RiskTopics

Management practices: Converting facilities to alternative health care sites
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During a crisis, surge capacity for patient space may be needed. Convention centers, hotels, and other facilities may be converted to manage patient care. When a facility is converted to a health care occupancy, consider the measures offered in this document.

Introduction

During times of a crisis, the space available in a convention center, hotel or other location may be modified to support needed patient care surge capacity. Conversion to a health care occupancy may introduce hazards not normally found in the facility. This document is offered to customers to:

- Share guidance to consider when a facility is used as a health care occupancy
- Raise awareness to selected health care hazards
- Reduce the likelihood of property damage events interrupting health care operations at converted facilities

The measures offered in this document are for property protection purposes. Measures beyond property protection are outside the scope of this document.

Oxygen and health care occupancies

Expect the use of oxygen.

While oxygen itself does not burn, it supports the combustion process. Where oxygen is released and allowed to enrich the surrounding air, it may support an increased rate of combustion (fire severity).

Consider the guidance in this document to manage oxygen storage, handling, and use.

Flammable liquids and health care occupancies

Expect the use of flammable liquids in quantities that may exceed normal levels.

This may include the use of hand sanitizer and laboratory chemicals. Consider the guidance of this document to manage flammable liquids storage, handling, and use.

Discussion

When a need for alternative health care sites develop, health care organizations may target locations providing capabilities closest to those found in typical health care facility; in other words, sites limiting the need to introduce temporary infrastructure. Infrastructure needs for an alternative health care site may include:

- Electric power (normal and emergency)
- HVAC (heating, ventilation, and air conditioning)
- Kitchens (commercial scale food storage and cooking capabilities)
- Laundry (off-site service may be an option)
- Loading docks (receive supplies and remove waste)
- Site access control
- Staff facilities (rest rooms, locker rooms, and cafeterias)
- Laboratories (rapid point-of-care tests)
- Medical gases (oxygen and compressed medical air)

ASHE (American Society of Healthcare Engineers) suggests the following facilities may be suited as alternative health care sites because they often require fewer temporary systems and services to convert them for temporary use:

- Convention centers
- Hotels
- Schools

Convention centers may include electrical infrastructure normally intended to distribute electrical power to exhibitor stands and booths. A partitioned patient space configuration may be like an exhibitor layout. In addition, convention centers may include commercial kitchens, HVAC for large occupant loads, and loading docks.

Hotels may be used to accommodate both health care staff and patients. Full-service hotels with conference centers, ballrooms, or convention centers may involve less need for need for temporary infrastructure.

Schools may be targeted for alternative health care sites. Schools often include commercial kitchens, loading docks, gymnasiums, and locker rooms.

Hazards

When converting facilities to an alternative health care site, new hazards may be introduced while other hazards may remain unchanged.

Hazards that may be new

New hazards introduced may include:

- Oxygen (storage, handling, and use)
- Flammable liquids (storage, handling, and use)
- Temporary electrical distribution
- Emergency generators
- Medical waste (processing and disposal)

Hazard that may not change

Hazards that may not change include:

- Boiler and fuel-fired heater rooms
- Employee locker rooms
- Gift or retail shops
- Kitchen and cafeterias
- Laundries (commercial or domestic scale)
- Maintenance shops
- Storage rooms (for combustible supplies and equipment)
- Trash collection rooms (non-medical waste)

Management programs

When converting facilities to alternative health care sites, some management programs may need to adjust to compensate for the new occupancy.

Management programs that may change

Emergencies such as earthquakes, fire, floods, hurricanes, and wildfires may still occur while the facility is operating as a health care occupancy. Recognize that the new health care occupancy may impact the effectiveness of existing emergency response plans.

Hospitals typically plan to protect and defend patients in place and limit vertical evacuation as a last resort. Hospitals often implement an emergency response procedure such as RACE (Rescue, Alarm, Confine, and Extinguish).

Management programs that may not change

While the building occupancy may change, a number of routine management programs may not change. Examples of programs that may not change include:

- Contractor controls
- Fire protection impairments
- Hot work
- Housekeeping
- Preventive maintenance
- Smoking controls

Guidance

Customers should consider the following guidance when facilities such as convention centers, hotels, or schools are converted to health care occupancies.

Site controls

Provide site controls as required by local authorities. For further guidance related to site controls, see Appendix A.

Oxygen and other medical gases

Patient care may involve the use of medical gases. A medical gas of specific concern from a property protection perspective is oxygen.

