

## LRAFB ELECTRICAL DESIGN STANDARDS

June 03, 2024

1. The intent of this standard is to introduce the designer to Little Rock Air Force Base (LRAFB) standard design practices. Designs shall minimize energy consumption and consider recycled material products. Products that utilize recycled materials shall be highlighted in the design analysis. Design in accordance with all applicable NFPA standards and all applicable UFC's <https://www.wbdg.org/ffc/dod/unified-facilities-criteria-ufc>. All electrical equipment and circuits shall be tested in accordance with NETA ATS (<https://www.netaworld.org/standards/ansi-neta-ats>) and verified to pass those requirements.
2. Distribution System:
  - a. Construction contract is responsible for electrical installation starting with the point of connection to the Point of Demarcation with the base electrical distribution system. The contractor shall be responsible for providing all conduit, wire and connectors to the Entergy Arkansas LLC (EAL) provided transformer. Coordinate with EAL and LRAFB electrical engineer for requirements. Standard transformer details are available on the EAL web page.
  - b. Service feed shall be underground from the transformer to the building. Provide a lockable single point of disconnect with overcurrent protection on the exterior of the building via a KNOX remote power box.
  - c. If a generator is required by the use of the facility, the generator shall be provided with a 4 pole Automatic Transfer Switch (ATS) with bypass isolation and 72 hours of fuel storage. Generators shall be designed around the base standard Cummins generator. Any deviation from Cummins specifications shall be rejected. Generator shall be serviceable without use of a ladder. Generator shall be at least loaded to 50% capacity. Whole building backup is generally not allowed. Distribution system shall be designed so that the emergency generator only provides backup power to authorized functions. Contractor is responsible to provide complete generator design calculations and associated information required to obtain approval from AFCEC by the 65% design submittal. All documentation required to obtain air permitting for the generator shall be provided within the 65% design submittal. **LOAD TESTING DETAILS TO COME**
  - d. Any road crossings required shall be made by directional boring under road unless otherwise approved. Where road cuts are unavoidable to provide power to the facility, all such instances shall be patched using the LRAFB road cut detail.
  - e. Provide a smart utility meter that is compatible with CE COINE requirements as detailed in the Air Force Meter Data Management Plan. Meter system shall comply with the newest UFGS guide specs, having the following features:
    - 15 minute interval data with 30 day memory
    - LED or LCD display with wireless communication capability (transceiver)
    - Maximum data functionality; peak, power factor, kVAR, CFM, harmonicsThe meter system shall be required to incorporate gas and water host transducer (KYZ) signals.

### 3. Building Power:

- a. Interior wiring shall be copper and all wiring shall be in conduit. Type MC cable is prohibited with exception only on an "as approved" basis. Its use may be considered for approval by the 19 CES/CENMP electrical engineer.
- b. All conduit shall be concealed above ceilings, in walls or in floors in finished areas.
- c. Duplex receptacles shall be placed throughout offices to allow flexibility in furniture layout. Duplex receptacles shall be within 12 inches of data outlets. Duplex receptacles shall be rated for 20 amps and limited to a maximum of *five per circuit*.
- d. Dedicated circuits shall be provided for all refrigerators and microwaves.
- e. Discuss with the user and provide support for the specific equipment needs for each area.
- f. All exterior outlets shall be ground fault interrupter type and shall be suitable for wet locations.
- g. Provide weather proof device covers for all exterior receptacles. These device covers shall be the type that can fully close with the cord and plug plugged into the receptacle.
- h. Do not use common neutral on single phase circuits.
- i. All circuits shall have properly sized ground wire. Do not use conduit as a ground.
- j. Conductors for branch circuits as defined in NEC Article 100, shall be sized to prevent a voltage drop exceeding 3 percent at the farthest outlet of power, heating, and lighting loads, or combinations of such loads, and where the maximum total voltage drop on both feeders and branch circuits to the farthest outlet (power utilization point) does not exceed 5 percent. Receptacle circuits shall be tested at the outlet electrically furthest from the panel to verify compliance to this requirement. Test shall be at full breaker current load (15 or 20 amps depending on breaker trip setting) or extrapolated from a lower load to full load to validate circuit passes this requirement. Transformers shall be adjusted so that the no load voltage at the last point of usage is 120 to 125VAC.
- k. All panelboards shall include copper bus bars, to include the ground bars. No aluminum bars shall be accepted.
- l. Color of devices and wall plates shall be coordinated with architectural design for compatibility.
- m. Panelboards recessed into walls shall have enough spare conduit capacity stubbed up above ceilings or into other accessible spaces to handle spares and spaces left in panelboard for future use. Design and finished installation of electrical systems shall include 25% spare capacity in panelboards for future growth. Panelboards shall be located in electrical rooms.
- n. Transient voltage surge suppression (TVSS) shall be as a minimum provided at the main distribution panel. The TVSS shall be at least 200kA, equivalent to Square D SurgeLogic.
- o. Where approved, electrical design shall provide power to automatic plumbing valves. Plug in transformers in outlets will not be acceptable.

