Supreme XTreme by JFB Hart Coatings

Certifications & Independent Testing — Document Package

Note: Several reports reflect the HP-105 / GlossTek-100 predecessor formulations of Supreme XTreme (manufactured today by Pruett-Schaffer Chemical Co.); product names appear as originally tested. Page numbers refer to this combined PDF.

JFB HART COATINGS, INC.

How do you know JFB Hart Coatings?

- Their superior performing urethane coatings for all kinds of surfaces.

What is the latest news with JFB?

- JFB is very pleased to announce that they are the very first to have paint and chemical product's in the marketplace that are NFSI certified!

What Products are certified?

- **HP-100** - High gloss, multiple component, with an eight hour dry time for use on resilient flooring.
- **FD-100** - High gloss, multiple component, with a four hour dry time for use on resilient flooring.
- **HP-101 Gloss/Matte/Satin** - Single component, with a two hour dry time for use on resilient flooring.
- **HP-105 Clear/Color** - Multiple component, with an eight hour dry time for use on non-resilient flooring, vertical surfaces, wood and many others.
- **HP-146 Clear/Color** - Single component, with a 45 minute dry time for use on vertical and horizontal surfaces; such as dry wall, concrete, metal, aluminum and many others.

Who and What is the NFSI?

- NFSI is an non-profit organization whose mission is to aid in the prevention of slip and fall accidents through education, training and research.
- NFSI certifies products as "High Traction"; which means they must have a static co-efficient of friction of .6 or greater.

NFSI CERTIFIED

For more information, please contact your local JFB Hart Coatings office.

820 Jorie Boulevard
Suite 410
Oak Brook, IL 60523
Ph #: 630-574-1729
Fax: 630-574-1798

491 Irmen Drive
Addison, IL 60101
Ph #: 630-628-1200
Fax: 630-628-1233

1849 Kaiser Street
Irvine, CA 92614
Ph #: 949-724-9737
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3773 Cherry Creek
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Ph #: 720-974-1100
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4702 Wesley Street
Suite D
Greenville, TX 75401
Ph #: 903-454-8981
Fax: 903-454-9020

18 Chelsea Court
Annapolis, MD 21403
Fax: 410-267-6860

JFB Hart Coatings, Inc.

INTEROFFICE MEMORANDUM

Timothy D. Kingsbury

TO: The Files

DATE: July 3, 2003

RE: NFSI Testing

The National Floor Safety Institute (NFSI) has been testing our HP-100 (GlossTek-100) with various levels of Aluminum Oxide. This testing is divided into two Phases. If a coating passes both Phases, it is certified by NFSI as "High Traction". This means the coating has much higher "slip resistance" than traditional coatings.

NFSI has told us that all current floor coatings will pass basic "slip resistance", which is defined as a coefficient of friction of at least 0.50 measured with a James Machine under dry conditions. This is consistent with general government guidelines, etc.

To be certified by NFSI as "High Traction" a coating must have a coefficient of friction of at least 0.60 under wet conditions. This is a much higher standard of "slip resistance".

Our HP-100 (GlossTek-100) with Aluminum Oxide has passed both Phases of NFSI testing, and is now certified as "High Traction". Phase I is a lab test with a sample of the coating on a 12" x 12" VCT sample. Our coating tested well above the "0.60 wet" standard in Phase I. Phase II is a 30 day field testing, after extensive foot traffic and regular floor maintenance. Again, our coating tested well above the "0.60 wet" standard in Phase II.

JFB Hart Coatings, Inc.
Slip Resistant Testing

ASTM D1894 & ASTM C1028

Product	Sample No	Initial Peak, lbf	Avg Kinetic Load, lbf	Sled Weight, lb	Static Coeff. of Friction	Kinetic Coeff. of Friction
GlossTek 100 Dry	1	40	33	51	0.78	0.66
	2	42	37	51	0.82	0.72
	3	42	39	51	0.82	0.76
	4	36	30	51	0.70	0.58
	5	35	29	51	0.68	0.57
	Average				0.76	0.66
	Std. Dev.				0.07	0.08
GlossTek 100 Wet	1	43	36	51	0.85	0.71
	2	44	38	51	0.86	0.75
	3	50	39	51	0.98	0.77
	4	34	31	51	0.67	0.61
	5	36	31	51	0.71	0.60
	Average				0.81	0.69
	Std. Dev.				0.13	0.08
GlossTek 100 with Aluminum Oxide Dry	1	43	40	51	0.83	0.78
	2	41	40	51	0.81	0.78
	3	43	40	51	0.83	0.78
	4	44	40	51	0.86	0.79
	5	42	38	51	0.82	0.75
	Average				0.83	0.78
	Std. Dev.				0.02	0.01
GlossTek 100 with Aluminum Oxide Wet	1	43	39	51	0.85	0.76
	2	52	40	51	1.02	0.78
	3	50	39	51	0.98	0.77
	4	44	40	51	0.87	0.78
	5	45	37	51	0.87	0.72
	Average				0.92	0.76
	Std. Dev.				0.08	0.03

National Floor Safety Institute

GT-100	Certified*
GT-100 with Aluminum Oxide	Certified*
GT-100 w/AO .5 lbs	0.61
GT-100 w/AO 1.0 lbs	.62-.63
GT-100 w/AO 1.5 lbs	0.63
GT-100 w/AO 2.0 lbs	.68-.70
GT-100 w/AO 2.5 lbs	.89-.98
* Products are certified if they pass a wet SCOF of .6 or greater.	

JFB HART COATINGS, INC.

LEED & GLOSSTEK

GlossTek is eligible for one LEED Credit, namely: EQ 4.2—Low Emitting Materials—Paints and Coatings. It meets the LEED criteria because the VOC levels are below the necessary limits established by the South Coast Air Quality Management District (SCAQMD) Rule 1113, Architectural Coatings, and rules in effect on January 1, 2004.

LEED

The LEED Green Building Rating System is a voluntary, consensus-based, market-driven building rating system based on existing proven technology. It evaluates environmental performance from a whole building perspective over a building's life cycle, providing a definitive standard for what constitutes a "green building."

The rating system is organized into five environmental categories. **The applicable category for GlossTek is Indoor Environmental Quality, EQ Credit 4.2 – Low Emitting Materials—Paints and Coatings.** EQ stands for environmental quality.

LEED is a measurement system designed for rating new and existing commercial, institutional and residential buildings. There are three LEED documentations: 1) LEED-NC – for New Construction and Major Renovations; 2) LEED-EB – for Existing Buildings; and 3) LEED-CI – for Commercial Interiors.

LEED is a performance-oriented system where credits are earned for satisfying criterion designed to address specific environmental impacts inherent in the design, construction and O & M of buildings. All commercial buildings are eligible for certification as a LEED-NC building. Commercial occupancies include (but are not limited to) offices, retail and service establishments, institutional buildings (libraries, schools, museums, churches, etc.), hotels, and residential buildings of our or more habitable stories.

LEED-NC addresses design and construction activities for both new buildings and major renovations of existing buildings. LEED-EB is designed to address operational and maintenance issues of working buildings. Many projects will cleanly and clearly fit the defined scope of only one LEED Rating System product. Other projects may be applicable to two or more LEED Rating System product scopes.

LEED-NC REGISTRATION AND APPLICATION

Project teams interested in obtaining LEED-NC Certification of their project must first register this intent with the USGBC at www.usgbc.org

Once a project is registered, the project design team begins to collect information and perform calculations to satisfy the prerequisite and credit submittal requirements (MSDS, technical data sheets, etc.).

The LEED-NC ratings are awarded according to the following scale:

Level	Points
Certified	26-32 points
Silver	33-38 points
Gold	39-51 points
Platinum	52-69 points

INDOOR ENVIRONMENTAL QUALITY – LOW-EMITTING MATERIALS (paints and coatings, EQ Credit 4.2)

Intent

Reduce the quantity of indoor air contaminants that are odorous, irritating, and/or harmful to the comfort and well being of installers and occupants.

Requirements

Paints and coatings used on the interior of the building (defined as inside the weatherproofing system and applied on-site) shall comply with the following criteria:

- Clear wood finishes, floor coatings, stains, sealers, and shellacs applied to interior elements: Do not exceed the VOC content established in South Coast Air Quality Management District (SCAQMD) Rule 1113, Architectural Coatings, rules in effect on January 1, 2004. **GLOSSTEK DOES NOT EXCEED THE VOC CONTENT ESTABLISHED BY THE SCAQMD.** The documentation that supports this claim is on JFB Hart Coating's website at www.jfbhartcoatings.com. Look for the GlossTek 100 or GlossTek 400 Technical Data Sheets, respectively.

Potential Technologies and Strategies

Specify low-VOC paints and coatings in construction documents. Ensure that VOC limits are clearly stated in each section of the specifications where paints and coatings are addressed. Track the VOC content of all interior paints and coatings during construction.

JFB Hart Coatings, Inc.
LEED for Retail
November 2010

The U.S. Green Building Council ("USGBC") announced the launch of LEED for Retail at the November 2010 Greenbuild International Conference & Expo in Chicago. LEED for Retail is the newest green-building rating system designed to meet the certification needs of high-volume property developers.

After review of the new standards, JFB Hart is pleased to announce ~~that a facility can use JFB Hart's~~ our high performance, low VOC products can be used by retail facilities to obtain LEED Credits ~~for their facilities~~. ~~Below is a list t~~The two pertinent sections are~~where JFB Hart's products are applicable~~:

IEQ Credit 4: Low-Emitting Materials

Standard Intent: To reduce the quantity of indoor air contaminants that are odorous, irritating, and/or harmful to the comfort and well being of installers and occupants.

Available LEED Points: 1 point

Standard Option 2: Paints and Coatings

Option 2 Description: Paints and coatings used on the interior of the building (i.e., weatherproofing system and applied onsite) must comply with the following criteria as applicable to the project scope[1]:

- Architectural paints, coatings, and primers applied to interior walls and ceilings must not exceed the volatile organic compound (VOC) content limits established in Green Seal Standard GS-11, Paints, 1st Edition, May 20, 1993.
  - Flat Topcoat VOC Limit = 50 g/L
  - Non-Flat Topcoat VOC Limit = 100 g/L
  - Primer or Undercoat VOC Limit = 100 g/L
  - Floor Paint VOC Limit = 100 g/L
- Anticorrosive and antirust paints applied to interior ferrous metal substrates must not exceed the VOC content limit of 250 g/L established in Green Seal Standard GC-03, Anti-Corrosive Paints, 2nd Edition, January 7, 1997.
- Clear wood finishes, floor coatings, stains, and shellacs applied to interior elements must not exceed the VOC content limits established in South Coast Air Quality Management District (SCAQMD) Rule 1113, Architectural Coatings, rules in effect on January 1, 2004.
  - Wood VOC Limit = 275 g/L
  - Floor Coatings VOC Limit = 100 g/L
  - Stains VOC Limit = 250 g/L
  - Shellacs VOC Limit:
    - Clear = 730 g/L
    - Opaque = 550 g/L

JFB Hart Products: *JFB Hart's products are applied to VCT, vinyl sheeting, linoleum, terrazzo, ceramic, concrete and other resilient and non-resilient flooring. The following products meet all the VOC limits noted above:*

- *GlossTek-100 VOCs are less than 50 g/L (available in clear only)*
- *GlossTek-400 VOCs are less than 50 g/L (available in clear only)*
- *MatteTek-300 VOCs are less than 50 g/L (available in clear and color)*
- *SatinTek-300 VOCs are less than 50 g/L (available in clear and color)*
- *VersaTek-100 VOCs are less than 30 g/L (available in clear and color)*

Additional Benefits: *JFB Hart's products reduce the cost of floor care by 40-80% by eliminating much of ~~reducing~~ the labor typically needed to maintain ~~the~~ floors. When using JFB Hart's products, a facility will eliminate virtually all the labor costs associated with maintaining acrylic finish; including burnishing, buffing, scrub and recoats and stripping. As an added*

[1] The use of a VOC budget is permissible for compliance with this credit

benefit~~In addition to the elimination of labor~~, ~~a facility will also reduce~~ the amount of waste, electricity and water used to maintain ~~acrylic~~ retail facility floors will be significantly lower.

