Greenhouse Preventative Maintenance

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Agenda

- Preventative seasonal maintenance
- Structure and glazing
- Fan and pad maintenance
- Heating
- Motorized vents & shutters
- Plumbing, electrical & controls
- Insect screen and shade systems
- Benches and HID lighting
- Questions and comments

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Spring Maintenance

- Inspect insect screen & make repairs
- Install exterior shade fabric
- Inspect & calibrate environmental controls and alarm dialers

Summer Maintenance

- Wash glazing in & out
- Secure loose fasteners
- Paint rusted surfaces
- Inspect foam closures
- Clean gutters
- Inspect glazing
- Inspect vents & shutters
- Re-caulk
- Maintain Kool-Cel

Fall Maintenance

- Inspect heating
- Change convection tubing
- Inspect inflation fan
- Inspect shade systems
- Emergency contact list
- Inspect & calibrate controls
- Set alarm dialers
- Clean HAF and Fan-Jet
- Replace poly
- Inspect roof vents
- Remove exterior shade

Winter Maintenance

- Adjust doors
- Fans & belts
- Repair irrigation
- Inspect electrical
- Fire extinguishers
- Exit lights
- HID lights
- Disinfect interior
- Kool-Cel

Winter Maintenance

- Repair benches
- Backflow inspection
- Remove insect screen at lean-to & half arch frames
- Update safety signage
- Update MSDS
- Inspect & rebuild fertilizer injectors

Structure & Glazing Maintenance

- Wash structure
  (Inside & outside)
- Replace missing bolts
- Inspect foam closure
  (ridge, roof rake & eaves)
- Repair glazing

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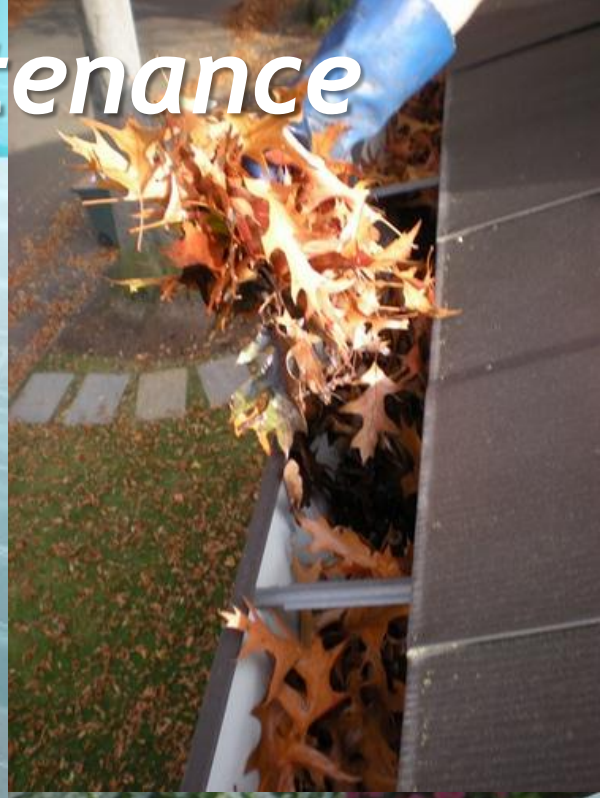
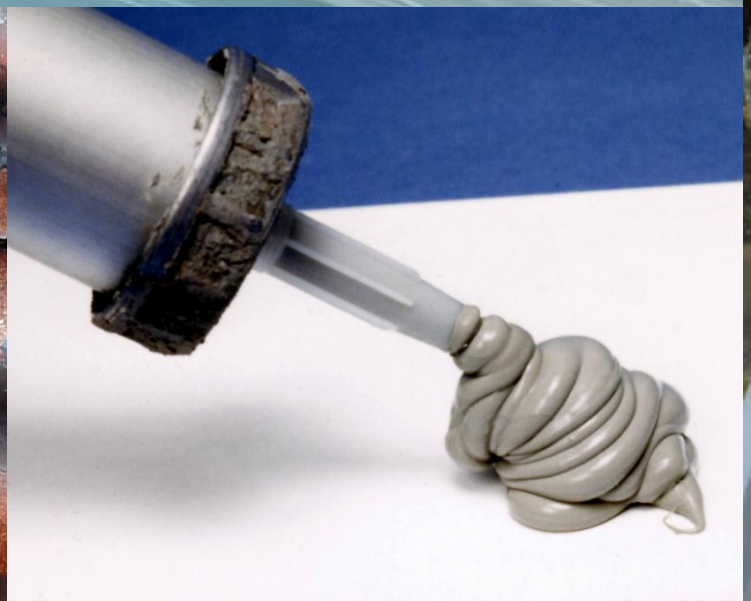
Structure & Glazing Maintenance

