Proactive infection prevention measures for the NUH to date:

- 12/2005: Development of “UCIMC Replacement Hospital Infection Control Plan”
- 6 Exterior Infection Control Risk Assessment (ICRA) permits
- 4 Interior ICRA permits:
  - ED remodel on north side
  - B1A Basement Radiology (structural)
  - B1A Second Floor (structural & architectural)
  - B1A Tie-ins to NUH
Results

- As of 2/2007 all ICRA permits have been successfully implemented.

- Measures of each ICRA were monitored daily.

- Surveillance of Aspergillus has shown no increase in inpatient cases during this time.

- There has been no other epidemiologic evidence of infection control issues related to construction to date.
Proactive measures include means & materials for the NUH:

- Moisture & mold resistant materials
- Storage of materials off floor
- Protection of duct & gas line openings
- Attention to sealing penetrations
- Confining/removal of debris
- Provision of waste facilities and hand hygiene stations for workers
Fireproofing contains mold-resistant chemical
Mold-resistant blue board (drywall) used
Building insulation comes from manufacturer covered for dust and moisture protection
Building materials are stored off of floor to prevent potential moisture damage
Wet materials are discarded
Ends of ductwork are covered to prevent dust and pest entry until system closed
First floor dining area created by contractor for construction crews to consolidate debris
Hand hygiene station provided in dining area by contractor for construction crews
Sanitary facilities provided for construction crews on every floor
Air handler units are delivered wrapped & sealed from manufacturer
Large main ductwork from air handler units are cleaned by contractor prior to installation, then sealed until system complete.
Plastic covering on large section of installed ductwork
Drywall installed up off of floor to prevent potential wicking of moisture

Drywall joints sealed
Exterior pre-cast concrete joints prior to sealing

2-step sealing process includes:

- Backing sealant
- Final sealant
Protection of medical gas rough-ins and ductwork in OR suite ceiling
Exterior moisture resistant sheeting (Densglass Gold) used behind the metal panel exterior at stairwells

2-layer waterproofing material applied prior to metal panels
University of California, Irvine
Replacement Hospital

INFECTION CONTROL PLAN

Developed By:
Hensel Phelps Construction Company &
Hygiene Technologies International, Inc.

In Consultation With:
UCI Medical Center & Design & Construction Services

December 2005
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EXECUTIVE OVERVIEW

The Infection Control Plan has been developed for the University of California, Irvine Medical Center (UCIMC) Replacement Hospital. The Plan establishes an infection control process that will be followed by the general contractor, Hensel Phelps Construction Company, their subcontractors, UCIMC, and UCI D &CS. The project is located at 101 The City Drive in Orange, California.

The purpose of this document is to provide detailed information regarding anticipated infection risk assessment and control, and to establish general policies and procedures that will be performed in order to minimize those risks.

The Plan is based on:
- The Infection Control requirements set forth in the Contract Documents,
- Best available information regarding the areas of the existing hospital that will be affected by the work and the anticipated demolition, construction and related activities, and
- Collaboration with the Medical Center, including a review of the Infection Control Management Plan for the UCIMC Replacement Hospital.

The Infection Control Plan

The Infection Control Plan for the UCIMC Replacement Hospital is a broad based comprehensive tool designed to address all potential construction related impacts on the care of existing and future patients. The Plan is broader than the traditional American Institute of Architects (AIA) Infection Control Risk Assessment (ICRA) process.

The first step in the development of the project was the incorporation of infection control principles into the design of the project. These design standards comply with the Office of State Health Planning & Design (OSHPD) permitting and Department of Health Services (DHS) licensing requirements and Centers for Disease Control & Prevention (CDC) recommendations.

The scope of the Infection Control Plan includes the regular ICRA process which addresses construction penetrations into existing facilities. For this project, this involves all construction connections to Building 1A. In addition, the Plan includes an Exterior ICRA process which covers demolition and grading activities. Finally the Plan covers all of the infection control practices to be utilized during the construction of the new hospital. The scope of the Plan is illustrated below.
The Plan provides the framework to ensure compliance with all applicable infection control mitigations during every phase of construction of the new Hospital. The Plan will be used by Hensel Phelps Construction Company, all related sub-contractors, UCI Design & Construction Services (D&CS) and the Medical Center.

Building in a Health Care Environment

The health care facility environment is not often implicated in disease transmission, except when susceptible individuals may potentially become exposed to pathogens. Inadvertent exposure to significant pathogens, such as *Aspergillus* mold species and *Legionella* bacteria species, or airborne pathogens, such as *Mycobacterium tuberculosis* and *varicella-zoster* virus, can result in adverse patient outcomes and cause illness among health care workers. Therefore, both the design of a health care facility and the construction process must be developed with infection control principles in mind.
Infection Control Risk Assessment (ICRA)

The primary objective of the ICRA process is to identify, assess, evaluate, and control potential hazards that may be introduced to the existing or the newly constructed UCIMC facilities due directly or indirectly to design or construction-related activities. The objective is to minimize the potential for patient and health care worker exposures to airborne, surface-borne, and water-borne pathogens to levels below the threshold known to cause disease.

Key ICRA considerations during design include:

- Designation of appropriate design and number of isolation rooms, i.e. airborne infection isolation (All) or protective environment (PE);
- Heating, ventilation and air conditioning systems (HVAC), including recommended ventilation and filtration;
- Mechanical systems involving water supply and plumbing;
- Number, type and placement of hand washing fixtures, clinical sinks, soap/hand gel dispensers, paper towels and lotion;
- Sharps disposal unit placement;
- Accommodations for personal protective equipment;
- Surfaces: ceiling tiles, walls, counters, floor coverings and furnishings:
- Utility rooms: soiled, clean, instrument reprocessing, holding, work rooms, linen, storage; and
- Design to support infection control practice, such as location of environmental services and supplies.

These considerations have been implemented in the design of the NUH as required by governing building codes and to comply with the contract documents.

Key ICRA considerations during construction include:

- Establishment of a multi-disciplinary team to conduct infection control risk assessment,
- Training of construction contractor personnel regarding ICRA;
- Use of dust and debris control procedures and barriers to mitigate: grading, demolition, vibration induced in adjacent structures and all related construction activities;
- Infection control impact of ventilation system and water system performance;
- Environmental infection control measures for special areas with patients at high risk, such as unit closures or patient/supply relocations;
- Airborne particulate sampling to monitor the effectiveness of air filtration and dust control measures;
- Guidance for recovering from water system disruptions, water leaks, and natural disasters;
- Protection of building materials and systems from the effects of moisture, soil contamination and pests;
- Development of traffic patterns for patients, health care workers, construction personnel and construction materials / debris.
- Expectations for cleanliness of construction environment and personnel;
- Occupational health expectations for construction personnel;
- Provision of appropriate and convenient hygiene facilities for construction personnel; and pest control considerations during construction and for newly constructed areas.
The Infection Control Plan & The ICRA Process

Infection Control Plan

Infection Control Risk Assessment of Pending Construction Activity

ICRA Permit Approved

Infection Control Permit Specific Training GC, Subs & Workers

Start of Construction & Implement Mitigations

Inspection & Verification of Compliance
1. BACKGROUND

Facility

The University of California, Irvine is building a replacement hospital at the medical campus in the City of Orange. The new Hospital is being built pursuant to the requirements of SB 1953. The project involves demolition of a number of existing structures, infrastructure improvements, and construction of a new seven story, 474,353 square foot facility. Currently, UCIMC operates a 453-bed hospital that provides a full scope of acute and general care services. The new Hospital will have 191 Beds, 13 Operating Rooms and shelled space for 30 more Beds and 2 more Operating Rooms.

The work covered this Plan will be performed by Hensel Phelps (HP) and their sub-contractors. The site is located at 101 The City Drive, in Orange, California.

Other related construction projects are also subject to the Medical Center’s Infection Control program. This includes, but is not limited to, Emergency Room waiting area, duct relocation above the Emergency room, Boiler Plant upgrades, and renovation at the lower level of Building 1A.

Upon completion and licensing of the new Hospital, Buildings 1 and 10 (non-compliant SB 1953 structures) will be demolished. The resulting space will converted into a park.

History Of This Infection Control Plan

The development of this Infection Control Plan was required in the initial bidding documents for this project. The bid documents included guidelines for the development of the Plan. HP included an outline of anticipated ICRA permits with their bid. Also, in February of 2005 the Medical Center prepared a protocol Plan to assist in the development and review of HP’s Plan.

The Draft Plan was submitted for review early in 2005. The Plan was reiterated through three Drafts. During this time, the infection control provisions of the Plan have been implemented. To date four ICRA Permits have been approved and implemented. Corrective measures when needed have been taken during this process. Communication and response times have been good.

The Infection Control Committee has been briefed on the progress of the construction. During this same period the Infection Control Working Group was established.
2. Infection Control Working Group

The Infection Control Working Group is the responsible for the implementation of the Infection Control Plan.