SS Credit 7.2: Heat Island Effect - Roof

Standard Intent: To reduce heat islands[2] to minimize impacts on microclimates and human and wildlife habitats.

Available LEED Points: 1 point

Standard Option 1: Use roofing materials with a solar reflectance index (SRI)[3] equal to or greater than the values in the table below for a minimum of 75% of the roof surface. Roofing materials having a lower SRI value than those listed below may be used if the weighted rooftop SRI average meets the following criterion:

$$\frac{\text{Area Roof Meeting Minimum SRI}}{\text{Total Roof Area}} \times \frac{\text{SRI of Installed Roof}}{\text{Required SRI}} \geq 75\%$$

Roof Type	Slope	SRI
Low-sloped roof	≤ 2:12	78
Steep-sloped roof	≥ 2:12	29

JFB Hart Products: *JFB Hart's HP-105 aliphatic polyurethane can be used as a topcoat for~~to~~ roofing surfaces to provide a SRI index rating that meets and exceeds the LEED criteria ~~numbers~~ noted above. The HP-105 is available in a high gloss clear and any color. The following is the SRI for the HP-105 on a low-sloped roof:*

- *1 coat of HP-105 = 78.8*
- *2 coats of HP-105 = 83.6*

[2] Heat islands are thermal gradient differences between developed and undeveloped areas.
[3] Under-cover parking is parking underground, under deck, under roof, or under a building.

Environmentally Aware
JFB HART COATINGS
Economically Proven

10210 WERCH DRIVE ◆ SUITE 203 ◆ WOODRIDGE, ILLINOIS 60517
(630) 633-6228 ◆ (630) 633-6238 FAX

April 7, 2014

Mr. Jeff Calhoun
Frazee Paint

RE: Request for Coatings Ingredients Information: LEED Related

Dear Jeff:

We manufactured the U-5000 coating product in Minneapolis, Minnesota under a private labeling agreement with Frazee Paint's parent entity, Comex USA.

The product's sole solvent is water which is harvested from the plant in Minneapolis. The two resins are procured from separate suppliers, one is located in Chicago, Illinois and the other is located in the Los Angeles, California area.

All other ingredients are made in the United States and sourced either out of Chicago, Illinois or other suppliers located in and around Minneapolis. None of the ingredients, including the two resins, are made from recycled materials.

Sincerely,

Timothy D. Kingsbury
Chief Financial Officer

NATLSCO
www.natlsco.com

LABORATORY, K-2

1 Kemper Drive
Long Grove, IL 60049-0075
Phone (847) 320-2488
Fax (847) 320-4331
Toll Free (888) 576-7522

REPORT DATE JAN 16, 2003
SAMPLES REC'D JAN 07, 2003
REQUEST NUMBER 413246
PAGE NUMBER 1 OF 5

TO:

SAMPLE	AIR VOLUME / ANALYSIS REQUESTED	MEDIA TYPE / RESULTS		ANALYZED DAT	
01085-010303-01	8.78 Liters	150 mg Charcoal Tube		JAN 16, 2003	
		micrograms		PPM	
		Front	Back	Front	Back
	BUTYL CELLOSOLVE (DE = 91%)	6.0	< 5.4	0.14	< 0.13
	BUTYL CARBITOL (DE = 100%)	< 5.7	< 5.7	< 0.098	< 0.098
	DIETHYL. GLYCOL DIBUTYL ETHER (DE = 94%)	< 5.4	< 5.4	< 0.069	< 0.069
01085-010303-02	73.1 Liters	150 mg Charcoal Tube		JAN 16, 2003	
		micrograms		PPM	
		Front	Back	Front	Back
	BUTYL CELLOSOLVE (DE = 91%)	33	< 5.4	0.092	< 0.015
	BUTYL CARBITOL (DE = 100%)	< 5.7	< 5.7	< 0.012	< 0.012
	DIETHYL. GLYCOL DIBUTYL ETHER (DE = 94%)	< 5.4	< 5.4	< 0.01	< 0.01

COMMENTS:

IF PRESENT, DE MEANS DESORPTION EFFICIENCY

Respectfully submitted,

William M. Walsh

William M. Walsh, CIH, ROH
Director Environmental Health Services
Environmental Sciences Laboratory

ACCREDITED BY THE AMERICAN INDUSTRIAL HYGIENE ASSOCIATION

NATLSCO
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REPORT DATE JAN 16, 2003
SAMPLES REC'D JAN 17, 2003
REQUEST NUMBER 413245
PAGE NUMBER 2 OF 5

TO:

USA

SAMPLE	AIR VOLUME / ANALYSIS REQUESTED	MEDIA TYPE / RESULTS	ANALYZED DAT
01085-010303-FB1		150 mg Charcoal Tube	JAN 16, 2003
		micrograms Front / Back	
	BUTYL CELLOSOLVE (DE = 91%)(BLANK)	< 5.4 / < 5.4	
		NONE DETECTED	
	BUTYL CARBITOL (DE = 100%)(BLANK)	< 5.7 / < 5.7	
		NONE DETECTED	
	DIETHYL. GLYCOL DIBUTYL ETHER (DE = 94%)(BLANK)	< 5.4 / < 5.4	
		NONE DETECTED	
01085-010303-03	57.1 Liters	1,2-PP Coated Glass Fiber Filter	JAN 10, 2003
		micrograms / PPM	
	HDI (HPLC)	< 1.0 / < 0.0025	
		micrograms / mg/m3	
	ISOCYANATE PREPOLYMER	< 1.0 / < 0.018	

COMMENTS:

IF PRESENT, DE MEANS DESORPTION EFFICIENCY

Respectfully submitted,

William M. Walsh IV

William M. Walsh, CIH, ROH
.rector Environmental Health Services
Environmental Sciences Laboratory

ACCREDITED BY THE AMERICAN INDUSTRIAL HYGIENE ASSOCIATION

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REPORT DATE JAN 16, 2003

SAMPLES REC'D JAN 07, 2003

REQUEST NUMBER 413246

TO:

SAMPLE	AIR VOLUME / ANALYSIS REQUESTED	MEDIA TYPE / RESULTS		ANALYZED DAT
01085-010303-04	492 Liters	1,2-PP Coated Glass Fiber Filter		JAN 10, 2003
	HDI (HPLC)	micrograms < 1.0	< 0.0003 PPM	
	ISOCYANATE PREPOLYMER	micrograms < 1.0	< 0.002 mg/m3	
01085-010303-FB2		1,2-PP Coated Glass Fiber Filter		JAN 10, 2003
	HDI (HPLC) (BLANK)	micrograms < 1.0 NONE DETECTED		
	ISOCYANATE PREPOLYMER (BLANK)	< 1.0 NONE DETECTED		

COMMENTS:

IF PRESENT, DE MEANS DESORPTION EFFICIENCY

Respectfully submitted,

William M. Walsh

William M. Walsh, CIH, ROH
Director Environmental Health Services
Environmental Sciences Laboratory

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REPORT DATE JAN 16, 2003
SAMPLES REC'D JAN 07, 2003
REQUEST NUMBER 413246
PAGE NUMBER 4 OF 5

TO:

LLD *	ANALYSIS REQUESTED	METHODOLOGY	CAS #
5.7	BUTYL CARBITOL CTS	OSHA 07 GAS CHROMATOGRAPHY	112-34-5
5	BUTYL CELLOSOLVE CTS	OSHA 83 GAS CHROMATOGRAPHY	111-76-2
4	DIETHYL. GLYCOL DIBUTYL ETHER CTS	OSHA 07 GAS CHROMATOGRAPHY	112-73-2
1	HDI (HPLC) PP12	OSHA 42 HIGH PRESSURE LIQUID CHROMATOGRAPHY	822-06-0
1	ISOCYANATE PREPOLYMER PP12	OSHA 42 HIGH PRESSURE LIQUID CHROMATOGRAPHY	

COMMENTS:

CONCENTRATION CALCULATED USING AIR VOLUMES SUPPLIED BY CLIENT
* LLD IS THE REPORTING LIMIT IN MICROGRAMS
* MODIFICATIONS MAY BE MADE TO ABOVE METHODS TO OPTIMIZE RESULTS
* UNLESS OTHERWISE NOTED, SAMPLES RECEIVED IN GOOD CONDITION
* RESULTS ARE STRICTLY LIMITED TO SAMPLES ANALYZED

Respectfully submitted,

William M. Walsh

illiam M. Walsh, CIH, ROH
Director Environmental Health Services
Environmental Sciences Laboratory

ACCREDITED BY THE AMERICAN INDUSTRIAL HYGIENE ASSOCIATION

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LABORATORY ANALYSIS REPORT

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REPORT DATE JAN 16, 2003
SAMPLES REC'D JAN 07, 2003
REQUEST NUMBER 413246

TO:

	REQUEST LAB COMMENTS:	
		TAKEN OFF HOLD: 01/07/03, DUE DATE: 01/15/03 ICPP QUANTITATED AGAINST CAS# 28182-81-2

Respectfully submitted,

William M. Walsh

William M. Walsh, CIH, ROH
Director Environmental Health Services
Environmental Sciences Laboratory

ACCREDITED BY THE AMERICAN INDUSTRIAL HYGIENE ASSOCIATION

Environmentally Aware

JFB HART COATINGS

Economically Proven

Part A

GlossTek™ 400*plus* MB

Microban® antimicrobial product protection

Premium, Durable Floor Finish System
Système d´enduit durable et de première qualité pour plancher

FOR PROFESSIONAL USE ONLY
POUR PROFESSIONNELS SEULEMENT

Microban® antimicrobial protection inhibits the growth of stain and odor causing bacteria, mold and mildew.

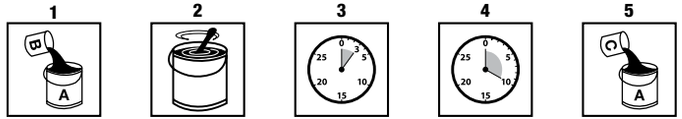
La protection antimicrobienne Microban® empêche la croissance des bactéries et de la moisissure qui provoquent des taches et des odeurs.

