ARC FLASH STUDY

Consultant Design Guideline

It is the intent of the University of Arkansas to comply with the Arc Flash requirements as provided for in NFPA 70E, Standard for Electrical Safety in the Workplace. The responsibilities and scope of work for design professionals and contractors for major renovation and new construction projects are to deliver to the University at the time of turnover, a system that fulfills the labeling requirements under the standard (See Appendix W for this standard), and that meet the analysis criteria as specified in IEEE Standard 1584.

The consultant specifications shall require the general contractor to deliver a completed arc flash study stamped by a professional engineer, complete with both electronic and hard copy report. The deliverable shall also include the electronic computer modeling files for the fault current, coordination, and arc flash calculations. The University prefers that the analysis be performed using SKM xxx, by Company, though it is not a requirement.

The consultant specification shall be structured to require a two step analysis process. The first step shall be based on the approved electrical equipment supplier submittal documents and reasonable assumptions for the installed condition. The model shall be run for the final deliverable report based on the as built condition, using actual cable lengths and the approved coordination protective device settings prior to the generation and installation of Arc Flash labeling.

The University can assist during the design process to insure that the contract documents comply with the requirements of this section.

26 01 30 Operation and Maintenance of Facility Electrical Power Generating and Storing Equipment
26 01 40 Operation and Maintenance of Electrical and Cathodic Protection Systems
26 01 50 Operation and Maintenance of Lighting
   26 01 50.51 Luminaire Relamping
   26 01 50.81 Luminaire Replacement

26 05 00 Common Work Results for Electrical
Consultant Design Guideline

**Electrical Load Calculations:**

1.01 General: The electrical system designer shall calculate the estimated peak building demand for electricity. The calculated peak demand shall consider load diversity. The calculations shall identify the peak electrical demand associated with each energy system including air handling systems, heating water system, chilled water system, domestic hot water system, elevators, exhaust fans, interior lighting, exterior lighting, and miscellaneous equipment. The electrical system designer shall also determine the appropriate capacity of the building primary transformer.

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**26 05 13 Medium-Voltage Cables**

CONSULTANT DESIGN GUIDELINE

Rate all primary cables at 15,000 volts. Rate all distribution transformers at 15,000-volt primary with a nominal center tap voltage rating of 12,470 volts

**INCLUDE IN CONSTRUCTION DOCUMENTS**

Specify all cables inside tunnels to be galvanized steel interlocked armor with a ground and jacket or single conductors in rigid galvanized steel conduit.

All buried medium voltage electrical shall have PVC conduit encased in red concrete at 30", minimum, depth.

Specify high voltage caution signs to be placed on all high voltage splice and pull boxes.

All primary electrical feeder terminations in the switchgear transformer cubical, etc., shall have dead front construction.

All new building construction or renovation that involves replacement or upgrade of the medium voltage switchgear or replacement of the primary transformers shall include a means of providing the building with a looped primary feed. The switch shall have a minimum of three ways: loop in, loop out, and building feed. Coordinate the design with Facilities Management to include appropriate duct bank access to the switch for future growth.

---

1 Computers, printers, copiers, task lighting, etc.
CONSULTANT DESIGN GUIDELINE
Minimum size for all conductors other than control wiring shall be #12.

Cable and wire shall be new, unspliced, annealed copper. Aluminum conductors shall not be allowed. Cable and wire shall be stranded for sizes #8 and larger and shall be solid for sizes #10 and smaller.

Insulation shall be THW, XHHW, or dual rated THHN-THWN, UL 44, 83 and 493.

Controls, communication, and signal wiring shall be stranded copper and shall conform to the recommendations of the manufacturers of the particular systems. Unless otherwise specified in other sections of these specifications, size control wiring as specified for power and lighting wiring, except that the minimum size shall be not less than #16. Multi-conductor cables shall have the conductors color-coded.

INCLUDE IN CONSTRUCTION DOCUMENTS

Splice and joint connectors shall comply with UL 486 A, B, D, and NEC.

Connectors for branch circuits (#10 and smaller) shall be solderless, screw-on, reasonable pressure cable type, 600 volt, 105 degree C. with integral insulation, approved for copper conductors. The integral insulator shall have a skirt that completely covers the stripped wires.

Connectors for feeder circuits shall be as follows:
Connectors shall be indent, hex screw, or bolt clamp-type of high conductivity and corrosion-resistant material.
Field installed compression connectors for cable sizes 250 MCM and larger shall have not less than two clamping elements or compression indents per wire. Insulation materials for splices and joints shall be approved for the particular use, location, voltage, and temperature. Insulate with not less than that of the conductor level that is being joined. Plastic electrical insulating tape shall comply with Fed Spec HH-I-595. Tape shall be flame retardant and cold weather resistant.

Wire lubricant shall be suitable for the wire insulation and conduit it is used with, and shall not harden or become adhesive. Prohibit wire lubricant on wire for isolated type electrical power systems.

**EXECUTION**

Install all wiring in raceway systems.

Install cable supports for all vertical feeders in accordance with the NEC. Provide split wedge type, which firmly clamps each individual cable and tightens due to cable weight.

For panelboards, cabinets, wireways, switches, and equipment assemblies, neatly form, train, and tie the cables in individual circuits.

Seal cable and wire entering a building from underground between the wire and conduit, where the cable exits the conduit, with a non-hardening approved compound.

Color-code secondary service, feeder, and branch circuit conductors as follows:

<table>
<thead>
<tr>
<th>PHASE</th>
<th>120/208 or 120/240</th>
<th>277/480</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Red</td>
<td>Brown</td>
</tr>
<tr>
<td>B</td>
<td>Blue</td>
<td>Orange</td>
</tr>
<tr>
<td>C</td>
<td>Black</td>
<td>Yellow</td>
</tr>
<tr>
<td>Neutral</td>
<td>White *</td>
<td>Gray</td>
</tr>
<tr>
<td>Ground</td>
<td>Green</td>
<td>Green</td>
</tr>
</tbody>
</table>

*or white with colored (other than green) tracer.

For phase conductors #8 and larger, color code using one of the following:

- Solid color compound or solid color coating.
- Stripes, bands, or hash marks of color specified above.
Color as specified using ¾" wide tape. Apply tape in half overlapping turns for a minimum of three inches for terminal points, and in junction boxes, pull boxes, troughs, manholes, and handholes. Apply the last two laps of tape with no tension to prevent possible unwinding. Where cable markings are covered by tape, apply tags to cable stating size and insulation type.

For modifications and additions to existing wiring systems, color-coding shall conform to the existing wiring system.

Splice cables and wires only in outlet boxes, junction boxes, pull boxes, manholes, or handholes. No splices shall be concealed within conduit. The number, size, and combination of conductors shall be in strict compliance with listed guidelines on the connector manufacturer's packaging. Splices and terminations shall be mechanically and electrically secure.

Control voltage (24 V, maximum) conductors may be installed without conduit above lay-in ceilings with permission from local authority having jurisdiction. The following conditions must be met:

Conductors shall be neatly bundled and "zip tied" to bottom chord of joists or to conduit on ten foot intervals. Conductors shall not be laid loosely on ceiling tiles.

All wiring in utility rooms and closets shall be neatly bundled and "zip tied" to nearest available strut, conduit, or pipe. Where no strut, conduit, or pipe is available, install wire in plastic raceway.

Install all wiring in walls, above gypsum board ceilings, or in occupied areas that have no ceiling in conduit.

Size wire sufficiently large that the voltage drop under in rush conditions does not adversely affect operation of the controls (maximum of 3% volt drop from source of power to end use).

Except where otherwise required, install a separate power supply circuit for each system in order that malfunctions in any system will not affect other systems.

Where power supply circuits are not shown for systems, connect them to the nearest panelboards of suitable voltages, which are intended to supply such systems and have suitable spare circuit breakers or space for installation.

Install a breaker lock on the branch circuit breaker for the power supply circuit for each system to prevent accidental de-energizing of the systems.

Install insulated crimp type forked lugs on control wiring that is to be connected to terminal strips. Size lugs properly for both the wire and the terminal strip. Use forked lugs unless the controls manufacturer specifies ring type.

Install a permanent wire marker on each wire at each termination. Identifying numbers and letters on the wire markers shall correspond to those on the wiring diagrams used for installing the systems.
In each pull box and junction box, install metal tags on each circuit cables and wires to designate clearly their circuit identification and voltage.

Feeders and branch circuits shall have their insulation tested after installation and before connection to utilization devices such as fixtures, motors, or appliances. Test shall be performed by meter and conductors and shall test free from short-circuits and grounds. Test conductors phase-to-phase and phase-to-ground. Meter motors after installation but before start-up and test free from grounds.

END SECTION

26 05 19.13 Under Carpet Electrical Power Cables
26 05 23 Control-Voltage Electrical Power Cables
26 05 26 Grounding and Bonding for Electrical Systems
26 05 29 Hangers and Supports for Electrical Systems

SECTION 26 05 33
RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS (Revised 08/28/2018)

CONSULTANT DESIGN GUIDELINE
Install all wiring in conduit.

Conduit shall be rigid, galvanized, heavy wall steel, for sizes 2½" and larger. Conduit less than 2½" in diameter shall be electrical metallic tubing (EMT), except where installed in slabs on grade, underground, building exterior, or where prohibited by Code, in which case rigid metallic conduit as described above shall be used.

At the Contractor's option, rigid aluminum conduit may be used in lieu of rigid steel conduit in sizes 2½" and larger, except aluminum conduit shall not be buried in concrete or directly in earth.

At the Contractor's option, PVC conduit may be used for underground conduit runs in the horizontal portion only. Rigid metallic conduit shall be required for elbows and vertical transitions for all underground conduit installations.

At the Contractor's option, conduit 2½" and larger may be electrical metallic tubing (EMT) only in interior applications where the conduit is installed concealed within the building ceiling space and non-masonry wall constructions.
INCLUDE IN CONSTRUCTION DOCUMENTS

Conduit size shall be in accordance with the NEC, but not less than ⅜” unless otherwise shown. Where permitted by the NEC, ⅜” flexible conduit may be used for tap connections to recessed lighting fixtures and ⅛” flexible conduit may be used for tap connections to handy boxes in existing walls.

Conduit shall not be required for control voltage conductors except fire alarm system wiring system shall have red anodized EMT conduit.

Design pipe straps specifically for use with electrical conduit; "plumbers tape" shall not be accepted. Design individual conduit hangers for the purpose, having a pre-assembled closure bolt and nut, and provisions for receiving a hanger rod. Multiple conduit (trapeze) hangers shall not be less than 1½” by 1½”, 12 gauge steel, cold-formed, lipped channels; with not less than (?)” diameter steel hanger rods. Solid masonry and concrete anchors shall be steel collet type. Wooden dowels and plastic type anchors shall not be acceptable. Design clamps to be used for attaching to beams, trusses, and joists. Clamps designed to be used for attaching to piping, lay-in ceiling grid, etc. shall not be acceptable.

Outlet, junction, and pull boxes shall comply with UL 50 and UL 514A. Boxes shall be cast metal where required by the NEC or shown, and equipped with rustproof box covers. Sheet metal boxes shall be galvanized steel except where otherwise shown.

Wireways shall be equipped with hinged covers, except where removable covers are shown. All cover assemblies shall contain captive retaining screws.

EXECUTION

Cut holes through concrete and masonry in new and existing structures with a diamond core drill or concrete saw. Pneumatic hammer, impact electric, hand or manual hammer type drills are not allowed, except where permitted by the Engineer as required by limited working space.

Where conduits, wireways, and other electrical raceways pass through fire partitions, firewalls, smoke partitions, or floors, install a fire stop that provides an effective barrier against the spread of fire, smoke and gases with approved materials. Completely fill and seal clearances between raceways and openings with the fire stop material.