As noted earlier, while oxygen itself does not burn, it supports the combustion process. Where oxygen is released and allowed to enrich the air, ordinary combustible materials may burn faster and more vigorously.

Storage of oxygen in cylinders or cryogenic containers

Store oxygen cylinders (compressed gas) and cryogenic containers (liquefied gas) as required by local authorities. For further guidance related to the storage of oxygen in cylinders or cryogenic containers, see Appendix B.

Storage of oxygen in bulk tanks

Store oxygen in bulk tanks as required by local authorities. For further guidance related to the storage of oxygen in bulk tanks, see Appendix C.

Handling of oxygen cylinders and containers

Transport oxygen gas cylinders and cryogenic containers as required by local authorities. For further guidance related to the handling of oxygen in gas cylinders or cryogenic containers, see Appendix D.

Handling of oxygen in distribution systems

Install oxygen distribution systems (pressure regulators, valve, piping, and tubing) as required by local authorities. For further guidance related to the handling of oxygen in distribution systems, see Appendix E.

Use of oxygen

Use oxygen following the guidelines of local authorities. For further guidance related to the use of oxygen, see Appendix F.

Storage, handling, and use of flammable and combustible liquids

Should the health care occupancy include a laboratory for processing medical samples, flammable and combustible liquids may be used in limited amounts. Store, handle, and use flammable and combustible liquids following the guidelines of local authorities. For further guidance related to the storage, handling, and use of flammable and combustible liquids, see Appendix G.

Temporary electrical distribution

Where an alternative health care facility does not include sufficient electrical distribution infrastructure, additional temporary electrical distribution may be needed. Where needed, provide temporary electrical systems following the guidelines of local authorities. For further guidance related to temporary electrical distribution, see Appendix H.

Emergency generators

Where an alternative health care facility does not include sufficient emergency power capabilities, a temporary emergency generator may be provided. Temporary emergency generators should be located and arranged following the guidelines of local authorities. For further guidance related to emergency generators, see Appendix I.

Managing medical waste

Manage medical waste following the guidelines of local authorities. For further guidance related to the management of medical waste, see Appendix J.

Management programs that may change

When a facility is operated as a health care occupancy, verify the health care management team provides an emergency response plan following the guidelines of local authorities. For further guidance related to Emergency response plans, see Appendix K.

Management programs that may not change

When a facility is operated as a health care occupancy, many routine management programs should be maintained in use such as those listed below. For further guidance related to these management programs, see Appendix L.

- Fire protection impairments
- Fire system inspection, testing, and maintenance
- Hot work
- Housekeeping

Conclusion

When a facility such as a convention center, hotel, or school is converted to a health care occupancy during a crisis, consider the measures offered in this document to help identify and manage hazards that may be associated with converting the facility for such use.

The Reference section includes a link to an American Society of Healthcare Engineers web page - ***Converting alternate care sites to patient space options*** – that may provide additional insights on the challenges of introducing a health care occupancy into non-health care facilities.

References

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Appendix A - Site controls

Consider site controls including, but not limited to, the following:

- Space to accommodate the anticipated flow and parking of vehicles.

  This may include ambulances and worker vehicles, but also vehicles delivering, loading, or unloading oxygen, flammable liquids, food, laundry, and waste. The intent is to provide space to minimize the potential for vehicle incidents, especially those that could cause a fire.

- Perimeter fencing (permanent or temporary) with either locked gates or openings with guard supervision to control access to outdoor:

  – Oxygen storage
  – Flammable or combustible liquids storage
  – Waste containers or compactors
  – Emergency generators

  The intent is to control access by unauthorized persons.

- Maintain any temporary tents, trailers, or structures at least 3 m (10 ft.) from buildings, outdoor storage (oxygen, flammable liquids, and waste), electrical equipment, or other features

Appendix B - Storage of oxygen in cylinders or cryogenic containers

For the storage of oxygen in cylinders or cryogenic containers, consider controls including, but not limited to, the following:

- Maintain storage in an outdoor area

  Note: While hospitals may maintain storage indoors, it is anticipated some protection features available at hospitals may not be available at facilities such as convention centers and hotels. These protection features may include: fire rated rooms and dedicated exhaust ventilation systems.

- Limit storage areas to only oxygen and provide separate storage areas for full and empty oxygen containers
- Enclose storage areas with a fence and gate resistant to unauthorized access
- Maintain at least a 6.1 m (20 ft.) clearance to cylinders containing other materials, any combustibles, and buildings
- Maintain storage areas free of combustible debris
- Secure cylinders individually in their upright position with chains or equivalent means

  Note: Do not corral cylinders with a single securement means, such as a chain. This will help avoid multiple cylinders falling.