Net Weight/Poids Net: 0.6 lbs/0.3 kg

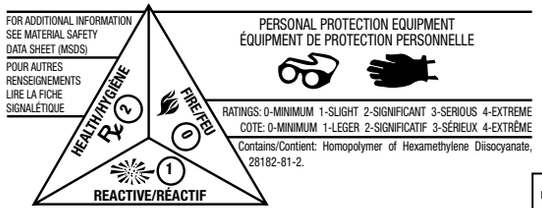
Label No. 16054-JFB

FOR PROFESSIONAL USE ONLY.
MIXING INSTRUCTIONS AND DIRECTIONS FOR USE:
READ ALL PRECAUTIONARY INFORMATION FIRST. WEAR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT.
Stir contents of one can of part B into the gallon container of part A (picture 1). Continually stir for a total of 3 minutes (picture 2 & 3).
After stirring allow the A-B mixture to sit for 10 minutes so that the two products can chemically react with each other (picture 4). Small bubbles will begin to appear on the surface of the mixture.
After waiting for the 10 minutes, slowly add the entire contents of part C into the A-B mixture (picture 5). You will notice a significant reduction in the viscosity.
Continue to stir until the mixture is smooth and has a uniform consistency. After Parts A, B, & C are mixed together you have a maximum time window of 90 minutes before the GlossTek 400 will become too tacky to work with. **TO APPLY:** Refer to the GlossTek Training Manual. Reference the training manual for the coverage rate of product and for additional information regarding the use of the product.
NOTES: SHIP AND STORE BETWEEN 40°F (4°C) & 95°F (35°C). • KEEP FROM FREEZING. • Do NOT store above 120°F. • Product temperature must NOT exceed 90°F during usage.

POUR PROFESSIONNELS SEULEMENT.
INSTRUCTIONS DE MÉLANGE ET D'UTILISATION: LIRE TOUS LES RENSEIGNEMENTS DE SÉCURITÉ EN PREMIER LIEU.
PORTER L'ÉQUIPEMENT DE PROTECTION INDIVIDUELLE RECOMMANDÉ.
Agiter le contenu d'un contenant du produit B et le verser dans le contenant de gallon du produit A (illustration 1). Agiter en continu pour une période de 3 minutes (illustrations 2 et 3).
Après agitation, laisser le mélange A-B reposer pendant 10 minutes de sorte que les deux produits peut réagir chimiquement ensemble (illustration 4). De petites bulles apparaîtront à la surface du mélange.
Après les 10 minutes, ajouter lentement le contenu complet du produit C au mélange A-B (illustration 5). Vous remarquerez une réduction importante de la viscosité.
Continuer à agiter jusqu'à ce que le mélange soit lisse et ait une consistence uniforme. Après avoir mélangé les produits A, B et C ensemble, vous avez 90 minutes pour utiliser le GlossTek 400 avant qu'il ne devienne trop collant pour travailler avec. **POUR APPLIQUER:** Consulter le manuel d'instruction du GlossTek. Consulter le manuel d'instruction pour connaître le pouvoir couvrant du produit et pour des renseignements supplémentaires au sujet de l'utilisation du produit.
REMARQUES: EXPÉDIER ET ENTREPOSER ENTRE 4°C (40 °F) ET 35°C (95°F). • NE PAS CONGELER. • Ne PAS entreposer à plus de 49°C (120°F). • La température du produit ne doit pas excéder 32°C (90°F) au cours de son utilisation.



Formula ingredients contain no Phosphorus. / Les ingrédients de ce produit ne contiennent pas de phosphore.



PERSONAL PROTECTION EQUIPMENT
ÉQUIPEMENT DE PROTECTION PERSONNELLE

RATINGS: 0-MINIMUM 1-SLIGHT 2-SIGNIFICANT 3-SERIOUS 4-EXTREME
COTE: 0-MINIMUM 1-LEGER 2-SIGNIFICATIF 3-SÉRIEUX 4-EXTRÊME

Contains/Contient: Homopolymer of Hexamethylene Diisocyanate, 28182-81-2.

NSF

Nonfood Compounds
Product Listed Category: R-2
Registration #000000

GlossTek 400 Part A

KEEP OUT OF REACH OF CHILDREN.
WARNING: CAUSES RESPIRATORY TRACT AND EYE IRRITATION. MAY CAUSE ALLERGIC RESPIRATORY AND SKIN REACTION. MAY BE HARMFUL IF SWALLOWED. MAY CAUSE SKIN IRRITATION.
Precautions: Keep container dry. Do not breathe gas/fumes/vapour/spray. Avoid contact with skin and clothing. Do not add water directly to product. Slowly stir product into water. Wear suitable gloves and eye protection. If you feel unwell, seek medical attention and show the label when possible. Keep away from incompatibles such as organic material, metals, acids, alkalis, moisture. Keep container closed. Use only with adequate ventilation. Wash thoroughly after handling.
FIRST AID:
Eye contact: In case of contact, immediately flush eyes with cool running water. Remove contact lenses and continue flushing with plenty of water for at least 15 minutes. Get medical attention if irritation persists.
Skin contact: In case of contact, immediately flush skin with plenty of water. Remove contaminated clothing and shoes. Wash clothing before reuse. Clean shoes thoroughly before reuse. Obtain medical attention.
Inhalation: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Obtain medical attention.
Ingestion: Rinse mouth; then drink one or two large glasses of water. DO NOT induce vomiting. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately.

READ MATERIAL SAFETY DATA SHEET BEFORE USING PRODUCT.
FOR EMERGENCY MEDICAL INFORMATION IN USA OR CANADA, CALL 1-800-535-5053.

GARDER HORS DE LA PORTÉE DES ENFANTS.
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Précautions: Conserver le récipient à l'abri de l'humidité. Ne pas respirer les gaz/fumées/vapeurs/aérosols. Éviter le contact avec la peau et les vêtements. Ne pas ajouter de l'eau directement sur le produit. Agiter lentement ce produit dans l'eau. Porter des gants appropriés et un appareil de protection des yeux. En cas de malaise, consulter un médecin et si possible lui montrer l'étiquette. Conserver à l'écart des matières incompatibles telles que les substances organiques, les métaux, les acides, les alcalins, l'humidité. Conserver le récipient fermé. Utiliser uniquement dans un environnement bien aéré. Laver abondamment après usage.
PREMIERS SOINS:
Contact avec les yeux: En cas de contact avec les yeux, rincer immédiatement les yeux à l'eau courante froide. Retirer les lentilles de contact et continuer de rincer les yeux à grande eau pendant au moins 15 minutes. Si l'irritation persiste, consulter un médecin.
Contact avec la peau: En cas de contact, rincer immédiatement la peau à grande eau. Retirer les vêtements et les chaussures contaminés. Laver les vêtements avant de les réutiliser. Laver soigneusement les chaussures avant de les remettre. Consulter un médecin.
Inhalation: En cas d'inhalation, déplacer à l'air frais. En l'absence de respiration, recourir à la respiration artificielle. Si respirer est difficile, donner de l'oxygène. Consulter un médecin.
Ingestion: Se rincer la boucher, puis boire un ou deux grands verres d'eau. NE PAS tenter de faire vomir. Ne rien faire ingérer à une personne inconsciente. Si de grandes quantités de cette substance sont ingérées, appeler un médecin immédiatement.

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JOB NUMBER: 30160 05-64631
PAGE: 1 of 3
DATE: February 8, 2005

SALT FOG EXPOSURE TESTING OF COATINGS: HP-146 CLEAR AND RED

Prepared for:
JFB HART COATINGS, INC
Attn: Tim Kingsbury
4702 Wesley St.
Suite D
Greenville, TX 75401

Prepared By:

Amy J. Ostergren
Project Manager
Product Testing Department
Phone: (651) 659-7303

Reviewed By:

Steven R. Miller
Engineering Technician
Product Testing Department

The test results contained in this report pertain only to the samples submitted for testing and not necessarily to all similar products.

JOB NUMBER: 30160 05-64631 **PAGE:** 2 of 3
Product: HP-146 Red and Clear **DATE:** February 8, 2005

COATING PERFORMANCE TESTING

INTRODUCTION:

This report presents the results of a salt fog exposure test conducted on a two sets of coated panels. The sample was submitted to our laboratory by Mr. Jason Beedie of JFB Hart Coatings Inc. The testing and data analysis were completed on January 19, 2005.

The scope of our work was limited to exposing the specimens to the ASTM B117 conditions and reporting the results.

RESULTS:

At 114 hours, all specimens exhibited complete corrosion. Photos of the specimens are included on page 3 of this report.

SAMPLE IDENTIFICATION:

Ten test specimens were submitted for testing. Five were identified as HP-146 clear and five were identified as HP-146 red. For each set of five specimens, two panels were scribed prior to testing, and three were tested unscribed.

TEST METHOD:

The exposure was conducted following **ASTM B117-03 "Standard Practice for Operating Salt Spray (Fog) Apparatus."** This practice describes the apparatus, procedure, and conditions required to create and maintain the salt spray (fog) test environment. This practice does not prescribe the type of test specimen or exposure periods to be used for a specific product. In summary, a 5% salt fog is generated in the test chamber. The vapor condenses on the test specimens as liquid salt-water. The test specimens are inclined so that condensate runs off the test surface by gravity and is replaced by fresh condensate in a continuous process during the condensate cycle. Some specimens were scribed, down to the base metal, with an X before beginning the test, and at the end of the exposure all specimens were examined for rusting and blistering.

REMARKS:

The test samples will be retained for 15 days from the date of this report and then discarded unless we are notified, in writing, otherwise.

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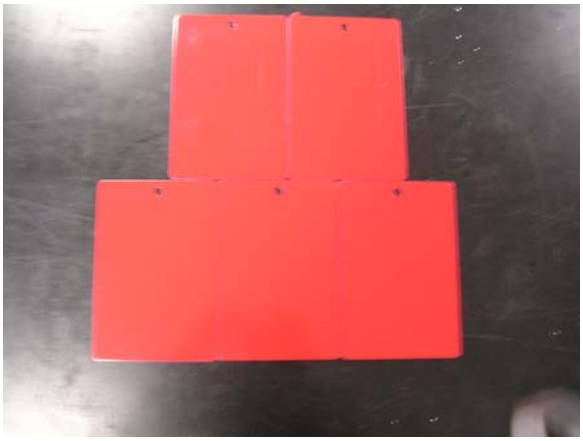
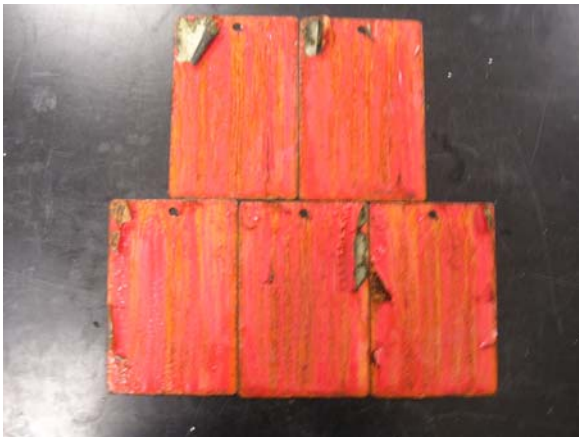
JOB NUMBER: 30160 05-64631 **PAGE:** 3 of 3
Product: HP-146 Red and Clear **DATE:** February 8, 2005

SPECIMENS AS RECIVED:



SPECIMENS EXPOSED FOR 114 HOURS – IMMEDIATELY UPON REMOVAL:



SPECIMENS EXPOSED FOR 114 HOURS – AFTER DRYING:

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Product Evaluation
Welder Qualification

JOB NUMBER: 30160 05-68856
PAGE: 1 of 9
DATE: August 3, 2005

PERFORMANCE PROPERTIES OF A COATING: HP-447 URETHANE COATING

Prepared for:
JFB HART COATINGS, INC
Attn: Tim Kingsbury
4702 Wesley St.
Suite B
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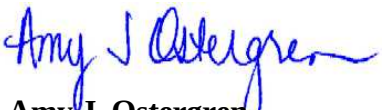
Prepared By:



Amy J. Ostergren
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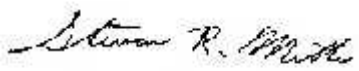
Reviewed By:



Steven R. Miller
Engineering Technician
Product Testing Department

The test results contained in this report pertain only to the samples submitted for testing and not necessarily to all similar products.

