**Chapter 17: Fire Attack Lines and Foam**

**Chief Concepts**

* Most attack hoses carry water directly from the attack engine to a nozzle that is used to direct the water onto the fire.
* Attack hoses usually operate at higher pressures than supply lines do.
* The hoses most commonly used to attack interior fires are either 38 mm (1.5 in.) or 44 mm (1.75 in.) in diameter. Each section of attack hose is usually 15.2 m (50 ft.) long.
* Attack hose must be tested annually at a pressure of at least 2068 kPa (300 psi) and is intended to be used at pressures up to 1896 kPa (275 psi).
* Depending on the pressure in the hose and the type of nozzle used, a 38-mm (1.5-in.) hose can generally flow between 273 and 568 L/min. (60 and 100 gpm). An equivalent 44-mm (1.75-in.) hose can flow between 545 and 818 L/min. (120 and 180 gpm).
* A (64-mm (2.5-in.) hose is used as an attack line for large fires and generally delivers a flow of approximately 1136 L/min. (250 gpm) It takes at least two fire fighters to control a 64-mm (2.5-in.) handline safely because when the hose is charged with water it can weigh as much as 91 kg (200 lb.).
* Booster hose contains a steel wire that gives it a rigid shape so that the hose can flow water without pulling all of the hose off the reel. The normal flow from a 25-mm (1-in.) booster hose is in the range of 182 to 227 L/min. (40 to 50 gpm). This type of hose should not be used for structural firefighting.
* Attack lines are usually stretched from an attack engine to the fire. The attack engine is usually positioned close to the fire, and attack lines are stretched manually by fire fighters. In some situations, an engine will drop an attack line at the fire and drive from the fire to a hydrant or water source. This procedure is similar to the reverse lay evolution, except that the hose will be used as an attack line.
* Attack hose is loaded so that it can be quickly and easily deployed. The three most common hose loads used for preconnected attack lines are the minuteman load, the flat load, and the triple-layer load.
* Preconnected hose lines can be placed in several different locations on a fire engine:
  + A section of a divided hose bed at the rear of the apparatus can be loaded with a preconnected attack line.
  + Transverse hose beds are installed above the pump on many engines and loaded so that the hose can be pulled off from either side of the apparatus.
  + Preconnected lines can be loaded into special trays that are mounted on the side of fire apparatus.
  + Many engines include a special compartment in the front bumper that can store a short preconnected hose line.
* To reach a fire that is some distance from the engine, it might be necessary to first advance a larger-diameter line, and then split it into two 44-mm (1.75-in.) attack lines. This is accomplished by attaching a gated wye or a water thief to the end of the 64-mm (2.5-in.) line, and then attaching the two attack lines to the gated outlets.
* A basic attack evolution looks like this:
  + Attack line is stretched in two stages. First, the hose is laid out from the attack engine to the building entrance or to a location close to the fire. Then, the hose is advanced into the building to reach the fire. Extra hose should be deposited at the entrance to the fire building. Make sure you flake out the hose before it is charged with water.
  + Once the hose is flaked out, signal the pump driver/ operator to charge the line.
  + Once the hose is flaked out, check your PPE and your partner’s PPE.
  + When you are given the command to advance the hose, keep safety as your number one priority.
  + As you move inside the building, stay low to avoid the greatest amount of heat and smoke. Communicate with the other members of the nozzle team as you advance.
  + As you advance the hose line, you need to have enough hose to enable you to move forward.
  + Charged hose lines are not easy to advance. It is only with good teamwork that efficient hose line advancement can occur.
* Nozzles are attached to the discharge end of attack lines to give fire streams shape and direction. Nozzles are used on all sizes of handlines as well as on master stream devices.
* Nozzles can be classified into three groups:
  + Low-volume nozzles flow 1821 L/min. (40 gpm) or less. They are primarily used for booster hoses; their use is limited to small outside fires.
  + Handline nozzles are used on hose lines ranging from 38 mm (1.5 in.) to 64 mm (2.5 in.) in diameter. Handline streams usually flow between 273 and 1591 L/min. (60 and 350 gpm).
  + Master stream nozzles are used on deck guns, portable monitors, and ladder pipes that flow more than 1591 L/min. (350 gpm).
* Nozzle shut-off enables the fire fighter at the nozzle to start or stop the flow of water.
* Two different types of nozzles are manufactured for the fire service:
  + *Smooth-bore nozzles.* Produce a solid column of water.
  + *Fog-stream nozzles.* Separate the water into droplets. The size of the water droplets and the discharge pattern can be varied by adjusting the nozzle setting.
* Specialized nozzles include these:
  + *Piercing nozzles.* Used to make a hole in sheet metal or building walls to extinguish fires.
  + *Cellar nozzles and Bresnan distributor nozzles.* Used to fight fires in cellars and other inaccessible places, such as attics and cocklofts.
  + *Water curtain nozzles.* Used to deliver a flat screen of water that forms a protective sheet of water on the surface of an exposed building.
* Firefighting foam can be used to fight multiple types of fires and to prevent the ignition of additional fuels. Several different types of foam are used for fires involving different types of fuels.
* Foams are either Class A or Class B.
  + Class A foam is used to fight fires involving ordinary combustible materials, such as wood, paper, and textiles.
  + Class B foam is used to fight Class B fires, or fires involving flammable and combustible liquids.
* Foam extinguishes flammable-liquid fires by separating the fuel from the fire. When a blanket of foam completely covers the surface of the liquid, the release of flammable vapours stops. Preventing the production of additional vapours eliminates the fuel source for the fire, which extinguishes the fire.
* Foam concentrate is the product that is mixed with water in different ratios to produce foam solution. The foam solution is the product that is actually applied to extinguish a fire or to cover a spill.
* The major categories of Class B foam concentrate are protein foam, fluoroprotein foam, film-forming fluoroprotein, aqueous film-forming foam, and alcohol-resistant foams.
* Compressed air foam systems are a new method of making Class A foam. Compressed air foam is produced by injecting compressed air into a stream of water that has been mixed with 0.1 percent to 1.0 percent foam.
* A foam proportioner is the device that mixes the foam concentrate into the fire stream in the proper percentage. The two types of proportioners—eductors and injectors—are available in a wide range of sizes and capacities.
* Foam solution can also be produced by batch mixing or premixing.
  + Batch mixing is a technique where foam concentrate is poured directly into an apparatus booster tank to produce foam solution.
  + Premixed foam is commonly used in 9.5-L (2.5-gal.) portable fire extinguishers.