



TEXAS COMMISSION ON FIRE PROTECTION

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To: All Fire Chiefs and Heads of Departments of Regulated Fire Departments

From: Tim Rutland, Executive Director, Texas Commission on Fire Protection

Date: March 10, 2015 (Updated 10/29/2015)

Subject: Risk Assessment for Selection of Structure and Proximity Protective Clothing

Recently, several Aircraft Rescue/Fire Fighting (ARFF) organizations approached the Commission about its practice regarding the requirement for ARFF personnel to be issued proximity fire fighting ensembles. The organizations felt that the current edition of NFPA 1851 allows them to conduct a risk assessment to determine whether their crews should be issued structural or proximity ensembles (or both). In response, the Commissioners directed that a work group be formed to study the issue and report back with recommendations, which it did in the January 2015 Commission meeting. As a result of the work group recommendations, the Commissioners determined that organizations should indeed perform a risk assessment to determine the type of gear worn by personnel, and directed that staff work with departments throughout the state in the accomplishment of the assessments.

The Commissioners directed that:

1. Per NFPA 1851 guidelines, **all departments** are to perform a risk assessment for their organization (not just ARFF organizations or divisions). The purpose of the assessment is to ensure that departments are outfitting their personnel with protective ensembles (structural, proximity, or both) appropriate for the duties being performed.
2. Risk assessments are to be completed no later than **2/28/2017** or prior to the selection of new gear if a department is considering switching from proximity to structural firefighting ensembles, whichever occurs first (see the "FAQ" document in the information packet for more details).
3. A completed risk assessment shall be approved by the head of the fire department.
4. Commission staff is to assist fire departments by providing guidance and informational material regarding risk assessments.

The staff at TCFP has developed an "information packet" to assist fire departments in the completion of their risk assessments. Included in the packet is an FAQ document, several sample "templates" for risk assessment documents, and other guidance.

The information packet is available on the Commission's home page under the "Compliance" link at the top of the page, or you can contact your compliance officer to obtain the packet.

If you haven't already done a formal risk assessment for your department, the process may at first seem like a monumental task. But in reality most departments have already done it: You know the types of incidents your personnel are likely to encounter; you have trained on strategy and tactics for various types of hazards; you have the big picture for your community.....now it is simply a matter of formalizing the process.....getting it "down on paper". At the same time, the process may give you the opportunity to consider some things that you hadn't before: particular target hazards, that possible incident on the nearby interstate, another look at your strategy in a particular type of situation. In the end, the process will surely prove beneficial to you and to the safety of your personnel. Let us know if you need anything as you work through it.

Frequently Asked Questions

You can expect to hear the buzzword "Risk Assessment" more and more when new personal protective equipment (PPE) purchases are involved.

Why is a risk assessment important?

1. A risk assessment enables the fire department to identify and assess all the specific risks (dangers) involved in the duties performed by fire fighters and can therefore properly specify and outfit fire fighters with the appropriate PPE.
2. A risk assessment is a document that justifies why the fire department is specifying particular PPE. The justification derived from the risk assessment is supported by facts and data.
3. A regulated fire department is required by Texas Commission on Fire Protection (TCFP), because it is in NFPA 1851, to conduct a risk assessment. TCFP Compliance Officers are required to inspect and confirm that a risk assessment has been completed by fire departments on a least a biennial schedule.

What Is a Risk Assessment?

A risk assessment may be considered the identification, evaluation and estimation of the levels of risk involved in a situation, their comparisons against benchmarks and past experience, then determining an acceptable level of risk. A risk assessment is created by a fire department as described in NFPA 1851, *Standard on the Selection, Care, and Maintenance of Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting* (see Chapter 5, Subsection 5.1, 5.1.1, and 5.1.2). A risk assessment is completed in accordance with TCFP regulations (see Texas Government Code §419.027 – Biennial Inspections and §419.040 (c) – Standard Operating Procedure and Texas Administrative Code §435.1 – Protective Clothing). The purpose of the risk assessment is to ensure that regulated fire departments have fully assessed the risks associated with the duties assigned to the fire fighter and has provided to the fire fighters the PPE suitable for the tasks the individual is expected to perform.

Chapter 5 of NFPA 1851, 2014, states that a risk assessment must be performed, including the following considerations written in section 5.1.2:

- Types of duties performed
- Frequency of use of ensemble elements
- Organization's experiences
- Incident operations
- Geographic location and climate
- Specific physical area of operation
- Likelihood of Chemical, Biological, Radiological and Nuclear (CBRN) terrorist incident

Completing a risk assessment can be done in a few ways. A risk assessment can be a brief document or it can be detailed and long depending on how much information and data is included. An outline is always a good place to start and for the most part this has already been done in Chapter 5 of the NFPA 1851 standard. From here, fire departments can do everything on their own or they can look at sample risk assessments provided by TCFP or done by neighboring departments or large metro departments. Professional safety consultants are also resources that help complete risk assessments.

