

## **PPI STATEMENT AC**

### **Operating 90 °C and 105 °C Rated Cables with HDPE Conduit**

December 1, 2023

The use of HDPE conduit as protective pathways for installation of various types of commercial and utility grade electrical cables has been an established practice for many years with a proven track record. The National Electrical Code allows the use of HDPE conduit with 90 °C (194 °F) and 105 °C (221 °F) rated cables when operated at temperatures of 90 °C (194 °F) or less.

US National Electrical Code (NEC, NFPA 70) Articles 353 High Density Polyethylene Conduit (HDPE Conduit) and 354 Nonmetallic Underground Conduit with Conductors (NUCC) are applicable. Each outline application and installation parameters for HDPE conduit as pathways for sub-surface electrical cables.

Article 353 allows for HDPE conduits to be direct buried or installed above ground where encased in not less than 50 mm (2 inches) of concrete. An electrical cable, or cables, would then be field installed following the conduit installation. Article 354 is for HDPE conduit with factory installed cables, commonly referred to CIC (Cable in Conduit), for installation via direct burial or concrete encasement.

Regarding operating temperatures, as stated in NEC 353.10 (6), “conductors or cables rated at a temperature higher than the listed temperature of the HDPE shall be permitted to be installed in the HDPE conduit, provided the conductors or cables are not operated at a temperature higher than the listed temperature rating of the HDPE conduit.”

Per NEC, Annex A, Table A.1(a)<sup>i</sup>, the HDPE products meeting NEC Articles 353 and 354 are UL 651A and UL 1990:

- [UL 651A, Standard for Safety: High Density Polyethylene \(HDPE\) Conduit](#) is a specification for conduit that is field installed prior to pulling or jetting the cables into the conduit.
- [UL 1990 Standard for Safety: Nonmetallic Underground HDPE Conduit with Conductors](#) is a specification for Cable in Conduit (CIC), where the cables are pre-installed within the conduit at the factory.

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<sup>i</sup> National Electrical Code, NFPA-70 – 2023, Appendix A, Table A.1(a) Product Safety Standards for Conductors and Equipment That Have and Associated Listing Requirement.

UL 651A clearly states that HDPE conduit is suitable for use with cables rated at 90 °C (194 °F), provided the ambient temperature does not exceed 50 °C (122 °F). The implication of NEC 353.10 (above) is that 105 °C (222 °F) rated cable is permitted with HDPE conduit if it is operated at temperatures of 90 °C (122 °F) and below.

Sub-surface direct burial or concrete encasement would have average ambient temperatures well below 50 °C (122 °F), except for rare situations or special locations, such as steam tunnels, geothermal fields, inadequate conduit bank spacing, etc. In these unusual circumstances, thermal analysis should be conducted. An extensive history of HDPE conduit being used for protecting electrical cables confirms the cited NEC articles.

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