HCAI Department of Health Care Access and Information
2020 West El Camino Avenue, Suite 800
Sacramento, CA 95833
hcai.ca.gov

AMENDED

Hospital Building Safety Board
Education and Outreach Committee

AGENDA

July 22, 2026
10:00 a.m. – 4:00 p.m.

The Committee may not discuss or act on any matter raised during the public comment section that is not included on this agenda, except to place the matter on a future meeting agenda. (Government Code §§ 11125, 11125.7, subd. (a).)

Locations:
2020 West El Camino Ave, Conference Room 930, Sacramento, CA 95833
355 South Grand Avenue, Conference Room 2000, Los Angeles, CA 90071
Teams Meeting Access; Meeting ID: 291 981 160 592 677; Passcode: 6A9wa3hS
Call in: (916) 535-0978; Phone Conference ID: 694 229 053#

Item #1 Call to Order and Welcome

Facilitator: Teresa Endres, AIA, ACHA, EDAC, AAH, Principal, HOK; Committee Chair (or designee)

Item #2 Roll Call and Meeting Advisories/Expectations

Facilitator: Teresa Endres (or designee)

Item #3 Review and approve the April 29, 2026, draft meeting report/minutes

Facilitator: Veronica Yuke, HCAI; HBSB Executive Director (or designee)

Item #4 Discuss email marketing announcements and how HBSB can help get the word out when there is an upcoming webinar, newly published advisory guide, etc.

- Determine the organizations to contact
- Determine which members will contact those organizations
- Confirm the process for having industry organizations help HBSB disseminate information
- Discussion and public input

Facilitator: Teresa Endres (or designee)

Item #5 Update from the Ad Hoc “HCAI Design Guide for Planning and Preparing for Disasters” Webinar Development Subcommittee on the remaining webinars:

- Infection Control – HVAC + Design
  - Review draft slides
  - Schedule webinar
  - Webinar presenters: Teresa Endres, Mikhail Fuks, and Abdel Darwich (or designees)

Department of Health Care Access and Information

Beyond Minimums: Crafting Resilient Healthcare Facilities

Building codes set the baseline; true resilience demands more for critical infrastructure and patient safety.

Proudly Partnered with AIA California

Attendees will earn 1.0 AIA HSW LU for attending this presentation live.
AIA CA will submit you for AIA credit within 10 days of the presentation.

AIA Continuing Education Provider

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HCAi

Department of Health Care Access and Information

OSHPD

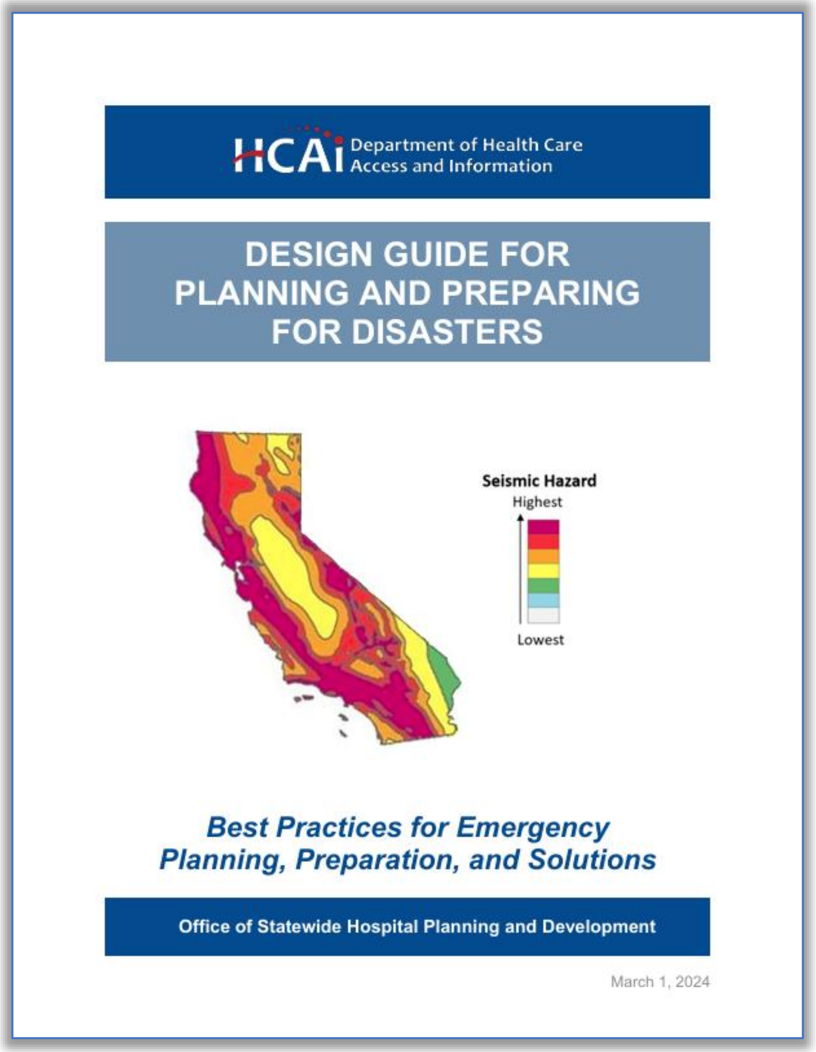
Office of Statewide Hospital Planning and Development

HBSB

Hospital Building Safety Board

Why A Guide?

- Facilities managers want to know what they can do to be prepared
- Provide a resource to help evaluate how past events could impact future regulations and design requirements
- Provide a repository of information during crucial times
    - ➢ The guide presents various scenarios and design options to aid facilities, staff, and design teams in understanding additions to facilities and planning for future flexibility effectively
- Limit “Anything Goes” policies!
- Best practices for facilities to be better prepared for a disaster



How to Apply the Guide

Alterations	New Facilities

• Planning for the unknown
• Providing flexibility in existing buildings
• What can be done ***now?***
• Adapting existing services and system
    ▪ Facility access
    ▪ Utility services
    ▪ Emergency projects
	• Planning for the unknown
	• Go beyond code minimums during design
	• Go beyond the code
	• Include potential flexibility for future care types
	• Identify options and provide best practices to allow for quick implementation

Who Should be Using the Guide

- Facility Operators
- Architectural and Engineering Design Teams
- Local Agencies, Planners
- Contractors
- Other people involved in planning for future impacts and reacting to situations when they arise

Purpose

At the start of the COVID 19 pandemic, facilities were struggling to find ways to provide safe patient care: safe for the staff as well as the patients.

OSHPD received many calls and questions as to what we were doing to assist.

In addition, people were asking what was going to change in how OSHPD did plan reviews and what code changes were anticipated for future code cycles.

OSHPD assembled people knowledgeable in healthcare regulations, planning, design, and operations. This included professionals, engineers, facility representatives, contractors, and many others that had experience in the many aspects of addressing and reacting to the pandemic and other emergencies.

The Emergency Design Task Force (EDTF) was born.

Emergency Design Task Force

The EDTF was tasked with identifying specific areas of concern for multiple types of events, such as pandemics, but also including wildfires and earthquakes amongst others. They were to look at how these past events could impact future regulations and design requirements.

It was determined that for normal everyday operations, the current regulations are fairly sufficient to meet the basic needs. Minor revisions are coming.

Adaptation

Adaptation

But what about those facilities that wanted to go above and beyond the basic needs?

Most, but not all, options to prepare for future events would most likely fit into this group.

The technology and processes learned would be optional approaches that a facility could decide to incorporate into their existing or proposed buildings. These options could include:

- switchable air volumes
- redundant services
- new technologies

If these were in place now, the facility would have flexibility in deployment in the future.

HCAI | HOSPITAL BUILDING SAFETY BOARD WEBINAR SERIES

2026 Schedule

Design Guide for Planning and Preparing for Disasters

Information at: https://hcai.ca.gov/facilities/building-safety/resources/building-safety-construction-webinars/

Session 1 – May 14, 2026

Wildfire and Wildland-Urban Interface Readiness for HealthCare Facilities

A preparedness-focused webinar examining wildfire and wildland-urban interface (WUI) risks, mitigation strategies, and operational planning measures to help healthcare facilities enhance resilience, continuity, and life safety during wildfire events."

Session 2 – June 10, 2026

Designing Hospitals for Wildfire Smoke: HVAC Strategies for Resilience and Readiness

An expert-led webinar exploring HVAC design strategies, filtration technologies, and operational best practices that help healthcare facilities maintain safe indoor air quality and operational continuity during wildfire smoke events.

Session 3 – July 7. 2026

Power Resilience, Regulatory Compliance, and the Future of Healthcare Infrastructure

A forward-looking webinar examining how healthcare organizations can strengthen power resilience, navigate evolving regulatory requirements, and modernize infrastructure systems to support reliable patient care and operational continuity.

Session 4 – TBD

Infection Control – HVAC + Design

A focused webinar on HVAC design, ventilation strategies, and air quality management practices that support infection prevention and control in healthcare environments.

Session 5 – TBD

Infection Prevention – Operations:

Designing Healthcare Facilities for Resilience, Surge, Readiness, and Infection Control Across Every Operational Mode

Session 6 – TBD

Hazard Vulnerability Analysis: A Systemic Approach to Risk Identification and Resilience Planning

A comprehensive webinar exploring hospital hazard vulnerability assessment methodologies, risk prioritization strategies, and preparedness planning to strengthen healthcare resilience and emergency readiness.

Agenda

Planning & Facility Design

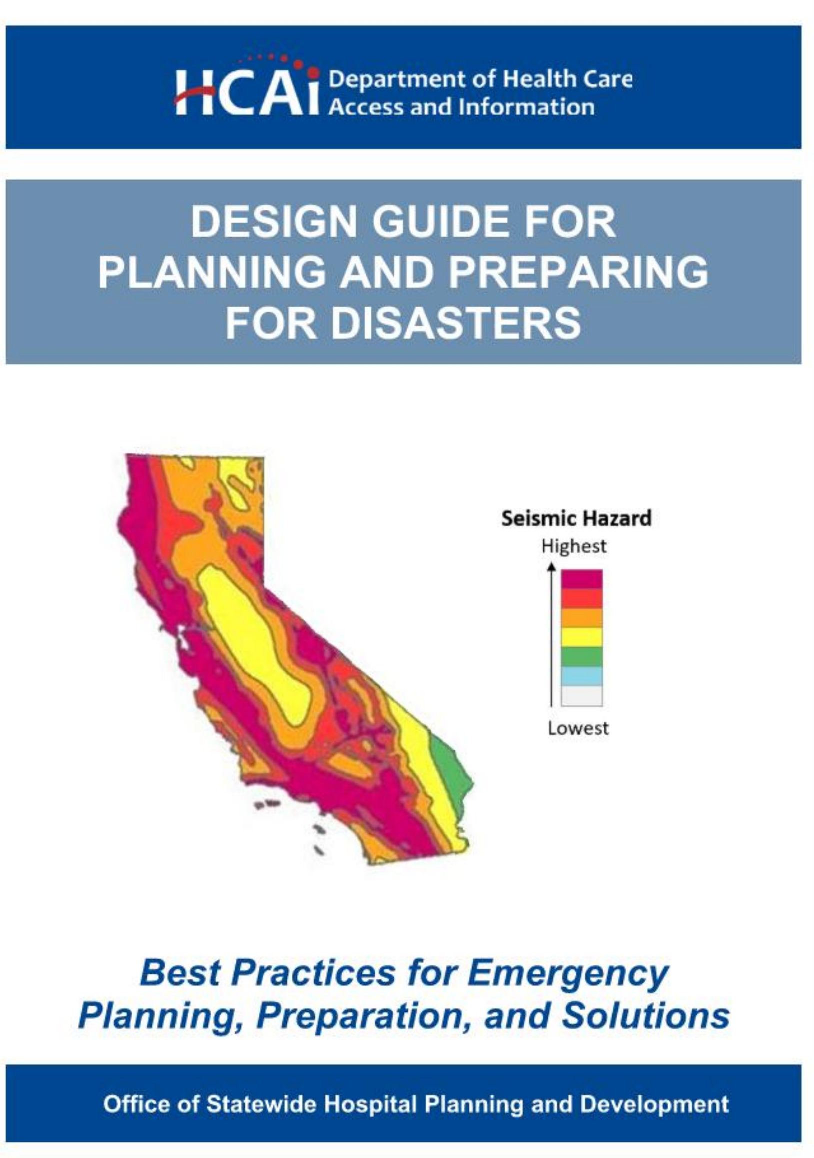
- Design Guide purpose, pandemic lessons, and surge planning
- Emergency Department, patient units, and staff support
- Designing beyond code minimums for resilience

HVAC & ASHRAE Standard 241

- HVAC strategies for infection control and resilience
- Standard 241: IRMM, ECAi, and Building Readiness Plans
- Application, examples, and key takeaways

Why This Matters?

1. Hospitals must remain operational during:
    1. Pandemics
    2. Wildfires
    3. Patient surge events
2. COVID exposed critical HVAC limitations
3. Ventilation impacts:
    1. Infection control
    2. Patient safety
    3. Operational continuity



Planning Diagrams History

Background context: SARS, MERS, and pandemic readiness planning

Emergency Design Task Force

Looked to countries with previous SARS/MERS pandemics

SARS Pandemic 2003

Asia (China, Hong Kong, Taiwan, Singapore, Vietnam, Philippines & Thailand), and Canada

MERS Pandemic 2012

Singapore MOH 2014

Pandemic Readiness and Response Plan for Influenza and Other Acute Respiratory Diseases + DORSCON Matrix

Resources

- Factors Influencing the Response to Infectious Diseases: SARS and MERS in South Korea (PubMed/NIH)
- SARS: Lessons from Toronto (NCBI Bookshelf/NIH)
- European Center for Disease Prevention and Control

Emergency Operations Planning to Accommodate Surge Capacity

Planning Diagrams History

Singapore Ministry of Health Pandemic Readiness and Response Plan

Summary tables for response measures under the DORSCON matrix

Possible scenarios	Applicable response phases	Border Control	Public health measures: Temperature screening in institutions / buildings	Social distancing	School closures	Contact tracing	Phone surveillance or quarantine	Antivirals for influenza	Vaccination
GREEN - Negligible to low public health impact									
• High virulence • No or limited H-H transmission • Disease mainly overseas	Alert (with containment of imported cases)	Health Advisory Notices (HANs) (Posters, Cards)	No	No	No	Yes, if cases are imported	Consider to implement depending on risk	Treatment of case where necessary	No
• Similar or lower virulence and transmissibility as seasonal flu	Mitigation	No	Consider to implement if necessary			No	No		Vaccination for high risk groups, if available
YELLOW									
• High virulence but low transmissibility • Disease mainly overseas	Alert (with containment of imported cases)	HANs Health Declaration Cards (HDCs) and temperature screening of inbound passengers, if necessary	No	No	No	Yes, if cases are imported	Consider to implement depending on risk	Treatment of cases where necessary	Procure and offer vaccine when available
• Local epidemic with low virulence but high transmissibility	Mitigation	HANs	Consider to implement if necessary			No	No		
• High virulence and transmissibility, but vaccine available	Mitigation		No						Distribute vaccine to mitigate impact
ORANGE									
• High virulence and transmissibility • Disease mainly overseas	Alert	HANs HDCs and temperature screening of inbound passengers, if necessary	No	No	No	Yes, if cases are imported	Quarantine	Treatment of cases, consider limited prophylaxis of personnel providing	Procure and offer vaccine when available
• High virulence and transmissibility • Disease in Singapore	Containment				Yes, selective closures if cases	Yes, as far as operationally feasible	Quarantine, as far as operationally feasible		

Singapore Ministry of Health Pandemic Readiness and Response Plan for Influenza and Other Respiratory Diseases design & operations guide
Disease Outbreak Response System Condition (DORSCON) Matrix

