PREFAE

This publication has been prepared as a guide for Architectural and Engineering (A&E) firms in the preparation of documents for the design and construction of new structures and the remodeling of existing structure for Indiana University. Items pertinent to requirements of Indiana University are contained herein.

The specification section numbers referenced by these standards are to help the A&E firms identify where IU Engineering standards are to be applied. These specification section numbers are based upon CSI standards and may not correspond to a particular A&E firm’s standard specification section numbering scheme.

Compliance with codes and OSHA regulations are minimum requirements. When requirements of Federal and/or State Codes are at variance with the contents of this publication, the most demanding requirements shall be observed.

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IT IS NOT INTENDED THAT THESE STANDARDS BE
COPYED AND USED AS A SPECIFICATION!
MATERIAL CONTAINED HEREIN SHALL NOT BE
COPYED VERBATIM IN SPECIFICATIONS OR IN NOTES
ON THE DRAWINGS EXCEPT WHEN INSTRUCTIONS
ARE GIVEN TO COPY CERTAIN ARTICLES OR
PARAGRAPHS.
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Changing technology and changes in State or University policies will require continuing revisions of these standards. Revisions will be maintained online at www.indiana.edu/~uao. Architects and Engineers doing work for the University are expected to ensure that they are working with the latest revision of the standards.

Throughout these standards, cross-references have been made frequently to emphasize the importance of coordination of all parts of the contract documents for a project. Because of the requirement for complete coordination, the holder of this document is cautioned to furnish complete standards to consultants or to ascertain that consultants have copies of the referenced sections and paragraphs affecting the consultant’s work.

If questions arise concerning instructions contained herein, please request clarification from Indiana University, Department of Engineering Services, (812) 856 - 7055.
Also Included:

26 09 63 - Architectural Lighting Controls

26 27 26 - Wiring Devices

26 52 00 - Emergency Lighting

26 53 00 - Exit Signs

A. General

1. Lighting systems shall conform to the requirements, standards and recommendations found in the latest edition of the following:
   a. ANSI/NFPA 70 - National Electrical Code, with Indiana Amendments.

2. All lighting systems and components shall be classified by Underwriter's Laboratories, Inc. (UL) as suitable for purpose specified and shown and shall bear an appropriate "UL" label.

3. Lighting designers shall employ IES standards for the selection of proper illumination levels for any given area or activity.


5. During the design process and prior to completion of construction documents, provide point-by-point photometric calculations of lighting design to Engineering Services or CFS for review and comment.

6. In general, loading of lighting system power circuits shall not exceed 80 percent of the maximum allowed by the National Electrical Code. To accomplish this, the lighting designer shall not exceed 13 amps connected load on a branch circuit utilizing a 20 amp overcurrent protective device.

7. Lighting in stairwells shall employ fluorescent or LED lamps and fixtures shall be installed so maintenance can be performed from a 6' stepladder. The use of dual technology motion sensors (infra-red and ultra-sonic) and/or day-light sensors to automatically control the light levels in the stairwell are strongly encouraged.
8. Fluorescent or LED lamps are to be used in light fixtures used to produce ambient light in a space. Other lamps may be used with specialty light fixtures. Prior to selecting fixtures for use in design, verify permitted lamp types with Engineering Services or CFS.

9. Light fixtures shall be supported independently from ceilings.

10. Provide separate non-switched night light circuits in mechanical equipment rooms, electrical equipment rooms and corridors. In buildings where emergency power is available, connect night lights to emergency power circuit.

11. Use occupancy sensors, timers and/or day-light sensors to meet the requirements found in the referenced standards. In general, the use of stand-alone devices is preferred over building wide systems. Contact Engineering Services or CFS prior to designing around a building wide lighting control system.
   a. Where occupancy sensors are used, dual technology (infra-red and ultrasonic) type are preferred.
   b. Low voltage ceiling or wall mounted occupancy sensors that employ a discrete power supply are preferred. The use of an auxiliary contact contained in the power supply may be used to send a signal to the building Energy Management System (EMS) is encouraged.
   c. Contact Engineering Services or CFS prior to using combination light switch / occupancy sensors or other types of occupancy sensors not listed above.

