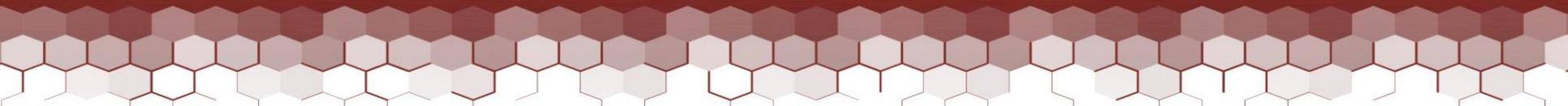




INFECTION PREVENTION
CONSIDERATIONS IN HEALTHCARE
DESIGN, CONSTRUCTION AND MAINTENANCE



CICTI
Construction Infection Control Training Institute















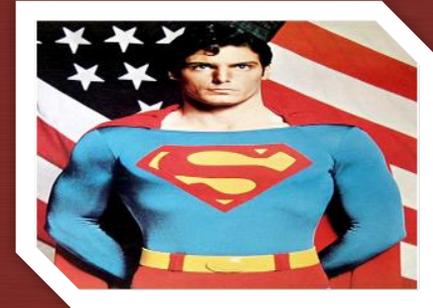






Natural Protection From Infection

- Intact Skin, As Oppose To:
 - Burns
 - Cuts / Wounds
 - Surgical Sites
- Functioning Immune System
 - Disease Processes
 - Treatments / Donor Organs
- Age



The Reality of Healthcare Today

- Life Expectancy (78.8 yrs)
- Age Demographics
- Global Disease Transmission
- Emerging Superbugs
- Radical Procedures
- Outpatient Services

- 722,000 Hospital Associated Infections (HAIs)
– 75,000 Deaths (CDC – 2014)

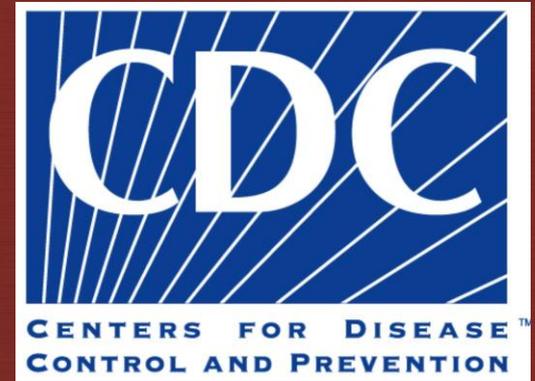


722,000 HAIs > 75,000 Deaths



Comparative Death Rates (2014)

- Vehicular Accidents – 33,000
- Homicides – 16,000
- Heart Disease and Cancer – 1.2 Million



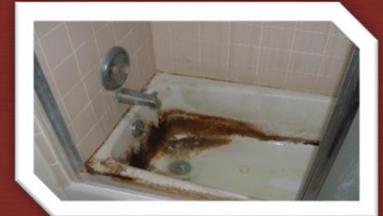
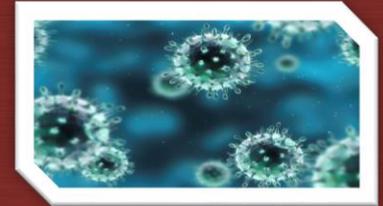
Why Are HAIs A Big Deal Now?

- Previous Hidden Revenue Stream
- Medicare / Medicaid Changes
- Public Knowledge
- Attorneys

