



**DESIGN &  
CONSTRUCTION  
GUIDELINES**

**APPENDIX A  
ENVIRONMENTAL HEALTH  
AND SAFETY  
DESIGN GUIDELINES  
(TAMPA CAMPUS)**

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**USF FACILITIES MANAGEMENT - ENVIRONMENTAL HEALTH & SAFETY**

# APPENDIX A – ENVIRONMENTAL HEALTH & SAFETY DESIGN GUIDELINES

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## SECTION 1 REGULATORY COMPLIANCE REQUIRED BY CONTRACTORS

**1.1** Contractors must comply with all applicable Federal, State, and Local laws, regulations, codes, and requirements associated with safety and environmental protection throughout the duration of all projects associated with the University of South Florida.

It is the Contractors' responsibility to immediately report any known regulatory non-compliance, significant injury (internal or external), property damage, and/or discharge of any hazardous material/pollutant to University of South Florida property to the designated USF-Project Manager (USF-PM) or Facilities Management-Environmental Health & Safety (FM-EH&S) (813-974-4036).

Per USF Policy 6-016 (Environmental Health & Safety Compliance), USF reserves the right to restrict or suspend any activity, equipment or area that is determined to pose a danger/negative impact to the environment, life, health, or safety. The equipment, activity or area found to be dangerous to life, health, safety or non-compliant with applicable regulations may not be reinstated until Environmental Health and Safety has conducted a follow up inspection and has determined that the equipment and/or area is in compliance.

**1.2** When applicable, safety programs must include the following (Note: The list below is not exhaustive and it is the Contractors' responsibility to identify and comply with all pertinent codes, standards, regulations, and laws):

- a. Hazard Communication Standard
- b. Lockout/Tagout Policy
- c. Personal Protective Equipment Program
- d. Use of Equipment including guards
- e. Confined Space Entry Program
- f. Hearing Conservation Program

- g. Respiratory Protection Program
- h. Construction Standards Safety Program
- i. Crane Safety/Lift Plans
- j. Trenching and Excavation Safety Program
- k. Asbestos Awareness Training
- l. Bloodborne Pathogen Training

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## **SECTION 2 NOISE, VIBRATION AND DUST CONTROL**

Contractors shall control noise, vibration and dust generated by all construction and renovation activities. At no time shall noise and vibration exceed OSHA standards/County ordinances, or disrupt academic, research, or administrative operations. In occupied buildings noise and dust control must be provided, and methods of control specified.

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## **SECTION 3 WASTE DISPOSAL**

- 3.1 The contractor shall assure that ALL waste materials generated during the project are managed and disposed of in accordance with all Federal, State and Local regulations. Regulated hazardous wastes will be removed from campus by the Contractor in consultation with FM-EH&S.
- 3.2 Any waste material left by a contractor will be properly disposed of by the University and the contractor assessed for disposal costs, plus a handling charge of one-thousand dollars (\$1,000.00) or twenty-five percent (25%), whichever is higher.

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## **SECTION 4 ASBESTOS SURVEYS AND ABATEMENT**

- 4.1 Before any renovation/demolition projects are implemented, the designated University Project Manager must obtain proof of asbestos absence by securing the assistance of FM-EH&S in making this determination. Proof of asbestos absence requires an up-to-date survey of the affected area by one of the University's contract Licensed Asbestos Consultant firms or by bulk sampling conducted by qualified FM-EH&S personnel. An Architect's letter (or Architect's certificate) exemption to surveying for asbestos only applies to the Asbestos Hazard Emergency Response Act (AHERA) Asbestos-Containing Materials in Schools rule and does not apply to the requirements of the asbestos National Emission Standards for Hazardous Air Pollutants (NESHAP) regarding renovation and/or demolition projects.
- 4.2 It is the university's procedure to abate all asbestos containing material (ACM) that may be impacted by renovation and/or demolition activities. However, if at any time during a renovation and/or demolition any previously unknown suspect asbestos containing material is encountered, work must stop until an appropriate survey action/abatement is completed. Suspect or presumed asbestos containing materials include such materials as surfacing materials (e.g., fireproofing, plaster ceilings and walls, ceiling tiles, etc.), thermal system insulation (e.g., pipe and boiler insulation, etc.), and miscellaneous materials (e.g., resilient flooring material, floor tile mastic, transite panels, joint compound, fire doors, etc.).
- 4.3 Regarding asbestos abatement projects, the professional services of a Florida Licensed Asbestos Consultant firm to conduct air monitoring/project oversight and a Florida Licensed Asbestos Contractor shall be utilized anytime a response action (e.g., encapsulation, enclosure, and/or removal) is conducted on asbestos containing material (ACM). Any exception to the use of an Florida Licensed Asbestos Consultant firm to conduct monitoring at the time of asbestos encapsulation, enclosure, and/or removal by a Florida Licensed Asbestos Contractor must be pre-approved by FM-EH&S personnel. The USF-PM coordinates scheduling of asbestos abatement

