Fermilab
ES&H Section

January 20, 1999

TO: George Robertson

FROM: Bill Griffing

SUBJECT: ES&H Manual Chapter 5043

Enclosed please find ES&H Manual Chapter 5043 – Management and Use of Cable Tray Systems. This chapter was recently reviewed by the Electrical Safety Subcommittee and is approved "as is", with the exception of one minor editorial change. This included changing the word "whatever" to "any" in the "Requirements and Recommendations" section, paragraph 1. The date of the chapter was also changed to reflect the review by the subcommittee.

After final approval, please send to Monica at MS119 for distribution.

Encl.

Approved:

George Robertson — Date 1/21/99

John Peoples — Date 1/27/99

cc: R. Coll

MANAGEMENT AND USE OF CABLE TRAY SYSTEMS

INTRODUCTION

This chapter describes general installation requirements and uses permitted for various types of cable tray systems for electrical conductors not generally covered by Article 318 of the National Electrical Code (NFPA 70). Hazards associated with the use of cable tray include overloading which may lead to mechanical failure and overheating which may lead to insulation failure and the possibility of fire.

This chapter does not apply to mechanical tray systems used to support piping, tubing, or other non-electrical loadings.

DEFINITIONS

Cable Tray - a mechanical support system used to provide cable routing and protection for electrical cables.

Power Cable Tray - a cable tray containing DC cables supplying magnet loads and/or AC cables for utilization equipment.

Premises Wiring Cable Tray - a cable tray containing conductors associated with the premises wiring system.

Signal - a voltage or current of low energy associated with equipment or process monitor and control. Such signals are typically associated with, but not limited to, accelerator and experimental control and data acquisition systems and their connective networks. This definition must not be confused with the NEC definition for a signaling circuit which refers to alarm (fire alarm) or security (burglar alarm) systems or with controllers that deliver electric power to equipment such as motors.

Utility Cable Tray - a cable tray containing signal (as defined above) cables .

Definitions of other applicable terms of AC Electrical Power Distribution System, Electrical Utilization Equipment, Point of Outlet, and Premises Wiring are found in Fermilab ES&H Manual Chapter 5042.

REQUIREMENTS AND RECOMENDATIONS

1. The following requirements and recommendations relate to all installations and uses of cable trays, of any type.

   a. Cable tray systems shall be grounded.

   b. Cable tray systems shall be engineered and properly installed so as to preclude mechanical failure under anticipated load conditions.

   c. Cable tray systems shall present a minimum of sharp edges to installed cables.

   d. Caution must be exercised when adding cables or other services to existing trays to insure that installed cables are not crushed, abraded, or otherwise damaged.

   e. Mechanical fastening of cables to the cable tray structure or to other cables in the cable tray system should be minimized. Excessive fastening unnecessarily constrains the addition or removal of cables at future times. It is recognized, however, that mechanical fastening of certain cable installations is necessary to limit movements associated with electromagnetic forces.

   f. It is strongly recommended that all unused cables be removed from existing cable tray systems. It is recognized, however, that such removal may be precluded if existing operational cables would be adversely affected by the removal process.

   g. Cable trays should not be utilized for storage of excessive lengths of installed cables. Cables should be dressed to suitable lengths upon installation.

   h. It is recognized that in many locations, due to limited space, the cable tray system offers the best means of bringing services to support experimental devices. In all cases, neither the mechanical loading nor the ventilating capability of the installed cable tray system shall be significantly compromised by addition of such services.

   i. Flammable gas lines are generally not permitted to be located in cable trays. Refer to Fermilab ES&H Manual Chapter 6020.3 for specific details relative to flammable gas line installation and routing.

   j. Utilization equipment shall not be located in cable tray.

2. The following requirements and recommendations relate to installations and uses of specific types of cable trays, as previously defined.

   a. For instances of where premise wiring is to be installed in a cable tray, such wiring shall be installed in accordance with the National Electrical Code. For those cases where premise wiring is installed in existing cable trays, it is suggested that the wiring be removed or be segregated through the use of tray dividers. The fill factor should be adjusted to meet the requirements of the National Electrical Code.

   b. For installations of cable into a power cable tray, the responsible engineer shall consider the cable for thermal, and electrical properties in consideration of the specific installation and the cable tray for structural integrity. All installations should reference the NEC guidelines for cable tray fill.

   c. For installations of cable into a utility cable tray, the responsible engineer shall take into account the structural load capability of the cable tray system and the durability of the existing cables. 100% cable fill of the tray is permitted. The nature of signal circuits is such that the energy carried by the cables is relatively low. Accordingly, the resultant losses in signal cables are of a sufficiently low level that heat dissipation is not a problem.

   d. While subject to the general requirements of this chapter, non-flammable gas lines which are neatly bundled and secured may be installed in utility cable tray or attached to the utility cable tray supports (not attached to the tray itself).

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