**Chapter 3: Personal Protective Equipment and Self-Contained Breathing Apparatus**

**Chief Concepts**

* PPE is an essential component of a fire fighter’s safety system. It enables a person to survive under conditions that might otherwise result in death or serious injury.
* Structural firefighting PPE enables fire fighters to enter burning buildings and work in areas with elevated temperatures and concentrations of toxic gases. It provides protection from the fire, keeps water away from the body, and helps reduce trauma from cuts or falls. This type of PPE is designed to be worn with SCBA.
* The components of structural PPE include the following items:
  + Bunker coat and pants—Have tough outer shells to withstand temperature extremes and repel water, and insulating layers to protect the skin.
  + Helmet—Protects the entire head and face from trauma; includes ear coverings and a face shield.
  + Protective hood—Constructed of a flame-resistant material to provide additional protection to the ears and neck.
  + Gloves—Constructed of heat-resistant leather to protect the hands from heat, water, vapours, cuts, and puncture wounds.
  + Boots—May be constructed of rubber or leather; designed to protect the feet from heat and trauma.
  + Work uniform—Must be made of natural fibres or special synthetic fibres to prevent burns.
  + SCBA—Provides essential respiratory protection that enables fire fighters to enter the fire atmosphere with a safe, independent air supply.
  + PASS—A device that will automatically sound if a fire fighter is motionless for a set time period.
  + Additional equipment—Goggles, earmuffs, ear plugs, hand light, and two-way radios.
* Structural PPE has several limitations:
  + Weight—PPE adds 23 kg (50 lb.) of extra weight to the fire fighter.
  + Overheating—PPE retains body heat and perspiration, which raises the risk of overheating.
  + Mobility—Full turnout gear limits the range of motion and makes movements awkward and difficult.
* Fire fighters should be able to don PPE in 1 minute or less. Following a set pattern of donning PPE helps reduce the time it takes to dress.
* Check the condition of PPE on a regular basis. Clean it when necessary, and get it repaired at once if it is worn or damaged. Damaged PPE will not protect you.
* Keep PPE clean to maintain its protective properties. The flammable by-products of burnt plastics and synthetic products can become trapped between the fibres, damaging the PPE.
* Cleaning instructions are listed on the tag attached to the clothing. Always follow the manufacturer’s cleaning instructions.
* The specialized protective equipment used during vehicle extrication includes special gloves and coveralls or jumpsuits. Latex gloves may be used if the fire fighter provides emergency medical care.
* The PPE for wildland fires is designed for comfort and maneuverability. It includes a jacket and pants made of fire-resistant materials, a helmet, eye protection, and pigskin or leather gloves. The boots are designed to provide comfort and sure footing.
* Respiratory hazards associated with fires include smoke, smoke particles, smoke vapours, toxic gases, oxygen deficiency, and increased temperatures.
* The two main types of SCBA are open-circuit and closed-circuit devices. An open-circuit breathing apparatus is typically used for structural firefighting. A tank of compressed air provides the breathing air supply for the user, and exhaled air is released into the atmosphere through a one-way valve. A closed-circuit breathing apparatus recycles the user’s exhaled air and is often used for extended operations, such as mine rescue work.
* One of the biggest limitations of SCBA is the limited amount of air in the cylinder. Fire fighters must manage their working time while using SCBA so that they have enough time to exit from the hazardous area before exhausting the air supply.
* Physical conditioning is important for all SCBA users. A fire fighter with an ideal body weight and in good physical condition will be able to perform more work per cylinder of air than a person who is overweight or out of shape.
* Breathing through an SCBA is different from normal breathing and can be very stressful. Covering your face with a face piece, hearing the air rushing in, hearing valves open and close, and exhaling against a positive pressure are all foreign sensations. Practicing breathing through SCBA in darkness helps to build confidence in the equipment and your skills.
* SCBA consists of four main parts: the backpack and harness, the air-cylinder assembly, the regulator assembly, and the face piece assembly. A compressed air cylinder is removable from the backpack harness and can be changed quickly in the field. SCBA regulators may be mounted on the waist belt or shoulder strap of the harness or attached directly to the face piece; they control the flow of air to the user. The face piece delivers breathing air to the fire fighter and protects the face from high temperatures and smoke.
* The pathway of air through an SCBA begins in the cylinder. The air passes through the cylinder shut-off valve into the high-pressure air line that takes it to the regulator. The regulator opens when the user inhales, reducing the pressure on the downstream side. In an SCBA unit with a face piece–mounted regulator, the air next goes directly into the face piece. In units with a harness-mounted regulator, the air travels from the regulator through a low-pressure hose into the face piece. From the face piece, the air is inhaled through the user’s air passages and into the lungs. When the user exhales, used air is returned to the face piece. The exhaled air is exhausted from the face piece through the exhalation valve.
* Each SCBA must be checked on a regular basis to ensure that it is ready for use. Inspection and operational testing should be conducted after a unit has been used, and on a regular schedule. In career departments, inspection and testing is done at the beginning of each shift. In volunteer departments, it is commonly done on a weekly schedule.
* Compressors and cascade systems are used to refill SCBA cylinders. A compressor or a cascade system can be permanently located at a maintenance facility or at a firehouse, or it can be mounted on a truck or a trailer for mobile use. Mobile filling units are often brought to the scene of a large fire.
* The steps for donning a complete PPE are as follows:

1. Place the protective hood over your head and bring it down around your neck.
2. Put on your bunker pants and boots. Adjust the suspenders and secure the front flap of the pants.
3. Put on your turnout coat and secure the front.
4. Open the air-cylinder valve on your SCBA and check the air pressure. Press the air-saver valve to prevent air flow if needed.
5. Put on your SCBA.
6. Tighten both shoulder straps of the SCBA harness.
7. Attach the waist belt of the harness and tighten it. Tighten the chest straps, if present.
8. Fit the face piece to your face.
9. Tighten the face piece straps, beginning with the lowest straps.
10. Check the face piece for a proper seal. (Follow the manufacturer’s instructions.)
11. Pull the protective hood up so that it covers all bare skin but does not obscure your vision.
12. Place your helmet on your head with the ear tabs extended, and secure the chin strap.
13. Turn up your coat collar and secure it in front.
14. Put on your gloves.
15. Check your clothing to be sure it is properly secured.
16. Make sure your PASS device is turned on.
17. Attach your regulator or turn it on to start the flow of breathing air.
18. Work safely!