“IOR Certification Code/Plans Questions” Part 1 Electrical

Electrical

Code

- Class A 10 Questions
- Class B 12 Questions

Sample Electrical Question

In ELEVATORS, DUMBWAITERS, ESCALATORS, MOVING WALKS, PLATFORM LIFTS & STAIRWAY CHAIRLIFTS, A sump pump located in an elevator hoistway shall be permitted to be cord connected. The cord shall be a hard usage oil-resistant type of a length not to exceed _____ and shall be protected from physical damage.

a) 3 ft
b) 6 ft
c) 8 ft
d) 10 ft

- **How to look for the response?** 

- **Sample #4- in CEC where is** ELEVATORS, DUMBWAITERS, ESCALATORS, MOVING WALKS, PLATFORM LIFTS & STAIRWAY CHAIRLIFTS**?**

Part VII. Grounding

610.61 Grounding. All exposed non–current-carrying metal parts of cranes, monorail hoists, hoists, and accessories, including pendant controls, shall be bonded either by mechanical connections or bonding jumpers, where applicable, so that the entire crane or hoist is a ground-fault current path as required or permitted by Article 250, Parts V and VII.

Moving parts, other than removable accessories, or attachments that have metal-to-metal bearing surfaces, shall be considered to be electrically bonded to each other through bearing surfaces for grounding purposes. The trolley frame and bridge frame shall not be considered as electrically grounded through the bridge and trolley wheels and its respective tracks. A separate bonding conductor shall be provided.

ARTICLE 620
Elevators, Dumbwaiters, Escalators, Moving Walks, Platform Lifts, and Stairway Chairlifts

Part I. General

620.1 Scope. This article covers the installation of electrical equipment and wiring used in connection with elevators, dumbwaiters, escalators, moving walks, platform lifts, and stairway chairlifts.

Informational Note No. 1: For further information, see ASME A17.1-2013/CSA B44-13, *Safety Code for Elevators and Escalators*.

Informational Note No. 2: For further information, see CSA B44.1-11/ASME-A17.5-2014, *Elevator and Escalator Electrical Equipment*.

Informational Note No. 3: The term *wheelchair lift* has been changed to *platform lift*. For further information, see ASME A18.1-2014, *Safety Standard for Platform Lifts and Stairway Chairlifts*.

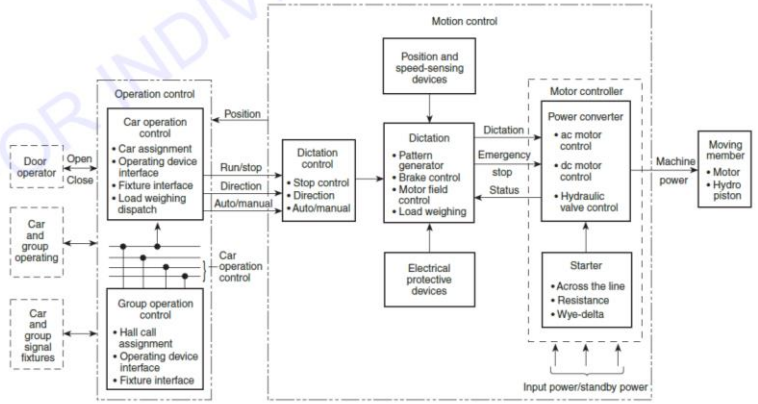
620.2 Definitions.

Informational Note No. 1: The motor controller, motion controller, and operation controller are located in a single enclosure or a combination of enclosures.

Informational Note No. 2: Informational Note Figure 620.2, No. 2 is for information only.

Control Room (for Elevator, Dumbwaiter). An enclosed control space outside the hoistway, intended for full bodily entry, that contains the elevator motor controller. The room could also contain electrical and/or mechanical equipment used directly in connection with the elevator or dumbwaiter but not the electric driving machine or the hydraulic machine.

Control Space (for Elevator, Dumbwaiter). A space inside or outside the hoistway, intended to be accessed with or without full bodily entry, that contains the elevator motor controller. This space could also contain electrical and/or mechanical equipment used directly in connection with the elevator or dumbwaiter but not the electrical driving machine or the hydraulic machine.



INFORMATIONAL NOTE FIGURE 620.2, NO. 2 Control System.

to be cord connected… means look into Wiring Method Section

Informational Note: Some elevator motor currents, or those motor currents of similar function, exceed the motor nameplate value. Heating of the motor and conductors is dependent on the root-mean square (rms) current value and the length of operation time. Because this motor application is inherently intermittent duty, conductors are sized for duty cycle service as shown in Table 430.22(E).

(B) Conductors Supplying a Single Motor Controller. Conductors supplying a single motor controller shall have an ampacity not less than the motor controller nameplate current rating, plus all other connected loads. Motor controller nameplate current ratings shall be permitted to be derived based on the rms value of the motor current using an intermittent duty cycle and other control system loads, if present.

(C) Conductors Supplying a Single Power Transformer. Conductors supplying a single power transformer shall have an ampacity not less than the nameplate current rating of the power transformer plus all other connected loads.

Informational Note No. 1: The nameplate current rating of a power transformer supplying a motor controller reflects the nameplate current rating of the motor controller at line voltage (transformer primary).

Informational Note No. 2: See Informative Annex D, Example No. D10.

(D) Conductors Supplying More Than One Motor, Motor Controller, or Power Transformer. Conductors supplying more than one motor, motor controller, or power transformer shall have an ampacity not less than the sum of the nameplate current ratings of the equipment plus all other connected loads. The ampere ratings of motors to be used in the summation shall be determined from Table 430.22(E), 430.24, and 430.24, Exception No. 1.

Informational Note: See Informative Annex D, Example Nos. D9 and D10.

620.14 Feeder Demand Factor. Feeder conductors of less ampacity than required by 620.13 shall be permitted, subject to the requirements of Table 620.14.

TABLE 620.14 Feeder Demand Factors for Elevators

Number of Elevators on a Single Feeder	Demand Factor*
1	1.00
2	0.95
3	0.90
4	0.85
5	0.82
6	0.79
7	0.77
8	0.75
9	0.73
10 or more	0.72

*Demand factors are based on 50 percent duty cycle (i.e., half time on and half time off).

620.15 Motor Controller Rating. The motor controller rating shall comply with 430.83. The rating shall be permitted to be less than the nominal rating of the elevator motor, when the controller inherently limits the available power to the motor and is marked as power limited.

Informational Note: For controller markings, see 430.8.

N **620.16 Short-Circuit Current Rating.**

(A) Marking. Where an elevator control panel is installed, it shall be marked with its short-circuit current rating, based on one of the following:

(1) Short-circuit current rating of a listed assembly
(2) Short-circuit current rating established utilizing an approved method

Informational Note: UL 508A-2013, Supplement SB, is an example of an approved method.

(B) Installation. The elevator control panel shall not be installed where the available short-circuit current exceeds its short-circuit current rating, as marked in accordance with 620.16(A).

Part III. Wiring

620.21 Wiring Methods. Conductors and optical fibers located in hoistways, in escalator and moving walk wellways, in platform lifts, stairway chairlift runways, machinery spaces, control spaces, in or on cars, in machine rooms and control rooms, not including the traveling cables connecting the car or counterweight and hoistway wiring, shall be installed in rigid metal conduit, intermediate metal conduit, electrical metallic tubing, rigid nonmetallic conduit, or wireways, or shall be Type MC, MI, or AC cable unless otherwise permitted in 620.21(A) through (C).

Exception: Cords and cables of listed cord- and plug-connected equipment shall not be required to be installed in a raceway.

(A) Elevators.

(1) Hoistways and Pits.

(a) Cables used in Class 2 power-limited circuits shall be permitted, provided the cables are supported and protected from physical damage and are of a jacketed and flame-retardant type.

(b) Flexible cords and cables that are components of listed equipment and used in circuits operating at 30 volts rms or less or 42 volts dc or less shall be permitted, provided the cords and cables are supported and protected from physical damage and are of a jacketed and flame-retardant type.

(c) The following wiring methods shall be permitted in the hoistway in lengths not to exceed 1.8 m (6 ft):

(1) Flexible metal conduit
(2) Liquidtight flexible metal conduit
(3) Liquidtight flexible nonmetallic conduit
(4) Flexible cords and cables, or conductors grouped together and taped or corded, shall be permitted to be installed without a raceway. They shall be located to be protected from physical damage and shall be of a flame-retardant type and shall be part of the following:

a. Listed equipment
b. A driving machine, or
c. A driving machine brake

Exception 620.21(A)(1)(c)(1), (2), and (3): The conduit length shall not be required to be limited between risers and limit switches, interlocks, operating buttons, and similar devices.

(d) A sump pump or oil recovery pump located in the pit shall be permitted to be cord connected. The cord shall be a hard usage oil-resistant type, of a length not to exceed 1.8 m (6 ft), and shall be located to be protected from physical damage.

(2) Cars.

