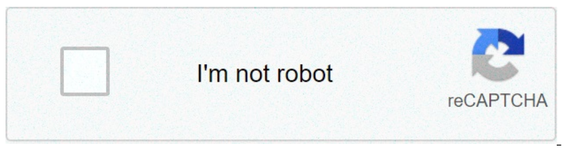

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Types of electrical installation pdf

Electrical installation of the "wiring" wiring redirection here. For the software development platform, see wiring (development platform). This article concerns the wiring of the building. For power distribution, see the power transmission of the power and the distribution of electricity. Relevant Topics Installations of Integrated Systems Wiring Practice By Registry North America United Kingdom Regulation of Electric System Practices BS 7671 United Kingdom IEC Wiring Regulation 60364 IEC International Standard Canadian Electrical Code (CE Code) NO NATIONAL Electrical Code (NEC) wiring and accessories supply caps AC and sockets cable cable electric cable with mineral duct-isolated cable hourglass cable MultiWay cable switch Cable cable armor cable ring cable ring ring circuit cable thermoplastic cable switching and protection AFICE ELCB apparatus ElectroBus Electric switch Switch switch Disconnector Switch Residual Fuse Device Distribution Device Electrical Deployment Device Floor System Switch The Electric Symbols VTE For wiring the electrical wiring is a wiring electrical installation and associated devices such as switches, Distribution cards, sockets and luminous fittings in a structure. Wiring is subject to safety standards for design and installation. The types of cables and the allowed dimensions are specified based on the operating voltage of the circuit and the capacity of electric current, with further restrictions on environmental conditions, such as the range of environmental temperatures, humidity levels and exposure to the light of the light Sun and chemicals. The associated circuit protection devices, control and distribution devices within a building's wiring system are subject to voltage, current and functional specifications. The safety codes of the wiring vary from location, country or region. The International Electrotechnical Commission (IEC) is attempting to harmonize wiring standards between member countries, but there are still significant changes in design and installation requirements. Practical wiring codes and regulations Main article: Electrical code This section needs further quotes for verification. Please help you improve this item by adding quotes to reliable sources. The material not brought can be challenged and removed. (April 2021) (find out how and when to remove this message Message of the model) The wiring layout plane for a wiring wiring The installation codes and the regulations are intended to protect people and property from electric shocks and fire risks. Usually they are based on a model code (with or without local amendments) produced by a national or international organization of standards, such as IEC. Australia and New Zealand in Australia and New Zealand, the AS / NZS 3000 standard, commonly known as "wiring rules", specifies the requirements for the selection and installation of electrical equipment and the design and test of these plants. The standard is mandatory both in New Zealand and in Australia; Therefore, all electrical works covered by the standard must be compliant. Europe in European countries, an attempt was made to harmonize national wiring standards in an IEC standard, IEC 60364 electrical installations for buildings. Therefore national standards follow an identical system of sections and chapters. However, this standard is not written in this language that can be readily adopted as a national wiring code. NÃ è is designed for use on the field by electric and inspectors to test compliance with of national wiring. By contrast, national codes, such as NEC or CSA C22.1, generally exemplify the common goals of IEC 60364, but provide specific rules in a module that allows guidance of those installation and inspection of electrical systems. Germany in Germany, DKE (the German Commission for the Electrical, Electronic and Computer Technology of DIN and VDE) is the organization responsible for the promulgation of electrical standards and security specifications. DIN VDE 0100 is the regulatory document of the German wiring harmonized with IEC 60364. North America America Information: Distribution of electricity Ã Ã§a Secondary distribution and wiring in North America the first electrical codes in the United States originated in New York in 1881 to adjust electrical lighting systems. Since 1897 the National Association of the US fire protection, a private non-profit organization formed by insurance companies, published the National Electrical Code (NEC). States, counties or cities often include the NEC in their local building codes in relation with local differences. The NEC is modified every three years. It's a consensus code considering suggestions from interested parties. The proposals are studied by committees of engineers, dealers, manufacturer's representatives, fire and other guests. Since 1927, the Association of Canadian standards (CSA) has produced the Canadian safety standards for electrical systems, which is the basis for the provincial electrical codes. The CSA also produces the Canadian Electrical Code, 2006 edition of which references IEC 60364 (electrical systems for buildings) and