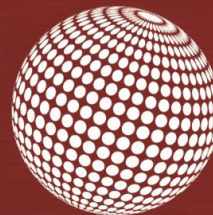




INFECTION PREVENTION CONSIDERATIONS IN HEALTHCARE DESIGN, CONSTRUCTION AND MAINTENANCE



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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)

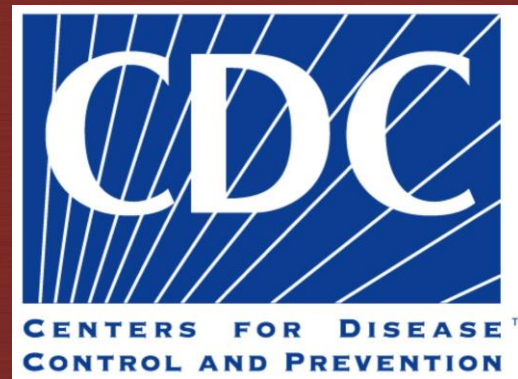


722,000 HAIs › 75,000 Deaths



Comparative Death Rates (2014)

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



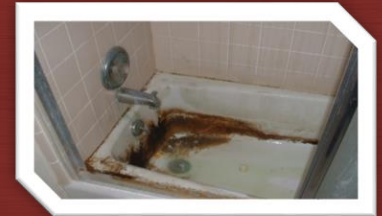
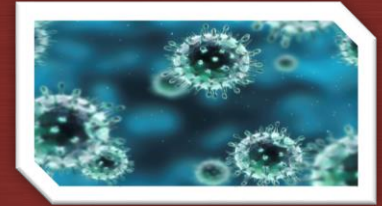
Why Are HAIs A Big Deal Now?

