JAMAICA FIRE BRIGADE

TRAINING DEPARTMENT

Hose and Hose Fittings

Introduction

Fire hose has been used for hundreds of years for the extinguishment of fires and is one of the basic elements of the firefighters' stock in trade. In areas where water supplies may be in short supply, hose may be necessary to relay water over considerable distance and special diameter hose has been designed for this.

Definition

A hose is a flexible tube which is used to convey fluids from point of supply to the point of delivery.

Types of hose and their Construction

Generally hose may be divided into two (2) categories according to its main use.

1. Intake hose or Suction hose
2. Attack hose or Delivery hose

Intake hose or Suction hose

This hose is one that is employed on the inlet side of the Department Pumper or a portable pump where water passing through it is either above or below atmospheric pressure. Used between the water supply and the pump, it is larger and more rigid than delivery hose. It should be sufficiently strong to withstand air pressure when a vacuum has been created at the pump and strong enough to withstand maximum hydrant pressure.

There are two groups within this category:

1. Soft sleeve or soft suction
2. Hard sleeve or hard suction

Soft Sleeve

These are used to transfer water from pressurized water source such as a hydrant to the pump inlet. The size ranges from 2 ½" to 6" (65mm to 150mm) in diameter. The delivery hose, when employed between the hydrant and the pump inlet is known as soft sleeve suction.

Hard Sleeve

Hard suction is used primarily to draft water from an open water source. It is also used to siphon water from one portable tank to another usually in a tanker shuttle operation. Hard suction hose is constructed of a rubberized reinforced material. It also ranges from 2 ½" to 6" (65mm to 150mm) in diameter. Their lengths varies worldwide, however, the ones most commonly used in the Jamaica Fire Brigade ranges from 3 to 3.5 meters in length.

There are two types of hard sleeve hose:

1. Non-collapsible hard suction hose
2. Flexible non-collapsible

These are both rubber covered and rubber lined with the difference being that the non-collapsible hard suction hose is reinforced by fabric and wire while the flexible non-collapsible hard suction hose is reinforced by fabric and plastic.

Attack hose or Delivery hose

This type of hose is used between the pump outlet and the nozzle or branch where water passing through it is at a pressure higher than that of atmospheric pressure and is used to control and extinguish fires. These hose are usually constructed of rubber or woven fabric coverings and lined by either rubber or plastic. The woven fabric consists of two sets of yarns (threads) that run at right angles to each other.

The lengthwise threads being the **WARP** gives the hose durability to resist wear and tear while the crosswise threads known as the **WEFT** give the hose its ability to resist the tendency of water pressure to burst the hose. The diameter of delivery hose varies from 38m to152mm, the larger diameter hose being used for water relay purposes. The delivery hoses used in this department are 45m to 64mm and are supplied in 25m to 30m lengths.

Booster Hose Reel

Booster hose reel are pre-connected hose that are usually carried coiled upon reels. These hose reels may be mounted several places upon the fire apparatus according to specified needs and the design of the apparatus. Some booster hose reels are mounted above the fire pump and behind the apparatus cab.

Hose reels are a type of delivery hose of small internal diameter, normally 19mm and are used for taking a hose lines quickly into a building, using the available water supply on the appliance. It is carried on a drum and for this reason it has to be flexible, yet it must not flatten unduly when coiled on the drum. The construction may vary with different types, but generally consists of an inner rubber tube or lining reinforced by wrapping with layers or piles of rubberized woven fabric applied spirally. An outer cover of abrasion resistant rubber is then applied and the whole is then vulcanized together. In the main guidelines for the care of hose generally apply to booster hose reels.

Characteristics of a good fire hose

A good firefighting hose must have the following characteristics;

1. Flexibility – hose must be sufficiently flexible to enable it to be handled easily and without kinking when in use and for it to be made into smooth roll whether wet or dry.
2. Durability – The durability and wearing qualities must be as high as possible and the materials used particularly in the warp must have high resistance to abrasion
3. Resistance to rot – Natural fiber hose are liable to be affected by mildew or rot. Therefore, it is important that these hose are given rot proofing treatment.
4. Should not change in length or diameter – Any increase in the length or diameter of hose when under pressure, indicates that the material is stretching. Unlimited stretch will tend to weaken the hose and eventually cause it to burst.
5. Weight – The weight of the hose should be relatively light enough to enable a firefighter to carry it over a distance and have enough strength to carry out his firefighting duties.