states that the Code addresses the fundamental principles of electrical protection in section 131. The Canadian Code ristamuta Chapter 13 IEC 60364, but there are no numerical criteria listed in this chapter to evaluate the adequacy of any electrical installation. Although US and Canadian national standards deal with the same physical phenomena and broadly similar objectives, they differ occasionally in technical details. As part of the program North American Free Trade Agreement (NAFTA), US and Canadian standards are slowly converging towards each other, in a process known as harmonization. United Kingdom UK, wiring systems are regulated by the institution of engineering and technology requirements for electrical systems: the IEE wiring regulations, BS 7671: 2008, which are harmonized with IEC 60364. The 17th edition (issued in January 2008) included new sections for microgeneration and solar photovoltaic systems. The first edition was published in 1882. In 2018, 18 Ã ° edition of the Wiring Regulations BS7671: 2018 was released and entered into force in January 2019 and BS7671: 2018 Amendment 1 was released on 20 February 20. BS 7671 is the standard to which the United Kingdom supports the electrical industry, and compliance with BS 7671 is now required by law through the electricity regulation, security, quality and continuity 2002. wiring region coding {electricity Regulation, safety, quality and continuity 2002 Color} This section needs additional citations for verification. Please help you improve this item by adding quotes to reliable sources. The material not brought can be challenged and removed. (April 2021) (Learn how and when to remove this message) Color coded cables into a flexible plastic electrical conduit commonly found in modern European houses in a typical electrical code, some color coding of the wires is required. There are many rules and exceptions for local country, state or region. [1] The most older installations vary in color codes and colors can fade with the insulation exposure to heat, light and aging. Europe Since 2011, the European Committee for Electrotechnical Standardization (CENELEC) requires the use of green / yellow color cables as protective conductors, neutral conductors as blue and brown as single phase conductors [2]. United States Main article: electrical wiring in North America The US National Electrical Code requires a bare copper or protective insulated conductor green or green / yellow, white or neutral gray, with any other color used for single phase. The NEC also requires high conductor leg High leg system Delta Have orange isolation, or to be identified by other suitable means such as tagging. Before the adoption of orange as the color suggested for the high leg in the 1971 NEC, it was a common practice in some areas to use red for this purpose. [Necessary quote] the introduction of the del clearly it states that it is not intended to be a design manual, and then creating a color code for ungrounded conductors or "hot" is beyond the scope and purpose of the NEC. However, it is a common misconception that the "hot wire" color coding is required by the Code. In the United States, the color coding of the three-phase system conductors follows a de facto standard, in which the black, red and blue are used for three-phase 120 systems / 208-volt, and brown, orange or purple and yellow are used in systems 277/480 volts. (Violet avoid conflicts with high delta NEC leg rule). In buildings with multiple voltage systems, ground conductors (neutral) of both systems they must be identified and made distinguishable to the connections between systems Avoid separately. Most of the time, systems 120/208-volt using the white isolation, while the 277/480 volt systems use insulating gray, although this particular color code at the moment is not an explicit requirement of the NEC. [3] Some local jurisdictions specify required color code in their local building codes, however. United Kingdom Main article :. Electrical wiring in the UK The UK requires the use of wire coated with yellow-green insulation / strips, for commissioning Safety connections to ground (earth) [4] This growing international standard has been adopted for its appearance characteristic, to reduce the risk of dangerous confusion of putting safety earth (ground) wires with other electrical functions, especially by people with red-green color blindness. In the UK, the phases can be identified as live, using colored lights: red, yellow and blue. The new colors of wires Do brown, black and gray, do not lend themselves to colored indicators. For this reason, the three-phase control panels often use spies the old colors. [5] Colors, fixed and flexible cable This section needs additional citations for verification. Please help you improve this item by adding quotes to reliable sources. The material not brought can be challenged and removed. (April 2021) (Further information on how and when to remove this template message) standard [at] the colors of wires flexible cable insulation (for example, size, power and wires of the lamp) Region or Phases neutral country Protective earth / ground Argentina , European Union, South Africa (IECA 60446) ,, Australia, New Zealand (AS / NZS 3000: 2007 