

grant to promote the development of state-level cultural heritage emergency networks. Three successful forums were held in Philadelphia, St. Louis, and Portland, OR, for 23 state and territorial delegations. These forums provided an opportunity to create lasting relationships between state cultural stewards and their respective state emergency managers, many of whom have never met before. These relationships will enable state agencies to communicate, collaborate, and coordinate more effectively when preparing for and responding to disasters. For more information, visit: www.thehep.wordpress.com

CONNECTING TO COLLECTIONS ONLINE COMMUNITY

The Connecting to Collections Online Community is seeking collections care experts to present on a range of topics for monthly hour-long webinars from integrated pest management to preservation outreach. If you have ideas on speakers or topics, please email us at [info\[at\]heritagepreservation.org](mailto:info[at]heritagepreservation.org). The Online Community has grown to more than 3,000 members and features an active discussion board, a wealth of online resources, and now a series of online courses. Speakers on the hour-long webinars not only gain valuable experience in online teaching but also have the added bonus of speaking to an eager and captive audience often in the hundreds. Learn more about the Community at www.connectingtocollections.org.

Health & Safety Committee

Choosing Gloves: A Quick Reference Guide

As part of a conservator's personal protective equipment (PPE) toolbox, appropriate gloves should be available for use with a given chemical. There are a variety of glove materials from which to choose, such as nitrile, latex, neoprene, and butyl, in addition to trade name gloves made from multiple materials that provide greater chemical protection. Chemical resistance guides or charts provide specific information about the chemical permeability of glove materials and should be consulted when selecting the appropriate glove. Many guides are available, including but not limited to those listed in the annotated references in the adjacent box. However, these charts may present conflicting information because the criteria for testing the different glove types and glove specifications may vary by manufacturer.

Guides can provide recommendations based on permeation, breakthrough time, permeation rates, and degradation of the material.

- Permeation is the process by which a chemical can pass through the protective material at a molecular or microscopic level. "Chemical permeation can be described in simple terms by comparing it to what happens to the air in a balloon after several hours. Although there are no holes or defects, and the balloon is tightly sealed, the air gradually passes through (permeates) its walls and escapes" (Ansell 2003).
- Breakthrough time (in minutes) is the time it takes the chemical to pass through the material and be analytically detected. Breakthrough time represents "how long a glove can be expected to provide effective permeation resistance

when totally immersed in the test chemical" (Ansell 2003).

- Permeation rate is the speed at which the chemical moves through the material after breakthrough.
- Degradation is the change in one or more physical properties of a glove material due to contact with a chemical. Certain glove materials may change color, become hard, stiff, or brittle, or they may grow softer, weaker, and swell to several times their original size. "If a chemical has a significant impact on the physical properties of a glove material, its permeation resistance is quickly impaired" (Ansell 2003). However, permeation and degradation do not always correlate.
- Penetration, in contrast to permeation, refers to the bulk flow of a chemical through physical spaces in the material such as tears, rips, pinholes and/or manufacturing defects that may or may not be visible to the naked eye.

Manufacturers may use this information in differing ways to define their recommendations and they may also provide data on the performance of materials against national consensus tests and standards. Guides should be read carefully to understand these conditions.

The Health & Safety Committee has created the following chart to help conservators select the appropriate material for chemical use (Table 1) based on data from the Quick Selection Guide to Chemical Protective Clothing (Forsberg and Mansdorf 2007). As one can see, no single type of glove is perfect for all chemicals. Please note that this guide represents the safest materials for both immersion and incidental contact based on results from continuous chemical contact. Therefore, while the chart may indicate that a certain material is rated fair or poor, this rating may not be indicative of splash resistance, or reflect the effectiveness of a particular brand or trade name product. The manufacturer's recommendations also should be consulted when selecting the suitable material, particularly when the gloved hands will be immersed in the chemical.

In addition to chemical protection, the working properties of the gloves—for example, flexibility and tear resistance that can vary by material—must also be taken into consideration when choosing the appropriate glove for a task. Non-disposable gloves usually provide excellent chemical barriers and perform better under mechanical stresses, but tend to be thicker and must be cleaned after each use. Most of these gloves are available in flexible models to address dexterity issues, or have slip resistance at the palm and/or fingertips to help with grip. Disposable gloves are typically thinner and allow for greater movement, but they generally only provide splash protection, may have shorter breakthrough and permeation times, and should be replaced after any chemical contact or after removing them for any reason. Doubling up or combining thinner glove types may lengthen breakthrough time and provide additional physical and chemical protection.