At floor, exterior wall, and roof conduit penetrations, completely seal clearances around the conduit and make watertight.

Contractor shall furnish and install all sleeves and inserts for all electrical work passing through, or attaching to, walls, floors, or ceilings. Install conduits passing through designated fire/smoke rated structure with appropriately rated sleeves and inserts to maintain the integrity of the rated wall/floor/ceiling structure. Installation shall conform to NFPA, NEC, and U.L. standards.

Install essential (emergency) raceway systems independently of other raceway systems, excluding those specifically "excepted" by NEC.
Install conduit as follows:

Install conduit in complete runs before pulling in cables or wires. Assure conduit installation does not encroach into the ceiling height headroom, walkways, or doorways. Conduit shall be mechanically and electrically continuous. Independently support conduit. Do not support conduit with suspended ceilings, suspended ceiling supporting members, lighting fixtures, mechanical piping, or mechanical ducts. Support conduit within 12” of changes of direction, and within 12” of each enclosure to which connected. Conduit installations under fume and vent hoods are prohibited.

Install conduit in concrete as follows:

Conduit shall be rigid steel or EMT; except do not install EMT in concrete slabs that are in contact with soil, gravel or vapor barriers. Align and run conduit in direct lines parallel or perpendicular to building lines. Prohibit installation of conduit in concrete that is less than 3” thick. Prohibit conduit outside diameter larger than 3” of the slab thickness. Space between conduits in slabs shall be approximately six conduit diameters apart, except one conduit diameter at conduit crossings. Install conduits approximately in the center of the slab so that there will be a minimum of ¾” of concrete around the conduits. Couplings and connections shall be watertight. Use thread compounds that are UL approved conductive type to insure low resistance ground continuity through the conduits.

Use flexible metal conduit for connections to motors and other electrical equipment subject to movement, vibration, misalignment, cramped quarters, or noise transmission. Provide liquid-tight flexible metal conduit for installation in exterior locations, moisture or humidity-laden atmosphere, corrosive atmosphere, water, or spray wash-down operations, and locations subject to seepage or dripping of oil, grease, or water. Provide a green ground wire with flexible metal conduit.

Equip conduits three inches and larger, that are rigidly secured to the building structure on opposite sides of a building expansion joint, with expansion and deflection couplings. Install the couplings in accordance with the manufacturer’s recommendations. Provide conduits smaller than 3” with junction boxes on both sides of the expansion joint. Connect conduits to junction boxes with 15” of slack flexible conduit. Flexible conduit shall have a copper green ground bonding jumper installed. In lieu of this flexible conduit, expansion and deflection couplings as specified above for 3” and larger conduits are acceptable.

Use wire mold raceway, or equal, for work on existing masonry walls in finished areas. Anchor wire mold on 30” centers. Size wire mold as per manufacturer’s guidelines.

In areas where Contractor is having trouble installing concealed wiring and/or conduit, consult the Architect about using wire mold.

END SECTION
Seismic Restraint

1.02 General: Mechanical systems including ductwork, piping, and equipment shall be equipped with seismic restraints in accordance with the Arkansas Fire Prevention Code and the Arkansas Mechanical Code.

1.03 Calculations: All design calculations shall be prepared by a registered professional engineer experienced in seismic design.

1.04 Materials

1.04.01 Duct Construction: Duct construction shall conform to SMACNA publications.

1.04.02 Piping Fabrication: Piping shall conform to ANSI / ASME B31.9 Building Services Piping Code.

1.04.03 Angles: Cold-formed angles shall conform to the material and identification requirements of the latest “Specifications for the Design of Cold-Formed Steel Structural Members” of the American Iron and Steel Institute with a minimum $F_y = 33$ ksi and a minimum $F_u$ of 38 ksi.

1.04.04 Shapes and Plates: Hot-rolled shapes and plates shall conform to ASTM A36. Pipes used as braces shall be standard steel pipes ASTM A120 or A53.

1.04.05 Cables: Cables shall be wire-core with minimum breaking strength of 4,940 lbs for ¼” cable, 10,980 lbs for 3/8” cable, and 19,280 lbs for ½” cable.

1.04.06 Bolts: Bolts shall conform to ASTM A307. Bolt holes shall be 1/16” larger than the bolt diameter.

1.04.07 Expansion Anchors: Expansion anchors and cast-in-place concrete inserts shall have sufficient shear and tension capacities for the application.

1.05 Duct Supports: Brace ducts with cross sectional areas of 6 SF and larger. Bracing shall occur at the intervals specified in the SMACNA tables. All runs (any length of ductwork without a change in direction) shall have a minimum of 2 transverse braces and 1 longitudinal brace. Bracing is not required if the duct is suspended by hangers 12” or less in length as measured from the top of the duct to the bottom of the support where the hanger is attached.
1.06 Pipe Supports: Brace all fuel oil and natural gas piping, 1” diameter and larger. Brace all piping in mechanical rooms that is 1-1/4” diameter and larger. Brace all piping 2-1/2” diameter and larger. Bracing shall occur at the intervals specified in SMACNA tables. Bracing is not required if piping is suspended by hangers 12” or less in length as measured from the top of the pipe to the bottom of the support.

1.07 Equipment Supports: Bracing shall be provided for pumps, heating water converters, control panels, variable frequency drives, water heaters, and expansion tanks. Equipment shall be braced independently of the attached piping and ductwork.

26 05 53 Identification for Electrical Systems

Identification of equipment

Identification/tagging/tracking of equipment that requires preventive maintenance, on some periodicity, to maximize its operational lifespan is essential. If the equipment will never require any service it need not be entered into our system. Our primary concern is to identify equipment (including mechanical, electrical, and plumbing) that needs to be checked and serviced on a regular basis. An online form [link provided below] facilitates entry of all information needed to input and track equipment in the UA Facilities Management Department's Computerized Maintenance Management System (CMMS). The following process, business rules, and information requirements apply.

INFORMATION NEEDED

1. Barcode tag number
2. Equipment nomenclature
3. Manufacturer
4. Model
5. Serial number (if available)
6. Building name
7. Room number
8. Recommended preventive maintenance procedures and frequencies (i.e. monthly, quarterly, semi-annually, annually)
9. Parts requirements for procedures/frequencies stated in item eight
10. Special conditions for access, unusual tools needed, et cetera should be noted in comments
11. If project is a renovation rather than new construction, report removed equipment by its (old) barcode tag number or by completing items two through seven of a data entry form for each piece of equipment being removed

Link for the new equipment entry form for contractors to use to enter newly installed equipment on campus:
PROCESS

1. Consult business rules on how newly installed building components and equipment are categorized in FAMIS to determine new equipment count
2. Acquire the necessary number of barcode tags from the Facilities Management CMMS Administrator
3. Tag equipment and complete associated data entry forms
4. If project is a renovation rather than new construction, report removed equipment, by FAMIS number or by completed data entry form, to the Facilities Management CMMS Administrator
5. Supply all applicable digitized owner's manuals, user's manuals, maintenance manuals, parts lists, et cetera to the Facilities Management Construction Coordinator who will then give a copy to the Facilities Management CMMS Administrator.
6. Resolve data discrepancies identified by the Facilities Management CMMS Administrator

BUSINESS RULES

1. Components that are cheaper to replace than maintain will not be included
   a. If in doubt, err on the side of identifying and documenting Components
2. Systems or Components with a minimum maintenance frequency of greater than one year will not be included
   a. If in doubt, err on the side of identifying and documenting Systems and Components
3. All inventory items will receive a new metal barcode tag
4. Barcode tags will be affixed using self-adhesive unless the inventory item is located outside or there is not an appropriate surface for adhesion
5. Use plastic zip ties or wire twist ties to affix the barcode tags to items described in the previous rule
6. Major Components of Parent Systems will be labeled according to the following rules:
   a. The Major Component has a replacement value of $500
   b. The frequency with which the Major Component is repaired/replaced is greater than the life of the Parent System
   c. The Pump or Motor (Major Component) is >= 2 HP (This does not include Sump Pumps. Inventory all Sump Pumps)
   d. The Equipment ID of the Parent System shall be recorded accordingly on the Inventory Template of the Major Component that is being barcoded
7. Barcode and record all Heat Pumps, Evaporators and Condensing Units
individually if their capacity exceeds 5 tons

8. Please record the following inventory items on a per floor basis, using one barcode tag per floor. Record locations of individual units and any unusual access or tool requirements individually in comments.
   a. Fan Coil Units
   b. Exit Lighting & Emergency Egress Lighting
   c. Eye Wash Stations
   d. Emergency Showers
   e. Electronic Handicapped Access Door Operators

9. Please record the following inventory items on a per building basis, using one barcode tag per category. Record locations of individual units and any unusual access or tool requirements individually in comments.
   a. Emergency Egress Doors
   b. Heat Pumps, Evaporators and Condensing Units with a capacity of <= 5 tons
   c. Bathrooms
   d. Drinking Fountains
   e. Recirculating Pumps
   f. Interior Doors
   g. Fire Doors

10. Major Systems or Components (i.e. Elevators and Sprinkler Risers) of value >= $1,000 shall be considered an inventory item even if the PM is outsourced

11. All Regulatory Code Reporting Items, such as backflow protection devices, expansion tanks, flash tanks, and steam converters) shall be included in the inventory

12. Individual pumps in duplexed configurations shall each be tagged as individual pieces of equipment. Note duplexed installations in comments.

End of Section

26 05 73 Overcurrent Protective Device Coordination Study

26 06 00 Schedules for Electrical
26 06 10 Schedules for Medium-Voltage Electrical Distribution
26 06 20 Schedules for Low-Voltage Electrical Distribution
   26 06 20.13 Electrical Switchboard Schedule
   26 06 20.16 Electrical Panelboard Schedule
   26 06 20.19 Electrical Motor-Control Center Schedule
   26 06 20.23 Electrical Circuit Schedule
   26 06 20.26 Wiring Device Schedule
26 06 30 Schedules for Facility Electrical Power Generating and Storing Equipment
PART 1. GENERAL

Performance criteria and goals for sustainable and energy-efficient new and major renovation buildings to follow ASHRAE 90.1 2007, as adopted by the State of Arkansas in April 2009. Buildings must be designed, constructed, and certified to at least 10% reduction below the baseline energy consumption determined by the performance rating method of Appendix G of ASHRAE 90.1 2007.

Lighting Control Manufacturer shall be Lutron Electronics or Facilities Management approved equivalent.

Wireless lighting controls shall be considered on renovation projects for system flexibility and ease of installation. Wireless shall have a minimum communication range of 30 feet through construction material and 60 feet line of sight.

Warranty: Provide a minimum two year warranty to include 100-percent replacement parts coverage and 100-percent manufacturer labor coverage to troubleshoot and diagnosis a lighting issue. Telephone technical support to be available 24 hours per day, 7 days per week, excluding manufacturer holidays.

PART 2. INCLUDE IN CONSTRUCTION DOCUMENTS

All lighting controls shall meet ANSI/ESD S20.20, NECA 130, UL 20, UL 1472, and NFPA 70. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

Unless specifically indicated to be excluded, provide all required conduit, wiring, connectors, hardware, components, accessories, etc. as required for a complete operating system.
All wired occupancy sensors shall have the following features:
   Capable of sensing both major motion (such as walking) and minor motion (such as small desktop level movements) according to published coverage areas, for automatic control of load indicated.
   Sensor technology: Passive Infrared/Ultrasonic Dual Technology
   Provide LED to visually indicate motion detection with separate color LED for each sensor type in dual technology units.
   Operation: Unless otherwise indicated, occupancy sensor to turn load on when occupant presence is detected and to turn load off when no occupant presence is detected during an adjustable turn-off delay time interval.
   Field configurable turn-on and hold-on activation with settings for activation by either or both sensing technologies.
   Turn-off Delay: Field adjustable, up to a maximum time delay setting of not less than 15 minutes and not more than 30 minutes.
   Power Packs for Low Voltage Occupancy Sensors: Plenum rated, self-contained low voltage class 2 transformer and relay compatible with specified low voltage occupancy sensor for switching of line voltage loads. Input supply voltage shall be dual rated for 120/277V. Provide quantity and configuration of power and slave packs with all associated wiring and accessories as required to control the load indicated on the drawings.
   Where wired sensors are indicated, wireless sensors are acceptable provided that all components and wiring modifications necessary for proper operation are included.

