A.B.C of UL 668.

- A resilient seat seal shall be made of a nonmetallic material firmly secured and assembled so that it may be easily replaced. The seal holder shall enclose the outer edge of the seal for its entire thickness. The valve seal, seal holder, and seal clamping ring shall have dimensions so that the seal face overhangs the body seat ring both inside and outside.

- The clearance between the edge of the seal holder and the inside of the body shall not be less than specified in Table 15.3 UL 668.

The clearance between the inside of the seat and the seal nut and clamping ring, shall not be less than 1.6 mm.

- The seal retainer nut or clamping ring shall be pinned in place or restrained from movement by locking feature.

#### 5.3.2.4 Additional requirements for straight pattern type valves

- A straightway pattern valve may be of the nonrising-stem or rising-stem construction.

- A straightway pattern valve, when fully open, shall have a straight through unobstructed waterway with a circular cross section, whose area at any point shall not be less than the cross sectional area of the waterway of the size of pipe with which the valve is intended to be used.

- The gate of straightway pattern valve should be either of the following: solid-wedge, split-wedge, or parallel-seat type.

- A straightway pattern valve shall have guides for the gate cast integral with the body.

- A valve that seats tightly with the gate in one position only shall have integrally cast guides of unequal widths, or other equivalent means, to provide for intended assembly.

- A valve for use on hydrants may have a gate with a single seating face and with guides cast in the body.

- A valve body shall have a boss formed on the underside at the outlet end that may be drilled to receive a drip cock.

#### 5.3.2.5 Tests

##### 5.3.2.5.1 Performance tests

Representative samples of valves are to be subject of tests specified in section 18.23 UL 668.

##### 5.3.2.5.2 Manufacturing test and production tests

The manufacturer shall provide the necessary production control, inspection, and tests. The program shall include at least the following:

**a)** Each valve shall be factory tested for body and seat leakage. Each test shall be conducted at twice the rated working pressure for 1 minute. The seat leakage test is to be conducted hydrostatically between the inlet and the closed seat. The body leakage test is to be conducted hydrostatically with the valve partially open and pressure applied on all parts, including the bonnet and body joint, and the stuffing box or sealing device. The valve shall show no seat leakage, no weepage or leakage through body and bonnet castings or at the joint between the two castings, and no leakage past the stuffing box or sealing device.

**b)** Straightway pattern valves having metal-to-metal seats with provisions for attachment to hydrants only shall have no more than slight weeping past the seat. Slight leakage at the valve stem is permitted.

##### 5.3.2.5.3 Certificate

Manufacturer should certify that the above tests have been carried out.

#### 5.3.2.6 Marking

A hose valve shall be marked with the following:

**a)** Name or identifying symbol of the manufacturer or private labeler.

**b)** Nominal size of valve.

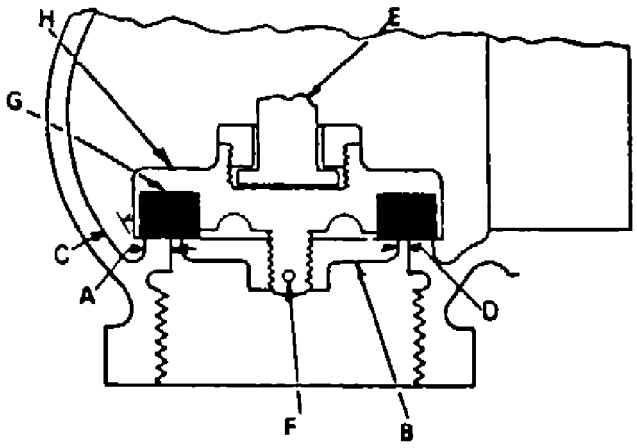
**c)** Distinctive model number, catalog designation, or the equivalent.

**d)** Rated working pressure.

**e)** Markings of valves shall be in raised cast letters; on permanent stamped metal nameplates; or applied by a method which affords equivalent permanence. Markings may be at any convenient location on the valve.

**f)** An arrow, 31.8 mm (1¼ inches) long, showing the direction to turn the handwheel to open the valve, with the word "Open" at the feather end, or in a break in the shaft, shall be cast on the rim of the handwheel so as to be easily readable. If the shaft of the arrow is broken to admit the word "Open," the sum of the parts of the arrow shall not be less than 24 mm.

**g)** If a Vendor produces valves at more than one factory, each valve shall have a distinctive marking to identify it as the product of a particular factory.




**ANGLE PATTERN VALVE SEAT DETAILS**

**A** Seat width.
**B** Nut or clamping ring for Resilient Seat Seal.
**C** Clearance between the edge of the Resilient Seat Seal holder and the inside of the body.
**D** Clearance between inside of the seat and the nut or clamping ring for the Resilient Seat Seal.
**E** Valve stem.
**F** Locking pin for Retainer Nut or Clamping Ring.
**G** Resilient Seat Seal.
**H** Holder for Resilient Seat Seal.

## 5.4 Ball Valves (Fig. 12)

### 5.4.1 General

- Ball valves are generally used on fire truck water delivery sections of the pump, foam system, fire extinguishing system and where quick action for opening of flow is intended.

Ball valves are also used where simultaneous opening and closing of two or three valves by quick action is needed.

### 5.4.2 Design and construction

#### 5.4.2.1 Bodies shall be of one piece or split construction (Fig. 12)

In case of split body valves, the minimum design strength of the split body. Joint or Joints shall be equivalent to that of the body end flange of a flange body, or the appropriate equivalent flange for a butt-weld-end, socket weld-end or threaded end body. Bolted covers shall be provided with not less than four bolts, stud bolts, stud or socket head cap or hexagon headed screw.

#### 5.4.2.2 Flanged ends

End flanges shall be cast or forged integral with the body or end piece of a split body design, or attached by butt welding.

#### 5.4.2.3 Stems, ball shanks, stem extensions

Stems, ball shanks, stem extensions, stem mounted handwheels or other attachments shall be provided with permanent means of indicating port position and shall be designed to prevent miss-orientation.

#### 5.4.2.4 Stem retention

The valve design shall be such that the stem seal retaining fasteners, e.g. packing gland fasteners, alone do not retain the stem. The design shall ensure that the stem shall not be capable of ejection from the valve while the valve is under pressure by the removal of the stem seal retainer, e.g. gland, alone.

#### 5.4.2.5 Body seat rings

Body seat rings or seat ring assemblies shall be designed so as to be renewable except for those valves having a one-piece sealed (welded) body construction.

#### 5.4.2.6 Ball

On full bore valves the ball port shall be cylindrical.

Sealed cavity balls shall be designed to withstand the full hydrostatic body test pressure. Typical types of ball construction are given in (Fig. 12-B).

**Notes:**

**1) The purchaser should state on his inquiry or order if reduced bore valves are required with ball valves having cylindrical ports.**

**2) Solid, sealed cavity and two-piece ball valves are shown with cylindrical ports in Fig. 12-A.**

#### 5.4.2.7 Wrenches and handwheels

When used, wrenches and handwheels shall be designed to withstand a force not less than that given in Table 12, BS 5351.

#### 5.4.2.8 Anti-Static design

Valves shall incorporate an anti-static feature that ensures electrical continuity between stem and body of valves DN 50 or smaller, or between ball, stem and body of larger valves if specified.

The use of conductive packing is permitted provided that the packing:

- **a)** Forms part of the primary stem seal,
- **b)** Is essential for the proper functioning of the valve,
- **c)** Cannot be removed by removing the gland and gland packings alone.

### 5.4.3 Operation

**5.4.3.1** Valves shall be operated by a handwheel or wrench.

**Note:**

**For manually operated valves,clockwise closing will always be supplied. Anticlockwise closing to be supplied by special request.**

**5.4.3.2** The length of the wrench or diameter of the handwheel for direct operated valves shall (after opening and closing a new valve at least three times) be such that a force not exceeding 350 N shall be required to operate the ball from either the open or closed position under the maximum differential pressure recommended by the manufacturer.

**5.4.3.3** Handwheels shall be marked to indicate the direction of closing.

**5.4.3.4** Handwheels and wrenches shall be fitted in such a way that whilst held securely, they may be capable of being removed and replaced where necessary.

**5.4.3.5** All valves shall be provided with an indicator to show the position of the ball port. When the wrench is the sole means of indicating port position, the design shall not permit incorrect assembly and shall then be arranged so that the wrench lies parallel to the line of flow in the open position.

**5.4.3.6** Stops shall be provided for both the fully open and fully closed positions of the valve.

**5.4.3.7** All valves shall be provided with same form of indicator for the position of the ball port.

### 5.4.4 Materials

**5.4.4.1** The body, body connector, insert and cover materials shall be selected to withstand at least twice the working pressure which is 12 bar (175 psi) for fire service.

**5.4.4.2** Valve used on foam liquid system shall be selected from materials to withstand corrosion effect.

**5.4.4.3** Body seat rings, stem seal, body seals and gaskets shall be suitable for use of foam liquid concentrate.

**5.4.4.4** Valve used for salt water or extinguishing agents such as dry chemical powder, shall be specified in the purchasing order.

**5.4.4.5** Wrench and handwheel shall be of steel, malleable cast iron or spheroidal graphite cast iron.

**5.4.4.6** Screwed body ends shall have female threads complying with requirement of applicable ISO Standard either taper or parallel at the manufacturers option unless the particular form is specified in the purchasing order.

**5.4.4.7** Flanged-end, butt-weld end, socket weld end, extended-weld end and threaded-end valves shall comply with BS 5351 Section 7-Clause 7.1, 67.5 and Tables 8 and 9.

### 5.4.5 Tests

#### 5.4.5.1 General

All valves shall be tested hydrostatically by the manufacturer before dispatch. Test shall be carried-out with water. Testing requirement for the body and seat shall be in accordance with BS 5146 Part 1.

#### 5.4.5.2 Pressure retention

The pressure retention of ball valve used shall withstand without leakage of hydrostatic test pressure of 22.5 bar for 2 minutes.

#### 5.4.5.3 Test certificate

The manufacturer shall issue a test certificate confirming that the valves have been tested in accordance with BS 5146 Part 1 and stating the actual pressures and medium used in the test.

### 5.4.6 Preparation for dispatch

**5.4.6.1** After testing, each valve shall be drained, cleaned, prepared and suitably protected for dispatch (painting of finish valve shall be specified in purchase order) in such a way as to minimize the possibility of damage and deterioration during transit and storage.

**5.4.6.2** All ball valves shall be in open position when dispatched.

**5.4.6.3** Body-end shall be suitably sealed to exclude foreign matter during transit.

**5.4.6.4** Valves shall have their jointing surfaces protected.

### 5.4.7 Marking

Each valve shall be marked clearly on the body or on a plate securely fixed to the body. Identification marking shall be in accordance with section 7 items 28 to 31 of BS 5159.

Information to be specified by purchaser [see Appendix A-(4)].

**Note:**

**For more information reference should be made to IPS-M-PI-110 Part 3.**

## 5.5 Gate Valves (Figs. 13-14)

### 5.5.1 General

**5.5.1.1** Gate valves covered by these requirements are of the outside screw and yoke type for nonrising stem type and flanged-end for installation either above ground or below-ground. The gate valve covered by these requirements are intended for installation and use for:

**a)** Low Expansion foam Combined Agent and Deluge Foam-water Spray Systems;
**b)** installation of Sprinkler Systems;
**c)** installation of Standpipe, Hose Systems, and hose Reels;
**d)** water Spray Fixed Systems for Fire Protection, See (IPS-E-SF-200);
**e)** isolation of Fire Water Mains (See IPS-M-PI-110 Section 6).

### 5.5.2 Construction and design

**5.5.2.1** A gate valve of the outside-screw-and-yoke type shall be constructed for use with standard pipe thread size 12.5 mm or larger. A gate valve of the nonrising stem type shall be constructed for use with standard pipe of thread size 65 mm or larger.

**5.5.2.2** Valve sizes refer to the nominal diameter of the waterway through the inlet and outlet connections and to the pipe size for which the connections are intended.

**Exception:** A 12.5 mm size valve may consist of a 20 mm valve assembly having 12.5 mm pipe threads tapped in the metal of the body.

### 5.5.3 Material

#### 5.5.3.1 Types of valves

Valves shall be one of the following types:

**a)** Type A, which is for T-key operation only .
**b)** Type B, which is for key/bar operation, but which can be operated by a T-key.

However, both types shall be capable of operation by a handwheel.

**Note:**

**Type B valves are designed for heavier duty than type A valves and will withstand higher torque loads.**

#### 5.5.3.2 Nominal sizes

For nominal sizes and pressure rating see Appendix B.

#### 5.5.3.3 Bodies and bonnets

**a)** The body of a valve shall be of the straightway type and shall provide, when the gate is fully open, a waterway diameter equal to or greater than the inside diameter of a mating pipe. The diameter measurement is to be made at points away from projecting lugs used for the seat ring assembly.

**Exception:** A gate valve providing a waterway having a diameter less than the diameter of the mating pipe is acceptable, if the valve incorporating such a waterway complies with the requirements of the friction loss test for valves having reduced waterways.

**b)** The body and bonnet of a 50 mm or smaller valve shall be made of material having strength, rigidity, and resistance to corrosion at least equivalent to bronze.

**c)** The body and bonnet of a valve larger than 50 mm shall be made of materials having strength, rigidity, and resistance to corrosion at least equivalent to cast-iron or bronze.

**d)** A casting shall be smooth and free from scale, lumps, cracks, blisters, sand holes, and defects of any nature that could make them unfit for the use for which they are intended. A casting shall not be plugged or filled, but may be impregnated to remove porosity.

**e)** Guides shall be cast integrally with the body. If the gate can be assembled in other than the intended manner, the guides shall be of unequal width, or other equivalent means shall be provided to facilitate correct assembly.

#### 5.5.3.4 Dimensions

Face-to face, body flange, maximum height and flange-to body dimensions shall be in accordance with BS 5163 Section 1.6.

#### 5.5.3.5 Gates

**a)** The gate for a 50 mm or smaller valve shall be of material having resistance to corrosion at least equivalent to bronze.

**b)** The gate for a valve larger than 50 mm shall be of cast-iron or other material having at least equivalent corrosion resistance.

**c)** The central part of a gate for a valve larger than 25 mm shall be recessed.

**d)** Any cast-iron surface of a gate shall be so constructed as to clear the body seat ring in all positions.

**e)** For a cast iron gate for an iron-bodied valve, guides or links shall be provided to reduce the risk of the gate-ring seating surfaces rubbing on the body or bonnet during operation.

#### 5.5.3.6 Seating surfaces

**a)** For a valve having a metal-to-metal seating surface, all seating surfaces of the gate and body shall be of bronze or material having at least equivalent corrosion resistance.

**b)** A seating surface that is constructed by a resilient material shall (1) be made of bronze or other metal having at least equivalent corrosion resistance or (2) have a protective organic coating complying with Tests on Organic Coating Materials for Seating Surfaces.

#### 5.5.3.7 Stem

**a)** A stem shall be made of material having thread standard strength and resistance to corrosion at least equivalent to bronze.

**b)** Stem threads shall be in accordance with acme, modified acme, half "V," or square.

**c)** The connection between a stem and its gate shall be so aligned that the stem will not be bound when the gate is seated.

**d)** A stem nut shall be of material having strength, wear resistance, and corrosion resistance at least equivalent to bronze.

**e)** The stem of a nonrising stem valve shall, when the valve is closed, enter the stem nut a distance equal to at least 1¼ times the outside diameter of the stem.

**f)** A 125 mm or larger outside-screw-and-yoke valve shall be provided with a bronze washer between the yoke and the handwheel, unless the construction of the stem nut does not permit the yoke and handwheel to come into contact.

**g)** The stem of a nonrising stem valve shall be provided with a square tapered end to closely fit the wrench nut. The diagonal of the base of the square shall be at least equal to the diameter of the stem.

#### 5.5.3.8 Stem sealing

The design of the stem seal valves shall be one of the following:

**a)** Stuffing box and gland;
**b)** injector packing form;
**c)** toroidal sealing rings (O-rings).

Seals or packings shall be capable of being replaced, with the valve under pressure and in the fully open position.

**Note:**

**The user is warned that there may be some leakage to atmosphere during this operation.**

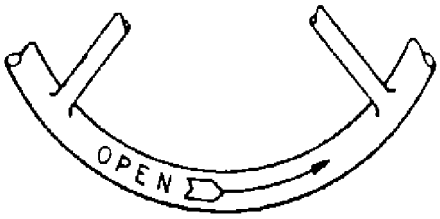
When the seal is a toroidal sealing ring the following additional requirements shall apply:

**1)** At least two such seals shall be used;
**2)** a dust seal shall be positioned above the seals to prevent ingress of foreign matter.

#### 5.5.3.9 Handwheel

**a)** A handwheel shall be constructed to be readily grasped by the hands.

**b)** An arrow showing the direction to turn the handwheel to open the valve, with the word "OPEN" at the feather end or in a break in the shaft, shall be cast on the handwheel so as to be easily readable.



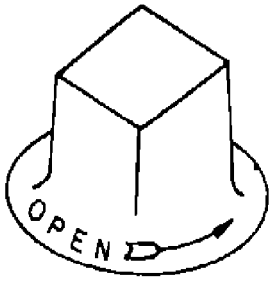

**HANDWHEEL DETAIL**

**c) Direction of closure**

Manually-operated valves shall be closed by turning the key or handwheel in a clockwise or anticlockwise direction when facing the top of the valve.

#### 5.5.3.10 Wrench nut

**a)** The wrench nut for a nonrising stem valve shall be made of material having strength and resistance to corrosion at least equivalent to cast iron. It shall be fitted to the tapered square end of the stem and shall be secured by a nut, pin, key, or cap screw.




**WRENCH NUT**

### 5.5.4 Tests

#### 5.5.4.1 General

The manufacturer shall conduct a type test on each type and size of valve.

Type testing shall consist of the following tests in the sequence specified in accordance with BS 5163.

**a)** Pressure testing;
**b)** strength testing, followed by pressure testing;
**c)** functional testing.

The results shall be recorded and retained by the manufacturer and shall include the results of a visual examination of the valve components after type testing.

Before commencing the tests, the number of turns of the stem to accomplish full obturator travel of the particular valve under test shall be determined. Following the strength test, the valve shall be required to operate through the same number of turns to verify that no damage to component parts has occurred.

#### 5.5.4.2 Performance tests

**5.5.4.2.1** Representative of each-size gate valve shall be subject of the following tests in accordance with either UL 262 or BS 5163 Section 4.

- **a)** Metallic materials test
- **b)** Nonmetallic material tests
- **c)** Tensile strength and elongation tests
- **d)** Accelerated oxygen pressure aging test
- **e)** Hardness tests
- **f)** Organic coating material for seating surface test
- **g)** Resilient seat material securement and cycling tests
- **h)** Stuffing box repacking test
- **i)** Leakage test
- **j)** Mechanical strength test

**5.5.4.2.2** To verify compliance with these requirements in production, the manufacturer shall provide the necessary production control, inspection, and tests.

**5.5.4.2.3** The program shall include at least factory testing of each valve for body and seat leakage. The body leakage test is to be conducted hydrostatically at twice rated working pressure applied to all internal parts with the valve open and pressure exerted on both sides of the gate. There shall be no leakage through the body or distortion. The seat leakage test is to be conducted hydrostatically at twice rated working pressure or pneumatically at rated working pressure.

The pressure is to be applied between one end and the closed gate or, for double-disc gate valves, between the valve discs. If tested pneumatically, the valve is to be fully submerged in water. If tested hydrostatically, there shall be no leakage past a metal-to-metal gate seat in excess of amount prescribed in clause 25 UL 262.

#### 5.5.4.2.4 Test certificate

The manufacturer shall issue a test certificate confirming that the valves have been tested in accordance with Standards given in 5.5.4.1, 5.5.4.2.1 and 5.5.4.2.3.

### 5.5.5 Marking

A gate valve shall be marked with the following:

- **a)** The nominal size
- **b)** Manufacturers name or identifying symbols
- **c)** Rated pressure
- **d)** Distinctive model number or catalog designation
- **e)** Identifying symbols for material

## 5.6 Check Valves (Non-Return) (Figs. 15 to 20)

### 5.6.1 General

Check valves covered by these requirements are intended to be installed and used for:

- **a)** Foam/Water proportioning system
- **b)** Foam/Water fire fighting trucks
- **c)** Gravity water tanks
- **d)** Back flow of water to cross connection system and multi units pumping systems

### 5.6.2 Types

**5.6.2.1** Check valves are generally of the following types:

**a)** Swing type for horizontal and vertical flow (Fig. 15, 16)
**b)** Piston type for angle or horizontal flow (Fig. 17)
**c)** Ball type for angle or horizontal flow (Fig. 18)
**d)** Ball type for vertical flow (Fig. 19)
**e)** Disk type for vertical flow (Fig. 20).

### 5.6.3 Nominal sizes

The sizes are DN 15 to DN 600.

### 5.6.4 Design

**5.6.4.1** The design criteria specified in section 2 of BS 1868 shall be observed.

**5.6.4.2** Check valves from DN 15 to DN 50 to be of female and screw type.

### 5.6.5 Materials

**5.6.5.1** Check valve used for salt water shall be made of materials suitable for that purpose and selected from materials specified in Table 2 BS 1868 (Section 3).

**5.6.5.2** Check-valve used for foam water system shall be made of corrosion resistance materials equal to brass.

### 5.6.6 Inspection and test

Check valves shall be inspected and pressure tested in accordance with the requirements of BS 5146 and manufacturer shall certify that the test has been carried out accordingly.

### 5.6.7 Marking

Identification marking is required covering the following:

**a)** Nominal size DN
**b)** Pressure rating PN
**c)** Direction of flow (arrow), to be cast or embossed on the body of each valve
**d)** Manufacturers name or trade mark
**e)** Body material identification

### 5.6.8 Preparation for dispatch

**5.6.8.1** All valves shall be thoroughly cleaned and dried.

**5.6.8.2** Unmachined external surface of the valve shall be painted in aluminum finish paint.

**5.6.8.3** Machine or threaded surfaces shall be coated with an easy removable rust prevention material.

**5.6.8.4** Valve shall be so packed to minimize the possibility of damage during storage and transit.

**Note:**

**For more information reference should be made to IPS-M-P1-110 part 6.**

## SECTION II

# 6. HOSE REELS (Figs. 21 to 24)

## 6.1 General

The requirements of this section have been framed to ensure that the equipment can be manipulated by one person, whilst at the same time ensuring reasonable robustness for long life, efficient operation and avoidance of excessive maintenance.

## 6.2 Classification

Hoses specified in this standard shall be classified as follows:

**Class A :** Rubber covered for use on fire-fighting vehicles and for use on hose reels for fixed installations;
**Class B :** Thermoplastics covered for use on hose reels for fixed installation.

Each class of hose is further divided into:

**Type 1** : Design working pressure 15 bar
**Type 2** : Design working pressure 40 bar

**Notes:**

**1) The ambient temperature shall be specified by purchaser.**
**2) Class A hoses have better resistance when in contact with hot surfaces.**
**3) The hoses may be either mandrel or non-mandrel made, finished smooth, fluted or fabric marked.**

## 6.3 Construction

**6.3.1** Class A hoses shall consist of:

**a)** Seamless rubber lining;
**b)** a textile reinforcement;
**c)** a rubber cover.

The cover shall be black for fire-fighting vehicles and red for fixed installations.