Conservators should also consider using gloves manufactured without the chemicals commonly known as accelerators (i.e., dithiocarbamates, thiurams, and mercaptobenzothiazoles). These chemicals are added to provide elasticity, strength, and integrity to the glove material but may cause allergic reaction and potential interactions between the sulfur-containing accelerator chemicals and the artifacts being handled. Manufacturers are aware of the potential negative health effects of sulfur containing accelerators

Table 1. AIC Health and Safety Committee: PPE Chemical Protective Material Selection Guide¹

Chemical	Butyl	Rubber	Neoprene	Nitrile	PE	PVAL	PVC	Silver Shield
Acetic acid	VG	P	F	P	P	P	P	VG
Acetone	VG	P	P	P	P	P	P	VG
Ammonium carbonate	-	VG	VG	VG	-	-	-	-
Ammonium hydroxide (30-70%)	VG	P	G	G	P	P	F	-
Aniline	VG	P	P	P	P	VG	P	VG
Benzene	P	P	P	P	P	VG	P	VG
Benzyl alcohol	VG	P	F	G	-	P	P	VG
Calcium hydroxide	-	-	VG	VG	VG	-	-	-
Citric acid (30-70%)	VG	VG	VG	VG	VG	P	G	-
Ethyl acetate	F	P	P	P	P	G	P	VG
Ethanol	VG	P	G	F	F	P	P	VG
Ethylene glycol	VG	VG	VG	VG	VG	F	VG	VG
Ferric chloride	-	-	VG	VG	-	P	G	-
Formic acid (>70%)	VG	P	VG	F	P	P	G	F
Glycerin/Glycerol	VG	VG	VG	VG	-	-	VG	VG
Hydrochloric acid (<30%)	VG	VG	VG	VG	F	P	G	G
Hydrofluoric acid (30-70%)	VG	F	VG	P	F	P	F	G
Hydrogen peroxide (30-70%)	VG	VG	VG	VG	VG	P	G	G
Iodine, solid	VG	-	VG	VG	G	-	-	-
Isooctane	P	P	F	VG	-	G	P	-
Isopropanol	VG	P	VG	VG	P	P	F	VG
Methanol	VG	P	F	P	P	P	P	F
Methylcellosolve (methyl glycol)	VG	P	P	P	-	P	P	VG
Methylene chloride	P	P	P	P	P	VG	P	G
Methyl ethyl ketone	G	P	P	P	P	P	P	VG
Methyl methacrylate	F	P	P	P	P	VG	P	VG
Naphthalene	P	P	P	P	-	-	P	-
Naphtha, 10-30% aromatics, (Mineral spirits)	P	P	F	VG	P	G	F	VG
Naphtha, 10-15% aromatics, (Petroleum benzene/VM&P)	P	P	P	G	-	G	P	-
Nitric acid (30-70%)	VG	P	VG	P	G	P	F	G
o-Toluidine	VG	-	F	-	P	-	P	VG
Oxalic acid (<30%)	VG	VG	VG	VG	-	P	VG	VG
Petroleum ether	P	P	P	VG	P	-	P	VG
Phenol (>70%)	VG	P	F	P	P	F	P	G
Phosphoric acid (>70%)	VG	VG	VG	VG	VG	P	VG	VG
Potassium hydroxide	VG	VG	VG	VG	-	P	VG	G
Propanol	VG	P	G	G	-	P	F	G
Sodium hydroxide	-	-	-	-	VG	-	-	-
Sodium thiosulfate	VG	VG	VG	VG	-	-	VG	-
Stoddard solvent	P	P	F	VG	-	G	P	-
Sulfuric acid (30-70%)	VG	VG	VG	F	VG	P	VG	VG
Tetra hydrofuran	P	P	P	P	P	F	P	VG
Toluene	P	P	P	P	P	VG	P	VG
Trichloroethylene	P	P	P	P	P	VG	P	VG
Triethanolamine	VG	G	G	F	-	-	G	G
Turpentine	P	P	P	F	-	G	P	VG
Xylene	P	P	P	P	P	VG	P	VG

¹ Recommendations from Forsberg, K and Mansdorf, S. Z. 2007. *Quick Selection Guide to Chemical Protective Clothing, 5th Edition*. New Jersey: Wiley & Sons Inc. Recommendations are not valid for very thin Natural Rubber, Neoprene, Nitrile and PVC gloves (0.3mm or less).

