ATT-812-000-016

Common Systems **Considerations For Determining The Affects On Floor Loading Of Superstructure Suspended From Ceilings**

This practice provides weights and floor loading considerations for ironwork and cabling suspended from building ceilings.

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Table of Contents

INTRODUCTION 1

1. REASON FOR REISSUE 1
2. GENERAL 1
   - 2.1. Floor Loading Considerations 2
3. SUPERSTRUCTURE FLOOR LOADING CALCULATIONS 8
4. NON-EARTHQUAKE AND MISCELLANEOUS CONSIDERATIONS 23
   - 4.1. Threaded Rod Braces 25
5. RELATED DOCUMENTS 26
6. ACKNOWLEDGEMENTS 27
7. CONTACT LIST 27

ACRONYMS 27

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INTRODUCTION

This practice provides equipment superstructure floor loading information that should be taken into consideration and applied when allocating floor space and engineering network equipment on the upper floors of network facilities. Reference to BSP 800-003-100MP is made throughout this practice. BSP 800-003-100MP may be re-designated as ATT-812-000-015 before this practice is re-issued.

1. REASON FOR REISSUE

Issue Number	Date Modified	Brief Description of Changes	Author
1		Renumber BSP 800-003-100MP Appendix 1; added reference to 812-000-015; restructured content; revised Table 1 and Fig.10 to reflect full fiber raceways; added Part 4 and Fig. 13	bm1924

2. GENERAL

The purpose of this section is to provide a means of reasonably estimating 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 equipment superstructure weight is supported by the ceiling and not by frames and apparatus installed on the floor below the superstructure.

Generally, Bell System network equipment structures have been constructed with floor load capabilities of 150 lb./ft² for network equipment areas and 300 lb./ft² for dc power equipment rooms that were defined prior to a building's initial construction. Of the 150 lb./ft² overall available floor loading, 115 lb./ft² was generally allocated to the weight of equipment frames, 25 lb./ft² was allocated to the weight of overhead superstructure and cable, and 10 lb./ft² was allocated 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, a minimum amount of ceiling supported superstructure would be needed for the support and routing of cables between building floors.

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.

The 80 lb./ft.² combined weight of network equipment installed in any given 400 ft.² area referenced in BSP 800-003-100MP is a 10 lb./ft.² de-rating of the average of the Fig. 1, 2 and 3 superstructure loading values indicated below. The 10 lb./ft.² de-rating value is a 4,000 lb. per building bay consideration for ancillary superstructure loads that may be particular to a specific network element or building condition not identified as being typical for an equipment environment.

	Fig. 1	Fig. 2	Fig. 3
Available Floor Loading	140.0 lb./ft.²	140.0 lb./ft.²	140.0 lb./ft.²
Minus Building Bay Superstructure Load	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 Load	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 Above Available Floor Loadings = 90.2 lb./ft.²

2.1. Floor Loading Considerations

Table 1 can be used to determine with reasonable accuracy the weight of 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 1 to 3 can be used as is appropriate when the floor below is void of equipment initially but is planned for equipment eventually. Cable rack calculations in Figures 1 to 3 are worst case (racks filled to capacity) in

that a means of determining relative average cable fill and weight of cable racks during their life in a building has not been determined.

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 shown in Fig. 9 should be used when determining equipment and equipment aisle spacings on the floor above. The foregoing is based on the assumption it's easier to spread frames initially to minimize future floor loading considerations than it is to restrict superstructure engineering for equipment installed below a floor.

Table 1

Nominal Weight Of Common Superstructure Materials

Auxiliary Framing and Bracing

Auxiliary Framing Channel	1.86 lbs/ft.	Double Level Support	0.75 lb.
5/8" Threaded Rod	0.8 lbs/ft.	Bolted Framing Splice	2.25 lb.
Brace Angle (2 x2 x 3/16")	2.5 lbs/ft.	5/8" Stiffening Clips	0.6 lb.
Misc. Angle (2 x 2 x 1/4")	3.2 lbs/ft.	Angle Brace Hardware	6.5 lb.
Unistrut P1000 U Channel	1.9 lbs/ft.	Dbl. Level Junction Hardware	0.66 lb.
Unistrut P3001 U Channel	3.4 lbs/ft.	3"-5 lb. Channel	5 lb./ft.
Unistrut P3301 U Channel	2.7 lbs/ft.	Threaded Rod Brace (≤1'-6")	5.2 lb.

Conventional Ladder Type Cable Racking

5" Wide Rack	5.4 lbs/ft.	Clamp Splice	1.2 lb.
12" Wide Rack	5.9 lbs/ft.	Clipped Intersection	0.8 lb.
15" Wide Rack	6.1 lbs/ft.	Double J Bolt Support	0.9 lb.
20" Wide Rack	6.5 lbs/ft.	1/2 x 1" Tube (0.065 Wall)	0.6 lbs/ft.
25" Wide Rack	8.5 lbs/ft.	3/8 x 2" Tube (0.065 Wall)	1.0 lbs/ft.
		3/8 x 2" Solid Bar	2.6 lbs/ft.
		1/4 x 1" Solid Bar	0.9 lbs/ft.
		1/2 x 1" Channel	0.8 lbs/ft.

Nominal Cable Weights - Racks At Fill Capacity

Rack Size	Miscellaneous		Power
	Unsecured	Secured	(Secured)
5” Wide	15 lbs/ft.	20 lbs/ft.	43.2 lbs/ft.
12” Wide	79.2 lbs/ft.	105.6 lbs/ft.	108 lbs/ft.
15” Wide	126 lbs/ft.	134.4 lbs/ft.	135 lbs/ft.
20” Wide	171 lbs/ft.	182.4 lbs/ft.	189 lbs/ft.
25” Wide	216 lbs/ft.	230.4 lbs/ft.	-

Non-metallic Fiber Optic Raceway (full)		**Metallic Fiber Optic Raceway** (full)	
2 x 2”	0.9 lbs./ft	2 x 3”	4.4 lbs/ft.
4 x 4”	4.8 lbs/ft.	2 x 6”	6.7 lbs/ft.
4 x 6”	7.1 lbs/ft.	4 x 6”	9.3 lbs/ft.
4 x 12”	14.2 lbs/ft.	4 x 12”	17.1 lbs/ft.

Equipment Lighting

SL5500 10’-0" (2 Ballast Light Fixture)	30 lbs.
SL5500 10"-0" (1 Ballast Light Fixture)	27 lbs.
SL5500 5’-6" (1 Ballast Light Fixture)	16 lbs.
Wiremold G4000 Raceway and Cover	1.2 lbs/ft.
Misc. Fixture Supports and Fittings	30 lbs. Per 20’ x 20’ Area

