

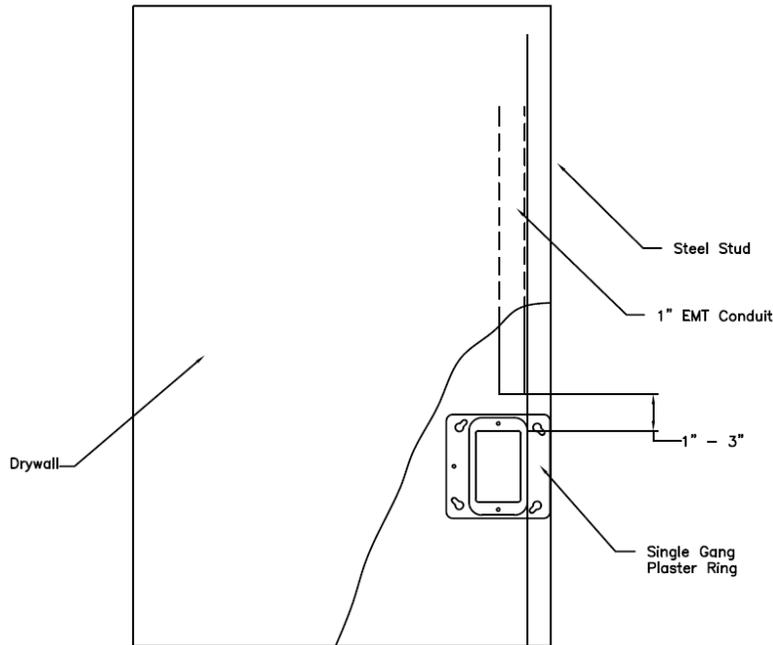
UNIVERSITY OF WATERLOO

Minimum Standards for Data/Voice Infrastructure in New Building Construction

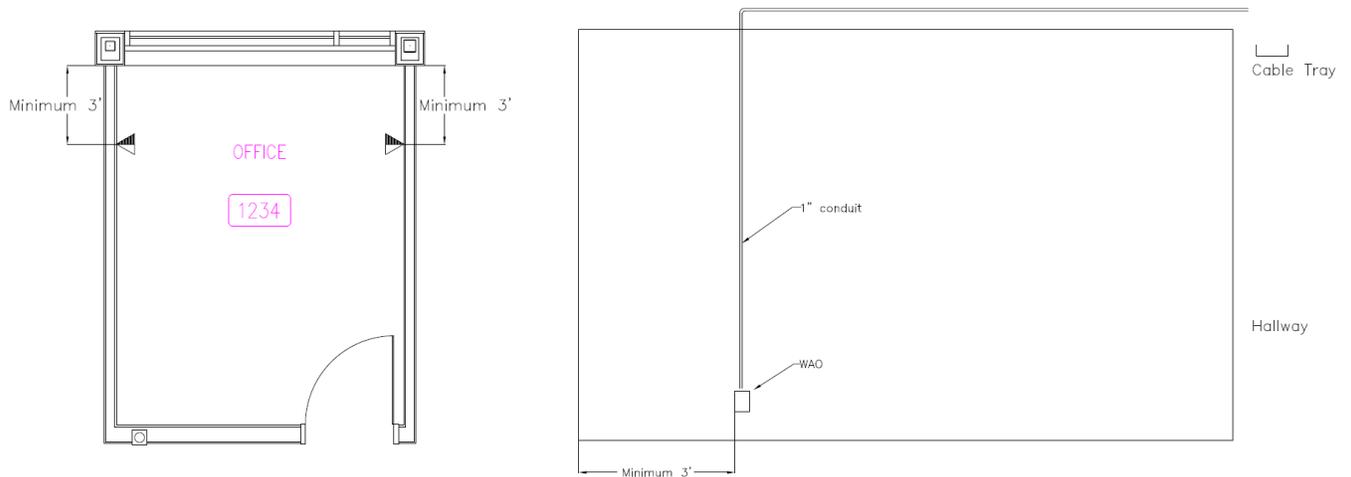
12/17/2012

Offices

- 1. Two Work Area Outlets (WAO) on opposite walls, each with 2 jacks
- 2. Each WAO shall be fed by a 1 inch conduit from the nearest cable tray to a single gang plaster ring
- 3. The WAO shall be located at least 3 feet from the corner of the room
- 4. Outlet height shall be the same height as the electrical receptacle