Causes and Prevention of Fire Hose Damage

Fire hose is a tool that is subjected to many potential sources of damage during firefighting. Usually little can be done at fires to provide safe usage and protect from injury. Fire hose should be selected with caution to ensure its lasting qualities. Even if constructed of quality materials, it cannot endure;

1. Mechanical injury
2. Heat/ Thermal injury
3. Organic damage
4. Chemical contact

Mechanical Damage

Fire hose maybe damage in a variety of ways while been used at fires. Some common mechanical injuries are:

1. Worn places
2. Rips and abrasion on the coverings
3. Crushed or damaged couplings
4. Cracked inner linings

Preventing Mechanical Damage

To prevent these damages the following practices are recommended

1. Avoid laying or pulling hose over rough sharp edges or objects
2. Use hose ramps or bridges to protect hose from vehicles running over it
3. Open and close nozzles, valves and hydrants slowly to prevent water hammer
4. Avoid excessive pump pressure on hose.

Heat/ Thermal Damage

The exposure of hose to excessive heat or its contact with fire will char, melt, or weaken the fabric covering and dry the rubber lining. A similar drying effect may occur to inner linings when hose is hung to dry in a drying tower for longer period than is necessary, or when it is dried in intense sunlight.

Preventing Heat/ Thermal Damage

To prevent thermal damage firefighters should conform to the following practices.

1. Protect hose from exposure to excessive heat or fire when possible
2. Do not allow hose to remain in any heated area after it is dry
3. Use moderate temperature for drying
4. Keep the outside of woven jacket fire hose dry
5. Run water through hose that has not been used for some time to prolong life
6. Allow laying fire hose on hot pavement to dry

Organic Damage

Organic damage such as mildew and mold may occur on woven jacket hose when moisture remains on the outer surfaces. Mildew and mold causes decay and the consequent deterioration of the hose.

Prevention of Organic Damage

1. Remove all wet hose from the appliance after a fire and replace with a dry hose
2. Remove, inspect, sweep and reload hose if it has not been unloaded from the appliance during a period of thirty (30) days
3. Exercise hose every thirty (30) days and run water through it every ninety (90) days to prevent drying and cracking rubber lining

Chemical Damage

Chemicals and chemical vapours will damage the rubber lining and often causes the lining and jacket to separate. When hose is exposed to petroleum products, paints, acids or alkalis, it may weaken to the point of bursting. After being exposed to chemicals, hose should be cleaned as soon as possible.

Preventing Chemical Damage

Some recommended practices are as follows:

1. Scrub hose thoroughly and brush all traces of acids contacts with a solution of baking soda and water. Baking soda neutralizes acids.
2. Remove hose periodically from the apparatus, wash it with plain water and dry it thoroughly.
3. Avoid laying hose in the gutter or next to the curb where vehicles have been parked because they can drop oil from their mechanical components and acids from batteries.

General Cleaning and Maintenance of Hose

If fire hose is properly cared for its life span can be extended appreciably. The techniques of washing and drying and the provisions for storage are very important functions in the caring of fire hose. The following highlights the proper care of fire hose.

Washing Hose

The method used in washing fire hose depends on the type of hose. Rubber hoses require little more than rinsing with clear water, although mild soap may be used if appearance is important. For woven jacket hose, however, more care is required. If the dirt cannot be removed by brushing, the hose should be washed and scrubbed with clear water.

When fire hose has been exposed to oil, it should be washed with a mild soap or detergent, making sure that the oil is completely removed. The hose should then

be rinsed thoroughly. If a commercial hose washing machine is not available, common scrub brushes or brooms can be used with a stream of water from a hose line and nozzle

Drying Hose

The methods used for drying hose also depend on the type of hose. Rubber hoses may be placed back on the appliance/apparatus while still wet with no ill effects. Woven jacket hose requires thorough drying before being reloaded on the apparatus. A Hose should be dried in accordance with local procedures and manufacturer's recommendations

Storing Hose

After fire hose has been adequately brushed, washed and dried, it should be rolled and stored in suitable racks. Hose racks should be located in a clean, well ventilated room in or close to the apparatus room/engine bay for easy access.

