East Fork Fire and Paramedic Districts Training and Safety Division

TOPIC:	COLD WEATHER OPERATIONS
TIME FRAME:	2 Hours
METHOD:	Lecture/field trip
OBJECTIVES:	Understand the effects of cold weather on road surfaces Understand the effects of cold weather on water use Understand basic cold weather effects on the human body
MATERIALS NEEDED:	Lesson Plan
REFERENCES:	Firehouse Magazine Article by *Jeffrey Pindelski*
ASSIGNMENT:	Go out into your first due district and determine any special hazards that may be created by extreme weather
PREPARATION:	None
SUNPRO CODE:	ENG02.05

Firefighting as we already know is an inherently dangerous profession. With the coldest part of the year approaching many members of our service must now contend with additional demands due to heavy snowfall and extreme temperature conditions. The hazards and complications of winter firefighting can be overcome by firefighters developing a basic understanding of those hazards and conditions and properly preparing for them beforehand.

Getting to the Incident

Approximately 70% of winter storm related deaths will occur on the roadway

A large number of these deaths can be contributed to slippery road surfaces and drivers being unfamiliar with a vehicles handling and performance under certain conditions.

Year after year, responding to and from emergency calls is one of the leading activities being performed in studies of firefighter fatalities.

Routes of travel to alarms will need to take snow/ice removal and accessibility to the incident into consideration.

The important point to remember-the fire department is of no value unless it is able to arrive on scene safely.

Once having arrived on scene, the company officer will have to make critical decisions on the commitment of apparatus.

Questions that need to be considered

Are tactical positions attainable or are they blocked by snow banks?

Can personnel access all sides of the building and are there any hazards or obstacles present that are not visible due to snow or ice such as stairs, drop offs or in ground swimming pools?

Are fire hydrants visible and accessible?

Proper pre-incident planning before weather turns bad can eliminate some of these hazards.

Water Supply Concerns

Once committed and flowing water, engine companies will need to keep water moving in some manner to keep hoselines, valves and pumps from freezing solid.

Static water will freeze as we already know at 32 degrees Fahrenheit but if enough movement is provided, water will not freeze spontaneously until the ambient temperature reaches -40 degrees Fahrenheit.

Basic chemistry can provide an understanding of waters behavior in extreme cold.

When heat (as in the form of friction caused by movement) is added, its molecules will move faster and freely interact.

As water freezes, the movement of molecules slow down and begin to align in a crystal like structure resulting in ice.

As water freezes, its density (or mass per unit volume) will also increase until it reaches a solid crystallized state.

This phenomenon is what keeps only top layers of lakes frozen or ice cubes floating in a drink.

If water is constricted as in a hoseline or piping when this expansion of mass takes place, the pressure exerted can cause costly damage.

In any cold weather operation, hoselines should be drained and picked up immediately when they stop flowing water and are no longer needed.

Water on the ground from cold weather operations will create an increased potential for slips and falls.

Fireground Hazards

In addition to the obvious fall hazards, ice will present other hazards and problems on the fireground.

As water is applied to a burning structure it will freeze and not run off.

As more and more water is applied, ice will cause additional weight and stress on structural members increasing collapse potential.

Locks and halyards on ladders can become frozen making them inoperable or difficult to move.

Aerial ladders can become caked with ice increasing weight loads on them resulting in failure or twisting of the ladder.

Self contained breathing apparatus used in the fire service are certified by NIOSH to be able to be used in temperatures as low as -25 degrees Fahrenheit but should still be used with caution during cold weather operations.

Going from extreme cold to a high heat interior position can cause problems with breathing apparatus.

It is imperative that S.C.B.A. are properly checked and maintained.

All firefighters will need to be trained and be thoroughly familiar with emergency procedures in the case of S.C.B.A. failure.

Hypothermia & Frostbite

Rehabilitation resources and additional alarms should be requested as soon as possible.

Firefighters will only be able to battle the elements for short periods of time in extreme weather.

All officers and firefighters should become aware of the signs and symptoms of frostbite and hypothermia.

They should also become familiar with ways that they can prevent them.

Frost bite is caused by parts of the body being exposed to extreme cold.

It can result from a very short time of exposure if cold enough.

Fluids contained within exposed body part freeze causing blood vessel damage and necrosis or death of tissue in the affected area.

Most often the hands, feet, ears and face of a firefighter are most prone to frostbite.

Frostbite will appear as changes in skin appearance as discoloration and will be accompanied by numbness and stiffness to the affected area.

The best way to prevent frostbite is to protect skin from direct exposure to cold air.

Firefighters should dress in layers of loose fitting clothes beneath their turnout gear.

Materials of these clothes should allow evaporation of perspiration and not be restrictive as to compromise the body's circulation in helping to keep the body warm.

Two pairs of socks and properly fitted footwear are also recommended.

Hypothermia results when the body core temperature falls below normal.

Firefighters suffering from hypothermia will exhibit shivering, confusion, extreme fatigue and drowsiness.

The best way to prevent hypothermia is also to dress in layers beneath turnout gear and to keep moving when working on the fireground to maintain a good level of circulation.

Hot fluids and a warm environment to rest regularly provided in the rehab sector will also be beneficial.

Firefighters should make certain to keep their heads covered with a hat or hood when working in cold weather.

As much as 50 % of the body's heat can be lost through the head and wearing a hat will help to minimize that loss.

Firefighters should also replace any wet clothing immediately as wet clothes will cool down the body's core temperature much quicker than air alone.

Cold weather can definitely take a toll on firefighters and the equipment that they use.

With proper pre incident planning, training and awareness, the hazards of extreme winter weather firefighting can be reduced to allow safe operations on the fireground.