**6.3.2** Class B hoses shall consist of:

**a)** a seamless rubber lining;
**b)** a textile reinforcement;
**c)** a thermoplastics cover.

The cover shall be red.

**6.3.3** The lining and cover of both classes of hose shall be free from air holes, porosity and other defects.

## 6.4 Dimensions

The bore of the hose shall be either 19 mm or 25 mm. The minimum thickness of the lining cover shall be 1.5 mm. The variation from concentricity measured between inside and outside diameters shall not exceed 2.0 mm.

The maximum mass of the hose shall be as follows:

19 mm bore (¾ in): 0.75 kg/m;
25 mm bore (1 in ): 0.90 kg/m.

### 6.5 Requirements for Complete Hose Assembly for Fixed Installations

**6.5.1** The complete assembly shall be capable of operating at 10 bar maximum working pressure and of delivering water to any point within its specified range without leakage. When tested there shall be no leakage from any part of the assembly.

**6.5.2** The hose shall be capable of being run out, through the hose guide if fitted, in any generally horizontal direction up to the limits of hose length. When tested the force required to start or restart rotation of the reel drum shall not be more than 200 N.

**6.5.3** The water shall be turned on at the reel either:

**a)** Automatically when the reel is unwound,in which case the valve shall be fully opened by not more than four complete revolutions of the reel, when the range of the jet shall not be less than 6 m. or,

**b)** By manual operation of the inlet valve.

**c)** An interlocking device shall be fitted whereby the nozzle cannot be withdrawn until the water supply has been turned on.

**6.5.4** When tested the water flow rate shall not be less than 24 L/min and the range of the jet shall not be less than 6 m.

### 6.6 Design

**6.6.1** The hose reel shall rotate around a spindle so that the hose can be withdrawn freely.

**6.6.2** The drum or hose support of the first coil of hose shall not be less than 150 mm diameter. The fitting by which the hose is attached to the reel shall be arranged in such a way that the hose is not restricted or flattened by additional layers of hose being placed upon it.

**6.6.3** The inlet valve of manual reel shall be a screw down stop valve or a gate valve. The valve shall be closed by turning the handle in a clockwise direction. The direction of opening shall be marked on the handle preferably by an engraved arrow and the word open. There shall be no visible leakage or distortion.

**6.6.4** Reels shall be of sufficient size to carry the length of hose fitted, excluding the nozzle, within the space defined by the end plates. The length of hose fitted shall not be more than 45 m for 19 mm internal diameter or 35 m for 25 mm internal diameter for fixed installation hose reels.

**6.6.5** The following types and models are generally used:

**a)** Swing and fixed open wall (Figs. 21, 24).

The swing arm allows the hose to be pulled-off through 180º of movement Figs. 1 and 4.

**b)** Recess hose reel with omnidirectional hose guide to be pulled off through in any direction Figs. 21,22.

**c)** Door mounted hose reel cabinet Fig. 23. It may be also desirable to provide an anti-over run device to prevent the hose from becoming entangled when run-out.

### 6.7 Material and Finish

**6.7.1** The hose reels shall be finished in signal fire service red.

**6.7.2** Ferrous materials shall not be used as a part of waterway. This does not include the connecting pipe and union between the valve and spindle.

**6.7.3** All components which would be adversely affected by external environmental condition shall be treated to resist corrosion.

### 6.8 Hose

The hose shall comply with the requirements of Class A Type 1 or 2 as specified in 6.2. For fixed installation, and Class A Type 2 for fire truck installation.

### 6.9 Nozzle

Each hose shall terminate in a shut-off nozzle to give either plain jet or jet/spray.

### 6.10 Production Tests

Each reel and subassembly shall be tested in accordance with Appendix A1 to A8 of BS 5274 for the following tests and certified by manufacturer:

**a)** Leakage test
**b)** Strength test
**c)** Import test
**d)** Load test
**e)** Unwinding test
**f)** Water flow and range test
**g)** Operational test of automatic valve
**h)** Production pressure test

### 6.11 Marking

**6.11.1** Each reel and valve subassembly shall be clearly marked with.

**a)** The name and address of manufacturer.
**b)** The date and the number of Standard used.

**6.11.2** Notice and operating instructions:

**a)** Fire hose reel assemblies shall be provided with a notice bearing (fire hose reel) in white letters on a red background or on adjacent to the hose reel.

**b)** Fire hose reel assemblies shall be provided with full operation instructions for display on or adjacent to the hose reel.

### 6.12 Preparation for Dispatch

**6.12.1** Hose reel assembly should be dispatched in crate or in carton in such a way to minimize the possibility of damage during transit and storage.

### 6.13 Hose Reels Mounted on Fire Fighting Truck

#### 6.13.1 Hose

The hose shall be of class A. rubber covered type 2 for working pressure of 40 bar and the cover shall be black. See 6.2.

#### 6.13.2 Dimension

The bore of the hose shall be of 25 mm and the length 43 m or more as specified.

### 6.13.3 Valve

The hose reel valve should be of quick opening ball type.

### 6.13.4 Nozzle

The hose reel shall be terminated to a super fog spray nozzle with squeeze grip valve (see Appendix C Fig. C1.).

The nozzle can be replaced with foam branch nozzle with deflector when required (see Appendix D Figs. D6 and D7.).

### 6.13.5 Tests

Same as given in Clause 6.10.

## SECTION III

# 7. FIRE FIGHTING HOSES AND COUPLINGS

## 7.1 Fire Fighting Hose

Fire hoses should deliver water effectively over a long period of time under a variety of conditions and hazards. Hazards such as impact, abrasion, damage, contamination, burning and the weathering effect. The fire hose shall be light weight, flexible and easy to handle wet or dry, highly resistance to chemical, heat, impact and abrasion, easy cleaning and minimum maintenance that could be carried out simply and effectively.

The hose shall consist of the following:

**a)** An impermeable elastomeric lining;
**b)** a Synthetic fiber reinforcement;
**c)** an externally applied coating of the reinforcement.

### 7.1.2 Dimension

The nominal length of fire hose shall be of 25 m, the bore 45 mm and 70 mm. The mass per unit length shall not exceed 0.37 kg for 45 mm and 0.68 kg for 70 mm per meter.

### 7.1.3 Construction

The fire hose shall be made all synthetic. Nylon wrap and weft totally encapsulated in PVC to form a unified lining and cover. The hose shall be made of first quality materials and to be protected against the effect of lining puncture. The hose shall be easily cleaned and easily repaired.

### 7.1.4 Hose assemblies

Hose assemblies shall be fitted with delivery hose couplings tied in by binding with galvanized mild steel wire of diameter 1.6 mm, and applied over a hose guard of synthetic fiber (to protect the hose from wire). Multi-serrated type couplings shall be secured by 20 continuous turns of wire and ribbed type couplings shall be secured by ties of at least eight continuous turns on both sides of the rib. The end of the wire shall be secured by twisting them together and embedding them in the hose guard.

### 7.1.5 Requirement

**7.1.5.1** The service test pressure for the fire hose shall be specified by the user, but in any case each hose assemblies shall be subject of proof test pressure of 22.5 bar.

### 7.1.6 Tests

The following tests shall be conducted by manufacturer in accordance with BS 5173.

**a)** Hydrostatic tests
**b)** Kink test piece under pressure
**c)** Burst pressure test
**d)** Adhesion test
**e)** Hot cub test
**f)** Impact test
**g)** Ozone test
**h)** Abrasion test
**i)** Oil test
**j)** Acid test

The test report shall include:

**1)** The date of tests and tests results;
**2)** All details necessary for the complete identification of the hose under the tests.

## 7.2 Pump Suction Hoses

### 7.2.1 General

This Sub-Section of Standard covers physical properties and performance of 3 classes of suction hoses which are also divided into three types according to design working pressure.

### 7.2.2 Classification

Hoses and hose assemblies shall be classified as follows:

**Class A:** Smooth bore rubber hose
**Class B:** Semi-embedded rubber hose
**Class C:** Smooth bore polymer-reinforced thermoplastic hose

Classes A and B are further divided into:

**Type 1:** Medium duty hose with a design working pressure up to and including 5 bar.
**Type 2:** Heavy duty hose with a design working pressure up to and including 7.5 bar.

**Note:**

**Ambient temperature to be specified.**

Class C is further described as:

**Type 3:** Medium duty hose with a design working pressure up to and including 5 bar (ambient temperature to be specified)

### 7.2.3 Construction

**7.2.3.1** Class A and B hoses shall consist of:

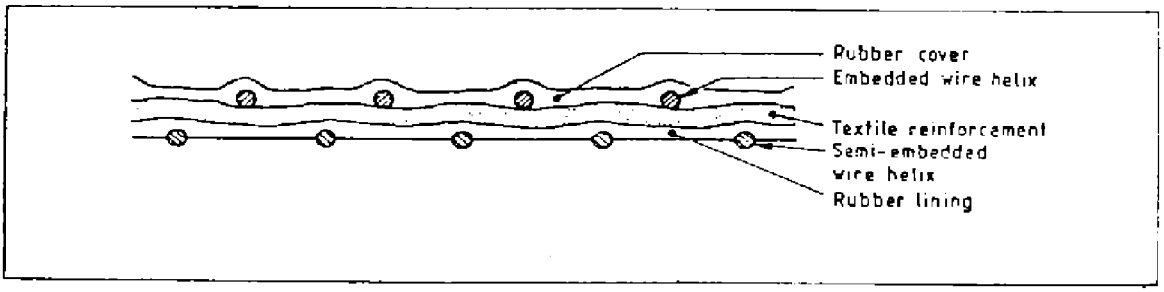
**a)** Rubber lining;
**b)** textile reinforcement;
**c)** an embedded single or twin wire helix;
**d)** a rubber cover.

#### 7.2.3.2 Lining and cover

The lining and cover shall be concentric and shall be free from holes, porosity and other defects.

#### 7.2.3.3 Wire helixes

All helix wire shall be galvanized as specified in BS 443. The wire used for the internal helix in Class B hoses and the embedded helix in Class A hoses shall have a minimum tensile strength of 1250 N/mm². The wire used for the embedded helix of Class B hoses shall have a minimum tensile strength of 650 N/mm².




**LONGITUDINAL CROSS SECTION OF TYPICAL CLASS B HOSE CONSTRUCTION**

#### 7.2.3.4 Hose ends

Hose ends shall be compatible with suction hose couplings, soft ends shall have an additional rubberized textile reinforcement applied as cuff over the soft.

#### 7.2.3.5 Finishing

The hose shall be consolidated and uniformly vulcanized.

#### 7.2.3.6 Dimensions

The nominal bore of the suction hose shall be of 75-100 & 140 mm.

The mass of the hose excluding couplings shall not exceed the following values:

| NOMINAL | MAXIMUM MASS | |
|---|---|---|
| BORE mm | TYPE 1 kg/m | TYPE 2 kg/m |
| 75 | 3.7 | 4.1 |
| 100 | 6.0 | 6.7 |
| 140 | 8.0 | 8.9 |

### 7.2.4 Tests

The following tests shall be carried out in accordance with BS 5173 by manufacturers and the test certificates issued.

**a)** Hydrostatic test
**b)** Vacuum test
**c)** Vacuum test with flexing
**d)** Adhesion test
**e)** Flexibility test
**f)** Hydrostatic test of suction hose assembled with couplings.

### 7.2.5 Attachment of couplings

When the couplings are fitted they shall be either:

**a)** Bound-in using steel wire complying with the requirements of BS 3592: Part 1 having a minimum tensile strength of 380 N/mm² and galvanized as specified in BS 443; or,

**b)** secured by the use of stainless steel band and buckle type clips.

### 7.2.6 Polymer reinforced thermoplastic hoses (Class C, Type 3)

#### 7.2.6.1 Materials and construction

##### 7.2.6.1.1 General

The hose shall be uniform in color, opacity and other physical properties. It shall consist of a flexible thermoplastic material supported in its mass by a helix of polymer material of a similar molecular structure.

The reinforcing and flexible components of the wall shall be fused and free from visible cracks, porosity of foreign inclusions.

##### 7.2.6.1.2 Dimensions and tolerances

When measured in accordance with the method described in BS 5173: Section 101.1 the bore of the hoses shall be as given in clause 7.2.3.6 and shall be compatible with suction hose couplings.

**7.2.6.1.3** The bore of the hose compatible with suction couplings and mass of the hose excluding couplings shall not exceed the values of the following Table:

| NOMINAL BORE mm | MAXIMUM MASS kg/m |
|---|---|
| 75 | 3.0 |
| 100 | 4.5 |
| 140 | 6.0 |

#### 7.2.6.2 Tests

##### 7.2.6.2.1 Hydrostatic pressure test

At proof pressure the hose shall exhibit no evidence of leakage, cracking or abrupt distortion indicating irregularity in materials manufactured.

**7.2.6.2.2** The tests as specified in BS 3165 clauses 5.2 and 5.3 shall be carried out by the manufacturers.

#### 7.2.6.3 Marking

For rubber hoses and assemblies a rubber label giving the following information shall be vulcanized to the hose approximately 0.5 m from one end. For thermoplastic hoses the information shall be marked.

**a)** The hose manufacturer's name or identification;
**b)** the number of standard used;
**c)** the nominal bore;
**d)** the month and the year of manufacture;
**e)** the design working pressure.

## 7.3 Fire Hose Couplings

### 7.3.1 General

Fire hose couplings used in Iranian Oil, Gas and Petrochemical Industries are of two types:

**a)** Delivery hose instantaneous couplings;
**b)** pump suction hose round threaded couplings.

Both types shall be made in accordance with BS 336 (1989). The release mechanism of delivery hose couplings shall be of pull release type (Figs. 25, 26) and delivery connector female coupling shall be of single lug twist type (Fig. 27).

### 7.3.2 Delivery hose couplings

#### 7.3.2.1 Sizes

The tail design shall be of either multiserrated or ribbed type of the following sizes (Fig. 25):

| NOMINAL SIZE | NOMINAL HOSE DIA. | TAIL EXT. DIAMETER | EXTERNAL DIA. BETWEEN RIBS | INTERNAL DIAMETER mm | |
|---|---|---|---|---|---|
| inch | mm | mm | mm | METAL | PLASTIC |
| 1¾ | 45 | 44.5 | 42 | 32.9 | 33 |
| 2¾ | 70 | 69.9 | 65.9 | 56.8 | 58 |

For delivery hose connector sizes reference be made to BS 336, Also see Fig. (26a-b).

#### 7.3.2.2 Locking of plungers

Nuts on plungers shall be of a self locking type.

**Note:**

**Peening over the end of the shank is not regarded as an efficient means of locking the plunger.**

#### 7.3.2.3 Plunger springs

Plunger springs metal delivery hose coupling shall be of such strength that they can be compressed to a length sufficient to free the plunger from engagement by a force of not less than 55 N or more than 110 N and for plastic couplings not less than 45 N and not more than 65 N.

#### 7.3.2.4 Washers

Coupling washers shall have the dimensions given in Fig. 25 (a) and shall be of natural rubber (Grades Y40, Z40) to BS 1154 or chloroprene (Grade C40) to BS 2752.

Expansion ring washers shall be of an elastomer of maximum shore hardness 70. The tolerances on the stated dimensions shall be in accordance with Class M 3 of BS 3734.

#### 7.3.2.5 Materials

A copper alloy part containing more than 15 percent zinc in the construction of any part used shall have corrosion resistance properties equivalent to those of high strength yellow brass. Materials may be used in accordance with BS 336 CZ 112-121-122-DCB3-LG2 PB 102 PB 103. High strength aluminum alloy and plastic material may be used if specified by purchaser.

Any plastic materials complying with BS 336 section 7-14 or 11-3 may be used for the body but the release plunger shall be made of metal.

**Note:**

**On diecast fittings and plastic injection mouldings where a bore is shown as parallel, a reasonable taper should be allowed to facilitate core withdrawal, but this taper should be kept to the minimum required for this purpose.**

#### 7.3.2.6 Castings and mouldings

Castings shall be clean, sound and free from gross porosity, cracks and other surface imperfections. No filling or similar after treatment of castings shall be carried out without the approval of the purchaser.

#### 7.3.2.7 Finishing

Metal couplings shall be smooth and polished. Delivery connectors may be crome plated, if specified by Purchaser.

#### 7.3.2.8 Tests

The manufacturer shall certify that the fire hose couplings and rubber sealing materials are tested in accordance with UL 236 for:

| | |
|---|---|
| **a)** Hydrostatic pressure test | Clause 13 |
| **b)** Creep test | Clause 14 |
| **c)** Pull test | Clause 15 |
| **d)** Crushing test | Clause 16 |
| **e)** Rough usage test | Clause 17 |
| **f)** Mercurous nitrate immersion test | Clause 18 |
| **g)** Salt spray corrosion test | Clause 19 |
| **h)** Test for rubber sealing materials | Clause 20 |

### 7.3.3 Suction hose couplings

**7.3.3.1** Couplings shall be made of rigid materials of copper alloy or die cast brass. At one end female swivel and other end male. Couplings at each end shall have two lugs for suction spanner.

Both screws shall be of round thread to BS 336 and Fig. 27.

#### 7.3.3.2 Sizes

Nominal bore shall be for the following:

**1)** 75 mm (3 inch)
**2)** 100 mm (4 inch)
**3)** 140 mm (2½ inch)

Diameter of suction hose and the length shall be specified by Purchaser:

**7.3.3.3** Couplings shall be tested for the following and certified by manufacturer:

**a)** Crashing test
**b)** Rough usage test
**c)** Mercurous nitrate immersion test
**d)** Salt spray test
**e)** Hydrostatic pressure test
**f)** Washer test.

## SECTION IV

# 8. FIRE FIGHTING NOZZLES

Fire fighting nozzles are generally used for:

- Water spray
- Foam application (See Appendix D)
- Other extinguishing agents

## 8.1 Water Spray Nozzles (Fig. 30)

### 8.1.1 General

The essential feature of water spray which distinguishes it from the use of water in other form is that water is applied in small drops using special types of nozzles.

The discharge both from hose line nozzles and sprinklers is simply water spray in a particular form. A great variety of water spray patterns are now employed both for manually directed hose and fixed spray nozzles and for sprinkler system. Water spray protection may be engineered to provide specialized protection for various industrial applications by using special type nozzles designed to achieve a better distribution of water at a given pressure.

Water spray may be used for any one or combination of the following purposes:

**a)** Extinguishment of fire;

**b)** control of fire, by application of spray to produce controlled burning where materials burning are not susceptible to complete extinguishment or where the extinguishment is not desirable, as in the case of explosive gases;

**c)** exposure protection by applying spray to exposed structures wetting of exposed surfaces;

**d)** prevention of fire by use of spray to dissolve, disperse dilute or cool flammable materials.

### 8.1.2 Types-hose nozzles

Hose nozzles are of three types:

**1)** Open nozzles (Non-adjustable) which provide solid streams (Figs. 30 & 31);

**2)** adjustable fog nozzles which provide variable discharge and pattern from shut off to solid stream and from narrow to wide angel spray (Fig. 30D);

**3)** combination nozzle in which solid stream, fixed or adjustable spray and shut off are selected usually by two or three way control valve (Fig. 30B).

### 8.1.3 Construction

**8.1.3.1** Branch pipe nozzle should be made of brass aluminum alloy and plastic as specified by the purchaser, and shall be constructed as shown in Fig. 31.

**8.1.3.2** Nozzles for use with standard branch pipe shall be of the form, finish and size shown in Fig. 31B.

**8.1.3.3** Integral branch pipe nozzle units shall be made of metal and/or plastics.

**8.1.3.4** Hand held controllable branch pipes shall be of metal and/or plastics. The means of controlling the flow of water shall provide a shut-off/jet facility and additionally provide a spray (Fig. 30B).

**8.1.3.5** A nozzle intended and marked for fire service use may be with dual hand holds or a single hand grip.

**8.1.3.6** The outer end coupling of nozzle hose connection shall be of instantaneous male in accordance with BS 336.

**Note:**

**There are variety of hose nozzles illustrated in Fig. 30.**

### 8.1.4 Hose reel nozzles

Hose reel nozzles subject of this Standard are of 2 types:

**1)** Super fog gun 19-25 mm hose reel hermaphrodite coupling adjustable to straight stream to extra fine fog for fire truck hose reel. Suitable pressure 7 to 10 bar or more with shut-off grip 60 to 100 LPM at 10 bar (See Appendix C);

**2)** fine fog nozzle 19 mm (¾ inch) hose reel with hermaphrodite or round thread standard connection adjustable to straight stream or spray with shut off lever suitable for 4 to 10 bar water pressure standard hose reels.

### 8.1.5 Water fog nozzles

A great variety of fog nozzles are made by manufacturers but the most suitable hand held are those of constant/select flow feature that allows on site manual adjustment. The pattern selection is from straight to wide spray, 100 to 350 LPM at 10 bar.

### 8.1.6 Fixed spray nozzles

Fixed spray system require proper engineering practice considering many factors including the specific characteristics of the hazard, the size and velocities of the dispersed water particles, location of nozzles and volume of water. For the selection of suitable spray nozzles, high velocity spray nozzles which deliver their discharge in the form of spray-filled cone or low velocity spray nozzles which usually deliver a much finer spray in form either of a spheroid or of well filled cone shall be used.

In general, the higher the velocity and finer the courser and size of water droplets, the greater the effective range of spray.

### 8.1.7 Materials

**8.1.7.1** A metal used in construction of any part shall have corrosion resistant properties equivalent to those of high-strength yellow brass.

#### 8.1.7.2 Rubber seals

**a)** Shall be made of vulcanized natural rubber of synthetic compound;
**b)** have uniform dimension and;
**c)** be of such size, shape, and resiliency as to withstand ordinary usage and foreign matter carried by water.

### 8.1.8 Tests

**8.1.8.1** Each spray nozzles used for sprinkler or any types of water protection shall be subject of the following tests:

**a)** Discharge calibration;
**b)** hydrostatic test (2 times of working pressure);
**c)** discharge flow and pattern;
**d)** salt spray corrosion test.

**8.1.8.2** Portable fire service hose nozzles straight stream or fog nozzles shall be subject of the following tests:

**a)** Discharge flow and pattern;
**b)** hydrostatic test (3 times of working pressure);
**c)** non-metallic high temperature;
**d)** leakage;
**e)** rough usage;
**f)** salt spray corrosion;
**g)** non-metallic salt water;
**h)** tensile strength;

**8.1.8.3** Manufacturer shall certify that the above tests have been carried out.

### 8.1.9 Marking

Water protection spray nozzles shall be marked with the following information cast on them:

**a)** Name of manufacturer or identifying symbol;
**b)** distinctive catalog designation;
**c)** rate of flow at designed pressure.

## 8.2 Foam Branch Nozzles

### 8.2.1 General

Foam branch nozzle is a portable device intended to discharge foam and may be either aspirating or non-aspirating. Portable foam branches may pick-up foam liquid concentrate directly from a container (self inducing) or utilize foam solution produced at some point before introduction into the nozzle.

Foam branches, portable hand held can be used for a wide range of flammable liquid fires. They also provide a rapid method of securing a flammable liquid spill with a vapor-suppressing foam blanket before ignition occurs.

Portable low expansion foam branch nozzles capacity varies from 220 to 900 L solution with expansion ratio of 8:1 to 10:1 at 5.5 to 8-bar (See Appendix D).

**Note:**

**The expansion ratio of medium expansion foam branch nozzles is 50-150 to 1 (See Appendix D and Fig. D8).**

### 8.2.2 Type (See Appendix D Table 1)

**8.2.2.1** Foam branch nozzles shall be designed to produce fully expanded foam with all types foam concentrate of low expansion.

