

## **2. CAS Numbers**

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## **3. European Toxicity Risk Code**

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## **EN 374-1 Protective Gloves Against Chemicals and Micro-organisms Performance Requirements**

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## **ANSI / ISEA 105-2005 American National Standard for Hand Protection Selection Criteria**

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## **Chemical Toxicity and Risk Information**

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## **2. CAS Numbers**

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The Chemical Abstract Services identification numbers provide unique identifiers for easy cross-reference to Material Safety Data Sheets (MSDS). Some chemicals are known by several widely used names. Some well known synonyms appear in this guide and have the same CAS Number.

### 3. European Toxicity Risk Code

The European “Guide to Classification and Marking of Hazardous Substances” established a labeling ordinance so that anyone handling a hazardous product knows the health risks. Hazardous products can cause injuries from inhalation, ingestion or skin contact after even a single exposure or from prolonged or repeated exposure. Based on toxicity information, the categories are:

RISK CATEGORY	RISK CODE
<b>1. Extremely Dangerous</b> (Dermal LD50 in rabbits is <50 mg/kg)	
A. Very Toxic.....	<b>Tx</b>
<b>2. Very Dangerous</b> (Dermal LD50 in rabbits is 25 to 200 mg/kg)	
A. Toxic.....	<b>T</b>
B. Highly Corrosive.....	<b>Cx</b>
C. Known Carcinogen.....	<b>CANCER</b>
<b>3. Dangerous</b> (Dermal LD50 in rabbits is 400 to 2000 mg/kg)	
A. Corrosive.....	<b>C</b>
B. Harmful.....	<b>X</b>
C. Irritant.....	<b>XI</b>
D. Allergen (Known Sensitizer).....	<b>SENS.</b>
E. Suspected Carcinogen.....	<b>CANCER</b>
<b>4. Other</b>	
A. Potentially Harmful (Low Toxicity).....	<b>V</b>
B. No Risk Information Available.....	<b>n.a.</b>

Most toxicity ratings are based on inhalation or oral routes of chemical exposure. The European Toxicity Risk Code is based on dermal exposure to chemicals. Gloves provide protection from dermal exposure to chemicals. Other items of Personal Protective Equipment protect from other routes of chemical exposure.

#### REFERENCES:

1. Forsberg and Mansdorf (2002) *Quick Selection Guide to Chemical Protective Clothing*, Wiley-Interscience, New York
2. National Swedish Environmental Protection Board (1984) *Recommendations of the Product Control Board Concerning Application of the Labeling Ordinance*.

## 4. Degradation Ratings

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Degradation is the physical change in a glove after chemical exposure. Typical effects may be swelling, wrinkling, deterioration, or delamination. There are no accepted standards for measuring degradation. Best degradation testing is based on a protocol considered by the ASTM F23 Protective Clothing Committee. One side of the glove material is exposed to the test chemical for four hours. The percent weight change is measured at four time intervals: 5, 30, 60 and 240 minutes. The gravimetric ratings are ranked as shown below.

Key To Degradation	Degradation Rating	% Weight Change
E =	Excellent	0-10%
G =	Good	11-20%
F =	Fair	21-30%
P =	Poor	31-50%
NR =	Not Recommended	Above 50%

Where degradation rating is poor (P) or not recommended (NR) after 60 minutes, the material is not tested for permeation resistance. Permeation results are listed as not recommended (NR) because of severe degradation.

**WARNING:** Weight change is only our measure of degradation and does not account for certain physical changes such as hardening of PVC.

## 5. Permeation Testing: ASTM F739-96

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**ASTM F739-96 Standard Test Method for Resistance of Protective Clothing Materials to Permeation by Liquids or Gases Under Conditions of Continuous Contact** of the American Society for Testing and Materials establishes test methods for determining the chemical resistance of chemical protective clothing which include:

- 1. Minimum Detectable Limits, (MDL in ppm)** – the smallest amount of chemical detectable by an analytical system being used to measure permeation. The MDL qualifies the breakthrough time as being the safest, most reliable information achievable.
- 2. Breakthrough Detection Time, (BDT)** – is the time in minutes from initial exposure of a chemical to the gloves outer surface to the time the chemical can first be detected on the glove's interior. The BDTs reported are normalized to a permeation rate of 0.1 micrograms per square centimeter per minute. So, the BDT is defined when the permeation rate equals  $0.1 \mu\text{g}/\text{cm}^2/\text{min}$ . All BDT's meet this requirement except those analyzed by closed loop or pH (conductivity).
- 3. Permeation Rate** – is the steady-state rate of a chemical in  $\mu\text{g}/\text{min}$  permeating an area ( $\text{cm}^2$ ) of glove material established when the chemical reaches equilibrium with the glove material during the eight-hour test period. The units of  $\mu\text{g}/\text{cm}^2/\text{min}$  are stipulated by ASTM F739-96.
- 4.** The code used in reporting results is as follows:
  - ND = Non detectable, no breakthrough detected after eight hours.
  - NR = Not recommended.
  - NA = Not applicable.
  - NT = Not tested.

## 5. Permeation Testing: ASTM F1383-96

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**ASTM F1383-96 Standard Test Method for Resistance of Protective Clothing Materials to Permeation by Liquids or Gases Under Conditions of Intermittent Contact** of the American Society for Testing and Materials establishes test methods for determining the chemical resistance of chemical protective clothing which include:

- 1. Minimum Detectable Limits, (MDL in ppm)** – the smallest amount of chemical detectable by an analytical system being used to measure permeation. The MDL qualifies the breakthrough time as being the safest, most reliable information achievable.
- 2. Breakthrough Detection Time, (BDT)** – is the time in minutes from initial exposure of a chemical to the gloves outer surface to the time the chemical can first be detected on the glove's interior. The BDTs reported are normalized to a permeation rate of 0.1 micrograms per square centimeter per minute. So, the BDT is defined when the permeation rate equals 0.1  $\mu\text{g}/\text{cm}^2/\text{min}$ . All BDT's meet this requirement except those analyzed by closed loop or pH (conductivity).
- 3. Permeation Rate** – is the steady-state rate of a chemical in  $\mu\text{g}/\text{min}$  permeating an area ( $\text{cm}^2$ ) of glove material established when the chemical reaches equilibrium with the glove material during the eight-hour test period. The units of  $\mu\text{g}/\text{cm}^2/\text{min}$  are stipulated by ASTM F1383-96.
- 4. Intermittent Exposure** – The intermittent exposure testing using a specially designed test cell was designed to mimic intermittent contact as follows, the test sample was totally immersed for 1 minute, then the exposure was removed for the next 9 minutes, then the total immersion exposure was repeated for another full minute and removed for the next 9 minutes. This exposure process was repeated over and over again for 240 minutes.
- 5. The code used in reporting results is as follows:**
  - ND = Non detectable, no breakthrough detected after eight hours.
  - NR = Not recommended.
  - NA = Not applicable.
  - NT = Not tested.

# **EN 374-1 Protective Gloves Against Chemicals and Micro-organisms Performance Requirements**

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The performance levels used to rank gloves are based on breakthrough times determined during constant contact with the test chemical under standard laboratory conditions described in EN 374-3. Color codes used are as illustrated.

## **Ranking based on EN 374-1: 2003**

<b>0</b>	<b>≤ 10 minutes breakthrough time; Dangerous selection</b>
<b>1</b>	<b>&gt; 10 minutes breakthrough time; Very poor; Splashes only; change quickly</b>
<b>2</b>	<b>&gt; 30 minutes breakthrough time; Poor choice; change quickly when exposed</b>
<b>3</b>	<b>&gt; 60 minutes breakthrough time; Sometimes satisfactory; change soon after exposure</b>
<b>4</b>	<b>&gt; 120 minutes breakthrough time; Good selection; change after 2 hours</b>
<b>5</b>	<b>&gt; 240 minutes breakthrough time; Next best selection; change after 4 hours</b>
<b>6</b>	<b>&gt; 480 minutes breakthrough time; Safest best selection with highest rating attainable</b>

# **ANSI / ISEA 105-2005 American National Standard for Hand Protection Selection Criteria**

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The performance levels used to rank gloves are based on physical hazard protection including length of wear, cut resistance and puncture resistance. Color codes used are as illustrated.

