



Government of
Northwest Territories

Northwest Territories Defensive Firefighter Training

SESSION 7

WATER SUPPLY

Government of the Northwest Territories
Municipal and Community Affairs

First Edition (2025)



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SESSION 7 – WATER SUPPLY



INTRODUCTION

NWT Defensive Firefighter Training (NWT-DFT) is a competency-based learning curriculum for community fire departments. This workbook provides volunteer firefighters with the knowledge required to achieve 34 skills. When successfully assessed, students and volunteer NWT firefighters will have met the basic requirements to respond to exterior fire scenes. Skills in the NWT-DFT program are to be assessed at National Fire Protection Association (NFPA) standards.

This session has been adapted for NWT communities without fire hydrant systems. For information on water supply for communities that do have fire hydrants please see *Appendix 1 – Fire Hydrants*.



LEARNING OUTCOMES

1. Describe common water sources in NWT communities without fire hydrants
2. Describe the process of water shuttling
3. Describe the purposes of common water supply tools and equipment
4. Describe the care and maintenance of water supply tools and equipment
5. Skill Drill 7-1: Perform setting up a portable tank
6. Skill Drill 7-2: Perform operating a fog steam nozzle
7. Skill Drill 7-3: Perform an annual service test on fire hose
8. Skill Drill 7-4: Perform marking a defective fire hose
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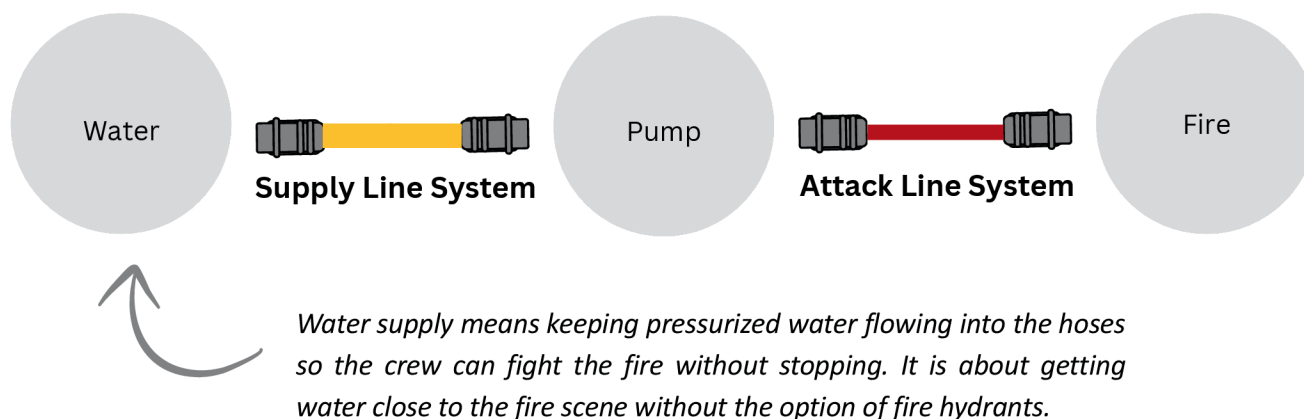
Digital versions of all books in the NWT Defensive Firefighter Training program are available for download and/or printing here:

<https://communitylearning.learnworlds.com/defensive-fire>



WATER SUPPLY OVERVIEW

Water supply means keeping water flowing to the fire. In many small NWT communities, this is hard because there are no hydrants, roads can be rough or icy, the fire may be far away, and crews are small.



Keeping a steady flow of water to the fire is challenging in small communities that don't have an underground water piping system. Where there are fire hydrants, underground pipes bring water to hydrants around the community. Without that system, communities need a plan that lists safe water sources and the equipment needed to move it. This plan often uses water shuttling with water trucks (tenders), portable tanks, and pumps.

INITIAL WATER SOURCE



Where is enough water always accessible?
How is water transported from source to scene?
How is water moved without piping?
How is water pressurized?

