

HexArmor®

# Hand Safety

## HANDBOOK

SAFETY + REDEFINED™

# Hand Safety Matters

Workplace hand injuries are a leading cause of lost workdays and emergency room visits around the globe. From minor to life-threatening and everything in between, these injuries can be costly to employers and life-changing for employees.

In this booklet you will find:

- An overview of the current state of industrial hand safety, including facts and statistics about hand injuries in the workplace
- Considerations for implementing or revitalizing a hand safety program in your workplace
- Resources for gaining further insight on hand safety, including websites, forms, checklists, etc.



# Hand Injuries in the Workplace

## Prevalent and Preventable

Besides the obvious physical harm to workers, hand injuries also take a financial toll. According to the Bureau of Labor Statistics and the National Safety Council, in 2012 U.S. workers sustained about 186,830 lost-time hand injuries. The cost per injury, including medical and indemnity, was \$21,918. Hand injuries across all industries result in an average five to 11 days away from work, not counting rehabilitation. Additionally, according to the U.S. Centers for Disease Control, hand injuries account for 1,080,000 emergency room visits by workers per year.

The scenario also plays out internationally. For example, hand injuries are the second most reported lost-time injury in the Queensland, Australia, mining industry, after back injuries. Approximately 16% of all LTIs reported in 2007-2012 were hand injuries.

In these figures alone, the negative impact of hand injuries is apparent. Yet most hand injuries are preventable. While glove use is not the only way to protect against hand injuries, it is a crucial component of any safety program and has been proven to reduce the risk of injury by 60%. Introduction of and compliance with a hand personal protection equipment (PPE) program can go a long way toward creating a safer and more productive work environment.

Finally, consider these statistics:

- 70% of workers who sustained hand injuries in the workplace were not wearing gloves
- The remaining 30% of those injured wore gloves, but they were inadequate, damaged, or wrong for the type of hazard present

Clearly, there is a widespread need to improve hand protection – and hand safety – in the workplace.

## Costs of Hand Injuries

The Occupational Safety and Health Administration (OSHA) estimates that the financial cost of hand injuries is more than \$300 million per year in lost production time, medical expenses, and worker compensation. A two-year study in the Netherlands showed that hand and wrist injuries are the most prevalent injuries in the workplace, accounting for 20% of hospital visits. Hand and wrist injuries pose the greatest financial burden, with annual expenses totaling \$740 million USD.

## Causes of Hand Injuries

Workplace hazards can be divided into four categories:

- **Mechanical**, including cutting surfaces, sharp points, pinch points, moving parts, and vibrating equipment
- **Personal**, such as jewelry, loose-fitting clothing, and improper or defective personal protective equipment
- **Contact**, such as hot or cold surfaces, chemicals, solvents or liquids, and electrical currents
- **Housekeeping**, including the improper storage of equipment and materials or slippery conditions

Hand injuries are associated with each of these categories. Causes of individual hand injuries can be a direct result of, for example, using a sharp tool or operating machinery. Indirect and sometimes more common causes include carelessness, boredom, or disregard of safety procedures. Hand injuries can range from minor to severe, most often involving cuts to fingers and joint dislocations.

### Common Direct Causes:

- Using a sharp tool
- Operating powered machinery
- Using powered hand-held tools or appliances
- Preparing food with a knife or other appliance

### Common Indirect Causes:

- Carelessness
- Lack of awareness
- Boredom
- Disregard for safety procedures
- Distractions
- Using incorrect/homemade tools
- Not doing a safety check before starting work

## Causes of Hand Injuries, U.S.

### 47% Cut and Puncture

These account for the highest number of reported hand injuries, according to the U.S. Bureau of Labor Statistics. In the Ontario, Canada, mining industry, approximately 50% of all hand injuries are cut or puncture wounds.

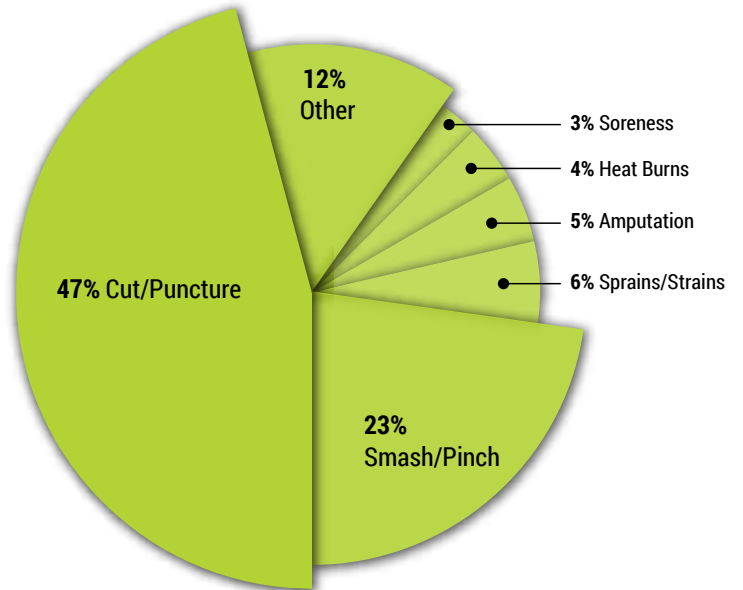
- Cuts and abrasions can result from handling materials such as glass, metal, or wood. They can occur using box cutters, knives, punch presses, and other machinery. Abrasions come from diverse sources such as handling slings and wire rope, knives, nails, staples, scrap metal, sharp tools, steel shims, and metal burrs.
- Punctures can be large wounds caused by wood splinters or metal burrs, smaller scale such as from cable wire or shards of glass, or tiny “needle sticks” from 25- to 31-gauge needles found in medical recycle waste. Sometimes leaving little visual evidence, punctures often are under-treated or neglected, which can lead to infection. Additionally, lacerations often start as punctures with the hazard dragging and then tearing the skin.

### 23% Smash and Pinch

Handling heavy tools, materials, and other objects can result in smash and pinch injuries. According to a U.S. oil and gas industry study, smash and contusion injuries make up more than half of all hand injuries on drill sites. In the mining and oil and gas industries, blunt force impacts, especially to the back of the hand, are very common.

### 12% Other

- **Thermal injuries:** Cold environments take their toll in multiple ways, including air temperature, wind speed, and wetness. The hands have a higher surface area to volume ratio than other parts of the body, so they lose heat more rapidly, resulting in freeze injuries.
- **Chemical exposure:** Chemicals can cause burns and other long-term health effects when they enter the body through the skin. These substances can be in the form of liquids, dusts, vapors, gases, or even fibers produced in a process.



[nationalsafety.wordpress.com/category/hand-protection](http://nationalsafety.wordpress.com/category/hand-protection)

## OSHA Regulations

OSHA regulations require employers to protect workers from workplace hazards such as machines, work procedures, and hazardous substances that can cause injury. OSHA standard 29 CFR 1910.132 requires employers to assess the workplace to determine if hazards are present, or are likely to be present, to make necessary the use of PPE. Specifically, the OSHA hand protection standard mandates that employers select and require employees to use appropriate hand protection when employees' hands are exposed to the following hazards:

- Skin absorption of harmful substances
- Severe cuts or lacerations
- Severe abrasions or punctures
- Chemical burns or thermal burns
- Harmful temperature extremes

Further, employers must institute all possible engineering and work-practice controls to reduce or eliminate hazards before using PPE to protect against them.

# Hand Protection Standards

## **ANSI/ISEA 105**

American National Standards Institute (ANSI) and International Safety Equipment Association (ISEA) developed the first American national standard for glove selection criteria, ANSI/ISEA 105. It specifies test methods to be used with results reported on a numeric scale for manufacturers to rate their products against certain contaminants and exposures. Hazards included in the ANSI/ISEA 105 standard are: cut, puncture, and abrasion resistance; chemical permeation and degradation; detection of holes; vibration reduction; and heat and flame resistance. The ANSI/ISEA 105 standard is not required in order to sell products in the United States or internationally.

## **EN 388**

The European Union developed a standardized system of laws that require anyone wanting to sell products in Europe to attain CE compliance/markings.

A CE compliance/markings requires testing at an accredited lab, with official lab results, by a certifying body. For protective clothing, the EN 388 is the standard used to test the mechanical properties of a product: abrasion-, cut-, tear-, and puncture-resistance. The EN 388 requires the use of specific test methods and reports results on a 1-4 or 1-5 scale.

PPE tested using the EN 388 standard are marked with a “Conformité Européenne” (CE) label and four numbers corresponding to the scores received in each of the mechanical tests.