What Failed During COVID

1. Limited airborne infection isolation capacity
2. Standard patient rooms not designed for:
    - Negative Pressure
    - High-efficiency filtration
    - Rapid conversion
3. Systems lacked scalability during surge

The Core Gap

1. Hospitals designed to minimum code requirements
2. Not designed for:
    - Emergency flexibility
    - System reconfiguration
    - Surge-level demand

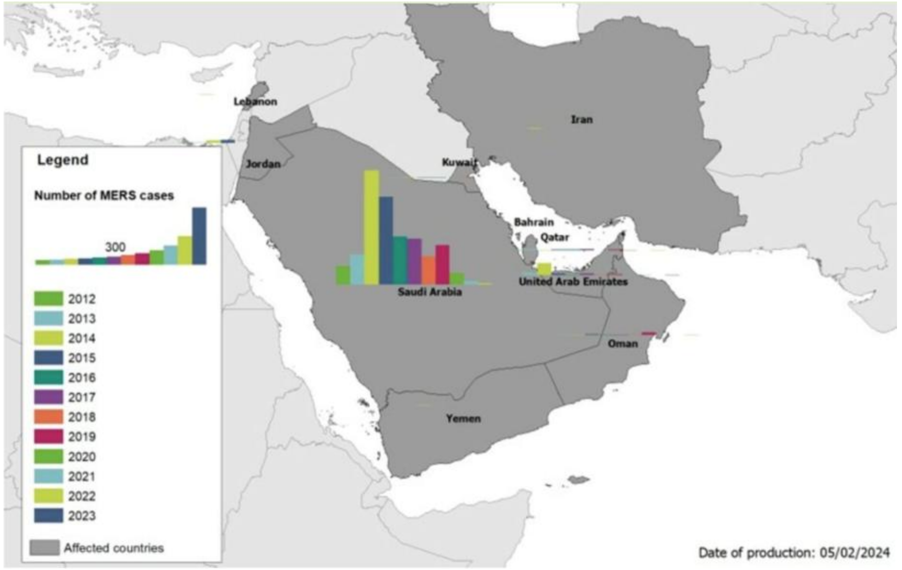
Planning Diagrams History

- The Emergency Design Task Force looked to countries with previous SARS/MERS pandemics
- **SARS pandemic 2003:** Asia (China, Hong Kong, Taiwan, Singapore, Vietnam, Philippines & Thailand), and Canada
- **MERS pandemic 2012**
- Singapore Ministry of Health 2014 Pandemic Readiness and Response Plan for Influenza and Other Acute Respiratory Diseases + DORSCON Matrix
- Pandemic patient units developed in Canada & Asia in response to 2003 SARS pandemic

Resources:

Factors Influencing the Response to Infectious Diseases: Focusing on the Case of SARS and MERS in South Korea - PubMed (nih.gov)

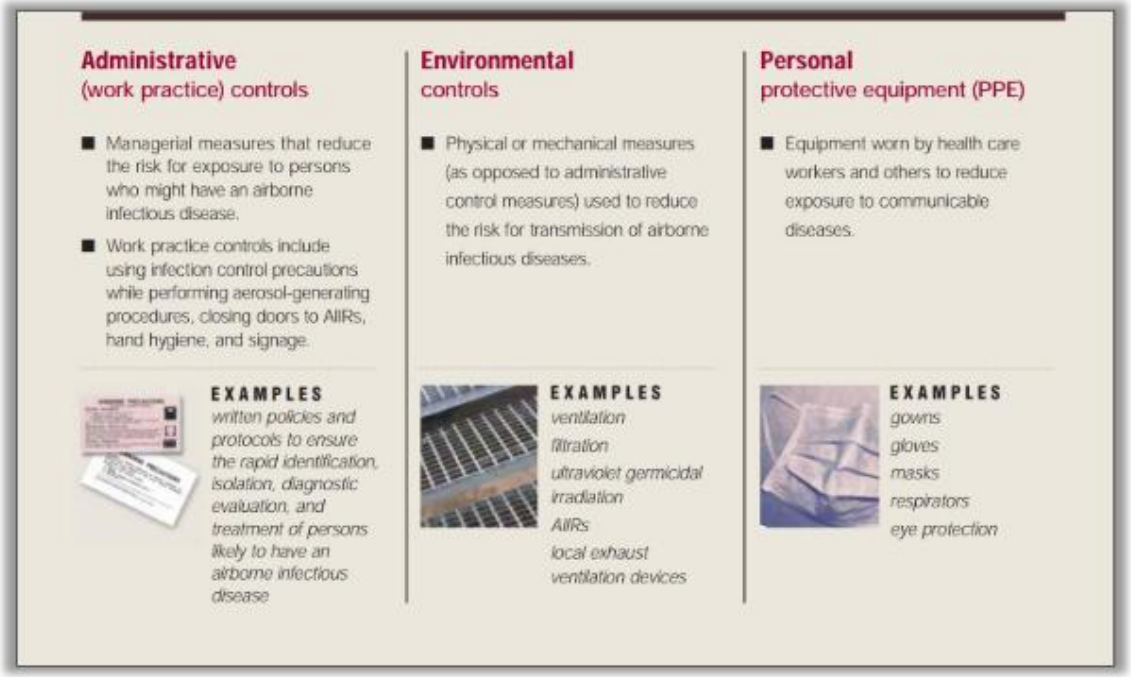
SARS: LESSONS FROM TORONTO - Learning from SARS - NCBI Bookshelf (nih.gov)



European Center for Disease Prevention and Control

Design Objective & HVAC Framework

1. Objective
   1. Convert standard rooms to isolation-capable environments
   2. Enable rapid (~12 hours) response to airborne events
2. Four Core HVAC Strategies
   1. Airflow & Pressurization
   2. Ventilation (Outside Air)
   3. Filtration
   4. System Flexibility & Controls



Planning for Surge

- Provide adequate medical evaluation and care
- The ability to survive a hazard impact and maintain or rapidly recover operations that were compromised
- Plan for large-scale events that affect many people, **which may include** chemical, biological, radiological, earthquakes, other natural or human-caused disasters
- Large hospitals typically operate at or near capacity
- Smaller hospitals faced with limited availability of resources and outside support
- When designing for resiliency, **consider designing beyond the code minimums**

Hazard Types to Plan For

- Chemical
- Biological
- Radiological
- Seismic / Earthquake
- Natural Disasters
- Human-Caused

The Importance of Resilience in Healthcare

Designing Beyond Code Minimums

Seismic Events

Threats posed by earthquakes and ground movement.

Pandemics

Widespread infectious disease outbreaks.

Mass Casualty Events

Incidents resulting in a large number of casualties.

Hazardous Materials

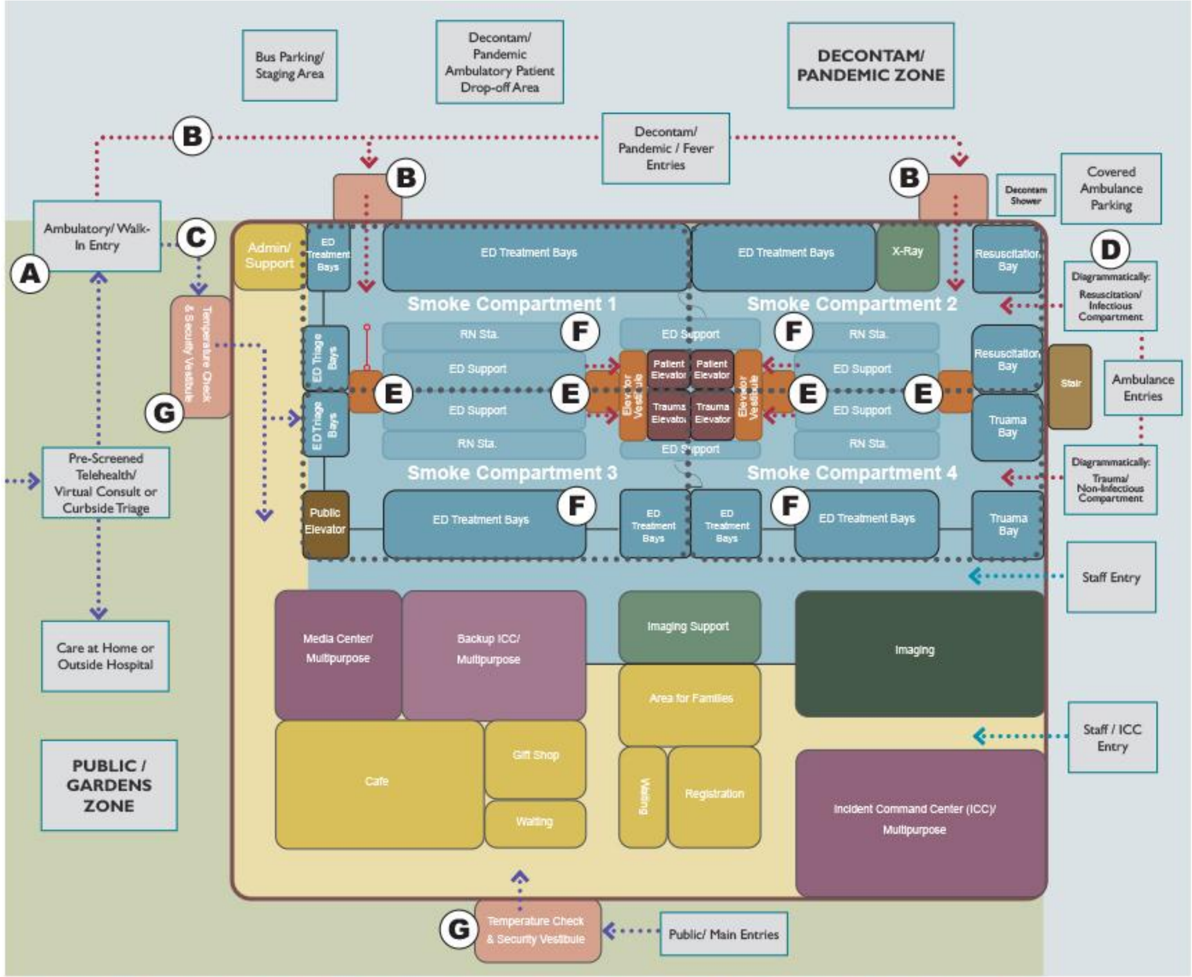
Risks associated with chemical, biological, or radiological substances.

Other Disasters

Includes both man-made and natural disasters not explicitly listed.

Designing beyond code minimums is a proactive choice for enhanced preparedness and continuity of operations.

Emergency Department Floor Plan Reference



EMERGENCY RESPONSE DIAGRAM | **NEW** EMERGENCY DEPARTMENT & ENTRY LEVEL

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LEGEND:

Emergency Department
Imaging Department
Public Space
Multipurpose Space
Patient Elevators
Public Elevators
Service Elevators

Public Flow
Patient Flow
Staff Flow
Material Flow
Do Not Exceed 20', Typical of Vestibules/ Rooms

The intent of the planning diagrams is to provide options for individual features / concepts

KEYNOTES:

A. Patients triaged via telehealth/virtual care or curbside/outside the hospital & directed to most appropruiate entry. "Emergency Event" triage include temperature check & questionaire regarding travel, exposure, etc.

B. Symptomatic patients are directed to Emergency Department fever entry/entries

C. Non-symptomatic ambulatory patients enter for additional/typical triage through Ambulatory Entry

D. Ambulance patients are triaged off-site/en route with option to enter the "Decontam/Pandemic" compartment

E. Anteroom or vestibule (created with two sets of corridor doors) to each Emergency Department compartment, which allows each compartment to be locked and isolated with one-way flow (donning & doffing through separate vestibules)

F. Emergency Department contains two or more compartments that have separate, dedicated & reduntant building systems which allows each unit to be locked & become a "Decontam/Pandemic" compartment. One-way flow in & out of each compartment through donning & doffing anteroom/corridor vestibule (anteroom vs. corridor vestibule is based on facility operataional model).

G. Fever check at the front door. No one with a fever would be allowed to enter the facility.

The diagrams assume new facilities are designed based on a modular approach. The planning/layout concepts apply to any layout for a new facility

EMERGENCY RESPONSE SPACES:

Support spaces that can flex into Emergency Response spaces. Typically these spaces are conference (expandanable), classrooms, workrooms, etc. that are multi-purpose rooms which flex to Emergency Response uses during an emergency event:

Incident Command Center (ICC) - ideal to have dedicated kitchenette and separate entry/exit directly to outdoors

Backup ICC - for secondary ICC overflow

Media Center - a location for media to gather and receive updates from emergency response, hospital & public health staff

Areas for Families - this space serves as a location for families to gather away from the media and public view, typically used for mass casualty events

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Emergency Department: Enhanced Preparedness

Optimizing for Surge Capacity and Infection Control

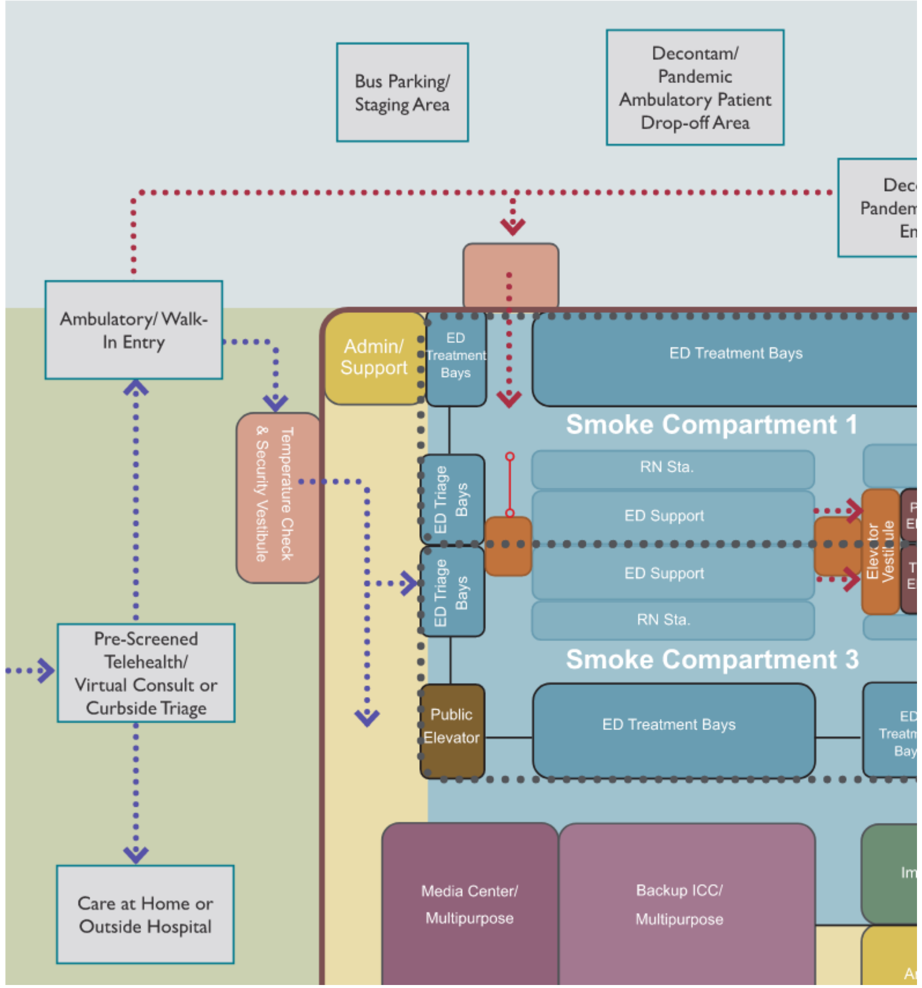
Infrastructure for Isolation & Flow

Implementing separate compartments with redundant HVAC systems, strict separation of clean and soiled flows, and dedicated elevators for different patient types to manage patient movement effectively during surges.