JOB NUMBER: 30160 05-68856 **PAGE:** 2 of 9
Product: HP-447 Urethane Coating **DATE:** August 3, 2005

COATING PERFORMANCE TESTING

INTRODUCTION:

This report presents the results of a series of coating performance tests conducted on a clear floor coating. The sample was submitted to our laboratory by Mr. Jason Beedie of JFB Hart Coatings Inc. The testing and data analysis were completed on August 3, 2005.

The scope of our work was limited to conducting the tests outlined in the table below and reporting the results.

SUMMARY OF RESULTS:

Test Description	ASTM	notes	Product: HP-447 Urethane Coating
Set to touch time	D1640	minutes	12
Dry Time dry to touch time	D1640	minutes	20
Tack Free/dry to handle time	D1640	minutes	22
Taber Abrasion w/ 1000 g wheel load	D4060	cycles to wear-through (weight loss at 1000 cycles)	1250 cyc (0.093 g/cycle)
Tape/Knife Adhesion	D3359		5B = 0% removed
Pencil Hardness:	D3363	G=gouge S=scratch	Gouge = 4B Scratch = 4B
Slip Resistance/Coef of Friction	D1894	dry (static/kinetic)	0.58 / 0.48
		wet (static/kinetic)	0.60 / 0.54
Chemical Resistance	D1308	chemicals which had an affect at 24 hrs	betadine and coffee stained
Detergent Resistance	D3207		no degradation at 100 or 200 cycles
Scrub Resistance	D2486	"abrasive" cycles to wear through	>4000
Package Stability - High Temp	Mil Std	observations	no changes
Package Stability - Low Temp	custom		initial values

SAMPLE IDENTIFICATION:

The test material was a clear coating, identified as HP-447 Urethane Coating. The coating was applied to 12” x 12” vinyl composition tiles (VCT), by the customer. Additional material was submitted in liquid form for the package stability, dry time and tack time tests.

JOB NUMBER: 30160 05-68856 **PAGE:** 3 of 9
Product: HP-447 Urethane Coating **DATE:** August 3, 2005

TEST METHODS:

DRY TIME: DRY/SET TO TOUCH:
Testing was conducted using **ASTM D1640-03, "Standard Test Methods for Drying, Curing, or Film Formation of Organic Coatings at Room Temperature**," as a guide. The coating was applied to glass using a 4 mil doctor blade, and allowed to dry. As stated in ASTM D1640, the following procedure is used to determine "Set-to-touch"

> ***7.2 Set-To-Touch Time****—To determine set-to-touch time, lightly touch the test film with the tip of a clean finger and immediately place the fingertip against a piece of clean, clear glass. Observe if any of the coating is transferred to the glass. For the purpose of this test, the pressure of the fingertip against the coating shall not be greater than that required to transfer a spot of the coating from 1.8 to 3.16 in. (3 to 5 mm) in cross section. The film is set-to-touch when it still shows a tacky condition, but none of it adheres to the finger.*
>
> Result: 12 minutes

TACK-FREE TIME: DRY TO HANDLE
Testing was conducted using **ASTM D1640-03, "Standard Test Methods for Drying, Curing, or Film Formation of Organic Coatings at Room Temperature**," as a guide. The coating was applied to glass using a 4 mil doctor blade, and allowed to dry. As stated in ASTM D1640, the following procedure was used to determine the times.

> *7.5 Dry-to-Touch Time: Continue testing after the set-to-touch time has been observed. The film is considered dry when it no longer adheres to the finger and does not rub up appreciably when the finger is lightly rubbed across the surface.*
>
> Result: 20 minutes

> *7.7 Dry-Through (or Dry-To-Handle) Time: Place the test panel in a horizontal position at a height such that when the thumb is placed on the film, the arm of the operator is in a vertical line from the wrist to the shoulder. Bear down on the film with the thumb, exerting the maximum pressure of the arm, at the same time turning the thumb through an angle of 90° in the plane of the film. The film is considered dry-through or dry-to-handle when there is no loosening, detachment, wrinkling, or other evidence of distortion of the film.*
>
> Result: 22 minutes

JOB NUMBER: 30160 05-68856 **PAGE:** 4 of 9
Product: HP-447 Urethane Coating **DATE:** August 3, 2005

TEST METHODS: (Continued)

TABER ABRASION RESISTANCE:
ASTM D4060-01, "Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser" was used as a guide for the abrasion resistance testing. This test method covers the determination of the resistance of organic coatings to abrasion produced by the Taber Abraser on coatings applied to a plane, rigid surface. The vinyl specimens were removed from the lot of coated tiles submitted by the client. Testing was conducted using CS-17 wheels and 1000 grams of load. While monitoring the condition of the coating at 250 cycle intervals, the testing continued until the substrate was exposed.

Results:

Sample	Specimen	Initial weight, g	Weight at 1000 cycles (or wear through) g	Cycle count at final weight	Weight loss, g	Weight loss, mg	Weight loss, mg/cycle	Cycles to wear through
HP-447	1	70.3032	70.2137	1000	0.090	89.5	0.090	1250
	2	71.1244	71.0280	1000	0.096	96.4	0.096	1250
	Average				**0.093**	**92.9**	**0.093**	**1250**

TAPE/KNIFE ADHESION:
ASTM D3359-02, "Standard Test Methods for Measuring Adhesion by Tape Test" was used to evaluate adhesion. The test method covers procedures for assessing the adhesion of coating films to metallic substrates by applying and removing pressure-sensitive tape over cuts made in the film. Test Method A is primarily intended for use at job sites while Test Method B is more suitable for use in the laboratory

Results:

Trial 1: 5B = 0% removed
Trial 2: 5B = 0% removed

ASTM D3359 Classification System:

5B = 0% removed	4B = less than 5% removed
3B = 5 – 15% removed	2B = 15 – 35% removed
1B = 35 – 65% removed	0B = Greater than 65% removed

JOB NUMBER: 30160 05-68856 **PAGE:** 5 of 9
Product: HP-447 Urethane Coating **DATE:** August 3, 2005

TEST METHODS: (Continued)

PENCIL HARDNESS:
ASTM D3363-05 "Standard Test Method for Film Hardness by Pencil Test" was followed for this procedure. This test method covers a procedure for rapid determination of the film hardness of an organic coating on a substrate in terms of drawing leads or pencil leads of known hardness.

ASTM D3363 hardness scale is as follows:
6B-5B-4B-3B-2B-B-HB-F-H-2H-3H-4H-5H-6H
Softer Harder

Starting with the hardest lead, and repeating the process down the hardness scale, the pencil is found that will not cut through the film to the substrate. Any defacement of the film other than a cut (gouge) is considered a scratch. Both end points, gouge and scratch hardness, are reported.

Result: Scratch= (defacement of film surface)

Trial 1, Panel 1:	4B
Trial 2, Panel 1:	4B
Trial 1, Panel 2:	4B
Trial 2, Panel 2:	4B

Gouge= (cut through to substrate)

Trial 1, Panel 1:	4B
Trial 2, Panel 1:	4B
Trial 1, Panel 2:	4B
Trial 2, Panel 2:	4B

JOB NUMBER: 30160 05-68856 **PAGE:** 6 of 9
Product: HP-447 Urethane Coating **DATE:** August 3, 2005

TEST METHODS: (Continued)

SLIP RESISTANCE / COEFFICIENT OF FRICTION:
The coefficient of friction testing was conducted using **ASTM D1894-01, "Standard Test Method for Static and Kinetic Coefficients of Friction of Plastic Film and Sheeting**," and **ASTM C1028-96, "Standard Test Method for Determining the Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull-Meter Method**," as procedural guides. The test determined the measurements of static and dynamic (kinetic) coefficients of friction, under both wet and dry conditions while utilizing Neo-lite standardized rubber shoe sole material.

Results:

Sample Identification	Sample No.	Initial Peak, lbf	Avg Kinetic Load, lbf	Sled Weight, lb	**Static Coeff. of Friction**	**Kinetic Coeff. of Friction**
HP-447 Dry	1	27	21	51	**0.52**	**0.42**
	2	23	22	51	**0.46**	**0.43**
	3	22	21	51	**0.44**	**0.42**
	4	28	22	51	**0.56**	**0.43**
	5	34	25	51	**0.67**	**0.48**
	6	30	25	51	**0.59**	**0.49**
	7	30	25	51	**0.58**	**0.48**
	8	29	25	51	**0.57**	**0.48**
	9	34	27	51	**0.66**	**0.52**
	10	35	28	51	**0.69**	**0.54**
	11	29	29	51	**0.57**	**0.57**
	12	33	28	51	**0.65**	**0.55**
	Average				**0.58**	**0.48**
	Std Dev.				**0.08**	**0.05**
HP-447 Wet	1	26	30	51	**0.51**	**0.58**
	2	26	26	51	**0.51**	**0.51**
	3	51	26	51	**1.00**	**0.51**
	4	26	26	51	**0.51**	**0.50**
	5	27	23	51	**0.54**	**0.45**
	6	27	23	51	**0.52**	**0.46**
	7	26	27	51	**0.50**	**0.52**
	8	32	28	51	**0.64**	**0.54**
	9	30	30	51	**0.58**	**0.58**
	10	31	30	51	**0.60**	**0.59**
	11	37	32	51	**0.72**	**0.62**
	12	28	30	51	**0.56**	**0.59**
	Average				**0.60**	**0.54**
	Std Dev.				**0.14**	**0.06**

JOB NUMBER: 30160 05-68856 **PAGE:** 7 of 9
Product: HP-447 Urethane Coating **DATE:** August 3, 2005

TEST METHODS: (Continued)

CHEMICAL RESISTANCE:
Testing was conducted using **ASTM D1308–02, "Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes**" as a guide. This test method covers determination of the effect of household chemicals on clear and pigmented organic finishes, resulting in any objectionable alteration in the surface, such as discoloration, change in gloss, blistering, softening, swelling, loss of adhesion, or special phenomena. Approximately 1 mL of each chemical was applied to the surface of a cured test panel and covered with a watch glass. After 24 hours, the area was wiped clean and visually examined.

Results:

HP-447 Urethane Coating Data after 24 hour covered spot test	discoloration	gloss change	blistering	softening	swelling	loss of adhesion
water	no	no	no	no	no	no
betadine (as packaged)	slight yellowing	no	no	no	no	no
road salt (50% CaCl by weight, w/ water)	no	no	no	no	no	no
spic-n-span (1% in water)	no	no	no	no	no	no
coffee (prepared to drink)	brown stain	no	no	no	no	no
vegetable oil (as packaged)	no	no	no	no	no	no
409 cleaner	no	no	no	no	no	no
Neither water, nor "Neutral Cleaner" removed the stains.						

