Cec table 310.16

There are many factors involved in the sizing of drivers. Specifications for driver sizes are not only in one section or even one article of the National Electrical Code (NEC). Although the maximum permissible ampacity for conductors is given in Table 310.15(B) (16) (formerly Table 310.16), other provisions must be considered. Item 110.14(C) must be accepted when sizing drivers. In accordance with paragraph 110.14(C), the temperature power associated with the ampacity of the driver shall be selected and coordinated so that the lowest temperature classification of any connected end, driver or device is not exceeded. The determination of the closure provisions is based on 110.14(C)(1)(a) or (C)(1)(b). Item 110.14(C) (1) (a) includes circuits with rated 100 amps (A) or less or marked for conductors of 14 AWG to 1 AWG. Item 110.14(a) shall be replaced by the following: Last month's column covered the first three of the four provisions for circuits rated 100A or less or marked for 14 AWG to 1 AWG conductors. This month's debate continues. Circuits with a nominal 100A or less The fourth clause in 110.14(C) (1) (a) refers to engines marked with the letters B, C or D. Conductors with an insulating capacity of 75 °C (167 °F) or higher may be installed provided that the ampacity of such conductors does not exceed 75 °C (167 °F) ampacity. Table 310.15(B) (16) shows the temperature ratings of conductors are 60 °C, 75 °C and 90 °C. This means that the ampacity of the 75°C conductor can be based on a column of 75 °C if it supplies energy to an engine marked with the design letter B, C or D. For example, THHN conductors will have 75°C terminals at one end and an engine marked with the design letter D at the other end. Once the applicable requirements of Article 430 have been met, the conductors supplying energy to this engine shall have at least 55 amps (A). What is the minimum size of THHN conductors needed to power this engine? The permissible ampacity of the THHN driver with 8 AWG (in column 90°C) is 55A. Although conductors with a temperature control of 90 °C may be installed, the ampacity must not exceed an ampoule of 75 °C. The ampacity of the wire 8 AWG in the 75 °C column is 50A. As this engine requires a minimum ampacity of 55A, the installation of 8 AWG conductors is not allowed. The permissible ampacity of the wire 6 AWG in the 75 °C column is 65A. The conductors supplying this engine must have at least 6 AWG (see Figure 1). Circuits with a rated power exceeding 100A There are two reserves for circuits with a rated power greater than 100A or marked for conductors greater than 1 AWG. The choice of driver must be based on one of the two provisions. The first provision requires the use of a driver with a rated 75 °C. Although there is a limited number of with a temperature rating of 75 °C, there are certainly more conductors with a rated output of 75 °C than conductors rated at 60 °C. See Table 310.15(B) (16) and Table 310.104(A) for maximum operating temperatures of conductors rated 600 volts (V). For example, THWN conductors (greater than 1 AWG) will power a circuit with a rated more than 100A. The wires will have 75°C ends at both ends. Ampacity may be based on a column of 75 °C because the conductors are greater than 1 AWG and the circuit it supplies is rated at more than 100A (see Figure 2). In accordance with the second provision in 110.14(C)(1)(b), it is permitted to use a conductor with a higher temperature rating, provided that the ampacity of such conductors is determined on the basis of the ampacity of 75 °C of the driver used. For example, what is the maximum ampacity for 1/0 AWG THHN copper conductor powered by a 150A breaker? Assume an ambient temperature of 30 °C and not more than three conductors carrying current on the track. The wires will have 75°C at one end, but the temperature assessment of the endings at the other end is unknown. To comply with 110.14(C)(1)(b)(2), do not exceed 75 °C ampacity for this conductor. Although the temperature rating at one end is unknown, the ampacity of this 90°C conductor may be based on a column of 75 °C because the conductors are greater than 1 AWG and the circuit it supplies is rated at more than 100A. This 1/0 AWG THHN copper conductor has a maximum ampacity of 150A (see Figure 3). The clause in 110.14 (C) (1) (b) also states that if conductors with a higher temperature rating are installed and the equipment is indicated and identified for use with such conductors, ampacity may be based on higher temperature ratings. This means that the ampacity of a 90 °C wire can be based on a column of 90 °C if all the terminals are dimensioned to at least 90 °C. Looking at whether the device (panel board, switchboard, disconnection, etc.) is indicated and identified for use with conductors of 90 °C, see the list and marking of the device, not only the markings on the eye. Quite often, the eye that is installed on the device