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

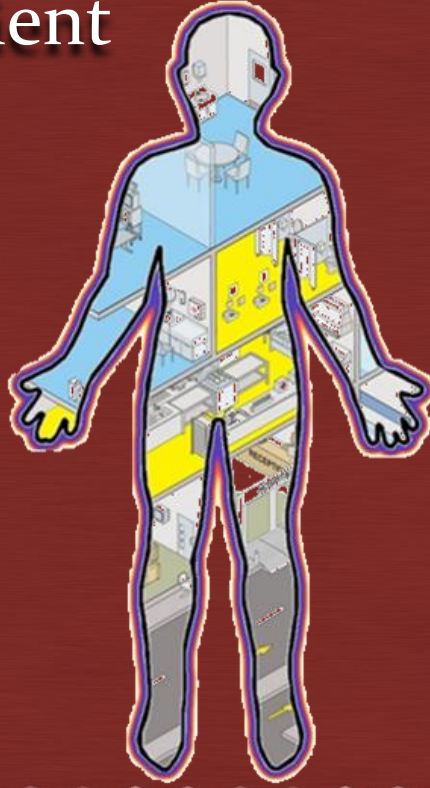


Fundamentals

- 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

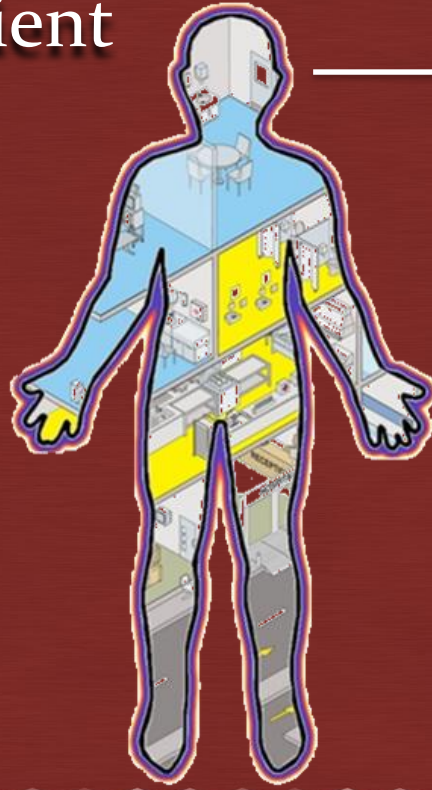


The Facility as a Patient



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The Facility as a Patient

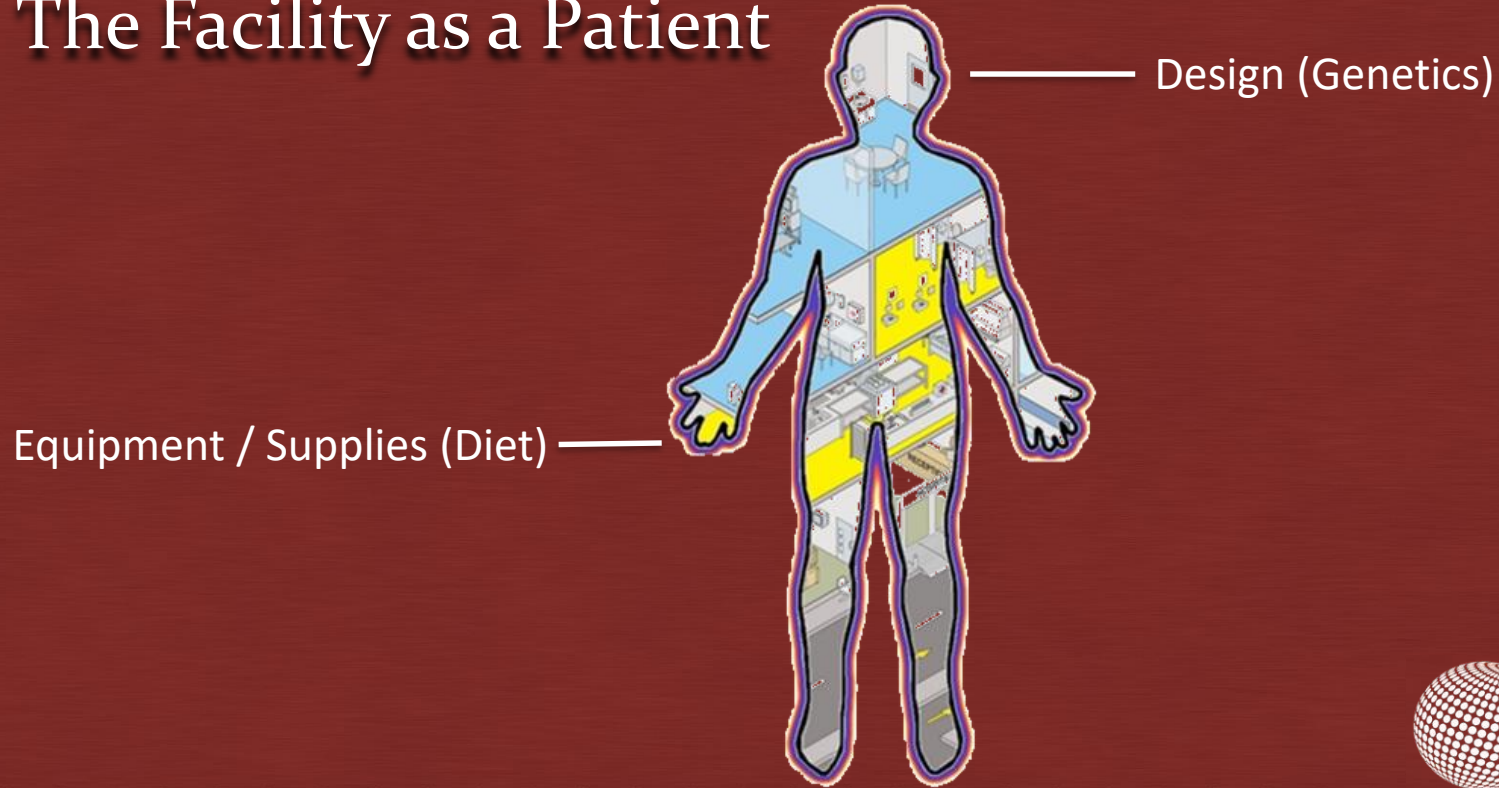


Design (Genetics)