## **Test Method Organizations**

### **ASTM**

American Society for Testing and Materials was founded in 1898 to address the issue of manufacturers encountering numerous quality problems due to inferior materials provided by suppliers. In its bylaws, the ASTM is dedicated to “the development and unification of standard methods of testing.” ASTM established the testing method ASTM F1790-97 and later ASTM F1790-05, which are both referenced by ANSI/ISEA 105.

### **ISO**

The International Organization for Standardization was founded in 1947. To date it has developed over 19,000 standards covering a wide range of topics, including food safety, manufacturing, health services, production process, and computing. Its standard, ISO 13997, was published in 1999.

# Cut Resistance



Since cuts, abrasions, and punctures are the most common types of hand injuries sustained in the workplace, cut resistance is often the number-one characteristic considered in selecting hand PPE.

Types of cuts:

- **Slicing:** Caused by the sliding of the skin across a very sharp edge.
- **Abrasion:** The result of continuous or repeated rubbing. The surface may or may not be sharp or jagged.
- **Punctures or Impact Cuts:** The result of sharp or pointed objects impacting the skin as with a falling pane of glass, splinters, or sheets of metal. Cuts can also occur when a puncture enters the hand and is then dragged. Needlesticks are an increasingly common cause of puncture wounds as well.

## Cut Resistance Standards

- **ANSI/ISEA 105-2016** Standard for Glove Selection Criteria, which uses the ASTM F2992-15 test
- **ANSI/ISEA 105-2011** Standard for Glove Selection Criteria, which uses the ASTM F1790-97 or ASTM F1790-05 test
- **EN 388** European Regulatory Standard for Protective Gloves, which uses EN 388 testing, reference the Coup machine

# Cut Resistance: ANSI/ISEA

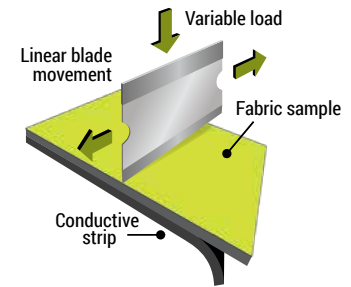
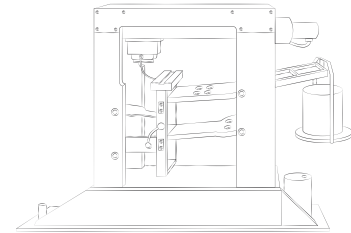
## ANSI/ISEA 105-2016 Standard for Glove Selection Criteria

The ANSI/ISEA 105-2016 standard, approved as of February 1st, 2016, has established ASTM F2992-15 as the test method for measuring cut resistance of materials used in protective clothing, including hand PPE. The standard references the Tomodynamometer (TDM) Test Method based on the ASTM F2992-15. The TDM tests the amount of weight (in grams) necessary for a blade to achieve cut-through of PPE material at the reference distance of 20mm of blade travel.

With the TDM, the test fabric receives several cuts, all in a uniform direction and length that may range in distance from 5 mm to 50mm, but 20mm is the target distance for cut-through. After each cut, a new blade is positioned in the tester and weight (in grams) is added until cut-through is achieved. Once cut-through occurs, a test range is established with several other cuts conducted using different weights. These test cuts are spaced 6mm apart on the test specimen and repeated until a total of 15 cuts are measured; 5 cuts at both extremes of the range and 5 in the middle. A calculation of the load or weight, and the distance required to cut through the fabric, illustrated on a curved line, is then conducted to determine the gram score or the weight required to achieve cut-through of the fabric at 20mm.

The standard employs a 9-level scale (expressed as A1-A9) that spans 200 grams to 6000 grams of cut resistance. The very granular rating system allows end users to precisely identify a level of cut resistance that meets a specific need.

## Tomodynamometer (TDM-100) Testing Instrument



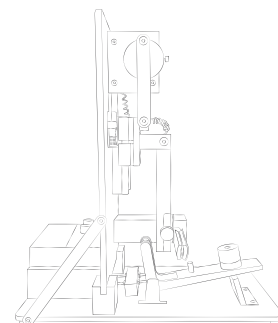
## Cut Resistance Levels, ANSI/ISEA 105-2016

Level	A1	A2	A3	A4	A5	A6	A7	A8	A9
Weight (G) needed to cut with 1" (20mm) blade travel	≥ 200 G	≥ 500 G	≥ 1000 G	≥ 1500 G	≥ 2200 G	≥ 3000 G	≥ 4000 G	≥ 5000 G	≥ 6000 G

## ANSI/ISEA 105-2011 Standard for Glove Selection Criteria

Prior to 2016, the ANSI/ISEA 105-2011 accepted the following tests methods for measuring cut resistance of hand PPE: ASTM F1790-97, which uses the Cut Protection Performance Tester (CPPT) instrument in a test to find the amount of weight, measured in grams, to achieve cut-through at the reference distance of 25mm, and ASTM F1790-05, which allows for the use of either the CPPT or the Tomodynamometer (TDM-100) testing instrument, and requires a similar cut-to-weight test with a shortened 20mm target distance. The gram results are then applied to the ANSI/ISEA 105-2011 scale to obtain a cut resistance level measured 1 to 5.

## CPPT Testing Instrument





Test data is documented in accordance with the specific test method (for example, ASTM F1790-97) on a Cut Performance Data Sheet and includes testing date, name of technician conducting the test, test fabric description, calibration, data point measurements and cut resistance level assigned in correlation with the ANSI/ISEA 105 scale.

### Cut Resistance Levels, ANSI/ISEA 105-2011

Level	1	2	3	4	5
Weight (G) needed to cut with 1" (20mm) blade travel	200-499 G	500-999 G	1000-1499 G	1500-3499 G	≥ 3500 G

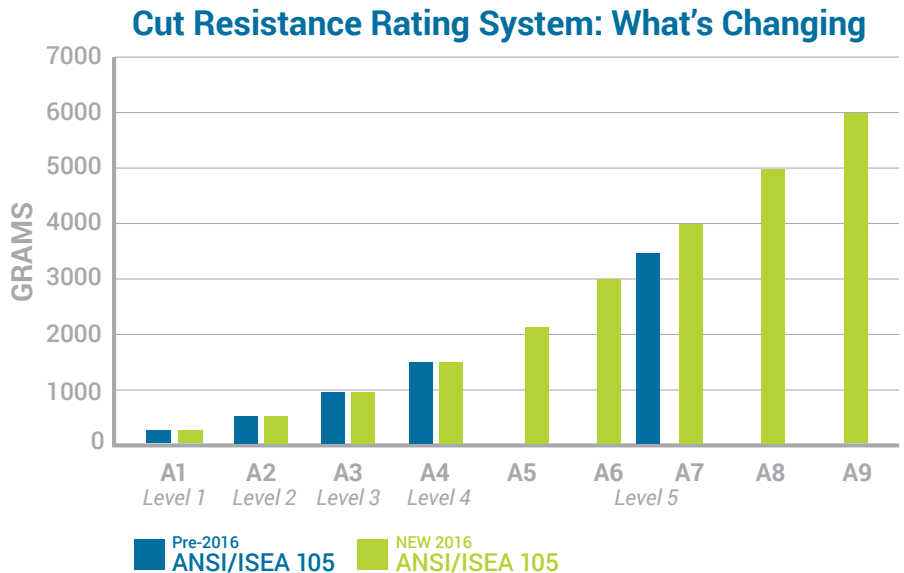
### Comparing the ANSI/ISEA 105-2011 and ANSI/ISEA 105-2016 Standards

A major difference between ANSI/ISEA 105 and ANSI/ISEA 105-2016 lies in how cut-resistance classifications are determined. In an effort to apply consistent meaning to the ratings for the end user ANSI/ISEA 105-2016 selected ASTM F2992-15 as the only accepted test method for measuring cut resistance, which uses the Tomodynamometer (TDM-100). However, the ANSI/ISEA 105 2011 version accepted the ASTM F1790 method along with its two additions: ASTM F1790-97 and ASTM F1790-05 which allows data from either of two different testing instruments: the Cut Protection Performance Tester (CPPT) or the TDM-100.

A second difference between the standards: As noted earlier, ANSI/ISEA105 measures cut resistance on a 1 to 5 point rating scale spanning from 200 grams to 3500 grams of cut resistance.

