COMMON SYSTEMS

CONSIDERATIONS FOR DETERMINING THE AFFECTS ON FLOOR LOADING OF EQUIPMENT SUPERSTRUCTURE SUSPENDED FROM BUILDING CEILINGS

1. GENERAL

1.01 This section provides equipment superstructure floor loading information that must be taken into consideration and applied when allocating floor space and engineering network equipment on the upper floors of network facilities. The purpose of this section is to provide equipment space planners and engineers with the means of reasonably determining the affects ceiling supported superstructure arrangements have on the overall floor loading capabilities of network facilities. The floor loading calculations provided herein are based on the premise that 100% of the weight of equipment superstructure is supported by the ceiling and not by apparatus installed below the superstructure.

1.02 Reserved for future use.

1.03 Generally, *Bell System* network equipment structures have been constructed with floor load capabilities of 150 lb./ft^2 for network equipment areas and 300 lb./ft^2 for dc power equipment rooms that were defined prior to a building's initial construction. Of the 150 lb./ft^2 overall available floor loading, 115 lb./ft^2 was generally allocated to the weight of equipment frames, 25 lb./ft^2 to the weight of overhead superstructure and cable, and 10 lb./ft^2 to transient loading, including HVAC ducting. It is believed these incremental floor loading values are based on the old Bell System New Equipment Building Systems (NEBS) concept. Under the NEBS concept, equipment framework assemblies would serve as the means of supporting overhead cable racks, cable, and equipment lighting; and installed cable would be removed from office cable racks when equipment was removed. Additionally, the need for ceiling supported superstructure for the purpose of routing cables between building floors would be minimally required above equipment areas.

1.04 The NEBS concept of cable management has not significantly occurred except to a certain degree for switching equipment areas. This is mostly because the multi-vendor and unique equipment design nature of transport equipment precludes the use of a common framework supported cable management system other than conventional cable racks which require the use of auxiliary framing as a supporting structure. Traditional auxiliary framing and cable racking methodologies support random sizing and placement of equipment frames more so than does framework supported cable distribution systems.

1.05 Generally, a minimum of two levels of auxiliary framing and cable rack is required above transport and collocation equipment areas, and a minimum of one level of auxiliary framing and cable rack is required above switching and power equipment areas. For equipment areas that are converted from 11'-6" to 7'-0" environments, the above minimum levels of superstructure are usually engineered below the existing superstructure arrangement. This superstructure engineering practice and the failure to mine cable from an office as equipment is removed creates the potential for substantially more vertical loading on equipment floors than may have been anticipated by the original NEBS concept.

Equipment Frame Floor Load Calculations

1.06 The floor loading value for an equipment frame is calculated by dividing the frame's maximum installed weight by the area of a rectangle bounded by the equipment's sides and the center of the equipment's minimum front and rear aisle space. Calculations for battery stand end aisle spaces should include the total area required between the end of a battery stand and a building wall or partition and 1/2 the area between the end of a battery stand and another piece of floor mounted equipment.

1.07 The weight of any superstructure supported by the floor for equipment installed on the floor below must be considered when equipment floor loading calculations are at or near the limits given in 800-003-100MP. Table 1 provides the incremental weights of the basic components comprising equipment superstructures commonly found in network facilities. Table 1 should be used to determine with reasonable accuracy the weight of any existing superstructure arrangements that are suspended from a building ceiling when equipment is planned or engineered on the floor above. The overall weight values given in Figures 3 through 11 should be used as is appropriate when the floor below an equipment area is void of equipment initially but is planned for equipment eventually.

1.08 Figure 1 and Tables 2 through 4 illustrate how Table 1 weight values were applied to the superstructure support and bracing arrangements depicted in the remaining figures provided in this section. It should be noted that angle braces can not be used with a 1'-0" braced distance because of how the brace feet are manufactured, however, the weight of such an arrangement was calculated as if they could.

1.09 Figure 2 illustrates the single level auxiliary framing bracing arrangement used to determine the overall weight information provided in the Figure 3 through 10 superstructure arrangements. The following auxiliary framing and earthquake bracing characteristics are illustrated in Figure 2:

a) Auxiliary framing is supported on 5'-0" centers in both primary and secondary directions (preferred and worst case ceiling load scenario),

b) Every run of framing spanning a building bay is likely to have a minimum of 1 framing splice,

c) The weight of auxiliary framing between column lines is equally divided between the ceiling inserts on both sides of the column line,

d) Earthquake braces are installed on 20'-0" centers in opposing directions, and

e) The total weight of earthquake braces is born by the ceiling insert the braces are attached to.

1.10 Figures 3 through 11 were used as generic superstructure arrangements to obtain the overall ceiling load values indicated. All calculations are worst case in that a means of determining relative average cable fill of cable racks during their life in an office has not been determined. Figure 3 also illustrates the basic cable rack fabrication hardware used with cable rack weight values. The 800-003-100MP Figure 9-2(B) equipment layout was used to establish a cable rack and equipment lighting basis because that floor plan was thought to have a greater applicability to future network equipment environments.

1.11 The following is a summation of the overall superstructure weights depicted in Figures 3 through 11.

Fig.	Subject	Total Weight Per Building Bay (lb.)	lb./ft.^{2} Per Building Bay	lb./ft.^{2} Per Ceiling Inserts
3	Single Level Framing	960.8	2.4	4.4
4	Double Level Framing - Older Transport Areas	1,993.6	5.0	8.9
5	Double Level Framing - Switch Areas	1,831.6	4.6	8.1
6	Tri-Level Framing - New Transport Areas	2,728.8	6.8	12.1
7	Framing And Cable Rack - Older transport Areas	19,602.7	49	87.1
8	Framing And Cable Rack - Switch Areas	12,834.4	32.1	57
9	Framing And Cable rack - New Transport Areas	26,849.3	67.1	119.3
10	PBSD-ED-6002 Fiber Raceway - Transport Areas	716.1	1.8	3.2
11	Equipment Lighting - Transport Areas	165.0	0.4	0.4

Note: Using the weight values given in Figures 3 through 6 and the examples provided below, the per-layer weight of earthquake braced auxiliary framing can be roughly estimated as being 815 lbs. + (*vd* - 1'-0" x 69 lbs.) where *vd* equals the vertical distance auxiliary framing is installed below the ceiling. The 815 lb. value is the weight of the auxiliary framing by itself (766 lb.) plus a 49 lb. load value for the first vertical foot of bracing (see Tables 2 through 4). The following examples show the differences between actual weights and the weights derived at using the above formula.

Example For Figure 3

	815.0 lbs.	(single level of earthquake braced framing)
plus	149.0 lbs.	(upper level support and bracing - 2.16' x 69 lbs.)
	964.0 lbs.	

Example For Figure 4

	1630.0 lbs.	(two levels of earthquake braced framing)
plus	149.0 lbs.	(upper level support and bracing - 2.16' x 69 lbs.)
plus	218.0 lbs.	(lower level support and bracing - 3.16' x 69 lbs.)
	1,997.0 lbs.	

Example For Figure 5

	1630.0 lbs.	(two levels of earthquake braced framing)
plus	149.0 lbs.	(upper level support and bracing - 2.16' x 69 lbs.)
plus	57.3 lbs.	(lower level support and bracing - 0.83' x 69 lbs.)
	1,836.3 lbs.	

Example For Figure 6

	2,445.0 lbs.	(three levels of earthquake braced framing)
plus	149.0 lbs.	(upper level support and bracing - 2.16' x 69 lbs.)
plus	57.3 lbs.	(mid level support and bracing - 0.83' x 69 lbs.)
plus	80.0 lbs.	(lower level support and bracing - 1.16' x 69 lbs.)
	2,731.3 lbs.	

2. APPLICATION TO BUILDING FLOOR LOAD VALUES

2.01 As illustrated in the figures and tables included in this section, the actual floor loading value available for network equipment elements on a given floor will vary according to the vintage and type of technology installed on the floor below. If the floor below contains a superstructure arrangement supported entirely by the network equipment frames, 140 lb./ft.^{2} of floor loading is available for equipment installed on the slab surface. In practice the 140 lb./ft.^{2} floor loading value is never completely available for equipment frames because of the need to engineer auxiliary framing and cable rack for cables routed between building floors.

2.02 Another impact on floor loading is the evolution of the equipment environment during the life of a particular building. It is reasonable to expect that the use of an equipment area and its associated overhead superstructure will change at least every 10 years. To allow for unrestricted technology evolution in an equipment building, network equipment should be planned initially (relative to floor loading considerations) in a way that accommodates changes on the floor below. To accomplish this, the most severe superstructure arrangements for the floor below (Fig. 6) should be used when determining equipment and equipment aisle spacings. The foregoing is based on the assumption it's easier to spread frames initially to minimize future floor loading considerations than it is to attempt to restrict superstructure engineering for equipment installed below a floor.