Example of inappropriate corralling of cylinders with a single chain (Photo source: The Zurich Services Corporation)

- Maintain cylinders with their valve caps in place
- Maintain cylinders and containers at a temperature less than or equal to 52°C (125°F)
- Avoid smoking, open flames, heat sources, and other potential ignition sources within 6.1 m (20 ft.) or inside of the storage area

Appendix C - Storage of oxygen in bulk tanks

For storage of oxygen in bulk tanks, consider controls including, but not limited to, the following:

- Provide protection, such as bollards, to help prevent vehicle impact
- Provide fencing and gates resistant to unauthorized access
- Locate bulk tanks outside, on ground level, separated from other features per the following table

Minimum bulk tank minimum distance to feature		
Features	**Distance**	
	Meters	**Feet**
Fire resistive or noncombustible buildings	0.3	1
Building openings (doors, windows, vents, etc.)	0.3	1
Combustible ground surfaces (including asphalt paving)	1	3
Vehicle parking	3	10
Combustible buildings	15	50
Flammable/combustible liquids	15	50

Examples of bulk storage tanks with atmospheric vaporizers; left photo shows traffic bollards, and both show access control by fencing and gates (Photo source: The Zurich Services Corporation)

Appendix D - Handling of oxygen cylinders and containers

For the handling (transport) of oxygen cylinders and containers, consider controls including, but not limited to, the following:

- Avoid transporting cylinders or containers by rolling them on their side
- Avoid transporting cylinder and containers without using all safety devices provided by the manufacturer (such as valve caps)
- For portable cylinders and containers of any size, use a wheeled cart or dolly designed for portable cylinder or container transport, and follow manufacturer's guidelines regarding cart and dolly use (including limits on the size and number of cylinders or containers placed on a cart or dolly at any time)
- Secure cylinders and containers to the cart or dolly during transport

Left: Cylinder valve cap, Right: Dolly for large cylinder transport (Photo source: The Zurich Services Corporation)

Appendix E - Handling of oxygen in distribution systems

When handling oxygen in distribution systems, consider controls including, but not limited to, the following:

- Select materials that are compatible with oxygen
- Route piping and tubing away from areas, such as storage areas and waste handling areas, occupied by accumulations of combustible materials.
- Protect piping and tubing from physical damage.
- Where oxygen is stored as a cryogenic liquid, consider using an atmospheric vaporizer to convert liquid oxygen to gaseous oxygen. Avoid the use of electrically heated or fuel-fired vaporizers.

Atmospheric vaporizers (Photo source: The Zurich Services Corporation)

Appendix F - Use of oxygen

When oxygen cylinders are at a point of use (patient area), consider controls including, but not limited to, the following:

- Avoid smoking, open flames, heat sources, and other potential ignition sources in oxygen use areas
- Secure larger cylinders using a stand or other means intended for use with the cylinder
- Store smaller cylinders in a designated mobile cart or bracket intended for use with portable cylinders.

Example of unsecure smaller cylinders (Photo source: The Zurich Services Corporation)

Appendix G - Storage, handling, and use of flammable and combustible liquids

When storing, handling, or using flammable or combustible liquids, consider controls including, but not limited to, the following:

Storage

- Maintain liquids in a flammable liquid storage cabinet when the liquids are not in active use
- Limit storage of alcohol-based hand sanitizer to 20 liters (5 gallons) outside of flammable liquid storage cabinets

Handling

- Transfer of used liquids into recycle storage containers should be conducted outside
- Recycled flammable and combustible liquids storage containers should be maintained outside in a flammable liquid storage cabinet or dedicated, fenced flammable liquids storage area.
- Transport new or used flammable and combustible liquid containers with a transport cart

Use

- Limit alcohol-based hand sanitizer to one container in patient partitions or rooms, staff work stations or rooms, or public service areas

Appendix H - Temporary electrical distribution

Temporary electrical systems are used for many purposes. As such, local electrical codes often provide guidance for such installations. When installing temporary electrical systems, consider following local electrical codes such as NFPA 70 (see Article 590 *Temporary Installations*).

In general, electrical codes typically expect temporary installations to comply with all requirements of a permanent installation. However, selected deviations - such as the installation of wiring exposed outside of wall, floor, or ceiling cavities - are typically permitted to accommodate the temporary nature of the installation.