(a) Flexible metal conduit, liquidtight flexible metal conduit, or liquidtight flexible nonmetallic conduit of metric designator 12 (trade size ⅜), or larger, not exceeding 1.8 m (6 ft) in length, shall be permitted on cars where so located as to be free from oil and if securely fastened in place.

Exception: Liquidtight flexible nonmetallic conduit of metric designator 12 (trade size ⅜), or larger, as defined by 356.2(2), shall be permitted in lengths in excess of 1.8 m (6 ft).

(b) Hard-service cords and junior hard-service cords that conform to the requirements of Article 400 (Table 400.4) shall be permitted as flexible connections between the fixed wiring on the car and devices on the car doors or gates. Hard-service cords only shall be permitted as flexible connections for the top-of-car operating device or the car-top work light. Devices or luminaires shall be grounded by means of an equipment grounding conductor run with the circuit conductors. Cables with smaller conductors and other types and thicknesses of insulation and jackets shall be permitted as flexible connections between the fixed wiring on the car and devices on the car doors or gates, if listed for this use.

(c) Flexible cords and cables that are components of listed equipment and used in circuits operating at 30 volts rms or less or 42 volts dc or less shall be permitted, provided the cords and cables are supported and protected from physical damage and are of a jacketed and flame-retardant type.

(d) The following wiring methods shall be permitted on the car assembly in lengths not to exceed 1.8 m (6 ft):

(1) Flexible metal conduit
(2) Liquidtight flexible metal conduit
(3) Liquidtight flexible nonmetallic conduit
(4) Flexible cords and cables, or conductors grouped together and taped or corded, shall be permitted to be installed without a raceway. They shall be located to be protected from physical damage and shall be of a flame-retardant type and shall be part of the following:

a. Listed equipment
b. A driving machine, or
c. A driving machine brake

(3) Within Machine Rooms, Control Rooms, and Machinery Spaces and Control Spaces.

(a) Flexible metal conduit, liquidtight flexible metal conduit, or liquidtight flexible nonmetallic conduit of metric designator 12 (trade size ⅜), or larger, not exceeding 1.8 m (6 ft) in length, shall be permitted between control panels and machine motors, machine brakes, motor-generator sets, disconnecting means, and pumping unit motors and valves.

Exception: Liquidtight flexible nonmetallic conduit of metric designator 12 (trade size ⅜) or larger, as defined in 356.2(2), shall be permitted to be installed in lengths in excess of 1.8 m (6 ft).

(b) Where motor-generators, machine motors, or pumping unit motors and valves are located adjacent to or underneath control equipment and are provided with extra-length terminal leads not exceeding 1.8 m (6 ft) in length, such leads shall be permitted to be extended to connect directly to controller terminal studs without regard to the carrying-capacity requirements of Articles 430 and 445. Auxiliary gutters shall be permitted in machine and control rooms between controllers, starters, and similar apparatus.

(c) Flexible cords and cables that are components of listed equipment and used in circuits operating at 30 volts rms or less or 42 volts dc or less shall be permitted, provided the cords and cables are supported and protected from physical damage and are of a jacketed and flame-retardant type.

(d) On existing or listed equipment, conductors shall also be permitted to be grouped together and taped or corded without being installed in a raceway. Such cable groups shall be supported at intervals not over 900 mm (3 ft) and located so as to be protected from physical damage.

(e) Flexible cords and cables in lengths not to exceed 1.8 m (6 ft) that are of a flame-retardant type and located to be protected from physical damage shall be permitted in these rooms and spaces without being installed in a raceway. They shall be part of the following:

(1) Listed equipment
(2) A driving machine, or
(3) A driving machine brake

(4) Counterweight. The following wiring methods shall be permitted on the counterweight assembly in lengths not to exceed 1.8 m (6 ft):

(1) Flexible metal conduit
(2) Liquidtight flexible metal conduit
(3) Liquidtight flexible nonmetallic conduit
(4) Flexible cords and cables, or conductors grouped together and taped or corded, shall be permitted to be installed without a raceway. They shall be located to be protected from physical damage, shall be of a flame-retardant type, and shall be part of the following:

a. Listed equipment
b. A driving machine, or
c. A driving machine brake

(d) A sump pump or oil recovery pump located in the pit shall be permitted to be cord connected. The cord shall be a hard usage oil-resistant type, of a length not to exceed 1.8 m (6 ft), and shall be located to be protected from physical damage.

Response:

a) 3 ft
b) 6 ft
c) 8 ft
d) 10 ft

Plan

- Class A 13 Questions
- Class B 9 Questions

Electrical Plan Questions

- Let’s analyze the questions with the correct responses…
- How to read/interpret the question
- How to arrive to a response (sometimes it is easy, sometimes it is not easy)
- Remember: Plans are not perfect. And this is why RFIs exist during construction

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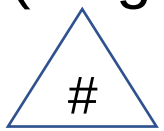
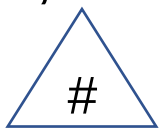
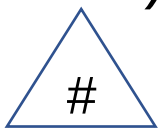
- delta symbol RFI 

ASI 

ACD 

- Depending on the size and complexity of the project
- the information provided on the fire and life safety drawings should provide a clear description of how the project complies with the various provisions of the CBC. Some of the general information for the project may also appear on the drawing title sheet.
- Also, much of the specific information will be contained in the body of drawing details and schedules.

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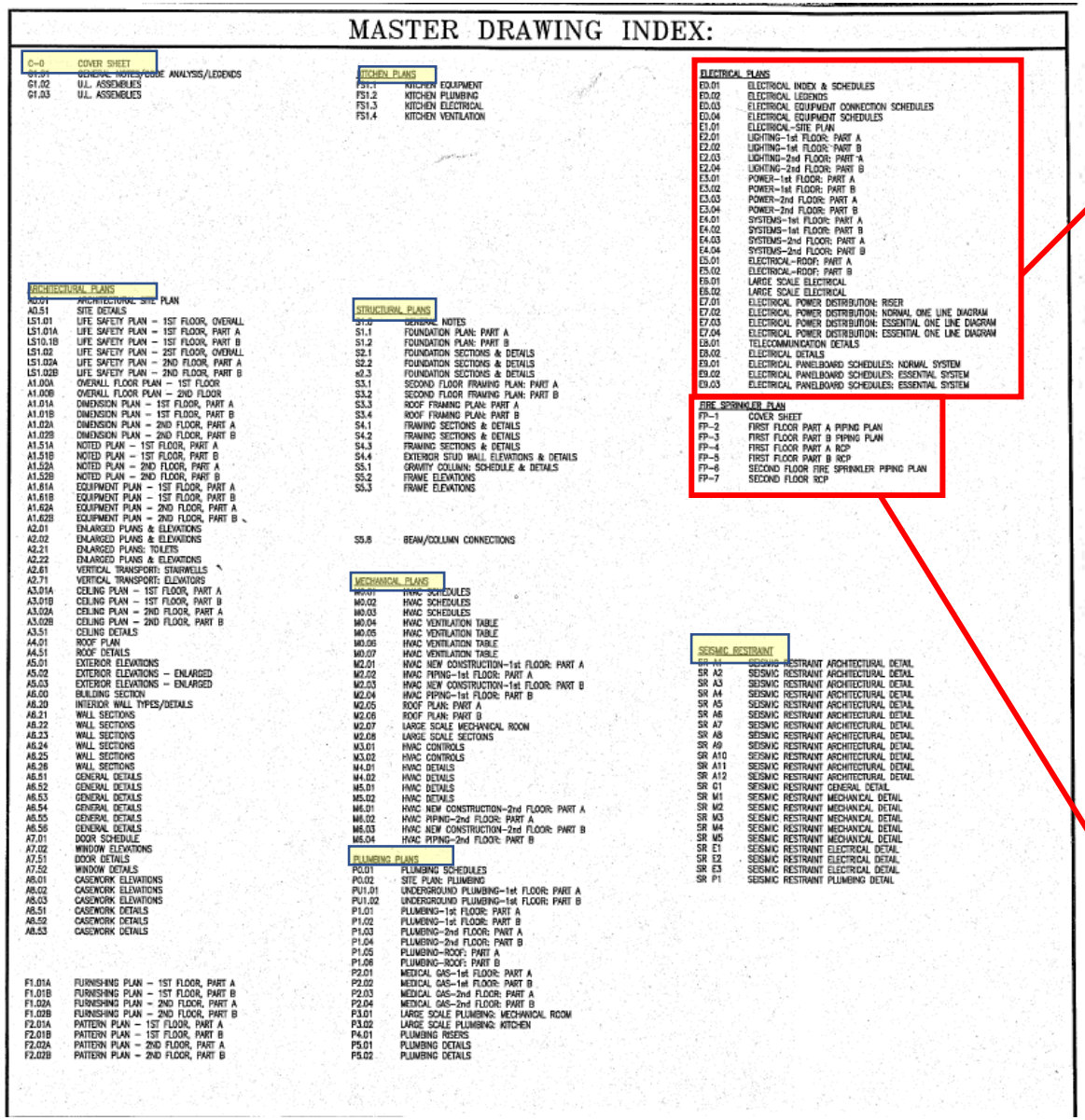

