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SECTION 013533 - INFECTION CONTROL PROCEDURES

Revise this Section by deleting and inserting text to meet Project-specific requirements.

This Section uses the term "Architect." Change this term to match that used to identify the design professional as defined in the General and Supplementary Conditions.

This document was developed after much research into infection control issues and standards defined by several hospital clients. Research indicated that the Centers for Disease Control (CDC) provided infection control risk assessment guidelines that many hospitals have followed. This section is based on the CDC ICRA guidelines. The charts contained within are borrowed from these same CDC guidelines.

The Project Architect should review this document and the issues presented with the Owner, Owner's Representative and the Owner's Infection Control Risk Manager before proceeding.

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Retain or delete this article in all Sections of Project Manual.

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes policies and procedures required of the Contractor to prevent transmission of infectious agents to vulnerable patient populations, health care workers and visitors within the [Hospital][clinical][clean room] environment.
- B. Related Requirements:

Retain subparagraphs below to cross-reference requirements Contractor might expect to find in this Section, but are specified in other Sections.

1. Division 01 Section "Temporary Facilities and Controls" for additional procedures and construction of temporary barriers.
2. Division 15 Sections for cleaning heating, ventilation and air-conditioning systems and ductwork prior to operation.

Retain this subparagraph if Work specified in this Section is measured and paid for under the provisions of alternates to determine a cost for infection control procedures.

3. Alternates: Refer to Division 1 Section "Alternates" for description of Work in this Section affected by alternates.

Remove any definitions not required to assist the Contractor in understanding the gravity of the situation.

1.3 DEFINITIONS

- A. Aspergillus: A thermotolerant fungus that causes significant disease among immunocompromised hosts that will disseminate to other organs including the skin and the brain. These fungi are ubiquitous, found in soil, water, dust and decaying material. Aspergillus have been cultured from unfiltered air, ventilation systems, contaminated dust dislodged during hospital renovation and construction, horizontal surfaces, food,

and ornamental plants. Aspergillus spores are easily suspended in the air and survive for prolonged periods. Because of their size, they are easily inhaled, which can lead to invasive infection of both the upper and lower respiratory tracts in a susceptible host.

- B. Biocide: A physical or chemical agent that is capable of killing microorganisms.
- C. Immunocompromised: A condition where a patient's immune response is reduced or absent. Because defense mechanisms are limited in immunocompromised patients, they are susceptible to infections by microorganisms that are present everywhere, but do not cause disease in healthy people.
- D. Nosocomial: An infection that is acquired in a hospital or as a result of medical care.

Retain the option below if the project is a healthcare environment.

- E. Negative Pressure: The relative air pressure difference between two areas in a [healthcare][clinical][clean room] facility. A space that is at negative pressure has a lower pressure than adjacent areas, ensuring that any directional air movement is from the clean air environment into the contained area and preventing contaminated air from escaping into adjacent rooms or areas through doors, openings and cracks.
- F. HEPA: An acronym that stands for high efficiency particulate air. A HEPA filter is an air filter capable of capturing 99.97% of particles as small as .3 microns.
- G. Multi-Stage Filtering: Successive, filtering that prevents early loading of filters with contaminants and thereby delaying reduced airflow. Typical multi-stage filters might consist of a large particulate filter (10 microns), a smaller particulate filter (5 microns), an activated charcoal filter (odors) and a HEPA filter (.3 microns).
- H. Negative Pressure Machine: Freestanding, portable device that creates a negative air pressure within a space. It does so by removing air via flexible ductwork from the containment area. The units can also be placed remotely from the containment area and use ductwork to remove air from the controlled environment.

Consider retaining the paragraph above or below depending on the requirements of the project. Be aware that terms "portable air scrubbers" and "negative pressure machines" are often used interchangeably; therefore, you may want to retain both to eliminate confusion. Be sure to select the appropriate option in the PRODUCTS article.

- I. Portable Air Scrubber: Freestanding, portable device that removes airborne contaminants by recirculating air through a HEPA filter. Portable air scrubbers can also serve as negative pressure machines by exhausting the recirculated air from the containment area.
- J. Containment: The process of isolating a contaminated area from the rest of the facility. Depending on the work to be done and the equipment required, airlocks, pass throughs, and equipment rooms may be necessary. Full containment always requires that negative pressure be maintained inside the containment area.

1. Containment Requiring Activities include, but are not limited to the following:

Modify the list to suit project or retain all for improved understanding.

- a. Demolition and removal of walls, floors, ceilings and other building finish materials.
 - b. Demolition of plumbing, mechanical and electrical systems and equipment.
 - c. Finish operations such as sanding, painting and application of special surface coatings.
 - d. All routine construction activity that can generate dust.
 - e. Sitework operations.
2. Source containment can also be used with localized negative pressure if a very small area is involved. A small piece of plastic sheet can be taped around the area to be removed. A small HEPA vacuum is used for this purpose by

inserting the inlet nozzle inside this small containment to create a negative pressure and to vacuum up released particles.

Designate who defines "containment area" or where information defining "containment area" can be found.