Integrated Patient Care

Integrating X-ray services within resuscitation and pandemic compartments to minimize patient transfers and reduce the risk of cross-contamination.

Patient Arrival



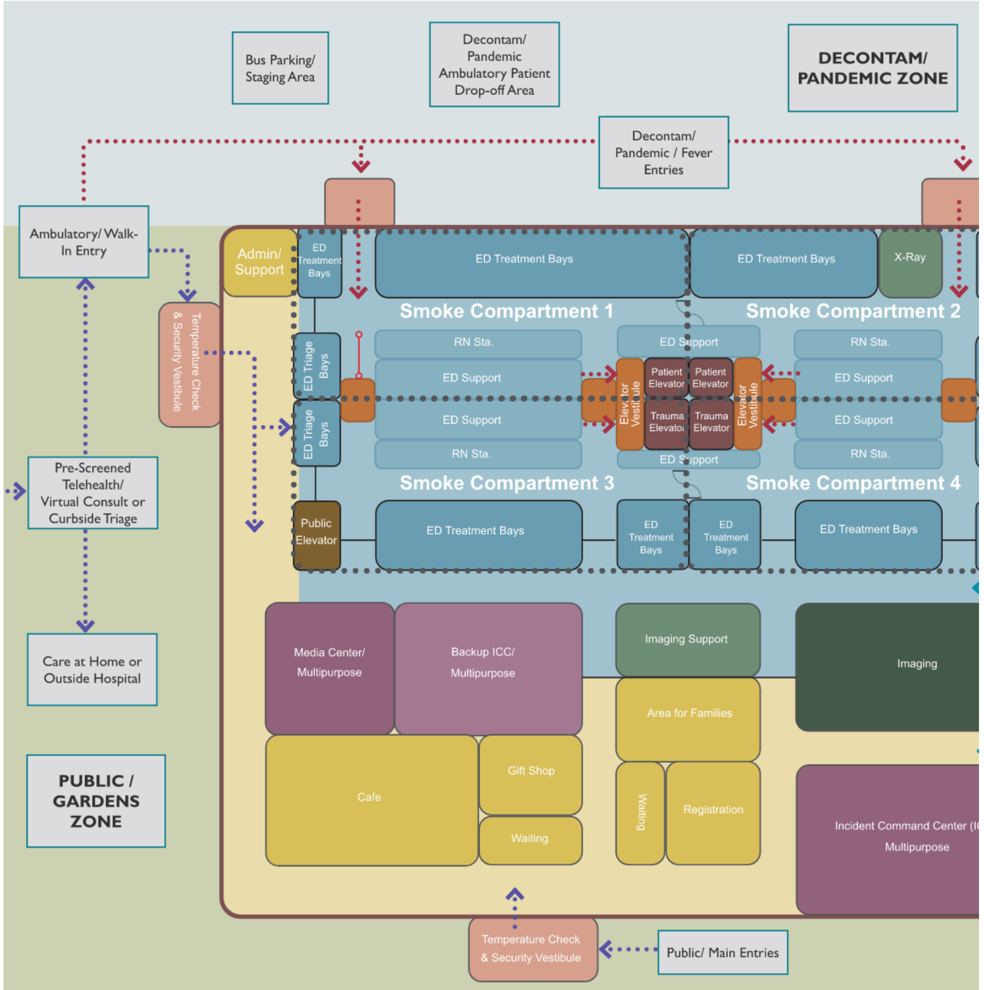
Parking & patient triage

- Ability to accommodate emergency conditions
- Virtual & curb-side patient triage

Patient waiting

- Exterior triage, waiting, and queuing areas are necessary during surge events
- Provide exterior safe & comfortable triage & waiting
- Differentiate between confirmed exposed patients, possibly exposed patients, and non-pandemic related emergencies
- Consider covered parking structures, tents, quick deployment trailers or modular
- **Consider designing beyond the code minimums**

Patient Arrival



Decontamination

- Drop-off in a location separate from designated parking areas
- Provide dedicated entry vestibules designated for decontamination that can be used as an air lock
- Beyond code minimums: decontamination showers
- Provide PPE donning/doffing areas/supplies immediately available
- Can be used for secondary screening or security screening
- Decontamination entry vestibules immediately outside of each pandemic/infection compartment in the Emergency Department
- OSHPD PIN 35 Healthcare Decontamination Facilities
- **Consider designing beyond the code minimums**

ED Entry and Triage Innovations

Improving Patient Flow Management

Enhanced Entry Security

Security and temperature checks at all entry points.

Flexible Entry Configurations

Optional isolation entry vestibules for pandemic or non-pandemic scenarios.

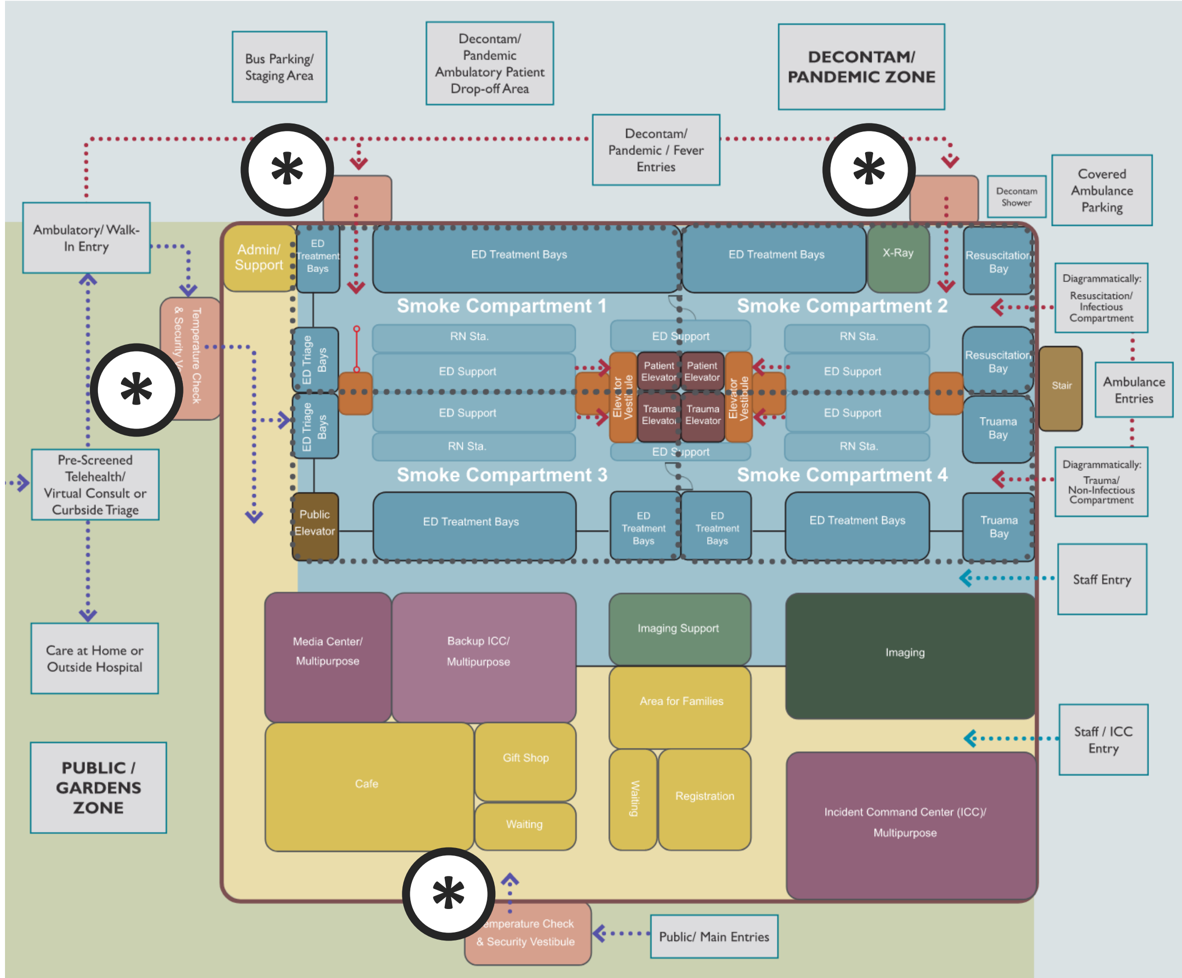
Streamlined Ambulance Access

Separate entry points for routine trauma and critical cases.

Remote Triage Solutions

Virtual and curbside triage options to manage patient influx.

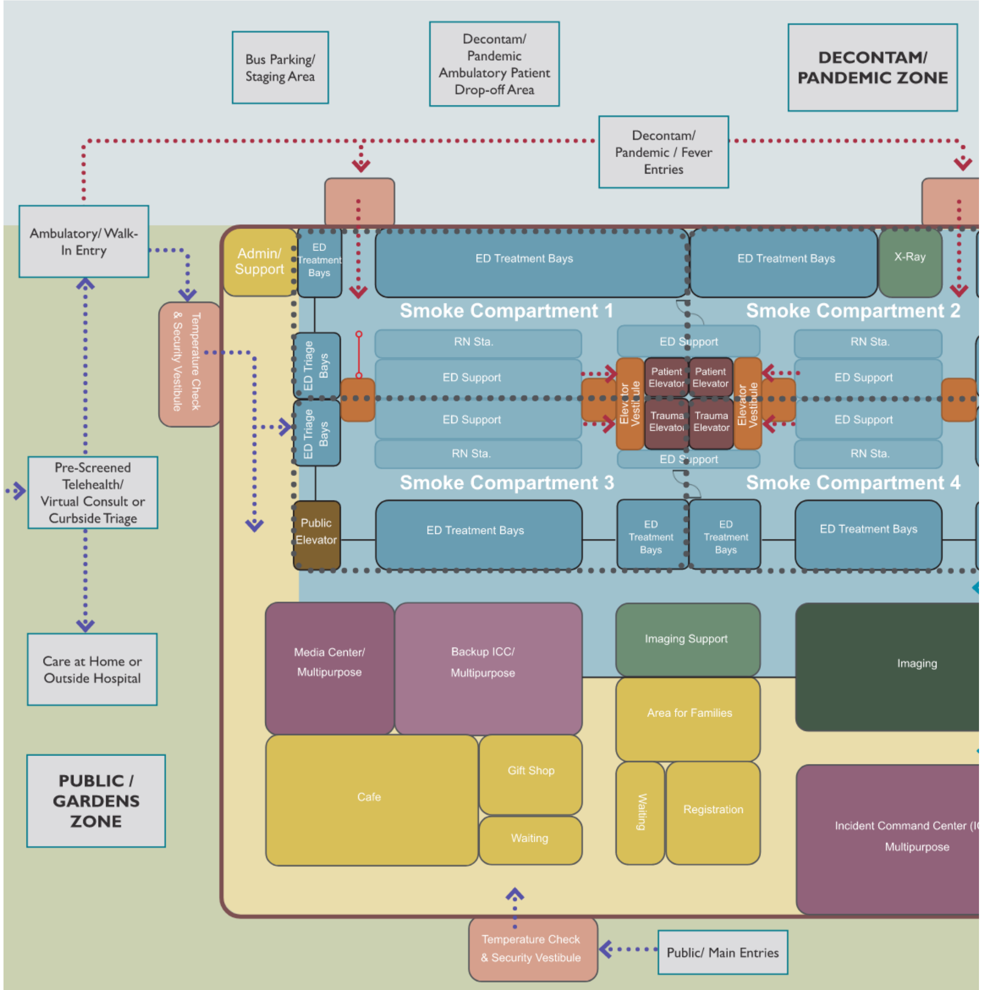
Hospital Entries



Recommendations for the Entry Level

- Evaluate each entry for appropriateness
- Entries should be clearly identified with instructions
- Entries for staff only should be identified & locked to prevent unauthorized access
- All public entries should be provided with symptom checkpoints and security
- Vestibules provide secondary opportunity to screen patients and public
- Screening prevents exposing staff & other patients
- Size public entry vestibules to accommodate secondary screening & security checks
- **Consider designing beyond the code minimums**

Emergency Department: Ambulatory Pre-Screening



Entering the ED

- Prior to arrival leverage telehealth or virtual care
- In the parking lot utilize curbside/outside screening
- Provide predetermined walk-up screening locations outside of the ED

After screening is completed

- Direct patients to the appropriate entrance based on their symptoms
- Provide separate pandemic/infectious or non-pandemic/non-infectious entrances
- **Consider designing beyond the code minimums**

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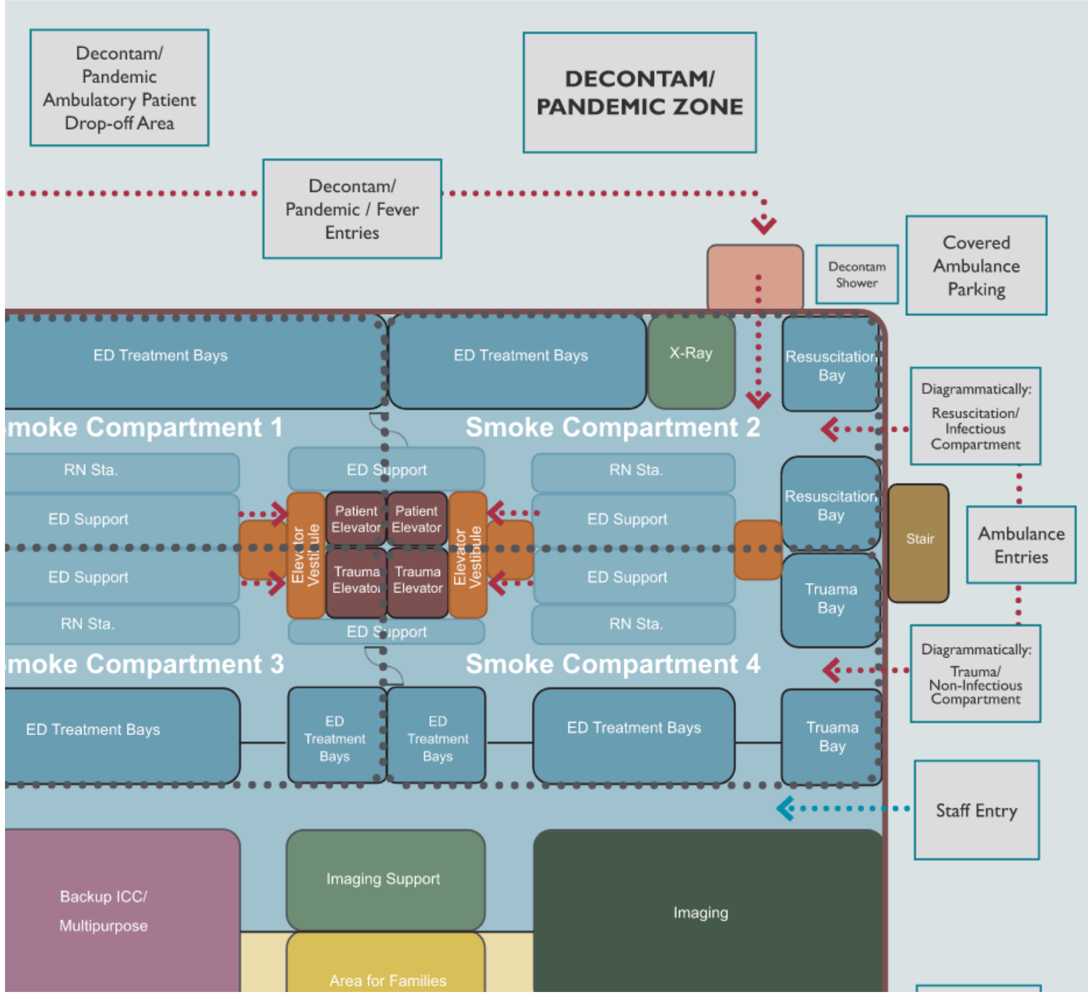
Emergency Department: Ambulance Entries

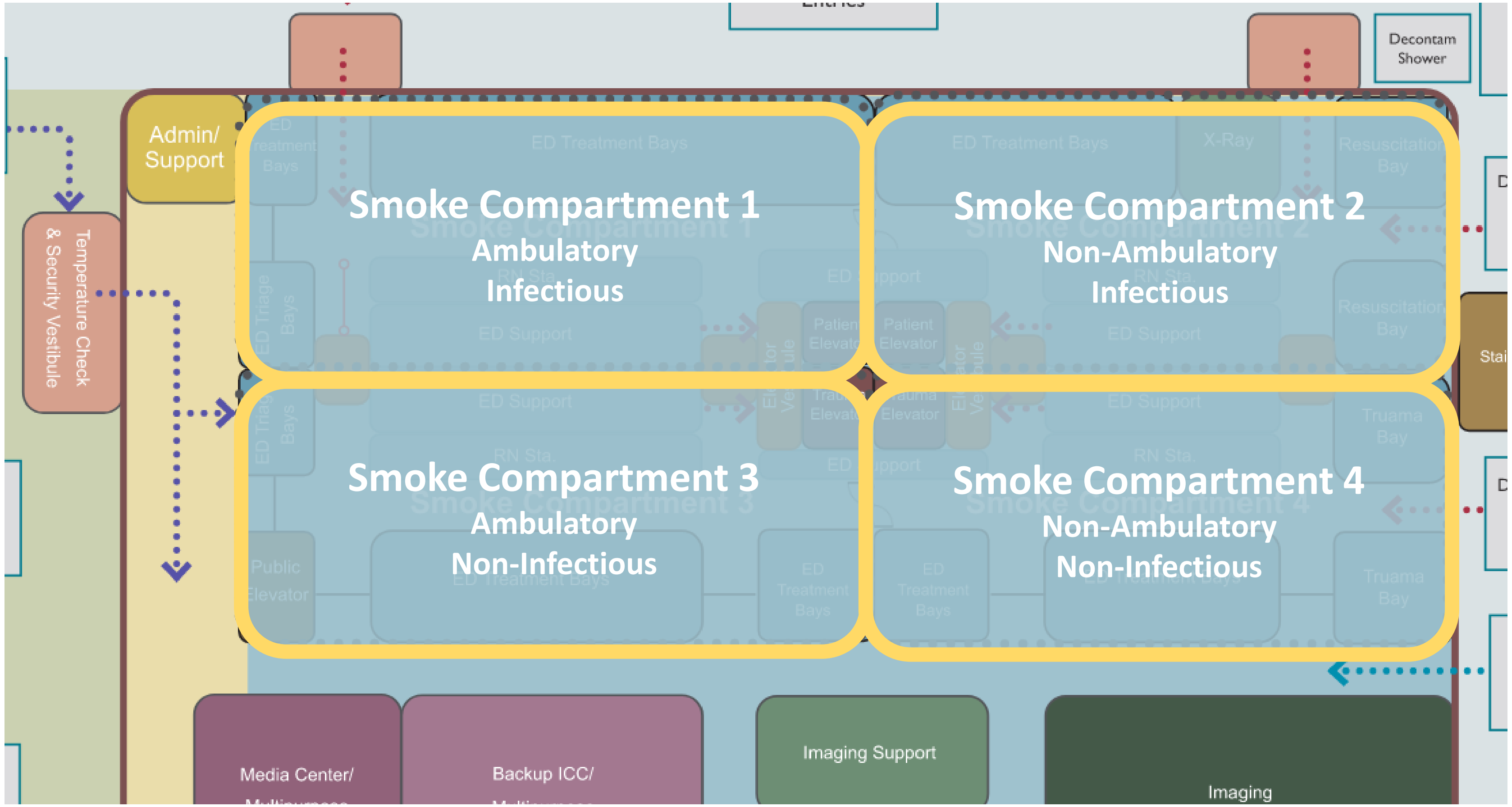


Separate ambulance entry

- Separate ambulance traffic from other patient areas
- Consider additional safeguards for pandemic, or hazardous materials exposure
- Consider separate dedicated ambulance entries into:
- **Infectious disease/resuscitation** compartment
- **Non-infectious/trauma** compartment
- **Consider designing beyond the code minimums**

ED Compartmentation

Dedicated **infectious disease/resuscitation** and **non-infectious/trauma** compartments.



Pandemic-Ready Patient Units

Designing for Integrated Infection Control and Flexibility

Flexible Entry Points

Option for separate entries into patient units to manage patient and staff flow.

Streamlined Material Flow

Maintaining separate clean and soiled pathways throughout the unit to prevent cross-contamination.

Patient Room Entry

Ante-room vestibules at each patient room create critical buffer zones for infection control.

Key Strategies

Flexible Patient Unit Entry Solutions

Multipurpose Rooms

Designate rooms to serve as either clean or soiled areas, providing flexibility during pandemics.

Ante-Room Vestibules

Implement entry vestibules for each patient room to create critical buffer zones.

Separation of Flows

Maintain distinct pathways for clean and soiled materials throughout the unit.

Acuity-Adaptable Units: Design Flexibility & Resilience

Maximizing adaptability for evolving healthcare needs.

Surge Capacity

Enable patient rooms to adapt to higher care needs during surges, crucial for pandemics and emergencies.

Design Flexibility

Incorporate varied configurations for patient toilet and shower rooms to maximize adaptability and optimize space.

Future-Proofing

Enhance facility resilience by allowing for evolving patient care demands.

STRATEGIC DESIGN FOR ADAPTABLE HEALTHCARE ENVIRONMENTS.

AAUs provide essential flexibility to meet unpredictable healthcare demands.

Key Features and Placement

Decontamination and Entry Vestibules

Dedicated Entry Vestibules

Designed as airlocks for decontamination.

Strategic Location

Situated immediately outside pandemic/infection compartments in the Emergency Department (ED).

Dual Functionality

Can be used for secondary screening or security screening; includes decontamination showers beyond code minimums.

Strategic Entry Management

Optimizing all facility entrances for safety and control

Evaluate & Identify Entry Points

Clearly mark all entry points with appropriate instructions.

Secure Staff Access

Implement robust measures to prevent unauthorized entry into staff-only areas.

Public Entry Screening

All public entries should be provided with symptom checkpoints and security.

Vestibule Design

Size public entry vestibules to accommodate secondary screening and security checks.

Pandemic Patient Unit (PPU) Design

- Explore optimal locations and workflows for PPE management at unit entry points.
- Dedicated donning alcoves.
- Separate doffing alcoves equipped with waste receptacles and handwashing stations.
- Ensure compliance with California Department of Public Health (CDPH) requirements for donning and doffing at patient room entry.
- Consider design beyond the code minimums.

California Acuity-Adjustable Patient Units

- California's Title 22 does not provide for acuity-adaptable patient rooms where a patient steps down in the same room
- California Department of Public Health will allow an entire unit to flex
- New facilities consider using the "Acuity-Adjustable" model to provide future flexibility during patient surges
- Existing units can be adapted to surge as needed
- Acuity-adjustable patient units (AAU) allow care to flex to a higher level as needed in the same room/unit
- AAUs are well-suited for pandemics and other large-scale emergencies
- **Consider design beyond the code minimums**

Core Strategy #1 – Airflow & Pressurization

1. Infection control relies on directional airflow.
2. Negative Pressure:
    1. Exhaust airflow > supply airflow
    2. Air flows into the room (not out)
3. Prevents contaminated air from spreading

Core Strategy #1 – Airflow & Pressurization

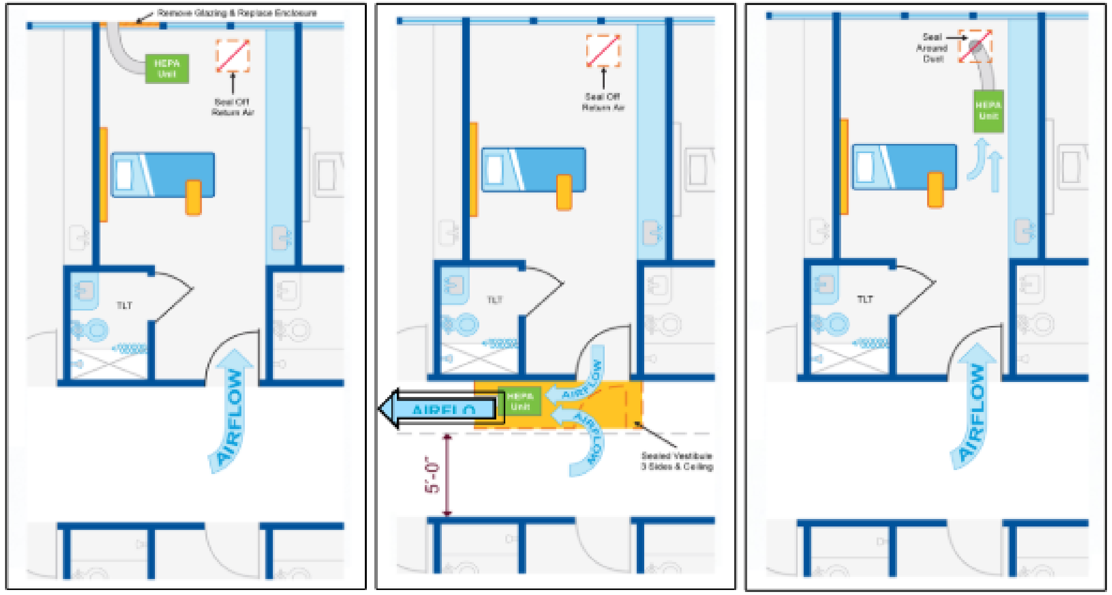
The constraints of the real-world…

1. Existing rooms are not airtight:
    1. Doors, ceilings, wall penetrations
2. Maintaining pressure differential is difficult
3. Retrofit conditions vary significantly

Directional airflow is more important than perfect pressure

Core Strategy #2 – Ventilation

1. Convert return air systems to exhaust during emergency events
2. Dual return grille concept:
    1. At patient bed (isolation mode)
    2. At door (normal mode)
3. Dedicated exhaust risers for surge scenarios
4. AHU Systems must support multiple modes:
    1. Normal Operation
    2. High outside air (pandemic)
    3. Reduced outside air (wildfire)



HEPA filtered to outside   HEPA to corridor   HEPA filtered to return air

Core Strategy #3 - Filtration

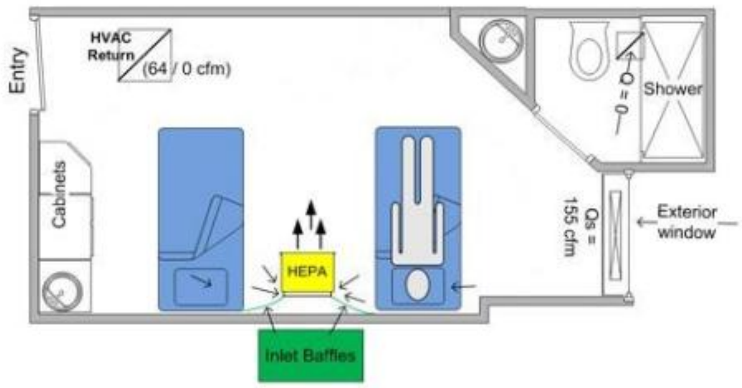
1. HEPA filtration removes airborne pathogens
2. Critical for infection control environments
3. Key constraints of additional filtration to check
    1. High pressure drop – does the system have capacity?
    2. Higher energy usage

Core Strategy #3 - Filtration

Deployment Approaches

1. Built-in HEPA systems (standby use)
2. Portable HEPA filtration units
3. Temporary ducted exhaust solutions

Flexibility is key to fit unique needs with speed



Temporary ventilation during pandemic.

Figure 3.3 – Use of Portable Air Cleaner

Figure 3.4 – Temporary Ducting to Outside

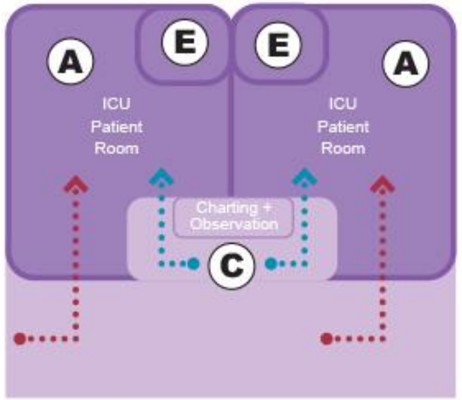
Core Strategy #4 – System Flexibility & Controls

Systems should be designed for adaptive operation:

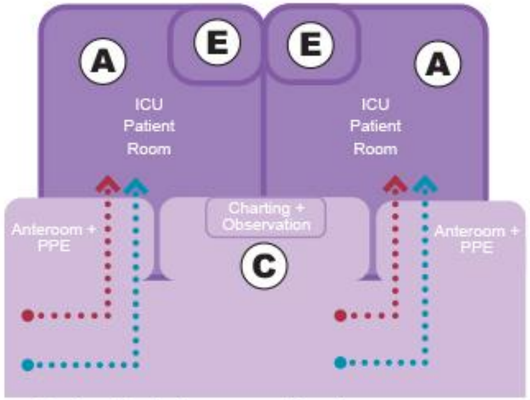
1. Variable speed fans (VFDs)
2. Control dampers for airflow adjustment
3. Switchable return/exhaust configurations
4. Continuous system operation during events
5. HVAC response must be:
    1. Pre-programmed
    2. Controlled by facilities teams
6. Not user-adjustable at room level

Key Takeaways

1. HVAC is a critical infection control system
2. Flexibility is the most important design priority
3. Systems must operate under multiple conditions
4. Planning ahead enables rapid emergency response



Option A: Flexible Anteroom



Option B: Anteroom + Charting

Assumptions:

Pandemic Patient Unit (PPU): ICU Patient Unit with "Pandemic Mode" capabilities designed as Care Suite with non-rated corridors

Options: Flexible Anteroom or Anteroom + Charting

Provides an alcove for PPE and medical equipment that supports the patient room during **pandemic mode**. The intent is to ensure corridors remain uncluttered during **pandemic mode** and ease of donning/doffing PPE.

The intent of the alcove options is to provide health facilities with options to quickly respond to pandemic and other emergency conditions.

Alcove for patient's medical equipment outside of the patient room. Staff can continue to frequently monitor the patient vitals while reducing exposure to possible unknown within the patient room.