The membership of the IC Working Group is as follows:
- Linda Dickey, Manager, Infection Control and Epidemiology
- Greg Eikam, Facilities Planning / Maintenance Director
- Leon Roach, Facilities Construction Director & IOR
- Tony Peltier, HP Construction Safety Officer with Hygiene Technologies International
- Pat Nemeth, D&CS Director Hospital Operations
- Don Holm, D&CS Construction Manager / ICRA Compliance

Infection Control Activities & Reporting

- Infection Control Committee – Medical Staff
- Infection Control Working Group – UCIMC, D&CS, HP
  - ICRA – Assessment & Permit Approval
  - ICRA – Permit Training
  - Inspection, Corrections & Monitoring
  - Reporting
- D&CS Central File
Members and Responsibilities

Medical Center

Linda L. Dickey, RN, MPH, CIC, Manager, Infection Control and Epidemiology

Ms. Dickey holds the position of Infection Control Officer. She, or her representative, shall ensure that all ICRA related permits are filed and submitted to the Infection Control Committee for documentation. The Infection Control Committee and its Chair shall ensure that all permits are appropriate, given the exposure potentials and risks that exist in the affected areas of the existing structure. Ms. Dickey shall report to the Infection Control Committee as often as is necessary in order to discuss issues related to individual permits and/or any related matter.

Ms. Dickey, or her representative, review compliance with all required infection control procedures and decide when and where to conduct air monitoring and surface sampling to determine fungal growth and exposure potentials, particularly with respect to Aspergillus species molds.

Ms. Dickey collaborates with two additional colleagues from the Facilities Department:
- Mr. Greg Eikam, Facilities Planning / Maintenance Director,
- Mr. Leon Roach, Facilities Construction Director & IOR.

D&CS

Pat Nemeth, MPH, Director Hospital Operations

Ms. Nemeth is the Director for the construction of the new Hospital. She reports to the Campus Architect and Associate Vice Chancellor. Her duties include all regulatory compliance and coordination with the Medical Center.

Jim Henderson, Construction Manager & IOR

Mr. Henderson is the Construction Manager responsible for all infection control compliance. In addition he is also an IOR.

Hensel Phelps

Clint Squire, Hensel Phelps Project Manager

Mr. Squire shall ensure that the construction work incorporates all ICRA requirements. He shall ensure that Training required herein occurs for all construction personnel. Further he is responsible to ensure compliance with all requirements and the prompt execution of any corrective measures, should same be warranted. He will ensure compliance with all document filing and reporting requirements to D&CS as required by contract.
Dan Long, Project Superintendent

Mr. Long is responsible for the overall performance and compliance with applicable regulations and procedural guidelines as specified in this Infection Control Plan. He is responsible for the performance of all personnel at the site, and shall be present, or shall designate another responsible party in his absence, during all work activities. If such operations do not incorporate all ICRA requirements, or if anticipated operations are not expected to incorporate all ICRA requirements, then notifications shall be made to the Construction Safety Officer and the Certified Industrial Hygienist, and he shall ensure that corrective modifications are made accordingly.

Anthony Peltier, Construction Safety Officer

Mr. Peltier shall coordinate the efforts of the IC Working Group as the representative of Hensel Phelps. He shall ensure that pertinent information is communicated from the Infection Control Officer to the Project Designer, the Project Superintendent, and the Certified Industrial Hygienist.

Mr. Peltier, in conjunction with Ms. Dickey, shall determine the Construction Class (I, II, III, or IV) by using the ICRA matrix in Section 4.0 of this ICRA. The Construction Class identifies appropriate infection control measures to use based on the type of work to be performed and the location of the job. He, or his representative, together with the Infection Control Working Group shall prepare ICRA permits and he shall keep records of all permits. In the event the Construction Safety Officer becomes aware of a deficiency in implementation of the ICRA, he shall ensure that changes are made to correct those deficiencies.

He shall provide education to all workers, contractors or vendors involved in the construction of the new Hospital. He shall also ensure that all training records are kept available in the Hensel Phelps files regarding training program attendance by Hensel Phelps personnel and each of their subcontractors.

Mr. Peltier will generate written documentation regarding health and safety matters at the subject site. He will also provide all Hensel Phelps and/or subcontractor management with written documentation of ICRA deficiencies or changes when they apply to contractor’s or subcontractor’s work. In addition, the Construction Safety Officer will maintain a record of all logs, a copy of the ICRA, and monitoring and sampling results.

Brian P. Daly, CIH, PE, Hygiene Technologies Technologies International, Inc.

Mr. Daly is certified in comprehensive practice by the American Board of Industrial Hygiene and is designated as a Certified Industrial Hygienist (CIH). Mr. Daly is the primary author of this Plan. He provides consultation support to Hensel Phelps in the administration and execution of the requirements herein. His duties include: periodic site visits to rate the compliance with ICRA, assistance with the preparation of ICRA permits, assistance to the Construction Safety Office in determining Construction Class (I, II, III or IV) information by using the ICRA matrix in Section 4.0 of this ICRA, and training on ICRA-related matters and microbial growth potentials.
Additional duties may include, but not be limited to, observance of work operations, site safety inspections, and industrial hygiene and ambient air monitoring.
3. New Hospital Infection Control

Infection Control Design Considerations

In an acute care hospital, infection control is optimized when key elements are considered in the design, such as:

- Design of specialized patient-care rooms to provide airborne infection control,
- Design of Operating Rooms,
- Design of Laboratories, Pharmacy and Central Sterile,
- Design of systems for air and water quality,
- Provisions for protection from weather and pest intrusion,
- Spaces for soiled and clean activities and storage,
- Use of surfaces, finishes and furnishings that are easily cleanable and maintained,
- Provision of fixtures for optimal hand hygiene close of the point of need, and
- Convenient placement of personal protective equipment and sharps disposal containers.

The design of this facility is in accordance with the requirements of OSHPD Type 1 (Acute Care) California Building Code requirements, which addresses many of these factors. In addition, the design of the new Hospital seeks to optimize infection control considerations.

Infection Control considerations occur in numerous areas throughout the Hospital. This section of the Plan reviews special design consideration for two types of areas:

- High Priority spaces with Negative or Positive air circulation controls, and
- The basic building blocks of a Hospital, the Patient Rooms and the Operating Rooms.

Negative and Positive Pressure Rooms

The first high priority spaces for infection control are:

- Negative Air Pressure Isolation rooms (located in each ICU),
- Positive Air Pressure rooms (located in Hem/Onc for Bone Marrow Transplant patients and in Pharmacy for Chemo and IV Prep) and
- Positive Air Pressure Operating Rooms.

The following Table provides a graphic illustration of the new Hospital. Negative Pressure Isolation Rooms and Positive Pressure Rooms are noted on the cross-section.
Graphic Cross-Section To Illustrate Location of Negative & Positive Pressure Rooms

<table>
<thead>
<tr>
<th>Floor</th>
<th>SW Tower</th>
<th>NW Tower</th>
<th>NE Tower</th>
<th>SE Tower</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>1 ICU</td>
<td>1 ICU</td>
<td>30 Shelled Med-Surg Beds</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>2 ICU</td>
<td>2 ICU</td>
<td>Med-Surg 2</td>
<td>Med-Surg 2</td>
</tr>
<tr>
<td>5</td>
<td>1 ICU</td>
<td>BURN</td>
<td>Med-Surg</td>
<td>Med-Surg 2</td>
</tr>
<tr>
<td>4</td>
<td>NICU 1 PICU</td>
<td>Peds</td>
<td>Peds 2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Shelled LAB Roof LAB</td>
<td>Operating Rooms</td>
<td>Morgue &amp; Other</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Cath &amp; IG Neuro Support PACU</td>
<td>PACU</td>
<td>Materials Mngt</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Shelled Lobby</td>
<td>Food Services</td>
<td>Mechanical</td>
<td></td>
</tr>
<tr>
<td>Basement</td>
<td>Shelled Electrical</td>
<td>IT Electrical</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Legend**

- Negative Isolation Room
- Positive Room
- Shelled
- Positive Room - Chemo & IV Prep
- ORs
- Walkway & Waiting

The Negative Isolation rooms have been designed with:
- Negative pressure, with 13.5 air changes per hour,
- Rooms sealed against air leaks, consistent with CDC recommendations,
- Patient room door self-closing,
- Permanently installed visual mechanism and audible alarm to monitor air flow status,
- Direct exhaust to outside, away from air intakes and populated areas,
- Ante rooms, with 100% exhaust, and
- Meets all Type 1 OSHPD code requirements.

The Positive Pressure rooms have been designed with:
- Positive pressure, with 16.5 air changes per hour,
- HEPA filtration for supply air,
- Rooms sealed against air leaks,
- Self closing doors,
- Permanently installed visual mechanism and audible alarm to monitor air flow status,
- Ante rooms with 100% exhaust.
- Design per Type 1 OSHPD code requirements.

The Operating Rooms have been designed with:
- Positive pressure, with 20-25 air exchanges per hour, with 7-9 per hour of outside air,
- Air velocity of 25-30 CFM / sq. ft. at the surgical site, which complies with 2005 CDC recommendations,
- HEPA filter array over the surgical site, which exceeds NIH and ASHRAE requirements,
- Non-aspirating diffusers,
- No dead-panel areas over operative field, and
- Individual temperature and humidity controls.