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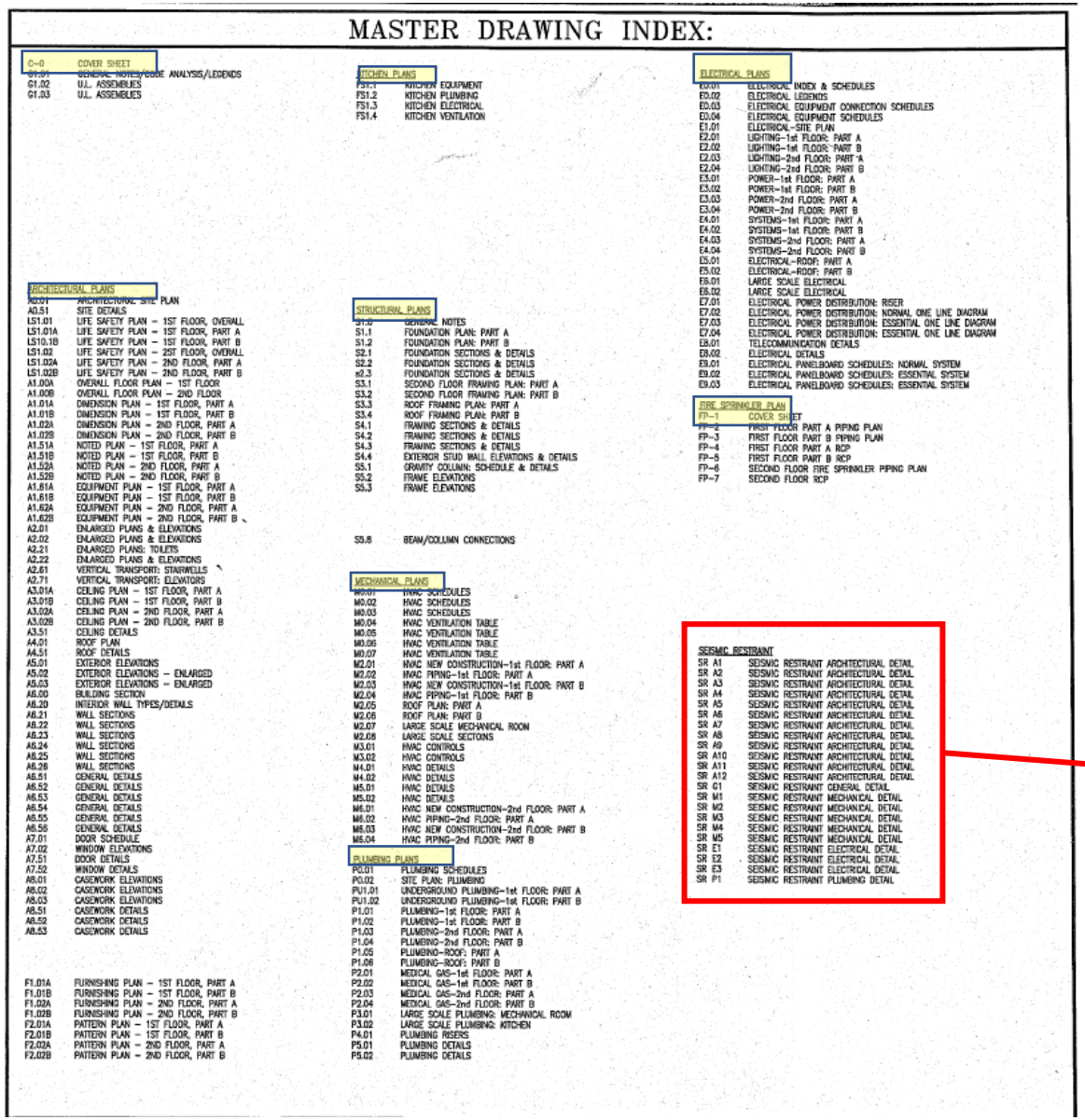

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What to remember

- Notes
- Key Words
- Typical Details
- General Notes
- Look into all the disciplines

Example #1

MATV outlet for floor mounted televisions shall be installed at ___ inches above finished floor.

MATV stands for Master Antenna Television. Where could you find the MATV outlet information? Look at the Index

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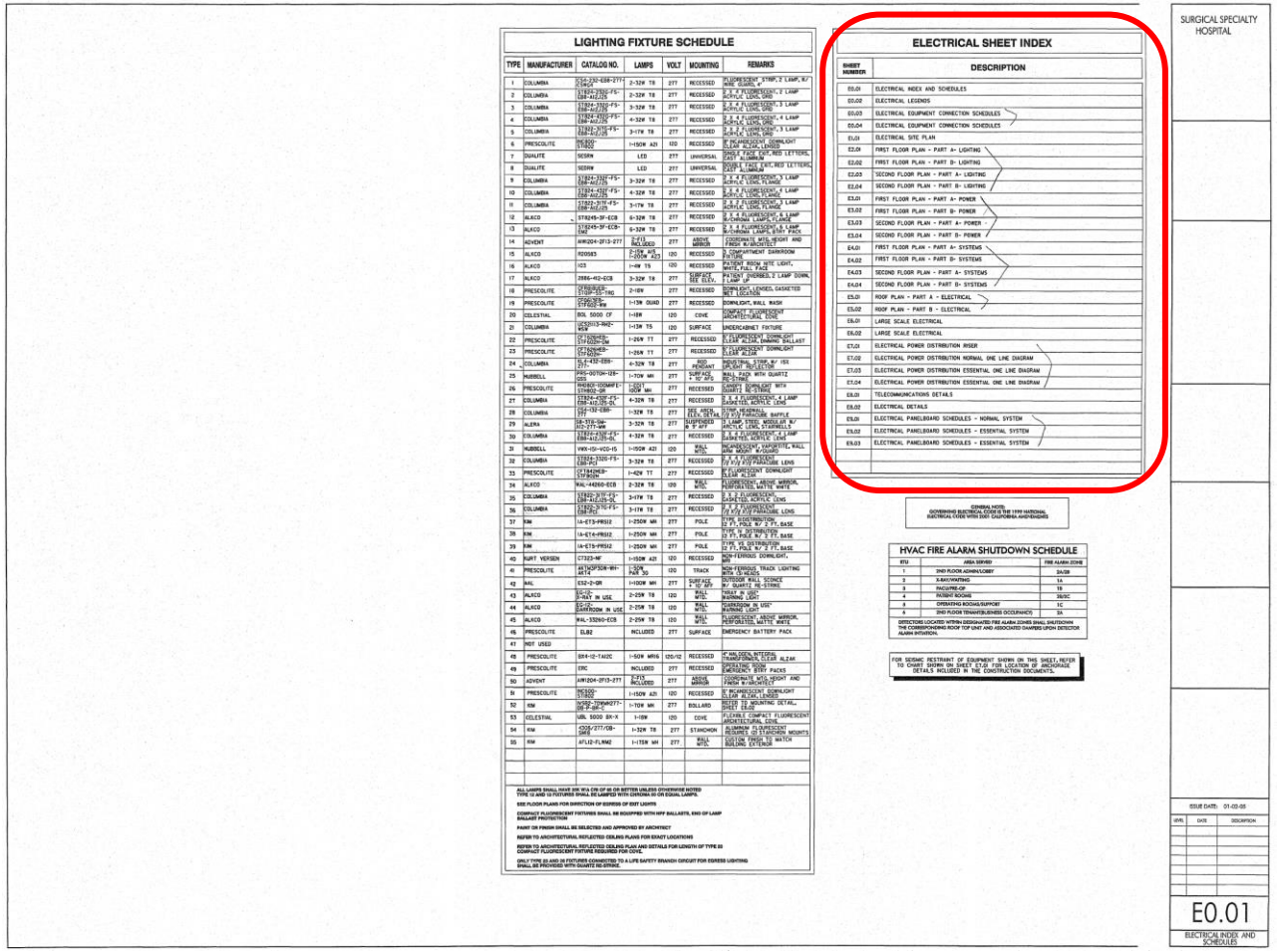
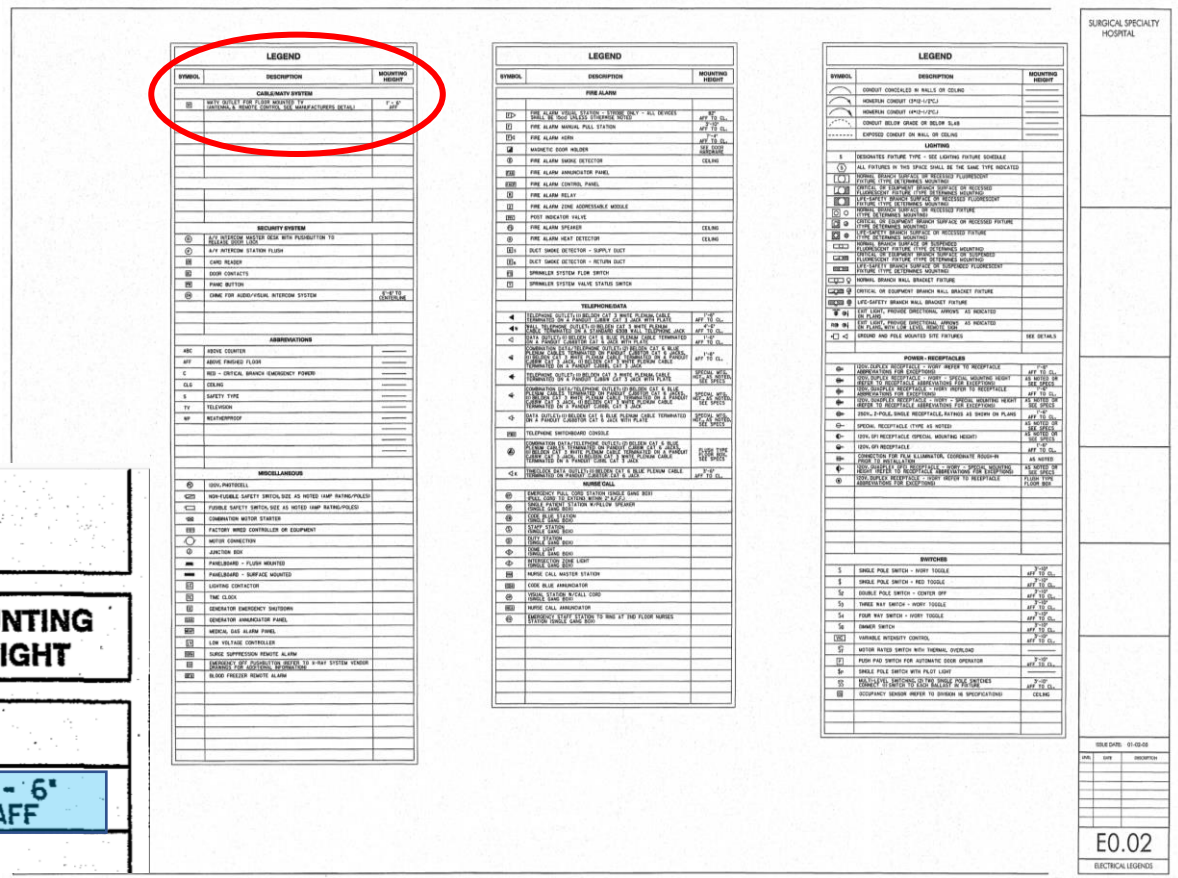
E8.02	ELECTRICAL DETAILS
E9.01	ELECTRICAL PANELBOARD SCHEDULES - NORMAL SYSTEM
E9.02	ELECTRICAL PANELBOARD SCHEDULES - ESSENTIAL SYSTEM
E9.03	ELECTRICAL PANELBOARD SCHEDULES - ESSENTIAL SYSTEM