**8.2.2.2** Foam branch nozzles shall operate as low as 3.4 bar (50 psi) although the best performance is achieved at 5.4 to 8.6 bar (80 to 125 psi).

**8.2.2.3** The foam branch shall be provided with pick up tube proportioning for either 3% or 6% with control lever as specified. In these nozzles proper proportioning of foam concentrate is accomplished with the suction created by water passing through the nozzles foam maker's venturi.

**8.2.2.4** The nozzle shall be capable of working with any remote proportioning system.

**8.2.2.5** Foam branch nozzles used by fire truck hose reels shall be of hermaphrodite coupling end of 25 mm and squeeze grip valve (Appendix D Figs D6, D7).

**8.2.2.6** The foam branch nozzles should be of stream/spray deflector type allowing the operator to switch from long range straight stream to spray stream pattern without shutting down the nozzles (Appendix D Fig. D5).

### 8.2.3 Construction

**8.2.3.1** Foam branch nozzles shall usually be made of brass or anodized aluminum alloy suitable for salt water.

**8.2.3.2** Non-metallic hand held foam branch nozzle may be acceptable for the purpose and should be tested in accordance with clause 23 of UL 401.

**8.2.3.3** A metal used in construction of any part shall have corrosion resistant properties equivalent to those of high strength yellow brass.

**8.2.3.4** Foam branch nozzle shall consist of the following parts:

**a)** Water inlet male coupling instantaneous (BS 336);
**b)** internal water head;
**c)** foam compound pick-up connection;
**d)** air inlet;
**e)** internal forcing tube;
**f)** deflector and swing handle;
**g)** female instantaneous coupling for foam discharge if specified by purchaser.

### 8.2.4 Tests

#### 8.2.4.1 Performance test

Foam branch nozzles shall be tested to determine the discharge flow of foam with predetermined expansion ratio.

**a)** The nozzle with deflector shall be measured for the range of flow in still atmosphere and spray pattern.
**b)** Foam branch nozzles shall be measured for the amount of foam liquid concentrate flow rate, from pick-up tube at the predetermined pressure.

#### 8.2.4.2 Miscellaneous tests

- Representative foam branch nozzle of each size shall be subject of the following tests:

**a)** discharge calibration;
**b)** discharge flow and pattern;
**c)** hydraulic operation;
**d)** non-metallic high temperature;
**e)** rough usage;
**f)** hydrostatic pressure;
**g)** salt spray corrosion
**h)** leakage;
**i)** air oven;
**j)** non-metallic water exposure and hot water;
**k)** tensile strength, ultimate elongation.

#### 8.2.4.3 Certification

Manufacturer shall certify that all above tests have been carried-out.

### 8.2.5 Marking

**1)** Each nozzle shall be marked with the following information, using stamped or cast figures and letters not less than 4 mm in height:

- **a)** name of manufacturer or its identifying symbol
- **b)** distinctive catalog designation
- **c)** date of manufacture
- **d)** rate of flow at position of straight stream and full spray

SECTION V

## 9. FIRE FIGHTING MONITORS

Fire fighting monitors are generally classified in two types:

**1)** water-water/foam monitors
**2)** dry powder monitor

### 9.1 Portable Water/Foam Monitor

**9.1.1** Monitor shall be supplied with portable base stabilizer assembly. The support legs of the stabilizer assembly to be removable for convenient storage and for mounting base onto fire truck or trailer unit. The minimum rotation shall not be less than 130° and horizontal not less than +45° (Figs. 32, 33).

**9.1.2** The monitor shall have the following design advantages:

**a)** Internally cast-in water way shall vary as such that reduces turbulence and friction loss;

**b)** half turn vertical and horizontal travel locks;

**c)** stainless or anodized aluminum alloy construction for rugged serviceability and light weight;

**d)** counterbalance for ease of operation;

**e)** portable monitor shall be capable of discharging 800 to 1500 LPM of foam solution and water at 10 bar with straight stream range of not less than 45 m and 18 to 20 m height;

**f)** the monitor shall be provided with manually spray control actuator;

**g)** portable foam monitor shall be fitted with pick up tube and metering valve, so foam concentrate may be supplied through the pick-up tube from a container;

**h)** inlet connections to be of 2 × 65 mm instantaneous male connections (BS 336);

**i)** center of gravity dimensions are to be based on nozzle in horizontal position without pick-up tube installed.

### 9.2 Trailer Mounted Water/Foam Monitors (Fig. 35)

**9.2.1** Water foam monitor of this type may be designed for flow rate of 1000 to 2000 LPM or more water or foam solution with straight stream range of 60 meter with 25° elevated nozzle at 10 bar pressure.

**9.2.2** The trailer may be of double axel with hose bin and a foam concentrate tank up to 2000 liters.

**9.2.3** The monitor may be of self oscillating type if specified.

**9.2.4** The monitor may be provided with spray/stream actuator arm which can adjust the spray patterns variations ranging from full spray to straight stream.

### 9.3 Foam/Water Monitors Mounted on Fire Trucks

Fire trucks monitors shall be designed as specified in IPS-G-SF-100. Fire truck monitor may also be designed to be hydraulically operated from the cab if specified.

## 9.4 Elevated Fixed Water/Foam Monitors (Fig. 34)

**9.4.1** Elevated fixed monitors with larger capacity are required for high risk areas such as near process and production units, in petrochemical complexes, refineries, loading terminals, on fire boats, tugs and on tankers for cargo space protection.

**9.4.2** The following types depending on hazard factors are to be considered:

**9.4.2.1** Unmanned sweep protection water powered oscillating shall be with the following features (Fig. 34B):

**a)** Automatic horizontal oscillation sweep with manually adjustable elevation which can be locked prior to operation with override mechanism;

**b)** provided with test connection for oscillating mechanism setting;

**c)** nozzle shall be of aspirating type suitable for foam solution of 3 to 6% foam liquid concentrate;

**d)** speed of oscillation to be adjustable from 0-30° per second;

**e)** arc of oscillation to be adjustable from 10° to 180°;

**f)** angle of elevation adjustable from 45 below horizontal to above 60°;

**g)** water demand for oscillator 4 LPM at 7 bar;

**h)** monitor inlet pressure to be of 5 to 10 bars;

**i)** foam aspirating nozzle inlet flow to be between 1200 to 4000 LPM or more if specified.

**9.4.2.2** Self oscillating hydraulic remote controlled monitor with the following features:

**a)** This monitor is normally elevated on suitable tower to provide a maximum area of coverage;

**b)** monitor is equipped with hydraulic motor to provide remote control of the monitor through 340° traverse arc and 125° of elevation arc (-45° to +80°);

**c)** monitor movement to be accomplished by selective rotational hydraulic motor driving through direct worm gear trains attached to the vertical and horizontal joints on the monitor.

## 9.5 Remote Electric Control Monitors (Fig. 36)

Using remote electric control incorporated into console control center, an individual section should operate a series of monitors protecting any potential hazard within the field of view.

Foam aspirating nozzle used for hydraulic electric remote control monitors can be of different flow rate from 700 to 4000 LPM of 3 to 6% foam liquid concentrate solution or water.

## 9.6 Dry Powder Extinguishing Monitor

Dry powder monitor is generally installed on truck or in locations of high risk areas.

It shall be installed in such a way that can be easily operated.

Its capacity shall be selected to combat the large size of fire without flash back risk.

Dry powder monitor of fire truck shall have the capacity of not less than 20 kg/s (1200 kg/min) with the throw between 30 to 50 meters.

The monitor shall be horizontally adjustable over 140° on each side from the straight forward position. The vertical elevation shall be at least 90° from the most downward position.

An operating handle shall be installed at the monitor to open and close. The monitor shall be equipped with a locking device and a cover on the barrel to prevent water entry.

## 9.7 Materials and Construction

**9.7.1** The monitor and the bearings shall be made of corrosion resistance materials of stainless, aluminum alloy or bronze see (ASTM A 276), for barrel and deflector see (ASTM B 179).

The choice of material should also be made with due regard to possible metallic corrosion when different metals are used and in contact of moisture.

**9.7.2** Oscillator components to be made of cast brass and stainless steel and the enclosure of steel. If the monitor is electric drive the motor shall be of explosion proof or totally enclosed.

**9.7.3** If series of monitors are operated from a remote location, the console control shall include the following standard features:

**a)** Start switch for hydraulic pump;
**b)** run light to indicate hydraulic pump energized;
**c)** shrouded push button for spray or straight stream selection;
**d)** operating mechanism for horizontal and vertical of nozzle.

**9.7.4** Welds shall be free from lack of fusion, cracks, non-metallic inclusion, porosity and cavities.

## 9.8 Finishing

**9.8.1** Machined surface shall be smooth and shall be of grade N7 in accordance with BS 1134.

When aluminum used for exposed surface, they shall have a sealed anodized finish of thickness and less than grade A.A 15 specified in accordance with methods described in BS 1615 or BS 5599. Parts not machined shall be finished clean as cast.

**9.8.2** Waterway should have a smooth finish. The exterior of all components should be sufficiently rounded and smoothed.

**9.8.3** Monitor nozzle to be of aluminum alloy or stainless steel finish, the other parts painted red enamel.

## 9.9 Performance Tests

**9.9.1** Tests shall be in accordance with UL 162 as follows:

**a)** Pressure retaining parts shall withstand without leakage by hydrostatic test pressure of not less than 2 times of highest working pressure.

**b)** The flow rate as specified by the user in LPM should be maintained.

**c)** Expansion ratio of foam liquid concentrate and drainage time should be indicated.

**d)** Straight stream range in meters in still air should be specified.

**e)** Speed of oscillation and water demand for oscillation should be specified.

**f)** Electric-powered oscillating motor shall be also tested and certified, if oscillating system is electric motor.

**g)** Remote control monitors shall also be tested and certified in writing.

## 9.10 Marking

Each foam/water monitor shall be marked with the following information using stamped and cast figures or metal name plate and letters not less than 8 mm in height:

**1)** Name of the manufacturer or its identifying symbols;
**2)** distinctive catalogue designation;
**3)** date of manufacture;
**4)** the flow rate at 10 bar pressure and expansion ratio;
**5)** minimum working pressure.

## 9.11 Instructions for Maintenance

Monitors shall be supplied accompanied by instructions for maintenance and use.

## 9.12 Shipping

Monitor units and related equipment shall be properly prepared for transit to prevent damage from handling warehousing or shipping and shall be labeled to ensure that it is not lost on transit and the following measures shall be taken:

**1)** All external connections shall be protected by temporary closures;
**2)** one package list shall be included inside every package;
**3)** adequate shipping supports and packing shall be provided in order to prevent internal damage during transit.

For ocean transport, the equipment shall be crated in heavy duty container sealed with strong tape or metal bands.

## 9.13 Guarantee

Manufacturer shall guarantee by letter of acceptance the satisfactory performance of the equipment mentioned in all sections in this Standard and replace without charge any or all parts defective due to faulty material, design or poor workmanship for period of 18 months after the date of shipment.

## APPENDICES

## APPENDIX A(1)
## HYDRANT VALVE UNDERGROUND INFORMATION TO BE SPECIFIED BY PURCHASER
## VALVE SPECIFICATIONS

Type: Wedge Gate b Screw Down b Pressure Rating

**MATERIALS**

| | | | | |
|---|---|---|---|---|
| **1)** Threaded part engaged with spindle: | | | Gun metal | b |
| | | | High tensile brass | b |
| | | | Cast iron (C1) | b |
| **2)** Body, duck foot bend | | | Spheroidal graphite (SG) | b |
| **3)** Seating.....Gun metal | b | | High tensile brass | b |
| **4)** Spindle.....Stainless steel | b | | High tensile brass | b |
| **5)** Screwed outlet Diecast brass | b | | High tensile brass | b |
| **6)** Surface base & frame C1 | b | | SG | b |

**Cap To Cover The Outlet Threads With Chain** Yes b No b

| | | |
|---|---|---|
| | "O" ring | b |
| Spindle sealing | Gland type | b |
| Test certificate | Required | b |

**Coating** b

| | | |
|---|---|---|
| Operating key required | Yes | b |
| | No | b |
| Surface box required | Yes | b |
| | No | b |

Others.....

**(to be continued)**

## APPENDIX A(2)
## BUTTERFLY VALVE SPECIFICATIONS

### CARBON STEEL, LINED BODY ABOVE-GROUND APPLICATION FOR COLD CLIMATE

Design, dimensions and marking generally to BS 5155.

**Type:** Wafer, tight shut-off, PN 16, suitable for mounting between raised face flanges ANSI class 150 with serrated spiral finish.

**Body:** ASTM A 216 WCC or WCB with maximum carbon content of 0.25% or ASTM A 105 normalized or Nodular cast iron GGG 40.3.

**Lining:** Polychloroprene or nitrile rubber.

**Disc and bearings:** Aluminum Bronze Alloy ASTM B 148 - C 95800 or BS 1400: AB2.

**Shaft:** Stainless steel AISI 316, or SAF 2205 or equivalent, provided that the steel is isolated from the medium by the lining. Otherwise it shall be made as given in BS 3076 NA 18 (Monel alloy K-500).

**Pins:** BS 3076 NA 18 (Monel alloy K-500).

**Surface protection:** The outside surface protection of valve and barrel shall be of rust proof undercoat, covered by fire service red.

| SIZE (in) | DN | FACE TO FACE (mm) | OPERATING MECHANISM |
|---|---|---|---|
| 2 | 50 | 43 | Wrench |
| 3 | 80 | 46 | Wrench |
| 4 | 100 | 52 | Wrench |
| 6 | 150 | 56 | Wrench |

**(to be continued)**

## APPENDIX A(3)
## HOSE VALVE SPECIFICATION

Type:

Straight way..... Inlet ..... mm outlet ..... mm

Rising stem b
Non/rising stem b
Single seat b
Double seat b

Angle 90° .....120° Inlet.....mm outlet.....mm b

Flanged End b Raised face..... b RingJoint.....

Threaded End b .....b Specify the thread.....

Workingpressure.....bar

Material made of brass b

Material made of bronze b

Body & Bonnet: Cast iron b Remaining Parts: Brass b Bronze b

Seat ring and Stuffing box: Brass b Bronze b

Outlet.....Female instantaneous (BS 336) single lug twist

Blank cap with chain..... b Yes..... Stem seal "O" ring b

Rubber seat seal.....UL 668 b ..... Metal to metal seat b

Test.....UL 668 b .....Resiliant rubber seat b

Instantaneous female gasket BS 336

Drain b Yes
b No

Paintingfinish.....

Others.....

**(to be continued)**

## APPENDIX A(4)
## BALL VALVE SPECIFICATIONS

The following information should be supplied by the Purchaser.

Nominal size DN ..... Pressure rating ..... bar

Valve pattern

Full bore ..... Reduced bore ..... Short ..... Long .....

Body ends

Flanged (raised face) ..... Flanged (ring joint) .....

Other flange finish (specify) .....

Butt-welded end preparation .....

Socket weld ends .....

Exterior weld ends .....

Threaded ends BS 21 (Taper) ..... ANSI/ASME B1.20.1.....

Shell over pressurization arrangement, if required

Type of arrangement .....

Drain tapping, if required

BS 21 (Taper) ..... ANSI/ASME B1.20.1.....

Ball port. If through cylindrical bore required .....

Conductive packings

If conductive packings are not permitted.

Operation

If other than wrench or handwheel (specify) .....

Operation

If anti-clockwise close is required .....

Materials

Pressure containing shell (specify) .....

Materials

Type of ball and where particular material is required, (specify) .....

Materials

Stem, where particular material is required, (specify) .....

Materials

Body seat rings. If other than virgin PTFE is required, (specify) .....

Identification plates

If fixing by spot welding is not permitted.

Leakage rate

For metal seated valves (specify) Rate 2 ..... Rate 3.....

Painting

If valves are to be painted .....**(to be continued)**

## APPENDIX A(5)
## CHECK VALVE SPECIFICATIONS

The following information should be supplied by the purchaser

Type:

| | | | | | |
|---|---|---|---|---|---|
| **1)** Swing type | b | Horizontal Flow<br>Vertical Flow | b<br>b | | |
| **2)** Piston type | b | Horizontal flow<br>Angle Flow | b<br>b | | |
| **3)** Ball type | b | Vertical flow | b | | |
| **4)** Disk type | b | Vertical flow | b | | |

| | | | | | |
|---|---|---|---|---|---|
| Nominal size DN | | Pressure rating PN | | Screw female<br>Flanged | b<br>b |
| Wrench | b | Hand wheel | b | | |

Painting

Test Certificate b

Others

CI (Cast Iron)

SG-(Spheroidal Graphite)

| | | | | | |
|---|---|---|---|---|---|
| Material: Corrosion resistance | | Yes | b | CI<br>SG | b<br>b |
| For Salt water: | Salt water<br>FLC (foam)<br>Foam solution | b<br>b<br>b | | | |
| | Hi-tensile brass<br>or gun metal | b<br>b | | | |

## APPENDIX B(1)
## SIZES AND PRESSURE RATINGS

| Valve Nominal Size | |
|---|---|
| mm | (in) |
| 15 | (½) |
| 20 | (¾) |
| 25 | (1) |
| 32 | (1¼) |
| 40 | (1½) |
| 50 | (2) |
| 65 | (2½) |
| 80 | (3) |
| 100 | (4) |
| 150 | (6) |
| 200 | (8) |
| 250 | (10) |
| 300 | (12) |
| 350 | (14) |
| 400 | (16) |
| 450 | (18) |
| 500 | (20) |
| 600 | (24) |

### NOMINAL PRESSURE AND CLASS RATINGS AND NOMINAL SIZE RANGE

| RATING | | NOMINAL SIZE RANGE | |
|---|---|---|---|
| PN | CLASS | mm | in |
| 10 | 150 | 50 to 600 | (2 to 24) |
| 16 | 150 | 50 to 600 | (2 to 24) |
| 25 | 300 | 25 to 600 | (1 to 24) |
| 40 | 300 | 25 to 600 | (1 to 24) |
| 64 | 600 | 25 to 600 | (1 to 24) |
| 100 | 600 | 25 to 600 | (1 to 24) |
| 160 | 900 | 25 to 300 | (1 to 12) |
| 250 | 1500 | 25 to 300 | (1 to 12) |
| 320 | 2500 | 25 to 250 | (1 to 10) |
| 400 | 2500 | 25 to 200 | (1 to 8) |

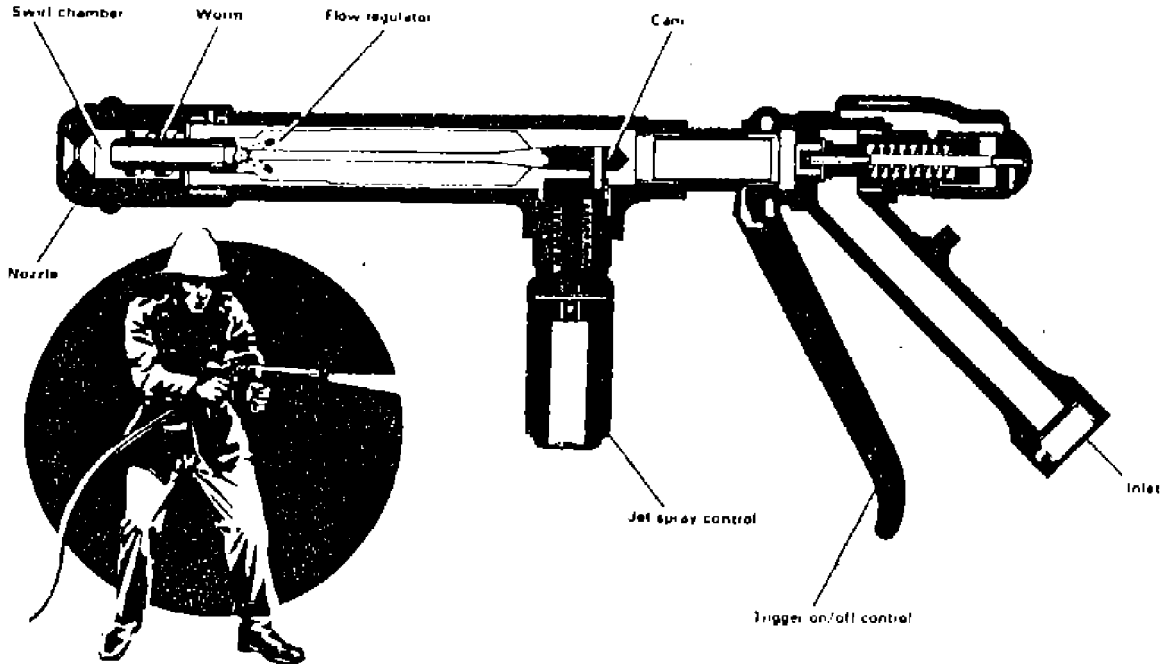
## APPENDIX B(2)
## HYDROSTATIC TEST PRESSURES

| NOMINAL PRESSURE | TEST PRESSURE | |
|---|---|---|
| | SHELL | SEAT |
| bar | bar | bar |
| 10 | 15 | 10 |
| 16 | 24 | 16 |
| 25 | 37.5 | 25 |
| 40 | 60 | 40 |
| 64 | 96 | 64 |
| 100 | 150 | 100 |
| 160 | 240 | 160 |
| 250 | 375 | 250 |
| 320 | 480 | 320 |
| 400 | 600 | 400 |

## APPENDIX C
## HOSE REEL BRANCH NOZZLE

The hose reel branch nozzle mainly installed on fire trucks is designed to be used as jet/spray branch capable of reaching at pressure of 10 bar and more. The branch is designed as a trigger operated gun with a pistol grip and have a forward grip to assist in steadying and aiming the gun. The forward grip serves as a jet/spray control. Water emerging from the nozzle forms a finely atomized spray and when a jet is required, the flow regulator is moved forward under the action of control cam and the water is then directed toward the nozzle via the center passage in the flow regulator bypassing swirl chamber. The type of branch is also suitable for use with high pressure for extra fine spray.

The rate of flow is 60 to 100 LPM and the throw is between 6 to 10 meters at 10 bar.




**SUPER FOG**
**Fig. C1**

# APPENDIX D
# FOAM-MAKING BRANCH NOZZLES

## 1. GENERAL

The aspirating devices which are used to produce foam can be divided into three basic categories:

**(i)** foam-making branches (FMB) for LX or MX foam;
**(ii)** generators for LX foam;
**(iii)** generators for HX foam.

The above equipment is available in various sizes requiring from under 100 L/min to over 6000 L/min of foam solution. It is obvious that pumps supplying water for foam-making must have the capacity to meet the needs of the particular type and amount of foam-making equipment in use.

Some aspirating devices are fitted with means of picking up concentrate and are known as self-inducing. With other types, the concentrate has to be introduced into the water stream at an earlier stage by some form of induction equipment.

## 2. LX FOAM-MAKING BRANCHES

### a) General

Fig. D-1 illustrates the principal features of a typical LX FMB. Designs vary and will incorporate some or all of these features. The strainer is frequently omitted, as often is the on/off control.

In the diagram are two orifice plates. The upstream orifice is the larger of the two and its function is to create turbulence in the space between the two orifice plates so that when the jet issues from the downstream orifice it rapidly breaks up into a dense spray. This fills the narrow inlet section of the foam-making tube and entrains the maximum quantity of air through the air inlet holes. Some FMBs have the upstream orifice plate fitted with disturbance notches. The downstream orifice is smaller and is precisely calibrated to give the designed flow rate. Some branch-pipes have a swivel device in place of this orifice; others have several converging orifices.