Other Mechanical, Electrical and Plumbing features include:
- Water temperatures will be supplied, with the hot-set to highest range permitted by licensing and building code. Cold water will be maintained as low as practical with all piping routed to minimize heat gain,
- Hot water distribution systems in patient care areas will maintain constant recirculation. The distribution legs are a maximum length of 25 feet, which has been approved by OSHPD.
- Efforts will be made to avoid dead-legs in plumbing system design. Emergency power will restore appropriate power and air conditioning in all rooms required by code.
- MEP fixtures are stubbed out into all shelled areas (except the Basement); in order to minimize future disrupts to patient care areas.
- All equipment with separate duct exhaust in the Laboratories, Morgue, Central Sterile and Pharmacy (Chemo and IV Prep).
- Kitchen duct exhaust designed for zero odors (CPP Project: 053167; Air Quality Assessment).
- Food Service areas (Dish Washing, Refrigerators, Servery) designed with special waterproofing considerations (See Vol 4B for wall assemblies).
The Basic Building Blocks of the Hospital and Infection Control

The Med-Surg room is designed with the following considerations:

- All required headwall and Med-Gas support,
- Single occupancy,
- All ADA compliant,
- Day-bed couch to promote Family Centered Care,
- All rooms with a view and colors and finishes to enhance the healing environment,
- Sinks are hard surface, with integrated back splash to minimize potential for water intrusion at the wall,
- Hand wash station at entrance of each room, with waterless hand rub provided,
- Provision for Sharps disposal,
- Protective equipment items for the care giver stored at the entrance to the room.
THE ICU PATIENT ROOM

The ICU room is designed with the following considerations:

- All required Headwall, Monitoring and Med-Gas support,
- Single occupancy,
- State of the art lights for in-room procedures,
- All rooms provide for dialysis support,
- Day-bed couch to promote Family Centered Care,
- All rooms with a view and colors and finishes to enhance the healing environment,
- Sinks are hard surface, with integrated back splash to minimize potential for water intrusion at the wall,
- Hand wash station at entrance of each room, with waterless hand rub provided,
- Provision for Sharps disposal,
- A Swivette toilet (under the sink) is provided for in-room waste disposal, or patient use,
- Protective equipment items for the care giver stored at the entrance to the room,
- In addition to the Nurses Station, a monitoring station is provided between every two rooms.
THE UNIVERSAL OPERATING ROOM

The “Universal” Operating Room is designed with the following considerations:

- Maximum size of the room to accommodate staff and equipment. Typical room is 600 plus sq.ft.
- Two rooms back up to a sub-sterile equipment storage area,
- State of the art lights and booms,
- Scrub sinks (with timers) outside of every OR, with waterless hand rub provided in the room,
- Provision for Sharps disposal,
- HVAC state of the art for infection control. (See prior description for air exchanges, HEPA filtration, temperature and humidity controls.)
**Infection Control Construction Considerations**

The products and construction processes designated for the construction of the new Hospital are all reviewed to ensure compliance with the Infection Control measures in the plan. The following Table provides an Executive Summary of the issues considered.

<table>
<thead>
<tr>
<th>Control of Dust &amp; Dirt</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Tunnel connections</td>
<td>Construct solid barriers (framed stud &amp; drywall, 2 sided and sealed) within the utility and pedestrian connections adjacent and below the hospital connecting to the demolition site. These connections should be sealed to prevent movement of air, decreasing opportunistic airborne soil fungal spores from migrating into the existing clinical tower during demolition and excavation.</td>
</tr>
<tr>
<td>2. Back Fill Dirt</td>
<td>Locate the back fill pile of dirt across the street from the construction site will help minimize dust from helicopter landings.</td>
</tr>
<tr>
<td>3. Emergency Department Traffic</td>
<td>Develop a pedestrian access route between the heliport and the Emergency Department.</td>
</tr>
<tr>
<td>4. Minimizing street dust</td>
<td>Schedule regular street cleaning to minimize traffic dust. Street must be cleaned such that pedestrians and/or vehicles will not track or raise plumes of dust or soil.</td>
</tr>
</tbody>
</table>
| 5. Clean HVAC system   | All fans and duct work shall be installed clean, including the following measures  
  - All fans and duct work shall be dust and oil-free and shall be sealed prior to installation, unsealed during installation, and sealed after installation.  
  - Fan units should be protected from water damage before enclosure in the mechanical spaces.  
  - Duct openings should be sealed with plastic after they are installed until supply air is turned on.  
  - All duct joints sealed properly.  
  - Ductwork joint leakage test shall be performed after ductwork is complete, but prior to insulation being installed on the outside. |
| 6. Removal of Debris and Dust | Construction areas will be kept free from debris, trash, excessive dust, etc. and will be monitored daily. Activities that generate excessive dust will be controlled; incidental dust due to various construction activities is anticipated. |
| 7. Building Penetrations | Assure all building penetrations are properly installed and checked for leakage (air and water), including:  
  - Doors  
  - Windows-make sure all windows are sealed with manufacturer’s specified product  
  - Roof membranes  
  - Ventilation/exhaust ducts  
  - All tears, openings or punctures in vapor barriers have been repaired  
  - All flashings and caulking checked for proper lapping and application  
  - All roof drains drain away from the foundation  
  - Roof drains properly supported and braced for large volume storms  
  - Proper ventilation and screening of |
<table>
<thead>
<tr>
<th>Control of Moisture</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Steel (Sprayed Fire-Resistive Materials)</strong></td>
<td><strong>CAFCO 300 will be utilized as the spray applied fire-resistive material. CAFCO 300 is tested per ASTM C665-88 (Fungus Resistance Test)</strong></td>
</tr>
</tbody>
</table>
| **2. Delivery of Interior Materials (drywall, paneling, ceiling tiles, framing lumber, casework, etc)** | **All Interior Materials shall be free from excess moisture, mold and any other damage prior to installation. Damaged materials will be removed from the site and shall not be installed. Protective measures include:**  
  - Schedule delivery of material when conditions are such that adequate weather protection has been established.  
  - Provide dry storage of materials off ground, away from moisture sources.  
  - Minimize storage time.  
  - Plastic sheeting or tarps used to cover materials are secured loosely to allow air circulation. |
| **3. Dry Wall Placement** | **Dry wall installation shall comply with UL listed assembly; specification to include installation at about 1/4 to 1/2 inch off the slab for minimizing water wicking when it is spilled during construction and after occupancy. Assure proper caulking of gap under rock for acoustical or fire rating.**  
  Wall assemblies in areas potentially affected by water intrusion have been designed for this condition (See Vol 4B, Sheets A910, A911, and A912). Areas include, but are not limited to,**  
  - Bathrooms,  
  - Elevator shafts,  
  - Janitors closets,  
  - Dishwashing areas,  
  - Showers, and  
  - Hydrotherapy. |
<p>| <strong>4. Notification to Owners of Water Damage</strong> | <strong>Contractor will notify UCI of any water damage to building and plan for repair.</strong> |
| <strong>5. Drying Equipment Access</strong> | <strong>Prearrange for drying equipment access to use if water intrudes into building</strong> |</p>
<table>
<thead>
<tr>
<th>Fans</th>
<th>Dehumidifiers</th>
<th>Wet-Dry vacuums</th>
<th>Pumps</th>
<th>“Super sucker” trucks</th>
</tr>
</thead>
</table>

6. Exterior soils

Surrounding ground shall be sloped away from foundation.

### Control of Water & Waste Systems

1. Water & Waste Services

Check all water and waste services (including fire sprinklers) for the proper installation of all lines and drains, including the following.

- Plumbing systems and fire suppression sprinkler systems pressure checked and checked for leaks.
- Potable water system is to be flushed with chlorinated water consistent with local municipal requirement to clear sediment from pipes and minimize waterborne microorganism proliferation.
- Water lines (particularly chilled water) properly insulated.
- Test and inspect plumbing and sprinkler piping as required by specification
- Flush all lines thoroughly prior to occupation
- Evaluate water for local municipal drinking water standards.

### Control of Pests

1. New Building Pre-Baiting (Owner)

UCIMC will develop a plan for ground floor pre-baiting of NUH (such as boric acid in walls), with specific attention to areas such as:

- Entrances
- Food preparation and storage areas
- Garbage storage areas

2. Disposal of Waste

- Provide for proper disposal of food waste during construction.
- Provide sufficient portable restroom facilities for workers during construction; keep clean and well-maintained.
- Maintain STRICT rule of no waste disposal of any kind in walls of new building.
4. Overview of Planned ICRA Permits & Schedule

The following is an overview of the Infection Control Risk Assessment Permits that will be obtained. The Project Plan ICRA Schedule indicates four task lines for each discrete infection control activity:

- Week to review ICRA,
- Target Date to approve ICRA Permit,
- Week for Training, and
- Target Dates for Construction

Exterior ICRA Permits

Although the ICRA permit is not typically applied for exterior construction, all parties involved in the development of this plan agreed it would be beneficial to apply infection control concepts and the ICRA permit process to the majority of the exterior construction activities.