- K. Containment Area: The construction activity area, adjacent staging and storage areas, passages for construction personnel to access the project site and delivery and removal of supplies and waste. It includes the entire volume of the project area including ceilings spaces above and adjacent to the construction area. Containment areas are determined **[by the Owner's Representative] [and] [the Hospital's Infection Control Committee] [as indicated on the Drawings]**.
- L. Pressure Differential: The difference in magnitude between a reference pressure and a variable pressure.
- M. Source containment can also be used with localized negative pressure if a very small area is involved. A small piece of poly sheet can be taped around the area to be removed. A small HEPA vacuum is used for this purpose by inserting the inlet nozzle inside this small containment to create a negative pressure and to vacuum up released particles.
- N. Air changes per hour is equal to the air filtered (in cubic feet) in one hour divided by the containment area size (in cubic feet), or

$$\text{Air Changes per Hour (AC/H)} = \frac{\text{Cubic Feet of Air filtered in 1 Hour}}{\text{Containment Area Size in Cubic Feet}}$$

Designate who defines "protection area" or where information defining "protection area" can be found.

- O. Protection Area: The designated project limits, **[hospital][clinical]** areas adjacent to containment area, either occupied or used for passage and areas connected to construction areas by mechanical system intake, exhaust and ductwork. Protection areas are determined **[by the Owner's Representative] [and] [the Hospital's Infection Control Committee] [as indicated on the Drawings]**.
- P. Minor Ceiling Access: Removal of limited ceiling or access panels for visual observation, minor adjustments or other activities that do not disturb dust. All acoustical and access panels shall be closed immediately upon leaving the worksite.
- Q. Major Ceiling Access: Removal of ceiling panels or systems that is not defined as "minor".
- R. Thorough Cleaning: Cleaning of surfaces that become exposed to dust shall be accomplished by the use of either a HEPA-filtered vacuum cleaner or a wet mop.
- S. Infection Control Risk Assessment (ICRA): A broad, long-range involvement of a Hospital's infection control/epidemiology leadership to assess the risk to patients and the Hospital environment to airborne contamination.

1.4 POLICY

The policy described below is general in nature, but one that any hospital or clinical facility could support. Verify with the Owner whether this fits the situation. Modify as needed to include Owner-specific requirements, if any.

- A. The intent of this policy is to minimize nosocomial infections in patients that may arise as a result of exposure to organisms released into the environment during construction and renovation activities. Controlling the dispersal of airborne or waterborne infectious agents concealed within building components is critical in all **[Insert Hospital Name Here][clinical][clean room]** facilities.

- B. Patient Care Objectives: All construction and renovation activities shall be defined and managed in such a way that **[patients']****[occupants']** exposure to dust, moisture and their accompanying hazards is limited.
1. Aspergillosis and related nosocomial fungal infections are caused through inhalation by immunocompromised patients of aspergillus spores, or other related spores, that can be present in the construction environment. The spores are known to be prolifically present in construction dust, debris and earthwork excavation dust. Outbreaks are associated with unfiltered air, contaminated ventilation systems at intake and exhaust ducts, and dust that is dislodged by renovation and construction. Control of construction dust, debris and excavation dust is imperative to help prevent outbreaks of aspergillosis or related nosocomial fungal infections in immunocompromised patients.
 - a. Inhalation of aspergillus spores or other fungal spores by immunocompromised patients can lead to serious complications and death.
 - b. Aspergillus and other related spores are present in the natural environment and are not a risk to healthy construction workers.
 2. Airborne contaminant control is critical in all **[Hospital]****[clinical]****[clean room]** areas. Contractor shall limit dissemination of airborne contaminants produced by construction-related activities, in order to provide protection of immunocompromised patients, other patients, staff, diagnostic operations and sensitive procedures and medical equipment from possible undesirable effects of exposure to such contaminants.
 3. Dust in ceilings and construction debris contains fungus spores. Construction activities causing disturbance of existing dust, or creating new dust, or other airborne contaminants, must be conducted in tight enclosures cutting off any flow of particles into patient areas.
 4. Ceilings and walls in protected areas and other areas within **[Hospital]****[clinical]****[clean room]****[Insert Other Facility Type Here]** as indicated on Drawings must be secure from airborne transmissions at all times. If access into the ceiling in occupied areas is required, procedures described within this Section shall be followed.
 5. Enclosed carts must be used when transporting construction debris and materials throughout the **[Hospital]****[clinical]****[clean room]** environment. The **[Owner Representative]** **[and]****[Infection Control Committee]** shall approve the transportation path and destination terminus prior to commencing the project.

The ARTICLE below describes the various situations in which infection control precautions must be taken. Evaluate each project situation with the Owner to determine the risk assessment by following the 4 steps described below. After evaluating the project situation, you may determine that the guidelines for small projects are not needed within the specification because the requirements are clear-cut. If so, the precautions can be described and the charts do not need to be a part of this section and should be deleted prior to final printing. For larger or complicated projects, one should retain the charts to assist the Contractor in better understanding the precautions necessary and the risks involved.

1.5 PROCEDURES

- A. The Owner's Representative in conjunction with the Hospital's Infection Control Committee will:

Retain option below if Assessment Guidelines are included in project manual.

1. Determine the infection control project classification using the matrices **[(located below)]**.
2. Coordinate the relocation of affected patients and pedestrian traffic routes to areas where there is less potential for exposure to airborne contaminants with the responsible departments.
3. Coordinate the preparation of the project area, including the removal of medical supplies, waste, and equipment, prior to the commencement of project activities with the responsible departments.