MATV outlet for floor mounted televisions shall be installed at ___ inches above finished floor.

A. 12
B. 18
C. 24
D. 30

So, let's look at the legend sheet E0.02

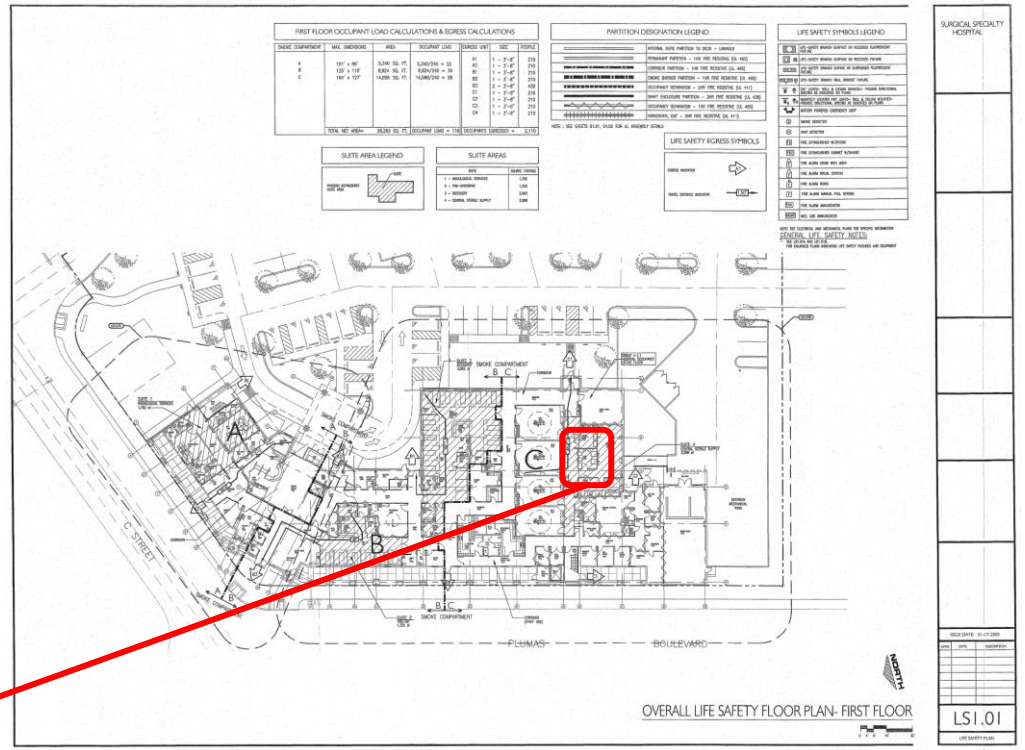


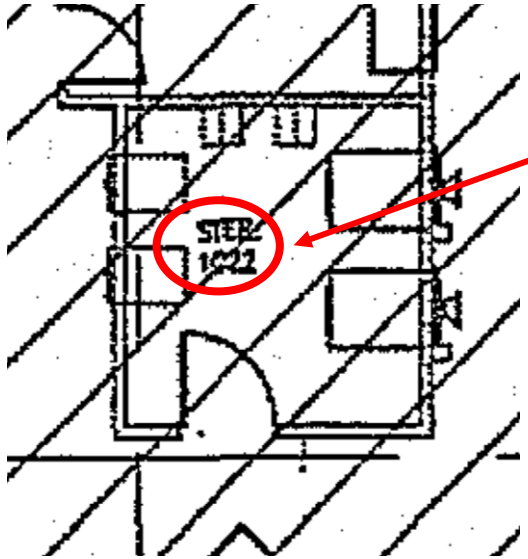
LEGEND

SYMBOL	DESCRIPTION	MOUNTING HEIGHT
	CABLE/MATV SYSTEM	
TF	MATV OUTLET FOR FLOOR MOUNTED TV (ANTENNA, & REMOTE CONTROL SEE MANUFACTURERS DETAIL)	1'-6" AFF

Example #2

A _____ shall be used as the steam sterilizer control disconnecting means for the steam sterilizers serving the O.R. area.



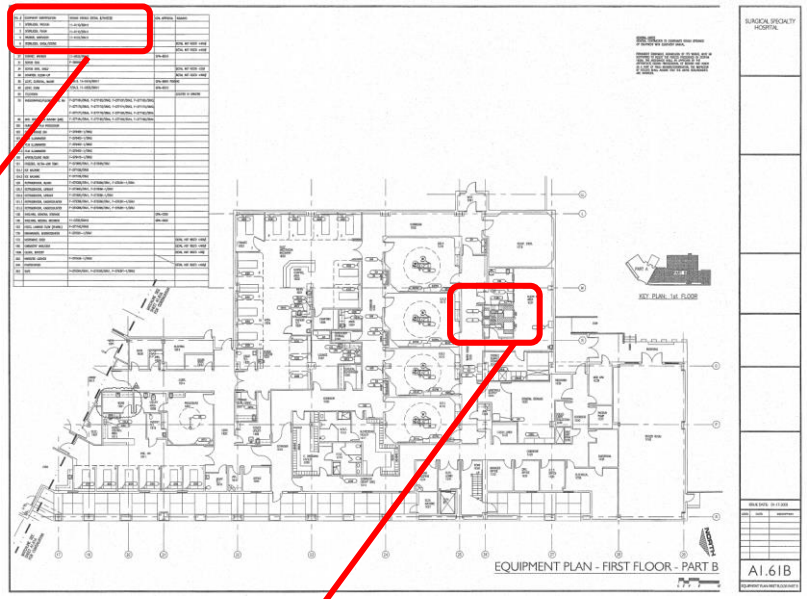


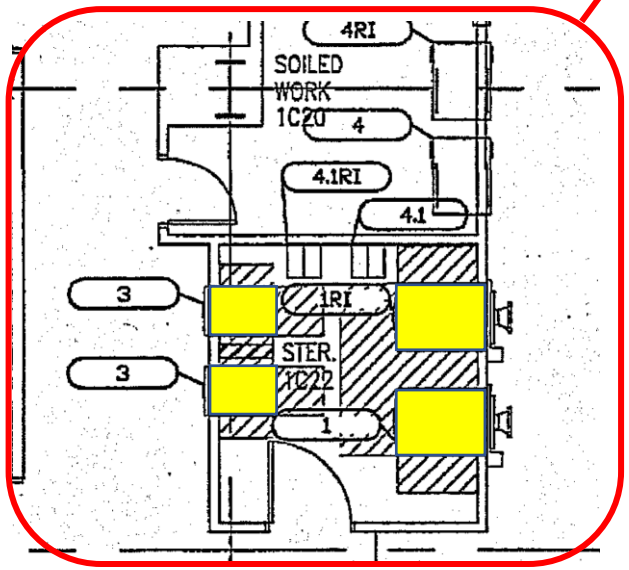
In order to find the steam sterilizer information, it is necessary to look for the sterilizer room location. Look, for example, LS1.01

A _____ shall be used as the steam sterilizer control disconnecting means for the steam sterilizers serving the O.R. area.