WATER FOR FIRE OPERATIONS





WATER SOURCES

Water Plants

Most communities have a water plant where water is cleaned so people can drink it and use it safely. This is where community water trucks fill up to deliver water to homes. Water plants are also pressurized. Usually water comes out of a truck fill arm at about 1,000 litres per minute. Therefore, water plants are sometimes used to access water for firefighting purposes.

The fill arm is fast, but the plant may not hold enough water for a large fire. A medium-sized fire, one that burns through a couple rooms in a house, can need a lot of water—up to 8,000 litres (2,000 gallons) to get the fire under control. Many community fire departments use the plant to fill trucks quickly, but have a backup plan if the water level at the plant drops too low.

WATER FILL STATIONS

Some water plants or town buildings have special places where fire trucks or water trucks can fill up with water. These places are called water fill stations. They have hoses or connectors that make it fast and easy to fill the trucks. A truck fill arm (also called a tanker-fill or hydrant-fill arm) is a special tool that helps fill fire trucks or water trucks with water quickly through a fill opening on top of the truck. Always test your trucks and equipment at your local fill station(s) to ensure compatibility before an emergency happens.



Pre-plan with the plant operator:

- Confirm the maximum safe draw (how many litres you can take and for how long).
- Set a minimum tank level where you must stop (to protect drinking water).
- Note after-hours access, keys/codes, and a 24/7 phone number.
- Check fitting sizes and keep the right adapters on the truck.
- Mark a safe route and turn-around for tankers.



WATER SOURCES

Static Water Sources

Static water sources are unpressurized so require a water pump to be placed nearby. Static water sources may work better than using the community's water plant when the fire requires more water and is far away. Small NWT communities usually get water from static water sources such as rivers, streams, lakes, or man-made water reservoirs. The kind of water source a community fire department uses depends on the land and water nearby - where is the water most accessible? Firefighters use pumps to pull or 'draft' water from these water sources. This is called drafting or suctioning.

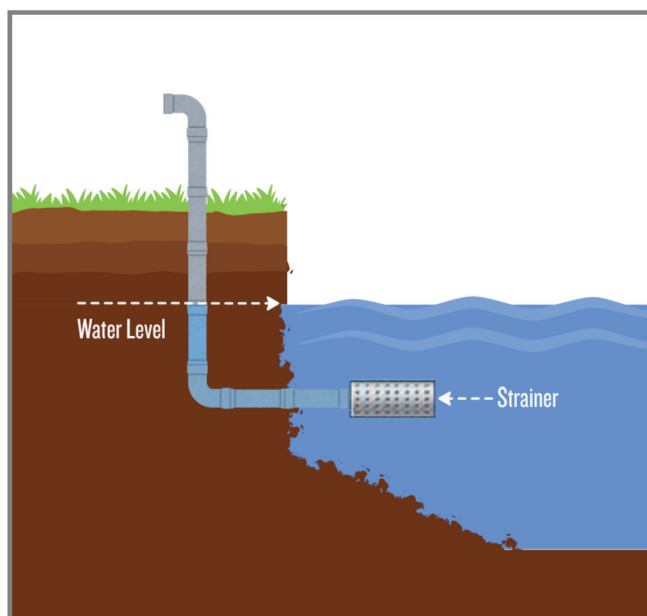
Portable Pumps

When water is not under pressure—like in a lake or pond—a pump is needed to move it. A portable pump can be carried by hand or moved with a vehicle to a water source. It pulls water in using a hard suction hose with a strainer to keep out debris. The pump pushes the water through a supply hose to another place, like a water truck or the fire engine. How much water the pump can move depends on the size of the pump.



Dry Hydrants

Some places may have a dry hydrant. It may look like a regular fire hydrant, but it is not connected to a pressurized water system. A dry hydrant is a pipe that goes into a lake, river, or pond. One end of the pipe has a strainer that sits under the water. The other end is above ground and connects to a suction hose. Dry hydrants help firefighters get water from a lake or river—even when the surface is frozen.