Care of hose

The following are general hints for the care of hose:

1. New hose should never be allowed to remain in the cases in which it is received but should be removed and coil loosened.
2. Hose should be stored in a cool, dry well ventilated place
3. Hose which is unused for long periods should not be allowed to remain in the appliance but removed and placed on racks
4. Rubber lined hose should have water passed through it from time to time to keep the lining in good condition, after which it should be thoroughly drained and dried in a hose tower
5. Great care should always be taken of rubber lined hose, especially when cooling down after large fires, as the hose is often stretched over debris which still retain heat, causing scorching and weakening of the hose
6. Hose should never be bent or kept at too acute an angle, especially under water pressure, since this causes a severe strain on the fibers and is a frequent cause of acute breakage, particularly if the edge under strain is rubbed against a hard surface
7. Hose known to have been contaminated with acids or alkalis should be thoroughly washed immediately with clean water
8. Hose should be drained by under- running. When under – running, it is essential to see that kinks do not form at the bends. These kinks may lead to the formation of pockets of air, or pockets of water. Firefighters must not be allowed to walk on hose in order to flatten it out or rid it of water before rolling.

Hose Fittings

Generally speaking any metal device used for joining two (2) lengths of hose or any piece of equipment to a length of hose is termed a coupling. A coupling is permanently attached to each end of a section of a fire hose.

Couplings are made of durable materials and designed so that it is possible to couple and uncouple them with little effort in a short time. Materials used for hose couplings are generally alloys in varied percentages of brass, aluminum or magnesium. The effectiveness of the fire hose operation depends upon the condition and maintenance of its coupling. Couplings constructed of metals, such as brass and aluminum alloy with a hard coating will not rust.

The portion of the coupling that serves as the point of attachment to the hose is called the shank (also called tailpiece, bowl or shell.)

Ways in which coupling are constructed

Couplings are made by the following methods:

1. Forging - is to heat or shape into an object
2. Extruding - is to make something by forcing a semi soft material such as plastic or molten metal through a specially shaped mold or nozzle
3. Casting – is the making of a solid object by pouring molten metal or glass, or plastic into a mold and allowing it to cool.

Types of coupling

There are several types of hose couplings used in the fire service across the world, but in this service the ones commonly used are:

1. Threaded or screwed
2. Snap or instantaneous
3. Storz or hermaphrodite

The Threaded/Screwed Coupling

This type of coupling has all outlets male and inlets female. These couplings are standard in the Jamaica Fire Brigade for:

1. Suction Hose or Intake
2. Pump inlets
3. Standpipe bases
4. Hydrant outlets

The male side of connected couplings can be distinguished from the female by noting the lugs – only male couplings have lugs on the shank. The female couplings have lugs on the swivel. The lugs on the coupling aid in tightening and loosening connections. Connections are made by hand and then tightened by spanners. There are three (3) types of lugs the pin, rocker and recessed. In this service the lugs on the threaded type coupling are mostly pin lugs.

The Snap/ Instantaneous Coupling

This type of coupling has all outlets being female and all inlets male. These are coupling are used for:

1. Pump Outlets
2. Delivery hoses- attack hose

Like the threaded type the male coupling can be distinguished from the female coupling by looking at the shank. The female coupling has instantaneous pin lugs that will grip the male as it snaps into position. To disconnect, pull the lugs in the opposite direction.

The Storz/ Hermaphrodite Coupling

This type of coupling has no distinct male or female components. Both couplings are identical and may be connected to each other. This type of coupling is found on:

1. Hose Reel
2. In – line inductor and pick up tube

The locking components are grooved and inset rings built into the swivel of each coupling. When mated, the lugs of each coupling fit into the recess in the opposing coupling ring and then slide into locking position with a one – third (1/3) turn in a clockwise direction. To disconnect, the two (2) parts are rotated counterclockwise with a one – third (1/3) turn.