Now that you know where 1C22 is, look for sterilizers. And if you don't know…

EQ. #	EQUIPMENT IDENTIFICATION	SEISMIC DETAILS (DETAIL #/SHEET#)
1	STERILIZER, VACUUM	11-0110/SRA11
3	STERILIZER, FLASH	11-0110/SRA11

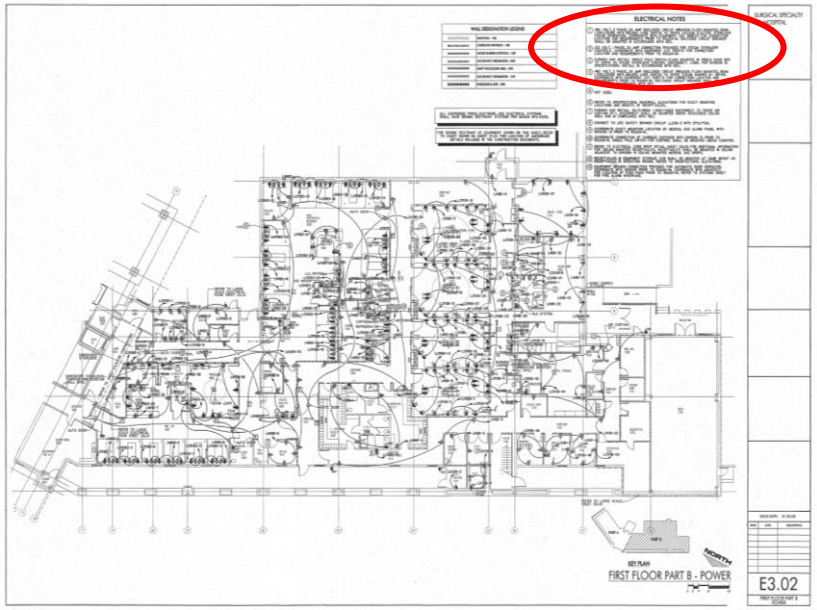




A _____ shall be used as the steam sterilizer control disconnecting means for the steam sterilizers serving the O.R. area.

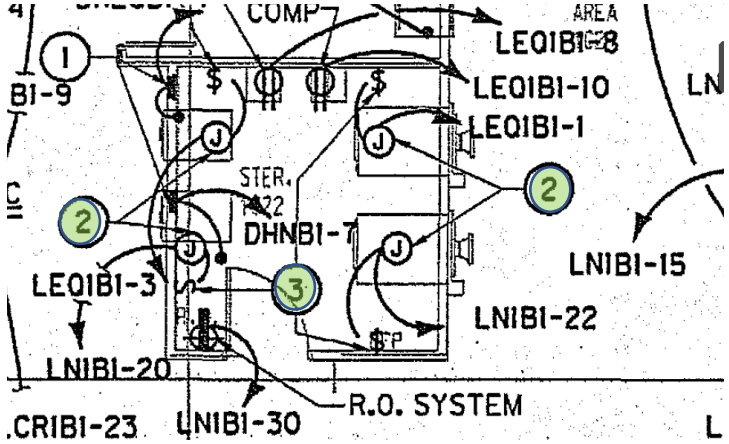
A. 30A non fused disconnect switch
B. 30A fused disconnect switch
C. single pole 20A switch
D. single pole 15A switch

Now that you know where 1C22 is, and how many sterilizers there are, look into the electrical sheets, and find the information



ELECTRICAL NOTES

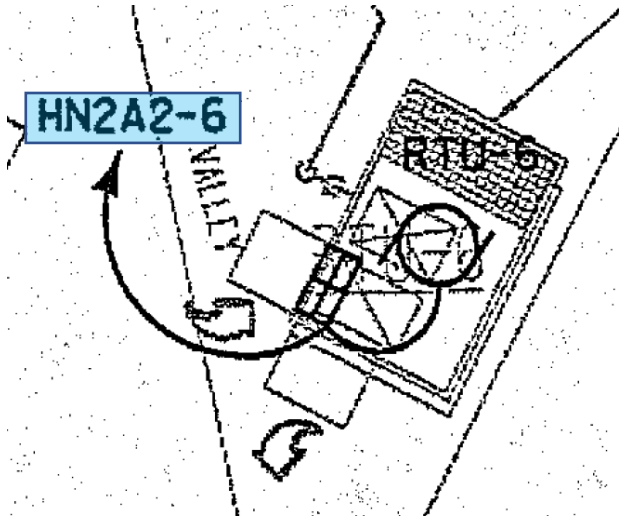
1. 480 VOLT, 3 PHASE, 50 AMP ENCLOSED CIRCUIT BREAKER, FLUSH MOUNTED, NEMA 1 ENCLOSURE WITH MOLDED CASE SWITCH TO SERVE VACUUM ELECTRIC STERILIZER STEAM GENERATOR. COORDINATE WITH EQUIPMENT CUT SHEETS FOR CONNECTION LOCATION AND REQUIREMENTS PRIOR TO ROUGH-IN. ENLCOSED CIRCUIT BREAKER SHALL BE MOUNTED IN ACCORDANCE WITH NEC.
2. 120 VOLT, 1 PHASE, 20 AMP CONNECTION PROVIDED FOR STEAM STERILIZER CONTROLS. COORDINATE WITH EQUIPMENT CUT SHEETS FOR CONNECTION LOCATION AND REQUIREMENTS PRIOR TO ROUGH-IN.
3. FURNISH AND INSTALL SINGLE POLE SWITCH, FLUSH MOUNTED IN SINGLE GANG BOX TO SERVE AS STEAM STERILIZER CONTROL DISCONNECT. LABEL PER DIVISION 16 SPECIFICATIONS. INSTALL IN ACCORDANCE WITH NEC.