However, ANSI/ISEA 105-2016 provides an expanded 9-level cut resistance scale (A1-A9) that spans 200 grams to 6000 grams of cut resistance This addresses the gaps between cut levels found in ANSI/ISEA 105 and provides for more accurate identification of the protection offered and allows end users to more precisely identify a level of cut resistance that meets a specific need. The approach also models more closely the classification scale used in international standards.

The graph shows the expanded cut resistance levels adopted by ANSI/ISEA 105-2016.



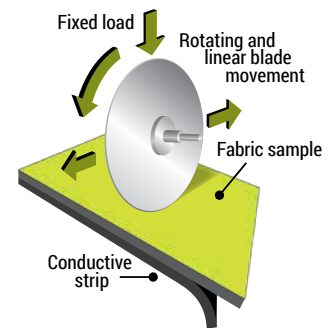
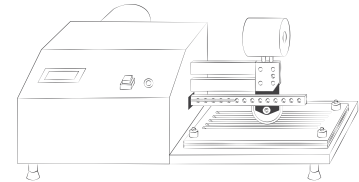
# Cut Resistance: EN388

## EN 388 European Regulatory Standard for Protective Gloves

EN 388 (CE) testing is done in accredited labs conducting the EN 388:2003 test using the Coup Test mechanism. Test fabric samples are cut by a counter-rotating circular blade that tracks back and forth under a specified load of 5n (509g). The circular blade provides a singular point of contact between the blade and the test fabric. The number of rotations required to cut through the fabric is counted. The blade cuts a control sample before and after the test fabric, and the average number of rotations for those two control samples is compared to the rotations on the test fabric to give the cut-resistance index. Five indices on each of the two samples are averaged to account for any variations in the test. The cut level index ranges from 1 (low) to 5 (high).

The EN 388 also accepts the ISO 13997 Standard test that uses a similar test method as the ASTM F1790-05. There are a few key differences; ISO 13997 requires the use of the TDM test mechanism (which operates similarly to the CPPT) whereas the ASTM F1790-05 provides an option to use either TDM or CPPT; and there is no specific report template. The ISO 13997 is suggested for high cut fabrics due to inconsistencies in the Coup Test, it is not required. If used, test scores are reported as a 4 or 5 on the 1-5 scale. No identification is used on the CE marking to indicate which test method (Coup Test or TDM) was used, however.

## Coup Test Instrument



## Comparison: EN 388 and ANSI/ISEA 105-2016 Standards

Since CE is the only certification-requiring body, safety glove manufacturers in North America can in theory produce gloves without testing for cut resistance. If they do test for cut resistance, they are able to use any of the methods discussed here. As a result, a glove manufacturer in North America could feasibly run the EN 388 Coup Test on a cut-resistant material and return results that show the material to be far more resistant to cuts than it actually is. That is why when comparing the cut resistance of two or more fabrics it is important to make sure that for all materials:

- The same test method was used
- The same type of cut tester was used

Unless these points are met, you cannot accurately compare the results.

## Comparison: EN 388 and ANSI/ISEA 105-2016 Cut Resistance Levels

The EN 388 Coup Test falls short of differentiating highly cut resistant material due to the inconsistencies in the test. Because the testing is done with a fixed weight under constantly rotating blades, the blades can dull over time when testing high cut materials, which can lead to results that are misleadingly high. In addition, because the Coup Test is recorded as an index, it is not comparable to the ANSI/ISEA 105 test results. For those reasons, as well as the continued use of two potential testing protocols in the EN 388, the ANSI/ISEA standard is preferred when evaluating PPE.

EN 388 Level	EN (Index Value)	ANSI/ISEA 105-206 Level	Weight (G) needed to cut with 1" (20mm) blade travel
0	-	A1	≥ 200
1	1.2	A2	≥ 500
2	2.5	A3	≥ 1000
3	5	A4	≥ 1500
4	10	A5	≥ 2200
5	20	A6	≥ 3000
		A7	≥ 4000
		A8	≥ 5000
		A9	≥ 6000

Converted to grams to determine approximate correlation. 101.97gF. Based on calculation G/F= .0098065N

# Puncture and Needle Resistance

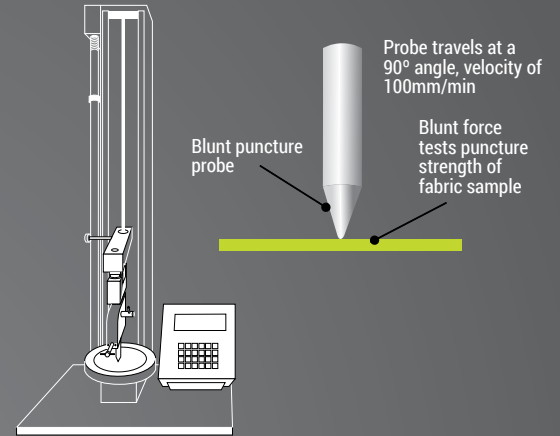
## Puncture Resistance

Puncture resistance is among the major mechanical properties required of protective clothing. The standard test using EN 388 is the only test currently recognized by both EN 388 and ANSI/ISEA 105-2016 standards.

Puncture resistance is defined as the maximum force required for a puncture probe to penetrate a specimen clamped between two plates in a sample holder. The EN 388 test uses a blunt puncture probe, similar to that of a ball point pen, and moves at a 90° angle at a speed of 100mm/minute. Results are reported in Newtons and converted to a 1-4 rating scale for EN 388 and a 1-5 scale for ANSI/ISEA 105.

Due to the nature of the test and puncture probe used, the results are a better determination of the tensile or burst strength rather than the puncture resistance. As with tests for cut resistance, lab testing of puncture resistance can only provide a benchmark since testing cannot accurately replicate punctures sustained in real-world situations.

## EN 388 Puncture Testing Instrument



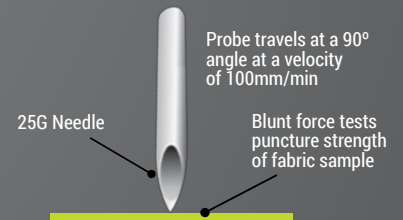
Level	1	2	3	4	5
ANSI/ISEA (Newtons)	10-19 N	20-59 N	60-99 N	100-149 N	150+ N
EN (Newtons)	20-59 N	60-99 N	100-149 N	150+ N	-

## ASTM F2878-10 Hypodermic Needle Puncture Resistance

An increasingly common cause of puncture wounds, hypodermic needles pose a life-threatening safety risk to health care professionals, law enforcement officials, sanitation workers, and others, due to risk of infection from blood-borne pathogens such as HIV and hepatitis C.

For the first time, the ANSI/ISEA 105-2016 have adopted a standard for hypodermic needle puncture resistance. ASTM F2878-10 Standard Test Method for Protective Clothing Material Resistance to Hypodermic Needle Puncture, addresses the unique mechanics of needlesticks and has been established as the standard for ANSI/ISEA 105-2016.

The ASTM F2878-10 test method uses a 25 gauge needle to determine the force required for a hypodermic needle to penetrate protective clothing or material. The puncture probe (25 gauge needle) travels at a 90° angle into a specimen at a velocity of 500mm/min. Results are reported in Newtons on a scale of 1-5.



Level	0	1	2	3	4	5
Force (N) needed to puncture specimen at 500mm/min	< 2 N	≥ 2 N	≥ 4 N	≥ 6 N	≥ 8 N	≥ 10 N

NOTE: ASTM F2878 describes three test probes that may be used: 21, 25, or 28 gauge needles. To be able to properly categorize the resistance to puncture in a consistent standard manner, only a 25 gauge hypodermic needle is to be used for classification to ANSI/ISEA 105-16

# Abrasion and Tear Resistance

## Abrasion Resistance

Abrasion resistance is also a critical factor in preventing hand injuries. If a glove fails too early due to wearing through from an abrasive hazard, the skin is quickly exposed to cut hazards. So the higher the abrasion level, the higher the level of protection from not just abrasions but from cuts and punctures.

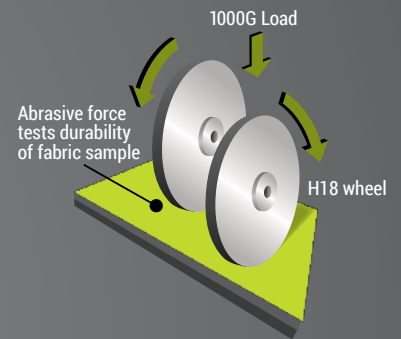
### ASTM D3384 Taber Abrasion Test Method

This test method determines the resistance to abrasion, or wear resistance, of fabrics coated with rubber or plastics.

