

Energy Usage Standards

- A. All systems shall be designed in compliance with the current ASHRAE Standard 90.1 “Energy Standard for Building Except Low-Rise Residential Buildings”, and the energy usage requirements prescribed by the Arkansas Energy Code and the Department of Energy.

Electrical Distribution Standards

- A. Electrical systems distributed throughout the building shall be based upon the 480-volt or 208-volt, three-phase, grounded wye configuration except electrical system extensions in existing buildings may match existing criteria.
- B. Transient voltage surge protection and lightning arrester devices shall be located on main service distribution equipment.
- C. Current carrying conductors shall be a minimum No. 12 American Wire Gauge, except for systems wiring such as fire alarm, data, telephone, etc. Conductors shall only be copper Aluminum Stabilloy may be utilized in lieu of copper conductors from the utility transformer to the building main disconnect switch. Terminations must be listed compression connectors using a compatible oxide inhibitor. A school district shall put in place and submit to the division a maintenance plan for annual review of all terminations by qualified personnel. Conductor size No. 12 and No. 10 must be solid type, except where flexibility is required, such as at motors. Conductors larger than No. 10 shall be stranded. Aluminum lugs for terminating copper conductors are acceptable, if labeled for that purpose.
- D. Current carrying conductors shall be installed in conduit systems conforming to the National Electrical Code, latest edition.
- E. Continuous equipment grounding conductors shall be installed in all circuits bonded to all ground lugs, bussing, switches, receptacles, equipment frames, etc., per the National Electrical Code. The main facility grounding field electrode system to ground shall be 5 ohms or less.
- F. Electrical systems main service equipment shall be designed with a minimum 25 percent spare amperage capacity and 20 percent spare space capacity. Panel board loads shall not exceed 75 percent of amperage capacity and each panel shall be provided with a minimum of 6 spare overcurrent protection devices. Provide spare overcurrent protection devices in branch distribution panel boards and main service equipment boards.
- G. Electrical energy distribution equipment shall be located in dedicated electrical or mechanical rooms. Main electrical service (switchboards) distribution equipment shall not be located in the main heating or cooling generating room. Branch circuit distribution panel boards recessed in corridor walls will not be acceptable. Provide exterior lockable Main Disconnecting means.
- H. Coordinate service entrance requirements with local utility service companies for electrical energy, telephone, and cable television.
- I. Dry type transformers shall be NEMA TP-1/TP-2 compliant energy efficient type.

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- J. Electrical branch circuits to 5 horsepower, 3-phase, and larger motors for air-handling units, exhaust fans, pumps, chillers, and condensing units shall be provided with phase loss protection. Protection shall prevent equipment from single phasing. Phase loss protection equipment shall be integral to starters or variable frequency drives serving the equipment.
- K. Voltage drop for feeders between the service entrance equipment and the branch circuit distribution equipment shall conform to the requirements of The Arkansas Energy Code.
- L. The intent of connecting emergency power to selected components of the HVAC system is to provide an opportunity to limit damage from freezing weather during a power outage of short duration. The following components are not required to be connected to the emergency power source and are optional within budgets:
1. Air handling unit pre-heat coil (heating coil)
 2. Cooling tower basin heaters.
 3. Chilled water circulating pump, when used for chiller freeze protection.
- Independent, separate raceway, wiring, and transfer switches shall be provided for emergency life safety systems and non-emergency life safety systems.
- M. Consideration to run all branch circuit and feeder conduits within buildings above ceilings and within walls shall be taken. No device conduits are permitted in or below slabs unless serving a device or millwork that requires it. Below slab conduit may be used from MDP to the secondary panels only. Conduit shall be $\frac{3}{4}$ " minimum trade size. MC cable may be used for "lighting whips" of lengths less 6'0". EMT conduit should be used within walls and above ceilings to ease future circuit and technology upgrades.
- N. PVC conduit is not allowed except for the underground portion of the incoming utility service to the buildings. It must then be encased in 3" of concrete. All elbows and risers to 6" above finished floor in PVC conduit runs must be rigid steel. PVC elbows are not allowed.
- O. MC cable is not allowed for use in walls to devices.