JOB NUMBER: 30160 05-68856 **PAGE:** 8 of 9
Product: HP-447 Urethane Coating **DATE:** August 3, 2005

TEST METHODS: (Continued)

DETERGENT RESISTANCE:

Detergent resistance testing was conducted using **ASTM D3207-92 (02), "Standard Test Method for Detergent Resistance of Floor Polish Films,"** as a guide. The test is used to determine the relative resistance of floor polishes to detergent scrubbing using the Gardner Straight Line Washability Meter, a standardized hog bristle brush, and a detergent. The customer submitted "Neutral Cleaner, which was diluted with 10 parts water per one part cleaner. The test evaluates the coated tiles after 100 and 200 cycles.

Results:

HP-447	
cycles	Observations
100	**no deterioration observed**
200	**no deterioration observed** ◄►
Overall corresponding ASTM rating: EXCELLENT	

ASTM D3207, Section 8.3 Rating System:	
Degree of resistance	Deterioration in film appearance
Excellent	**none *(at 200 cycles)***
Very good	<10 % after 200 cycles
Good	>10 % after 200 cycles but <10 % after 100 cycles
Fair	>25 % after 200 cycles with< 25 % after 100 cycles
Poor	>50 % after 100 cycles

SCRUB RESISTANCE:

Scrub resistance testing was conducted in accordance with **ASTM D2486-00, "Standard Test Methods for Scrub Resistance of Wall Paints," Method A** – cycles-to-failure. In the standard test Method A, the test coating is applied to a thin black plastic panel. The coated panel is placed over a 1/2-inch by 10-mil shim. The coated panel is then scrubbed with a nylon bristle brush and a prescribed abrasive scrub medium until the coating film is removed in one continuous thin line across the shim. Since the VCT substrate was too thick to be affected by the shim, the coated VCT tile was scrubbed until wear through was observed, or until a maximum of 4000 cycles.

Results:

Trial	Cycle to Wear Through
1	>4000 (test terminated)
2	>4000 (test terminated)
Average	>4000

JOB NUMBER: 30160 05-68856 **PAGE:** 9 of 9
Product: HP-447 Urethane Coating **DATE:** August 3, 2005

TEST METHODS: (Continued)

PACKAGE STABILITY – HIGH TEMPERATURE:
The package stability test was conducted using Fed Test Method Std 141D, Method 4261.1, "Appearance of Transparent Liquids" as a guide. Under the customer's direction, the test was conducted at 125 ± 4 °F using clean glass tubular bottles. Two tubes were filled with component A, and two with component B, then sealed. Initial observations for haze, color, clots, etc. were recorded. The tubes were placed in a circulating water bath at 125 °F for 48 hours. After 48 hours, observations regarding haze, color, clots, skins, insolubles, etc. were recorded. The tubes were allowed to stand undisturbed for 24 hours at room temp, examined, and observations were again recorded. One tube from each pair was vigorously shaken. As soon as the air had escaped from the liquid, it was compared to the appearance of the liquid in the other tube. Observations were again recorded.

Results:

Component: "Quick Dry"	Observations	Component: "X-Link"	Observations
After 48 hr heating	no change	After 48 hr heating	no change
After 24 hr. standing	no change	After 24 hr. standing	no change
After shaking	no change	After shaking	no change

PACKAGE STABILITY – LOW TEMPERATURE:
The following methodology was used for the Low Temperature test. The methodology was developed after consultation with the client.

- Freeze one set of packaged product to 10 °F for 6 hours, then warm to 72 °F for 18 hours.
- Repeat for 3 freeze cycles.
- Allow to thaw to room temperature, mix and measure "set-to-touch" and "dry-to-touch."

Results:

Cycles Completed	"Set to Touch" time,	"Dry to Touch" time,	"Dry to Handle" time,
Initial	12 minutes	20 minutes	22 minutes
3	14 minutes	20 minutes	22 minutes

REMARKS:

The test samples will be retained for 15 days from the date of this report and then discarded unless we are notified, in writing, otherwise.

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JOB NUMBER: 30160 05-70837
PAGE: 1 of 3
DATE: October 6, 2005

PENCIL HARDNESS OF A COATING: HP-447 URETHANE COATING

Prepared for:
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Prepared By:

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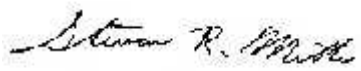
Reviewed By:



Steven R. Miller
Engineering Technician
Product Testing Department

The test results contained in this report pertain only to the samples submitted for testing and not necessarily to all similar products.

JOB NUMBER: 30160 05-70837 **PAGE:** 2 of 3
Product: HP-447 Urethane Coating **DATE:** October 6, 2005

COATING PERFORMANCE TESTING

INTRODUCTION:

This report presents the results of pencil hardness tests conducted on a clear floor coating. The sample was submitted to our laboratory by Mr. Jason Beedie of JFB Hart Coatings Inc. The testing and data analysis were completed on October 6, 2005.

The scope of our work was limited to conducting pencil hardness testing and reporting the results.

SUMMARY OF RESULTS:

Test Description	ASTM	notes	Product: HP-447 Urethane Coating
Pencil Hardness:	D3363	G=gouge S=scratch	Gouge = 4B Scratch = 4B, 5B, &- 6B

SAMPLE IDENTIFICATION:

The test material was a clear coating, identified as HP-447 Urethane Coating. The coating was applied to 12" x 12" vinyl composition tiles (VCT), by the customer.

TEST METHOD:

PENCIL HARDNESS:

ASTM D3363-05 "Standard Test Method for Film Hardness by Pencil Test" was followed for this procedure. This test method covers a procedure for rapid determination of the film hardness of an organic coating on a substrate in terms of drawing leads or pencil leads of known hardness.

ASTM D3363 hardness scale is as follows:

6B-5B-4B-3B-2B-B-HB-F-H-2H-3H-4H-5H-6H

Softer Harder

JOB NUMBER: 30160 05-70837 **PAGE:** 3 of 3
Product: HP-447 Urethane Coating **DATE:** October 6, 2005

TEST METHOD: (Continued)

Starting with the hardest lead, and repeating the process down the hardness scale, the pencil is found that will not cut through the film to the substrate. Any defacement of the film other than a cut (gouge) is considered a scratch. Both end points, gouge and scratch hardness, are reported.

Result: Scratch= (defacement of film surface)

Trial 1	6B
Trial 2	5B
Trial 3	4B

Gouge= (cut through to substrate)

Trial 1	4B
Trial 2	4B
Trial 3	4B

REMARKS:

The test samples will be retained for 14 days from the date of this report and then discarded unless we are notified, in writing, otherwise.

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JOB NUMBER: 30160 03-56434.1
PAGE: 1 of 3
DATE: September 23, 2003

SCRUB RESISTANCE TESTING OF A CURED COATING: HP-146 BASE

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Prepared By:

Amy J. Ostergren

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Reviewed By:

Steven R. Miller

Steven R. Miller
Engineering Technician
Product Testing Department

The test results contained in this report pertain only to the samples submitted for testing and not necessarily to all similar products.

JOB NUMBER: 30160 03-56434.1

DATE: September 23, 2003

SCRUB RESISTANCE TESTING

INTRODUCTION:

This report presents the results of scrub resistance testing conducted on a cured coating. The sample was submitted to our laboratory on September 15, 2003 by Mr. Tim Kingsbury of JFB Hart Coatings Inc. The testing and data analysis were completed on September 22, 2003.

The scope of our work was limited to conducting scrub resistance testing, in accordance with ASTM D2486-00, "Standard Test Methods for Scrub Resistance of Wall Paints," on the sample submitted and reporting the results.

RESULTS:

Sample:	**HP-146 Base (No A-35)**
Scrub Medium:	Abrasive
Cycles to wear-through:	
Trial 1:	2160
Trial 2:	1525
Average	**1842**

SAMPLE IDENTIFICATION:

One sample of a cured yellow coating, applied to standardized black scrub testing panels was submitted for testing. The coating was identified as HP-146 Base.

JOB NUMBER: 30160 03-56434.1

DATE: September 23, 2003

TEST METHOD:

SCRUB RESISTANCE:
Scrub resistance testing was conducted in accordance with ASTM D2486-00, "Standard Test Methods for Scrub Resistance of Wall Paints," Method A – cycles-to-failure. In Test Method A, the test paint is applied to a black plastic panel. After curing, the coated panel is placed over a 1/2-inch by 10-mil shim. The coated panel is then scrubbed with a nylon bristle brush and a prescribed abrasive scrub medium until the coating film is removed in one continuous thin line across the shim.

REMARKS:
The test samples will retained for 15 days from the date of this report and then discarded unless we are notified, in writing, otherwise.

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JOB NUMBER: 30160 08-95082

DATE: May 2, 2008

TABER ABRASION OF COATINGS

Prepared for:
JFB Hart Coatings Inc
Attn: Jason B. Beedie
10210 Werch Drive, Suite 203
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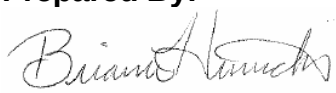
Prepared By:



Briana Hinrichs
Testing Technician
Product Evaluation Department

Reviewed By:

William Stegeman
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Product Evaluation Department
Phone: 651-659-7230

The test results contained in this report pertain only to the samples submitted for testing and not necessarily to all similar products.

JOB NUMBER: 30160 08-95082 **PAGE:** 2 of 3
DATE: May 2, 2008

TABER ABRASION OF COATINGS

INTRODUCTION:

This report presents the results of taber abrasion tests conducted on samples of coatings. The testing was authorized by Jason B. Beedie of JFB Hart Coatings Inc on April 23, 2008. The testing and data analysis were completed on May 2, 2008.

The scope of our work was limited to conducting taber abrasion tests on the samples submitted and reporting the results.

SUMMARY OF RESULTS:

Sample Identification	Weight loss @ 1000 cycles, mg	Cycles to wear through
Griplok Gloss 20 grams	22.6	4000
Griplok Gloss 40 grams	31.5	7500
Griplok Gloss 100 grams	19.9	3000
UV Cured Urethane	79.2	7250
HP-300 Satin	70.7	1750

SAMPLE IDENTIFICATION:

The samples were identified as 4" x 4" tiles, labeled by customer as Griplok Gloss 20 grams, Griplok Gloss 40 grams, Griplok Gloss 100 grams, UV cured Urethane, and HP-300 Satin.

TEST METHOD:

The samples were allowed to condition at standard laboratory conditions of 72 ± 4°F and 50 ± 5% relative humidity for at least 40 hours prior to testing. Testing was done according to ASTM D4060 with notes listed below.

Test Method	Test Method Title	Notes
ASTM D4060	Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser	Testing done using CS17 wheels and 1000 gram weights. Weight loss measured at 1000cycles and checked every 250 cycles until wear through.

JOB NUMBER: 30160 08-95082 **PAGE:** 3 of 3
DATE: May 2, 2008

CALIBRATED TEST EQUIPMENT:

Fisher Analytical Balance, S# 5525, ID MM170-086, calibrated 7/07

UNCALIBRATED TEST EQUIPMENT:

Taber Abraser 5150, s#9384388, with 1,000 g aux. wt., Taber CS-17 wheels, Taber S-11 resurfacing disks.

