Managing Cross Connection Control in Healthcare Facilities

Presentation Agenda

- Types of Healthcare Facilities
- Plumbing Code Considerations
- Preparing for Surveying a Healthcare Facility
- Containment and Isolation
- Types of Processes – Healthcare Facilities and How To Control Cross Connections

Types Health Care Facilities

- Large Hospitals
- Long Term Care (LTC) Facilities
- Laboratory Buildings
- Surgi-Centers
- Cancer Centers
- Office/Administration Support

Backflow Preventer–Selection Criteria

1. Evaluate Hazard Level of substance that could backflow – High/Health Hazard or Low Hazard?
2. Could backflow occur due to Backpressure, Backsiphonage, or BOTH?
3. Is “Continuous Pressure” resulting from a downstream shutoff or control valve possible (Y/N)?

Survey Preparation

Survey Preparation/Considerations

1. Codes and Regulations – Must know relevant codes. This was under IPC...
2. Containment vs. Isolation?
3. Point of use visual inspection vs. above ceiling tile/level?
4. Field Forms/Data Entry Process (i.e., how will you document field data?)
5. Ladders, equipment (considerations for inspecting pipe above tile)!
Survey Preparation/Considerations

6. Site Water Main and Architectural Drawings – Showing All Rooms, plumbing drawings, etc.
7. Meet with Personnel Familiar w/ Water Systems
8. PPE (eye protection, hearing protection, “Bunny Suits”, face masks, etc).
9. Clarify Accessibility (master keys, permission, escorts, etc.)
10. Communication – e.g., nurses on patient floors

Containment Case Study

- Large Medical Campus. Multiple Outbuildings plus Main Hospital.
- Two (2) separate community water supplies.
- Each supply controlled with reduced pressure principle backflow preventer (Located in Pit!!)
- Each line combines to form a “Campus Loop”.
- Campus Loop supplies multiple campus buildings.

Containment Case Study - Questions

1. Are all Campus Buildings supplied by Campus Loop? How does affect containment?
2. Is each building supplied by campus loop “contained”?*
3. Are all domestic, fire and irrigation service connections accounted for/identified?

Containment Case Study - Findings

1. Are all Campus Buildings supplied by Campus Loop? Cancer Center supplied directly from community water supplier – no containment.
2. Is each building supplied by campus loop “contained”? Not each building was contained – many unprotected bypasses or no containment.
3. Are all domestic, fire and irrigation service connections accounted for/identified? Identified irrigation and fountain connections from campus loop – no protection.
Common Systems-Survey

**Building Systems**
- Chilled Water
- Boilers/Steam Generation
- Cooling Towers
- Kitchen/Cafeteria Operations
- Lawn Irrigation
- Decorative Fountains
- Humidification Systems

**Medical Process Systems**
- Morgue/Autopsy
- Labs and Equipment
- Equipment Sterilization/Cleaning
- Dialysis Systems
- Treated/Soft Water Systems
- Endoscopy Equipment
- Bed Pan Washers
- Therapy Tubs/Cleaning

Final CCC Survey Report Information
- Inventory of all backflow prevention assemblies, devices and methods
- Itemized list of recommendations based upon survey information – be specific in terms of location, system, etc.
- Service connection assessment
- Internal Program Compliance, Local/State (Health Dept) or OSHA Compliance

Domestic Hot Water Production
Use “Condenser Return Water” to Preheat Domestic Cold Water Before Supplying Heat Exchanger

Heat Exchangers
Plumbing Code 608.16.3
Toxic Transfer Fluid = Double Wall Required
Non Toxic Transfer Fluid = Single Wall Allowed

Preheat Domestic Cold Water For Domestic Hot Water Loop

Heat Exchangers
MI Plumbing Code 608.16.3
- Must Evaluate Process Water Heat Exchanger
- Must Evaluate Steam/Domestic Hot Water Heat Exchanger
- Determine Toxicity of Transfer Fluid
- Determine HX Type Required (Single vs. Double Wall)
Domestic OR Process Hot Water?