Lighting Standards

- A. Interior instructional spaces shall be artificially illuminated with energy-efficient and high-efficiency fluorescent light fixtures utilizing low harmonic electronic ballasts and low-mercury certified lamps.
- B. High volume spaces such as gymnasiums, student dining, etc., shall be illuminated with high-efficiency, high-intensity discharge lamp type light fixtures; or, an equal or better energy efficient fluorescent luminaire that maintains or increases light levels. Fluorescent luminaires which are at least as efficient as high-intensity discharge fixtures are recommended over seating areas. Quartz restrike options shall be incorporated into some fixtures to provide an average of 2 foot-candles of illumination during the cool-down/warm-up (restrike) period caused by momentary electrical outages.
- C. The minimum illumination (foot-candle) levels shall conform to the established Illuminating Engineers Society of N.A. guidelines. See illumination chart at the end of this section. Foot-candle calculation

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shall be developed by using computerized point-by-point analysis of classrooms and other learning spaces. Ceiling, wall, and floor material reflectances shall be verified with the Electrical Design Professional.

- D. Emergency means of egress lighting shall be provided per local and NFPA Code requirements. The following areas shall have emergency illumination whether having natural illumination or not:
1. Exits and exit access corridors
 2. Small and large assembly areas
 3. Locker rooms
 4. Student restrooms
 5. Main and other dedicated electrical rooms
 6. Main mechanical room and other mechanical decks
 7. Emergency power equipment location
 8. Administration and other building control areas
 9. Kitchen/student dining
 10. Interior instructional space
 11. Rooms with occupant load over 50 people
 12. Exterior side of exterior exit doors

Where the total emergency power load exceeds 8 kW, emergency power shall be delivered by on-site, standby power generator. Generators rated 150 kW and below shall use gaseous fuel (if available, large units shall be diesel).

- E. Light fixtures shall be controlled by switches on a per room basis where fixtures are located. Circuit breakers will not be acceptable for turning lighting “on” and “off”.
- F. Exterior parking areas shall be illuminated with high-intensity, discharge lamp type light fixtures.
- G. High school student dining area shall be equipped with theatrical type lighting controlled by dimmer banks and control consoles.
- H. Computer labs shall be illuminated with fluorescent light fixtures constructed and configured to reduce glare on computer monitors. Minimum Visual Comfort Probability (VCP) in these rooms shall be 80%.
- I. Fluorescent lighting in instructional spaces shall be oriented so the long dimension of the fixture is parallel with the chalkboard on the primary instructional wall unless design parameters suggest otherwise. Optionally provide wall wash type fixtures to illuminate white-boards or chalk-boards.
- J. Provide site lighting to foot-candle levels recommended by Illuminating Engineering Society of N.A.
- K. Light fixtures located in gymnasiums and auxiliary gymnasiums shall be equipped with protective wire guards.
- L. Exit signs shall be wall mounted, where possible, in lieu of ceiling mounted and be of the LED type.
- M. Art rooms shall be provided with supplemental incandescent track lighting in middle schools and high schools.
- N. Walk through fluorescent lighting shall be provided to supplement main lighting in gymnasium and auxiliary gymnasiums to illuminate area to 5 foot-candles. Fixtures shall be vandal-resistant type and protected with wire guards. Mount fixture at same level as high intensity discharge lighting.

