High Performance Innovations
for Buildings & Urban Environment

Cool and Photocatalytic Materials at the Service of Sustainable Healthcare

Enriching Lives Through Innovation

www.abolinco.com

Introduction

Sustainable Healthcare # 1

* Hospitals make significant contributions to their communities by providing a wide variety of services. Hospitals operate all day everyday, making their environmental footprint large in many communities.

Hospitals impact the environment by:

- Generating approximately 7,000 tons per day of waste, including infectious waste, hazardous waste, and solid waste.
- Using mercury in medical devices, equipment, light bulbs, etc.
- Using materials that may have toxic effects: PVC, DEHP, cleaning materials, heavy metals in electronics, pesticides, batteries.
- Consuming large amounts of energy in buildings and car fleets, and generating significant greenhouse gas emissions.
- Consuming large amounts of water for domestic use and heating/cooling as well as landscaping.

Introduction

Sustainable Healthcare # 2

* **However, to really reduce healthcare's environmental impacts, the following changes can be implemented:**

* Materials management: Reduce use of toxic materials such as mercury, PVC, DEHP, cleaning materials, flame retardants, pesticides, and other similar products.
* Environmentally Preferable Purchasing: Work with group purchasing organizations and other suppliers to ensure that supply chains are sustainable. Purchase products with as much recycled content as possible.
* Electronics: Purchase only approved products.
* Use LEED or other rating systems for new construction, renovations, and operations.
* Use green landscaping methods on your property to reduce water use and manage storm water more sustainably.

Introduction

Sustainable Healthcare # 3

* In the following slides we present a small part of possible interventions, in reference to the use of special construction materials with high solar reflective and photocatalytic properties, the benefits from the use and the possible credits according to LEED rating system.

* **The presentation for practically reasons has actually two sections**
  - a) Within the first slides we present the materials and their uses.
  - B) During the last pages we try a short focus on critical parameters, such as the indoor air quality and the nosocomial infections, and on the available rating systems (LEED, GGHC) which affect or underline the volume and/or the role of our proposed building materials solutions in hospitals.

* **Our wish for this presentation is to act as a catalyst for further discussions and investigations about this issue. Healthcare as a whole cannot be subject of a technical approach only, so we would like to apologize in advance from healthcare specialists and patients for our partly approach on this very important issue.**

Sustainability for Healthcare Projects

AN EYE ON:

- HealthCare Coatings and Pavement Materials
  Cool & Photocatalytic Applications
- Nosocomial Infections
  Healthcare-associated infections
- Efficient Measures and Rating Systems
  (LEED, GGHC)
- Air Quality

HEALTHCARE COATINGS and PAVEMENTS WHERE AND WHY

- Active Cool
- Cool Barrier Hygienic
- Cool Barrier Roof & Façade
- Cool Barrier Pavement Materials

Active Cool

Photocatalytic Paint based on Cool Materials Technology

* The ACTIVE COOL fights harmful substances such as the Volatile Organic Compounds, Nitrogen Oxides, Benzene, Sulfur Dioxides, Bacteria, Particulate Matters, Mould.

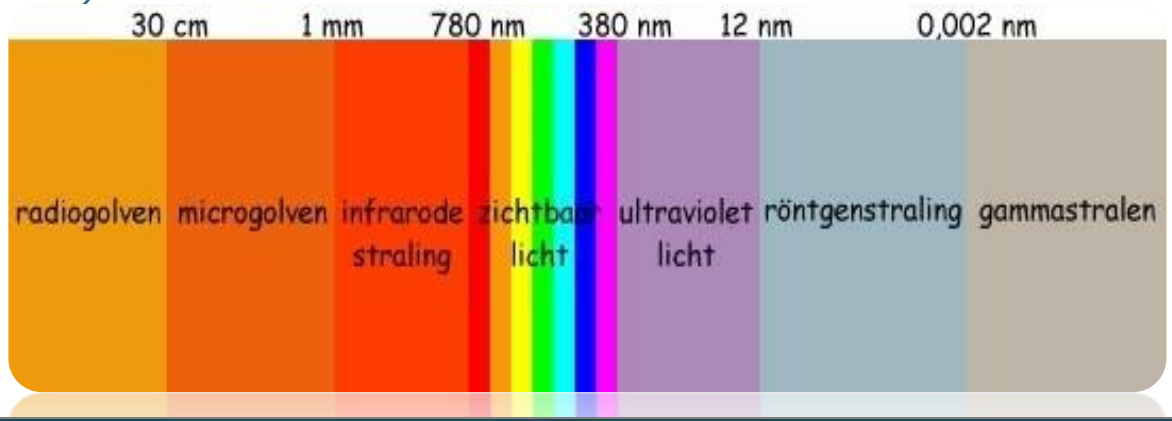
* In addition, in comparison to ordinary paints with the same colour, it performs a supreme high solar reflective matt surface which blocks the incoming sun rays, helping you keep your home cooler.

OPTICAL PROPERTIES ACTIVE COOL		
COLOUR	SOLAR REFLECTANCE	INFRARED EMITTANCE
WHITE	0,90	0,89
LIGHT BLUE CB 013	0,82	0,90
LIGHT RED CB 015	0,78	0,89
LIGHT GREEN CB 016	0,81	0,89
LIGHT GREY CB 022	0,76	0,90
LIGHT OCHRE CB 019	0,85	0,88

Active Cool

…and heterogeneous photocatalysis? #1

* Photocatalysis is the acceleration of a photoreaction in the presence of a catalyst
* Photo = light (*Greek*): energy source for the reaction
  * Form of Energy
    * Ultra-violet light *(< 380 nm)* (special lamps or outdoor light – no transmission through normal glass)
    * Visible light *(380 >< 740 nm)*



Active Cool

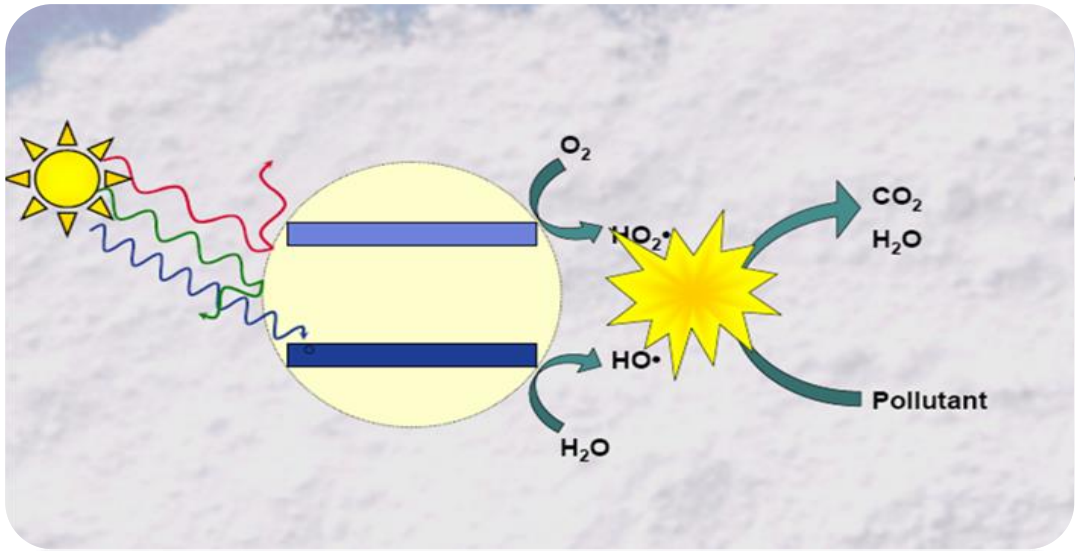
…and heterogeneous photocatalysis? #2

* Catalyst (*TiO_2*): a substance which **accelerates** a chemical reaction, but which itself **is not consumed** by the overall reaction.
* In the case of TiO_2 (*semi-conductor*) radicals are formed due to the energy absorption of the light. These **radicals** will **provoke** the chemical reaction with the pollutants.
* Heterogeneous: reaction between pollutants in **gas** form and radicals formed at **the surface** of the material, due to the presence of TiO_2 at the surface.