- Must ensure correct labeling – see picture...is this correct?
- Hot water line supplies sterilization equipment AND small restroom – compliant?
- Domestic hot water return lines must be **UPSTREAM** of backflow preventer supplying process water

Chemical Injection Systems - Air Gaps

- Common to see disinfectant introduction into potable cold and/or domestic hot water systems for bacteria control
- Typical disinfectant introduction (chlorine dioxide, hypochlorite, etc.)
- Air gaps on system drains required (AG=2X Diameter of Discharge Pipe, or 1” Minimum)

Chilled Water – RPBP Required

Typical Makeup – Chilled Water Return

Central Sterile Processing

- Many processes requiring water to process surgical instruments – all high hazard cross connections
- Ultrasonic Cleaners
- Sinks w/ Spray Hoses
- Chemical Dispensers
- Sterilization Equipment
- Autoclaves
- Deionized/RO Water
- **These areas require special access and PPE.**
Central Sterile Processing

- Typically dedicated cold and hot water mains are isolated with reduced pressure principle backflow preventers to “zone isolate” multiple processes
- Practice requires strict/accurate pipe labeling
- Often find other potable uses supplied by dedicated non-potable system
- Often find processes not protected

MUST WEAR THE BUNNY SUIT WHEN SURVEYING

Zone Isolation - Central Sterile

- RPBP in supply to cold and hot water
- Piping typically located above ceiling
- Often times find assemblies located above ceiling level/ile

Central Sterile – Sinks/Spray Stations

Autoclave – RPBP in Supply

Central Sterile – Washer (RPBP Required)

Sterilizers – RPBP in Supply
Endoscope Reprocessors
- May utilize cold and hot water - mixed to supply equipment
- Water subsequently filtered
- Water used to reprocess endoscopes – decontaminate between uses
- Commonly found - Gastroenterology Units
- HIGH HAZARD CROSS CONNECTION – RPBP typically required on cold and hot supply!!

Astra Tee Transesophageal Reprocessor
Found Commonly Ultra Sound Dept.

Air Gap

Deionized Water Systems
- Need deionized water for lab processing functions
- Water may be heated for glass washing and supplying sterilizers
- Deionized water may be used to supply/makeup to clean steam, specific humidification operations, etc.
- Reduced pressure principle backflow preventer required – High Hazard cross connection!

DI System Supplied by Atmospheric Vacuum Breaker – Inappropriate Device

Reduced Pressure Principle Backflow Preventer
Approved?

Dialysis Treatment

- Centralized multistep water treatment system to supply product water loop
- Wall hydrants to connect dialysis treatment units to treated loop
- RPBP in potable cold and domestic hot water supply
- High Hazard!

Dialysis Cart and Wall Connection

Dental Operations/Lab

- Dental Chairs – water supply vs. bottle water supply
- Grinder systems
- Vacuum systems
- Lab faucets

Morgue Supply

- RPBP in cold supply and also in supply to dedicated domestic hot water heat exchanger
- Dedicated cold and hot water lines supply morgue operations
- Discharge lines also supply public restroom – is this acceptable?

Embalming Station Supply

- RPBP in main supply
“SAF T” Pumps
• Disposal of infectious liquid medical waste
• Potable water flows through venturi – aspirating dangerous fluids to waste stream (High Hazard)
• Commonly found - Operating Room areas
• Must review drainage of RPBP

“Macerator”
• Disposal of bedpan pulp materials and waste
• Machine pulverizes materials with addition of water to facilitate decomposition and drainage
• Water typically flows from top of lid
• RPBP may be recommended – water supply is typically threaded hose connection from behind unit

Blood Bank – Equipment Drain (Waste Dilution)
• Multiple system drains and drain trap primers may be found in lab areas.
• Approved air gap must be equivalent of 2X diameter of outlet pipe.