All wireless occupancy sensors shall have the following features:
   Does not require external power packs, power wiring, or communication wiring.
   Power: Battery-operated with minimum ten-year battery life.
   Capable of being placed in test mode to verify correct operation from the face of the unit. Provides a clearly visible method of indication to verify that motion is being detected during testing and that the unit is communicating to compatible RF receiving devices.
   Sensing Mechanism: Passive infrared (PIR) coupled with technology for sensing fine motions.
   Provide temporary mounting means for drop ceilings to allow user to check proper performance and relocate as needed before permanently mounting sensor. Temporary mounting method to be designed for easy, damage-free removal.
   Programmable to operate as an occupancy sensor (automatic-on and automatic-off), or a vacancy sensor (manual-on and automatic-off).
   Turn-off Delay: Field adjustable, up to a maximum time delay setting of not less than 15 minutes and not more than 30 minutes.
All in-wall occupancy sensors shall have the following features:
   Designed for installation in standard wall box at standard wall switch mounting height
   with a field of view of 180 degrees, integrated manual control capability, and no
   leakage current to load in off mode.
   Manual-Off Override Control: When used to turn off load while in automatic-on mode,
   unit to revert back to automatic mode after no occupant presence is detected during the
   delayed-off time interval.
   Passive Infrared (PIR): Capable of detecting motion within an area of 900 square feet.

All wired daylighting controls shall have the following features:
   System Description: Control system consisting of photo sensors and compatible control
   modules and power packs, contactors, or relays as required for automatic control of
   load indicated according to available natural light; capable of integrating with
   occupancy sensors and manual override controls.
   Daylighting Control Dimming Modules for Low Voltage Sensors: Low voltage class 2
   control unit compatible with specified photo sensors and with specified dimming
   ballasts/drivers, for both continuous dimming of compatible dimming ballasts/drivers
   and switching of compatible power packs, contactors, or relays in response to changes
   in measured light levels according to selected settings
   Operation: Unless otherwise indicated, specified load to be continuously brightened as
   not enough daylight becomes available and continuously dimmed as enough daylight
   becomes available. Load to be turned off when available daylight is sufficient to fully
   dim the load.
   Power Packs for Low Voltage Daylighting Control Modules: Plenum rated, self-
   contained low voltage class 2 transformer and relay compatible with specified low
   voltage daylighting control modules for switching of line voltage loads. Input supply
   voltage shall be dual rated for 120/277V. Provide quantity and configuration of power
   and slave packs with all associated wiring and accessories as required to control the
   load indicated on the drawings.
   Where wired sensors are indicated, wireless sensors are acceptable provided that all
   components and wiring modifications necessary for proper operation are included.

All wireless daylighting controls shall have the following features:
   Does not require external power packs, power wiring, or communication wiring.
   Power: Battery-operated with minimum ten-year battery life.
   Partially shielded for accurate detection of available daylight to prevent fixture lighting
   and horizontal light component from skewing sensor detection.
   Provide linear response from 2 to 150 footcandles.
   Provide temporary mounting means for drop ceilings to allow user to check proper
   performance and relocate as needed before permanently mounting sensor. Temporary
   mounting method to be design for easy, damage-free removal.
All Wall Dimmers and Switches shall have the following features:
Provide control stations of type, rating, and configuration as indicated or as required to control the loads as indicated.
Surge Tolerance: Designed and tested to withstand surges of 6,000V, 200 amps according to IEEE C62.41.2 without impairment to performance.
Dimmers: Provide full range, continuously variable control of light intensity.
For wireless controls: Communicates directly to compatible RF receiving devices through use of a radio frequency communications link. Allows for easy reprogramming without replacing the unit. Does not require external power packs, power, or communication wiring. Capable of being mounted with a table stand or directly to a wall under a faceplate. Battery-operated with a minimum ten-year battery life.

**PART 3 EXECUTION**

Electrical Contractor shall install products in accordance with manufacturer’s instructions.

Within the design intent, reasonably minor adjustments to locations of sensors may be made in order to optimize coverage and avoid conflicts or problems affecting coverage.

Ensure that daylight sensor placement minimizes sensor view of electric light sources. Locate ceiling-mounted and luminaire-mounted daylight sensors to avoid direct view of luminaire.

Manufacturer’s startup services may or may not be required. Check with manufacturer.

END OF SECTION
**26 12 00 Medium-Voltage Transformers**
- 26 12 13 Liquid-Filled, Medium-Voltage Transformers
- 26 12 16 Dry-Type, Medium-Voltage Transformers
- 26 12 19 Pad-Mounted, Liquid-Filled, Medium-Voltage Transformers

**26 13 00 Medium-Voltage Switchgear**
- 26 13 13 Medium-Voltage Circuit Breaker Switchgear
- 26 13 16 Medium-Voltage Fusible Interrupter Switchgear
- 26 13 19 Medium-Voltage Vacuum Interrupter Switchgear

**26 18 00 Medium-Voltage Circuit Protection Devices**
- 26 18 13 Medium-Voltage Cutouts
- 26 18 16 Medium-Voltage Fuses
- 26 18 19 Medium-Voltage Lightning Arresters
- 26 18 23 Medium-Voltage Surge Arresters
- 26 18 29 Medium-Voltage Reclosers
- 26 18 33 Medium-Voltage Enclosed Bus
- 26 18 36 Medium-Voltage Enclosed Fuse Cutouts
- 26 18 39 Medium-Voltage Motor Controllers

**SECTION 26 20 00**

**LOW VOLTAGE ELECTRICAL DISTRIBUTION**

**CONSULTANT DESIGN GUIDELINE**

Generally, the contractor will furnish and install transformer, primary cables, secondary cable connectors, C.T.'s, and metering equipment. The contractor will make secondary cable connections to the transformer. There may be cases where the new facility is being constructed outside the limits of the UofA power grid. In those cases primary voltage transformers and connections may be provided by the electric service company.

Coordinate all service and metering details:

Southwestern Electric Power Company (SWEPCO)
A unit of American Electric Power
101 W. Township Street
Fayetteville, Arkansas 72702
(479) 973-2324

The University of Arkansas has a good relationship with SWEPCO and we advise early conversation with the power provider to coordinate all aspects of the new design.

If the facility is not going to be on the UofA electric power grid, the local power company will determine metering requirements based on the electrical service entrance size. Coordinate the exact metering requirements with the local power company prior to start of construction.

Contractor shall furnish written confirmation to architect/engineer regarding available fault
current prior to connection of service (amps interrupting capacity-AIC). Information shall include AIC-RMS line to line and line to neutral at service transformer secondary connections.

Contractor shall be responsible for all fees and charges incurred for the installation and/or modification of the electrical service as required by the General Contractor. Contractor shall include these fees and charges in the electrical base bid.

END OF SECTION

26 21 00 Low-Voltage Overhead Electrical Power Systems

26 22 00 Low-Voltage Transformers
26 22 13 Low-Voltage Distribution Transformers
26 22 16 Low-Voltage Buck-Boost Transformers
26 22 19 Control and Signal Transformers

26 23 00 Low-Voltage Switchgear
26 23 13 Paralleling Low-Voltage Switchgear

26 24 00 Switchboards and Panelboards

SECTION 26 24 13
SWITCHBOARDS

CONSULTANT DESIGN GUIDELINE

Acceptable manufacturers shall be Challenger, Cutler-Hammer, Siemens, Square D, or Facilities Management approved equal.

INCLUDE IN CONSTRUCTION DOCUMENTS

Provide submittal data for the following:
Manufacturer and model:
Housing, Buses, and Breakers.

Type 1 switchboard shall be front accessible with the following features:

Main breaker shall be individually mounted and compartmentalized.
Feeder breakers shall be panel mounted.
Section alignment shall be as shown on the manufacturers' data. Main section line and load terminals shall be accessible from front and side. Distribution section line and load terminals shall be accessible from the front. Bus connections shall be accessible from the front and end. Switchboard shall have bolted line and load connections. Wiring gutter covers shall be full height for access to wiring terminals.

Provide a completely enclosed steel enclosure not less than the gauge required by the standards. The enclosure is to consist of the required number of vertical sections bolted together to form one metal enclosed rigid switchboard. Cover the sides, top, and rear with removable screw on sheet steel plates.

Provide ventilating louvers where required to limit the temperature rise of current carrying parts. Protect all openings against entrance of falling dirt, water, or foreign matter.

Buses shall be arranged for 3-phase, 4-wire distribution. Main phase buses (through bus), full size neutral bus, and ground bus shall be full capacity the entire length of the switchboard. Provide for future extensions by means of bolt holes or other approved method. Brace the bus to withstand the available short circuit current at the particular location as shown on the drawings. No magnetic material shall be between buses to form a magnetic loop.

Buses and connections shall be hard drawn copper. Bus temperature rise shall not exceed 65° C. Current density shall not exceed 1200 amperes per square inch for copper. Size section busing based on the sum total of breakers served to permit operation of each unit at not less than 125 percent of its trip rating or 50 percent of the frame size, whichever is greater.

Provide bare bus and mount on insulated bus supports. Provide neutral disconnect link to permit isolation of neutral bus from the common ground bus and service entrance conductors.

Provide un-insulated ¼" x 2" copper equipment ground bus bar the length of the switchboard and secure at each section.

Connect an un-insulated ¼" x 2" copper bus between the neutral and ground buses to establish the system common ground point.

Provide 20%, minimum, space for future.

Where draw out circuit breakers are provided, furnish a portable elevating carriage or switchboard-mounted device for installation and removal of the breakers.

Control wiring shall be 600-volt class B stranded SIS. Install all control wiring complete at the factory adequately bundled and protected. Wiring across hinges and between shipping units shall be class C stranded. Size wire in accordance with NEC. Provide control circuit fuses.

Main breakers shall be low voltage AC power type, dead front, stored energy with solid-state trip devices. Arcing contacts shall be renewable.
Rating shall be 3-pole, 600 volts AC, 60-cycle with frame size, trip rating, system, voltage, and interrupting rating as shown on the drawings.

Provide draw out mounting for breakers over 1600 amperes and where shown on the drawings. A racking mechanism shall position and hold the breaker in the connected, test, and disconnect positions. An interlock shall prevent movement into or out of the connected position unless the breaker is tripped open.

Provide an indicator visible from the front of the unit to indicate whether the breaker is open or closed.

Provide a mechanical trip button accessible from the front of the door to trip the breaker.

Include provisions for padlocking the breaker in the open position.

Manually operate breakers 1600-ampere frame size and less. Electrically operate breakers larger than 1600-ampere frame size.

END SECTION

26 24 16 Panelboards
26 24 19 Motor-Control Centers
26 25 00 Enclosed Bus Assemblies

26 26 00 Power Distribution Units

26 27 00 Low-Voltage Distribution Equipment
26 27 13 Electricity Metering
26 27 19 Multi-Outlet Assemblies
26 27 23 Indoor Service Poles
26 27 26 Wiring Devices
26 27 73 Door Chimes

26 28 00 Low-Voltage Circuit Protective Devices
SWITCHES AND FUSES

CONSULTANT DESIGN GUIDELINE

Switches shall be heavy duty, Type HD, and horsepower rated as required.

