STEEL CONDUIT

Protecting the Brains of the Operation from EMI

Steel Conduit provides the best protection for the wiring of sophisticated control systems.

DATA PROCESSOR RECEIVES A GRAPHIC LESSON IN SH

ASCO, a large data processing firm, recently learned that steel conduit provides excellent protection for the wiring of sophisticated control systems. It shields the control circuits from electromagnetic interference (EMI) from nearby power conductors that can induce current, causing them to operate improperly.

The company's new processing center was equipped with five Caterpillar 3416B, 2 MVA standby generators. All control and power conductors linking the generators with switchgear and control cabinets were installed in PVC conduit encased in a common concrete duct bank. The control wiring was in separate conduits located about 18" above the power conduits. Conduit runs were about 350 feet in length.

The individual generators were controlled by a Woodward DSLC, and utility paralleling was controlled by a Woodward MSLC. The Cat units had ECMPII electronic controls. The DSLC controls engine speed using a Pulse Width Modulated (PWM) signal, ± 3 volts, on-duration 70%. The

Steel Conduit. Get wired for the future.

IELDING CONTROL CIRCUITS FROM MAGNETIC FIELDS

signal travels from the DSLC to the engine on a single twisted-pair shielded conductor.

When the standby generators were first tested and commissioned, access was limited to a temporary load bank of 2 MW for just one week. That allowed time for individual, on-site, factory load testing, but not load testing with the units in parallel.

Five months later a permanent 3 MW load bank, data floor load banks and increased building load were in place, and load testing of the standby generators was done in parallel. Approaching a 60% load with two units on the bus, speed control problems with one or both units began to be experienced. A temporary fix was taken by grounding both ends of the speed signal conductor shield. Re-routing the speed signal conductors was suggested, but was never done.

When the data center was completed, the speed control issue was raised again. Testing showed the DSLC output signal was rock solid, but that the same signal at the engine had erratic voltage. Eventually it was found that the interference was caused by a magnetic field surrounding the power conductors.

The solution proved to be the installation of rigid steel conduit from ASCO's controls to each engine — a problem that could have been avoided by using steel conduit initially.

The company later encountered a similar problem at one of its Dallas data center sites, where control circuits had been placed in PVC conduit embedded in concrete. The problem, again, was solved by re-routing the control circuits in steel conduit.

"EMI is an issue that should be considered in planning new facilities where sophisticated electronic and mechanical equipment will be operated," says Dr. Sakis Meliopolis, who headed a project team at Georgia Tech which conducted extensive research on the subject over a three year period.

While some designers attempt to save their clients money by basing the selection of a wiring system only on initial cost, that approach fails to capitalize on steel conduit's significant long-term advantages, one of which is not having to retrofit to provide EMI shielding. Such a retrofit can more than make up for any initial cost advantage of other types of conduit.

Dr. Meliopolis' research indicates that steel conduit is the most effective raceway, by a wide margin, in reducing electromagnetic field (EMF) levels from encased power distribution circuits. According

to the study, steel conduit can reduce EMF at 60 Hz power frequency levels by as much as 95%. It showed that aluminum conduit reduced EMF by just 10%, and that non-metallic conduit was ineffective in reducing field levels.

Steel conduit also offers a number of other proven benefits, including: the best physical protection possible, the quickest and most efficient changeover or upgrading of electrical circuits, non-combustibility which inhibits the spread of fires, superior grounding capabilities and recyclability.

The Steel Tube Institute

The Steel Tube Institute was founded in 1930 and sponsors cooperative member efforts to improve manufacturing techniques for conduit and other tubular steel products and informs customers and fabricators about these products' utility and versatility. It is headquartered in Coral Gables, Florida.

What Is Steel Conduit?

Steel conduit protects electrical conductors against mechanical and electrical damage, and provides excellent grounding for electrical equipment. It also protects against electromagnetic fields (EMF) that could hurt the performance of nearby computers and other electronic equipment. There are three basic types: Rigid Steel Conduit (GRC); Intermediate Metal Conduit (IMC); and Electrical Metallic Tubing (EMT).

Free GEMI Analysis Software Available

The Georgia Tech study that confirms the EMI shielding advantages of steel conduit is incorporated in the Grounding and ElectroMagnetic Interference (GEMI) analysis software, available free from the Steel Tube Institute. The GEMI CD helps you accurately calculate the electromagnetic field density of a network design for conduit-enclosed circuits. It also helps you confirm that your system design complies with the equipment grounding requirements of the NEC.

For your free GEMI CD, contact the STI. Log onto www.steelconduit.org and download it at no cost.

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