3.8.1, 3.8.3), (before), "a color other than green, yellow, green / yellow, black or blue "(above), (previously) Brazil (ABNT NBR 5410: 2004 6.1.5) [6] ,,,,, Any color can be used for the stages of flexible cables, with the exception green and green / yellow striped. For safety reasons, the yellow must not be used for yellow / green stripes cables are present. Blue can be used for the phases within flexible cables when neutral is not present. (Blue), Chinese (PRC) ,,, United States, Canada (120 V) Ã Ã brass metal metallic silver ,; Ã Ã Ã Ã Ã Ã green / yellow striped United States, Canada (split-phase 240 V) [7] ,,; Ã Ã Ã Ã Ã Ã green / yellow stripes integrated cable (for example, in-, on, or behind-the-wall cables) Region or neutral country Phases Protective earth / ground Argentina; China; European Union (IECA 60446) in April 2004; the UK from March 31, 2004 (BSA 7671); Hong Kong in July 2007; Singapore since March 2009; Russia since 2009 (GOST R 50462); Ukraine, Belarus, Kazakhstan ,, [b] India, Pakistan; United Kingdom, before 31 March 2004 (BSA 7671); Hong Kong before 2009; Malaysia and Singapore, before February 2011 ,, [b] (formerly) no insulation (above). CHANNEL at the ends. Australia, New Zealand (AS / NZS 3000: 2018 3.8.1, Table To designate every stage, the above colors are prohibited. While any other color is allowed, for single-phase installations the "Line" color is usually red and the color "Switched Line" is usually white [C], recommended for single phase usually used for "switched line", , recommended for multi-phase [C] (from about 1980 a one Wire) (from about 1966 Ã ¢ â,¬ "stranded wire) stranded wire - no isolation; extremitous sleeve (previously) [D] Brazil (ABNT NBR 5410: 2004 6.1.5) ,, for three-phase systems. Not required At national level, but it is necessary in some areas, usually from meter to the main panel, so any color can be used for fixed cable phases (excluding blue, green and green / striped yellow). ,, For safety reasons , Yellow should not be used when there are green / yellow striped cables. (Blue) in plants in which neutral also acts as a protective ground, blue light cables must be used with green / yellow striped terminal signs., No insulation accepted under specific circumstances. China (PRC) ,,, South Africa,; O, [B] United States [E] ,, for 120, 208 or 240 V ,, for 277 or 480 V ã, metal brass for 120, 208 or 240 V for 277, or 480 V Ã, metallic silver, no isolation required for Canada isolated systems [8] [e], for monof systems ASE ,, for three-phase systems, Â ¢ No insulation, for single-phase systems isolated, for three-phase isolated systems, for three-phase systems isolated, for boxes of isolated systems (for example, translucent purple) denotes labels on wiring terminals. ^ Colors in this table represent the most common standard and favorite colors for wiring; However, others could be in use, especially in previous installations. ^ A B C cables can have a non-isolated eg [need to clarifications] that is managed with the identifier colors appropriate to both ends, especially in the UK. ^ A B except in the National Installations of New Zealand, the only color allowed by neutral is standard of black wiring, Australian and New Zealand allow Australian and European color codes. (However, TPS "Building Wire" European color codes is generally not available in Australia and New Zealand.) Australian standard phase color conflict with IEC 60446 colors, in which IEC-60446 Supported neutral color (blue) It is a phase color allowed the standard Australia / New Zealand. The care must be taken when the system used in any existing wiring is determined. ^ The land protection conductor is now connected separately in all cables. ^ A B The Canadian and American wiring practices are very similar, with current harmonization efforts. Wiring methods This section does not cite sources. Please help you improve this section by adding quotes to reliable sources. The material not brought can be challenged and removed. (2021 April) (find out how and when to remove this message) Installing the electrical wiring to "chase" Groove in the masonry structure of the walls of a building material for wiring the internal electrical systems in buildings vary depending on the use and of the Quantity foreseen power demand on the type of occupation circuit and size of the national and local regulatory environment in which the wiring must operate. The wiring systems in a single-family house or duplex, for example, are simple, with relatively low power requirements, infrequent changes to the structure and the arrangement of the building, usually with dry, moderate temperature and non-corrosive environmental conditions. In a lightweight commercial environment, more frequent wiring changes can be provided, large appliances can be installed and special heat conditions or humidity can be applied. Heavy industries have more demanding wiring requirements, such as very large currents and higher voltages, frequent changes to the layout of the equipment, corrosive or wet or explosive atmospheres. In structures that manage flammable gases or liquids, the special rules can govern the installation and wiring of electrical equipment in areas The cables and cables are valued by the voltage of