projects with licensed consultants and contractors. The University's Asbestos Coordinator, or similar designee, in FM-EH&S should be notified before proceeding with any abatement work.

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## **SECTION 5 LEAD CONSTRUCTION REQUIREMENTS**

The [CFR Title 29, Part 1926.62 \(OSHA Lead Standard for the Construction Industry\)](#) requires the contractors to undergo detailed appropriate worker training and protection and worker exposure air monitoring during any construction activity that may generate lead dust, mist, or fumes (e.g., removing lead contaminated paint, welding galvanized steel, etc.). The [Environmental Protection Agency's \(EPA\) Lead Renovation, Repair, and Painting \(RRP\) Rule](#), requires the adherence to additional specific lead-safe work procedures during any maintenance or construction activity resulting in the disturbance of a painted surface considered to be lead-based (confirmed by approved testing methods) in any facility visited by children under the age of six (6) twice weekly for three (3) hours or more. Construction activities involving lead-based paint need to be reviewed by FM-EH&S to ensure proper lead-safe procedures are conducted for removal and/or surface preparation prior to recoating/repainting. Before proceeding in any renovation or construction project involving lead or potential lead exposure, contact FM-EH&S for safety guidelines.

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## **SECTION 6 FIRE PROTECTION**

The following is a summary of the applicable Florida codes and standards related to Fire Protection. It is the Contractors' responsibility to identify and comply with all pertinent codes, standards, regulations, and laws related to fire protection.

- 6.1** Adoption of Fire Prevention and Life Safety Codes are outlined in the [Chapter 69A-3.012 \(Standards of the National Fire Protection Association\)](#) and [Other Standards Adopted, Florida Administrative Code \(F.A.C.\)](#).
- 6.2** [Chapter 633 \(Fire Prevention and Control\) F.S.](#) requires the State Fire Marshal to establish Uniform Fire Safety Standards for all State owned and State leased buildings. The Uniform Fire Safety Rules and Standards requirements are located within [Chapter 69-A \(State Fire Marshal\) F.A.C.](#)
- 6.3** [Chapter 69A-60 F.A.C.](#) establishes the Florida Fire Prevention Code, which adopts National Fire Protection Association [NFPA 1 \(current edition, Fire Code\)](#) and [NFPA 101 \(current edition, Life Safety Code\)](#) code documents as part of the required Uniform Fire Safety Standards. The applicable chapters of the Florida Fire Prevention Code establish specific needs for each designated occupancy.

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## **SECTION 7 FIRE AND SECURITY MONITORING SYSTEMS**

All alarm systems installed for the University will use only standardized hardware approved by the Fire and Security Monitoring Systems Committee. Departments or individuals in newly constructed buildings, or renovated buildings requiring alarm systems must submit an application for approval in accordance with [USF Policy 6-014 \(Security Alarm Monitoring Systems\)](#).

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## **SECTION 8 LABORATORIES, EQUIPMENT, RESEARCH, AND SHOP AREAS**

### **8.1 SAFETY SHOWERS, EMERGENCY EYE WASHES, AND COMBINATION UNITS**

- 8.1.1** The design guidelines for safety showers, emergency eyewashes, and combination units have been adopted from the following source: the [ANSI Z358.1 \(current version\), \(Standard for Emergency Eyewashes and Shower Equipment\), American National Standards Institute](#). These

standards shall be used to establish the minimum requirements set forth by the USF Building Design Guidelines for new construction and renovations, unless otherwise reviewed/approved by the FM-PM and FM-EH&S.

- 8.1.2** Safety showers, emergency eyewashes, and combination units shall be located as close to hazardous materials and associated operations/activities as possible and practical. The emergency equipment should be in a well-lighted location no more than ten (10) seconds unobstructed walking distance and located on the same level as the hazard, within fifty-five (55) feet. Laboratories using highly corrosive materials shall have emergency equipment immediately adjacent to the hazard (no more than ten feet). A highly, visible sign shall be positioned by the emergency equipment to identify its location. Safety showers and emergency eyewashes shall be located near each other to allow for dual use during an emergency.

