

xorel. TEST RESULTS

XOREL AND THE
ENVIRONMENT

SUMMARY OF
TEST RESULTS

Xorel® and the Environment

ENVIRONMENT

“The complex of physical, chemical and biotic factors that act upon an organism or an ecological community and ultimately determine its form and survival,” Webster.

Today’s environment relates to the surroundings in which we live and work. Tomorrow’s environment will be impacted by the manufacturing processes used to produce today’s products, the longevity of these products, and the ease with which they can be disposed of or recycled.

Interior designers and architects approach their work today with a deep sense of responsibility not only toward their client’s functional and aesthetic needs but also to the present and future environment. The environmental characteristics of specific textiles play an important role in the designer’s selection process. To judge the impact of a textile upon the environment, designers must consider the following:

1. The effects on the environment of the manufacturing process by which the textile is made.
2. The safety and comfort of the people living or working in the interior in which the textile is a major component.
3. The longevity of the textile.
4. The ease of disposal or recycling of the textile.

How do Xorel fabrics relate to each of these issues?

MANUFACTURING

- Compared to other fabrics, the manufacturing of Xorel yarn results in substantially less carbon monoxide, nitrogenoxide, hydrocarbons, sulfur dioxide and dust.
- Raw material requirements, energy and water consumption during manufacturing are smaller for Xorel than for most other fabrics.
- Xorel fabrics are totally chlorine free and contain no plasticizers or stabilizers, which are used in the production of vinyl products (PVC-Polyvinyl Chloride).
- During the production of Xorel yarn, no odors or waste waters are developed.
- The composition of Xorel dyes is carefully monitored to eliminate any harmful chemicals.
- Since IFR Xorel fabrics are inherently flame-retardant and stain-resistant, no topical chemical treatments are necessary, such as Teflon® or flame retarding, which are used in many other fabrics. This eliminates the need to use and dispose of the additive chemicals needed for these processes.

Xorel® and the Environment

SAFETY

Safety is concerned with three issues: flame retardancy, toxicity, and bacterial growth.

Flame Retardancy

All Xorel fabrics, both IFR and non-IFR, qualify for use in Class A and Class 1 areas under the ASTM E-84 Tunnel Test. They also pass NFPA 265 Room Corner Test. IFR Xorel fabrics are inherently flame retardant and pass the most stringent vertical tests in the United States, Canada and Europe, including NFPA 701, original and 1999 revision, City of New York 294-40 S.R., State of California Title 19, Federal Aviation Authority 25.853(a+b).

Xorel fabrics are also certified for use aboard ships under the standards of the International Maritime Organization (IMO) MSC 61(67).

Toxicity

Toxicity has two components, the level of noxious gasses produced by the textile during a fire and the level of gasses it emits during normal, everyday use. This latter phenomenon, called "off-gassing", can be critical not only to the comfort of an office's occupants but to their health as well.

A. Fire

Under the International Maritime Organization's Smoke and Toxicity Test Procedure (part 2 of Annex 1 to IMO Resolution MSC. 61(67), IFR Xorel was found to have dramatically low readings of seven noxious gasses identified by the IMO. Following are the maximum levels accepted by the IMO and the readings established for IFR Xorel.

	IMO Limit	Xorel Results
Carbon Monoxide (CO)	1450 ppm	326 ppm
Hydrogen Bromide (HBr)	600 ppm	30 ppm
Hydrogen Chloride (HCl)	600 ppm	20 ppm
Hydrogen Cyanide (HCN)	140 ppm	2 ppm
Hydrogen Fluoride (HF)	600 ppm	10 ppm
Nitrogen Oxide (NOx)	350 ppm	30 ppm
Sulfur Dioxide (SO2)	120 ppm	2 ppm

Xorel fabrics have also passed the Pittsburgh Protocol Test Method and have been approved by the New York City Department of Buildings, MEA 474-89-M.

