Texas Commission on Fire Protection
Information on:
NFPA 1851 *Standard on Selection, Care, and Maintenance of Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting* Chapter 5 Selection
Relating to:
Required Risk Assessment and Related Standard Operating Procedure

The following is an example of a PPE risk assessment. It should be noted that this is only an example and not a TCFP mandated format or text, and is for review/example purposes only.

A portion of this example was developed with the use of the following text, which is not mandated by TCFP:

Fred A. Manuele (2008) *Advanced Safety Management.* John Wiley and Sons inc. Hoboken, New Jersey.

The following information is provided to assist in developing a risk assessment in relation to the selection of personal protective equipment in compliance with NFPA 1851, 2020 edition and TAC §435.1.

Selection and Purchase

Prior to starting the selection process of structural fire fighting ensembles and ensemble elements and proximity fire fighting ensembles and ensemble elements, the organization shall perform a risk assessment.

The risk assessment shall include, but not be limited to, the hazards that can be encountered by structural or proximity fire fighters based on the following:

(1) Type of duties performed

(2) Distinguishing response activities for different potential incidents

(3) Organization's experiences

(4) Incident operations

(5) Geographic location and climate

(6) Specific physical area of operation

(7) Likelihood of or response to CBRN terrorism incident

(8) Need for two sets of ensemble elements or spare ensemble elements

Types of Duties Performed:

Structural Fire Fighting

- Lay and connect hose lines
- Apparatus operation
- Direct nozzles-direct hose stream
- Carry, place, and climb ladders
- Fire pump operation
- Ventilation of structure
- Salvage and overhaul
- Search and rescue
- Forcible entry

Aircraft Rescue Fire Fighting

- Lay and connect hose lines
- Apparatus operation
- Direct nozzles-direct hose stream
- Carry, place, and climb ladders
- Fire pump operation
- Ventilation of structure
- Salvage and overhaul
- Search and rescue
- Forcible entry
- Flammable liquids fire attack

Specialty Rescue

- Mitigate hazardous materials emergency
- Motor vehicle extrication/stabilization
- EMS
- High angle rescue
- Trench rescue
- Confined space rescue
- Collapse stabilization/Rescue

Distinguishing Response Activities for Different Potential Incidents

Organization's Experiences

Determine the department's needs by identifying the type of fires the organization has experienced. For example: structural fires, aircraft crash fires, flammable liquid fires, brush or grass fires, rescue, hazardous materials, etc. Use qualifiers or quantifiers if it helps. For example, you may assign a qualifier to each ensemble element such as: 1) Meets Department Needs, 2) Does Not Meet Department Needs, 3) Exceeds Department Needs, or use: 1) Frequent PPE Failure, 2) Infrequent PPE Failure or 3) No PPE Failure. You can also rate the department's current elements in use on a 1-5 scale with 1= Completely Satisfied and 5= Completely Dissatisfied:

Structure

- Structural Helmets
- Protective Hoods
- Coat/trouser outer shell
- Coat/trouser moisture barrier
- Coat/trouser thermal liner
- Structural gloves
- Structural boots

ARFF

- Proximity Helmets
- Protective Hoods
- Proximity Coat/trouser outer shell
- Proximity Coat/trouser moisture barrier
- Proximity Coat/trouser thermal liner
- Proximity gloves
- Proximity boots

Incident Operations

Check the appropriate boxes noting which of the incident operations below are performed by your department:

Fire Fighting

- o Interior fire attack
- o Exterior fire attack
- o Transitional fire attack
- o Vertical fire attack
- o Horizontal ventilation
- o Primary and secondary search
- o Salvage and overhaul
- o Flammable liquids fires

Rescue/EMS

- o Extrication with hydraulic/power tools
- o Provide BLS/ALS treatment
- o Urban search and rescue
- o Trench rescue
- o High angle rescue
- o Confined space rescue
- o Hazardous materials

Risk Assessment Formula:

R=L x S

- R= risk being measured
- L= likelihood of a firefighter being exposed to the hazard
- S= Severity/Consequences to the firefighter exposed to the hazard

	Risk	Assessment	Value of "L" and "S"
Value	**Likelihood**	**Severity**	**Consequence**
0	Never	None	None
1	Exceptional	Low	Minor Injury
2	Occasional	Moderate	Major Injury
3	Very Likely	High	Life Threatening
4	Always	Extreme	Death

"0" should only be allowed where there is absolutely NO chance of the hazard being encountered.

