



# Conditioned Greenhouses

The following shall apply to all conditioned (heated/cooled) agricultural buildings after January 1<sup>st</sup>, 2023.

## Energy Code Changes

California's updated 2022 Energy Code (taking effect in 2023) now directly addresses "Conditioned Greenhouses" (see definition on next page). This change now only allows construction of conditioned greenhouses with a building envelope constructed of non-opaque glazing products such as double pane glass, double wall polycarbonate, or double film polyethylene.

## Conditioned Greenhouses Building Envelope | CA Energy Code §120.6(h)(4)

**Conditioned greenhouses, building envelope.** Conditioned greenhouses shall meet the following requirements.

- A. Opaque (wood/metal framed) wall and opaque roof assembly shall meet the requirements of Section 120.7; and
- B. Nonopaque (transparent) envelopes shall have two or more glazings separated by either air or gas.
  - ❖ Double film polyethylene and double wall polycarbonate meet the requirements of non-opaque glazing products.



Single Plastic Membrane



Double Plastic Membrane



## Q & A

- ❖ **Doesn't an "ag-exempt structure" exempt me from the building code? Why do I have to comply with the energy code?** The ag-exemption exempts you from the structural requirements of the building code but not the mechanical, electrical, plumbing, or energy code.
- ❖ **If I am not conditioning my greenhouse, can I build a nonopaque membrane greenhouse NOT constructed with double film polyethylene?** Yes, however, if you add electrical and/or plumbing you will still have to comply with other energy, electric, and/or plumbing code requirements. See other requirements below.

## Other Requirements

Even unconditioned ag-exempt greenhouses must comply with current electrical, plumbing, mechanical, and energy codes. Below are common code requirements for ag-exempt greenhouses provided with lighting. A CF1R shall be submitted for all mechanical equipment. If you are not familiar with what a CF1R is you can shop through the Humboldt Builders Exchange (<https://www.humbx.com/>) to find a local energy consultant or other design professional who can provide this for you.

- **Receptacle GFCI Protection CEC §547.5(G).** All 125-volt through 250-volt receptacles supplied by single-phase branch circuits rated 150 volts or less to ground, 50 amperes or less, and all receptacles supplied by three-phase branch circuits rated 150 volts or less to ground, 100 amperes or less, shall have ground-fault circuit-interrupter protection for personnel.
- **Equipment Enclosures, Boxes, Conduit Bodies, and Fittings in Damp or Wet Locations CEC §547.5(C).** In damp or wet locations, equipment enclosures, boxes, conduit bodies, and fittings shall be placed or equipped so as to prevent moisture from entering or accumulating within the enclosure, box, conduit body, or fitting. In wet locations, including normally dry or damp locations where surfaces are periodically washed or sprayed with water, boxes, conduit bodies, and fittings shall be listed for use in wet locations and equipment enclosures shall be weatherproof.

- **Mounting CEC §547.5(B).** All cables shall be secured within 200 mm (8 in.) of each cabinet, box, or fitting. Nonmetallic boxes, fittings, conduit, and cables shall be permitted to be mounted directly to any building surface covered by this article without maintaining the 6 mm (1/4 in.) airspace in accordance with 300.6(D).
- **Luminaires Exposed to Water CEC §547.8(C).** Luminaires exposed to water from condensation, building cleansing water, or solution shall be listed for use in wet locations.
- **Horticultural Lighting Equipment CEC §480.170.** Lighting equipment identified for horticultural use shall be listed. Lighting equipment identified for horticultural use shall be installed and used in accordance with the manufacturer's installation instructions and installation markings on the equipment as required by that listing.
- **Horticultural Lighting GFCI Protection CEC §410.184.** Lighting equipment identified for horticultural use employing flexible cord(s) with one or more conductors shall be supplied by lighting outlets protected by a listed ground-fault circuit interrupter.
- **Horticultural Lighting Support CEC §410.186.** Special fittings identified for support of horticultural lighting equipment shall be designed specifically for the horticultural lighting equipment on which they are installed and shall be used in accordance with the installation instructions provided and shall be securely fastened.
- **Grounding Electrode CEC §250.32(A).** A building(s) or structure(s) supplied by a feeder(s) or branch circuit(s) shall have a grounding electrode system and grounding electrode conductor installed in accordance with Part III of Article 250. Where there is no existing grounding electrode, the grounding electrode(s) required in 250.50 shall be installed.
- **Separate Equipment Grounding Conductor CEC §547.5(F).** Where a separate equipment grounding conductor, not part of a listed cable assembly, is installed underground it shall be insulated.
- **Time-Switch Lighting Controls CA Energy Code §110.9(b)(1).** All controls that provide time-switch functionality, including all automatic and astronomical time-switch controls, shall have program backup capabilities that prevent the loss of the device's schedule for at least 7 days, and the device's date and time for at least 72 hours if power is interrupted.
  - ❖ A multilevel astronomical time-switch control (see definition below) is required for compliance with the Prescriptive Requirements for Indoor Lighting CA Energy Code §140.6.
- **Conditioned Greenhouses, Space Conditioning Equipment CA Energy Code §120.6(h)(5).** Space-conditioning systems used for plant production shall comply with CA Energy Code §110.2 and current CA Mechanical Code.
- **Greenhouses, Horticultural Lighting CA Energy Code §120.6(h)(6).** In a greenhouse with more than 40 kW of aggregate horticultural lighting load, the electric lighting system used for plant growth and plant maintenance shall meet the following requirements:
  - A. The horticultural lighting systems shall have a photosynthetic photon efficacy (PPE) rated in accordance with ANSI/ASABE S640 for wavelengths from 400 to 700 nanometers and meet one of the following requirements:
    - i. Integrated, nonserviceable luminaires shall have a rated PPE of at least 1.7 micromoles per joule; or
    - ii. Luminaires with removable or serviceable lamps shall have lamps with a rated PPE of at least 1.7 micromoles per joule.
  - B. Time-switch lighting controls shall be installed and comply with Section 110.9(b)1, Section 130.4(a)4 and applicable sections of Reference Nonresidential Appendix NA7.6.2.
  - C. Multilevel lighting controls shall be installed and comply with Section 130.1(b).

## Important Energy Code Definitions | CA Energy Code §100.1

1. **Covered Process** – is a process that is regulated under Part 6, Sections 120.6 and 140.9, which includes controlled environment horticultural spaces.
2. **Controlled Environment Horticultural (CEH) Space** – is a building space dedicated to plant production by manipulating indoor environmental conditions, such as through electric lighting, irrigation, mechanical heating, mechanical cooling or dehumidification. CEH space does not include building space where plants are grown solely to decorate that same space.
3. **Conditioned Greenhouse** – is a greenhouse that is provided with wood heating, mechanical heating that has a capacity exceeding 10 Btu/hr-ft<sup>2</sup>, or mechanical cooling that has a capacity exceeding 5 Btu/hr-ft<sup>2</sup>.
4. **Building Envelope** – is the ensemble of exterior and demising partitions of a building that enclose conditioned space.
5. **Astronomical Time-Switch Control** – is a lighting control that controls lighting based on the time of day and astronomical events such as sunset and sunrise, accounting for geographic location and calendar date.
6. **Multilevel Astronomical Time Switch** – is an astronomical time-switch control that reduces lighting power in multiple steps.