B. Off-Gassing

A report by Berkeley Analytical Associates states "The measured emission rates of VOCs from Xorel are very low. Emissions from tested samples raise no significant indoor air quality concern." In additional testing for VOCs under ASTM D5116-97, Xorel fabrics passed the requirements of section 01350 of the California State Building Guideline for Indoor Environmental and Air Quality. They have also been tested and approved by the California Health Services Department.

GREENPEACE recognizes Xorel fabrics as a viable environmental alternative to PVC vinyl.

*VOC = Volatile Organic Compound

Xorel® and the Environment

Bacterial Growth

In the special area of hospitals and health care facilities, Xorel's anti-bacterial qualities create a safe environment for both workers and patients. This is also a significant consideration for interiors of dense occupancy, such as cruise ships, theaters, and restaurants.

In a series of tests conducted by the United States Testing Company to determine the suitability of Xorel fabrics for hospital use, it was established that Xorel does not support the growth of bacteria, fungi, or staphylococcus aureus. When paper backed Xorel will not permit the passage of bacteria and is resistant to water permeability.

COMFORT

Comfort is enhanced by several factors: ergonomic seating upholstered in breathable fabrics, low sound levels, proper lighting, and cleanliness of surroundings.

Upholstery

Xorel fabrics are breathable and for special health care requirements a manufacturer can add a barrier to prevent the passage of liquids.

Acoustics

Xorel fabrics are acoustically neutral permitting sound to pass through to the absorbent core of acoustical systems and panels.

Lighting

Xorel fabrics are woven with yarns of varying reflective qualities. Certain Xorel fabrics with a high degree of reflection will increase light levels without increasing electricity use.

Cleanliness

Xorel fabrics' remarkable stain resistance and ease of maintenance make their use for furniture, walls and systems the ideal solution for a clean environment.

Xorel® and the Environment

LONGEVITY

One of the principal reasons that developed economies have a problem with waste disposal is the short life span of so many of the products these economies generate.

Xorel fabrics on the other hand have an exceptionally long life cycle and do not require periodic replacement as do most textiles exposed in high-traffic commercial areas. Not only are their durability and strength unmatched but their inherent, natural stain-resistance makes them the most easily maintained fabrics available. Xorel fabrics are colorfast and will show no sign of fading after many years of use.

The less frequently a fabric must be replaced the less labor consumed, the less waste to be disposed of, and the lower the long-term cost. Some Xorel installations have been in place for 20 years.

DISPOSAL

When Xorel products are ready for disposal, they can be incinerated without emitting toxic gasses (see Toxicity above) and are therefore an ideal energy source in waste burning plants, with a higher BTU (British Thermal Unit) rating than coal.

Xorel fabrics can be safely landfilled without harming groundwater. Unbacked Xorel fabrics can be recycled.

The Carnegie group of textile companies is proud to have developed Xorel, a product so aesthetically pleasing yet so practical and so compatible with our environment that it is recognized as one of the leading textile advances of the last two decades.

Summary of Test Results

All Xorel® fabrics are woven with polyethylene yarn of different sizes and shapes. Most Xorel fabrics are inherently flame retardant and are designated IFR XOREL. All Xorel yarns are solution dyed and are totally free of chlorine, plasticizers, heavy metals, and chemical finishes. Regardless of which yarn type is used, all Xorel fabrics are generically the same and have the same basic characteristics with the exception of flame retardancy. Therefore test results achieved on any particular Xorel fabric can be presumed to apply equally to all other Xorel fabrics.

FLAME RETARDANCY

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UNITED STATES

Tunnel Tests - ASTM E 84

The ASTM E 84 Tunnel Test is the most widely accepted procedure to determine the surface burning behavior of building materials used for exposed surfaces, such as ceilings or walls. The results developed for flame spread and smoke are stated relative to red oak, which is given an arbitrary rating of 100 and GRC board, given a rating of 0. Please note that the smoke index is not an indication of toxicity but a relative measure of the ability to see beyond the smoke produced by the burning surface.