2.03 The 80 lb./ft.^{2} combined weight of network equipment installed in any given 400 ft.^{2} area referenced in 800-003-100MP is a 10 lb./ft.$^{2\ \text{derating}}$ of the average of Fig. 7, 8 and 9 superstructure loading values indicated below. The 10 lb./ft.$^{2\ \text{derating}}$ value is a 4,000 lb. per building bay consideration for ancillary superstructure loads that may be particular to a specific network element, building condition (not identified as being typical in an equipment environment).

	Fig. 7 Superstructure	Fig. 8 Superstructure	Fig. 9 Superstructure
Available Floor Loading	140.0 lb./ft.^{2}	140.0 lb./ft.^{2}	140.0 lb./ft.^{2}
Minus Building Bay Superstructure Loading	49.0 lb./ft.^{2}	32.1 lb./ft.^{2}	67.1 lb./ft.^{2}
	91.0 lb./ft.^{2}	107.9 lb./ft.^{2}	72.9 lb./ft.^{2}
Minus Fig. 11 Equipment Lighting Loading	0.4 lb./ft.^{2}	0.4 lb./ft.^{2}	0.4 lb./ft.^{2}
Available Loading On Floor Above	90.6 lb./ft.^{2}	107.5 lb./ft.^{2}	72.5 lb./ft.^{2}

Average Of Available Loading = 90.2 lb./ft.^{2}

2.04 Figure 12 represents a somewhat worst case scenario of equipment placement and its relationship to the 80-lb./ft.^{2} floor loading rule. Illustrated in Figure 12 is the physical capability of placing (61) 2'-2" wide by 1'-0" deep equipment frames within the boundaries of a standard 20' x 20' equipment area using the undesirable 800-003-100MP Figure 9-2(A) aisle spacings. It should be expected that the space between building columns will contain fewer equipment frames than shown in Figure 12 for cable hole access reasons. Additionally, the weight, heat dissipation and equipment access characteristics of newer technologies generally call for wider aisles than the minimums referenced in 800-003-100MP Figure 9-2(A).

Table 1
Nominal Weight Of Common Superstructure Materials

AUXILIARY FRAMING AND BRACING

Auxiliary Framing Channel	1.86 lb./lin. ft.	Double Level Support	0.75 lb.
5/8" Threaded Rod	0.8 lb./lin. ft.	Bolted Framing Splice	2.25 lb.
Brace Angle (2 x2 x 3/16")	2.5 lb./lin. ft.	5/8" Stiffening Clips	0.6 lb.
Misc. Angle (2 x 2 x 1/4")	3.2 lb./lin. ft.	Angle Brace Hardware	6.5 lb.
Unistrut P1000 U Channel	1.9 lb./lin. ft.	Double Level Junction Hardware	0.66 lb.
Unistrut P3001 U Channel	3.4 lb./lin. ft.	3"–5 lb. Channel (per lineal foot)	5 lb.
Unistrut P3301 U Channel	2.7 lb./lin. ft.		

CONVENTIONAL LADDER TYPE CABLE RACKING

5 in. Wide Cable Rack	5.4 lb./lin. ft.	Clamp Splice	1.2 lb.
1'-0"	5.9 lb./lin. ft.	Clipped Intersection	0.8 lb.
1'-3"	6.1 lb./lin. ft.	Double J Bolt Support	0.9 lb.
1'-8"	6.5 lb./lin. ft.	1/2 x 1" Tube (0.065 Wall)	0.6 lb./lin. ft.
2'-1"	8.5 lb./lin. ft.	3/8 x 2" Tube (0.065 Wall)	1.0 lb./lin. ft.
		3/8 x 2" Solid Bar	2.6 lb./lin. ft.
		1/4 x 1" Solid Bar	0.9 lb./lin. ft.
		1/2 x 1" Channel	0.8 lb./lin. ft.

NOMINAL CABLE WEIGHTS (800-006-151MP Issue B, Racks At Fill Capacity)

	Miscellaneous		Power
	Unsecured	Secured	(Secured)
5" Rack	15 lb./lin. ft.	20 lb./lin. ft.	43.2 lb./lin. ft.
1'-0" Rack	79.2 lb./lin. ft.	105.6 lb./lin. ft.	108 lb./lin. ft.
1'-3" Rack	126 lb./lin. ft.	134.4 lb./lin. ft.	135 lb./lin. ft.
1'-8" Rack	171 lb./lin. ft.	182.4 lb./lin. ft.	189 lb./lin. ft.
2'-1" Rack	216 lb./lin. ft.	230.4 lb./lin. ft.	N/A

PBSD-ED-6002 FIBER OPTIC RACEWAY (Hendry/NorCal)

2 x 3" raceway with covers	3.2 lb./lin. ft.	G-49 2 x 2" cable transition - short	4.2 lbs.
2 x 6" raceway with covers	4.3 lb./lin. ft.	G-50 2 x 2" cable transition - long	5.8 lbs.
4 x 6" raceway with covers	4.5 lb./lin. ft.	G-52 4 x 6" cable transition - short	2.5 lbs.
4 x 12" raceway with covers	7.5 lb./lin. ft.	G-53 4 x 6" cable transition - long	4.5 lbs.
		G-65 2 x 3" 90°turn	2.7 lbs.
G-31 2 x 6" Tee	2.5 lbs.	G-66 2 x 2" cable transition - short	1.8 lbs.
G-32 4 x 6" Tee	2.5 lbs.	G-67 2 x 2" cable transition - long	3.4 lbs.
G-41 2 x 6" 90°turn	4.4 lbs.		
G-42 4 x 6" 90° turn	5.3 lbs.		
G-45 flat bar support for 6"	3.7 lbs.		
G-46 flat bar support for 12"	4.7 lbs.		

EQUIPMENT LIGHTING

Sentinel SL5500 10'-0" (2 Ballast Light Fixture) ..... 30 lbs.
Sentinel SL5500 10"-0" (1 Ballast Light Fixture) ..... 27 lbs.
Sentinel SL5500 5'-6" (1 Ballast Light Fixture) ..... 16 lbs.

Wiremold G4000 Raceway and Cover ..... 1.2 lb./lin. ft.

Misc. Lighting Fixture Supports and Fittings ..... 30 lbs. Per 20' x 20' Area

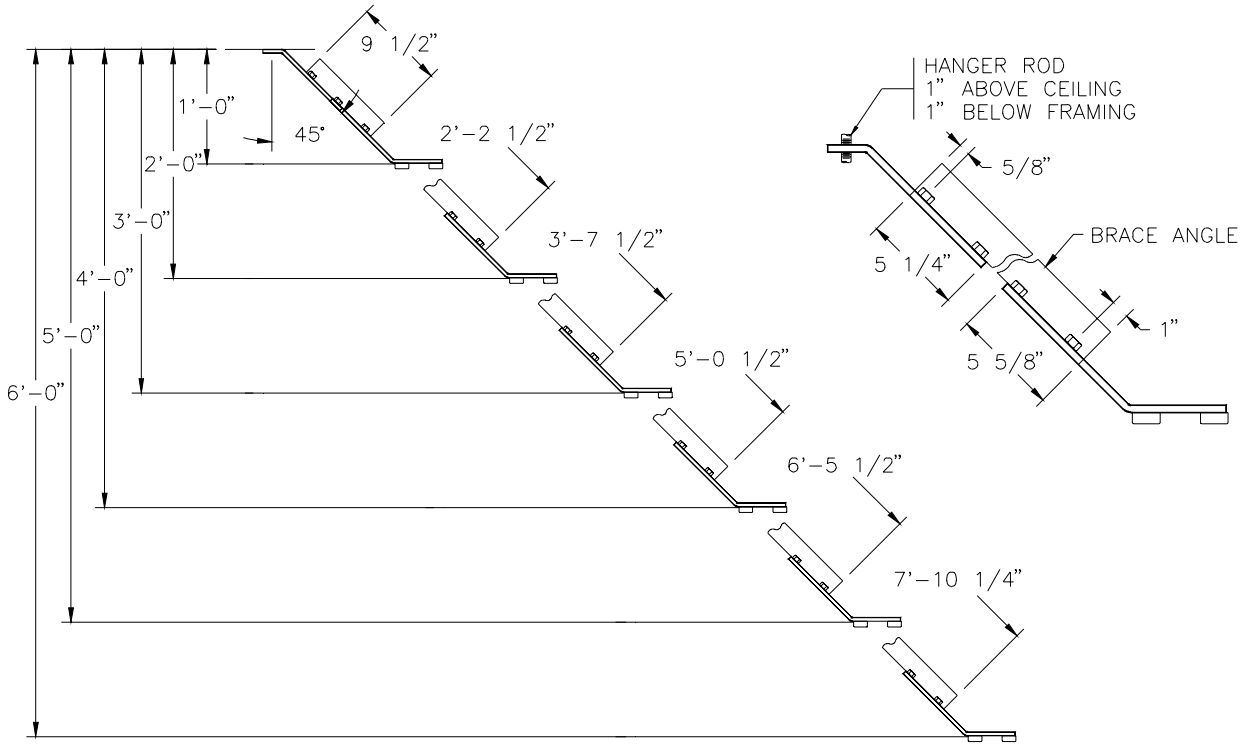


Figure 1 - Relationship Of Brace Angle Lengths to Distance Braced

TABLE 2

Hanger Rod Weights Per Supported Distance Of Framing (See Figure 1)

Support Distance	A Length	B Weight Each Rod (A x 0.8 lb.)	C Weight Per Bldg. Bay (B x 16)
1'-0"	1'-4" (1.33')	1.04 lb.	17 lb.
2'-0"	2'-4" (2.33')	1.86 lb.	30 lb.
3'-0"	3'-4" (3.33')	2.66 lb.	43 lb.
4'-0"	4'-4" (4.33')	3.46 lb.	55 lb.
5'-0"	5'-4" (5.33')	4.26 lb.	68 lb.
6'-0"	6'-4" (6.33')	5.06 lb.	81 lb.

TABLE 3

Brace Angle Weights Per Vertical Distance Braced (See Figure 1)

Distance Braced	A Length	B Weight Each Angle (A x 2.5 lb.)	C Weight Per Bldg. Bay (B x 16)
1'-0"	9 1/2" (0.79')	1.98 lb.	32 lb.
2'-0"	26 1/2" (2.2')	5.5 lb.	88 lb.
3'-0"	43 1/2" (3.63')	9.08 lb.	145 lb.
4'-0"	60 1/2" (5.04')	12.6 lb.	202 lb.
5'-0"	77 1/2" (6.45')	16.13 lb.	258 lb.
6'-0"	94 1/4" (7.85')	19.63 lb.	314 lb.

TABLE 4

Combined Weights of Rod And Brace Angles Per Vertical Distance Braced See Tables 2 and 3

Distance Braced	A Hanger Rods Table R-1 C	B Brace Angles Table R-2 C	C Total Weight (A + B)	D Increase From Previous Dist.
1'-0"	17 lb.	32 lb.	49 lb.	---
2'-0"	30 lb.	88 lb.	118 lb.	69 lb.
3'-0"	43 lb.	145 lb.	188 lb.	70 lb.
4'-0"	55 lb.	202 lb.	257 lb.	69 lb.
5'-0"	68 lb.	258 lb.	326 lb.	69 lb.
6'-0"	81 lb.	314 lb.	395 lb.	69 lb.

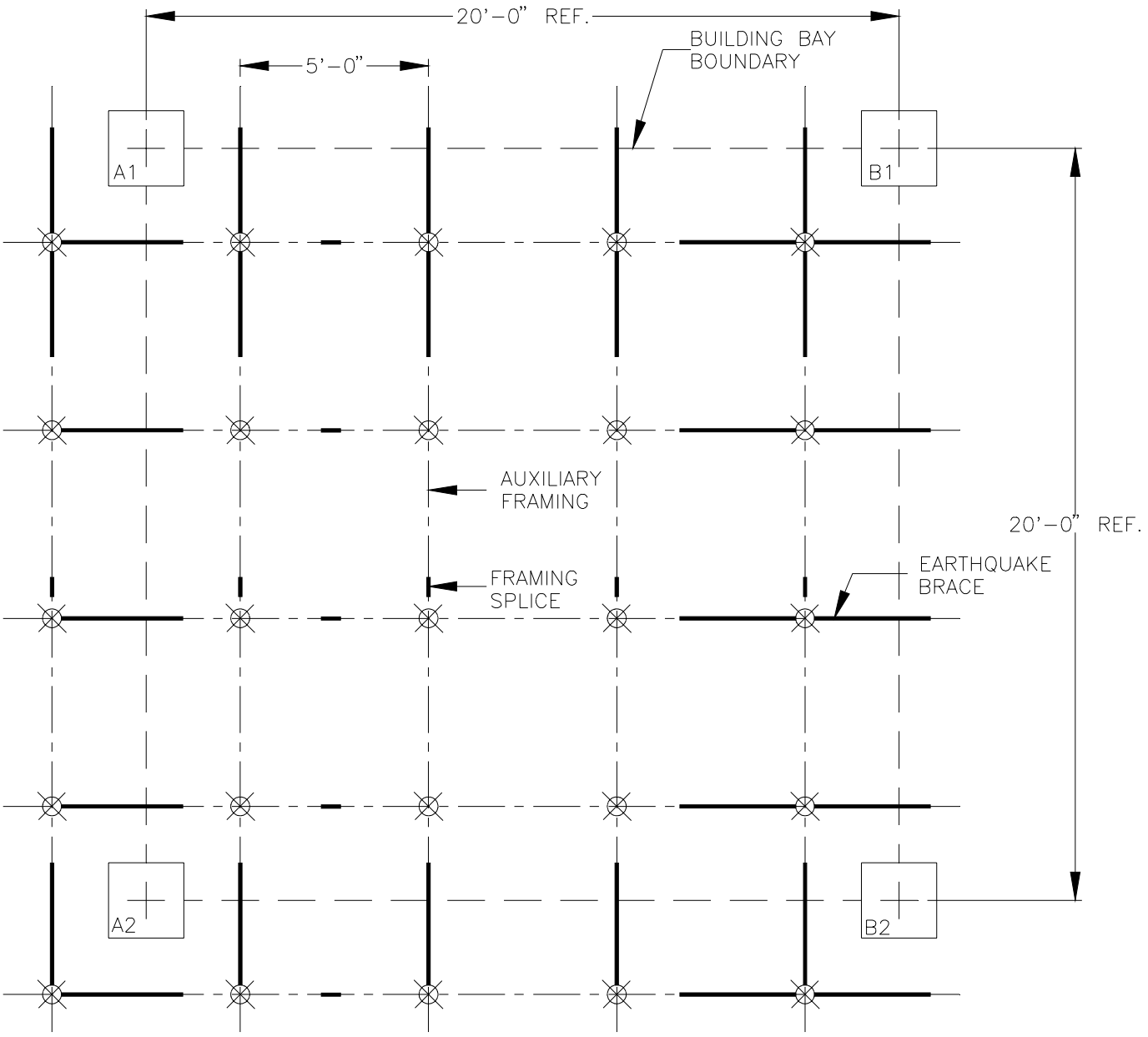


Figure 2 - Standard Auxiliary Framing And Bracing Arrangement

Nominal Weight Of Figure 3 Single Level Framing Arrangement

Qty	Description	Weight	
16	20 foot lengths of auxiliary framing channel @1.9 lb./lin. ft.	608.0	lbs.
16	5/8 x 3'-6" hanger rods @ 0.8 lb./lin. ft.	44.8	lbs.
16	Double level auxiliary framing supports @ 0.75 lb. ea.	12.0	lbs.
8	Bolted auxiliary framing splices @ 2.25 lb. ea.	18.0	lbs.
40	5/8" Stiffening clips @ 0.6 lb. ea.	24.0	lbs.
16	Earthquake bracing hardware @ 6.5 lb. ea.	104.0	lbs.
16	3'-9" brace angles @ 2.5 lb./lin. ft.	150.0	lbs.
	Total	960.8	lbs.