Most FMBs have a narrow section at the inlet end in which the air entrainment takes place, and then a wider section in which the foam forms. The wider section of the foam-making tube frequently contains "improvers" which are designed to enhance the foam quality, e.g. semi-circular baffles or a cone.

At the outlet, the branchpipe is reduced in diameter to increase the exit velocity, thus helping the foam stream to be projected an effective distance. The design is crucial: too narrow an outlet produces back pressure with less air entrainment and a lower-expansion (sloppy) foam. If the outlet is too large, the expansion is higher but the throw is reduced.

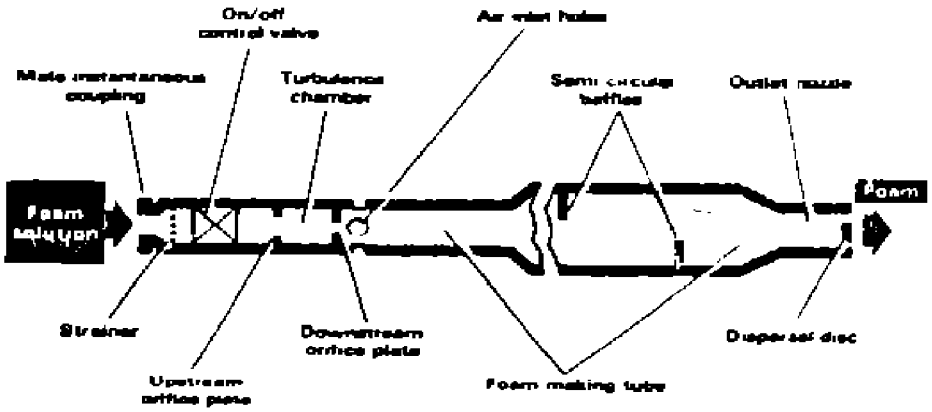
Some branches are fitted with a dispersal mechanism, e.g. adjustable blades within the nozzle which enable a hollow conical spray to be produced. This overcomes the foam's tendency to remain in a coherent "rope" and allows the foam to fall more gently onto the fuel. (Fig. D-5)

**Note:**

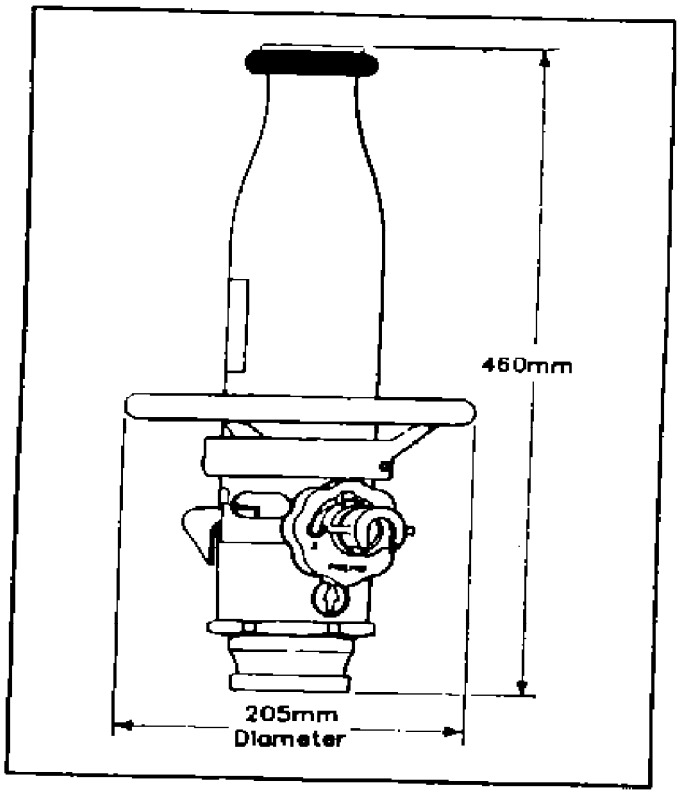
**FMB:** **Foam Making Branch**
**LX:** **Low Expansion**
**MX:** **Medium Expansion**
**HX:** **High Expansion**

**(to be continued)**

APPENDIX D (continued)



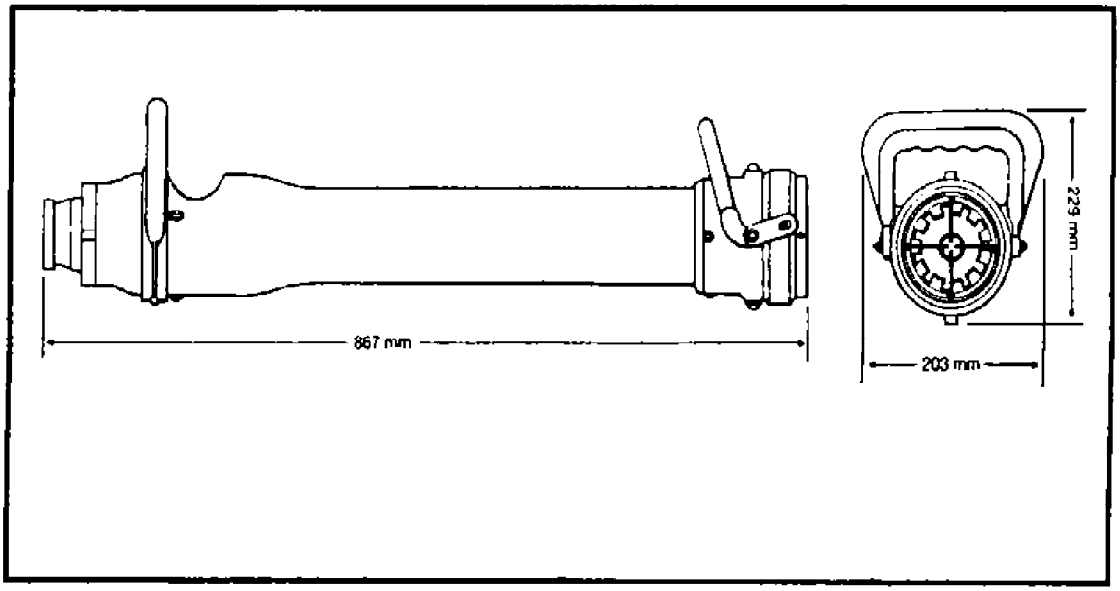

PRINCIPAL FEATURES OF A LOW EXPANSION FOAM BRANCH PIPE
Fig. D-1




FB. 5x

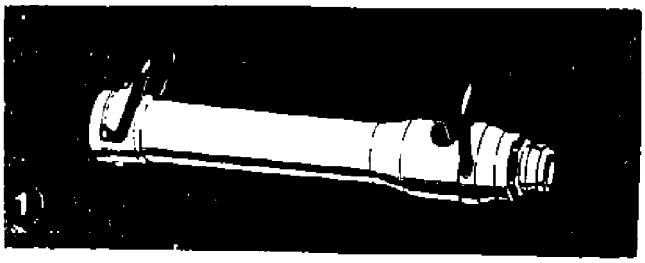
(to be continued)

APPENDIX D (continued)




FB. 10x

Fig. D2




No. FB10/10 455 LITERS/MIN OF FOAM SOLUTION AT 7 BAR

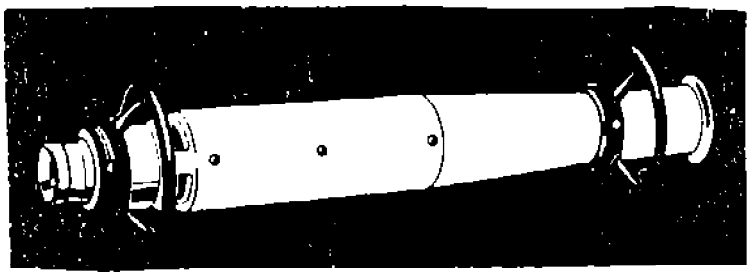

No. F450 450 LITERS/MIN FOAM SOLUTION AT 7 BAR

LX FOAM BRANCH PIPES REQUIRING APPROXIMATELY 450 LITERS/MIN FOAM SOLUTION

Fig. D-3

(to be continued)

APPENDIX D (continued)



No. FB20X 910 LITERS/MIN OF FOAM SOLUTION AT 7 BAR

LX FOAM BRANCH PIPE REQUIRING APPROXIMATELY 900 LITERS/MIN FOAM SOLUTION
Fig. D-4

MOS (MANUALLY OPERATED SPRAY) NOZZLE
Fig. D-5

### b) Types

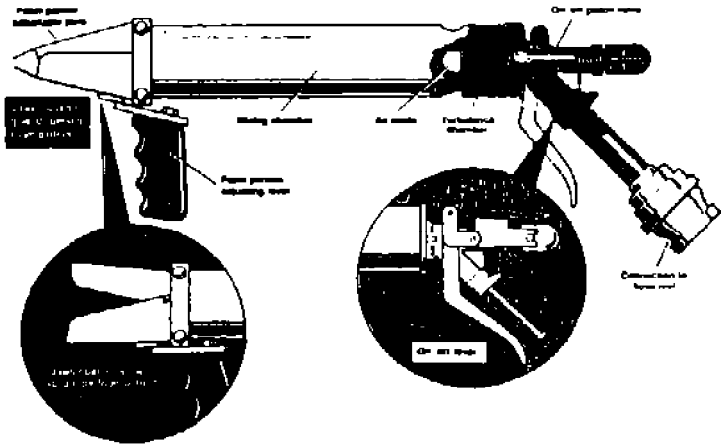
In order to distinguish between capacities of FMBs, it is necessary to use a common factor. As the same FMB can produce different amounts of foam from different concentrates, classification by foam production is useless. Therefore, the classification used is by the nominal flow requirement of foam solution in liters/min. This figure corresponds in each case to the nominal operating pressure for the particular branch. Some common models of LX FMB are illustrated in Figs. D1 to D5 and their performance characteristics are listed in Table 1.

The B225 FMB (see fig. D2) is specially designed for use with AFFF or FFFP, although it can be used with synthetic foam. Note the adjustable jaws giving the option of a cohesive jet or a spray, and the on/off trigger mechanism controlling the release of the foam. Table 1 gives the performance data for this branch.

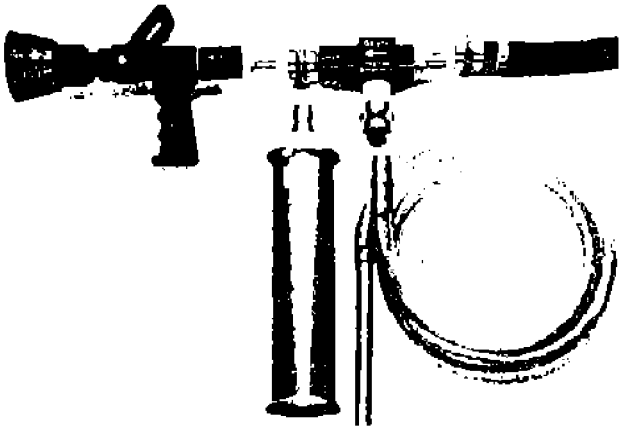
Special types of branch are available for use with hose-reel equipment. (See Fig. D6 and D7.)

(to be continued)

APPENDIX D (continued)



THE B225 SPRAY/JET FOAM BRANCH PIPE FOR USE WITH FILM-FORMING FOAMS
Fig. D-6



'FOG FOAM' HOSE-REEL FOAM UNIT
Fig. D-7

(to be continued)

APPENDIX D (continued)

TABLE 1 - LX FOAM-MAKING BRANCHES: PERFORMANCE DATA

| Branch | Nominal flow requirement (litres/min) | Nominal operating pressure (bar) | Maximum operating pressure (bar) | Throw at nominal pressure (metres) | Throw at maximum pressure (metres) | Expansion at nominal pressure (approx.) | Self-inducing capability | Remarks |
|---|---|---|---|---|---|---|---|---|
| FB 5X MkII | 230 | 5.5 | 10.5 | 20 | 24 | 10:1 | Yes | Can vary concentration from 3% to 6% when operated in self-inducing mode. |
| F 225 | 225 | 7 | 10 | 12[a]<br>20[b] | 14[a]<br>23[b] | 8:1[a]<br>10:1[b] | Yes | |
| B 225 | 225 | 7 | 8.8 | 13[c]<br>7[d] | 14[c]<br>8[d] | 10:1 | No | Designed for use with film forming foams. |
| FB 10/10 | 455 | 7 | 10.5 | 21 | 25 | 10:1 | No | Can change from straight-forward jet to conical spray. |
| F 450 | 450 | 7 | 10 | 18[a]<br>21[b] | 20[a]<br>23[b] | 8:1[a]<br>10:1[b] | Yes | |
| FB 20X | 910 | 7 | 10.5 | 25 | 27 | 10:1 | No | Requires 2 men to manoeuvre it. Often adapted as a monitor, either free-standing or fixed on an appliance. |
| F 900 | 900 | 7 | 10 | 21[a]<br>24[b] | 23[a]<br>26[b] | 8:1[a]<br>10:1[b] | No | Not illustrated, but similar in appearance to the F 450. |

[a] Basic model, giving cohesive 'rope' type foam jet.

[b] Alternative version giving non-cohesive foam stream.

[c] Jaws open, i.e. jet mode.

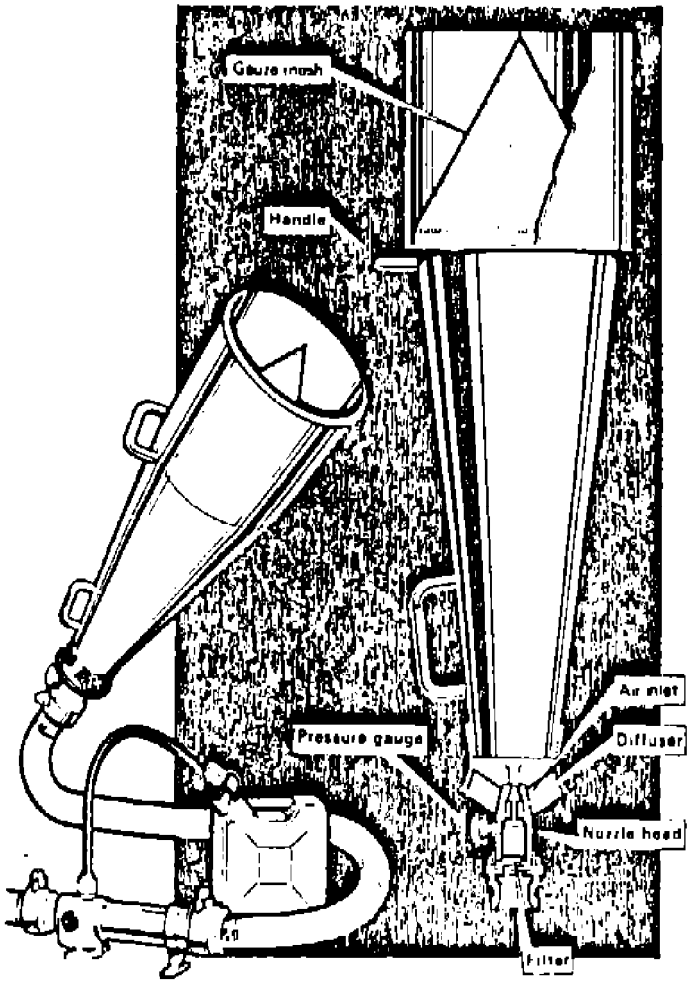
[d] Jaws closed, i.e. spray mode.

(to be continued)

APPENDIX D (continued)

### Medium Expansion Foam Branch

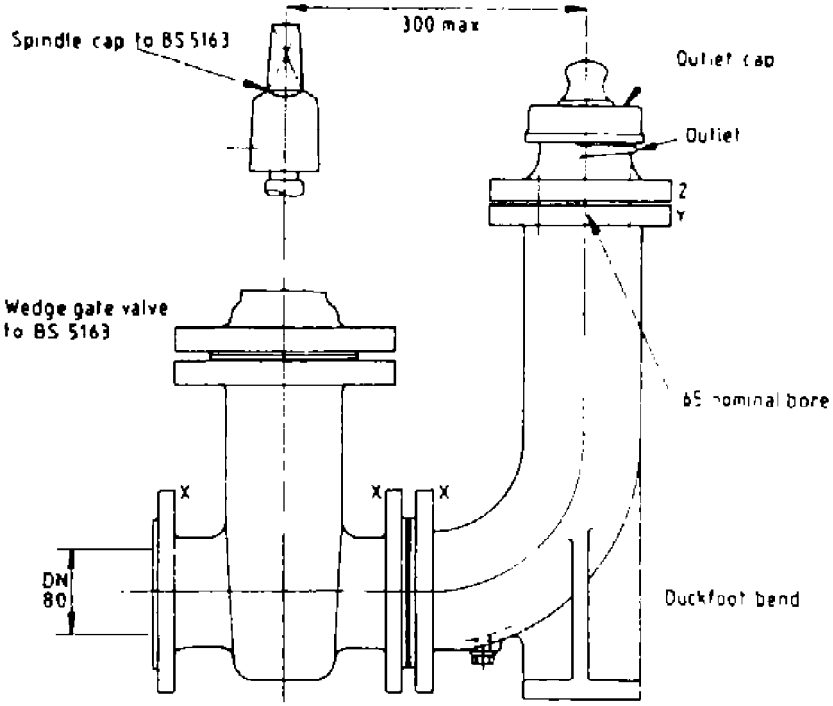
Medium expansion foam branches are designed to be used with synthetic foam concentrate and will produce foam at expansions usually ranging from 50:1 to 150:1. The greater expansion is due to ratio of medium expansion foam is due to projection distance and is less than low expansion. The branch defuses and aerates the stream of foam solution and projects it through a gage mesh to produce bubbles of uniform size (Fig. D-8).



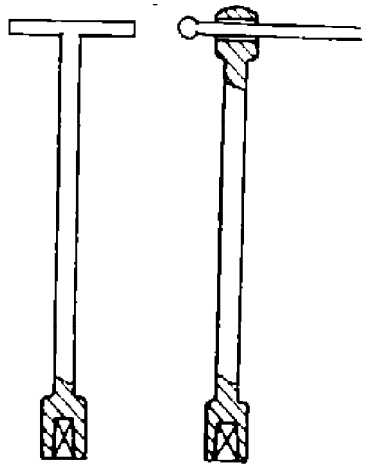

**PRINCIPLE OF OPERATION OF A MEDIUM EXPANSION FOAM BRANCH PIPE**
**Fig. D-8**

## FIGURES FOR VALVES

### UNDERGROUND HYDRANT VALVE



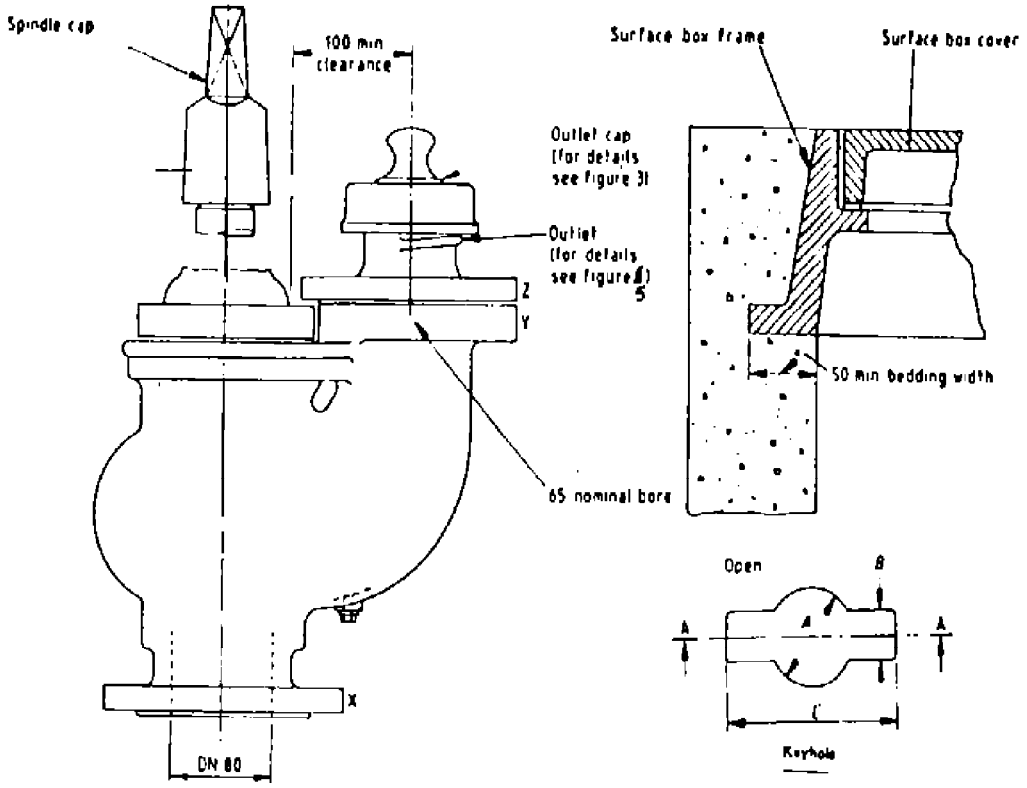

**TYPICAL FIRE HYDRANT: VEDGE GATE**
**Fig. 1**



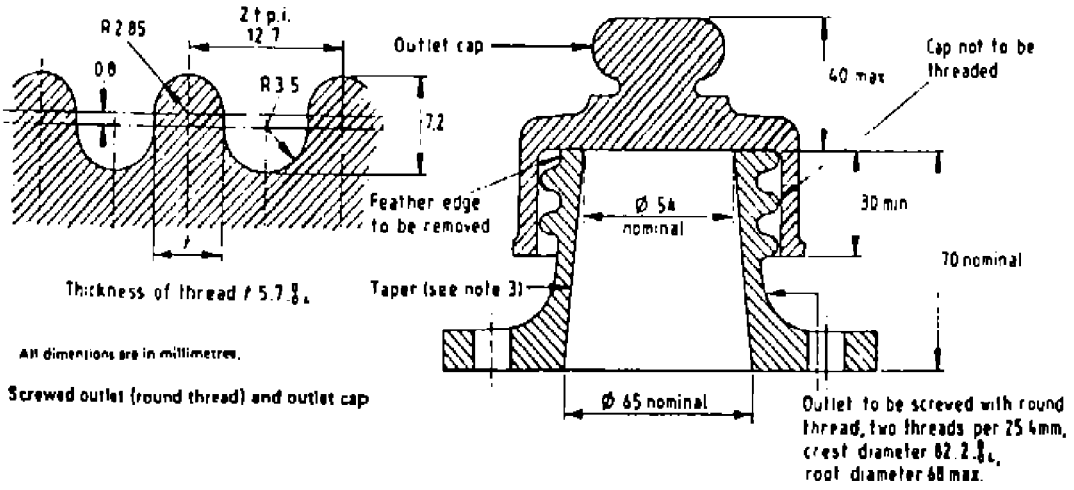
NOTE. This sketch is diagrammatic only.