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- O. Options shall be investigated for control of exterior and interior corridor lighting by direct digital control, the energy management system, or occupancy sensors.
- P. Interior lighting shall be controlled by occupancy sensors, automatic timed lighting controlled system or a combination of both to comply with ASHRAE 90.1 as required by the Arkansas Energy Code. Exterior lighting shall be controlled by photo sensor or astronomical time clock to comply with ASHRAE 90.1 1 as required by the Arkansas Energy Code to automatically turn lighting off when sufficient daylight is available.
- Q. Instructional space lighting shall be configured to provide at least two levels of light. One level shall be configured to darken the area around a video or projection screen.
- R. Options shall be investigated for providing non-disruptive day-light harvesting in classrooms and other spaces with natural lighting.

Wiring Devices Standards

- A. General purpose use, 120-volt duplex receptacles shall be specification grade, 20 amp standard grounded type.
- B. Separate receptacles located within instructional spaces shall be provided for general purpose uses and for computer/video technologies.
- C. Instructional spaces shall be provided with a minimum of 8 general use receptacles, as well as double duplex receptacles next to computer/video technologies ports.
- D. Each space or room shall be provided with a minimum of one, 120-volt receptacle.
- E. General purpose receptacles in corridors shall be spaced a maximum of 50 feet apart.
- F. Office areas, conference rooms, and teacher workrooms shall be provided with a minimum of 4 receptacles.
- G. Duplex receptacles within 6 feet of plumbing fixture units shall be ground fault protected. These receptacles shall be protected by a local or an integral ground fault device.
- H. A maximum of 4 computers shall be on a single 20-amp, 120-volt electrical circuit with a dedicated ground, and neutral. Do not share computer circuit neutrals with other branch circuits.
- I. Key-type switches protected with wire guards shall be used to control lighting in gymnasiums, auxiliary gymnasiums, and locker rooms. Non-protected key switches shall be used to control lighting in corridors, large group restrooms, and other public spaces. Instructional type spaces shall be controlled by toggle-type switches.
- J. Provide an exterior, weatherproof ground fault protected duplex receptacle outside each main exterior door.
- K. Electrical receptacles serving food service equipment not located against walls shall be mounted above the floor line on pedestal-type mountings.
- L. Pre-kindergarten/kindergarten classrooms and their auxiliary spaces shall have duplex, tamper-resistant receptacles installed.
- M. Receptacles shall be side-wired using pigtails. Back-wiring or thru-wiring on device terminals is not acceptable.

Fire Alarm System Standards

- A. Fire alarm and fire protection systems shall be installed per the Fire Prevention Code and NFPA 72.
 - B. Companies designing, installing or servicing fire alarm systems in Group E occupancies must be properly licensed by the Arkansas Board of Private Investigators, Private Security Agencies and Alarm Systems Companies.
 - C. Fire alarm shop drawings must be prepared in accordance with the Arkansas Fire Prevention Code and approved by the State Fire Marshal's office or their Designee prior to installation.
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- ~~A. Fire alarm systems shall be of addressable type, incorporating activation devices such as pull stations, smoke detectors, flow switches, duct detectors, etc., and audio visual devices such as horns and strobes.~~
 - ~~B. System shall comply with the local building code, National Fire Protection Association, and the Americans with Disabilities Act. System shall be in full compliance with IBC and Arkansas Fire Alarm Code.~~
 - ~~C. Main control panel shall be located in the administrative area with remote annunciator stations at main entries, conforming to local jurisdiction requirements.~~
 - ~~D. Strobe devices shall have their candela light intensity discharge conforming to the Americans with Disabilities Act and local codes.~~
 - ~~E. Visual devices shall be located in spaces occupied by students, instructors, and the public. Audible devices shall be located so device delivers sounds levels that are 15 Db over ambient noise levels in areas occupied by students, instructors, or public.~~
 - ~~F. System shall be connected electronically by a digital communicator to an independent monitoring agency or company that is not located on building site premises.~~
 - ~~G. A manual pull station shall be provided per in food service areas, at each exterior door used as means of egress, and at other locations conforming to the National Fire Protection Association, and other local codes.~~
 - ~~H. Provide a two-way communication system in spaces designated by the Design Professional as "area for a rescue". Communication system shall conform to the Americans with Disabilities Act.~~
 - ~~I. Provide audible alarm devices in high ambient noise areas such as technology production labs, vocal rooms, and instrumental rooms.~~
 - ~~J. Protect fire alarm devices located in gymnasiums, auxiliary gymnasiums, and locker rooms with wire guards.~~
 - ~~K. Provide duct smoke detectors where required by NFPA 90 A.~~
 - ~~L. Smoke detectors shall provide full coverage of all spaces.~~