Where any temporary wiring passes through fire rated construction, provide a firestopping system with a rating equivalent to the fire rated construction being penetrated. Select a firestopping system that is a Zurich Recognized Technology and have the system installed by a qualified contractor.

Consider conducting electrical thermal imaging of installed temporary electrical systems under load to identify abnormal conditions such as loose connections.

Have a qualified person (such as an electrician or electrical engineer) verify the use of extension cords is in accordance with local electrical codes.

Appendix I - Emergency generators

When installing temporary emergency generators, consider controls including, but not limited to, the following:

- Follow local electrical codes for guidance on the electrical interconnection of emergency generators to facility electrical systems
- Provide protection, such as bollards, to help prevent vehicle impact
- Provide fencing and gates resistant to unauthorized access
- Provide access for refueling vehicles
- Locate the temporary emergency generator outside and separate it from other features per the following table:

Minimum emergency generator distance to feature

Features	Distance	
	Meters	Feet
Fire resistive or noncombustible buildings	3	10
Vehicle parking	3	10
Oxygen storage (cylinders, containers, or bulk tanks)	3	10
Combustible buildings	15	50
Flammable/combustible liquids	15	50

Appendix J - Managing medical waste

Hospitals typically handle medical waste separate from other waste. When facilities such as convention centers or hotels are converted to a health care occupancy, additional waste handling equipment may be introduced for medical waste. This may include additional trash containers or trash compactors.

Consider extending the protection features provided for existing waste containers and compactors to any added containers or compactors for medical waste. This may include locating and arranging waste containers and compactors as follows:

- Outside and away from buildings, oxygen storage, and flammable and combustible liquid storage
- Adjacent to buildings, under canopies attached to buildings, or inside buildings (such as indoor loading docks) where automatic sprinkler protection is provided

Appendix K - Management programs that may change

Emergency response plans

Should an emergency occur, hospitals typically protect and defend patients in place and use vertical evacuation as a last resort. Hospitals often implement an emergency response procedure such as RACE (Rescue, Alarm, Confine, and Extinguish).

When a facility, such as a convention center or hotel, is converted to a health care occupancy, verify those managing the health care occupancy have:

- Developed and implemented an emergency response plan appropriate for any similar health care facility
- Trained all staff (medical and non-medical) regarding their emergency response duties

Keep in mind, emergency responders are likely to focus upon life safety as their priority when responding to a health care occupancy. Only when life safety needs have been managed will they be likely to redirect their efforts towards property protection. An effective emergency response plan may allow emergency responders to direct their attention towards property protection at the earliest possible time.

Appendix L - Management programs that may not change

Maintain the implementation of management programs including, but not limited to, those listed below.

Contractor controls

Maintain contractor control practices such as having contractors complete training regarding site rules, hazards, and work practices. This includes compliance with established programs for reporting fires, conducting hot work, smoking controls, and fire protection impairment.

Fire protection impairments

Avoid unnecessary impairments; however, for those impairments that do occur, follow all elements of a fire protection impairment program.

Impairment program

For further information, see the Risktopic ***Management Practices: Fire Protection Impairments***.

Fire system inspection, testing, and maintenance

Maintain inspection, testing, and maintenance practices for fixed fire protection and detection systems. Follow the guidance of equipment manufacturers, system designers, and local authorities.

Fire protection and detection

For further information, see the white paper ***Inspection, testing, and maintenance (ITM) - Fixed fire protection and detection***.

Hot work

Do not allow hot work to be performed in a permit-required area without following all elements of a hot work permit system.

Hot work program

For further information, see the Risktopic ***Management Practices: Hot work in permit required areas***.

Hot work in areas where oxygen is stored, handled, or used

As discussed earlier, while oxygen itself does not burn, it does support the combustion process. Where oxygen is released and allowed to enrich the surrounding air, it may support an increased rate of combustion (fire severity). For this reason, consider the use of "cold work" methods in place of hot work where oxygen is stored, handled, or used.

Housekeeping

When a facility is operated as a health care occupancy, verify the health care management team maintains housekeeping and waste disposal standards to avoid accumulations of waste inside or outside of buildings. Recognize there may be an increase in waste handling efforts associated with the addition of medical waste.

Maintenance programs

Continue building maintenance, mechanical maintenance, and electrical maintenance programs.

Where commercial cooking increases, consider the need to increase cleaning of filter and extraction ductwork.

Smoking controls

Maintain smoking controls. Verify smoking will not be permitted within 6.1 m (20 ft.) of areas storing, handling, or using oxygen, flammable liquids, combustible liquids, waste materials, or other combustibles.

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