- p. Snap switches used for disconnecting equipment shall be placed near the equipment and be mounted in such a manner as to not be confused with a light switch.
  - q. All circuit homeruns on drawings shall include associated panelboard tag and circuit numbers. Panelboard tag and circuit numbers shall be printed on receptacle and light switch covers.
  - r. Connections to ground rods shall be exothermic welds. Compression connections will be disapproved.
  - s. Contractor shall leave all ground connections uncovered until such time that CE electrical engineer inspects and approves exothermic weld, otherwise the contractor shall be required to uncover for inspection. Resistance to ground test shall be by the “fall of potential” method.
  - t. Lightning protection required on all roofs. All lightning protection down conductors shall be copper and shall terminate into a counterpoise via exothermic weld. Down Conductors shall be in metal conduit painted to match facility exterior color. Lightning protection conductors placed on the roof may be aluminum but shall transition to Down Conductors via bi-metallic connectors. Structural steel shall not be used in lieu of copper Down Conductors. Air terminal devices, conductors and clamps shall not penetrate roof.
4. Outdoor feeder:
- a. All outdoor feeders shall be in conduit at least 24” below grade.
  - b. Keep electrical feeders a minimum of 3 feet away from parallel runs of other utilities.
  - c. Exterior above ground conduit shall be Rigid Galvanized Steel (RGS). Underground conduits shall transition to RGS via concrete pad extending above finished grade by 8”.
5. Communications:
- a. Service to the facility shall be through the number of four-inch PVC conduit to nearest manhole or connection point as designated by communications squadron. At least one of these conduits shall be filled with 1” innerduct; see Comm. Design guide and specifications for type.
  - b. Provide data outlets unless specifically stated otherwise. Outlets shall be placed all around rooms to allow flexibility in furniture layout. Design layout for computers, printers, scanners, telephones and fax machines.
  - c. An outlet shall be placed next to Energy Management System panel. Contractor will provide a patch cord to connect EMCS panel to the outlet.
  - d. An outlet shall be placed in close proximity to the CE COINE utility meter. Contractor shall provide a patch cord to connect CE COINE utility meter to the outlet.
  - e. Wiring shall be protected from damage by either conduit or center rail type cable tray.
  - f. Limit the length of each communication circuit to less than 280 feet.