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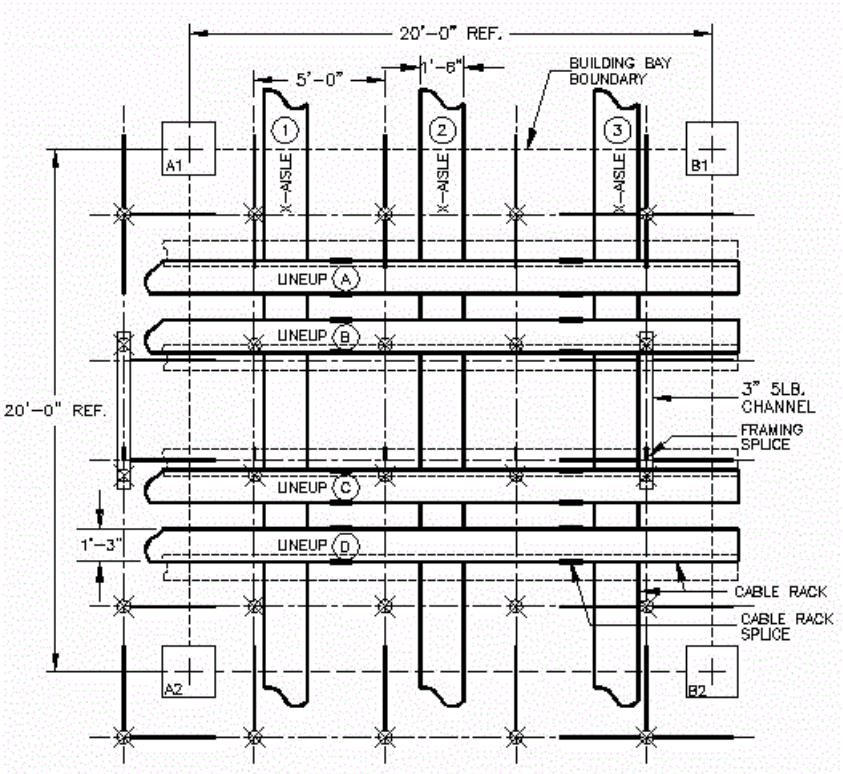
Figure 1. Typical Auxiliary Framing and Cable Rack Arrangement - Older Transport Areas



Nominal Weight Of Figure 1 Auxiliary Framing And Cable Rack Arrangement

Qty	Description	Weight (lbs.)
1	Fig. 6 weight minus 28 stiffening clips (16.8 lb.)	944
80	Feet of 1'-3" cable rack and unsecured lineup cable (A,B,C,D) @ 126 lb./ft.	10,568
45	Feet of 1'-8" cable rack and unsecured cross aisle cable (1,2,3) @ 171 lb./ft.	7,987.50
8	Clamp cable rack splice @ 1.2 lb. each	9.6
24	Clipped cable rack intersection @ 0.8 lb. each	19.2
16	Cable rack J bolt supports @ 0.9 lb. each	14.4
2	3" 5lb. Channel 6'-0" long @ 30 lb. each	60
	Total	19,602.70

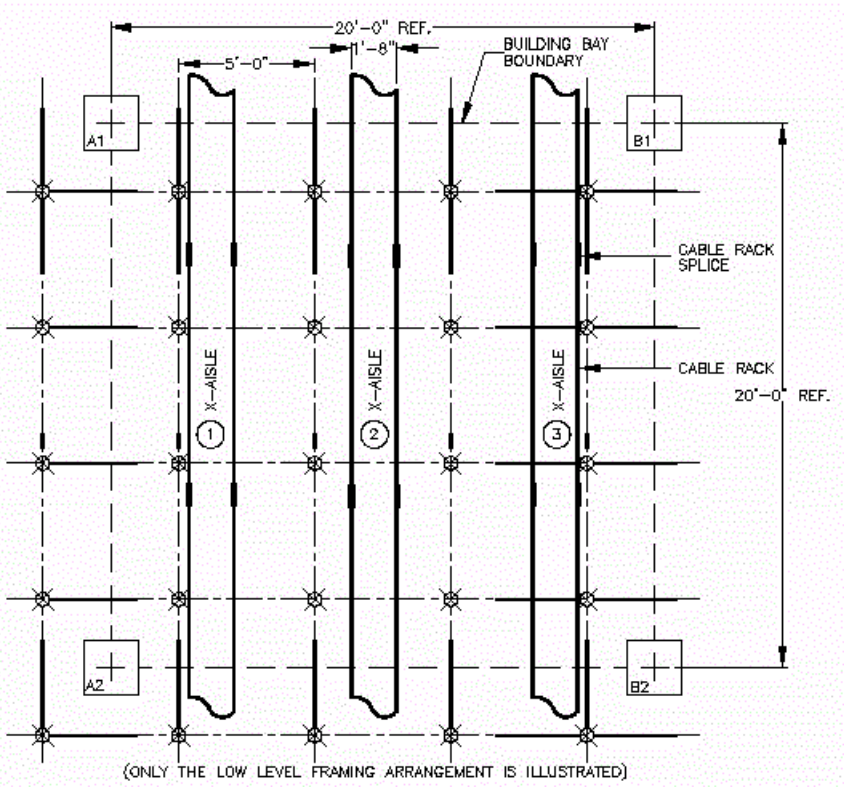
Concentrated Weight Per Hanger Rod Area

19,602.7 ÷ 225 ft.² = 87.1 lb./ft.²

Weight Per Building Bay Area

19,602.7 ÷ 400 ft.² = 49 lb./ft.²

Figure 2. Typical Auxiliary Framing and Cable Arrangement - Switching Areas



Nominal Weight Of Figure 2 Auxiliary Framing And Cable Rack Arrangement

Qty	Description	Weight (lbs.)
1	Fig. 8 weight minus 12 stiffening clips (7.2 lb.)	1,824.40
40	Feet of 1'-8" cable rack and unsecured misc. cable @ 171 lb./ft.	7,100

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20	Feet of 1'-8" cable rack and secured power cable @ 189 lb./ft.	3,910
	Total	12,834.40

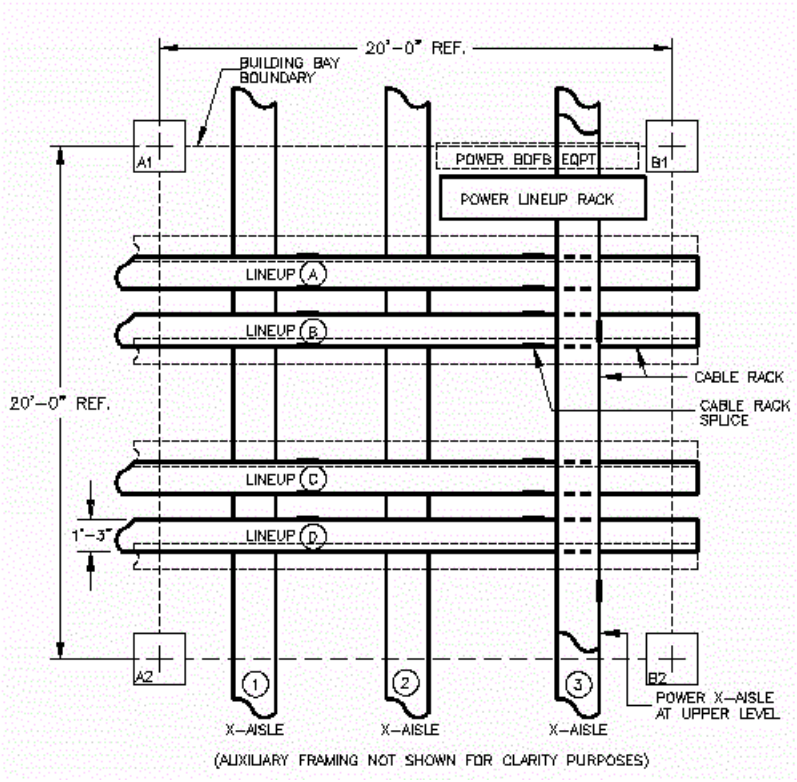
Concentrated Weight Per Hanger Rod Area

12,834.4 ÷ 225 ft.² = 57 lb./ft.²

Weight Per Building Bay Area

12,834.4 ÷ 400 ft.² = 32.1 lb./ft.²

Figure 3. Typical Cable Racking Arrangement - Newer Transport Areas (see Fig. 9 for auxiliary framing arrangement



Nominal Weight Of Figure 3 Auxiliary Framing And Cable Rack Arrangement

Qty	Description	Weight (lbs.)

1	Fig. 9 framing weight minus 36 stiffening clips (21.6 lb.)		2,707.20
1	Fig. 1 miscellaneous cable rack weight		18,598.70
28	Feet of 1’-8" upper level cable rack and secured power cable @ 189 lb./ft.		5,474
2	Clamped cable rack splice @ 1.2 lb. each		2.4
2	Clipped cable rack intersection @ 0.8 lb. each		1.6
2	3" 5lb. Channels per Figure 7 @ 30 lb. each		60
6	Cable rack J bolt supports @ 0.9 lb. each		5.4
		Total	26,849.30

Concentrated Weight Per hanger Rod Area

$26{,}849.3 \div 225\ ft.^2 = 119.3\ lb./ft.^2$

Weight Per Building Bay Floor Area

$26{,}849.3 \div 400\ ft.^2 = 67.1\ lb./ft.^2$

3. SUPERSTRUCTURE FLOOR LOADING CALCULATIONS

The floor loading values presented in Part 2 were based on high seismic risk areas because of the substantially greater use of auxiliary framing and bracing. Refer to Part 4 for low seismic or non-earthquake floor loading considerations. Figure 4 and Tables 2 through 4 illustrate how Table 1 weight values were applied to the superstructure support and bracing arrangements depicted in the figures provided in this section. It should be noted that angle braces cannot 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.

Figure 4. Relationship of Brace Angle Lengths To Distance Braced

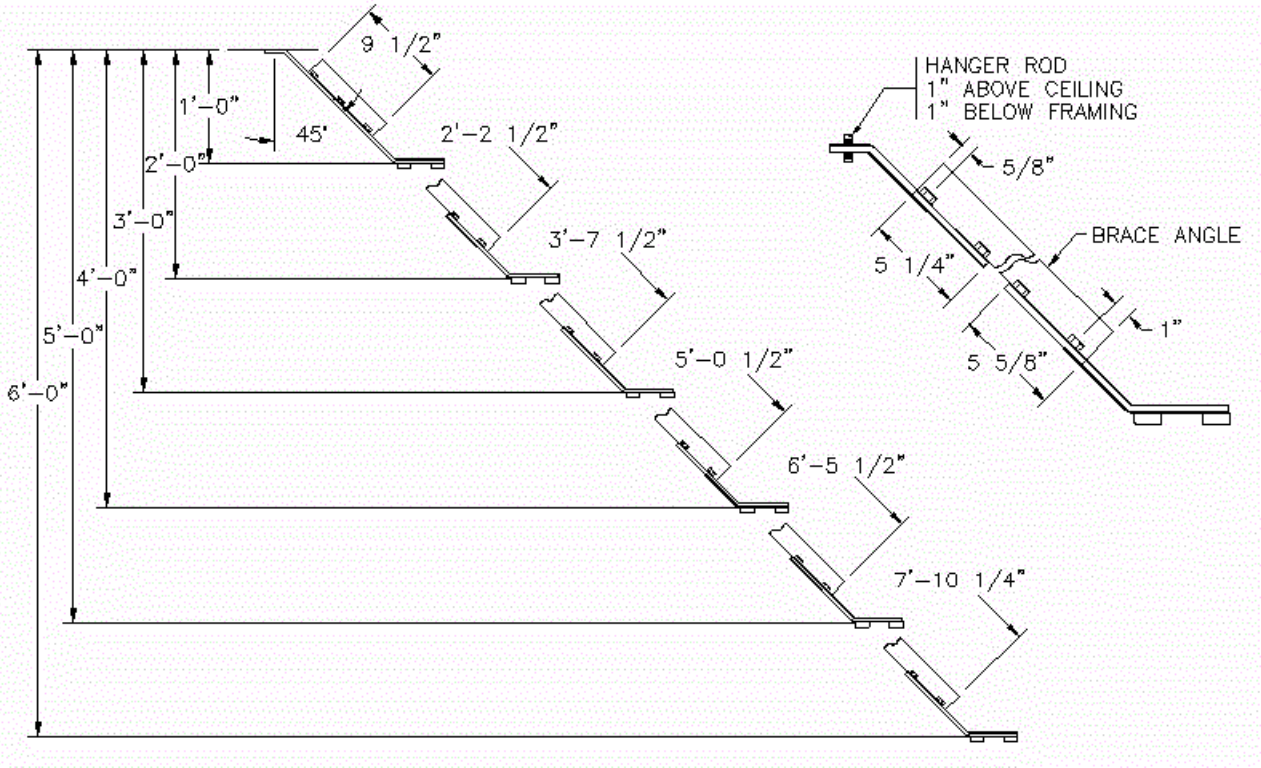


Table 2

Hanger Rod Weights Per Supported Distance Of Framing

	A	B	C
Support Distance		Weight Each Rod	Weight Per Bldg. Bay
	Length	(A x 0.8 lb.)	(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 Distance Braced

	A	B	C
Distance Braced		Weight Each Angle	Weight Per Bldg. Bay
	Length	(A x 2.5 lb.)	(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 Per Building Bay of Support Rods and Brace Angles Per Vertical Distance Braced

	A	B	C	D
Distance Braced	Hanger Rods Table 2(c)	Brace Angles Table 3(c)	Total Weight (A + B)	Increase From Previous Distance
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 5 illustrates the single level auxiliary framing and bracing layout used to determine the overall building bay weight information provided in Figure 6 through 11 superstructure arrangements. The following auxiliary framing and earthquake bracing characteristics are illustrated in Figure 5:

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A. Auxiliary framing is supported on 5’-0” centers in both primary and secondary directions (preferred and worst case ceiling load scenario),

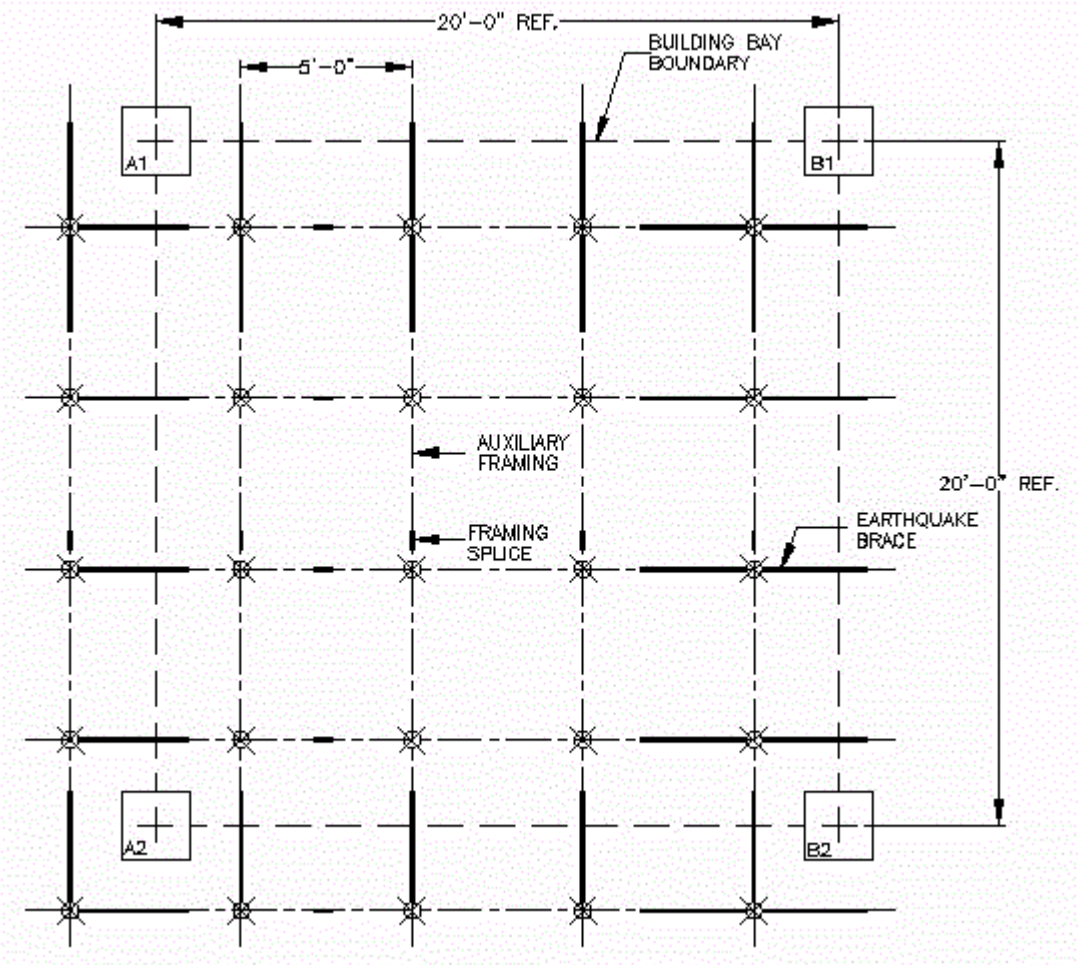
B. Every run of framing spanning a building bay is likely to have a minimum of 1 framing splice,