Concentrated Weight Per Hanger Rod Area
960.8 ÷ 225 ft.^{2} = **4.4 lb./ft.^{2}**

Weight Per Building Bay Floor Area
960.8 ÷ 400 ft.^{2} = **2.4 lb./ft.^{2}**

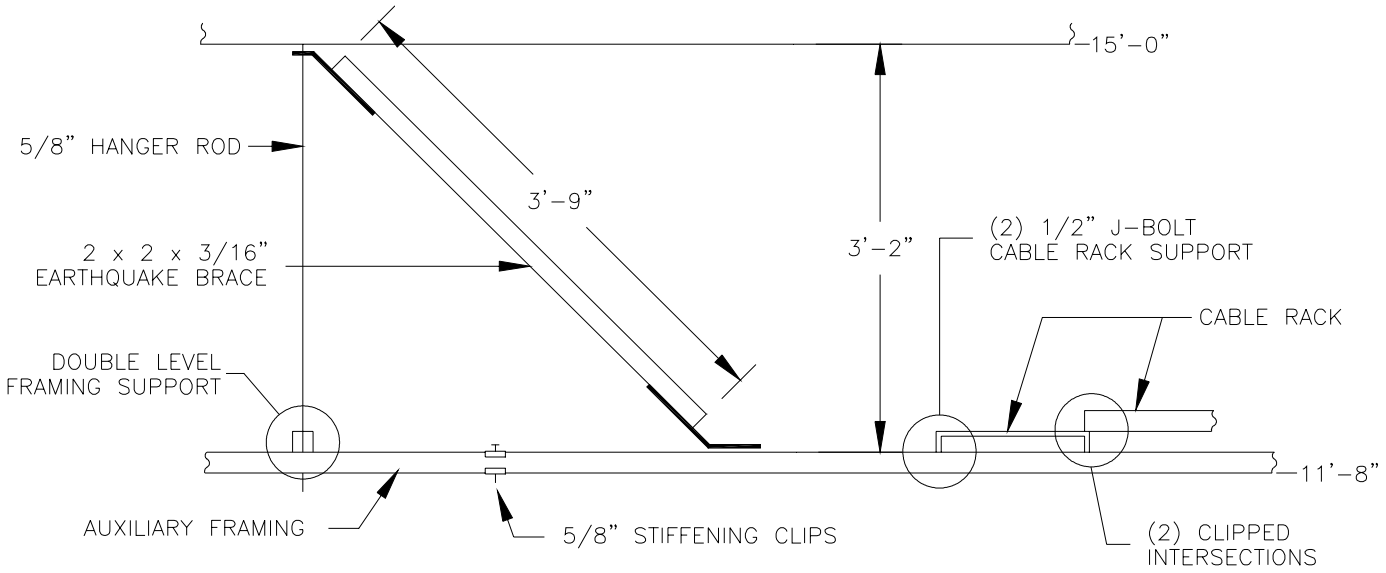


Figure 3 - Typical Single Level Auxiliary Framing Arrangement

Nominal Weight Of Figure 4 Double Level Framing Arrangement

Qty	Description	Weight	
32	20 foot lengths of auxiliary framing channel @1.9 lb./lin. ft.	1,216.0	lbs.
16	5/8 x 8'-0" hanger rods @ 0.8 lb./lin. ft.	102.4	lbs.
16	Double level auxiliary framing supports @ 0.75 lb. ea.	12.0	lbs.
16	Double level framing junction hardware @ 0.7 lb. ea. (low level framing)	11.2	lbs.
16	Bolted auxiliary framing splices @ 2.25 lb. ea.	36.0	lbs.
80	5/8" Stiffening clips @ 0.6 lb. ea.	48.0	lbs.
32	Earthquake bracing hardware @ 6.5 lb. ea.	208.0	lbs.
16	5'-3" brace angles @ 2.5 lb./lin. ft. (low level framing)	210.0	lbs.
16	3'-9" brace angles @ 2.5 lb./lin. ft. (high level framing)	150.0	lbs.
	Total	1,993.6	lbs.

Concentrated Weight Per Hanger Rod Area
1,993.6 ÷ 225 ft.^{2} = **8.9 lb./ft.^{2}**

Weight Per Building Bay Floor Area
1,993.6 ÷ 400 ft.^{2} = **5.0 lb./ft.^{2}**

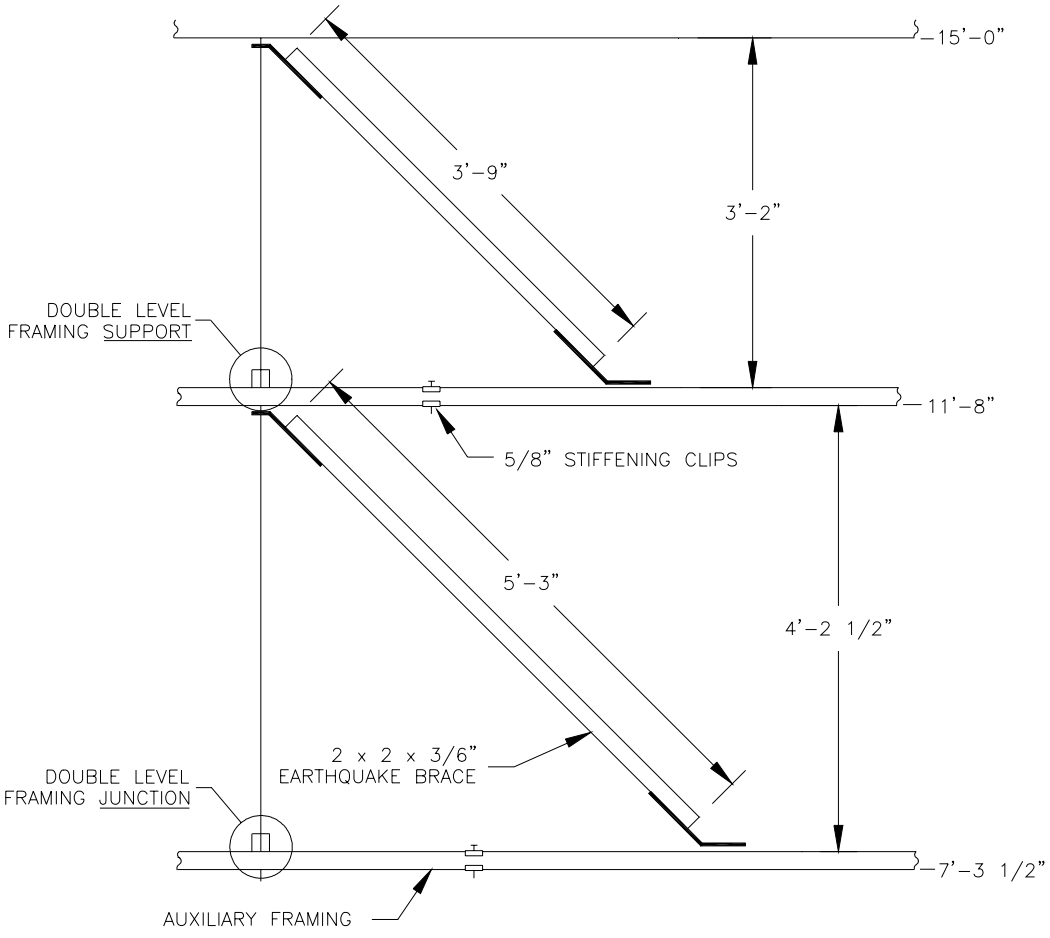


Figure 4 - Typical Double Level Auxiliary Framing Arrangement - Older Transport Areas

Nominal Weight Of Figure 5 Double Level Framing Arrangement

Qty	Description		Weight	
1	Fig. 4 weight minus hanger rods and low-level brace angles (312.4 lb.)		1,681.2	lbs.
16	5'-6" hanger rods @ 0.8 lb./lin. ft.		70.4	lbs.
16	2'-0" brace angles @ 2.5 lb./lin. ft. (low level)		80.0	lbs.
		Total	1,831.6	lbs.

Concentrated Weight Per Hanger rod Area
1,831.6 ÷ 225 ft.^{2} = **8.1 lb./ft.^{2}**