will have a temperature rating of 90 °C. The designation AL9CU or CU9AL on the eye indicates that the eye is indicated for copper and aluminium conductors. The number 9 indicates that the eye has a driver temperature of 90 °C. The designation AL7CU or CU7AL on the eye indicates that the eye is indicated for copper and aluminium conductors. Number 7 indicates that the eye has a driver temperature of 75 °C. If the device is not indicated and identified for use with conductors of 90 °C, the driver's ampacity shall not exceed an amputee of 75 °C for this size conductor. For example, the meshes at the top of the panel plate are labeled AL9CU, but the label inside the panel board indicates that the clamps are approved for wires with an angle of 60 °C and 75 °C. As the list states that the panel board is 60°C and 75°C for use with conductors, ampacity the power supply wires to this panel board must not exceed 75 °C (see Figure 4). If the conditions of use require the correcting and/or adjustment of the maximum ampacity of the driver, the last sentence of 110.14(C) is very useful. Conductors with a temperature rating higher than specified for termination may be used for ampacity adjustment, correction or both. Conditions of use include adjusting factors for more than three current-carrying conductors on the track or cable and ambient temperature correction factors. Correction and correction factors will be discussed later in this series on the size of drivers. Next month's column will continue to discuss the size of drivers. MILLER, owner of Lighthouse Educational Services, teaches classes and seminars on the electrical industry. He is the author of the Illustrated Guide to the National Electrical Code and the Electrician Exam Prep Manual. It can be reached at 615.333.3336, charles@charlesRmiller.com and www.charlesRmiller.com. Section 110.14(C) requires the use of a column of 60 °C per 100A or less and columns of 75 °C for more than 100A to resize the driver. What is the THHN value with a rating of 90°C if ampacity cannot be used to dimension the conductors?Q. Section 110.14(C) requires the use of a column of 60 °C per 100A or less and columns of 75 °C for more than 100A for driver sizing. What is the 90°C THHN value if ampacity cannot be used to dimension the driver? A. The advantage of 90°C driver insulation occurs only when the driver's ampacity has to be adjusted due to coupled conduction or elevated ambient temperatures according to 310.15. When adjusting the ampacity of the conductor, the ampacity is based on the temperature isolation of the conductor shown in Table 310.16, not on the terminal temperature assessment [110.14(C)]. For example: What is the adjusted ampacity of the nine current transmitted by 12 AWG THHN conductors on the track? According to Table 310.16, ampacity is 12 AWG THHN 30A adjustment factor (Table 310.15(B)(2)(a)] = 0,70 Adjusted ampacity = 30A x 0,70 = 21A Therefore, this conductor is still suitable for use on circuit 20A. Sign up for EC&M eNewsletters Choosing the right driver size includes referring to more than one section and more than one chapter in the National Electrotechnical Code (NEC). The following questions must be answered before selecting drivers. What is the lowest temperature rating of any connected end, driver or device? What is the associated load or what is the calculated load in accordance with Article 220? Is the load or any part of the load a continuous load? What will be the maximum ambient temperature? How many jet wires will be on the track or cable? Table 310.15(B) (16) contains maximum permissible ampacity of isolated conductors rated up to and including 2000 volts (V). (Before the code was issued in 2011, this table was Table 310.16). Table 310.15(B)(16) contains columns for and aluminium wires. Ampacities for copper aluminium conductors are in the same columns as aluminium wires. Each of the two types of conductors is divided into three categories: 60 °C, 75 °C and 90 °C. Driver sizes range from 18 AWG to 2000 kcmil. Equivalent data for single insulated conductors are given in Table 310.15(B) (17) (formerly Table 310.17). The ampacities in Table 310.15(B) (16) are based on no more than three conductors transmitted by current on the track, cable or soil (directly buried). Ampacitys are also based on an ambient temperature of 30 °C. Ampacities vary depending on both the type of driver and the insulation properties (see Figure 1). Copper conductors of the same size have three different permissible ampacities. The same applies to aluminum (and copper-clad aluminum) conductors. The maximum allowable ampacities depends on the driver's temperature. For example, a 3 AWG copper conductor with a temperature of 60 °C has a maximum allowable amputee of 85 amperes (A). The maximum permissible ampacity of the same 3 AWG copper wire at 75 °C is 100A. If the copper wire temperature output is 3 AWG 90 °C, the permissible ampacity is 115A (see