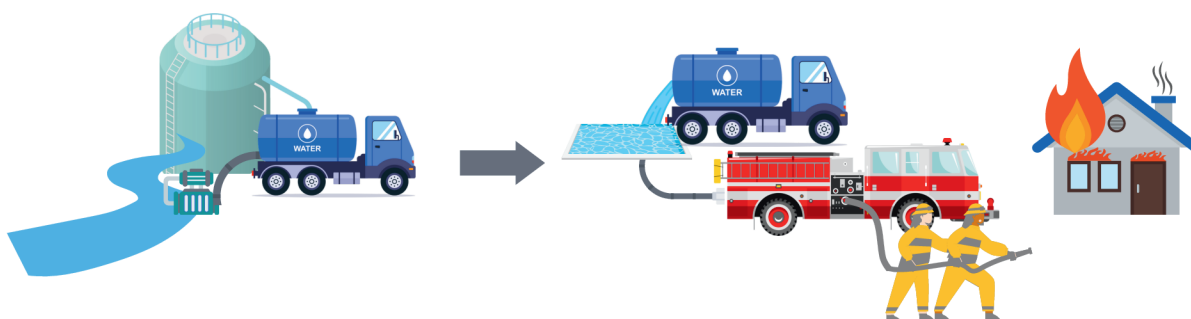


WATER SHUTTTLING

Water shuttling means moving water from a water source to the fire. A water truck brings the water to a portable tank set up beside the fire truck (also called a pumper). The fire truck pulls water from the tank using a hard suction hose. While the fire truck uses the water, the water truck drives back to the water source to get more. It goes back and forth, shuttling water to keep the portable tank full.

Scenario

- Water truck fills up at the water plant or drafts water from another static water source
- Water truck arrives at the fire scene near the pumper engine
- Water truck dumps water into portable tank
- Hard suction hose is set up between portable tank and engine
- Pumper engine suctions water from tank to pump into attack lines



Water Shuttling Safety

- Firefighters operating near water sources must wear approved personal flotation devices (PFDs) when working in proximity of water to prevent drowning incidents.
- Establish clear perimeters around water and ensure there are department guidelines in place to maintain safe operations around water.
- Ensure water truck drivers manage speed, set up traffic controls like cones and signage, and avoid backing up if possible.
- Make sure equipment is maintained and set up properly.
- Use the ICS system.
- Use fill and dump sites that are easily accessible and pose minimal risk to personnel and equipment.





WATER SHUTTTLING

Water Shuttling Step-by-Step

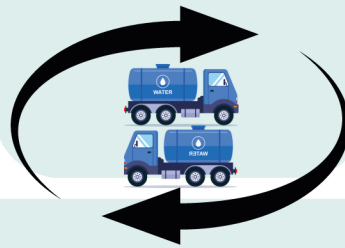
FILL SITE SET UP

1. Identify a safe and accessible static water source.
2. Set up portable pump at the water source.
3. Connect hard suction hose with a strainer and set into the water or use dry hydrant.
4. Prime pump and start pulling water into pump to fill the water truck.



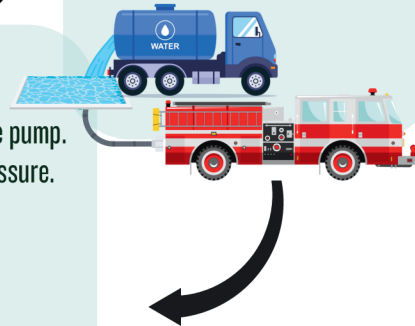
MAINTAIN WATER SUPPLY

1. Water tanker(s) drives from the fill site to the dump site.
2. Empty water into the portable tank (via gravity or quick dump valve).
3. Empty tankers return to the fill site to reload.
4. Assign personnel to monitor water levels, coordinate traffic and safety procedures.