Weight Per Building Bay Floor Area
1,831.6 ÷ 400 ft.^{2} = **4.6 lb./ft.^{2}**

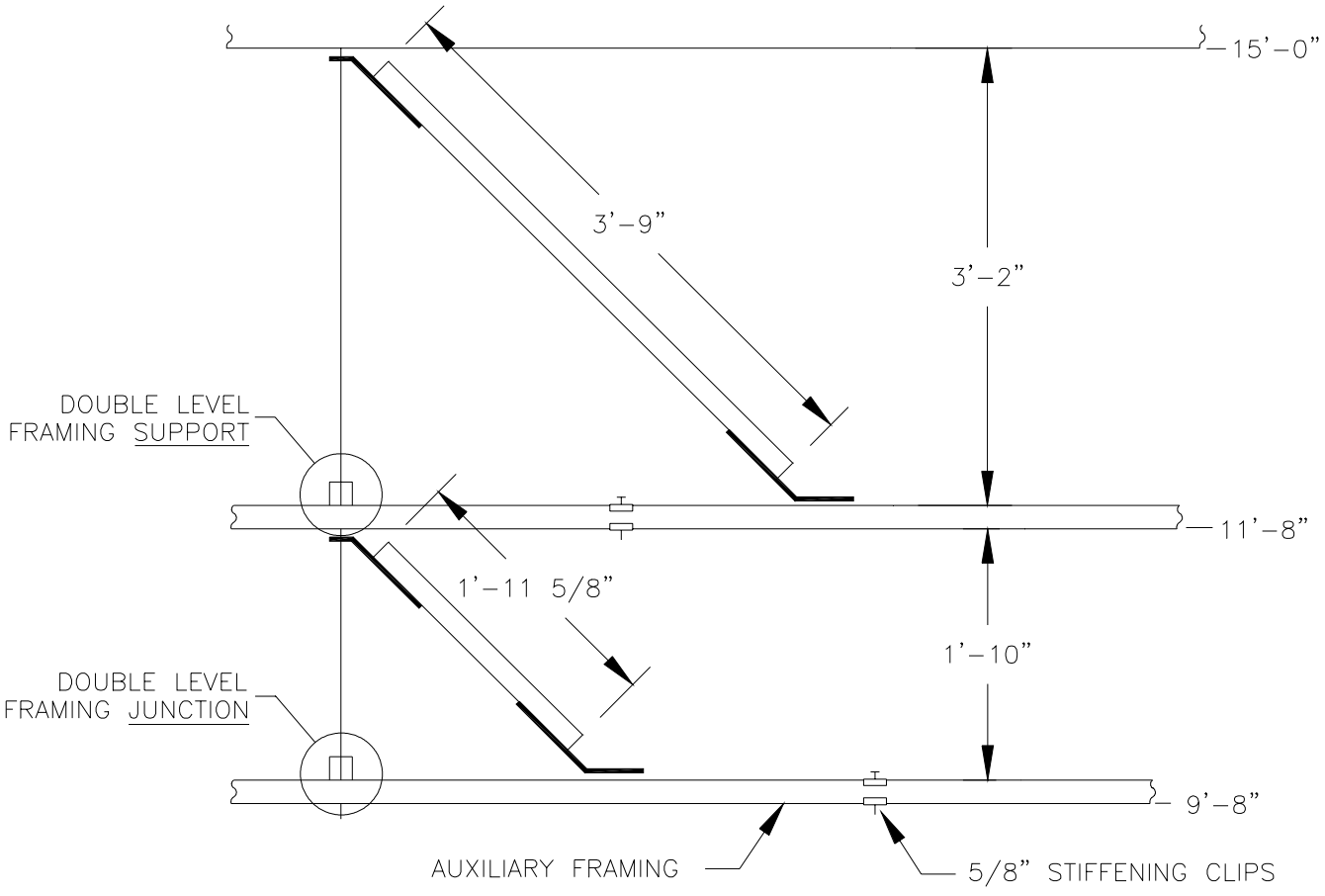


Figure 5 - Typical Double Level Auxiliary Framing Arrangement - Switching Areas

Nominal Weight Of Figure 6 Tri-Level Framing Arrangement

Qty	Description	Weight	
1	Fig. 5 weight minus hanger rods (70.4 lb.)	1,761.2	lbs.
1	Fig. 3 weight minus hanger rods, brace angles and sup hdwr (206.8 lbs.)	754.0	lbs.
16	Double level framing junctions @ 0.7 lb. ea. (lowest framing level)	11.2	lbs.
16	8'-0" hanger rods @ 0.8 lb./lin. ft.	102.4	lbs.
16	2'-6" brace angles @ 2.5 lb./lin. ft. (low level)	100.0	lbs.
	Total	2,728.8	lbs.

Concentrated Weight Per Hanger rod Area
2,728.8 ÷ 225 ft.^{2} = **12.1 lb./ft.^{2}**

Weight Per Building Bay Floor Area
2,728.8 ÷ 400 ft.^{2} = **6.8 lb./ft.^{2}**

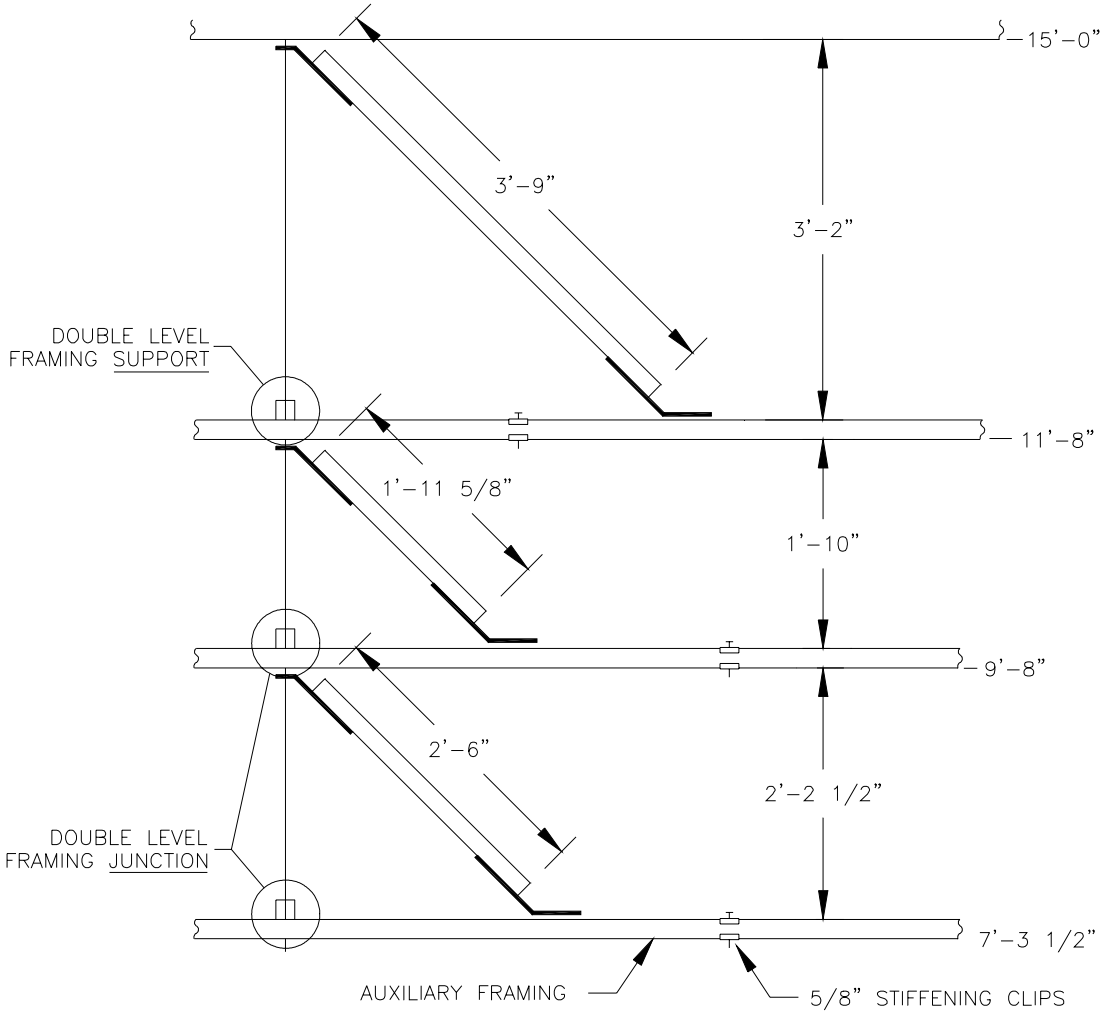


Figure 6 - Typical Tri-Level Auxiliary Framing Arrangement - Newer Transport Areas

Nominal Weight Of Figure 7 Auxiliary Framing And Cable Rack Arrangement

Qty	Description	Weight	
1	Fig. 3 weight minus 28 stiffening clips (16.8 lb.)	944	lbs.
80	Feet of 1'-3" cable rack and unsecured lineup cable (A,B,C,D) @ 126 lb./lin. ft.	10,568	lbs.
45	Feet of 1'-8" cable rack and unsecured cross aisle cable (1,2,3) @ 171 lb./lin. ft.	7,987.5	lbs.
8	Clamp cable rack splice @ 1.2 lb. each	9.6	lbs.
24	Clipped cable rack intersection @ 0.8 lb. each	19.2	lbs.
16	Cable rack J bolt supports @ 0.9 lb. each	14.4	lbs.
2	3" 5lb. Channel 6'-0" Long @ 30 lb. Each	60	lbs.
	Total	19,602.7	lbs.