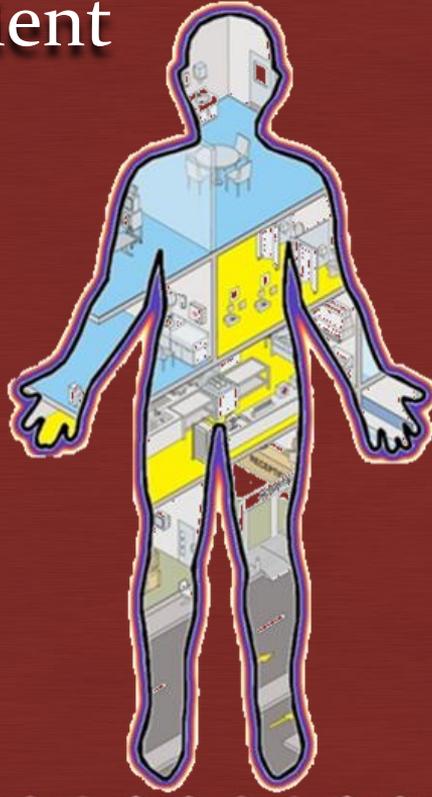


Fundamentals

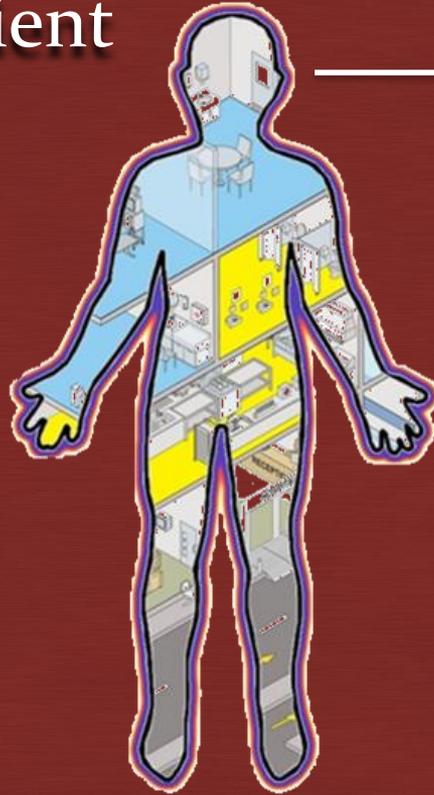
- Molds, Bacteria and Viruses are Ubiquitous
- Small Subset of Microbes Pathogenic
- **Water Essential to Microbial Growth**
- All Buildings Subject to Microbial Amplification
- Construction / Maintenance Disturbs the Built Environment
- Healthcare Settings Concentrate People at Higher Risk