B. Interior Lighting Fixtures

1. Interior lighting fixtures shall utilize fluorescent, high intensity discharge, or, LED lamps, as appropriate for intended purpose.

2. When available, fixtures shall be painted after fabrication.

3. Areas of computer usage shall utilize light fixtures specifically designed for glare control. Where feasible, the use of indirect and direct/indirect systems shall be considered.

4. Wherever practical or directed, provide multi-levels / locations of lighting control. This is to include:
   a. three and four way switching
   b. high-medium-low levels of light output from 3-lamp fluorescent fixtures and high-low levels of light output from 4-lamp fluorescent fixtures.

5. Where 3-lamp fluorescent fixtures are utilized in multi-level switching functions, use (1) 2-lamp ballast and (1) 1-lamp ballast in each fixture. NOTE: follow ASHRAE/IES 90.1 as pertains to use of 1-lamp ballasts. 4-lamp fluorescent fixtures utilized in multi-level switching functions shall use (2) 2-lamp ballasts in
6. Where applicable or directed, interior lighting fixtures are to be "heat removal" type. Do not utilize lighting fixtures for HVAC systems (air supply or return), unless directed by Engineering Services or CFS.

C. Lamps

1. Lamps shall be selected to mate with lighting fixtures selected.

2. Incandescent
   a. In general, incandescent lamps shall not be used in the lighting design.
   b. The use of incandescent lamps shall be for special applications and only as directed by Engineering Services or CFS.
   c. Where used, incandescent lamps shall be 130 volt rated.
   d. Incandescent lamps used in conjunction with dimming systems shall utilize filaments recognized by the dimming system manufacturer to reduce "ringing" and "chatter" of the lamp.

3. Fluorescent
   a. In general, fluorescent lamps shall be four-foot, 25 watt, T8 type with medium bi-pin base and 2400 initial lumens minimum. The use of T5 type lamps is also acceptable. Verify use of T5 type lamps on the IUPUI campus with CFS prior to beginning a lighting design featuring this lamp.
   b. Lamp color shall be at the discretion of the designer. The University preference is mid-range color (3500 Kelvin correlated color temperature) or cool-white color (4100 Kelvin correlated color temperature). Care shall be taken to utilize only one lamp color in any given space and to provide uniform color rendering throughout a project.
   c. Conform to ANSI standards, C78 series and C82 series as applicable to each type of lamp.
   d. Preferred manufacturers
      1) General Electric Co.
      2) North American Philips Lighting Corp.
      3) Osram Sylvania, Inc.

4. Light Emitting Diode (LED)
   a. Indiana University supports the use of LED lighting, but recognizes that national standards regulating this technology are still being developed. Any and all LED lighting solutions must be approved by Engineering Services or CFS prior to release of design for construction.
   b. As a minimum, LED lighting must provide the following:
      1) Color Temperature: The University preference is mid-range color (3500 Kelvin correlated color temperature) or cool-white color (4100 Kelvin correlated color temperature). Care shall be taken to utilize only one lamp color in any given space and to provide uniform color rendering throughout a project.
      2) Color Rendering Index (CRI): minimum acceptable CRI = 0.85.
c. Where multiple LEDs are used in a fixture, they shall be installed as easily replaceable assemblies.
d. LED lamps shall comply with the latest edition of the standards and guidelines listed below.

1) American National Standards Institute/American National Standards Lighting Group (ANSI/ANSLG)
   a) C78.377 - Specifications for the Chromaticity of Solid State Lighting Products
   b) C136.37 - Solid State Light Sources Used in Roadway and Area Lighting

2) International Commission on Illumination (CIE)
   a) 127 - Measurement of LED's
   b) 177 - Colour Rendering of White LED Light Sources

3) Federal Trade Commission (FTC)
   a) 16 CFR Part 260 - Guides for the Use of Environmental Marketing Claims
   b) 16 CFR Part 305 - Appliance Labeling Rule: Lighting Facts Label