Active Cool

…and heterogeneous photocatalysis? #3

* Important:
  * Light access
  * Pollutant access
  * Pollutant removal
* Parameters:
  * Light intensity
  * Relative humidity
  * Specific surface
  * Contact time



Active Cool

… and heterogeneous photocatalysis? #4

* It oxides/reduces, in the presence of light, all type of pollutants present in the air to less pollutant components: outside pollutants (*VOC's – NO_x SO2, CO, (SMOG-elements*),…) as well as indoor pollutants: Formaldehyde, Methyl Mercaptan, Acetaldehyde, etc. (*sick building syndrome*) => **AIR PURIFICATION**

* In the presence of light It enhances the **self-cleaning effect** due to chemical break down of the pollutants attached to the surface or due to a hydrofilic effect due to which the pollutant is removed by the water => **SELF-CLEANING EFFECT by Pollutants Decomposition**

Active Cool

Benefits and Applications:

* Air Purification – interior/exterior walls
* Self-Cleaning (Pollutants decomposition) - exterior walls
* Anti-Algae - interior/exterior walls
* Anti-Bacterial - interior/exterior walls
* Indoor Thermal Comfort (High Solar Reflectance) - exterior walls
* Energy Savings - (High Solar Reflectance) - exterior walls
* Daylight Transmission - (High Brightness) – Interior walls
* Water-Based

Active Cool

Where to Apply – Interior #1

Standard Patient Rooms – Ceilings and Walls (Mineral Surfaces)

The majority of patient care areas in a hospital are standard patient rooms.

Standard patient rooms can be either single or multiple patient spaces and are typically dedicated to the care of individuals **without serious health risk.** These rooms will often have an exterior wall and window which can have a significant impact on room air patterns in certain climatic regions.

Active Cool

Where to Apply – Interior # 2

Isolation Rooms - Ceilings and Walls (Mineral Surfaces)

Isolation rooms can be separated into two main categories: **Airborne Infection Isolation (AII)** and **Protective Environment (PE) rooms**. As the names would suggest, these rooms have different functions. AII rooms are designed for patients with serious and contagious conditions (e.g. Tuberculosis), while PE rooms exist to protect patients with weakened immune systems or some form of impairment to their natural defense system. AII rooms are designed with the primary purpose of protecting hospital occupants (other than the patient) from airborne infection, while PE rooms should protect the more vulnerable patients (e.g. bone marrow transplant patients) from airborne contaminants present in the hospital environment.

Active Cool

Where to Apply – Interior #3

Airborne Infection Isolation (AII) Rooms – Ceilings and Walls (Mineral Surfaces)

The general layout and some design conditions of an AII room will be similar to that of a standard patient room. The possibility of exterior walls and windows, an attached toilet room, and similar equipment loads are a few commonalities between these spaces. Yet the AII room serves a different purpose and consequently has a number of key differences with respect to standards and air distribution equipment. The minimum total air-change rate for an AII room is typically 12 ach, but this may vary depending on the applicable code.

Active Cool

Where to Apply – Interior #4

Protective Environment (PE) Rooms – Ceilings and Walls (Mineral Surfaces)

PE rooms, while also considered isolation rooms, are essentially used for the opposite purpose to that of an Airborne Infection Isolation (AII) room. Patients in these rooms have a high susceptibility to infection and need greater protection than the average hospital occupant to avoid further health complications. These patients include, but aren't limited to, burn patients, bone marrow or organ transplant patients, leukemia, and AIDS patients. Most codes require a minimum total air change rate of 12 ach for a PE room. The exhaust rate should be approximately 20% less than the supply to achieve a suitable positive pressure differential relative to the corridor.

Active Cool

Where to Apply – Interior #5

Burn Center Intensive Care Units (ICU) – Ceilings and Walls (Mineral Surfaces)

Burn center Intensive Care Units. ICUs have a number of unique challenges. These spaces are generally kept at higher relative humidity levels to prevent excess moisture loss from wounds and the associated complications. Draft represents another major consideration. In any application, steps are taken to reduce the possibility and inconvenience of draft in an occupied space, but draft in a burn center can result in severe pain for patients and must therefore be more carefully avoided. The last significant comfort related design criterion is the need for rapid temperature adjustment around the patient bed. During a wound dressing change it is preferable to raise the temperature around the patient from 10 °F to 15 °F. This reduces the ΔT between the air and wound temperature, thus creating a more comfortable condition for the patient.

Active Cool

Where to Apply – Interior #6

Waiting and Examination Rooms - – Ceilings and Walls (Mineral Surfaces)

Waiting and examination rooms involve a number of unknowns. In most cases, the patients in these rooms have yet to be diagnosed and the contagion risk must still be determined. The goal of the ventilation system in these spaces should be to provide a comfortable environment while also reducing the probability that infection will spread between occupants. A waiting room is generally a patient holding area for one or more examination rooms.

Active Cool

Where to Apply – Interior #7

Hospital Operating Rooms- – Ceilings ONLY (Mineral Surfaces)

Operating rooms and Surgical Zones are among the most unique spaces in any hospital. The patients who occupy operating rooms typically undergo invasive procedures that will expose internal tissue to room air. It is not uncommon for these patients to already have weakened immune defenses, and the physical interference with their organs and systems (skin, blood flow, body temperature, etc.) can make them even more susceptible to infection. Frequently the walls of the operation rooms are covered with special antibacterial covers or are subject of frequent cleaning with strong antibacterial agents which can damage the surface of Active Cool.

Active Cool

Where to Apply – Interior #8

Hospital Pharmacies– Ceilings and Walls (Mineral Surfaces)

Unlike most health care applications where patient safety and infection control are the primary issues, the concern in the pharmacy is primarily particulate control.

Active Cool

Where to Apply – Interior #9

Laboratories– Ceilings and Walls (Mineral Surfaces)

Biological Laboratories
- Contain biologically active material
- Chemical fume hoods and biological safety cabinets
- Negative room pressurization

Animal Laboratories
- Manipulation, surgical modification and observation of laboratory animals
- Animal holding rooms
- Negative room pressurization

Chemical Laboratories
- Synthesis and analytical functions
- Includes materials and electronic sciences
- Multiple fume hoods
- Negative room pressurization

Physical Laboratories
- Spaces associated with physics
- High precision analytical equipment
- High air-change rates
- Typically positive room pressurization

Active Cool

Where to Apply – Interior #10

Clean Rooms – Application under the Monitoring and the Control of hospital's Authorized Personnel

Clean rooms are defined as specially constructed, environmentally controlled enclosed spaces with respect to airborne particulates, temperature, humidity, air pressure, airflow patterns, air motion, vibration, noise, viable (living) organisms, and lighting. Particulate control includes: Particulate and microbial contamination, Particulate concentration and dispersion See Also "Federal Standard 209E" and "British Standard 5295"

Active Cool

Where to Apply – Interior #11

Others Areas:

- Corridors - Ceilings and Walls (Mineral Surfaces)
- Warehouses - Ceilings and Walls (Mineral Surfaces)
- Kitchens and relevant spaces – Ceilings (Mineral Surfaces) . The walls are subject to ISO 22000 STD (ex. HACCP) requirements and Construction Design.
- Public Rooms and Spaces - Ceilings and Walls (Mineral Surfaces)
- **GENERAL: in all ceilings and walls (House-Keeping Areas Mineral Based) that are not subject of frequent cleaning with disinfectants and antibacterial agents.**

Active Cool

Where to Apply – Exterior

- **All Exterior Walls**

- Reduce the energy required for interior cooling
- Reduce thermal stresses on the walls potentially improving system lifetimes
- Improve indoor thermal comfort
- Reduces the temperature of building envelope Contributes to air pollution reduction
- Improves outdoor air quality
- Helps keep the aesthetic option of the exterior walls clean

Active Cool

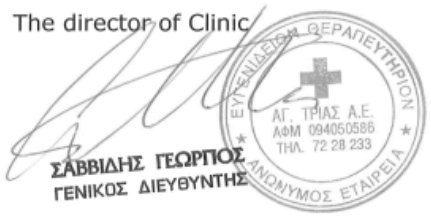
Active Cool – Success Story

Investigation, under real conditions, on the effectiveness of the photocatalytic paint system in reducing the bacterial load and certain pollutants in certain environments: the interior walls and the indoor air, at Eygenideio Clinic of Athens University An important objective was to investigate the effectiveness of the photocatalytic paint system under real time conditions such as daily and uncertain urgent conditions. For this reason, during the experiment the patient rooms were, most of the time, occupied by patients and under full medical service function. **(www.eugenideio.uoa.gr)**

EYGENIDEIO HOSPITAL Case Study 2008

Application of Active Cool Photocatalytic Paint in Interior:

- **100% Reduction of Bacteria on Interior walls**
- **40% Reduction of Volatile Organic Compounds**
- **25% Reduction of PM 2,5**



Active Cool

LEED & Potential Points # (a)

➢Indoor Environmental Quality Credit 4.2

Low-Emitting Materials: Paints and Coatings

Intent

Reduce indoor air contaminants that can be harmful to occupants and installers.