Use formula values listed above to complete the "Hazard/Risk Formula Calculations" table below:

Hazard Risk Formula Calculations

Hazard Origin and Type	**Likelihood** Of firefighter being exposed to hazard	**Severity** Consequences to firefighter if exposed to hazard	**Risk** (Total of L x % of fire related calls)	**Control Measures**
Thermal Hazards				
Convective Heat				**High TPP**
Radiant Heat				**High TPP**
Flame				**High TPP**
Contact Heat				**High LOI**
Molten Metal				**High TPP**
Burning Embers				**High LOI**
Conductive Heat				**High LOI**
Flashover				**High TPP**
Electrical Hazards				
Electrical Arch				High TPP
Static Electricity				Anti Static Fiber
Environmental Hazards				
Ambient Cold				Winter liner
Ambient Hot				High THL
Cold Surfaces				Fire/Ice sole
Air Velocity Mechanical				IH Pant/Harness
Air Velocity Wind				IH Pant/Harness
Mechanical Hazards				
Penetration				High Burst Strength
Cut				High Tear Resistance
Abrasion				High Taber Value
Non-Visibility Hazards				
Not Being Seen				Type and Amount of Trim
Biological/Chemical Hazards				
Liquid				CBRN
Gas				CBRN
Biological Toxins				CBRN
Biological Allergens				CBRN
Airborne Pathogens				CBRN
Physiological Heat Stress				
Physiological Heat Stress				High THL

Definitions:

TPP-Thermal Protection Performance-a test method for measuring thermal protection was introduced and a minimum thermal protective performance (TPP) rating was established. This test method replaced the requirement for a minimum composite thickness, and its purpose is to measure the rate at which convective and radiant heat penetrates through the composite system – outer shell, thermal liner, and moisture barrier – to cause second degree burn to the human skin.

LOI- Limiting Oxygen Index-Flame resistance is commonly measured by LOI, the amount of oxygen needed to support combustion. The higher the LOI value, the more flame resistant the material will be.

High THL-Total Heat Loss- The total heat loss test is used to measure how well garments allow body heat to escape. The test assesses the loss of heat both by the evaporation of sweat and the conduction of heat through the garment layers. As clothing is made more insulating it will be to high heat exposure (such as by increasing its TPP rating), there is a tradeoff with how well the heat build-up in the fire fighter's body (that can lead to heat stress) is alleviated.

Risk -A measure of the probability and severity of adverse effects that result from an exposure to a hazard [**1250,** 2010]

Risk Assessment -An assessment of the likelihood, vulnerability, and magnitude of incidents that could result from exposure to hazards [**1250,** 2010]

Rating Structural Fire Fighting PPE

Based on the hazards encountered by your department how would you rate the following qualities for each element listed? Prioritize the following categories by order of importance to you organization with"1" being the most important "2" the 2nd most important etc. Use each number once only.

Structural Helmet

- Thermal protection
- Impact protection
- Weight
- Profile (Low/High)
- Balance
- Cost

Structural Coat and Trouser (includes all three layers)

- Direct flame protection
- UV degradation
- Cut/tear/abrasion resistance
- Ease of donning
- Comfort
- TPP
- THL

Design of Finished Garment

- Durability of construction
- Ergonomic design features
- Proper fitting and design

Structural Hoods

- Direct flame protection (LOI)
- Thermal protective performance (TPP)
- Moisture vapor flow (THL)
- Durability
- Comfort
- Cost

Structural Boots

- Weight
- Cut/tear/abrasion resistance
- Thermal protective performance (TPP)
- Moisture Vapor Flow (THL)
- Puncture protection
- Sole durability/replacement
- Cost

Structural Gloves

- Moisture Vapor Flow (THL)
- Thermal protective performance
- Dexterity
- Tactile
- Durability
- Cost