LEGEND:

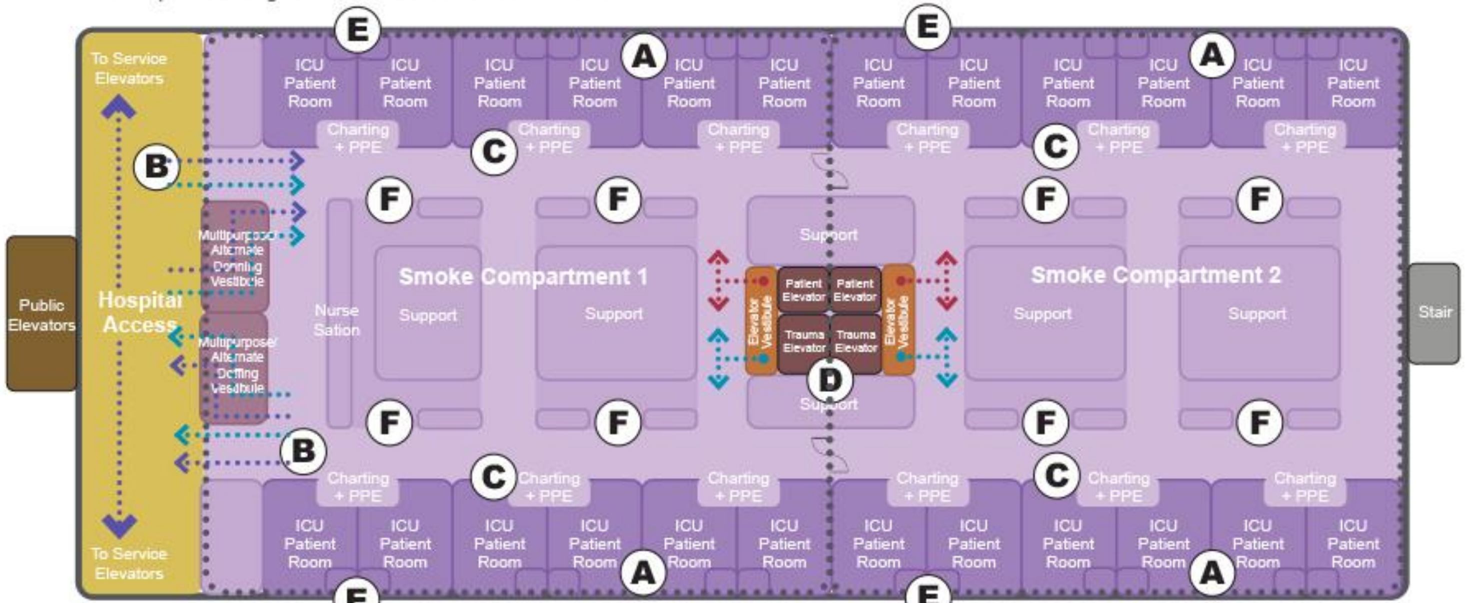
- MED / SURG Department
- ICU Department
- Public Space
- Multipurpose Space
- Patient Elevators
- Public Elevators
- Service Elevators
- Public Flow
- Patient Flow
- Staff Flow
- Material Flow
- Do Not Exceed 20', Typical of Vestibules/ Rooms

The intent of the planning diagrams is to provide options for individual features / concepts

KEYNOTES:

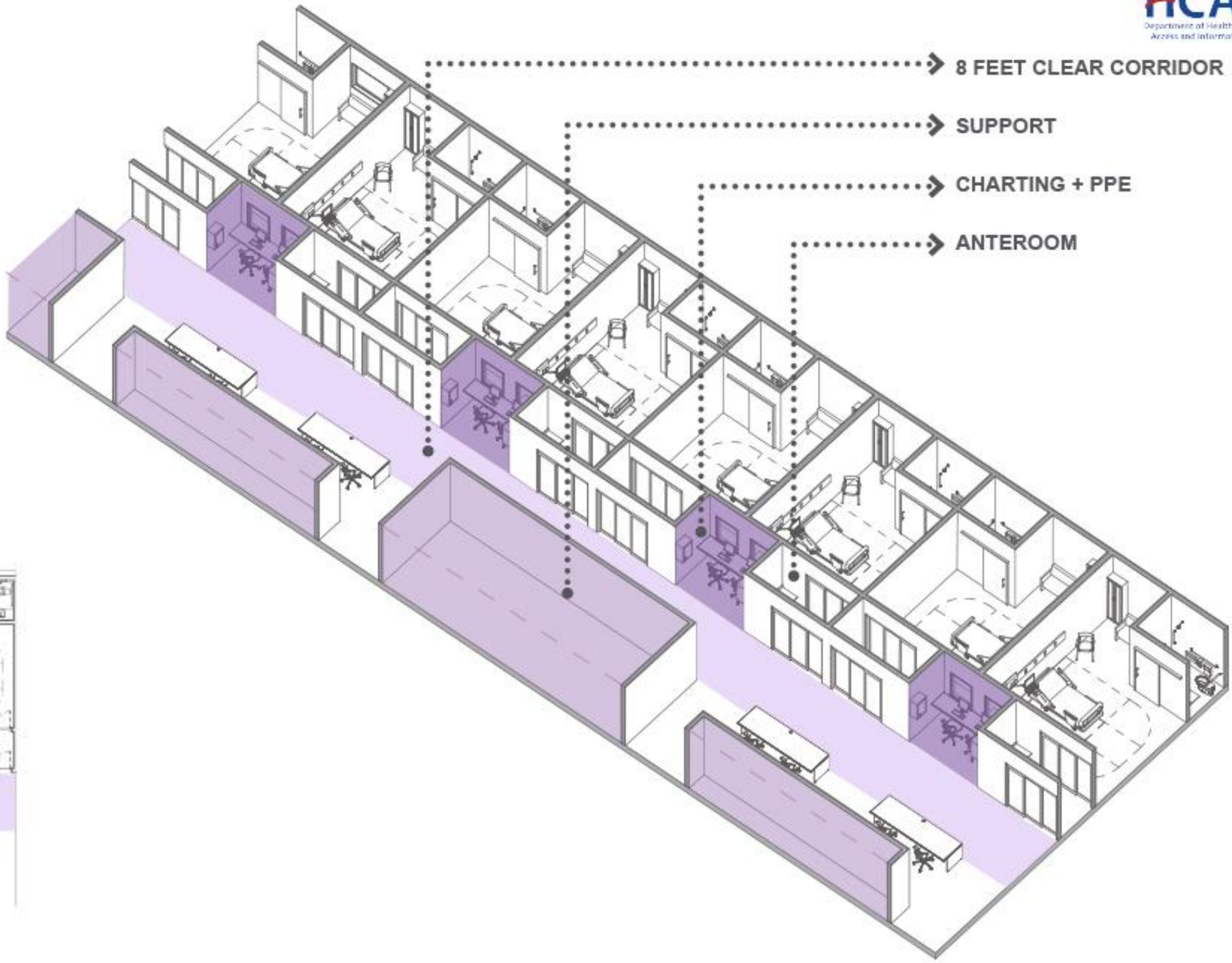
- **A** Patient rooms are neutral or negative - refer to Chapter 2
- **B** One-way flow of patients, staff, and materials are recommended, where possible
- **C** Charting + PPE/Equipment Alcove: hand washing station recommended - anterooms shall comply with code requirements
- **D** During "Pandemic Mode" implement operational model to limit access to the Pandemic Patient Unit from the patient and trauma elevators
- **E** Patient Toilet Room - health facilities to determine in-board vs. out-board toilet rooms vs. side-by-side
- **F** Health facilities to determine centralized vs. decentralized nurse stations

Intent is to recommend that health fascilities identify and design specific units that can flex into "Pandmeic Mode" when needed. These Pandmeic Patient Units would operate as typical ICU during "Non-Pandemic Mode".



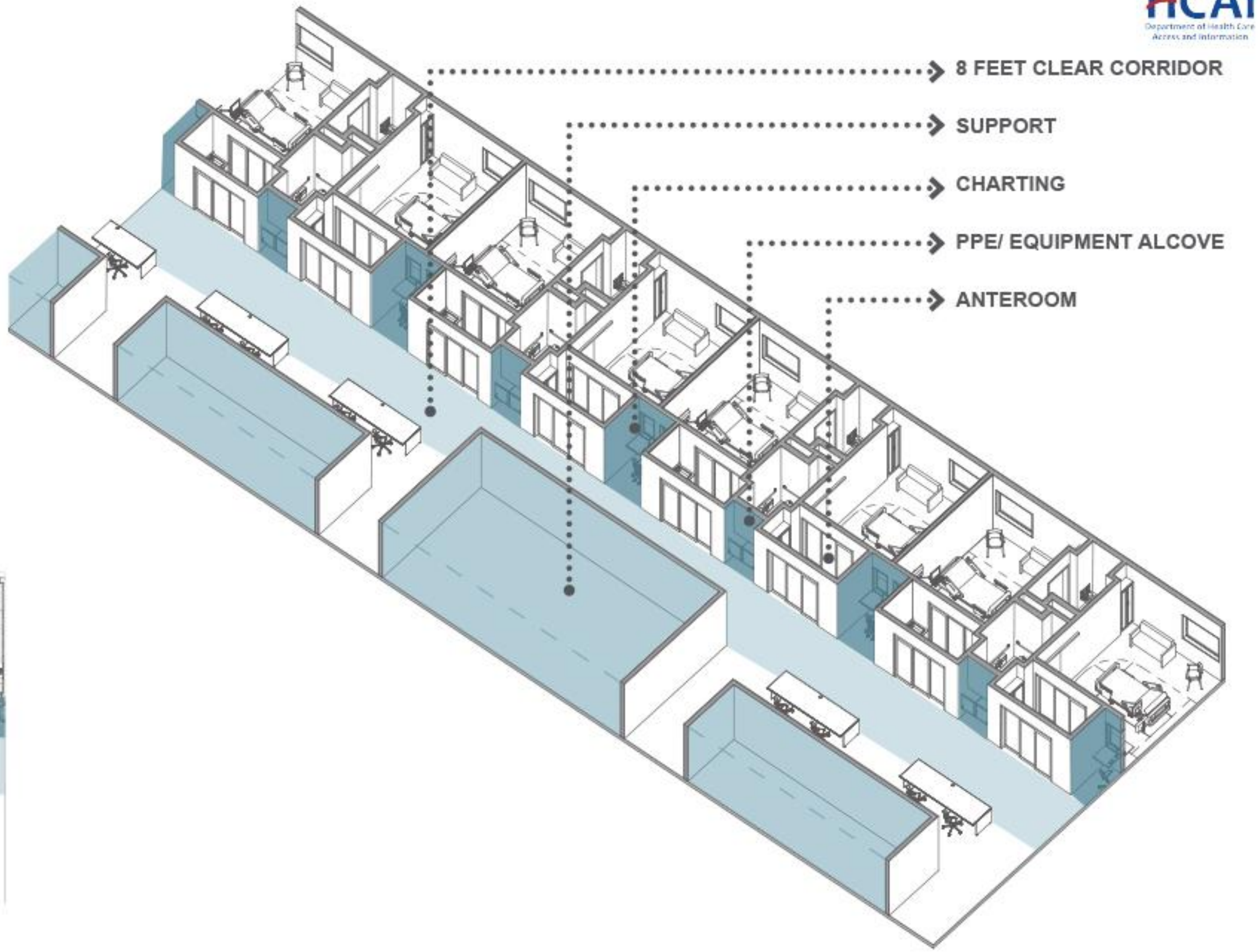
EMERGENCY RESPONSE DIAGRAM | PANDEMIC PATIENT UNIT - NEW ICU

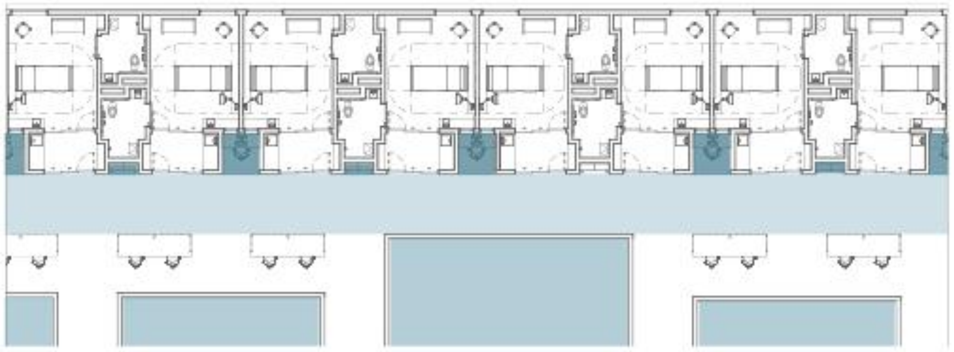
Pandemic/Isolation Patient Unit Floor Plan Reference



KEYPLAN

Pandemic/Isolation Patient Unit Floor Plan Reference





KEYPLAN

Retrofit vs New Construction

Existing Facilities

1. Limited by infrastructure
2. Temporary solutions often required

New Construction

1. Opportunity to design
    1. Flexibility
    2. Redundancy
    3. Surge capability

Recommendations and Considerations for Negative Pressurization During Emergency Conditions

Patient Areas							Non-Patient Area Filtration
Temporarily Converting Existing Rooms to Negative Pressure	Creation of "Flex" Pressurization Rooms	Use of Corridor for Make Up Air	Use of Pressure Monitoring of Isolation Rooms	Filtration for Infectious Airborne Diseases	Use of Economizers on Air Intakes	Location of Patient Room Exhaust in Positive and Negative Isolation Rooms	

Flexible Donning/Doffing Solutions in PPUs

Adapting donning and doffing areas within patient units.

Multipurpose Room Considerations

Explore spaces that can be adapted for donning and doffing activities.

Usage Options

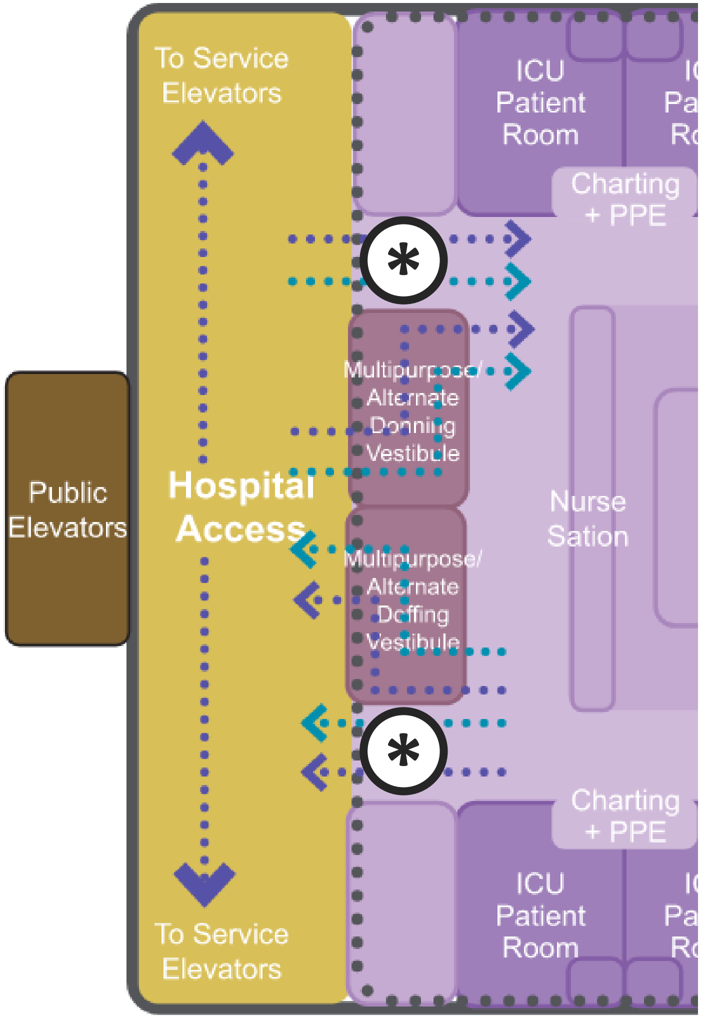
Consider dedicated spaces, combined spaces, or flexible use of existing areas.

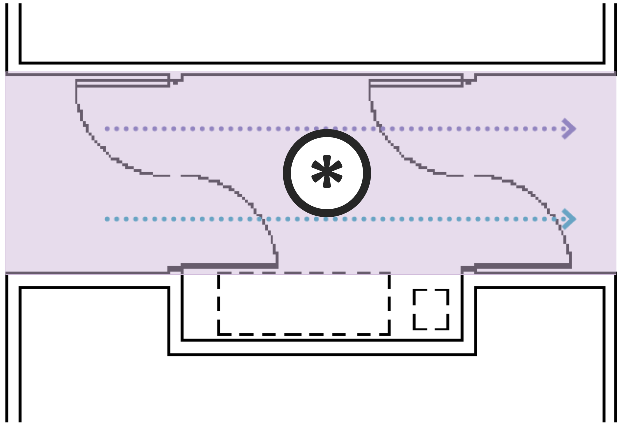
Objectives

Ensure compliance with health department requirements and maintain operational efficiency.