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.

Figure 5. Standard Auxiliary Framing and Bracing Arrangement



Figures 6 through 11 were used as generic ironwork arrangements to obtain the overall ceiling load values indicated. Figure 6 also illustrates the basic cable rack fabrication hardware used with cable rack weight values. The BSP 800-003-100MP Iss. B, Figure 9-2(C) equipment layout was used to establish a cable rack and equipment lighting basis because that floor plan was thought to have greater applicability to network equipment environments.

The following is a summation of the overall superstructure weights depicted in Figures 1 to 3 and 6 through 11.

Fig.	Environment	Total Weight Per BuildingBay (lb.)	lb./ft.² Per Building Bay	lb./ft.² Per Ceiling Insert Area
1	Framing And Cable Rack – Older Transport Areas	19,602.70	49	87.1
2	Framing And Cable Rack – Switch Areas	12,834.40	32.1	57
3	Framing And Cable rack – New Transport Areas	26,849.30	67.1	119.3
6	Single Level Framing	960.8	2.4	4.4
7	Double Level Framing – Older Transport Areas	1,993.60	5	8.9
8	Double Level Framing – Switch Areas	1,831.60	4.6	8.1
9	Tri-Level Framing – New Transport Areas	2,728.80	6.8	12.1
10	Non-metallic Fiber Raceway – Transport Areas	709.3	1.8	3.2
11	Equipment Lighting – Transport Areas	165	0.4	0.4

NOTE: Using the weight values given in Figures 6 through 9 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 minus support rods and brace angles (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 minor differences between actual weights and weights derived at using the above formula.

Example For Figure 6

815.0 lbs.	(single level of earthquake braced framing)
+149.0 lbs.	(upper level support and bracing – 2.16’ x 69 lbs.)
964.0 lbs.	(4 lb. difference)

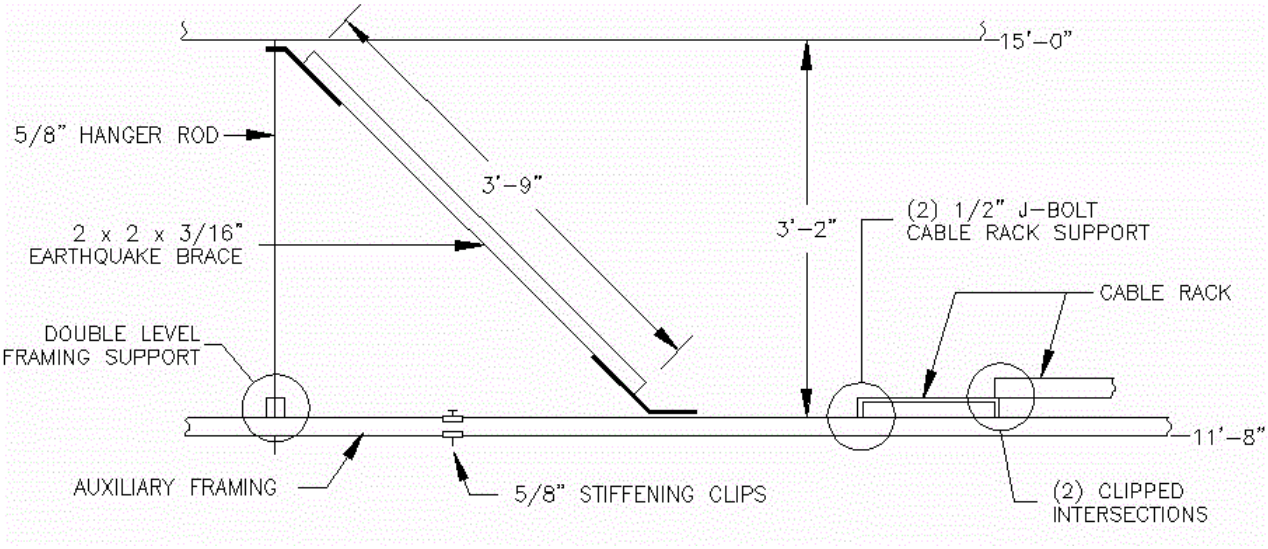
Example For Figure 7

1630.0 lbs.	(two levels of earthquake braced framing)
+149.0 lbs.	(upper level support and bracing – 2.16’ x 69 lbs.)
+218.0 lbs.	(lower level support and bracing – 3.16’ x 69 lbs.)
1,997.0 lbs.	(4 lb. difference)

Example For Figure 8

1630.0 lbs.	(two levels of earthquake braced framing)
+149.0 lbs.	(upper level support and bracing – 2.16’ x 69 lbs.)
+57.3 lbs.	(lower level support and bracing – 0.83’ x 69 lbs.)
1,836.3 lbs.	(5 lb. difference)

Figure 6. Typical Single Level Auxiliary Framing Arrangement



Nominal Weight Of Figure 6 Single Level Framing Arrangement

Qty	Description	Weight (lbs.)
16	20 foot lengths of framing channel @1.9 lb./ft.	608
16	5/8 x 3'-6" hanger rods @ 0.8 lb./ft.	44.8
16	Double level framing supports @ 0.75 lb. each	12
8	Bolted framing splices @ 2.25 lb. each	18
40	5/8" Stiffening clips @ 0.6 lb. each	24
16	Angle bracing hardware @ 6.5 lb. each	104
16	3'-9" brace angles @ 2.5 lb./ft.	150
	Total	960.8