DUMP SITE SET UP

1. Set up one or more portable (drop) tanks near the fire scene.
2. Position a pumper engine at the dump site to draw from the portable tank.
3. Connect the hard suction hose to the engine intake and place it into the portable tank.
4. Prime the engine pump to remove air from the suction hose so water is ready to be drawn in.
5. Connect attack lines to the discharge ports



FIRE ENGINE PUMP SET UP

1. Follow engine procedures to draft water from portable tank into engine pump.
2. Engage the pump panel controls to bring the pump up to operating pressure.
3. Monitor pump pressure and water flow into attack lines.
4. Begin fire suppression.



WHEN THE WATER SOURCE IS CLOSE TO A FIRE SCENE

Sometimes, water shuttling isn't needed. If the fire is close to a static water source (and hoses can reach it while maintaining enough water pressure) you can use a pump and hoses to move water directly, instead of using water tenders or water trucks.





WATER SUPPLY TOOLS

Water Pumps

Pumps help move water from the source to the fire for water shuttling operations.

- Portable pumps: Lightweight, gas-powered pumps placed at static water sources.
- Fire truck (engine) pumps: Built-in pumps used to fill tankers or supply attack lines at fire scene.
- Relay pumps: Used when pumping through hose over long distances to boost water pressure.

Portable Tanks

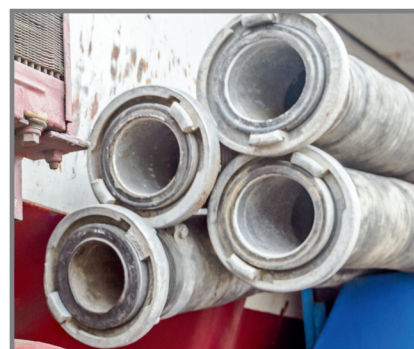
Portable tanks keep water flowing when water trucks can't stay at the fire. They let trucks dump and go, so the fire engine can pump steadily without running dry.

- Folding frame: Metal frame, square pool, most common.
- Onion tank: Round, self-standing, good on uneven ground.
- Low tank/pumpkin: Low walls, good for quick dumps.
- Snap tank: Light, fast, good for wildland work.

Fire Hose

Firefighters use three types of hose to get water from a source to the fire. Suction hose pulls water from a static source, supply hose moves water between trucks or from a hydrant to a pumper, and attack hose delivers water from a fire truck onto the fire.

- Suction hose: Used to draw water from a source like a lake, river, or portable tank into the fire truck's pump. It's thick and rigid to handle the strong suction pressure.
- Supply hose: A large-diameter hose used to move water from the portable tank or a hydrant to the pumper engine. In water shuttling, it keeps a steady flow of water from the tank so the engine can keep pumping on the fire without stopping.
- Attack hose: A smaller flexible hose used by firefighters to apply water directly onto the fire. It is fed by the water coming through the supply hose, so it can keep flowing as long as the supply is steady.



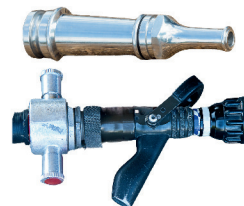


WATER SUPPLY TOOLS

Nozzles

Nozzles control how water comes out of the attack hose. Picking the right one helps fight the fire safely and saves water.

- Smooth Bore: Solid stream, good for reach and high flow.
- Fog Nozzle: Adjustable spray (wide fog to straight stream), good for cooling fires.
- Combination Nozzle: Can switch between fog and straight stream.



Water Tenders (Tankers)

This is a truck that hauls large amounts of water (often 1,500–3,500 gallons or 5,500–13,000 litres) from a source to the fire scene. It dumps water into portable tanks during water shuttling.