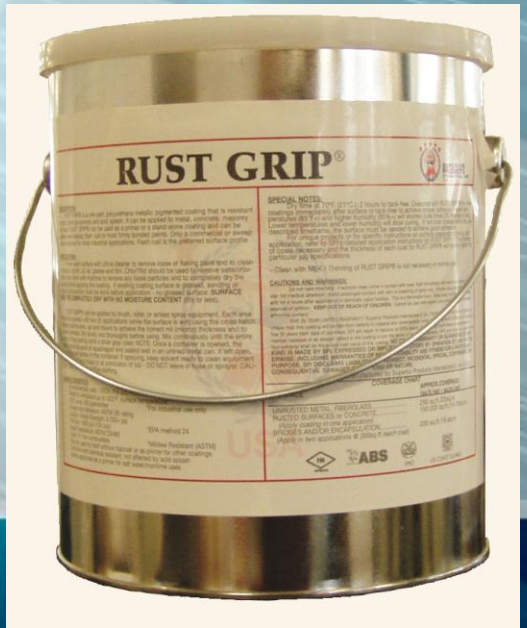
- Sand & paint rusted areas
- Clean out debris in gutters
- Caulk as needed
- Apply Rust Grip





Rust Grip

- Columns at grade
- Kool-Cel stringer
- Gutters and benches
- End wall columns at Kool-Cel

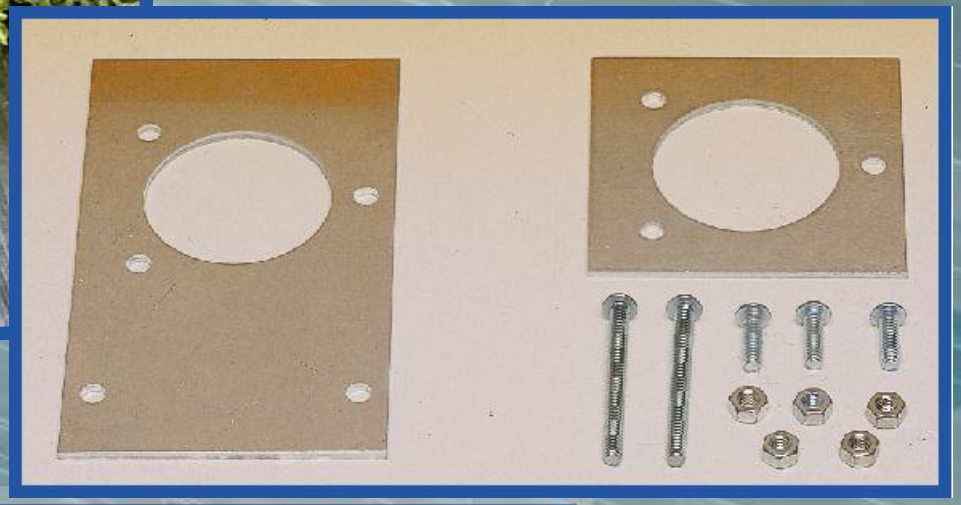


Structure & Glazing Maintenance

- Keep an extra roll of poly on hand, poly repair tape & manometer
- Keep an extra sheet of polycarbonate

Polyethylene Accessories

- Check damper for proper air flow
- Consider outside air intake



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Polyethylene Accessories

Dura Tape is a clear UV resistant film with acrylic adhesive

Available in 2”, 4”, 6” & 10” wide by 48’ long

Manometer

- 12” to 14” of space between layers of a double poly roof
- Air pressure hot days = .2”
- Air pressure cold & windy days = .45”

Exhaust Fan Maintenance

- Power wash – prop, orifice housing, guards, shutter
- Replace belts annually
- Install belt tighter – to increase CFM performance
- Inspect all fan guards

