Electrical Cabling Material Issues

Each UPS module is wired to a collection of wallmounted circuit breaker panels in the computer room. Each panel typically feeds an electrical distribution box under the raised floor. From these circuit breaker panels and distribution boxes, various wiring methods and materials have been used.

A mixture of wiring materials is used to extend branch circuits to and from these under floor electrical boxes. TECK90 flexible liquid tight conduits are mingled with BX connectors and appliance cords that are known by the trade name of “cabtire” and provide no protection from damage. Rule 12-020 (2) of the CEC specifies what type of branch circuit materials are allowed under raised floors in a computer room environment:

The preferred method is to run branch circuit conductors and ground wires directly from the circuit breaker panel to the receptacle in a continuous manner, without using any splices or consolidation points.

“Cabtire” cables are disallowed under a raised floor in the event that a floor tile gets dropped onto the cable which could easily penetrate the rubber sheathing of the cable to cause a short or a life threatening situation. TECK90 flexible conduit should be terminated with Starteck adapters.

There is a wide variety of wiring methods used in the computer room – some that are contrary to the Canadian Electrical Code. The City should standardize on one method. This should either be liquid-tight flexible conduit with FSA adapters, or TECK90 cable with StarTeck adapters. “Cabtire” cable is not allowed under a raised floor by the Canadian Electrical Code (Rule 12-020).

Unused Cabling Issues

There were several instances of abandoned electrical wires left under the raised floor. It was unlikely that these wires were intended for re-use since they had been completely disconnected from the electrical panel and left scattered under the raised floor. This practice adds to the number of obstructions that block airflow under the raised floor. Abandoned cables also increase the amount of unnecessary “fire load” under the floor.

These cables should be removed, connections properly terminated and the under-floor space cleaned using HEPA/ULPA equipment.

Electrical Branch Circuit Labeling Issues

At the receptacle end, the electrical branch circuit labelling was a mix of permanent marker labels and label maker labels stuck on the receptacle boxes. At the electrical panels, some labels were done with a label maker and stuck onto the panels or onto a sheet taped to the door. The information on the sheets was mostly up to date, but there was no indication of the currency of the information.
Some circuits have been discontinued but the breakers have not been turned off or removed to reflect the changes.

Branch circuit labelling should be consistently administered at each site. Receptacles should be labelled at their faceplates with a mechanically created label. Up to date panel schedules should be kept inside each circuit breaker panel.

Electrical Receptacle Issues

There are many instances of residential NEMA 5-15R “straight-blade” receptacles installed under the raised floor and on the raised floor through holes cut in the floor tiles. These types of receptacles are disallowed by Rule 12-020-1(b). Diagram 2 of the electrical code specifically lists “twistlock” receptacles.

The proper method for implementing residential receptacles in a raised floor environment is to provide a box with a hinged lid to house the NEMA 5-515R receptacles in. The receptacles are accessible from above the raised floor, but not from below the floor.

NEMA 5-15R “straight-blade” receptacles and power bars have been installed under the floor in the 510 Main St. computer rooms. This is not allowed by the Canadian Electrical Code (Rule 12-