#### How the test works:

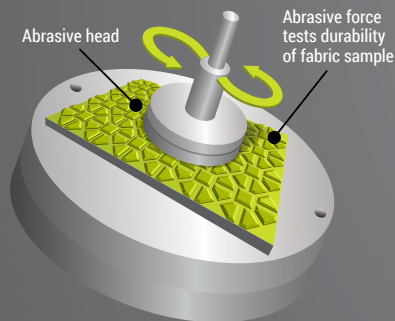
A four-inch circular test specimen is mounted on a horizontal-axis platform while being abraded to failure under a specified vertical weight load (of 500 or 1,000 grams) by the sliding rotation of two vertically oriented abrading wheels. The abrading wheels are composed of vitrified clay and silicon carbide abrasive particles. The abrasion is measured by mass lost in grams. The results are recorded as abrasion Levels 1-6.

### ASTM D3384 Abrasion Testing Instrument



### EN 388 Martindale Abrasion Test Method

The EN 388 Martindale Abrasion Test tests fabric by continually rubbing small discs of worsted wool or wire mesh (the abradant) against the test specimens in a figure eight.



#### How the test works:

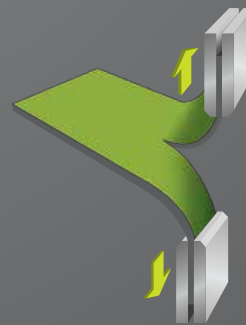
The fabric is continually inspected for wear and tear, and the test ends when two yarns break or when there is a noticeable change in appearance.

## EN 388 Tear Resistance

#### How the test works:

A rectangular sample of material is partially slit in its center, lengthwise, and torn axially by simultaneously pulling on each "leg" under tension.

The tear resistance corresponds to the maximum force recorded over the distance torn in the material. The greater the force measured, the greater the tear resistance of the material. Results are reported in Newtons.



# Other Properties of Hand PPE



When evaluating hand PPE for your safety program, you need to consider more than just cut and impact protection. Additional factors that can affect the success of your program are considered below. It cannot be emphasized enough the importance of conducting glove trials and collecting feedback from workers to ensure the gloves being considered offer the properties needed for safe and efficient work.

## Impact Protection

Handling heavy tools and materials is a fact of life for many workers. Consequently, painful smash injuries – which can be serious – are a frequent occurrence. Some companies have made an effort to address this problem by including impact protection in their hand safety standards. In recent years, “impact” gloves have flooded the PPE market. And while some believe these are interchangeable, the truth is not all impact gloves are created equal. They offer varying levels of comfort, dexterity, and – most importantly – protection. To date, no standard exists.

## Grip

Confidence in grip can play a major role in the successful and safe completion of projects. Oils, liquids, dust, and mud all affect the grip quality of different materials in different ways. Poor grip can lead to hand strain and fatigue. Gloves that enable a good grip help lower the incidence of dropped tools (which can result in an impact injury) and reduce the number of fatigue- and strain-related conditions reported by workers. Because grip is largely a subjective issue, look for gloves with a wide range of grip options with standard levels of cut and impact protection.

## Dexterity

Dexterity is crucial to workers dealing with small parts or handling jobs that require repetitive motions. Gloves that are bulky or restrictive can complicate a worker’s ability to effectively complete a task. If workers don’t have the dexterity and tactile sensitivity they need to do a job effectively, there’s a chance they’ll remove gloves in order to work, leaving hands susceptible to injury.

## Comfort

Comfort must be considered for those wearing gloves for long periods of time, since uncomfortable gloves can lead to lower compliance, and lower compliance can lead to a higher rate of hand injuries. An ill-fitting glove can be as dangerous as not wearing hand protection. Gloves that retain body heat and sweat can lead to skin problems and circulation issues. Ideally, gloves should contour to the shape and form of the individual’s hand.

## Weather

Extreme weather conditions introduce a host of potential hazards that can result in hand injury. Workers dealing with extremely cold weather can suffer from numbness, loss of grip and feeling, and other cold-related issues, including frostbite. Extreme variance in temperature can even exist in plants and warehouses when employees are near furnaces, hot water, or cold storage. Look for warm- and cold-weather versions of many gloves to address the range of climates found in the field.

# Developing a Safety Program

## Assessing the Need for Personal Protective Equipment (PPE)

One of the most effective ways to avoid injuries and costs is to implement a hand protection program. As we've seen, hand injuries are the second leading cause of a work-related injury. They are also the most preventable. A Liberty Mutual Research Institute for Safety study found that wearing gloves reduces hand injury risk by 60%. Similar findings show up in an Occupational Environmental Medicine article recounting a 2008 survey of workers injured in the northeastern United States:

- 63% of the hand injuries were lacerations
- Workers reported that they had worn gloves only 27% of the work time, and only 19% reported wearing gloves at the time of the injury

OSHA guidelines specify that appropriate PPE is provided for workers and that all other preventive measures against hazards are taken.

- When engineering and work-practice controls fail to eliminate the risk of injury to your employees' hands or arms, protective gloves are the primary means of protecting their hands
- When the risk of injury includes the arm, protective sleeves may be appropriate
- Nature of the hazard(s) and the operation to be performed will determine your selection of gloves

## Developing a Hand Safety Program

In addition to ensuring a safer workplace, an effective hand safety program can decrease workplace injuries, reduce lost-time, increase compliance with the law, and lower insurance costs. A savvy safety manager also must consider these effects of a solid hand safety program:

- Helps build employee morale, loyalty, and trust
- Ensures your company is meeting its responsibilities toward its workers
- Raises awareness and enhances company image
- Shows good citizenship in the local community

An excellent safety record can also be an effective recruiting tool, helping attract the most highly skilled talent to your company. In today's competitive business environment, it's easy to see how safety becomes a fundamental driver of many companies' long-term business success.

In establishing a hand safety program, you need to consider more than just gloves. In fact, OSHA considers personal protective equipment to be the last line of defense when it comes to preventing injuries. Training, engineering and workplace controls, and an overall culture of safety are equally important aspects of your hand safety program. According to the website SafetyInfo.com, OSHA has long been pushing to require businesses to have written safety and health programs in place. You can get started using the simple framework that follows:

**Program Purpose:** Develop a short statement about why the hand safety program exists. Use clear, concise language everyone will understand.

**Policy:** Write a statement of company policy that conveys management's support for the safety program and what is intended by the company in establishing the program.

**Responsibilities:** Define who is responsible for which parts of the program: management, supervisors, and workers.

**Record-Keeping:** Identify the specific forms and documents required for your safety program, including audits, inspections, and training documentation.

**Training:** An important element of any safety program, training educates the workforce on the guidelines of your program and why the guidelines are needed. It enables employees to learn their jobs properly, reinforces safety policies and procedures, and provides an opportunity to communicate safety principles and commitment of management to a safe workplace.

Your plan should list what training is required for managers, supervisors, and workers, going beyond OSHA requirements. Training should take into account what each group should know and what they should be able to do to meet your program goals. If the program includes a mandate to use protective gloves, workers need to know when and where they should wear them. Also include:

- Type of training, such as classroom, field, on-the-job, or a combination of training session types
- How often the training is to be conducted and for whom
- Special qualifications required for trainers
- Specific source materials to be used for each session, such as OSHA, ANSI, or other industry standard



## Audits and Inspections

Outline the specific program monitoring procedures that are required, including procedures for discrepancy correction and program improvement. Your safety program should require at minimum an annual review of effectiveness and hazard coverage.

### Hazards

List and define the specific hazards covered in your hand safety program. Do a walk-through to determine areas where hazards exist in your facility. Conducting a job safety analysis (JSA) on each operation can help identify potential hazards and promote safety awareness on the job. There are four basic steps to conducting a JSA:

- Analyze the steps to perform a task or job function
- Look for the obvious and hidden hazards
- Look for potential direct and indirect exposure:
  - Caught in or between
  - Contact with chemicals, electricity, heat/cold, caustics, toxics, sharp edges, heavy tools
  - Bodily reaction from voluntary or involuntary motion
  - Struck against or by
  - Rubbed or abraded by friction, pressure, and/or vibration
- Determine preventive measures to address these hazards

## Hazard Controls

Outline any engineering, administrative, work-practice, and training controls that will mitigate your listed hazards. Assess the risk of serious hand injury at the activity and/or task level, including the operation of powered and non-powered hand tools. Establish specific preventive controls that reduce the likelihood of a serious hand injury. Types of controls you may put in place include:

**Engineering Controls:** Safeguards put in place to protect workers by preventing exposure to hazards. Work with designers, erectors, installers, manufacturers, and suppliers to rectify hazards where there is risk of serious hand injury.