Potential Points: 1

➢Innovation in Design Credits 1.1 - 1.4

Low-Emitting Materials: Paints and Coatings

Intent

To allow additional points to be awarded for exceptional performance above the LEED NC requirements, or for innovative performance in Green Building categories not addressed by the LEED NC rating system.

Potential Points: 4

Active Cool

LEED & Potential Points # (b)

➢IEQ Credit 7.1: Thermal Comfort-Design

Intent
To provide a comfortable thermal environment that promotes occupant productivity and well-being. **Potential Points: 1**

➢EAc1.1: Optimize Energy Performance – Lighting Power

Intent
Achieve increasing levels of energy conservation beyond the referenced standard to reduce environmental impacts associated with excessive energy use. **Potential Points: 1**

➢EA Credit 1: Optimize Energy Performance

Intent
Achieve increasing levels of energy performance above the baseline in the prerequisite standard to reduce environmental and economic impacts associated with excessive energy use.
Potential Points: 2

Cool Barrier Hygienic

Two Component, Waterborne Modified Epoxy Dispersion based Surface Coating with a Gloss Finish

* Cool Barrier Hygienic is a two component; White and coloured, waterborne epoxy resin based surface coating containing an organic in-film preservative.

Suitable for Surfaces Subject of Frequent Cleaning with Detergents and Mild Disinfectants

Characteristics / Advantages

- Easy application
- Fast drying, two coats in one working day
- Good resistance to repeated cleaning regimes using mild detergents and cleaning solutions
- Hard finish, impact, scratch and abrasion resistant
- Leach resistant in-film preservative
- Seamless, glossy, easy clean finish
- Good covering and hiding power (opacity)
- Low odors

Cool Barrier Hygienic

Where to Apply – Interior

Top Coat specially designed for the treatment of internal walls in surgical rooms, mortuaries and in general on wall areas subject of very often cleaning with mild disinfectants and detergents.

- For concrete, bricks, cement based and gypsum substrates, metallic surfaces and ceramic tiles. Can be used for Asbestos encapsulating works.
- Suitable for clean rooms in the pharmaceutical and medical industry.
  Also suitable for food and beverage industry, hospitals, healthcare facilities, kitchens and leisure facilities.

Cool Barrier Hygienic

LEED & Potential Points # (a)

➢Indoor Environmental Quality Credit 4.2

Low-Emitting Materials: Paints and Coatings

Intent

Reduce indoor air contaminants that can be harmful to occupants and installers.

Potential Points: 1

➢Innovation in Design Credits 1.1 - 1.4

Low-Emitting Materials: Paints and Coatings

Intent

To allow additional points to be awarded for exceptional performance above the LEED NC requirements, or for innovative performance in Green Building categories not addressed by the LEED NC rating system.

Potential Points: 4

Cool Barrier Roof

High Solar Reflective Liquid Applied Membrane Based on "Cool Materials" for Big and Low Slope Roofs

* Cool Barrier Roof for big and low slope roofs is an excellent quality elastomeric waterproof coating based on "cool" raw materials technology.
* It forms an extremely high reflective mat surface that blocks the incoming solar radiation and remains cooler, contributing to the saving of energy for cooling needs.
* It is specially formulated to retain its elasticity, even in low temperatures ranging between -20°C to 80°C. It covers completely all existing hairlines or small cracks and withstands in difficult weather conditions such as rain, snow, UV radiation. It prevents mould and green spots.
* ASTM 6083 Compliant.

COOL ROOFS

Cool Barrier Roof

Where to Apply – Roofs

* Suitable Substrates: It is suitable for every kind of new or old mineral substrate, metal and top - granulated modified bituminous membranes.

* Colors: It is available in a standard white and in a number of shades through Abolin Cool Barrier Colors Palette.

Cool Barrier Roof

Success Stories

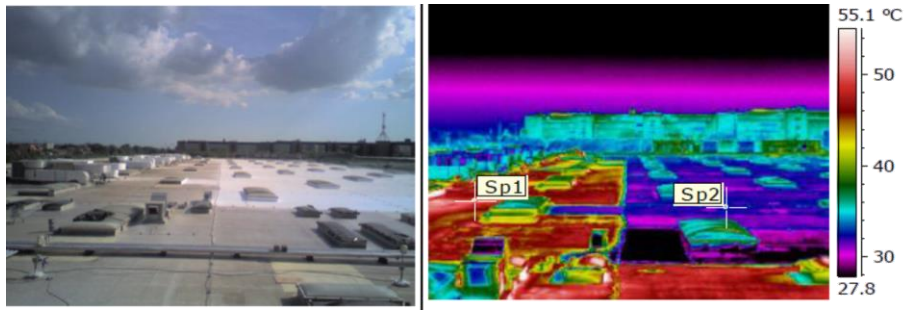
CARREFOUR

Date: 14/07/2011
Place: Assago Milan Italy
Total Roof Surface: 17.000 Sqm
Application: Cool Barrier Roof

"We are about 25% reduction in electricity consumption for air conditioning"

Carrefour

Energy Manager: Mr. Giovanni Piano



Cool Barrier Roof

LEED & Potential Points # (a)

➢IEQ Credit 7.1: Thermal Comfort-Design

Intent
To provide a comfortable thermal environment that promotes occupant productivity and well-being.
Potential Points: 1

➢Innovation in Design Credits 1.1 - 1.4

Low-Emitting Materials: Paints and Coatings
Intent
To allow additional points to be awarded for exceptional performance above the LEED NC requirements, or for innovative performance in Green Building categories not addressed by the LEED NC rating system.
Potential Points: 4

Cool Barrier Roof

LEED & Potential Points # (b)

➢EA Credit 1: Optimize Energy Performance

Intent

Achieve increasing levels of energy performance above the baseline in the prerequisite standard to reduce environmental and economic impacts associated with excessive energy use.

Potential Points: 2

➢Sustainable Sites (SS)

Sustainable Sites 7.2 – Heat Island Effect – Roof

Intent

1. This credit is intended to reduce the heat island effect
2. Minimize impact on microclimate and habitats

Potential Points: 1

Cool Barrier Facade

High Solar Reflective Elastomeric Coating Based on "Cool Materials" for Big and Low Slope Roofs

* Cool Barrier Façade for big slope roofs and Exterior Walls is an excellent quality elastomeric coating based on "cool" raw materials technology.
* It forms an extremely high reflective mat surface that blocks the incoming solar radiation and remains cooler, contributing to the saving of energy for cooling needs.
* It is specially formulated to retain its elasticity, even in low temperatures ranging between -20°C to 80°C. It covers completely all existing hairlines or small cracks and withstands in difficult weather conditions such as rain, snow, UV radiation. It prevents mould and green spots.
* ASTM 6083 Compliant.

COOL ROOFS

Cool Barrier Facade

Where to Apply – Exterior Walls

* Suitable Substrates: It is suitable for every kind of new or old mineral substrate, metal and top - granulated modified bituminous membranes.

* Colors: It is available in a standard white and in a number of shades through Abolin Cool Barrier Colors Palette.

Cool Barrier Facade

Success Stories – Exterior Walls

National Organization of Medicines
Athens Greece

Prefecture of Athens
Directory of Public Health

Cool Barrier Facade

LEED & Potential Points

➢Innovation in Design Credits 1.1 - 1.4

Low-Emitting Materials: Paints and Coatings

Intent

To allow additional points to be awarded for exceptional performance above the LEED NC requirements, or for innovative performance in Green Building categories not addressed by the LEED NC rating system.

Potential Points: 4

➢IEQ Credit 7.1: Thermal Comfort Design

Intent

To provide a comfortable thermal environment that promotes occupant productivity and well-being. **Potential Points: 1**

➢ EA Credit 1: Optimize Energy Performance

Intent

Achieve increasing levels of energy performance above the baseline in the prerequisite standard to reduce environmental and economic impacts associated with excessive energy use.