The Facility as a Patient



The Facility as a Patient

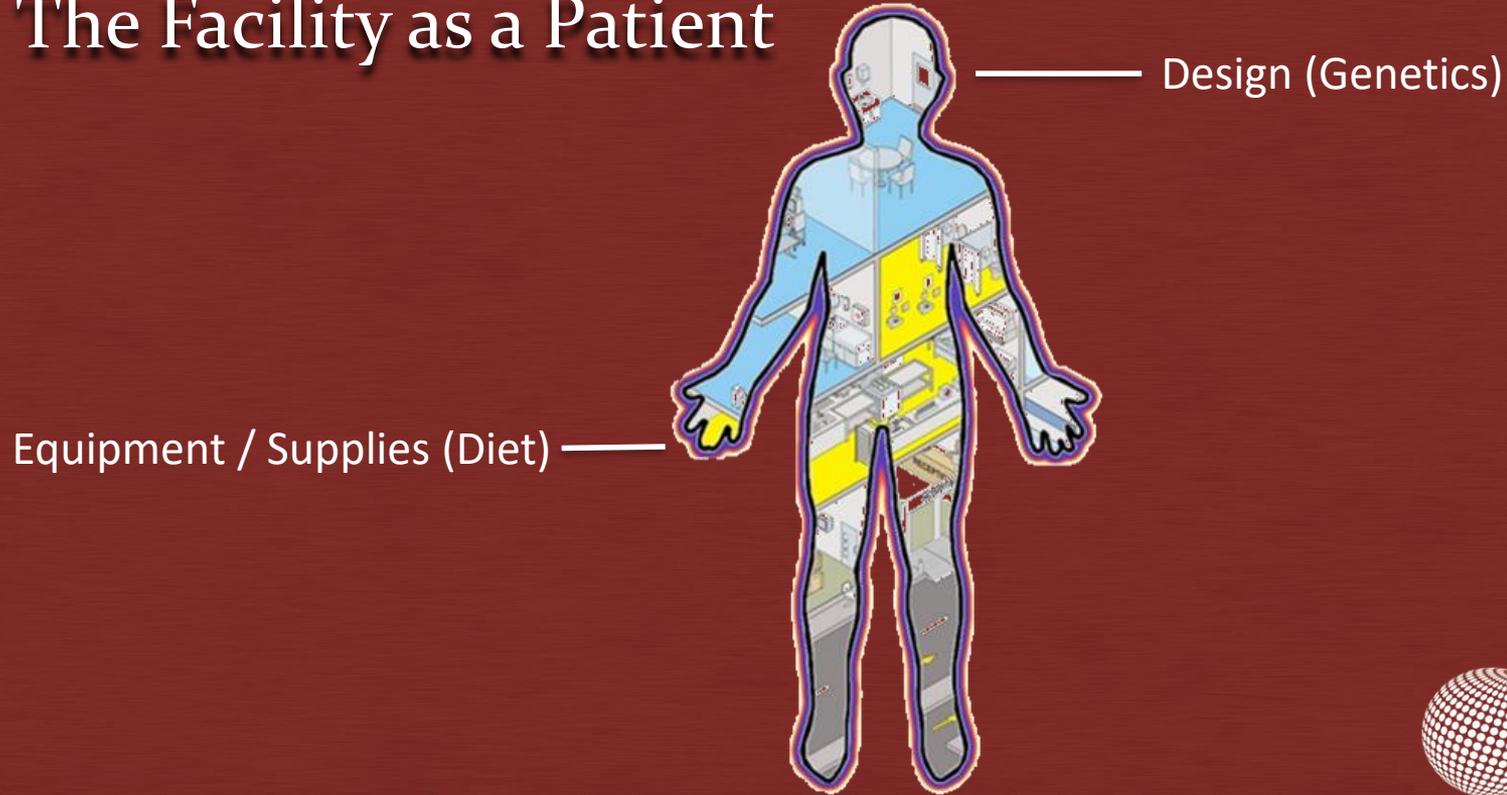


Design (Genetics)