Concentrated Weight Per Hanger Rod Area

960.8 ÷ 225 ft.² = 4.4 lb./ft.²

Weight Per Building Bay Area

960.8 ÷ 400 ft.² = 2.4 lb./ft.²

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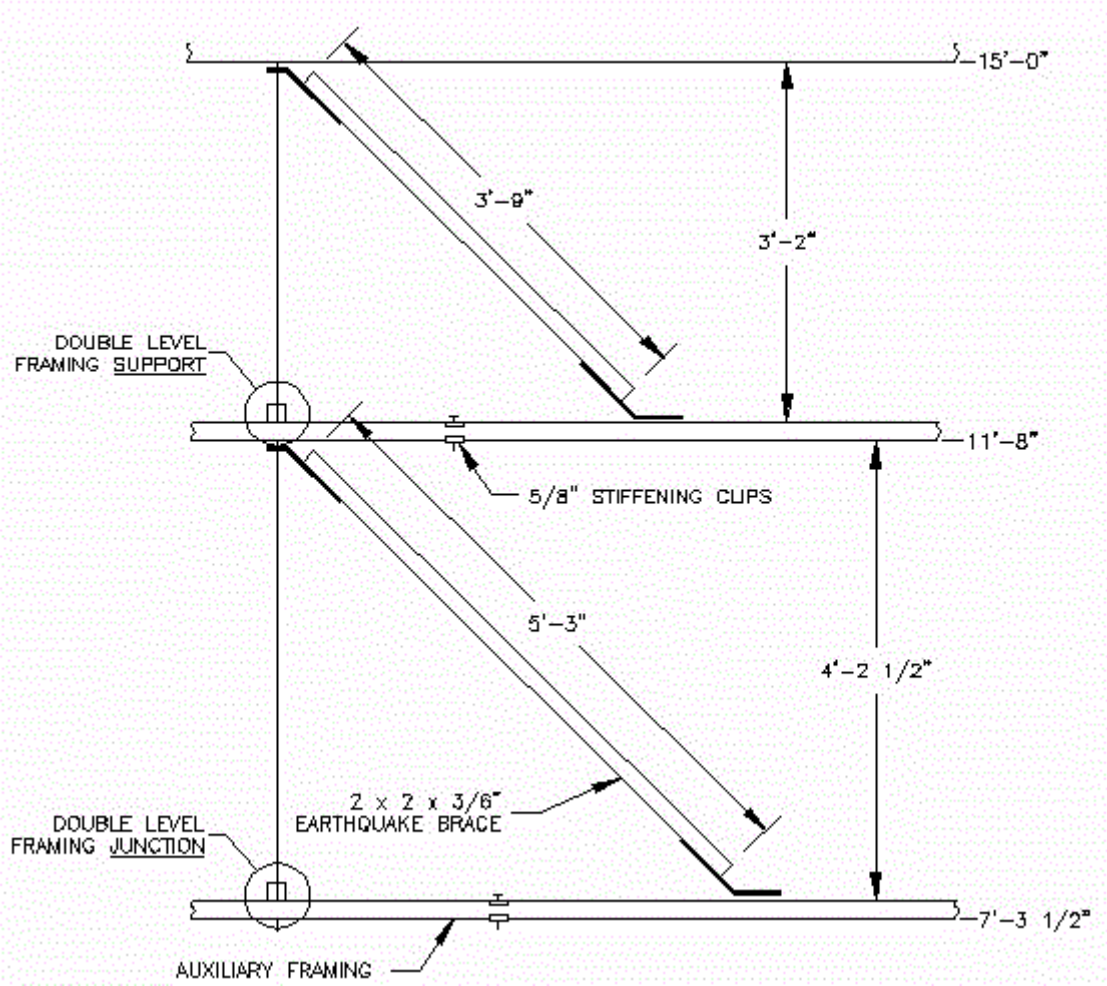
Figure 7. Typical Double Level Auxiliary Framing Arrangement - Older Transport Areas



Nominal Weight Of Figure 7 Double Level Framing Arrangement

Qty	Description	Weight (lbs.)
32	20 foot lengths of framing channel @1.9 lb./ft.	1,216.00
16	5/8 x 8'-0" hanger rods @ 0.8 lb./ft.	102.4
16	Double level framing supports @ 0.75 lb. each	12
16	Double level framing junction hardware @ 0.7 lb. each (low level framing)	11.2
16	Bolted framing splices @ 2.25 lb. each	36

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80	5/8” Stiffening clips @ 0.6 lb. each	48
32	Angle bracing hardware @ 6.5 lb. each	208
16	5’-3” brace angles @ 2.5 lb./ft. (low level framing)	210
16	3’-9” brace angles @ 2.5 lb./ft. (high level framing)	150
	Total	1,993.60

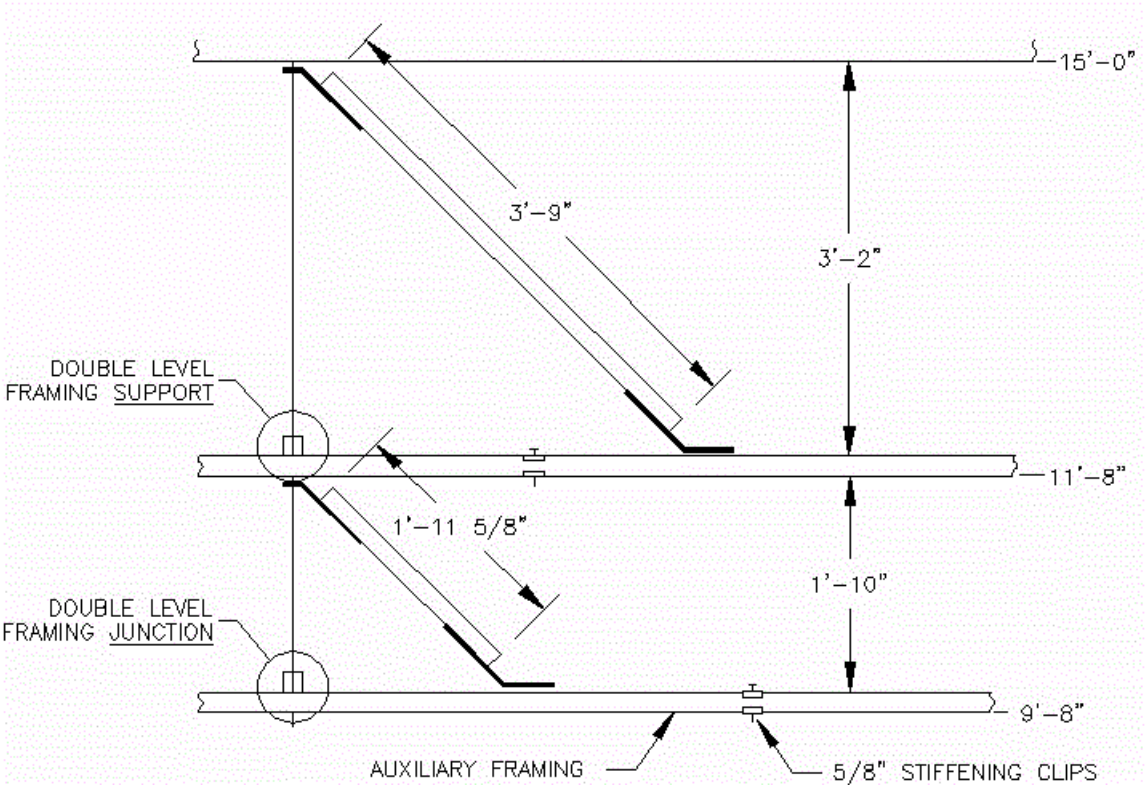
Concentrated Weight Per Hanger Rod Area

1,993.6 ÷ 225 ft.² = 8.9 lb./ft.²

Weight Per Building Bay Area

1,993.6 ÷ 400 ft.² = 5.0 lb./ft.²

Figure 8. Typical Double Level Auxiliary Framing Arrangement - Switching Area



Nominal Weight Of Figure 8 Double Level Framing Arrangement

Qty	Description	Weight (lbs.)
1	Fig. 7 weight minus hanger rods and low-level brace angles (312.4 lb.)	1,681.20
16	5’-6” hanger rods @ 0.8 lb./ft.	70.4
16	2’-0” brace angles @ 2.5 lb./ft. (low level)	80
	Total	1,831.60

