

# INDUSTRIAL MACHINERY AND SURGE PROTECTIVE DEVICES

## SURGE PROTECTION NOTE 5

BY JEREMY LIELAND,  
INDUSTRIAL SOLUTIONS  
ENGINEER

### INTRODUCTION

On August 4, 2016 the 2017 edition of the National Electrical Code® (NEC) was released. This edition of the code introduced a requirement for Surge Protective Devices (SPDs) in Industrial Machinery with safety interlock circuits. The requirement is in Article 670.6 and reads: “Industrial machinery with safety interlock circuits shall have surge protection installed.” This application note will examine the code requirements and definitions. It is intended to help engineers at machinery builders and the associated control panel builders understand the requirements and make recommendations to them in implementation.

### CODE DEFINITIONS

Article 670 defines industrial machinery as: “A power-driven machine (or a group of machines working together in a coordinated manner), not portable by hand while working, that is used to process material by cutting; forming; pressure; electrical, thermal, or optical techniques; lamination; or a combination of these processes. It can include associated equipment used to transfer material or tooling, including fixtures, to assemble/disassemble, to inspect or test, or to package. [The associated electrical equipment, including the logic controller(s) and associated software or logic together with the machine actuators and sensors, are considered as part of the industrial machine.]” This broad definition covers all types of machinery that one may encounter in the industrial environment.

In order to define safety interlock circuits, one needs to look at NFPA 79, the Electrical Standard for Industrial Machinery, since the NEC does not have a definition. Standard 79, Article 3.3.60 gives the following definition: “Interlock (for safeguarding). An arrangement that interconnects guard(s) or device(s) with the control system or all or part of the electrical energy distributed to the machine. Further, Article A9.2 gives some clarification on “safety related functions” as

### TERMS

- **SPD:** Surge Protective Device



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“emergency stopping, interlocking, temperature, or speed control, and so on.” In essence, safety interlock circuits can be anything from a simple e-stop switch or limit stop all the way to a complex system such as light curtains or gated access locations.

## RECOMMENDATIONS

As of this note’s publication, the 2017 NEC has been adopted by 10 states and is being considered for adoption by 21 more. To avoid issue of building different machinery for clients in different states, it is highly recommended to build all machines to 2017 code requirements. The simplest way to implement the requirement is to add a din-rail mounted surge protection device to each machine power panel. This will not only protect the safety interlock

circuits, but also will protect other components inside the equipment such as drives and motors and CNC or PLC systems. A device such as the Mersen STP series of products would be effective at meeting these requirements. A single device at each machine’s main disconnect would typically suffice. See figure 1.

In instances where the main power panel cannot accommodate additional din-rail mounted components, an enclosed Type 1 SPD could be used either mounted to the machine enclosure, or upstream at a power distribution panel or transformer. Panel mount devices such as the Mersen STXR or STXP series would be effective solutions in these instances. See Figure 2 below for location examples

