Infection Prevention During Design & Construction of Health Care Facilities

Hospital Authority/Infection Control Branch, Centre for Health Protection

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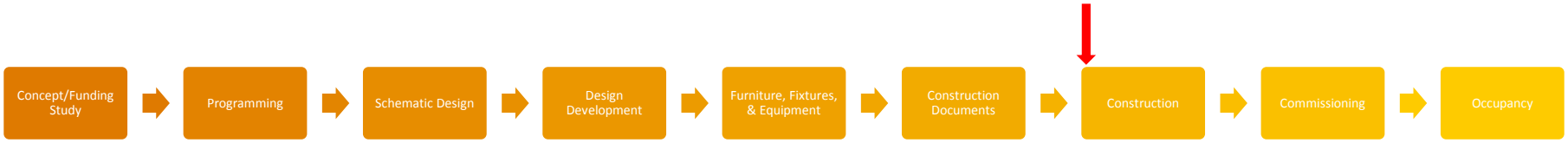
Objectives

Discuss how infection prevention (IP) pertains to all stages of the construction process

Identify infection prevention considerations during health care facility design

Identify infection prevention strategies to employ during construction activity

When is IP often involved?



Missed opportunities:

- Space size not optimal for infection prevention
- Work flow not well planned (e.g. separation of clean & soiled activities)
- Hand hygiene stations missing/placement not optimal
- Inadequate or misplaced airborne infection isolation rooms
- Overbuilding space (e.g. use of protective environment when not indicated)
- Poor planning of protective measures during construction
- Increased expense due to delay in planning

What is an ICRA?

ICRA = Infection Control Risk Assessment

A thought process

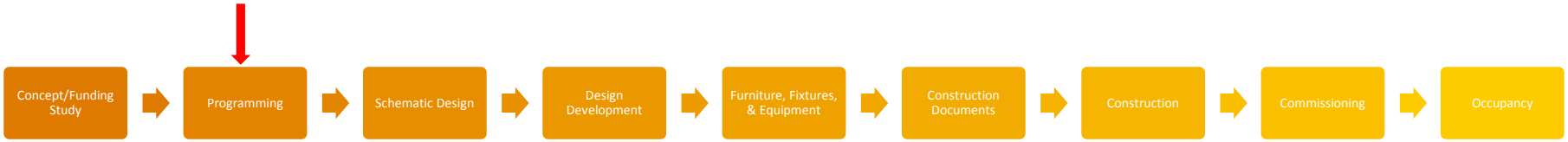
Results in:

- Recommendations for design, construction means/methods
- Infection prevention risk mitigation recommendations (ICRMR) during construction process and commissioning

Goals:

- Optimize design & to prevent infection
- Prevent of infection transmission during construction
- Appropriate building function after construction (commissioning)

Programming



Results: List of key functional spaces to meet intended use of the space

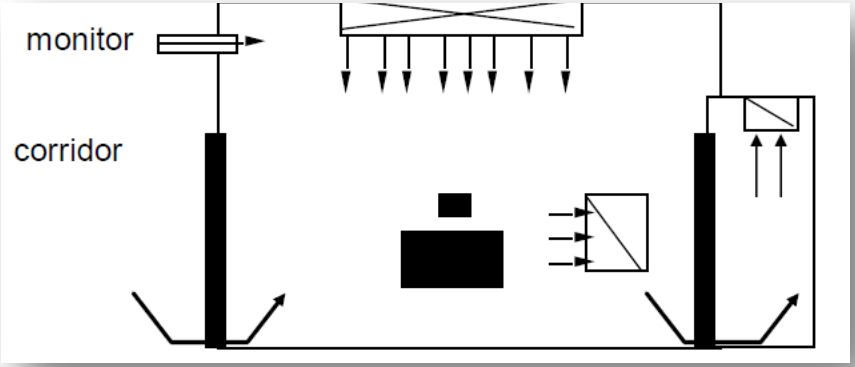
IP Considerations: Include space for functions such as instrument reprocessing, clean/soiled areas, airborne infection isolation rooms (AIIR) or protective environment rooms(PE)

Note: Project phasing should be considered early (patient movement)

Example: AIIR Placement

Is Airborne Isolation needed?

