

**REDUCING
BACTERIAL
CONTAMINATION**

(and BURN INJURY)

THROUGH THE USE OF

**EFFECTIVE
PROTECTIVE APPAREL**

**A GUIDE FOR
COMMERCIAL FOODSERVICE
OPERATORS**



**Reprint of portions of a Seminar delivered by
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To Risk & Safety Directors
of the National Restaurant Association**

I. PROTECTIVE APPAREL AS A SOURCE OF BACTERIAL CONTAMINATION

Most foodservice operators and regulatory agencies view kitchen protective apparel (oven mitts and gloves, aprons, etc.) as products which perform one service alone: to reduce burn injury to foodservice employees. It is true that this remains the *primary* function of protective apparel, and a great deal of information has been developed over the past fifteen years concerning burn injury in commercial foodservice and methods of reducing those injuries. This presentation touches briefly on those developments in Sections III and IV.

Perhaps surprisingly though, a significant correlation has also been established between burn injury prevention and bacterial contamination. Few have ever considered the OVEN MITT as a major source of cross-contamination in the commercial kitchen. Health Inspectors often review kitchens for safe equipment and practices, but dismiss the oven mitt as a burn-preventive instrument, never considering its role in the spread of bacterial contamination.

In fact, the oven mitt has been identified as a significant source of cross-contamination not just at one, but at two separate and equally critical levels; the mitt's exterior and its interior.

The **National Sanitation Foundation** recognized the health risks of the Oven Mitt in 1996 when, for the first time ever, it created a Protocol for Oven Mitts (NSF Protocol #96/011/480/2480).

Established in Ann Arbor, Michigan in 1944 as an agency dedicated to developing uniform public health safety standards in the restaurant and foodservice industries, the NSF is an independent, not-for-profit organization which maintains an exemplary reputation for integrity, objectivity, credibility and leadership in environmental and public health safety by developing and promoting education, standards and conformity within the industry. This organization is indeed the "watchdog" of the commercial foodservice industry. Through its Certification program, the NSF establishes and enforces standards for equipment manufactures, food handlers and restaurateurs. The round blue NSF Certification mark is the most respected mark in public and health safety in the world. In order to receive NSF Certification, manufacturers and their products must meet rigorous standards in cleanliness and performance. (visit the NSF website at www.nsf.org)

The NSF found it necessary to create a Protocol that "evaluates oven mitts for their suitability for use in commercial foodservice establishments. Requirements for all mitts (both Class I and Class II) include durability, heat resistance, liquid/steam penetration and cleanability. Class II oven mitts (intended for direct flame application) have additional requirements for flame resistance and thermal protection".

Now foodservice operators have alternatives to poorly constructed and, in fact, dangerous "commodity" protective apparel which create multiple hazards. "Commodity protective

apparel” is a generic term which refers to common cotton terrycloth or quilted cotton oven mitts which today constitutes the norm within the industry. It is worth noting that the foodservice industry is the largest private-sector employer in the country, and yet it operates under safety standards that are antiquated and in some cases deficient when it comes to Effective Protective Apparel.

On their exterior, commodity oven mitts pose a hazard of contamination by food matter which penetrates the outer fabric. Contamination is established by direct contact with materials such as raw or cooked meats or vegetables, fats, greases, oils and related organics that harbor and proliferate bacterial growth. Once such organic materials penetrate the fabric of the mitt, they are almost impossible to extricate. This is especially true because commodity protective apparel is too flimsy to survive laundering and therefore is almost never washed. The same contaminated mitt is then used to perform subsequent operations in the kitchen. This is cross-contamination.

On their interior, oven mitts pose a second hazard of contamination by any organic substance which has come into contact with the wearer’s hands and then transmitted to the inside of the mitt. Foodservice operators may be instructed and smart enough to wash their hands *before* handling food, but few if any ever think of washing their hands *after* handling food before using an oven mitt. Any substance on the surface of the hand is delivered to the interior of the mitt and then to the hands of subsequent wearers and of course on to other objects in the kitchen including food. This problem is exacerbated by natural oils and perspiration emanating from the hands of the wearer.

II. NSF CERTIFIED PROTECTIVE APPAREL and BACTERIAL CONTAMINATION

Unlike commodity oven mitts which *create* health hazards, NSF Certified Protective Apparel actually *reduces* health hazards due to the performance characteristics required for Certification. Those performance characteristics are a result of the design and materials used in NSF Certified Protective Apparel.