- g. Layout of all communications equipment in communications rooms and closets shall be shown on design drawings to ensure adequate space is provided. **See Communications Design Guide for specific requirements.**
  - h. Where more than one communications room is located in a facility, provide conduit with backbone cable between the two rooms. This conduit may be plastic innerduct placed in cable tray.
  - i. Conduit lengths on exterior systems shall be kept under 450 feet unless manhole/handholes are provided. Manholes/handholes shall be placed 400-450 feet apart. Exterior conduit runs shall have minimum bending radius of 40 feet until conduit reaches facility. Conduit entering and leaving handhole/manholes shall be kept at same depth so they align. **See attached typical handhole detail.**
  - j. A power duplex outlet shall be placed no further than 12 inches from each data outlet.
  - k. **Utilize LRAFB specification section 27 20 00 Computer/Telephone Systems and UFC 3-580-01.**
  - l. **See 19 CS Communications design guide for additional details and requirements.**
6. Community Access Television:
- a. For CATV, one two-inch PVC conduit shall be run to the building communications room from the nearest communication manhole.
  - b. Designer shall provide the number of CATV outlets as required by the user. Normally provide CATV outlets in conference rooms and commander offices. Some services facilities may require additional outlets.
7. Lighting:
- a. Consider maintenance of luminaires when designing a lighting layout. When choosing a luminaire consider task, architectural compatibility, base standards and energy efficiency.
  - b. Dimmable LED fixtures (with dimming controls) is required for office spaces and standard LED is required for exterior applications with strict compliance with UFC 3-530-01 requirements.
  - c. Comply with UFC 3-530-01, Illuminating Engineering Society of North America and ASHRAE 90.1. Target luminance levels shall be achieved. Use Energy Star qualified products. Where lighting levels are not listed in the UFC the light levels shall be in accordance with Illuminating Engineering Society North America unless otherwise indicated. Photometric plans shall be provided with the 95% design submittal supporting the design.
  - d. Use dual technology occupancy type sensors along with dimming wall switches to control lights. All entrances to a space shall have the ability to dim the lights to that space and turn on or off. Switches shall be wired into system as “ON Permissive” devices. For dimmers/switches installed next to single doors, the location shall be on the opposite side of the door as the door hinge.
  - e. Exterior Lighting:
    - i. All exterior luminaires shall control light with cutoff optics so that light does not aim towards sky. (Dark sky compliant to the furthest extent possible).

- ii. All exterior lighting shall be at a minimum controlled by photocells. Astronomical time clocks are highly encouraged.
- iii. Lighting shall use “white” light source for main entrances to facilities by LED. Follow latest version of UFC 3-530-01.
- iv. Ensure architectural compatibility of the luminaires with building and surrounding areas. Standard LRAFB exterior luminaires are as follows:
  - 1. Sidewalk lights shall be the base standard “Washington Post” style light (AWDE3) LED fixture on a Princeton pole from Holophane or approved equal.
  - 2. Parking lot light fixtures are LED of the “shoe box” style on square metal poles. Other than standard luminaires will be considered for services type facilities, which may have architectural characteristics to accentuate the theme of the area.
- v. Exterior light fixture color shall be manufacturer’s standard dark bronze.
- f. Interior Lighting:
  - i. Lighting shall be suitable for the purpose of the area.
  - ii. Dimmable LED fixtures (with dimming controls) are required for all interior spaces.
  - iii. Energy efficiency shall be considered in the design of all locations. Dual technology occupancy sensors are to be used to the greatest extent possible. Occupancy sensors are not to be the sole method of switching.
  - iv. Night lighting is not allowed unless specifically indicated by the government.
  - v. Lighting design shall always include photometric plans.
  - vi. Lighting design shall control glare in areas where glare will be a problem for the operation of that area (areas that contain computer monitors, televisions, etc.). Luminaires used with glare control shall have means to control light in horizontal direction or indirect lighting may be used.
  - vii. Existing standard LRAFB luminaires are as follows: Parabolic louvered two feet by four feet LED fixtures with dimmable drivers (and dimming controls) in general offices with low ceilings and corridors; Suspended indirect LED lighting fixtures with dimmable drivers in general offices with high ceilings; recessed LED two feet by four feet or two feet by two feet fixtures with dimmable drivers for corridors; recessed LED fixtures with dimmable drivers above restroom sinks. LED high-bay fixtures with dimmable drivers in bay areas such as can be found in maintenance hangars, storage facilities, etc. LED fixtures are required with strict compliance to LED requirements of UFC 3-530-01. Fixtures shall be UL listed.
  - viii. Conference rooms. Ensure light fixture ballasts do not cause interference with wireless A/V systems. Lighting shall be designed to provide multiple light-scapes to promote general discussions, video conferencing and video presentations.
  - ix. All light switches in each room shall be the same style.
  - x. All interior light fixtures shall be labeled with panelboard tag and circuit numbers (black letters on clear Brother or TZ tape).

