

# Best Management Practices for Housekeeping

## Rationale

Good housekeeping is a fundamental principle of effective greenhouse operations. Good housekeeping prevents pest harborage, allows for easier and quicker problem identification, and sets a tone of order and discipline. Housekeeping has safety implications; clean and orderly greenhouses reduce the risk of tripping or slipping, and facilitate identification of other hazards.

Proper arrangement and spacing of plants facilitates good airflow, efficient irrigation, and effective pesticide application, thereby decreasing pest and disease incidence and reducing pesticide use.

Control of watering and fertilizer applications by properly trained staff and greenhouse users can reduce overuse of water and fertilizer. Excess watering causes puddling on floors and, combined with warm temperatures and high light levels in greenhouses, provides excellent conditions for algae growth. Reduced water and fertilizer application lessens environmental impact, amount of algae, and potential accidents from slippery walkways. Algae growth on greenhouse glazing prevents adequate light transmission, and algae present on bench tops and in pots inhibits plant growth and attracts insects. Sanitation and environmental modifications are the preferred method of algae growth prevention and control.

**Environmental Principle:** With proper watering techniques, good sanitation practices, and correct spacing of plants there will be less environmental impact from unnecessary use of chemical and excess fertilizers, and a reduction of algae in the greenhouse setting.

Note: the following structures are covered under Housekeeping: interior walls, floors benches and screens. The evaporative cooling and shading are covered under Maintenance (section 9-1 pages 2&3).

Operational Aspects	Environmental Assurance		
	Level 1	Level 2	Level 3
<b>Overview</b>			
Emergency Preparedness	greenhouse staff trained to handle emergencies; spill kits are accessible; more general training; notification of emergency response via verbal as well as signage	greenhouse staff trained to handle emergencies; spill kits are accessible; more general training; notification of emergency response via verbal as well as signage; refresher training annually	greenhouse staff trained to handle emergencies; spill kits are accessible; more general training; notification of emergency response via verbal as well as signage; refresher training annually; perform regular drills

Operational Aspects	Environmental Assurance		
	Level 1	Level 2	Level 3
Environmental Awareness	staff are made aware of hazard to surface and groundwater by excess runoff and overuse of sanitizers and disinfectants; hazards are identified and eliminated, or are reduced and closely monitored	staff are made aware of hazard to surface and groundwater by excess runoff and overuse of sanitizers and disinfectants; hazards are identified and eliminated, or are reduced and closely monitored; staff are encouraged to reduce hazards	staff are made aware of hazard to surface and groundwater by excess runoff and overuse of sanitizers and disinfectants; hazards are identified and eliminated, or are reduced and closely monitored; staff are encouraged to reduce hazards
Training	all staff are trained in the practice of good housekeeping, proper watering practices, and sanitation	all staff are trained in the practice of good housekeeping, proper watering practices, and sanitation; staff are trained to operate disinfectant application equipment and records of training kept	all staff are trained in the practice of good housekeeping, proper watering practices, and sanitation; staff are trained to operate disinfectant application equipment and records of training kept; appropriate PPE training and use coinciding with license for job classification
Communication	staff communicate (verbal and signage) with greenhouse users, managers and fellow staff regarding housekeeping and disinfectant application where and when appropriate	staff communicate (verbal and signage) with greenhouse users, managers and fellow staff regarding housekeeping and disinfectant application where and when appropriate	staff communicate (verbal and signage) with greenhouse users, managers and fellow staff regarding housekeeping and disinfectant application where and when appropriate
<b>Management</b>			
Head House	a separate potting and storage area outside the greenhouses; head house is not a growing area; head house is kept clean and sanitized	a separate potting and storage area outside the greenhouses; head house is not a growing area; head house is kept clean and sanitized; head house is separate area for pot storage; potting takes place separate from the pot soil filling area; floors and benches are constructed of non-porous materials; head house surfaces are sanitized before and after use; sanitation supplies are easily available	a separate potting and storage area outside the greenhouses; head house is not a growing area; head house is kept clean and sanitized; head house is separate area for pot storage; potting takes place separate from the pot soil filling area; floors and benches are constructed of non-porous materials; head house surfaces are sanitized before and after use; sanitation supplies are easily available; head house is away from greenhouse; there are separate areas for different departments use

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Plant Care	plants are arranged to provide good airflow and access for effective watering and pesticide application; plants are watered only as needed	plants are arranged to provide good airflow and access for effective watering and pesticide application; plants are watered only as needed; potting media surface is allowed to dry out between watering; if present, algae layer manually removed from media surface to allow water and air flow, and decrease susceptibility to shore flies and fungus gnats	plants are arranged to provide good airflow and access for effective watering and pesticide application; plants are watered only as needed; potting media surface is allowed to dry out between watering; if present, algae layer manually removed from media surface to allow water and air flow; media is treated for fungus gnats and shore flies if present; scouting is done for overall plant health and records kept
Pest Management	scouting as plants come in and while in the greenhouse	scouting as plants come in and while in the greenhouse; prevention and screening in place; manage weeds to aid in insect and disease management	weekly scouting as plants come in and while in the greenhouse; prevention and screening in place; interior and exterior weed management to aid in insect and disease management; isolation with a communication with plant owners; find out condition of plants as they enter the greenhouse
	Refer to Pest Control section (3-1) of BMP Plan; Pest Exclusion, Sanitation & Pruning and Rouging		
Vermin Control	program is in place to control vermin	pesticide and fertilizer storage is constructed to conceal and prevent vermin access	pesticide and fertilizer storage is constructed to conceal and prevent vermin access; proactive in identifying vermin access and damage

