

Surface Material Failures: Let's Talk Pain Points and Solutions



American Academy of Healthcare Interior Designers ------2004 – 2024 ------









Evaluation & CECs

USING YOUR MOBLE APP

STEP 1 CHECK IN TO THE SESSION

STEP 2 ENTER CHECK IN CODE

STEP 3 COMPLETE THE EVALUATION







Announcing Exciting News! <u>Durable Coated Fabrics Task Group</u> – is expanding and continuing to grow – becoming the Durable Coated Finishes Task Group!

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- AAHID supports the credential, <u>Certified Healthcare</u> <u>Interior Designer (CHID)</u>
- New logo with continued great work!







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Learning Objectives

- 1. Improve your selection process for successful outcomes by evaluating multiple attributes/next steps when specifying products and materials
- 2. Increase knowledge of cleaning and disinfecting processes and procedures used on healthcare surface
- 3. Understand relevant failures which are the result of environmental contaminates, cleaning chemicals and methods, and the advanced testing required to identify them.
- 4. Provide an overview of questions required to assess durability, performance, testing, cleanability, and suitability attributes when selecting finish materials for healthcare.



Jane Rohde, AIA, FIIDA, ACHA, CHID, LEED AP BD+C, GGA-EB, GGF, EDAC Principal, JSR Associates, Inc.

1. Improve your selection process for successful outcomes by evaluating multiple attributes/next steps when specifying products and materials.

Multiple Attributes

But what is the most important attribute?



Nutrition Facts		
About 25 servings per container g)		
Amount per serving		
Calories	100	
	% Daily Value*	
Total Fat 1.5 g	2%	
Saturated Fat 1 g	5%	
Trans Fat 0 g		
Cholesterol 0 mg	0%	
Sodium 125 mg	5%	
Total Carbohydrate 21 g	8%	
Dietary Fiber 1 g	0%	
Total Sugars 13 g		
Includes 12 g Added Su	igars 24%	
Protein 1 g	00/	
Protein 1 g Vitamin D 0 mcg	0%	
Protein 1 g Vitamin D 0 mcg Calcium 10 mg	0%	
Protein 1 g Vitamin D 0 mcg Calcium 10 mg Iron 1 mg	0% 0% 6%	



Performance Sustainability Health

+

Product Service Life Protect the Earth Human Wellness



Performance vs. Sustainability vs. Health

Premature Product Failure Premature Landfill Human Risk



Examples of Performance Characteristics for Owner Project Requirements

- Aesthetics
- Cleanability
- Durability
- Compliance to Minimum
 Performance Standards
- Desired Product Service Life
- Circularity
- Price Point
- Resilience
- Sustainable Attributes

Appropriate Product Design & Selection to Meet Application Requirements!





\$400K+ Unbudgeted Expense





Premature Product Failures





Check-in Code: PDC1009

Owner Project Requirements (OPR)

Project Type: Hospital Emergency Room

Building Service Life: Exterior: 50 years

Building Service Life: Systems: 20 years – 2 ½ Cycle Renovations based on System Service Life

Building Service Life: Interior: 12 years – 4+ Cycle Renovations based on Product Service Life

Outcome: Improve ED CAHPS Scores (pre- and post-COVID-19 pandemic)

Outcome: Mitigate / Reduce Infection Risk

Outcome: Improve Patient and Family Satisfaction

Outcome: Improve Care Staff Retention

Outcome: Improve Staff Satisfaction

Outcome: Reduction of Fall Risk

Resource: Facility Guidelines Institute: <u>www.fgiguidelines.org</u>: Hospital – OPR and Safety Risk Assessment Resource: Centers for Medicare and Medicaid Services: <u>https://www.cms.gov/Research-Statistics-Data-and-</u> <u>Systems/Research/CAHPS/ED</u> (as of 11/05/2020)

Design Firm Recommendations

Hospital Emergency Room – existing site constraints determine orientation and location of building addition

LEED® v4.1 Silver Certification

Fitwel[®] Two Stars Certified

Operational cost savings is key to the Client

Environmental expectations: Energy & Water Savings

Material Selection: Product Service Life, Global Warming Potential, & IEQ

Health & Wellness: Acoustic and Lighting Comfort Safety, Quality, & Control, Water Access & Quality

Hospital Emergency Room

Performance characteristics for ER product specifications:

- Surfaces to withstand high frequency of cleaning & disinfection
- Handwashing sink
 accessible locations
- Visual & physical staff
 access to patients
- Patient & family comfort
- Surface impact resistance
- Lighting controls & contrast
- Durable acoustic materials
- Warm aesthetics



Resource: Facility Guidelines Institute: <u>www.fgiguidelines.org:</u> Hospital Guidelines – Functional Programming & SRA Photo credit: Shaw: LVT / Wall Protection / Mattress Covers / Handrails: *UMC Hospital Emergency Room Application*

Hospital Emergency Room – existing site constraints dictate orientation and location of building

LEED® v4.1 Silver Certification – Material / IEQ Credits

Fitwel[®] Two Stars Certified – Material / IEQ Criteria

Material Selection: Primary: Product Service Life – Durability, Performance

Secondary: Global Warming Potential, Environmental Product Declaration

Health & Wellness: Primary: Safety – Infection Control & Prevention, Cleaning, Sanitizing &

Disinfection, Indoor Air Quality

Secondary: Acoustic and Lighting Comfort, Water Access & Quality, Thermal Control

Product Selection Process

Attribute Example: Product Life Cycle: Comparison of Products

- Performance Testing of Products
- What are the other performance and functional considerations based upon the
 - OPR and the Sustainable / Health & Wellness Requirements?
 - Infection Control and Prevention
 - Global Warming Potential (Embodied Carbon)
 - Indoor Environmental Quality
 - Operationally Green Cleaning and Disinfection
 - IAQ: VOCs Product Emissions / On-going
 - Acoustics / Thermal / Lighting Comfort (e.g., LRV)

It is essential to move beyond a single attribute comparison for final product selection!

