Because theaters and similar buildings are usually required to be of fire-rated construction as determined by applicable building codes, the fixed wiring methods for power and lighting circuits are limited to those specified in 520.5(A).

See also

518.4 and its commentary for wiring methods where fire-rated construction is required

Section 520.5(B) permits the installation of communications circuits, Class 2 and Class 3 remote-control and signaling circuits, sound-reproduction wiring, and fire alarm circuits using wiring methods, including power-limited circuit cables covered in Article 722 and communications cables covered in Chapter 8. Where portability, flexibility, and adjustments are necessary, suitable cords and cables are permitted. Section 520.5(D) permits Type AC cable as one of the wiring methods in buildings or portions of buildings that are not required to be of fire-rated construction. Under this condition, Type AC cable is not required to contain an insulated equipment grounding conductor (EGC).

520.6 Number of Conductors in Raceway. The number of conductors permitted in any metal conduit, rigid nonmetallic conduit as permitted in this article, or electrical metallic tubing for circuits or for remote-control conductors shall not exceed the percentage fill shown in Table 1 of Chapter 9. Where contained within an auxiliary gutter or a wireway, the sum of the cross-sectional areas of all contained conductors at any cross section shall not exceed 20 percent of the interior cross-sectional area of the auxiliary gutter or wireway. The 30-conductor limitation of 366.22 and 376.22 shall not apply.

520.9 Branch Circuits. A branch circuit of any size supplying one or more receptacles shall be permitted to supply stage set lighting. The voltage rating of the receptacles shall be not less than the circuit voltage. Receptacle ampere ratings and branch-circuit conductor ampacity shall be not less than the branch-circuit overcurrent device ampere rating. Table 210.21(B)(2) and 210.23 shall not apply. The requirements in 210.8(B), other than 210.8(B)(6), shall apply.

The occupancies referenced in Article 520 are excluded from all the general requirements relating to connector rating and branch circuit loading found elsewhere in the *NEC*®, such as in Table 210.21(B)(2). Connectors must be rated sufficiently for the parameters involved, thus permitting connectors with voltage and current ratings higher than the branch-circuit rating to be used. However, per 406.4(F), the same connector cannot be used for a different voltage or current on the same premises.

The stage set lighting and associated equipment, such as stage effects, both fixed and portable, must be as flexible as possible. Connectors often are used for different purposes and are therefore marked on a show-by-show basis to designate the voltage, current, and type of current actually employed. Stage set lighting is usually planned in advance, and the loads on each receptacle are known. Loads are not casually connected as they might be at a typical general-use wall receptacle. Care is taken to ensure that circuits are not overloaded, thereby avoiding unwanted tripping during a performance. Outdoor circuits are often dimmed and are exempt from the GFCI requirement of 210.8(B)(6) because dimmer-rated GFCI devices are not readily available.

520.10 Portable Equipment Used Outdoors. Portable stage and studio lighting equipment and portable power distribution equipment not identified for outdoor use shall be permitted for temporary use outdoors if the equipment is supervised by qualified personnel while energized and barriered from the general public.

Informational Note: See ANSI/ESTA E1.58-2017, *Electrical Safety Standard for Portable Stage and Studio Equipment Used Outdoors*, for information on the use of portable stage and studio lighting equipment outdoors.

Portable indoor stage or studio equipment that is not marked as suitable for wet or damp locations is permitted to be used temporarily in outdoor locations. If rain occurs, this equipment is typically de-energized, and a protective cover is installed before it is re-energized. At the end of the day, the equipment is either de-energized and protected or dismantled and stored.

Part II. Fixed Stage Switchboards

520.21 General. Fixed stage switchboards shall comply with the following:

(1) Fixed stage switchboards shall be listed.
(2) Fixed stage switchboards shall be readily accessible but shall not be required to be located on or adjacent to the stage. Multiple fixed stage switchboards shall be permitted at different locations.
(3) A fixed stage switchboard shall contain overcurrent protective devices for all branch circuits supplied by that switchboard.
(4) A fixed stage switchboard shall be permitted to supply both stage and nonstage equipment.
(5) Fixed stage switchboards shall comply with the marking and working space requirements in 408.18(C) but shall not be required to comply with the load terminal location requirements in 408.18(C)(1), (C)(2), and (C)(3).

520.25 Dimmers. Dimmers shall comply with 520.25(A) through (C).

A high-density digital dimmer rack typically contains one dimmer (usually of 20-, 50-, or 100-ampere capacity) for each branch circuit connected to it. The rack is usually supplied by a 3-phase, 4-wire-plus-ground feeder, which is distributed via buses to all dimmers in the rack. Typical dimmer racks contain between 12 and 96 dimmers and can have total power capacities of up to 288 kilowatts. In large theatrical systems, many racks may be bused together. A central control electronics module drives multiple dimmers in the rack. A digital data link can connect the dimmer rack to a remotely located computer control console.