- Machine guards
- Safety controls
- Ventilation
- Substitution with less harmful material
- Enclosure or isolation of a process
- Monitoring devices
- Changing a process

**Administrative Controls:** Procedures, assessments, inspection, and records to monitor and ensure that safe practices and environments are maintained.

- Periodic inspections
- Equipment operating and maintenance procedures
- Hazard analysis
- Selection and assignment of personal protective equipment

**Work-Practice Controls:** Changing the way workers do their jobs to eliminate potential hazards.

- Worker job rotation
- Personal hygiene
- Housekeeping and maintenance

**Training Controls:** Ensuring that workers are fully trained to safely perform all assigned tasks. No employee should attempt any task without proper training in the equipment used, required personal protective equipment, specific hazards, and their control and emergency procedures.

- Initial new hire safety orientation
- Job-specific safety training
- Periodic refresher training

## Safety Guidelines

Rules and guidelines will help eliminate any doubt about what is required for safe performance on the job. More complex programs may lend themselves to developing standard operating procedures (SOPs), while other programs may need only general guidelines. Guidelines may include such considerations as:

- Rules for wedding bands and rings; other jewelry
- Rules and signage about loose sleeves and gloves near rotating equipment
- Rules for isolation and lockout systems
- Safe work instructions: specific instructions for hand positions, weight of parts.
  - Demarcating "safe handholds" on plant equipment
- Identification and signage of hand hazards on machinery
- Rules regarding what PPE must be worn for specific tasks

# Developing a Safety Program

## Communication

No safety program can be effective if employees don't know about it. Launching an awareness campaign to reinforce the changes and requirements is not just a good idea, it is necessary. The best awareness campaigns are integrated throughout all company communications. Especially make use of visual media such as posters, fliers, banners, etc. Place images of specific gloves by specific machines or in specific areas where hazards are present. If your budget allows, consider a short video promotion posted on a company YouTube page. Your intranet site should be a platform for messaging as well. Email signatures, web banners, and internal chat protocols all should incorporate safety messaging.

Monthly safety meetings can be an effective tool for involving workers in your safety program. Formats should be relaxed and open, helpful and informational. Engagement and two-way communication are key. Workers who have been on the job a long time have heard safety "lectures" so many times they may just tune out. Make it your goal to spark conversation that gets people involved. Some companies have found that safety incentive programs help increase compliance and lower the incidence of hand injuries. Such programs can be developed and implemented as a component of your overall communications campaign.

## Monitoring

To know whether your hand safety program is effective, and to understand where it needs improving, you must monitor the program's implementation and results. A short "focused safety" audit is a simple checklist of hand safety requirements and best practices. Managers, supervisors, and/or hourly workers observe others on the job and complete the checklist – as a way to simply raise awareness of where there is compliance with mandates or where improvement is needed. Where there are gaps, your program, training, and communications can be changed accordingly.

One way to perform simple audits is with a new smart phone app called DL Alerts, available for iPhone and Android phones. It allows users to report safety hazards and record safety best practices by taking a photo with their smart phone, which then reports it via email to a specified source.

## Checklist for Developing a Safety Program:

- ✓ Identify steps taken to assess potential hazards in every employee's work space and in workplace operating procedures
- ✓ Identify appropriate PPE selection criteria
- ✓ Identify how you will train employees on PPE use, including:
  - What PPE is necessary
  - When PPE is necessary
  - How to properly inspect for wear or damage
  - How to properly put on and adjust the fit
  - How to properly take off PPE
  - The limitations of the PPE
  - How to properly care for and store PPE
  - Identify how you will assess employee understanding of PPE training
- ✓ Identify how you will enforce proper PPE use
- ✓ Identify how you will provide for any required medical examinations
- ✓ Identify how and when to evaluate the PPE program

## Train Workers to Know:

- ✓ Why hand and arm protection is necessary, i.e., the workplace hazards that threaten their hands and arms
- ✓ How the protective gloves and sleeves will protect them
- ✓ The limitations of the protective equipment you've supplied
- ✓ When they must wear the gloves and sleeves
- ✓ How to properly put on the gloves and sleeves
- ✓ How to ensure a comfortable and effective fit
- ✓ How to identify signs of wear, such as:
  - Cracks, scrapes, or lacerations
  - Thinning or discoloration
  - Break-through to the skin
- ✓ How to clean and disinfect non-disposable gloves/sleeves



# Operational Questionnaire

1. Is there a hazard assessment procedure used to determine if hazards that require the use of personal protective equipment (head, eye, face, hand, or foot protection) are present or are likely to be present?
2. If hazards or the likelihood of hazards are found, is PPE selected and are employees properly fitted?
3. Have employees been trained on PPE procedures: What PPE is necessary for a job task, when they need it, and how to properly adjust it?
4. Are protective goggles or face shields provided and worn where there is any danger of flying particles or corrosive materials?
5. Are approved safety glasses required to be worn at all times in areas where there is a risk of eye injuries such as punctures, abrasions, etc.?
6. Are employees who need glasses/contacts required to wear only approved safety glasses, protective goggles or use other medically approved precautionary procedures?
7. Are protective gloves, aprons, shields, or other means provided and required where employees could be cut or where there is reasonably anticipated exposure to corrosive liquids, chemicals, blood, or other potentially infectious materials?
8. Are hard hats provided and worn where danger of falling objects exists?
9. Are hard hats inspected periodically for damage to the shell and suspension system?
10. Is appropriate foot protection required where there is the risk of foot injuries from hot, corrosive, or poisonous substances, falling objects, crushing, or penetrating actions?
11. Are approved respirators provided for regular or emergency use where needed?
12. Is all protective equipment maintained in a sanitary condition and ready for use?
13. Are there eye wash facilities and a quick-drench shower within the work area where employees are exposed to injurious corrosive materials?
14. Is special equipment available where needed?
15. Where food or beverages are consumed on the premises, are they consumed in areas where there is no exposure to toxic material, blood, or other potentially infectious materials?
16. Is protection against the effects of occupational noise exposure provided when sound levels exceed those of the OSHA noise standard?
17. Are adequate work procedures and protective clothing and equipment provided and used when cleaning up spilled toxic or otherwise hazardous materials or liquids?
18. Are there appropriate procedures in place for disposing of, or decontaminating, personal protective equipment contaminated with, or reasonably anticipated to be contaminated with, blood or other potentially infectious materials?

# Hand Protection Checklist

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- ✓ Be aware of potential hand hazards before an accident can happen.
- ✓ Be aware of possible unguarded pinch points.
- ✓ Always use push-sticks, guards, shields, and other protective devices when appropriate. Do not remove guards.
- ✓ Use brushes to wipe away debris.
- ✓ Inspect equipment and machinery before and after tasks to make sure that it is in good operating condition.
- ✓ Disconnect power and follow established lock-out procedures before repairing or cleaning machinery.
- ✓ Never wear jewelry or loose clothing when working with moving machine parts.
- ✓ Use the appropriate personal protective equipment- gloves, guards, forearm cuffs, barrier creams- for the specific task you are performing.
- ✓ When wearing gloves, be sure they fit properly and are rated for the specific task you are performing.
- ✓ Select tools designed to keep wrists straight to help avoid repetitive motion/overuse problems.

Source: SafetyInfo.com: Hand Safety: Avoiding Finger, Hand, and Wrist Injuries

# Types of Protective Gloves

## Selecting Protective Gloves for a Workplace

There are many types of gloves available today to protect against a wide variety of hazards. The nature of the hazard and the operation involved affects the type of glove needed. Because gloves designed for one function may not protect well against another, it is essential that workers use gloves designed for the hazards and tasks found in their workplace. Following are factors that may influence the selection of protective gloves for a workplace:

- Risk of cuts, lacerations, punctures, and abrasions
- Risk of smashes or pinches
- Type of chemicals handled; nature and duration of contact
- Area requiring protection (hand only, forearm, arm)
- Grip requirements (dry, wet, oily)
- Thermal protection
- Size and comfort

Gloves are made from a wide variety of materials and are designed for many types of workplace hazards. In general, gloves fall into four groups:

- Leather or canvas gloves
- Fabric and coated fabric gloves
- Chemical- and liquid-resistant gloves
- Insulating rubber gloves

### Leather and Canvas

- Sturdy gloves made from leather or canvas provide some protection against cuts and burns, and protect against sustained heat
- Leather protects against sparks, moderate heat, blows, chips, and rough objects
- Aluminized gloves provide reflective and insulated protection against heat and require a synthetic insert to protect against heat/cold
- Aramid fibers protect against heat and cold, are cut- and abrasion-resistant, and wear well.
- Various synthetics offer protection against heat and cold, are cut- and abrasion-resistant and may withstand some diluted acids. These materials do not stand up against alkalis and solvents.