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	Level 1	Level 2	Level 3
Sanitation	all surfaces are kept free of plant debris, soil and weeds; staff trained on spreading of disease; little to no storage in the greenhouses	all surfaces are kept free of plant debris, soil and weeds; staff trained on spreading of disease; little to no storage in the greenhouses; no flats or pots to be stored in the greenhouses; arrange for necessary storage in a near-by location other than the greenhouses; tools are disinfected when possible; avoid unnecessary use of chemicals and excess fertilizers	all surfaces are kept free of plant debris, soil and weeds; prevent puddling of water on floors; staff trained on spreading of disease; little to no storage in the greenhouses; no flats or pots to be stored in the greenhouses; arrange for necessary storage in a near-by location other than the greenhouses; benches, floors, tools and plant containers are disinfected between crops; avoid unnecessary use of chemicals and excess fertilizers; where feasible and for regulated equipment have a building for separate storage; foot baths and sanitation structures installed and maintained; hose dipping stations are regularly maintained
Hoses	hoses are kept free from walkways; nozzles are kept off the floor; hose integrity is maintained	hoses are kept free from walkways; nozzles are kept off the floor; hose integrity is maintained; hoses are hung properly as to not fall on the floor; water pressure is turned off while not in use	hoses are kept free from walkways; nozzles are kept off the floor; hose integrity is maintained; hoses are hung properly as to not fall on the floor; water pressure is turned off while not in use
Floors	keep soil off gravel and concrete floors; reduce excess water; if pooling, squeegee or add more gravel if applicable	keep soil off gravel and concrete floors; reduce excess water; if pooling, squeegee or add more gravel if applicable; thru water management keep excess off floor; disinfect gravel and concrete floors between crops or more frequently as appropriate	keep soil off gravel and concrete floors; reduce excess water; if pooling, squeegee or add more gravel if applicable; thru water management keep excess off floor; disinfect gravel and concrete floors between crops or more frequently as appropriate; gravel add bio-controls; weed control; physical weed mat barrier is in place over gravel or soil floors to reduce weeds
Floor Construction	well drained gravel floors	concrete floors to reduce the amount of excess moisture in the greenhouse	concrete floors to reduce the amount of excess moisture in the greenhouse; floors sloped to drain properly and prevent pooling; design concrete surface textured to reduce slipping

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Bench Management	benches and area around plants free of debris	benches and area around plants free of debris; benches cleaned and disinfected between crops; no wooden benches	benches and area around plants free of debris; benches cleaned and disinfected between crops; no wooden benches; benches are non-porous and are easy to clean and maintain with no debris or water puddling; benches are cleaned routinely; benches are pressure washed/bio-foamed between crops
Ventilation	passive or manual controlled outdoor air inlets to manage greenhouse humidity and control temperature	actively controlled computer or thermostat outdoor air inlets to manage greenhouse humidity and control temperature; proper ventilation from horizontal airflow fans; clean insect screening as necessary	actively controlled computer or thermostat outdoor air inlets to manage greenhouse control temperature with an active system to increase humidity during winter/dry months; proper ventilation from horizontal airflow by computer monitoring of RH with automated ventilation systems; clean insect screening as necessary
Light Reduction for Algae Control	completely opaque tubing is used for irrigation lines to exclude light; fertilizer tanks are covered to exclude light	completely opaque tubing is used for irrigation lines to exclude light; fertilizer tanks are covered to exclude light; wrap existing completely opaque tubing with pipe wrapping foil used for irrigation lines; fertilizer lines and system should be checked for algae and cleaned regularly	use specialty tubing for irrigation lines to completely exclude light; fertilizer tanks are covered to exclude light; wrap existing completely opaque tubing with pipe wrapping foil used for irrigation lines; fertilizer lines and system should be checked for algae and cleaned regularly
Disinfectant Use	in accordance with label; surfaces and general use tools should be clean and free of debris before use	in accordance with label; surfaces and general use tools should be clean and free of debris before use; disinfectants used for pre-crop clean up and regularly during crop production for sanitation	in accordance with label; surfaces and general use tools should be clean and free of debris before use; disinfectants are part of a regular schedule before, during and after plants are in the greenhouse; applied to floors, walls, benches, tools and plant containers for sanitation

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<b>Safety</b>			
Slipping Hazard Communication	staff, users and visitors are made aware of safety hazards of wet floors through training or signage	staff, users and visitors are made aware of safety hazards of wet floors through training and signage	staff, users and visitors are made aware of safety hazards of wet floors through training and signage
Footwear	open-toed footwear is discouraged; use of non-skid footwear is encouraged	open-toed footwear is prohibited; use of non-skid footwear is encouraged; non-skid footwear is provided to staff	open-toed footwear is prohibited; staff are required to use non-skid footwear and it is provided