

## **Beth Israel Deaconess Medical Center Electrical Design Guidelines**

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These guidelines are required as part of the basis of design for all Electrical systems designed for Beth Israel Medical Center. The guidelines shall not directly replace MEP Engineering consultant specifications but are intended to convey a set of standards for all projects at the Facility. Where applicable codes conflict with these guidelines the codes shall supersede these requirements and consultant shall notify the BIDMC Facilities Engineering Department of such conflicts and guidelines shall be updated accordingly. Any deviation from these requirements shall be brought to the attention of the BIDMC Facilities Engineering Department during review with an explanation why it is required or how it may improve the system or systems affected.

Released by:

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BIDMC Electrical Guidelines  
Rev 1.0 – August 2019

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## 1. CONSTRUCTION REQUIREMENTS

All electrical work shall be in accordance with the most current Massachusetts Electric Code, NFPA 99 Health Care Facilities Code and OSHA regulations including 29 MFR 1926 subpart K and 29 CFR 1910.147) along with NFPA 70E code. The electrical work shall merit the approval of the state and local enforcing authorities.

### 1.1 General Procedure

- 1.1.1 All construction work must minimize the impact of their activities on BIDMC patients, staff and operations. Construction site and adjacent spaces shall be assessed and potential hazards to the facility's environment beyond the construction area shall be identified.
- 1.1.2 Environmental risk of infection for patients and staff during construction activities shall be assessed. BIDMC Infection Control Policies shall be adhered to.
- 1.1.3 Where electrical work to remain is damaged or disturbed in the course of the work, the Contractor shall report all damages to BIDMC. Removal of damaged portions and replacement of new products of equal capacity, quality, and functionality shall be coordinated with BIDMC.
- 1.1.4 Unless otherwise noted, demolish and remove existing electrical materials and equipment only to the extent required by new construction and as indicated. Removal of equipment shall not interfere with existing operations.
- 1.1.5 Notify BIDMC Project Manager of discrepancies between existing conditions and project drawings before proceeding with demolition or renovation
- 1.1.6 During construction the contractor shall at all times maintain electrical utilities of the building without interruption. Should it be necessary to interrupt any electrical service or utility, the contractor shall request permission in writing from BIDMC Project Manager for such interruption at least ten (10) business days (or two calendar weeks) in advance. Any interruption shall be made with minimum amount of inconvenience to the BIDMC. Arrange to provide and pay for temporary power source if required by project conditions. If requested by Maintenance Operations, power may be metered. Submit drawing of proposed temporary connections for approval.

## 1.2 Demolition

- 1.2.1 Services passing through areas of renovation shall be maintained throughout the construction period. Cables or wiring shall be covered or elevated to protect from damage.
- 1.2.2 Circuits serving areas adjacent to the construction area that are modified as part of a renovation shall be re-circuited as part of the project.
- 1.2.3 Provide temporary and/or modify existing emergency power, emergency lighting, fire alarm, and other services as required for construction-period Life Safety measures. Submit proposed plan to BIDMC Project Manager.
- 1.2.4 Contractor shall ensure that light switches within the Work area remain operational. Where temporary 120 volt light strings are installed, a switch shall be provided for the light strings near the Project entry door. Lights shall be switched off every day at the completion of the shift.
- 1.2.5 Turn off circuit breakers or switches serving abandoned circuits at the commencement of work and tag breaker or switch and label in panel schedule as "SPARE". Circuit breakers shall be in the "OFF" position and locked out.
- 1.2.6 Remove conduit and wire back to panelboards or to nearest junction box that is not being removed and needs to remain in service. Wire shall be removed back to point of origin.

## 1.3 Conduit and Junction Boxes:

- 1.3.1 Conduit and boxes in existing walls to remain (if not reused) shall be removed.
- 1.3.2 Conduit in existing or new ceilings that is not intended for reuse shall be removed back to the panel from where it originates.
- 1.3.3 Conduits that had been run in existing slabs shall be saw-cut off flush where they exit the slab and then be fire-sealed.

## 1.4 Conductors that are not to be reused shall be removed back to the nearest point-of-use. Where the entire circuit is to be removed, the conductors shall be removed back to the panelboard from which they originate.

- 1.5 Existing devices that are not installed at reusable locations shall be removed. Boxes shall be blanked. Non-hospital grade receptacles shall be replaced with hospital grade type.
- 1.6 Relocation: Carefully remove, clean and restore items designated for relocation to a “like new” condition, and store them for reuse.
- 1.7 Materials and equipment to be removed, except items specifically noted to be relocated or delivered to BIDMC, become property of the Contractor and shall be immediately removed from the Project Site and legally disposed of. If the BIDMC identifies other items during construction, those items become BIDMC property and shall be turned over to BIDMC. All salvaged items belonging to BIDMC shall be stored in a secure area until delivery to BIDMC as directed. Transport all such items to BIDMC's designated storage area.
- 1.8 Demolished items, rubbish and debris shall be removed from the construction site daily, and at the completion of the work. Floors shall be swept clean daily. Failure to do so may result in the cleanup being performed by others and all costs thereof being deducted from the Contractor's final payment.
- 1.9 All tools and ladders shall be locked up at the end of the work every day. All materials shall be new and of the quality specified. Materials shall be standard products of manufacturers regularly engaged in the production of such equipment and shall be the manufacturer's latest standard design.
- 1.10 All work installed shall be first class and complete in both effectiveness and appearance, whether finally concealed or exposed, and shall be executed by experienced electricians.
- 1.11 Re-conditioned or re-furbished electrical is not allowed except by special permission of the AHJ and BIDMC Engineering. In these rare circumstances, the reconditioned or re-furbished electrical shall be marked with the organization responsible for the reconditioning or re-furbishing of the electrical item. See NEC 2017 Art. 110.21(A)(2) for complete requirements of markings that must be present.

## **2 UTILITY COORDINATION**

- 2.1 For projects requiring investigation of the existing electrical distribution system in determining whether sufficient capacity is available to accommodate new loads, a request to BIDMC Project Manager is required indicating equipment to be monitored and duration required.

## **3 ELECTRICAL CALCULATIONS**

- 3.1 Where the existing electrical system shall being modified, a complete riser diagram and associated detailed panel board schedules shall be included within the Contract Documents. All added/removed/modified loads shall be clearly indicated on the Contract Documents.

### **3.2 Power System Studies**

- 3.2.1 Short Circuit Studies, Protective Device Evaluation Studies and Protective Coordination Studies shall be performed by BIDMC lead Protection Engineering firm, Everett Engineers. Contact: Keith R. Pogarian, PE, LEED AP, email: [keith.pogarian@eg-engineers.com](mailto:keith.pogarian@eg-engineers.com) or phone: 978.266.3711.

- 3.2.2 The power system studies are required to confirm the adequacy of the ratings of all electrical system components and proper coordination settings of all circuit breakers to the satisfaction of the Electrical Engineer of record. These studies shall not be used as the basis to compromise the electrical system and do not imply that short circuit ratings of devices may be lower than those specified for the distribution equipment elsewhere.

- 3.2.3 The studies shall be submitted to the Design Team prior to receiving final approval of the distribution equipment shop drawings and prior to the release of equipment for manufacture. It is the responsibility of the Design Team to provide documentation required to perform the following:

3.2.3.1 Fault Current Calculations

3.2.3.2 Protective Device Coordination

3.2.3.3 Arc Flash Analysis

Arc Flash Warning Labels as well as any recommended settings or adjustments of protective device (new and existing) to ensure selective coordination of the

electrical distribution system shall be provided to the construction team with completed study. All documentation shall be submitted to the BIDMC Project Manager.

#### **4 LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES**

- 4.1 Conductors shall be 600-volt and shall be copper. 600-volt aluminum conductors will be considered for conductors feeding switchboards, switchgear and panel boards rated above 225 amps.
- 4.2 No wire shall be smaller than No. 12 AWG, except that wiring for signal and pilot control circuits may be No. 14 AWG, and pre-manufactured fixture whips for light fixtures may be No. 14 AWG.
- 4.3 Network circuitry shall not be permitted.