Care of Hose Coupling

All parts of the fire hose coupling are susceptible (vulnerable) to damage. On threaded type the male threads are exposed when not connected to the female and are subjected to damage. The swivel of the female is subjected to bending. In the snap couplings, both male and female ends are subjected to damage as that of the threaded. Couplings can be bent or crushed if they are run over by vehicles or they can be damage by being banged or dragged on pavement and roadway. Here are some simple rules for the care of fire hose couplings.

1. Avoid dropping and/ or dragging couplings. This will cause shock and /or abrasion
2. Do not permit vehicles to run over fire hose, to prevent this use hose bridges or ramps
3. Examine couplings when hose is washed and dried
4. Remove the gasket and twist the swivel in warm soapy water
5. Clean thread to remove tar, dirt, gravel and oil
6. Inspect gasket and replace if cracked or creased

There are various devices used with fire hose other than hose coupling and nozzles. These devices are usually grouped into two (2) categories:

1. Hose Appliances
2. Hose Tools

Hose Appliances

This is any piece of hardware device use in conjunction with the fire hose for the purpose of delivering water. Examples of hose appliances are:

1. Valves
2. Valves Devices
3. Fittings
4. Intake Devices

Valves

Valves control the flow of water. These valves include:

1. Ball valves - these are used in pumper discharges and gated wyes or dividing breeching. It is open when the handle is in line with the hose and closed when it is at right angle to the hose.
2. Gate valves – these are used to control the flow from a hydrant. It has a baffle that is moved by a handle and screw arrangement.
3. Butterfly valves - these are used on large pump intakes. It uses a flat baffle operated by a quarter turn handle.
4. Clapper valves - these are used in Siamese or connecting breeching to allow intake or suction hose to be connected and charged before the addition of more hoses. The clapper is a flat disc that is hinged on one side and swing in a door – like manner.

Valve Devices

These increase or decrease the number of hose lines operated at the fireground. Some of these devices are used in the Jamaica Fire Brigade. They are:

1. Wye Appliances/Dividing Breeching

These make it desirable to divide one (1) hose stream into two (2) or more hose streams or one (1) hose line into two (2) or more hose lines.

The most common has a 2 ½ "(65mm) inlet to two (2) 1 ½" (38mm) outlets. In this fire service this appliance is called a dividing breeching. The 2 ½ "(65mm) may also divide one 2 ½ "(65mm) hose lines into two 2 ½ "(65mm) lines. Wye appliances are often equipped with gated valves so that the flow of water being fed into the hose lines each may be controlled independently. The threaded type Wye has the outlets being male and the inlets female. It consists of two (2) male couplings and one (1) female coupling.

The Snap or Instantaneous Wye appliances or dividing breechings are the ones commonly used in the Jamaica Fire Brigade. They have all outlets being female and inlets male. It consists of two (2) female couplings and one (1) male coupling.

Siamese Appliance/ Collecting Breeching

These make it desirable to combine two (2) or more hose lines or stream into one (1) hose line or stream.

The typical threaded appliance has two (2) or more female connections coming into the appliance and one (1) male discharge exiting the appliance. Siamese appliances may or may not have clapper valves. They are commonly used to overcome the problems caused by friction loss in hose lays that carry a large flow of water or cover a long distance. It is also used when supplying ladder pipes that are not equipped with a permanent water supply. Two (2) or three (3) lines are used to supply one (1) line that is actually going up the ladder.

The Snap or Instantaneous Siamese Appliances or collecting breechings have all outlets female and inlets male. This appliance has two (2) male couplings and one (1) female coupling.

Fittings

These are hardware accessories available for connecting:

1. Hose of different sizes

2. Instantaneous to threaded type coupling
3. Instantaneous/ threaded to Storz type coupling

1. Adaptors

Adaptors are fittings for connecting hose couplings with dissimilar threads but the same inside diameter or to connect threaded type to an instantaneous or to connect threaded type to Storz type coupling. These appliances allow hoses to be connected when both coupling are the same sex. They consist of a metal fitting terminating at each end in a coupling and averaging 100 to 150 in length Adaptors are either double male or double female and are usually cast(in brass or aluminum) as one fitting, except in the case of the screwed female end where the nut and sleeve are separated.

Reducers

Reducers are used to attach smaller hose to a larger hose. They are commonly found on pump discharge outlets so that smaller hose lines may be hooked directly to the pump. Usually the larger end has a female connection and the smaller end has a male connection. A common type reducer is used to reduce a 2 ½" line into a 1 ½ "line.