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Kool-Cel Pad Maintenance

- Treat Cooling Pads with Zero-Tol, Physan 20, or JR's ECT
- Test pH and salt levels
- Clean sump tank
- Replace water every 4 to 6 weeks
- Clean distribution & return system
- Clean filter regularly
- Check lid on tank
- One edge coating of Kuul Pads

Cleaning Evaporative Cooler

- ECS - Mini-Dos .4% with ZeroTol 1:300
- Add to sump tank at ½ oz. ZeroTol/gallon water
- Change water weekly
- Use Bio-Safe Test Strip

Kool-Cel Maintenance

- Clean sump tank, 8” PVC pipe or extruded plastic gutter and filter regularly
- Install lid at sump to avoid exposure to sunlight in water

Water Quality

- Maintain water at a Ph level between 6 to 8
- Hard water resulting in calcium carbonate deposits – should be kept within limits

- Sodium chloride level >50,000 ppm will deposit salt
- Water in tank should be below 40,000 PPM

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Transition Tank With Lid

Float valve, pump, and check valve

Bleed Off Tube

Maintain A Water Bleed Off Rate Of 3 - 5%

Tube drains outside into gravel basin or into floor drain

Kool-Cel System

- Sump pump
- Replacement filter insert

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Positive Pressure Cooling

Install motorized shutter inside greenhouse

Maintain pads, replace belts annually, use purge pump, winterize unit

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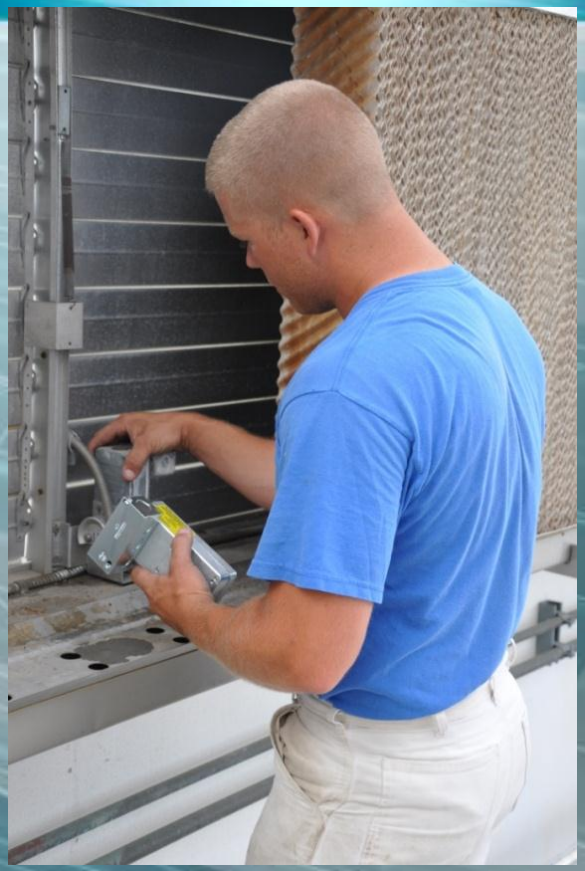
Motorized Shutter Maintenance



- Have a spare damper motor
- Shutter panels should open & close freely
- Replace damaged units

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Roof Vent Maintenance

- Check vents routinely
- Rack arms should be straight
- Check pinion gears for wear

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Roof Vent Maintenance

When vent is closed, check the bottom rail closure, rail should be against the header

