Total Protection Solutions

# APPLICATION ADVISORY 11-05

**APPLICATION**: Protection of Electronic Ballasts.

**SUMMARY**: At least one utility has gone on record with its concern that "..electronic ballast may normally be susceptible to transient voltage impulses.." and recommends that "..service entrance and sub-panel surge suppression should be considered to avoid ballast transient damage." [1]

**DISCUSSION**: While the cost of electronic ballasts today is very close to the cost of the standard iron core ballasts used in the past for fluorescent lighting, electronic ballasts are being installed in most new fluorescent installations as well as being retrofitted to growing numbers of older installations. There are two main reasons for this trend:

1. Energy Savings: lower power cost, resulting from reduced power consumption, has been the primary reason to switch from magnetic to electronic ballasts, and

2. Legislative Mandates: New state and federal regulations require that energy operating costs for lighting be reduced. Only electronic ballasts can meet the new code requirements for energy efficiency.

However, as with almost every up side, there is a downside.

Where the standard iron core ballast is a comparatively rugged induction device with a small capacitive element (L-C), most electronic ballasts incorporate an inexpensive switch mode power supply (SMPS) feeding integrated circuits (IC) supplying a small high frequency transformer. As such, they are much more vulnerable to power quality aberrations – especially transient voltage/current surges which, by degrading sensitive IC components, can ultimately lead to ballast failure.

Externally and internally generated transients can enter the lighting panel via the power feed to its bus, or internally from other, non-lighting, transient producing devices fed from other distribution panels or the lighting panel itself. In this regard, with many commercial and most industrial lighting panels operating on 3Ph-60Hz-277/480V, it is all too easy, even in new construction, for major transient generating 3Ph-60Hz-480V equipment – roof-top air conditioners, elevators, etc. – to send transients to other panels or to blast transients back down their own feeder circuits and onto the 277/480V lighting circuits. Also, lighting panels feeding parking lot lights, signs, or other outside lights or equipment are available avenues for lightning to enter the building.

The greater the affect of both lighting and non-lighting transient generating sources on power quality at the lighting panel bus, the more urgent it becomes to effectively protect electronic ballasts from the ravages of transient voltage/current surges.

**RECOMMENDATION**: At a minimum, install a hard-wired **Total Protection Solutions**[2] transient voltage surge suppressor (TVSS) on each lighting panel serving electronic ballasts. It is also strongly recommended that a suitable **Total Protection Solutions** unit be installed at the building service entrance on the main panelboard. This is particularly important in lightning intensive areas, in areas where surrounding facilities are heavy transient generators, and when situated near utility switching locations equipped for system power factor correction[3].

The service entrance suppressor takes the extremely high voltage and current of an externally generated surge wave (e.g. per IEEE C62.41-1991, the peak values for a Location Category C3 Combination Wave are 20,000V/10,000A) and reduces it down to a much lower level (e.g. in a large facility, a **ST300** or **ST400** on a 480V, 4500A Main Service Board would reduce a 20KVA impulse to close to 1KVA. Then, a **ST160** on the 480V distribution panel would reduce the 1KV impulse to under 300 volts.

The **LowProfile 120 or 80** unit at the lighting panel then acts as the final stage to further reduce the externally generated surge down to a virtually negligible level. Furthermore, the **LowProfile** unit has an optional **Enhanced Transient Filter (ETF)** which continuously works to clean up all of the internally generated ring wave transients that prematurely age bulbs and ballasts. The older magnetic ballasts were basically an autotransformer and any surges would pass right through the transformer to the bulbs. In many cases the bulbs were more susceptible to transients than the magnetic ballasts. Today, the electronic ballasts are much more susceptible to transients than the older magnetic ballasts, although bulb susceptibility to transients is reduced with use of electronic ballasts. Regardless of the type of lighting system, by giving all bulbs and ballasts clean, filtered power, bulb and ballast life are increased, bulb and ballast replacement is reduced, and the customer receives a quick payback on his investment. This **Total Protection System** approach is of greater benefit to electronic ballast longevity (and protecting other equipment in the building), than just installing a standard surge suppressor, with little or no effective transient filtering capability, on the lighting panel.

**Lighting Panels**

For electronic ballast installations, use the appropriate **Total Protection Solutions** unit. All **LowProfile ETF** models incorporate an Enhanced Tracking Filter, which provides maximum filtration and suppression in all common and normal modes. For recessed panels, units can be ordered with an optional flush mount cover plate.

a) For 3Ph-60Hz-277/480v panels install the Model **TK-LP120-3Y480-LF**
b) For 3Ph-60Hz-120/208V panels install the Model **TK-LP120-3Y208-LF**

One caution – if the facility has an energy management system, security system, emergency communications system, etc., which uses the power line sine wave as its signal carrier, do not order the **Enhanced Transient Filter** option. Some of these systems impress a signal, which can be suppressed/attenuated by these units. In such cases, install standard **LowProfile** units without the "F" suffix. Finally, for panels feeding outside parking lot lights or signs, consider using the stronger TK-ST160 units.

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[1] FPL Business Energy Expo 94 (07/21/94)

[2] Total Protection Solutions surge suppression is made by Joslyn in Richmond, Virginia

[3] IEEE Emerald Book (IEEE 1100-1999), Chapter 8.6