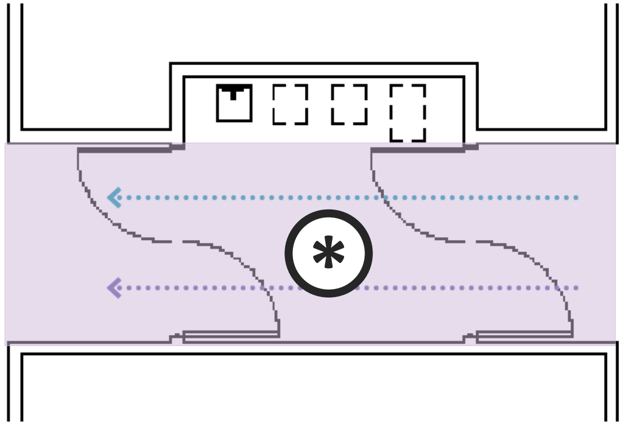
Ensure compliance and operational efficiency through adaptable donning and doffing areas.

PPU Donning/Doffing Options





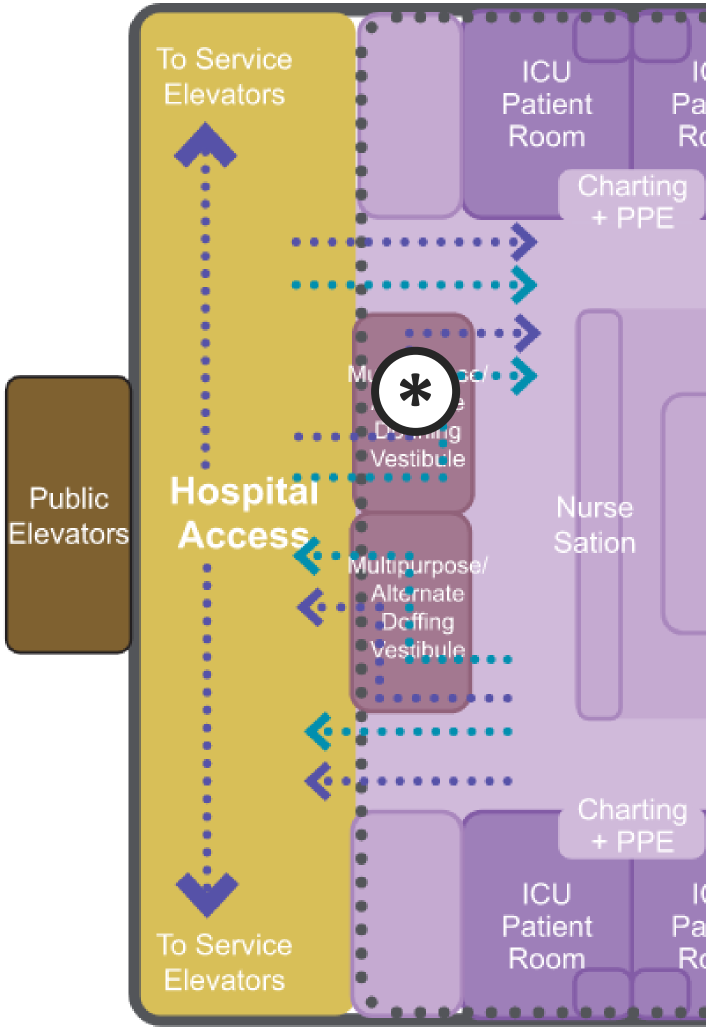
DONNING - DEPARTMENTAL ENTRY

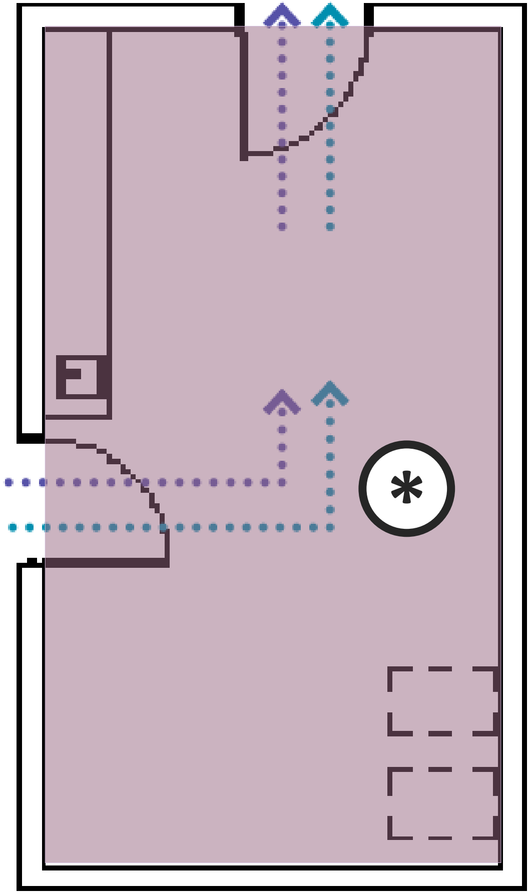


DOFFING - DEPARTMENTAL EXIT

- Donning & doffing at patient unit entry was explored with California Department of Public Health (CDPH)
- Internation PPU:
    - PPE donning alcove at PPU entry to unit
    - PPE doffing alcove w/ trash receptacle + hand washing station at exit of unit
- **Consider design beyond the code minimums**

PPU Donning/Doffing Options





- CDPH requires donning & doffing at **patient room entry**, as opposed to unit entry
- The Guide includes donning & doffing at patient unit entry as an option
- Donning/doffing multipurpose room(s):
  - Dedicated donning & doffing
  - Combined donning/doffing
- **Consider design beyond the code minimums**

Key Considerations

Staff Support and Well-being

Respite and Recharge Rooms

Offer quiet, contemplative spaces away from patient areas.

Natural Elements

Prioritize access to natural daylight and views where possible.

Flexible Spaces

Utilize flex space to accommodate staff respite during emergency conditions where dedicated spaces cannot be provided.

Use of Interior Spaces

Staff Spaces

- Provide in or adjacent to departments most utilized during emergency conditions
- During emergency conditions
  - Staff may not be able to leave the facility
  - Will be working significantly extended hours
- **Lesson learned + beyond code minimum**
- Staff lounge is not an appropriate area for staff in need of a quiet contemplative space to decompress or grieve
- Consider respite & recharge rooms
- Provide access to natural daylight and views
- Where dedicated respite spaces cannot be provided
  - Provide flex space to accommodate staff respite during emergency conditions

Why Standard 241?

1. COVID-19 exposed major gaps in HVAC guidance for infection control
2. Inconsistent strategies across healthcare facilities
3. Need for a unified, performance-based standard


ASHRAE
ARD
ASHRAE Standard 241-2023
Control of Infectious Aerosols

BACKGROUND

Work on HCAI/OSHPD Guide Completed

ASHRAE Standard 241-2023
Control of Infectious Aerosols

Purpose

- ASHRAE 241 establishes minimum requirements for controlling infectious aerosols to reduce disease transmission risk in new and existing buildings and major renovations, covering air system design, installation, operation, and maintenance.

Scope

- Based on reduction of *long range transmission* risk
- Does not establish overall requirements for acceptable indoor air quality but requires IAQ as a pre-requisite

1. Infection Risk Management Mode (IRMM)

The mode of operation in which measures to reduce infectious aerosol exposure documented in a building readiness plan are active

Decision on IRMM Enable / Disable: Not specified in 241

- Public health official
- Owner
- Occupant

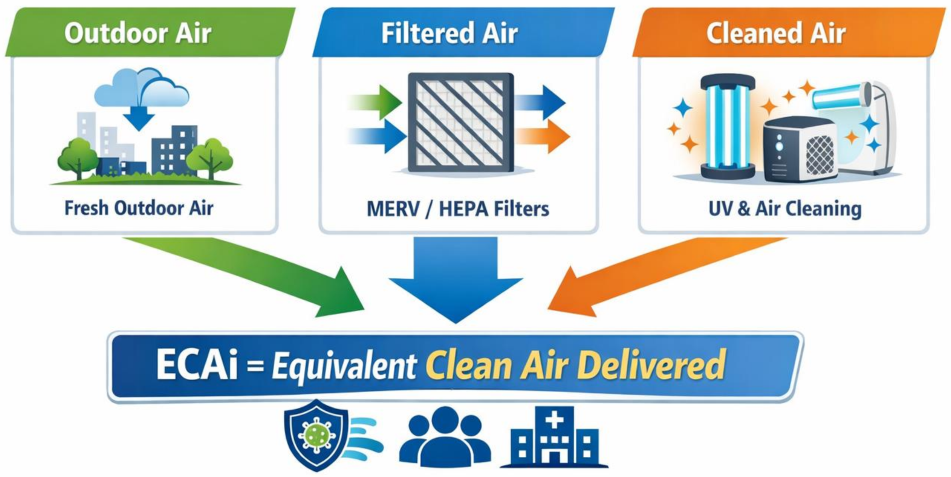
Why not all the time?

- Potential Energy use and cost increase
- Infection risk and consequences of infection vary over a wide range

Normal IRMM

2. Equivalent Clean Airflow-Infection (ECAi)

1. Core concept of Standard 241
2. Represents "pathogen-free" air delivered to occupants
3. Includes:
   1. Outdoor air
   2. Filtered Air
   3. Cleaned Air
4. It's not just how much air you deliver. It's how clean that air is !
5. Multiple strategies can achieve the same result



2. How are(ECAi) goals determined?

1. 0.1% infection probability
2. 1-hour exposure
3. 1% infected population (higher for healthcare)

Determining ECAi

1. ECAi Depends on:
   1. Space type
   2. Occupancy
   3. Activity level
2. Typical range: 20–90 cfm/person
3. Allows calculation of maximum occupancy under IRMM

Correctional Facilities		
Cell	30	15
Dayroom	40	20
Commercial/Retail		
Food and beverage facilities	60	30
Gym	80	40
Office	30	15
Retail	40	20
Transportation waiting	60	30
Educational Facilities		
Classroom	40	20
Lecture hall	50	25
Industrial		
Manufacturing	50	25
Sorting, packing, light assembly	20	10
Warehouse	20	10
Health Care		
Exam room	40	20
Group treatment area	70	35
Patient room	70	35
Resident room	50	25
Waiting room	90	45
Public Assembly/Sports and Entertainment		
Auditorium	50	25
Place of religious worship	50	25
Museum	60	30
Convention	60	30
Spectator area	50	25
Lobbies	50	25
Residential		

3. Air Cleaning Effectiveness and Safety

1. Major issue during COVID: lack of validated technologies
2. Standard 241 addresses:
    1. Effectiveness (removal/inactivation)
    2. Safety (e.g., ozone, byproducts)
3. Appendix A provides testing requirements
4. Goal is a level playing field for all technologies

4. Building Readiness Plan (BRP)

1. A documented response strategy for infection events
2. Includes:
    1. Engineering controls
    2. Operational measures
3. Acts as a facility "playbook" for IRMM

Documents the engineering and non-engineering controls that facility systems will use for the facility to achieve its goals

Summarizes results of assessment and planning exercises and documents measures to be implemented in IRMM

Direct descendant of ASHRAE Epidemic Task Force guidance

Adoption

- LEED
- ASHRAE 62.1 now references both 241 and G44

Resilient Spaces

Indoor Environmental Quality

EQc4 | Possible 2 Points

All credits | Guidance

Language | Addenda | Resources and tips | Courses | Forum

Intent

To support design features that increase the capacity for occupants to adapt to changing climate conditions and be protected from events that may compromise the quality of the indoor environment and subsequently occupant health and well-being.

Requirements

Comply with any of the following options for up to two points:

Option 1. Management Mode for Episodic Outdoor Ambient Conditions — New Construction Only (1 point)

This option applies to LEED BD+C: New Construction projects only.

Design systems with the capability to operate an episodic outdoor event management mode as described in *ASHRAE Guideline 44*. The mode should address varying outdoor conditions or events that could negatively influence indoor air quality, such as wildfire smoke. Include the management mode in the design and commissioning documents. Verify proper implementation of the mode during commissioning.

AND/OR

Option 2. Management Mode for Respiratory Diseases — New Construction Only (1 point)

Design occupied spaces with the capability to operate an infection risk management mode that provides the minimum equivalent clean airflow rates outlined in *ASHRAE 241-2023*, Section 5.1. Include the management mode in the design and commissioning documents as outlined in *ASHRAE 241-2023,* Section B10.2 Design Documentation. Verify proper implementation of the mode during commissioning.

ASHRAE 241 Calculator

- Standard is free viewing at https://www.ashrae.org/technical-resources/standards-and-guidelines/read-only-versions-of-ashrae-standards
- With the purchased standard, an Excel Std 241 calculator is provided
- Let’s do an example !

ASHRAE 241 Example

- ED Waiting Room – 1,500 sq.ft / 50 persons / 12 ACH/ MERV 14
- During a pandemic mode, does NOT comply with Std 241
- HEPA upgrade alone → insufficient
- Effective solution:
  - Reduce occupancy (50 → 30)
  - Increase airflow (12 → 15 ACH)
  - Maintain MERV 14
- Demonstrates multi-variable approach

Std 241 and energy

- Which strategies to comply with Std 241 use the least energy?
- Pacific Northwest National Lab (PNNL) did a study in 2025. Published October 2025.
- Compared multiple strategies
- Findings:
  – Increasing outdoor air → most energy intensive
  – Increasing airflow → also energy intensive
  – Lowest energy options → Portable air cleaners and UV systems

For Building Owners

1. Assess existing conditions
2. Define ECAi targets by space
3. Identify gaps
4. Select strategies (OA, filtration, cleaning)
5. Develop Building Readiness Plan
6. Implement improvements

For Designers of HCAI/OSHPD projects

1. HVAC System Sizing
   1. Systems may need to support dual-mode operation (normal + IRMM)
   2. Increased airflow, pressure drop, and capacity considerations
2. Filtration Strategy
   1. Greater reliance on MERV 13–14 and HEPA where applicable
   2. Filtration becomes a primary compliance tool, not just baseline
3. Design & Plan Review Impact
   1. Future need to demonstrate ECAi compliance
   2. Impacts OPR, BOD, and mechanical design documentation
4. Future Code Direction
   1. ASHRAE 241 already referenced in 62.1
   2. Possible path toward Title 24 / HCAI adoption especially with Std 170/FGI adoption
   3. Early adoption positions projects ahead of code

Investing in Resilience - Design

Recap of Key Strategies

- Incorporating robust structural integrity.
- Ensuring redundant critical systems (power, water, HVAC).
- Designing for flexible space utilization.
- Implementing advanced security measures.
- Planning for pandemic and emergency readiness.

Beyond Code Minimums

- A strategic investment, not just an expense.
- Enhances patient safety and well-being.
- Protects invaluable healthcare staff.
- Guarantees enduring operational capacity during crises.

Resilience ensures the facility remains a safe haven and a vital operational asset, even in the face of unforeseen challenges.

Investing in Resilience - HVAC

1. Standard 241 introduces a new way to define "clean air"
2. ECAi is the central design metric
3. Multiple strategies can achieve compliance
4. Planning (BRP) is as important as design
5. Healthcare facilities must be ready to adapt quickly

Resilience ensures the facility remains a safe haven and a vital operational asset, even in the face of unforeseen challenges.

Item #5 Continued

- Infection Control – Operations + Hazard Vulnerability Assessment
  - Review draft slides
  - Schedule webinar
  - Webinar presenters: Jennifer Cox and Kelly Martinez (or designees)
- Discussion and public input

Facilitator: Teresa Endres (or designee)

Department of Health Care Access and Information

Infection Prevention Operations

Designing healthcare facilities for resilience, surge readiness, and infection control across every operational mode.