## **8.2 CHEMICAL FUME HOODS, EXHAUST SYSTEMS, AND LABORATORY VENTILATION**

- 8.2.1** The design guidelines for chemical fume hoods, exhaust systems, and laboratory ventilation must meet and/or comply with the minimum requirements of the latest versions of the following sources:

- [ANSI/AIHA Z9.5 \(current version\), \(Laboratory Ventilation\), American National Standards Institute /American Industrial Hygiene Association](#)
- [NFPA 45 \(current version\), \(Standard on Fire Protection for Laboratories Using Chemicals\), National Fire Protection Association](#)
- [ANSI/ASHRAE 110 \(current version\), \(Method of Testing Performance of Laboratory Fume Hoods\), American Society of Heating Refrigeration and Air-conditioning Engineers](#)
- [ACGIH Manual of Recommended Practice \(current version\), Industrial Ventilation American Conference of Governmental Industrial Hygienists](#)
- [SEFA \(current version\), \(Laboratory Fume Hoods Recommended Practices\), Scientific Equipment and Furniture Association](#)

These standards shall be used to establish the minimum requirements set forth by the USF Building Design Guidelines for new construction and renovations, unless otherwise reviewed/approved by the FM-PM and FM-EH&S. In the event of potentially conflicting requirements/specifications between the referenced sources, regulatory/code requirements will take precedent and any additional voluntary standard based requirements will be reviewed/approved by the FM-PM and FM-EH&S in consideration of intended application(s) and/or associated safety factors.

Please note, in general, ductless fume hoods are not approved for use at USF and should not be proposed in the absence of substantial justification and user commitment to use and maintain such fume hoods in strict compliance with manufacturer requirements.

### **8.2.2 Chemical Fume Hoods**

The minimum installation and performance requirements for chemical fume hoods include the following:

- 8.2.2.1** In general, fume hoods should maintain an average face velocity of eighty to one-hundred (80-120) feet per minute [with sash at normal operating height (approximately eighteen (18) inches) for constant air volume hoods with a bypass feature] with no face velocity measurement more than plus or minus twenty percent (20%) of the average; however, exceptions may apply and proposed variations must be reviewed/approved by the USF-PM and FM-EH&S.

- 8.2.2.2** Each hood shall have a continuous monitoring device (flow alarm, flow indicator, or face velocity indicator). The monitoring device shall, by visible and audible signal, give warning when the airflow through the hood has deviated from the predetermined range in [Subparagraph 8.2.2.1](#) hereinabove.

- 8.2.2.3** The commissioning process requires the testing methodologies and acceptance standards set forth by [ANSI/ASHRAE 110 \(current version\), Method of Testing Performance of Laboratory Fume](#)

[Hoods \(American Society of Heating Refrigeration and Air-conditioning Engineers\)](#) be successfully completed before occupant use of the hood.

**8.2.2.4** Chemical fume hoods shall be located away from primary laboratory exits and from areas of high traffic, to the furthest extent feasible.

**8.2.2.5** Chemical fume hoods shall be constructed of non-combustible; nonporous materials selected to resist corrosion for the service intended.

**8.2.2.6** Glass within the sash must be at least seven/thirty-second (7/32) inches thick laminated safety glass.

**8.2.2.7** Electrical outlets and utility controls shall be located on the outside of the hood.

**8.2.2.8** A back baffle device shall be provided for proper adjustment of airflow through the fume hood. This device should be adjustable from the outside of the hood.

**8.2.2.9** Chemical fume hoods may include a sash stop mechanism to minimize unsafe hood operation, provided it can be manually overridden.

### **8.2.3 Laboratory Exhaust Systems**

The minimum installation and performance requirements for laboratory exhaust systems include the following:

**8.2.3.1** Ducts from all laboratory fume hoods and local exhaust systems shall be constructed entirely of noncombustible materials. No laboratory ventilation system ductwork shall be internally insulated.

**8.2.3.2** Fans, motors and their controls shall be located outside the laboratory building or in a roof penthouse or roof mechanical equipment room to prevent any leaks from migrating into the building or to prevent personnel come coming into contact with exhaust airflow. Fans shall be located and arranged so as to afford ready access for repairs, cleaning, inspection, and maintenance.