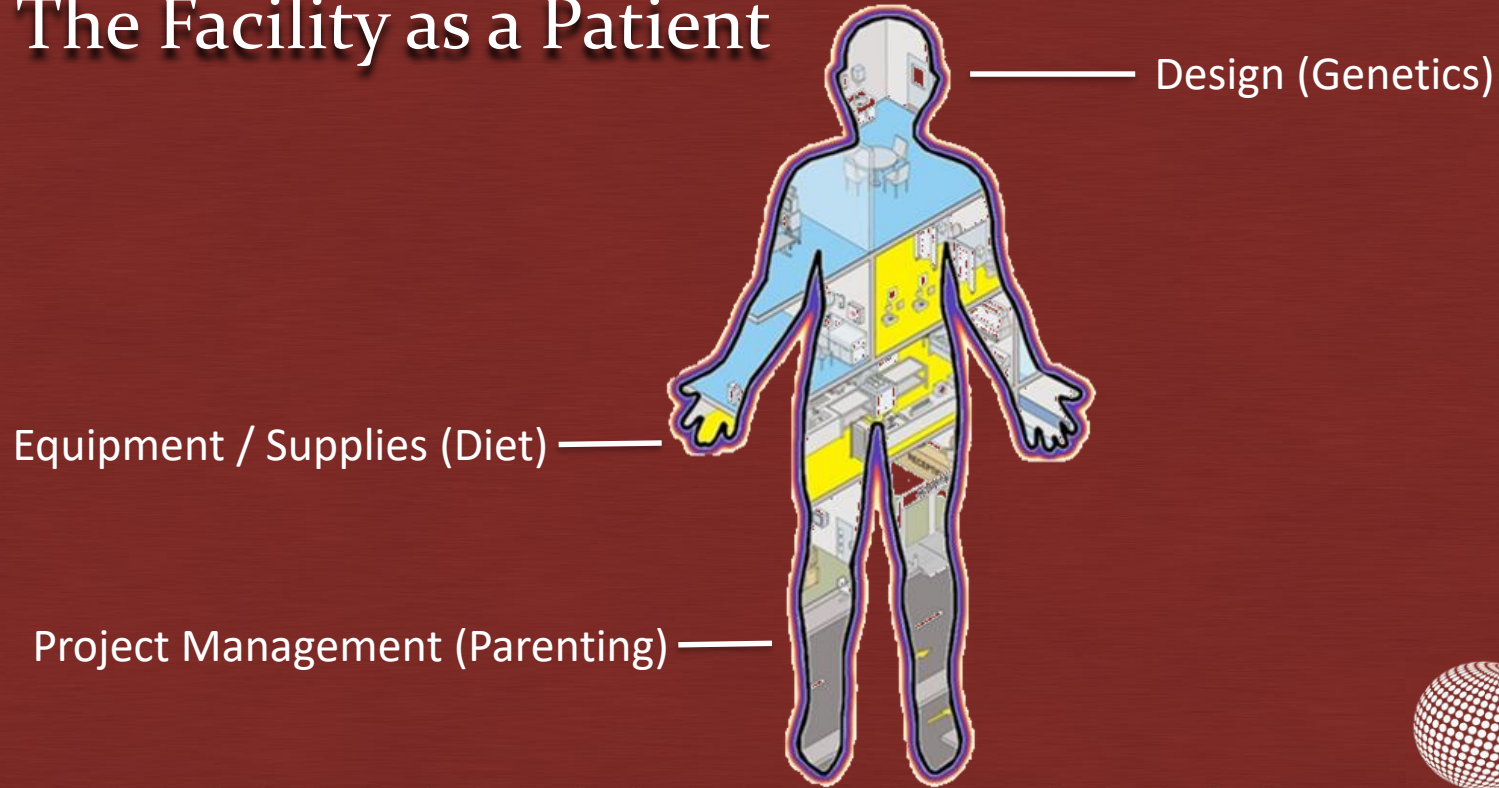


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