

Kore Kooler® Rehab Chair

User Information Guide

The Kore Kooler Rehab Chair Provides the Most Effective Means to Safely and Effectively Lower a Firefighter's Core Temperature to Prevent Heat Stress.

Purpose

To prevent heat stress by lowering the body's core temperature to within its safe range quickly and effectively.

How it Works

- The Kore Kooler uses forearm immersion to promote cooling through conduction.
- The multitude of blood vessels running through the arms and hands that are located close to the skin's surface make this technique an excellent method to reduce core temperatures.
- Heat is dissipated through the blood vessels and skin into the cooler water.
- Cooled blood then returns to the heart and is pumped throughout the body.

The Science Behind Core Cooling

- The Royal British Navy (1996)¹ demonstrated the effectiveness of forearm immersion in water temperatures ranging from 50-86°F/ 10-30°C to effectively lower core body temperatures of shipboard firefighters.
- Defence Research and Development Canada (DRDC) (2003)² also studied the effects of heat stress on firefighters while wearing protective clothing.
- The DRDC determined that forearm immersion was the most effective means of lowering core temperature.
- Forearm immersion was more effective than a misting fan and does not lose effectiveness as humidity increases.
- The DRDC study determined the need to "actively cool" after the second cylinder change (30-minute bottles) and after each subsequent cylinder change.

What is Heat Stress?

- Heat stress occurs when the body's internal core temperature rises above its normal level.
- Heat stress is a result of internal, metabolic heat build-up and external stress from environmental factors while wearing personal protective equipment (PPE).
- As core temperature rises, so does the risk of heat stress.
- Core temperature greater than 102°F (39°C) is dangerous and can lead to heat stress.
- Heat stress factors include air temperature, humidity, radiant heat, air movement, the physical demands of work, the clothing worn, and the work performed.
- An individual's fitness level, body composition, psychological disposition, and personal perception can also affect a person's perception of heat stress.
- The potential dangers of heat stress range from heat rash, heat cramps and heat exhaustion to potentially fatal heat stroke.
- Heat stress can be prevented through cooling the core temperature.

How Can Heat Stress be Avoided?

- Utilize the six R's of rehabilitation (see additional info on back).
 - Rest
 - Rehydration—fluid intake (hydration)
 - Restoration—active cooling
 - Rx—medical monitoring and treatment
 - Relief—from extreme climatic conditions
 - Refueling—where required
- Watch for signs of heat stress.
- Train personnel in proper rehab procedures.
- Use active cooling and forearm immersion to keep cool.



¹ J.R. House, Cathy Holmes, and A.J. Allsop. Prevention of Heat Strain by Immersing the Hands and Forearms in Water, J Royal Naval Medical Service, 1997; 83.1:26-30.

² Dr. Tom McLellan, Defence Research and Development Canada, "Current Fire Fighter Occupational Medicine Issues, Approaches for Fire Fighter Rehabilitation," September 2003, IAFF John P. Redmond Foundation Health and Safety Seminar, San Francisco.

User Information Guide *cont.*

When to Use the Kore Kooler Rehab Chair

- Whenever tactical level rehab is required for large-scale incidents, long-duration incidents, and those associated with significant temperature extremes.
- At minimum, following the second cylinder use at an incident while working inside and wearing PPE.
- Hazardous Materials Incidents
- High-rise operations
- Confined space and below grade
- Training exercises, fires, etc.

Using the Kore Kooler Rehab Chair

- Ensure the chair is stable.
- A fresh water reservoir bag is to be inserted for each user. Fold bag over the front and secured with both snaps at the rear.
- Add water to each reservoir bag. Fill one bag half-way and repeat on the opposite side. This will ensure stability before filling the bags with enough water so that they are approximately 1" or 2.5 cm from the top. Use water that is

ambient temperature or below (50-86°F/ 10-30°C). Colder water may be used if local EMS protocols allow.

- Insert entire forearm and hand into the water. It is most effective with complete contact.
- Agitate the water by moving your forearm slightly every minute or so to maximize the cooling effect.
- Arms and hands must remain in water for at least 10 minutes to be effective.
- For maximum benefits, users should remain immersed in the water for 20 minutes.

Where to Use the Kore Kooler Rehab Chair

- A place away from hazardous atmospheres including apparatus exhaust fumes, smoke, and other toxins.
- A location that provides for shade in summer and protection from inclement weather at other times.
- Where there is adequate water supply (bottled or running) to provide for hydration and active cooling.
- Use on level ground.

The Six R's of Rehabilitation

Rest—a “time-out” to help firefighters stabilize vital signs.

- Recommended work to rest ratio is 20 minutes of work when using a 30-minute cylinder followed by 10 minutes of rest.
- The rest period should be accompanied with hydration.
- When up to two 30 cylinders or one 45 to 60 minute cylinder are used for a HazMat incident, the member must be allowed a 20 minute rest period with hydration.

Rehydration—replacing lost fluids/plasma volume.

- Drink between 12 and 32 ounces of water during a 20-minute rest period and even more in extreme temperatures.
- According to a Defence Research and Development Canada (DRDC) study (2003), 2/3—full fluid replacement can result in a 20% performance advantage compared with no fluid replacement.
- All members must be hydrated and should be medically accessed to ensure they are fit to return to duty.

Rx—medical monitoring and treatment.

- Heart rate during recovery cannot be used to indicate the thermal strain according to the findings of the DRDV heat stress study.
- EMS personnel provide medical monitoring including: core temperature, heart rate, and blood pressure. Members displaying elevated/abnormal signs should be considered for medical treatment.
- Personnel who are weak or fatigued, with pale clammy skin, low blood pressure, nausea, headache, or dizziness shall be assessed by EMS personnel.
- Personnel experiencing chest pain, shortness of breath, dizziness, or nausea shall be transported to a medical facility for treatment.

Restoration—of core temperature through “active cooling.”

- Active cooling should be applied where temperatures, conditions and/or workload create the potential for heat stress.
- Active cooling is essential for core cooling.
- Either forearm immersion or the use of the misting fans extends exposure and work times significantly but not equivalently.
- Misting fans rely on evaporative cooling which is significantly less effective in humid environments.
 - Core cooling, when combined with full hydration, can increase safe work times by up to 100%.
 - The DRDC study found the use of forearm immersion as the most effective cooling strategy to be used in firefighter rehabilitation.
 - Total forearm immersion is superior because the skin surface is in continuous contact with the medium and water will transfer or absorb heat at least 20 times more effectively than air at the same temperature.
- When combined with hydration, active cooling can effectively double the duration time that each firefighter will be able to safely continue to work and remain encapsulated.



Relief—from extreme climatic conditions.

- Ensure personnel “dress down” (removing bunker gear etc.) to promote cooling.

Refueling—calories and electrolytes

- Have the capacity to provide balanced foods for long duration incidents.