The key is to do a risk assessment. By doing a risk assessment, the department may uncover previously unknown risks to its fire fighters and it should result in a more rigorous and objective determination of the performance requirements of the PPE being selected for purchase by the fire department. The risk assessment will help reduce liabilities to the department and those involved in specifying PPE if an accident, injury or line of duty death occurs.

What is a risk?

Risk is the chance, high or low, of someone or something being harmed by a hazard and how serious the harm could be.

What is a hazard?

A hazard may be considered anything that could cause harm that may be encountered at the scene of an emergency incident.

When do I have to complete the risk assessment?

The risk assessment must be performed either (1) prior to the selection of new structural and/or proximity fire fighting ensembles or (2) no later than February 28, 2017, whichever occurs first.

Prior to February 28, 2017:

- Completion of the risk assessment is necessary for purchase of ensembles if a department is considering switching from proximity to structural
- Completion of the risk assessment is not necessary when individual PPE ensemble elements are being replaced (ex: gloves, helmets, etc.).

What should I include in my risk assessment?

At a minimum you should include the elements listed in Chapter 5.1.2 of NFPA 1851, 2014 Edition.

Is there a template that I can follow to do my risk assessment?

Yes, there are suggested but not required templates located in the information packet and under the compliance tab on the TCFP website.

Is the risk assessment a legal requirement?

Yes, the risk assessment is required by the adoption of the NFPA standard in Texas Government Code §419.040 (b) and in Texas Administrative Code §435.1(2).

Who is responsible for approving the risk assessment for the fire department?

The Head of Department is responsible for approving the department's risk assessment.

Do I need to use a consultant?

No. Use of a consultant is at the discretion of Head of Department.

Who do I involve in a risk assessment?

A Head of Department has the discretion to involve anyone necessary to complete the risk assessment.

Do I need to sign my risk assessment?

Although a signature is not necessary on the document, the fire department must be able to verify that the risk assessment has been approved by the Head of Department.

How long do I need to keep my risk assessment?

The risk assessment shall be kept indefinitely and updated and revised when necessary.

Does the TCFP conduct risk assessment for regulated agencies?

No. The TCFP does not conduct risk assessments for agencies.

What is my Compliance Officer's role with the risk assessment?

The Compliance Officer will verify that your agency is in compliance with the risk assessment requirements by reviewing the department's appropriate standard operating procedure and the reviewing the risk assessment as needed.

How and where should the risk assessment be reflected in my department's SOP's?

- Per Texas Administrative Code §435.1(3), regulated fire departments are to maintain an SOP regarding the use, selection, care, and maintenance of protective clothing worn by fire fighting personnel. The purpose of the risk assessment is to justify the department's decisions regarding the selection of protective clothing for its personnel, and should be reflected in this SOP.
- Texas Administrative Code, §435.15 also requires departments to develop, maintain, and use an SOP for personnel operating at emergency incidents, and the SOP is to include a limitation on operations that can be safely performed by personnel. The risk assessment will also assist the department in making decisions regarding operational limitations, particularly in light of the protective clothing being worn by personnel, and should again be reflected in this SOP.
- Texas Administrative Code, §435.11 calls for the development, maintenance, and use of an incident management system by all departments. The adopted system will, in addition to other requirements, require operations to be conducted in a manner that recognizes hazards and assists in the prevention of accidents and injuries. The risk assessment will certainly aid the department in reviewing its incident management system, and making revisions as necessary.

Risk Assessment - Selection of Structural and Proximity Protective Clothing How it Works

Audience:

The Fire Chief or Head of Department of all TCFP regulated fire departments.

Objective:

Regulated fire departments must comply with:

1. Texas Government Code §419.027 – Biennial Inspections
2. Texas Government Code §419.040 (c) – SOP pertaining to the proper use, selection, care, and maintenance of all of its protective clothing.
3. Texas Government Code §419.044 – SOP pertaining to conducting operations in a manner that recognizes hazards and prevents accidents and injuries.
4. Texas Government Code §419.046 – SOP pertaining to proper training and use of SOPs for personnel operating at emergency incidents.
5. Texas Administrative Code §435.1 – Protective Clothing
6. NFPA 1851 (2014) – Chapter 5 Selection, 5.1.1 & 5.1.2 Risk Assessment

Requirement:

1. Fire departments shall purchase, provide and maintain protective clothing for all fire protection personnel.
2. Fire departments shall ensure that protective clothing used by fire protection personnel assigned to fire suppression duties comply with the adopted NFPA standards.
3. Fire departments shall maintain and provide upon request an SOP that complies with the NFPA standard for the selection, care, and maintenance of structural and proximity protective clothing, an SOP that complies with conducting operations that recognize hazards and prevent accidents, and injuries, and a SOP that complies with proper training and use of SOPs with conducting operations.
4. Prior to the selection of structural firefighting ensembles in lieu of proximity gear and not later than February 28, 2017 fire departments shall perform a risk assessment compliant with NFPA 1851.