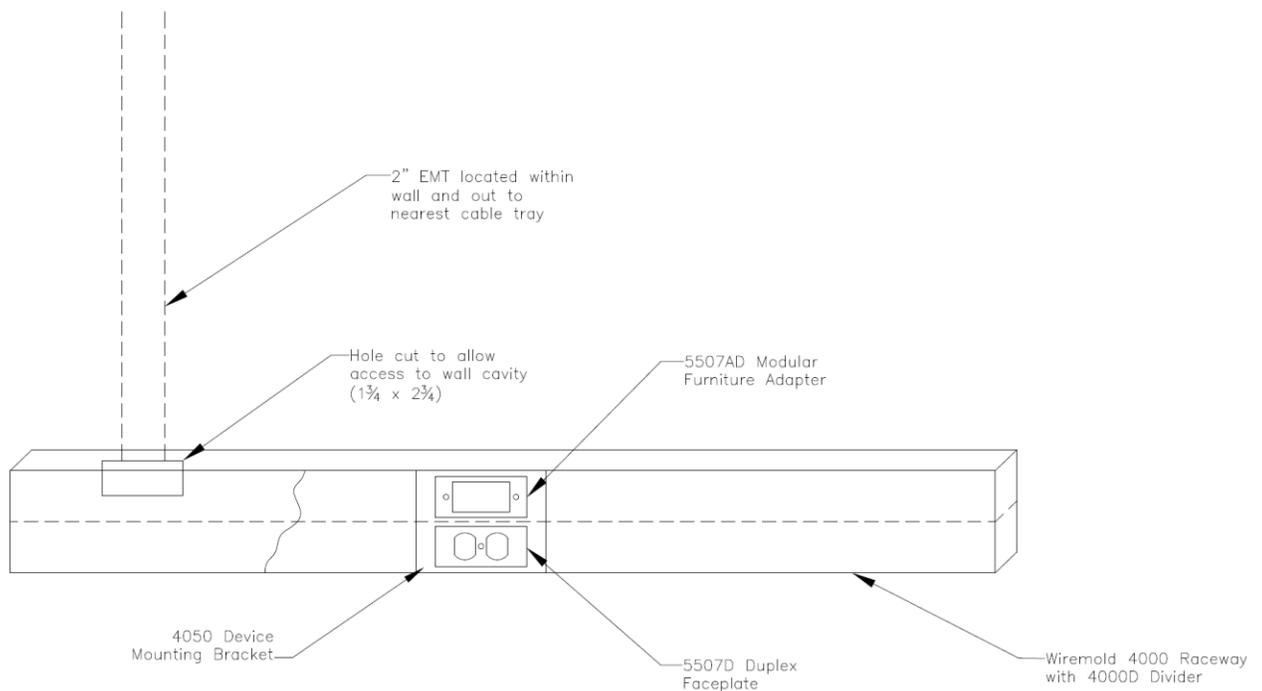
Work Area Outlet (WAO)