Concentrated Weight Per Hanger Rod Area
19,602.7 ÷ 225 ft.^{2} = **87.1 lb./ft.^{2}**

Weight Per Building Bay Floor Area
19,602.7 ÷ 400 ft.^{2} = **49 lb./ft.^{2}**

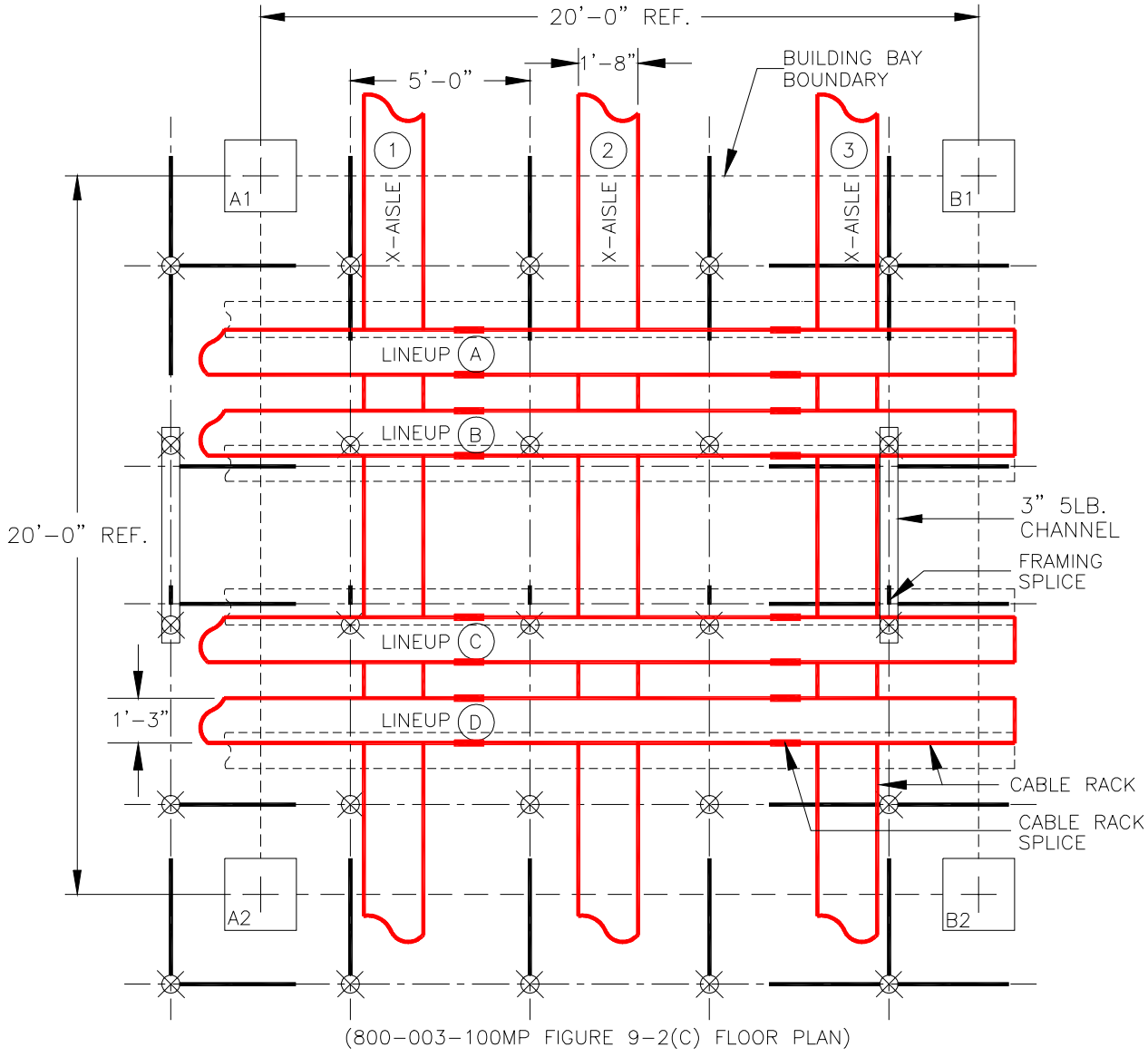


Figure 7 - Typical Auxiliary Framing And Cable Rack Arrangement - Older Transport Areas

Nominal Weight Of Figure 8 Auxiliary Framing And Cable Rack Arrangement

Qty	Description	Weight	
1	Fig. 5 weight minus 12 stiffening clips (7.2 lb.)	1,824.4	lbs.
40	Feet of 1'-8" cable rack and unsecured misc. cable @ 171 lb./lin. ft.	7,100	lbs.
20	Feet of 1'-8" cable rack and secured power cable @ 189 lb./lin. ft.	3,910	lbs.
	Total	12,834.4	lbs.

Concentrated Weight Per Hanger Rod Area
12,834.4 ÷ 225 ft.^{2} = **57 lb./ft.^{2}**

Weight Per Building Bay Floor Area
12,834.4 ÷ 400 ft.^{2} = **32.1 lb./ft.^{2}**

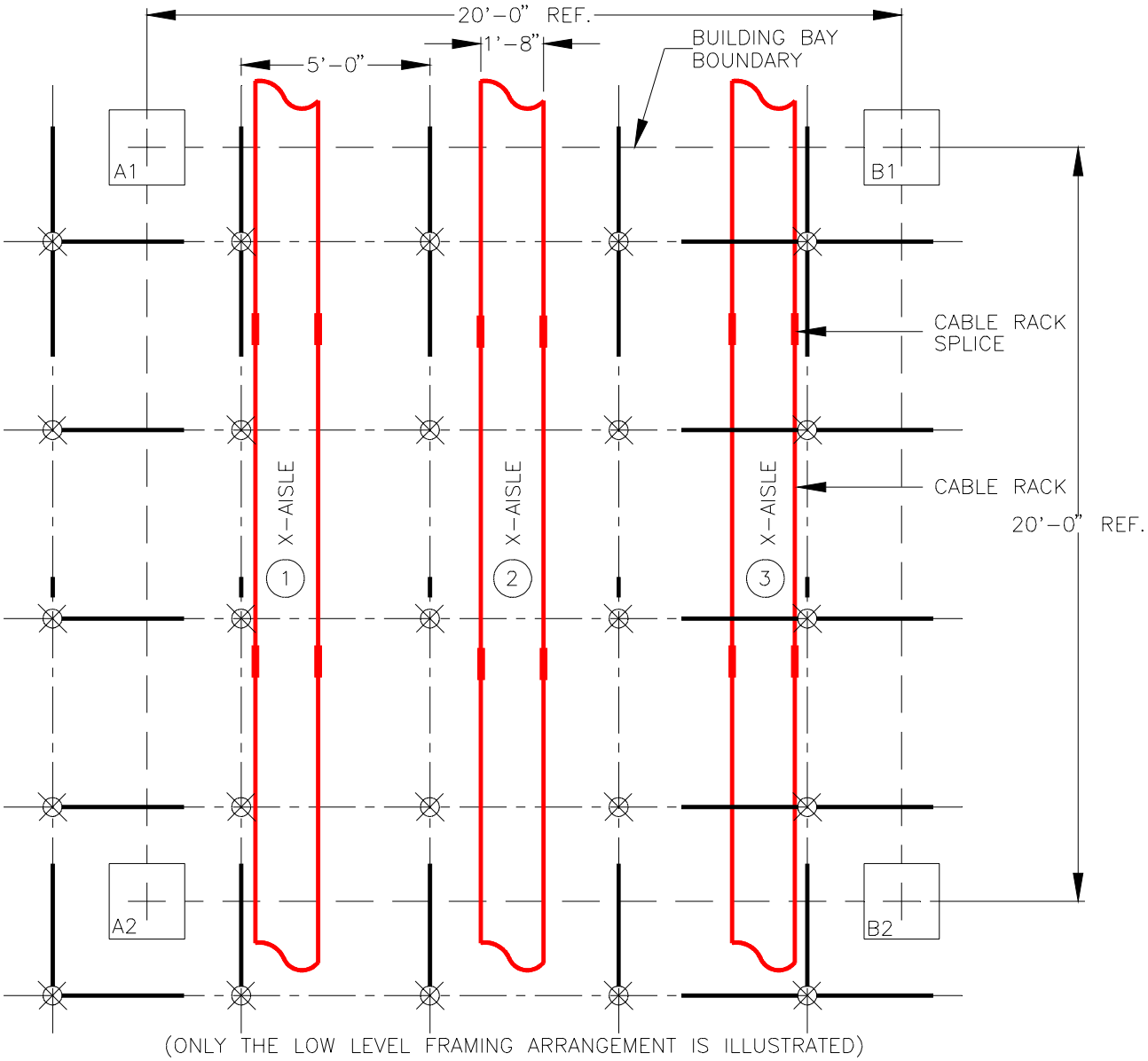


Figure 8 - Typical Auxiliary Framing And Cable Rack Arrangement - Switching Areas

Nominal Weight Of Figure 9 Auxiliary Framing And Cable Rack Arrangement

Qty	Description	Weight	
1	Fig. 6 framing weight minus 36 stiffening clips (21.6 lb.)	2,707.2	lbs.
1	Fig. 7 miscellaneous cable rack weight	18,598.7	lbs.
28	Feet of 1'-8" upper level cable rack and secured power cable @ 189 lb./lin. ft.	5,474	lbs.
2	Clamped cable rack splice @ 1.2 lb. each	2.4	lbs.
2	Clipped cable rack intersection @ 0.8 lb. each	1.6	lbs.
2	3" 5lb. Channels per Figure 7 @ 30 lb. Each	60	lbs.
6	Cable rack J bolt supports @ 0.9 lb. each	5.4	lbs.
	Total	26,849.3	lbs.