### Fabric and Coated Fabric Gloves

- Fabric and coated fabric gloves are made of cotton or other fabric to provide varying degrees of protection.
- Fabric gloves protect against dirt, chafing, and abrasions. They do not provide sufficient protection for use with rough, sharp, or heavy materials. Adding a plastic coating will strengthen some fabric gloves.
- Coated fabric gloves are normally made from cotton flannel with napping on one side. By coating the un-napped side with plastic, fabric gloves are transformed into general-purpose hand protection offering slip-resistant qualities. These gloves are used for tasks ranging from handling bricks and wire to chemical laboratory containers.

### Chemical/Liquid-Resistant Gloves

Chemical-resistant gloves are made with different types of rubber: natural, butyl, neoprene, nitrile, and fluorocarbon (viton); or various types of plastic: polyvinyl chloride (PVC), polyvinyl alcohol, and polyethylene. These materials can be blended or laminated for better performance. As a general rule, the thicker the glove material, the greater the chemical resistance; however, thick gloves may impair grip and dexterity, having a negative impact on safety. When selecting gloves to protect against chemical exposure hazards, always check with the manufacturer or review the manufacturer's product literature to determine the gloves' effectiveness against specific workplace chemicals and conditions.

# Glove Selection: Protective Materials

## Types Of Fibers And Protective Fabrics On The Market Today

In the past, many companies provided workers with cotton or leather gloves to protect them from cuts, punctures, and abrasions. Today, advanced technology has resulted in hand protection that meets specific needs while enhancing worker comfort, dexterity, and productivity. For example, HexArmor® gloves with SuperFabric® brand materials offer 10 times more cut and abrasion resistance than standard leather gloves. You can also purchase gloves that are form-fitting with an ergonomic design that enhances comfort, allowing workers to keep their gloves on throughout the day.

For years, leather was the most-used material for cut-resistant gloves. But better protection calls for thicker leather, which means less dexterity, comfort, and grip. As a result, manufacturers began developing other materials that increased cut, abrasion, and puncture protection without compromising dexterity and flexibility.

With the proper selection and use of gloves, the majority of hand injuries are preventable. Gloves are manufactured with many different types of materials, most of which are designed to provide some level of cut resistance. While there are a multitude of cut-resistant fabrics on the market, the majority consist of leather, Kevlar®, Dyneema, composite yarns, and SuperFabric® brand materials.



### Leather

Leather is one of the oldest fabrics used to make gloves. It is a durable, flexible material created by tanning the hides of animals. The unique properties of leather allow for both a comfortable fit and useful grip.

Due to its resistance to abrasion and wind, leather found a use in rugged occupations. However, the natural fibers of leather will break down with the passage of time and exposure to environmental factors. It is also difficult to wash and, depending on the type of leather, does not have great cut resistance.



### Kevlar®

Kevlar® is the registered trademark for a synthetic fiber. Developed by DuPont in 1965, this high-strength material was first commercially used in the early 1970s as a replacement for steel in racing tires. Typically it is spun into ropes or fabric sheets that can be used as such or as an ingredient in other materials.

Currently, Kevlar® is used in a variety of products ranging from bicycle tires to racing sails to body armor because of its high tensile strength-to-weight ratio; by this measure it is five times stronger than steel on an equal weight basis.

Perhaps best known for its use in bulletproof body armor and protective gear, it is created by overlapping multiple layers into sheets and then laminating several sheets together. Because the fiber itself is difficult to break, the layers create a “super web” that halts bullets. Additionally, it is very light compared to other products.



However, because it is an open-weave knit material, Kevlar® is susceptible to small punctures through the knit penetrating the skin. This has resulted in severe injury with punctures through a glove, tearing the skin. Ultraviolet exposure and temperature extremes also degrade the fibers, resulting in declining performance over time.

### Dyneema®

Dyneema®, or high performance polyethylene (HPPE), is an ultrahigh molecular weight polyethylene fiber that offers high cut resistance, even when wet. It's 10 times stronger than steel per unit weight. Because of its unique properties, gloves made with Dyneema® are lightweight, flexible, and cool to the hands. They may be used in a variety of applications such as glass handling, sheet metal assembly, and handling small, sharp parts.

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Chemically inert, Dyneema® does well in environments where chemicals are involved. And unlike Kevlar®, it resists degradation and maintains its performance when exposed to UV light over time. However, Dyneema/HPPE is very slippery, and the glove either needs to be dipped or worn with an outer glove in order to maintain grip. Additionally, some puncture/tear issues occur with the woven glove.

### Protective Tile Technology Like SuperFabric®\* Brand Materials

Introduced in 1996, fabrics created with protective tiles were designed to meet almost every conceivable performance need. Designed specifically to address PPE requirements, these textiles incorporate a variety of protective fabric functions, such as industry-leading cut, puncture, and needle resistance.

The fabrics exceed both ANSI/ISEA F1790 and CE/EN 388 Level 5 cut resistance. Performance is enhanced through the configuration of tiny protective tiles that provide resistance to lacerations and slashes like no other material on the market.

Protective tiles come in a variety of geometries, thicknesses, composites, and base materials. Because of the physics behind the materials, it offers higher levels of protection against abrasions and cuts than most fabrics on the market. (Additionally, a combination of the number of layers will also offer needlestick resistance.) Like all fabrics, the thickness, substrates, and surface coatings supplement varying levels of cut, puncture, and abrasion resistance, as well as grip and flexibility.



### Composite Yarns

Composite yarns are a relatively new concept in fabric development. They are generally made of a core thread wrapped in a complementary thread. At times the core thread is stainless steel or fiberglass, and the complementary yarn is a fiber such as Kevlar® or HPPE. The secondary yarn is wound around the core at roughly 5 to 60 turns per meter of the thin metal wire.

These new fibers have allowed glove manufacturers to make hand protection with higher levels of cut resistance while maintaining the same dexterity offered by Kevlar® or Dyneema®. By maximizing the rolling action, slickness, and strength of each of the materials within the composite, they are able to capitalize on the strength of each material. Cut resistance in gloves made with composite yarns is influenced by four factors:

- **Material strength:** Determined by the strength of the winding yarn
- **Toughness:** A hard yarn/core such as stainless steel dulls sharp edges
- **Slickness:** Yarns like Dyneema® are slippery, allowing a blade to glide over the surface without cutting through
- **Rolling action:** Knit gloves allow the individual yarns to roll as a sharp edge slides over them, which produces what some call a “ball bearing effect.” Like slickness, it keeps sharp edges from cutting through in some instances.

Even so, a knit glove with higher cut resistance will still be susceptible to lacerations that begin as a puncture, due to the “windowing” effect. In addition, steel fiber cores break down over time, creating splinters that can become embedded in the hand or get into work environments. Many companies do not allow the use of steel thread or fiberglass because of the shedding issues. Also, these gloves are often bulky with no inherent grip properties.

\*SuperFabric® is a registered trademark of HDM, Inc.

# How to Conduct a PPE Trial

A glove trial is the process of field testing different models of safety gloves, either from a single source or from several manufacturers, in order to identify the best glove for a particular job. When done correctly, the benefits of a glove trial include:

- Improved hand safety program and equipment; reduced rate of injuries
- Increased awareness of hand safety issues among workers
- Higher rates of compliance with hand safety PPE requirements
- Reduction in costs related to hand protection through increased efficiency and durability of work gloves, or reduced insurance rates, medical costs, and workers' compensation claims

## 1. Assess the Hazards and Work Environment

When you begin a glove trial, it is important to consider as many application-specific issues as possible. Answer these questions in detail:

### What hazards are present?

Do a thorough assessment and make a list of all existing and potential hazards. These may include metal, glass, wood, sawing or cutting tools, blades or knives, wire, needles, hammers, scaffolding joints, pipes, insulation, connections, etc. Are there cut hazards in the form of long, sharp edges? What about possible pinch and smash injuries from dropped tools, rocks, pipes, etc.?

### How much protection is needed?

Gloves may need to be cut level 5 to provide sufficient protection, or you may only need a cut level 4 or less. If there are impact hazards, you'll need a glove with back-of-hand impact protection. Some applications require heat resistance, anti-vibration padding, or chemical-exposure protection.

