Best Management Practices for 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, corrosions 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: Any 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 and are trained to notify supervisor in such an event	staff can recognize equipment malfunctioning and alarms and are trained to notify supervisor in such events	staff are trained in limited operational response (e.g., shutting off valves) when they recognize equipment malfunctioning or hear 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)	staff receive orientation to impacts (e.g., poorly maintained or broken equipment can lead to environmental impacts)	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
Training	staff are trained to recognize equipment and facility malfunctions	staff are trained to recognize and react to equipment and facility malfunctions	staff are trained to recognize and react to equipment and facility malfunctions

Operational Aspects	Environmental Assurance >>		
	Level 1	Level 2	Level 3
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 integrity and plant care
Management			
Preventive Maintenance (mechanical, electrical, plumbing & other environmental control equipment)	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; reports or receipts tracked and required by maintenance system; equipment-specific
Routine Maintenance (mechanical, electrical, plumbing & other environmental control equipment)	greenhouse staff note problems as they occur; report problems informally 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 implemented
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
Shading - Application	shading material is applied on schedule on a yearly or more frequent basis	shading material is applied as needed, but only when weather will remain clear until material is well-dried	automatic shading is provided by movable curtains in the greenhouse

Operational Aspects	Environmental Assurance >>		
	Level 1	Level 2	Level 3
Shading - 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	easily removed shading formulations are always used; shading material is allowed to be removed by snowfall or on schedule with water and scrubbing	no removal of external shading is required; automatic shading is provided by movable curtains in the greenhouse
Spill Cleanup (maintenance-related chemicals)	maintenance staff know where spill clean-up materials are kept; spills are cleaned up fairly promptly	maintenance staff know where spill clean-up materials are kept; spills are cleaned up as soon as possible	maintenance 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
Disposal of Plastic Coverings	sanitary landfill	sanitary landfill	recycle
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	drainage problems are identified and prioritized for repair; drainage issues are systematically resolved; 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 Systems	irrigation leaks are identified	irrigation systems are inspected; leaks are identified and prioritized for repair	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	structural leaks are repaired systematically; glazing is inspected routinely