B. Infection Control Risk Assessment (ICRA) Guidelines

1. STEP 1: Identify the Construction Project Activity Type (Types A-D) by selecting the appropriate construction activity type from the table below. Construction activity type is determined by the amount of dust that is generated, the duration of the activity and the involvement with HVAC systems.

Construction Project Activity by Type (A-D)	
TYPE A	<p>Inspection and Non-Invasive Activities. Includes, but is not limited to:</p> <ul style="list-style-type: none"> ▪ removal of ceiling tiles for visual inspection only, e.g., limited to 1 tile per 50 square feet ▪ painting (but not sanding) ▪ wallcovering, electrical trim work, minor plumbing, and activities that do not generate dust or require cutting of walls or access to ceilings other than for visual inspection.
TYPE B	<p>Small scale, short duration activities which create minimal dust Includes, but is not limited to:</p> <ul style="list-style-type: none"> ▪ installation of data, telephone and computer cabling ▪ access to chase spaces ▪ cutting of walls or ceiling where dust migration can be controlled.
TYPE C	<p>Work that generates a moderate to high level of dust or requires demolition or removal of any fixed building components or assemblies Includes, but is not limited to:</p> <ul style="list-style-type: none"> ▪ sanding of walls for painting or wall covering ▪ removal of floorcoverings, ceiling tiles and casework ▪ new wall construction ▪ minor duct work or electrical work above ceilings ▪ major cabling activities ▪ any activity that cannot be completed within a single workshift.
TYPE D	<p>Major demolition and construction projects Includes, but is not limited to:</p> <ul style="list-style-type: none"> ▪ activities which require consecutive work shifts ▪ requires heavy demolition or removal of a complete cabling system ▪ new construction.

- C. STEP 2: Identify the Patient Risk Group that will be affected by selecting the appropriate Patient Risk Group from the table below. The Patient Risk Groups

defined are based on project location and occupancy. If more than one risk group will be affected, select the higher risk group. For all construction classes, patients must be removed from the room while work is performed.

Patient Risk Group			
Low Risk	Medium Risk	High Risk	Maximum Risk
<ul style="list-style-type: none"> ▪ Office areas 	<ul style="list-style-type: none"> ▪ Cardiology ▪ Echocardiography ▪ Endoscopy ▪ Nuclear Medicine ▪ Physical Therapy ▪ Radiology/MRI ▪ Respiratory Therapy 	<ul style="list-style-type: none"> ▪ CCU ▪ Emergency Room ▪ Labor & Delivery ▪ Laboratories (specimen) ▪ Medical Units ▪ Newborn Nursery ▪ Outpatient Surgery ▪ Pediatrics ▪ Pharmacy ▪ Post Anesthesia Care Unit ▪ Surgical Units 	<ul style="list-style-type: none"> ▪ Any area caring for immunocompromised patients ▪ Burn Unit ▪ Cardiac Cath Lab ▪ Central Sterile Supply ▪ Intensive Care Units ▪ Negative pressure isolation rooms ▪ Oncology ▪ Operating rooms including C-section rooms

- D. STEP 3: Match the Patient Risk Group (Low (L), Medium (M), High (H), Maximum Risk (X)) with the Construction Project Type (A, B, C, D) to find the Class of Precautions (I – IV). Using the Construction Activity Type and the Patient Risk Group selected from the tables above, use the infection control matrix below to determine Construction Classification (Class). Construction Classification (Class) determines the procedures to be followed during construction and renovation projects.

Patient Risk Group/Construction Project Type Comparison				
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
MAXIMUM Risk Group	II	III/IV	III/IV	IV

1. **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.

- E. STEP 4: Description of Required Infection Control Precautions by Class. Implement the appropriate Construction Guideline based on the project classification selected from the Construction Activity matrix above (STEP 3). Construction Classification (Class) Guidelines are procedures to control release(s) of airborne contaminants resulting from construction, demolition, or renovation activities.

Description of Required Infection Control Precautions by <u>Class</u>		
During Project Construction		Upon Project Completion
CLASS I	<ol style="list-style-type: none"> 1. Execute work by methods to minimize raising dust from construction operations. 2. Immediately replace a ceiling tile displaced for visual inspection 	<ol style="list-style-type: none"> 1. Clean work area upon completion of task.
CLASS II	<ol style="list-style-type: none"> 1. Provide active means to prevent airborne dust from dispersing into atmosphere. 2. Water mist work surfaces to control dust while cutting. 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. 	<ol style="list-style-type: none"> 1. Wipe work surfaces with cleaner/disinfectant. 2. Contain construction waste before transport in tightly covered containers. 3. Wet mop and/or vacuum with HEPA filtered vacuum before leaving work area. 4. Upon completion, restore HVAC system where work was performed.
CLASS III	<ol style="list-style-type: none"> 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 containers. 5. Cover transport receptacles or carts. Tape covering unless solid lid. 	<ol style="list-style-type: none"> 1. Do not remove barriers from work area until completed project is inspected by the owner's Safety Department and Infection Prevention & Control 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 cleaner/disinfectant. 5. Upon completion, restore HVAC system where work was performed.