Where is best utilization?



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Schematic Design

Programming

- What is needed for intent of space?

Schematic Design

- How will needs fit into space?

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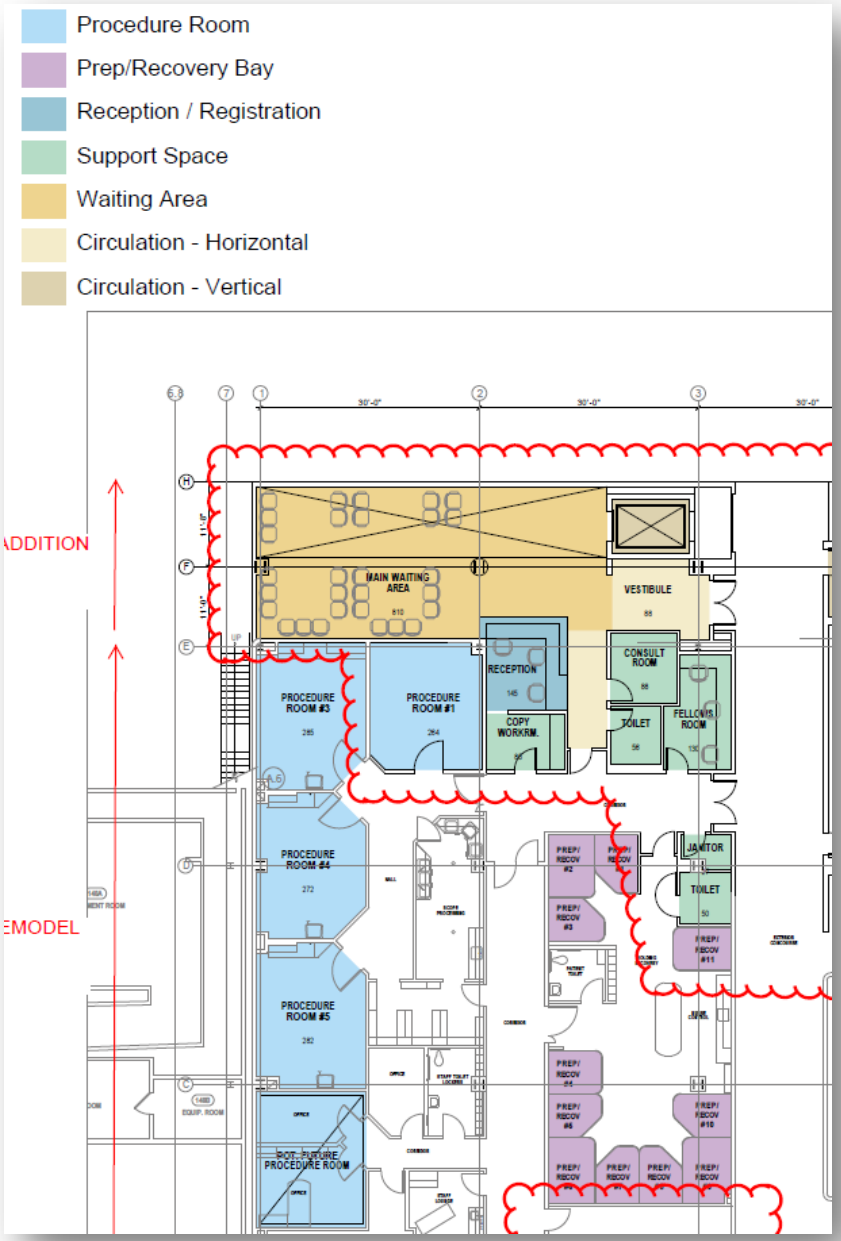
Schematic Design

Results: Design that shows how functional spaces will fit into given square footage