#### **5 GROUNDING AND BONDING**

- 5.1 All feeders and branch circuit wiring shall be provided with an effective ground-fault current path.
- 5.2 An insulated copper equipment grounding conductor shall be bonded to all receptacles and non-current carrying conductive surfaces of fixed electrical equipment operating at over 100V.

#### **6 HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS**

- 6.1 Conduits, cable trays, boxes and fittings shall be supported from the building structure with metal supports. **No electrical item shall be hung from pipes or ductwork.**

#### **7 RACEWAY AND BOXES**

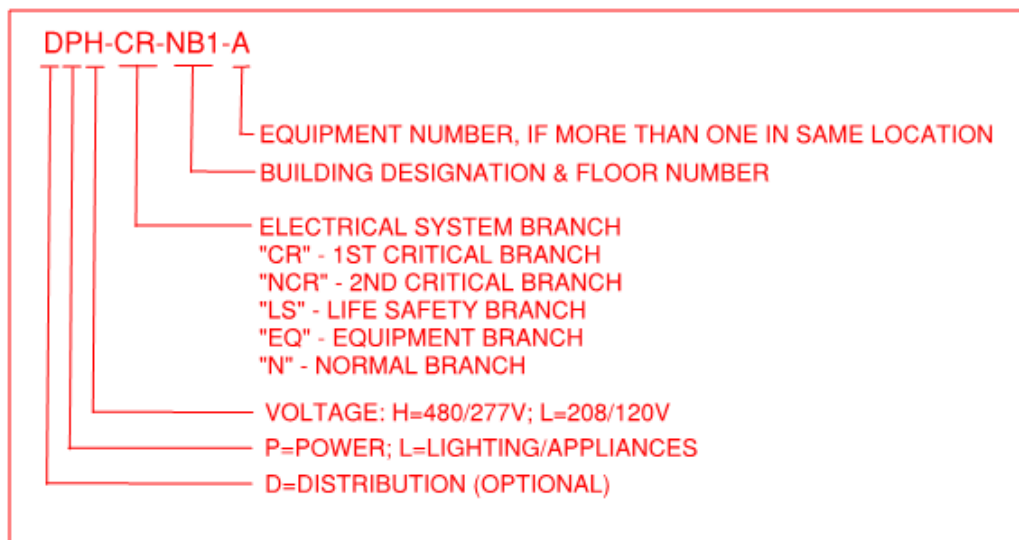
- 7.1 Minimum trade size for conduit shall be 3/4 inch.
- 7.2 Flexible conduit and liquid-tight in wet locations may be utilized for connections to light fixtures and equipment with noise, vibration or motion problems.
- 7.3 Any boxes located outside the building envelop shall be NEMA 3R.
- 7.4 All junction boxes shall be clearly marked with panel and circuit numbers.

#### **8 UNDERGROUND DUCTS, MANHOLE AND RACEWAYS**

- 8.1 Underground high voltage circuits shall be installed in concrete encased PVC conduit. The top of the concrete envelope shall be more than 30 inches below grade.
- 8.2 Where conduits pass through masonry or concrete walls or floors, the Electrical Subcontractor shall provide and set individual sleeves for each conduit and all other work under his charge, as necessary for passable of all raceways. Sleeves shall be of sufficient size to provide 1/2" air space around conduit passing through the floor or walls. All openings shall be sealed, smoke-proofed and made tight. The Electrical Subcontractor shall be responsible for the exact location of sleeves provided and coordinate all requirements for conduit sleeves.
- 8.3 Underground piping passing through exterior walls, foundation slabs on grade, or manhole walls shall have penetration closures of the modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the conduit and wall opening. Links shall be loosely assembled with bolts to form a continuous belt around the conduit and with a pressure plate under each bolt head and nut.