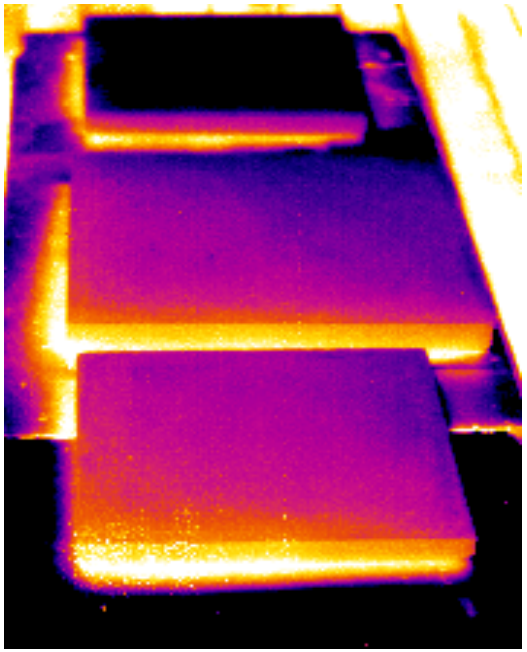
Potential Points: 2

Cool Barrier Pavement Materials

High Solar Reflective Cool Barrier Pave Blocks and Tiles

* Cool and/or Photocatalytic pavements refer to a range of construction materials. These pavement technologies tend to store less heat and may have lower surface temperatures compared with conventional products. They can help address the problem of urban heat islands, which result in part from the increased temperatures of paved surfaces in a city or suburb. In addition:

- Air purification
- Deodorising activity
- Anti- microbial activity
- Anti- mould activity



Cool Barrier Pavement Materials

Where to Apply – Exterior Urban Areas

Cool Barrier Pavement Materials

BENEFITS

* Improve the quality of air
* Improve thermal comfort conditions
* Fight harmful pollutants and City Smog
* Contribute in CO_2 emissions reduction
* Contribute in Global warming mitigation
* Save energy by decreasing the needs for cooling

Cool Barrier Pavement Materials

LEED & Potential Points

- **Sustainable Sites (SS)**

Credit 7.1: Heat Island Effect - Non-Roof

Intent

This credit is intended to reduce the heat island effect (developed areas that absorb and hold heat) caused by site hardscapes such as roads, parking lots, walkways, sidewalks and courtyards. **Potential Points: 1**

Sustainability for Healthcare Projects

Nosocomial Infections

Definition, Causes, Methods…

Nosocomial Infections

- Nosocomial comes from the Greek words "nosos" which means *disease* and "komeio" which means *the place where there is care of.*
- A nosocomial infection is an infection that occurs or originates in a hospital or a health care setting and whose development and spread is favored by hospital environment such as an infection acquired during a hospital stay or visit.
- Also defined as an infection not present and without evidence of incubation at the time of admission to a healthcare setting.
- Nosocomial infections are also known as hospital-acquired infections (HAI).
- As health care increasingly expands beyond hospitals into outpatient settings, nursing homes, long-term care facilities, and even home care, the more appropriate term has become healthcare-associated infections (also healthcare-acquired infections).

Nosocomial Infections

Statistics Overview

* Healthcare-associated infections (HAIs) are a common cause of morbidity and mortality in the United States and are among the most common adverse events in healthcare. (http://www.cdc.gov/HAI/pdfs/hai/infections_deaths.pdf)
* A prevalence survey conducted under the auspices of WHO in 55 hospitals of 14 countries representing 4 WHO Regions (Europe, Eastern Mediterranean, South-East Asia and Western Pacific).

showed that:

- An average of 8.7% of hospital patients had nosocomial infections.
- At any time, over 1.4 million people world-wide suffer from infectious complications acquired in hospital.

Nosocomial Infections

Reasons why the problem exists

Nosocomial infections are the result of three factors occurring in tandem:

1. High prevalence of pathogens.
2. Large numbers of compromised hosts.
3. Efficient mechanisms of transmission (chain of transmission).

Nosocomial Infections

Modes of transmission

- **Contact transmission.**
- Droplet transmission.
- **Airborne transmission.**
- **Common vehicle transmission.**
- Vector borne transmission.

Nosocomial Infections

Modes of transmission :
CONTACT

- Contact transmission is the most important and frequent mode of transmission of nosocomial infections.
- It is divided into two subgroups: direct contact and indirect contact.

Direct contact transmission:

- Involves direct contact between body surfaces which physically transfers microorganisms from an infected or colonized person (doctor, nurse, co-patient, etc..) to a susceptible host, during patient care activities (e.g. feeding).
- Direct contact transmission can occur between patients.

Indirect-contact transmission:

- Involves contact between a susceptible host and a contaminated intermediate object.
- Such objects include contaminated instruments, needles, or dressings, or contaminated gloves that are not changed between patients.

Nosocomial Infections

Modes of transmission :
Airborne Transmission

- Occurs by the dissemination of small droplet nuclei or evaporated droplets that contain microorganisms that remain suspended in the air for a long time.
- Microbes can also be carried by dust particles.
- In this mode of transmission organisms can be dispersed by air currents in different directions and long distances (e.g. other rooms, wards etc..)

Nosocomial Infections

Modes of transmission :
Common vehicle transmission:

- The mode of transmission of infectious pathogens from a source that is common to all the cases of a specific disease, by means of a medium, or "vehicle," such as water, food, air, or the blood supply used by a transfusion service to a number of people.

Nosocomial Infections

Sources of nosocomial infections

The source of the infecting organism may be:

- **Exogenous:** from another patient or a member of the hospital staff, or from the inanimate environment in the hospital.
- **Endogenous:** from the patient's own flora which may have acquired new characteristics from other organisms in the hospital environment.

Nosocomial Infections

Causes

- A large number of microorganisms are responsible for hospital infection.
- In fact any microbe may have the ability to cause an infection in the hospitalized patient.
- Healthcare-associated infections can be caused by bacterial, viral, fungal, and even parasitic agents.

Nosocomial Infections

Prevention of Nosocomial infections

Methods of prevention of nosocomial infection include:

- Observance of aseptic technique.
- Frequent hand washing especially between patients.
- **Careful handling, cleaning, and disinfection of equipment and environmental (housekeeping including) surfaces.**
- Where possible, use of single-use disposable items.
- Patient isolation.
- Avoidance where possible of medical procedures that can lead with high probability to nosocomial infection.
- Various institutional methods such as air filtration within the hospital (Architectural Design).
- General awareness that prevention of nosocomial infection requires constant personal surveillance.
- Active oversight within the hospital.

Nosocomial Infections

Level of Disinfection/Cleaning Required for Patient Care Equipment

Spaulding Classification of Objects	Application	Level of Germicidal Action Required
Critical	Entry or penetration into sterile tissue, cavity or bloodstream	Sterilization
Semi-critical	Contact with mucous membranes, or non-intact skin	High-level Disinfection
Non-critical	**Contact with intact skin**	**Low-level Disinfection**

Nosocomial Infections

Non-critical environmental surfaces

* Bed rails
* Bedside or overbed tables
* Nurse call buttons
* Furniture in patient rooms
* **Floors - Walls**

Rutala WA et al. CDC Guideline for Disinfection & Sterilization In Healthcare Facilities, 2008

Nosocomial Infections

Non-critical environmental surfaces

* Disinfect (or clean) environmental surfaces on a regular basis and when visibly soiled
* Follow manufacturers' recommendations for use of disinfectant (or detergent) products
* **Clean walls, window blinds and window curtains in patient-care areas when they are visibly soiled**
* Use an approved disinfectant in patient-care areas
* If contamination by blood/body fluids is possible
* If contamination by multidrug-resistant organisms is possible

Rutala WA et al. CDC Guideline for Disinfection & Sterilization In Healthcare Facilities, 2008

Nosocomial Infections

Non-critical environmental surfaces - General

- Prepare disinfectant (or detergent) solutions as needed, and replace them with fresh solution frequently
  - Replace floor mopping solution every 3 patient rooms
  - Change no less often than at 60-min. intervals
- Decontaminate mop heads and cleaning cloths regularly to prevent contamination
- Detergent and water are adequate for cleaning surfaces in nonpatient-care areas
  - Example: administrative offices
- Promptly clean and disinfect spills of blood and other potentially infectious materials

Rutala WA et al. CDC Guideline for Disinfection & Sterilization In Healthcare Facilities, 2008