1. Liquid-Vapor Barrier

The first criterion established by NSF is that the Effective Protective Apparel must contain an effective Liquid-Vapor Barrier which prevents the penetration of hot liquids such as boiling water, hot oil or hot grease as well as penetration of steam. Such a barrier was originally deemed necessary as a protective barrier against sources of many kitchen burns. However, it was immediately recognized that the liquid-vapor barrier actually serves to impart critical sanitation characteristics to the product.

Commodity protective apparel does not fail because it wears out; it fails by its very design. The products’ failures to protect against burns will be summarized in Sections III and IV, but from a sanitation standpoint, it is important to understand that commodity products do not contain an effective liquid-vapor barrier. Because of this, the products cannot be used wet and therefore cannot be washed while in service. (In fact, because of

their flimsy construction, they generally cannot be washed at all.) They therefore become havens of bacteria both on the exterior and on the interior.

2. Washability

Due to the presence of a liquid-vapor barrier, NSF-Certified Products can be used wet and therefore can be washed regularly. Most importantly, they can be washed at the sink with antibacterial soap during the shift and remain in service. They can also be washed in the dishwasher or in the washer/dryer. They are constructed in a way that survives multiple washes; in fact, for certification, NSF stipulates that a product demonstrate the ability to withstand a minimum of 25 commercial machine launderings.

3. Cleanability

Simply surviving washing is not sufficient for the NSF. More importantly, the product must demonstrate the ability to become *clean* and *sanitary* when washed. For certification, the NSF therefore requires that, after intentionally exposing the mitt to spiked levels of E. Coli and S. Aureus, contamination must be reduced by at least 99% when machine washed one time (according to AATCC Standard 135). A removable liner (either washable or disposable) should be used to enhance the ease of cleaning the inside.

4. Durability

The nature of the liquid-vapor barrier is also important. While a simple layer of vinyl or neoprene may in theory serve as a barrier, the material will be exposed to oven-range temperatures. If the material melts, it will not only fail as a liquid-vapor barrier, it could release dangerous toxins such as sulfur oxide, cyanide and other poisonous chemicals which may be inhaled by employees or worse, may enter food being served. For this reason, the NSF stipulates a liquid-vapor barrier which will not melt, burn, turn brittle/crack or break down at a molecular level when exposed to 500° F. for 24 continuous hours.

The above criteria of the NSF's Protocol relate directly to **SANITATION** of the product. Understanding these principles leads one to recognize the critical role protective apparel plays in Food Safety and the role of the oven mitt in the cycle of bacterial contamination. Of course, this is —theoretically—only the secondary role of protective apparel, the primary function being burn prevention.

For Class I (not flame-resistant) Certification, two additional criteria comprise the Protocol which are important to understand, for together they outline the elements necessary for “Effective Protective Apparel” in a no-flame environment:

5. Conductive Heat Test

For Certification, after both wet and dry conditioning, mitts must have a second-degree burn time of not less than 26 seconds and a pain time of not less than 15 seconds when tested according to NFPA—1971 (1997) as modified. In other words, they must exhibit demonstrable protection against burns.

6. Whole-Mitt Heat Resistance

For Certification, the mitt shall not separate, melt, drip, crack and shall not shrink more than five percent in length or width, after dry conditioning only, when tested according to NFPA—1971 (1997) as modified.

For Class II (flame-resistant) Certification, two further criteria comprise the Protocol which are important to understand, for together they outline the elements necessary for “Effective Protective Apparel” in an environment that includes open flame:

7. Flame Resistance

Samples of the outer shell fabric and the liquid-vapor barrier of the mitt shall have an average “after-flame” of not longer than 2 seconds, an average “char length” of not more than 10.2 cm (4 inches) and shall not melt or drip when tested according to NFPA—1971 (1997), Section 6.4.

8. Thermal Protective Performance - Flame

Samples of the mitt shall have an average Thermal Protective Performance (TPP) rating of not less than 35.0, after wet and dry conditioning according to ASTM F 1060, and NFPA 1971 (1997), Section 6.10, as modified.

When these criteria are viewed as a whole, it becomes clear that, in order to be effective, an oven mitt must be far more than the simple, failed products which the industry has, unfortunately, accepted.

In order to be Effective, Protective Apparel must be comprised of a system of elements which, when applied together, provide real and measurable burn protection and sanitation.