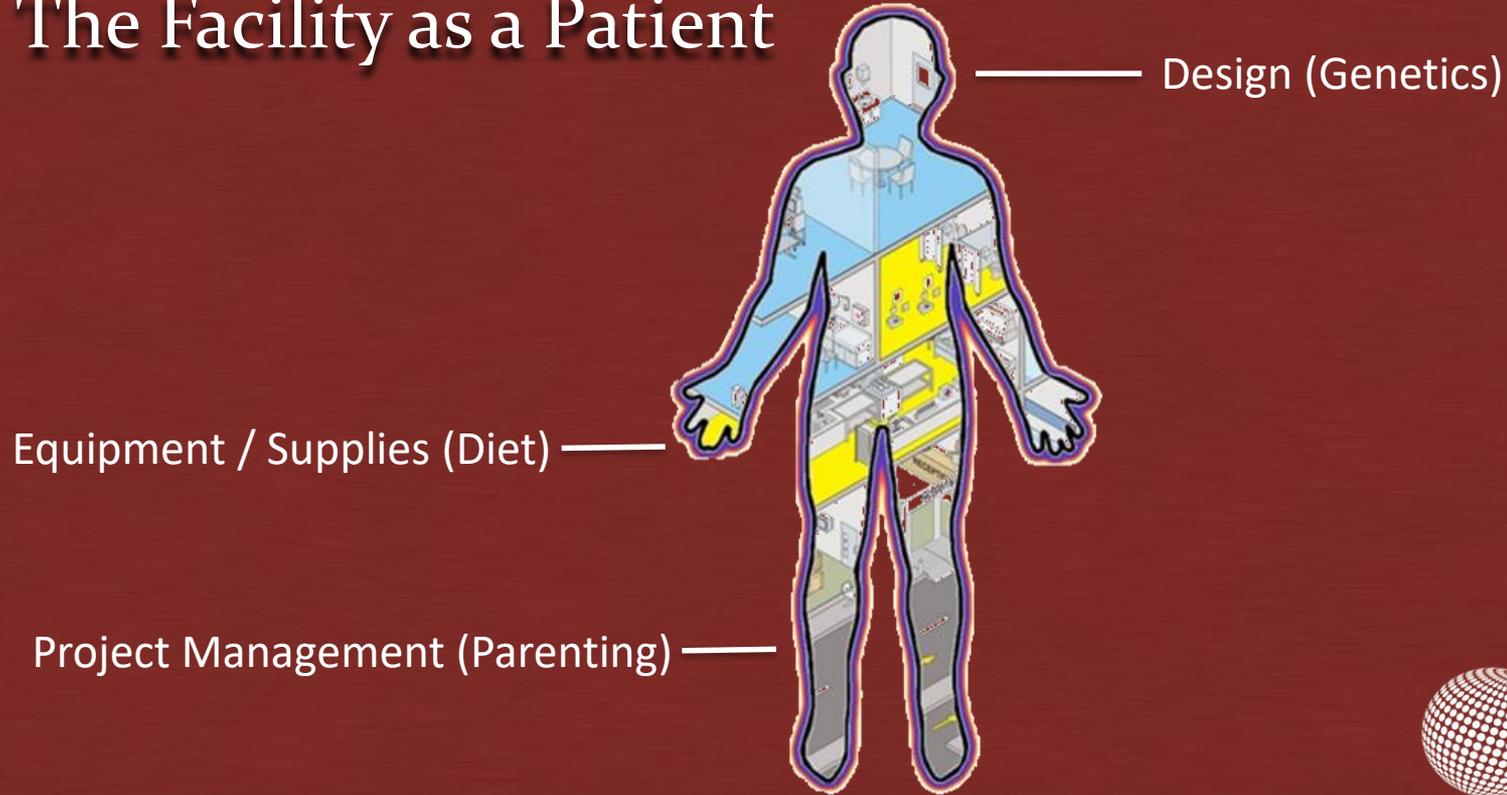


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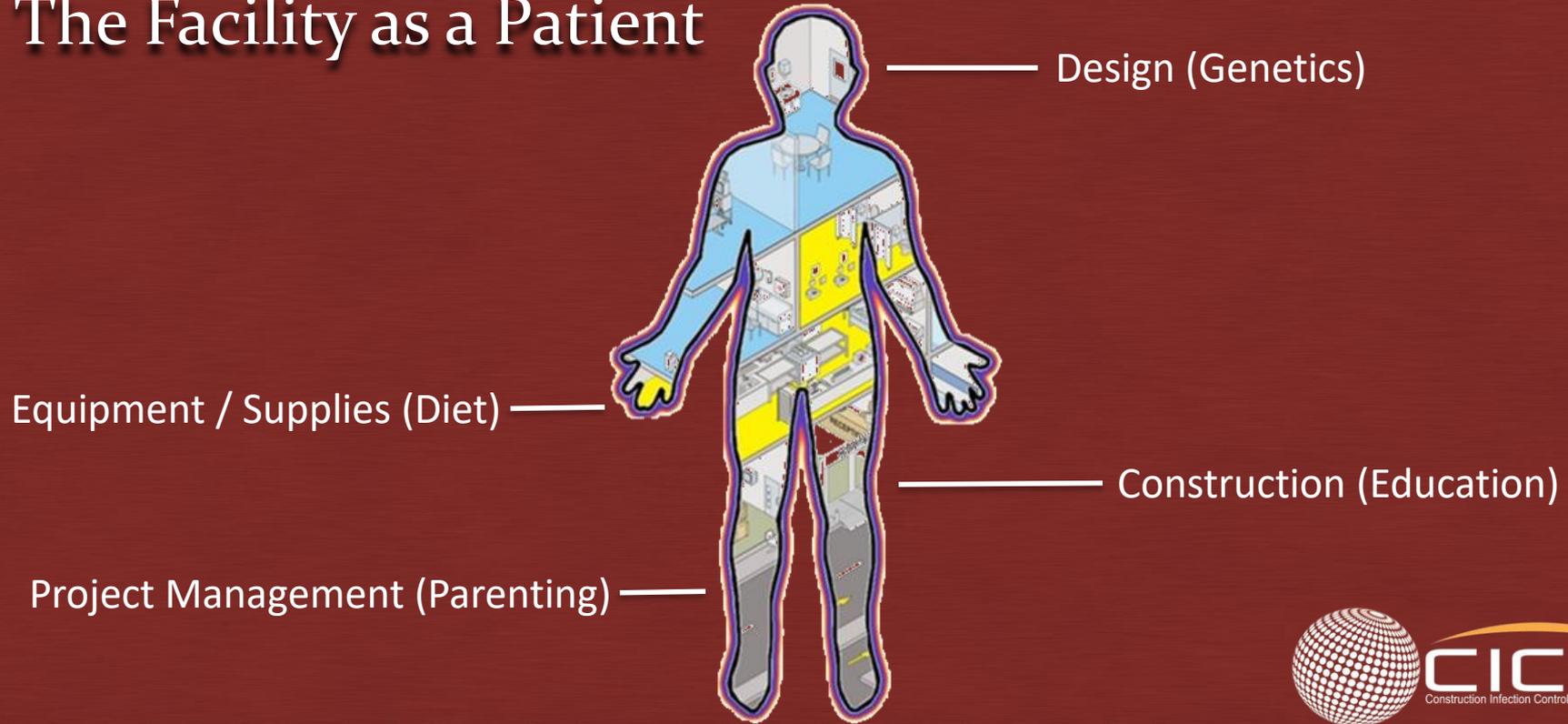
The Facility as a Patient