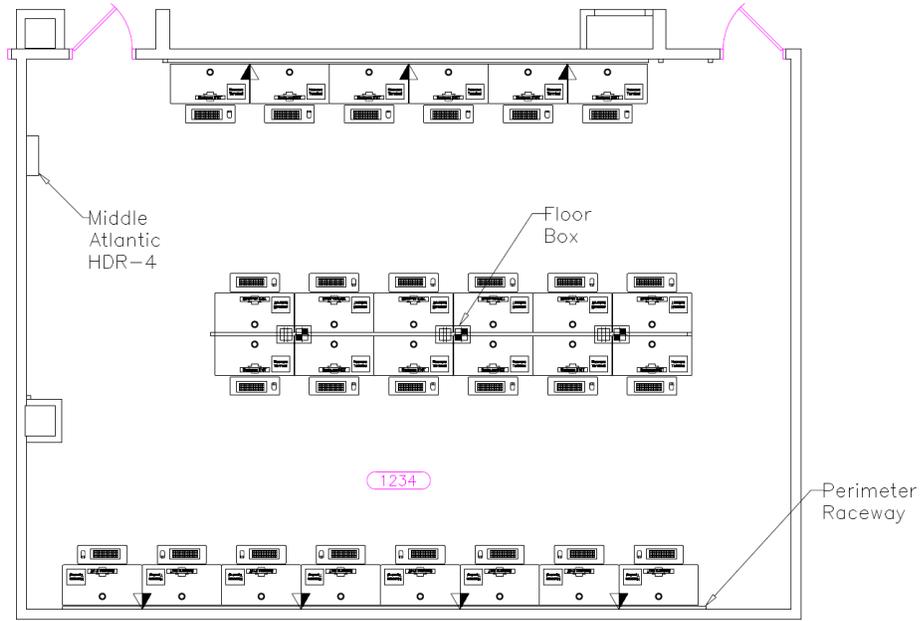
Typical Office Layout

Computer Labs

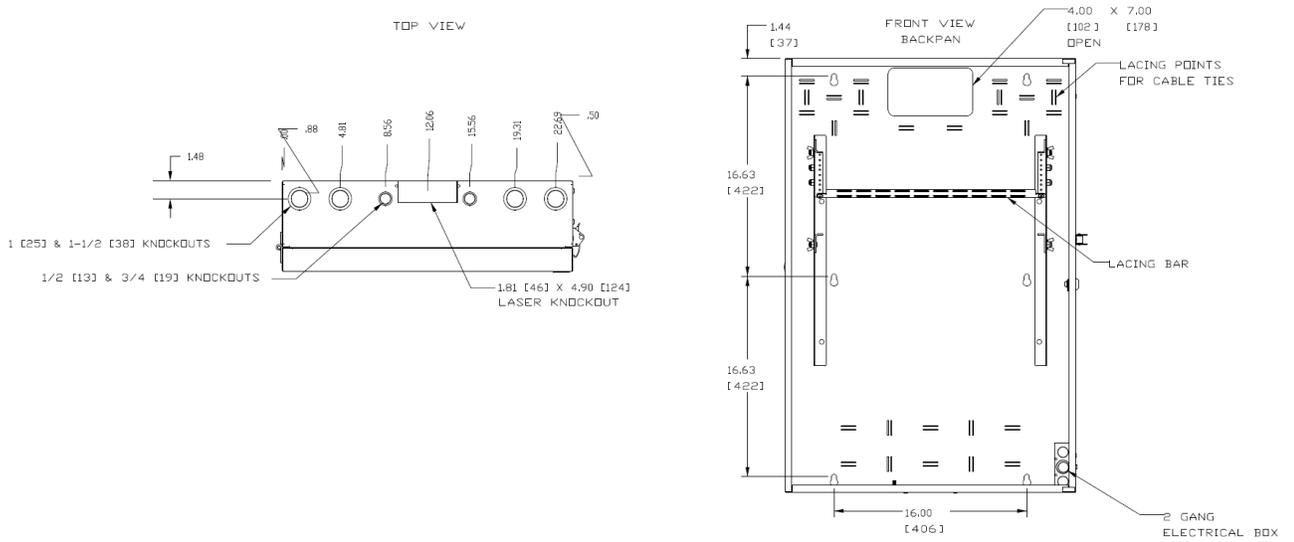
1. A 2-channel perimeter raceway system shall be used for all wall outlets, with 1 outlet for every 2 tables. The raceway shall be fed with a 2" conduit in the wall cavity. Each wall shall have a separate raceway system.
2. Floor boxes will be used for island tables, with 1 floor box for every 4 tables. Each floor box shall be fed with a separate 1" conduit to the ceiling space.
3. A wall mount data cabinet (Middle Atlantic HDR-4) shall be installed on the wall. A quad electrical receptacle, 2 of which will be surge protected shall be installed in the cabinet. There shall be a Wiremold 4000 raceway from the knockout at the top of the cabinet to the ceiling space.



