(1) Under engineering supervision in industrial installations where conditions of maintenance and supervision ensure that only qualified persons monitor and service the system.
(2) In hazardous (classified) locations where specifically permitted by other articles in this *Code*.

337.12 Uses Not Permitted. Type P cable shall not be installed or used:

(1) Where it will be exposed to physical damage
(2) Where not specifically permitted by other articles in the *Code*

337.24 Bending Radius. The minimum bending radii during installations and handling in service shall be adequate to prevent damage to the cable.

337.30 Securing and Supporting. Type P cable shall be supported and secured by cable ties listed and identified for securement and support; straps, hangers, or similar fittings; or other approved means designed and installed so as not to damage the cable.

337.31 Single Conductors. Where single-conductor cables are used, the installation shall comply with 300.20.

337.80 Ampacity. The ampacity of Type P cable shall be determined in accordance with 310.14(A) or (B) for 14 AWG and larger conductors. For 18 AWG and 16 AWG conductors, the ampacities shall be determined in accordance with Table 402.5 or 310.14(B). When installed in cable tray, the ampacities shall be permitted to be determined in accordance with 392.80. The installation shall not exceed the temperature ratings of terminations and equipment.

Part III. Construction Specifications

337.104 Conductors. Conductors shall be of tinned copper. Conductors shall employ flexible stranding. The minimum conductor size shall be 18 AWG.

337.108 Equipment Grounding Conductor. An equipment grounding conductor complying with 250.122 shall be provided within multiconductor Type P cable.

337.112 Insulation. Insulated conductors shall be a thermoset type identified for use in Type P cable. All conductors shall be suitable for wet locations. The minimum wall thickness shall be 0.76 mm (30 mils).

337.114 Shield. Metallic shield(s) shall be permitted over a single conductor or groups of conductors.

337.115 Jacket. Multiconductor cables shall have an overall nonmetallic jacket that is impervious to moisture, corrosion resistant, and sunlight resistant. When installed external to an enclosure or industrial machinery, single conductor cables shall have an overall nonmetallic jacket that is impervious to moisture, corrosion resistant, and sunlight resistant. Single conductor cables rated 2000 volts with conductor sizes equal to or larger than 4/0 AWG shall be permitted to use an increased insulation thickness in lieu of using a separate cable jacket. When the increased insulation thickness is used, the insulation material shall be sunlight resistant.

337.116 Armor. Armor shall be permitted over the jacket. If provided, the armor or metallic covering shall be a braided basket weave type consisting of wire laid closely together, flat and parallel, and forming a basket weave that shall firmly grip the cable. The wire shall be commercial bronze, tinned copper, stainless steel, or aluminum. The armor shall not be used as a current-carrying conductor or as an equipment grounding conductor. A nonmetallic jacket that conforms to 337.115 shall be provided over the armor.

337.120 Marking. Type P cable shall be marked in accordance with 310.8. When an armor is provided, the cable shall be marked accordingly.

ARTICLE 338 Service-Entrance Cable: Types SE and USE

Part I. General

338.1 Scope. This article covers the use, installation, and construction specifications of service-entrance cable.

According to the UL *Guide Information for Electrical Equipment*, category TYLZ cable (service-entrance cable rated 600 volts) is listed in sizes 14 AWG and larger for copper and 12 AWG and larger for aluminum or copper-clad aluminum. Type SE cable contains Types RHW, RHW-2, XHHW, XHHW-2, THWN, and THWN-2 conductors. Type USE cable contains conductors with insulation equivalent to RHW or XHHW. Type USE-2 contains insulation equivalent to RHW-2 or XHHW-2 and is rated 90°C, wet or dry.

The type designation of the conductors may be marked on the cable surface. If used, the marking indicates the temperature rating for the cable corresponding to the temperature rating of the conductors. If this marking does not appear, the temperature rating of the cable is 75°C. The cables are designated as Type SE, Type USE or USE-2, and submersible water pump cable.

Type SE — Cable suitable for aboveground installations. Both the insulated conductors and the outer jacket are suitable for use where exposed to sunlight.

Type USE or USE-2 — Cable suitable for underground installations, including direct burial. Although both the conductor insulation and the outer covering are suitable for use where exposed to sunlight, the cables are not suitable inside the premises or aboveground other than to terminate at service or metering equipment.