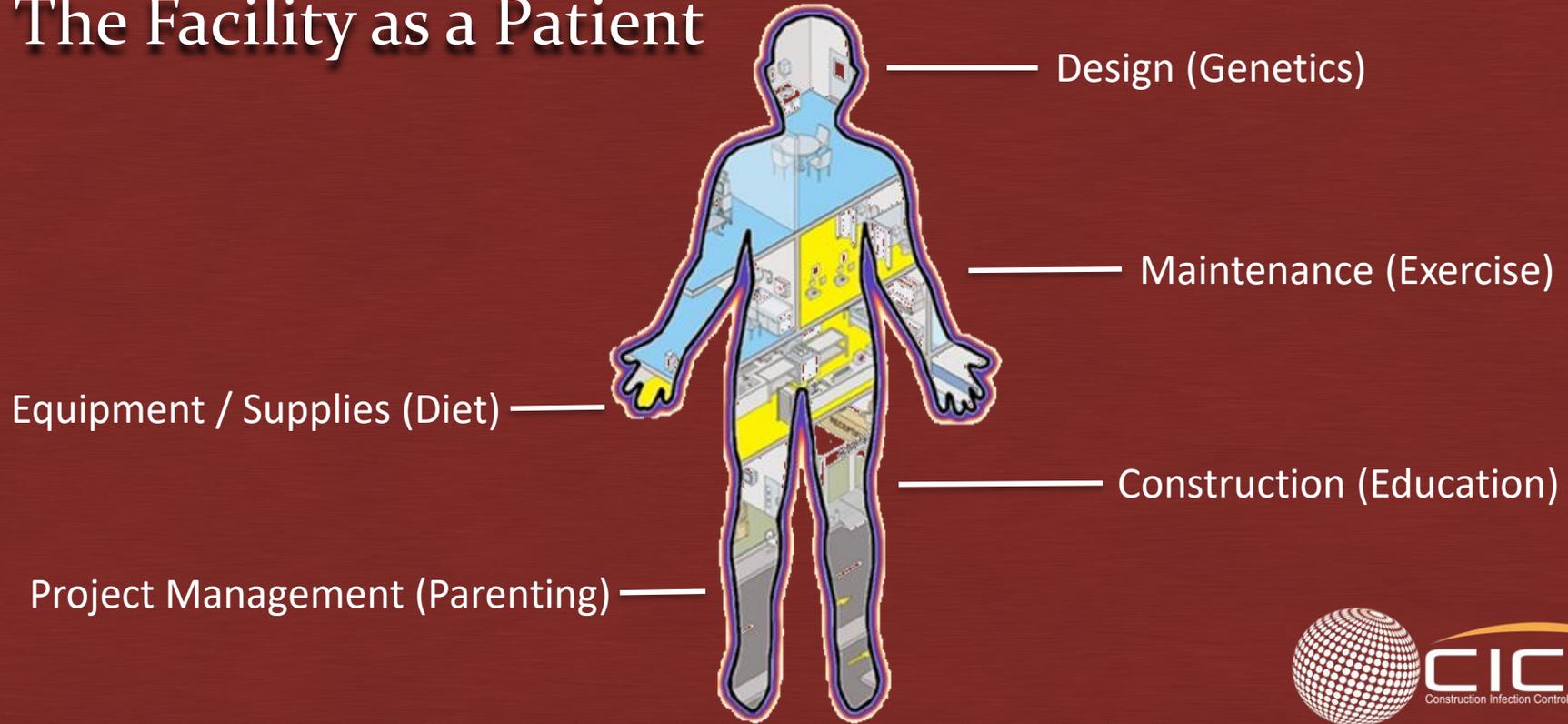
The Facility as a Patient



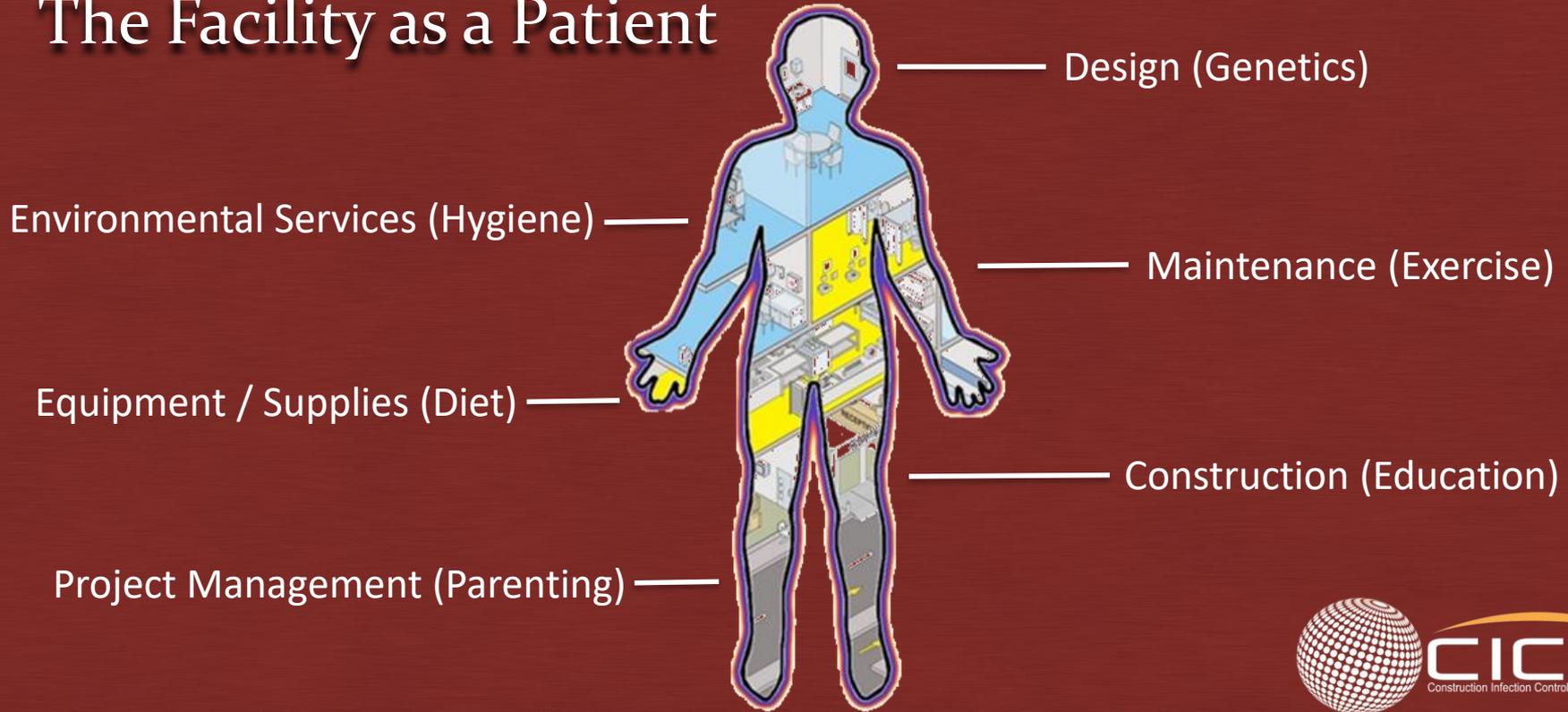
The Facility as a Patient



The Facility as a Patient

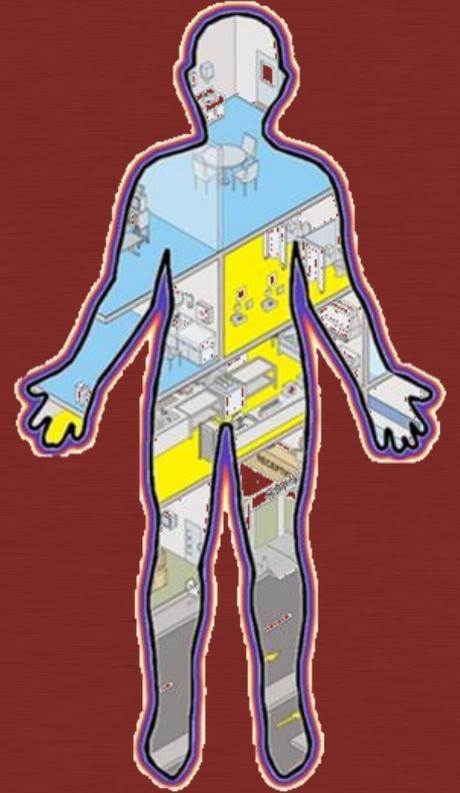


The Facility as a Patient



Microbial Risks to Our Patient: Mold – Bacteria - Viruses *via*

- Air
- Surfaces
- Water
- Occupants



Microbial Modes of Transmission

Air-

- Outdoor Air
- Air Intakes, Building Skins
- HVAC Systems
- Indoor Air
- Respiration (People)