4) Illuminating Engineering Society (IES)
   b) LM-79-08 - Approved Method: Electrical and Photometric Testing of Solid-State Lighting Devices
   c) LM-80-08 - Approved Method: Measuring Lumen Depreciation of LED Light Sources
   d) LM-82-12 - Characterization of LED Light Engines and LED Lamps for Electrical and Photometric Properties as a Function of Temperature
   e) RP-16-10 - Nomenclature and Definitions for Illuminating Engineering
   f) TM-16-05 - Light Emitting Diode (LED) Sources and Systems
   g) TM-21-11 - Projecting Long Term Lumen Maintenance of LED Light Sources

5) National Electrical Manufacturers Association (NEMA)
   a) SSL-3 - High-Power White LED Binning for General Illumination
   b) SSL-4 - SSL Retrofit Lamps: Minimum Performance Requirements
   c) SSL-6 - Solid State Lighting for Incandescent Replacement - Dimming

6) National Fire Protection Association (NFPA)
   a) 70 - National Electrical Code (NEC)

7) Underwriters Laboratories, Inc. (UL)
   a) 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products
   b) 1598C - Light Emitting Diode (LED) Retrofit Luminaire Conversion Kits
D. Ballasts and Drivers

1. In lieu of University Standard 2 year warranty on ballasts, specify that the contractor is to provide 10% spare materials for each type ballast used on project. These ballasts shall be delivered to location specified by the University.

2. Fluorescent - Electronic Type
   a. Fluorescent electronic ballasts shall be low-energy, solid-state, full-light output, capable of operating one, two, three or four T8 lamps as required. All ballasts shall be high power factor, Class P thermally protected, sound-rated A, long life and low weight. All ballasts shall comply with the following ratings:
      1) Minimum Power Factor: 98 percent.
      2) Minimum Ballast Factor: 84 percent.
      3) Maximum Crest Factor: 1.70.
      4) Maximum Total Harmonic Distortion: 10 percent.
      5) Maximum Third Harmonic Distortion: 10 percent.
   b. Fluorescent electronic ballasts shall conform to the following requirements:
      1) FCC Regulations, Part 15, Subpart J for electromagnetic interference.
      3) UL 935, "Fluorescent Lamp Ballasts".
      4) The standards of the Certified Ballast Manufacturers' Association (CBM).
   c. Unless otherwise directed by Engineering Servicer or CFS, the type of fluorescent ballast (Instant Start, Rapid Start or Programmed Rapid Start) shall be left to the discretion of the lighting designer. However, programmed rapid start ballasts are preferred when using occupancy sensors.
   d. Preferred manufacturers
      1) Philips Advance
      2) Universal Lighting Technologies
      3) General Electric

3. Fluorescent - Dimming Type
   a. Fluorescent dimming ballasts shall meet all the criteria outlined above for fluorescent electronic ballasts. In addition the dimming performance shall be as follows:
      1) Dimming range shall be continuous between 100% and 10% light output for general lighting applications.
      2) Dimming range shall be continuous between 100% and 1% where directed by Engineering Services or CFS.
b. Preferred manufacturers
   1) Advance – Mark X (10-100%)
   2) Lutron Electronics Co., Inc.
      a) Hi-Lume (1-100%)
      b) ECO-10 (10-100%).

4. High Intensity Discharge
   a. High intensity discharge ballasts shall be core and coil construction, constant wattage autotransformer type, with integral automatically reset thermal overload protection and high power factor. HID ballasts located indoors shall be "quiet" type.
   b. Preferred manufacturers
      1) Philips Advance
      2) Universal Lighting Technologies
      3) General Electric

5. Light Emitting Diode (LED) Driver
   a. Indiana University supports the use of LED lighting, but recognizes that national standards regulating this technology are still being developed. Any and all LED lighting solutions must be approved by Engineering Services or CFS prior to release of design for construction.
   b. LED drivers shall be Underwriters Laboratories, Inc. (UL) listed and labeled for intended purpose.
   c. LED drivers shall comply with the latest edition of the standards and guidelines listed below.
      1) American National Standards Institute/American National Standards Lighting Group (ANSI/ANSLG)
         a) 47 CFR Part 15 - Radio Frequency Devices
      2) Federal Communications Commission (FCC)
         a) 127 - Measurement of LED’s
         b) 177 - Colour Rendering of White LED Light Sources
      3) Federal Trade Commission (FTC)
         a) 16 CFR Part 260 - Guides for the Use of Environmental Marketing Claims
         b) 16 CFR Part 305 - Appliance Labeling Rule: Lighting Facts Label
      4) Illuminating Engineering Society (IES)
         a) G-2-10 - Guide for the Application of General Illumination ("White") Light-Emitting Diode (LED) Technologies
         b) LM-79-08 - Approved Method: Electrical and Photometric Testing of Solid-State Lighting Devices
         c) LM-80-08 - Approved Method: Measuring Lumen Depreciation of LED Light Sources
         d) LM-82-12 - Characterization of LED Light Engines and LED Lamps for Electrical and Photometric Properties as a Function of Temperature
         e) RP-16-10 - Nomenclature and Definitions for Illuminating Engineering
f) TM-16-05 - Light Emitting Diode (LED) Sources and Systems