Manufacturer shall be Challenger, Cutler-Hammer, Siemens, Square D, or Facilities Management approved equal.

INCLUDE IN CONSTRUCTION DOCUMENTS

Switches shall be quick-make, quick-break type in accordance with UL98, National Electrical Manufacturers Association (NEMA) KS1, and NEC.

Switches shall be capable of accepting UL and NEMA standard fuses.

Switches shall have the following features:
Switch shall have copper blades, which shall be visible in the OFF position.
Switch shall have an arc chute for each pole.
External operating handle shall indicate ON and OFF position and shall have lock-open padlocking provisions.
Mechanical interlock shall permit opening of the door only when the switch is in the OFF position.
Fuse mounting shall be for the size and type of fuses shown on the drawings. Furnish switches completely fused. Furnish a complete set of spare fuses for each switch being installed. Deliver to the Owner additional sets of spare fuses to constitute not less than two complete sets for the type, size, and rating of each set installed.
Switch shall have a solid neutral for each switch being installed in a circuit that included a neutral conductor.
Switch shall have grounding Lug for connection of the grounding conductor.
Enclosures shall be the NEMA types shown on the drawings for the switches. Where the types of switch enclosures are not shown, they shall be the NEMA types that are most suitable for the environmental conditions where the switches are being installed.

END SECTION
SECTION 26 29 23
VARIABLE FREQUENCY MOTOR CONTROLLERS

CONSULTANT DESIGN GUIDELINE

Variable frequency controller shall be UL listed and shall conform to latest standards of ANSI and IEEE requirements.

Variable frequency drives may be one of the commodity items available through the UofA IDIQ procurement system. The consultant should inquire with Facilities Management about the current status of procurement.


The controller shall comply with FCC Rules and Regulations, Part 15, Subpart J for emissions of conducted and radiated RFI.

Manufacturer shall be Graham or Facilities Management approved equal.

INCLUDE CONSTRUCTION DOCUMENTS

Contractor shall provide manual for starting and operating controllers, complete with operating limits, wiring diagram, and maintenance schedule.

Manufacturer shall furnish maintenance of controller for one year from Date of Substantial Completion.

The controller shall have capability of allowing the motor to be disconnected at the safety “disconnect” switch without damage to the controller’s electronics.

Controller shall have a displacement power factor of 0.95 or greater, lagging over entire range of operating speed and load.

Minimum efficiency at full load shall be 96 percent.

Additional required features shall be as follows: Controller shall have integral digital display to indicate voltage, output frequency, and output
Controller shall have status indicators for over-current, over-voltage, ground fault, over-temperature, and input power ON.
Unit shall have current limit adjustment from zero to 100 percent of rated load. Both acceleration and deceleration rate shall be adjustable from three to 60 seconds. Unit shall have HAND-OFF-AUTOMATIC switch and manual speed control.

Provide terminal for remote contact to allow starting under both manual and automatic modes. Provide a manual bypass, overload motor protection, short circuit protection for full voltage, non-reversing operation of the motor. Include isolation switch to allow maintenance of inverter during bypass operation.

Include integral fused disconnect switch on the line side of each controller. Controller shall have internal 115-volt control power with transformer and protective fuses. Cabinet shall have door mounted speed indicator and ammeter. Drive shall have automatic restart capability after power failures. Unit shall have a diagnostic panel consisting of LED indicators of the following conditions: over voltage, under voltage, over current, underload timer on, run, fault, auto/manual, clipper, 6 inverter, input bus charged, input surge cycle complete, and output bus charged.

Contractor shall provide two of each type of air filter and three of each size and type of fuse.

END SECTION

26 30 00 FACILITY ELECTRICAL POWER GENERATING AN STORING EQUIPMENT

26 31 00 Photovoltaic Collectors

26 32 00 Packaged Generator Assemblies
26 32 13 Engine Generators
   26 32 13.13 Diesel-Engine-Driven Generator Sets
   26 32 13.16 Gas-Engine-Driven Generator Sets
26 32 16 Steam-Turbine Generators
26 32 19 Hydro-Turbine Generators
26 32 23 Wind Energy Equipment
26 32 26 Frequency Changers
26 32 29 Rotary Converters
26 32 33 Rotary Uninterruptible Power Units

26 33 00 Battery Equipment
26 33 13 Batteries
26 33 16 Battery Racks
26 33 19 Battery Units
26 33 23 Central Battery Equipment
26 33 33 Static Power Converters
26 33 43 Battery Chargers
26 33 46 Battery Monitoring
26 33 53 Static Uninterruptible Power Supply

26 35 00 Power Filters and Conditioners
26 35 13 Capacitors
26 35 16 Chokes and Inductors
26 35 23 Electromagnetic-Interference Filters
26 35 26 Harmonic Filters
26 35 33 Power Factor Correction Equipment
26 35 36 Slip Controllers
26 35 43 Static-Frequency Converters
26 35 46 Radio-Frequency-Interference Filters
26 35 53 Voltage Regulators

26 36 00 Transfer Switches
26 36 13 Manual Transfer Switches
26 36 23 Automatic Transfer Switches

26 40 00 Electrical and Cathodic Protection

26 41 00 Facility Lightning Protection
26 41 13 Lightning Protection for Structures
   26 41 13.13 Lightning Protection for Buildings
26 41 16 Lightning Prevention and Dissipation
26 41 19 Early Streamer Emission Lightning Protection
26 41 23 Lightning Protection Surge Arresters and Suppressors

26 42 00 Cathodic Protection
26 42 13 Passive Cathodic Protection for Underground and Submerged Piping
26 42 16 Passive Cathodic Protection for Underground Storage Tank

26 43 00 Transient Voltage Suppression
26 43 13 Transient-Voltage Suppression for Low-Voltage Electrical Power Circuits

SECTION 26 50 00 LIGHTING

CONSULTANT DESIGN GUIDELINE

1) Vault Lighting
   a. Install (2) ceiling mounted units inside the vault – Canlet Ceiling Mount 68-02I0FC(screw base) -01-OG-09 [ceiling mount, with incandescent screw base, with clear glass globe and cage guard]
   b. Install (1) wall mounted unit outside in the pit – Canlet Wall Mount 68-02IW-01-01-01 + 68WME02 [wall mount, with incandescent screw base, with reflector, clear glass globe and cage guard with white reflector + wall mount extension bracket]
c. Lighting should be switched from inside the vault on the line side of the GFCI if that is allowed so that nuisance trips on the GFCI do not kill the lighting.

d. We do want CFL lighting but not with a separate ballast. We don’t really want to use fixed ballast fixtures, but rather screw base CFLs. Otherwise when a ballast fails, we have to get an electrician to fix it as opposed to just changing the bulb.

End of Section

SECTION 26 51 00
INTERIOR LIGHTING

CONSULTANT DESIGN GUIDELINE

Lighting levels should not exceed the minimum recommended by the IES guideline.

Submit fixture and dimming information in accordance with Plan Review and Submittals.

Provide fluorescent light fixtures with parabolic lenses general for building lighting. Use specification grade fluorescent fixtures with conventional lenses in storage rooms, toilets, corridors, etc. Use HID fixtures in areas that have high ceilings.

Use “Lay-in” mounted light fixtures in areas that have suspended acoustic tile ceilings.

Fluorescent fixture lenses shall be 0.156” thick, minimum.

Obtain and specify electronic ballasts in accordance with ballast specifications issued by the Office of State Purchasing, Department of Finance and Administration, PO Box 2940, Little Rock, AR 72203 (501) 324-9316.

In areas requiring a dimmer system, secondary incandescent fixtures may be used with primary general fluorescent lighting.

Exit lights shall be LED as manufactured by Hubbell.

The recommended lighting energy allowance is no greater than two watts per building gross square feet.

INCLUDE IN CONSTRUCTION DOCUMENTS

Submit all lighting for review and approval by Facilities Management.

EXECUTION

No lights shall be located over stairwells. Lights shall be over landings, or wall mounted only.
26 51 13 Interior Lighting Fixtures, Lamps, and Ballasts

26 52 00 Emergency Lighting

26 53 00 Exit Signs

26 54 00 Classified Location Lighting

26 55 00 Special Purpose Lighting
26 55 23 Outline Lighting
26 55 29 Underwater Lighting
26 55 33 Hazard Warning lighting
26 55 36 Obstruction Lighting
26 55 53 Security Lighting
26 55 59 Display Lighting
26 55 61 Theatrical Lighting
26 55 63 Detention Lighting
26 55 70 Healthcare Lighting

SECTION 26 56 00
EXTERIOR LIGHTING

CONSULTANT DESIGN GUIDELINE

Use campus standard exterior light fixtures. Cut sheets for approved fixtures are included in folder “Campus Furnishings Standards” of this Guide.

Provide a photometric analysis for all exterior lighting layouts, and submit to Facilities Management Planning Group for approval. Photometrics should follow the campus lighting guidelines as established in Part Two: Planning Guidelines, Section 2.1 C (see Facilities Management, Planning Group web page).

INCLUDE IN CONSTRUCTION DOCUMENTS

Pole lighting voltage shall be either 208 or 460. 120 volt pole lighting is unacceptable. Voltage drop in lighting circuits shall not exceed 7%.
EXECUTION

Exact location of exterior light fixtures shall be coordinated with Facilities Management Planning Group. No uplighting allowed.

END SECTION
CAMPUS LANDSCAPE STANDARDS

b1 - handrails & guardrails
b13 - light footings
b18 - bike rack footing & spacing
b20 - trash can footings
b22 - paving
b30 - drain inlets
b31 - plantings
Notes:
1. All rails to be continuous and ground flush and smooth.
2. All steel components to be painted with Benjamin Moore D10-60 semi-gloss Bronze Tone.

HANDRAIL A (decorative posts) - Classic

CAD file available for download at http://planning.uark.edu
HANDRAIL A (decorative posts) - Classic

CAD file available for download at http://planning.uark.edu

- Lamb's tongue: steel part no. 44095, bronze part no. 45315
- 1"x1/2" c-channel
- Handrail molding: 20' length, steel part no. 44229, bronze part no. 45311
- 36" starting post, steel part no. 351, bronze (use 40" - part no. 131)
- Square-hole collar, steel part no. 369, bronze part no. 269
- 1"x1" stainless steel tube

HANDRAIL A
part numbers
Notes:
1. all welds to be continuous and ground flush and smooth
2. all steel components to be painted with Benjamin Moore DTM alkyd semi-gloss "Bronzestone"
GUARDRAIL A (decorative posts) - Classic

CAD file available for download at http://planning.uark.edu

- 1”x1/2” c-channel
- 3/4”x3/8” flat
- 40” starting post
- square-hole collar
- 1”x1” stainless steel tube

Part numbers:
LANDSCAPE STANDARDS

Cad file available for download at http://planning.uark.edu

HANDRAIL B (plain posts) - Classic

Notes:
1. all metals to be continuous and ground flush and smooth
2. all steel components to be painted with Benjamin Moore DM aged semi-gloss Bronz tone

1'–0"
3'–0"
12"
2'–10"
3'–0"
12" min.

HANDRAIL B

Facilities Management
University of Arkansas
HANDRAIL B (plain posts) - Classic

CAD file available for download at http://planning.uark.edu

lamb's tongue
steel part no. 44295

handrail molding - 20' length
steel part no. 44294

1"x1/2" c-channel

1"x1" tube

HANDRAIL B

part numbers
GUARDRAIL B (plain posts) - Classic

Notes:
1. all rails to be continuous and ground flush and smooth
2. all steel components to be painted with Benjamin Moore DM alloys semi-gloss Bronzate.