Reduces heat loss and increases heating efficiency

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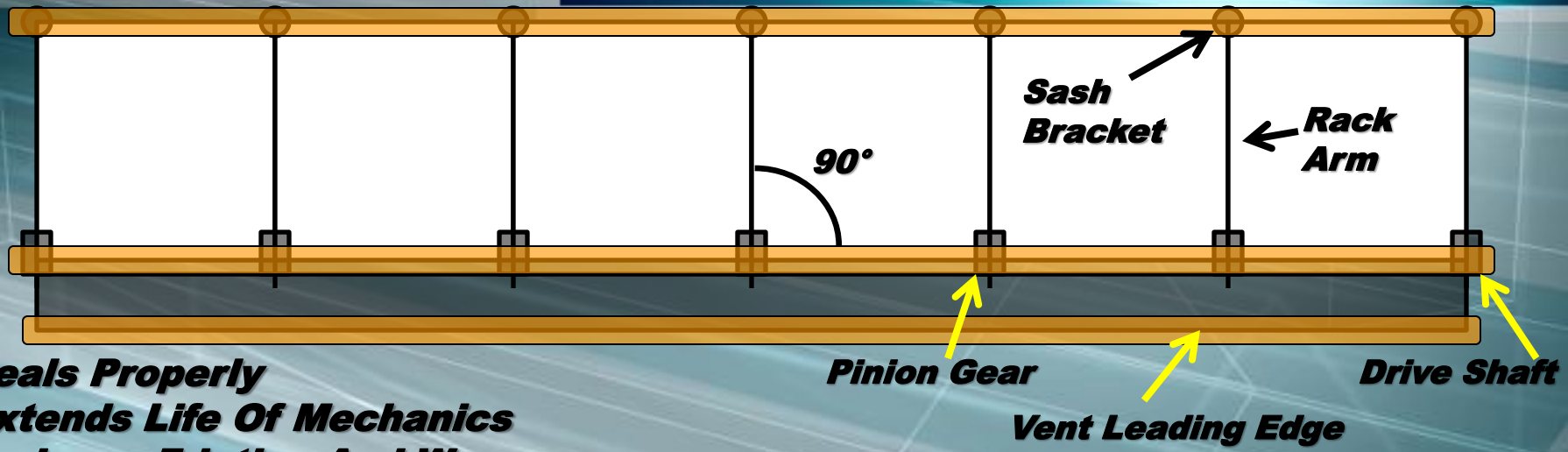
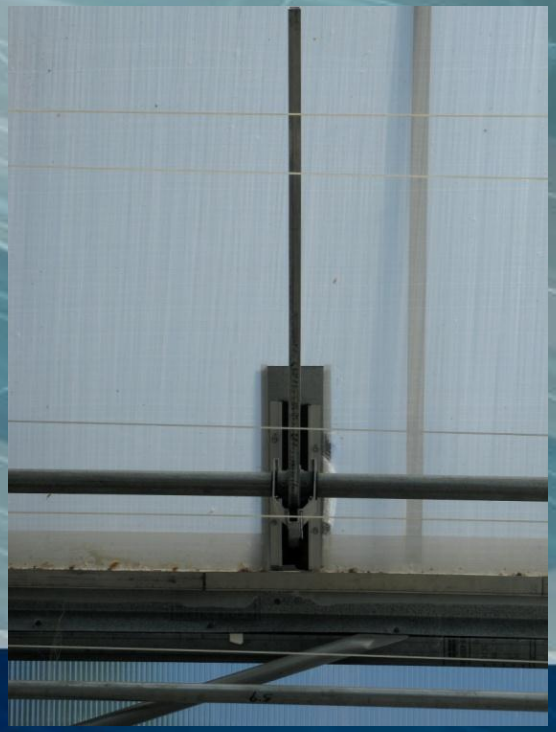
Proper Vent Apparatus Alignment