5) National Electrical Manufacturers Association (NEMA)
   a) SSL-1 - Electronic Drivers for LED Devices, Array, or Systems
   b) SSL-4 - SSL Retrofit Lamps: Minimum Performance Requirements
   c) SSL-6 - Solid State Lighting for Incandescent Replacement - Dimming

6) National Fire Protection Association (NFPA)
   a) 70 - National Electrical Code (NEC)

7) Underwriters Laboratories, Inc. (UL)
   a) 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products
   b) 1598C - Light Emitting Diode (LED) Retrofit Luminaire Conversion Kits

F. Dimming Systems (Sections 26 09 63 and 26 27 26)

1. Single Station
   a. General
      1) Single station (wall box) dimming switches shall have an easily accessible and operable on/off switch that is independent of the dimming function. “Slide to off” or “rotate to off” type switches are not acceptable.
      2) Installing multiple single station dimming switches in a common wall box and under a common cover plate (ganging) is acceptable. Follow manufacturers' written instructions concerning de-rating of ganged single station dimming switches. Do not gang more than three (3) single station dimming switches. If more than three (3) single station dimming switches are required, use a multi-station or Architectural dimming system solution.
   b. Linear Fluorescent Type: Single station dimming switches used for linear fluorescent dimming systems shall be composed of wall box control stations, ballast interfaces, and electronic dimming ballasts, as required for the installation. Preferred style is Lutron Ariadni.
   c. Compact Fluorescent (CFL) Type - Any single station dimming switch used to control CFL lighting shall be fully tested, approved, and listed by the switch manufacturer for the specific CFL light fixture/ballast installation.
   d. Light Emitting Diode (LED) Type - Any single station dimming switch used to control LED lighting shall be fully tested, approved, and listed by the switch manufacturer for the specific LED light fixture/driver installation.
e. Preferred manufacturers
   1) Lutron Electronics Co., Inc.
   2) Leviton Manufacturing Co., Inc.

2. Multi-Station
   a. Use a multi-station wall box type lighting control system, like Lutron Grafik-Eye, when the lighting design has more than three (3) dimming/control zones in a single room, or where an interconnection to an auxiliary system such as an AV system or window shade control system are required. Small classrooms and conference rooms are likely candidates for multi-station lighting control systems.
   b. Preferred manufacturers
      1) Lutron Electronics Co., Inc.
      2) Leviton Manufacturing Co., Inc.
      3) Crestron Electronics, Inc.

3. Architectural Dimming Systems
   a. Use an architectural dimming system when the lighting design has more than eight (8) dimming/control zones in a single room, or where a shared dimming rack can/must be utilized to serve more than one (1) room or partition.
   b. Architectural dimming systems will typically be employed in large classrooms, large assembly spaces, and large multi-function spaces.
   c. In general, the architectural dimming system equipment rack will be installed in an equipment room immediately adjacent to the space served. The main system controller / microprocessor will be housed in the dimming equipment rack. Provide a user interface at or near the dimming rack for system modifications and updates. The use of universal type dimming modules is strongly encouraged.
   d. Use low-voltage push button control stations at entries.
   e. Use low-voltage master manual slide type dimming control stations at instructor stations. A minimum of eight (8) presets buttons shall also be located at the instructor station. The preset buttons may be part of the master control station.
   f. Provide other low-voltage dimming control stations, preset control stations, room partition stations, and audio/visual interface controls as required.
   g. Preferred manufacturers
      1) Electronic Theater Controls, Inc. (ETC)

E. Emergency Lighting (Section 26 52 00)

   1. Provide emergency lighting as required by referenced standards or where directed. The main function of emergency lighting is to direct building occupants safely out of building in the event of an emergency.