Recommendations are based on resistance to chemical breakthrough under conditions of continuous contact:
 VG = Recommended (> 8 hours of resistance)
 G = Recommended (4- 8 hours of resistance)
 F = Use with caution (1-4 hours of resistance)
 P = Not Recommended (< 1 hour of resistance)
 - = Not Tested

Rubber = Natural Rubber/Latex
 PE = polyethylene
 PVAL = polyvinyl alcohol
 PVC = polyvinylchloride
 Silver Shield = North Silver Shield® laminate of polyamide/ethylene vinyl acetate/polyethylene plastic films

and have developed alternative manufacturing processes in order to provide accelerator free versions of these products (Ansell 2008). Technical assistance is always available from glove manufacturers and vendors to help determine the correct product for use. A “live” discussion is often best to address specific concerns and samples can usually be obtained upon request. Finally, while MSDSs are vague about the specific glove materials required for use of a particular chemical, the data sheets should be reviewed to assess the overall risk for chemical exposure. Prudent health and safety practices should always be observed to provide a safe working environment.

For more definitions, properties of glove materials, links to glove manufacturers and suppliers, and an online version of the Health & Safety Committees’ chart, visit the AIC wiki page (www.conservation-wiki.com/wiki/Chemical_Protective_Gloves).

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Annotated List of Sources (all websites accessed on 5/1/2013)

Ansell Cares. 2008. *Chemical Accelerators in Medical Gloves*.

www.newcastle.edu.au/Resources/Faculties/Faculty%20of%20Health/documents/RCStore%20Documents/RCStore%20Ansell%20chemical%20accelerators.pdf

Ansell Occupational Healthcare. 2003. *Chemical Resistance Guide: Permeation and Degradation Data, 7th edition*. www.ansellpro.com/download/Ansell_7thEditionChemicalResistanceGuide.pdf

This chart contains data for laminate film, nitrile, unsupported neoprene, supported polyvinyl alcohol, polyvinyl chloride, natural rubber, and neoprene/natural rubber blend gloves. Unsupported gloves are manufactured using hand forms that are dipped directly into a glove compound with no supporting liner. The resulting glove provides good tactility and dexterity. Supported gloves are manufactured with a knitted or woven cloth liner that adds structural strength. The liner ensures the gloves have greater resistance to snags, abrasions, cuts, and punctures, but affects tactility. Three categories of data are represented for each Ansell product and corresponding chemical: 1) overall degradation resistance rating; 2) permeation breakthrough time; and 3) permeation rate.

Considine, B., et. al. 2010. *Conserving Outdoor Sculpture: The Stark Collection at the Getty Center*. Los Angeles: Getty Conservation Institute. The chart in this book provides selection recommendations for a variety of chemicals commonly used in conservation. This type of “best choice” chart may be misleading by suggesting only one material is appropriate for a specific chemical. The user may want to maximize working properties by selecting different glove materials.

Forsberg, K. and S.Z. Mansdorf. 2007. *Quick Selection Guide to Chemical Protective Clothing*, 5th edition. New Jersey: Wiley & Sons, Inc.

This comprehensive guide on understanding, selecting, and using chemical protective materials contains information for 19 different generic and trade protective barriers and nearly 800 chemicals. The data tables are based on “published and unpublished results of permeation testing completed by accredited test laboratories, manufacturers’ test laboratories, and researchers using ASTM, ISO, and EN standard methods. The majority of the data shown for generic barriers are a summary of the results of more than one test” (Forsberg and Mansdorf 2007, Section IV). Recommendations are based largely on breakthrough times under conditions of continuous exposure.

North Safety Products. 2005. *Chemical Safety Guide*.

www.northsafety.com/ClientFormsImages/NorthSafety/CorpSite/E8D15F2E-1F59-454F-B8F0-147FA2B9D81D.pdf This chart

Ten Important Considerations for the Selection and Use of Chemical Protective Clothing

(Adapted from Forsberg, K. and Mansdorf, S. Z. 2007. *Quick Selection Guide to Chemical Protective Clothing, 5th Edition*. New Jersey: Wiley & Sons Inc.)

1. All chemicals pass or permeate through protective barriers sooner or later. It is very important to keep track of allowable use times. Remember, permeation can take place without any visible evidence or change in the protective materials. Color changes or changes in texture, as well as hardening or softening of protective barriers after use, usually indicate degradation.

2. Even the best protective clothing products will not perform properly if they are torn, cut, or damaged. Inspect protective clothing before each use. The integrity of gloves can be checked for leaks by air inflation or by filling with water. If your hands are damp after removing the glove after use, assess to see if this is due to perspiration or unexpected leakage.

3. A barrier may protect against one chemical very well, but perform poorly against another or a mixture of chemicals. Each chemical and material combination must be considered. No single protective material is an absolute barrier against all chemicals.