**RING KEY AND BAR**
**Fig. 2**

**(to be continued)**



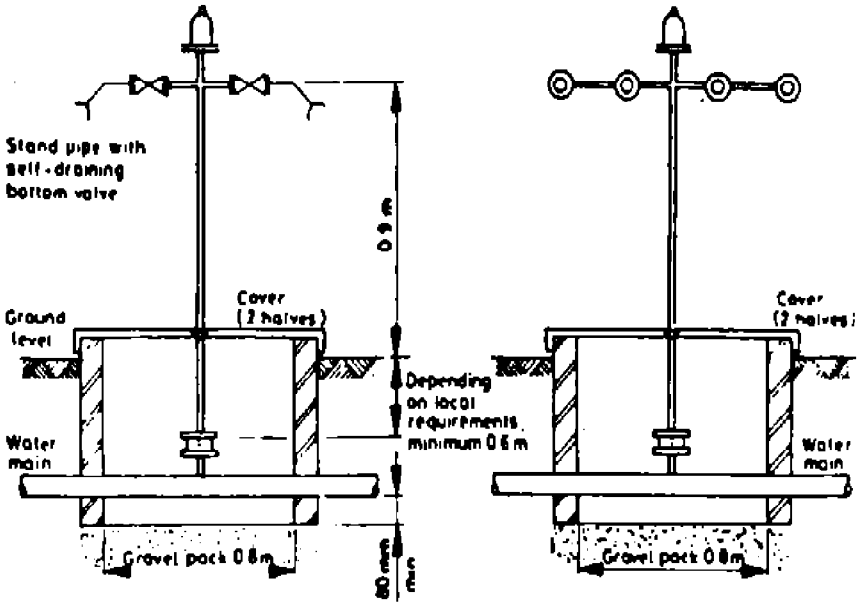

**SCREW-DOWNSURFACE BOX**
**Fig. 3 Fig. 4**



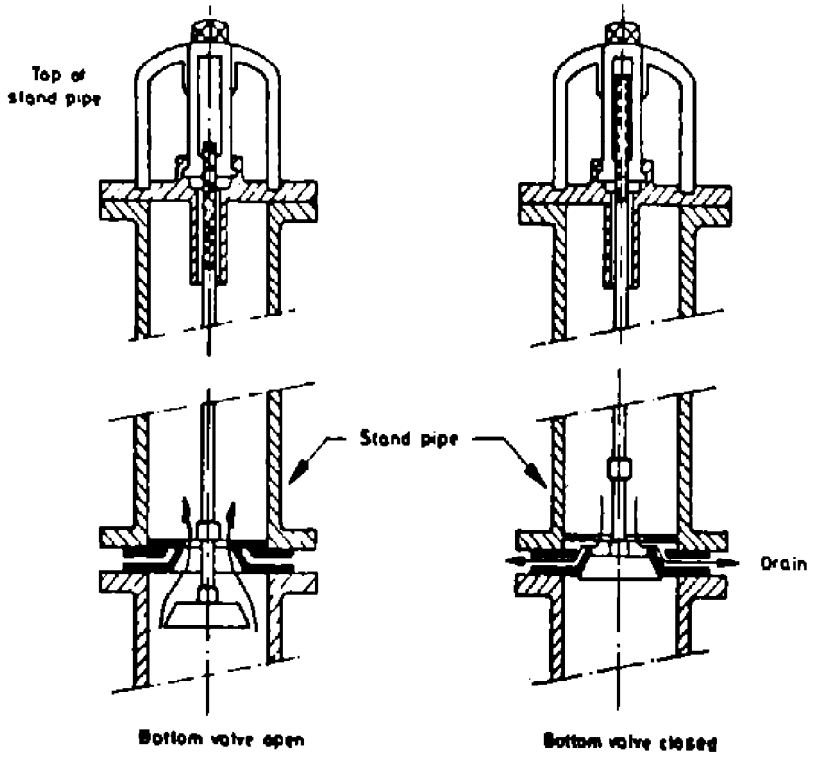

**SCREWED OUTLET (ROUND THREAD) AND OUTLET CAP**
**Fig. 5**

**(to be continued)**

## TWO-WAY AND FOUR-WAY HYDRANTS FOR UNDERGROUND MAIN LINES



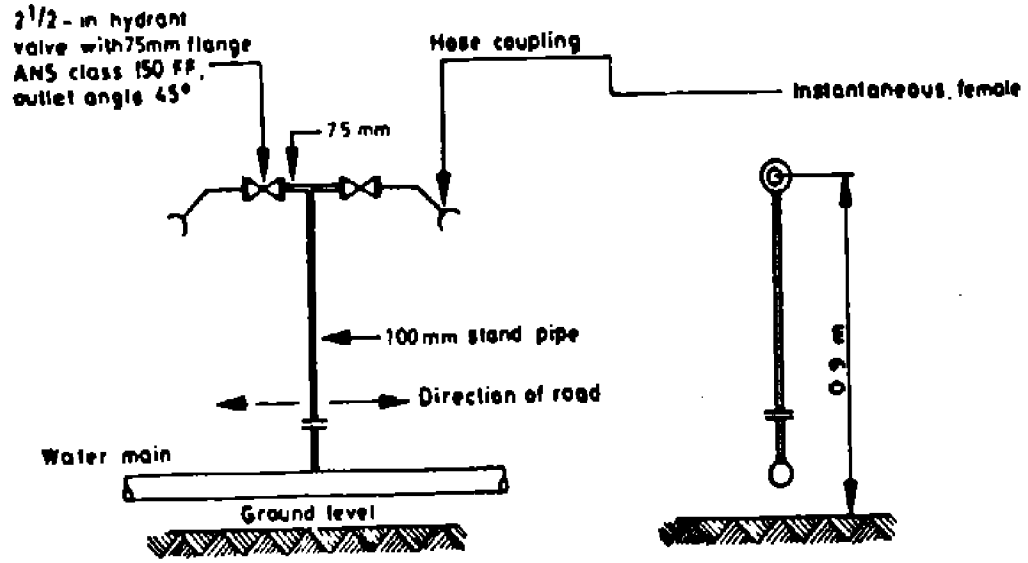

TWO-WAY HYDRANT FOUR-WAY HYDRANT
Fig. 6 Fig. 7



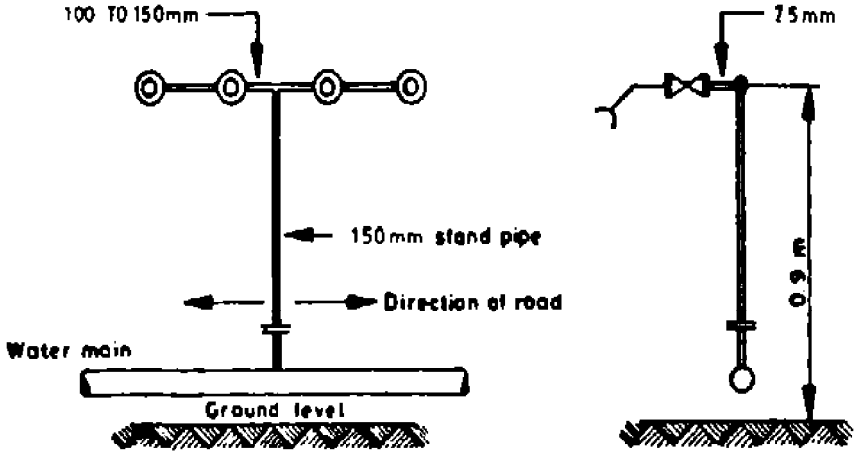

TYPICAL DETAIL OF SELF-DRAINING BUTTERFLY VALVE
Fig. 8

(to be continued)

## TWO-WAY AND FOUR-WAY HYDRANTS FOR ABOVEGROUND MAIN LINES




TWO-WAY HYDRANT
Fig. 9




FOUR-WAY HYDRANT
Fig. 10

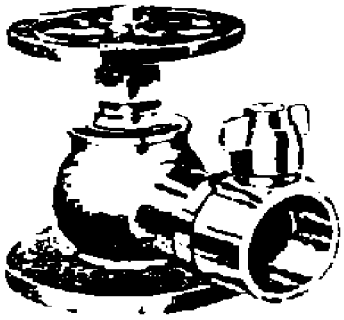
ALL OTHER DIMENSIONS SAME AS FOR TWO-WAY HYDRANT

(to be continue)

Fire Pump Delivery Valve.

Horizontal Outlet.

Bib Nose Outlet.

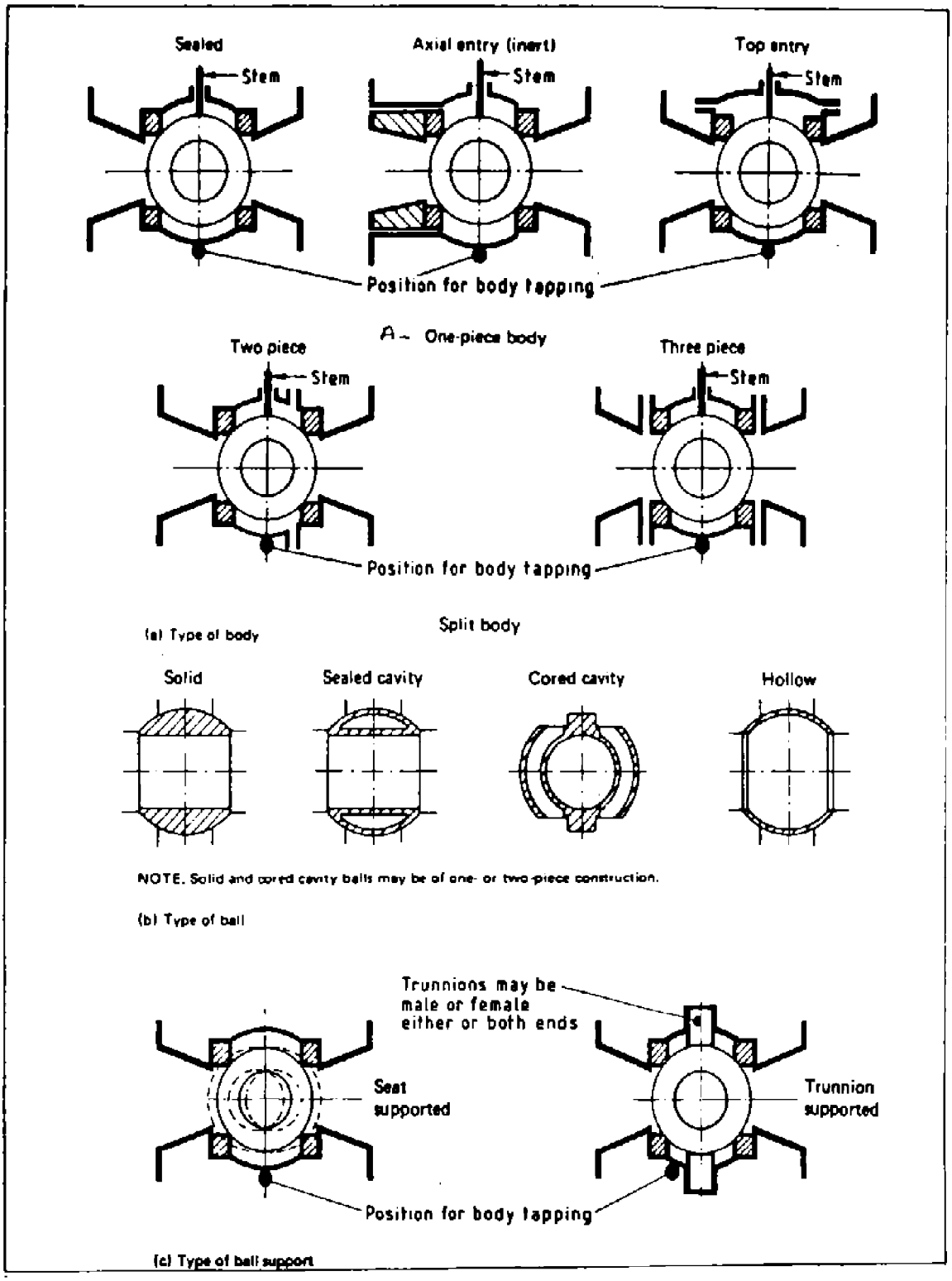


Right Angle Outlet.

Oblique Outlet.

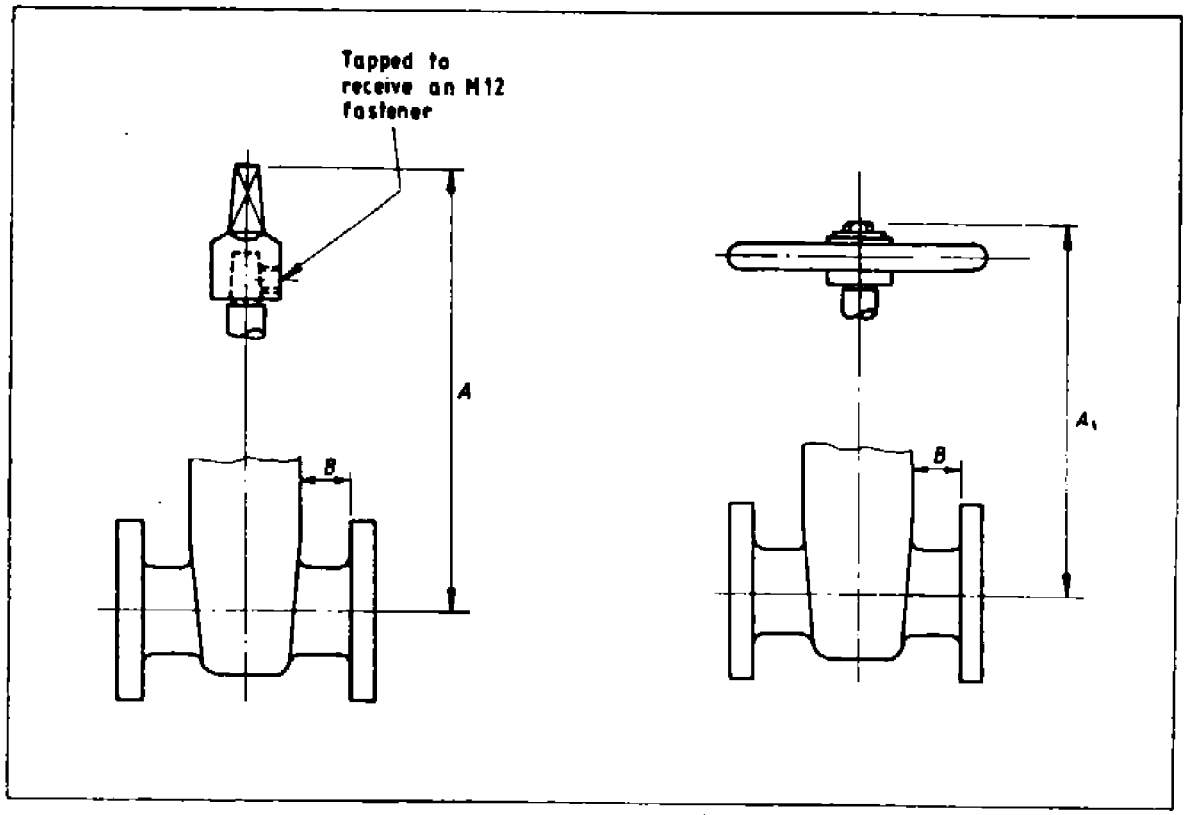
**DELIVERY HOSE VALVES**
**Fig. 11**

**(to be continued)**



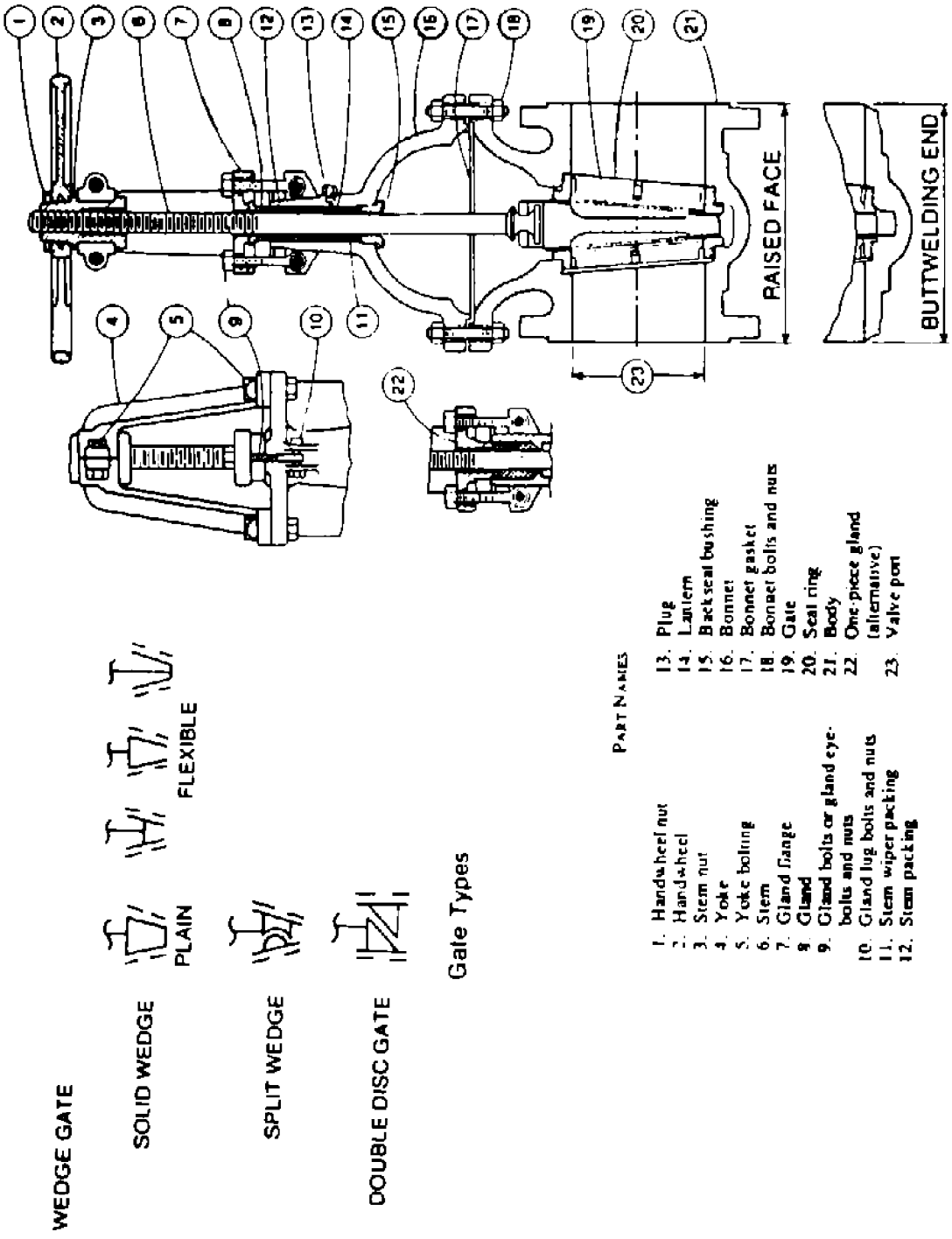

**TYPICAL VARIATIONS OF CONSTRUCTION BALL VALVE**
**Fig. 12**

**(to be continued)**



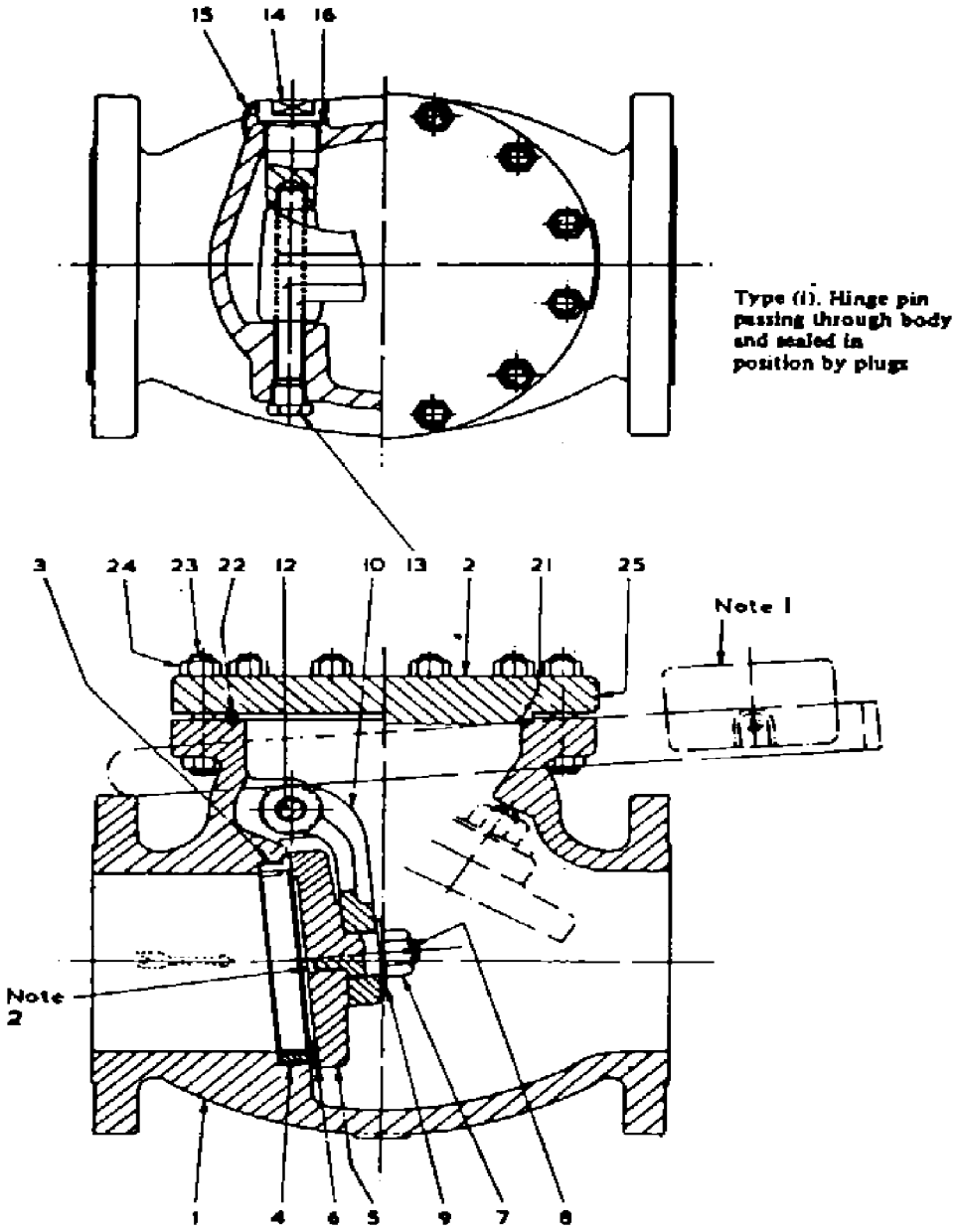

**TYPICAL GATE VALVE**
**Fig. 13**

**(to be continued)**




**TYPICAL GATE VALVE**
**Fig. 14**

**(to be continued)**




**SWING TYPE CHECK VALVES**
**Fig. 15**

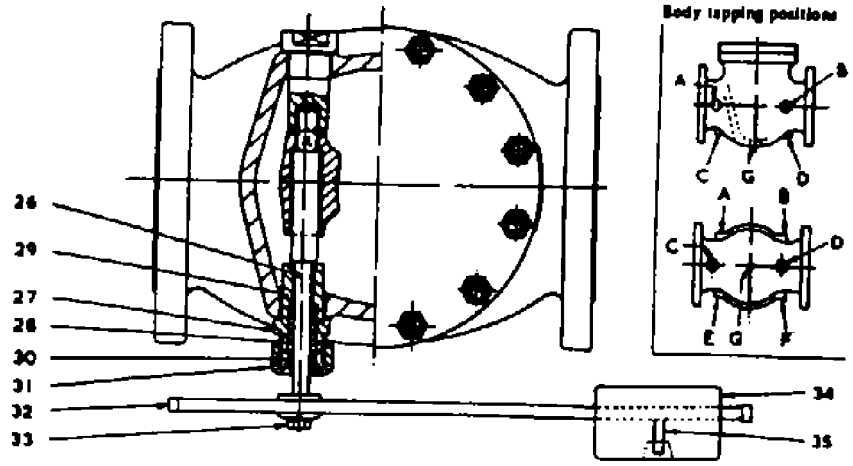
**Notes:**

**1) Chain dotted lines show outside lever and weight to assist disk in closing.**

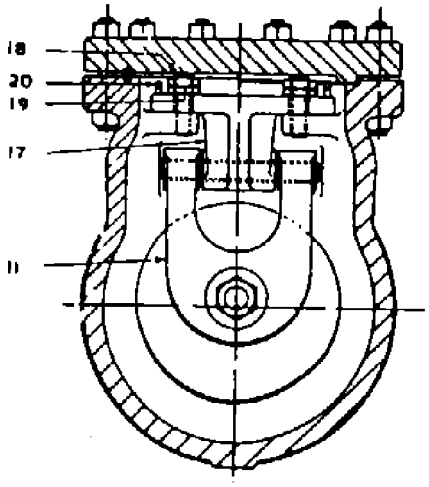
**2) Seal weld.**

**3) These sketches are composite for the purpose of showing some typical variations in individual details. A product utilizing any combination of these details (except when such combination may be specifically prohibited in the text) or similar construction will be acceptable provided that it complies with the requirements of this Standard in all other respects.**