   2. Connect emergency lighting to emergency power distribution systems where new emergency power distribution systems are a part of design.
3. Connect emergency lighting to existing emergency power distribution systems only after a complete load study of existing distribution system to verify sufficient capacity or where directed by Engineering Services or CFS.

4. Provide integral battery power for emergency lighting where no existing or new emergency power distribution system exists. Wherever possible, provide all lead, long life batteries. High temperature, maintenance free, nickel-cadmium batteries are acceptable, however, lead-calcium type are not. Batteries shall have a minimum 5 year guarantee.
   a. Emergency battery power supply shall be suitable for installation remote from or in ballast compartment of fluorescent luminaire. Unit shall be capable of providing normal fixture operation in a switched fixture. Include "TEST" switch and "AC ON" indicator light capable of installation in luminaire or remote from luminaire. Power supply shall have self-test diagnostic feature. Test shall be performed at minimum of 30 seconds every 30 days and 90 minutes once year.
   b. Preferred manufacturers
      1) Philips Bodine
      2) Dual-Lite

F. Exit Signs (Section 26 53 00)

1. Preferred exit signs shall have cast aluminum housings and stencil faces with matte black finish. Letters shall be red. However, in buildings with existing exit signs to remain and having green colored letters, new exit signs shall also have green colored letters pursuant to the Indiana Building Code. Light source shall be light emitting diodes (LED). Exit signs shall employ a diffuser lens for even illumination of letters. Products that exhibit “dots” or “hot spots” shall not be acceptable.

2. Preferred Manufacturers:
   a. Lithonia – “Signature LRE” Series
   b. Sure-Lites – “CAX” Series
   c. Emergi-Lite – “Preceptor” Series

G. Regulated Waste Disposal

1. All waste shall be labeled, stored, handled, transported, and disposed of in accordance with applicable State, and Federal regulations.

2. Fluorescent Lamps: All fluorescent lamps shall be assumed to be Hazardous Waste or Universal Waste unless contractor can document otherwise to IU Environmental Health and Safety Department (EH&S). IUB representative is Dan Derheimer, (812) 855-3234. IUPUI representative is Kevin Mouser, (317) 274-4351. Comply with all hazardous waste regulations. Legible copies of all Treatment, Storage, and Disposal Facility (TSD) signed manifests shall be provided to EH&S within ten days of TSD receipt. Contractor shall box all
fluorescent lamps being removed and contract their disposal to an approved lamp recycler.

3. Approved lamp recyclers include:
   a. Lighting Resources
      498 Park 800 Drive
      Greenwood, IN  46143
      Telephone:  (317) 888-3889
   b. Onyx Environmental Services
      3230 101st Avenue N.E.
      Blaine, MN  55449
      Telephone:  (763) 786-3660
   c. Superior Special Services
      1275 Mineral Springs Drive
      Port Washington, WI  53074
      Telephone:  (800) 556-5267

4. Ballasts: Contractor shall dispose of all non-PCB ballasts as solid waste to local landfill. Contractor shall dispose of all PCB ballasts as PCB ballast waste. Contractor shall provide drums and five gallon plastic buckets and plastic bags that serve as liners for buckets. Ballasts shall be accumulated in one secured location at the Project Site; verify location with Owner prior to start of job. Contractor shall label drums and buckets as “PCB”, “non-PCB”, or “PCB Leaker”, as appropriate. Drums and buckets shall be securely closed at end of each workday. Contractor shall arrange for the proper disposal of ballasts with one of the approved recyclers listed above. Provide EH&S with legible copy of TSD signed manifests.

5. Proper personal protective equipment must be used when handling leaking PCB ballasts. Contractor(s) performing this work must be approved by EH&S.

6. Remove ballasts from all light fixtures.

7. Wipe light fixture’s metal parts clean of deposits leaked from ballasts. Dispose of rags with ballasts. Spills must be cleaned in accordance with the national PCB Spill Cleanup Policy (52 FR 10688).

END OF 26 51 00