## 9 IDENTIFICATION FOR ELECTRICAL SYSTEM

- 9.1 Electrical panels shall be provided with phenolic labels attached with glue and screws to the outside cover.
- 9.2 Identification number shall be provided as follows:





## **10 TRANSFORMERS**

- 10.1 Manufacturer shall be Eaton.
- 10.2 Dry-type transformers shall have metallic enclosures designed to provide for air cooling and to prevent accidental contact with live conductors.
- 10.3 All transformers shall be UL listed and shall bear the UL label.
- 10.4 Transformer wiring compartment shall be located below the core and coil, and shall be cooled by air circulation, or the wiring compartment shall be insulated from the core and coil by means of a suitable thermal insulation barrier. Transformer core shall be constructed of high grade, non-aging silicon steel with high magnetic permeability hysteresis and eddy current losses. Magnetic flux densities shall be kept well below the saturation point. Transformer will be well ventilated to prevent excess humidity and moisture entering enclosure.
- 10.5 Transformers shall operate at 100% nameplate KVA rating continuously while in a 40 degrees C ambient environment without exceeding the rated average winding temperature rise of the ANSI insulated system used.
  - 10.5.1 Transformers rated above 30 KVA shall have a 220 degrees C insulation system with 150 degrees C average temperature rise or 180 degrees C hot spot rise in a 40 degrees C ambient.
  - 10.5.2 Transformers rated 30 KVA and below shall have a 180 degrees C insulation system with 115 degrees C average temperature rise or 145 degrees C hot spot rise in a 40 degrees C ambient.
- 10.6 Sound levels must fall within ANSI-NEMA Standard levels according to KVA size.
- 10.7 All transformers shall have neoprene rubber pads between the high-grade core and coil assembly and the transformer enclosure to isolate sound and vibration. A flexible conduit connection to the transformer may be used.

## **11 PANELBOARDS**

- 11.1 Manufacturer shall be Eaton.
- 11.2 Panelboards shall be dead front with door-in-door enclosure and bolt-on thermal magnet circuit breakers.
- 11.3 Panel label shall be provided in accordance with Section 9: Identification for Electrical Systems.

11.4 Arc Flash labels shall be provided indicating the following:

11.4.1 Flash boundary in inches, cal/cm<sup>2</sup>

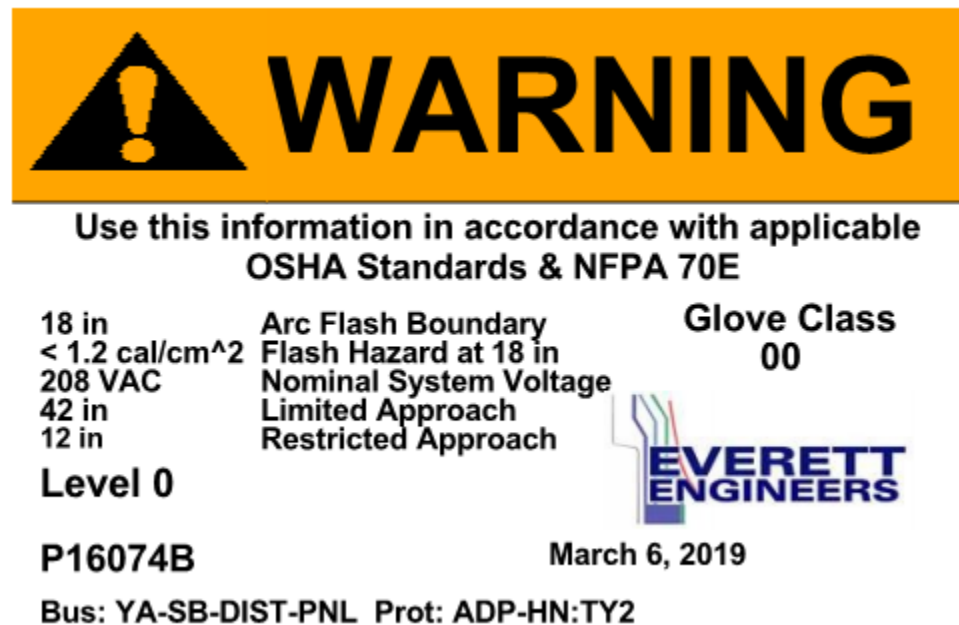
11.4.2 Flash Hazard at 18"

11.4.3 PPE Category Appropriate

11.4.4 Equipment name

11.4.5 Location of upstream disconnect

***Sample Arc Flash Hazard Label:***



11.5 Shock Hazard labels shall be provided indicating the shock hazard voltage when cover is removed, limited approach in inches, restricted approach in inches, and prohibited approach in inches. See sample above.