### What kind of dexterity is required?

Do your workers require a high level of tactile sensitivity in order to do their jobs? Will they be picking up small parts or handling sheets of plywood or steel beams? Dexterity needed on the job must be taken into account in glove selection, especially if workers are removing their gloves to complete high-dexterity tasks.

### Where is the job being performed?

Identify details that will have an impact on glove selection based on where your employees are doing the majority of their work. What is the climate? Is it an excessively hot or cold environment? Does the environment change based on the season, or does it stay fairly constant throughout the year?

### Are there potential grip issues?

Grip can be affected by mud, oils, cleaning fluids, and other workplace substances. Poor grip can lead to increased hazards from dropped tools and knives, in addition to increased fatigue and strain. A glove must be designed to offer a good grip for the application, with the palm material providing appropriate grip characteristics.

### What is the temperature of materials being handled?

Do workers regularly handle tools or parts that are extremely hot or cold? This can affect glove properties such as grip, protection, and durability.

### Are there any corrosive materials?

Consider whether there are fluids like solvent or acids present that could break down the glove fibers or coating.

## 2. Identify the Common Applications

The key to finding the right glove for the job is to look at the applications and tasks that are representative of most of the work being done. Select a glove that offers the necessary levels of comfort, protection, and dexterity for the most common, day-to-day tasks.

Although it is tempting to look for a one-glove solution, the reality is that a single glove can almost never meet all needs. If you outfit your entire workforce with a glove that is suited only to the easiest job, the most hazardous task, or the application that only occurs once a week or once a month, it may provide too little protection – or too much – for the work they're doing every day.

This will have a negative impact on glove compliance, safety outcomes, and the overall effectiveness of your hand safety program. If necessary, offer a different glove for use with an extreme or unusual task. Most of the time it is best for workers, and for hand safety programs, to use a glove that offers the right level of protection for the work performed most often.

### 3. Audit Your Current Glove Program

An audit of your existing glove solution will help you understand what is working, what isn't, and areas where improvement is needed. Learn what your employees like about the gloves they use now. Find out where the glove isn't meeting their needs. Identify any trade-offs between a new glove and the old. By collecting this information, you can work to ensure that the trade-offs are minimized and that any new gloves used in the trial offer the same features that your work crews have become accustomed to. You can address any objections that may come up during the trial, selection, and implementation process. Knowing what your team likes and dislikes will help you find something better and explain how it is an improvement upon your old glove.

### 4. Select Your Trial Crew

Having the right trial crew will help you find the right gloves and also help get buy-in from the rest of the employees once a glove has been chosen and the new program is rolled out. Choose people for the trial crew who are serious about safety on the job and will provide honest and constructive feedback. Encourage them to share their experiences, personal preferences, and anything else that might be relevant to glove selection. Be clear that this feedback will help determine which gloves are ultimately provided to the entire team. Let them know that their feedback will be shared with the glove manufacturer and could result in product improvements.

Get an agreement from the crew stating that they will provide written feedback as well as the glove samples at the end of the trial, since both are needed to make the best decision. Provide feedback forms that are easy to use.

### 5. Collect and Review the Data

When you've reached the end of your field-testing period, collect all of the feedback forms and the gloves used in the trial. Give the trial crew a chance to offer verbal feedback, and record what is said. Record anecdotes and stories of any "saves" from accident or injury that occurred during the glove trial. Collect and review written feedback forms. Examine the trial glove samples and note their condition with regard to cut resistance and durability of fabric. Include all relevant information in your report. Also, it is important to realize that the first glove or round of gloves tested may not fit your needs.

As you continue to try gloves, it might pay to revisit the specifics of various applications. For example, is there a fluid present that was not accounted for in your initial hazard and work environment assessment that could be causing premature failure or excessive wear? One goal of the glove-trial process is to uncover this type of information and address it with your glove selection. Add the new data to the application profile and hazards assessment as you select and field test the next glove solution.

### 6. Develop Final Glove Specifications

Based on all the data collected after a successful trial, you can specify your gloves.

Specifications include:

- Fiber type (e.g., protective tiles, nylon, etc.)
- Base weight (oz/yd<sup>2</sup>)
- Glove construction
- String knit, terry, etc.
- Coatings, dots, leather palms
- Ambidextrous (offers extended wear)
- Reinforced thumb saddle
- Cuff length
- Yarn size
- Glove sizing
- Cut resistance (rating force and test method)
- Puncture resistance
- Abrasion resistance
- Needlestick resistance
- Other performance values required for the job (thermal testing, abrasion testing, etc.)

# Job Safety Analysis Form

Job to be performed: \_\_\_\_\_ Department: \_\_\_\_\_  
 JSA written by: \_\_\_\_\_ Date: \_\_\_\_\_  
 Supervisor: \_\_\_\_\_ Supervisor signature: \_\_\_\_\_

**Task performed by (names):**


Personal protective equipment, special tools, and other equipment required: \_\_\_\_\_

Step	Description	Potential Hazard	Recommended Safe Job Procedure
1			



# PPE Audit

Facility: \_\_\_\_\_ Area: \_\_\_\_\_  
 Auditor: \_\_\_\_\_ Date: \_\_\_\_\_

Area	Satisfactory	Action Required	Corrective Action (Date)
<b>Employee Knowledge</b>			
Date of last PPE training			
When to use PPE			
Limitations			
Selection and inspection			
Cleaning and storage			
Donning and removal			
<b>Program Administration</b>			
Hazard assessment completed			
Hazard control survey completed			
PPE hazard certification completed			
High-hazard areas identified			
PPE disposal procedures			
<b>Safeguards</b>			
Engineering safeguards			
Administration safeguards			
Training safeguards			
<b>Area Inspection</b>			
Signs and warnings posted			
Adequate PPE stock available			
Electricians wear electrically rated safety shoes/hard hats			
PPE clean and properly stored			
PPE used properly			

# Annual Safety Audit Form

Facility: \_\_\_\_\_ Area: \_\_\_\_\_  
 Auditor: \_\_\_\_\_ Date: \_\_\_\_\_

Area	Satisfactory	Action Required	Corrective Action (Date)
<b>Safety Officer</b>			
Person assigned			
Written job description			
<b>Written Program</b>			
Safety policy statement			
Written programs			
Responsibilities defined			
Safety plan of action			
Safety rules			
Operating procedures posted			
Administrative procedures			
Written fire-prevention plan			
Written emergency plan			
<b>Management Responsibility</b>			
Sufficient staff and resources			
Management commitment			
Communication with employees			
<b>Program Enforcement</b>			
Written enforcement policy			
Records of disciplinary action			
Managers held accountable			
<b>Hazard Identification</b>			
Department inspections			
Hazard analysis for each task			
Purpose inspections			
Safety reviews for changes			
Hygiene inspections			
Hazard-control procedures			

Area	Satisfactory	Action Required	Corrective Action (Date)
<b>Hazard Control</b>			
All hazards classified			
No employees in hazard areas			
Correction documentation			
Corrective actions taken			
<b>PPE Program</b>			
Hazard analysis completed			
PPE assessment completed			
Replacement as required			
Adequate stocks available			
Training completed			
<b>Communication</b>			
Periodic safety communication			
Means for communication			
Employee participation			
<b>Training</b>			
Safety orientation program			
Pre-assignment task tracking			
Annual retraining			
Training records maintained			
Supervisor training			
Specialized training			
<b>Accident Investigation and Corrective Action</b>			
Written records			
Trends evaluated			
First-aid responders trained			

Source: Safetyinfo.com

# Glove Trial Feedback Form

Your Name: \_\_\_\_\_ Date: \_\_\_\_\_  
 Company: \_\_\_\_\_ Position: \_\_\_\_\_  
 HexArmor® Product: \_\_\_\_\_ Location: \_\_\_\_\_  
 Previous Products Used: \_\_\_\_\_

## Protection and Performance

1) Below Average 2) Average 3) Fair 4) Good 5) Excellent

1) Back-of-hand protection						
2) Cut protection in palm area	1	2	3	4	5	n/a
3) Puncture protection	1	2	3	4	5	n/a
4) HexArmor® PPE allows me to perform my job better than other gloves	1	2	3	4	5	n/a
5) I feel better protected in this product than in others	1	2	3	4	5	n/a
6) Product is appropriate for my application	1	2	3	4	5	n/a
7) Durability	1	2	3	4	5	n/a
8) Lasted _____ days of 8-hour work shifts	1	2	3	4	5	n/a
	1	2	3	4	5	n/a

## Grip (If Applicable)

1) Grip when dry						
2) Grip when wet or coated with chemicals	1	2	3	4	5	n/a
3) Grip consistency	1	2	3	4	5	n/a
4) The grip/coating used is appropriate for my application	1	2	3	4	5	n/a
5) Grip/coating lasted _____ days of 8-hour work shifts	1	2	3	4	5	n/a
	1	2	3	4	5	n/a

## Comfort/Fit

1) Overall comfort						
2) Overall fit	1	2	3	4	5	n/a
3) Dexterity	1	2	3	4	5	n/a
4) Product is comparable in comfort to previous products worn	1	2	3	4	5	n/a
5) If applicable: Gloves are correct length in the fingertips	1	2	3	4	5	n/a
6) If applicable: Gloves are correct width across the palm	1	2	3	4	5	n/a
7) If applicable: Product kept me cooler/warmer than previous products	1	2	3	4	5	n/a
	1	2	3	4	5	n/a

## Overall Satisfaction

	1	2	3	4	5	n/a
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Activities performed while wearing PPE

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Types of fluid gloves were exposed to (such as hydraulic oil, grease, mud, etc.):

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Did you wash the PPE during the trial period? If so, how were they washed and how many times?