Other Tools

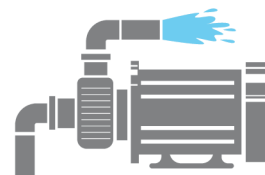
- Dump Valves: Special valves on the back/sides of a tender that let it unload water quickly into a portable tank.
- Jet Siphons: Simple devices that use a small stream of water to move water between tanks, keeping water levels stable when multiple water tanks are used.
- Draft Pits/Dry Hydrants: Permanent pipe systems installed in lakes or ponds so tankers or pumps can access water year-round (see page 7).
- Hard Suction Hose Adapters and Strainers: Strainers keep debris out of pumps, adapters connect hose to unusual water sources.
- Portable Fill Devices: Truck-fill arms or floating strainers that make tender filling faster and safer.



TOOL CARE AND MAINTENANCE

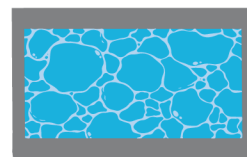
Water Pumps

- Run pumps regularly to make sure they start and run properly.
- Check oil, fuel, and air filters on portable pumps.
- Inspect pump seals and valves for leaks.
- Flush pumps with clean water after use, especially if drafting from dirty sources.



Portable Tanks

- Rinse/inspect for leaks or buildup.
- Check dump valves and covers for proper operation.



Hoses and Couplings

- Inspect hoses after use for holes, wear, or burns.
- Wash and fully dry hoses before storing.
- Check couplings for cracks, dents, damaged threads.
- Lubricate coupling gaskets if needed.



Nozzles and Appliances

- Clean nozzles and check for damage or debris.
- Operate all valves and moving parts to prevent sticking.
- Store appliances in a clean, dry space.



Water Tender

- Work with the town's water service staff to coordinate maintenance, schedule downtime, and ensure the truck can be used for fire response.
- Inspect the water tank for leaks, cracks, or loose fittings.
- Check valves, hoses, and spray bars.
- Test lights, brakes, and tires regularly for safe road travel.
- Clean and flush plumbing.
- Refill fuel after use so the truck is always ready for a fire call.
- Training Reminder: Firefighters should be trained and familiar with operating the town's water tender so they can use it safely during an incident.



REMEMBER

- Always follow the manufacturer's recommendations for the care and maintenance of tools.
- Always follow your department's Standard Operating Procedures (SOPs) for inspection schedules, maintenance intervals, and logging. Regular checks and proper record-keeping keep all equipment ready for the next fire.



SKILL DRILLS

SKILL DRILLS

Practice the following skills. Each step will be assessed in the NWT Defensive Firefighter Training program



SKILL DRILL 7-1: Set up a portable tank

1	Use two fire fighters to lift the portable tank off the apparatus.
2	Place the portable tank on as level ground as possible beside the engine.
3	Expand the tank (metal-frame type) or lay it flat (self-expanding type).
4	One fire fighter helps pump driver/operator place strainer on end of the suction hose.
5	Put the suction hose into the tank and connect it to the engine.
6	Second fire fighter helps the tanker driver discharge water into the portable tank.
7	Secure the tank.

NOTE:

- Tank may be mounted on a side rack or on a hydraulic rack that lowers it to ground.
- The pump driver/operator indicates the best location for the portable tank.
- If the tank is self-expanding, the fire fighters may need to hold the collar until the water level is high enough for the tank to support itself.
- Make sure the tank is stable and the frame is locked. Some tanks have straps or additional supports that need to be fastened.



SKILL DRILL 7-2: Operate fog stream nozzle

1	Select the desired nozzle. Attain a stable stance (if standing).
2	Slowly open the valve and allow water to flow.
3	Open the valve completely.
4	Select the desired water pattern by rotating the bezel of the nozzle.
5	Apply water where needed.



