

Best Management Practices for Facility Maintenance

Rationale

Threats to the integrity of a facility and its systems include: frost heaving, poor drainage, poor electrical service, concrete deterioration, peeling or flaking paint, corruptions of steel equipment and reinforcing, puncturing of clay or synthetic liners, plumbing rupture, loss of backflow prevention, and loss of secondary containment systems. Preventive maintenance minimizes factors that cause deterioration. Timely repair of small problems prevents them from becoming larger issues, and minimizes algae growth and other pest problems.

Environmental Principle: Deterioration of the greenhouse jeopardizes the safety of workers and the environment by facilitating the introduction of greenhouse chemicals into the soil and water.

Operational Aspects	Environmental Assurance >>		
	Level 1	Level 2	Level 3
Overview			
Emergency Preparedness	staff can recognize equipment malfunctioning, greenhouse utilities problems and are trained to notify supervisor in such an event	staff can recognize equipment malfunctioning, greenhouse utilities problems and alarms and are trained to notify appropriate response team in such events; staff then notify supervisor for further response and correction	staff are trained in limited operational response (e.g., shutting off valves) when they recognize equipment malfunctioning, greenhouse utilities problems or observe equipment alarms; staff then notify supervisor for further response and correction
Environmental Awareness	staff are trained in behaviors, but not impacts (e.g., poorly maintained or broken equipment is not good) and must be addressed	staff receive orientation to impacts (e.g., poorly maintained or broken equipment can lead to environmental impacts); poorly maintained equipment can lead to basic environmental impacts, understanding and awareness of what the impacts are	staff understand that poorly maintained or broken equipment can have environmental consequences and legal liabilities, and understand the necessity of personal action in responding to equipment maintenance needs

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	Level 1	Level 2	Level 3
Training	staff are trained to recognize equipment and facility malfunctions and understand what the environmental impacts are	staff are trained to recognize and react to equipment and facility malfunctions and understand what the environmental impacts are; staff are made aware of contacts and standard operating procedures for being around asbestos and lead paint; staff receive specific hazard training (i.e. asbestos and lead paint)	staff are trained to recognize and react to equipment and facility malfunctions and understand what the environmental impacts are; staff are made aware of contacts and standard operating procedures for being around asbestos and lead paint; staff receive periodic specific hazard training (i.e. asbestos and lead paint)
Communication	individuals in the greenhouse community report maintenance concerns as they occur	individuals in the greenhouse community report maintenance concerns as they occur; greenhouse staff and maintenance personnel discuss repairs where appropriate to maximize long-term effectiveness of repairs	individuals in the greenhouse community report maintenance concerns as they occur; greenhouse staff and maintenance personnel discuss repairs where appropriate to maximize long-term effectiveness of repairs; greenhouse staff and maintenance personnel meet regularly to discuss preventive maintenance and foreseeable maintenance issues affecting greenhouse structural change to facility integrity and plant care
Management			
Preventive Maintenance	no preventive maintenance schedules (greenhouse and maintenance staff)	equipment list; work orders generated by calendar or season; subjective scheduling; no or informal record keeping; no tracking	work orders generated by electronic maintenance system; facility reports or receipts tracked by maintenance system; equipment-specific or by location
Corrective Maintenance	greenhouse staff note problems as they occur; report problems to greenhouse management	greenhouse staff note problems as they occur; report problems to greenhouse management; maintenance staff note problems as they occur; repair as needed	greenhouse and maintenance staff work together to identify problems as they occur; repairs are prioritized and promptly implemented; periodic review of pending maintenance issues
Evaporative Cooling	evaporative cooling system leakage and bleed off are not monitored; cooling system is operated seasonally, regardless of actual ambient temperature	cooling system is periodically inspected and excessive leakage or bleed off is corrected; cooling system is operated only during hot weather	dissolved solids content of cooling system water is periodically monitored and water bleed off is adjusted appropriately; leaks are repaired promptly; cooling system operation is linked to environmental controls

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Shading Compound - Application	shading material is applied on schedule on a yearly or more frequent basis; proactive measures are taken to prevent accidental release	shading material is applied as needed, but only when weather will remain clear until material is well-dried	automatic manual shade curtains are utilized in the greenhouse
Shading Compound - Removal	easily removed shading formulations are used where appropriate; shading material is allowed to be removed by snowfall or on schedule with water and scrubbing; least toxic with appropriate application chemicals are used for removal of shading compound	easily removed shading formulations are always used; shading material is allowed to be removed by snowfall or on schedule with water and scrubbing; no chemical removal of shading compound	no removal of external shading compound is required; automatic shading is provided by movable curtains in the greenhouse
Spill Cleanup (maintenance-related chemicals)	staff know where spill clean-up materials are kept; spills are cleaned up fairly promptly	staff know where spill clean-up materials are kept; spills are cleaned up as soon as possible	staff know where spill clean-up materials are kept; spills are cleaned up as soon as possible; secondary containment or spill absorption material is used where appropriate and is disposed of and promptly removed
Disposal of Plastic Coverings	sanitary landfill	sanitary landfill or reused	recycled or reused
Paint Maintenance	staff are aware that flaking paint may contain lead; if old paint is maintained that may be flaking, peeling or powdery safety precautions are taken; staff and food crops are protected	staff are aware that flaking paint may contain lead; if old paint is maintained that may be flaking, peeling or powdery safety precautions are taken; staff and food crops are protected; paint is tested and checked for lead	staff are aware that flaking paint may contain lead; if old paint is maintained that may be flaking, peeling or powdery safety precautions are taken; staff and food crops are protected; paint is tested and checked for lead; lead paint is removed or encapsulated
Energy Usage	traditional growing practices without consideration or energy optimization	staff are aware of current use practices with attempts made to conserve energy without negatively impacting crop and/or project goals	utilize advanced energy conservation systems to optimize energy use to optimize crop and project goals

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Water Control			
External & Internal Drainage	drainage problems are identified and prioritized for repair	drainage problems are identified and prioritized for repair; drainage issues are systematically resolved ; where appropriate drainage system is on a preventative maintenance program	drainage problems are identified and prioritized for repair; drainage issues are systematically resolved; where appropriate drainage system is on a preventative maintenance program to include re-routing where appropriate drainage in and around structure is visually inspected as weather conditions determine; proper grading in and around structures prevents ponding; landscape plantings kept away from drainage system; pests prevented from tunneling in, under or around structure
Irrigation & Mist Systems	irrigation leaks are identified; large leaks eliminated and repaired	irrigation systems are inspected; leaks are identified and prioritized for repair; large leaks eliminated and repaired	hose couplings and other connections are kept tight and leak free; irrigation leaks are repaired immediately upon discovery; periodic inspections are conducted; algae accumulation on greenhouse floors is used as an indicator of system failure
Structural Leaks	greenhouse structural leaks are identified and prioritized for repair	structural leaks are repaired systematically; glazing is inspected routinely	structural leaks are promptly repaired systematically; glazing is inspected routinely and repairs are made promptly
Back Flow Preventers	back flow preventers and air-gap as required and are installed and maintained to meet code requirements	back flow preventers and air-gap as required and are installed and maintained to meet code requirements; secondary back flow preventers are installed at each fertilizer injector	back flow preventers and air-gap as required and are installed and maintained to meet code requirements; secondary back flow preventers are installed at each fertilizer injector