**4) For name of Parts see Fig. 16.**




Typical design of outside lever and weight attachment

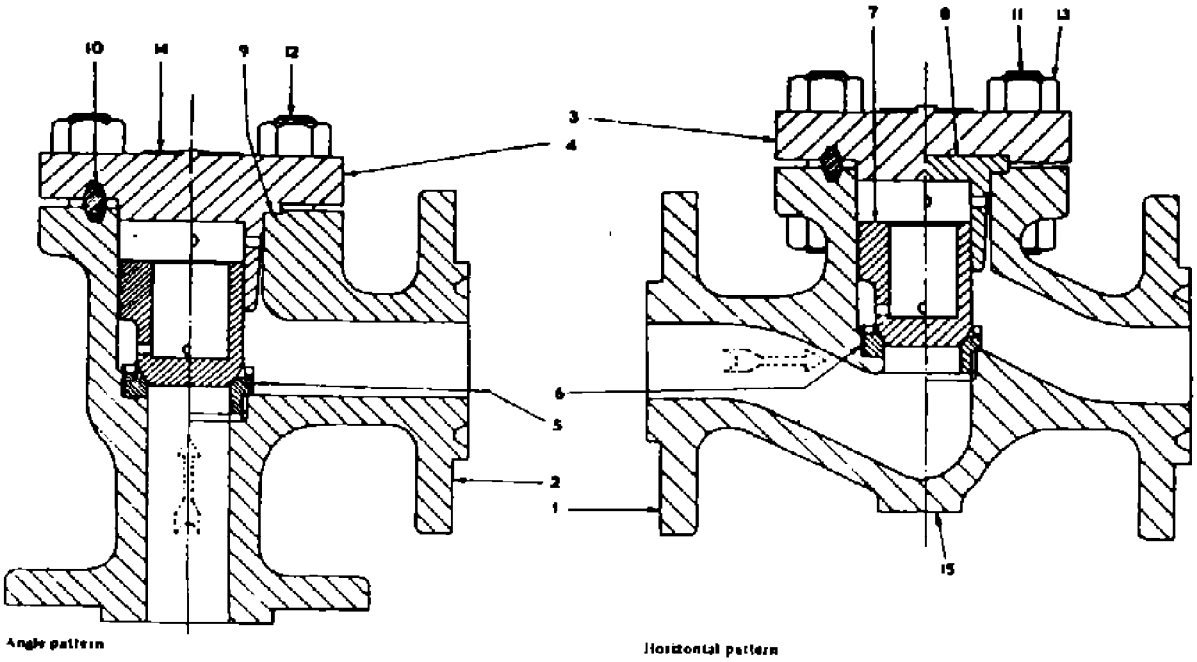



Type (ii). Hinge attached to internal body lugs

| Ref. | Name of part | |
|---|---|---|
| 1 | Body | |
| 2 | Cover | |
| 3 | Shoulder seated ring | |
| 4 | Bottom seated ring | |
| 5 | Disk | |
| 6 | Disk facing ring | |
| 7 | Disk-retaining nut | |
| 8 | Pin for disk-retaining nut | |
| 9 | Disk washer | |
| 10 | Hinge (type (i)) | |
| 11 | Hinge (type (ii)) | |
| 12 | Hinge pin | |
| 13 | Pipe plug (taper threaded) for hinge pin (type (i) only) | |
| 14 | Hinge pin plug (parallel threaded) (type (i) only) | |
| 15 | Locking device for hinge pin | |
| 16 | Gasket for pipe plug (parallel threaded) | |
| 17 | Bearing bracket (type (ii) only) | |
| 18 | Stud for bracket (type (ii) only) | |
| 19 | Lock nuts for bracket (type (ii) only) | |
| 20 | Dowel pin for bracket (type (ii) only) | |
| 21 | Cover gasket | |
| 22 | Ring joint | |
| 23 | Stud bolts | |
| 24 | Nuts for stud bolts | |
| 25 | Nameplate | |
| 26 | Extended hinge pin | |
| 27 | Stuffing box | For outside attachment valves only |
| 28 | Packing | |
| 29 | Packing washer | |
| 30 | Gland | |
| 31 | Gland nut | |
| 32 | Lever | |
| 33 | Lever retaining pin | |
| 34 | Weight | |
| 35 | Setscrew | |

**NAME OF PARTS**
**SWING TYPE CHECK VALVES**
**Fig. 16**

**(to be continued)**




| Ref. | Name of part |
|---|---|
| 1 | Body, horizontal pattern |
| 2 | Body, angle pattern |
| 3 | Cover |
| 4 | Cover with disk guide |
| 5 | Shoulder sealed ring |

| Ref. | Name of part |
|---|---|
| 6 | Bottom sealed ring |
| 7 | Disk |
| 8 | Disk guide |
| 9 | Cover gasket |
| 10 | Ring joint |

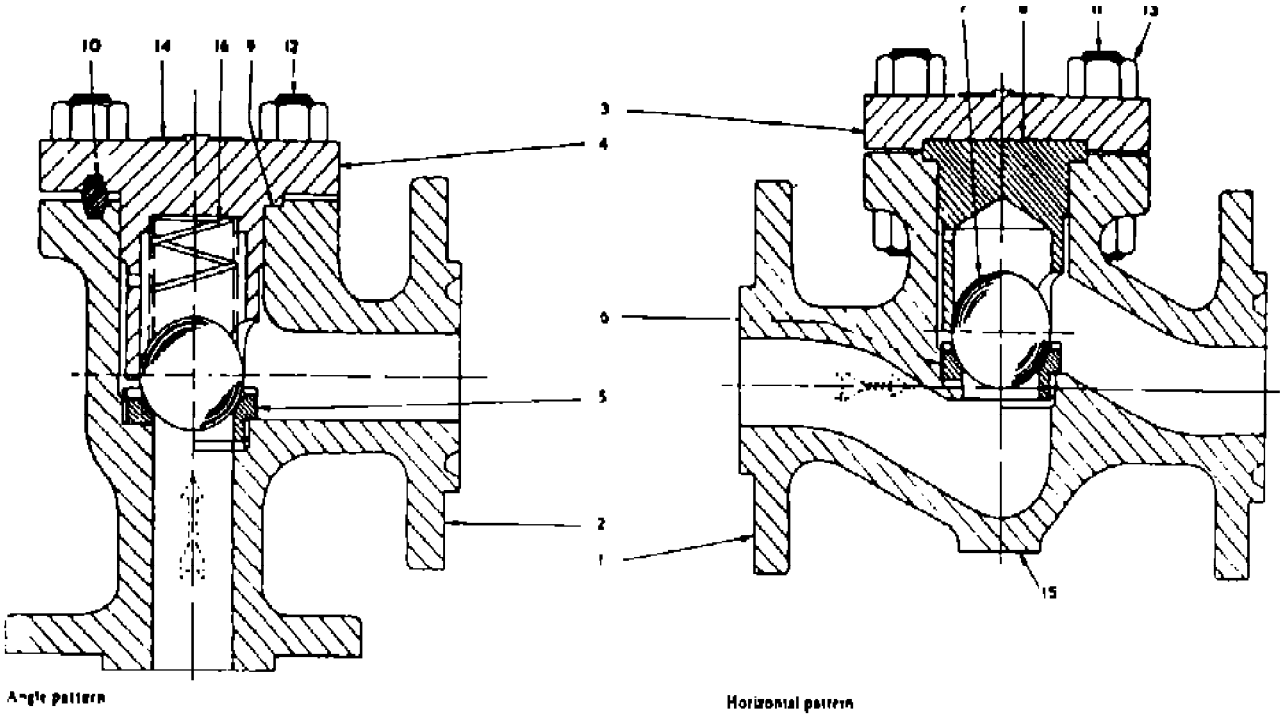
| Ref. | Name of part |
|---|---|
| 11 | Stud bolts |
| 12 | Driven-in studs |
| 13 | Nuts for stud bolts or driven-in studs |
| 14 | Nameplate |
| 15 | Body drain boss |

**PISTON TYPE CHECK VALVES**
**Fig. 17**

**Note:**

**(See item 3 of Fig. 15)**

**(to be continued)**




| Ref. | Name of part |
|---|---|
| 1 | Body, horizontal pattern |
| 2 | Body, angle pattern |
| 3 | Cover |
| 4 | Cover with disk guide |
| 5 | Shoulder seated ring |

| Ref. | Name of part |
|---|---|
| 6 | Bottom seated ring |
| 7 | Ball |
| 8 | Ball guide |
| 9 | Cover gasket |
| 10 | Ring joint |

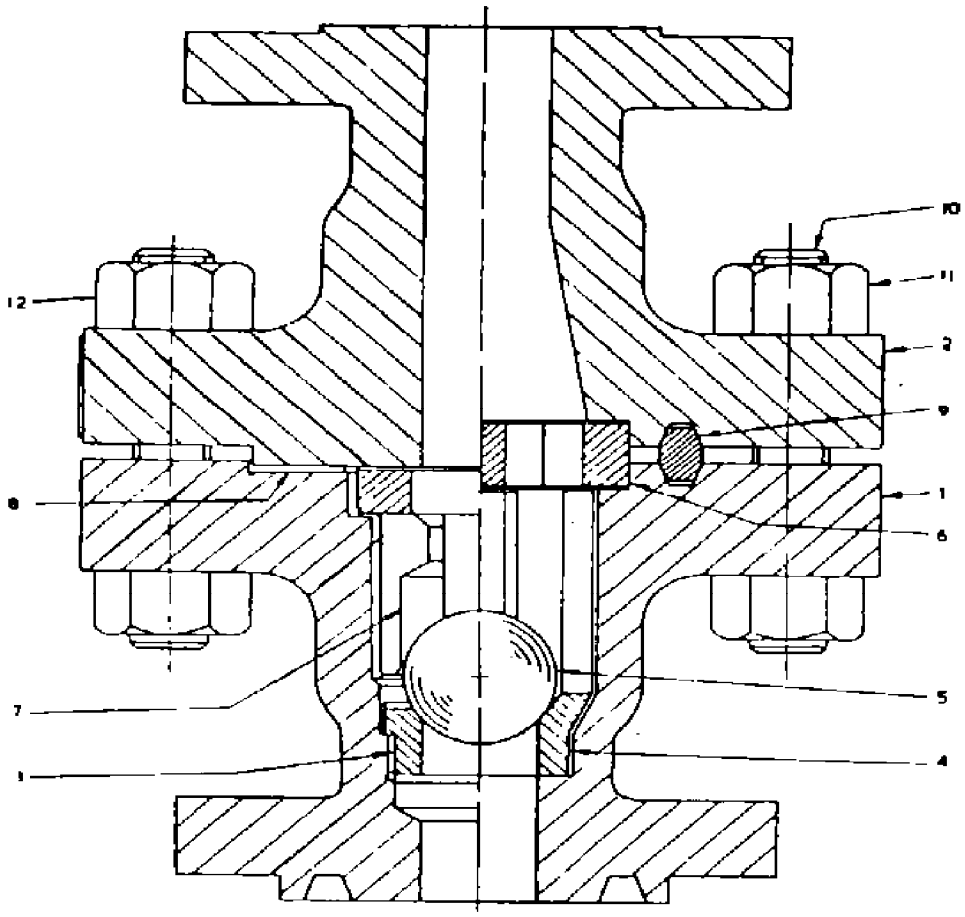
| Ref. | Name of part |
|---|---|
| 11 | Stud bolts |
| 12 | Driven-in studs |
| 13 | Nuts for stud bolts or driven in studs |
| 14 | Nameplate |
| 15 | Body drain bush |
| 16 | Loading spring |

**BALL TYPE CHECK VALVES**
**Fig. 18**

**Note:**

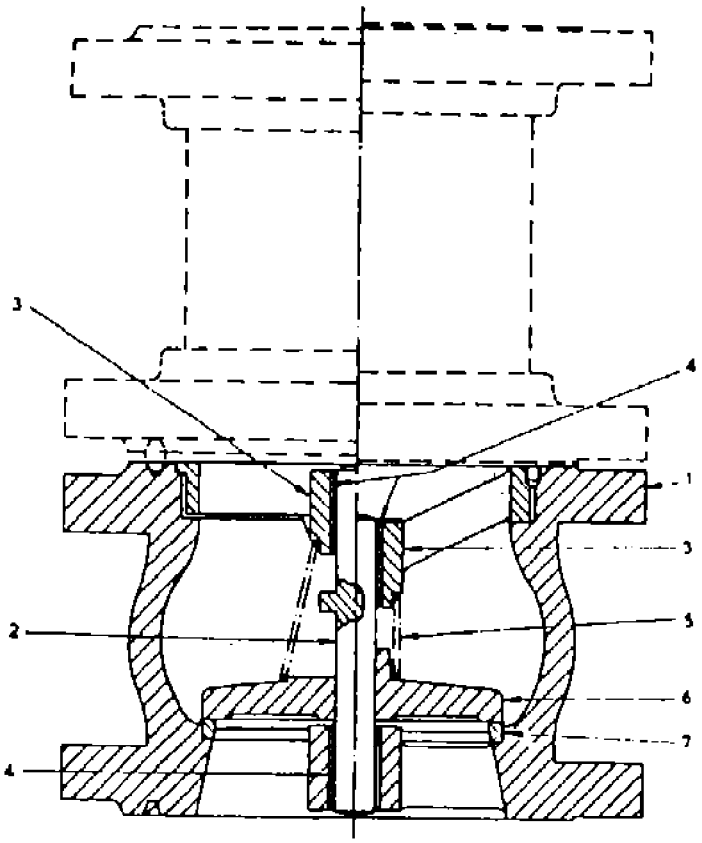
**(See item 3 of Fig. 15)**

**(to be continued)**




**VERTICAL PATTERN**
**Fig. 19**

**(to be continued)**




| Ref. | Name of part |
|---|---|
| 1 | Body |
| 2 | Disk spindle |
| 3 | Spindle support cage |
| 4 | Spindle guide bush |
| 5 | Loading spring |
| 6 | Disk |
| 7 | Seat ring |

**DISK TYPE CHECK VALVES**
**Fig. 20**

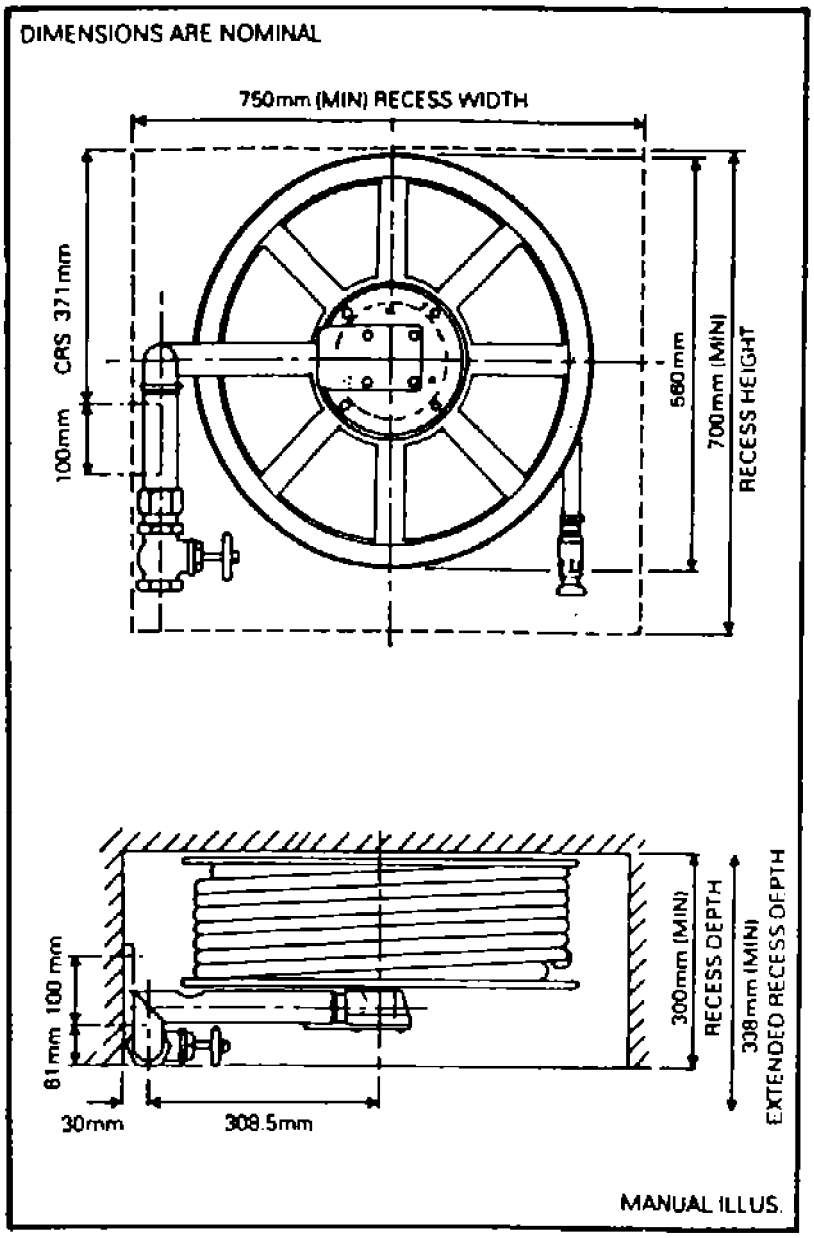
**Notes:**

**The face-to-face dimensions of disk check valves are considerably less than those given in BS 2080 for lift type check valves. When the standard dimensions are required, then these valves should be fitted with a spool piece as indicated.**

**These sketches are composite for the purpose of showing some typical variations in individual details and part names. A product utilizing any combination of these details (except when such combination may be specifically prohibited in the text) or similar construction will be acceptable provided that it complies with the requirements of this Standard in all respects.**