HEALTHCARE
GGHC & LEED

HEALTHCARE - GGHC & LEED

Sustainability for Healthcare Projects

"Green hospitals are healthier for the patients, doctors, and nurses; use less energy and water; and have less of an impact on the environment"

US Green Building Council

HEALTHCARE - GGHC & LEED

A Healthier Environment

"Green hospitals seek to reduce use of and exposure to toxic chemicals and provide a healthier healing environment." **Adele Houghton, Project Manager.**

"…many hospitals are managing to lower energy bills, reduce waste and achieve healthier indoor air quality." **Adele Houghton, Project Manager.**

Green Guide for Healthcare

HEALTHCARE - GGHC & LEED

Principles of Sustainable Construction

* Reduce resource consumption
* Reuse resources
* Use recyclable resources
* Protect nature
* Eliminate toxins
* Apply life-cycle costing
* Focus on quality

HEALTHCARE - GGHC & LEED

Facility Goals for Sustainability

* Provide a safe and comfortable work environment for hospital staff often working under high stress situations.
* *Improve quality of patient care!*

HEALTHCARE - LEED

US Green Building Council

HEALTHCARE - LEED

LEED for New Construction

* Sustainable Sites
* Water Efficiency
* Energy and Atmosphere
* Materials and Resources
* Indoor Environmental Quality
* Innovation in Design

LEED NC
registered

Certification Levels: Certified, Silver, Gold, Platinum

HEALTHCARE - LEED

Sustainable Sites

* Prere. 1 Construction Activity Pollution Prevention
* Credit 1 Site Selection
* Credit 2 Development Density & Community Connectivity
* Credit 3 Brownfield Redevelopment
* Credit 4.1 Alternative Transportation, Public Transportation Access
* Credit 4.2 Alternative Transportation, Bicycle Storage & Changing Rooms
* Credit 4.3 Alternative Transportation, Low-Emitting & Fuel Efficient Vehicles
* Credit 4.4 Alternative Transportation, Parking Capacity
* Credit 5.1 Site Development, Protect or Restore Habitat
* Credit 5.2 Site Development, Maximize Open Space
* Credit 6.1 Stormwater Design, Quantity Control
* Credit 6.2 Stormwater Design, Quality Control
* **Credit 7.1 Heat Island Effect, Non-Roof**
* **Credit 7.2 Heat Island Effect, Roof**
* Credit 8 Light Pollution Reduction

HEALTHCARE - LEED

Energy and Atmosphere

* Prereq 1 Fundamental Commissioning of the Building Energy Systems
* Prereq 2 Minimum Energy Performance
* Prereq 3 Fundamental Refrigerant Management
* **Credit 1 Optimize Energy Performance**
* Credit 2 On-Site Renewable Energy
* Credit 3 Enhanced Commissioning
* Credit 4 Enhanced Refrigerant Management
* Credit 5 Measurement & Verification
* Credit 6 Green Power

HEALTHCARE - LEED

Indoor Environmental Quality

* Prereq 1	Minimum IAQ Performance
* Prereq 2	Environmental Tobacco Smoke (ETS) Control
* Credit 1	Outdoor Air Delivery Monitoring
* Credit 2	Increased Ventilation
* Credit 3.1	Construction IAQ Mgt Plan, During Construction
* Credit 3.2	Construction IAQ Mgt Plan, Before Occupancy
* Credit 4.1	Low-Emitting Materials, Adhesives & Sealants
* **Credit 4.2**	**Low-Emitting Materials, Paints & Coatings**
* Credit 4.3	Low-Emitting Materials, Carpet Systems
* Credit 4.4	Low-Emitting Materials, Composite Wood & Agrifiber Products
* **Credit 5**	**Indoor Chemical & Pollutant Source Control**
* Credit 6.1	Controllability of Systems, Lighting
* Credit 6.2	Controllability of Systems, Thermal Comfort
* **Credit 7.1**	**Thermal Comfort, Design**
* Credit 7.2	Thermal Comfort, Verification
* Credit 8.1	Daylight & Views, Daylight 75% of Spaces
* Credit 8.2	Daylight & Views, Views for 90% of Spaces

HEALTHCARE - LEED

Innovation and Design Process

* **Credit 1.1**	**Innovation in Design**
* **Credit 1.2**	**Innovation in Design**
* **Credit 1.3**	**Innovation in Design**
* **Credit 1.4**	**Innovation in Design**
* Credit 2	LEED Accredited Professional

HEALTHCARE - GGHC

Green Guide for Healthcare (GGHC)

HEALTHCARE - GGHC

What is GGHC?

"The Green Guide For Healthcare is a ***self-certifying*** best practices toolkit, it does not provide achievement level threshold rankings."

Green Guide for Healthcare v2.2

Relationship to LEED Products

The Green Guide is not a LEED® rating system and is not a product of the U.S. Green Building Council. The Green Guide has a history of collaboration with the U.S. Green Building Council, beginning with an agreement in 2002 to borrow the organizational structure from the USGBC's LEED Green Building Rating System.

HEALTHCARE - GGHC

GGHC Principles

* Protecting the immediate health of the building occupants
* Protecting the health of the surrounding community
* Protecting the health of the global community and natural resources

Green Guide for Healthcare v2.2

HEALTHCARE - GGHC

Integrated Design

* Integrated Design Process
* Health Mission Statement and Program

HEALTHCARE - GGHC

Sustainable Sites

Credit 1 Site Selection 1
Credit 2 Development Density & Community Connectivity 1
Credit 3.1 Brownfield Redevelopment: Basic Remediation Level 1
Credit 3.2 Brownfield Redevelopment: Residential Remediation Level 1
Credit 3.3 Brownfield Redevelopment: Minimizing Future Hazards 1
Credit 4.1 Alternative Transportation: Public Transportation Access 1
Credit 4.2 Alternative Transportation: Bicycle Storage & Changing Rooms 1
Credit 4.3 Alternative Transportation: Low-Emitting & Fuel Efficient Vehicles 1
Credit 4.4 Alternative Transportation: Parking Capacity 1
Credit 5.1 Site Development: Protect or Restore Open Space or Habitat 1
Credit 5.2 Site Development: Reduce Development Footprint 1
Credit 5.3 Site Development: Structured Parking 1
Credit 6.1 Stormwater Design: Quantity Control 1
Credit 6.2 Stormwater Design: Quality Control 1
Credit 7.1 Heat Island Effect: Non-Roof 1
Credit 7.2 Heat Island Effect: Roof 1
Credit 8 Light Pollution Reduction 1
Credit 9.1 Connection to the Natural World: Outdoor Places of Respite 1
Credit 9.2 Connection to the Natural World: Exterior Access for Patients 1
Credit 10.1 Community Contaminant Prevention: Airborne Releases 1
Credit 10.2 Community Contaminant Prevention: Leaks & Spills

HEALTHCARE - GGHC

Energy and Atmosphere

Credit 1.1 Optimize Energy Performance: 3.5%/10.5% 1
Credit 1.2 Optimize Energy Performance: 7%/14% 1
Credit 1.3 Optimize Energy Performance: 10.5%/17.5% 1
Credit 1.4 Optimize Energy Performance: 14%/21% 1
Credit 1.5 Optimize Energy Performance: 17.5%/24.5% 1
Credit 1.6 Optimize Energy Performance: 21%/28% 1
ACredit 1.7 Optimize Energy Performance: 24.5%/31.5% 1
NACredit 1.8 Optimize Energy Performance: 28%/35% 1
Credit 1.9 Optimize Energy Performance: 31.5%/38.5% 1
Credit 1.10 Optimize Energy Performance: 35%/42% 1
Credit 2.1 On-Site Renewable Energy: 0.05 watts of renewable generating capacity / sf of building area 1
Credit 2.2 On-Site Renewable Energy: 0.10 watts of renewable generating capacity / sf of building area 1
Credit 2.3 On-Site Renewable Energy: 0.15 watts of renewable generating capacity / sf of building area 1
Credit 3 Enhanced Commissioning 1
Credit 4 Enhanced Refrigerant Management 1
Credit 5 Measurement & Verification 1
Credit 6.1 Green Power: 20% 1
Credit 6.2 Green Power: 50% 1
Credit 6.3 Green Power: 80% 1
Credit 6.4 Green Power: 100% 1
ACredit 7 Equipment Efficiency 1