Agenda

Topics and Objectives

Foundational & Built Environment

- Infection prevention role in design
- ICRA, regulatory framework, materials
- Airflow, water, hand hygiene, EVS workflow
- Flexibility, surge, and isolation pathways
- Convertible rooms, ante-rooms, traffic flow

Operations, Support & Validation

- Ventilation, water, and clinical workflow
- Patient and staff flow during outbreaks
- Sterile processing, waste, technology
- Commissioning, construction, governance

Infection prevention woven through every phase — from predesign to activation — not bolted on at the end.

Foundational Principles

The infection-prevention lens applied at every design decision — from regulatory framework to early operational planning.

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Role of Infection Prevention in Design

Embedding IP throughout the design lifecycle

Strategic Voice at the Table

IP integrated from predesign through activation — not consulted reactively after construction begins.

Operational Mode Awareness

Normal-mode and emergency-mode design considered side by side for every clinical area.

Risk-Based Decision Making

Every design choice evaluated against transmission risk, cleanability, and surge convertibility.

Cross-Disciplinary Alignment

Bridges clinical, facilities, EVS, design, and regulatory perspectives into one coherent strategy.

Phased Construction Protection

Air, water, and traffic separation maintained throughout renovations and retrofits.

When IP is embedded throughout the design process, preparedness becomes structural — not an afterthought.

Infection Control Risk Assessment (ICRA)

The structured framework for integrating IP into facility design and construction.

Clear Decision Workflows

Defined pathways for design choices that impact infection prevention, with named decision-makers and time limits.

Early Mode Identification

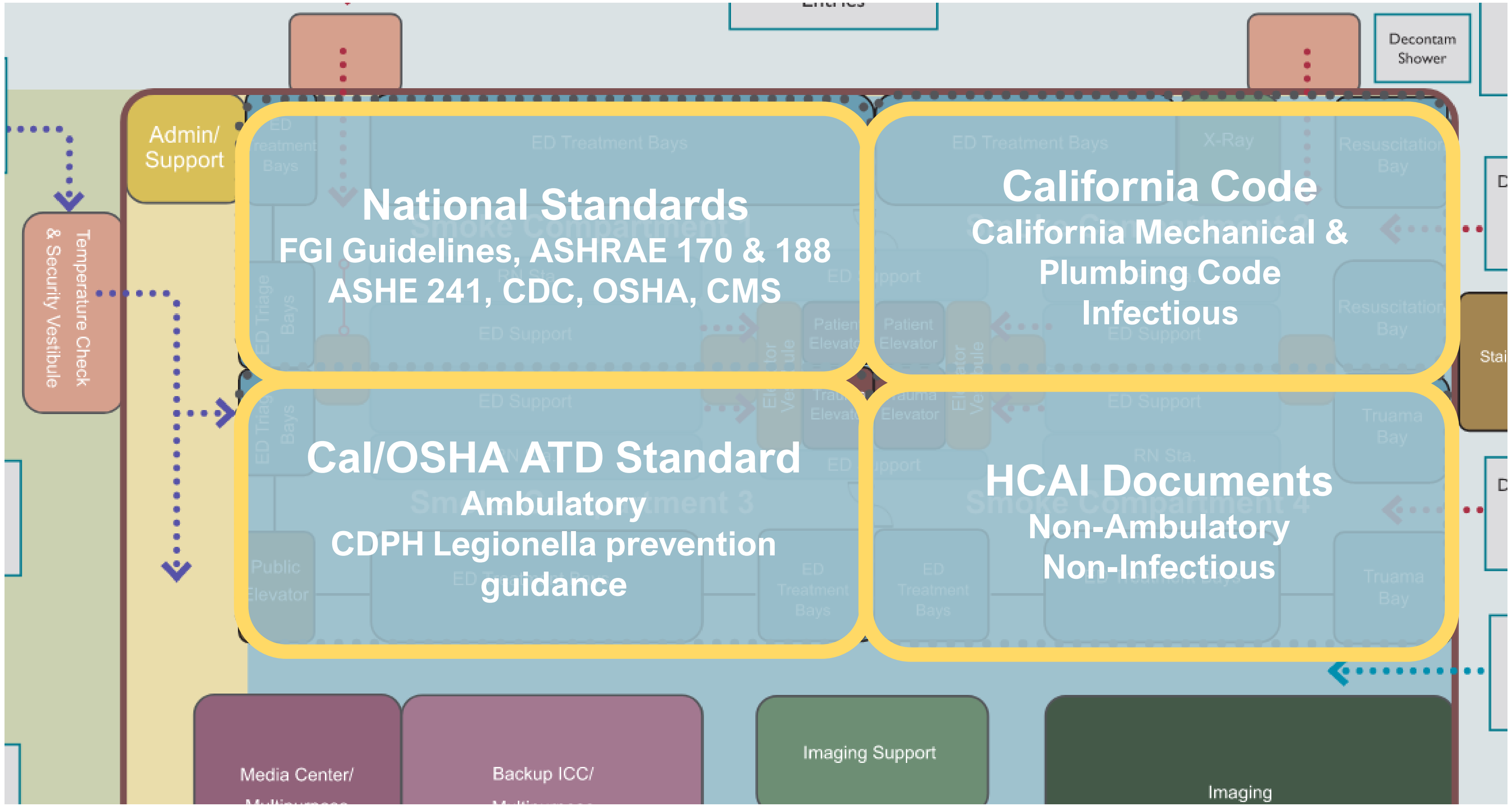
Pandemic and emergency operational modes flagged during programming — not surfaced during construction.

Preparedness-Driven Standardization

Room and unit standardization that builds flexibility for surges, conversions, and rapid staff deployment.

Regulatory & Guideline Framework

National, California, **and HCAI** standards that **shape infection-prevention** design in California.



Built Environment Factors

The physical infrastructure that determines whether infection control is achievable in daily operations and during surges.

Airflow, Pressurization & Ventilation

Normal-mode and emergency-mode airflow strategies designed in from the start.

Normal vs. Emergency Modes

HVAC designed for both routine operation and rapid switch to pandemic/surge modes — with documented sequences and tested transitions.

Convertible Rooms & Wards

Med/surg rooms designed to flex into AIIR. Entire units convertible into isolation wards — ductwork, dampers, and exhaust pre-stubbed for rapid switchover.

Materials & Finishes for Cleanability and Durability

HCAI-Compliant Selection

All finishes documented and verified against HCAI material requirements before specification.

Disinfectant Compatibility

Cleanable, durable surfaces compatible with hospital-grade disinfectants used in surge cleaning protocols.

Seams, Joints & Surge Resilience

Integral coving, sealed transitions, minimal crevices — finishes that withstand enhanced environmental disinfection.

Hand Hygiene Infrastructure

Sink and dispenser strategy that supports compliance under normal conditions and during water disruption.

Placement Strategy

Visible, accessible, at every transition point: room entry and exit, between patient zones, at staff workstations. Consider placement of soap and paper towel dispensers.

.

Surrounding Space

Ensure adequate space around splash zone, countertop space where patient supplies won't become wet/contaminated.

Supply Redundancy

Backup ABHR dispensers, refill protocols, and pandemic-stock storage planned in coordination with EVS.

Water Outage Contingency

Pre-identified alternative stations and waterless protocols ready to activate during service disruption.

Infrastructure must make compliance the easy choice — not the difficult one.

Environmental Services Workflow Integration

Storage & Staging

Dedicated rooms for supplies, equipment, and PPE — sized and located with EVS workflow input from day one.

Cleaning & Disinfection Access

Utility rooms, dilution systems, and cleaning equipment accessible without crossing patient zones.

Waste Routing & Clean/Soiled Separation

Distinct pathways for waste collection and disposal that never cross clean-supply flow. Design separation, not procedural workarounds.

Flexibility & Surge Capacity

How rooms, units, and pathways can be reconfigured under outbreak conditions — without major construction.

Convertible Units

Designing rooms that can flex to higher acuity and standardize for rapid conversion.

Standard → AIIR Conversion

Routine patient rooms pre-engineered with the ductwork, dampers, and exhaust capacity to switch to airborne isolation.

PACU → Critical Care

Post-anesthesia care units designed with medical gas, electrical, and headwall capacity to support critical care during surges.

Universal Room Design

Standardized layouts, headwalls, and finishes across units so staff can deploy anywhere without orientation delay.

Procedural Flexibility

Treatment areas planned with multiple use cases anticipated — every space carries surge value.

Temporary Isolation Areas & Traffic Flow

- Pre-planned options that activate quickly when standard zones reach capacity.
- Donning and doffing zones at unit entries with hand hygiene and waste capture.
- Ante-rooms and transition spaces secured during outbreaks as buffer zones.
- Clean and dirty pathways physically segregated — not just procedurally.
- Mortuary surge planning with outdoor space and utilities for refrigerator trailers.

Ventilation & Water Systems

Mechanical and plumbing systems engineered to switch operational modes safely — and to prevent stagnation, Legionella, and emergency failures.

Emergency-Mode Ventilation & Pressurization

Three layers of resilience: convertibility, power continuity, and real-time visibility.

Convertible Pressure Modes

Rooms designed to switch between positive and negative pressure where clinically warranted, with documented limits and verification.

Power-Loss Pressurization

Critical isolation rooms maintained on emergency power; fans, dampers, and controls on essential branches with battery backup.

Real-Time Monitoring

Continuous pressure and ACH sensors with BMS integration, audible alerts, and remote dashboards for IP and FMS visibility.

Failure modes documented and tested at commissioning — not discovered during an outbreak.

Preparedness in Water Systems

Designing potable, hot, and non-potable water systems to prevent Legionella, support ASHRAE 188, and respond to emergencies.

HCAi
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Low-Use Zones & Stagnation Prevention

Recirculation Design and Automatic Flushing

Hot-water loops maintained at target temperatures across all branches, including remote outlets and lightly used wings. Utilize fixtures that can be programmed to automatically flush to ensure continuous flow.

Dead-Leg Elimination

No abandoned branches. Capped-off connections removed rather than left for future use.

Aerosolizing Fixture Strategy

Fixture selection mapped to clinical risk — minimize aerosolizing outlets near immunocompromised patients.

Water Management Plan Integration

Aligning facility design with ASHRAE 188 and California Legionella expectations.

Water management team identified at predesign with documented control measures and verification protocols.

ASHRAE 188 Alignment

Risk assessment per facility zone with documented control measures, verification, and corrective-action plans.

California Expectations

CDPH Legionella guidance, HCAI water-system commissioning requirements, and coordination with local water authority.

Emergency & Low-Use Response

Design features supporting flushing, automated flow/temperature monitoring, and sampling access for IP and water-safety teams.

Sampling Ports, Sensors & Backup Disinfection

The instrumentation that makes water systems observable — and the redundancy that keeps them safe.

Strategic Sampling Ports

Sample access throughout distribution — not just at the source. Accessible without disrupting service.

Sensor Infrastructure

Continuous temperature, chlorine residual, and flow monitoring with BMS integration and alerting.

Automated Flushing

Smart-fixture or solenoid-driven flushing in low-use branches, with logs available to compliance teams.

Hyperchlorination Access

Pre-installed hyperchlorination access points for shock disinfection during contamination events.

Backup Disinfection

Secondary-disinfection compatibility — capable of continuing during power loss or system disruption.

Emergency Response Scenarios

Main Break Response: Isolation valves, alternate supply tie-ins, and prioritized service zones documented and accessible to facilities staff.

Contamination Event Response: Sampling protocols, backup disinfection, and communication plans pre-defined — not improvised.

Construction Shutdown Protocols: Pre-flush procedures, branch isolation strategies, and recommissioning validation before reopening any service zone.

Recommissioning Triggers: Every shutdown becomes a future stagnation event. Recommissioning belongs in the original design — not in the after-action report.

Communication Continuity: IP, facilities, and clinical leadership notified in real time when water system status changes.

Clinical Operations During Outbreaks

How people — patients, staff, and visitors — move through the facility when the rules change. The design decisions that protect everyone.

Patient Flow During High-Consequence Infectious Disease or Novel Infection Outbreaks

Waiting Room Segregation

Physically separate waiting areas for infectious vs. non-infectious patients, with distinct entries when possible.

Dedicated Patient Pathways

Pre-planned routes that avoid shared corridors, elevators, and processing areas during outbreaks.

Triage Decision Points

Screening checkpoints that route patients to the correct pathway before they enter shared spaces.

Visitor & Staff Separation

Coordinated flow design that protects clinical and support staff from inadvertent exposure.

Separation that protects everyone in the building — not just the people being treated for infection.

Staff Workflow & Decontamination

Protecting the workforce that protects everyone else.

PPE Storage & Surge Stock

Decentralized PPE caches sized for surge demand, with clear stocking and replenishment protocols.

Reusable PPE Processing

Infrastructure for PAPR cleaning, respirator decontamination, and other reusable PPE management.

Don / Doff Zones

Dedicated, well-marked donning and doffing areas with hand hygiene, waste capture, and direct observation lines.

Staff Decontamination Showers

Showers and clean-clothing stations at critical transitions — contaminated to clean, dirty to home.

Pathway Discipline

Designed traffic flow that staff actually follow — because the layout makes the correct route obvious.

Staff safety is the precondition for everything else. Design accordingly.

Visitor Management & Additional Populations

Designing for the people who arrive at the hospital but aren't admitted — and surge populations needing outdoor accommodation.

Screening Stations

Indoor and outdoor checkpoints with shelter, lighting, and computing capacity for high-throughput triage.

Holding Zones

Spaces to hold visitors awaiting clearance without contaminating clinical areas or congesting entries.

Exterior Population Spaces

Pre-identified site areas with electricity, sanitation, and shelter access for tents, buses, or modular units.

Surge Infrastructure Hooks

Site utilities (power, water, data) ready to support tents, buses, modular units, or refrigerated trailers.

Sterile Processing & Perioperative

Surge readiness for the spaces that keep instruments safe — and the patients who depend on them.

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Scalable Capacity & Redundancy

Designing SPD and the perioperative environment to flex up without compromising sterility.

Scalable Sterile Processing

Equipment capacity, workflow, and storage that absorb peak demand without bottlenecking the OR schedule.

Scalable OR / Procedural

Operating rooms and procedure spaces designed for flex utilization — anesthesia, holding, and recovery scalable in parallel.

Contingency Sterilization

Support for deferred sterilization: extended cycles, alternate processing locations, IUSS protocols documented in design.

HVAC Redundancy

Procedure rooms and ORs on redundant ventilation — N+1 fans, dampers, and exhaust paths to maintain pressurization.

Centralized vs. Decentralized

Decentralized and centralized reprocessing each have tradeoffs. Choose with surge scenarios explicitly in mind.

Sterile processing is the silent backbone of surgical surge response — design it that way.

Waste, Hazmat & Biohazard Readiness

The unglamorous infrastructure that quietly determines whether surge operations succeed or fail.

Redundant Routing, Surge Storage & Decontamination

Designing waste handling to scale with patient volume — not to fail at the worst possible time.

Redundant Waste Routing

Multiple pathways from generation point to dock, so a single chase, elevator, or corridor closure doesn't halt operations. Redundancy isn't optional for waste.

Surge Storage & Decontamination

Pre-identified climate-controlled biohazard surge space plus dedicated decon stations for equipment and carts — with utilities, drainage, and ventilation already in place.

Technology, Validation & Governance

The monitoring, automation, commissioning, and governance systems that make rapid response possible.

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Real-Time Environmental Monitoring

Continuous Monitoring

Air pressures, temperature/RH, water quality, and ACH tracked 24/7 with BMS integration and audit trail.

Mode-Switching Automation

Pre-programmed sequences for AIIR mode, pandemic surge mode, and water-flushing mode — single-action activation.

Automated Dashboards

IP, facilities, and clinical leadership see the same data in real time. One source of truth, accessible remotely.

Supply Chain & Storage Preparedness

Strategic storage that survives interrupted deliveries and supports outbreak response.

Strategic Surge Storage

PPE, disinfectants, and high-consequence pathogen kits stored at quantities sized for documented surge scenarios.