Summary: Complexity of Product Failure

- Evaluation of material selection based upon single attribute can lead to premature failure.
- Perception of "sustainability" or "material health".
- Appropriate product for the appropriate application.
- Evaluate ALL performance requirements including cleaning and disinfection,
- Real world conditions kill time, staff time, FTEs, environmental services training and education.

Balancing Criteria

- There are trade-offs –
 realizing that some take
 precedent and priority over
 others
- Product Service Life to be identified and tied to Use
 Phase – based upon
 performance including
 maintenance and durability
- Infection Control & Prevention – must be considered for all materials & all settings





Shari Solomon, Esq. CIEC President, CleanHealth Environmental, LLC

2. Increase knowledge of cleaning and disinfecting processes and procedures used on healthcare surfaces.

Surface Contamination

 Over the past decade, substantial scientific evidence has accumulated indicating that contamination of environmental surfaces plays an important role in the transmission of several key healthcare-associated pathogens, including MRSA, VRE, Clostridium difficile, Acinetobacter, and norovirus



Understanding and Preventing Transmission of Healthcare-Associated Pathogens Due to the Contaminated Hospital Environment - David J. Weber, MD, MPH (May 2013)

Organisms Outside Human Body

Microbe	Survival Time
Clostridium difficile (spores)	5 months
Acinetobacter spp.	3 days to 5 months
Enterococcus spp. including VRE	5 days – 4 months
Pseudomonas aeruginosa	6 hours – 16 months
Klebsiella spp.	2 hours to > 30 months
Staphylococcus aureus, inc. MRSA	7 days – 7 months
Norovirus (and feline calicivirus)	8 hours to > 2 weeks ¹
SARS Coronavirus	72 hours to >28 days ²
Influenza	Hours to several days ³

Adapted from Kramer et al. BMC Infect Dis 2006;6:130.

1. Doultree et al. J Hosp Infect 1999;41:51-57.

- 2. Rabenau et al. Med Microbiol Immunol 2005;194:1-6.
- 3. Bean et al. J Infect Dis 1982;146:47-51.

Threat of Antibiotic Resistant Organisms (AROs)

• Estimated that in the next 30 years, deaths caused by AROs will surpass those caused by all cancers combined.

-World Health Organization

 Ability to cause severe infections, survive in the environment for prolonged periods, and spread easily between hospitalized patients and nursing home residents.



<u>Candida auris (C. auris)</u>



Clostridioides difficile (C. diff)

Per the CDC....

- *C. auris* can contaminate surfaces extensively, and it is difficult to eradicate.
- To disinfect surfaces contaminated with *C. auris*, use either 10% bleach (made fresh daily) or a product with Environmental Protection Agency (EPA) approval specifically for *C. auris*.



CENTERS FOR DISEASE" CONTROL AND PREVENTION

Safer Choice Disinfectant

	SEA.
hydrogen peroxide**	4EN SEAL
citric acid	5
lactic acid	
ethyl alcohol (also called ethanol or just	®
alcohol)	
isopropyl alcohol	
peroxyacetic acid **	SAFER
hypochlorous acid	
	Los Requisitos de la

**The combination of hydrogen peroxide and peroxyacetic acid is a designated AOEC asthmagen, so avoid products that contain both.

A Para Producto Más Seguros epa.gov/saferchoice

Cost of Various HAIs

НАІ Туре	Cost in Dollars
MRSA Infection	\$35,000-\$60,000
C.diff Infection (CDI)	\$18,000-\$90,000
Surgical Site Infection (SSI) (Knee or Hip)	\$30,000-\$50,000
Central Line Associated Blood Stream Infection (CLABSI)	\$16,000-\$20,000
Catheter associated Urinary Tract Infection (CAUTI)	\$5,000-\$10,000
Ventilator associated pneumonia (VAP)	\$15,000-\$25,000
Infect Control Hosp Epidemiol 2010; 31:365-373 <u>J Hosp Infect.</u> 2010 Apr;74(4):309-18 Merollini et al. BMC Health Services Research 2013, 13:91	http://www.cdc.gov/mmwr/preview/ mmwrhtml/mm6008a4.htm http://www.cdc.gov/hai/pdfs/hai/scot t_costpaper.pdf

Cleaning vs. Sanitizing vs. Disinfecting

Cleaning

- The physical removal of material (e.g., dust, soil, blood and body fluid); removes rather than kills
- A surface not cleaned effectively cannot be properly sanitized or disinfected.



Sanitizing

Carry a general claim of germ control, but generally not organism specific

Disinfecting

- The inactivation of pathogens.
- Most common disinfectants:
 - quaternary ammonium compounds
 - hydrogen-based
 - sodium hypochlorite



Soft Surfaces

- According to the EPA, no disinfectant can claim to disinfect soft surfaces.
- EPA introduced the **soft surface sanitizing claim**.
- A sanitizer kills 99.99 percent of pathogens. = 3 Logs
- A disinfectant kills 99.9999 percent = 6 Logs

* If there were 1 million pathogens on a surface, after sanitizing there would still be 10,000 left. After disinfecting, 100 pathogens would remain.