the circuit, temperature and environmental conditions (humidity, sunlight, oil, chemicals) in which they can be used. A wire or cable has a voltage assessment (in neutral) and a maximum temperature rating of the conductor surface. The quantity of current or cable or wire can be safely transformed depends on the installation conditions. The international international standard The dimensions are reported in the IEC 60228 standard of the International Electrotechnical Commission. In North America, the standard of the american wire gauge is used for wire sizes. Main article cables: Power cable This section needs additional quotes for verification. Please help you improve this item by adding quotes to reliable sources. The material not brought can be challenged and removed. (2021 April) (Learn how and when removing this message) Modern wiring materials Modern non-metallic coated cables, such as (United States and Canadian) NMB and NMC, are composed of two to four wires covered with thermoplastic insulation, more flush For protective / grounding grounding (bonding), surrounded by a flexible plastic jacket. In North America and in the UK this conductor is usually naked thread but in the United Kingdom it is necessary that this naked protective land conductor (PE) is sheathed in green / yellow insulating tubes where the cable sheath has been removed. Most other jurisdictions require the protective earth conductor in both the same standard as current transport conductors with green / yellow insulation. With some cables the individual conductors are wrapped in paper before the plastic jacket is applied. Special versions of non-metallic bulky cables, such as the United States Type UF, are designed for direct underground burial (often with separate mechanical protection) or external use in which exposure to ultraviolet radiation (UV) is a possibility. These cables differ to have a construction resistant to humidity, without paper or other absorbent fillers and formulated for UV resistance. Synthetic polymeric insulation similar to the rubber is used in the industrial cables and in the power cables installed underground due to its resistance to the upper humidity. Isolated cables are valued by their permitted operational voltage and their maximum operating temperature on the surface of the conductor. A cable can transport more use ratings for applications, for example, a rating for dry plants and another if exposed to humidity or oil. Generally, the wire of the single conductor in small size is a solid thread, since the wiring is not required to be very flexible. Construction cables exceeding 10 AWG (or about 5 mm2) are locked for flexibility during installation, but are not sufficiently flexible to use as an appliance cable. The cables for industrial buildings, commercial and apartments can contain many isolated conductors in a total jacket, with helical belt reinforcement or aluminum armor, or steel armor, and perhaps even a PVC jacket or overall lead for protection by Humidity and physical damage. The cables intended for the service very flexible or in marine applications can be protected from woven bronze wires. The power or communication cables (for example, the computer network) that are routed into or through the air handling spaces (plenum) of office buildings are needed under the construction code of the model to be cashed in Metallic conduit, or evaluated for the low flame and the production of smoke. Mineral cables covered in copper isolated in a panel for some industrial uses in steels and similar warm environments, no organic material offers a satisfactory service. Sometimes isolated cables are isolated with flakes of compressed mica. Another form of a high temperature cable is an isolated mineral cable, with single conductors placed inside a copper tube and the space filled with magnesium oxide powder. The entire assembly is drawn more small, thus compressing the dust. Cables have a certified fire resistance assessment and are more expensive than the nominal non-fire cable. They have little flexibility and lead more like rigid duct rather than flexible cables. The environment of the installed wires determines the quantity of current cable is authorized to transport. Because multiple conductors in grouped in a cable cannot dissipate heat the most easily as simple as individual isolated conductors, these circuits are always evaluated to a lowest "ampacitá". The tables in the electric safety codes give maximum maximum Current based on the size of the conductor, the voltage potential, the type of insulation and the thickness and the rating of the temperature of the cable itself. The allowed current will also be different from wet or dry places, for hot positions (attics) or cool (underground). In a cable race through different areas, the part with the lowest rating becomes the general race assessment. The cables are usually fixed with special fittings where they enter electrical appliances; This can be a simple screw clamp for cables covered in a dry position, or a cable connector with polymeric gauge that mechanically engages the armor of a armored cable and provides a water resistant connection. Special cables fittings can be applied to prevent explosive gases flow inside the