- g. Lighting means of Egress, Emergency and Exit Lighting:
  - i. Where fixtures allow, emergency lighting shall be accomplished using an emergency battery in the normal lighting luminaire.
  - ii. All multi-personnel offices or spaces designed for more than one occupant shall be assumed to contain a designated means of egress aisle.
  - iii. Exit lights shall be red LED type with emergency battery backup. Exit lights shall be self testing/self diagnostic type.
  - iv. Comply with UFC 3-600-01 and UFC 3-530-01.
  - v. All emergency and exit lighting shall be placed on a dedicated circuit to ease inspection and testing.

8. Fire Alarm System:

- a. For Design-Bid-Build projects, performance based design shall not be accepted. The registered FPE of record (QFPE) shall provide a full 100% fire alarm design which shall include schematic diagrams of all circuits to include all devices in each circuit, voltage drop, battery run times, candela ratings for devices. The QFPE shall indicate the design basis with "or approved equal" verbiage.
- b. Design an addressable type fire alarm system unless otherwise specified in contract documents. Notification appliances must be analog.
- c. Addressable devices shall be grouped in zones for transmission of alarm to central fire station. Enough zones shall be provided that will allow fire department or maintenance personnel to quickly determine the alarmed area of a facility.
- d. All circuits shall be class A with no T-Taps allowed. IDC circuits shall be Style D or E. Signaling Line Circuits (SLC) shall be Style 6 or 7. Notification Appliance Circuits (NAC) shall be style Z. As a minimum, speakers shall be UL listed to UL 1480 (most current edition.)
- e. Zone conditions shall be transmitted to the central fire station utilizing a Monaco BT-XF radio transceiver with antenna.
- f. Unless an automatic sprinkler system is present, the facility shall have a complete automatic detection system with 100% coverage unless not required by UFC 3-600-01 or UFC 4-021-01. Full coverage smoke detectors are not to be used.
- g. All devices shall be powered from the building fire alarm panel.
- h. Duct type smoke detectors shall be provided, on supply and return ducts in accordance with NFPA 90A and applicable mechanical codes. Provide remote test and reset station for each duct smoke detector that is mounted above 7' or cannot be reached from floor. Provide automatic shutdown of all air handlers when fire alarm panel goes into alarm.
- i. Audio/visual annunciation devices shall be provided throughout to facilitate emergency exit of personnel during a fire. Public areas shall have visual strobe devices (lobbies, corridors, restrooms, conference rooms, etc.).
- j. All devices shall be placed so that maintenance can be performed without difficulty. **This may necessitate catwalks in hard to reach areas.**
- k. For facilities that have fire suppression systems, install flow/pressure devices in each riser. Provide tamper switch for all control valves and post indicator valves. Each riser shall report as a separate alarm zone to the fire department.

- l. Use UFC 3-600-01 (Fire Protection Engineering for Facilities) and LRAFB specification section 28 31 00 (Fire Detection and Alarm Systems)
  - m. Keys for panels, devices, boxes, etc must match and be 17021.
9. Other gas or element detection systems, such as carbon monoxide detection, shall be powered from the building's Fire Alarm Control Panel (FACP). A separate zone shall be enunciated through the building transceiver to the Fire Department. NFPA codes for such detection systems shall be complied with. Devices whose sole power comes from batteries shall not be acceptable.
10. Mass Notification System:
  - a. Use most current UFC 4-021-01 with ECB 2018-17 (Design and O&M: Mass Notification Systems) and LRAFB specification section 27 51 16 (Building Mass Notification Systems)
  - b. When Fire Alarm and Mass Notification Systems are required, a single combined system shall be required.
  - c. NAC circuits shall be style Z. Notification appliances must be analog.
  - d. As a minimum, speakers shall be UL listed to UL 1480 (most current edition.)
  - e. Provide radio transceiver with antenna compatible with LRAFB Giant Voice System and connect to the ACU and tested for proper operation. The Giant Voice messages must be relayed into the entire facility.
  - f. Textual display signs must read the LRAFB MNS message, full text, or minimum short text of "BOMB THREAT", "INTRUDER ALERT", "SHELTER IN PLACE", etc. Simply reading "EVACUATE" or "ANNOUNCEMENT" is not suitable.
11. Intrusion Detection System:
  - a. Where operation requires, provide an intrusion detection system that will communicate with the central security forces panel.
  - b. Intrusion detection system includes motion devices, listening devices, visual monitoring equipment, duress buttons, vibration sensors, glass break sensors and control panel.
  - c. Communication with the central security forces panel is through a dedicated, un-switched, supervised telephone line.
  - d. All devices shall be powered from the building security panel.
  - e. Contractor shall design and install per requirements of applicable ETL's, AFI's and UFC's.
12. Conference Room Audio/Visual Systems:
  - a. Designer shall lay out supporting equipment for conference room audio/visual systems. This shall include projectors, screens, TV's, speakers, computers, podiums and light control.
  - b. At the location for computer support equipment, include LAN connection, cable television outlet (provide minimum empty conduit to above ceiling if user does