HIERARCHY OF SUSCEPTIBILITY



Selected EPA-Registered Disinfectants

- List K: EPA's Registered Antimicrobial Products Effective against Clostridium difficile Spores
- List N: Disinfectants for Use Against SARS-CoV-2
- List P: Antimicrobial Products Registered with EPA for Claims Against Candida Auris
- List Q: Disinfectants for Emerging Viral Pathogens (EVPs)



THE LABEL IS THE LAW!

Emerging Technologies



Additional Disinfection Methods

Ultraviolet Germicidal Irradiation

- Short wave, high energy ultraviolet C (UVC) light destroys microorganism's DNA
- Applications for water, air and surfaces

High-Intensity Narrow-Spectrum (HINS) Light

- 405 nm, sometimes referred to as "Near UV," although not in the UV spectrum.
- Provides continuous disinfection of air and exposed surfaces in occupied spaces



Antimicrobial Surfaces

Replacing traditional materials (e.g., plastic, stainless steel) with materials with antimicrobial properties or treating surfaces with coatings

- Copper
- Silver
- Zinc

Antimicrobial surface coatings

• Surfaces sprayed with surfacine or organosilane





New EPA Registrations



- EPA Guidance for Products
 Including or Adding Disinfectant
 Efficacy Claims for Use on Soft
 Surface Textiles in NonResidential Settings (August 29, 2023)
- **Residual Efficacy Claims (2019)** Addition of residual (i.e., extended or long-lasting) efficacy claims:
 - for currently registered or new product registrations that would qualify for List N;
 - or products that can be used as a residual supplement to disinfectants on List N.



Linda Gabel, CHID, NCIDQ, IIDA Senior Facility Planner, The Ohio State University Wexner Medical Center

3. Understand relevant failures which are the result of environmental contaminants, cleaning and methods, and the advanced testing required to identify them.
The James/Wexner Medical Center

Academic Medical Center

1.2 million SF state-of-the-art Cancer Hospital opened in 2014

Project Goals for Furniture and Finishes:

- Create a safe environment for patients, guests and staff
- Sophisticated esthetic
- LEED Gold / reduce use of PVC based products Design Consultant chose to replace 90% of PVC with Polyurethane coated fabrics and finishes.
- Reduce first cost
- Increased durability
- Ease of housekeeping and maintenance

Unintended Consequences:

Rapid degradation of Polyurethane coated fabrics, wood finishes, & materials on furniture and equipment, starting at 8 months.





Check-in Code: PDC1009

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Public and Patient Area Failures

Issues:

- Cleaning & Chemicals
- "no rinse" protocol
- UV-C light treatment
- Heat
- Oils
- Sweat
- 24/7 use
- Rubbing/abrasion
- Polyurethane-based materials







Clinical and Office Support Areas Failures

Issues

- Heat
- Oils
- Sweat
- 24/7 use
- Rubbing/abrasion points
- Polyurethane-based materials





These surfaces are not scheduled to be routinely cleaned by EVS

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Why is this so important?

1. Epidemiology (EPI) Concerns

EVS staff is unable to properly clean and disinfectant the surfaces due to damage & vulnerable subsurface of material exposed to HAI*/pathogens:

- SARS-CoV-2
- Candida Auris
- Multidrug resistant organisms (e.g. MRSA, VRE)
- Clotridoides (formerly Clostridium) difficile
- 2. Contaminated Furniture pulled out of service
 - all items sent to hard trash. FTEs hired to manage recycle, landfill, replacement and/or repairs
- 3. Financial impact unforeseen cost of replacement furniture
 - capital & operational budget diversions est. \$9 Million over 5+ years
- *Hospital Acquired Infections

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- Acinetobacter
- Pseudomonas
- Klebsiella





Third Party Lab Material Testing: 2018-2019

Goal – Create fabric performance tests that reflect the current state of disinfecting chemicals/methods, and environmental contaminates within the acute care hospital setting to more accurately predict fabric performance:

Disinfectant Exposure Tests

Chemical remaining on fabric, extended dwell time

Stain Resistance Test

New staining agents, extended dwell time, EVS chemicals

Ten durable coated fabrics types currently marketed 24/7 "healthcare"

tested:

- Vinyl with Brand A topcoat •
- Vinyl with UV and acrylic topcoat ٠
- Vinyl with Brand B topcoat ٠
- Polyurethane •
- Thermoplastic Elastomer ٠

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- Polycarbonate with Brand C topcoat
- Silicone, no topcoat •
- Silicone with Brand C topcoat •
- 100% nylon matrix
- **Treated Leather** •