**8.2.3.3** Automatic fire dampers shall not be used in laboratory hood exhaust systems. Fire detection and alarm systems shall not be interlocked to automatically shut down laboratory hood exhaust fans.

**8.2.3.4** Controls and dampers where required for balancing or control of the system shall be of a type that in the event of a failure, will fail open to assure continuous draft.

**8.2.3.5** Duct velocities of laboratory exhaust systems shall be high enough to minimize the deposition of liquids or condensable solids in the exhaust systems during normal operation. Duct velocities should be maintained between 1500-2000 linear feet per minute to ensure that fine particles are transported and excessive condensation will not occur.

**8.2.3.6** Exhaust stacks shall never have a rain cap or anything else that adversely affects the creation of a vertical discharge plume of the exhaust air. A minimum velocity of three-thousand (3,000) feet per minute is usually adequate to ensure for proper discharge of exhausted air and will prevent rain from entering the stack.

**8.2.3.7** The exhaust stack shall be in a vertical up direction at a minimum of ten (10) feet above the adjacent roofline, high bay, penthouse, or other obstacle. The stack shall be located with respect to openings and air intakes of the building or adjacent buildings to avoid re-entry of exhausted air.

**8.2.3.8** Air exhausted from the general laboratory space and chemical fume hoods shall not be recirculated.

### **8.2.4 Laboratory Ventilation**

The minimum installation and performance requirements for laboratory ventilation include the following:

**8.2.4.1** The ventilation rate in laboratories shall be sufficient, combined with other controls, to control air contaminants generated by the activity. Laboratory units and laboratory hoods in which chemicals are present shall be continuously ventilated under normal operating conditions. Six to twelve (6-12) room air changes/hour is normally adequate general ventilation if local exhaust systems such as hoods are used as the primary method of control; however, exceptions may apply and proposed variations must be reviewed/approved by the FM-PM and FM-EH&S.

**8.2.4.2** Air supply systems for rooms containing chemical fume hoods shall not create room air drafts at the face of the hood greater than thirty percent (30%) of the average face velocity of the hood. All sources of air currents (supply air discharge, infiltration air) shall be located as far as practical from the fume hood.

**8.2.4.3** Laboratories must be maintained at a slightly negative pressure with respect to adjoining areas (some exceptions apply). The preferred method of ensuring that air flows into a laboratory space is using a ten percent (10%) "offset" between the volumetric airflow of the total room supply and the total room exhaust (the exhaust being the larger value).

**8.2.4.5** No laboratory ventilation system ductwork shall be internally insulated. Sound baffles or external acoustical insulation at the source should be used for noise control.

## **8.2.5 Perchloric Acid Fume Hoods**

Special consideration and criteria exist for Perchloric acid fume hoods. The minimum installation and performance requirements for Perchloric acid fume hoods include the following:

**8.2.5.1** All interior hood materials, exhaust ductwork, fans, sealant, gaskets, and lubricants shall be resistant and non-reactive to perchloric acid and have impervious surfaces.

**8.2.5.2** Baffles shall be removable for inspection and cleaning.

**8.2.5.3** Perchloric acid hoods must be provided with a spray-type wash down system that will wash the interior of hood, interior of hood ducts, fan, and stack. This system shall include a watertight hood with depression and water collection trough.

**8.2.5.4** The Perchloric acid fume hood and related exhaust system shall be separate from other fume hoods and exhaust systems.

**8.2.5.5** Perchloric acid hoods shall be located to ensure the shortest, most direct exhaust system. The ductwork shall have no sharp bends, no flexible connectors, and no horizontal runs.

**8.2.5.6** The hood shall be permanently labeled, "Perchloric Acid Hood."

## **8.2.6 Local Exhaust Ventilation**

Local exhaust ventilation (e.g., "snorkels" or "elephant trunks"), other than fume hoods, shall be designed to adequately control exposures to hazardous chemicals. An exhausted manifold or manifolds with connections to local exhaust may be provided as needed to collect potentially hazardous exhausts from gas chromatographs, vacuum pumps, or other equipment which can produce potentially hazardous air pollutants. The contaminant source needs to be enclosed as much as possible, consistent with manufacturer specifications and operational needs, to maximize control effectiveness and minimize air handling difficulties and costs. Local exhaust ventilation will be reviewed/approved by the FM-PM and FM-EH&S in consideration of intended application(s) and/or associated safety factors.