CAD file available for download at http://planning.uark.edu

Landscape Standards
GUARDRAIL B (plain posts) - Classic

CAD file available for download at http://planning.uark.edu

GUARDRAIL B

part numbers
LANDSCAPE STANDARDS

Notes:
1. All welds to be continuous and ground flush and smooth
2. All steel components to be painted with Benjamin Moore D1 M alkyd semi-gloss “Bronzestone”
HANDRAIL - Contemporary

CAD file available for download at http://planning.uark.edu

1 1/2" O.D. tube

1 1/2"x3/4" flat
Notes:
1. all welds to be continuous and ground flush and smooth
2. all steel components to be painted with Benjamin Moore DTM alkyd semi-gloss “Bronzestone”
GUARDRAIL - Contemporary

CAD file available for download at http://planning.uark.edu
PEDESTRIAN LIGHT - Classic

CAD file available for download at http://planning.uark.edu

- classic standard post & luminaire by Spring City
- face access door away from sidewalk
- finish grade
- 16" dia. sonotube base
- bolts supplied by mfr.
- (4) #4 rebar attach to anchor bolts
- compacted subgrade 95% standard proctor density
- 12" dia. bolt pattern

PEDESTRIAN LIGHT
footing detail
PEDESTRIAN LIGHT - Classic alternate*  CAD file available for download at http://planning.uark.edu

CAD diagram showing details of a pedestrian light fixture, including:
- Classic standard post & luminaire by Spring City
- Face access door away from sidewalk
- Finish grade
- 12" dia. sonotube base
- Bolts supplied by mfr.
- Compacted subgrade 95% standard proctor density
- 7" dia. bolt pattern

Footings detail

05.20.2011  b14  Landscape Standards
PEDESTRIAN LIGHT - Contemporary

- contemporary standard post & luminaire by Bega

- finish grade

- 14" dia. sonotube base

- bolts supplied by mfr.

- compacted subgrade 95% standard proctor density

- 8.5" min./10" max. dia bolt pattern

PEDESTRIAN LIGHT
footing detail
PARKING & SERVICE AREA LIGHT

- parking & service area standard post & luminaire by Bega
- finish grade
- 14" dia. sonotube base
- bolts supplied by mfr.
- compacted subgrade 95% standard proctor density
- 8.5" min./10" max. dia bolt pattern

05.20.2011  b16  Landscape Standards
PARKING & SERVICE AREA LIGHT

CAD file available for download at http://planning.uark.edu

- parking & service area standard post & luminaire by Dega
- bolts supplied by mfr.
- finish grade
- 14" dia. sonotube base
- (4) #4 rebar tied 12" o.c. attach to anchor bolts
- compacted subgrade 95% standard practor density
- 8.5" min./10" max. dia bolt pattern

footing detail

05.20.2011 b17 Landscape Standards
IN-GROUND MOUNT BIKE RACK

CAD file available for download at http://planning.uark.edu

BIKE RACK
footing detail - inground

3/8" steel rods supplied by mfr.
inground bike rack by Palmer Group
IN-GROUND MOUNT BIKE RACK

CAD file available for download at http://planning.uark.edu
TRASH CAN - Classic

CAD file available for download at http://planning.uark.edu

classic standard trash can by Landscape Forms

finish grade

6" concrete base

2" - 2"

TRASH CAN
footing detail
TRASH CAN - Contemporary

CAD file available for download at http://planning.uark.edu

contemporary standard trash can by Landscape Forms

finish grade

6" concrete base

to footing detail

void 10 1/2"
LANDSCAPE STANDARDS

ASPHALT PAVER WALK

CAD file available for download at http://planning.uark.edu

ASPHALT PAVERS

construction detail - over compacted earth - cross section
(two edge options)
ASPHALT PAVER WALK

CAD file available for download at http://planning.uark.edu

4” concrete slab / 3500 psi
6x6=W1.4xW1.4 wwf centered in slab

asphalt paver by Hanover
3” depth, set vertically

asphalt paver by Hanover
1 1/4” to 3” depth as needed

2” weep
10”-0” o.c.

1 1/2” compacted sand setting bed min.

compacted subgrade @ 95% proctor density

3/8”x 8” steel edging

crushed stone

4” gravel base compacted @ 105% proctor density

16” tapered steel stoke at 30” o.c. max.

finish grade

width varies

border pavers w/ mortared joints

hand tight pavers, sand swept

running bond pattern to be perpendicular to edge

WITH PAVER EDGING

WITH STEEL EDGING

ASPHALT PAVERS

construction detail - over concrete slab - cross section
(two edge options)
LANDSCAPE STANDARDS

SENIOR WALK

CAD file available for download at http://planning.uark.edu

TOP VIEW

1/2" depth hand-tooled score joint

6" compacted subgrade @ 95% proctor density

6" concrete walk / 5500 psi
#4 rebar 2'-0" o.c. each way

6" gravel base compacted @ 105% proctor density

7'-0"

finish grade

SENIOR WALK

construction detail – cross section
Notes:
1. concrete to be 5500psi
2. reinforcing to consist of #4 bar at 2'-0" o.c. each way, 2" from bottom of slab
3. concrete mix to have maximum 3/4" aggregate
4. compressive strength of concrete test cylinders to be taken by contractor at his expense on day of pour
5. walk to have a minimum curing time of 90 days prior to sandblasting
6. 4" dia. PVC schedule 40 sleeve at 30'-0" o.c.
7. saw-cut control joints at 15'-0" o.c. to be cut within 24 hrs. of pour
8. expansion joints at 30'-0" o.c.
9. walk surface to have slick trowel finish
10. contractor to “press” top 1/2" of wet concrete so that aggregate material is 1/2" below top of walk
11. "S" stamp to be embossed by contractor at all sleeve locations, each side
4-inch CONCRETE WALK

Notes:
1. 4" dia. PVC schedule 40 sleeve at 30'-0" o.c. (as required by owner)
2. saw-cut control joints at 15'-0" o.c.
3. expansion joint at 30'-0" o.c.
4. walk surface to have light broom finish
5. "S" stamp to be embossed by contractor at all sleeve locations, each side

4" concrete walk / 3500psi
6x6-W1.4xW1.4 wwf
saw-cut control joint
1 1/2" depth
1/2" expansion joint
pre-molded e.j. filler (zip strip)
sealant flush w/ surface
compacted subgrade
@ 95% proctor density
6" gravel base
compacted @ 105% proctor density

4" CONCRETE WALK
construction detail - longitudinal section

CAD file available for download at http://planning.uark.edu
4-inch CONCRETE WALK

Notes:
1. 4” dia. PVC schedule 40 sleeve at 30’-0” o.c. (as required by owner)
2. saw-cut control joints at 15’-0” o.c.
3. expansion joint at 30’-0’ o.c.
4. walk surface to have light broom finish
5. “S” stamp to be embossed by contractor at all sleeve locations, each side

4" CONCRETE WALK at EXISTING WALK
construction detail - longitudinal section

CAD file available for download at http://planning.uark.edu
CRUSHED STONE WALK

CAD file available for download at http://planning.uark.edu

UNDISTURBED OR COMPACTED SUBGRADE
© 95% PROCTOR DENSITY

ASPHALT PAYER BY HANOVER
3" DEPTH, SET VERTICALLY

CONCRETE FOOTING

GEOTEXTILE SOIL SEPARATOR
TURN UP 3" ON ALL OUTSIDE EDGES

16" TAPERED STEEL STAKE
AT 30" O.C. MAX.

WIDTH VARIES

CRUSHED STONE WALK
CONSTRUCTION DETAIL — CROSS SECTION
(TWO EDGE OPTIONS)
ASPHALT TRAIL

CAD file available for download at http://planning.uark.edu

2% cross slope
in same direction as existing grade
unless otherwise noted

TOP VIEW

6" class 7 aggregate base compacted @ 98% proctor density

2" asphalt walk type 3 asphalt

geotextile soil separator turn up on outside edges

compacted subgrade @ 95% proctor density

8'-0", 10'-0", or 12'-0" as required

ASPHALT TRAIL

construction detail - cross section
Notes:

1. consult engineer for structural details

DRAIN INLET

TOP VIEW

- catch basin frame and grate by Neenah; model number R-2504 with Type C grate (or approved equal)
- 1' - 10 3/4"

finish grade
imported topsoil

2' - 0"

2 1/2" exp. anchor each side

4' - 0" min.

DRAIN INLET IN LAWN

construction detail – cross section

05.20.2011  b30  Landscape Standards
set root flare 3" above finish grade.

remove container or burlap & wire from top 1/3 of rootball.

backfill material to be 1/3 imported topsoil, 1/3 sand, 1/3 "Back to Earth".

2"x2" wood stakes typ. provide 3 stokes per tree see planting plan.

2" bark mulch

finish grade

undisturbed or compacted subgrade

guying tape

2" barking plate

6" perforated PVC sch 40 w/cap. wrap bottom end w/geotextile fabric, 4'-0" length as required by owner.

slotted HDPE drain (no sock) as required by owner.

drainage gravel

3 X rootball diameter

lightweight CMU

5% slope to drain

position guys at height of second branch

planting detail
Notes:
1. planting bed to be completely over-excavated
2. before laying planting mixture, scorefy subgrade in the direction of slope for proper drainage
3. all labels to be removed from base of plant

container depth or 6" min.
whichever is greater

6" min. below all plants

planting detail

1/3 imported soil, 1/3 sand

spacing as per planting plant
2" bark mulch

spreading as per planting plant
2" bark mulch

planting detail

finish grade

1/3 imported soil, 1/3 sand

undisturbed subgrade

remove container & prune any circling roots

6" min.

steel edging as required by owner (see detail)

Planting Bed

CAD file available for download at http://planning.uark.edu
STEEL EDGING

CAD file available for download at http://planning.uark.edu

1/4" x 5" steel edging

16" tapered steel stake at 32" o.c. max.

finish grade
CAMPUS FURNISHINGS STANDARDS

a1 - benches & tables
a5 - bike racks
a7 - bollards
a10 - cafe furniture
a13 - handrails & guardrails
a14 - lights
a21 - trash & recycling cans
a25 - emergency phones
a27 - pavers
a29 - crushed stone
FURNISHINGS STANDARDS

**BENCH - Classic**

**Monarch Teak Bench**

**5ft Bench**
- Item No. 4612
- Weight 65 lbs
- Dimensions 59.5L x 28W x 37.5H
- Color natural teak

**6ft Bench**
- Item No. 4613
- Weight 70 lbs
- Dimensions 71.5L x 28W x 37.5H
- Color natural teak

**8ft Bench**
- Item No. 4614
- Weight 94 lbs
- Dimensions 95.5L x 28W x 37.5H
- Color natural teak

**Anchoring Brackets**
- Item No. 1001 - 6in Below-grade Steel
  1005 - 3in On-grade Brass

**MANUFACTURER/SUPPLIER**

Country Casual
7601 Rickenbacker Drive
Gaithersburg, MD 20879

Phone 301.926.9195 / 800.289.8325
Fax 301.926.9198

sales@countrycasual.com
www.countrycasual.com
BENCH - Contemporary

Wellspring Teak Bench

4ft Teak Bench

Item: 48in Wellspring bench, without center arm
Weight: x lbs
Dimensions: 48L x 25W x 34H
Seat Height: 17.5
Color: natural teak

6ft Teak Bench

Item: 72in Wellspring bench, without intermediate arms
Weight: x lbs
Dimensions: 72L x 28W x 34H
Seat Height: 17.5
Color: natural teak