1. Demolition of Building # 2, 12, 13, 14
   - Start: 5.31.05  Finish: 7.13.05.
   - ICRA permit obtained 5.27.05
   - Construction activity: Demolition of Building #2
   - Potentially affected buildings/areas: Buildings 1, 1A, and 10

2. Excavation for New University Hospital
   - Start: 8.1.05 Finish: 11.21.05
   - ICRA permit obtained 7.25.05
   - Construction activities: Excavation
   - Potentially affected buildings/areas: 1, 1A, and 10

3. Excavation for Central Energy Plant
   - Start: 2.03.06 Finish: 11.20.06
   - Week to perform ICRA:
   - Construction Activities: Excavation
   - Potentially affected Buildings: 1, 1A, and 10

4. Excavation for relocation of 4160 Feeder Line
   - Start: 7.18.05 Finish: 7.22.05
   - ICRA permit obtained: 7.18.05
   - Construction Activities: Excavation and electrical
   - Potentially affected Buildings: Building 1A
Existing Hospital ICRA Permits

1. Remodel at the emergency room waiting area and security office areas.
   - Start: 6.06.05 Finish: 7.11.06
   - Date ICRA obtained: 5.27.05
   - Construction activity: Demolition of the Northern exterior wall at the security office.
   - Potentially affected buildings: 1A, Emergency waiting room and adjacent areas.

2. Building 1A Basement structural (reading room).
   - Start: 10.14.05 Finish: 12.09.05
   - Date ICRA obtained: 9.27.05
   - Construction Activities: Removal of concrete, structural reinforcement, framing.
   - Potentially affected Buildings: 1A, Radiology

3. Building 1A Second floor structural.
   - Start: 5.11.06 Finish: 6.22.06
   - Week to obtain ICRA: 4.24.06
   - Construction Activities: removal of roofing materials, drill and epoxy, scrape spray applied fire proofing, hang and finish drywall, finish trades
   - Potentially affected Buildings: 1A, second floor, OB / Post-Partum

4. Building 1A 3rd floor roof.
   - Start: 5.18.06 Finish: 7.13.06
   - Week to obtain ICRA: 5.08.06
   - Construction Activities: Demo of roofing materials, drill and epoxy
   - Potentially affected areas: Building 1A, second floor

5. Building 1A 3rd to 5th floors
   - Start: 9.01.06 Finish: 10.13.06
   - Week to obtain ICRA: 8.14.06
   - Construction Activities: Demo of roofing materials, drill and epoxy
   - Potentially affected areas: Building 1A, second through 5th floors
## 5. MATRIX FOR PRECAUTIONS

**Infection Control Risk Assessment**  
Matrix of Precautions for Construction & Renovation

**Step One:**  
Using the following table, *identify the Type of Construction Project Activity (Type A-D)*

<table>
<thead>
<tr>
<th>TYPE A</th>
<th>Inspection and Non-Invasive Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Includes, but is not limited to:</td>
</tr>
<tr>
<td></td>
<td>▪ removal of ceiling tiles for visual inspection limited to 1 tile per 50 sq. ft.</td>
</tr>
<tr>
<td></td>
<td>▪ painting (but not sanding); and</td>
</tr>
<tr>
<td></td>
<td>▪ wall covering, electrical trim work, minor plumbing, and activities which do not generate dust or require cutting of walls or access to ceilings other than for visual inspection.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TYPE B</th>
<th>Small-Scale, Short Duration Activities that Create Minimal Dust</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Includes, but is not limited to:</td>
</tr>
<tr>
<td></td>
<td>▪ installation of telephone and computer cabling;</td>
</tr>
<tr>
<td></td>
<td>▪ access to chase spaces; and</td>
</tr>
<tr>
<td></td>
<td>▪ cutting of walls or ceiling where dust migration can be controlled.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TYPE C</th>
<th>Work that Generates a Moderate-to-High Level of Dust or Requires Demolition or Removal of Any Fixed Building Components or Assemblies</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Includes, but is not limited to:</td>
</tr>
<tr>
<td></td>
<td>▪ sanding of walls for painting or wall covering;</td>
</tr>
<tr>
<td></td>
<td>▪ removal of floor coverings, ceiling tiles and casework;</td>
</tr>
<tr>
<td></td>
<td>▪ new wall construction;</td>
</tr>
<tr>
<td></td>
<td>▪ minor duct work or electrical work above ceilings;</td>
</tr>
<tr>
<td></td>
<td>▪ major cabling activities; and</td>
</tr>
<tr>
<td></td>
<td>▪ any activity which cannot be completed within a single work shift.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TYPE D</th>
<th>Major Demolition and Construction Projects</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Includes, but is not limited to:</td>
</tr>
</tbody>
</table>
activities which require consecutive work shifts;
requires heavy demolition or removal of a complete cabling system;
and
new construction.

Step Two:

Using the following table, identify the Patient Risk Groups that will be affected. If more than one risk group will be affected, select the higher risk group:

<table>
<thead>
<tr>
<th>Low Risk</th>
<th>Medium Risk</th>
<th>High Risk</th>
<th>Highest Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Office areas</td>
<td>Cardiology</td>
<td>CCU</td>
<td>Any area caring for immune compromised patients</td>
</tr>
<tr>
<td></td>
<td>Echocardiography</td>
<td>Emergency Room</td>
<td>Burn Unit</td>
</tr>
<tr>
<td></td>
<td>Endoscopy</td>
<td>Labor &amp; Delivery</td>
<td>Cardiac Cath Lab</td>
</tr>
<tr>
<td></td>
<td>Nuclear Medicine</td>
<td>Laboratories - specimen</td>
<td>Central Sterile Supply</td>
</tr>
<tr>
<td></td>
<td>Physical Therapy</td>
<td>Newborn Nursery</td>
<td>Operating rooms (including C-section rooms)</td>
</tr>
<tr>
<td></td>
<td>Radiology/MRI</td>
<td>Outpatient Surgery</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Respiratory Therapy</td>
<td>Pediatrics</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Post Anesthesia Care</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Unit</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Surgical Units</td>
<td></td>
</tr>
</tbody>
</table>

Step Three:

Match the Patient Risk Group (Low, Medium, High, Highest) with the planned Construction Project Type (A, B, C, D) on the following matrix, to find the Class of Precautions (I, II, III or IV) or level of infection control activities required.

Class I to IV or Color-Coded Precautions are delineated below.
IC Matrix - Class of Precautions: Construction Project by Patient Risk

<table>
<thead>
<tr>
<th>Patient Risk Group</th>
<th>TYPE A</th>
<th>TYPE B</th>
<th>TYPE C</th>
<th>TYPE D</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOW Risk Group</td>
<td>I</td>
<td>II</td>
<td>II</td>
<td>III/IV</td>
</tr>
<tr>
<td>MEDIUM Risk Group</td>
<td>I</td>
<td>II</td>
<td>III</td>
<td>IV</td>
</tr>
<tr>
<td>HIGH Risk Group</td>
<td>I</td>
<td>II</td>
<td>III/IV</td>
<td>IV</td>
</tr>
<tr>
<td>HIGHEST Risk Group</td>
<td>II</td>
<td>III/IV</td>
<td>III/IV</td>
<td>IV</td>
</tr>
</tbody>
</table>

Note: Infection Control approval will be required when the Construction Activity and Risk Level indicate that Class III or Class IV control procedures are necessary.