IP Considerations:

Assess size of spaces, location, work flow
Examples: Size of scope reprocessing room, flow from dirty to clean to storage, location of EVS supplies/equipment



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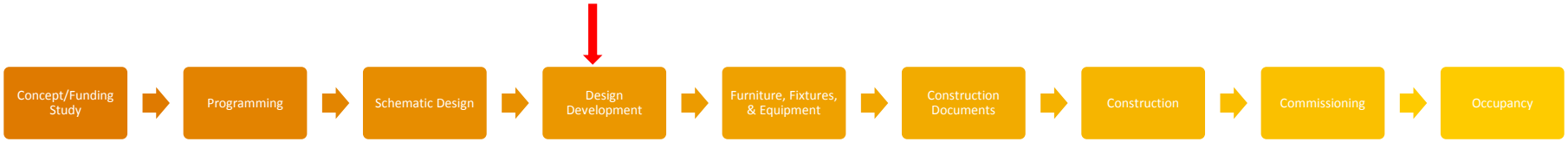
Example: Reprocessing Space

Design Development



Programming

- What is needed for intent of space?

Schematic Design

- How will needs fit into space?

Design Development

- Details of space identified

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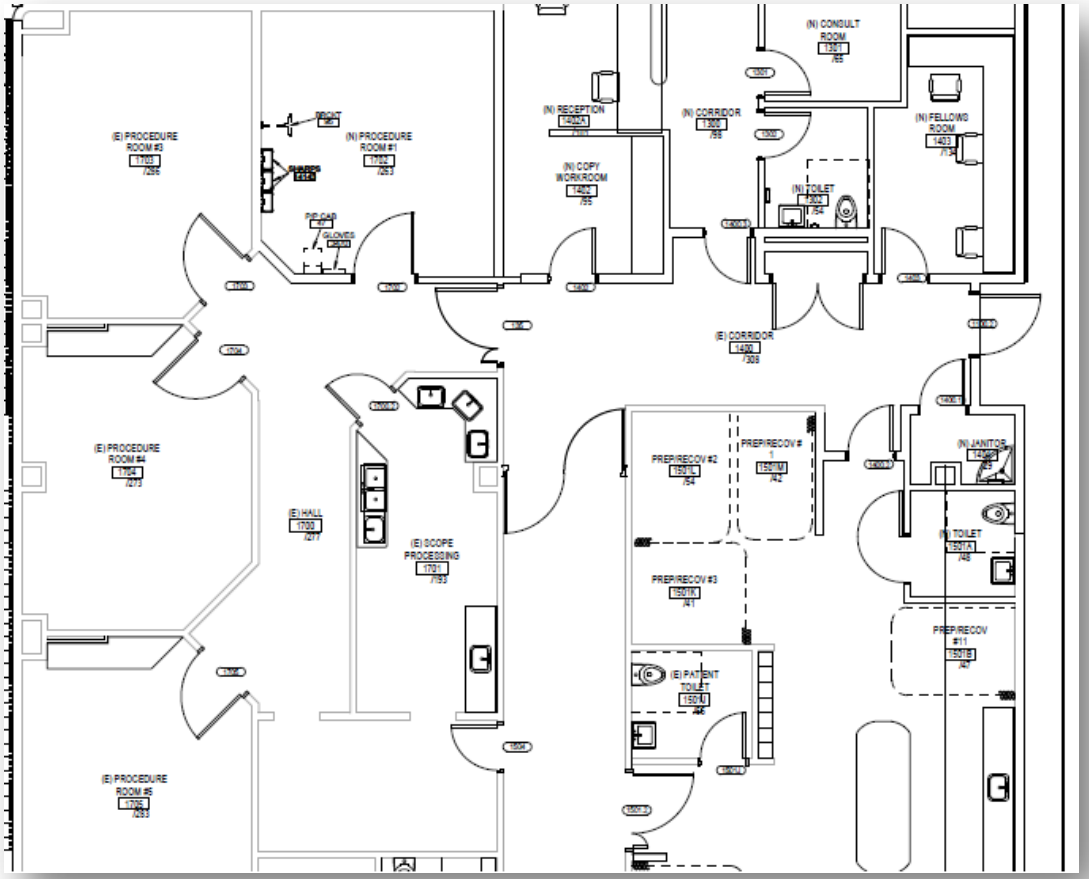
Design Development