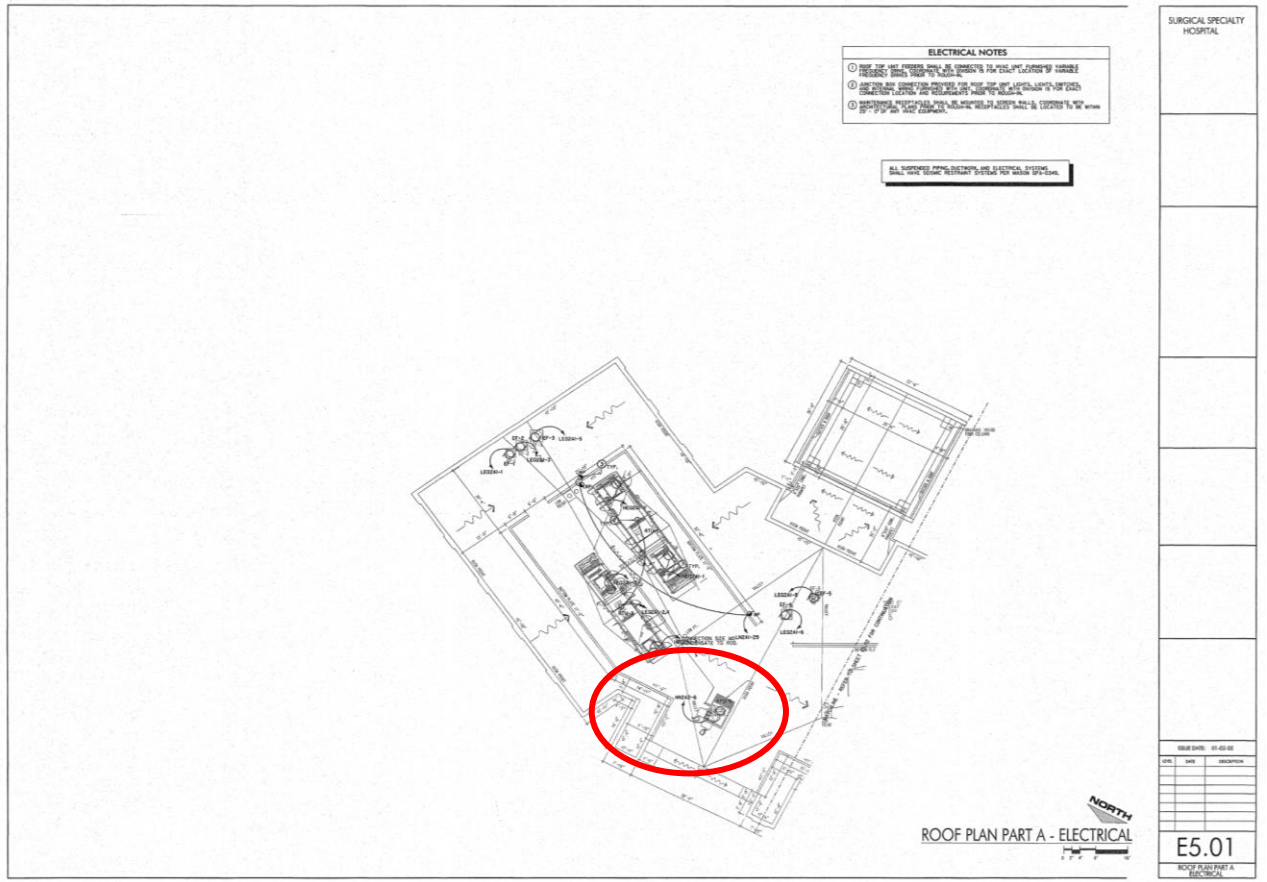


Example #3

Mechanical unit RTU-6 shall be fed using a ____V, __ pole, ___ Amp circuit breaker.

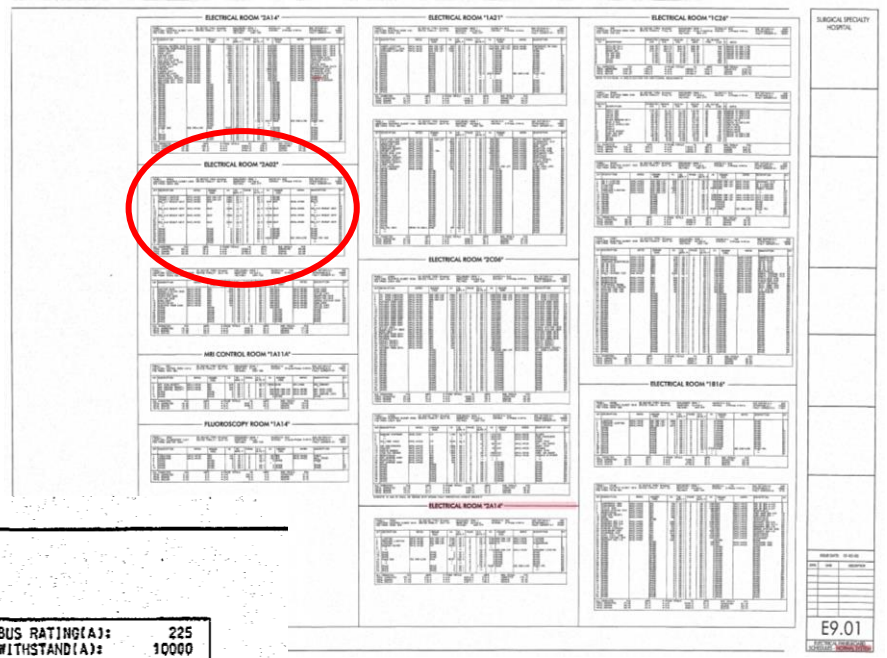
RTU stands for Roof Top Unit.
Look the Electrical Roof Plan to see the Panel for RTU-6





Mechanical unit RTU-6 shall be fed using a ____V, __ pole, ___ Amp circuit breaker.

A. 480, 3, 15
B. 120, 1, 20
C. 208, 3, 30
D. 277, 1, 20



ELECTRICAL ROOM "2A02"

PANEL: HN2A2 — OC DEVICE TYPE: Brecker — ENCLOSURE: NEMA 1 — MAINS(A): MLO — BUS RATING(A): 225
LOCATION: ELECTRIC CLOSET 2A02 — DEVICE FAMILY: Bolt On — MOUNTING: Surface — WIRING: 3-Phase 4-Wire — WITHSTAND(A): 10000
FED FROM: HN2A1 BUS — VOLTAGE: 480/277 — FAULT CURRENT(A) 5596

CKT	DESCRIPTION	NOTES	DEMAND CODE	VA	OC AMPS P	PHASE	OC AMPS P	VA	DEMAND CODE	NOTES	DESCRIPTION	CKT
1	TENANT LIGHTING	2#12,1#12G	NON CON LGT	2460	20 1	A	20 1	0	SPARE		SPARE	2
3	TENANT LIGHTING	2#12,1#12G	NON CON LGT	2220	20 1	B	20 1	0	SPARE		SPARE	4
5	DDC 6-1 REHEAT UNIT	3#12,1#12G	HEAT	6900	15 3	C	15 3	3991	MTR	3#12,1#12G	RTU-6	6
7	"		"	-	"	A	"	-			"	8
9	"		"	-	"	B	"	-			"	10
11	DDC 6-3 REHEAT UNIT	3#12,1#12G	HEAT	6500	15 3	C	20 3	12700	HEAT	3#12,1#12G	DDC 6-2 REHEAT UNIT	12
13	"		"	-	"	A	"	-			"	14
15	"		"	-	"	B	"	-			"	16
17	DDC 6-5 REHEAT UNIT	3#12,1#12G	HEAT	2500	15 3	C	20 3	10000	HEAT	3#12,1#12G	DDC 6-4 REHEAT UNIT	18
19	"		"	-	"	A	"	-			"	20
21	"		"	-	"	B	"	-			"	22
23	DDC 6-6 REHEAT UNIT	3#12,1#12G	HEAT	6000	15 3	C	15 3	2500	HEAT	3#12,1#12G	DDC 6-7 REHEAT UNIT	24
25	"		"	-	"	A	"	-			"	26
27	"		"	-	"	B	"	-			"	28
29	SPARE		SPARE	0	20 1	C	20 1	0	SPARE		SPARE	30
31	SPARE		SPARE	0	20 1	A	20 1	0	SPARE		SPARE	32
33	SPARE		SPARE	0	20 1	B	20 1	0	SPARE		SPARE	34
35	SPACE		SPACE	0	20 1	C	20 1	0	SPARE		SPARE	36
37	SPACE		SPACE	0	20 1	A	50 3	12780	NONE	SEE ONE-LINE	TN2A2 PRI BUS	38
39	SPACE		SPACE	0	20 1	B	"	-			"	40
41	SPACE		SPACE	0	20 1	C	"	-			"	42

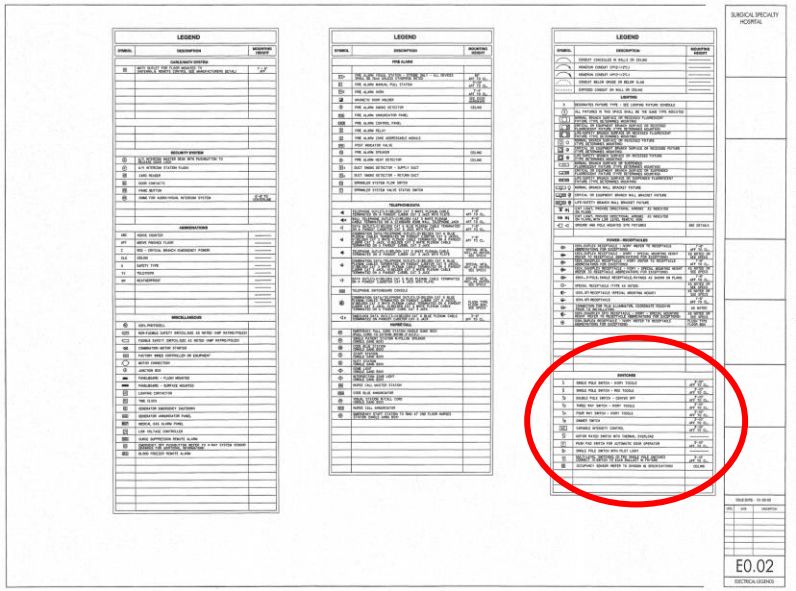
ALL CONNECTED	KVA	AMPS	* PHASE TOTALS	VA	AMPS	BUS TOTALS	KVA
TOTAL CONNECTED	68.55	86.2	* A-N	23900.4	86.2	CONNECTED	68.55
TOTAL DEMAND	20.06	27.6	* B-N	23480.9	84.7	DEMAND	20.06
TOTAL DESIGN	20.06	27.6	* C-N	21170.6	75.4	DESIGN	20.06

Note:
Another way is to start from the panel schedule without knowing the Panel ID, and to search RTU-6, however it's more time-consuming.

Example #4

How many dimmer switch are in patient room 2B12?

Prior to read how many dimmer switches are in 2B12, find the symbol for them in the Switches legend.