- 11.6 Panelboard shall be equipped with a shut off breaker in its own enclosure to the side of the main panel for NFPA-70E requirements.
- 11.7 Spaces within panel shall be filled with single 20-amp breakers, left in the 'ON' position and indicated on the panel directory as 'SPARE'.
- 11.8 Panel shall be provided with an updated, typed panel directory at the completion of project. Existing circuits of unknown loads shall be indicated on directory as "IN USE".
- 11.9 Provide 25% spare capacity.

## **12 DRIVES, STARTERS AND MOTOR CONTROLLERS**

- 12.1 VFDs shall be by Yaskawa.
- 12.2 Motor starters shall be by Eaton.
- 12.3 Provide motor starters and ancillary components which comply with the manufacturer's standard materials, and which are designed and constructed in accordance with published product information as required for a complete installation. Unless specifically indicated otherwise provide all power wiring, disconnects, starters, relays, hand-off-auto switches, pilot lights, motor connections, supports and all miscellaneous and necessary appurtenances required for a satisfactory and complete working system.

## **13 LIGHT FIXTURES**

- 13.1 Refer to **Beth Israel Deaconess Medical Center Lighting Standards**

## **14 LIGHTING CONTROL DEVICES**

- 14.1 Refer to **Beth Israel Deaconess Medical Center Lighting Standards**

## **15 WIRING DEVICES**

- 15.1 Refer to NFPA 99 and NEC 517.25 Part III Essential Electrical System for device/load requirements to be connected to the hospital's essential electrical system.
- 15.2 Receptacles
  - 15.2.1 Shall be UL-listed as hospital grade

15.2.2 Shall be NEMA 5-15R: Pass & Seymour Legrand PlugTail

15.2.3 Receptacle body color shall be white (normal) or red (emergency)

15.2.4 Emergency receptacle shall be illuminated

15.2.5 Cover plate shall be stainless steel with p-touch label indicating panel and circuit number

### 15.3 Switches

15.3.1 Shall be commercial grade, 20-amp: Pass & Seymour Legrand PlugTail rated for 120/277V.

15.3.2 Switch body color shall be white (normal) or red (emergency)

15.3.3 Switch cover shall be stainless steel with p-touch label indicating panel and circuit number.

## 16 CABLE TRAY SYSTEM

16.1 Cable tray or J-hooks shall be provided for telecommunications systems. Details shall be provided to clearly depict the method of installation and a coordinated path for the tray to follow.

16.2 Raceways, cables, boxes and conduits shall not be supported from cable tray systems.

## 17 TELECOMMUNICATIONS

17.1 Outlet boxes and conduit with pull strings shall be provided at each device location.

17.2 Conduit from outlet to above ceiling shall be a minimum of one inch.

## 18 NURSECALL SYSTEM

18.1 BIDMC utilizes Signet Responder 4000 system.

18.2 All nurse call modifications and new installation shall be coordinated with BIDMC Clinical Engineering.

18.3 Back boxes and conduit with pull strings shall be provided at each device location.

- 18.4 Conduit from outlet to above ceiling shall be a minimum of one inch.
- 18.5 Back box sizes shall be coordinated with the shop drawings and system wiring diagram provided by the vendor.