interior of the coated cables, where the cable passes through the areas where flammable gases are present. To avoid loosening the connections of the individual conductors of a cable, the cables must be supported near their entry to devices and regular intervals along their currents. In high buildings, special designs are required to support wire vertical racing conductors. Generally, only a cable to connect cable is allowed, unless the fitting is appointed or listed for more cables. Special cables and termination techniques are required for cables installed in ships. Such assemblies are subjected to environmental and mechanical extremes. Therefore, in addition to the problems of electrical and fire safety, these cables may also be necessary to be resistant to pressure where the bulkheads of a ship penetrate. They must also resist corrosion caused by salted water or salty spray, which is made through the use of thicker and specially built jackets and staminating individual cables stands. Distribution transformer of the US single-phase residential power, showing the two "row" driven conductors and the naked "neutral" conductor (derived from the center-tap center of the transformer). The distribution of support cantenaries are also shown. In the practice of North America, an elevated cable from a transformer on a power pole at a residential electric service is usually consisting of three twisted conductors (triplexed), with one that is a naked neutral conductor, with the other two are The insulated conductors for both two built-in 180-degree 120 V tensions normally supplied. [9] The neutral conductor is often a support "messenger" steel wire, used to support isolated line conductors. Main article of copper conductors: the electrical devices of the cable and copper cable often use copper conductors due to their properties, including their high electric conductivity, tensile strength, ductility, corrosion resistance, resistance Corrosion, thermal conductivity, thermal expansion coefficient, weldability, overloaded electricity resistance, compatibility with electrical insulators and installation facilities. Copper is used in many types of electrical wiring. [10] [11] Clamps for aluminum conductors to combine aluminum and copper conductors. The terminal blocks can be mounted on a DIN rail. The aluminum thread was common in the North American residential wiring from the end of the 1960s in the 1970s due to the increasing cost of copper. Due to its greater resistivity, aluminum wiring requires larger conductors than copper. For example, instead of 14 AWG (American Keeter wire) copper wire, aluminum wiring should be 12 AWG on a typical Ampere 15 lighting circuit, although local construction codes vary. The solid aluminum conductors were originally made in the 1960s Utility aluminum alloy that had undesirable properties for a construction cable and were used with wiring devices intended for copper conductors [12] [13]. These practices were found to cause defective connections and potential fire risks. At the beginning of the 1970s a new aluminum wire was introduced in one of the different special alloys, and all devices Ã ¢ â,¬ "switches, switches, containers, junction connectors, cable walnuts, cables, Ã ¢ â,¬ "have been designed specifically for the purpose. These new aluminum threads and special projects face problems with joints between dissimilar metals, oxidation on metal surfaces and mechanical effects that occur as different metals expand at different rates with increases Temperature. [Request required] Unlike copper, aluminum has a trend with CREEP or cold flow under pressure, so old steel steel screw connections could loosen over time. The most recent electrical devices designed For aluminum conductors they have functionalities destined to compensate for this effect. Unlike copper, aluminum forms a layer of insulating oxide on the surface. This is sometimes faced aluminum conductors with an antioxidant dough (containing zinc powder in one base of low-residual polybutene [14]) to joints, or applying a mechanical termination designs TA to go through the oxide layer during installation. Some terminations on wiring devices designed only for the copper wire overheats under heavy current load and cause fire if used with aluminum conductors. Standard magazine for metal materials and wiring devices (such as the "copper-aluminum-revised" designation) have been developed to reduce these problems. While the larger dimensions are still used to power power to electric panels and large devices, aluminum wiring for residential use has acquired poor reputation and has decreased. The aluminum conductors are still heavily used for the transmission of wholesale power, power distribution and large power circuits with heavy current loads, due to the various advantages that offer copper wiring. Aluminum conductors cost and weigh less than copper conductors, so you can use a much larger cross-section area for the same weight and price. This can compensate for the greater resistance and the lower mechanical strength of aluminum, which means that the area of the largest cross section is required to obtain a comparable power capacity and other functionality. The aluminum conductors must be installed with