Figure 2). Table 310.104(A) contains information on drivers rated 600V. Before the code was issued in 2011, the following table was Table 310.13(A). The driver information in this table includes trade name, type letter, maximum operating temperature, application provisions, insulation, insulation thickness and outer cover (if any). The use of the conductor and the insulation of conductors rated as 600V are in Tables 310.13(B) to (E). Type THHN construction wire is a common conductor used throughout the construction industry. This conductor shall have a maximum operating temperature of 90 °C. Only because the wire has insulation at 90 °C, ampacity is not automatically selected from the 90°C column. Instead, the appropriate column for selecting the driver's ampacity depends on the temperature rating of the end points (or connection). In accordance with point 110.14(a) of the Annex to Regulation (EC) No 1782/2003, the member states shall ensure that the following conditions are met The determination of the closure provisions is based on 110.14(C)(1)(a) or (C)(1)(b). While 110.14(C) (1) (a) includes circuits rated 100A or less or marked for 14 AWG to 1 AWG conductors, 110.14(C)(1)(b) includes circuits rated above 100A or marked for conductors greater than 1 AWG. Unless otherwise specified and marked otherwise, the driver ampacities used in determining the provisions for the termination of the device shall be based on Table 310.15 (B) (16), suitably amended in 310.15(B) (7). The driver shall have at least two ends or terminations. Each termination has a temperature rating. If at least one rating is not known, use the default ratings in 110.14(C) (1) (a) or (C) (1) b). The driver's temperature limits can be compared to the chain strength. The string is only as strong as its weakest link. For example, a driver with 90 °C has a 60°C termination at one end and a 75°C end at the other. The weakest link in this example is termination at 60 °C (see Figure 3). Circuits with a rated power of 100A or less There are four provisions for circuits with a rated output of 100A or less or marked for conductors of 14 AWG to 1 AWG. The choice of driver must be based on one of the following four provisions. The first provision instructs us to use a driver with a rated 60 °C. The maximum ampacity for a conductor of 60 °C is given in column 60 °C in Table 310.15(B) (16). The first provision is very limited because the only conductors with a temperature of 60 °C are types TW and UF. The type of electrical installation of machine tools (MTW) in a wet place is also 60 °C. In accordance with the second provision in 110.14 (C) (1) (a), it is permitted to use a conductor with a higher temperature classification, provided that the ampacity of such conductors is determined on the basis of an ampacity of 60 °C of the driver used. If any termination is either 60 °C or unknown, the maximum ampacity of the driver is the ampacity given in the 60 °C column, regardless of the insulating power of the driver. For example, a THHN driver will have a 60°C termination at one end and a 75°C termination on the other. As one of the connecting points has a rating of 60°C, the driver's ampacity must not exceed that given in column 60°C (see Figure 4). The third provision in 110.14 (C) (1) (a) states that conductors with a higher temperature rating may be installed if the equipment is indicated and identified for use with such conductors. This means that the ampacity of the 75 °C wire can be based on a column of 75 °C if all the terminals are dimensioned to at least 75 °C. This also means that the ampacity of a wire with 90 °C can be based on a column of 90 °C if all the terminals are rated at at least 90 °C. Use caution when using the 90 °C column as no device is indicated and identified for use with conductors with 90 °C other than individual eye, terminal rods and devices for use on circuits above 600V. This third provision in 110.14 (C) (1) (a) also means that the ampacity of a driver with 90 °C may be based on a column of 75 °C if all the terminations are dimensioned to at least 75 °C. For example, a THHN driver will have a 75°C termination at one end and a 60/75°C termination on the other. A temperature rating of 60/75 °C means that the device has been indicated for conductors with both 60 °C and 75 °C; therefore it is permissible to use 75 °C if the installed conductor is rated at at least 75 °C. Since all connecting points in this example have a rating of at least 75°C, the driver's ampacity may be based on the 75°C column (see Figure 5). Next month's Focus Act continues the debate on temperature restrictions. MILLER, owner of Lighthouse Services, teaches classes and seminars on the electrical industry. He is the author of the Illustrated Guide to the National Electrical Code and the Electrician Exam Prep Manual. It can be reached at 615.333.3336, charles@charlesRmiller.com and www.charlesRmiller.com. www.charlesRmiller.com.