2 Channel Perimeter Raceway System



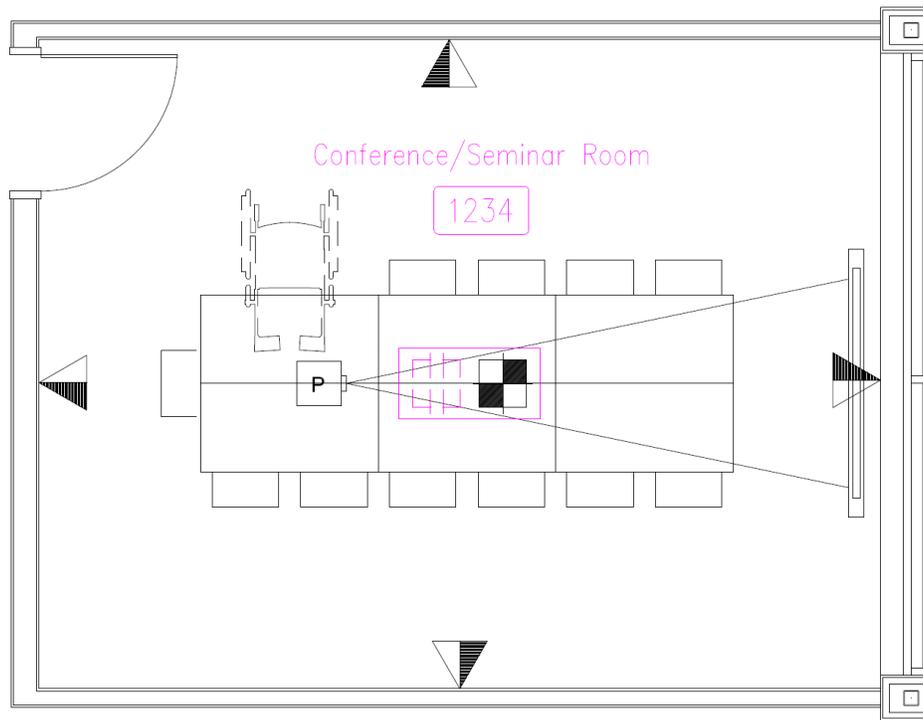
Typical Computer Lab Layout



Middle Atlantic HDR-4

Conference/Seminar Rooms

1. There shall be 1 WAO per wall.
2. There shall be 1 floor box at the centre of table location, with one 1" conduit to the nearest cable tray for data, and one 1" conduit to the ceiling space for a projector cable.



Typical Conference/Seminar Room Layout

Classrooms

1. Classrooms require a floor box at the podium location, with one 1" conduit to the nearest cable tray for data, and one 1" conduit to the projector location.
2. Any other requirements will be designed on an individual basis.

Server Rooms

1. Server rooms shall have the same ground facilities as Telecommunications rooms.
2. Other requirements will be designed on an individual basis.

Training Rooms

1. Training rooms may be of fixed or flexible design and will dealt with on an individual basis.

Grounding and Bonding

Definitions

- A. BC (Bonding Conductor) – Typical bonding conductor install from any telecommunications grounding busbar (TMGB or TGB) to telecommunications equipment and/or raceway.
- B. TBC (Telecommunications Bonding Conductor) – The bonding conductor installed from the building’s grounding electrode system to the TMGB. This bonding conductor shall be size the same as the TBB.
- C. TBB (Telecommunications Bonding Backbone) – Continuous bonding conductor installed from the TMGB to the furthest telecommunications room. All TGBs shall attach to the TBB.
- D. TMGB (Telecommunications Main Grounding Busbar) – The main telecommunications grounding bar located where the Outside Plant cables enter the telecommunications room.
- E. TGB (Telecommunications Grounding Busbar) – The telecommunications grounding bar located in every telecommunications room that does not contain the TMGB.