Plan:

Fire departments with personnel assigned to fire suppression duties shall perform a risk assessment prior to the selection of either structural or proximity fire fighting ensembles. Fire departments shall develop and maintain an SOP pertaining to the proper use, selection, care and maintenance of all of its protective clothing, an SOP that pertains to conducting operations in a manner that recognizes hazards and prevents accidents and injuries, and an SOP pertaining to proper training and use of SOPs for personnel operating at emergency incidents. The SOPs shall utilize the risk assessment for determining which specific fire fighting ensembles are selected. To ensure departments meet these minimum requirements TCFP conducts biennial inspections of all regulated departments.

How It Works:

Upon receiving a biennial Compliance Inspection or other inspection as permitted by statute, a fire department shall make available to the inspector the required SOPs. The inspector will review the SOP to ensure it confirms the risk assessment was utilized by the department to justify the selection of the particular protective ensemble. The inspector may request to review the risk assessment to ensure compliance with NFPA 1851.

Results:

Fire departments reduce the health and safety risks of their fire protection personnel by conducting the risk assessment to determine the best protective ensemble for the fire fighting duties they perform. By developing and maintaining standard operating procedures in compliance with TCFP inspection requirements, fire departments ensure that all the fire protection personnel in the department follow the minimum safety standards adopted by state law. By meeting these objectives all regulated fire departments will assist TCFP compliance officers to consistently and expeditiously conduct fair and objective inspections to support the safety of fire protection personnel in Texas.

Next Steps:

All regulated fire departments shall conduct the risk assessment and update the SOPs with the results as relates to the selection of new structural and proximity fire fighting ensembles not later than February 28, 2017.

PPE Risk Assessment Template #1

Type of duties performed:

- Standard Structural Fire Fighting Duties
- Non-Standard Fire Fighting Duties (Proximity or Entry Type Duties)

Type of PPE Needed: Structural-Yes or No Proximity-Yes or No

Frequency of use of ensemble elements:

- Low Frequency Use (Standard Replacement Cycle)
- Moderate Frequency Use (Moderate Replacement Cycle)
- High Frequency Use (More Frequent Replacement Cycle Required)

Type of PPE Needed: Structural-Yes or No Proximity-Yes or No

Organization's experiences:

PPE Performance at Incidents: Example: structural fires, aircraft crash fires, flammable liquid fires, brush or grass fires.

- Does Not Meet Department Needs - Frequent PPE Failure
- Meets Department Needs - Infrequent PPE Failure
- Exceeds Department Needs - No PPE Failure

Type of PPE Needed: Structural-Yes or No Proximity-Yes or No

Incident Operations:

- Basic Structural
- Wildland
- EMS
- Proximity/Entry

Type of PPE Needed: Structural-Yes or No Proximity-Yes or No

Geographic location and climate:

- High Heat/ High Humidity * High Heat/Low Humidity
- Moderate Heat/High Humidity *Moderate Heat/Low Humidity
- High Cold/Low Humidity *High Cold/High Humidity

Type of PPE Needed: Structural-Yes or No Proximity-Yes or No

Specific physical area of operation:

- Exterior Operations
- Interior Operations
- Proximity/Entry Operations

Type of PPE Needed: Structural-Yes or No Proximity-Yes or No

Likelihood of or response to CBRN terrorism incident:

- High
- Moderate
- Low

Type of PPE Needed: Structural-Yes or No Proximity-Yes or No

Circle PPE Determined from Assessment

- NFPA 1971 Current Edition Structural Compliant PPE Determined
 - NFPA 1971 Current Edition Proximity Compliant PPE Determined
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NFPA 1971, have been reviewed before purchase of protective clothing. All protective clothing issued to members of the _____ FD shall be compliant with the minimum standards found in NFPA 1971.

All ensemble elements considered for purchase have been evaluated for comparative strengths and weaknesses. The interface of all ensemble elements and equipment utilized by the department are considered for proper fit and function.