Security Systems Standards

- A. Within the base building electrical system cost, provide the following basic security system, items B, C, and D.
- B. Provide conduit rough-in and wiring only for key pad locations, motion sensors, and control panel.
- C. System selection, installation and funding shall be by the school district.
- D. A minimum system design shall include door contact switches at exterior doors and motion detectors distributed throughout

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corridors, administrative areas, and in rooms with 6 computers or more.

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Lightning Protection Standards

- A. Within the design of the base building electrical system, the Electrical Design Professional has the option of including an Underwriter's Laboratory (UL) listed and certified lightning protection system, where calculations indicate the facility may be at elevated risk. Therefore, where calculations indicate the facility may be at an elevated risk, new school buildings shall be protected but additions to existing schools with no history of damage with similar roof elevations may be omitted.

Technology Electrical Standards

- A. Within the base building electrical system cost, provide the following basic Technology rough-ins: (Items B - L). Coordinate the placement of all Technology Conduits, boxes and outlets with the Technology Design Professional.
- B. Provide Telecommunications cable tray above corridor ceilings of academic wings.
 - 1. Provide 24" center-hung raceway in main corridors.
 - 2. Provide 18" center-hung raceway in secondary corridors.
 - 3. Cable tray shall connect between all intermediate closets Telecommunication Rooms (TRs) and the Main Cross-connect (MC).
 - 4. Provide continuous bonding conductor (minimum #6 AWG), in accordance with NEC-250 and TIA/EIA-607, in all cable trays and bond to associated Telecommunications Grounding Busbar (TGB).
 - 5. NOTE: Cable "D" devices may be used in lieu of cable trays in both main and secondary corridors, providing they are of sufficient size to clearly distinguish individual runs.
- C. Junction boxes used for data/voice/video outlets shall be 2-gang, 3 1/2" deep boxes and equipped with a minimum of a 1" conduit home run to the associated Telecommunications Cable Tray, except where noted by the Telecommunications Design Professional.
- D. Telecommunications Rooms (TRs) shall be provided with a minimum of two (2) 120-volt, 30 Amp circuits for powering rack mounted UPS Units. Quantity and location of circuits will depend upon requirements of Technology Design professional. If the building has a standby Generator, these circuits shall be attached to the standby power. General use receptacles, as well as double duplex receptacles shall be provided next to computer/video technologies ports.
- E. Provide power outlets, technology cabling home-run conduits and projector mounting brackets as follows:
 - 1. Provide one (1), 2-gang, 3 1/2" deep box for Technology use (HI station) and a quad power outlet mounted at 18" below finished ceiling for monitors installed in wall or ceiling mounts.
 - a. Provide one (1), home run, 1-1/4" conduit from HI Station box to associated instructor LO Station box.
 - b. Provide one (1), home run, 1" conduit from HI Station box to associated Telecommunications Cable Tray.