### 8.3 CHEMICAL STORAGE FACILITIES

The design guidelines for chemical storage facilities have been adopted from the following source: [Di Berardinis L.J. et al. Guidelines for Laboratory Design \(current edition\), John Wiley & Sons Inc. New York](#). This resource shall be used to establish minimum requirements set forth by the [USF Design & Construction Guidelines \(USF-DCG\)](#) for new construction and renovations, unless otherwise reviewed/approved by the FM-PM and FM-EH&S.

#### 8.3.1 General Storage Installation and Performance Requirements

The minimum installation and performance requirements for chemical storage areas include the following:

**8.3.1.1** Current chemical storage needs and handling locations shall be determined from expected users. If possible, current figures should be increased by a factor of one-point-five to two (1.5 to 2) to allow for growth.

**8.3.1.2** Minimum quantities of chemicals should be stored in laboratories. A laboratory complex shall have a central chemical storage area for large supplies of chemicals, if feasible. In all instances, the quantity of chemicals stored in laboratories shall not exceed Maximum Allowable Quantities.

**8.3.1.3** Cabinets, shelves, special storage equipment, and drawers shall be installed to provide separation of incompatible chemicals. Shelves shall be installed at or below eye level and securely fastened to the wall, ceiling, or floor. Island shelves shall be secured from tipping (i.e. braced across the top to other walls/shelves). Open shelves for chemicals shall be located out of normally traveled routes. Shelves shall be of sturdy construction with a recommended raised-lip edge of one-half to three-quarter (1/2 to 3/4) inch.

#### 8.3.5 Specific Chemical Hazards

The following types of storage equipment are required for specific chemical hazards:

**8.3.5.1** Shelves or cabinets for low to no hazard reagents and chemicals.

**8.3.5.2** Corrosion resistant cabinets shall be available for acid and base storage. The cabinet shall adequately provide separation to prevent cross mixing of acids and bases.

**8.3.5.3** Locked or secured cabinets shall be provided for storage of highly toxic materials, select agents, radioactive materials and controlled substances that require security control.

**8.3.5.4** Flammables and combustibles shall be stored in an [Underwriters Laboratories \(UL\)](#) approved flammable storage cabinet. If the laboratory requires that it keep its flammable or combustible chemicals at a low temperature, a UL-approved refrigerator rated for flammable storage shall be provided.

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## SECTION 9 MISCELLANEOUS - PLUMBING, CROSS-CONNECTION AND BACKFLOW PREVENTION, DRINKING WATER SYSTEMS, HVAC, FOOD SERVICE AREAS

**9.1 SOLDER AND PIPING:** Per the requirements of the [Safe Drinking Water Act \(SDWA\)](#), solder and flux may not contain more than zero-point-two percent (0.2%) lead. Pipes and fittings may not contain more than zero-point-two five percent (0.25%) lead.

**9.2 CROSS-CROSS-CONNECTION AND BACKFLOW PREVENTION:** Follow the minimum requirements and guidelines specified by the following:

- [Chapter 62-555 \(Permitting, Construction, Operation and Maintenance of Public Water Systems\), Florida Administrative Code](#)



- [AWWA M14 \(current version\), \(Recommended Practices for Backflow Prevention and Cross-Connection Control\); American Water Works Association](#)
- [USC Manual of Cross-Connection Control \(current version\), University of Southern California. Los Angeles, CA. 2012](#)

There shall be no submerged inlets on construction or renovation sites (e.g. Hoses connected to potable water lines in standing water; water hookups lacking vacuum breakers, double check valves, etc.).