4. Recommendations are generally based on tests that have been performed at room temperature. Higher temperature usually decreases the breakthrough time of chemicals.

5. Generally, thicker is better. Increasing the thickness of the protective article will normally increase the time to breakthrough, but the benefits may be offset by a decrease in tactility and dexterity. The use of multiple layers (e.g. double gloving) can increase thickness and provide desirable properties of different materials.

6. Chemically resistant gloves and other chemical protective clothing may all look alike. Be sure that the material you are using is the right one for the job you are doing. Do not depend on only the appearance or color of the material since most barriers are available in many different forms and colors.

7. Once the barrier material has absorbed a chemical, it will continue to permeate (pass through) the material. If the protective material has been contaminated to the point of breakthrough it must be decontaminated or disposed. To avoid contaminating yourself, grasp one glove (near the wrist) and remove it by turning it inside out. Then, use the inside-out glove to remove the second one. Properly dispose of both gloves.

8. Many recommendations for glove use give the common generic name of the glove material. Most of the polymer formations in each material type vary by manufacturer and can vary by product lot. Research has shown this variation in chemical resistance can be significant for neoprene, nitrile, and PVC. Users should check with the manufacturer for the test results.

9. Some protective clothing has a shelf life and/or requires special storage measures, such as avoidance of sunlight, ozone, or moisture and temperature extremes. Check with the manufacturers for the proper storage, maintenance, and care. Also remember that alterations may void the manufacturer’s warranty and change the performance of the material.

10. Very thin ultra-lightweight gloves in rubber and polyethylene often offer poor chemical and mechanical resistance. These types of disposable gloves have much shorter breakthrough times and the ratings from mechanical tests are also typically poor. Latex or natural (non-vulcanized) rubber gloves and gloves produced with accelerators also present a significant risk of allergic reaction.

contains information on Silver Shield®, Viton®, Chemsoft®, butyl, nitrile, and natural rubber gloves. Three categories of data are represented for each North Safety product and corresponding chemical: 1) degradation rating; 2) breakthrough time; and 3) permeation rate.

U.S. Department of Energy. *Occupational Safety and Health Technical Reference Manual*. "Chemical Resistance Selection Chart for Protective Gloves." Reproduced in Occupational Safety and Health Administration (OSHA), United States Department of Labor. 2003. "Personal Protective Equipment." www.osha.gov/Publications/osh3151.html This chart rates glove materials by VG: Very Good; G: Good; F: Fair; and P: Poor (not recommended) and is available on the OSHA website. However, the source for these ratings and how the ratings were determined is not provided on the website.

New Publications

Climate for collections: standards and uncertainties. Ashley-Smith, Jonathan, Andreas Burmester, and Melanie Eibl, eds. London: Archetype, 2013. ISBN: 9781909492004. This volume publishes 35 papers presented at a conference held at the Pinakothek der Moderne in Munich, November 7-9, 2012, on the occasion of the 75th anniversary of the Doerner Institut. The papers investigate the current state of knowledge about suitable environmental conditions for cultural heritage collections and address issues connected with the interaction between environmental conditions and climate change. This book is also available as a PDF

download at www.doernerinstitut.de/en/projekte/kuk2013/kuk_1.html

Adhesives and consolidants in painting conservation. Barros D'Sa, Angelina, Lizzie Bone, Rhiannon Clarricoates, and Alexandra Gent. London: Archetype, in association with the Icon Paintings Group, 2012. ISBN: 9781904982883. This book publishes ten of twelve papers presented at a conference organized by the ICON Paintings Group, held at the National Portrait Gallery, London, in May 2011. The authors discuss issues such as the practical application of materials, reversibility and long-term performance, and the properties of materials used as adhesives/consolidants.

Compendium of image errors in analogue video. Gfeller, Johannes, Agathe Jarczyk, and Joanna Phillips, with a contribution by Irene Schubiger. Zürich: SIK ISEA, Schweizerisches Institut für Kunstwissenschaft, 2013. ISBN 9783858813817. The authors of this book provide guidelines for the condition assessment and preservation of analogue video. Along with an included DVD, the book illustrates in stills and moving images the 28 most common image errors found on videotapes.

Preserving and exhibiting media art: challenges and perspectives. Noordegraaf, Julia. Amsterdam: Amsterdam University Press, 2013. ISBN: 9789089642912. This introduction to the preservation and presentation of media art is a mix of scholarly articles and case studies. The texts provide an overview of the history and theory of media art preservation and the practical skills required to achieve it.

Historical perspectives on preventive conservation. Staniforth, Sarah,

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