Disinfectant Exposure Test - Results

Disinfectant	Fabric 1 Vinyl w/Brand A Topcoat	Fabric 2 Vinyl w/UV & Acrylic Topcoat	Fabric 3 Thermoplastic Elastomer	Fabric 4 Silcone, no topcoat	Fabric 5 Polyurethane	Fabric 6 Treated Leather	Fabric 7 Vinyl w/Brand B Topcoat	Fabric 8 100% Nylon Matrix	Fabric 9 Polycarbonate w/Brand C Topcoat	Fabric 10 Silcone w/Brand C Topcoat
A In-house Bleach	Rating: 3.0	Rating: 3.0	Rating: 1.7	Rating: 3.3	Rating: 1.0	Rating: 2.0	Rating: 1.3	Rating: 1.0	Rating: 2.0	Rating: 4.0
B Oxivir TB: Hydrogen Peroxide (0.5%)	Rating: 2.0	Rating: 3.0	Rating: 2.0	Rating: 3.0	Rating: 1.0	Rating: 2.7	Rating: 3.0	Rating: 1.3	Rating: 2.0	Rating: 3.0
C Oxycide: Hydrogen Peroxide + Peroxyacetic Acid	Rating: 2.0	Rating: 3.0	Rating: 2.0	Rating: 3.0	Rating: 1.3	Rating: 2.3	Rating: 2.3	Rating: 2.3	Rating: 2.0	Rating: 3.0
D Quaternary- Virex II 256	Rating: 4.0	Rating: 4.0	Rating: 2.0	Rating: 4.0	Rating: 1.3	Rating: 3.0	Rating: 4.0	Rating: 1.3	Rating: 1.7	Rating: 4.0
E JF2 Glance: Non-ammoniated	Rating: 4.0	Rating: 4.0	Rating: 2.0	Rating: 2.7	Rating: 1.0	Rating: 3.7	Rating: 4.0	Rating: 1.0	Rating: 2.3	Rating: 3.0
F JF3 Stride Citrus Neutral Cleaner	Rating: 3.3	Rating: 4.0	Rating: 2.0	Rating: 2.7	Rating: 1.0	Rating: 4.0	Rating: 4.0	Rating: 3.3	Rating: 2.7	Rating: 2.3
G Hand Sanitizer- 70% Isopropanol	Rating: 4.0	Rating: 3.3	Rating: 2.0	Rating: 2.0	Rating: 1.0	Rating: 3.7	Rating: 4.0	Rating: 1.3	Rating: 3.0	Rating: 3.0

Excellent 4

3 Good

1

Severe Effect

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2 Poor



Stain Resistance Test

Commonly used environmental contaminates in healthcare and public areas:

Patient Transferrable Stains

- 1. Super Lustrous Lipstick- Love That Red
- 2. Baby Oil
- 3. Daily Moisture Dry Skin Moisturizer
- 4. Acetone Nail Polish Remover
- 5. Non-Acetone Polish Remover
- 6. Broad-Spectrum Sunscreen SPF 50 (Oxybenzone 5%, Avobenzone 3%, Octocrylene 4%, Homosalate10%, Octisalate 5%)
- 7. Skin Sunscreen Lotion with Broad Spectrum SPF 60+ (Zinc oxide 4.7%, Titanium dioxide 4.9%)
- 8. Black castor oil strengthen restore leave-in conditioner

Synthetic Body Fluids and Clinical Reagents

- 1. Stomach Acid Carolina Biological Supply Company: Gastric Juice, Artificial, Laboratory Grade
- 2. Human Sweat Pickering AATCC TM15 Sweat pH 4.3
- 3. Urine Carolina Biological Supply Company: Simulated Urine, Normal
- 4. Viscot Mini Surgical Fine Tip Marker

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Stain Resistance Test – Results

Application of staining agent with *extended dwell time of 48 hours* Cleaning of staining/contaminate agents *with hospital disinfectants in lieu of soap & water*:

Stain	Replicate (Cleaning Agent)	Fabric 1 Vinyl w/Brand A Topcoat	Fabric 2 Vinyl with UV & Acrylic Topcoat	Fabric 3 Thermoplastic Elastomer	Fabric 4 Silcone, no topcoat	Fabric 5 Polyurethane	Fabric 6 Treated Leather	Fabric 7 Vinyl w/Brand B Topcoat	Fabric 8 100% Nylon Matrix	Fabric 9 Polycarbonate w/Brand C Topcoat	Fabric 10 Silcone w/Brand C Topcoat
	1	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +
	(Oxivir)	Rating: 2.7	Rating: 2.3	Rating: 3.0	Rating: 3.0	Rating: 2.3	Rating: 3.0	Rating: 2.7	Rating: 2.0	Rating: 1.7	Rating: 3.0
	2	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +
	(Bleach)	Rating: 2.0	Rating: 2.7	Rating: 2.0	Rating: 2.0	Rating: 1.0	Rating: 2.7	Rating: 2.0	Rating: 1.3	Rating: 1.7	Rating: 1.0
M	3	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +
Ultraguard	(Virex)	Rating: 2.3	Rating: 2.0	Rating: 1.7	Rating: 1.7	Rating: 2.0	Rating: 2.7	Rating: 2.3	Rating: 1.3	Rating: 1.3	Rating: 1.
Sunscreen	4	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +
Continous (Oxivir)	(Oxivir)	Rating: 2.0	Rating: 2.7	Rating: 2.7	Rating: 3.0	Rating: 2.3	Rating: 3.0	Rating: 3.0	Rating: 1.7	Rating: 2.0	Rating: 2.
,	5	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +
	(Bleach)	Rating: 3.0	Rating: 2.0	Rating: 2.0	Rating: 1.0	Rating: 1.3	Rating: 2.3	Rating: 2.3	Rating: 2.3	Rating: 1.0	Rating: 1.
	6	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +
	(Virex)	Rating: 2.3	Rating: 2.0	Rating: 1.7	Rating: 1.0	Rating: 1.3	Rating: 3.0	Rating: 3.0	Rating: 1.0	Rating: 1.7	Rating: 1.0
	S= Stain Present										
	Evaluated using:	+ (present)	or - (not presen	t)							

ALCHEIN

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Stain Resistance Test – Results & Take-Aways