not need cable television connection), an empty conduit to projector location and an empty conduit to below conference room table.

- c. Provide a duplex receptacle at projector/TV location and quad receptacles below the conference room table at four foot intervals.
- d. Provide a LAN connection below the conference room table.

13. Systems Furniture:

- a. Power feed for systems furniture shall incorporate flexibility for future layout changes. Care shall be exercised in determining the best method for connection to the facility to provide the least obtrusive connection and the greatest flexibility.
- b. Data connections shall be continuous without splices from patch panel to the outlets in the systems furniture. It is not acceptable to be required to move systems furniture to get to a data outlet.

14. Exposed electrical equipment shall be painted to standard base colors.

15. Equipment subject to damage by vehicular traffic, such as a roadway or driveway within 5', shall be protected by concrete filled 6" steel bollards buried a minimum of 4' below grade and extending up a minimum of 4'.

16. All equipment and conduit subject to damage by grounds maintenance mowers shall be placed on concrete pads extending 8" above finished grade.

17. Demolition – No circuit of any voltage shall be 'abandoned in place'.

- a. Power: Any conduit or wiring that is not required for the completion of a project and is not in use shall be removed back to the point of origin in a panelboard. If a circuit feeds multiple equipment outlets then that portion of the circuit wire and conduit that is not to remain in use shall be removed back to the point where the circuit is to remain in use.
- b. Communications: Low voltage circuits; such as phone and LAN, fire alarm and mass notification systems, conduit and wiring shall be removed back to the cable point-of-origin cabinet, punchdown block or equipment rack.
- c. Transformers belonging to LRAFB: Any demolished transformer and medium voltage equipment that contains insulating liquid shall be tested for PCBs prior to turn in to DRMO. (Transformers belonging to Entergy shall be dealt with by Entergy.) The turn in procedure is as follows:
  - i. Oil filled transformers and other equipment containing insulating liquid must be tested for the presence of PCB's by the Contractor.
  - ii. Equipment cannot be leaking. All caps/covers etc. must be tight.
  - iii. Contractor shall unload equipment themselves, there is no forklift support at DRMO on LRAFB.
  - iv. Contractor shall present HAZMO/CAP (Bldg. 1575, 501-987-5247) with analytical results, KVA rating, serial number, manufacturer, date equipment was taken out of service and an estimate of the original cost of the equipment. HAZMO will send proper forms to DRMO and inform contractor to set up a turn-in appointment with DRMO.