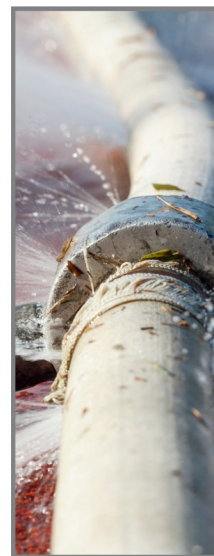
SKILL DRILLS

Practice the following skills. Each step will be assessed in the NWT Defensive Firefighter Training program



SKILL DRILL 7-3: Perform annual service test on fire hose

1	Visually inspect the hose for any obvious damage or wear before testing.
2	Attach the hose to apparatus, ensuring all connections are secure to prevent leaks.
3	Mark the hose at intervals to monitor for slippage during the test.
4	Fill the hose with water, expelling all air to ensure accurate pressure readings.
5	Gradually increase the pressure to the designated test pressure as specified by NFPA standards and maintain this pressure for a set period.
6	Observe the hose for leaks, bulges, or other failures. Use pressure gauges to monitor for any drop in pressure that might indicate a leak.
7	Document the results, noting any hoses that fail the test so they can be removed from service and repaired or replaced.



SKILL DRILL 7-4: Mark a defective hose

1	Inspect the hose for defects.
2	Upon finding a defect, mark the area on the hose, and remove the hose from service.
3	Tag the hose as defective, provide a description of the defect, and notify your superiors.



SKILL DRILL 7-5: Replace damaged section of hose

1	Shut down or clamp off the damaged hose line.
2	Remove the damaged section of hose.
3	Replace the damaged section of hose with two new sections. • <i>This creates four couplings instead of two, but ensures the line reaches properly without straining or stretching the hose.</i>
4	Restore the water flow.



LEARNING DEBRIEF

REMEMBER

- Developing proper work habits during training in this course helps ensure safety later
- Do not attempt anything you feel is beyond your ability or knowledge
- Tell someone if you see something that you feel is an unsafe practice
- Continue to learn teamwork and practice working as a team
- A firefighter injured during training should not return until medically cleared for duty

Reflect on the following questions. Jot down notes or sketches in the spaces provided.

Why is it important for firefighters to use different tools, like hoses, pumps, and nozzles, when moving water to fight fires?	
How does water shuttling help firefighters when there are no fire hydrants nearby?	
What are the challenges firefighters might face when using static water sources like lakes or ponds, and how can they overcome them?	



APPENDICES

APPENDIX 1: Fire Hydrants

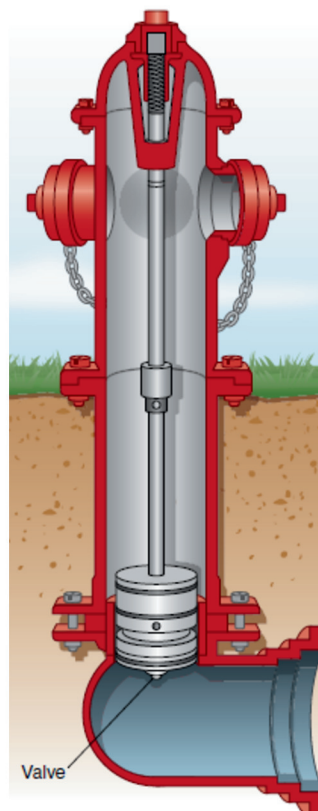
Fire hydrants can provide pressurized water for fire operations if they are set up in your community. They consist of an upright steel casing (barrel) attached to an underground distribution system (water pipes). Fire hydrants are equipped with valves, and various outlet sizes of standard threads.

Firefighters need to know how to operate fire hydrants (by following SOPs). Community governments oversee water distribution and supply, which includes adequate:

- **Water flow:** The amount of water moving through a pipe or hose measured in litres/gallons per minute. According to National Fire Protection Association (NFPA) the minimum flow rate for fire hydrants in residential areas is typically 500 gpm for a duration of at least two hours.
- **Water pressure:** The amount of energy or force per unit area of water, measured in kilopascals (kPa) or pounds per square inch (psi). A typical requirement is to maintain a residual pressure of at least 20 pounds per square inch (psi) while delivering the required flow rate.