Description of Required Infection Control Precautions by Class

<table>
<thead>
<tr>
<th>During Construction Project</th>
<th>Upon Completion of Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLASS I</td>
<td>Clean work area upon completion of task.</td>
</tr>
<tr>
<td>1. Execute work by methods to minimize raising dust from construction operations. 2. Immediately replace a ceiling tile displaced for visual inspection</td>
<td>1. Wipe work surfaces with disinfectant. 2. Contain construction waste before transport in atmosphere 3. Seal unused doors with duct tape 4. Block off and seal air vents. 5. Place dust mat at entrance and exit of work area. 6. Remove or isolate HVAC system in areas where work is being performed.</td>
</tr>
<tr>
<td>CLASS II</td>
<td>1. Do not remove barriers from work area until completed project is inspected by the owner’s Safe Department and thoroughly cleaned by the owner’s Environmental Services Department. 2. Remove barrier materials carefully to minimize spreading of dirt and debris associated with construction 3. Vacuum work area with HEPA filtered vacuums 4. Wet mop area with disinfectant. 5. Remove isolation of HVAC System in areas where work is being performed.</td>
</tr>
<tr>
<td>1. Remove or Isolate HVAC system in area where work is being done to prevent contamination of duct system. 2. Complete all critical barriers i.e. sheetrock, plywood, plastic, to seal area from non work area or implement control cube method (cart with plastic covering and sealed connection to work site with HEPA vacuum for vacuuming prior to exit) before construction begins. 3. Maintain negative air pressure within work site utilizing HEPA equipped air filtration units. 4. Contain construction waste before transport in tightly covered</td>
<td></td>
</tr>
<tr>
<td>CLASS IV</td>
<td></td>
</tr>
<tr>
<td>----------------</td>
<td></td>
</tr>
<tr>
<td>1. Isolate HVAC system in area where work is being done to prevent contamination of duct system</td>
<td></td>
</tr>
<tr>
<td>2. Complete all critical barriers i.e. sheetrock, plywood, plastic, to seal area from non work area or implement control cube method (cart with plastic covering and sealed connection to work site with HEPA vacuum for vacuuming prior to exit) before construction begins.</td>
<td></td>
</tr>
<tr>
<td>3. Maintain negative air pressure within work site utilizing HEPA equipped air filtration units.</td>
<td></td>
</tr>
<tr>
<td>4. Seal holes, pipes, conduits, and punctures appropriately</td>
<td></td>
</tr>
<tr>
<td>5. Construct anteroom and require all personnel to pass through this room so they can be vacuumed using a HEPA vacuum cleaner before leaving work site or they can wear cloth or paper coveralls that are removed each time they leave the work site.</td>
<td></td>
</tr>
<tr>
<td>6. All personnel entering work site are required to wear shoe covers. Shoe covers must be changed each time the worker exits the work site.</td>
<td></td>
</tr>
<tr>
<td>7. Do not remove barriers from work area until completed project is inspected by the owner's Safety Department and Infection Control Department and thoroughly cleaned by the owner's Environmental Services Department.</td>
<td></td>
</tr>
<tr>
<td>1. Remove barrier material carefully to minimize spreading of dirt and debris associated with construction.</td>
<td></td>
</tr>
<tr>
<td>2. Contain construction waste before transport in tightly covered containers.</td>
<td></td>
</tr>
<tr>
<td>3. Cover transport receptacles or carts. Tape covering unless solid lid.</td>
<td></td>
</tr>
<tr>
<td>4. Vacuum work area with HEPA filtered vacuums.</td>
<td></td>
</tr>
<tr>
<td>5. Wet mop area with disinfectant.</td>
<td></td>
</tr>
<tr>
<td>6. Remove isolation of HVAC system in areas where work is being performed.</td>
<td></td>
</tr>
</tbody>
</table>
6. GENERAL SAFE WORK PRACTICES

- The subject work areas will be restricted to authorized visitors and personnel. Workers will be required to have attended an infection control training meeting prior to working on the site. (See the Training section of this Plan for “badge identification” requirements.) The meeting will review:
  1. the infection control procedures associated with their work activities,
  2. their infection control responsibilities, and
  3. other pertinent information.

- All barrier system shall be kept in place until all particulate-generating activities have ceased in the area. All barriers shall be checked for leaks.

- All dust-generating operations conducted with the existing hospital shall be performed using dust suppression devices, such as HEPA vacuums, performed within enclosures that are kept under negative air pressure and/or other appropriate engineering controls shall be applied. In areas kept under negative air pressure, all openings, including but not necessarily limited to interior doorways and duct openings, should be sealed. The work area enclosure should be exhausted to the outdoors. The precise type of barrier will be dictated by the type of work, the duration and the extent of the work performed in a specific area. All barriers should be kept away from heat-generating sources, electrical components, or other such devices. An appropriate number of HEPA negative air filtration machines should be used. Negative air pressure (at a minimum of -0.02 inches of water) should be maintained until clearance of the area is achieved. The work area enclosure air should be exhausted to the outdoors. Note that the precise type of barrier will be dictated by the type of work, the duration, and the extent of work performed in a specific area.

- The work area must be left free from accumulation of waste and rubbish at the end of each work shift;

- If suspect fungal growth is found, then the Project Superintendent shall be notified so that an investigation can be conducted to ascertain if the growth is superficial (confined only to an exposed surface) or if the growth is expected to exist within wall or ceiling cavities or air plenums. Surfaces with superficial fungal growth may be treated with A-456 disinfectant, and gross contamination shall be removed with a HEPA vacuum. Following removal of all loose fungal growth, a biocide-containing encapsulant will then be applied to the surface that once supported fungal growth.

- If fungal growth is expected to have occurred in wall or ceiling cavities in either the existing structures or the New University Hospital, then the Project Superintendent shall be notified so that an abatement contractor can be hired to perform remediation using all appropriate engineering controls.

- If fungal growth is expected to have occurred in an air plenum, then the Project Superintendent shall be notified so that an investigation can be conducted to ascertain if the air in that plenum is being circulated in any area of the hospital. If the plenum is part of the HVAC
system, then all appropriate air registers shall be deactivated or blocked. An abatement contractor will then be hired to perform remediation using all appropriate engineering controls.

- If body fluids are encountered, whether wet or dry, discontinue any operations that would likely aerosolize such fluids and contact the Project Superintendent. Gloves and other appropriate personal protective equipment should be worn when handling such exposed items. Said items shall be removed to an appropriate waste container. The Infection Control Officer should be contacted if additional information is needed.

- All exterior windows shall be kept closed at all times, except when needed as part of the negative air pressure system.

- If holes or other openings are discovered between floors, those openings shall be sealed.

- In the event of any water release event occurs in the New University Hospital, UCI Design & Construction Services shall be immediately notified. Affected materials shall be evaluated and a determination made as to what materials, in any, need to be removed. If water intrusion occurs during tie-ins, UCIMC shall make the determination if materials must be removed and replaced. In circumstance when affected materials are not removed, they shall be subjected to dehumidification measures so that those materials may be dry within 72 hours. Fans and dehumidifiers may be used for this purpose if approved by the Facilities Department. If dehumidification is not anticipated within 72 hours, then physical removal of affected building materials may be necessary and shall be considered. The causes of water intrusion into the subject structures should be identified or confirmed and repairs should be made accordingly.

- If fungal growth abatement is required to be performed by an outside contractor, then that work shall commence at the point of the most obvious water staining/suspect fungal growth and extend in both directions one stud bay or two feet past any signs of fungal growth or water staining. All adjacent wall/ceiling cavity interiors shall be vacuumed with equipment having HEPA filtration. The wall/ceiling interior surfaces should then be abraded as needed to remove fungal growth, cleaned with HEPA vacuum equipment, sanitized with a suitable biocide, encapsulated with a biocide-based material, and dried. During this abatement phase of work, inspections should be made of proximate walls in order to identify other possible fungal growth reservoirs and the cause(s) of the water intrusion. Additional abatement may be deemed necessary at that time.

- Any carpet in the areas affected by water intrusion should be dehumidified, or if affected by fungal growth, that carpet should be replaced. All tack strips, if any, showing evidence of water intrusion or fungal growth should be removed and discarded. The exposed sub floor should be vacuumed with equipment having HEPA filtration.

- Prior to starting abatement work, all mechanical systems and components in the units in which fungal growth abatement is planned shall be deactivated and sealed. The contractor shall deactivate and lock out power to all HVAC systems that affect or may affect any work area.
• The handling, containerization, and disposal of hazardous wastes shall be performed in accordance with all applicable county, state, and federal regulations, including but not limited to Title 22 of the California Code of Regulations, and Titles 40 and 49 of the Code of Federal Regulations.

• The subject work areas will be restricted to authorized visitors and personnel. These individuals will be required to attend a tailgate safety meeting upon entering the subject areas during which they will be informed of the various work zones and facilities, the health and safety hazards associated with their assigned work activities, control measures, the care and use of personal protective equipment, emergency action plans, and other pertinent information.

• Any skin contact with contaminated or potentially contaminated surfaces, samples or equipment shall be avoided. Hands shall be thoroughly washed after handling contaminated or suspected contaminated materials before eating, drinking, or other such activity.

• All persons entering the site will be required to identify themselves to the Project Superintendent. Persons who have not attended a tailgate safety meeting on that day shall be required to do so with the Construction Safety Officer or other authorized representative. Persons unfamiliar with the site will be informed of site hazards and shall be instructed to avoid contact with contaminated surfaces, soils, sample materials, or related equipment.

• Contaminated personal protective equipment will not be removed from the site until it has been cleaned or properly packaged and labeled for transportation and/or disposal.

• The work area must be left free from accumulation of waste and rubbish at the end of each work shift.

• At the end of each working day and/or the work being performed, site personnel shall restore the work area to the same degree of neatness as when work commenced.
7. STANDARD OPERATING PROCEDURES

- Infection-control personnel shall be actively involved in all phases of health-care facility’s design, demolition, construction, and renovation, and documentation to that effect shall be kept on the site. Hensel Phelps will ensure that the necessary types of construction barriers are in place at all appropriate times, and they shall perform daily inspections documenting the presence of negative airflow within the construction zone or renovation area.

- UCIMC shall monitor Negative airflow in All rooms and positive pressure in PE rooms at Building 1A.

- Possible environmental sources (e.g., water, laboratory solutions, or reagents) of specimen contamination should be evaluated when non-tuberculous mycobacteria (NTM) of unlikely clinical importance are isolated from clinical cultures. If environmental contamination is found, the probable mechanism shall be eliminated.

- If the project is rated a Class I or II, then proceed with work after appropriate infection control precautions have been instituted. No written ICRA permit form is required to be filed with the Infection Control Officer.

- If the project is rated a Class III or IV, then proceed with work only after appropriate infection control precautions have been instituted and after an ICRA permit form have completed and filed with the Infection Control Officer. The ICRA permit form shall be completed and precaution put into place by the Project Manager prior to the start of such work.