## **Abrasion Resistance based on ASTM D 3389-94 Standard Test Method for Coated Fabric Abrasion Resistance**

<b>0</b>	< 100 Abrasion cycles to fail (500 gram load)
<b>1</b>	≥ 100 Abrasion cycles to fail (500 gram load)
<b>2</b>	≥ 500 Abrasion cycles to fail (500 gram load)
<b>3</b>	≥ 1000 Abrasion cycles to fail (500 gram load)
<b>4</b>	≥ 3000 Abrasion cycles to fail (1000 gram load)
<b>5</b>	≥ 10,000 Abrasion cycles to fail (1000 gram load)
<b>6</b>	> 20,000 Abrasion cycles to fail (1000 gram load)

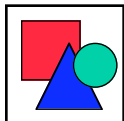
## **Cut Resistance based on ASTM F 1790-97 Test Method for Measuring Cut Resistance of Materials Used in Protective Clothing**

<b>0</b>	< 200 grams of weight needed to cut through material with 25 mm of blade travel
<b>1</b>	≥ 200 grams of weight needed to cut through material with 25 mm of blade travel
<b>2</b>	≥ 500 grams of weight needed to cut through material with 25 mm of blade travel
<b>3</b>	≤ 1000 grams of weight needed to cut through material with 25 mm of blade travel
<b>4</b>	≤ 1500 grams of weight needed to cut through material with 25 mm of blade travel
<b>5</b>	≤ 3000 grams of weight needed to cut through material with 25 mm of blade travel

## **Puncture Resistance based on EN 388: 1994 Protective Gloves Against Mechanical Risks**

<b>0</b>	< 10 Newtons of Force to Puncture
<b>1</b>	≥ 10 Newtons of Force to Puncture
<b>2</b>	≥ 20 Newtons of Force to Puncture
<b>3</b>	≤ 60 Newtons of Force to Puncture
<b>4</b>	≤ 100 Newtons of Force to Puncture
<b>5</b>	≤ 150 Newtons of Force to Puncture

# Chemical Toxicity and Risk Information



## NFPA Health, Flammability and Reactivity Ratings for this Chemical

### NFPA Health Rating for this Chemical ▲

- 0 = **NONE**: Materials result in injury under unusual conditions or by overwhelming dosage.
- 1 = **SLIGHT**: Short term exposure may result in minor injury that is reversible.
- 2 = **MODERATE**: Short term exposure may result in minor temporary or permanent injury; may result in major injury.
- 3 = **HIGH**: Short term exposure may result in major temporary or permanent injury; may threaten life.
- 4 = **EXTREME**: Short term exposure may result in major injury or death.

### NFPA Flammability Rating for this Chemical ▲

- 0 = **NONE**: Will Not Burn.
- 1 = **MINOR**: Ignites after considerable heating.
- 2 = **MODERATE**: Ignites if moderately heated.
- 3 = **SEVERE**: Can be ignited at all temperatures.
- 4 = **EXTREME**: Very flammable gases or liquids.

### NFPA Reactivity Rating for this Chemical ▲

- 0 = **NONE**: Stable under exposure to fire. Not reactive with water.
- 1 = **MINOR**: Unstable at high temperature and pressure; may react with water with energy release, but not violently.
- 2 = **MODERATE**: Unstable; undergoes violent chemical change, but will not detonate; may form explosive mixtures with water.
- 3 = **SEVERE**: Explosive if initiated, heated or water added.
- 4 = **EXTREME**: Readily explosive under normal conditions.

### ACGIH Skin Notation

If “**Yes**,” This chemical has been identified by the American Conference of Governmental Hygienists as one that may permeate intact skin and may cause toxic effects.

### Other Toxicity and Risk Information

#### IARC Carcinogen in Animals:

If “**YES**”, this chemical has been shown by the International Agency for Research on Cancer to cause cancer in animals. The chemical would then be a suspected Human carcinogen.

If “**NO**”, this chemical has not been shown to cause cancer in animals.

#### IARC Carcinogen in Humans:

If “**YES**”, this chemical has been shown by the International Agency for Research on Cancer to have carcinogenic potential in humans. If “**NO**”, this chemical has not been shown to be a potential carcinogen in humans.

#### EPA Extremely Hazardous Substance:

If “**YES**”, this chemical appears on the list of extremely hazardous substances developed by the U.S. Environmental Protection Agency (EPA) as required by the Superfund Amendments and the Reauthorization Act of 1986. If “**NO**”, this chemical has not been shown to be an extreme hazard.

# Chemical Toxicity and Risk Information



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