

## American Boat and Yacht Council (ABYC)

### ABYC E-11 – AC and DC electrical systems on boats

#### 11.11 Ground-fault protection – AC systems

- 11.11.1** An equipment leakage circuit interrupter (ELCI) shall be installed with or in addition to the main shore power disconnect circuit breaker(s) or at the additional overcurrent protection as required by E-11.10.2.8.3 whichever is closer to the shore power connection
- 11.11.1.1** This device shall meet the requirements of UL 1053, *Standard for Safety for Ground-Fault Sensing and Relaying Equipment*, and the requirements of UL 943, *Ground-Fault Circuit Interrupters*, with the exception of trip level and trip time. Trip level shall be set at a maximum of 30mA. The trip time shall be set at a maximum of 100ms.
- 11.11.1.2** The ELCI shall be readily accessible.
- 11.11.2** If installed, a ground-fault protector (GFP) shall only be used to protect equipment
- 11.11.3** GFCI breakers shall meet the requirements of UL 943, *Ground-Fault Circuit Interrupters*, and the requirements of UL 489, *Molded Case Circuit Protectors for Circuit Breaker Enclosures*.
- 11.11.4** GFCI breakers may be installed as panelboard feeder breakers to protect all associated circuits or in individual branch circuits.
- 11.11.5** Single-pole GFCI breakers shall only be used if:
- 11.11.5.1** The single phase 120 volt system has a polarity indicator, or
- 11.11.5.2** The system uses either a transformer, or
- 11.11.5.3** The system is 120/240 volts.
- 11.11.6** GFCI receptacle devices shall meet the requirements of UL standard 943, *Ground-Fault Circuit Interrupters*, and the requirements of UL 498, *Electrical Attachment Plugs and Receptacles*.
- 11.11.7** GFCI receptacle devices may be installed as part of a convenience outlet installation either in single outlet applications or in multiple feed through installations.

### S-31 Environmental Considerations for Systems and Components Installed Onboard Boats

#### 31.6 Qualification Testing

- 31.6.1 Testing General
- 31.6.2 Electromagnetic Compatibility
- 31.6.2.1 Electronic equipment shall be subjected to the specified electromagnetic interference tests for:
- 31.6.2.1.1 Immunity to conducted low frequency interference.
- 31.6.2.1.2 Immunity to conducted high frequency interference.
- 31.6.2.1.3 Immunity to radiated radio frequency fields.
- 31.6.2.1.4 Immunity to fast, low energy transients – bursts (on power, control and signal lines) AC only.
- 31.6.2.1.5 Immunity to slow high energy transients.
- 31.6.2.1.6 Immunity to electrostatic discharge (ESD).
- 31.6.9 Radiated Emissions
- 31.6.10 Conducted Emissions
- 31.6.11 Environmental Compatibility
- 31.6.11.1 Insulation Resistance Test
- 31.6.11.2 Vibration Test
- 31.6.11.3 Humidity Test 1 – Cyclic
- 31.6.11.4 Humidity Test 2 – Steady State
- 31.6.11.5 Salt Mist Test
- 31.6.11.6 Dry Heat Test 1 – Steady State
- 31.6.11.7 Dry Heat Test 2 – Storage
- 31.6.11.8 Low Temperature Test 1 – Operation
- 31.6.11.9 Low Temperature Test 2- Storage