- For Class III and IV projects, precautions will be communicated to both project workers and staff members of the immediate work areas. All staff, contractors, subcontractors, material suppliers, and vendors are required to follow the precautions defined in the ICRA.

- All abatement work should be performed by an appropriately qualified and experienced contractor using engineering controls designed to reduce the potential for dispersion of spores and other airborne particulates. Personnel involved in the abatement efforts should be protected with, at minimum, air-purifying respirators with HEPA filtration. Respirator filters should be changed daily to preclude the possibility of mold growth on moist filter elements. Protective disposable clothing consisting of full-body coveralls, head covers, gloves, and boot covers should be worn by personnel during remediation activities. Skin protection is required to prevent contact with mycotoxins that may be present on fungi-contaminated materials. Note that all personnel performing remediation should be informed of the hazards associated with molds for immune compromised individuals, including those individuals with HIV, cancers, disorders of immune regulation, or allergic or hypersensitivity diseases.
• All industrial hygiene work should be performed by or under the direction of an individual who is certified in comprehensive practice by the American Board of Industrial Hygiene (ABIH). An industrial hygienist well acquainted with fungal growth abatement procedures, use of appropriate personal protective equipment, and with the health hazards associated with exposure to fungi should be present during performance of the abatement work. Prior to encapsulation of surfaces, a clearance inspection should be performed within the enclosed work areas by or under the direction of an ABIH-Certified Industrial Hygienist (CIH). When surfaces are suitably decontaminated, an encapsulant should be applied to surfaces as specified. Following encapsulation, an industrial hygienist should perform a clearance survey, during which surface and air samples are collected within the enclosed work area. The CIH should review all relevant data and clearance should be given prior to dismantling the abatement enclosure and release of the abatement area.

• In the event unanticipated hazardous material(s) are observed or symptoms of distress are experienced by workers, an investigation shall be conducted by the Construction Safety Officer, Project Superintendent, and/or CIH. These individuals have the authority to collect samples to ascertain the identity of the material(s).
8. TRAINING REQUIREMENTS

The Training Program is a critical element in the successful implementation of the infection Control Plan. All directly responsible D&CS, UCIMC Facilities, Hensel Phelps and Sub-Contractors personnel will receive instruction regarding the Infection Control Plan, Specific ICRA Permits and infection control measures.

The Training Program provides for tiered levels of information and compliance. The goal is to ensure knowledge applicable to each tier of responsibility and task duties. The follow diagram provides an overview of the program.

Infection Control Training Program

- Infection Control Officer Training for Facilities, D&CS & HP on Infection Control
- HP Supervisors Training on Infection Control Plan "Train the Trainers"
- HP Training w/ CIH & Infection Control Officer For Subs on Infection Control
- HP & Training For Subs on each Specific ICRA
- Each Worker receives a ★ on Badge
The initial Infection Control and ICRA training was provided to HP personnel by Hygiene Tech.

All construction and ancillary personnel that may under some circumstance encounter fungal growth during the course of their work shall receive training that includes topics concerning fungal growth, assessment, exposure potentials, harmful effects upon over-exposure, and general abatement techniques. Training schedules will be established by Hensel Phelps for all Sub-Contractors. All training records for all participants shall be maintained by Hensel Phelps.

Each Sub-Contractor shall brief each worker regarding infection control requirements applicable to their work. This training shall include a basic understanding of mold (fungal growth) and appropriate response, including notification of their supervisor and appropriate mitigation. Each worker shall sign and certify that they have been briefed and understand their responsibilities. Each worker shall be provided a one page infection control information sheet. Upon completion of this training, each applicable worker shall receive a star on their Badge and/or Hardhat.

★ These stars will provide visible verification on the job site that each worker has been appropriately trained.

All on-site construction and ancillary personnel shall have successfully completed all applicable Cal-OSHA training courses:

- Section 5144--Respiratory Protection
- Section 5155--Airborne Contaminants
- Section 5194--Hazard Communication
- Section 3203--Injury and Illness Prevention Program
- Section 5141--Control of Harmful Exposure to Employees
- Section 3204--Employee Exposure and Medical Records
- Article 10--Personal Safety Devices and Safeguards
9. COMPLIANCE PROGRAM

Inspections & Corrective Measures

D&CS is responsible for Inspection and all regulatory compliance of the construction of the new Hospital. This includes construction compliance with the requirements of the Infection Control Plan. D&CS will ensure their employees, vendors, and any other ancillary personnel under their supervision comply with the requirements of this infection control plan.

Hensel Phelps is required by contract to comply with all infection control requirements and ensure the compliance of their sub-contractors and vendors.

The Medical Center is required to ensure compliance for all Owner Furnished items and systems. UCIMC will ensure their employees, vendors, and other contractors comply with the requirements of this infection control plan. UCIMC will brief staff members in affected areas as to the nature of the work being performed, ICRA considerations (i.e. locations of critical barrier, duration of work, etc). UCIMC will also ensure their employees do not cross and/or alter critical barriers.

These three corporate entities are partners in the total Compliance Program. The following chart summarizes Inspection responsibilities, Frequencies and Authorities.

Components of the Compliance Program

<table>
<thead>
<tr>
<th>Inspection</th>
<th>Frequency</th>
<th>Authorities</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HP</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ensure Compliance</td>
<td>---</td>
<td>Corrective Measures if needed</td>
</tr>
<tr>
<td><strong>D&amp;CS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inspect &amp; Verify Compliance</td>
<td>---</td>
<td>Approve Corrective Measures</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Coordinate w/ Medical Center</td>
</tr>
<tr>
<td><strong>Medical Center</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Support: IC Officer &amp; Facilities</td>
<td>---</td>
<td>PM Monitoring</td>
</tr>
</tbody>
</table>

| **HP**     |           |             |
| Real Time Project Sup & Safety Officer | --- |             |

| **D&CS**   |           |             |
| OSHPD IORs: Continuous | --- | Const. Mngr Daily IC Observation Reports |

| **D&CS**   |           |             |
| Contract Administration | --- | Stop activity if needed to ensure Compliance |

| **HP**     |           |             |
| Contract Responsibilities w/ D&CS & All Subs | --- |             |

| **Medical Center** |           |             |
| Scheduled: Site Observations | --- | Weekly PM Monitoring & IC Com’t Reports |

| **Medical Center** |           |             |
| As Needed: Notification to D&CS of Concerns | --- |             |
Monitoring & Sampling

Unanticipated Event Assessment

In the event evidence of microbial growth is identified, or if for any other reason site personnel believe that building occupants may be exposed to microbes in concentrations that are above-background or whose types include one or more unexpected varieties of microbes, then HygieneTech would intend to develop an air monitoring surface/water sampling strategy that may include collection of 1) spore trap samples for total fungi analyses; 2) surface samples for fungal growth assessment determinations; 3) swab surface samples for viable microbe analyses to determine surface contamination of viable fungi and/or bacteria; 4) air samples to identify viable fungi and viable bacteria; 5) water samples to evaluate concentrations of *Legionella pneumophila* or other bacterium; 6) moisture content in materials and relative humidity in air; and/or 7) any air, surface, water or other sample deemed necessary to identify, evaluate, and control contaminants that pose a health threat to occupants in the subject environment.

Following receipt of the analytical data, which are expected approximately seven working days after the survey, HygieneTech would plan to prepare a report containing background information, observations, sampling locations and activities, monitoring results, conclusions, and recommendations. All professional services would be performed by or under the direction of Industrial Hygienists who are certified in the comprehensive practice of industrial hygiene by the American Board of Industrial Hygiene and who are registered Professional Engineers with the State of California.

Clearance Surveys

If fungal growth abatement activities are required at anytime during this project, HygieneTech would intend to provide monitoring and consulting services. HygieneTech surveys would be performed for the purposes of 1) meeting with the abatement contractor prior to commencement of work; 2) periodically inspecting work areas during as well as following completion of the abatement work but before encapsulation; 3) inspecting work areas again following encapsulation during which clearance air and surface samples would be collected; 4) assessing exposure potentials and associated health risks for building occupants; and 5) recording observations and analytical data that would indicate that surfaces in the hospital are not supporting fungal growth.

Following receipt of the analytical data, which are expected approximately seven working days after the survey, HygieneTech would plan to prepare a report containing background information, observations, sampling locations and activities, monitoring results, conclusions, and recommendations.