HEALTHCARE - GGHC

Materials and Resources

Credit 1.1 Building Reuse: Maintain 40% of Existing Walls, Floors & Roof 1
Credit 1.2 Building Reuse: Maintain 80% of Existing Walls, Floors & Roof 1
Credit 1.3 Building Reuse: Maintain 50% of Interior Non-Structural Elements 1
Credit 2.1 Construction Waste Management: Divert 50% from Disposal 1
Credit 2.2 Construction Waste Management: Divert 75% from Disposal 1
Credit 2.3 Construction Practices: Site & Materials Management 1
Credit 2.4 Construction Practices: Utility & Emissions Control 1
Credit 3.1 Sustainably Sourced Materials: 10% 1
Credit 3.2 Sustainably Sourced Materials: 20% 1
Credit 3.3 Sustainably Sourced Materials: 30% 1
Credit 3.4 Sustainably Sourced Materials: 40% 1
Credit 3.5 Sustainably Sourced Materials: 50% 1
Credit 4.1 PBT Elimination: Dioxins 1
Credit 4.2 PBT Elimination: Mercury 1
Credit 4.3 PBT Elimination: Lead & Cadmium 1
Credit 5.1 Furniture & Medical Furnishings: Resource Reuse 1
Credit 5.2 Furniture & Medical Furnishings: Materials 1
Credit 5.3 Furniture & Medical Furnishings: Manufacturing, Transportation & Recycling 1
Credit 6 Copper Reduction 1
Credit 7.1 Resource Use: Design for Flexibility 1
Credit 7.2 Resource Use: Design for Durability 1

HEALTHCARE - GGHC

Environmental Quality

Credit 1 Outdoor Air Delivery Monitoring 1
Credit 2 Natural Ventilation 1
Credit 3.1 Construction EQ Management Plan: During Construction 1
Credit 3.2 Construction EQ Management Plan: Before Occupancy 1
Credit 4.1 Low-Emitting Materials: Interior Adhesives & Sealants 1
Credit 4.2 Low-Emitting Materials: Wall & Ceiling Finishes 1
Credit 4.3 Low-Emitting Materials: Flooring Systems 1
Credit 4.4 Low-Emitting Materials: Composite Wood & Insulation 1
Credit 4.5 Low-Emitting Materials: Furniture & Medical Furnishings 1
Credit 4.6 Low-Emitting Materials: Exterior Applied Products 1
Credit 5.1 Chemical & Pollutant Source Control: Outdoor 1
Credit 5.2 Chemical & Pollutant Source Control: Indoor 1
Credit 6.1 Controllability of Systems: Lighting 1
Credit 6.2 Controllability of Systems: Thermal Comfort 1
Credit 7 Thermal Comfort 1
Credit 8.1a Daylight & Views: Daylight for Occupied Spaces: 6% above 'square-root base' daylit area 1
Credit 8.1b Daylight & Views: Daylight for Occupied Spaces: 12% above 'square-root base' daylit area 1
Credit 8.1c Daylight & Views: Daylight for Occupied Spaces: 18% above 'square-root base' daylit area Credit 8.1d Daylight & Views: Daylight for Occupied Spaces: 75% of regularly occupied spaces 1
Credit 8.1e Daylight & Views: Daylight for Occupied Spaces: 90% of regularly occupied spaces 1
Credit 8.2 Daylight & Views: Connection to the Natural World: Indoor Places of Respite 1
Credit 8.3 Daylight & Views: Lighting & Circadian Rhythm 1
Credit 9.1 Acoustic Environment: Exterior Noise, Acoustical Finishes, & Room Noise Levels 1
Credit 9.2 Acoustic Environment: Sound Isolation, Paging & Call System, & Building Vibration 1

Innovation and Design

Credit 1.1 Innovation in Design: 1
Credit 1.2 Innovation in Design 1
Credit 1.3 Innovation in Design 1
Credit 2 Documenting Health, Quality of Care & Productivity Performance Impacts: Research Initiatives 1

Construction
Integrated Design

Title	*Intent*	*Credit Goals*	*Source*
ID Prereq 1 Integrated Design Process	Establish and implement a multi-stakeholder collaborative goal setting and design process.	Use cross discipline design and decisionmaking starting in the programming and pre-design phase of the project and continuing throughout construction to optimize achievement of sustainable design objectives.	New
ID Prereq 2 Health Mission Statement & Program	Establish human health as a fundamental evaluative criterion for building design, construction, and operational strategies.	Incorporate a health mission statement in the project's design intent document that includes goals to safeguard the health of building occupants, the local community, and the global environment while creating a high performance healing environment for the building's patients, caregivers, and staff. Include consideration of "triple bottom line" values - economic, environmental, and social.	New

HEALTHCARE - GGHC

Credit Summary - Highlights: Construction

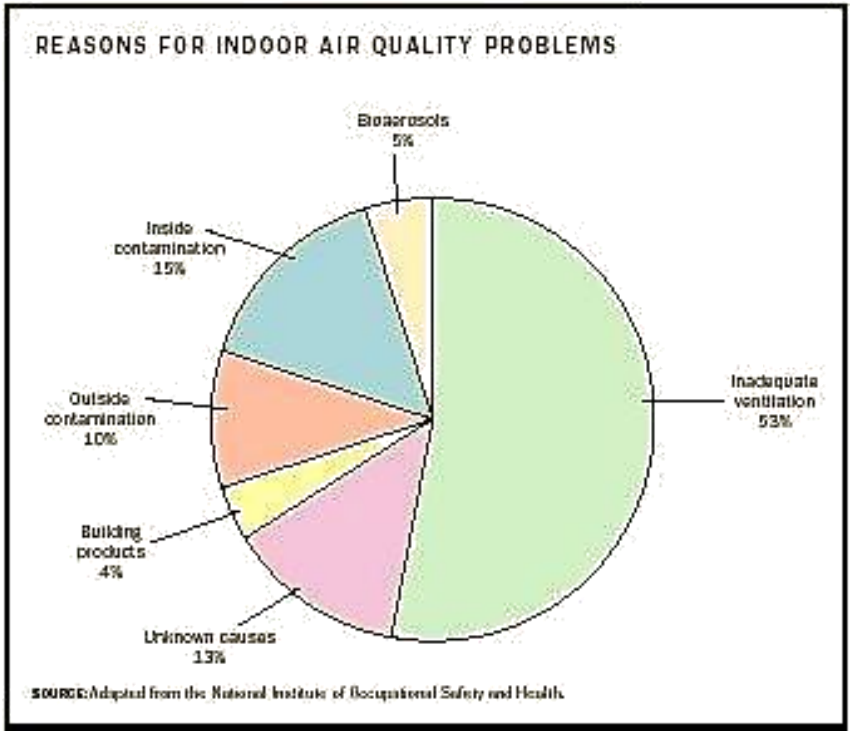
- Reduce pollution from construction activities by controlling soil erosion, waterway sedimentation and airborne dust generation.
- Avoid development of inappropriate sites and reduce the environmental impact from the location of a building on a site.
- Conserve, preserve, and enhance existing natural areas and restore damaged areas to provide habitat for native flora and fauna and to promote biodiversity. Reduce the development footprint to reserve site area for future development.
- Prevent contaminant releases to air, land and water.
- Reduce heat islands to minimize impact on microclimate and human and wildlife habitat.
- Establish the minimum level of energy efficiency for the proposed building and systems.
- Achieve increasing levels of energy performance above the baseline in the prerequisite standard to reduce environmental and economic impacts associated with excessive energy use.
- Reduce the environmental impacts of the materials acquired for use in the construction of buildings and in the upgrading of building services.
- Minimize indoor air contaminants that are odorous, potentially irritating and/or harmful to the comfort and well-being of installers and occupants.
- Provide for the assessment of building thermal comfort over time.

INDOOR AIR QUALITY (IAQ)

Indoor Air Quality General

UNDERSTANDING IAQ

* HEALTH EFFECTS
* CAUSATIVE AGENTS
* SOURCES
* CONTROL METHODOLOGIES
* RESOURCES



Indoor Air Quality General

Sick Building Syndrome

Sick building syndrome (SBS) is a situation in which occupants of a building experience acute health effects that seem to be linked to time spent in a building, but no specific illness or cause can be identified. The complaints may be localized in a particular room or zone, or may be widespread throughout the building.