Results: Design showing structural, engineering/systems details within space

IP Considerations:

Examples: hand hygiene stations, sharps containers, PPE, cleaning products, design of HVAC, surfaces & finishes within space



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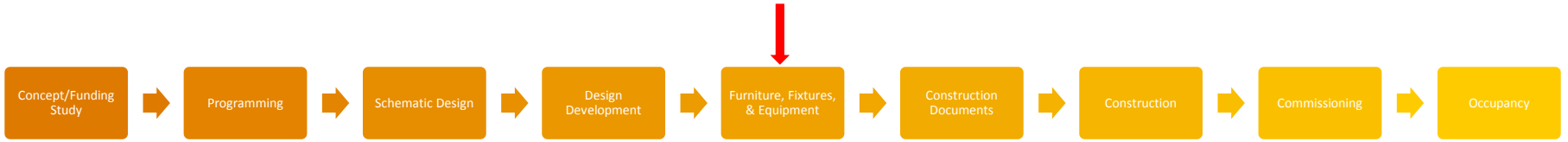
Design Consideration Examples:

Use of solid surface materials for wet areas, such as sink countertops

Adequate storage & accessibility for personal Protective equipment

Number & location of hand hygiene stations and hand rub dispensers

Furniture, Fixtures & Equipment



Schematic Design

- How will needs fit into space?

Design Development

- Details of space identified

Furniture, fixtures & Equipment Planning

- What items are needed in this space?

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Furniture, Fixtures & Equipment

Results: Selection of furniture, fixtures & equipment for functional program

IP Considerations:

Examples: Furniture surfaces (cleanability), equipment needs (e.g. automated endoscope reprocessors)

Construction Documents

Design Development

- Details of space identified

Furniture, fixtures & Equipment Planning

- What items are needed in this space?

Construction Documents

- Detailed construction drawings, technical specifications

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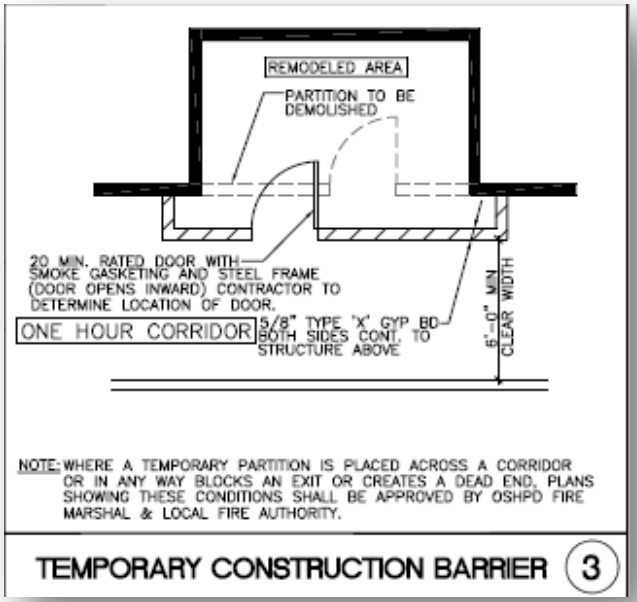
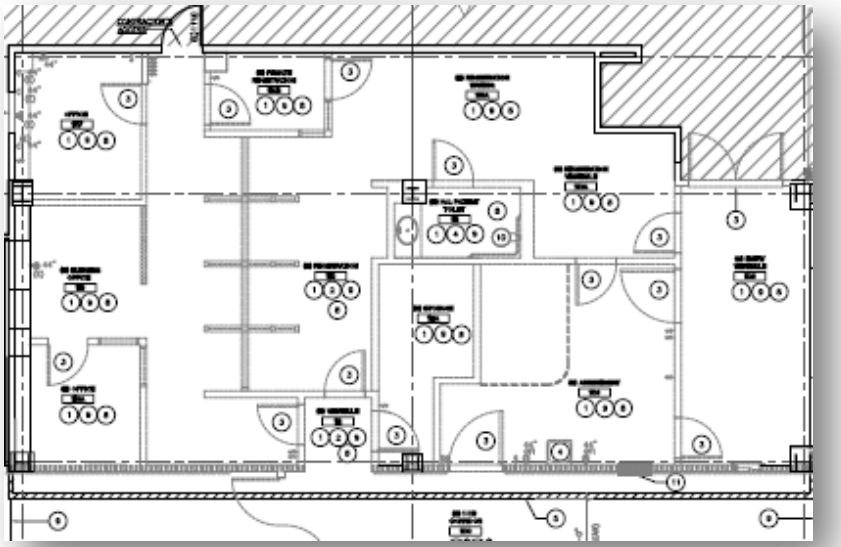
Construction Documents