Fire hydrants need to be inspected yearly by:

- Ensuring they can be seen and accessed
- Checking for any exterior damage.
- Ensuring the barrel is dry and free of debris.



Dry-barrel hydrant

Water comes in through valve at base of barrel by turning the operating stem

There are two types of fire hydrants: dry-barrel and wet-barrel. In the NWT, we only use dry-barrel hydrants since wet-barrel hydrants are always filled with water and are at risk of freezing

Fire Hydrant Connection: Step-by-Step

1	Locate and Clear the Hydrant • <i>Ensure the hydrant is visible and free of obstacles.</i>
2	Flush the Hydrant • Remove one cap and open the hydrant to remove any debris.
3	Connect the Hose • <i>Attach appropriate hose size to the hydrant's outlet.</i>
4	Open the Hydrant Valve • <i>Slowly open the valve to release water.</i>
5	Monitor Water Pressure • <i>Ensure adequate pressure for firefighting.</i>
6	Close the Hydrant After Use • <i>Close valve slowly to avoid sudden surge in water pressure, drain.</i>
7	Report Issues • <i>Report any damage, low pressure, or leaks for repair.</i>



GLOSSARY OF TERMS

Communications

- **ABC Button:** Customizable preset button on radios
- **Channel Selector:** Dial or button to change radio channels
- **Communication Feedback Loop:** Confirming messages by repeating them back
- **Decoding:** Interpreting the received message
- **Emergency Button:** Sends alert for immediate help
- **Emergency Line:** Dedicated line for urgent calls
- **Emergency Traffic:** High-priority message overrides others
- **Encoding:** Turning thoughts into a message
- **Feedback:** Receiver's response to a message
- **Message:** Information being communicated
- **Monitor/Scan Buttons:** Used to listen to multiple radio channels
- **Noise:** Anything that disrupts communication
- **Portable Radio:** Handheld radio for communication
- **Push-to-Talk (PTT) Button:** Press to talk on a radio
- **Receiver:** Person who gets the message
- **Sender:** Person who sends the message
- **Transmission:** Sending a message over radio

Equipment

- **Apparatus:** Firefighting vehicle
- **Deck Gun:** Fixed, high-volume water device on fire trucks
- **Dry Barrel Hydrant:** A hydrant that drains to prevent freezing
- **Handline:** Hose operated by hand
- **Hose Appliance:** Tools used with fire hoses to control flow
- **Hose Couplings:** Connect hoses to each other or a water source
- **Hose Lays:** How hoses are arranged from source to scene
- **Hose Loads:** Hose stacking methods for easy deployment
- **Nozzle:** Controls water stream from a hose
- **Pumper Truck/Attack Engine:** Vehicle with pump, hose, and water for fire attack
- **SCBA (Self-Contained Breathing Apparatus):** Air tank and mask for breathing in smoke-filled areas
- **Standpipe:** Built-in pipe system for supplying water inside buildings
- **Storz-Type Coupling:** Quick-connect hose ends without threads
- **Suction Hose:** Pulls water from static sources
- **Supply Hose:** Delivers water from source to pump
- **Threaded Couplings:** Screw-type hose connections
- **Turnout Gear:** Protective clothing worn during responses

Education and Training

- **Codes and Standards:** Laws and guidelines for fire safety
- **Exit Drills In The Home (EDITH):** Practice home fire escape plans
- **Home Safety Surveys:** Checking homes for fire safety issues
- **NFPA (National Fire Protection Association):** Sets fire safety standards