Patient Transferrable Stains	Scores:
Super Lustrous Lipstick- Love That Red	100% fabrics stains present – no 4s
Baby Oil	75% of fabrics stains present, all at 2 or 3, few 4s
Daily Moisture Dry Skin Moisturizer	60% of fabrics stains present; all at 2 or 3, few 4s
Acetone Nail Polish Remover	30% fabrics types stains present; 3 or 4
Non-Acetone Polish Remover	30% fabric types stains present; 2, 3, 4
Broad-Spectrum Sunscreen SPF 50 (Oxybenzone	100% fabrics stains present – no 4s; all fabric
5%, Avobenzone 3%, Octocrylene 4%,	types scored 1-2, very few 3s
Homosalate10%, Octisalate 5%)	
Skin Sunscreen Lotion with Broad Spectrum SPF	100% fabrics stains present – no 4s; 1 fabric type
60+(Zinc oxide 4.7%, Titanium dioxide 4.9%)	scored 1, most scored 2
Jamaican black castor oil strengthen restore leave-in	100% fabrics stains present – no 4s
conditioner	
Synthetic Body Fluids and Clinical Reagents	Scores:
Stomach Acid	40% fabrics stains present, all at 3 & 4
Human Sweat	0% fabric stains present, though 50% scored 3 on
	degradation & appearance
Urine	0% fabric stains present, though 50% scored 3 on
	degradation & appearance
Viscot Mini Surgical Fine Tip Marker	100% fabrics stains present; no 4s, many 1,2s

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O.R. Materials Degradation Discovery 2021

Yellowing & degradation of new interior finish materials,
 O.R. Equipment plastics and devices



Recently renovated Operating Rooms, (noticeable within 8 months to 2 years)

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Causal Hypothesis

Germicidal process using high intensity UV-C (254 nm) radiation, with or without the use of wet chemical agents to clean and disinfect the rooms, may be the source of the new damage.

Test materials/products at risk for levels of damage/failure to determine:

- Is it minor, visible damage only, with minimal risk to humans?
- Is it accelerated damage that has a predictive timeline of replacement before it becomes damaged/friable/hoarding pathogens?
- Is it already damaged /friable/ hoarding pathogens and creating a high risk, requiring immediate evaluation for replacement?

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We also use this technology for COVID, ICU, Cancer and (AII) patient room turns

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Why is the use of UV-C exposure so important?

- Significant reduction in surgical site infections
- Rapid kill time for hardest to kill pathogens
- Enables faster room turns

Evidence-based multifaceted program reduces S. aureus transmission and SSIs



Treatment reduced the risk of surgical site infection (hazard ratio, 0.12; 95% CI, 0.02-0.92; P = .04; with clustering by surgeon: 95% CI, 0.03-0.51; P = .004; with clustering by specialty: 95% CI, 0.03-0.55; P = .006).

Figure 3

patients were monitored for 60 days post surgery to identify any SSIs. Those in the infection prevention bundle were significantly less likely to have a SSI 60 days post-op than those in the usual care treatment (n= 1 vs. n = 10)







UV-C Disinfecting Light Exposure Testing – Phase 1

Materials Tested:

- Rigid plastic wall panels
- Epoxy Flooring (2 types)
- Tubing from O.R. equipment



Lab Experiment set up: accelerated exposure to mimic 0 - 5 years of exposure

- Expose material to Surfacide tower emitting high intensity UV-C (254 nm) radiation, with or without the use of wet chemical agents to clean and disinfect the rooms.
- Room is sealed off from any other light exposure and to protect lab staff.
- ASTM D4762: D3039/D3039M for tensile test
- ASTM D4762: C366/C366M for thickness determination

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UV-C Disinfecting Light Exposure Testing

Lab Procedure to mimic that of OR Procedures

- 1) Samples are wiped down once with VersaSure wipes and dry for minimum 20 minutes
- 2) Samples are wiped down with Diversey Expose ii 256 and dry for minimum of 20 minutes
- 3) Samples are wiped down with Diversey Expose ii 256 and dry for minimum of 20 minutes
- 4) Samples are wiped down with Diversey Expose ii 256 and dry for minimum of 20 minutes
- 5) Samples are wiped down with Diversey Expose ii 256 and dry for minimum of 20 minutes
- 6) Last week (week 4) of every month wipe down with Clorox Healthcare Bleach wipe
- 7) UV-C exposure 40-50 minutes

Total of approximately 3 hours per cycle to simulate 1 week, 156 hours to simulate 1 year, 312 hours to simulate 2 years, etc.

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UV-C Disinfecting Light Exposure – 2 months

Visible/Measurable Color Change:

 No measurable differences of any materials tested

Wettability:

 Rigid plastic wall panels exhibited change in resistance to water/porosity (the ability of water to disperse, ball up vs. absorbed into micro-fissures)



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UV-C Disinfecting Light Exposure – 3 months

Visible/Measurable Color Change:

- Measurable difference in rigid
 plastic wall panel
- No measurable difference in flooring and tubing







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UV-C Disinfecting Light Exposure 16-42 months

After UV 16 months



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THE OHIO STATE UNIVERSITY WEXNER MEDICAL CENTER

UV-C Disinfecting Light Exposure – Friable microplastics after 36 months exposure to UV-C

Submicron-Micron size (> 200 nm), tube or facet-shaped microplastics

Micron size (> 1 µm), flake-shape microplastics

NOTE: use of water/ethanol rinse to collect microplastics, micron microscope image of microplastics remaining