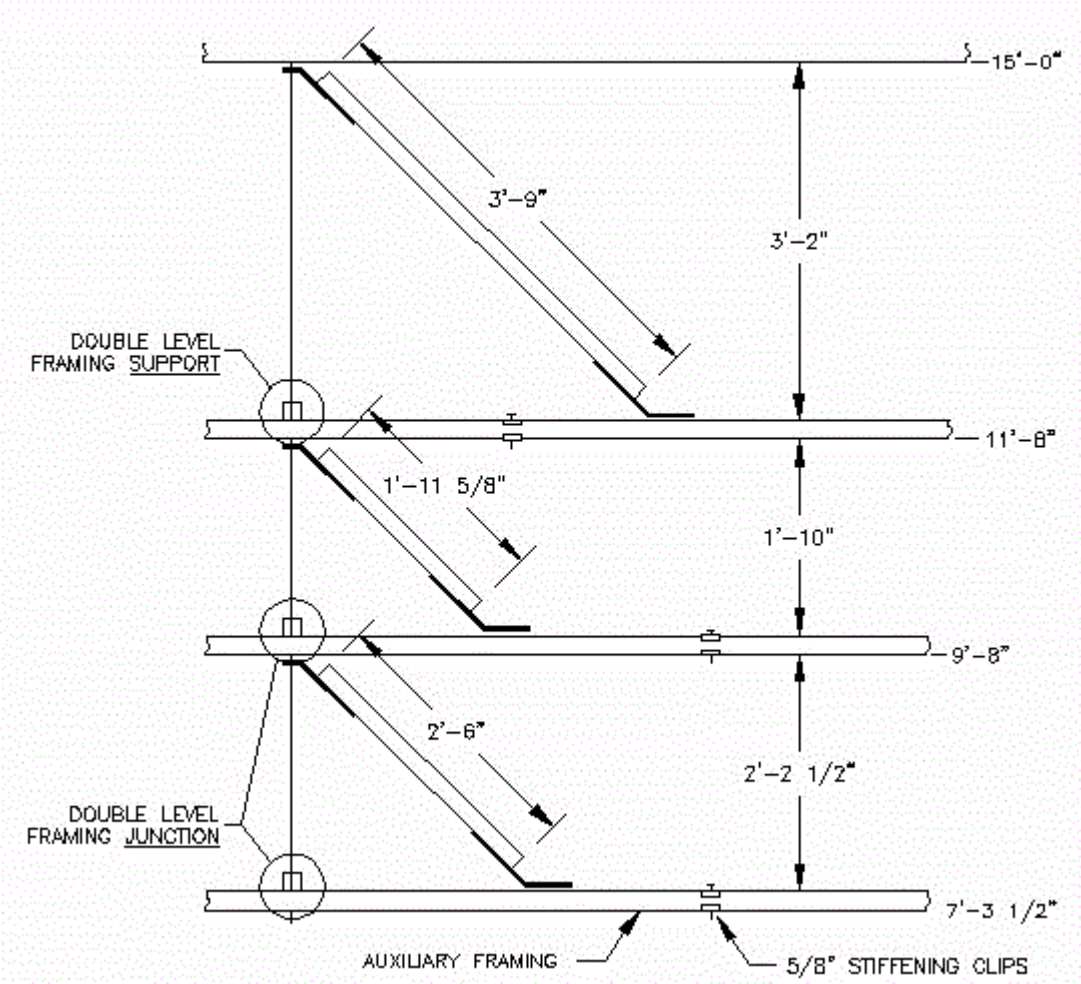
Concentrated Weight Per Hanger rod Area

1,831.6 ÷ 225 ft.² = 8.1 lb./ft.²

Weight Per Building Bay Area

1,831.6 ÷ 400 ft.² = 4.6 lb./ft.²

Figure 9. Typical Tri-Level Auxiliary Framing Arrangement - Newer Transport Areas



Nominal Weight Of Figure 9 Tri-Level Framing Arrangement

Qty	Description	Weight (lbs.)
1	Fig. 8 weight minus hanger rods (70.4 lb.)	1,761.20
1	Fig. 6 weight minus hanger rods, brace angles and support hardware (206.8 lbs.)	754
16	Dbl. level framing junctions @ 0.7 lb. ea. (lowest framing level)	11.2
16	8'-0" hanger rods @ 0.8 lb./ft.	102.4

.

16	2'-6" brace angles @ 2.5 lb./ft. (low level)	100
	Total	2,728.80

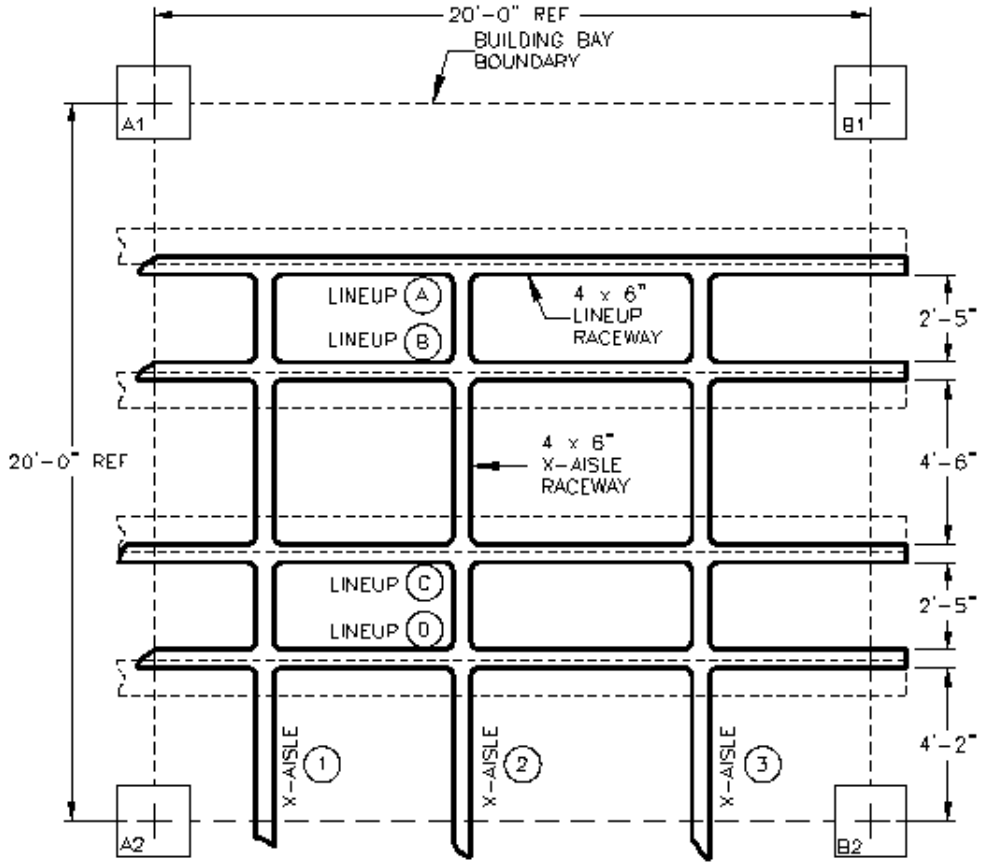
Concentrated Weight Per Hanger rod Area

2,728.8 ÷ 225 ft.² = 12.1 lb./ft.²

Weight Per Building Bay Area

2,728.8 ÷ 400 ft.² = 6.8 lb./ft.²

Figure 10. Typical Fiber Optic Raceway Arrangement - Transport Areas



Nominal Weight Of Figure 10 Fiber Non-metallic Fiber Optic Raceway Arrangement

Qty	Description	Weight (lbs.)