Anchoring Brackets

Item: stainless steel surface mounting kit

MANUFACTURER/SUPPLIER

Landscape Forms, Inc.
431 Lawndale Avenue
Kalamazoo, MI 49048

Regional Sales Office, Dallas, TX
Phone: 214.343.1145 / 888.667.1145
Fax: 214.340.6769

specify@landscapeforms.com
www.landscapeforms.com
COFFEE TABLE - Classic

Avignon™ Teak Coffee Table

Item No.  789875
Weight  27 lbs
Dimensions  47L x 24W x 17H
Color  natural teak

MANUFACTURER/SUPPLIER

Smith and Hawken Trade
4 Hamilton Landing, Suite 100
Novato, CA 94949

Phone  800.423.0117
Fax  800.630.7161

trade@smithandhawken.com
www.smithandhawkentrade.com
FURNISHINGS STANDARDS

PICNIC TABLE - Classic/Contemporary

Larchmont Picnic Table

Item No.  #4859
Weight  115 lbs
Dimensions  71L x 63.5W x 28H
Color  natural teak

MANUFACTURER/SUPPLIER

Country Casual
7601 Rickenbacker Drive
Gaithersburg, MD 20879

Phone  301.926.9195 / 800.289.8325
Fax  301.926.9198

sales@countrycasual.com
www.countrycasual.com
BIKE BOLLARD - Classic/Contemporary

Bollard CycLoops - embedment mount

Item No. 2172-E-C
Material Steel
Dimensions 4.5dia x 36H
Color RAL 7037 “dusty grey” powder coat

MANUFACTURER/SUPPLIER

Columbia Cascade Company
TimberForm Site Furnishings Division
1975 SW Fifth Avenue
Portland, OR 97201-5293

Phone 503.223.1157
Fax 503.223.4530

hq@timberform.com
www.timberform.com
## BIKE RACK - Classic/Contemporary

### Welle Series U Rack - inground - 1 loop

<table>
<thead>
<tr>
<th>Item No.</th>
<th>WSH3602-IG-P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material</td>
<td>Steel</td>
</tr>
<tr>
<td>Dimensions</td>
<td>2.375 dia x 18.25W x 46H</td>
</tr>
<tr>
<td>Color</td>
<td>RAL 7037 “dusty grey” powder coat</td>
</tr>
</tbody>
</table>

### Welle Series U Rack - surface mount - 3 loops

<table>
<thead>
<tr>
<th>Item No.</th>
<th>WSH3606-SF-P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material</td>
<td>Steel</td>
</tr>
<tr>
<td>Dimensions</td>
<td>54L x 18W x 36H</td>
</tr>
<tr>
<td>Color</td>
<td>RAL 7037 “dusty grey” powder coat</td>
</tr>
</tbody>
</table>

### Welle Series U Rack - surface mount - 4 loops

<table>
<thead>
<tr>
<th>Item No.</th>
<th>WSH3608-SF-P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material</td>
<td>Steel</td>
</tr>
<tr>
<td>Dimensions</td>
<td>78L x 18W x 36H</td>
</tr>
<tr>
<td>Color</td>
<td>RAL 7037 “dusty grey” powder coat</td>
</tr>
</tbody>
</table>

### Welle Series U Rack - surface mount - 5 loops

<table>
<thead>
<tr>
<th>Item No.</th>
<th>WSH3610-SF-P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material</td>
<td>Steel</td>
</tr>
<tr>
<td>Dimensions</td>
<td>102L x 18W x 36H</td>
</tr>
<tr>
<td>Color</td>
<td>RAL 7037 “dusty grey” powder coat</td>
</tr>
</tbody>
</table>

## MANUFACTURER/SUPPLIER

Palmer Group  
1072 Folsom Street #328  
San Francisco, CA 94103  

Phone 415.333.6428 / 888.764.2453  
Fax 415.333.2032  

www.bikeparking.com
BOLLARD - Classic

Brunel

Item No.        BRU 523
Material        Cast Iron
Dimensions      100cm dia x 1160cm H
Color           Primed

Brunel - removable

Item No.        BRU 523 + SOCK LC hinged removable socket (included)
Material        Cast Iron
Dimensions      100cm dia x 885cm H
Color           Primed

MANUFACTURER

Furnitubes International
Meridian House
Royal Hill
Greenwich
London, SE 10 8RT

Phone  011 44.020.8378.3200
Fax    011 44.020.8378.3250

www.furnitubes.com
BOLLARD - Classic

Gunner

Item No.        GUN 503
Material        Cast Iron
Dimensions      165cm dia x 1050cm H
Color           Primed

Gunner Security*

Item No.        GUN 503 SC
Material        Cast Iron bollard / Steel insert
Dimensions      165cm dia x 1370cm H
Color           Primed

*anti-ram raid version

MANUFACTURER

Furnitubes International
Meridian House
Royal Hill
Greenwich
London, SE 10 8RT

Phone 011 44.020.8378.3200
Fax 011 44.020.8378.3250

www.furnitubes.com
FURNISHINGS STANDARDS

TRAFFIC BOLLARD - Contemporary

TrafficGuard® Round Post Lock

| Item No. | RPL 3 |
| Material | Steel |
| Dimensions | 3.5dia x 36H (above ground) |
| Color | RAL 7037 “dusty grey” powder coat |

TrafficGuard® Accessories

High Shear Security Lock Pins

2.6 times the shear capacity of stock pins
Recommended if a higher level of security is needed

Reflective End Marker Labels

Increases the visibility of bollards in low light situations

Removable Bollard Storage Rack

| Size | 2, 4, or 6 units |
| Material | Hot dipped, galvanized finish |

MANUFACTURER

TrafficGuard® Direct LLC
PO Box 201
Geneva, IL 60134-9946

Phone 877.727.7347
Fax 800.814.7194

http://trafficguard.net
**CAFE FURNITURE - Classic**

**Bistro Collection Chairs & Tables**

**Metal Folding Chairs - steel frame & painted Beechwood slats**

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Description</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>5001</td>
<td>“Classique” chair</td>
<td>02 Cedar Green</td>
</tr>
</tbody>
</table>

**Metal Folding Chairs - steel frame & steel slats**

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Description</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>0101</td>
<td>“Square” chair</td>
<td>02 Cedar Green</td>
</tr>
</tbody>
</table>

**Metal Folding Tables - steel frame & top**

<table>
<thead>
<tr>
<th>Item Nos.</th>
<th>Description</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>0245</td>
<td>24in Round Solid Top table</td>
<td>02 Cedar Green</td>
</tr>
<tr>
<td>0237</td>
<td>30in Round Solid Top table / without parasol hole</td>
<td>02 Cedar Green</td>
</tr>
<tr>
<td>0233</td>
<td>30in Round Solid Top table / with parasol hole</td>
<td>02 Cedar Green</td>
</tr>
<tr>
<td>0230</td>
<td>24in Round Perforated Top “Floreal” table</td>
<td>02 Cedar Green</td>
</tr>
<tr>
<td>0234</td>
<td>30in Round Perforated Top “Floreal” table</td>
<td>02 Cedar Green</td>
</tr>
<tr>
<td>6041</td>
<td>46Lx30W Rectangular Solid Top table</td>
<td>02 Cedar Green</td>
</tr>
</tbody>
</table>

**MANUFACTURER**

Fermob Outdoor Lounge  
Parc Actival  
01140 Thoissey, FRANCE

info@fermob.com  
www.fermob.com

**DISTRIBUTOR**

UpCountry  
1389 Weber Industrial Drive  
Cumming, GA 30041

Phone 770.888.9606  
Fax 770.205.0182

gardens@upcountry.biz  
www.upcountry.biz
**CAFE FURNITURE - Contemporary**

Parc Centre Chairs & Tables

**Metal Chairs - steel frame with powdercoat finish**

<table>
<thead>
<tr>
<th>Item</th>
<th>Parc Centre Chair, without arms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color</td>
<td>Titanium (Panguard II® polyester powdercoat)</td>
</tr>
</tbody>
</table>

**Metal Tables - steel frame & top with powdercoat finish**

<table>
<thead>
<tr>
<th>Item</th>
<th>24in Round table, freestanding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color</td>
<td>Titanium (Panguard II® polyester powdercoat)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item</th>
<th>30in Round table, freestanding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color</td>
<td>Titanium (Panguard II® polyester powdercoat)</td>
</tr>
</tbody>
</table>

**MANUFACTURER**

Landscape Forms, Inc.
431 Lawndale Avenue
Kalamazoo, MI 49048

Regional Sales Office, Dallas, TX
Phone 214.343.1145 / 888.667.1145
Fax 214.340.6769

specify@landscapeforms.com
www.landscapeforms.com
CAFÉ UMBRELLA - Classic

Umbrella & Base

Royal Cafe & Bistro Wood Umbrella

Item: 6ft Octagonal Asian Hardwood
Material: Hardwood pole / Suncrylic Solution-Dyed Acrylic fabric
Dimensions: 72dia x 92H
Wood Finish: Dark Wood Premium Finish
Fabric Color: White

Tuscany Umbrella Base

Item No.: MB35X
Weight: 50 lbs
Material: Cast Iron
Dimensions: 23dia
Color: Hammered Bronze powder coat
Neck Size: TT (Thru-Table) - fits 1.5dia poles

DISTRIBUTOR

Patio Experts, LLC
14252 Culver Drive, # 641
Irvine, CA 92604

Phone: 714.842.4759 / 800.593.6612
Fax: 714.842.0939

info@patioexperts.com
www.outdoorpatioumbrellas.com / www.patioexperts.com
HANDRAIL/GUARDRAIL - Classic

Traditional Railing Components*

### Steel components

<table>
<thead>
<tr>
<th>Part Nos.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>4429</td>
<td>handrail moulding - 20ft length</td>
</tr>
<tr>
<td>4429S</td>
<td>straight lamb’s tongue</td>
</tr>
<tr>
<td>4429B</td>
<td>bevel lamb’s tongue</td>
</tr>
<tr>
<td>331</td>
<td>36in starting post</td>
</tr>
<tr>
<td>331L</td>
<td>40in starting post</td>
</tr>
<tr>
<td>329</td>
<td>36in spindle</td>
</tr>
<tr>
<td>330</td>
<td>36in spindle</td>
</tr>
<tr>
<td>329L</td>
<td>42in spindle</td>
</tr>
<tr>
<td>330L</td>
<td>42in spindle</td>
</tr>
<tr>
<td>369</td>
<td>square hole base</td>
</tr>
<tr>
<td></td>
<td>others as needed (finials, corners, etc.)</td>
</tr>
</tbody>
</table>

### Bronze components

<table>
<thead>
<tr>
<th>Part Nos.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>4531</td>
<td>handrail moulding - 20ft length</td>
</tr>
<tr>
<td>4537</td>
<td>handrail moulding for bending</td>
</tr>
<tr>
<td>4531S</td>
<td>straight lamb’s tongue</td>
</tr>
<tr>
<td>4531B</td>
<td>bevel lamb’s tongue</td>
</tr>
<tr>
<td>131</td>
<td>40in starting post</td>
</tr>
<tr>
<td>129</td>
<td>36in spindle</td>
</tr>
<tr>
<td>130</td>
<td>36in spindle</td>
</tr>
<tr>
<td>129L</td>
<td>42in spindle</td>
</tr>
<tr>
<td>130L</td>
<td>42in spindle</td>
</tr>
<tr>
<td>269</td>
<td>square hole base</td>
</tr>
<tr>
<td></td>
<td>others as needed (finials, corners, etc.)</td>
</tr>
</tbody>
</table>

**MANUFACTURER/SUPPLIER**

Julius Blum & Co. Inc.
PO Box 816
Carlstadt, NJ 07072

Phone     201.438.4600
Fax       201.438.6003

www.juliusblum.com

*see Campus Landscape Standards for fabrication information*
PEDESTRIAN LIGHT - Classic