compatible connectors and particular attention must be paid to ensure that the contact surface is not oxidized. Raceways and Cable Runs See also: Electric Conduit This section needs additional verification quotes. Please help you improve this item by adding quotes to reliable sources. The material not brought can be challenged and removed. (2021 April) (Learn how and when removing this message Message Message) The electrical conductors, seen inside the nominal fightening tree, as seen which enters a Firestat. Firestat is made of Firestat mortar at the top, Rockwool on the bottom. Rackets are used to protect cables from damage. Isolated cables can be performed in one of the different shapes between electrical devices. This can be a specialized folding tube, called conduit, or one of the different varieties of metal (rigid or aluminum steel) or non-metallic tubes (PVC or HDPE). Rectangular troughs in metal or PVC wire (North America) or trunking (United Kingdom) can be used if many circuits are needed. The wires performed underground can be performed in plastic pipes enclosed in concrete, but the metal elbows can be used in serious throws. Wiring in areas displayed, such as factory floors can be performed in cable trays or rectangular tracks with lids. Where the wiring, or the tracks that contain the wiring, must cross walls and Fire resistance, the openings are required by local building codes to be fired. In cases where the security-critical wiring must be maintained operating during an accidental fire, the fireproof to maintain the integrity of the circuit in a way to comply with the certification list of a product. The nature and thickness of any passive fire protection materials used in combination with wiring and slopes has a quantifiable impact on the ampacità deriving, since the properties of the thermal insulation necessary for fire resistance also inhibit the cooling of the Air of power conductors. A cables tray can be used in shops and housing cables trays are used in industrial industrial areas Many isolated cables are correct together. The individual cables can exit the tray anywhere, simplifying the installation of the wiring and reducing the cost of the work for the installation of new cables. The power cables can have accessories in the tray to maintain authorization between the conductors, but the small control wiring is often installed without any intentional spacing between cables. Local electrical regulations can limit or position special requirements on mixing voltage levels within a cable tray. Good design practices can segregate, for example, low level measurement or signal cables from trays carrying high power branch circuits, to prevent noise induction in sensitive circuits. Because the wires run in ducts or underground cannot dissipate the heat with the same outdoor airfare, and since the adjacent circuits contribute to induced currents, the wiring regulations provide rules to establish the current capacity (width). Special sealed fittings are used for addressed wiring through potentially explosive atmospheres. Bus bars, bus conduit, bus cable Main items: busbar and bus conduit This section does not quote any source. Please help you improve this section by adding quotes to reliable sources. The material not brought can be challenged and removed. (April 2021) (find out how and when to remove this message Message) Firestop drops with penetrators consisting of electrical duct to the left and a bus duct on the right. The Firestat consists of Firestat mortar on the top and on the rock on the bottom, for a resistance assessment of 2 hours. For very high currents in electrical appliances, and for high currents distributed through a building, bus bars can be used. (The term "bus" is a contraction of the Latin omnibus Ã ¢ â,¬ "which means" for all ".) Each live conductor of such a system is a rigid piece of copper or aluminum, usually in flat bars (But sometimes as a tube or other shapes). The open bus bars are never used in publicly accessible areas, although they are used in the production plants and in the power supply companies to obtain the benefit of air cooling. A variant It is to use heavy cables, especially where it is desirable to transpose or "roll" phases. In industrial applications, the conductor bars are often preassembled with insulators in grounded cases. This assembly, known as Bus or Busway conduit, can be to be Used for connections with a large painting or to bring the main power supply into a building. A form of a bus conduit known as "plug-in bus" is used to distribute long power The length of a building; It is built to allow the installation of the switches or regulators of the TAP-OFF motor to places designated along the bus. The great advantage of this scheme is the possibility of removing or adding a branch circuit without removing the voltage by the entire conduit. Busbar for the distribution of protective earth bus ducts (land) can have all the phase conductors in the same casing (bus not isolated) or can have each conductor separated from a ground barrier from adjacent phases (segregated bus). To conduct large currents between the devices, a cable bus is used. [Further explanation required] For very large currents in the generation of