Submersible water pump cable — A multiconductor cable containing two, three, or four single-conductor, Type USE or USE-2 cables in a flat or twisted assembly. The cable is tag-marked "For use within the well casing for wiring deep-well water pumps where the cable is not subject to repetitive handling caused by frequent servicing of the pump units."

338.6 Listing Requirements. Type SE and USE cables and associated fittings shall be listed.

Part II. Installation

338.10 Uses Permitted.

(A) Service-Entrance Conductors. Service-entrance cable shall be permitted to be used as service-entrance conductors and shall be installed in accordance with 230.6, 230.7, and Parts II, III, and IV of Article 230.

(B) Branch Circuits or Feeders.

(1) Grounded Conductor Insulated. Type SE service-entrance cables shall be permitted in wiring systems where all of the circuit conductors of the cable are of the thermoset or thermoplastic type.

Branch circuits using Type SE cable as a wiring method are permitted only if all circuit conductors within the cable are insulated. The equipment grounding conductor (EGC) is the only conductor permitted to be bare or covered within Type SE cable used for branch circuits.

(2) Use of Uninsulated Conductor. Type SE service-entrance cable shall be permitted for use where the insulated conductors are used for circuit wiring and the uninsulated conductor is used only for equipment grounding purposes.

Exception: In existing installations, uninsulated conductors shall be permitted as a grounded conductor in accordance with 250.32 and 250.140, where the uninsulated grounded conductor of the cable originates in service equipment, and with 225.30 through 225.40.

Service-entrance cable containing a bare grounded (neutral) conductor is not permitted for new installations where it is used as a branch circuit to supply appliances such as ranges, wall-mounted ovens, counter-mounted cooking units, or clothes dryers. The exception permits a bare neutral service-entrance cable for existing installations only.

(3) Temperature Limitations. Type SE service-entrance cable used to supply appliances shall not be subject to conductor temperatures in excess of the temperature specified for the type of insulation involved.

Δ **(4) Installation Methods for Branch Circuits and Feeders.**

(a) *Interior Installations.* Interior installations shall comply with the following:

(1) In addition to the provisions of this article, Type SE service-entrance cable used for interior wiring shall comply with the installation requirements of Part II of Article 334, excluding 334.80.

(2) Where more than two Type SE cables containing two or more current-carrying conductors in each cable are installed in contact with thermal insulation, caulk, or sealing foam without maintaining spacing between cables, the ampacity of each conductor shall be adjusted in accordance with Table 310.15(C)(1).

(3) For Type SE cable with ungrounded conductor sizes 10 AWG and smaller, where installed in contact with thermal insulation, the ampacity shall be in accordance with 60°C (140°F) conductor temperature rating. The maximum conductor temperature rating shall be permitted to be used for ampacity adjustment and correction purposes, if the final ampacity does not exceed that for a 60°C (140°F) rated conductor.

Type SE cable is used for a variety of interior circuits, including ranges, clothes dryers, heating, and air-conditioning equipment and as feeders to supply panelboards that are not the service equipment.

While all conductors in nonmetallic-sheathed cable are required to have an insulation temperature rating of 90°C, 334.80 limits the operating (calculated load) ampacity to those contained in the 60°C column of Table 310.16. This limitation applies to all uses of NM cable. In contrast to this restriction, Type SE cable is limited to operating at a 60°C ampacity only if the ungrounded conductor sizes are 10 AWG and smaller and it is installed in thermal insulation. Type SE cable is permitted to have conductors with either 75°C or 90°C insulation. If the cable surface does not have a temperature marking, the conductors have a 75°C insulation temperature rating, and ampacity adjustment or correction is based on that rating. If the cable is marked with a conductor insulation temperature rating, ampacity adjustment or correction of the conductor can be made based on the conductor temperature marked on the cable.

Where Type SE cable with ungrounded conductor sizes 10 AWG and smaller is installed in thermal insulation, the adjusted and/or corrected operating ampacity of the conductors cannot exceed those contained in the 60°C column of Table 310.16. If the cable is not installed in thermal insulation, the limiting factor on conductor ampacity is the requirement, as stated in 110.14(C), for coordinating the operating ampacity of the conductor with the terminal temperature ratings of the electrical equipment.

(b) *Exterior Installations.* Exterior installations shall comply with the following: