

Research Greenhouse: Intended for upper level courses requiring horticultural research and experimentation. Most instructors will be experts in the field and should be heavily involved in design. Average size: Varies dramatically based on project requirements.

1. Side Wall Vents

Description: Aluminum framed, awning hinged windows with fiberglass screens and safety covers.

Size: Typically 3' wide x 2' tall.

Operation: Motorized drive shaft with scissor arm operators; 115V; activated by the control system (below).

Manufacturer: Vents-Sunshine Rooms, Inc.; drive system-Lock; controls-Wadsworth.

Purpose: Allows fresh air intake at bottom of greenhouse.

Suggested qty.: Lean-to styles, continuous on longest wall; traditional style, continuous on two sides.

Notes: Must be used in conjunction with ridge vents. Traditional rack and pinion operators are not recommended due to their appearance, space consumption, and safety concerns. Each vent motor will require a control box separate from the control system.



2. Ridge Vents

Description: Aluminum framed, ridge vent windows.

Size: Typically 3' wide x 2' tall.

Operation: Motorized drive shaft with scissor arm operators; 115V; activated by the control system (below).

Manufacturer: Vents-Sunshine Rooms, Inc.; drive system-Lock; controls-Wadsworth.

Purpose: Extract hot air from greenhouse, pulling fresh air in from wall vents.

Suggested qty.: Continuous along ridge.

Notes: Must be used in conjunction with side wall vents. Traditional rack and pinion operators are not recommended due to their appearance, space consumption, and safety concerns. Each vent motor will require a control box separate from the control system.



3. Operable Door(s)

Description: Aluminum framed, narrow stile, commercial door.

Size: Typically 3' wide x 7' tall.

Operation: Push/pull hardware.

Manufacturer: Manko.

Purpose: Provides access in and out of the greenhouse (may be a fire exit).

Suggested qty.: As needed per project.

Notes: Panic hardware, 42" wide and 6' wide double doors are available.



4. Horizontal Air Flow (HAF) Fans

Description: Fan with wire basket suspended from rafters.
Size: 12” diameter.
Operation: 115V; activated by the control system (below).
Manufacturer: Schaefer model VT12PA.
Purpose: Use in pairs to create gentle, horizontal air circulation.
Suggested qty.: Two per 750 sq. ft. of floor area.
Notes:



5. Heater

Description: Ceiling suspended unit heater (natural or LP gas available).
Size: Determined per geographic region, glazing and usage.
Operation: 115V; Activated by the control system (below).
Manufacturer: Modine models Hot Dawg or Effinity.
Purpose: Keep plants alive and people comfortable during winter months.
Suggested qty.: Determined per region, glazing and usage. Call for support.
Notes: Heat may be supplied by the building’s primary heat system if controlled separately. Gas heaters will require gas piping and venting duct work.



6. Shade System

Description: Drive rack and guide wire based overhead shading system with aluminized fabric.
Size: To cover overhead area.
Operation: Motorized; 115V; activated by the control system (below).
Manufacturer: Fabric-Svensson; motor system-Wadsworth Push-Pull.
Purpose: Reduce glare and heat in warmer months; provide insulation during winter nights.
Suggested qty.: Overhead area and possibly west facing walls.
Notes: Fabric and color selection by architect.



7. Exhaust Fans

Description: Aluminum exhaust fan(s) made especially for greenhouses with aluminum slant-wall housing, louvers, and safety grill.
Size: Typically, 1/3hp, 30” fans are adequate though many sizes are available.
Operation: 115V; activated by the control system (below).
Manufacturer: American CoolAir.
Purpose: Extract hot air, pulling fresh air in from intake shutters.
Suggested qty.: Typically, one is adequate (two in southern climates).
Notes: Used in conjunction with intake shutters on opposing walls.



8. Air Intake Shutters

Description: Aluminum air intake shutters.

Size: Typically 21" x 21".

Operation: Motorized; 115V; activated by the control system (below).

Manufacturer: American CoolAir.

Purpose: Shutters open when the exhaust fan comes on providing fresh air.

Suggested qty.: Typically two 21" shutters per exhaust fan.

Notes:



9. Permanent Evaporative Coolers

Description: Exterior mounted evaporative coolers.

Size: Approx. 3' wide x 3' deep x 3' tall; 1/2hp motor.

Operation: 115V; activated by the control system (below).

Manufacturer: Champion model AS2C51.

Purpose: Supplies cool, humid air to plants.

Suggested qty.: Typically one or two units placed each side of greenhouse.

Notes: Requires ductwork, setting pads, and plumbing. (Substitute option below.)



10. Environmental Control System

Description: A greenhouse specific, "advanced-level," one-zone control system with corrosion resistant cabinet, contactor panel, blueprints and temperature sensor.

Size: 16" x 16" x 5" deep cabinet; 14½" x 16½" x 6¼" deep contactor panel.

Operation: 115V.

Manufacturer: Wadsworth model EnviroSTEP control.

Purpose: Central controller for most cooling and heating equipment including wall and ridge vents, exhaust fans, intake shutters, HAF fans, heater, and evaporative coolers.

Suggested qty.: One per greenhouse (or per zone).

Notes: Two days on site training recommended. Multiple zones will require a different controller or multiple EnviroSTEPS.



11. Environmental Control Software

Description: Environmental control management software for pc computers.

Size: 500MB available hard disk space.

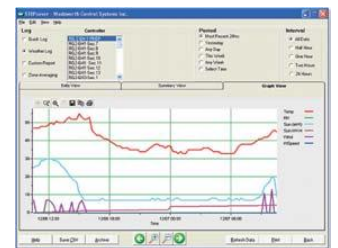
Operation: Windows operating systems 2000, XP, or Vista.

Manufacturer: Wadsworth STEPSaver software.

Purpose: Enables advanced management of the environmental control via a personal computer. Features include monitoring, setting changes, data logging, analysis tools, remote access, alarm reports, and more.

Suggested qty.: Typically one per greenhouse. Wadsworth allows multiple computers (local or remote) to access the software to monitor one greenhouse.

Notes:



12. Alarm Manager for Environmental Control System

Description: An add-on of the control system that will automatically call up to four phone numbers with custom alarm messages.

Size: 8¾" x 4¾" x 2½" deep box.

Operation: 115V.

Manufacturer: Wadsworth Alarm Manager.

Purpose: Protect your plants and work from unusually harsh weather or an equipment failure.

Suggested qty.: One per greenhouse.

Notes: Does not require separate phone line.



13. Weather Monitor for Environmental Control System

Description: An add-on of the control system that measures and monitors the weather conditions.

Size: Mast-10' tall.

Operation: Direct connection to control system (see above).

Manufacturer: Wadsworth Weather Station.

Purpose: Overrides the regular settings to prevent plant or greenhouse damage.

Suggested qty.: One per greenhouse.

Notes: Exterior mounted weather mast sensors connect directly to EnviroSTEP.



Optional Equipment

14. Growing Benches

Description: Aluminum frame benches with stationary legs and plastic tops.

Size: 3' tall x 3' wide x 3', 4', and 6' lengths.

Operation: n/a.

Manufacturer: Frames-Sunshine Rooms, Inc.; tops-Dura-Bench.

Purpose: Provides a growing area for plants.

Suggested qty.: Typically around the perimeter and center of the greenhouse.

Notes:



15. Potting or Work Tables

Description: Stainless steel top work tables

Size: 36" tall x 30" wide x 48" or 60" long.

Operation: n/a.

Manufacturer: Eagle or equal.

Purpose: Provides an area to work with plants and study area.

Suggested qty.: Two or three per average sized greenhouse.

Notes: Optional sink and lower shelf are available.



Optional Equipment

16. Built in Misting System

Description: An automatic PVC mist distribution system with timer controls, solenoid valve, and misting nozzles to cover a 6' x 50' area.

Size: ½" sch40; 50' length.

Operation: Control-120V; activated automatically.

Manufacturer: Phytotronics automatic misting kit.

Purpose: Effective, automated method to supply moisture to plants.

Suggested qty.: Typically one system per greenhouse (or per misting zone).

Notes: Kit includes timer controls, solenoid valve, risers, misting nozzles, strainer, PVC pipe and fittings, 20' of 2-conductor wire, one brass hose adapter, PVC primer and glue, and Teflon tape. Supply plumbing up to the solenoid valve will be required by the plumbing contractor.



17. Built in Watering System

Description: An automatic PVC water distribution system with timer controls and plumbing kit to cover 50'.

Size: ½" sch40; 50' length.

Operation: Control-24VAC plug-in transformer; activated automatically.

Manufacturer: Phytotronics model Trident T3A system.

Purpose: Effective, automated method to water the roots of plants.

Suggested qty.: Typically one system per greenhouse (or per watering zone).

Notes: Supply plumbing up to the system will be required.



18. Fertilizing System

Description: Portable fertilizer injector.

Size: 15 gal. reservoir; 14 gpm mixer.

Operation: Water pressure powered; manually activated.

Manufacturer: Dosatron model DosaCart with injector D14MZ2.

Purpose: Mixes fertilizer into water at a controlled rate.

Suggested qty.: Typically one per greenhouse (or per zone).

Notes: Option to mount permanently to water supply line is available. Many fertilizing systems are available. Owner input is recommended.



19. In-Wall Evaporative Cooler

Description: A wall section converted to a cellular pad system in which water is circulated. Exhaust fans pull outside air through the pads, thereby supplying cool air for the greenhouse.

Size: Typically 4' high by the length of one end wall; 4" thick pads.

Operation: In-line pump-115V; activated by the control system (below).

Manufacturer: American CoolAir.

Purpose: Effective means to cool large greenhouses in hot climates.

Suggested qty.: One system per greenhouse.

Notes: Longer wall sections may require additional exhaust fans.



Optional Equipment

20. Bench Heating System

Description: Bench-installed, hot water system for heating the plants.

Size: Designed per project. Please call for recommendations.

Operation: Activated automatically by dedicated control.

Manufacturer: DeltaT Solutions.

Purpose: Reduce costs by heating the plants on the benches rather than the vast amount of air inside the greenhouse.

Suggested qty.: One system per greenhouse.

Notes: Requires a hot water boiler and significant plumbing.



Other Equipment to Consider by Other Trades

21. Water Supply

Multiple water spigots with watering and misting hoses.

22. Floor Drains

At least one per greenhouse will ease cleaning considerably.

23. Grow Lights

Since these would be installed by a licensed electrician they should also supply them. We recommend high pressure sodium fixtures by P.L. Light Systems, 1-800-263-0213.



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