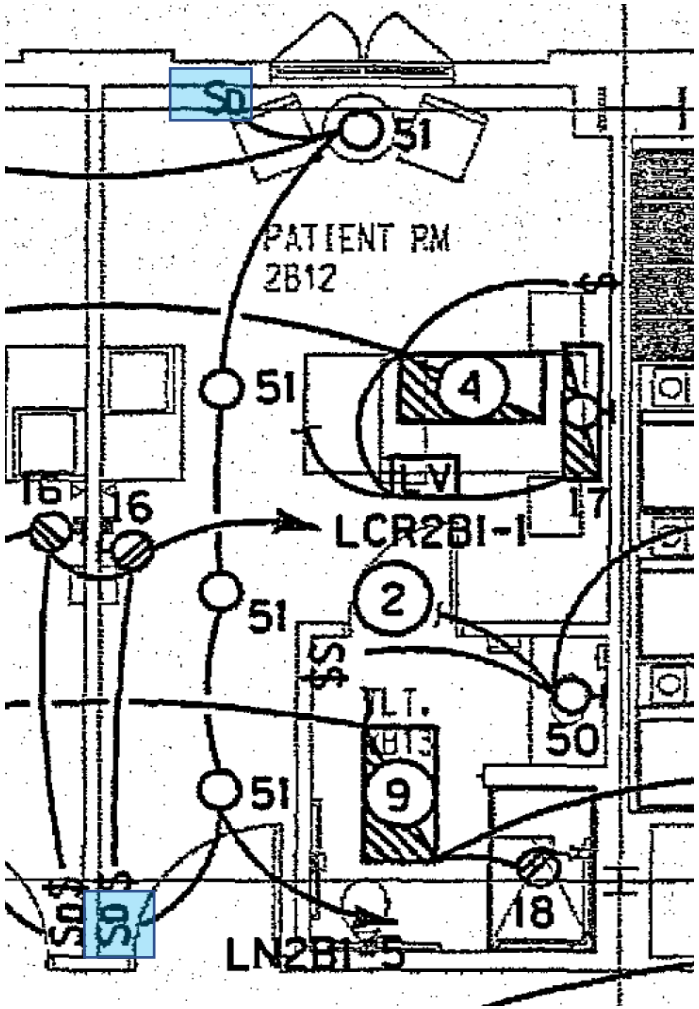


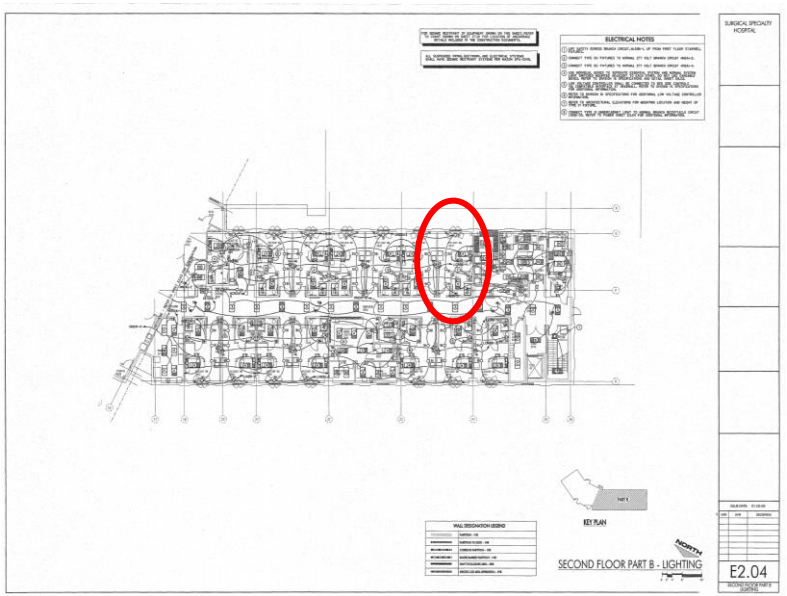
SWITCHES		
S	SINGLE POLE SWITCH - IVORY TOGGLE	3'-10" AFF TO CL.
$	SINGLE POLE SWITCH - RED TOGGLE	3'-10" AFF TO CL.
$2	DOUBLE POLE SWITCH - CENTER OFF	3'-10" AFF TO CL.
$3	THREE WAY SWITCH - IVORY TOGGLE	3'-10" AFF TO CL.
$4	FOUR WAY SWITCH - IVORY TOGGLE	3'-10" AFF TO CL.
$D	DIMMER SWITCH	3'-10" AFF TO CL.
VIC	VARIABLE INTENSITY CONTROL	3'-10" AFF TO CL.
$T	MOTOR RATED SWITCH WITH THERMAL OVERLOAD	———
P	PUSH PAD SWITCH FOR AUTOMATIC DOOR OPERATOR	3'-10" AFF TO CL.
$P	SINGLE POLE SWITCH WITH PILOT LIGHT	———
$S	MULTI-LEVEL SWITCHING, (2) TWO SINGLE POLE SWITCHES CONNECT (1) SWITCH TO EACH BALLAST IN FIXTURE	3'-10" AFF TO CL.
OS	OCCUPANCY SENSOR (REFER TO DIVISION 16 SPECIFICATIONS)	CEILING

How many dimmer switch are in patient room 2B12?

A. 1
B. 2
C. 3
D. none

Now that you know that the symbol is SD, look in 2B12

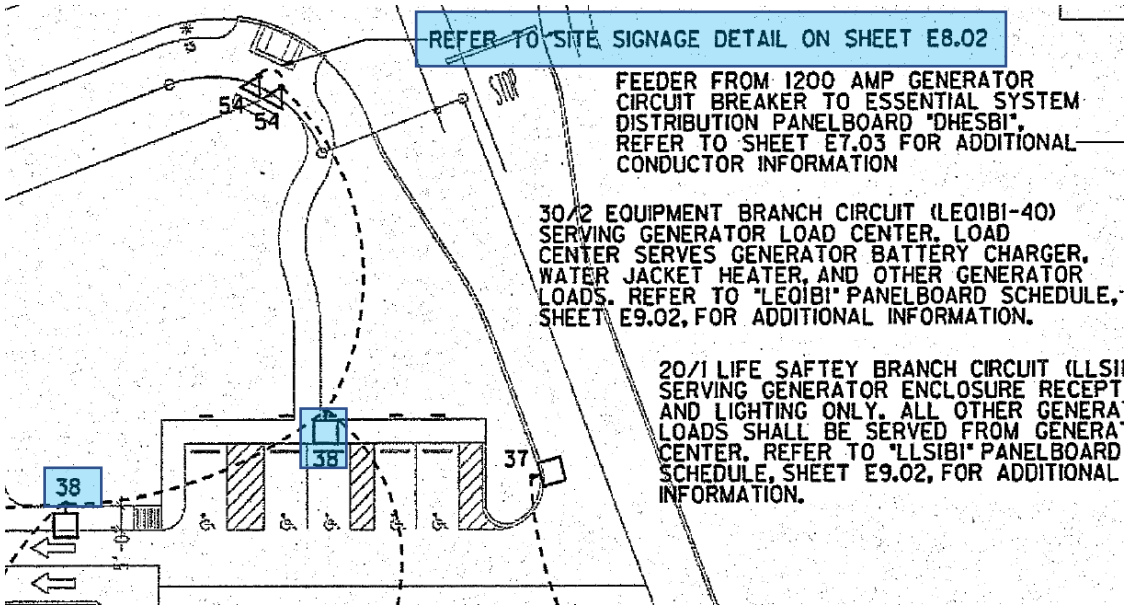


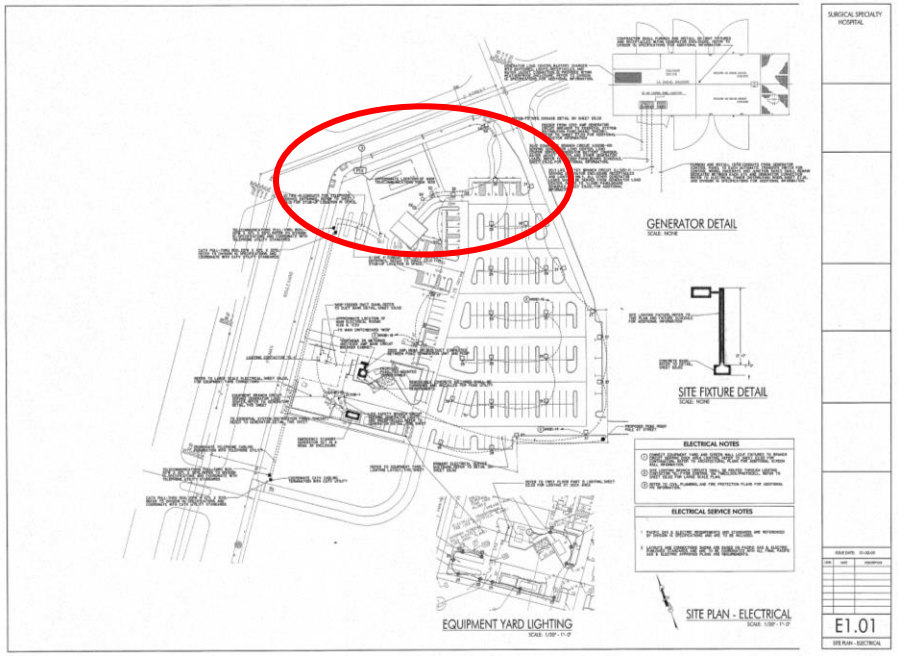


Example #5

The concrete base for light pole fixture #38 shall be provided with _____ vert. reinforcing bars & #3 ties @ 12” and extend _____ feet below grade.