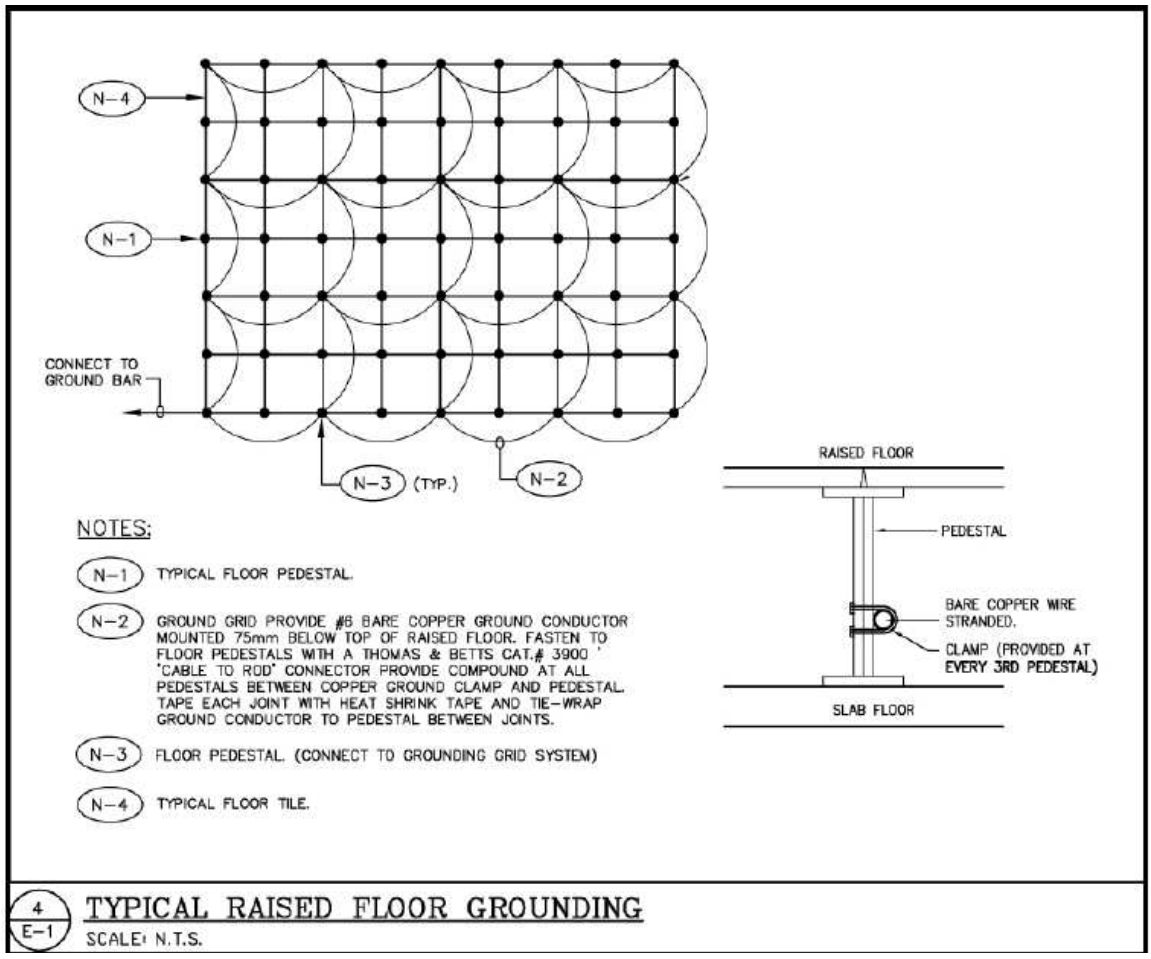
020). Where the use of these types of receptacles is unavoidable, they should be installed above the raised floor or in a recessed floor box to satisfy the CEC.

Raised Floor Grounding Issues

The raised access floor has not been adequately bonded to ground, as required by the Canadian Electrical Code (CEC). The code states that “every fourth pedestal” shall be bonded to ground. The purpose of this grounding system is to protect personnel from electric shock in the event the raised floor panels were to become electrically energized due to a power fault. Its secondary purpose is to allow static charges and high-frequency noise to bleed safely away from the processing equipment. The use of a bolted metal stringer under-structure for the raised floor helps to preserve the intent of this code requirement.

The City should also follow IEEE-1100 grounding guidelines and ensure to bond all electrical panels, air conditioning units and equipment racks to the raised floor ground grid in both locations as well.

The requirement of “every 4th pedestal” is open to some interpretation. A typical raised floor grounding diagram is shown below for illustration purposes. This method of grounding fully satisfies the “every 4th pedestal” requirement of the CEC. Using this pattern of grounding, no single floor panel will be without a pedestal bonded to ground at one corner. Translation: Every 4th pedestal should translate into 25% of all pedestals (i.e. ¼ of all pedestals are bonded to ground).



Raised Floor Exposed Core and Stringer Issues

The raised access flooring tiles used in this computer room are of a wood-core construction enclosed in an electroplated steel pan. The tiles are installed over a bolted stringer substructure to provide a finished raised floor height of 12 1/2-inches above a concrete sub-floor. Some stringer caps were missing from their proper place on top of the stringers. These caps help to seat and position the tile properly, reduce noise by preventing the metal tiles from contacting the metal stringers, and to assist with bleeding static charges and high-frequency electrical noise away from the equipment racks.

Several areas of the raised floor were inspected where cables penetrate the tiles to feed racks or computer equipment. There are many instances where the tile cuts have not been treated with a fire retardant grommet to protect the cables from the sharp edges of the steel tile. This is a violation of the National Fire Protection Association (NFPA) fire codes (see NFPA 75 – Standard for the Protection of Electronic / Data Processing Equipment).

There are several cable cutouts that have been improperly created. These cuts have not been dressed with a fire-retardant grommet to protect the cables and maintain the noncombustible rating of the floor.

Raised Floor Air Leakage Issues

There are several cable cutouts that have been improperly created. The amount of air leakage from these openings is significant. The City should begin managing these floor penetrations in order to provide the required cable protection and address the air leakages.

There are several products and techniques available to address the air loss issue. When selecting from these possibilities they should be viewed in light of the requirement to properly dress the cut edges of the tiles to meet NFPA 75 requirements.