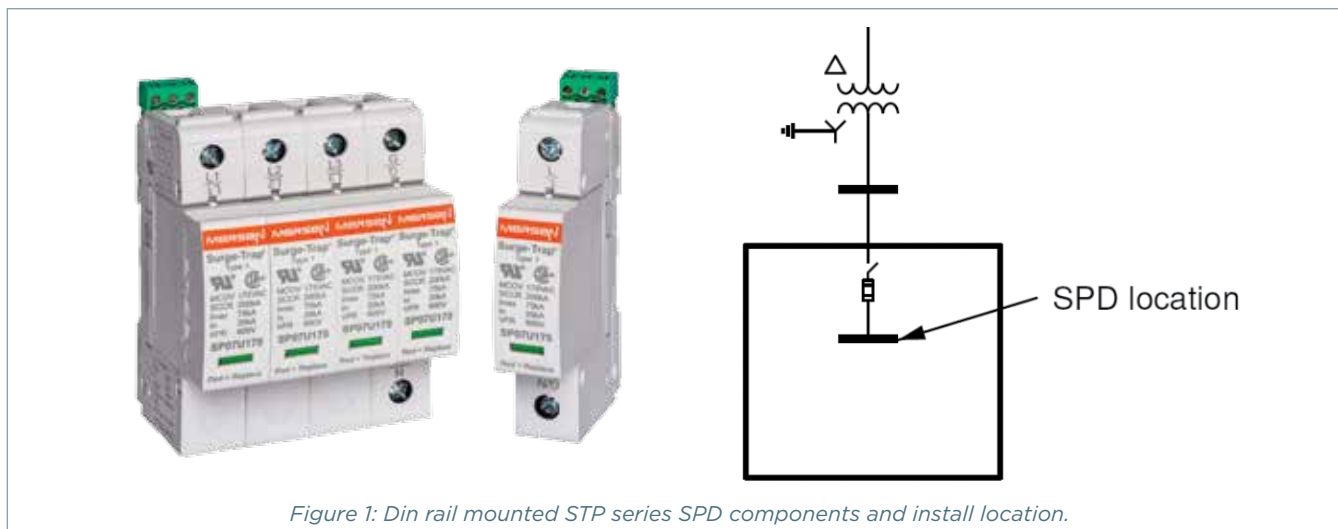


Figure 1: Din rail mounted STP series SPD components and install location.

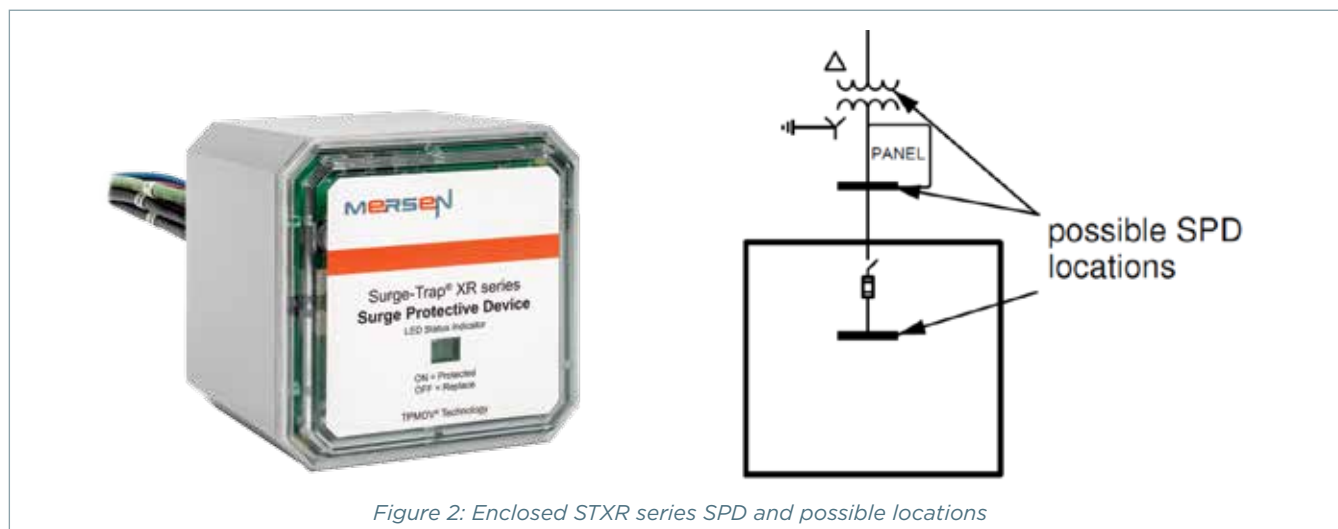


Figure 2: Enclosed STXR series SPD and possible locations

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There are certain cases of machinery in which consideration for multiple SPD locations should be given. Machinery that is constructed with multiple control and power panels distributed over a large area or material handling equipment with indoor and outdoor components are examples. One specific example would be a large gantry crane fed from an internal substation. Cascading surge protection in these instances would eliminate issues from stray surges induced in the machine power system. See Figure 3 for an example installation locations.