Results: Architect provides documents needed for plan review & bid

IP Considerations:

Examples: inclusion of general ICRMRs, requirements for water-resistant materials, means & methods (ex: drywall ½” from floor)





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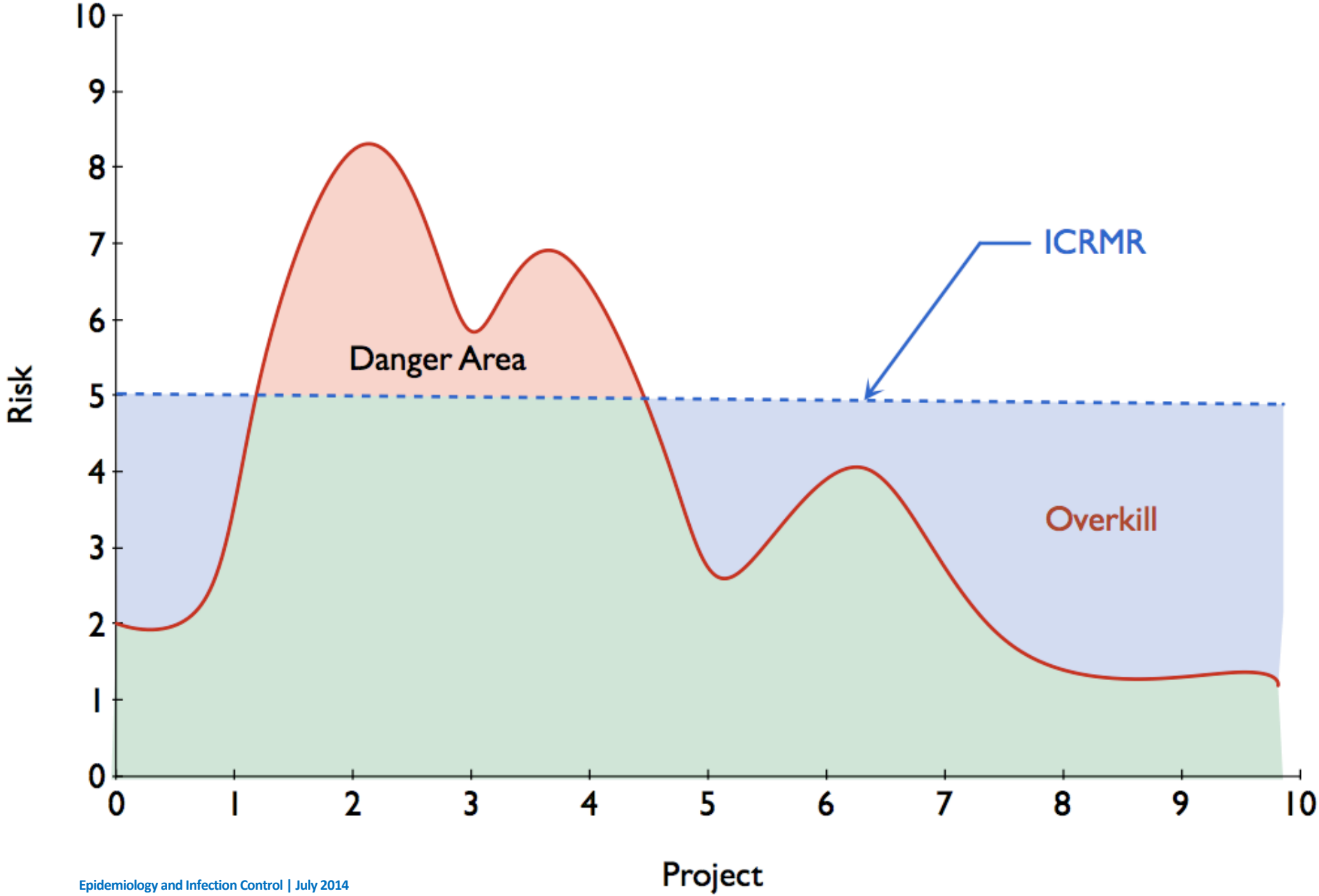
10
9
8
7
6
5
4
3
2
1
0
Risk
Danger Area
ICRMR
Overkill
0
1
2
3
4
5
6
7
8
9
10
Project