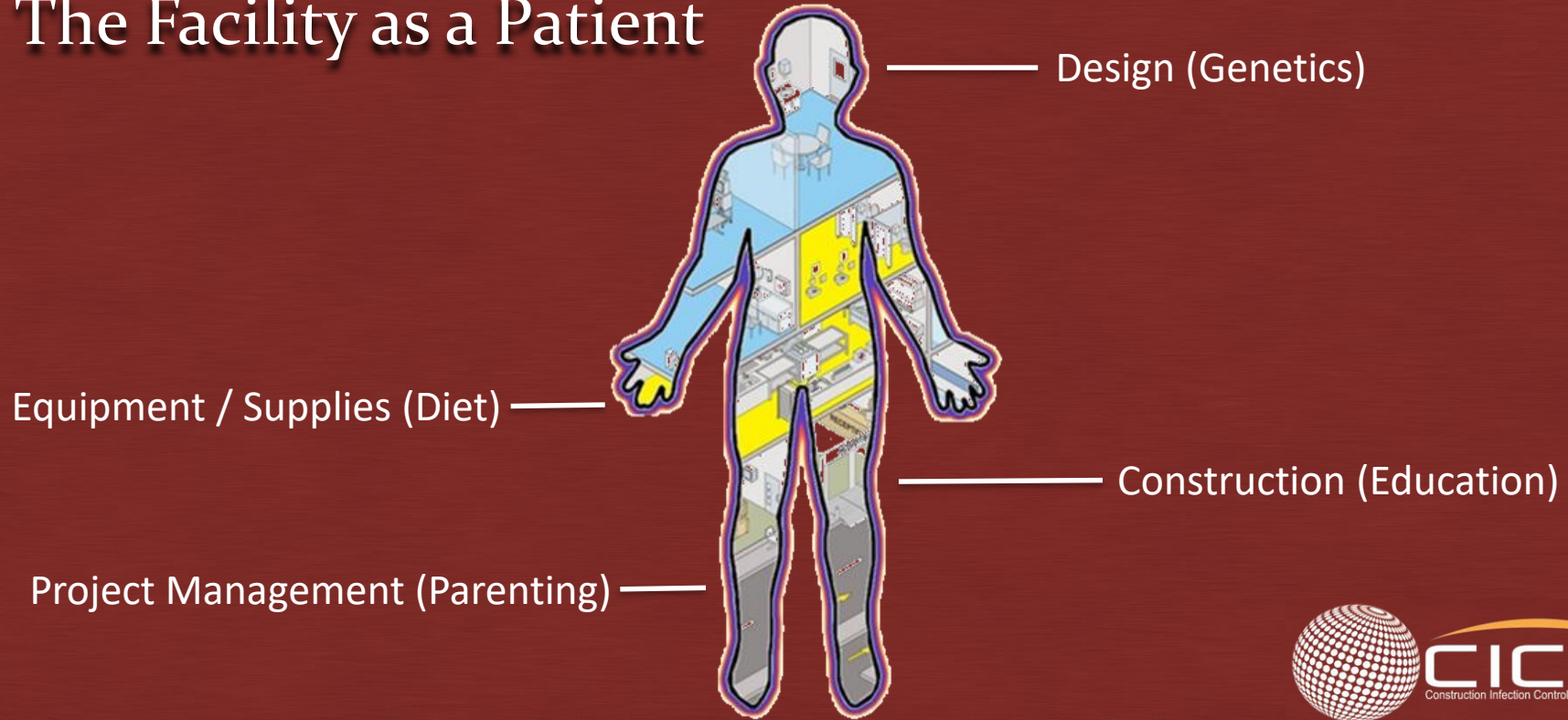
The Facility as a Patient