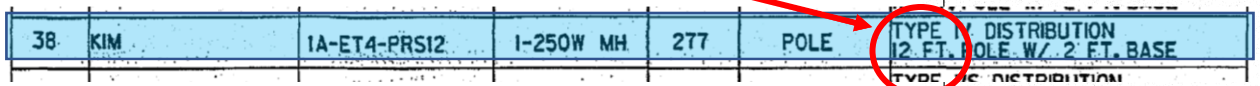
For light pole information, you should look into the Electrical Site Plan

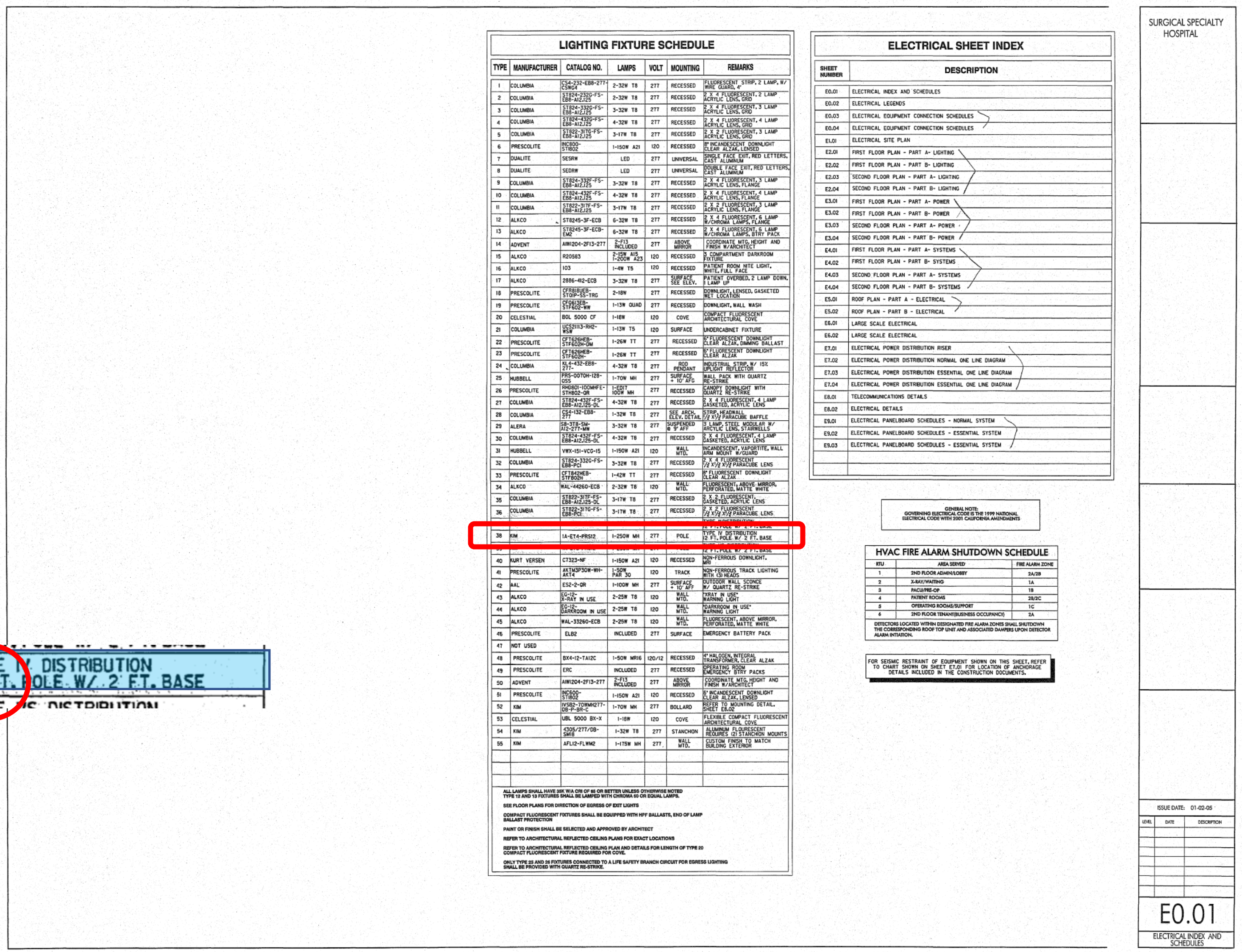




The concrete base for light pole fixture #38 shall be provided with ______ vert. reinforcing bars & #3 ties @ 12” and extend _____ feet below grade.

In the Electrical Schedule, look for the Light Fixture 38 for information, like the height…

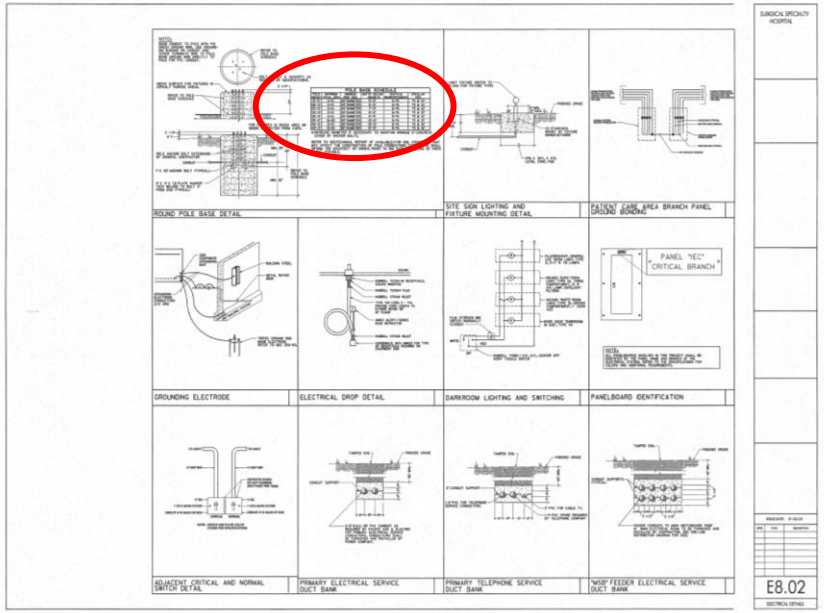




The concrete base for light pole fixture #38 shall be provided with _____ vert. reinforcing bars & #3 ties @ 12” and extend _____ feet below grade.

A. 6-#6, 5’-0”
B. 6-#6, 6’-0”
C. 7-#6, 5’-0”
D. 7-#6, 6’-0”

Now that you know the height of the Light Pole and you are on the referred sheet, you can find the response



POLE BASE SCHEDULE

POLE HEIGHT	MAXIMUM TOTAL EPA	MINIMUM PIER SIZE	DEPTH BELOW GRADE *	VERTICAL REINFORCEMENT	CIRCULAR TIES
15’-0"	0-10	20" DIAMETER	5’-0"	6-#6	#3 @ 12"
20’-0"	0-10	20" DIAMETER	6’-0"	6-#6	#3 @ 12"
25’-0"	0-10	20" DIAMETER	7’-0"	6-#6	#3 @ 12"
30’-0"	0-10	20" DIAMETER	8’-0"	6-#6	#3 @ 12"
35’-0"	0-10	24" DIAMETER	8’-0"	8-#6	#3 @ 12"
35’-0"	10-20	24" DIAMETER	10’-0"	8-#6	#3 @ 12"
40’-0"	0-10	30" DIAMETER	10’-0"	8-#6	#3 @ 16"
40’-0"	10-20	30" DIAMETER	12’-0"	8-#6	#3 @ 16"

* INCREASE DIAMETER IF NECESSARY TO MAINTAIN MINIMUM 6" CONCRETE COVER OF ANCHOR BOLTS.

Homework

Homework #1

The natural gas range/convection blower is served by which electrical panel and CKT?

A. LN2B2-10
B. LN2B2-7
C. LEQ2A1-11
D. LN2B2-14

Homework #2

The factory wired controller for RTU-5 is connected to what circuit?

A. DHEQB1-7,8
B. LEOQB1-21,8
C. DHEQB1-7
D. DHEQB1-8

See you at Part 2

Send your Homework Responses to:

OSHPD.fddisu@oshpd.ca.gov


Q&A