TEST DATA:

Taber Abrasion Results

Sample Identification	Initial Weight, g	Weight @ 1000 cycles, g	Weight loss, g	Weight loss, mg	Weight loss, mg/cycle	Cycles to wear through
Griplok Gloss 20 grams	65.5777	65.5551	0.0226	22.6	0.02	4000
Griplok Gloss 40 grams	66.2717	66.2402	0.0315	31.5	0.03	7500
Griplok Gloss 100 grams	66.0306	66.0107	0.0199	19.9	0.02	3000
UV Cured Urethane	67.4762	67.3970	0.0792	79.2	0.08	7250
HP-300 Satin	68.5725	68.5018	0.0707	70.7	0.07	1750

REMARKS:

The test materials not consumed in testing will be retained for 14 days from the date of this report and then discarded unless we receive written notification requesting otherwise.

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Standard Method of Test for
Surface Burning Characteristics of Building Materials

ASTM E 84–07

633 Aqua Plus Pigment

Report Number 08–01264

Test Number 3951–0822
January 22, 2008

Vitrulan Corporation
Waynesboro, Virginia

Commercial Testing Company

Dewane Jackson

(Authorized Signature)

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INTRODUCTION

This report is a presentation of results of a surface flammability test on a material submitted by Vitrulan Corporation, Waynesboro, Virginia.

The test was conducted in accordance with the ASTM International fire test response standard E 84–07, *Surface Burning Characteristics of Building Materials*, sometimes referred to as the Steiner tunnel test. This test is applicable to exposed surfaces such as walls and ceilings. The test is conducted with the specimen in the ceiling position with the surface to be evaluated exposed face down to the ignition source. The ASTM E 84 test method is the technical equivalent of NFPA No. 255 and UL No. 723.

This standard is used to measure and describe the response of materials, products, or assemblies to heat and flame under controlled conditions, but does not by itself incorporate all factors required for fire–hazard or fire–risk assessment of materials, products, or assemblies under actual fire conditions.

PURPOSE

The purpose of the test is to provide only the comparative measurements of surface flame spread and smoke development of materials with that of select grade red oak and fiber–reinforced cement board, Grade II, under specific fire exposure conditions. The test exposes a nominal 24-foot long by 20-inch wide test specimen to a controlled air flow and flaming fire adjusted to spread the flame along the entire length of a red oak specimen in 5.50 minutes. During the 10-minute test duration, flamespread over the specimen surface and density of the resulting smoke are measured and recorded. Test results are calculated relative to red oak, which has an arbitrary rating of 100, and fiber–reinforced cement board, Grade II, which has a rating of 0.

The test results are expressed as Flame Spread Index and Smoke Developed Index. The Flame Spread Index is defined in ASTM E 176 as "a number or classification indicating a comparative measure derived from observations made during the progress of the boundary of a zone of flame under defined test conditions." The Smoke Developed Index, a term specific to ASTM E 84, is defined as "a number or classification indicating a comparative measure derived from smoke obscuration data collected during the test for surface burning characteristics." There is not necessarily a relationship between the two measurements.

The method does not provide for measurement of heat transmission through the surface tested, the effect of aggravated flame spread behavior of an assembly resulting from the proximity of combustible walls and ceilings, or classifying a material as noncombustible solely by means of a Flame Spread Index.

The zero reference and other parameters critical to furnace operation are verified on the day of the test by conducting a 10–minute test using 1/4–inch fiber–reinforced cement board, Grade II. Periodic tests using NOFMA certified 23/32–inch select grade red oak flooring provide data for the 100 reference.

TEST SAMPLE

The test sample, selected by the client, was identified as **633 Aqua Plus Pigment**, a pre–pasted glass textile wallcovering with a total weight of 5.4 ounces per square yard. Three test panels, each measuring two feet wide by eight feet in length, were prepared by adhering the material to 1/4–inch thick fiber–reinforced cement board, Grade II. After soaking the wallcovering in water to activate the adhesive, the material was placed onto the smooth side of the cement board, and smoothed with a brush and roller. After drying overnight, one coat of a two–part water–based epoxy was rolled onto the wallcovering using a 3/8" napped roller at the manufacturers recommended coverage rate of 200 square feet per gallon. After a second overnight drying period, one coat of a two–part clear polyurethane coating was rolled onto the wallcovering using a 3/8" napped roller at the manufacturers recommended coverage rate of 250 square feet per gallon. The prepared panels were transferred to storage racks and conditioned to equilibrium in an atmosphere with the temperature maintained at 71 ± 2°F and the relative humidity at 50 ± 5 percent. For testing, the panels were placed end–to–end on the ledges of the tunnel furnace and tested with no auxiliary support mechanism. This method of sample preparation is described in Appendix X1 of the E 84 standard, Guide to Mounting Methods, Section X1.9.3.

TEST RESULTS

The test results, calculated on the basis of observed flame propagation and the integrated area under the recorded smoke density curve, are presented below. The Flame Spread Index obtained in E 84 is rounded to the nearest number divisible by five. Smoke Developed Indices are rounded to the nearest number divisible by five unless the Index is greater than 200. In that case, the Smoke Developed Index is rounded to the nearest 50 points. The flame spread and smoke development data are presented graphically on Page 4 of this report.

Test Specimen	Flame Spread Index	Smoke Developed Index
Fiber–Reinforced Cement Board, Grade II	0	0
Red Oak Flooring	100	100
633 Aqua Plus Pigment	**20**	**5**

OBSERVATIONS

Specimen ignition over the burners occurred at 0.08 minute. Surface flame spread was observed to a maximum distance of 4.60 feet beyond the zero point at 1.77 minutes. The maximum temperature recorded during the test was 606°F.

CLASSIFICATION

The Flame Spread Index and Smoke Developed Index values obtained by ASTM E 84 tests are frequently used by code officials and regulatory agencies in the acceptance of interior finish materials for various applications. The most widely accepted classification system is described in the National Fire Protection Association publication NFPA 101 *Life Safety Code*, where:

Class A	0	– 25 Flame Spread Index	0 – 450 Smoke Developed Index
Class B	26	– 75 Flame Spread Index	0 – 450 Smoke Developed Index
Class C	76	– 200 Flame Spread Index	0 – 450 Smoke Developed Index

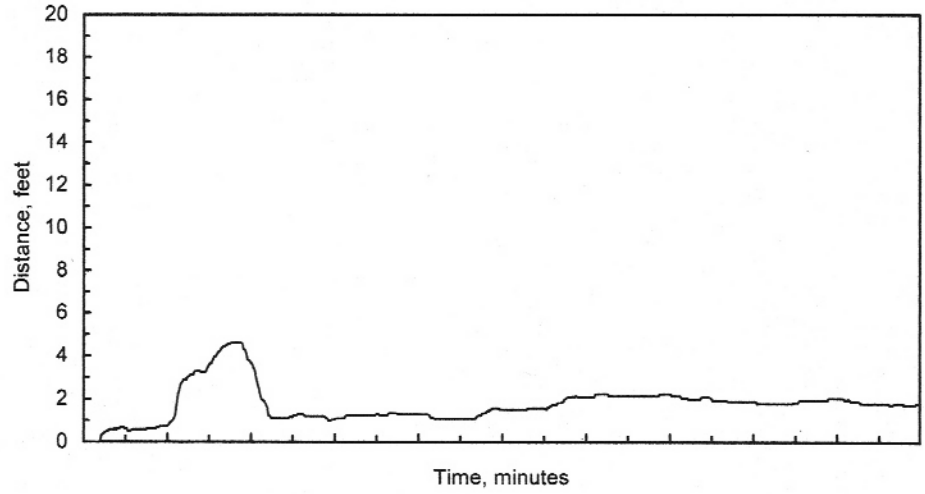
Class A, B, and C correspond to Type I, II, and III respectively in other codes. They do not preclude a material being otherwise classified by the authority of jurisdiction.

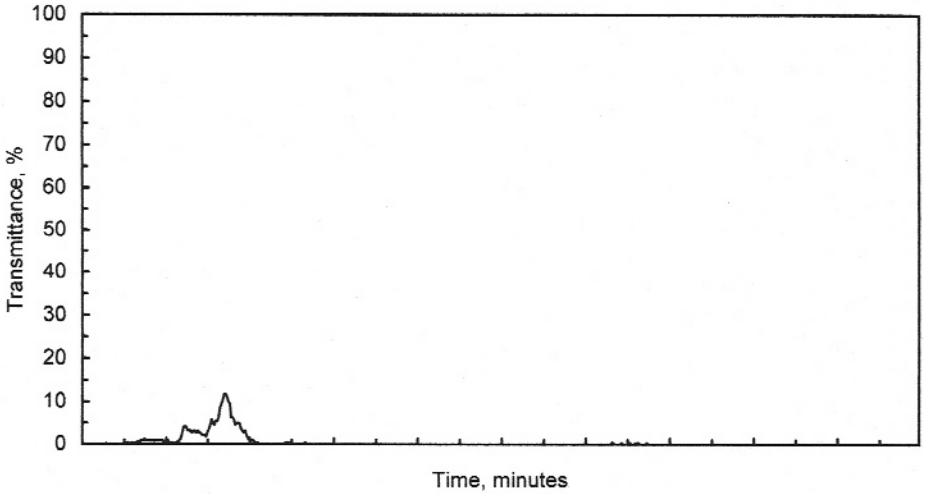
ASTM E 84 TEST DATA

Client: Vitrulan Corporation
Test Number: 3951-0822
Material Tested: 633 Aqua Plus Pigment
Date: January 22, 2008

Test Results:

Time to Ignition	=	00.08 minutes
Maximum Flamespread Distance	=	04.60 feet
Time to Maximum Spread	=	01.77 minutes
Flame Spread Index	=	20
Smoke Developed Index	=	5





Designation: D 3960 – 01

Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings[1]

This standard is issued under the fixed designation D 3960; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 This practice measures the volatile organic compound (VOC) content of solventborne and waterborne paints and related coatings as determined from the quantity of material released from a sample under specified bake conditions and subtracting exempt volatile compounds and water if present.

NOTE 1—The regulatory definition, under the control of the U.S. EPA, can change. To ensure currency, contact the local air pollution control agency.

1.2 This practice provides a guide to the selection of appropriate ASTM test methods for the determination of VOC content.

1.3 Certain organic compounds that may be released under the specified bake conditions are not classified as VOC as they do not participate in atmospheric photochemical reactions. Such nonphotochemically reactive compounds are referred to as exempt volatile compounds in this practice.

NOTE 2—A list of the current US EPA approved exempt volatile compounds is found in Appendix Appendix X3, paragraph X3.1.1.1.

1.4 VOC content is calculated as a function of (*1*) the volume of coating less water and exempt volatile compounds, and (*2*) the volume of coating solids, and (*3*) the weight of coating solids.