III. PROTECTIVE APPAREL AS A METHOD FOR BURN INJURY PREVENTION

- **Causes of burns:**

There are many types of kitchen burns emanating from many different sources. Each must be examined and understood.

—82 % of “reported” burns are caused by hot liquid, steam, hot oil, hot grease or direct contact with open flame.

—16% of reported burns are caused by direct contact with hot surfaces.

With 82% of burns caused by hot liquid, grease, steam or flame and 16% due to contact, fully 98% of reported burns are considered to be identifiable and preventable. The remaining 2% of reported burns are defined as “unpreventable” regardless of measures taken.

- **Sources of burns:**

Hot Liquids—boiling water, soups and stocks, coffee, tea, dishwasher, etc.

Steam—hot contact with wet towels or other wet apparel lacking an effective vapor barrier, steam ovens, combi ovens, stock pots, dishwashers and so forth.

Hot Oil—fryer operation, oil filtration, sauté and other pan frying, etc.

Hot Grease—throughout the kitchen

Open Flame—broilers, barbecues, char grilles, rotisseries and other cookware.

Hot Surfaces—ovens, broilers, rotisseries, grills, stock pots, tilting skillets, etc.

Cold—freezers, frozen food or other extremely cold items.

Chemicals—Cleaning compounds, disinfectants, acids, etc.

- **Impact of burns:**

Burn injuries slow employee performance, lower employee morale and cost the employer money in lost productivity, down time, Worker's Comp payouts, elevated insurance premiums, perhaps even legal fees and litigation awards. In the United States, someone is burned every 17 seconds. The typical kitchen burn is second degree and requires from 14 to 17 days to heal. The average Worker's Comp claim now costs the employer over \$1,700. Even minor, unreported burns produce an impact. The fact that unreported burns occur must serve as a red flag to operators that conditions exist which will eventually allow major, perhaps even catastrophic burns. It is a sad fact that the vast majority of foodservice operators are largely unaware of the extent and costs of burn injuries within their operations, alleging that they do not have a burn injury problem. Yet, the National Restaurant Association identifies the two leading injuries in commercial foodservice as cuts and burns.

- **Reported vs Unreported Burns:**

Over 90% of burns go unreported. Only 10% of all burns are reported and in most cases, these are the serious injuries that are costliest in time and money. In order to successfully combat burn injury, ALL burns must be recognized and reckoned, not just the severe and catastrophic burns that get reported.

The philosophical question “if a tree falls in the forest and nobody is there to hear it, does it make any noise?” is well-known. Perhaps the most philosophical of answers is “NO”, but most people would agree that the true answer is “YES”.

Unreported burns are very similar in nature. Because many burns are not reported does not mean they are not felt. Unreported burns make themselves “heard” all too often only when they become catastrophic injuries.

Until ALL burns are acknowledged—not just the reported burns or catastrophic burns—the elimination of “ALL” burns (98%) cannot be pursued. Addressing small and incidental burns—which are mostly unreported burns—is the first step in eliminating reported and catastrophic burns.

Information on unreported burns is difficult to obtain but is nonetheless available. The source of this information is usually the employee. Employees often hesitate to disclose facts about burns, fearful of being accused of carelessness or inefficiency. In many cases,

they are more comfortable talking with a third party rather than management. In most cases, the information obtained is valuable.

IV. ELEMENTS OF BURN INJURY REDUCTION

- **Identifying *practices* which mitigate and prevent burn injuries**

Prescriptions for safe practice do exist and include the following:

Developing an understanding of the causes and sources of burns. Only with this clear understanding can the employee be vigilant against identified risks.

Promoting attention and awareness in the workplace. Employee carelessness poses a major cause of burn injury. Repetitive, mundane tasks lull employees into a complacent state. Employees must be trained to remain attentive to their functions. Safe practice must be part of the workplace culture and should be rewarded.

- **Identifying *practices* which mitigate and prevent burn injuries:**

Effective Protective Apparel vs. Ineffective Apparel

V. SUMMARY OF EFFECTIVE PROTECTIVE APPAREL

A. Definition

Effective Protective Apparel is defined as protective products

- i. which incorporate an effective *liquid and vapor barrier* material that will not burn, melt or turn brittle/crack when exposed to oven-range temperatures. The liquid-vapor barrier must be able to withstand extended exposure to oven temperatures without breaking down at a molecular level which could cause emission of noxious fumes;
- ii. as a result of the liquid-vapor barrier, these products must protect *wet or dry*;
- iii. as a result of the product's ability to protect wet or dry, the product must be washable, which allows it to be maintained in a constantly sanitary condition; these products must resist heat and —when necessary—exposure to open flame as commonly found in foodservice without breaking down or falling apart (failing);
- iv. the products must prove durable to offer the operator an appreciable return on investment;
- v. Protective Apparel is further qualified as “effective” when Certified by recognized third-party professional certifying agencies, i.e. NSF.