Other common fittings includes elbows that change the direction of flow, hose caps that close off male couplings and hose plugs that close off female couplings.

Intake Devices

These are also known as suction strainers. They are attached to the drafting end of a hard suction and their function is to keep debris from entering the fire pump.

They are two (2) types

1. Metal Strainer
2. Basket strainer

Metal Strainer

Metal strainers – these are constructed of copper or aluminum alloy and cylindrical in shape. They are perforated with holes sufficient in size and number not to restrict the maximum capacity of the suction hose, yet small enough to prevent entry of pieces of wood, stones or other solid subject. They are fitted with a female suction hose coupling and are made in sizes to fit the standard size of suction hose.

Basket Strainer

These are used in conjunction with the metal strainer but never alone. When resting on a soft surface such as mud the metal strainer tends to sink in because of its weight, thus reducing its efficiency. The basket strainer act as an outer shell and rest in the mud and also has a larger surface area than that of the metal strainers. This leaves a considerable portion exposed so allowing the metal to work unimpaired. These strainers are cylindrical in shape and are constructed of woven wicker with one (1) open end to which is attached a piece of canvas known as the skirt. This has a running cord which secures the basket around the suction.

Hose Tools

Hose tools are a variety of tools used in conjunction with hose lines. Hose tools do not have water flowing through them.

They are a variety of hose tools used in conjunction with hose lines. Some of the common ones are:

1. Hose rollers
2. Hose jackets
3. Hose clamps
4. Spanner wrenches
5. Hose bridges or ramps
6. Chafing blocks
7. Hose strap, hose rope and hose chain

Hose Roller (Hoist)

Hose can be damaged when dragged over sharp surfaces such as roof and windowsills. Hose roller consisting of a metal frame with two (2) or more rollers, is placed on the potentially damaging edge and secure with a rope or C-clamp.

Hose jacket

When a section of hose ruptures, the entire hose line is unable to transport water effectively. The most practical way to permanently correct the problem is to shut down the line and replace the damaged section of hose. When firefighting conditions are such that it is impossible to shut down operations, a hose jacket may be used. These consist of a two (2) piece metal cylinder that hinges open and close. Rubber gaskets found at each end of the cylinder seals against the hose to prevent leakage. A clamp device locks the cylinder closed when in use. Hose jacket are made in two sizes 2.5” and 3” (65mm to 77mm). The hose jacket

encloses the hose so effectively that it can continue to operate at full pressure. It can also be used to connect hose with mismatched or damaged screw thread couplings.

Hose clamps

A hose clamp can be used to stop the flow of water in a hose line for the following reasons:

1. To prevent charging the hose bed during hose laying operations.
2. To allow replacement of a burst section of hose without shutting down the water supply
3. To allow extension of a hose line without shutting down the water supply
4. To allow advancement of a charged hose line up stairs

Based on the method by which they work, there are three types of hose clamps

1. screw down
2. press down
3. hydraulic press

It is important to know that a hose clamp can cause injury to firefighters or damage to hose if it is not used correctly. Some general rules that apply to hose clamps are as follows:

1. Apply the clamp at least 20ft (6m) behind the apparatus
2. Apply the clamp approximately 5ft (1.5m) from the coupling on the incoming water side
3. Stand to one side when applying or releasing the press down type hose clamp
4. Center the hose evenly in the jaws to avoid pinching the hose
5. Close and open the hose clamp slowly to prevent water hammer

Spanner, Hydrant Wrench and Rubber Mallet

The primary purpose of the spanner wrench (spanner) is to tighten or loosen hose couplings.

Hydrant wrench is used to remove caps from fire hydrant outlets and to open hydrant valves. The hydrant wrench is usually equipped with a pentagon opening in its head that fits most standard fire hydrant operating nuts.

Rubber mallet is used to strike against the lugs to tighten and loosen intake hose couplings.