Microbial Modes of Transmission

Surfaces-

- Soil, Skin, Hair, Fibers
- Drywall
- Counter Tops
- Horizontal Surfaces
- High Touch Surfaces



Microbial Modes of Transmission

Water-

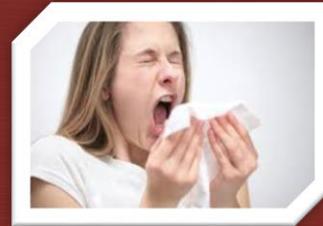
- Water Systems
- Fire Sprinklers
- Equipment Leaks
- Sinks / Toilets
- Roof and Sanitary Drains
- Kitchens
- Water Features
- Cooling Towers



Microbial Modes of Transmission

Any One of Us!-

- Cross Contamination
- Hair & Skin
- Shoes
- Coughing / Sneezing
- Clothes
- Things We Overlook

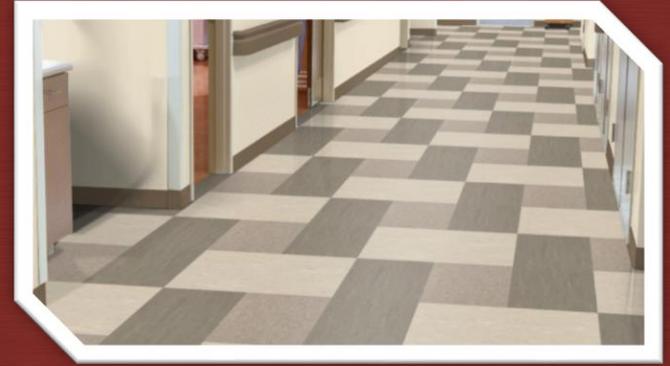




Designing for IP

Major Considerations

- Water = Life
- Water Moves from Hot to Cold (Condensation)
- Less Absorbent Materials = Less Life
- Every Seam, Groove, Grout Line is a Ditch
- More Dissimilar Materials = More Ditches
- Cleanability Must be Considered



Designed Misses



Materials Selection

- Non organic materials
- Smooth, continuous surfaces
- No rough, irregular surfaces
- Limited seams, joints
- Horizontal surfaces = dust / pathogens
- Durability (thin laminates)



Designing for IP – Some Suggestions

- Non-paper faced gypsum board
- Anti-microbial coatings
- Ion generating metals
- Curtain free designs
- Integral blinds



Designing for ICRA – Some Suggestions

- Rated Temp Walls (Necessary? Feasible?)
- Temp Walls / Operational Constraints
- Anterooms MUST Be Large Enough ($\geq 6'$)
- Material Storage Specifications
- HEPA Air Scrubber Validation
- Effectively Trained Workforce to Implement / Maintain



The image features a decorative border at the top and bottom. The border consists of a central horizontal band of dark red hexagons. Above and below this band are rows of lighter, semi-transparent hexagons. Interspersed among these hexagons are faint, light-colored chemical structures, including what appear to be benzene rings and other organic molecules. The overall aesthetic is clean and scientific.

Building for IP

In-House Modifications

- Un-designed Changes
- Aesthetics
- Wall Protection
- User Equipment
- EXHAUST FANS
- VAV Installs
- Chemical > Steam Sterilizers
- Management of Water Events



OFE / Vendor Installs

- Vendor Training / Oversight ?
- ‘Special Ops’
- Vendor MEP Modifications
- Assessment, Coordination, Notification ?
- ICRA Measures ?
- Inspections ?



Capital Projects - ICRA As a Differentiator

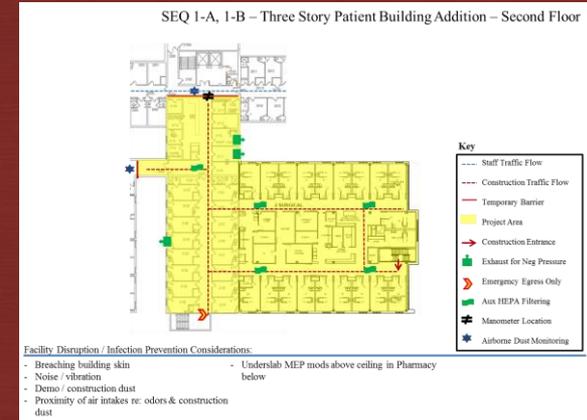
RFP -> Through -> Award

- ICRA Program Documentation in RFP Docs
- Scope, Location, Phasing, Operational Constraints
- Underslab and Out of Phase Footprint Work
- Site work (AHU Intakes, Entrances, MD Parking)
- Preliminary ICRA Document as RFP Submission
- Focal Point In Interview For Higher Risk Projects