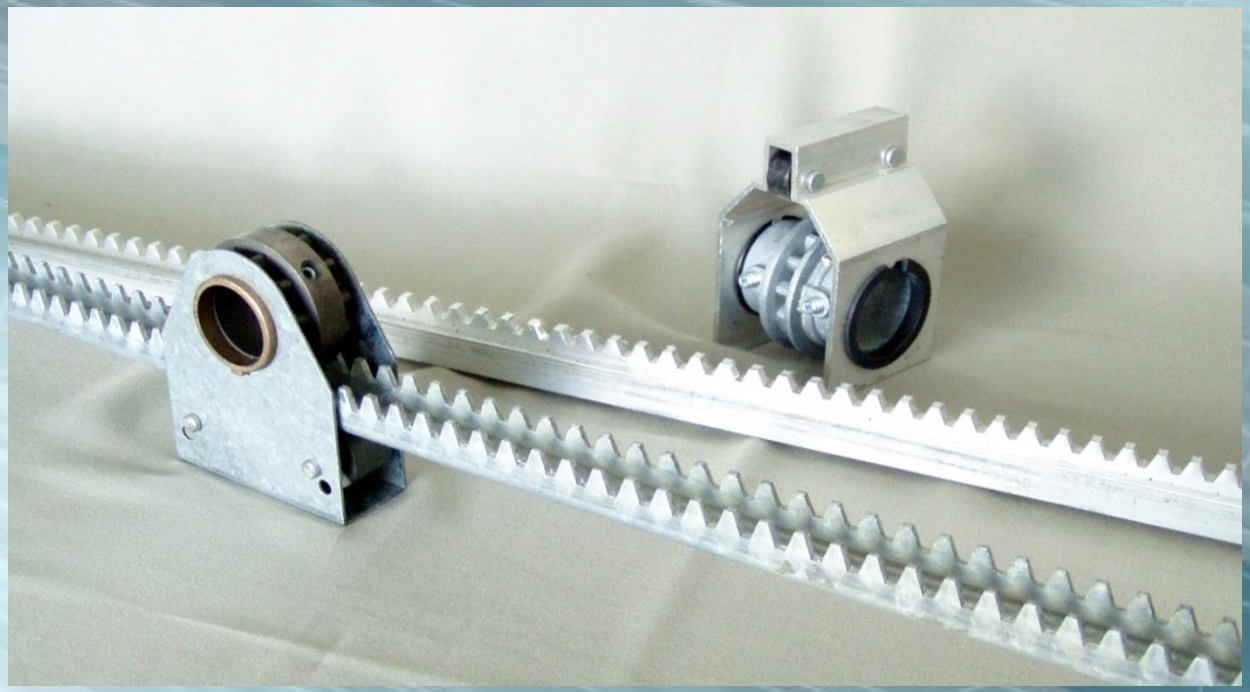


- Seals Properly
- Extends Life Of Mechanics
- Reduces Friction And Wear
- Lowers Operating And Maintenance Costs



Pad Vent and Motor Drive Maintenance

Roof and Pad Vent Pinion Gears & Rack Arms



Lightly lubricate pinion bearings and at the teeth with Teflon dry, wax lubricant, every 6 months

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Roof Vent With Weather Stat

Override sensor should be set to close the roof vent at wind speeds of no more than 25 MPH

Monitors Wind Speed And Detects Rain

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Air Circulation Maintenance

- Clean Horizontal Air Flow (H.A.F.)
- Install Variable Speed Control

- Fan-Jet System
  - Change convection tubing
  - Check Shutter
  - Check tube hangers and snap rings

Unit Heater Maintenance

- Service unit heaters before the heating season - 30 to 60 days

- Seasonal inspections – heat exchanger, flue pipe blockage, gas pressure & leaks

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www.modine.com - Pre-season Checklist, pub. 76-500J, Service Diagnosis, pub. 75-551.5

Plumbing Maintenance

Backflow preventer

Filters

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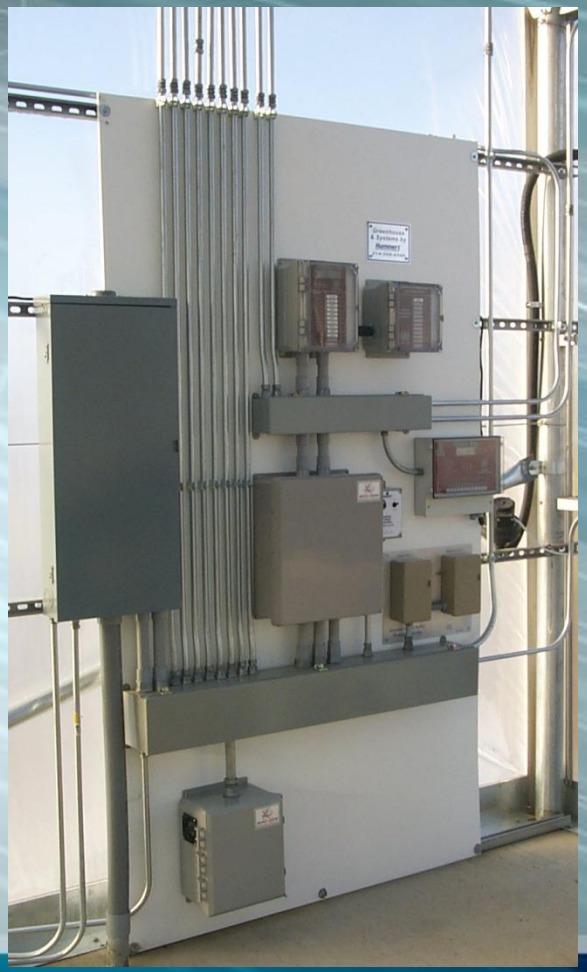
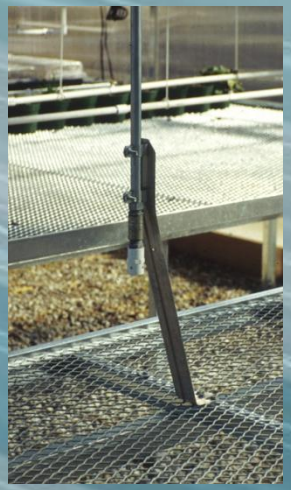
Plumbing Maintenance
Calibrate Fertilizer Injectors