- 9.3 PUBLIC DRINKING WATER SYSTEM PERMITTING AND CONSTRUCTION REQUIREMENTS:** Follow the [Chapter 62-555 \(Permitting, Construction, Operation and Maintenance of Public Water Systems\), Florida Administrative Code](#). Additional information may be obtained from the FM-EH&S or [Florida Department of Health-Hillsborough County](#) at (813) 307-8059.
- 9.4 PUBLIC DRINKING WATER SYSTEM DISINFECTION/CLEARANCE REQUIREMENTS:** All newly constructed buildings and renovations/repairs (depending on the scope) must have water mains/distribution systems disinfected and cleared for public use. Contractors are to follow the disinfection guidelines in [AWWA C651 \(current version\), \(Standards for Disinfecting Water Mains\), American Water Works Association](#) and the clearance procedures specified in [Exhibit A Drinking Water Disinfection & Clearance Procedures](#).
- 9.5 HEATING, VENTILATION AND AIR CONDITIONING (HVAC) REQUIREMENTS:** Follow the basic design recommendations for humid climates found in the current [ASHRAE Handbook of Fundamentals \(current version\), \(American Society of Heating Refrigeration and Air-conditioning Engineers\)](#) and [ANSI/ASHRAE Standard 62.1 \(current version\), \(Ventilation for Acceptable Indoor Air Quality\), American Society of Heating Refrigeration and Air-conditioning Engineers](#), guidelines.
- 9.6 FOOD SERVICE AREAS IN NEWLY CONSTRUCTED OR RENOVATED BUILDINGS:** Comply with the [Chapter 64E-11 \(Food Hygiene\), Florida Administrative Code](#). New construction and renovation plans/drawings require [Florida Department of Health \(FDOH\)](#) approval.

**DRINKING WATER DISINFECTION & CLEARANCE PROCEDURES****A****NEW WATER MAIN DISINFECTION AND CLEARANCE PROCEDURES**

(Contractor is to do the following except when specifically directed otherwise.)

**Note:** In the below procedures, the bacteriological testing portion is a three day process. It is advised that the below work be scheduled to start on a Monday, but not later than Tuesday, so that the bacteriological samples are delivered to the Lab on Wednesday but no later than Thursday of any week in order to get the results back in that week.

**WET-TAP CONDITION:**

1. **Excavate/expose** main line at tap location. Over excavate a pocket to maintain any trench water below pipe work. Use pump if need be.
2. **Clean** main pipe and rinse off with 1% chlorine solution. Spray excavated work area with 1% chlorine solution.
3. **Sanitize** tapping sleeve by submerging in 1% chlorine solution. Tapping sleeve is to be full saddle type.
4. **Pressure test** saddle and tap valve installation with potable water (150 psi for 2 hours).
5. Tap the main line if approved. All tools and tapping equipment are to be rinsed, soaked or sprayed with 1% chlorine solution.

**Line Extension from the tap or an existing valve:**

1. **Construct** branch line(s) or extension(s) with sample/injection port at starting end, intermediate sample ports (if required) and blow-off/sample port at downstream end(s). Branch line is to be kept separated from connecting valve(s) unless connected with a temporary backflow prevention device.
2. **Flush** branch line(s) with potable water. If not connected to tap valve with BFPD, use jumper connection to closest fire hydrant with BFPD at hydrant. AWWA Guidelines calls for a velocity of 2.5 fps minimum to properly clean the new pipe work. The Guidelines provide a list of the blow-off sizes needed with a residual pressure of 40 psi to achieve the required flow.
3. **Pressure test** new line(s) at 150 psi for 2 hours. Set up is to be able to measure water lost while maintaining 150 psi. If means to measure water loss is not provided, then a 0 pressure loss is required. Test is to be witnessed by the Engineer of Record (EOR) or his designee. If pressure test fails, repair and retest.
4. **Disinfect** the new line(s) by the displacement method with a pre-mix of the specified chlorine concentration through the injection port until observed at the downstream end. Provide a least 2 vessels (i.e. 55 gal. drums for the mix) such that one is being mixed while the other is being pumped alternating back and forth between them. The chlorine concentration shall be a minimum of 25 ppm but not more than 50 ppm for a 24 hour soak time. Under extenuating circumstances, a 200 ppm chlorine concentration for a 3 hour soak time will be considered but must be prior approved. These chlorine concentrations must be controlled and will be verified.
5. After soak time, measure residual chlorine level. A drop below 10 ppm for the 24 hour process or 50 ppm for the 3 hour process indicates that the new pipe work has not been properly cleaned. Repeat flushing and disinfection steps above. (the system has to be able to maintain a healthy condition. A drastic reduction in chlorine levels is an indication that an unhealthy condition exists)