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How many days/weeks/months would you estimate HexArmor® PPE would last in your profession before replacement?

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Please describe any potential injury HexArmor® PPE may have prevented:

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Are there any changes or improvements you would suggest for this product(s)?

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Additional Comments:

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# Glove Sizing Guide

Industrial gloves fit differently than most gloves because of the materials used to provide protection. We recommend using our size charts and reviewing glove descriptions and materials.

## Measure Your Hand (Recommended)

Using a string or measuring tape, measure the circumference around the knuckles, excluding the thumb. Your hand should be open with the fingers together. Compare this measurement to the chart on the right to determine your glove size.

## Or Place Your Hand on the Chart Below

Place your right hand on the glove chart so that the saddle of your thumb and index finger line up with the X. The measurement closest to the right edge of your hand will be the appropriate glove size.

Hand Circumference	HexArmor® Size
5 in. (12 cm) - 6 in. (15 cm)	5/XXS
7 in. (18 cm) - 7 1/2 in. (19 cm)	6/XS
7 1/2 in. (19 cm) - 8 in. (20 cm)	7/S
8 in. (20 cm) - 8 1/2 in. (21 1/2 cm)	8/M
8 in. (21 1/2 cm) - 9 in. (23 cm)	9/L
9 in. (23 cm) - 10 in. (25 cm)	10/XL
10 in. (25 cm) - 11 in. (28 cm)	11/XXL
11 in. (28 cm) - 12 in. (30 cm)	12/3XL

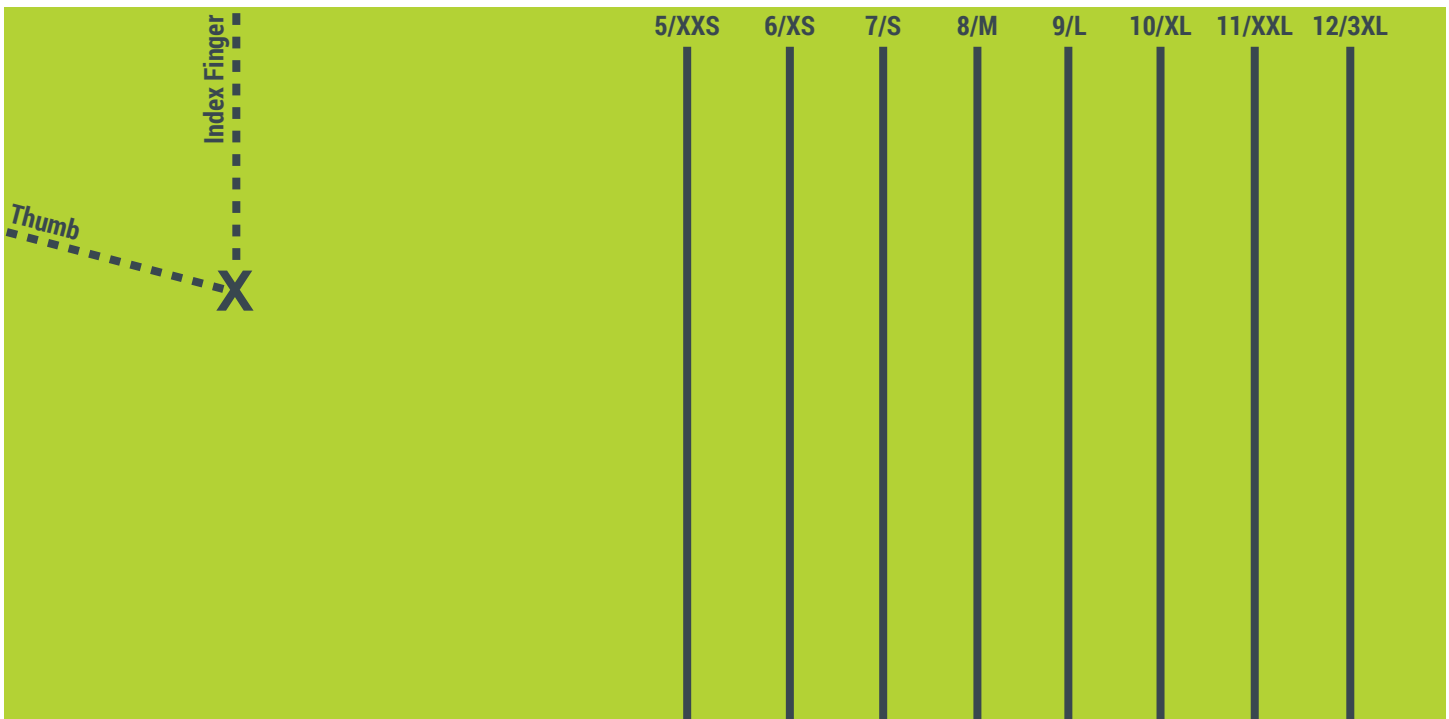


Chart Should Be 7 1/2 in. (19 cm)

# Hand Safety Resources



## Get Started Improving Hand Safety; It's Up to You to Make it Work!

Hand safety starts at the top, with the highest levels of management actively promoting and modeling safe behavior. This sends a message that the company is serious about safety and helps establish a culture of safety throughout the ranks. A first step to take is to partner with a respectable glove manufacturer in developing your hand safety program. A good partner can help you analyze your operations, the hazards specific to your workplace, your past injury rates, and your PPE budget.

They can also help you:

- **Assess risks.** Are the risks in your operation purely cut-related? Or are there puncture risks too? If so, your distributor partner can help you assess your overall protection needs.
- **Collect data.** Get the data in the form of outside lab results for cut tests that help you focus on true comparisons among gloves tested with different standards (ASTM/ISO vs. EN).
- **Test, test, test.** Conducting safe and scientific tests with typical hazards is important. A hunting knife in the conference room does not qualify! A trusted distributor/manufacturer can help you set up a safe test for a true work hazard in the real world.
- **Keep good records.** If you don't already, begin collecting injury data with pictures and an assessment of what happened so you can track successes over time with your program. This will also help you evaluate new products in future testing.

## Resources and Links

**Environmental Health & Safety Today Magazine:**  
<http://ehstoday.com/>

**HexArmor:**  
<http://www.hexarmor.com/>

**HexArmor Links:**  
<http://www.hexarmor.com/our-story/case-studies>  
<http://www.hexarmor.com/our-story/videos>  
<http://www.hexarmor.com/our-story/videos/astm-f1790-standard-test-method-for-measuring-cut-resistance-video>  
<http://www.hexarmor.com/our-story/videos/coup-cut-testing-demonstration-EN-388-cut-test>

**ISHN Magazine (Safety, Health, Industrial Hygiene Issues):**  
<http://www.ishn.com>

**Mining Safety (So. Africa):**  
<http://www.miningsafety.co.za/dynamiccontent/73/Preventing-Hand-Injuries>

**Mining Safety (Queensland, Australia):**  
<http://mines.industry.qld.gov.au/assets/mines-safety-health/safety-bulletin-133.pdf>

**National Safety Council:**  
<http://www.nsc.org/pages/home.aspx>

**OSHA, Personal Protective Equipment:**  
<https://www.osha.gov/Publications/osha3151.html>

**Safety Info (a paid site with some free information available):**  
<http://www.safetyinfo.com>

**Workplace Safety North (Ontario, Canada):**  
<http://www.workplacesafetynorth.ca/sites/default/files/Hand%20Injuries%20Participant%20Manual.pdf>



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