B. Critical Comparison of Effective vs Ineffective Apparel

Ineffective apparel remains the standard of the commercial foodservice industry. These commodity products, usually quilted or simple terrycloth cotton, are porous which means boiling water, steam, hot oil and hot grease penetrate easily. They therefore do not protect against those ubiquitous risks. Products burn up, fall apart and cannot be washed. The latter fact means they become particularly dangerous havens of bacteria, regular transfer points of cross-contamination. Because they don't endure in the demanding commercial environment, they are thrown away/replaced regularly at great cost to the operator. Worst of all, these products fail miserably when wet—and everything in the commercial kitchen becomes wet—which means they do not fail only after long use; they fail immediately *by design*.

Effective Apparel on the other hand assures reliable performance wet or dry by virtue of its liquid-vapor barrier. In addition, Effective Apparel protects against open flame when necessary. In other words, Effective Protective Apparel protects against all known types and sources of burn injury. It is washable at all times to assure sanitation and is durable to assure an appreciable return on investment. The difference in performance between ineffective vs. effective protective apparel is enormous and constitutes one of the most critical factors contributing to food safety and mitigating risk of bacterial contamination as well as preventing burn injury.

C. Benefits

Effective Protective Apparel will deliver the following benefits to foodservice operators:

- **Sanitation**

Effective Protective Apparel must be able to mitigate bacterial contamination. Products must be constructed in a manner which allows washing in the dish machine, in a washing machine/dryer and most importantly, at the sink (whenever needed throughout the shift), all the while remaining in service. This supports management's responsibility of maintaining a sanitary environment. Conversely, ineffective apparel actually contributes to health risks as a focal point of cross-contamination, as these inferior products cannot be washed and become a haven of bacteria and disease.

- **Safety**

By design, Effective Protective Apparel must mitigate burn injuries by delivering the highest level of *safety* available in the industry. These products must actually do what they were designed to do: protect against all foreseeable types of burn risk in the commercial kitchen regardless of existing conditions (i.e., wet or dry, flame or no flame, etc.)

- **Savings**

Although not directly applicable to Employee Safety initiatives, it is important to note that, due to its construction, Effective Protective Apparel is many times more durable and lasts far longer than commodity products and therefore decreases operator expenditures. This is important because if not cost-effective, operators will not be inclined to adapt

Effective Protective Apparel and the benefits these advanced products offer will not be obtained. It is noteworthy that, in one recent case, a major national chain reported savings of 400% in only 15 months after adapting Effective Protective Apparel. To arrive at this figure, the chain only calculated replacement cost of the apparel; it did *not* factor reductions in down time, lost productivity, Worker's Comp payouts, litigation and other costs related to burn injury which would have yielded evidence of an even greater rate of savings.

- **Certification**

Effective Protective Apparel can be identified through the findings of independent, third-party organizations which test this type of product for safety and performance. The NSF (National Safety Foundation) is the leading independent certifying agency for commercial foodservice.

SUMMARY

Each foodservice operation must be evaluated in terms of its cooking procedures, equipment, temperatures, management and employee work practices (workplace culture), management and employee education, burn injury history and other elements. Appropriate procedural, equipment and apparel modifications must be introduced in order to approach the ultimate goal of mitigation of risks of bacterial cross-contamination as well as 98% burn injury reduction.

INSIST ON NSF-CERTIFIED PROTECTIVE APPAREL TO SUPPORT SANITATION AND REDUCE BURNS IN ALL COMMERCIAL FOODSERVICE OPERATIONS!

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Tucker Safety Products has been a pioneer and leader in burn injury reduction for more than fifteen years. Tucker Safety Products has been instrumental in the development of the SafeStep™ Evaluation and Injury Prevention Program which educates foodservice operators in effective methods of employee and customer safety. Tucker Safety Products performs professional evaluations of commercial foodservice operations, often on a no-cost basis. For further information, contact Tucker Safety Products.

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