The standard classification system is as follows:

Class	Flame Spread	Smoke Developed
1 or A	0-25	450 Maximum
2 or B	26-75	450 Maximum
3 or C	76-200	450 Maximum

However building and fire codes may vary from state to state and even from one municipality to another within a state. These codes generally assign a Class designation to different areas within a building, determined by proximity to a fire exit or by density of occupancy.

It is therefore the responsibility of the specifier to determine whether the material selected meets the code requirements of the location in which it is to be installed.

The ASTM E84 test is also published under the following designations:
ANSI 2.5, NFPA 255, UBC 42-1, UL 723

Vertical Tests – NFPA 701, NYC 294-40 S.R., CAL TITLE 19, FAA 25.853 (a & b)

Vertical tests are generally required for fabrics that hang freely such as window draperies or cubicle curtains. Most of them are considered more stringent than the Tunnel Test because the tested fabric is surrounded by air during the procedure.

Although they are rarely used hanging freely, IFR Xorel fabrics have been subjected to the tests to indicate their high degree of flame retardancy.

Summary of Test Results

Upholstery Tests

California 117E and NFPA 260 This two tests are the most commonly required for upholstery fabrics.

Room Corner Tests NFPA 265 This test is the most demanding of all flame retardancy tests.

Although not generally required under most building and fire codes, it probably offers the best indication of the fire safety of a textile wallcovering.

Please note that the Xorel fabric specifically chosen for this test was STRIE 6423, which is woven with non-flame retardant yarns. Xorel fabrics made from inherently flame-retardant yarns should perform at least as well.

EUROPE and CANADA

Flame retardancy tests in Europe have varied from country to country but the European Community is establishing a test which will apply uniformly to all EC Countries. Xorel fabrics have been tested and passed the individual requirements for Finland (EC test), France, Switzerland and Canada.

INTERNATIONAL MARITIME ORGANIZATION (IMO)

The IMO is a specialized agency of the United Nations which is responsible for measures to improve the safety of international shipping.

Among these measures is MSC.61(67) International Code for Application of Fire Test Procedures (the FTP Code).

IFR Xorel fabrics were tested under this code and have qualified for shipboard use by passing the following:

- Upholstery Composite - A.652 (16)
- Surface Flammability - A.653 (16)
- Smoke and Toxicity - ISO 5659 Part-2

INDOOR AIR QUALITY 118-143

The release of formaldehyde and other volatile organic compounds (VOCs) from interior building materials can create significant health problems. This is a major issue for the Leadership in Energy and Environmental Design (LEED) program of the United States Green Building Council.

Xorel fabrics were first tested for indoor air quality in 1993 and certified as safe for use in San Francisco's Main Library. They have been more recently tested and approved following the procedure of ASTM D5116-97, Sections 01350 and 01351, for the State of California Capitol East End Complex.

Xorel fabrics have also been tested and approved by the California Health Services Department.

Greenpeace also recognizes Xorel fabrics as a viable environmental alternative to PVC vinyl.

Summary of Test Results

TOXICITY IN FIRE 144-150

There are no nationally accepted standards in the United States for the evaluation of toxic gasses from a fire.

However IMO Resolution MSC.61(67) (Fire Test Procedures Code) includes a test for Smoke and Toxicity which sets safe limits for the emission of seven specific gasses.

	IMO Limit	Xorel Results
Carbon Monoxide (CO)	1450 ppm	326 ppm
Hydrogen Bromide (HBr)	600 ppm	30 ppm
Hydrogen Chloride (HCl)	600 ppm	20 ppm
Hydrogen Cyanide (HCN)	140 ppm	2 ppm
Hydrogen Fluoride (HF)	600 ppm	10 ppm
Nitrogen Oxide (NOx)	350 ppm	30 ppm
Sulfur Dioxide (SO2)	120 ppm	2 ppm

By passing this test as well as the IMO tests for Surface Flammability and Upholstery Composite (see the Flame Retardancy Section), IFR Xorel fabrics have qualified for shipboard use.