CLASS IV	<ol style="list-style-type: none"> 1. 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. Seal holes, pipes, conduits, and punctures. 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 work site. 6. All personnel entering work site are required to wear shoe covers. Shoe covers must be changed each time the worker exits the work area. 	<ol style="list-style-type: none"> 1. Do not remove barriers from work area until completed project is inspected by the owner's Safety Department and Infection Prevention & Control Department and thoroughly cleaned by the owner's Environmental Services Dept. 2. Remove barrier material carefully to minimize spreading of dirt and debris associated with construction. 3. Contain construction waste before transport in tightly covered containers. 4. Cover transport receptacles or carts. Tape covering unless solid lid. 5. Vacuum work area with HEPA filtered vacuums. 6. Wet mop area with cleaner/disinfectant. 7. Upon completion, restore HVAC system where work was performed.
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Note above that the Hospital's own housekeeping staff should always be responsible for final disinfection of the area before occupancy. They are familiar with proper cleaning techniques. Do not rely upon the Contractor for this critical step.

Additional questions to ask the Owner include the following:

- Identify the areas surrounding the project and assess potential impact of the construction upon these spaces.
- Identify possible issues related to plumbing, ventilation and power in terms of service outages.
- Consider risk of potential water damage.
- Can modification of work hours eliminate conflicts and risks?

Review containment issues regarding traffic flow (e.g. construction workers and materials, staff, patients, supplies), debris removal (when, where and how).

Describe each containment area risk by classifying each of the following surrounding areas:

- Unit, Department or Space Above
- Unit, Department or Space Below
- Unit, Department or Space Lateral Right
- Unit, Department or Space Lateral Left
- Unit, Department or Space Behind
- Unit, Department or Space Front

If the project contains multiple areas, provide a separate designation for each by copying the paragraph below and produce a paragraph for each separate area.

F. Infection Control Risk Assessment (ICRA) has categorized the **[project][Insert phase or separate area Here]** as follows:

1. Construction Project Activity Type: **[A][B][C][D]**.
2. Patient Risk Group Type: **[L][M][H][X]**.
3. Infection Control Precautions Class: **[I][II][III][IV]**.

1.6 PERFORMANCE REQUIREMENTS

A. Owner's Representative Responsibilities:

1. Determine that the Containment and Protection Areas are properly defined and adequately enclosed by the Contractor.
2. Issue a Statement of Requirements in both graphic and written form to communicate the above, based upon an evaluation of the construction area and the impact of the project on patient care.
3. Approve all enclosures constructed by the Contractor.

B. Owner's Responsibilities:

1. Assist Owner's Representative to determine the Containment and Protection Areas.
2. Coordinate access to Infection Control Risk Manager.

C. Contractor's Responsibilities:

1. Comply with applicable codes and referenced controls using installation procedures and methods that satisfy code requirements and referenced infection control procedures.
2. Determine specific means and methods of achieving and maintaining control of airborne contaminants during construction.
3. Propose work plan and procedures for control of airborne contaminants.
4. Submit Contractor's work plan for control of contamination for review in advance of performing any construction activities. Follow procedures established for product shop drawing submittals.
 - a. Owner's Representative and Architect shall review work Plan Submittal for general compliance.
 - b. **[Contractor shall possess a signed and stamped copy of the reviewed submittal prior to proceeding with the work.]**
5. Conform to notification requirements in Quality Assurance Article.
6. Provide and maintain all dustproof enclosures, measurement devices, warning signs and warning lighting to protect the patients, **[Hospital][clinical][clean room]** staff and public. Contractor shall remain responsible for compliance with all contamination control requirements.
7. Verify that all construction personnel have reviewed infection control procedures by using sign-in method. Provide a copy of attendees.

Delete subparagraph below if no permit is required. If retained, provide Owner's permit form at the end of the section.

1.7 PRECONSTRUCTION CONFERENCE

Retain "Pre Construction Conference" Paragraph below. This is a critical component to assure the Contractor creates the appropriate environment for a successful project.

- A. Pre-Construction Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to Infection Control Risk Assessment (ICRA) including, but not limited to, the following:

Delete subparagraphs below if not required. If retaining, revise to include product-specific requirements. Insert additional requirements to suit Project.

1. Identify Infection Control Risk Assessment.
2. Review infection control policy.
3. Review infection control procedures.

Coordinate subparagraph below with Division 1 Section "Quality Requirements" article in this Section. Expand requirements to suit Project.

- A. Attendees shall include the Owner's Representative[, **the Hospital's Infection Control Coordinator**], the Architect[, **the Construction Manager**] [, **the Contractor**] [**the major Subcontractors**] and any other parties involved with the project.

Insert additional agenda items below not listed in Division 1 Section "Project Management and Coordination" that may be appropriate.

1.8 SUBMITTALS

- A. Progress Schedule: Submit work and procedure schedules for temporary containment construction. Incorporate infection control milestones within the master project schedule as described in Division 1 Section, "Project Management and Coordination."
- B. Work Plan: Submit drawings and construction details of temporary barriers, descriptions of procedures to be used to achieve and maintain control of construction-related airborne contaminants.
- C. Product Data: Include standard specifications, material descriptions, furnished specialties and accessories, rated capacities and capabilities of individual components for achieving containment.
- D. Special Reports:
1. Provide written report of Infection Control procedures, including locations, exit routes, details of dust barriers, and means of creating negative pressure prior to commencing the project.
 2. Provide written report confirming specified air velocity whenever enclosure is erected or modified in designated Protection Area.