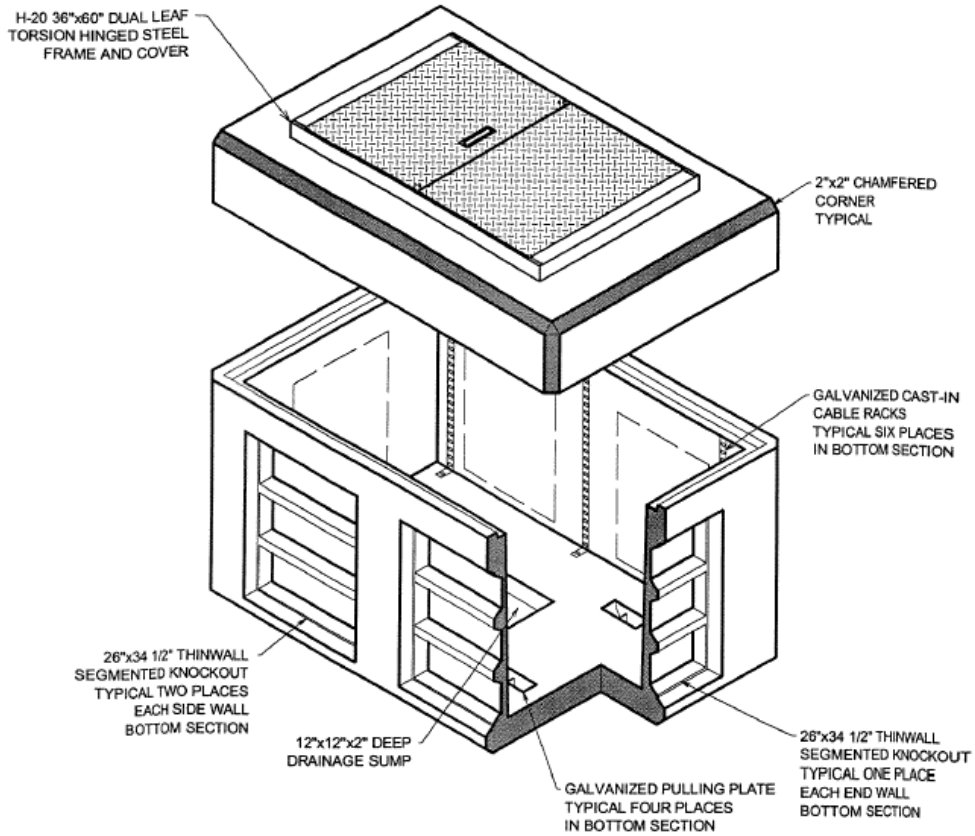
- v. The Contractor shall call DRMO in advance of delivering the equipment to DRMO for a turn-in appointment @ (501) 987-3715.
- vi. Contractor shall deliver and unload equipment to DRMO site on base per scheduled appointment.
- vii. The contractor shall provide DRMO a copy of the complete analysis at the time of turn-in.
- viii. The contractor will affix a single page of the analysis that reflects the PCB results for that particular piece of equipment to the side of the equipment.
- ix. Equipment must be secured to a pallet prior to transport to DRMO.

ALL CONCRETE SHALL HAVE A 28-DAY COMPRESSIVE STRENGTH OF 7500 psi.

REINFORCING STEEL SHALL COMPLY WITH ASTM A615 GRADE 60, A706 GRADE 60, OR A497 GRADE 70. BAR BENDING AND PLACEMENT SHALL COMPLY WITH THE LATEST ACI STANDARDS.

STANDARD STRUCTURAL DESIGN IS BASED ON AASHTO HS 20 WHEEL LOADING.

THE PULL BOX DESIGN IS BASED ON THE OUTSIDE OF THE TOP SLAB AT ANY ELEVATION BETWEEN FINISHED GRADE AND 0.50 FEET BELOW FINISHED GRADE WHEN THE WATER TABLE IS ASSUMED AT 3.00 FEET BELOW GRADE.



**CONDUIT ENTRY**

VARIOUS SIZE AND CONFIGURATION GREENLINE TERMINATORS ARE AVAILABLE FOR INSTALLATION AT EACH SEGMENTED KNOCKOUT LOCATION.