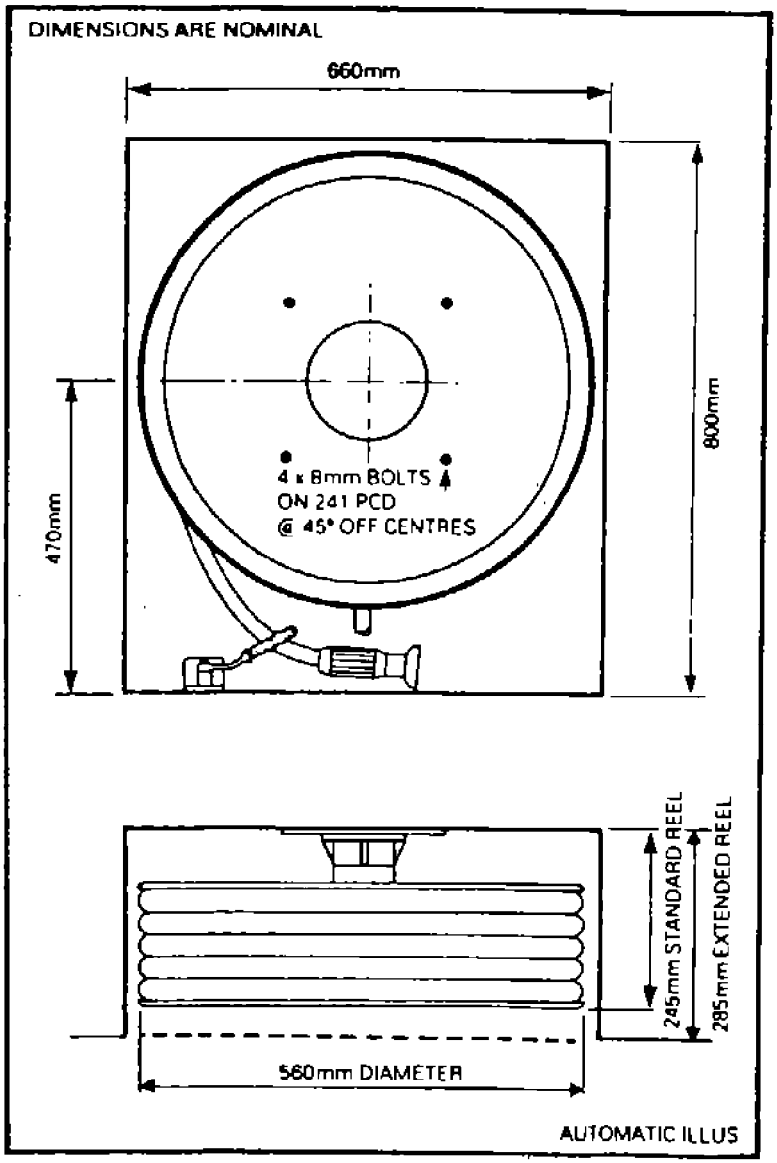
**(to be continued)**

**FIGURES FOR**
**HOSE REELS**



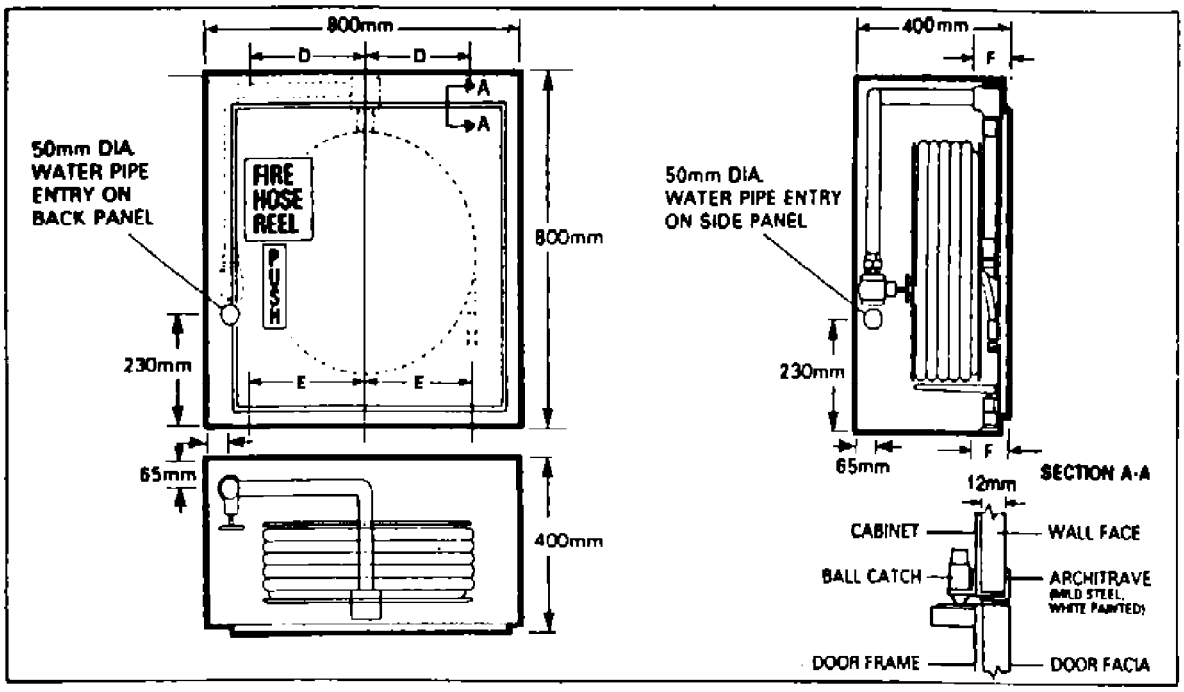

**SWINGING RECESS HOSE REELS**
**Fig. 21**

**(to be continued)**



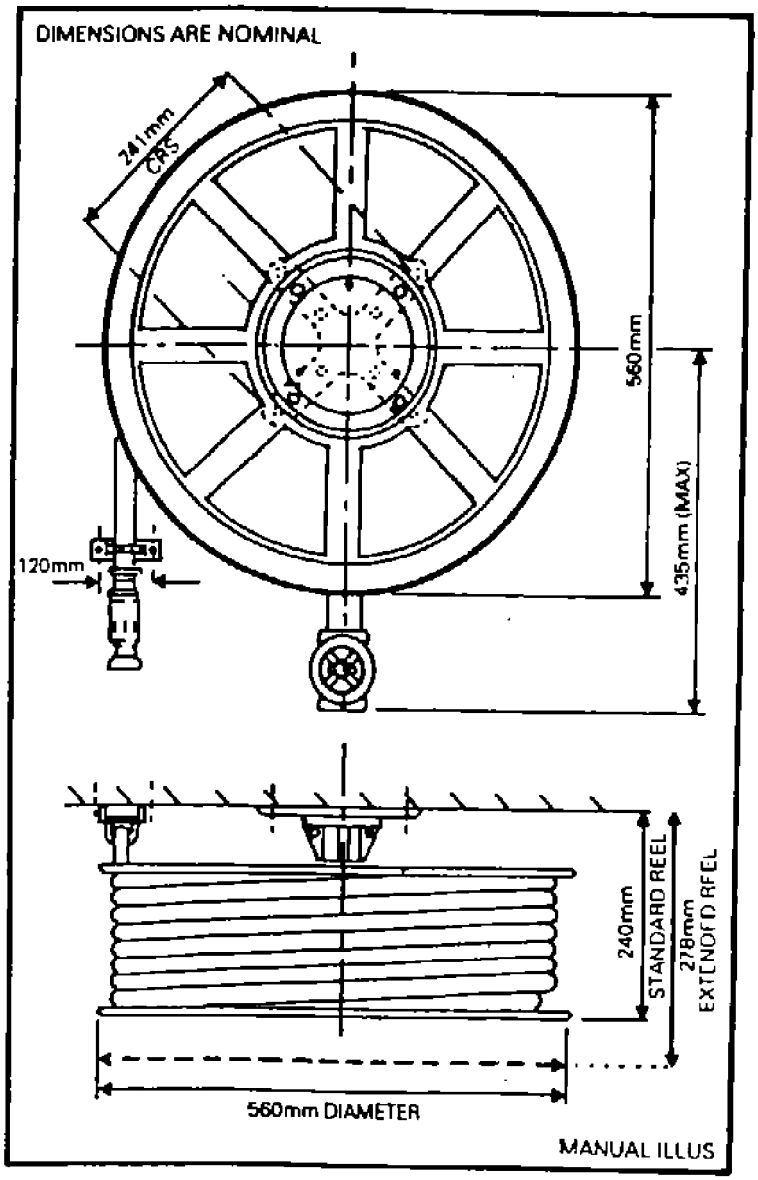

**FIXED RECESS HOSE REELS**
**Fig. 22**

**(to be continued)**




**DOOR MOUNTED HOSE REEL CABINET**
**Fig. 23**

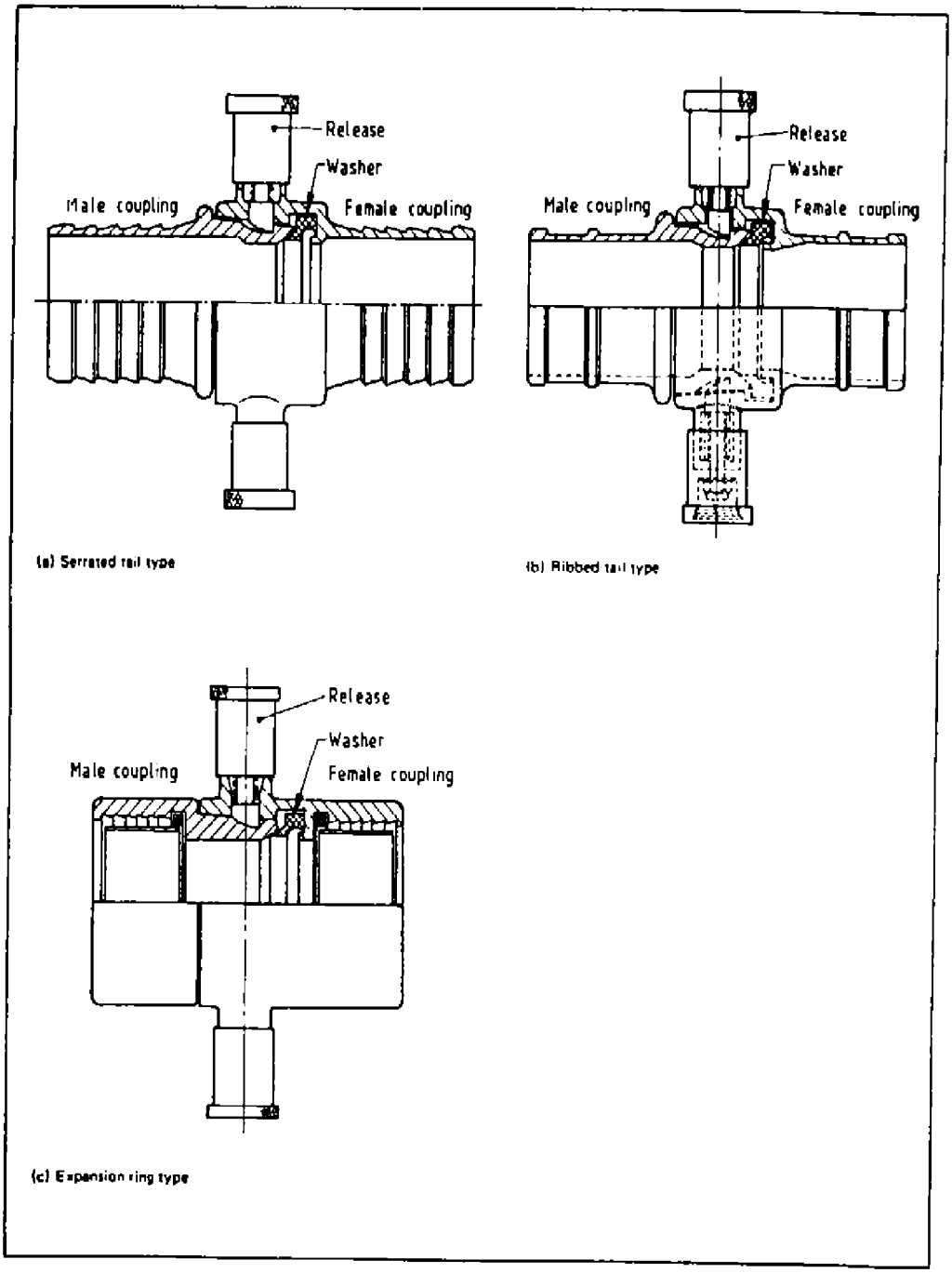
**(to be continued)**



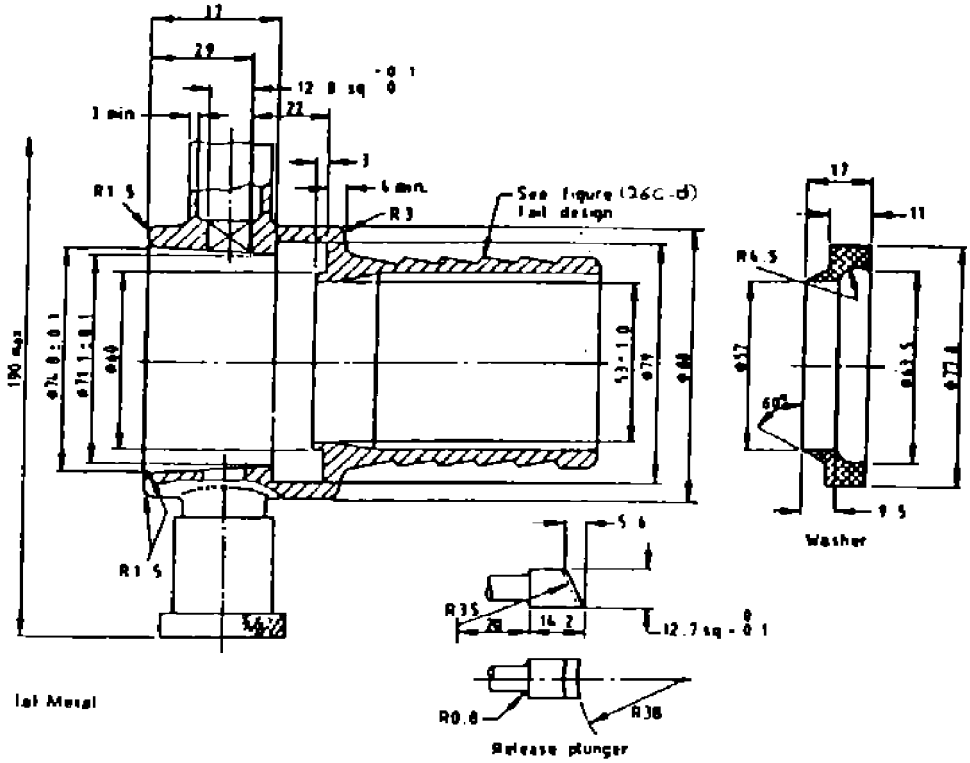

**FIXED OPEN WALL HOSE REELS**
**Fig. 24**

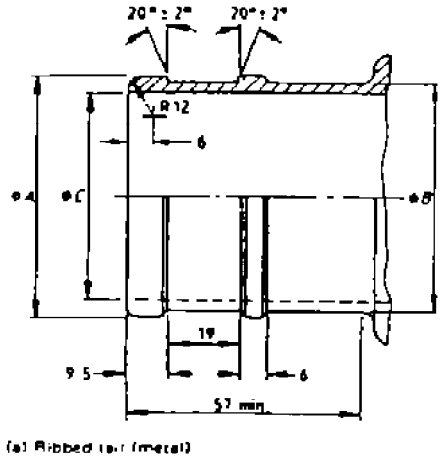
**(to be continued)**

## FIGURES FOR
## FIRE HOSE COUPLINGS

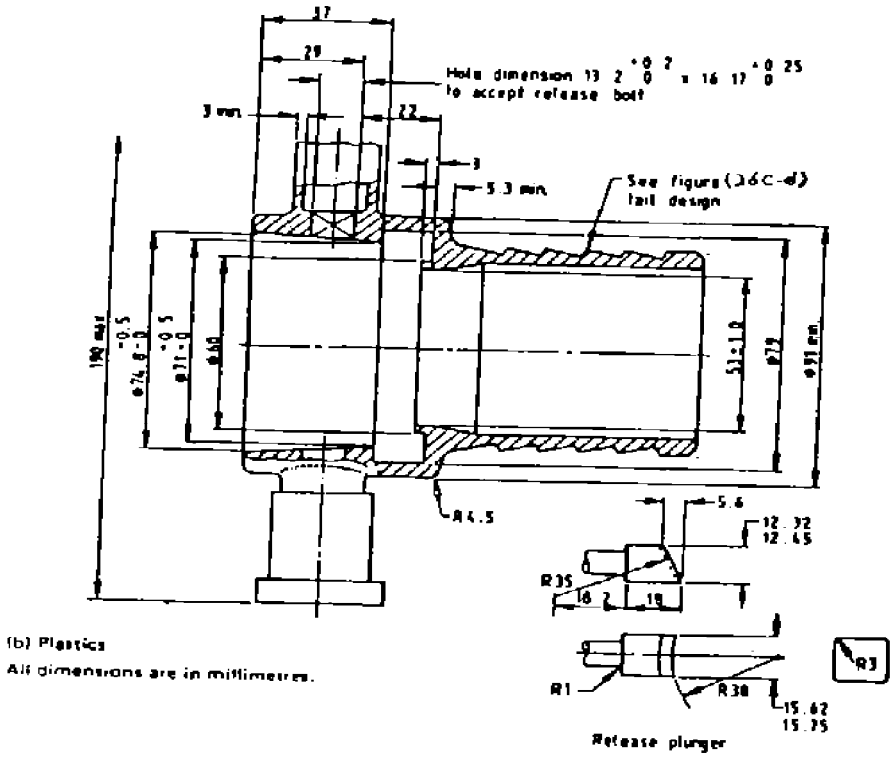



**PULL RELEASE FIRE HOSE COUPLINGS GENERAL ARRANGEMENT**
**Fig. 25**



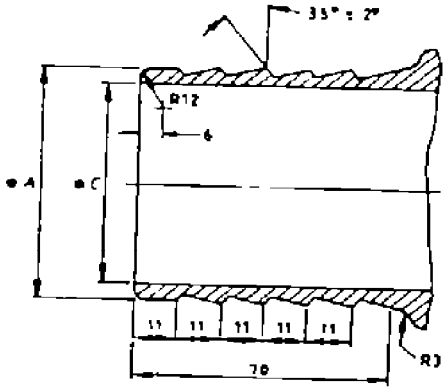



**FIRE HOSE COUPLINGS FEMALE DETAILS**
**Fig. 26(a)**



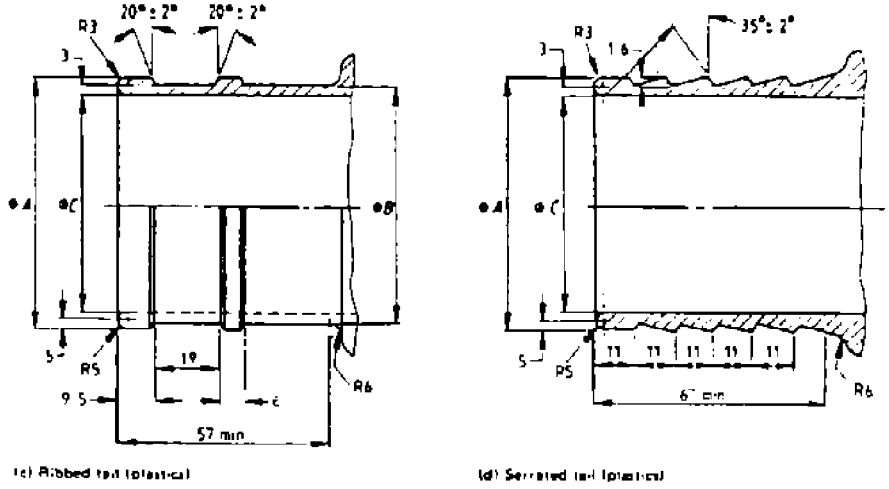

(b) Plastics

All dimensions are in millimetres.




(b) Multi-serrated tail (metal)

Fig. 26(b)

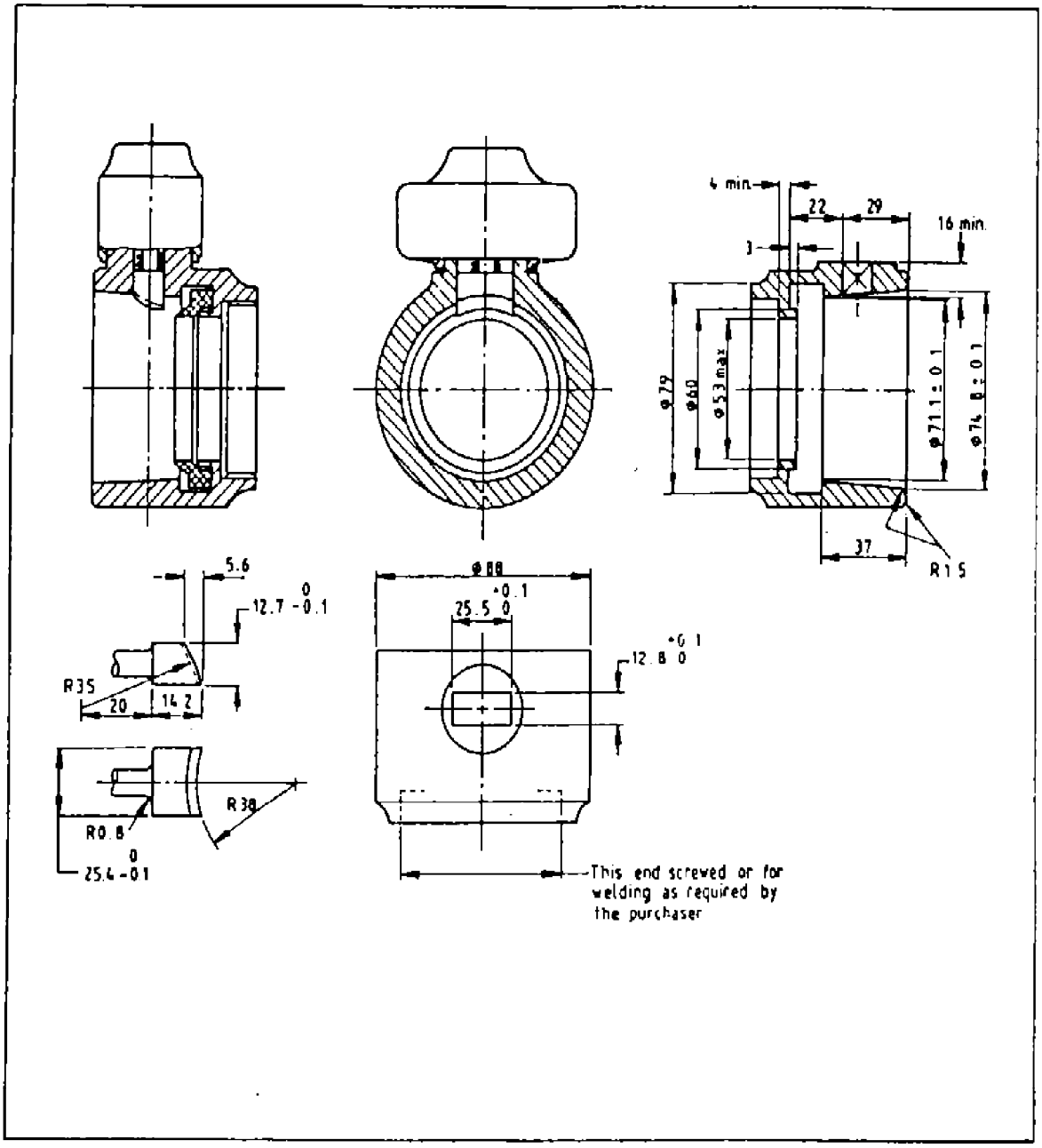



(c) Ribbed tail (plastics)

(d) Serrated tail (plastics)