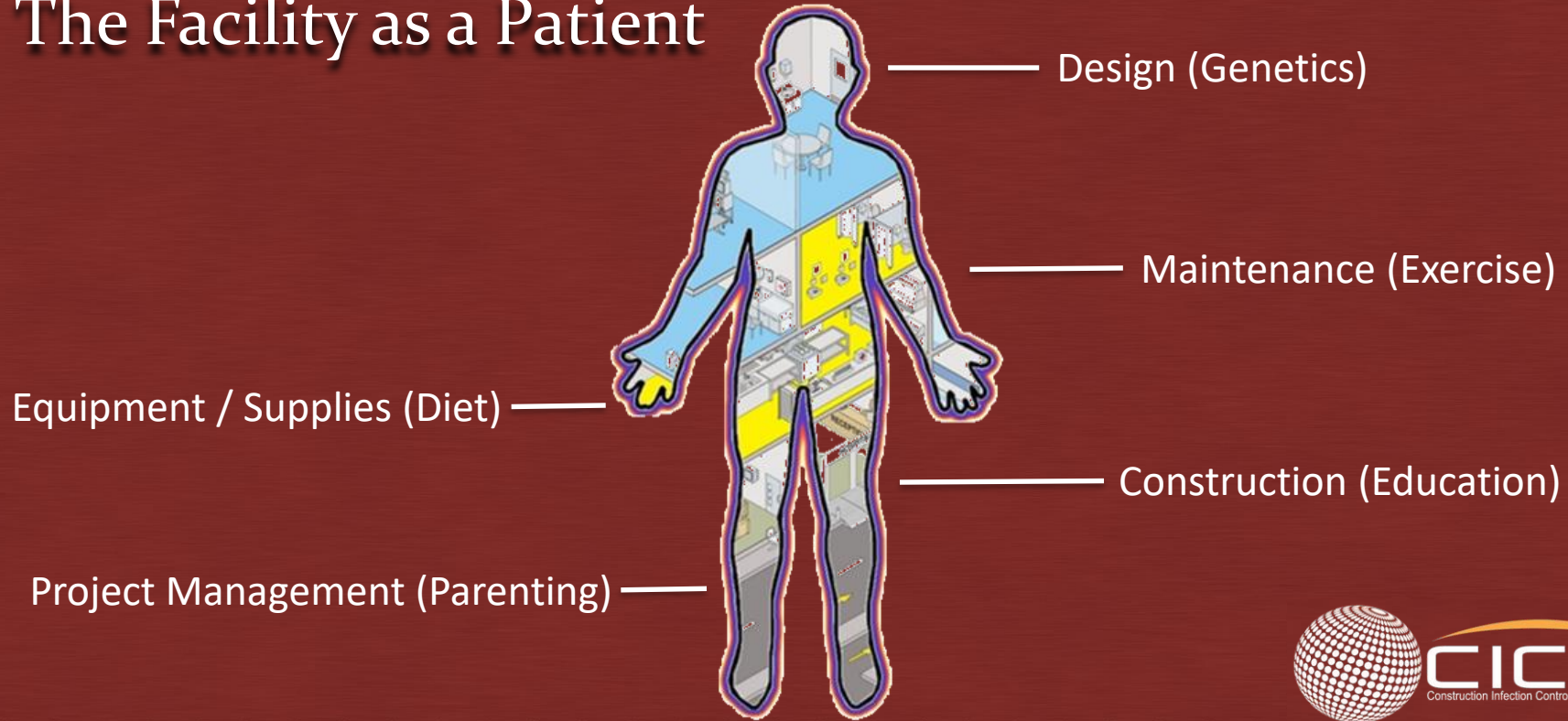
The Facility as a Patient



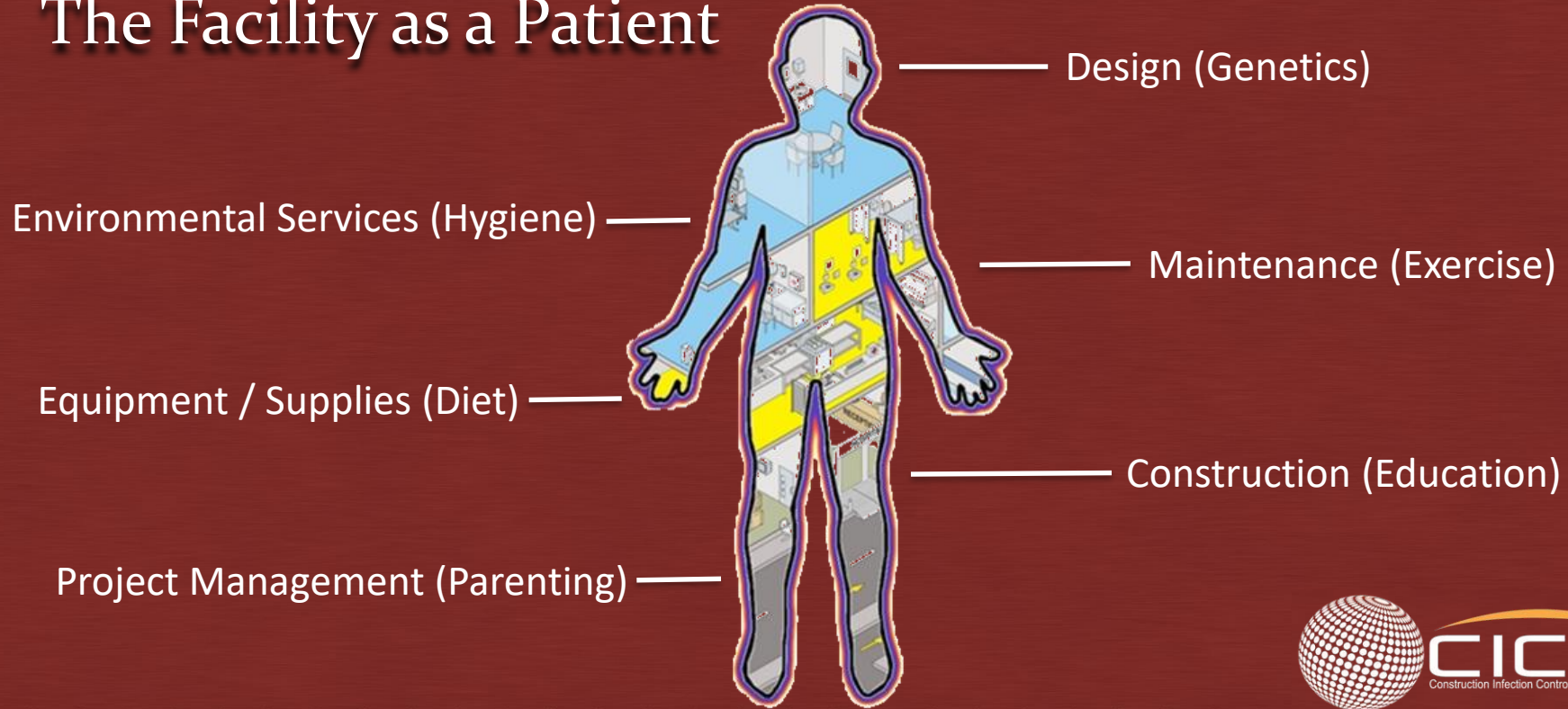
The Facility as a Patient



The Facility as a Patient



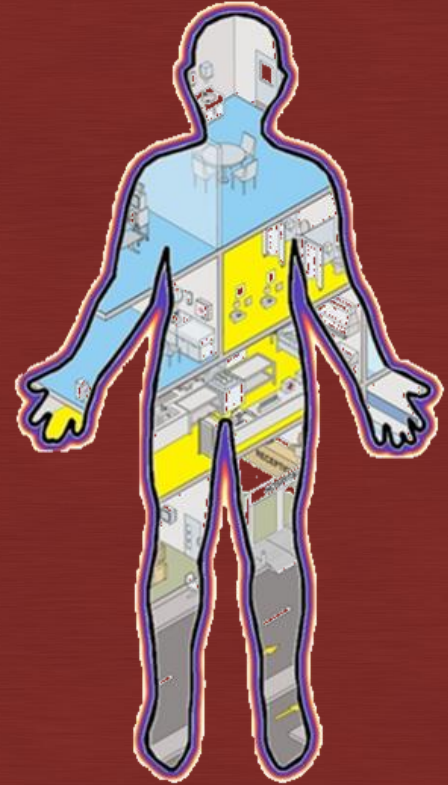
The Facility as a Patient



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-

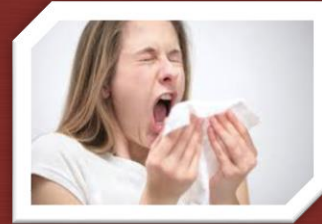
- Water Systems
- Fire Sprinklers
- Equipment Leaks
- Sinks / Toilets
- Roof and Sanitary Drains
- Kitchens
- Water Features
- Cooling Towers



Microbial Modes of Transmission

Any One of Us!-

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

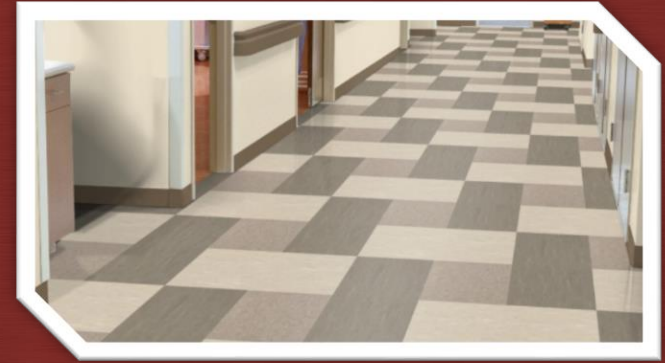


The image features a decorative border at the top and bottom. This border consists of a horizontal band of hexagons in various shades of red and brown. Below the hexagonal band, there is a layer of white chemical structures, which appear to be skeletal representations of organic molecules, possibly related to pharmaceuticals or materials science. The central area of the image is a solid dark red background.