Products

Grounding Busbars

- A. Telecommunications Main Grounding Busbar (TMGB)
 1. Panduit # GB4B0612TPI-1, grounding busbar with busbar insulators.
- B. Telecommunications Grounding Busbar (TGB)
 1. Panduit # GB2B0306TPI-1, grounding busbar with busbar insulators.

Grounding Connections

- A. Grounding conductor terminations (lugs) shall be listed compression type, two hole, long barrel with window lug with a minimum of (2) crimps. Crimp according to manufacturer’s recommendation.
 1. Panduit # LCC6-14JAW-L or equal.
- B. Grounding conductor terminations (HTAP) shall be listed compression type with a minimum of (2) crimps. Crimp according to manufacturer’s recommendations.
 1. Panduit HTAP kit # HTWC6-6-1 or equal.

Bonding Conductors

A. Cable Tray Bonding Conductor

1. Stranded green #6 AWG insulated bonding jumper

B. Telecommunications Bonding Conductor (TBC)

1. Green insulated copper bonding conductor, sized as required by Ontario Electrical Safety Code.
2. The TBC shall be, as a minimum, the same size as the TBB.

C. Telecommunications Bonding Backbone (TBB)

1. Green insulated copper conductor, minimum size of #6 AWG. The TBB shall be sized at 2 kcmil per linear foot of conductor length up to a maximum size of 3/0 AWG. Insulation shall meet fire ratings of its pathway.

Sizing of the TBB	
TBB length (ft)	TBB Size (AWG)
Less than 13	6
14-20	4
21-26	3
27-33	2
34-41	1
24-52	1/0
53-66	2/0
Greater than 66	3/0

Execution

Telecommunications Installation

A. Installation of the TMGB

1. Install the TMGB at the bottom of plywood backboard near the outside plant entrance conduits.
2. TMGB shall be installed so that the TBC for telecommunications is as short as possible and maintains a horizontal or downward path to the building's grounding electrode system.

B. Installation of the TBC for Telecommunications

1. TBC shall be installed in continuous EMT conduit. EMT conduit must be bonded to the TBC at both ends of the conduit.
2. TBC shall maintain a horizontal or downward path from the TMGB to the building's grounding electrode system. No bend shall form an included angle of more than 90 degrees or have a radius of less than 6".

C. Installation of the TGB

1. Install the TGB at the bottom of plywood backboard near the TBB.

2. TGB shall be installed so that the bonding conductor connecting the TGB to the TBB is as short as possible and maintains a horizontal or downward path to the TBB.
3. Install a stranded bonding conductor (same size as the TBB) from the TGB to the TBB. This wire shall be terminated on the TGB with the Panduit two-hole compression type lug and terminated on the TBB end with the Panduit HTAP kit.

D. Installation of the TBB

1. Install green insulated copper ground conductor (refer to table X for conductor size) from the TMGC to the furthest telecommunications room.
2. Conductors shall be installed in continuous EMT conduit until it enters a telecommunications room. EMT conduit must be bonded on each end to the TBB.
3. Each TBB shall be continuous to the furthest telecommunications room
4. The end of the TBB shall be terminated on the TGB of the furthest telecommunications room.
5. The TBB shall maintain a horizontal or downward path to the TMGB. No bend shall form an included angle of more than 90 degrees or have a radius of less than 6”.

E. Grounding Cable Tray

1. Install green #6 AWG bonding jumper (12” max) with Panduit two-hole lugs at each cable tray joint or install manufactured braided copper grounding jumper.
2. Install green #6 AWG grounding conductor with Panduit two-hole lugs from the side on the cable tray down to TMGB or TGB. Maintain a horizontal or downward path from the cable tray to the TMGB or TGB.