80	Feet 4 x 4” lineup raceway @ 4.8 lb./ft.	384
41	Feet 4 x 6” cross aisle raceway @ 7.1 lb./ft.	291.1
19	Flat bar raceway supports @ 1.0 lb. each	19
19	5/8 x 1’-0” hanger rods @ 0.8 lb. each	15.2
	Total	709.3

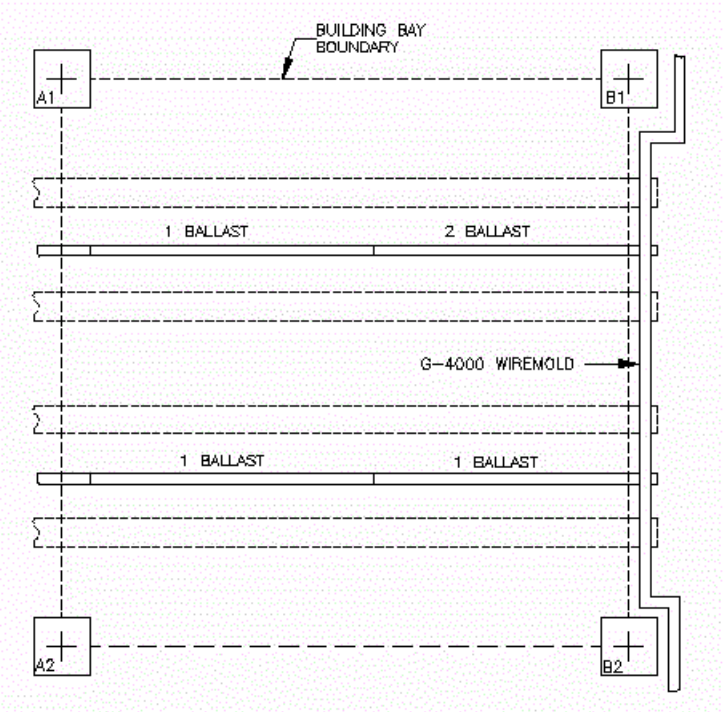
Concentrated Weight Per hanger Rod Area

709.3 ÷ 225 ft.² = 3.2 lb./ft.²

Weight Per Building Bay Area

709.3 ÷ 400 ft.² = 1.8 lb./ft.²

Figure 11. Typical Equipment Lighting Arrangement - Transport Areas



Nominal Weight Of Figure 11 Equipment Lighting Arrangement

Qty	Description	Weight (lbs.)

I.

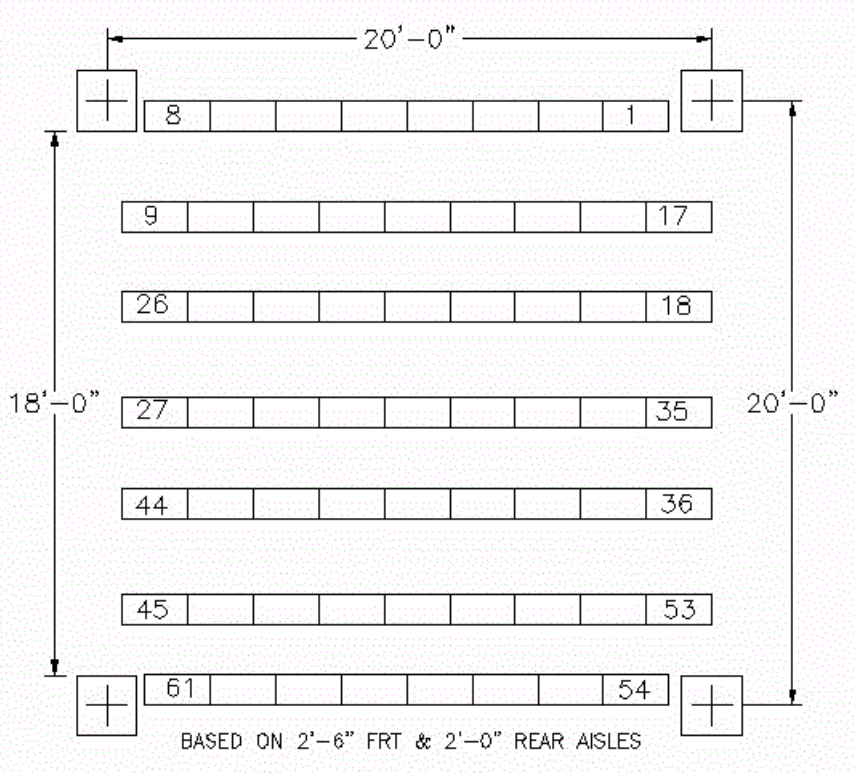
1	10 foot 2 ballast fixture @ 30 lbs. each	30
3	10 foot 1 ballast fixture @ 27 lbs. each	81
20	Feet G-4000 Wiremold @ 1.2 lb./lin. ft.	24
1	Increment of lighting fixture support and fittings @ 30 lbs. each	30
	Total	165

Weight Per Building Bay Area

$165.0 \div 400 \text{ ft.}^2 = 0.4 \text{ lb./ft.}^2$

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 BSP 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 BSP 800-003-100MP Figure 9-2(A).

Figure 12. Comparative Relationship Of 1'-0" Deep Equipment Frames To Available Floor Space (per BSP 800-003-100MP Fig. 9-2(A) Aisle Spacing)



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 Telcordia's See NEBS Data (SEEND) file and pertain to 7'-0" equipment products.

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

4. NON-EARTHQUAKE AND MISCELLANEOUS CONSIDERATIONS

Figure 13 illustrates how superstructure floor loading was calculated and extrapolated to Figures 1 through 9 for non-earthquake applications. The weight of auxiliary framing and bracing in non-earthquake areas is roughly 52% of that used in earthquake areas due mostly to a 40% reduction in framing and a 75% reduction in bracing requirements. Cable rack and cable loading considerations remain constant because the same equipment is used in both environments.