1.9 QUALITY ASSURANCE

Retain paragraph below if Contractor selects testing agency. Modify second paragraph to suit project.

- A. Testing Agency Qualifications: An independent agency qualified for testing indicated.
- B. Testing: **[Owner will engage][Engage] [a qualified independent testing agency to][Owner will]** test air quality and pressure for compliance with specified requirements for performance and test methods.

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

- A. Provide **[products][materials]** that comply with stated requirements for each type of **[products][materials]** specified.
- B. Products identified below are recommended as appropriate to the task at hand. Other manufacturers than those listed may be submitted for approval, but it is the Contractor's responsibility to provide effective documentation that adequately supports a substitute **[product][material]**.

2.2 INFECTION CONTROL PRODUCTS

Retain "Products" Paragraph and list of manufacturers and products below to require specific products or a comparable product from other manufacturers.

- A. Adhesive-Faced Contamination Control Mats: Sanitary walk-off mat consisting of multi-layered, disposable, 2 mil, non-allergenic, non-odorous, polyethylene sheets with non-drying solid adhesive and anti-microbial germicide. Subject to compliance with requirements, **[provide the following] [provide one of the following] [available products that may be incorporated into the Work include, but are not limited to, the following]:**
1. American Floor Mats; Clean Room Sticky Mats
 2. Controlled Environment Equipment Corporation; Cleanline[®] Medical Mats.
 3. Liberty Industries, Inc.; Tacky Mat[®] 800030
 4. Stickymat USA; Tacky Mat.
 5. Texwipe; CleanStep[®] Adhesive Contamination Control Mats
 6. **<Insert manufacturer's name; product name or designation>**.
- B. Portable Enclosures: Construct a temporary enclosure whenever work is performed outside of the containment area. Provide an enclosure of polyethylene sheet described below, enclosing ladder and sealing off opening at the ceiling system, or provide a prefabricated enclosure unit.

When making decisions on the strength of vacuum devices, the CDC recommends that vacuum pressures of 300-800 CFM be achieved. Verify power requirements with Hospital's infection control committee.

Portable Pre-Fabricated Environmental Enclosure: A temporary enclosure for work in **[sterile][patient][Insert Other Option Here]** environment outside of the Containment Area. A heavy-duty vinyl enclosure and adjustable, spring-loaded top frame to accommodate variabilities in ceiling height; provide ceiling mechanism for snug fit that will not damage ceiling panels. Furnish with inspection window, pressure differential porthole for a HEPA-filtered vacuum device capable of **[300 CFM][300-800 CFM]** and manometer.

1. Fiberlock Technologies, Inc.; Kontrol Kube[®].
 2. Mintie Technologies, Inc.; ECU Ceiling Cavity[™].
 3. ZipWall LLC; Zipwall[®].
- C. Polyethylene Sheet: Provide 6 mil, internally reinforced polyethylene laminate, fire-retardant sheet, NFPA-approved, sealed with fire-retardant tape at joints and penetrations above the ceiling.
1. Reef Industries, Inc.; Griffolyn[®] Type 55 FR.
 2. Raven Industries; DURA-SKRIM[®] 2FR or 10FR.

2.3 ACCESSORIES

- A. Biocide or Fungicide: Provide one of the following:
1. TriGene ADVANCE Laboratory Disinfectant.
 2. Bane-Clene[®]; Microban[®] Disinfectant Spray.
 3. Decon Labs, Inc.; CiDecon[®] Q Aerosol Spray.
- B. Spray Adhesive: Provide one of the following:
1. Amrep Professional Products Group; MISTY[®] Heavy Duty Adhesive.
 2. Aramsco; Ram-Tack Adhesive.
 3. BOSS[®] Products; BOSS[®] 635 Contact/Spray Adhesive.

- C. Disinfectant Wipes: Provide one of the following:
1. Clorox® Disinfecting Wipes.
 2. Lysol® Disinfecting Wipes.
 3. CiDecon® Plus Wipes.
 4. Scott® Disinfectant Wipes.
 5. Seventh Generation Disinfecting Wipes.

Verify whether Owner or Contractor provides protective clothing and whether the containment area or the areas outside the containment area is most critical. It could be both.

- D. Protective Clothing: **[The Owner will][The Contractor shall]** provide **[disposable paper jumpsuits][reusable, fabric coveralls]**, head and shoe coverings for use by construction personnel **[outside][inside]**of the Containment Area.

OSHA regulation 29 CFR 1926 is the construction safety regulation. It refers to other OSHA subparagraphs (1910.134) for pertinent respiratory gear.

- E. Respiratory Gear: Provide respiratory gear as required by OSHA regulation 29 CFR 1926 (Construction Safety Regulations).

2.4 EQUIPMENT

- A. Hospital will provide the **[Portable Air Scrubbers][and][Negative Air Machines]** for Contractor installation and use during the project.

Delete the paragraph above and retain below if Contractor is responsible for providing equipment.

- B. **[Portable Air Scrubbers][and][Negative Air Machines]**:

1. Product[s]: Multi-filtered, including 99.9% efficient HEPA filter, variable-speed motor, static pressure-monitored, equipped with electrical or mechanical lockout to prevent fan from operating without a HEPA filter, powered mechanical equipment utilized to create a dust-free environment. Subject to compliance with infection control requirements, provide one of the following:

Both manufacturers' products listed below can accommodate "portable air scrubbers" and "negative air machines". It is more important how each system is constructed, the result desired and the CFM capability (size based on volume exhausted). See DEFINITIONS article.