F. Installation of Bonding Conductors

1. Shall be routed so as to minimize bends and length.
2. Shall be a minimum of #6 AWG.
3. Bonding conductors shall maintain a horizontal or downward path to the TMGB or TGB. No bend shall form an included angle of more than 90 degrees or have a radius of less than 6”.
4. Use Panduit HTAP kit to bond the TBB to the TMGB or TGB.

General Pathways

Cable Tray

- A. 12" x 4" wire basket cable tray shall be used
- B. Cable tray shall be run throughout the building
 - 1. Cable tray shall be run directly to telecommunication rooms
 - a. Where required use STI EZ-Path, fire rated pathway system sized accordingly.
 - 2. Cable tray runs shall be continuous. Sections shall never be joined by conduit runs.
- C. There shall be a minimum of 12" access above cable tray.
- D. Cable tray shall be accessible at corners.
- E. In drywalled ceiling areas, the cable tray shall be accessible by 24" x 24" access panels every 6-8 feet.

Telecommunications Room Provisioning

Size and Location

- A. Multi-story buildings shall have a minimum of one Telecommunications Room per floor
- B. Telecommunications rooms should be located as close as possible to the centre of, and on the same floor as the area it is intended to serve
- C. Telecommunications rooms in multi-floor buildings should be vertically aligned
- D. Telecommunications rooms may not be shared with other services

Telecommunication Room Sizes	
No. of drops per serving area	TR size
0 – 280	8' x 8'
281-840	10' x 8'
841+	12' x 8'

- Multiple Telecommunications Rooms will be required if cable length to any new or future WAO will exceed 90 m.
- Additional equipment such as video conferencing equipment may require the size of the room to be increased.

Room Characteristics

- A. Walls should be covered with 20 mm (3/4") plywood, 8ft high. Plywood should be fire rated, or covered with 2 coats of fire retardant paint. (as per local code)
- B. Treat floors, walls, and ceiling to minimize dust
- C. Minimum ceiling height should 3 m (10 ft)
- D. Suspended ceiling are not permitted in telecommunications spaces
- E. Doors should be at least 0.91 m (3 ft) wide and 2 m (6.6 ft) high
- F. Conduit should be installed for access control
- G. Equipment that is not related to the support of telecommunications rooms(piping, ducts etc) should not be located in, or pass through telecommunications rooms

Power

- A. Convenience receptacles located every 1.8 m (6 ft) around perimeter walls
- B. Minimum 2 X 30A 208V on separate circuits, for equipment power
- C. If emergency power is available, equipment power should be connected to it
- D. A grounding and bonding system, tying together all of the telecommunications rooms to the building ground will be installed. See TIA-607 Commercial Building Grounding and Bonding Requirements for Telecommunications.

Lighting

- A. Lighting should be a minimum of 500 lux at 1 m AFF
- B. Lighting layout should be coordinated with equipment layout
- C. Emergency lighting to be provided

HVAC

- A. Temperature range should be 18 °C to 24 °C (64 °F to 75 °F)
- B. Humidity range should 30% to 55% relative humidity

Trays, Sleeves, and Ducts

- A. Cable tray from hallways should extend into the telecommunications room and connect to a cable tray extending across the top of the equipment racks
- B. There should be a minimum of 2 x 100 mm (4 in.) sleeves between telecommunication rooms above and below. The sleeves with bushings should extend 25 to 76 mm (1 to 3 in)