## REFERENCES

NFPA 70: National Electrical Code  
 NFPA 79: Electrical Standard for Industrial Machinery

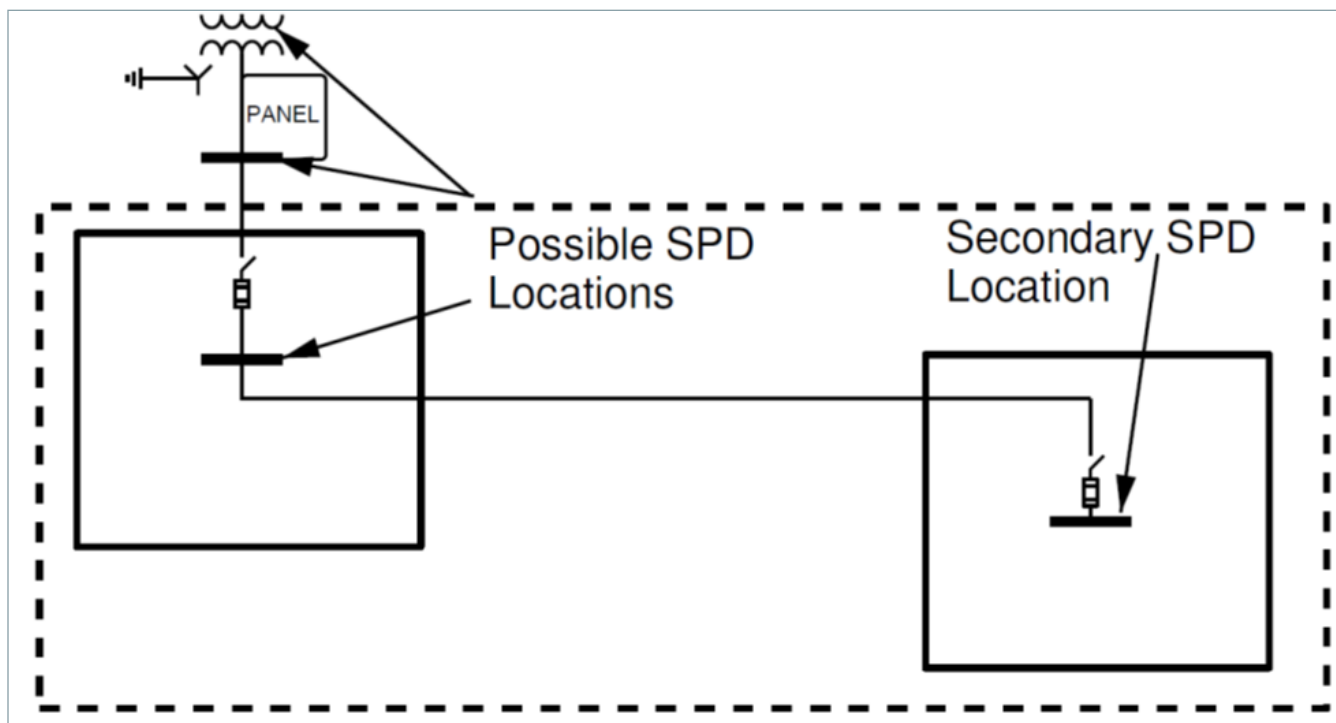


Figure 3: Cascaded protection within the machine

## CONTACT

## USA

374 Merrimac Street, Newburyport, MA 01950  
 T 978 462 6662 | F 978 462 0181  
 info.nby@mersen.com

## CANADA

6200 Kestrel Road, Mississauga, ON L5T 1Z1  
 T 905 795 0077 | F 905 795 2508  
 technicalservices.mis@mersen.com

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## ADDITIONAL RESOURCES

**Surge Protection Note 1:** Introduction to Specifying Surge Protection

**Surge Protection Note 2:** Surge-Trap® and the Different kA Ratings

These and other Tech Topics are available on [ep.Mersen.com](http://ep.Mersen.com).