Concentrated Weight Per hanger Rod Area
26,849.3 ÷ 225 ft.^{2} = **119.3 lb./ft.^{2}**

Weight Per Building Bay Floor Area
26,849.3 ÷ 400 ft.^{2} = **67.1 lb./ft.^{2}**

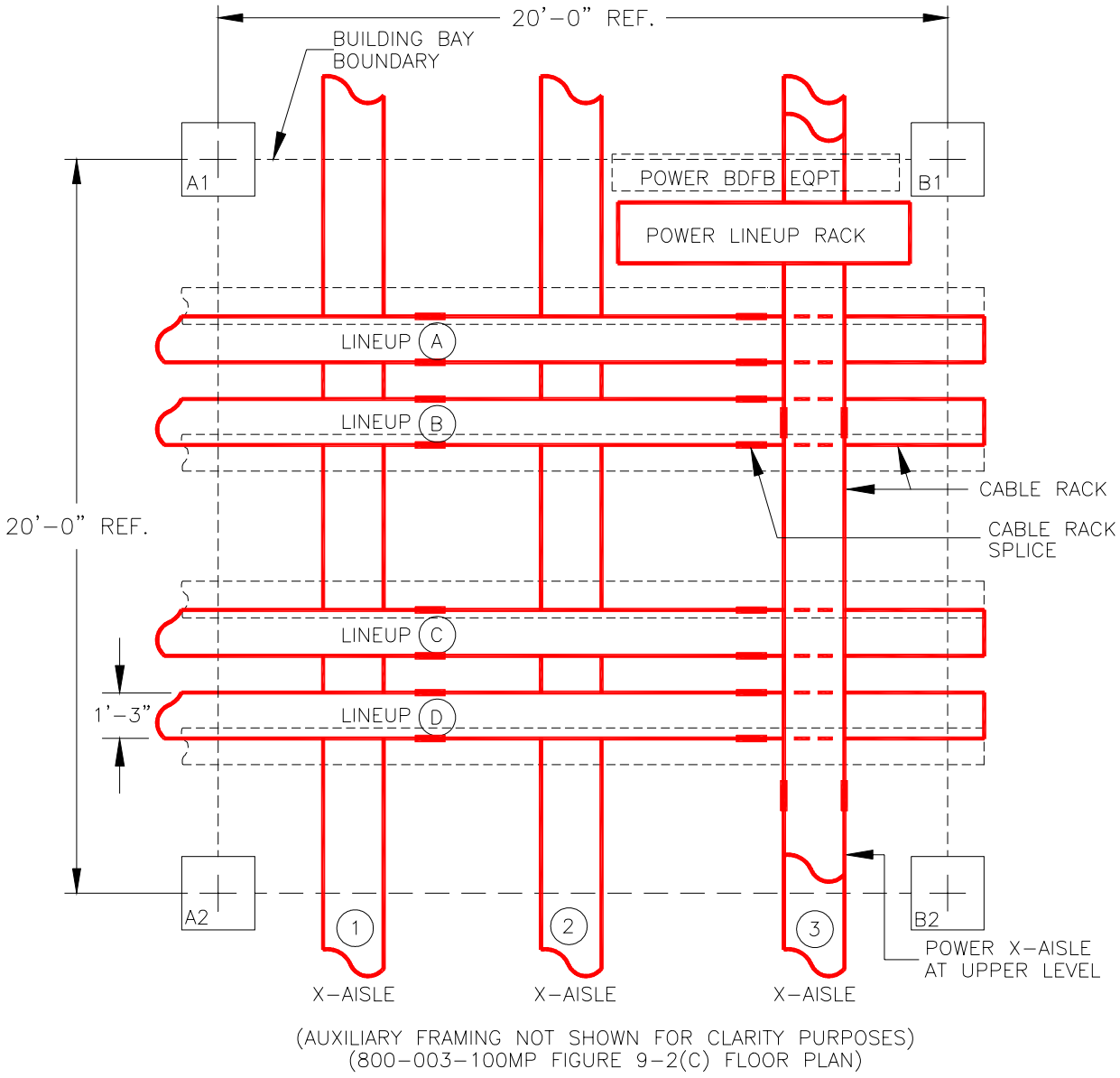


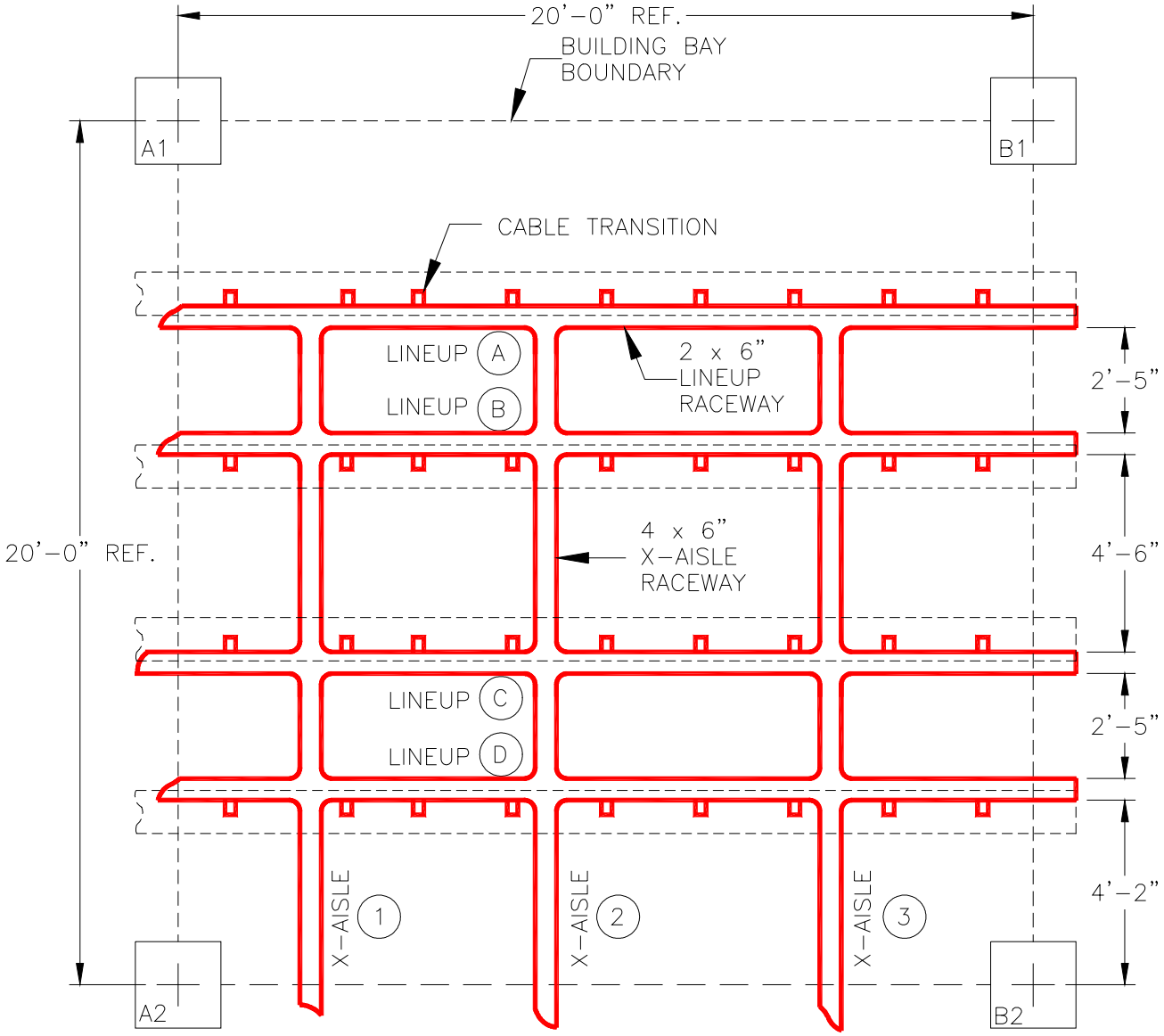
Figure 9 - Typical Cable Racking Arrangement - Newer Transport Areas
(See Figure 6 For Framing Arrangement)

Nominal Weight Of Figure 10 Fiber Optic Raceway Arrangement

Qty	Description	Weight	
80	Feet 2 x 6" lineup raceway @ 3.2 lb./lin. ft.	256.0	lbs.
41	Feet 4 x 6" cross aisle raceway @ 4.5 lb./lin. ft.	184.5	lbs.
21	PBSD-ED-6002 G-32 4 x 6" tee @ 2.5 lb. each	52.5	lbs.
19	PBSD-ED-6002 G-45 flat bar support @ 3.7 lb. each	70.3	lbs.
36	PBSD-ED-6002 G-67 cable transitions @ 3.4 lb. each	122.4	lbs.
38	5/8 x 1'-0" hanger rods @ 0.8 lb. each	30.4	lbs.
	Total	716.1	lbs.