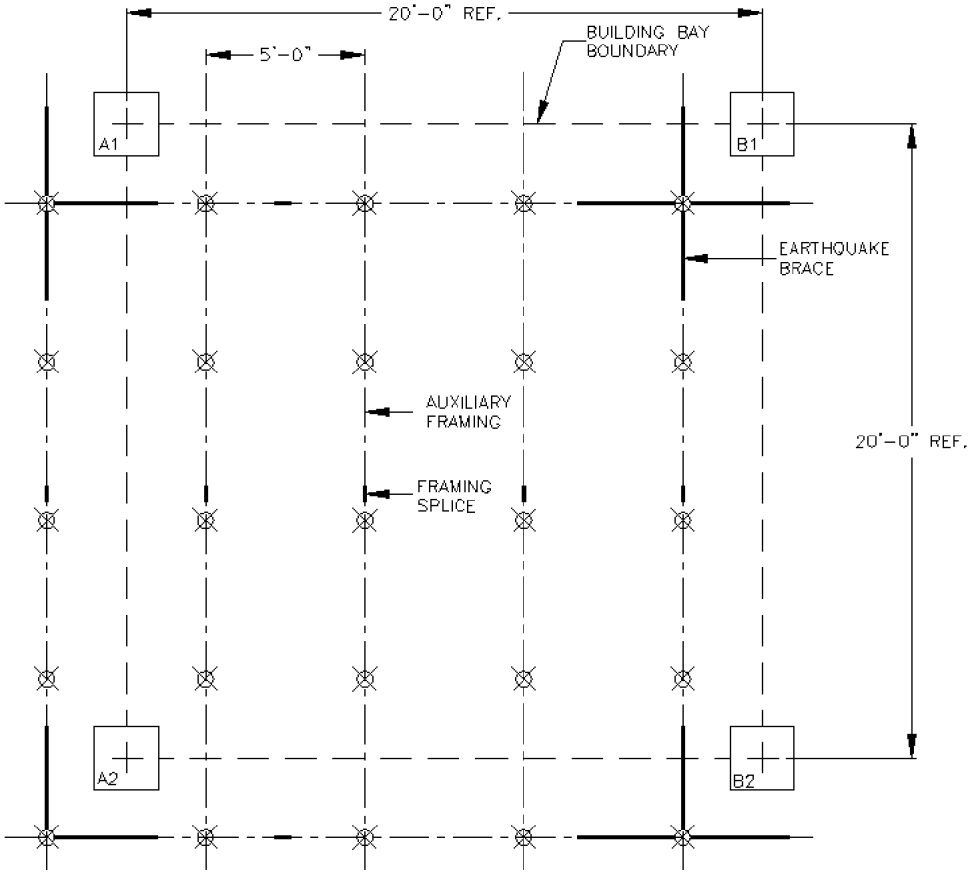
Using the weight values given in Figure 13 and extrapolated to Figures 7 to 9 the per-layer weight of framing and bracing in non-earthquake areas can be roughly estimated as being 444 + (vd – 1'-0" x 27 lbs.) where vd equals the vertical distance auxiliary framing is installed below the ceiling. The 444 lb. value is the weight of the auxiliary framing minus support rods and brace angles (419 lb.) plus a 25 lb. load value for the first vertical foot of bracing (Table 4(A) + 25% of 4(B)). The formula produces a variation of about 5 lbs. from actual weight summations.

In view of the above the below values can be reasonably assumed when applying Figures 1 to 3 in non-earthquake (low risk) areas. The values given below equate to ±95% of the values calculated for earthquake environments (bulk of weight remains that of racking and cable).

Fig.	Environment	Total Weight Per Building Bay (lb.)	lb./ft.² Per Building Bay	lb./ft.² Per Ceiling Insert Area
1	Framing And Cable Rack – Older transport Areas	19,149.60	47.9	85.1

2	Framing And Cable Rack – Switch Areas	11,958.70	29.9	53.2
3	Framing And Cable Rack – New Transport Areas	25,549.80	63.9	113.6

Figure 13. Typical Non-Earthquake Auxilairy Framing Arrangement



Nominal Weight Of Figure 13 Single Level Framing Arrangement

Qty	Description	Weight (lbs.)
10	20 foot lengths of framing channel @1.9 lb./ft.	380
16	5/8 x 3'-6" hanger rods @ 0.8 lb./ft.	44.8
4	Double level framing supports @ 0.75 lb. each	3
12	Single level framing supports @ 0.6 lb. each	7.2
5	Clipped framing splices @ 0.6 lb. each	3

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4	Angle bracing hardware @ 6.5 lb. each		26
4	3’-9" brace angles @ 2.5 lb./ft.		37.4
		Total	501.4

Concentrated Weight Per Hanger Rod Area

960.8 ÷ 225 ft.² = 2.2 lb./ft.²

Weight Per Building Bay Area

960.8 ÷ 400 ft.² = 1.3 lb./ft.²

4.1. Threaded Rod Braces

Figure 14 illustrates the physical relationship of 5/8” threaded rod braces. For simplicity reasons the 5.2 lb. per brace weight value listed in Table 1 includes 3.8 lb. for hardware and a 1.4 lb. value for a 20.5 inch threaded rod.

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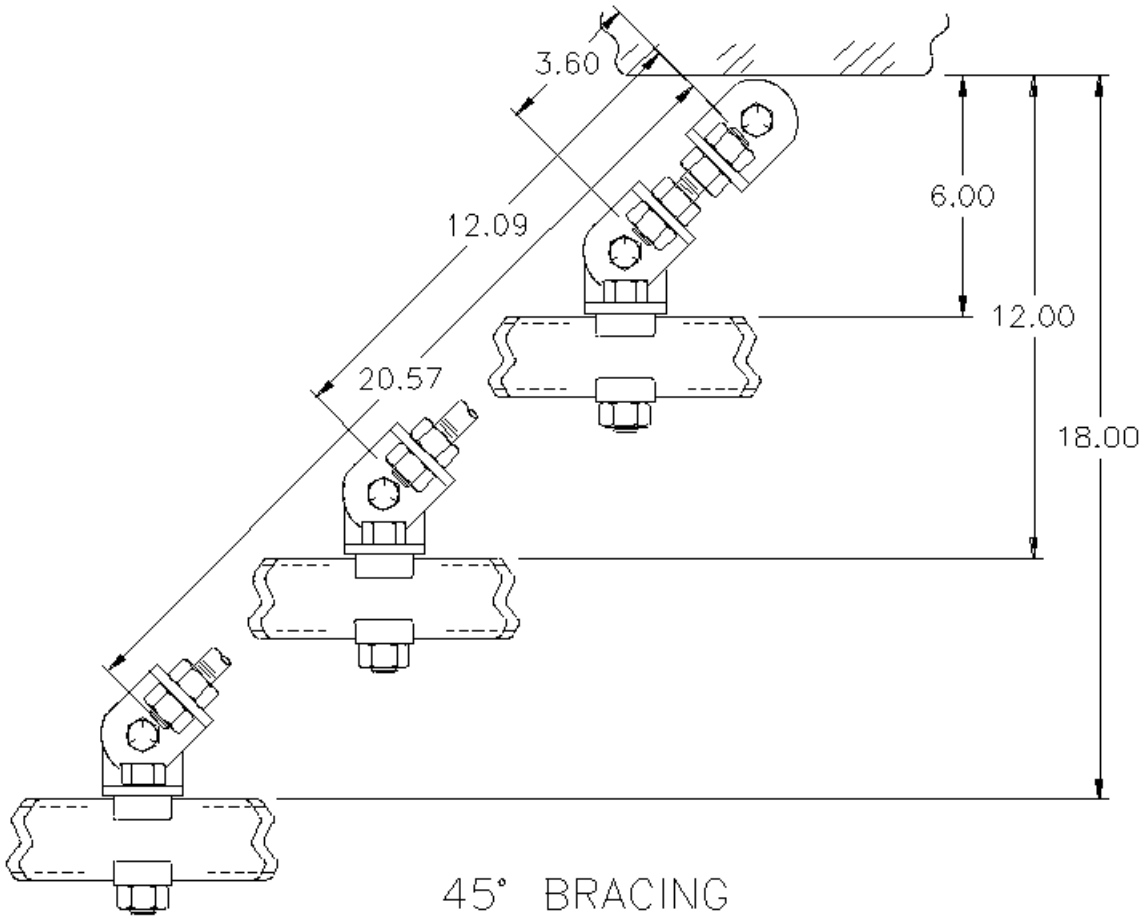
Figure 14. Threaded Rod Brace Relationships



5. RELATED DOCUMENTS

6. ACKNOWLEDGEMENTS

7. CONTACT LIST

ACRONYMS

A.1 DOCUMENT SPECIFIC ACRONYMS

A.2 NETWORK ACRONYMS DICTIONARY

Refer to ATT-000-000-020, Network Acronyms Dictionary.