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2. Provide one 2-gang, 3½" deep box for the instructor's LO station and quad power outlet at 18" AFF.
 - a. Provide one home run, 1-1/4" conduit from LO Station box to associated monitor HI Station box.
3. For locations with an Overhead Mounted Projector in lieu of a Monitor, provide one (1), 1-gang, 3½" deep box for Technology use (Projector HI station) and a dual power outlet mounted in a finished ceiling tile, projector bracket in the finished ceiling.
 - a. Provide one (1), home run, 1-1/4" conduit from Projector HI Station box to associated instructor LO Station box.
 - b. Provide one (1), home run, 1" conduit from Projector HI Station box to associated Telecommunications Cable Tray.
- F. Provide a minimum 4-3/4 inch high center divided surface applied metal raceway in computer labs where equipment is located on perimeter of room.
 1. Provide one (1) 1" conduit for every six computer workstation locations stubbed up above the nearest finished ceiling and home run to the Telecommunications cable tray.
- G. Provide two (2) 2-gang, 3½" deep boxes for the video projector local inputs, with one on the backside of the proscenium wall and one in the control booth.
 1. Provide one home run 1½" conduit from each box to the video projector in the ceiling.
- H. Provide a minimum of one 4" conduit for Wide Area Network (WAN) from the Service Provider (SP) Entrance (DEMARC) to the property line.
- I. Provide one (1), 4" conduit for cable television (CATV) from the Service Provider (SP) Entrance (DEMARC) to the property line.
- J. Provide one (1), 4" conduit for the telephone from the Service Provider (SP) Entrance (DEMARC) to the property line.
- K. Provide a minimum of two (2), 4" conduits from the Service Provider Entrance (DEMARC) to the Main Cross-Connect (MC) Telecommunications Room (TR). Conduit runs for fiber optic cable have no more than four 90 degree bends without installations of a pull box. All 90 degree bends are to be wide sweep.
- L. Provide one (1), 2" sleeve in all classroom block walls.

Telecommunications Grounding Standards

- A. Provide Telecommunications Grounding/Bonding System in accordance with NEC-250 and TIA/EIA-607 using approved Grounding Hardware. CAD Weld Bonding Conductors to Building Steel.
- B. Provide Telecommunications Main Grounding Busbar (TMGB), and Grounding Busbar (TGB) in Main Cross-connect (MC) Telecommunications Room (TR).
 1. All TMGB and TGB Connections to be made with double-bolted, Compression style, Grounding Lugs.

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2. As a minimum, Bond TMGB to following:
 - a. Building Steel (minimum #2 AWG insulated copper bonding conductor).
 - b. Main Electrical Service Ground (minimum #2 AWG insulated copper bonding conductor).
 - c. Local Service Panel Ground (minimum #6 AWG insulated copper bonding conductor).
 - d. Telecommunications Bonding Backbone (TBB) that connects TMGB to other TGBs (minimum #2 AWG insulated copper bonding conductor).
 - e. Associated Telecommunications Cable Tray(s) (minimum #6 AWG insulated copper bonding conductor).
 - f. Telecommunications Conduit(s) Entering TR (minimum #6 AWG insulated copper bonding conductor).
- C. Provide Telecommunications Bonding Backbone (TBB) between all TGBs and the TMGB.
 1. The TBB shall be a minimum of #2 AWG insulated copper bonding conductor.
 2. All TBB Connections to be made with double-bolted, Compression style, Grounding Lugs.
- D. As a minimum, the Technology Contractor shall bond the following devices to the associated TMGB and TGBs using a minimum #6 AWG insulated copper bonding conductor using compression style lugs:
 1. PABX equipment
 2. Equipment racks and cabinets
 3. TR cable ladder and tray
 4. CATV Equipment
 5. Lightning and surge protectors
 6. Telecommunications devices
 7. Coupled Bonding Conductors (CBCs)
 8. Backbone cable shields
 9. Telecommunication and fiber cable shields
 10. Antenna cable shields
 11. Raised floors

Intercom / Bell Systems Guidelines

- A. Provide a complete intercom communication system with call stations and speakers in each occupied space and speakers on the building exterior. Speakers shall be located and sufficiently powered to be clearly heard.
- B. The intercom system shall be capable of generating various tone signals to be used in special notification situations.
- C. Provide Battery Back-up for operation during a power failure.