PPE Risk Assessment Template #2

<p>Type of duties performed:</p> <ul style="list-style-type: none"> ▪ Standard Structural Fire Fighting Duties ▪ Non-Standard Firefighting Duties (Proximity or Entry Type Duties) <p style="text-align: center;">Type of PPE Needed:</p> <p>Structural-Yes or No</p> <p>Proximity-Yes or No</p>	<p>Specific physical area of operation:</p> <ul style="list-style-type: none"> ▪ Exterior Operations ▪ Interior Operations ▪ Proximity/Entry Operations <p style="text-align: center;">Type of PPE Needed:</p> <p>Structural-Yes or No</p> <p>Proximity-Yes or No</p>	<p>Organization's experiences:</p> <p>PPE performance at structural fires.</p> <ul style="list-style-type: none"> ▪ Frequent PPE Failure ▪ Infrequent PPE Failure ▪ No PPE Failure <p>PPE performance at aircraft crash fires.</p> <ul style="list-style-type: none"> ▪ Frequent PPE Failure ▪ Infrequent PPE Failure ▪ No PPE Failure <p>PPE performance at flammable liquid fires.</p> <ul style="list-style-type: none"> ▪ Frequent PPE Failure ▪ Infrequent PPE Failure ▪ No PPE Failure <p>PPE performance at brush / grass fires.</p> <ul style="list-style-type: none"> ▪ Frequent PPE Failure ▪ Infrequent PPE Failure ▪ No PPE Failure <p>Other type incident experiences.</p> <p style="text-align: center;">Type of PPE Needed:</p> <p>Structural-Yes or No</p> <p>Proximity-Yes or No</p>
<p>Incident Operations:</p> <ul style="list-style-type: none"> ▪ Basic Structural ▪ Wildland ▪ EMS ▪ Proximity/Entry <p style="text-align: center;">Type of PPE Needed:</p> <p>Structural-Yes or No</p> <p>Proximity-Yes or No</p>	<p>Geographic location and climate:</p> <ul style="list-style-type: none"> ▪ High Heat/ High Humidity ▪ High Heat/Low Humidity ▪ Moderate Heat/High Humidity ▪ Moderate Heat/Low Humidity ▪ High Cold/Low Humidity ▪ High Cold/High Humidity <p style="text-align: center;">Type of PPE Needed:</p> <p>Structural-Yes or No</p> <p>Proximity-Yes or No</p>	<p>Likelihood of or response to CBRN terrorism incident:</p> <ul style="list-style-type: none"> ▪ High ▪ Moderate ▪ Low <p style="text-align: center;">Type of PPE Needed:</p> <p>Structural-Yes or No</p> <p>Proximity-Yes or No</p>
<p>Frequency of use of ensemble elements:</p> <ul style="list-style-type: none"> ▪ Low Frequency Use (Standard Replacement Cycle) ▪ Moderate Frequency Use (Moderate Replacement Cycle) ▪ High Frequency Use (More Frequent Replacement Cycle Required) <p style="text-align: center;">Type of PPE Needed:</p> <p>Structural-Yes or No</p> <p>Proximity-Yes or No</p>	<p style="text-align: center;">Circle PPE Determined from Assessment</p> <ul style="list-style-type: none"> ○ NFPA 1971 Current Edition Structural Compliant PPE Determined ○ NFPA 1971 Current Edition Proximity Compliant PPE Determined 	<p>Additional Comments/Considerations::</p>

NFPA 1971 has been reviewed before purchase of protective clothing. All protective clothing issued to members of the _____ FD shall be compliant with the minimum standards found in NFPA 1971.

All ensemble elements considered for purchase have been evaluated for comparative strengths and weaknesses. The interface of all ensemble elements and equipment utilized by the department are considered for proper fit and function.

PPE Risk Assessment Template #3

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, 2014 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) Frequency of use of ensemble elements
- (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

PPE Risk Assessment Template

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

PPE Risk Assessment Template

Frequency of Use of Ensemble Elements

- Number of and type of fire incidents
- Number of and type of rescue/EMS calls
- Total # of calls
- Percentage of Fire Calls
- Percentage of non-fire calls

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

PPE Risk Assessment Template

Incident Operations

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

Fire Fighting

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

Rescue/EMS

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

Risk Assessment Formula:

$$R=L \times S$$

- 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:

PPE Risk Assessment Template

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
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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
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Biological/Chemical Hazards

Liquid				CBRN
Gas				CBRN
Biological Toxins				CBRN
Biological Allergens				CBRN
Airborne Pathogens				CBRN

Physiological Heat Stress

Physiological Heat Stress				High THL
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PPE Risk Assessment Template

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

PPE Risk Assessment Template

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