Fire Science

- **Backdraft:** Explosive ignition when oxygen re-enters a smoldering fire
- **Combustion:** Chemical process of burning
- **Conduction:** Heat transfer through contact
- **Convection:** Heat movement through air or gas
- **Decay Stage:** Fire slows as fuel runs out
- **Fire Tetrahedron:** Fire needs heat, fuel, oxygen, and a chemical reaction to burn
- **Fire Triangle:** Fire needs heat, fuel, and oxygen to start
- **Flashover:** Sudden full-room ignition
- **Fully-Developed Stage:** Maximum burning
- **Growth Stage:** Fire starts spreading and intensifying
- **Heat Transfer:** Movement of heat via conduction, convection, or radiation
- **Incipient Stage:** Fire just igniting
- **Light (Thermal) Energy:** Heat and light given off by fire
- **Mechanical Energy:** Energy from movement, sometimes causes sparks
- **Oxidation:** Reaction of fuel with oxygen
- **Pyrolysis:** Breakdown of material from heat before ignition
- **Radiation:** Heat traveling in waves
- **Smoke Colour:** Helps indicate type of material burning
- **Smoke Explosion:** Ignition of trapped fire gases

Incident Command Structure

- **Chain of Command:** Order of authority
- **Division:** Personnel and resources assigned to a geographic location
- **Emergency Management Organization (EMO):** Coordinates emergency responses
- **Group:** Personnel and resources assigned to a specific task
- **Incident Action Plan (IAP):** Plan for managing an incident
- **Incident Command System (ICS):** Structured approach to managing emergencies
- **Incident Commander (IC):** Person in charge of an incident
- **Operations Function:** Part of ICS that manages tactical operations
- **Span of Control:** Number of people a leader can manage (usually 3–7)
- **Single Resource:** One unit (e.g., one engine or person)
- **Unity of Command:** Each person reports to only one boss

Operations and Tactics

- **Advancing Hose:** Moving hose toward the fire
- **Attack Hose:** Used directly on the fire
- **Charged Hose:** Filled with water, ready to use
- **Defensive Operations:** Fighting fire from a distance
- **Establishing Command:** Identifying who's in charge
- **Evolution:** Planned firefighting tasks or maneuvers
- **Exposure:** Nearby object at risk of catching fire
- **Freelancing:** Acting without direction during an incident
- **Initiating Response:** Units are en route
- **Overhaul:** Checking for and putting out hidden fire
- **PAR (Personnel Accountability Report):** Roll call for safety
- **Rehabilitation:** Rest and recovery for firefighters
- **Salvage:** Protecting property during/after firefighting
- **Scene Size-Up:** Assessing what's happening at the scene
- **Size-Up:** First look and judgment of the fire scene
- **Staging Area:** Place where people/equipment wait near the scene

PPE and Safety

- **Accountability Tag:** Tracks firefighter location and status
- **Bunker Gear:** Full protective firefighting gear
- **Carcinogens:** Cancer-causing substances from fire/smoke
- **Critical Incident Stress Management (CISM):** Mental health support after tough calls
- **Freelancing:** Acting without direction during an incident
- **PPE (Defensive):** Gear for indirect fire attack
- **PPE (Structural):** Gear for entering burning buildings
- **Rehab Officer:** Person monitoring health in rehab area
- **Safety Culture:** Shared values and actions for safety
- **Unacceptable Risk:** Danger too high to allow action

Radio Language and Protocols

- **Arrival on Scene:** Unit has reached the incident
- **Cancelling Response:** Units not needed anymore
- **Clearing the Scene:** Leaving the scene, ready for next call
- **Incident Type:** Describes the emergency
- **Location Indicators:** Help identify where something is
- **Phonetic Alphabet:** A set of code words used to clearly communicate letters over radio
- **Priorities:** Life safety, property protection, incident control
- **Resource Request:** Ask for more units/equipment
- **Situation Report:** Update on the current status

Water Supply

- **Dry Hydrant:** Pipe for pulling water from lakes or ponds
- **Portable Pump:** Moveable water pump
- **Portable Tank:** Temporary water holding tank at the scene
- **Pumper Truck/Attack Engine:** Vehicle with pump, hose, and water for fire attack
- **Static Water Supply:** Water from non-pressurized sources like ponds
- **Water Fill Station:** Spot for refilling water trucks
- **Water Shuttling:** Moving water from water source to scene