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UV-C Disinfecting Light Exposure – SEM results of surface morphology after 48 months

Flooring untreated



Wall untreated



Flooring treated after 4-year UV-C



Wall after 4-year UV-C



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UV-C Disinfecting Light Exposure – Tensile Strength of OR Equipment Tubing

Tensile test

We performed at least four tests for new and exposed tubing

Test sample size:

Thickness: 0.15 mm; width: 0.30 mm; length: 2 cm

New tubing

Maximum elongation: 1230 ± 104 %

Strength at maximum elongation: 8.2 ± 1.4 Newton Exposed tubing (4 years)

Maximum elongation: 561 ± 60 %

Strength at maximum elongation: 5.3 ± 0.5 Newton



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Impact of OR Material Failures

HARD COSTS to renovate one OR with like materials: \$310,000*

- hard construction and ICRA costs = \$300,000
- moves/clean storage/logistics of all ME = \$10,000

SHUT DOWN LOSS OF REVENUE: - \$1,050,000*

- Requires shut down of adjacent ORs to mitigate vibration and sound, ICRA
- Vibration/sound/Impact to departments on the floors below only after-hours work = 14 days construction
- 3 ORs shut down x an average of \$25K per day, evening work

LOSS OF PATIENT CARE DAYS: 42

• may have procedures cancelled due to the delay

*2023 costs; Construction costs would likely be much higher in order to invest in UV-C resistant wall materials, such as stainless steel, laminated glass, or exterior grade solid surface materials to achieve a longer life-cycle.

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Medical Implications of Microplastics and Nanoplastics

Recent studies are now emerging regarding the implications of a direct heath harm link from microplastics and nanoplastics.

From the New England Journal of Medicine:

"In this study, patients with carotid artery plaque in which MNPs (Microplastics and Nanoplastics) were detected had a higher risk of a composite of myocardial infarction, stroke, or death from any cause at 34 months of follow-up than those in whom MNPs were not detected."

Microplastics and Nanoplastics in Atheromas and Cardiovascular Events | NEJM

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Lessons Learned

- The wet EVS chemical residue did not have any noticeable impact to the degradation of the materials – both test sample sets degraded at the same rate.
- Assume most polymer materials in the built environment, (rigid, flexible, coatings, paints) are vulnerable to degradation from a germicidal disinfecting light technology at some level over time. (High intensity UV-C (254 nm) radiation used in our tests and in our facilities is currently one of the most aggressive UV-C systems on the market for a rapid kill time.
- Determine the areas within your facility that will receive which germicidal disinfecting light technology exposure, extent of time needed for disinfecting, and frequency of use.
- Determine appropriateness of material selections in areas that will be exposed to the specific intensity of germicidal disinfecting light technology – no standard tests available, so work with your vendor providing the UV-C emitter to assist with testing.
- Assess First Cost versus Life-Cycle Material Replacement/Operational Downtime Costs and review with your customer/leadership to understand implications of choices.

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4. Provide an overview of questions required to assess durability, performance, testing, cleanability, and suitability attributes when selecting finish materials for healthcare.

Failures = Lost Revenue



Exercise equipment



Stainless Steel



Wood chair frames



Concrete sinks



Sagging, stretched fabrics and seat cushions

Focus - Durable Coated Fabrics











Furniture Graveyard due to Fabric Failures

Something had to be done...

frustration,



time lost,





money lost,



We needed answers...

Too many unanswered questions...

Memo tag/Sample ticket material composition and testing information was confusing and inconsistent.

Websites provide inconsistent information on testing and material composition.

Sales reps could not provide additional information.



Large Maryland Medical Center CVIR/ICU Lounge Study 2019-2020

Goals:

To test 18 "healthcare" "24/7" durable coated fabrics' durability and performance

Regular testing of cleaning processes for cleanliness/bioburden

Results: Post Pandemic

Durability: Good-Excellent, with some stretching on humid days

Cleanliness: Inability to comply with daily cleaning as recommended by fabric manufacturers



Before reupholstering



After reupholstering

Memo sample ticket and Website info comparison: V.3 - 9.28.20							
Test names, if noted, are highlighted							
Coated Fabric A	Coated Fabric B	Coated Fabric C	Coated Fabric D	Coated Fabric E			
(Sample ticket)	(Sample ticket)	(Sample ticket)	(Sample ticket)	(Sample ticket)			
				Name			
Name and # of pattern	Name	Collection	Name	Number			
Color	Color and #	Name	Style	Color			
Content	Contents	Content	Color	Content			
Finish	Finish	Width	Width	Backing			
Backing	Fluid Barrier	Abrasion (Wyzenbeek)	Material	Width			
Cleaning	Width	Cleaning Code		Application			
Weight	Abrasion Resistance	Key Features :		Features			
Width	Hydrolysis Resistance	Bleach cleanable		Environmental info			
Repeat	Flammability	Resists blue jean dye		3 flame ratings			
Abrasion (dbl rubs noted)	(3 tests noted)			<mark>Wyzenbeek</mark>			
				Lightfastness AATCC			
				<mark>16</mark>			
TEST NAME/# NOT GIVEN	TEST NAMES/# NOT	TEST NAME/# NOT	NO TESTS NOTED	Cal 133			
(other than Wyzenbeek)	GIVEN (other than	GIVEN (other than		BIFMA			
	Wyzenbeek noted)	Wyzenbeek)		Wyzenbeek noted; but			
				not by test #			
				2 TESTS NOTED			
VS. Website info	VS. Website Info	VS. Website info	VS. Website info	VS. Website info			
Additional website info -	Additional website info -	Additional website info	Add'l website info	Info exactly the same			
two more tests are noted	Abrasion Resist. ASTM D-	4 Flammability test	5 flame tests	as sample ticket			
but not by formal test	<mark>4157</mark>	Colorfastness – <mark>AATCC</mark>	<mark>ASTM D4157 –</mark>				
name or #	Break Strength ASTM -D-	<mark>16H</mark>	<mark>Wyzenbeek</mark>				
Price	<mark>751-06</mark>	Emissions CA	Crocking AATCC 8				
Finish (topcoat)	Tear Strength ASTM D-	Hydrolytic Stability – ISO	Light AATCC 16.3				
Backing	<mark>2261</mark>	<mark>1419</mark>					
Warranty	<mark>Seam slippage ASTM D-06</mark>						
Environmental	Colorfastness to light						
Flammability "meets all"	AATCC 16						
	Crocking ATTCC-8						
No test noted on Website	Hydrolytic Sta. ISO 1419			2 Tests noted on			
	7 Tests noted on Website	2 Tests noted on Website	3 Tests noted on Website	Website			