**4'-0"x6'-6"x48"**

**greenline**

**PULL BOX**

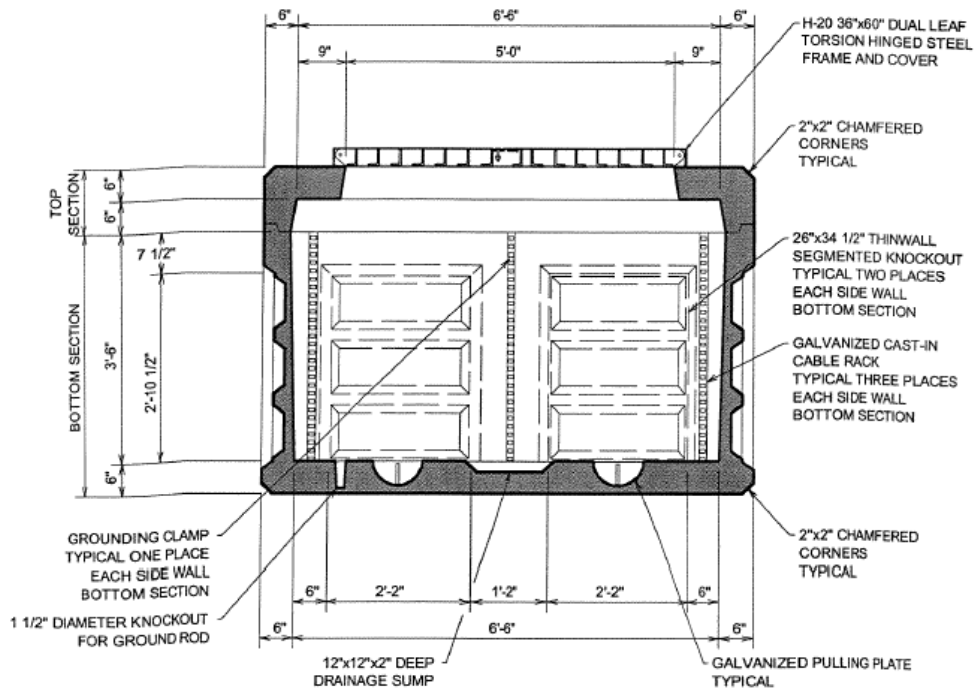
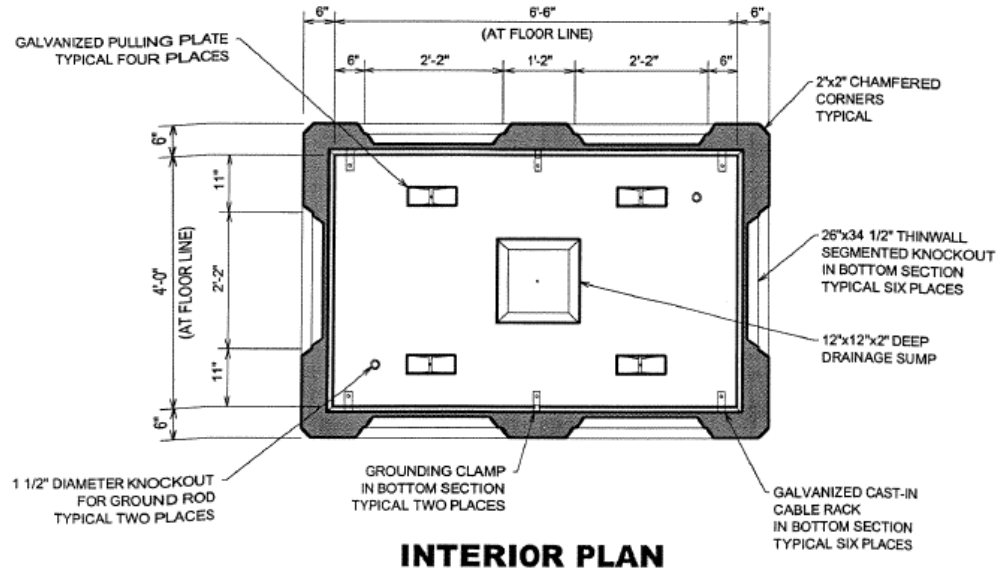
**newbasis**

**MINIMUM EXCAVATION**

7'-0"x9'-6"

**APPROXIMATE WEIGHTS**

BOTTOM SECTION - 6630 LBS.  
TOP SECTION - 3170 LBS.



**SECTION - SIDE WALL**

**4'-0"x6'-6"x48"**

**greenline**

**PULL BOX**

**newbasis**

**APPROXIMATE WEIGHTS**

BOTTOM SECTION - 6630 LBS.  
TOP SECTION - 3170 LBS.