Frequently, problems result when a building is operated or maintained in a manner that is inconsistent with its original design or prescribed operating procedures. Sometimes indoor air problems are a result of poor building design or occupant activities.

Indoor Air Quality General

Possible Health Affects

* EYE, NOSE, OR THROAT IRRITATION
* HEADACHES
* FATIGUE
* IRRITABILITY
* DRY SKIN
* NASAL CONGESTION
* DIFFICULTY BREATHING
* NOSE BLEEDS
* NAUSEA
* ASTHMA
* ALLERGY
* RESPIRATORY DISEASE

- CHRONIC OBSTRUCTIVE PULMONARY DISEASE (COPD)

Indoor Air Quality General

Molds

Molds are part of the natural environment. Molds reproduce by means of tiny spores; the spores are invisible to the naked eye and float through outdoor and indoor air. Mold may begin growing indoors when mold spores land on surfaces that are wet. There are many types of mold, and none of them will grow without water or moisture.

Indoor Air Quality General

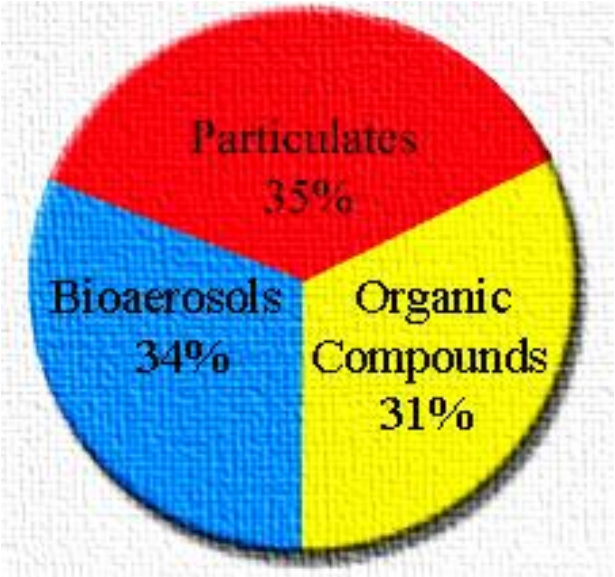
Causative Agents # 1

* ASBESTOS
* CHRYSOTILE
* AMOSITE
* CROCIDOLITE
* FIBERGLASS
* INORGANIC DUSTS
* METALLIC DUSTS
* LEAD
* ORGANIC DUSTS
* PAPER DUSTS
* POLLEN
* WATER VAPOR
* **TOBACCO SMOKE COMPONENTS**

Indoor Air Quality General

Causative Agents # 2

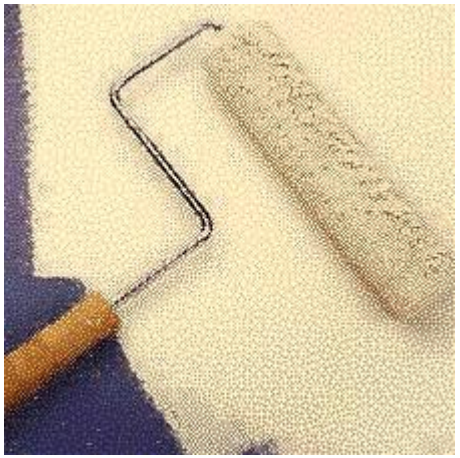
* INDOOR AIR CONTAMINANT TYPES
* COMBUSTION PRODUCTS
* **VOLATILE CHEMICALS & MIXTURES**
* **RESPIRABLE PARTICULATES**
* RESPIRATORY PRODUCTS
* BIOLOGICS & BIOAEROSOLS
* RADIONUCLIDES
* **ODORS**
* **CARBON MONOXIDE (CO)**
* **OXIDES OF NITROGEN (NOX)**
* **OXIDES OF SULFUR (SOX)**
* CARBON DIOXIDE (CO_2)
* POLYAROMATIC HYDROCARBON'S (PAH)



Indoor Air Quality General

Causative Agents Sources # 1

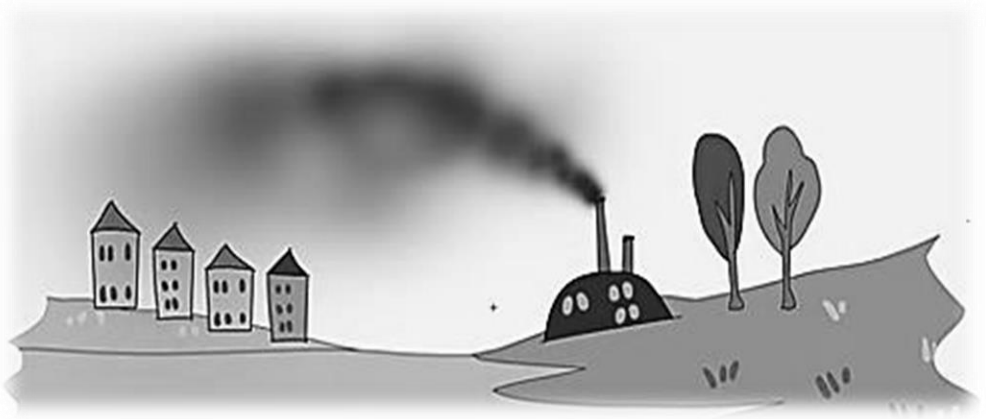
* COMBUSTION PRODUCTS
* KEROSENE HEATERS
* LOADI
* WOOD STOVES / UNVENTED GAS STOVES
* NEARBY TRAFFIC
* VOLATILE CHEMICALS & MIXTURES
* ADHESIVES & CAULKING COMPOUNDS
* CARPETING & DRAPERY
* PARTICLE BOARD
* VOLATILE CHEMICALS & MIXTURES
* **FLOOR & WALL COVERINGS**
* **PAINTS, VARNISHES AND STAINS**
* UPHOLSTERY



Indoor Air Quality General

Causative Agents Sources # 2

* TOBACCO SMOKE
* CONSTRUCTION DEBRIS
* **OUTDOOR AIR**
* PLANTS & PLANT PARTS
* PRODUCTION PROCESSES
* PEOPLE
* PLANTS
* HVAC SYSTEMS
* COOLING TOWERS
* HUMANS/ANIMALS
* STAGNANT WATER RESERVOIRS
* HUMIDIFIERS
* SOIL
* WATER
* **BUILDING MATERIALS**



Indoor Air Quality Construction Activity

Overview

* Maintaining good indoor air quality (IAQ) during construction is a significant concern in hospital settings.
* Understanding how to control potential hazards that can cause infections in immune suppressed patients is imperative for ensuring a safe environment for patients and staff as the construction process proceeds.

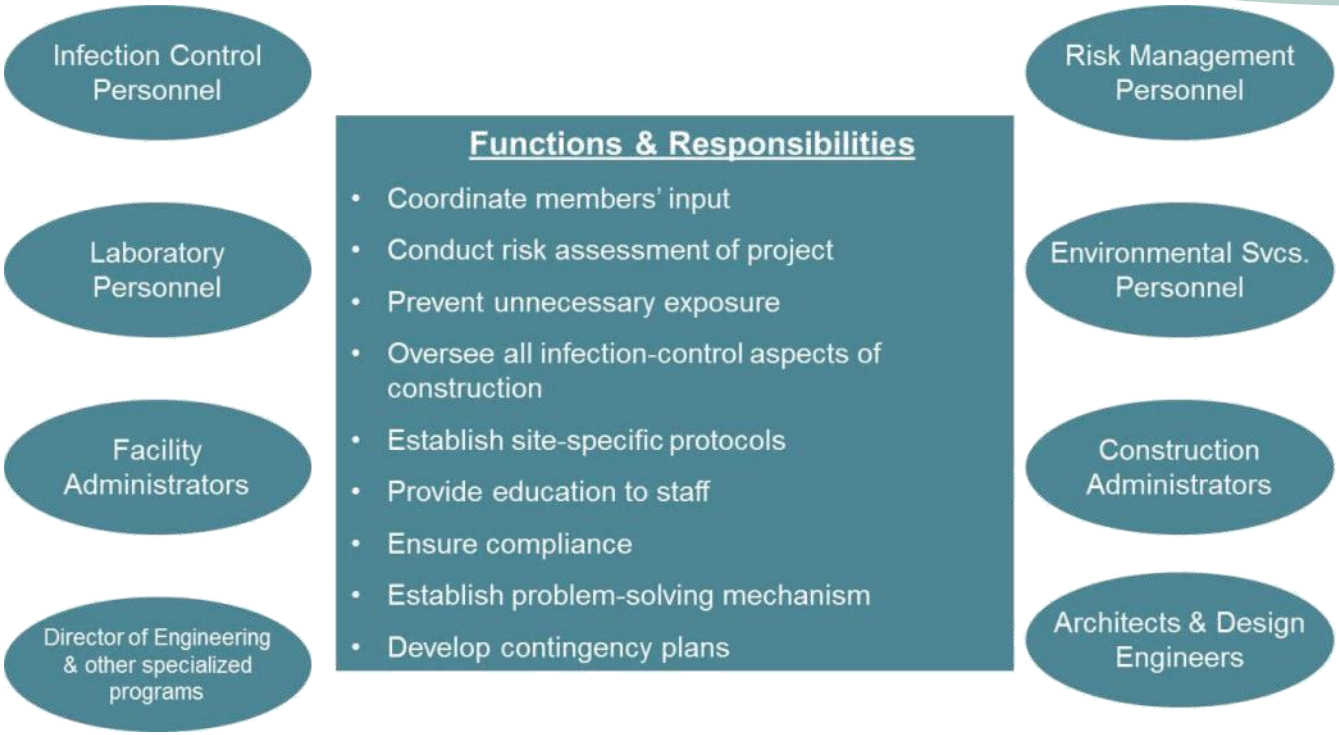
Indoor Air Quality Construction Activity

