

Most utilities, municipals and cooperatives buy photocontrols based on a written specification. Often an approved list is provided to guide Purchasing about which suppliers and models have been tested by engineering. Underlying the approved list are two assumptions: 1) the Standards Engineer had the equipment, budget and time to do a proper evaluation; and 2) the supplier will ship product exactly like the samples. This memo will address photocontrol testing as it relates to each of these assumptions.

DTL is often asked "How can utilities easily test photocontrols?" Everyone wants test procedures that are:

1. Good
2. Quick
3. Inexpensive

Design Testing:

However, as with most things in life, the above three rarely go together. In Appendix I, we recommend a good, complete design test procedure that is within the realm of reality for most medium and larger users. This test should be performed on all new controls and whenever a manufacturer announces a design change or improvement.

Incoming Inspection:

Once a control design is approved by standards, then the utility should be prepared to do periodic incoming inspection. Unfortunately, many utilities do not do this inspection. Some suppliers may realize this and shave pennies or even dimes by shipping out of spec products. In Appendix II we recommend an incoming inspection procedure. Manufacturers have a strong temptation to save costs. Bidding pressures have reduced margins on some controls to the point where production line quotas and in-process rejects make or break the profit/loss equation. On a production basis, some AC relay controls and thermal controls cannot meet good performance specs. This is especially true for specs requiring low turn OFF/ON ratios (below 3:1) and reasonably precise turn-ON levels: say 1.5 ± 0.3 ftc. Users will have a hard time testing calibration on thermal type controls. The long time delay poses problems for the manufacturers as well. Typically a manufacturer will test 50-200 controls at a time or run a quicker but less exact non-operational parametric test. As a result, these controls may only work in the broadest sense ON at night, OFF in the morning. For these and other reasons, thermal controls are sold only to utilities where lowest possible purchase price comes first.

AC relay controls with time delay (made by Ripley, Fisher Pierce or Lampas/Lumatrol), cannot be properly calibrated except with the internal delay element (PTC) in the circuit. This is very time-consuming in production. At least one major manufacturer calibrates without the PTC, applies a fudge factor, installs the PTC and ships the control; actual turn ON values are anyone's guess. Since time delay is accomplished by a thermal element, ambient temperature can also affect calibration. Run a light level test at -20EC and +50EC to easily observe this phenomenon.

It is commonly assumed that suppliers notify customers of design changes. In an ideal world such changes would be accompanied by test details and a utility Standards Engineer would have time to re-do his/her evaluations. In reality, change and redesigns often happen because of economic factors. The user may not become aware of design changes unless the model number changes.

From the 1970s until 1990 there was a steady decrease in photocontrol quality, price and life. It was also a time of tightened budgets for manufacturers and users. You can understand the pressure on manufacturers to build cheap. Product numbers and external appearance may be the same but internal construction and performance may have changed. Fortunately, the 1990s and into 2002 have seen a steady trend to higher quality electronic controls. There is a general industry movement toward lower life cycle cost rather than lowest initial cost.

Let the buyer beware! Testing at utilities - both by standards engineering and by incoming inspection - can save you money. Photocontrols may appear to be an insignificant expense. However they control a large amount of power, generally un-metered power. In addition, the change-out cost of failed units can easily be 20 times the purchase price. For a few dollars more up front, electronic controls can meet exacting standards and give 10-20 years of life. A cheap control, bought strictly on lowest bid, may waste 2 hour a day in burning hours and fail in 2-4 years.

Photocontrol Design testing

- 1.) Run 3 or more controls for 3,650 operations on 1,000 watt tungsten load per ANSI C136.10, 1996.
- 2.) Run an additional 3 controls for 3,650 operations on a 1,800 VA, 50% P.F. load. Contact DTL for specific equipment recommendations.
- 3.) Measure plug blade dimensions per ANSI C136.10. All dimensions are critical to easy interchangeability.
- 4.) Check turn ON and turn OFF levels in photocontrol test box (available from DTL or other control manufacturers). Test at 105, 120 and 130 VAC for 120 volt controls. (Or at 210, 240 and 260 for 240 volt controls)
- 5.) If possible, test for length of time of contact chatter on control Turn OFF. It should be less than 50 milliseconds and ideally less than 5. This requires a digital storage oscilloscope.
- 6.) Drop 20 controls 3 feet to hard floor. Repeat #4 & #5.
- 7.) Age 20 or more controls outdoors and energized for 3-6 months. A load is not necessary. Make sure you get at least one month of a hot July or August. Repeat #4. Open controls and look for signs of rust or corrosion. Look for globe discoloration.
- 8.) Using a test similar to UL 773, subject a unit to an impact test. Drop a 2 inch steel ball 12" onto control at - 20°. Low impact housings will shatter, quality housings will not. This can be done at room temperature but test is not as severe.

* Do not neglect Section 7, the aging test. Cheap controls drift and fail prematurely; quality controls should last 10-15 years.

Incoming Inspection

The following tests should be performed on 1% to 5% of incoming photocontrols.

- 1.) Test turn ON and turn OFF levels in photocontrol test box.
- 2.) Confirm ON/OFF operation at 105 VAC. (Or at 210 if testing a 240 volt control).
- 3.) Do visual check to see that product is the same internally and externally as originally tested.