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)



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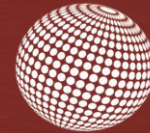
Designing for IP – Some Suggestions

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



Designing for IP – Some Suggestions

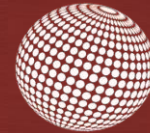
- Distinct staff/patient surfaces
- No remotes, touch screens
- Self-closing doors, drawers
- Anything hands-free



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Designing for IP – Some Suggestions

- Continuous insulation vs. rolled
- Insulation at valve locations (cold)
- Minimize uninsulated junctions (vav/duct)
- Humidity monitoring above grid height
- IR assessment of installed insulation
- Redundant AHUs for High Risk Areas?



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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. This border consists of a repeating pattern of hexagons in various shades of red and brown. Interspersed among these hexagons are chemical structures, including what appear to be substituted benzene rings and other organic frameworks. The central area of the image is a solid dark red rectangle.

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

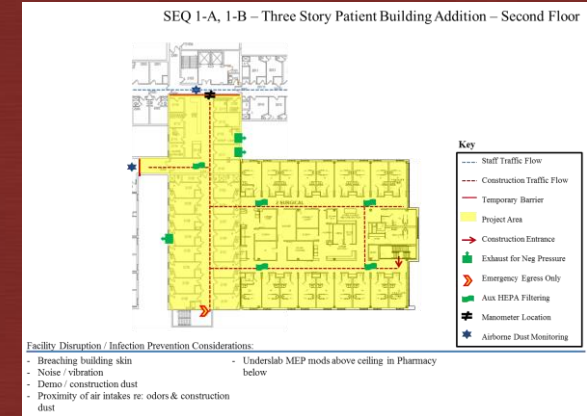
RFP -> Through -> Award

- 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

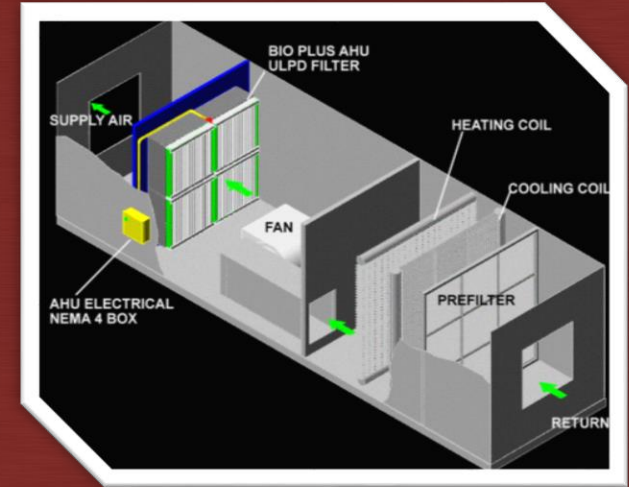




Life Cycle IP

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



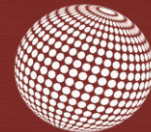
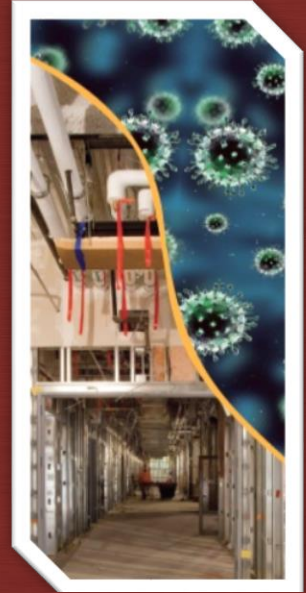
Building Maintenance and Modification

- 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!

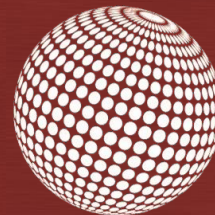


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