General Information

* Construction and renovations can create environmental disturbances which can increase airborne fungal spore counts and bacteria counts.
* To minimize the risk for airborne infection, substantial planning and coordination before, during, and after projects should occur.

Indoor Air Quality Construction Activity

Multi-disciplinary Team



Indoor Air Quality Construction Activity

Preliminary Considerations

- There are 3 major topics to consider before initiating any construction or repair activity:
  - Design & Function of the new structure/area
  - Assessment of environmental risks for airborne disease & opportunities for prevention
  - Measures to contain dust and moisture during construction/repairs
- Inadvertent allowance of substantial raw, unfiltered outdoor air or dampness can compromise indoor air quality

Indoor Air Quality Construction Activity

Infection-Control Risk Assessment

* IRCA should be conducted before initiating repairs, demolition, construction or renovation
* ICRA matrix compares project activities to patient risk groups to determine the level of IC precautions required

IC Matrix – Class of Precautions: Construction Project by Patient Risk				
	Construction Project Type			
Patient Risk Group	TYPE A	TYPE B	TYPE C	TYPE D
LOW Risk Group	I	II	II	III/IV
MEDIUM Risk Group	I	II	III	IV
HIGH Risk Group	I	II	III/IV	IV
HIGHEST Risk Group	II	III/IV	III/IV	IV

Indoor Air Quality Construction Activity

ICRA Matrix

* Categorize patient areas affected by construction according to their risk level:
  * Low risk - Office areas
  * Medium risk - Cardiology, Physical therapy
  * High risk - Emergency room, Surgical units
  * Highest risk - Burn units, Operating rooms
* Categorize construction projects according to levels of dust created:
  * Type A - Inspection activities which create no dust
  * Type B - Small scale activities which create minimal dust
  * Type C - Minor demolition producing moderate levels of dust
  * Type D - Major demolition or construction

Indoor Air Quality Construction Activity

Internal Demolition, Construction, Renovations, and Repairs

* Containment of dust & moisture during interior activity can be achieved by:
  * **Educating construction workers**
  * Preparing the site
  * Notifying and issuing advisories for staff, patients & visitors
  * Relocating staff and patients as needed
  * **Issuing standards of practice & precautions**
  * Monitoring for adherence to control measures
  * Implementing daily clean-up
  * Ensuring water system integrity during and after construction

Indoor Air Quality Construction Activity

Infection Control Precautions

* Isolate HVAC system in construction area
* Completely isolate area with construction barriers
* Seal doors and windows with tape
* Maintain negative pressure within work site with HEPA equipped filtration units
* Require workers to wear proper PPE in work site
* Construct anteroom for changing into and out of PPE
* Place dust mats at work site entrance and exit
* Contain construction waste in tightly covered containers

Indoor Air Quality Construction Activity

Air Sampling

* Particle counts in a given air space should be evaluated against counts obtained in a comparison area.
* Particle counts can help determine if barriers and efforts to control dust dispersion are effective.
* The lack of standards linking fungal spore levels with infection rates is the most significant technical limitation of air sampling for airborne agents. Hospital may choose to sample.

Indoor Air Quality Construction Activity

External Demolition & Construction

* Issues to review prior to demolition:
  * Proximity of air intake system to the work site
  * Adequacy of window seals and door seals
  * Proximity of areas frequented by immunocompromised patients
  * Location of underground facilities

Indoor Air Quality Construction Activity

Strategies to Reduce Dust & Moisture Intrusion

* Shroud demolition site if possible
* **Placement of storage for construction materials**
* Properly install and maintain filters
* Seal and caulk doors & windows
* Close off public entry ways as needed
* Reroute trucks if possible
* **Encourage reporting of hazardous or unsafe incidents associated with construction**

Indoor Air Quality Construction Activity

Recommendations # 1

* Establish a multi-disciplinary team that includes infection-control staff to coordinate demolition, construction, and renovation projects and consider proactive preventive measures at the inception; produce and maintain summary statements of the team's activities.
* Educate both the construction team and the health-care staff in immunocompromised patient-care areas regarding airborne infection risks associated with construction projects, dispersal of fungal spores during such activities, and methods to control dissemination of fungal spores.
* Incorporate mandatory adherence agreements for infection control into construction projects, dispersal of fungal spores during such activities, and methods to control the dissemination of fungal spores.
* Establish and maintain surveillance for airborne environmental disease as appropriate during construction activities to ensure the health and safety of patients. Implement infection-control measure relevant to construction, renovation, maintenance, demolition, and repair.

Indoor Air Quality Construction Activity

Recommendations # 2

* Use airborne-particle sampling as a tool to evaluate barrier integrity.
* Commission the HVAC system for newly constructed hospitals and renovated spaces before occupancy and use, with emphasis on ensuring proper ventilation for operating rooms, Airborne Infection Isolation (AII) rooms, and Protective Environment (PE) areas.
* If a case of health-care-acquired aspergillosis or other opportunistic environmental airborne fungal disease occurs during or immediately after construction, implement appropriate follow-up measures.
* If there is epidemiological evidence of ongoing transmission of fungal disease, conduct an environmental assessment to determine and eliminate the source.
* If air-supply systems to high-risk areas (e.g., PE rooms) are not optimal, use portable, industrial-grade HEPA filters on a temporary basis until rooms with optimal air-handling systems become available.

Cool Barrier Technology:

BENEFITS:

- ✓ Saves Energy by Decreasing the Needs for Cooling
- ✓ Improves Thermal Comfort Conditions
- ✓ Contributes in CO_2 Emissions Reduction
- ✓ Contributes in Global Warming Consequences Mitigation
- ✓ Increase the Durability of the Product and Longevity of the Structure
- ✓ Peak Demand Reduction
- ✓ Pollutants and Smog Reduction
- ✓ Bacteria Load Reduction
- ✓ Indoor and Outdoor Air Purification

Resources

* *Guidelines for Environmental Infection Control in Health-Care Facilities*, CDC, 2003 (download at www.cdc.com).
* *Guidelines for Design and Construction of Hospital and Health Care Facilities*, American Institute of Architects, 2001 (revision due in 2006).
* http://www.epa.gov/region03/green/healthcare.html
* http://www.usgbc.org/DisplayPage.aspx?CategoryID=19
* Health Care without Harm: www.noharm.org
* Hospitals for a Healthy Environment: http://www.h2e-online.org/
* Green Guide for Health Care: http://www.gghc.org/
* World Health Organization: http://www.who.int/en/

Thank you for your attention !

Urbanus Green Innovations Cyprus Ltd (U.G.I Cyprus) operates as a sustainable management consultant and as a raw materials supplier. U.G.I focuses on the promotion of specifications and standards into national and local construction codes and on the supply of high performance raw materials for the industrial and construction sector.

Cool and Photocatalytic Construction Materials Manufacturer, Athens Greece

Prokopis Perdikis Abolin Co
www.abolinco.com, abolin@abolinco.com