## 19 FIRE ALARM

- 19.1 Refer to **Beth Israel Deaconess Medical Center Fire Alarm Specifications**
- 19.2 For projects located in the ***East Campus (All buildings except Shapiro)***  
System: EST  
Programmer: Signet  
Contact: Lisa Jocelyn; [lisa.ioslyn@signetgroup.net](mailto:lisa.ioslyn@signetgroup.net)
- 19.3 For projects located in the ***East Campus (Shapiro Building Only)***  
System: EST  
Programmer: Fire Equipment Inc.  
Contact: Dave Curreri; [dcurreri@firefire.com](mailto:dcurreri@firefire.com)
- 19.4 For projects located in the ***West Campus (Rosenberg, Farr, Deaconess, Palmer, Baker, Span)***  
System: Honeywell  
Programmer: Honeywell  
Contacts: Tim Conley; [Timothy.Conley@Honeywell.com](mailto:Timothy.Conley@Honeywell.com)  
Bill Glennon; [William.Glennon@Honeywell.com](mailto:William.Glennon@Honeywell.com)
- 19.5 For projects located in the ***West Campus (Libby Building)***  
System: EST  
Programmer: Bennett Communications  
Contacts: Mark Popielski; [MPopielski@bennettcom.com](mailto:MPopielski@bennettcom.com)
- 19.6 For projects located in the ***West Campus (Lowry Building)***  
System: Notifier  
Programmer: Northeast Integrated Systems  
Contact: Carrie Ruddy; [Carrie.Ruddy@nisco.us](mailto:Carrie.Ruddy@nisco.us)
- 19.7 Request for building specific Fire Alarm Sequence of Operations shall be made to BIDMC Project Manager.
- 19.8 All projects shall utilize BIDMC specific Fire Alarm Narratives for submission to secure BFD fire alarm permits. Request for narratives shall be made to BIDMC Project Manager.

- 19.9 All tubing, fittings, boxes and MC cables shall be colored RED.
- 19.10 All existing smoke detectors must maintain access for service and testing.
- 19.11 All fire alarm relays and modules shall be located at the location of the fire alarm cabinet or where coordinated with BIDMC Engineering.

## **20 SECURITY**

- 20.1 Back boxes and conduit with pull strings shall be provided at each device location
- 20.2 All projects with new/modified security scope shall be coordinated with BIDMC Public Safety and BIDMC Security Vendor.

## **21 AUTOMATIC DOORS**

- 21.1 Automatic door system shall be by Record, LCN or Stanley (in that priority). Safety sensors shall be provided on both side of the doors and sensor touchless operating paddles.
- 21.2 Door fire rating and doors serving as part of a life safety system must be connected to the fire alarm system per the latest code. Typically the automatic operator is disabled during a fire alarm event.
- 21.3 All projects with automatic doors requiring integration with the fire alarm system and/or security system shall be coordinated with BIDMC Engineering.

## **22 PNEUMATIC TUBE SYSTEM**

- 22.1 System shall be Swisslog.
- 22.2 All equipment shall be connected to emergency power.
- 22.3 Stations shall be provided with a remote alarm.
- 22.4 Stations shall have 4 carriers order with new station.
- 22.5 Communication cabling shall be CAT6 or per manufacturer's wiring recommendations.
- 22.6 Blowers shall be mounted 18" off the floor.
- 22.7 Stations shall have access to flapper valve (usually located 6' to 8' above station).

- 22.8 Stations location in halls or areas not within sight must be provided with a security door.
- 22.9 Transfer units shall be installed in an accessible location and must be coordinated with BIDMC Engineering during design.

## **23 SYSTEM CLOCK**

- 23.1 Clocks shall be Pyramid Time System Stock #S9A3AAGBXB Sunc 900 MHz Analog 13" BLK Bezel. All clocks require lithium battery #42224.

**Contact:**

Pyramid Time Systems, LLC  
John Bechara ; [jbechara@ptitime.com](mailto:jbechara@ptitime.com)  
45 Gracey Ave. Meriden, CT 06451  
Office: 203.238.0550 X 267

## **24 OPERATION AND MAINTENANCE OF SYSTEMS**

- 24.1 Contractors shall provide an Equipment Matrix and Inventory log of all components of utility by location with the following information:
    - 24.1.1 Manufacturer
    - 24.1.2 Model number (as applicable)
    - 24.1.3 Serial number (as applicable)
    - 24.1.4 Frequency of PM
    - 24.1.5 Link to O&M (as applicable)
- Excel file shall be requested from BIDMC Project Manager at project kickoff.