There was no standard list for the most important tests needed for healthcare environments.

Missing and Inconsistent information...

Manufacturer's Website Information

- Limited and inconsistent between manufacturers
 - Ex: one had test results for twelve staining agents; another had none
- Limited and inconsistent cleaning information

Manufacturer and/or Distributor Sales Reps

• Sometimes provided additional info; sometimes unable

Sustainable information

Sometimes dominated the memo card; did not list performance characteristics



Results of Collaboration: CFFA-Healthcare-201C

CFFA CHEMICAL FABRICS & FILM ASSOCIATION, INC.

CFFA-HEALTHCARE-201C December 2023

Recommended Minimum Performance Standards for VINYL-COATED AND OTHER CHEMICAL COATED UPHOLSTERY FABRICS - HEALTHCARE

1. Scope

- 1.1 This document sets forth recommended performance standa fabrics produced with woven, non-woven, or knit substrates for indoor furniture in healthcare settings.
- 1.2 This performance standard is not applicable to vinyl or chem applications.
- 1.3 The test results for coated fabrics, when tested in accordance must attain the minimum values of all properties listed in <u>TA</u> to conform to this standard.

2. Applicable Documents*

For applicable documents used in this performance standard, ref Pamphlet, most recent Edition.

3. Definitions

Abrasion – Measurement of the ability of the chemical coating to against another (abradent) surface.

Accelerated Exposure to Disinfectants – To determine surface deterioration due to cracking or peeling, as a result of exposure t

The CFFA-Healthcare-201 has been reprinted with permission of the Chemical Fabrics and Film Association.

Resource: CFFA:

https://www.cffaperformanceproducts.org/content/ pdfs/HealthcareStandard201IndoorUpholstery.pdf



4.3 Properties described in <u>TABLE 1</u> for coated fabrics collectively make up the minimum performance standards. Depending upon specific tailoring and performance requirements, these properties should be used to select the construction of coated fabric most suited for each end use. Properties are measured using CFFA Standard Test Methods. All test methods are outlined in the CFFA Standard Test Methods pamphlet which describes their purpose and relates the properties tested to various aspects of performance.

TABLE 1

		FABRIC BACKING OR SUBSTRATE				
PROPERTY	TEST METHOD	KNITS	NON- WOVENS	WOVENS		
Abrasion: (Wyzenbeek) Healthcare / High	CFFA 1a #10 Duck	100,000 cycles	100,000 cycles	100,000 cycles		
Traffic ¹ Healthcare/ Normal Traffic ¹		50,000 cycles	 50,000 cycles	50,000 cycles		
Accelerated Exposure to Disinfectants ²	CFFA 101	Slight Change	Slight Change	Slight Change		
Accelerated Light		Very slight	Very slight	Very slight		
2	0001.0			Check-in Co		



Look for the CFFA-Healthcare-201 Certified mark !

A durable coated fabric must pass <u>all tests</u> to become Certified.



There is no criteria for "CFFA compliant"

If a durable coated fabric is CFFA certified, it will be listed on the CFFA website as a certified coated fabric; <u>https://www.cffaperformanceproducts.org/healthcare.asp</u>

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43 Properties described in <u>TABLE 1</u> for coated fabrics collectively make up the minimum performance standards. Depending upon specific tailoring and performance requirements, these properties should be used to select the construction of coated fabric most suited for each end use. Properties are measured using CFFA Standard Test Methods. All test methods are outlined in the CFFA Standard Test Methods pamphlet which describes their purpose and relates the properties tested to various aspects of performance.