Decentralized Caches

Critical supplies stored at point of use, not just central warehouse — reduces transport risk and surge bottlenecks.

Decontamination Flow

Inbound supply decontamination paths designed to keep contamination out of clean storage areas.

INVENTORY VISIBILITY DRIVES SURGE RESPONSE TIMING.

Stock-level dashboards integrated with monitoring — leadership sees consumption in real time, not month-end.

Operations & Response

Facilities Management & Emergency Coordination

Maintainability Under Outbreak

Safe zones for FMS staff to access mechanical rooms without crossing patient or contaminated zones.

Remote Inspection & Access

Cameras, sensors, and remote-operable systems where physical access carries infection risk. Cross-trained staff with documented access paths.

System Maps & Documentation

Up-to-date schematics for airflow, water zones, and pressurization grids — accessible during emergency response, not buried in a binder.

Commissioning, Recommissioning & Validation

Proving the systems work — before patients depend on them, and every time they're modified.

IP Role in Commissioning

Infection prevention at the table for functional testing — not just signing off on a punch list at the end.

Pre-Occupancy Verification

Pressurization tests, airflow patterns, and water-system flushing all verified before clinical activation.

Scenario-Based Testing

Simulated surge, outage drills, and water-disruption exercises that prove systems work under real conditions.

Recommissioning Triggers

Defined events that trigger re-validation: renovations, system changes, occupancy shifts, post-incident review.

Construction & Renovation Preparedness

ICRA-integrated construction that protects operations throughout the project lifecycle.

1

ICRA Integration

Risk assessment for every phase, every trade, every space — documented and signed off before work begins.

2

Phased Construction

Air, water, and traffic separation maintained throughout the project lifecycle, with documented controls per phase.

3

Temporary Controls

Negative pressure, HEPA filtration, sealed barriers, and monitoring — not improvised mid-project.

4

Turnover & Reopening

Water-system flushing, air-balance verification, and IP signoff before re-occupancy. Always.

Every active project in a working hospital is an infection-prevention project.

Governance & Decision-Making

Embedding infection prevention into every phase of the project lifecycle.

1
Predesign
IP at the programming table. Operational modes and risk priorities established before design begins.

2
Schematic
ICRA decisions logged. Convertibility, isolation strategy, and traffic flow baked into the SD set.

3
Design Development
IP review checklists complete. Materials, finishes, plumbing, and HVAC validated against IP requirements.

4
Construction
ICRA monitoring active. Temporary controls verified weekly. Issues escalated through defined paths.

5
Activation
Functional validation. Pressurization, airflow, water flushing, mode switching — all proven before patients arrive.

6
Ongoing
IP signoff required for any system modification post-activation. Recommissioning triggers documented in operations manual.

IP review checklists signed off at every phase release — with named decision-makers and escalation paths.

Key Takeaways

Infection Prevention is Not A Department

Infection Prevention is a design and operational strategy that ensures the successful design of a resilient facility

Collaboration

Resilient healthcare facilities are built through collaboration among clinical teams, facilities, environmental services, infection prevention, designers, and leadership

Integration

Infection Prevention integration from predesign through operations

HOSPITAL BUILDING SAFETY BOARD · BUILDING RESILIENT HOSPITALS

Hazard Vulnerability Analysis

A systematic process to identify threats, assess vulnerabilities, and safeguard operational continuity across California's healthcare facilities.

Presented by: Kelly Martinez & Jennifer Cox

Why It Matters to Design Professionals & IORs

The HVA is where risk becomes a design input — long before construction documents are stamped.

Risk drives design

HVA findings define which hazards your building must resist — seismic forces, flood elevation, wildfire exposure, and utility redundancy.

Justifies scope & budget

It ties structural, mechanical, and life-safety scope to documented, ranked risk rather than assumption — strengthening every design decision.

Context for project teams

The HVA gives the team the risk rationale behind the critical systems and assemblies.

One compliance thread

It links your work to HCAI, CMS, and Joint Commission emergency-preparedness expectations from concept through activation.

What Is a Hazard Vulnerability Analysis?

A structured, repeatable risk assessment tailored to the healthcare environment.

An HVA identifies the threats most likely to disrupt an organization, then evaluates the likelihood of each and the severity of its impact on operations, patient care, and staff safety.

Conducted annually · reviewed by the Emergency Preparedness/Environment of Care Committee

1 Identify Hazards

Catalog potential events across Natural, Technological, Human, and Hazmat categories.

2 Assess Risk

Score probability and severity for each event on a consistent scale.

3 Prioritize

Rank events by relative threat so resources go where they matter most.

4 Mitigate

Translate top risks into prevention, preparedness, and response plans.

Why the HVA Matters in a Resilient Hospital Model

It transforms reactive crisis response into proactive, data-informed risk mitigation.

Strategic preparedness	Move beyond ad-hoc responses to structured, data-informed readiness plans.
Infrastructure resilience	Identify and address physical and technological vulnerabilities before they fail.
Business continuity	Sustain essential services and patient care even under extreme stress.
Capital prioritization	Direct limited resources to the investments with the greatest impact on safety.
Regulatory compliance	Meet and exceed emergency-preparedness and disaster-management requirements.

The HVA Process: Six Steps

From committee kickoff to a living mitigation plan.

1 Convene the team

The Emergency Preparedness Committee meets annually to lead the assessment.

2 List hazards

Brainstorm possible events — earthquakes, IT failures, active shooters, chemical spills.

3 Score probability

Rate the likelihood of each event: 0 = N/A, 1 = Low, 2 = Moderate, 3 = High.

4 Score severity

Rate human, property, and business impact plus preparedness on the same 0–3 scale.

5 Compute risk

The tool calculates a relative threat (0–100%) per event and category.

6 Build mitigation plan

Translate the top risks into prevention, response, and recovery actions.

Steps 2–4 repeat for each of the four hazard categories.

Categories of Hazards Evaluated

Every hazard a facility could face is grouped into four families — each assessed on the same scale.

Natural

Earthquake, wildfire, flood, extreme heat, drought, storms

Technological & Infrastructure

Power, IT, cyber, medical gas, HVAC, communications

Human-Caused

Violence, active shooter, civil unrest, terrorism

Operational

Staffing, supply chain, EHR downtime, systemic failure

Hazard Category: Natural

Threats from the physical environment and their impact on hospital operations.

Geological

Earthquakes — the defining seismic threat for California facilities.

Meteorological / Climatological

Wildfires, severe storms, extreme heat, and prolonged drought.

Hydrological

Flooding from external water sources and site drainage failure.

Impact areas assessed: hospital operations · site access · utilities & infrastructure · staffing availability

Hazard Category: Technological & Infrastructure

System failures that threaten the building's ability to sustain care.

Power outages

Uninterrupted power sustains life support, diagnostics, and operations.

IT system failures

Critical systems such as EHR and PACS must stay available.

Cybersecurity breaches

Protecting patient data and defending against malicious attacks.

Medical gas failures

Reliable oxygen and gas delivery is essential to patient care.

HVAC failures

Maintaining temperature, humidity, and air quality is critical.

Communication outages

Reliable communications coordinate care during any event.

Hazard Category: Human-Caused & Operational

Risks arising from human action and from internal, systemic vulnerabilities.

Human-Caused

Intentional or unintentional human actions.

- Active shooter & workplace violence
- Civil unrest and protest activity
- Terrorism & bomb threats
- Hazardous-material release (Hazmat)

Operational

Internal or systemic risks that disrupt function.

- Staffing shortages & labor actions
- Supply-chain and resource disruption
- EHR / IT downtime events
- Infrastructure & equipment failure

How Risk Is Scored

Each event's relative threat is computed the same way — probability times severity.

Risk
Relative threat (0–100%)

=

Probability
Scored 0 – 3

×

Severity
Average of six impact factors

Severity averages six weighted factors:

- Human Impact
- Property Impact
- Business Impact
- Preparedness
- Internal Response
- External Response

The 0–3 Scoring Scale

Impact scales ascend; preparedness and response scales descend.

Criterion	0	1	2	3
Probabil	N/A	Low	Moderate	High
Human / operty / Business Impact	N/A	Low	Moderate	High
Preparedn	N/A	High	Moderate	Low / none
Internal Re	N/A	High	Moderate	Low / none
External esponse	N/A	High	Moderate	Low / none

Note: lower preparedness and response scores reflect better readiness — a strong plan reduces the calculated risk.

Risk Prioritization Matrix

Probability and impact combine to rank where mitigation must go first.

PROBABILITY	Low	Medium	High
High	Medium	Med-High	High
Medium	Low-Med	Medium	Med-High
Low	Low	Low-Med	Medium

IMPACT

Reading the matrix

High-probability, high-impact events sit in the red zone and demand immediate focus.

The matrix visualizes the same math behind the worksheet — Probability × Severity — so leadership can see priorities at a glance.

Sample HVA: Natural Hazards Worksheet

Probability × severity (average of six factors), expressed as relative threat.

Event	Prob	Human	Prop	Bus	Prep	Int	Ext	Risk
Earthquake	3	3	3	3	2	2	1	**78%**
Temperature Extremes	3	3	1	2	2	2	1	**61%**
Drought	3	3	1	1	1	2	2	**56%**
Epidemic	2	3	1	3	2	3	2	**52%**
Wildfire	2	1	2	1	3	3	2	**44%**
Structure Fire	2	2	3	3	1	1	2	**44%**
Air Particulates	2	2	0	2	2	2	2	**37%**
Flood, External	1	1	2	2	1	1	2	**17%**
Severe Thunderstorm	1	2	1	2	1	1	1	**15%**

Sample data for illustration. Each factor scored 0–3; Risk is the resulting relative threat (0–100%).

From Scores to Action: The Mitigation Plan

Top-ranked hazards are documented across four phases of emergency management.

Mitigation

Reduce likelihood and severity before an event occurs.

Preparedness

Plans, training, supplies, and partnerships in place.

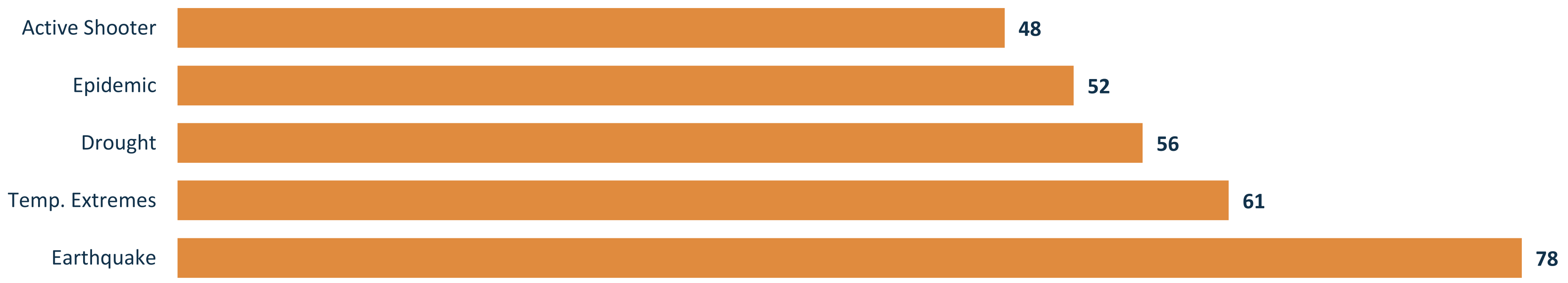
Response

Activate the command structure when an event happens.

Recovery

Restore services, inspect assets, and capture lessons.

Top-ranked hazards in the sample HVA



The HVA's Role in Infrastructure & Capital Planning

Where HVA findings become the business case for what gets built and hardened.

Informing critical decisions

HVA findings are the evidentiary foundation for strategic infrastructure investment.

Risk-mitigation priorities

Seismic reinforcement, redundant power, flood barriers, and fire-resistant assemblies.

Optimizing capital investment

Aligning limited dollars to identified risk for maximum resilience per dollar.

Infrastructure renewal cycles

Proactive maintenance, upgrade, and replacement plans based on assessed need.

Operational Preparedness & Response Planning

How the facility organizes people and resources when an event occurs.

Surge capacity	Rapidly expand resources and services during high-demand periods.
Emergency staffing	Protocols for activating and managing personnel during a crisis.
Interagency coordination	Seamless collaboration with external partners and responders.
Equipment staging	Timely positioning of essential equipment and alternate care sites.
Incident command	A defined framework for standing up and running incident command.

Compliance & Accreditation Alignment

A documented HVA is the cornerstone of emergency-preparedness compliance.

Key regulatory & accrediting bodies

- CMS
- The Joint Commission (TJC)
- HCAI
- State Health Departments

Demonstrates compliance

A documented HVA is required to develop robust emergency-preparedness plans.

Evidence of due diligence

Concrete proof the organization proactively identifies and addresses threats.

Facilitates accreditation

Aligning with emergency-management standards simplifies the survey process.

Integration into Continuous Improvement

The HVA is a living process — not a document that is filed and forgotten.

Annual review

Ensures the HVA stays relevant year over year.

Post-event updates

Incorporates lessons learned from major events.

Capital-planning integration

Feeds strategic resource allocation.

Training incorporation

Drives preparedness through integrated training.

The Cornerstone of Hospital Resilience

Anticipate risk

Identify threats specific to the healthcare environment.

Prioritize mitigation

Focus resources on the most critical risks first.

Protect life safety

Safeguard patients, staff, and visitors.

Sustain care

Maintain essential services through disruption.

The HVA is the foundation of a healthcare system that is not only prepared — but truly resilient.

Item #6 Discuss lessons learned from the webinars already presented by the “HCAI Design Guide for Planning and Preparing for Disasters” Webinar Development Subcommittee:

- Wildfire and Wildland-Urban Interface Readiness for Healthcare Facilities
  - Presented May 14, 2026
  - Presenters: Gary Dunger, Janice Cheung, and Nanci Timmins

Wildfire and Wildland-Urban Interface Readiness for Healthcare Facilities

- May 14, 2026
  - Registered: 224
  - Attended: 112
  - 37 surveys submitted
    - "This webinar met my expectation"
      89% responded 8 – 10 (max 10)

Item #6 Continued

- Designing Hospitals for Wildfire Smoke: HVAC Strategies for Resilience and Readiness
  - Presented June 10, 2026
  - Presenters: Mikhail Fuks and Abdel Darwich
- Power Resilience, Regulatory Compliance, and the Future of Healthcare Infrastructure
  - Presented July 7, 2026
  - Presenters: David Bliss, John Griffiths and Jamie Schnick
- Discussion and public input

Facilitator: Teresa Endres (or designee)

Designing Hospitals for Wildfire Smoke: HVAC Strategies for Resilience and Readiness

- June 10, 2026
  - Registered: 251
  - Attended: 135
  - 53 surveys submitted
    - This webinar met my expectation”
      81% responded 8 – 10 (max 10)

Power Resilience, Regulatory Compliance, and the Future of Healthcare Infrastructure

- July 7, 2026
  - Registered: 320
  - Attended: 173
  - 64 surveys submitted
    - This webinar met my expectation”
      83% responded 8 – 10 (max 10)

Item #7 Discuss the AIA + HCAI OSHPD HBSB “Road Show,” a collaboration with the American Institute of Architects (AIA) Central Valley Academy of Architects for Health and HCAI

- Tentative date – Spring 2027
- Discuss which HBSB members will present and which will attend
- Discussion and public input

Facilitator: Teresa Endres (or designee)

Item #8 Reschedule the October 15, 2026, meetingTentative date – Spring 2027

- Discussion and public input

Facilitator: Teresa Endres (or designee)

Item #9 Comments from the Public/Subcommittee Members on Issues not on this Agenda

The Subcommittee will receive comments from the Public/Subcommittee Members. Matters raised at this time may be taken under consideration for placement on a subsequent agenda.

Facilitator: Teresa Endres (or designee)

Item #10 Adjournment