2. Referenced Documents

2.1 *ASTM Standards:*

D 1475 Test Method for Density of Paint, Varnish, Lacquer, and Related Products[2]

D 2369 Test Method for Volatile Content of Coatings[2]

D 2697 Test Method for Volume Nonvolatile Matter in Clear or Pigmented Coatings[2]

D 2832 Guide for Determining Volatile and Nonvolatile Content of Paint and Related Coatings[2]

D 3792 Test Method for Water Content of Water Reducible Paints by Direct Injection into a Gas Chromatograph[2]

D 3925 Practice for Sampling Liquid Paints and Related Pigmented Coatings[2]

D 4017 Test Method for Water in Paints and Paint Materials by Karl Fischer Method[2]

D 4457 Test Method for Determination of Dichloromethane and 1,1,1-Trichloroethane in Paints and Coatings by Direct Injection into a Gas Chromatograph[2]

D 5095 Test Method for Determination of the Nonvolatile Content in Silanes, Siloxanes and Silane-Siloxane Blends Used in Masonry Water Repellent Treatments[3]

D 5201 Practice for Calculating Formulation Physical Constants of Liquid Paints and Coatings[2]

D 5403 Test Methods for Volatile Content of Radiation Curable Materials[3]

D 6093 Test Method for Percent Volume Nonvolatile Matter in Clear or Pigmented Coatings Using a Helium Gas Pycnometer[2]

D 6133 Test Method for Acetone Content of Solvent-Reducible and Water-Reducible Paints, Coatings, Resins, and Raw Materials by Direct Injection into a Gas Chromatograph[2]

E 180 Practice for Determining the Precision of ASTM Methods for Analysis and Testing of Industrial Chemicals[4]

2.2 *Other Documents:*

EPA Federal Reference Method 24—Determination of Volatile Matter Content, Density, Volume Solids, and Weight Solids of Surface Coatings[5]

EPA 450/3-84-019, U.S. Environmental Protection Agency Procedures for Certifying Quantity of Organic Compound Emitted by Paint, Ink, and Other Coatings[5]

EPA 450/3-83-013R, U.S. Environmental Protection Agency Glossary for Air Pollution Control of Industrial Coatings Operations[5]

3. Terminology

3.1 *Definitions:*

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[1] This practice is under the jurisdiction of ASTM Committee D01 on Paint and Related Coatings, Materials, and Applications and is the direct responsibility of Subcommittee D01.21 on Chemical Analysis of Paints and Paint Materials.

Current edition approved Jan. 10, 2001. Published March 2001. Originally published as D 3960 – 81. Last previous edition D 3960 – 98.

[2] *Annual Book of ASTM Standards*, Vol 06.01.

[3] *Annual Book of ASTM Standards*, Vol 06.02.

[4] *Annual Book of ASTM Standards*, Vol 15.05.

[5] Available from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

3.1.1 *exempt volatile compound*—organic compounds that do not participate significantly in atmospheric photochemical reactions.

3.1.2 *nonvolatile material*—the solid material remaining after volatiles have been removed from a coating under specified test conditions.

3.1.3 *volatile organic compound (VOC)*—any organic compound that participates in atmospheric photochemical reactions.

3.1.3.1 *Discussion*—The definition of VOC adopted by the U.S. EPA and a list of exempt volatile compounds are included in Appendix X3.

3.1.4 *volatile organic compound content (VOC content)*—the mass of VOC released from a coating under specified test conditions.

3.1.4.1 *Discussion*—VOC content is expressed in this practice as a function of: (*1*) the coating volume less water and exempt volatile compounds, and (*2*) the volume of coating solids and (*3*) the weight of solids.

4. Summary of Practice

4.1 Take a representative sample of the liquid coating in accordance with Practice D 3925. Mix thoroughly before taking specimens for individual tests. If air bubbles become entrapped, stir by hand until the air has been removed.

4.2 The volatile content, density, water content, volume solids and exempt solvent content of the coating are determined in accordance with designated methods and instructions. For multicomponent coatings, the components are first mixed in the appropriate ratios and the applicable values determined on the mixture. These values are combined using specified equations to calculate the VOC content of the coating.

NOTE 3—In Reference Method 24, the U.S. EPA defines a waterborne coating as any coating with more than 5 % water by weight in its volatile fraction, and requires/allows water determination for waterborne coatings only.

5. Significance and Use

5.1 This practice discusses applicable ASTM test methods used in the determination of the VOC content of paints and related coatings and provides equations for calculating the VOC content expressed as the mass of VOC: (*1*) per unit volume of coating less water and exempt volatile compounds, and (*2*) per unit volume of coating solids and (*3*) per unit mass of coating solids.

5.2 Volatile organic compound content is used to compare the amount of VOC released from different coatings used for the same application, that is, to coat the same area to the same dry film thickness (assuming the same application efficiency).

5.3 VOC content data are required by various regulatory agencies.

5.4 Only the expression of VOC content as a function of the volume of coating solids gives a linear measure of the difference in VOC released from different coatings used for the same application.

NOTE 4—Thus assuming the same transfer efficiency, a coating with VOC content of 3 lb of VOC/gal of solids would release ½ the VOC that would a coating with 6 lb of VOC/gal of solids.

5.5 When VOC content is expressed as a function of the volume of coating less water and exempt solvents, the values obtained do not account for differences in the volume solids content of the coatings being compared: this expression, therefore, does not provide a linear measure of the difference in VOC emitted from different coatings used for the same application.

NOTE 5—Thus, a coating with VOC content of 3 lb of VOC/gal less water and exempt volatile compounds would release about 85 % less VOC than a coating with 6 lb of VOC/gal less water and exempt volatile compounds.

6. Nonvolatile and Volatile Content

6.1 Guide D 2832 includes suggested time/temperature drying schedules for the determination of the nonvolatile and volatile content of various types of coatings.

NOTE 6—For regulatory compliance testing, follow the method and conditions specified in the applicable regulation. Federal Reference Method 24 specifies the use of Test Method D 2369.

6.2 Test Method D 2369 includes a specific drying schedule and sample weight, and heating 1 h at 110 ± 5°C for the determination of the weight percent volatile content of solvent-borne and waterborne coatings.

6.2.1 For multicomponent coatings, Test Method D 2369 specifies the components should be mixed first, then the volatile content should be determined on the mixture. Test specimens are held in the aluminum dish for at least 1 h before baking.

NOTE 7—Other induction periods are used. See U.S. EPA Reference Method 24.

6.2.2 The nonvolatile content of silanes, siloxanes, and silane/siloxane blends used in masonry water repellent treatments is defined using Test Method D 5095. In this standard, applicable to both solvent and water reducible materials, the test specimen, containing an added catalyst, is allowed to stand at room temperature for 1 h prior to heating in an oven at 110° ± 5°C for 60 min.

NOTE 8—In VOC determinations, for 6.2.2 only, the density and water content (if applicable) are measured on the test material without the added catalyst.

6.2.3 The nonvolatile content of radiation curable coatings, inks, and adhesives is defined using Test Method D 5403. These materials contain volatile reactive components that become nonvolatile after radiation curing. Test Method A is applicable to radiation curable materials that are essentially 100 % reactive but may contain traces (no more than 3 %) of volatile materials as impurities or introduced by the inclusion of various additives. Test Method B is applicable to all radiation curable materials but must be used for materials that contain volatile solvents intentionally introduced to control application viscosity and that are intended to be removed from the material to cure.

7. Water Content

7.1 To determine the water content of waterborne coatings two test methods are available:

7.1.1 In Test Method D 3792, a paint specimen is diluted with dimethyl formamide, an internal standard (2-propanol) is

added, and an aliquot of the mixture is injected directly into a gas chromatograph.

7.1.2 Test Method D 4017 offers three options for determining water content by Karl Fischer titration.

7.1.2.1 A specimen is dissolved in pyridine or another suitable solvent and titrated in the presence of a buffer, 1-ethyl piperidine. The use of newer non-pyridine titration reagents is also allowed.

7.1.2.2 The water in a latex paint is first extracted into anhydrous methanol, then an aliquot of the methanol extract is titrated with non-pyridine reagent in methanol solvent (see Appendix X1).

7.1.2.3 The specimen is dispersed in methanol solvent using a homogenizer accessory, then directly titrated with non-pyridine reagent (see Appendix X2).

7.1.3 With waterborne multicomponent coatings, the components are first mixed in the appropriate ratios, then water content is determined using Test Methods D 3792 or D 4017.

8. Density

8.1 The density of the paint or coating at 25°C is determined in accordance with Test Method D 1475. Although both the pycnometer and weight-per-gallon cup are covered by the test method, and the former is more accurate and precise, the weight-per-gallon cup is recommended because of its speed and ease of use.

8.2 With multicomponent coatings, first mix the components in appropriate ratios in sufficient quantity to determine the weight-per-gallon using Test Method D 1475.

9. Exempt Solvents

9.1 In Test Method D 4457 an internal standard (1-propanol) is added to the test specimen, and then the specimen is injected directly into a gas chromatograph.

9.2 In Test Method D 6133 an intenal standard is added to the whole paint and injected directly into the gas chromatograph.

9.3 With multicomponent coatings, the exempt volatile content is determined on the mixture of the components.

10. Calculation of VOC Content

10.1 In this practice VOC content is expressed in three ways: (*1*) as the mass of VOC per unit volume of the coating less water and exempt volatile compounds, and (*2*) as the mass of VOC per unit volume of coating solids and (*3*) the weight of VOC per unit weight of solids. The following equations should be used to calculate VOC content and may be used for coatings both “as supplied” and “as applied” (see Note 8).

NOTE 9—For compliance with VOC regulations, the VOC content should be calculated after any thinning or dilution (“as applied”). Instructions for VOC calculations of such diluted coatings are available in EPA 450/3-84-019.

10.2 *VOC Content Expressed as the Mass of VOC per Unit Volume of Coating Less Water and Exempt Volatile Compounds* :

10.2.1 *General Expression*:

$$VOC = \frac{\text{(weight percent of total volatiles less water less (exempt volatile compounds)(density of coating)}}{\text{100 \% − (volume percent of water) − (volume percent of exempt volatile compounds)}} \quad (1)$$

or

$$VOC = \frac{(W_o)(D_c)}{100\ \% - V_w - V_{ex}} = \frac{(W_v - W_w - W_{ex})(D_c)}{100\ \% - (W_w)(D_c/D_w) - (W_{ex})(D_c/D_{ex})} \quad (2)$$

where:

VOC = VOC content in g/L of coating less water and exempt volatile compound (see Note 9),
W_o = weight of organic volatiles, % ($W_v - W_w - W_{ex}$),
W_v = weight of total volatiles, % (100 % − weight % nonvolatiles, see Test Method D 2369),
W_w = weight of water, % (see Test Methods D 3792 or D 4017),
W_{ex} = weight of exempt volatile compound, % (see 3.1.3.1, Note 10, and Test Method D 4457),
V_w = volume of water, % (W_w)(D_c/D_w),
V_{ex} = volume of exempt volatile compound, % (see 3.1.3.1, Note 10), = (W_{ex})(D_c/D_{ex}),
D_c = density of coating, g/L, at 25°C, (see Test Method D 1475),
D_w = density of water, g/L, at 25°C, (0.997×10^3), and
D_{ex} = density of exempt volatile compound g/L, at 25°C, (see Test Method D 1475).

NOTE 10—To convert from g/L to lb/gal, multiply the result (VOC content) by 8.345×10^{-3}(lb/gal/g/L). To convert g/L to kg/L, divide the result by 10^3.