stations or substations, where it is difficult to provide circuit protection, a phase bus is used isolated. Each phase of the circuit is performed in a separate metallic metal casing. The only possible defect is a phase-to-ground fault, since the cases Separate. This type of bus can be classified up to 50,000 amps and up to hundreds of kilovolt (during normal service, not only for defects), but is not used for the construction wiring in the conventional sense. Electric panels Electric panels, cables and firestops in an electric service room in a paper mill in Ontario, the electric panels of Canada are easily accessible junction boxes used to redirect and change electrical services. The term is often used to refer to automatic interruption panels or fuses. Local codes can specify the physical clearance around the panels. [Necessary quote] Degradation for Rasberry Crazy Forms parasites have been known The interiors of the electrical wiring installations, preferring CC currents on approx. This behavior is not well understood by scientists. [15] Squirrels, rats and other rodents can sprinkle unprotected wiring, causing fire and shock risks. [16] [17] This is especially true for phone and computer cables insulated in PVC. Several techniques have been developed to discourage these parasites, including the insulation loaded with pepper powder. [Necessary quote] Early wiring methods This section needs additional quotes for verification. Please help you improve this item by adding quotes to reliable sources. The material not brought can be challenged and removed. (April 2021) (find out how and when to remove this message) The first internal power wiring systems used conductors that were naked or covered with fabric, which were fixed by staples to the building of the building or on the racing cards. Where the conductors crossed the walls, were protected with cloth ribbon. The junctions were performed similar to the telegraphic and welded safety connections. The underground conductors were isolated with cloth ribbon wraps soaked in pitch and cutlery in wooden troughs that were then buried. These wiring systems were unsatisfactory due to the danger of electrocution and fire, in addition to the high cost of work for such installations. The first electrical codes arose in 1880 with the commercial introduction of electricity; However, many conflicting standards existed for the selection of cable sizes and other design rules for electrical systems, and a necessity has been seen to introduce uniformity on safety reasons. Knob and tube (USA) Main article: Wiring with knob knob wiring knob (orange cable is an unrelated extension cable) The first standardized wiring method in buildings, in common use in North America from about 1880 to the 1930s, the wiring of the knob and the tube (K & T): the single conductors have been carried out through the cavities between structural members in walls and ceilings, with ceramic tubes that form protective channels through joists and the Ceramic knobs attached to structural members to supply air between wire and timber and support wires. Because the air was free to circulate on the wires, smaller conductors can be used as needed in cables. Organizing the wires on the opposite sides of the structural members of the building, a certain protection was offered against the short circuits that can be caused by the guide of a nail in both conductors simultaneously. In the 1940s, the cost of the installation of two conductors rather than a cable led to a drop in new and-tube knob installations. However, the US code allows new K & T wiring installations in special situations (some rural and industrial applications). Cables covered in metal electric cable with lead cable from a house of around 1912 in southern England. Two conductors are sheathed in red and black rubber, the central ground wire is naked. These cables are dangerous because the sheath is subject to uniform if I flexed repeatedly. In the United Kingdom, an early form of insulating cable, [18] introduced in 1896, consisted of two impregnated-paper conductors isolated in a general sheath. The joints were welded and special fittings were used for lamp holders and switches. These cables were similar to the underground telegraph and time telephone cables. The cables blocked by the paper turned out to be unsuitable for interior wiring systems, as a very careful process was required to guarantee that the humidity has not affected A subsequently invented system in the UK in 1908 employed the insulating thread in vulcanized rubber enclosed in a striped metal sheath. The metal sheath has been linked to each metal wiring device to guarantee the grounding continuity. A system developed in Germany called "Kuhlo Wire" used one, two or three wires insulated in brass rubber or lead iron tube, with a crimped seam. The enclosure could also be used as a return conductor. The Kuhlo thread could be performed exposed and coated or embedded in plaster. Special Boxes output and junction boxes have been realized for lamps and switches, made of porcelain or steel sheet. The seam has been attacked not considered watertight as the thread of Stannos used in England, which had a welded sheath. [19] A a bit 'similar system called "concentric