SCHOOL LIGHTING LEVELS - 2004

ROOM TYPE CLASSIFICATION	2000 IES FOOTCANDLES	RECOMMENDED DESIGN FOOTCANDLES DIRECT LIGHTING(1)	RECOMMENDED DESIGN FOOTCANDLES INDIRECT LIGHTING
ADMINISTRATIVE			
Offices/Receptionist	50	50	40
Storage Rooms	-	25	25
Restrooms	5	25-30	25-30
Conference/Resource Rooms	30-100	50	40
Health Clinic	50	50	40
Teacher Prep/Workroom	50	50	40
CLASSROOMS-GENERAL			
Art Rooms/Kiln	50	50	40
Modular Technology Labs	-	50	40
CADD Labs	30	30	30
Industrial Tech/Production Labs	100	60	60
Computer Labs	30	40	40
Graphics Labs	30-100	50	40
Life Skills Labs	50	50	50
Science Labs	50	50	50
Laundry Rooms	-	25	25
Music Rooms	30-50	50	40
Large Group Instruction Rooms	30	50	40
MEDIA CENTER			
Active Areas	30 vertical	50	40
Inactive Areas	5 vertical	40	40
ATHLETIC AREAS			
Gymnasium - Elementary School	100	50	-
Gymnasium - Middle School	100	50	-
Gymnasium - High School	100	60	-
Multi-use P.E. Rooms	-	50	-
Locker Rooms	10	25	25
STUDENT DINING			
Assembly	10-20	20	-
Stage/Work Lights	30	20	-
Make-up/Dressing Rooms	30-50	50	-
Theatrical Control Room	10-30	30	-
Equipment room with dimmable incandescent lighting offering 10 foot-candles of illumination.			

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STUDENT DINING	10-50	50	40
Cooking	50	75-80 (2)	-
Food Preparation	50	75-80 (2)	-
Serving Line	50	75-80 (2)	-
Ware Washing	10	75-80 (2)	-
CUSTODIAL CLOSETS	10-30	20-30	-
ELECTRICAL ROOMS	30	20-30	-
MECHANICAL ROOMS	30	30	-
PARKING AREA	.2	1 (3)	-
DRIVEWAYS	.3	.5 (3)	-
CIRCULATION AREAS			
Building Entries	5	5-10 (3)	-
Corridors	5	20	20
Corridors with Lockers	5	20	20
Stairways	5	20	20
(1) Maintenance factor 70% LL/SF = Lamp Lumens per square foot			
(2) Foot-candles shall comply with local health department regulations			
(3) Foot-candles shall conform to page 4200-6			

Outlet Locations

ELECTRICAL OUTLET DEVICE TYPE	Masonry Wall, Base (Starter) Course <u>Height</u> 4 inch 8 inch Mounting Height Above Floor to Bottom of Outlet (Device) Box	
Receptacle outlets, microphone outlets (jacks), equipment outlets (jacks), television outlets (jacks), portable telephone outlets, computer outlets, etc. * General throughout 18" * Mechanical equipment rooms 52" * Above counter tops 30"H 36" 36"H 44" 48"H 52" * Above backsplash top 2" minimum * Above radiators 6" minimum * Above or adjacent to lavatories 44" * Behind domestic refrigerators 52" * Behind domestic washers and dryers 36" * Serving domestic dishwashers 2" * Wall-mounted telephone outlets 44" * Telephone/video control 44"		18" 48" 40" 48" 56" 2" minimum 6" minimum 48" 56" 32" 2" 48" 48"
Toggle switches	48"	48"
Recessed motor controllers	60"	56"
Electric panels, terminal cabinets, etc., to center of tub or box	50"	48"
Clocks	Near ceiling	Near ceiling
Pull stations (fire alarm)	44"	44"
Volume controls, call-in switches, doorbell buttons	44"	44"
Horn/strobes (fire alarm)	80"	80"