Hose Bridge or Ramp

These help prevent injury to hose when vehicles cross it. They should be used wherever a hoseline crosses the street or other area where vehicular traffic cannot be diverted. Some ramps can be positioned over small spills to keep hose liens out of potentially damaging liquids. Ramps can also be used as chafing blocks

Chafing Block

This device is used to protect fire hose where the subjected to rubbing from vibrations. They are particularly useful where the hose comes in contact the pavement. Chafing blocks may be made of wood leather or sections of old truck tires.

Hose Strap Hose Rope and Hose Chain

One of the most useful tools to aid in carrying or handling a charged hose line is a hose strap. Similar to the hose strap is the hose rope and chain. These devices can be used to carry a pull fire hose, but their primary function is to provide a more secure means to handle pressurized hose when applying water. Another important use of these tools is to secure hose to ladders and fixed objects.

Nozzles (Branches)

Nozzles/branches (branch pipes) are devices that are attached to the discharge end of attack lines to give fire streams shape and direction. It also increases the velocity of the water as it approaches the nozzle tip so providing an effective firefighting jet. The size of the jet is governed by the size of the nozzle. The branch consists of a metal tube having an internal diameter which tapers gradually in size towards the delivery end. Branches are constructed from gunmetal, brass or aluminum alloys.

Nozzles/Branches may be divided into two (2) principal classes:

1. Uncontrolled – these yield a fire stream in the form of a jet which cannot be controlled
2. Hand controlled - these provide for some form of control by shutting off the jet, altering its size or shape, or changing character by means of converting it into a spray.

Branches are classified into three groups:

1. Low volume (eg. Booster hose reel)

2. Hand line (used on attack lines)
3. Master stream (used on deck guns, portable monitors and ladder pipes)

The nozzle shut off enables operator to start, stop or reduce the flow of water thereby maintaining effective control of the hand line or master stream appliance.

The most common nozzle shut off mechanism is the quarter turn valve. The handle that controls this valve called the bale. In some cases, nozzles incorporate a rotary control valve operated by rotating the nozzle in one direction and the opposite direction to shut off the flow of water.

Two (2) types of nozzle manufactured for fire service;

1. Smooth bore (produces a solid column of water)
2. Fog stream (separate the water into droplets)

Nozzles must have an adequate volume of water and an adequate pressure in order to produce a good fire stream.

Smooth Bore Nozzles

Consist of a shut off valve and a smooth bore tip that gradually decreases in diameter of the stream to a size smaller than the hose diameter.

Advantages

1. Manufactured to fit both hand lines and master stream
2. It has a longer reach than a combination fog nozzle operating at a straight stream setting
3. It is capable of deeper penetration into burning materials. This results in quicker knockdown and extinguishment.
4. Operate at lower pressures than adjustable stream nozzles
5. Extinguish fire with less air movement and less disturbance of the thermal layering than fog stream

Most smooth bore nozzles are designed to operate at 50psi while adjustable stream nozzles generally require 75 to 100psi. Lower nozzle pressure makes it easier for a firefighter to handle the nozzle.

Disadvantages

1. Do not absorb heat as readily as fog stream
2. Not as effective as fog stream for hydraulic ventilation
3. Cannot change setting to produce a fog pattern

Fog Stream Nozzles

These nozzles produce fine droplets of water. It absorbs heat more quickly and efficiently.

Advantages

1. It creates a variety of patterns (from a straight stream to a narrow stream cone of less than 45 degrees angle to a wide angle fog pattern that is close to 90 degrees.)
2. Can be used to create a water curtain to protect firefighters from extreme heat
3. Can be used to exhaust smoke and gases through hydraulic ventilation

Disadvantages

1. Move large volumes of air, which can result in a sudden heat inversion that pushes hot gases and steam on to firefighters
2. The straight stream from a fog stream nozzle will break up faster and will not have the reach of a solid stream
3. If used incorrectly, can push fire in to unaffected area.

Types of Fog Stream Nozzles

1. Fixed gallonage – deliver a preset flow in gallons per minute at the rated discharge pressure
2. Adjustable gallonage – allow the operator to select a desired flow. This is done by rotating a selector bezel to adjust the size of the opening. Once the setting is chosen the nozzle will only deliver the rated flow as long as the rated pressure is provided at the nozzle
3. Automatic adjusting – deliver a wide range of flow; the amount of water flowing through the nozzle is adjusted to maintain the rated pressure and produce a good stream. A typical automatic nozzle could have an operating range of 90 to 225 g/m while maintaining 100psi discharge pressure.