Concentrated Weight Per hanger Rod Area
716.1 ÷ 225 ft.^{2} = **3.2 lb./ft.^{2}**

Weight Per Building Bay Floor Area
716.1 ÷ 400 ft.^{2} = **1.8 lb./ft.^{2}**



(800-003-100MP FIGURE 9-2(C) FLOOR PLAN)

Figure 10 - Typical Fiber Optic Raceway Arrangement - Transport Areas

Nominal Weight Of Figure 11 Equipment Lighting Arrangement

Qty	Description	Weight	
1	10 foot 2 ballast fixture @ 30 lbs. each	30.0	lbs.
3	10 foot 1 ballast fixture @ 27 lbs. each	81.0	lbs.
20	Feet G-4000 Wiremold @ 1.2 lb./lin. ft.	24.0	lbs.
1	Increment of lighting fixture support and fittings @ 30 lbs. each	30.0	lbs.
	Total	165.0	lbs.

Weight Per Building Bay Floor Area
165.0 ÷ 400 ft.^{2} = **0.4 lb./ft.^{2}**

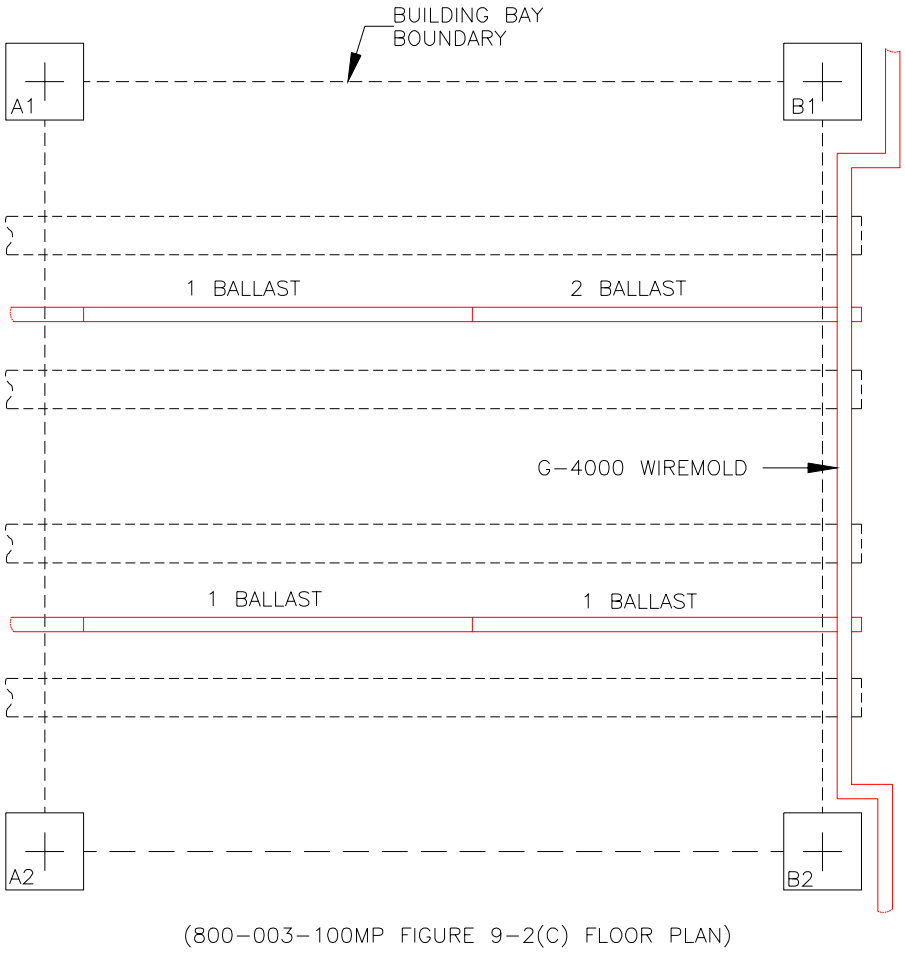


Figure 11 - Typical Equipment Lighting Arrangement - Transport Areas

Nominal Effects Of Figure 12 Equipment Placement On The 80 lb./ft.^{2} Rule

Qty	Description
61	D4 bays @ 557 lbs. each = 33,977 lbs. ÷ 400 ft.^{2} = 84.9 lb./ft.^{2} floor load
53	D4 bays (1 - 53) @ 557 lbs. each = 29,521 lbs. ÷ 400 ft.^{2} = 73.8 lb./ft.^{2} floor load
45	D4 bays (9 - 53) @ 557 lbs. each = 25,065 lbs. ÷ 400 ft.^{2} = 62.6 lb./ft.^{2} floor load
45	D4 bays (9 - 53) @ 557 lbs. each = 25,065 lbs. ÷ 324 ft.^{2} = 77.4 lb./ft.^{2} floor load (324 ft.^{2} pertains to an 18'-0" x 18'-0" area)

The following equipment frame weights were used to derive the above floor loading scenarios. Weights were taken from the March 1996 release of Bellcore's See NEBS Data (SEEND) file and pertain to 7'-0" equipment products.

Product	Weight		
D4 Chan Bank	557	lbs.	
FMT-150 MUX	448	lbs.	
RC-28C MUX	299	lbs.	
RC-28C1	309	lbs.	
RC-28D	391	lbs.	
DSX-1	326	lbs.	
DSX-1C	525	lbs.	(ADC high density)
DSX-1C	682	lbs.	(ADC super high density)

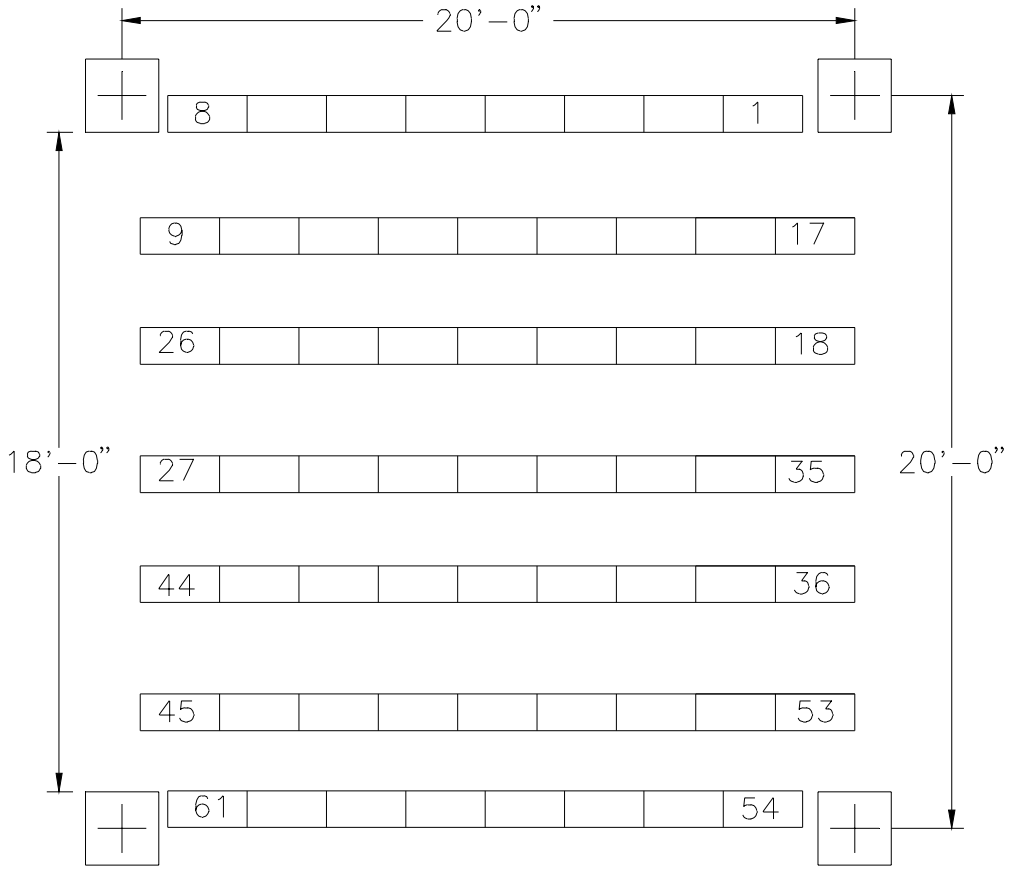


Figure 12 - Comparative Relationship Of 1'-0" Deep Equipment Frames To Available Floor Space (Per 800-003-100MP Figure 9-2(A) Aisle Spacings)