NOTE 11—See X2.1 and X2.2 for comments on coatings containing one or more exempt volatile compounds.

10.2.2 *Solventborne Coatings*—Calculate the VOC content in grams of VOC per litre of coating less water and exempt volatile compounds using the appropriate equation:

10.2.2.1 For solventborne coatings that do not contain water or exempt solvents:

$$VOC = \frac{(W_v)(D_c)}{100\ \%} \quad (3)$$

10.2.2.2 For solventborne coatings that contain an exempt volatile compound but do not contain water (see section 3.1.3 and Note 3):

$$VOC = \frac{(W_v - W_{ex})(D_c)}{100\ \% - (W_{ex})(D_c/D_{ex})} \quad (4)$$

10.2.2.3 For solventborne coatings that contain water but do not contain exempt volatile compounds (see 3.1.3 and Note 3):

$$VOC = \frac{(W_v - W_w)(D_c)}{100\ \% - (W_w)(D_c/D_w)} \quad (5)$$

10.2.2.4 For solventborne coatings that contain both an exempt volatile compound and water, use Eq 1 in 10.2.1 (see 3.1.3 and Note 3).

10.2.3 *Waterborne Coatings*—Calculate the VOC content in grams of VOC per litre of coating less water and exempt volatile compound using the appropriate equation.

10.2.3.1 For waterborne coatings that contain no exempt volatile compounds, use Eq 4 in 10.2.2.3 (see 3.1.3 and Note 3).

10.2.3.2 For waterborne coatings that contain exempt volatile compounds, use Eq 1 in 10.2.1 (see 3.1.3 and Note 3).

10.3 *VOC Content Expressed in Terms of the Mass of VOC per Unit Volume of Coating Solids (Nonvolatiles)*:

10.3.1 Calculate the VOC content in grams of VOC per litre of coating solids according to the following equation:

$$VOC_m = \frac{(W_o)(D_c)}{V_n} \quad (6)$$

where:

VOC_m = VOC content in g/L of coating solids,
W_o = $W_v - W_w - W_{ex}$ (terms defined as in 10.2.1), and
V_n = volume of nonvolatile content of the liquid coating, % (see Test Methods D 6093 and D 2697, and Note 12 and Note 13).

NOTE 12—The EPA Reference Method 24 does not include an analytical method for determining V_n, but states that the value be calculated from the coating manufacturer's formulation.

NOTE 13—An expression for calculating formula V_n from the coating formulation is included in X2.3, Eq X2.1.

10.4 *VOC Content Expressed in Terms of Weight of VOC per Weight of Solids*:

10.4.1 Calculate the VOC content in weight of VOC per weight of coating solids according to the following equations:

$$W_o = (W_v - W_w - W_{ex}) \quad (7)$$

$$VOC_b = \frac{W_o}{W_s}$$

where:

VOC_b = VOC content in weight VOC per unit weight of solids, and
W_s = weight of solids, %.

NOTE 14—The calculated VOC is expressed as weight of VOC/weight of solids. This may be "lb VOC per lb solids" or "Kg of VOC per Kg of solids".

11. Keywords

11.1 VOC; VOC calculations; VOC content; VOC content of paint; VOC content; test precision

APPENDIXES

(Nonmandatory Information)

X1. AUTOMOTIVE COATINGS SUPPLIERS ROUND ROBIN

X1.1 A round robin was conducted at the laboratories of automotive coatings suppliers for determination of VOC using Practice D 3960. The analysts involved were persons experienced in running all the test methods involved in VOC determination. The data was analyzed statistically in accordance with Practice E 180. As was suspected from previous round robins conducted to evaluate Practice D 3960 (which involved some laboratories not familiar with these test methods), when well experienced analysts conduct the tests, the precision data is much improved.

X1.2 The interlaboratory study involved four laboratories and six samples; four solventborne automotive topcoats and two waterborne automotive topcoats. One operator in each of the four laboratories analyzed the sample in duplicate on 2 different days. The following duplicates, repeatability, and reproducibility coefficients of variation were obtained.

Automotive Topcoats	Duplicates, %	Repeatability, % (Within Laboratory)	Reproducibility, % (Between Laboratory)
Solventborne	0.86	1.62	2.86
Waterborne	3.94	5.29	9.75

X2. CALCULATION OF VOC CONTENT (SECTION 10)

X2.1 *Measurement of Exempt Volatile Compound Content*—The value of the weight percent or volume percent of exempt solvent in the VOC expression (Eq 1, Eq 3, and Eq 5) can be obtained using Test Methods D 4457 and D 1475 if the solvent is methylene chloride or 1,1,1-trichloroethane.

X2.2 *Two or More Exempt Solvents*—For solvent or waterborne coatings containing more than one exempt solvent, the values for W_{ex} and (W_{ex})(D_c/D_{ex}) to be used in Eq 1 or Eq 3 (10.2.1, 10.2.2.2, 10.2.2.4 or 10.2.3.2) are the summations of the values of W_{ex} and (W_{ex})(D_c/D_{ex}) for each individual solvent. Also, the value for W_{ex} to be used in 10.3.1 (to determine W_o in Eq 5) is the summation of the individual W_{ex} values.

X2.3 *Volume Nonvolatile Content*—The volume percent nonvolatile content, V_n, in Eq 5 (10.3.1) can be calculated from the summation of the individual contributions of each component in the coating formulation ("p" components) using the following equation (Eq X2.1 and Eq X2.2):

$$V_n = \sum_{j=1}^{p} [([V_n]_j)(V_j/100\ \%)] \quad (X2.1)$$

where:

$(V_n)_j$ = volume of nonvolatile component "j," % [(100 %) × (volume of nonvolatiles of "j" per unit volume of "j")], and

V_j = volume of component "j" in the coating % [(100 %) × (volume of "j" used)/(total volume of coating)].

NOTE X2.1—Instructions for calculating the value for the formula percent volume solids (or formula volume percent nonvolatile) content of the coating are provided in Practice D 5201.

NOTE X2.2—Eq X2.1 is meant to clarify the equation (II-4) currently in the EPA certification manual EPA-450/3-84-019 for the expression of calculated volume percent nonvolatile content, V_n.

X2.4 *Amount of VOC in a Coating Expressed in Terms of Mass of VOC per Unit Volume of Coating Including Water and Exempt Volatile Compounds* —The amount of volatile organic compounds in both solvent- and waterborne coatings can be expressed in terms of the mass of volatile organic compounds per unit volume of coating including water and exempt volatile compounds according to the following equation (X2.3):

$$VOA = \frac{(W_o)(D_c)}{100\ \%} \quad \text{(X2.2)}$$

where:

VOA = Amount of volatile organic compounds in g/L of coating including water and exempt volatile compounds.

NOTE X2.3—Calculation of the amount of volatile organic compound based on the total volume of coating (including water and exempt volatile compounds), as illustrated in Eq X2.2, does not provide a measure of the amount of VOC that would be released from two coatings used for the same application (that is, to coat the same area to the same dry film thickness assuming the same application efficiency for each coating) *when one or both of the coatings contain water or exempt solvents.* These units do not identify which of the coatings will release the greater amount of VOC as they treat water and exempt volatile compounds as coating solids. These units, therefore, have not been used, recommended or accepted by U.S. EPA for demonstration of compliance with VOC content regulations as such calculations yield misleading results for coatings that contain water or exempt volatile compounds.

NOTE X2.4—The expression in X2.2 is useful for the calculation of the mass of VOC released per unit of time (for example, the mass of VOC per unit of volume including water and exempt volatile compounds times the volume of total coating used per unit of time). This expression may also be useful for certain labeling purposes where the amount of VOC per unit container is desired.

X3. DEFINITION OF VOLATILE ORGANIC COMPOUNDS (VOC)

X3.1 Applicable to EPA regulations governing the preparation of state implementation plans (SIP's) which are required under Title I of the Clean Air Act [Act].[6,7]

X3.1.1 *Section 51.100 Definitions*:

X3.1.1.1 *Volatile Organic Compounds (VOC)*, means any compound of carbon, excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate, which participates in atmospheric photochemical reactions.

(1) This includes any such organic compound other than the following, which have been determined to have negligible photochemical reactivity: Methane; methyl acetate; ethane; methylene chloride (dichloromethane); 1,1,1-trichloroethane (methyl chloroform); 1,1,1-trichloro-2,2,2-trifluoroethane (CFC-113); trichlorofluoromethane (CFC-11); dichlorodifluoromethane (CFC-12); chlorodifluoromethane (CFC-22); trifluoromethane (FC-23); 1,2-dichloro-1,1,2,2-tetrafluoroethane (CFC-114); chloropentafluoroethane (CFC-115); 1,1,1-trifluoro 2,2-dichloroethane (HCFC-123); 1,1,1,2-tetrafluoroethane (HF-134a); 1,1-dichloro 1-fluoroethane (HCFC-141b); 1-chloro 1,1-difluoroethane (HCFC-142b); 2-chloro-1,1,1,2-tetrafluoroethane (HCFC-124); pentafluoroethane (HFC-125); 1,1,2,2-tetrafluoroethane (HFC-134); 1,1,1-trifluoroethane (HFC-143a); 1,1-difluoroethane (HFC-152a); parachlorobenzotrifluoride (PCBTF); cyclic, branched or linear completely methylated siloxanes; acetone; and perfluorocarbon compounds that fall into these classes:

(a) (*a*) Cyclic, branched, or linear, completely fluorinated alkanes;

(b) (*b*) Cyclic, branched, or linear, completely fluorinated ethers with no unsaturations;

(c) (*c*) Cyclic, branched, or linear, completely fluorinated tertiary amines with no unsaturations; and

(d) (*d*) Sulfur containing perfluorocarbons with no unsaturations and with sulfur bonds only to carbon and fluorine.

(1) For purposes of determining compliance with emissions limits. VOC will be measured by the test methods in the approved state implementation plan (SIP) or 40 CFR part 60,[5] appendix A, as applicable. Where such a method also measures compounds with negligible photochemical reactivity, these negligibility-reactive compounds may be excluded as VOC if the amount of such compounds is accurately quantified and such exclusion is approved by the enforcement authority.

(2) As a precondition to excluding these compounds as VOC or at any time thereafter, the enforcement authority may require an owner or operator to provide monitoring or testing methods and results demonstrating, to the satisfaction of the enforcement authority, the amount of negligible-reactive compounds in the source's emissions.

(3) For purposes of Federal enforcement for a specific source, the EPA will use the test methods specified in the applicable EPA-approved SIP in a permit issue pursuant to a program approved or promulgated under Title V of the Act, or under 40 CFR part 51,[5] subpart I or appendix S, or under 40 CFR parts 52[5] or 60.[5] The EPA will not be bound by any state

[6] U.S. Environmental Protection Agency, "Glossary for Air Pollution Control of Industrial Coating Operations," *EPA-450/3-83-013R*, Environmental Protection Agency, Washington, DC, December 1983.

[7] 40 CFR Part 51, "Requirements for Preparation, Adoption and Submittal of Implementation Plans: Approval and Promulgation of Implementation Plans," *Federal Register*, Vol 57, No. 22, February 22, 1992, pp. 3941–46.

determination as to appropriate methods for testing or monitoring negligibly-reactive compounds if such determination is not reflected in any of the above provisions.