Monitors and Special Branches

Monitors are used in circumstances where large quantities of water in a jet form are required and they fall into two categories

1. Portable monitors – these are designed to stand on the ground
2. Fixed monitors – these are secured to fire appliances such as fireboats or firefighting tugs and turntable ladders.

Portable monitors are used in cases of very large fires where copious quantities of water are required or in circumstances where it is necessary to leave a large working jet in operation of danger due to the risk of falling walls or collapsing building. They may be found with nozzles up to 51mm to 64mm in diameter.

Fixed monitors are invariable rigidly connected to the deck of fire boats and sometimes have permanently piping arrangements from the pumps. They are usually straight through type and with an unlimited supply of water, can deliver up to 13,600 liters of water a minute through a 90mm nozzle at a pressure of seven (7) bars. Elevation and lateral direction of the fire stream is usually controlled through an arrangement of gears.

Maintenance of Nozzles

Firefighters should inspect nozzles periodically and after each use to make sure that they are in proper working condition. This inspection should include the following:

1. Check the swivel gasket for damage or wear. Replace worn or missing gasket.
2. Look for external damage to the nozzle
3. Look for internal damage and debris. When necessary, thoroughly clean nozzles with soap and water, using a soft bristle brush
4. Check for ease of operation by physically operating the nozzle parts. Clean and lubricate any moving parts that appear to be sticking according to manufacturer's recommendations
5. Check to make sure that the pistol grip (if applicable) is secured to the nozzle

Standpipes

These are used to couple hose to underground hydrant by extending the outlet of the hydrant above ground level. They are usually constructed of brass and/or gunmetal, but more recently of aluminum alloy. They usually have instantaneous couplings as outlets but the coupling at the base conforms to the type of hydrants the standpipe is designed for usually screwed outlet or bayonet lugs

Collecting Heads

A collecting head consist of a metal casting, usually made of aluminum alloy, having on one side a number of inlets (two, three or four) according to the capacity of the pump, fitted with standard (64mm) male instantaneous delivery hose couplings. On the other side is a single outlet with a standard female screw type suction hose coupling for connection to the pump eye (inlet). Each inlet on a collecting head is fitted with a non return valve.

When using collecting heads the pressure of the inlet side should be kept as low as possible and the aim is to maintain, without an appreciable build up of pressure, a steady supply which equals that which is demanded from the output side.

Hydrants

A hydrant is a metal device placed at regular intervals along a pipe work (generally 105m to 120m), solely to provide water for firefighting purposes. However areas of high risk and dense population will have hydrants installed closer (90m to 105m). Hydrants are usually constructed of cast iron, ductile iron and steel.

There are two types of hydrants

1. Pillar
2. Underground

Most hydrants in this country are pillar but few are underground and can be found in old towns or in older sections of large towns. Hydrants are operated by the opening of a valve interspersed between it and the main. The direction in which the valve is turned as well as the styling of the hydrant will depend on the manufacturer's specification. It is therefore important for firefighters to familiarize themselves with the hydrant on their station ground. The valves are located or placed in a valve pit a short distance away from the hydrant themselves and some will have the valve as an integral part of the hydrant.

Tools for Hydrant Operation

The tools required for hydrant operation are:

1. Hydrant cover key
2. Hydrant key and bar
3. Adaptor
4. Standpipe for underground hydrant

Blank caps and spindles are normally left fitted on the hydrants and valves. However due to vandalism these may be missing and the fire appliances normally equipped with these for such circumstances.

Good hydrant practice demands that valve pits are left clean and free of dirty water which may seep back into the main through faulty valve and contaminate the water supply. Hydrants should be open and close slowly to prevent water hammer to the hose and main.

Water hammer is the force created by rapid acceleration or deceleration of water in a main. It generally results from closing of valve or nozzle too quickly, the water flowing in the main has both mass and velocity, if this velocity is instantaneously converted into pressure energy then this energy must be absorbed by the main and could result in the failure of the main (burst main)

The hydrant valve should be closed sufficiently to prevent leaks, but not too the extent that it is jammed and cause difficulty for other users.