Means/Methods Examples:

Moisture & mold resistant materials

Means/Methods Examples:

Ductwork covered to prevent dust and pest entry until system closed

Means/Methods Examples:

No use of wet or molded materials

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Means/Methods Examples:

Exterior moisture resistant sheeting (Densglass Gold) used behind the metal panel exterior at stairwells

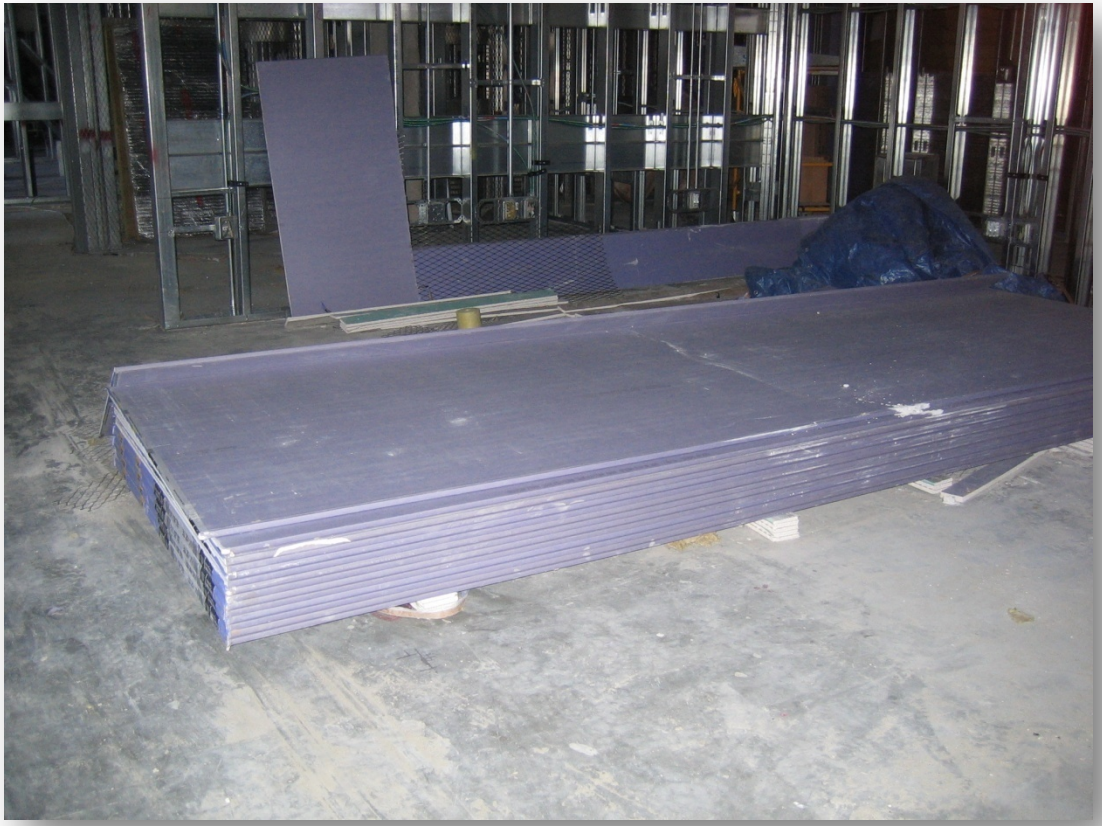
2-layer waterproofing material applied prior to metal panels