NEW YORK CITY DEPARTMENT OF BUILDINGS
 DIVISION OF MATERIALS AND EQUIPMENT ACCEPTANCE
 MEA 474-89M

Xorel fabrics have been found acceptable for use in accordance with the report of the Material and Equipment Acceptance (MEA) Division of the New York City Building Code.

DURABILITY AND STRENGTH 151-168

According to the standards established by A.C.T. (the Association of Contract Textile Companies) a fabric qualifies for heavy duty upholstery use if it passes 30,000 double rubs in the Wyzenbeek abrasion test ASTM D3597.

Xorel fabrics went to one million (1,000,000) double rubs in this test with "no significant yarn breakage" in either the warp or the weft. At this point, the test was discontinued. Xorel fabrics exceeded all other A.C.T. requirements for

Tear Strength	ASTM D2261	
Tensile Strength	ASTM D5034	
Seam Slippage	ASTM D4034	ASTM D434

and scored the highest rating, Class 5, in a test for resistance to pilling and fuzzing.

In a Scrubability test, Xorel went to 5,000 cycles, ten times the minimum required for heavy duty wallcoverings, no noticeable change in appearance.

Xorel fabrics also comply with:

- Blocking Resistance test FTM 5872
- Adhesion to Coating test ASTM D 751 Sections 50-53
- Cold Crack Resistance test ASTM F 793 Paragraph 7.13

Summary of Test Results

COLORFASTNESS169-175

Light - AATCC 16E

Under this test procedure colorfastness to light is measured by a fadeometer, a device that directs intense light at a fabric sample to measure its resistance to fading at different time levels ranging from 40 hours to 200 hours.

Results are stated on a scale of 1 to 5 as follows:

- Class 5, No Fading
- Class 4, Slight Fading
- Class 3, Noticeable Fading
- Class 2, Considerable Fading
- Class 1, Excessive Fading

Under ACT standards, fabrics to be used for upholstery, direct glue wallcoverings, panels and upholstered walls must attain a minimum rating of Class 4 after 40 hours. Drapery fabrics must attain a Class 4 rating after 60 hours. Six representative Xorel colors were tested, four for 80 hours and two for 200 hours. All six achieved a rating of Class 5, No Fading.

Crocking - AATCC 8 Dry And Wet Procedure

This procedure measures the loss of color caused by rubbing the fabric while dry or while wet. Xorel achieved the highest rating, Class 5.

ACOUSTICS176-236

ASTM C 423

These sound absorption tests determine how much the sound absorption property of a highly absorptive fiberglass batting is diminished (or increased) by covering it with a Xorel fabric. The result is expressed as a numerical change (+ or -) in the noise reduction coefficient (NRC) of the fiberglass.

- Xorel II - increase .05
- Xorel 6571 - increase .05
- Xorel 6423 - decrease .20
- Xorel 6547 - decrease .05
- Xorel 6603 - decrease .05
- Xorel 6557 - increase .05
- Xorel 6619 - increase .05
- Xorel 6623 - increase .05
- Xorel 6621 - increase .05
- Nexus 6425 - increase .05

These results indicate that the tested fabrics are essentially neutral in key frequencies, i.e., they permit sound to pass through to the fiberglass batting without significantly affecting the absorption effectiveness of the batting.

Summary of Test Results

HOSPITAL USE	237-247
ASTM E - 2180 ASTM G -21-70 ASTM G - 22-76	
AATCC 100 BACTERIAL STRIKE - THROUGH	
The suitability of Xorel fabrics for use in hospitals is indicated by these tests which show that Xorel fabrics will not support the growth of fungi, bacteria, or staphylococcus aureus, and when paper backed will not permit the passage of bacteria.	
STAIN RESISTANCE	248
In tests conducted at intervals of one hour, one day and seven days, 27 common stains were completely removed by cleaning procedures specified by Carnegie. These procedures are outlined in a special @Xorel informational brochure entitled "Suggested Maintenance Procedures".	
DIMENSIONAL STABILITY	249
Xorel fabrics were tested for their reaction to conditions of high humidity. No change. occurred during the test in the fabric's length (warp) or width (weft).	