All laboratory analyses of industrial hygiene samples shall be performed at facilities that are accredited by the American Industrial Hygiene Association (AIHA) and participates in the National Institute for Occupational Safety and Health (NIOSH) Proficiency Analytical Testing.
program and is deemed proficient. All laboratory samples subjected to microbial analyses shall be performed at facilities that successfully participate in the AIHA Environmental Microbiology Proficiency Analytical Testing program. All samples submitted for analysis shall be accompanied by “Chain-of-Custody” and “Request for Analysis” forms.
10. RECORDKEEPING

Records shall be kept consistent with all applicable Contract requirements and Cal-OSHA regulations. The following records will be maintained at the offices of each contractor and subcontractor:

1. All required Contract Documents, including but limited to: work plans, schedules, drawings, specifications, logs, etc.
2. Hazard Communication Training
3. Medical Surveillance
4. Site Safety Inspection Reports
5. Personal Monitoring Records
6. Accident Logs and OSHA Logs

The following records will be maintained by the Project Superintendent and each subcontractor Site Manager at the site and/or the corporate offices as appropriate:

1. Infection Control Plan
2. Related ICRA Permits
3. Site Entry Log
4. Visitor Log
5. Accident Log
6. Worker Illness and Injury Reports
7. Sampling Activities
8. Daily Work Activities & Conditions
9. Chain of Custody Forms
10. Emergency Action Forms
11. Site Safety Inspection Reports
12. Training Records
13. Tailgate Safety Meeting Forms
11. SIGNATURES

Plan Prepared By:

_______________________________________________________________________
Brian P. Daly, CIH, Technical Director      Date

Plan Submitted By:

_______________________________________________________________________
Clint Squire, HP Project Manager       Date

Plan Submitted By:

_______________________________________________________________________
Dan Long, HP Superintendent       Date

Plan Approved By:

_______________________________________________________________________
Pat Nemeth, D&CS, Director Hospital Operations     Date

Plan Approved By:

_______________________________________________________________________
Linda Dickey, Medical Center, Infection Control Officer    Date
APPENDIX

A. Forms
B. Definitions
C. Documents Reviewed
D. Emergency Contacts
A. Forms

UCI Medical Center
EXTERIOR CONSTRUCTION
INFECTION CONTROL RISK ASSESSMENT (ICRA) PERMIT

Exterior construction which may: 1. Raise plumes of dust or soil, and or 2. Intrude into existing water systems, and/or 3. Create moisture conditions for future mold growth in or on new or existing structures will comply with the ICRA measures specified below.

<table>
<thead>
<tr>
<th>Project Title/Phase:</th>
<th>Start Date:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brief Description:</td>
<td>Est. Completion Date:</td>
</tr>
<tr>
<td>Project Coordinator:</td>
<td>Phone/Pager:</td>
</tr>
<tr>
<td>Contractor/Vendor:</td>
<td></td>
</tr>
<tr>
<td>Contractor Representative:</td>
<td>Rep Telephone/Pager:</td>
</tr>
</tbody>
</table>

PROTECTIVE MEASURE | PERSONS RESPONSIBLE

**Control of Impacts:**

**Dust Mitigations:**
1. Spoils will be covered or bagged.
2. No spoils will remain near heliport.
3. Dust plumes will be watered.
4. Street dust will be minimized by:
   - Truck wheel cleaning
   - Street cleaning as indicated by visible dust plumes

**Engineering measures:**
1. Stairwell/window enclosures:
2. Provide new pre-filters to (list affected air handlers) prior to start of work
3. Maintain optimal air filtration throughout project
4. Maintain positive pressure from Emergency Department to exterior during project
5. Provide particle monitoring (interior/exterior) to validate performance of filters

**Administrative measures:**
1. Route pedestrian (patient and staff) traffic away from construction area
2. Education:
3. Clothing of contractors will be free of gross debris/dust when entering any of the hospital’s facilities.

**Control of Impacts:**

**Moisture Mitigations:**
1. Assure surrounding ground is sloped away from foundation

**Engineering measures:**
1. Assure all building penetrations are properly installed and checked for leakage (air and water)

**Administrative measures:**
<table>
<thead>
<tr>
<th>Control of impacts:</th>
<th>Mitigations: None</th>
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<tbody>
<tr>
<td>Water systems:</td>
<td>Engineering measures:</td>
</tr>
<tr>
<td></td>
<td>Check all water services for:</td>
</tr>
<tr>
<td></td>
<td>• Proper installation</td>
</tr>
<tr>
<td></td>
<td>• Plumbing systems pressure checked and checked for leaks.</td>
</tr>
<tr>
<td></td>
<td>• Potable water system is to be flushed with chlorinated water consistent with local municipal requirement to clear sediment from pipes and minimize waterborne microorganism proliferation.</td>
</tr>
<tr>
<td></td>
<td>• Evaluate water for local municipal drinking water standards</td>
</tr>
<tr>
<td></td>
<td>• Water lines (particularly chilled water) properly insulated</td>
</tr>
<tr>
<td></td>
<td>• Insure all drains are connected</td>
</tr>
<tr>
<td></td>
<td>• Test and inspect plumbing and sprinkler piping as required by specification</td>
</tr>
<tr>
<td></td>
<td>• Due to issues related to stagnant water, flush all lines thoroughly</td>
</tr>
<tr>
<td>Administrative measures:</td>
<td>None</td>
</tr>
<tr>
<td>---------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>Control of impacts:</td>
<td>Mitigations: None</td>
</tr>
<tr>
<td>Pest s:</td>
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<tr>
<td></td>
<td>Administrative measures: None</td>
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</tbody>
</table>

Additional requirements:

Approved by:

Owner- Date: 
Contractor- Date: 

Reported to:

Date:
## UCI Medical Center
### INFECTION CONTROL RISK ASSESSMENT (ICRA) PERMIT

<table>
<thead>
<tr>
<th>Project Title:</th>
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<td>Project Coordinator:</td>
<td>Est. Completion Date:</td>
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<td>Contractor/Vendor:</td>
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<tr>
<td>Contractor Representative:</td>
<td>Rep Telephone/Pager:</td>
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</table>

<table>
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<th>Check Off Type &amp; Group</th>
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<tr>
<td>GROUP 1</td>
<td>Class I</td>
<td>Class II</td>
</tr>
<tr>
<td>GROUP 2</td>
<td>Class I</td>
<td>Class II</td>
</tr>
<tr>
<td>GROUP 3</td>
<td>Class I</td>
<td>Class II</td>
</tr>
<tr>
<td>GROUP 4</td>
<td>Class II</td>
<td>Class III</td>
</tr>
</tbody>
</table>

### CLASS I
1. Execute work by minimizing dust generation from construction operations
2. Immediately replace any ceiling tile displaced for visual inspection
3. Minimize patients’ exposure to work area

### CLASS II
1. Provide active means to prevent airborne dust from dispensing into atmosphere
2. Use wet method to control dust while cutting
3. Seal unused doors with duct tape
4. Block off and seal air vents
5. Wipe horizontal and patient care surfaces with a hospital approved disinfectant
6. Contain construction waste before transport in tightly covered containers
7. Wet mop and/or vacuum with HEPA filtered vacuum before leaving work area
8. Place dust mat at entrance and exit of work areas and replace or clean when no longer effective

### CLASS III
1. Isolate HVAC system in area where work is being done to prevent contamination of duct system
2. Complete all critical barriers before construction begins
3. Maintain negative air pressure within work site utilizing HEPA equipped air filtration units and/or use cubicle containment system to isolate dust
4. Do not remove barriers from work area until complete project area is thoroughly cleaned
5. Vacuum work area with HEPA filtered equipment
6. Wet mop area with hospital approved disinfectant
7. Direct construction and debris traffic away from pt. care areas
8. Contain construction waste before transport in tightly covered containers
9. Remove barrier materials carefully to minimize spreading dirt and debris; wet wipe or HEPA vacuum barriers prior to removal
10. Place dust mat at entrance and exit of work areas and replace or clean when no longer effective

### CLASS IV
1. Must obtain Infection Control review of project before work begins
2. Isolate HVAC system in area where work is being done to prevent contamination of duct system
3. Complete all critical barriers before construction begins
4. Maintain negative air pressure within work site utilizing HEPA equipped air filtration units
5. Seal holes, pipes, conduits and punctures prior to start of work
6. 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 remove each time they leave the work site. Wet mop or HEPA vacuum the anteroom daily
7. Place dust mat at entrance and exit of work areas and replace or clean when no longer effective
8. Direct construction and debris traffic away from pt. care areas
9. Do not remove barriers from work area until complete project area is thoroughly cleaned
10. Vacuum work area with HEPA filtered equipment
11. Wet mop area with hospital approved disinfectant
12. Remove barrier materials carefully to minimize spreading dirt and debris; wet wipe or HEPA vacuum barriers prior to removal
13. Contain construction waste before transport in tightly covered containers
14. During demolition, dust producing work or work in the ceiling, disposable shoe covers & coveralls must be worn & removed in the anteroom when leaving the work area

### Additional requirements:

<table>
<thead>
<tr>
<th>Project Manager:</th>
<th>Date:</th>
<th>Infection Control:</th>
<th>Date:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contractor:</td>
<td>Date:</td>
<td>Unit Manager:</td>
<td>Date:</td>
</tr>
</tbody>
</table>

50
ICRA Observation Report

Date: Report #: 
Project Name: 
Project Number: 
Documented By:
B. Definitions

Airborne Infection Isolation

Airborne infection isolation (AII) refers to the isolation of patients infected with organisms spread via airborne droplet nuclei <5 microns (µm) in diameter. This isolation area receives numerous air changes per hour (ACH) (≥ 12 ACH for new construction as of 2001; ≥ 6 ACH for construction before 2001), and is under negative pressure, such that the direction of the air flow is from the outside adjacent space (e.g. the corridor) into the room. The air in an AII room is preferably exhausted to the outside, but may be re-circulated provided that the return air is filtered through a high-efficiency particulate air (HEPA) filter. The use of personal respiratory protection is also indicated for persons entering these rooms when caring for TB or small pox patients and for staff who lack immunity to airborne viral diseases (e.g. measles or varicella zoster virus [VZV] infection).