- a. Abatement Technologies, Inc.; HEPA-AIRE® Portable Air Scrubber.
- b. Micro-Trap Inc.; Micro Trap™ 2000 Negative Air Filtration Unit.
- c. Mintie Technologies, Inc.; 2000V Negative Air Machine.
- d. Omnitec Design, Inc.; Omniaire OA2000V HEPA Negative Air Machine.
- e. **<Insert manufacturer's name; product name or designation.>**

- C. Hospital will provide the HEPA-filtered vacuum for Contractor use during the project.

Delete the paragraph above and retain below if Contractor is responsible for providing equipment. In selecting vacuum units below, the CFM capability is more important than the debris holding capacity.

- D. HEPA-Filtered Vacuum Machine:

1. Product[s]: Multi-stage, 99.9% efficient HEPA filtration system, grounded, interference suppressed, 110/120V or 220/240V motor, minimum 10-gallon, minimum 500-1000 CFM capacity, powered mechanical equipment utilized to negatively pressurize small temporary dust enclosures to create a dust-free environment or in use to clean surfaces or construction personnel. Subject to compliance with infection control requirements, provide one of the following:

- a. Festool; CT Dust Extractor, Cleantex CT 48 HEPA (12.7 gal).
 - b. Nikro Industries, Inc.; HEPA Vacuum (Dry), Model PD15110 (15 gal).
 - c. Dustless® Technologies; Dustless HEPA Vacuum (16-gal).
 - d. **<Insert manufacturer's name; product name or designation.>**
- E. Air Pressure Monitor:
1. Product[s]: Differential switch/gauge to monitor differential pressure between the containment area and the protection area. Diaphragm type with dial and pointer in metal case, vent valves, black figures on white background and front recalibration adjustment with a range of plus/minus 0- to .50-inches water gauge and high-low adjustable set points. Subject to compliance with infection control requirements, provide a product comparable to the following:
 - a. Abatement Technologies, Inc.; HEPA-CARE®
 - b. Dwyer Instruments, Inc.; Model #3000MR-0.
 - c. OMEGA; DPG300
 - d. **<Insert manufacturer's name; product name or designation.>**
 2. Install the differential pressure switch/gauge in a NEMA-rated enclosure. Provide all necessary power wiring, transformers and relays to operate the system. Provide a switch that will enable activation of audio, visual, or both alarms that activates upon sensing pressure differences beyond the range set points. Provide a manual reset gauge after an alarm condition.

PART 3 - EXECUTION

3.1 EXAMINATION

Generally, retain both options below unless Owner's infection control policy states differently.

- A. Examine **[containment area]** **[and]** **[protection area]**, with Owner Representative present, for compliance with Infection Control requirements.

Delete subparagraph below if not required.

1. For the record, prepare written report, endorsed by Owner Representative, listing conditions detrimental to Infection Control performance.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

- B. Notify the Owner's Representative according to time line requirements identified previously before commencing work.

3.2 MONITORING

Determine which option below is appropriate, if any. Delete checklist option, if hospital or clinical setting has no checklist procedure.

- A. Before commencing any demolition or construction in occupied areas, a complete review of all airborne contaminant control policies shall be conducted. **[A checklist shall be completed and signed by the Infection Control Risk Manager and the**

Contractor, confirming][The Owner's Representative and Infection Control Risk Manager shall confirm] that the area is ready for work to begin.

- B. Owner will monitor conditions in the vicinity of project in Protection Areas. Such areas are **[identified by the Owner's Representative][indicated on drawings]**. Whenever unsafe conditions are observed, Contractor will be notified to correct conditions immediately to avoid work stoppage.
1. All work shall be stopped immediately whenever a hazardous containment control deficiency exists on the project.
 2. The Contractor shall take immediate action to correct all deficiencies.

3.3 PROTECTION

Select an option below that suits the project.

- A. Contractor shall install dust proof enclosures for work as **[directed above][directed by the Owner's Representative][indicated on the Drawings]** and when required to protect areas occupied by the Owner from dust, debris, and damage.
- B. Provide a temporary work surface to provide a safe working platform and protect the ceiling and the spaces below from falling objects and materials. Construction must be conducted in tight enclosures cutting off any flow of dust particles into patient areas.
1. Airborne contaminant control requirements: Floor to structure, airtight enclosures, drywall barriers, using tape and foam padding to seal all joints and penetrations.
 2. Keep enclosure door closed at all times.
 3. Traffic between Containment Area and open areas shall be kept to a minimum.
 4. Transport materials and refuse into an area from an external site without violating patient care areas by transporting in covered containers.
 5. Provide negative pressure in construction area.
 6. Provide adequate forced ventilation of enclosed areas to cure installed materials, to prevent excessive humidity, and to prevent hazardous accumulations of dust, fumes, vapors, or gases.
 7. Ductwork Dust Caps: Block off all existing ventilation ducts within the construction area. Method of capping ducts shall be dust-tight and withstand airflow pressures.
- C. Dust Proof Enclosures:
1. Full height, noncombustible construction with minimum 5/8" fire-rated gypsumboard both sides with 3-1/2 inch R-11 insulation batts to reduce noise [**Insert requirement for 1-hour rated enclosure if required by authorities with jurisdiction**]. Use tape to tightly seal top, bottom, penetrations and seams, to prevent spread of dust to occupied areas, including above ceiling. Secure all tape with spray adhesive. Dust proof enclosures adjacent to or in public areas shall be taped and painted on the side exposed to public view.
 2. Enclosure Doors: 4'-0" minimum width, unless shown otherwise, solid core wood with metal frame and hardware, closer and tightly weatherstripped to prevent flow of dust. Locate as indicated on drawing and swing out of the construction area. Keep enclosures locked outside of working hours. Coordinate with the Owner for access.
 3. Install disposable, multi-layered tacky floor mats on both sides of construction entrance prior to commencing demolition or construction. Remove old tacky surface as needed to prevent tracking, daily as minimum.
 4. Obtain Owner's approval of exact location and details of enclosure construction.