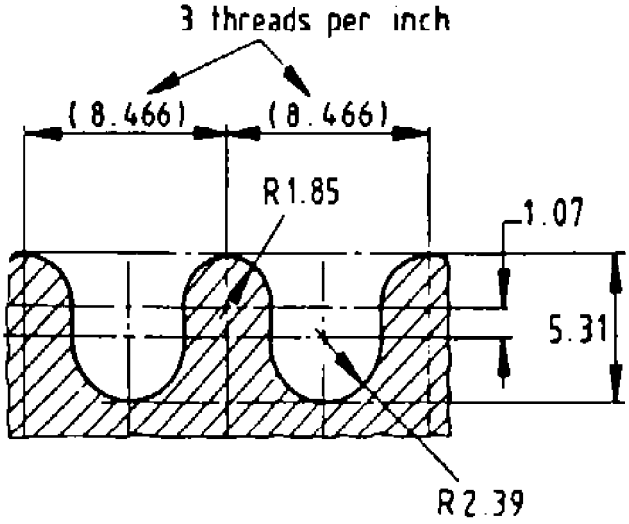
**All dimensions are in millimeters.**

**Fig. 26(c, d)**

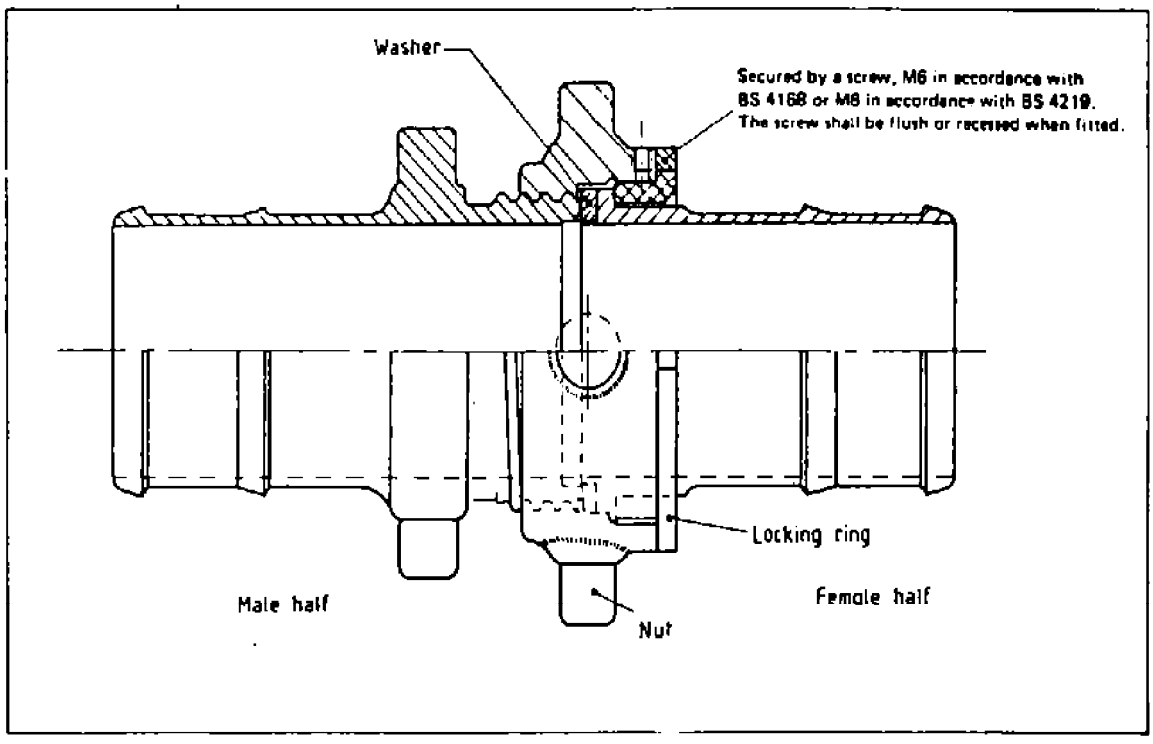



**All dimensions are in millimeters.**

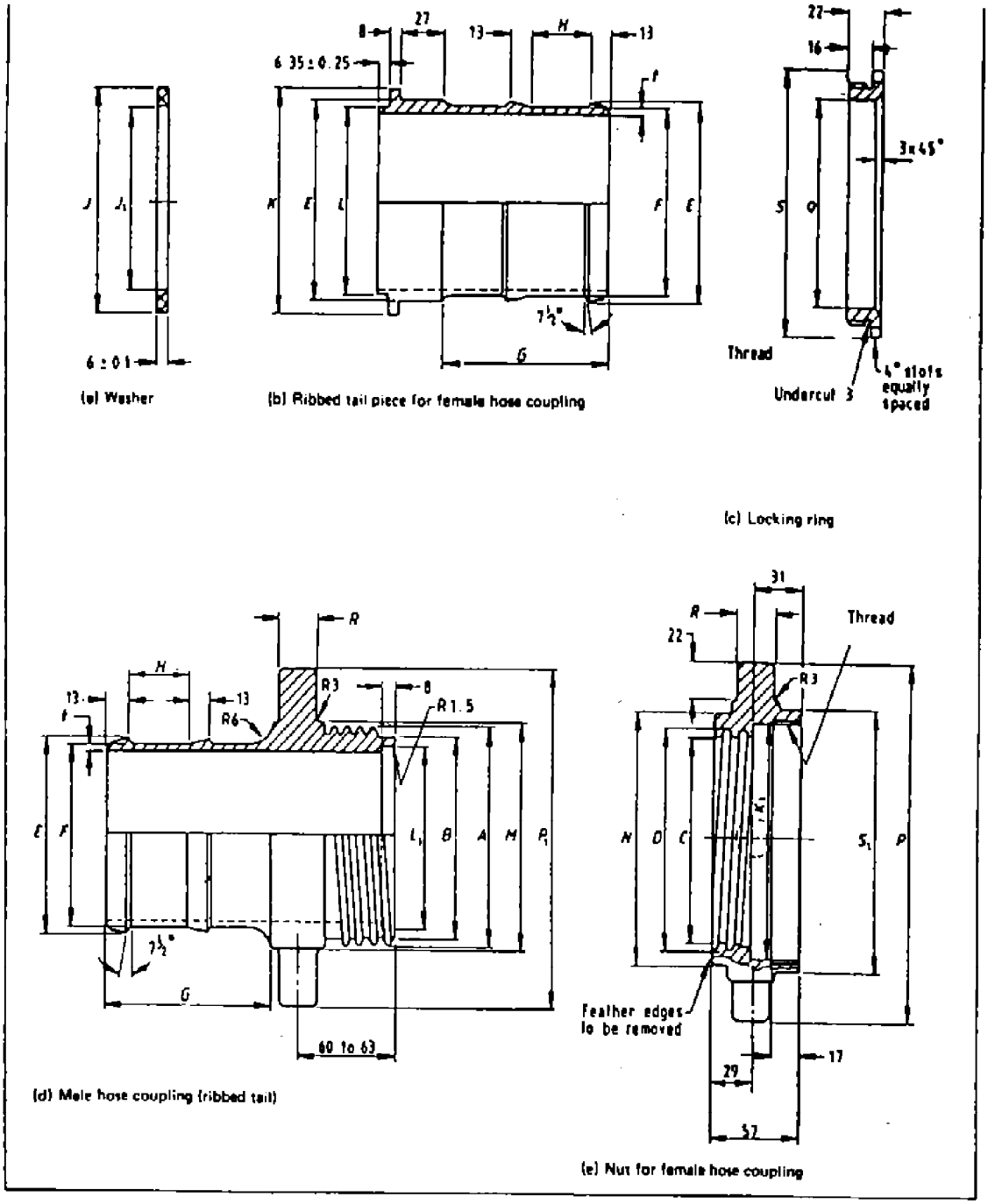
**SINGLE LUG TWIST TYPE**
**DELIVERY HOSE CONNECTOR**
**Fig. 27**




**BASIC FORM OF SCREW THREAD FOR SUCTION HOSE COUPLING**



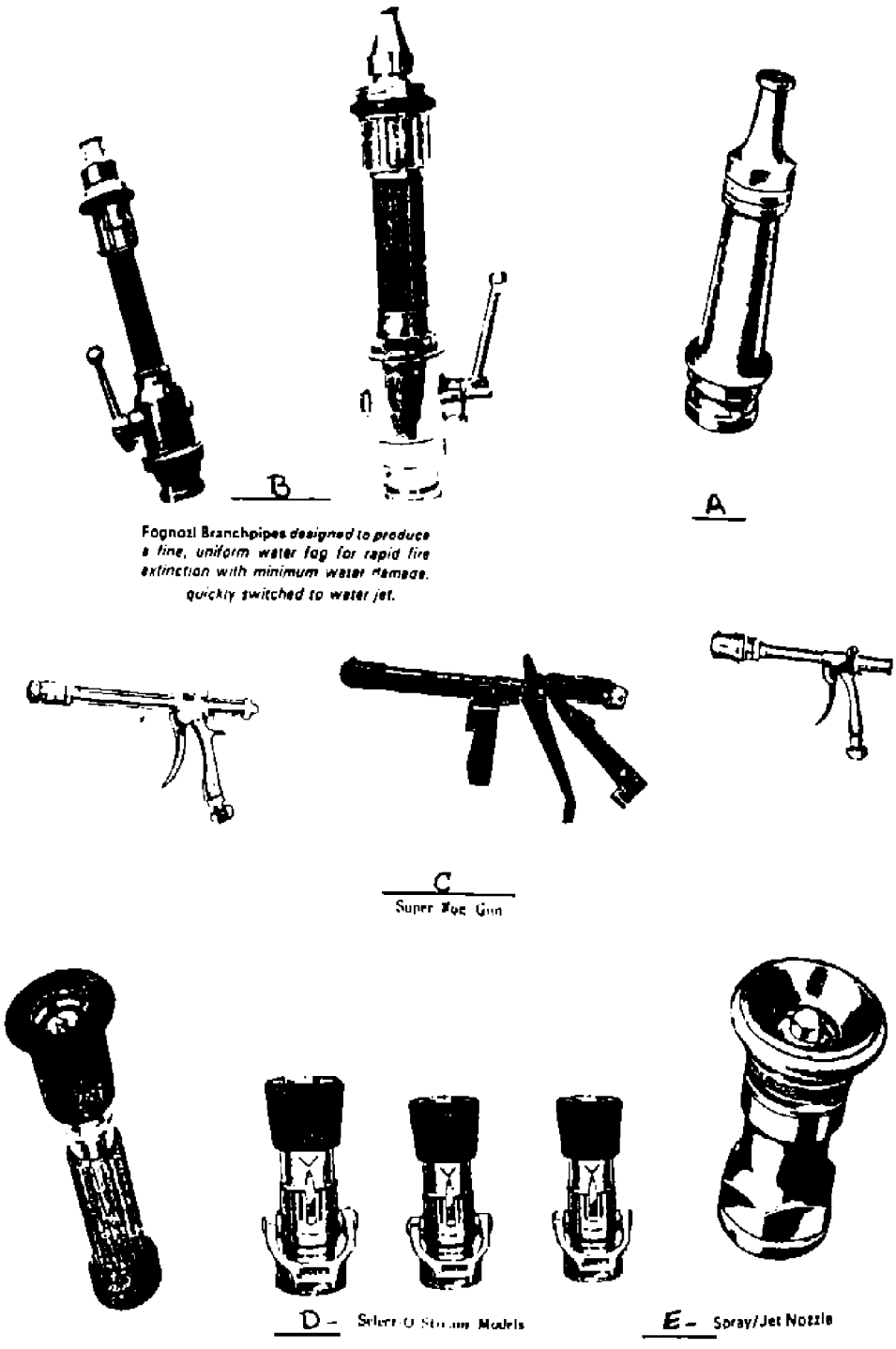

**SUCTION HOSE COUPLING GENERAL ARRANGEMENT**
**Fig. 28**




**All dimensions are in millimeters.**

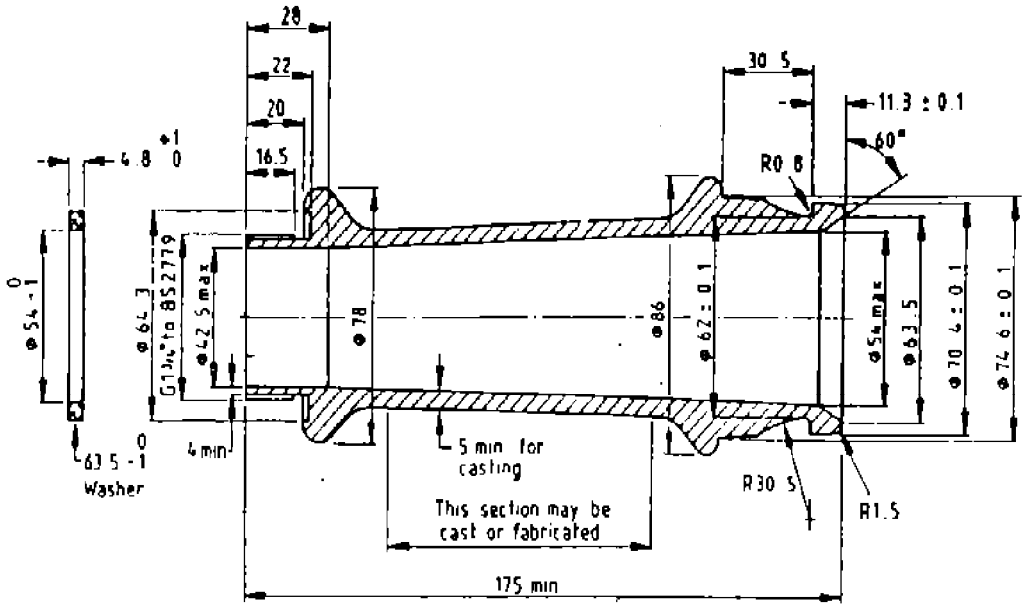
**SUCTION HOSE COUPLING DETAILS**
**Fig. 29**

**FIGURES FOR**
**FIRE FIGHTING NOZZLES**

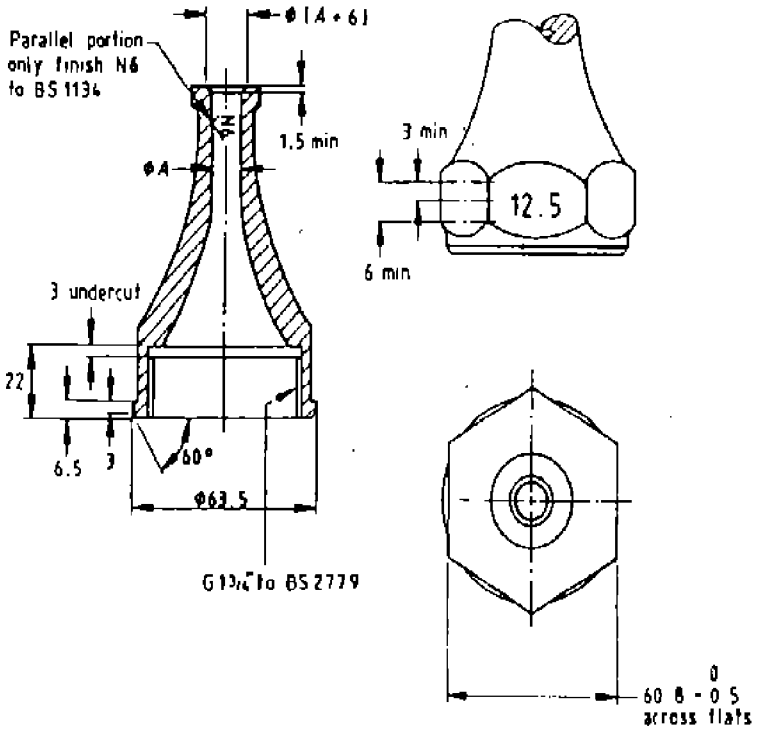



**DIFFERENT TYPES OF NOZZLES**
**Fig. 30**

**(to be continued)**




(A) - BRANCH PIPE

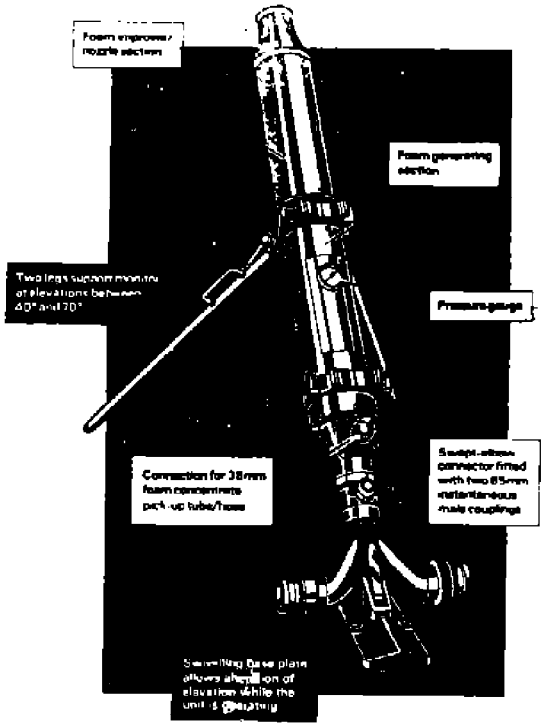



(B) - NOZZLE FOR BRANCH PIPE

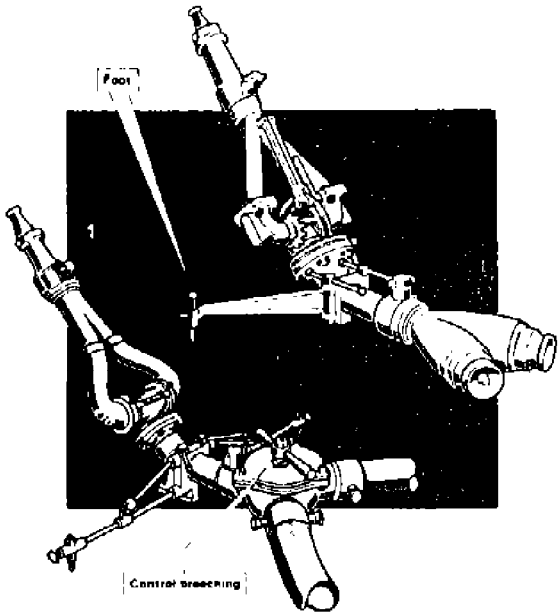
Fig. 31

**All dimensions are in millimeters.**

## FIGURES FOR FIRE FIGHTING MONITORS

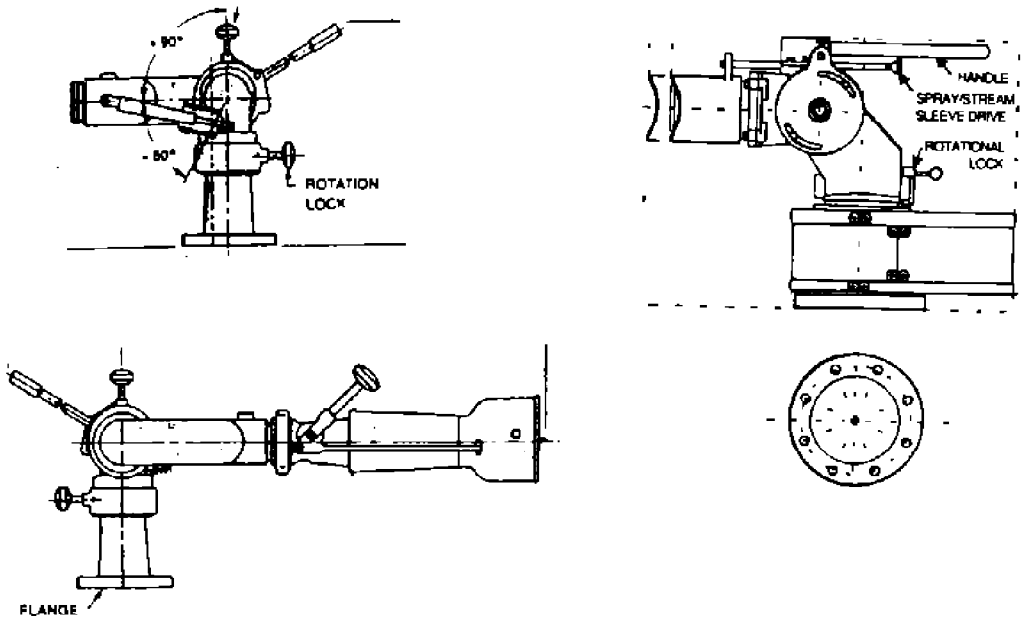



**PORTABLE FOAM MONITOR**
**Fig. 32**




**TWO TYPES OF PORTABLE WATER MONITOR**
**Fig. 33**

**1) with control breeching;**
**2) with two-way collecting breeching.**




(A) WATER/FOAM(B) OSCILLATION TYPE

ELEVATED FIXED FOAM MONITORS
Fig. 34

**Note:**

**Monitor oscillation system should be charged with a 50%/50% solution of glycol base antifreeze and water to protect against freezing in cold climates.**

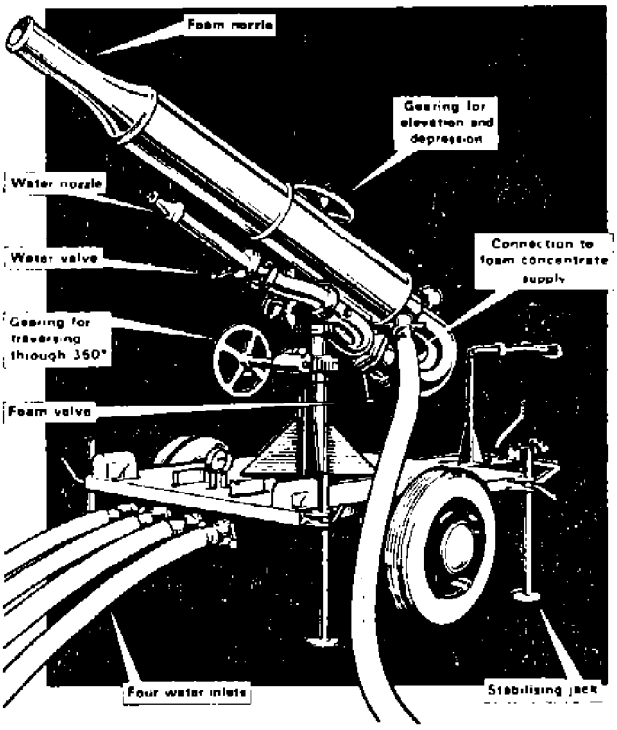
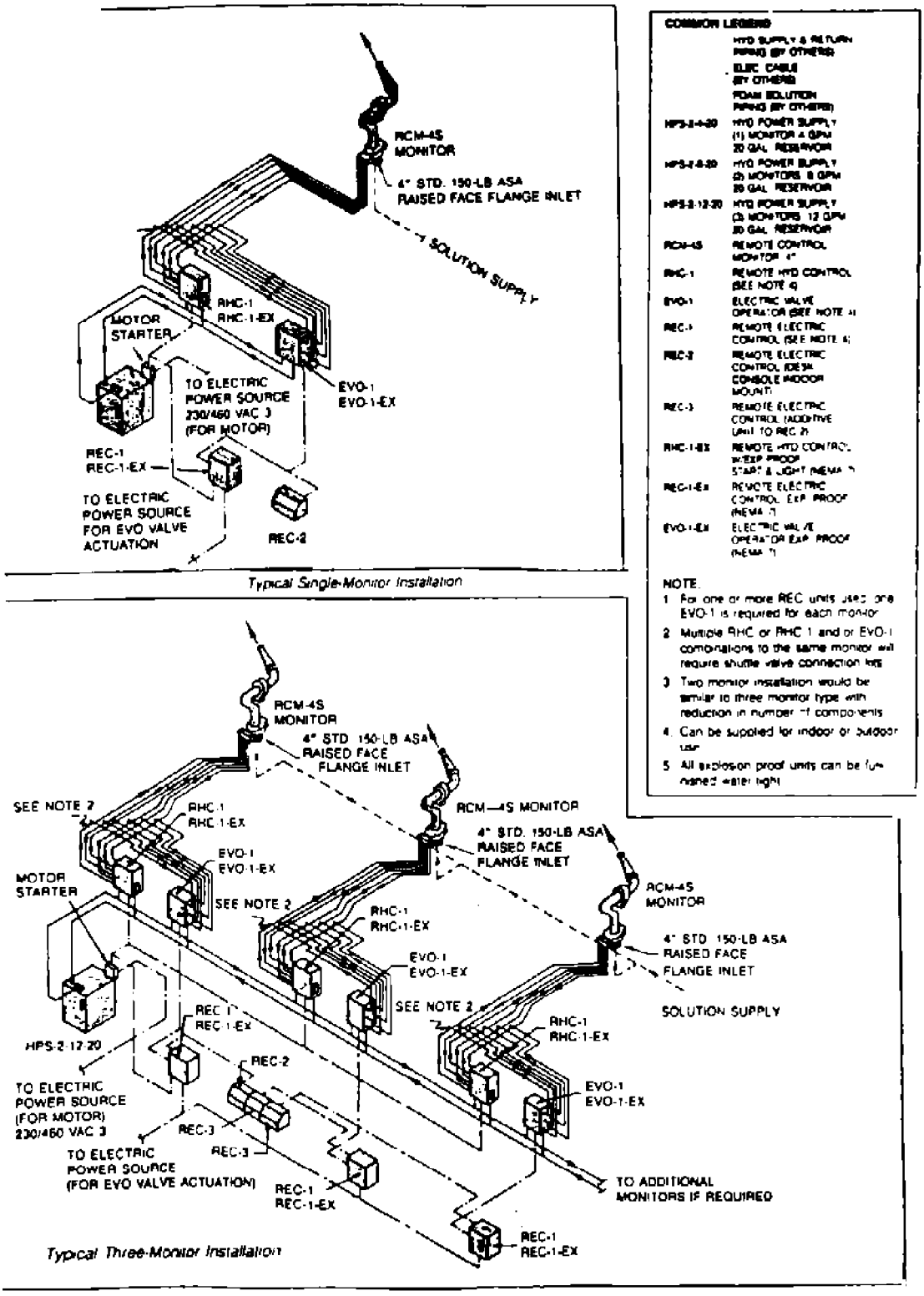



DIAGRAM SHOWING THE LAYOUT OF A TRAILER-MOUNTED FOAM WATER MONITOR
Fig. 35




**REMOTE CONTROLLED MONITOR SYSTEMS**
**Fig. 36**