Telecommunications Room Layouts

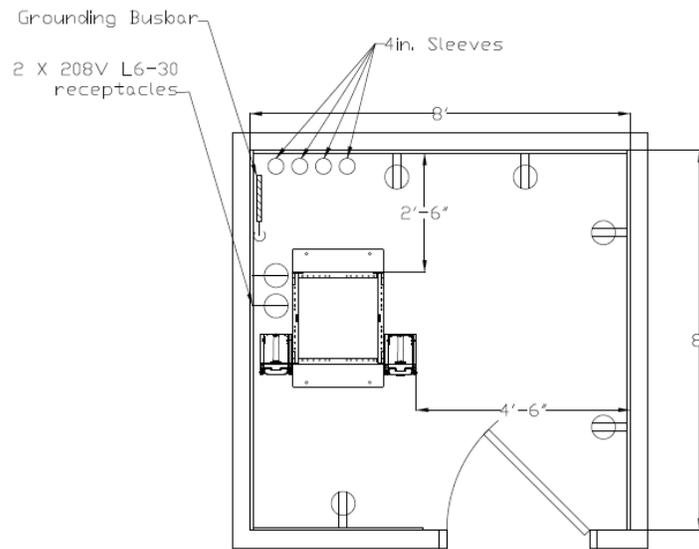


Figure 1: 8ft. x 8ft. Telecommunications Room

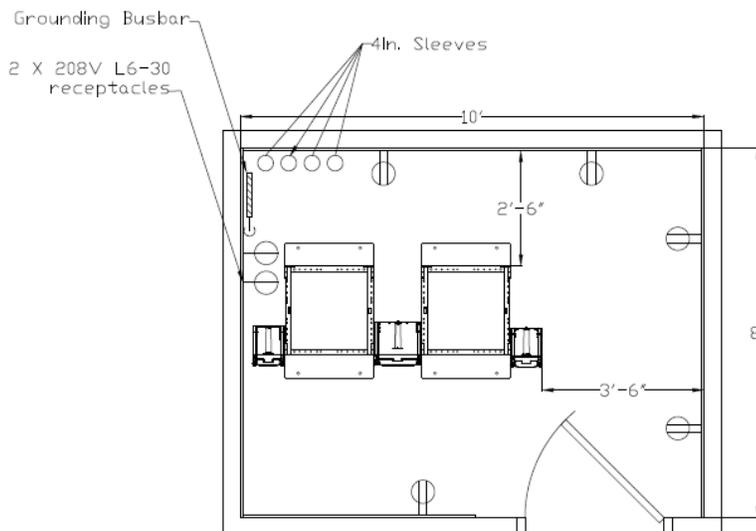


Figure 2: 8ft. x 10ft. Telecommunications Room

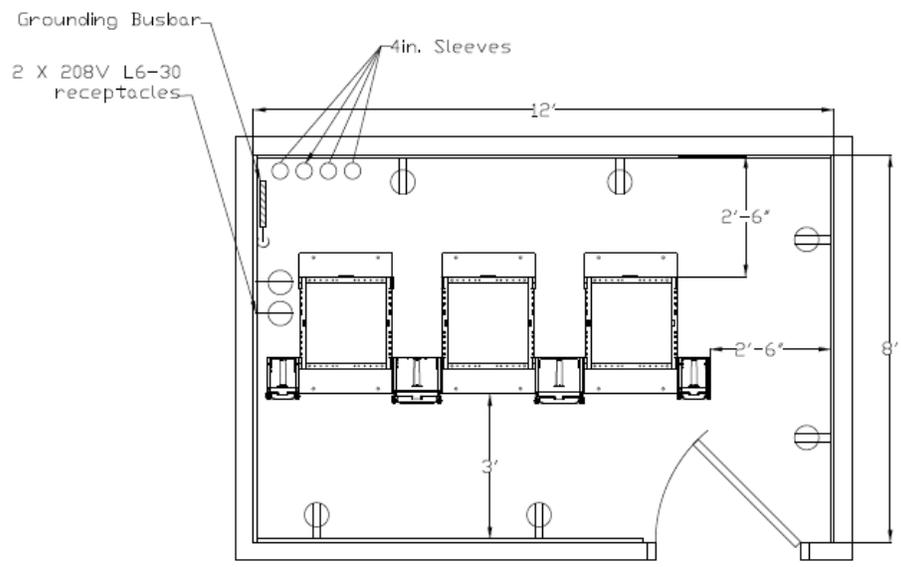


Figure 3: 8ft. x 12ft. Telecommunications Room