Protective Environment

Protective environment (PE) is a specialized patient-care area, usually in a hospital, with a positive air flow relative to the corridor (i.e., air flows from the room to the outside adjacent space). The combination of HEPA filtration, high numbers of air changes per hour (≥ 12 ACH), and minimal leakage of air into the room creates an environment that can safely accommodate patients who have undergone allogenic hematopoietic stem cell transplant (HSCT).

Immune Compromised Patients

Immune compromised patients are those patients whose immune mechanisms are deficient because of immunologic disorders (e.g., human immunodeficiency virus [HIV] infection or congenital immune deficiency syndrome), chronic diseases (e.g., diabetes, cancer, emphysema, or cardiac failure), or immunosuppressive therapy (e.g., radiation, cytotoxic chemotherapy, anti-rejection medication, or steroids). Immune compromised patients who are identified as high-risk patients have the greatest risk of infection caused by airborne or waterborne microorganisms. Patients in this subset include persons who were severely neutropenic for prolonged periods of time (i.e., an absolute neutrophil count [ANC] of ≤ 500 cells/mL), allergenic HSCT patients, and those who have received the most intensive chemotherapy (e.g. childhood acute myelogenous leukemia patients).
C. Documents Reviewed

The following is a partial list of the documents that were reviewed and used in preparing the Infection Control Plan.

- UCI Replacement Hospital Base Bid Contract Documents, dated 12/04
- UCIMC Protocol Infection Control Plan, Fall 2004
- Special thanks to Denver Children’s Hospital for review of their construction protocol.
- California Code of Regulations, Title 22, Division 5, Chapter 1: General Acute Care Hospitals
- CDC Guideline for the Prevention of Transmission of Mycobacterium tuberculosis in Health-Care Facilities, 1994
- CDC Guideline for Environmental Infection Control in Health-Care Facilities, 2003
- Allegheny County Health Department report on Legionella Infection, dated January, 1997
- ASHE ICRA Matrix and Permit
- ASHRAE Journal article entitled “Ventilation,” June 2001

- Methodology for Minimizing Risk from Airborne Organisms in Hospital Isolation Rooms, ASHRAE Transactions, Symposia, 2000


- Aspergillus fumigatus and Aspergillosis, Clinical Microbiology Reviews, April, 1999

- Assessment of Health Risks Related to Construction, HPAC Engineering, February, 2002
D. Emergency Contacts

In the event of an emergency, the team member that observes this condition shall give an emergency alarm (three blasts of an emergency horn). All unnecessary communications will cease and the member giving the alarm shall notify the Project Superintendent of all pertinent information. Actions shall be directed by the Project Superintendent, Construction Safety Officer, CIH, or other competent authority. All injured personnel shall be taken to the UCIMC Emergency Room and all uninjured personnel shall remain in a safe area.

All appropriate local emergency response agencies shall be notified immediately. Emergency contacts include:

- UCIMC (714) 456-5700
- Fire Department 911
- Police 911
- Ambulance/Paramedics 911
- Poison Control Center (University of California) (714) 634-5988
- National Response Center (800) 424-8802
- Chemtrec (24 hours) (800) 424-9300

All emergency actions as well as emergency and non-emergency accidents/injuries shall be documented by the Project Superintendent, Construction Safety Officer, or other competent individual, in accordance with all applicable regulations.
Infection Control Management During Construction

- UCI MC Replacement Hospital
ICRA PERSONNEL/ RESPONSIBILITIES

- Linda L. Dickey – UCI MC Infection Control Officer
- Pat Nemeth – UCI D&CS Director
- Don Holm – UCI D&CS Construction Mgr
- Greg Eikam – UCI MC Facilities Director
- Clint Squire – HP Project Manager
- Anthony Peltier – HP Industrial Hygienist
- Dan Long – HP Project Superintendent
- Kevin Martin – HP Superintendent
- Brian P. Daly – Hygiene Tech-Certified Industrial Hygienist
Why care about Infection Control during construction?
Because...

- Disease causing organisms result in nearly two million infections in hospitals each year.
- Nearly 88,000 individuals die as a result of these infections.
- At least 5% of these deaths have been linked to construction activities in or near medical facilities.
Documented Outbreaks

• 21 cases of invasive aspergillosis at Johns Hopkins Hospital
  – Cause: Depressurized oncology rooms, poorly sealed windows and doors

• “Patients at Scripps Memorial exposed to potentially lethal fungus”
  – Investigators declared hospital failed to maintain a sanitary environment (16 cases of aspergillosis with 6 deaths)

• “5 patients infected and colonized in burn and oncology units”
  – Cause: Air intake vents had not been covered during demolition

• “Two patients die at LA hospital due to hospital-acquired legionnaires disease”
Johns Hopkins Hospital

FIGURE 1. Schematic floor plan of the third floor bone marrow transplant unit. The second floor, which houses the leukemia unit, is identical in layout. The number of cases in each room is indicated by variable shading, and the cases in the two floors have been combined for the figure. Fourteen of the 21 cases were in the southeast corner of the floor, near the door to the central stairwell. The inpatient-outpatient clinic is labeled as IPOP. The entrance through the double doors is located on the northern end of the floor.

Thio, CL, et.al., ICHE vol21 p18, Jan 2000
Potential Environmental/Construction Hazards:

- *Aspergillus* mold species
- Legionella bacteria species
- Excess construction dusts/debris
- Welding fume
- *Varicella-zoster* virus
- *Mycobacterium tuberculosis*
How Do Patients Get Infections From Construction?

Examples:

- Construction dust and debris
- Wet construction materials
- Open doors and windows
- Construction induced vibration
- Biofilm in pipes released during/after work
What is the difference in these shaft walls?
-Luck?
-Better materials?
-Construction Mgmt?
-All of the above?
Aspergillus

- Fungi commonly found in soil, water, plants, and dust/debris
- May be dislodged during construction
- Causes invasive Aspergillosis
- High Mortality
Legionella

- In still/stagnant water and biofilms
- Infects humans via droplets (e.g. showerheads, fountains, A/C units)
- Avoid dead legs in plumbing
- Flush water lines prior to patient use

Figure 1. Legionella are found in greater concentrations in the biofilm; a high-nutrient slime layer coating pipes and surfaces in contact with water.
Infection Control Risk Assessment (ICRA)

“For all construction projects in a health care facility the risk of construction induced infection shall be assessed and potential patient impact identified and controlled”. (J CAHO, CDC, AIA)
ICRA is a Thought Process

- Applies to all projects, large & small
- Goal is to protect patients and healthcare workers
- Improve Quality
Risk Assessment Should Consider

- Patient population
  - Immunosuppression (Oncology, Infants, Burn Units, Steroid therapy, Transplants)
- Extent of the Project
- Duration of the Project
- Impact on Mechanical Systems
- Whether the space will remain occupied during construction
- What surrounding areas may be impacted
ICRA Matrix

- **Type A**: Non invasive activities
- **Type B**: Small scale short duration
- **Type C**: Moderate to high level of dust, demolition
- **Type D**: Major demolition

<table>
<thead>
<tr>
<th>Patient Risk Group</th>
<th>Construction Project Type</th>
<th>TYPE A</th>
<th>TYPE B</th>
<th>TYPE C</th>
<th>TYPE D</th>
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</thead>
<tbody>
<tr>
<td>LOW Risk Group</td>
<td></td>
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<td>II</td>
<td>II</td>
<td>III/IV</td>
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<tr>
<td>MEDIUM Risk Group</td>
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<td>III</td>
<td>IV</td>
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<tr>
<td>HIGH Risk Group</td>
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<td>III/IV</td>
<td>III/IV</td>
<td>IV</td>
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<tr>
<td>HIGHEST Risk Group</td>
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<td>II</td>
<td>III/IV</td>
<td>III/IV</td>
<td>IV</td>
</tr>
</tbody>
</table>
Construction-Related Roof Leak

Construction schedules: difficult to coordinate
Roofer behind schedule while sheetrock ahead

Water damage requires immediate response
Building 1A ICRA Permit Requirements
Critical Barriers
Critical Barriers
Pressurization
Pressurization
Pressurization
Enforcement

- HPCC – Continuous Inspection
- UCI D&CS – OSHPD I ORs Continuous; Const. Mngr Daily
- Medical Center: Scheduled Site Observations
- “Star Program”
ICRA Education

• Today’s overview
• Specific training for each ICRA during project
  - Includes general ICRA principles/practices
  - Requirements for each permit
  - Will receive STAR on hardhat
• Information for hospital staff
Bottom line: What do I need to do?

- Educate yourself
- Reinforce education for your workers
- Know your ICRA permit requirements
- Monitor
- Communicate issues