Means/Methods Examples:

Building materials from manufacturer covered for dust and moisture protection

Means/Methods Examples:

Building materials are stored off slab for moisture protection



Means/Methods Examples:

Air handler units are delivered wrapped & sealed from manufacturer

Means/Methods Examples:

Dining area for construction crews consolidates debris

Provision of hand hygiene stations and waste facilities

- Keeps construction area cleaner
- Best practice for workers

Means/Methods Examples:

Pests will flee from demolished spaces

Baiting reduces pests that may enter adjacent buildings

Construction

Furniture, fixtures & Equipment Planning

- What items are needed in this space?

Construction Documents

- Detailed construction drawings, technical specifications

Construction

- Construction underway

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Tools: The ICRA Matrix

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

Adapted from ICRA Matrix developed by J. Bartley - ECSI, Beverly Hills, MI; used with permission

Construction Administration

Results: Contractor builds project; oversight structure varies (contract type, project scope)

IP Considerations:

Examples: Plan final ICRMRs, monitor compliance, perform surveillance (e.g. aspergillus)

Steps	Complete? (x) Yes / No / NA			Control Measures	Comments
appropriate infection prevention measures are instituted prior to the start of work.			X	▪ Spray stained tiles with detergent prior to removal; bag immediately	- Area will be unoccupied by patients.
	X			▪ Minimize patients' exposure to work area.	
			X	▪ Thoroughly flush all water systems after interruption of service	
5b. Infection Prevention Risk Level 2					
- It is not necessary to notify Infection Prevention - Risk Level I measures also apply.	X			▪ Use wet method to control dust while cutting	Notify EVS to clean unit at end prior to occupancy.
	X			▪ Seal unused (non-egress) doors.	
	X			▪ Block off / seal adjacent air vents.	
	X			▪ Wipe horizontal and patient care surfaces with a hospital approved disinfectant	
	X			▪ Contain construction waste before transport in tightly covered containers.	
			X	▪ Wet mop and/or vacuum with HEPA filtered vacuum before leaving work area.	
	X			▪ Place dust mat at entrance and exit of work areas and replace or clean when no longer effective.	
5c. Infection Prevention Risk Level 3					
- Risk Levels I – II measures also apply. - Project Manager /Coordinator to perform Infection Control Risk Assessment (ICRA) with Infection Prevention and complete form to document requirements prior to start of work.	X			▪ Isolate HVAC system in area where work is being done to prevent contamination for duct system.	Construction waste path and supplies through back door of ED. HEPA vacuum to be used to clean up space at completion of work UCI EVS to assure area is terminally cleaned prior to patient use.
	X			▪ Complete all critical barriers before construction begins.	
			X	▪ Maintain negative air pressure within work site utilizing HEPA equipped air filtration units and/or use cubicle containment system to isolate dust.	
	X			▪ Do not remove barriers from work area until complete project area is thoroughly cleaned.	
		X		▪ Direct construction and debris traffic away from pt. care areas.	
	X			▪ Remove barrier materials carefully to minimize spreading dirt and debris; wet wipe or HEPA vacuum barriers prior to removal.	
5d. Infection Prevention Risk Level 4					
- Project Manager/Coordinator to perform Infection Control Risk Assessment (ICRA) with Infection Prevention and complete form to document requirements prior to start of work. - Risk Levels I - III measures also apply.			X	▪ Seal holes, pipes, conduits, openings, and punctures prior to start of work.	Anteroom will not be utilized; no entry into clinical space is required. See notes below.
			X	▪ Construct anteroom and require all personnel to pass through this room cleaning equipment and clothing using a HEPA vacuum cleaner before leaving/entering work area; or they can wear cloth or paper coveralls that are removed each time they leave the work site. Wet mop or HEPA vacuum the ante room daily.	
			X	▪ During demolition, dust producing work or work in the ceiling disposable shoe covers and coveralls must be worn and removed in the anteroom when leaving the work area.	
5e. Infection Prevention - External					
- Project Manager and Infection Control will amend measures as appropriate for each project.					
- Dust – Mitigation			X	▪ Spoils to be covered or bagged.	
			X	▪ Dust plumes to be watered	
			X	▪ Street dust will be minimized by - Truck wheel cleaning	