6. **Re-flush** - After soak time with proper residuals, flush lines until parent system ambient chlorine concentration is reached.
7. **1<sup>st</sup> Day Bac-T Sampling** - Have USF Facilities Management-Operations (FM-OPS) collect first day bacteriological samples at beginning, intermediate and end sample ports. Sample port locations should be shown on the drawings. (Schedule with FM-OPS ahead of time)
8. **2<sup>nd</sup> Day Bac-T Sampling** - Prior to sampling, measure residual chlorine level. If level has dropped below 0.2 ppm, repeat Steps 7, 12 and 13. If residual drops again below 0.2 ppm after the first day sampling (an unhealthy condition is indicated), then repeat Steps 7 and 9 - 13. If residual is 0.2 or greater, have FM-OPS collect second round of samples with downstream samples being collected before full pipe volume exchange occurs. FM-OPS will transport to the Lab.
9. **3<sup>rd</sup> Day** - Receive Lab results. If both day's results do not pass, re-flush and resample as described above. If two consecutive days of good results are still not received, flush, re-chlorinate the line and resample as described above.
10. For a regulated line (a line requiring a permit from the Health Dept.), copies of the bacteriological results and pressure test results (if performed by USF personnel on behalf of the Engineer of Record) are to be turned over to the Engineer of Record (EOR). The EOR is to prepare Certificate of Completion, combine Bac-T and pressure test results and submit to USF for review and signing. Package is then to be returned to the EOR for submitting to the Health Dept. under his cover for "Clearance".
11. After Clearance is received from the Health Dept. or given by USF (if it is not a regulated main), connect branch line to main valve as follows (there is a 60 day window for this before the Bac-Ts become invalid): If BFPD was used at tap valve, remove device. Control trench water such that it does not reach any of the sanitized pipe work. Soak connecting pieces in 1% chlorine solution and install. Turn on tap/branch valve and observe for leaks in connecting pieces and re-tighten if necessary.

## B

### **BUILDING PLUMBING DISINFECTION AND CLEARANCE**

(Contractor is to do the following except when specifically directed otherwise.)

**Note:** In the below procedures, the bacteriological testing portion is a three day process. It is advised that the below work be scheduled to start on a Monday, but not later than Tuesday, so that the bacteriological samples are delivered to the Lab on Wednesday but no later than Thursday of any week in order to get the results back in that week.

1. **Pressure test** new line(s) at 150 psi for 2 hours. A 0 pressure loss is required. Test is to be witnessed by the Engineer of Record (EOR), Building Code Official or his designee. If pressure test fails, repair and retest.
2. **Flush Building System** with potable water. Before this process can start, the building plumbing is to be connected to the distribution system through an approved BFD, meter, and Health Dept. cleared service line. AWWA Guidelines calls for a velocity of 2.5 fps minimum to properly clean the new pipe work.
3. **Drain System** - After successful pressure testing, drain the building plumbing including all water heaters.
4. **Disinfect** the Building Plumbing by the displacement method with a pre-mix of the specified chlorine concentration through the injection port (building side of the BFD) until observed at all downstream end points. Provide a least 2 vessels such that one is being mixed while the other is being pumped alternating back and forth between them. Vessel size should be based on plumbing volume and pump rate such that an uninterrupted flow can be maintained. Expect the plumbing volume to be displaced several times before the mix can be verified at all fixtures.

The chlorine concentration shall be mixed for a 50 ppm dosage for a 24 hour soak time. The chlorine concentration must be controlled and will be verified. Maintain building system pressure during the soak period.

5. After soak time, measure residual chlorine level. A drop below 10 ppm for the 24 hour period indicates that the new pipe work has not been properly cleaned. Repeat flushing and disinfection steps above. (the system has to be able to maintain a healthy condition. A drastic reduction in chlorine levels is an indication that an unhealthy condition exists)
  6. **Re-flush** - After soak time with proper residuals, flush lines until parent system ambient chlorine concentration is reached.
  7. **1<sup>st</sup> Day Bac-T Sampling** - Have a Lab collect the first day bacteriological samples at the injection point, and the designated downstream fixtures. Representative sample point locations will be designated by the University.
  8. **2<sup>nd</sup> Day Bac-T Sampling** - Prior to sampling, measure residual chlorine level. If level has dropped below 0.2 ppm, repeat Steps 6, 7 and 8. If residual drops again below 0.2 ppm after the first day sampling (an unhealthy condition is indicated); then repeat Steps 1 and 3 - 8. If residual is 0.2 or greater, have the Lab collect second round of samples with downstream samples being collected before full pipe volume exchange occurs.
  9. **3<sup>rd</sup> Day** - Receive Lab results. If both day's results do not pass, re-flush and resample as described above. If two consecutive days of good results are still not received, flush, re-chlorinate the system and resample as described above.
  10. After 2 consecutive days of acceptable bacteriological results are received, the Building Code Administrator will authorize the system to be put into service.
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