Spring City post & luminaire

“Newburyport” Lamp Post

| Item No.   | IPSNBP-16-12-TN3.5/3-323/1NW-LR-BG |
| Material  | Cast Iron                          |
| Dimensions| 16dia x 144H                        |
| Color     | Bottle Green                       |

“Savannah Genie” Luminaire

| Item No.   | ALMSVH-YSDP-BG                      |
| Material  | Cast Aluminum                       |
| Dimensions| 19.125oct x 39.125H                 |
| Color     | Bottle Green                        |
| Globe     | Seeded Acrylic                      |

Optical System (by Clear Energy Services)

| Lamp       | CF 70W quad GX24q-6 / 841 (GE item no. 48868) |
| Ballast    | 120V - 277V Universal Voltage Electronic Ballast (GE item no. 47506) |

MANUFACTURER

Spring City Electrical Mfg. Co.
Hall & Main Streets
PO Drawer 19
Spring City, PA 19475

Phone 610.948.4000
Fax 610.948.5577

www.springcity.com

OPTICAL SYSTEM

Clear Energy Services
438 E Millsap Road
Suite 203
Fayetteville, AR 72703

Phone 479.695.1976
Fax 479.527.8831

*see Campus Landscape Standards for footing detail
PEDESTRIAN LIGHT - Classic alternate*

Spring City post & luminaire

“Pasadena” Lamp Post

Item No. IPSPAS-9-9.5-TN2.875/3-323/1NW-BG
Material Cast Iron
Dimensions 9L x 9W x 114H
Color Bottle Green

“William and Mary” Luminaire

Item No. ALMWMS-YSDP-BG
Material Cast Aluminum
Dimensions 16.625oct x 34H
Color Bottle Green
Globe Seeded Acrylic

Optical System (by Clear Energy Services)

Lamp CF 70W quad GX24q-6 / 841 (GE item no. 48868)
Ballast 120V - 277V Universal Voltage Electronic Ballast (GE item no. 47506)

MANUFACTURER

Spring City Electrical Mfg. Co.
Hall & Main Streets
PO Drawer 19
Spring City, PA 19475

Phone 610.948.4000
Fax 610.948.5577

www.springcity.com

OPTICAL SYSTEM

Clear Energy Services
438 E Millsap Road
Suite 203
Fayetteville, AR 72703

Phone 479.695.1976
Fax 479.527.8831

*see Campus Landscape Standards for footing detail
PEDESTRIAN LIGHT - Contemporary

BEGA pole & luminaire

Pole 1308HR

- Item No.: 1308HR
- Material: Aluminum
- Dimensions: 5dia x 164H
- Color: BEGA Black

Luminaire 8223P Modified

- Item No.: 8223P modified
- Material: Aluminum
- Dimensions: 31.5dia x 29.25H
- Color: BEGA Black

- Globe: White Plastic Diffuser
- Lamp: CF 120W triple 4p / 841
- Ballast: 120V - 277V Universal Voltage Electronic Ballast

MANUFACTURER

BEGA/US
1000 Bega Way
Carpinteria, CA 93013

Phone 805.664.0533
Fax 805.566.9474

www.bega-us.com

*see Campus Landscape Standards for footing detail
PARKING & SERVICE AREA LIGHT - Classic/Contemporary

BEGA pole & luminaire

Pole 1908HR

- Item No.: 1908HR
- Material: Aluminum
- Dimensions: 5dia x 323.25H
- Color: BEGA Black

Luminaire 8145MH - single

- Item No.: 8145MH
- Material: Aluminum
- Dimensions: 20L x 9W x 4H
- Color: BEGA Black
- Globe: Tempered Clear Glass
- Lamp: MH 150W T6 G12
- Ballast: 120V/277V Dual Voltage Metal Halide Ballast

Luminaire 8146MH - double

- Item No.: 8146MH
- Material: Aluminum
- Dimensions: 38.5L x 9W x 4H
- Color: BEGA Black
- Globe: Tempered Clear Glass
- Lamp: MH 150W T6 G12
- Ballast: 120V/277V Dual Voltage Metal Halide Ballast (2)

MANUFACTURER

BEGA/US
1000 Bega Way
Carpinteria, CA 93013

Phone  805.664.0533
Fax     805.566.9474

www.bega-us.com

*see Campus Landscape Standards for footing detail
WALL-MOUNTED LIGHT - Contemporary

BEGA wall-mounted luminaire

Luminaire 7475MH

Item No. 7475MH
Material Cast Aluminum
Dimensions 18.75L x 9W x 4.5H
Color BEGA Black

Globe Tempered Clear Glass
Lamp MH 70W T6 G12
Ballast 120V/277V Dual Voltage Metal Halide Ballast

MANUFACTURER

BEGA/US
1000 Bega Way
Carpinteria, CA 93013

Phone 805.664.0533
Fax 805.566.9474

www.bega-us.com
**WALL-PACK LIGHT - Classic/Contemporary**

**GeoMatrixx™ Series**

**GXMW Series Medium Architectural WallPack**

<table>
<thead>
<tr>
<th>Item No.</th>
<th>GX M W 57 HFL L GA 8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material</td>
<td>Cast Aluminum</td>
</tr>
<tr>
<td>Dimensions</td>
<td>13L x 12W x 6.5H</td>
</tr>
<tr>
<td>Color</td>
<td>Galvanite</td>
</tr>
<tr>
<td>Globe</td>
<td>Tempered Clear Glass</td>
</tr>
<tr>
<td>Lamp</td>
<td>CF 57W</td>
</tr>
<tr>
<td>Ballast</td>
<td>120V - 277V Universal Voltage Electronic Ballast</td>
</tr>
<tr>
<td>Mounting</td>
<td>12ft max height</td>
</tr>
</tbody>
</table>

**Mounting Box**

| Item No.          | GMSBOX                        |

**Photo Control**

| Item No.          | P105A (button)                |

**MANUFACTURER**

**ExceLine**

2345 Vauxhall Road  
Union, NJ 07083

Phone  800.334.2212  
Fax     908.964.0968

www.exceline.com
LIGHTED BOLLARD - Classic/Contemporary

Horizontal louver bollard

Horizontal louver bollard - 180° light distribution

<table>
<thead>
<tr>
<th>Item No.</th>
<th>8136P-BLK bollard + 895A anchorage for 8136 (included)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material</td>
<td>Extruded Aluminum</td>
</tr>
<tr>
<td>Dimensions</td>
<td>5.5dia x 39.375H</td>
</tr>
<tr>
<td>Color</td>
<td>BEGA Black</td>
</tr>
<tr>
<td>Globe</td>
<td>hand-blown 3-ply opal diffuser</td>
</tr>
<tr>
<td>Lamp</td>
<td>CF 13W quad 4p</td>
</tr>
<tr>
<td>Ballast</td>
<td>120V - 277V Universal Voltage Electronic Ballast</td>
</tr>
</tbody>
</table>

Horizontal louver bollard - 360° light distribution

<table>
<thead>
<tr>
<th>Item No.</th>
<th>8429P-BLK bollard + 895A anchorage for 8429 (included)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material</td>
<td>Extruded Aluminum</td>
</tr>
<tr>
<td>Dimensions</td>
<td>5.5dia x 39.375H</td>
</tr>
<tr>
<td>Color</td>
<td>BEGA Black</td>
</tr>
<tr>
<td>Globe</td>
<td>hand-blown 3-ply opal diffuser</td>
</tr>
<tr>
<td>Lamp</td>
<td>CF 13W quad 4p</td>
</tr>
<tr>
<td>Ballast</td>
<td>120V - 277V Universal Voltage Electronic Ballast</td>
</tr>
</tbody>
</table>

MANUFACTURER

BEGA/US
1000 Bega Way
Carpinteria, CA 93013

Phone 805.664.0533
Fax 805.566.9474

www.bega-us.com
FURNISHINGS STANDARDS

TRASH CAN - Classic

Chase Park™ Litter Receptacle with polyethylene liner - top opening

<table>
<thead>
<tr>
<th>Item</th>
<th>Chase Park Litter Receptacle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material</td>
<td>Cast Iron base / Cast Aluminum body / Spun Aluminum lid</td>
</tr>
<tr>
<td>Dimensions</td>
<td>24dia x 39H</td>
</tr>
<tr>
<td>Capacity</td>
<td>40 gallons</td>
</tr>
<tr>
<td>Color</td>
<td>Stone (Panguard II® polyester powdercoat)</td>
</tr>
</tbody>
</table>

MANUFACTURER

Landscape Forms, Inc.
431 Lawndale Avenue
Kalamazoo, MI  49048

Regional Sales Office, Dallas, TX
Phone  214.343.1145 / 888.667.1145
Fax    214.340.6769

specify@landscapeforms.com
www.landscapeforms.com

*see Campus Landscape Standards for footing detail
RECYCLING CAN - Classic

Chase Park™ Recycling Receptacle with polyethylene liner - top opening

Item: Chase Park Recycling Receptacle with 5” diameter opening in top
(for aluminum cans or plastic bottles)
Material: Cast Iron base / Cast Aluminum body / Spun Aluminum lid
Dimensions: 24dia x 39H
Capacity: 40 gallons
Color: Ivy (Panguard II® polyester powdercoat)

MANUFACTURER

Landscape Forms, Inc.
431 Lawndale Avenue
Kalamazoo, MI  49048

Regional Sales Office, Dallas, TX
Phone  214.343.1145 / 888.667.1145
Fax  214.340.6769

specify@landscapeforms.com
www.landscapeforms.com

*see Campus Landscape Standards for footing detail
TRASH CAN - Contemporary

Petoskey Litter Receptacle with polyethylene liner

Item: Petoskey Litter Receptacle
Material: Cold-rolled Steel body / Spun Steel lid
Dimensions: 20dia x 42H
Capacity: 30 gallons
Color: Stone (Panguard II® polyester powdercoat)

MANUFACTURER

Landscape Forms, Inc.
431 Lawndale Avenue
Kalamazoo, MI 49048

Regional Sales Office, Dallas, TX
Phone: 214.343.1145 / 888.667.1145
Fax: 214.340.6769

specify@landscapeforms.com
www.landscapeforms.com

*see Campus Landscape Standards for footing detail
**RECYCLING CAN - Contemporary**

Petoskey Recycling Receptacle with polyethylene liner

<table>
<thead>
<tr>
<th>Item</th>
<th>Petoskey Recycling Receptacle with 5” diameter opening (for aluminum cans or plastic bottles); or newspaper slit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material</td>
<td>Cold-rolled Steel body / Spun Steel lid</td>
</tr>
<tr>
<td>Dimensions</td>
<td>20dia x 42H</td>
</tr>
<tr>
<td>Capacity</td>
<td>30 gallons</td>
</tr>
<tr>
<td>Color</td>
<td>Ivy (Panguard II© polyester powdercoat)</td>
</tr>
</tbody>
</table>

**MANUFACTURER**

Landscape Forms, Inc.
431 Lawndale Avenue
Kalamazoo, MI  49048

Regional Sales Office, Dallas, TX
Phone  214.343.1145 / 888.667.1145
Fax  214.340.6769

specify@landscapeforms.com
www.landscapeforms.com

*see Campus Landscape Standards for footing detail*
EMERGENCY PHONE - Classic/Contemporary

CB 1-s Pedestal Interactive Voice Communication Unit

Item No. CB 1-s pedestal + FP 1 faceplate (included)
Material Steel body / Stainless Steel faceplate
Dimensions 12.75dia x 108H
Color Safety Blue

Text “Emergency”
Text color Reflective White

Lamp MH 70W
Ballast 120V

Optional Features to include:

Cellular communication
70W MH area light
Photocell for area light
Step-down power transformer (as needed)

MANUFACTURER

Code Blue Corp.
92 E 64th Street
Holland, MI 49423

Phone 800.205.7186
Fax 616.392.8391

info@codeblue.com
www.codeblue.com
EMERGENCY PHONE - Classic/Contemporary

CB 8 Wall-Mounted Interactive Voice Communication Unit

Item No.  CB 8 wall-mounted unit + FP 1 faceplate (included)
Material  Steel body / Stainless Steel faceplate
Dimensions  14L x 12.75W x 25.75H
Color  Safety Blue

Text  “Emergency”
Text color  Reflective White

Optional Features to include:

- Cellular communication
- Beacon/strobe kit
- Step-down power transformer (as needed)

Remote Mount Combination Blue Beacon/Strobe Kit

Item  Remote Mount Combination Blue Beacon/Strobe Kit
Material  Steel body / Polycarbonate refractor

MANUFACTURER

Code Blue Corp.
92 E 64th Street
Holland, MI  49423

Phone  800.205.7186
Fax  616.392.8391

infocb@codeblue.com
www.codeblue.com
**ASPHALT PAVERS - Classic/Contemporary**

**Commercial Asphalt Block**

<table>
<thead>
<tr>
<th>Item</th>
<th>6” x 12” commercial asphalt block</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material</td>
<td>Type 3 Asphalt cement, ASTM D-312</td>
</tr>
<tr>
<td>Dimensions</td>
<td>12L x 6W x (1 1/4” to 3”)H, thickness dependent upon application</td>
</tr>
<tr>
<td>Finish</td>
<td>Ground Finish or Tudor Finish, dependent upon application</td>
</tr>
<tr>
<td>Color</td>
<td>Matrix #10</td>
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</table>

<table>
<thead>
<tr>
<th>Item</th>
<th>5” x 12” commercial asphalt block</th>
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</thead>
<tbody>
<tr>
<td>Material</td>
<td>Type 3 Asphalt cement, ASTM D-312</td>
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<tr>
<td>Dimensions</td>
<td>12L x 6W x (1 1/4” to 3”)H</td>
</tr>
<tr>
<td>Finish</td>
<td>Ground Finish or Tudor Finish, dependent upon application</td>
</tr>
<tr>
<td>Color</td>
<td>Matrix #10</td>
</tr>
</tbody>
</table>

**MANUFACTURER**

Hanover Architectural Products  
240 Bender Road  
Hanover, PA 17331  

Phone 717.637.0500  
Fax 717.637.7145  

www.hanoverpavers.com

*see Campus Landscape Standards for installation details*
### TRUNCATED DOME PAVERS - Classic/Contemporary

**Detectable Warning Paver**

**12” x 12” Detectable Warning Paver**

<table>
<thead>
<tr>
<th>Item</th>
<th>12” x 12” detectable warning paver</th>
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</thead>
<tbody>
<tr>
<td>Material</td>
<td>concrete, ASTM C936, ASTM C67</td>
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<tr>
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<td>11.75L x 11.75W x (1 1/4” to 4”)H, thickness dependent upon application</td>
</tr>
<tr>
<td>Finish</td>
<td>Tudor Finish</td>
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<tr>
<td>Color</td>
<td>Charcoal</td>
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**24” x 24” Detectable Warning Paver**

<table>
<thead>
<tr>
<th>Item</th>
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<tbody>
<tr>
<td>Material</td>
<td>concrete, ASTM C936, ASTM C67</td>
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<td>Tudor Finish</td>
</tr>
<tr>
<td>Color</td>
<td>Charcoal</td>
</tr>
</tbody>
</table>

**MANUFACTURER**

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240 Bender Road  
Hanover, PA  17331  

Phone   717.637.0500  
Fax      717.637.7145  

www.hanoverpavers.com
CRUSHED STONE - Classic/Contemporary

Crushed Stone Gravel

<table>
<thead>
<tr>
<th>Item</th>
<th>Syenite “Screenings”</th>
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<tbody>
<tr>
<td>Material</td>
<td>Syenite</td>
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<td>Size</td>
<td>Screenings</td>
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</tbody>
</table>

MANUFACTURER

Granite Mountain Quarries, Inc.
1010 Shamburger Lane
Little Rock, AR 72201

Phone  501.490.1535
Fax    501.490.1852

*see Campus Landscape Standards for installation detail
FAMA Method—208V Equipment and Other Miscellaneous Parameters:

We do not include 208V equipment or circuits, if not fed by at least one transformer 125kVA or larger- per IEEE 1584 Amendment B (2011).

NFPA 70E (2012) does not directly address the question of inclusion of 208V circuits in arc flash studies- rather it refers to IEEE 1584 Standard.

NFPA 70E (2012) states the following-

Article 130.5— An arc flash hazard analysis shall determine the arc flash boundary, the incident energy at the working distance, and the personal protective equipment that people within the arc flash boundary shall use.

Informational Note No. 5: See IEEE 1584 for more information regarding arc flash hazards for three-phase systems rated less than 240 volts.

Referring to IEEE 1584 Standard-

Quoting IEEE 1584 Amendment B (2011), Changes to Clause 4, page 5, 4.2 Step 1: Collect the system and installation data-

“Equipment below 240V need not be considered unless it involves at least one 125 kVA or larger transformer in its immediate power supply.”

FAMA Method—Working Distance:

We use 18 inches as working distance for all locations.
FAMA Method- Calculating Available Fault Current

We calculate maximum available bolted fault current using the method of the IEEE calculator- IEEE_1584_Bolted_Fault_Cal.xls

Since that calculator is limited to only simple radial circuits, we have built extended models on that base to include the 12470V grid from our campus utility source and additional feeders, motors and transformers as needed. The extensions we add as needed employ the same per unit calculation methods as found in the IEEE calculator as found in standard industry practice.

We also sometimes test our calculations with other Isc calculators such as Bussmann- Short Circuit Program- bussoft\s_circt.exe.

We calculate available fault current according to three possible scenarios:

1. Maximum available fault current based on the load in question connected in our campus medium voltage grid sourced by the highest MVA provided by our utility company.

2. Minimum available fault current based on the load in question connected in our campus medium voltage grid sourced by the lowest MVA provided by our utility company.

3. Standby generator sourced with no utility power.
FAMA Method-- Generator Available Fault Current

To determine Generator available bolted fault current we use:

RMS Symmetrical Three Phase Fault Current = \( I_{sc} = \frac{E}{X''d} \)

Where:

\( I_{sc} \) = Bolted Fault Current in Amps  
\( E \) = Nominal Generator Output Voltage  
\( X''d \) = Subtransient Reactance

When \( X''d \) is not known, we compute it based on a conservative value provided in IEEE 141-1993, Table 4A-1, (page 174) which is in per unit of generator kVA rating. Specifically we use \( puX''d = 0.10 \)

If Generator X/R is not known, we use a table value found in ANSI/IEEE C37.010-1979 Figure 19 (page 42).
FAMA Method—Motor Contribution to Fault Current

Motor contribution to short circuit current is included only in Scenario 1- Maximum Available Short Circuit Current calculations.

We do not include motor contribution to fault current in Scenario 2- Minimum Available Short Circuit Current calculations.

We disregard motors less than 50HP as sources of fault current per Standard IEEE 1584b-2011 Sect 4.2.

For those motors 50 HP and greater, we field inspect each to determine type of drive or starter. If conventional starter including soft start type, or if supplied by variable speed drive which can be placed in bypassed operation, we calculate and include motor contribution to fault current.

We compute motor sourced fault power using the following two methods- choosing the highest result:

Method 1

\[
\text{MVA } \text{sc} = \frac{\text{kVAm} \times 0.001}{(X''d \times \text{ANCi multiplier})}
\]

Where-
\[
\text{kVAm} = \text{motor rated operating } kV \times \text{motor rated FLA} \times 1.732
\]
\[
X''d = \% \text{subtransient reactance on rated kVA of motor divided by 100}
\]
\[
\text{ANCi Multiplier} = 1.0 \text{ for synchronous motors during } X''d \text{ and 1.5 during } X'd
\]
\[
= 1.0 \text{ for induction motors above 250 HP during } X''d
\]
\[
= 1.2 \text{ for induction motors 50 HP up to 250 HP during } X''d
\]

When a motor % X''d value is not available, we use

Synchronous motors- % X''d m = 20

Induction motors- % X''d m = 16.5

Method 2

\[
\text{MVAsc} = \text{HP } \times \text{kVA per HP } \times 0.001
\]

Where-
\[
\text{HP} = \text{the motor HP}
\]
\[
\text{kVA per HP} = \text{NEC70 Table 430.7(B) highest value according to nameplate Code Letter}
\]

This method computes motor locked-rotor current which is a conservative estimate of motor contribution to fault current.

Either MVAsc value will be paired with X/R values found in ANSI/IEEE C37.010-1979 Figure 18 for induction motors and Figure 19 for synchronous motors and generators (page 42) to complete the specification of motor as source of fault power.

The MVAsc and X/R values for each included motor is treated as a parallel source resulting in parallel impedance paths to each bus within the system, to be accounted for as such in our short circuit current calculations.
FAMA Method—Values for Fault Current Calculations

When specific information for fault current calculations is not available, we use values provided with the IEEE 1584 Standard Calculator or those found in IEEE standards or the NFPA 70 Table 9.

In particular we use the following for medium voltage cables as found in IEEE141-1993 Table 4A-7:

\[ R = 0.102 \text{ ohms per 1000' for 2-0 cable} \]
\[ X = 0.042 \text{ ohms per 1000' for 2-0 cable} \]

\[ R = 0.0375 \text{ ohms per 1000' for 350 MCM cable} \]
\[ X = 0.0375 \text{ ohms per 1000' for 350 MCM cable} \]

In addition to using IEEE Standards as reference and source of values, we use GE Industrial White Paper GET—3550F 0489.
FAMA Method—Protective Devices and Arc Flash Hazard Calculation

We calculate maximum fault current at each bus using the IEEE_1584_Bolted_Fault_Cal.xls (extended) at the voltage at which each bus is powered. The resulting bolted fault current is entered into IEEE 1584 Hazard Calculator at the voltage at which it occurs.

Protective device opening times are determined at the protective device arcing fault current and the protective device reduced arcing fault current values as provided by the IEEE 1584 Hazard Calculator. Protective device arcing fault current used and reported is only that fault current sourced from utility or utility and motor source combined, that flows through the particular protective device that will open the arc first. Fault current flowing to the arc but not flowing through the controlling protective device, when of very short duration, low in magnitude as compared to the major source, and unable to sustain the arc alone, is disregarded as having no material effect on reported hazard.

We analyze protective device opening times with CYMTCC 5.014 software or other comparable software. Comparing protective devices operating at differing voltage requires adjustment at the transformer ratio, which is performed automatically by the software employed. Protective device opening times are manually determined by visual inspection at the protective device arcing fault current and protective device reduced arcing fault, or automatically determined depending on the software employed.

After determined fault current and protective device opening times, we calculate and report arc flash hazard using IEEE_1584_Arc_Flash_Hazard.xls.

For any given bus, we calculate hazard using the opening time of the protective device that will open the arc first at that point in the system. In some cases improper coordination exists and the immediate upstream protective device is not the first to open. When improper coordination exists, correction is recommended, but we report the hazard as it exists.

For panels with Main breakers or fuses which control the entire panel, we use the opening time of the next upstream device unless said Main controlling device is entirely isolated from the rest of the panel by separate steel compartment to prevent propagation of the arc from load-side to line-side of said Main protective device.

Having analyzed protective devices, we recommend any changes to protective devices which would improve coordination, improve circuit protection, or reduce arc flash hazard.