Examples of ICRMR

External work:

Re-route pedestrian traffic

Water dust plumes

Contain excavation spoils

Keep doors/windows closed in adjacent buildings

Pressurize sensitive spaces

Examples of ICRMR

Internal work

- Use of barriers to prevent dust migration
- Use of negative air flow

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Examples of ICRMR

Considerations for waste disposal

Examples of ICRMR

- Wiping horizontal surfaces with disinfectant after work completion
- Using dust mat at entrance and exit of work area during dust-producing work
- Remove construction debris in contained manner

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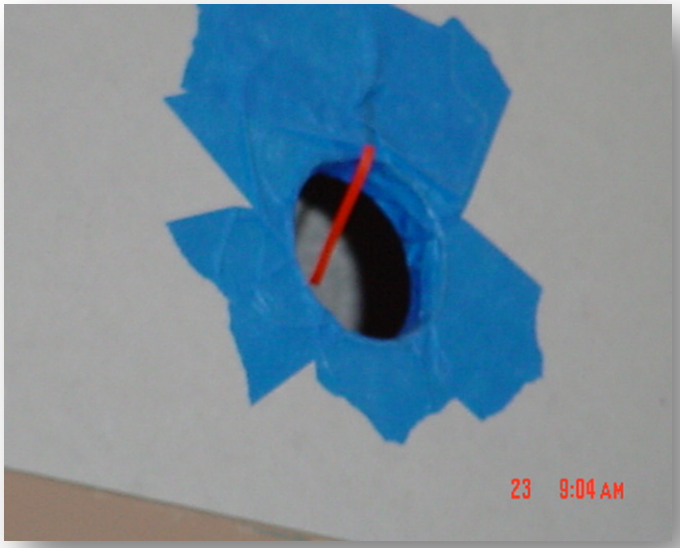
Examples of ICRMR

Pressure Monitoring of Barriers



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Further monitoring

- Particle monitoring
- Environmental cultures
- Moisture/water intrusion evaluation

A. Streifel, University of Minnesota

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Commissioning

Construction Documents

- Detailed construction drawings, technical specifications

Construction

- Construction underway

Commissioning

- Verification of systems functioning to specifications

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Commissioning

Results: Assures equipment, utilities, building systems function properly

May be performed by Commissioning Agent

IP Considerations:

Examples: Validates settings are appropriate (e.g. positive/negative air flow, air exchanges, water temperatures)

Occupancy

Construction Administration

- Construction underway

Commissioning

- Verification of systems functioning to specifications

Occupancy

- Occupation of space by staff, patients

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Occupancy

Results: Assures safe transition of staff, patients, and visitors into new space

IP Considerations:

Examples: Verification of spaces prior to occupancy, plan for isolation patient transfer

QUESTIONS?