wiring" was introduced in the United States around 1905. In this system, an insulated wire was wrapped with copper tape which was then sealed, forming the an earth (return) of the wiring system. The bare metal sheath to the ground potential, it was considered safe to touch. While companies like General Electric fittings produced by the system and some buildings were wired with it, it has never been adopted in the National Electrical Code in the United States. The disadvantages of the system such special fittings have been requested and that any defect in the connection of the sheath would result in the sheath that there would be energized. [20] cables other armed historians wiring methods with two rubber insulated conductors in a flexible metal sheath were used since 1906, and have been considered at the time a better method of knob-and-tube open wiring, although much more expensive . The first rubber-insulated cables â â for wiring of US buildings were introduced in 1922 with the US Patent 1,458,803, Burley, Harry & Rooney, Henry, "insulated wire", issued 12/06/1923 , assigned to Boston Isolated Wire and CableA. It is of two or more solid copper electrical cables with rubber insulation, more cotton cloth fabric on each protective conductor insulation, with a coating of a general fabric, usually impregnated with tar as a protection against moisture. The waxed paper has been used as a filler and separator. Over time, the rubber insulated cables become brittle due to exposure to atmospheric oxygen, so they must be handled with care and are usually replaced during the restructuring. When the switches, sockets sockets or lighting fixtures are replaced, the simple act of tightening the connections can cause the hardened insulation of flake conductors. In addition rubber insulation inside the cable often it is in better condition than the insulation exposed to connections, due to reduced exposure to oxygen. The sulfur vulcanized rubber in isolation attacked bare copper wire so that the conductors were canned to prevent it. The conductors returned to be naked when the rubber ceased to be used. Diagram of a simple electric cable with three insulated conductors, with IEC color scheme. About 1950 were introduced PVC insulation and jackets, especially for the residential wiring. Approximately at the same time, the individual conductors with PVC insulation thinner and a thin nylon jacket (eg. US type Thn, THHN, etc.). It has become common. [Citation needed] The most simple form of the cable has two insulated conductors twisted to form a unit. These cables not coated with two (or more) conductors are used only for low control voltage signals and applications such as wiring bell. Other methods of fastening cables that are now obsolete include: Re-use of existing gas pipes during the conversion of gas-lighting systems for electric lighting. The insulated conductors have been pulled through the tubes which had previously provided the gas lamps. Although occasionally used, this isolation method was likely damaged by sharp edges inside the tube at each joint. Moldings made of wood with grooves cut to individual wire conductors, covered by a wooden cap strip. These were banned in the codes North Americans of 1928. The wooden molding was also used to some extent in the UK, but it has never been allowed by the German and Austrian rules. [21] A system of flexible double ropes supported by glass or porcelain buttons has been used near the end of the 20th century in Europe, but it was soon replaced with other methods. [22] During the early 20th century, various patented shapes of wiring system such as Bergman and Tüschel tubing were used to protect wiring; These used very thin fiber tubes or metal tubes that were also used as a return return In Austria, wires were hidden by inserting a rubber tube in a groove in the wall, plaster above, then remove the tube and pulling wires through the cavity. [24] Metal molding systems, with a flattened oval section consisting of a basic profile and a cap snap-cap on the channel, were more expensive than interrupted wiring or wood molding, but it could be easily performed on masonry surfaces. Similar surfaces Raceway wiring systems are still available today. See also 10603 ¢ A frequent use Mil-Spec compatible wires Bus conduit input cables of the cable management system Gland power plugs National tray AC and electrical conduit sockets Electric chamber Electric wiring in North America wiring Electric in the UK distribution of electricity ground ground industrial wiring and multiphase electrical plugs and Mil-DTL-13486 sockets Ã ¢ Mil-Spec Wire in compliance Neutral wire OFHC portable power cable limitation of dangerous substances Directive (ROHS) Single-phase system structured wiring electricity References Three-phase ^ "National Electrical Code". National Electrical Manufacturers Association. Abstract 4 January 2016. ^ "New color code cable for electrical systems". Energy market authority. Abstract 4 January 2016. ^ "Color Coding Chart". Conwire. Abstract 4 January 2016. ^ Noel Williams, Jeffrey S. Sargen (2007). NEC D and A: Questions and answers on the National Electrical Code. P.Ã, 117. IsbnÃ, 9780763744731. 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