Verify use of explosive or pneumatic drive fasteners with Owner. Coordinate with Division 01 "Summary".

5. Materials for enclosure shall be precut in unoccupied areas before delivering to project site. No explosive or pneumatic drive fasteners permitted[, **unless authorized by Owner**].
 6. Provide entrance vestibules as described. Provide floor mats inside vestibule and inside enclosures at door to vestibule.
- D. Enclosure outside of work area (including spaces above ceilings): Whenever work is necessary outside of the construction enclosures (containment area), the space where work is being done, including ladders, shall be contained within a full-height portable enclosure. At Contractor's option, a prefabricated unit may be used.
1. All work performed outside the construction enclosure shown on drawings, including all work in corridors and lobbies shall be performed outside of normal working hours and shall be scheduled in advance with Owner, except where specified otherwise.
 2. At no time shall any construction equipment or material be stored outside the construction enclosure.
 3. Any dust tracked outside of construction area shall be cleaned up immediately. Contractor shall have the necessary personnel and equipment (HEPA-filtered vacuum, dust and wet mops, brooms, and clean wiping cloths) to keep adjacent occupied areas clean at all times.
- E. Power and Lighting: Provide sufficient temporary lighting and power ventilating equipment to ensure proper workmanship and safety.
- F. Access Provisions: Provide ramps, stairs, ladders and similar temporary access elements as reasonably required to perform the work and facilitate its inspection during installation.
- G. Airborne dust generation of significant quantities of dust will not be tolerated. Clean the work area prior to starting work to minimize existing dust becoming airborne during construction. Provide drop cloths and dust partitions as necessary to contain dust and debris generated by the work.
- H. Demolition material, dust and dirt shall be removed in covered, tightly sealed, rubber tired, polyethylene dump carts. Containers shall be fitted with clean polyethylene covers, completely sealed at perimeter by wire tying or taping. Before leaving area, all containers shall be wiped clean with biocide to prevent tracking of dust. Provide debris chutes if required.
- I. If work is being performed above an accessible ceiling and if work must be performed while the space below is occupied, spray top of ceiling panels to be removed and surrounding affected panels, with fine detergent/water mist to settle dust prior to removal.
- J. A portable plastic fabric tunnel or a polyethylene enclosure for larger openings shall be used for each single ceiling access outside of the Containment Area. The enclosure's opening shall have a 3-foot overlap of polyethylene to decrease risk of airborne dust. The portable plastic fabric tunnel, or portable enclosure, shall remain in place until the ceiling is secured (all accesses closed). In patient care areas, the apparatus (tunnel or enclosure) shall be dismantled and access panels replaced or remodeling of access completed at the end of each day.
- K. If the contractor needs to crawl about pipes, ducts, or other building infrastructure to investigate a condition, the Contractor shall use additional procedures, (e.g. put on a mask, disposable coverall and disposable shoe covers) before going into the access. The surfaces that will be disturbed shall be vacuumed with a HEPA-filtered vacuum before proceeding. Afterwards the contractor shall strip off the coverall, and shoe covers carefully, turning the coverall "inside-out" and deposit the mask, coverall, and

shoe covers into a plastic trash bag inside the enclosure. This plastic trash bag shall be secured (tied off) and discarded as directed by Owner's Representative and may not be discarded within any patient care area.

- L. Exercise caution when handling fluids, or piping systems, in the space above ceilings and other **[Hospital] [clinical][clean room]** operations. When working with fluids, provide a watertight barrier beneath the work area to catch and retain all spillage before it reaches the ceiling below.
- M. Water leaks must be cleaned up and repaired as soon as possible, but within 72 hours to prevent mold proliferation in floor and wall coverings, ceiling panels and cabinetry in patient care areas. If cleanup and repair are delayed more than 72 hours after the water leak, the involved materials must be assumed to contain fungi and handled accordingly. Use of a moisture meter to detect water penetration of walls should be used whenever possible to guide decision-making. If the wall or other component does not have less than 20% moisture content more than 72 hours after water penetration, it shall be removed.
- N. Contractor is responsible for determining when a dust proof enclosure is required to protect any adjoining area; however, the Contractor shall provide a dust proof enclosure where indicated and whenever requested by the **[Owner's Representative][,] [Architect] [and] [or] [Construction Manager]**. Take all necessary precautions to protect the people and spaces below from injury or damage due to Contractor's operations.
- O. Notify **[head nurse][department manager]** so that patient room doors near ceiling work will be kept closed while the work is in progress.

3.4 CONTAINMENT AREA

- A. Maintain levels of airborne contaminants within Containment Area and Protective Area limits as defined by the Owner's Representative and Infection Control Risk Manager.
- B. **[Portable Air Scrubbers][and][Negative air machines]** shall remove airflow from construction area at not less than 100 FPM at enclosure entrances with all doors fully open. As an alternative, provide adequate exhaust air volume to provide 6 air changes per hour.
- C. Dust Control: The Contractor shall take appropriate steps throughout the term of the Project to prevent airborne dust due to work under this contract. Water shall be applied wherever practical to settle and hold dust to a minimum, particularly during demolition and moving of materials. Care must be taken to prevent the accumulation of standing water or the saturation of any materials. No chemical palliatives shall be used without permission of the Owner's Representative.
 - 1. Spray surfaces with water during dust-producing interior demolition activities. Hard surface floors in work area, adjacent hallways and passage areas require vacuuming with HEPA-filtered vacuum cleaners and frequent wet-mopping during demolition and construction; protect adjacent carpeted areas with plastic and plywood and vacuum with HEPA-filtered vacuum cleaners.
 - 2. Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent airborne dust from dispersing into atmosphere.
 - 3. Any dust tracked outside enclosure shall be removed immediately, using HEPA-filtered vacuum.
 - 4. All cleaning outside enclosure shall be by HEPA-filtered vacuum or other approved method.

Verify with Owner and Infection Control Risk Manager that procedures below are appropriate for the project.

- D. The following procedure shall be implemented when construction personnel are required to pass through a Protected Area to enter the Containment Area:
1. Provide airlock entry vestibules to dustproof enclosures when shown on Drawings or required by **[Owner's Representative][,][Architect][and][or][Construction Manager]**.
 2. Construction personnel shall wear protective clothing when passing through the Protective Area or when directed by the Owner's Representative. The protective clothing shall be removed in the airlock vestibule prior to entering the Containment Area and stored for reuse.
 - a. When exiting the Containment Area the protective clothing shall again be worn when passing through the Protective Area.

Retain either the paragraph and subparagraph above or remove above and retain the paragraph below depending on the project's infection control requirements. Verify requirements with the Owner and Infection Control Risk Manager.

3. Construction personnel shall wear protective clothing at all times when passing through the Protective Area and while working in the Containment Area.

- E. Construction Personnel: Instruct personnel to refrain from tracking dust into adjacent **[Hospital] [clinical][clean room]** areas or opening windows or doors allowing airborne contaminants into the adjacent **[Hospital] [clinical][clean room]** area.

Delete below if no exterior work and negative pressure exhaust system is not in the vicinity of building air intake louvers.

- F. Exterior Work: Direct exhaust from equipment away from building air intakes; assure that filters on building air intakes are operational and protected from excessive amounts of airborne contaminants.
- G. Any ceiling panels opened for investigation beyond sealed areas shall be replaced immediately when unattended or covered with an appropriate temporary barrier.
- H. Removal of construction barriers and ceiling protection shall be done carefully **[outside of normal working hours]**.

3.5 EQUIPMENT

- A. Connect **[portable air scrubbers] [and] [negative air machines]** to emergency power and run continuously.

3.6 FIELD QUALITY CONTROL

Retain first option in Paragraph below if Owner engages agency; retain second option if Contractor engages agency. If retaining second option, retain "Field quality-control test reports" Paragraph in "Submittals" Article.

Retain paragraph below to identify who shall perform tests and inspections.

- A. Testing Agency: **[Owner will engage] [Engage]** a qualified testing agency to perform tests and inspections.
- B. Testing Services: Testing and inspecting of completed phases of the work shall take place in successive stages, in areas of extent and using methods described in Quality Assurance article. Do not proceed with removal or construction of each enclosure for

the next area until **[test results for previously completed phases of the work show compliance with requirements.]****[Owner's Representative is satisfied that work is completed and clean up procedure has been performed.]**

- C. Repair or replace construction enclosures where test results indicate that it does not comply with specified requirements.
- D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of repaired or replaced work with specified requirements.

3.7 CLEANING

- A. Provide thorough cleaning of **[existing] surfaces** that become exposed to dust each day. Thoroughly clean each temporary access when work is completed or at the end of each work shift, using approved methods.

Normally retain the second option below with the Owner to perform final cleaning, as the Owner's own forces are more skilled.

- B. Provide a final thorough construction cleaning of area before **[start of Owner's room occupancy]****[turning space over to Owner for final cleaning]**.

Select first option above and delete the paragraph below if Contractor is responsible for final medically clean standards cleaning.

- C. Final cleaning of construction (to medically clean standards) shall be performed by the Owner's own housekeeping forces.

3.8 ENFORCEMENT

- A. Failure to maintain containment areas will result in issuance of a written warning. If the situation is not corrected within (8) eight hours of receipt of warning, Owner will have cause to stop the work as provided in the General Conditions.
 - 1. Failure of Contractor to correct deficiencies in containment will result in corrective action taken by Owner and all costs deducted from the Contractor.
- B. The Owner's Representative will perform periodic inspections to determine compliance with infection control procedures. Written documentation shall be filed as part of the project documentation. Photographs may be taken to document work site conditions.

Include Owner's permit form if required.

END OF SECTION 013533