Hanna Instruments pH & EC meters

Electrical Maintenance - Test Sequencing And Calibration Of Environmental Controls



Test alarm dialers and phone numbers



Clean all sensor probes inside and out, replace filters as needed

Check calibration of aspirator sensor with electronic thermostat

Maintain Environmental Control Log

Day Mode: 4:30 am
Night Mode: 8:30pm

Midday & Evening Modes: Not in use

Inputs
1 air temp
2 RH
3 Pyra
4 Soil Temp
5 Par
6 Outside Temp
7 not in use
8 not in use

	Day	Night
Cooling	68	73
Heat 1	59	64
Heat 2	59	43
Vent 1	66	76
Dehum	76	67

Outputs
1 vent 1 open
2 Vent 1 close
3 Cool 1 stage 5
4 cool 1 stage 4
5 cool 1 stage 3
6 cool 1 stage 2
7 cool 1 stage 1
8 air circ 1
9 heat 1 stage 1
10 heat 2 stage 1
11 crop lights
12 Not in use
13 Blackout
14 Irrigation

Electrical Maintenance & Thermal Imaging

Inspect GFCI receptacles and switches

Inspect electrical devices, Circuit breakers, correct all wiring deficiencies

Lighting Maintenance

- Clean lens and fixtures replace lamps as needed
- HID lighting should have safety lens

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Exit Emergency Light

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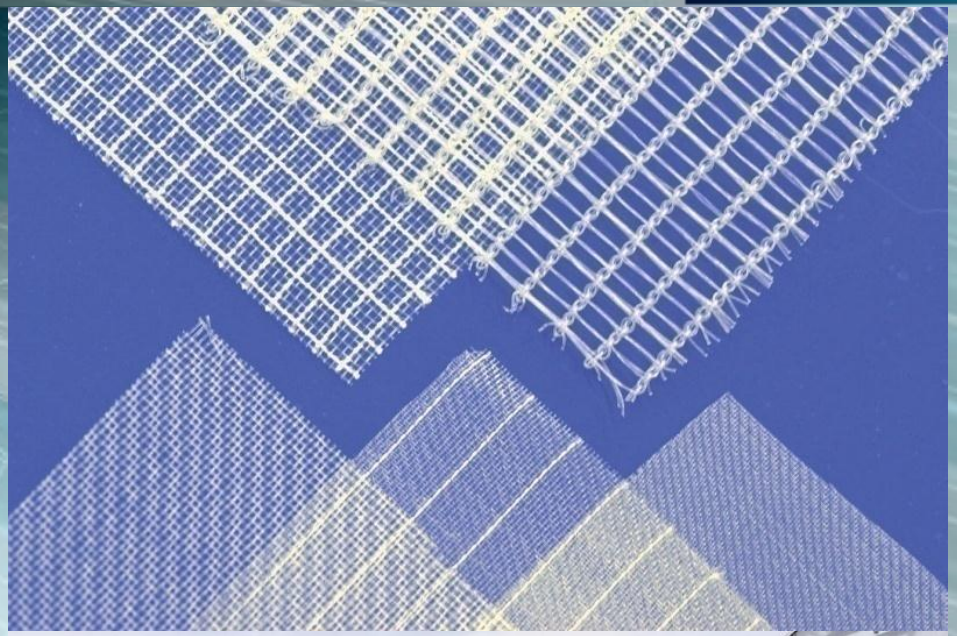
Insect Screen Maintenance