ICRA Best in Class – Award -> Through -> Demo

- Existing Conditions
- Access, Debris, Material Mobilization
- Barriers, Neg Pressure, Cleaning Procedures
- Preliminary ICRA Revised
- Subcontractor ICRA Elements in Bid Packages
- ICRA as Schedule Item, Prior to Demo
- ICRA QA/QC Measures



ICRA Best in Class - Award -> Through -> Demo

NEGATIVE PRESSURE NO-NOs

- Inferior Flex Duct, Air Machines
- Tie In to Returns or Shared Exhaust
- Filtration Assumptions
- Tissue Test – We Have Evolved
- Too Much Negative Pressure
- Too Much Exterior Exhaust



ICRA Best in Class - Award To Demo

Additional Best Practices

- Airless Paint Sprayers w/ Water
- HEPA Filtered Boot Scrubber
- Disinfected Carpets Before Sticky Mats
- Dirty Filters = Good Filters
- Misting Over Outdoor Air Intakes
- ICRA Educated Workforce



ICRA Best in Class - Demo -> Through -> Commissioning

- Particulate Monitoring!!!!
- 24/7 Remote Monitoring / Notification
- Continuous Cleaning
- Designated ICRA Maintenance
- Charcoal Filters
- Material Storage
- Duct Cleanliness
- Careful at Air On

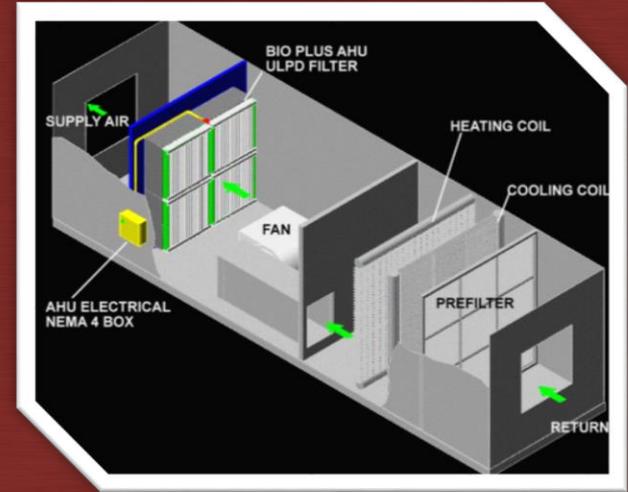


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Life Cycle IP

HVAC Maintenance

- UV for Surfaces, Ions for Air
- Filters – Particulate / Pressure Monitoring?
- AHU Cleaning
- Re-Insulate
- Condensate Drains
- Duct Leakage
- Closed Fire Dampers
- Pressure Differential Monitoring



Roof Maintenance

- Thermal Imaging
- Drainage Pathways
- Walkways
- Membrane Condition
- Flashing Integrity
- MEP Elements' Anchoring
- Expansion Joints



Skin Maintenance

- Thermal Imaging
- New Signage
- Caulk Joints
- Mortar, Grout
- New Penetrations
- Flashing Integrity
- Expansion Joints
- Windows
- Curtain Walls
- Discoloration
- Landscaping



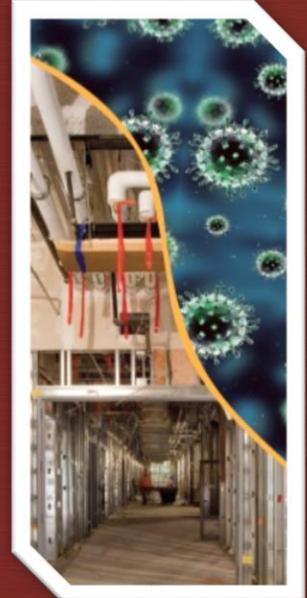
Building Maintenance and Modification

- Historic Moisture Events, Resolved?
- ICRA Education for Maintenance
- Break/Fix Work
- Aesthetic Upgrades
- Changes in Space Utilization
- Test and Balance



Infection Prevention Considerations in Healthcare Design, Construction and Maintenance

- Patients' Skin / Immune Systems
- Water = Life
- Control Your Dust
- Keep It Clean
- Don't Forget To Wash Your Hands!



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