Bed Pan Washer/Slop Hopper
• Approved vacuum breaker for spray hose must be installed per Plumbing Code (IE: 6” above floor)
• Inspect for valves at end of spray hose (implies possible continuous pressure)
• AVB or SVB (continuous pressure-valve) required
• Often installed adjacent to chemical dispenser (inspect for vacuum breaker, wasting tee)

Dethawer – Blood Bank/Lab
• Bath to warm up frozen blood samples
• Typically supplied water by hose drop
• Approved vacuum breaker required

Shower Heads/Hoses
• Shower hose may be “air gapped”
• Showers may have atmospheric vacuum breaker in supply
• Some showers may have Watts SBC or equivalent in supply
• ASME A112.18.1 or ASME A112.18.3
Ice Machines

Inspection Items
- Found throughout patient floors, kitchens, therapy areas
- Internal air gap or ASSE 1022 required in water supply to ice maker
- Approved air gap required for water cooled condenser - drain line
- Water supply filters - commonly have drain line – approved air gap required

Commercial Laundry Machines

RPBP Required Cold and Hot Supplies

Decorative Fountains

- High Hazard Cross Connection!
- Chemical treatment, exposure, bacterial growth, etc.
- Many hospitals are decommissioning due to Legionella concerns

Decorative Fountains – Typical System Makeup

Approved?
- Double Check Valve Assembly (Low Hazard Assembly) in Supply to Fountain
- Reduced Pressure Principle Backflow Prevention Assembly Required!

Water Wall
Decorative Fountain – Supplied Reclaimed Water

Indoor Decorative Fountain-Manual Fill

Medical Vacuum System Pumps

- Medical Vacuum System – pumps require water seal
- Sealing water may be once pass through (high water use), or recirculated/cooled to perform seal via a heat exchanger/chilled water (reduce water makeup)
- Reduced pressure principle backflow preventer typically required

Potable Water Line-Backup Supply to Vacuum System – Approved?

Humidification-Water Supplied

- Steam-humidification common
- Remote water supplied units commonly found in OR and MRI areas
- Must inspect internal makeup and drain from system for approved air gap
- Multiple systems typically recommend RPBP in supply
- Picture – what’s wrong???

Steam Humification Unit

- Reduced pressure principle backflow preventer in cold water supply
Emergency Room Decontamination Showers

- Showers for Decontamination
- Typical Hot and Cold Water routed to SVB
- Must review “Critical level” of Spill Resistant Vacuum Breaker in relation to highest point of hose

Outdoor Multiple Decontamination Showers

Janitor Sinks – Soap Dispenser
Why Is This a Non-Compliant Installation?

- Valve is downstream of AVB at splitter and inside unit soap dispenser. AVB cannot have valve downstream.
- Hose is elevated – AVB cannot be subject to backpressure.
- AVB can fail allowing chemical to backflow into potable water supply, or allowing domestic hot water to flow into cold supply.

To correct this, see next slide!

SOLUTION: Install Water Wasting Tee

1. Forces user to shut off water supply after mixing soap and water, allowing water to drain from hose via “Wasting Tee”.
2. Shutting off water supply and allowing for hose drainage prevents “continuous pressure” and “backpressure” on AVB.
3. Protects AVB and allows it to function properly.

Water/Steam Cleaning Station

More field photos – violations!
RPBP – Condensate Makeup Tank Supply – Location, Location, Location…

Domestic Water Backup – Condensate Tank – Taken From Catwalk

Chilled Water Makeup w/ RPBP Bypass Connected to Strainer!

Oops……….lawn irrigation system supply

Facility Best Management Practices CCC Program
**CCC - Best Management Practices**

Develop Cross Connection Control Plan
1. Containment/Isolation Policy
2. Survey Requirements (i.e., how often)
3. Backflow Prevention Assembly Testing
4. Required and Approved Backflow Preventers
5. Recordkeeping/Data Management

CCC Plan/Program may also support efforts in Legionella WMP!

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**Legionella WMP/Best Practices**

1. Perform an in-field assessment of building water systems for Legionella risk to include evaluating water equipment, cross connections, dead legs, plumbing materials, etc.
2. Develop a Legionella Water Management Plan
3. Maintain accurate data management/records, training, system drawings/information

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**Further Information**

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**Process Flow Diagram Sample**

Refer to "Building 100 Process Flow Diagram"