- Wash insect screen as needed
- Patch holes
- Check air flow for proper static pressure

6’ Bay Insect Screen Extension

Proper use of screen at pad vent

Check for adequate square footage of inlet air to supply air flow for exhaust fans

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Clean Insect Screen

Remove insect screen in the fall to protect from ice and snow damage

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Interior Greenhouse Maintenance

- Use Zero-Tol or Physan 20
- Remove weeds & debris, use weed barrier
- Sidewalks should have broom finish

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Insect Screen Applications

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Keep It Clean

- Keep grass and weeds cut
- Install concrete or gravel aprons
- Reduces insect populations

Aluminet & Pak Shade Fabric

Install in spring

Remove in fall

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Energy & Shade Curtains

- Lightly lubricate shaft hangers
- Visually check that leading edge pipes are straight
- Check fabric for worn spots and tears
- Curtains must seal properly to insure energy savings

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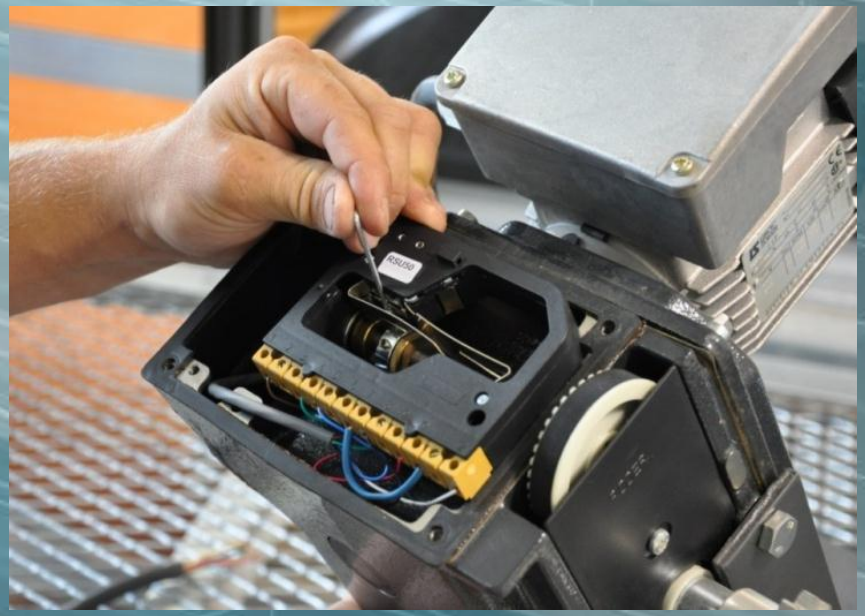
Inspect Limit Switch Settings On Motor Drives



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Inspect Benches

- Paint rusted bench parts with rust grip
- Inspect for sharp corners

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Inspect Benches

Rolling benches must have anti tip device

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Inspect & Clean Mist Nozzles, Drippers
Inspect Propagation Mats

Use vinegar to clean nozzles and drippers

Lighting Maintenance

- Relamp bulbs after 10,000 – 12,000 hours of use.
- For every 1,000 hours, the useful light output deceases by 1%
- After 10,000 hours 10% of light output is lost

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Reflector Cleaning

- New (1-3 yrs) & clean
  - Water and vinegar at 1:100
- Old (>3 yrs) and dirty
  - Water and Raymax No. 5 at 1:120

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Reflector Work Instructions

1) Flush reflector with water inside and out.

2) Fill basin with water and cleaning agent at proper ratio. Submerge reflector and clean with soft brush.

3) Rinse reflector in a second basin of clean water to remove remaining cleaning solution.

4) Rinse reflector in 3rd basin of distilled water to remove hard water residue. If residue is still present repeat steps 1 to 4.

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Chemical Storage Cabinet

- Maintain MSDS
- Spray log
- Pesticide signage
- Inspect safety equipment
- Inspect first aid kit
- Eye wash station
- Insect fire extinguisher
- Inspect fire alarm system
- Emergency plan
- Emergency call list of vendors

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Questions and Comments