		FABRIC BACKING OR SUBSTRATE		
PROPERTY	TEST METHOD	KNITS	NON- WOVENS	WOVENS
Abrasion: (Wyzenbeek) Healthcare / High	CFFA 1a #10 Duck	100,000 cycles	100,000 cycles	100,000 cycles
Traffic ⁴ Healthcare/ Normal Traffic ¹		50,000 cycles	50,000 cycles	50,000 cycles
Accelerated Exposure to Disinfectants ²	CFFA 101	Slight Change	Slight Change	Slight Change
Accelerated Light Aging (indoor) ³	CFFA 2	Very slight change	Very slight change	Very slight change
Adhesion*	CFFA 3	3.0 lbs.	3.0 lbs.	3.0 lbs.
Blocking	CFFA 4	None- Slight Adh. (2)	None- Slight Adh. (2)	None-Slight Adh. (2)
Cold Crack ⁴	CFFA 6a	No Cracking	No Cracking	No Cracking
Crocking: Dry & Wet	CFFA 7	Excellent (4)	Excellent (4)	Excellent (4)
Denim Stain Resistance	CFFA 70	Slight (8)	Slight (8)	Slight (8)
Flame Resistance (CAL117-2013)	CFFA 9	Pass	Pass	Pass
Flex*	CFFA 10	25,000 Cycles No Cracking/ Crazing	25,000 Cycles No Cracking/ Crazing	25,000 Cycles No Cracking/ Crazing
Hydrolytic Stability, PU ⁵	CFFA 110	10 weeks	10 weeks	10 weeks
Seam Strength	CFFA 14	30 x 25 lbs.	35 x 35 lbs.	25 x 25 lbs.
Stain Resistance ⁶	CFFA 142	No stain (4)	No stain (4)	No stain (4)
Tear Strength: Tongue Trap	CFFA 16b CFFA 16c	4 x 4 lbs. N/A	N/A 15 x 15 lbs.	4 x 4 lbs. N/A
Tensile	CFFA 17	50 X 50 lbs.	50 X 50 lbs.	40 x 40 lbs.
Volatility?	CFFA 18	8%	8%	8%

TABLE 1

¹No objectionable loss of grain when compared to unabraded sample

²No cracking/peeling.

³200 hours using a Weatherometer or Fadeometer, or 150 hours using a QUV – dry cycle CFFA Standard Test Method 2.d. ⁴Using a 5 lb. roller, 20° F (-6.6°C).

^sHydrolytic Stability, PU - Adhesion: Must maintain 75% of original strength; Abrasion: Must pass 25K double rubs; Flex Resistance: No breaks in coating at 15K cycle.

"Inks and lipsticks are rated Visible stain (2).

⁷Activated carbon technique, but at 220°F (104°C).

Highlights of CFFA-HC-201C

- **CFFA 70**: Denim Stain Resistance, also known as "reverse crocking".
- **CFFA 142**: Stain resistance in the healthcare environment; 12 different common stains, including ink, lotion, oils, lipstick and bodily fluids.
- **CFFA 101**: Accelerated Exposure to disinfectants.
- Pass All 16 Minimum Performance
 Tests (some have subtests).

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Program Your Specifications

- Budget
- Cleanability (alternative cleaning methods?)
- Testing/Certification/Declarations
- Sustainability
- Culture
- Aesthetics

Answer your own questions: Find the balance.



Budget "Oh I thought the budgeted number included installation!"

- What is expected service life of the product? (CFO, Facilities)
 - Prepare ROI and expected service life value.
- How was the budget developed?
- Does budget include Evidence-based design goals?
- Is it realistic? If not, do you revise the budget or downgrade the product/materials?
- If fabrics are COM, was it included in the budget?
- Special notes to Interior designers:
 - Get a copy of the *itemized* budget
 - Stay involved in the "value engineering" process

Cleanability (and disinfecting)

Get EVS, Infection Control, and Purchasing Involved!

- Understand products being used for cleaning, sanitizing, disinfecting – including wipes.
 - Chemicals used on hard surfaces (countertops, floors, elevators doors, etc. ? AND on soft surfaces (coated fabrics, arm caps, wood)??
 - Are the cleaning products wiped off with clear water?
 - Are boxes of wipes put in patient rooms for family members to use? Do they contain bleach?
 - Understand the product warranty with regard to cleaning
 - When do GPO contracts expire for cleaning products?
 - Does EVS' standard disinfecting process conform to the disinfecting products recommended "kill" time?



Cleaning product's own photo after saying do not use on vinyl or soft surfaces



Questions Specifiers and Facility Managers should ask when considering any product for healthcare use!!

- 1. What are the specific cleaning, sanitizing, and disinfecting testing results for the product? LOOK FOR THE LABEL!
- 2. What are the cleaning, sanitizing, and disinfecting chemicals used and procedures for maintenance in your project environment?
- 3. What is the expected **useful service life in your project** location?
- 4. What are your real-world environmental conditions? (humidity, sunlight, etc.)
- 5. Read the Memo Tag (sample ticket), ask your rep, check the website, ask the manufacturer's Technical Department.
- 6. Understand the **minimal testing standards** for the products being considered, such as the CFFA-Healthcare-201 certification.
- 7. Do a mock-up, evaluate conditions, and measure results!
- 8. Develop your own additional questions.

Lessons Learned...

Field test results are only the first steps...

The path you travel while gathering the data and the questions asked lead to new discoveries.



We must ask more questions!



Keep asking questions until you get the answers!!



And there is no EASY BUTTON!!

Check-in Code: PDC1009



Spread the Word!

- Share the AAHID website resources.
- Recommend to
 manufacturers to have
 products tested to CFFA
 Healthcare 201 Standard.
- Recommend designers to use a multiple attribute approach to product selection.
- Understand materiality and performance.



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Evaluation & CECs

USING YOUR MOBLE APP

STEP 1 CHECK IN TO THE SESSION

STEP 2 ENTER CHECK IN CODE

STEP 3 COMPLETE THE EVALUATION









Wrap-up and Questions

Thank you for attending!

Please remember to check in to the session and complete the evaluation to receive CE / CEU/ CEC credit.



American Academy of Healthcare Interior Designers ------2004 – 2024 ------







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