

SECTION 5.

SAFE FLOOR LOADS

1. GENERAL.

1.1 When designing a communication building to cater for the installation of internal plant, full consideration must be given to the floor loads which will be imposed by the installation of various units of equipment.

2. STANDARD FLOOR LOADING.

2.1 New Buildings. In all new buildings, the equipment room floor must conform with the Buildings Branch Instructions, which specify a floor loading to allow for an imposed load of 200 lbs./square foot. This will provide for all types of internal plant which will be installed in communication buildings. Certain types of equipment which may exceed this figure are secondary batteries and prime-movers of 60 K.V.A. capacity and over. In certain circumstances, isolated racks of equipment may also exceed the average maximum figures used in determining this floor load requirement. When such equipment is to be installed, full details of its weight, base dimensions and the proposed location in the building should be furnished.

The weights of major items of equipment together with details of the method of calculating floor loads are set out in this section to serve as a guide to the designer in sending advice to the Buildings Branch.

2.2 Buildings not Specially Designed for Communication Plant. When it is necessary to purchase a building which has not been specifically designed to accommodate communication plant the safe floor load figures should be obtained from the Buildings Branch and should be considered from the following aspects:-

- (i) They should be checked against calculations based on the type of plant to be installed.
- (ii) Where the figures supplied indicate a lower strength factor than that required, consideration should be given:
 - (a) to a request to the Buildings Branch to strengthen the floor by special treatment.
 - (b) to ascertain whether the safety factor of the floor would satisfy the conditions which apply.
- (iii) Arrange to use a type of plant which is within the safe floor loads figures for the building.

3. SAFE FLOOR LOAD OF VARIOUS TYPES OF EQUIPMENT.

3.1 In the tables included herein, weights of various types of equipment and the floor loadings resulting therefrom are specified. It will be seen that the designed floor loading of 200 lbs. Per square foot will generally cover all types of equipment.

TABLE A SAFE FLOOR LOADS

Type of Equipment	Rack Height	Safe Floor Load (lbs./sq.ft.)	REMARKS
2000 type automatic	10' 6½"	180	-
	8' 6½"	168	-
Long Line and carrier	10' 6½"	175	Isolated Long Line racks require special calculations for safe floor loads
Pre-2000 type automatic		150	-
Crossbar		100	-
M.D.F's		150	(a) When erected on a floor other than the equipment floor.
		180	(b) When erected in equipment room.
Manual Exchange apparatus Racks	10' 6½"	180	-
	8' 6½"	168	-
Manual positions	-	150	-
Power Plant			
(a) Motor Generators	-		
(i) 500 amp, output and under.		100	-
(ii) over 500 amp. Output	-	200	-
(b) Emergency Power Plant.			
(i) up to 60 K.V.A.	-	100	
(ii) 60 K.V.A. and over			
(c) Secondary Batteries			See following notes.

NOTES.

- As the Buildings Branch Instructions specify a safe floor load of 200 lbs./sq. Ft. Manufacturers data should be sent to that branch when any power plant or other equipment exceeding this figure is to be installed.
- Secondary Batteries which impose a floor load exceeding 200 lbs. Per square foot will necessitate additional treatment to strengthen the floor.

Basement floors cast on poor foundations, or floors other than the basement will require treatment. However, where the basement or ground floors are cast on solid rock or other firm foundations no treatment is required.
- Emergency Power Plant. For standby equipment of 60 K.V.A. and over, the floor loading is to be designed from the manufacturer's data. Machines of this size usually run at low speeds and consequently introduce vibration problems. Machines of less than 60 K.V.A. output are generally run at 1000 r.p.m. or more, the vibration problems are not of great importance.

4. WEIGHTS OF TYPICAL RACKS.

4.1 The weights of typical racks, fully equipped, are given in Tables in this instruction. Reference to these Tables will show that the last column but one gives the total weight of rack and that this includes the normal weight of external cabling and the cable runway supported by the rack.

The last column gives the weight per linear foot, and it will be seen that in this respect, the different racks show a fairly wide variation.

5. METHOD OF CALCULATION OF FLOOR LOADS.

5.1 In an automatic telephone switchroom, the heaviest concentrated load is due to the equipment racks, which are mounted with the floor angle in direct contact with the floor surface. As the racks are normally in suites of 4, 5 or 6 in a row, certain racks e.g., the end rack in the suite, have to support a build-up of cables which gives an out-of-balance effect and, in order to cater for this, an allowance is made in the calculations for the floor loading.

In addition to the above, an allowance of 33.6 lb. Per square foot is made for the unoccupied space in the gangways between the racks, as this space may be occupied by travelling ladders, test sets, cable drums, or maintenance personnel; also the ceiling of the room below may at any point have a Rawl bolt inserted carrying a load up to 150 lb.

The method of calculation herein outlined is that followed by the British Post Office; the out-of-balance figures are based on the past experience of the B.P.O.

5.2 Calculations for Floor Slabs.

Taking the figures for 2/10 P.B.X. final selector rack, 200 line, the weight per square foot is calculated as follows:-

- (a) Total weight of rack - 1756 lb. Per rack or 390 lb. Per linear foot.
 - (b) Dead concentrated weight, allowing for gangway space of 3'3" per foot run
equals $\frac{390}{3.25} = 120$ lb. per square foot.
 - (c) Live load - 33.5 lb. per square foot.
 - (d) Out-of-balance cable effect - 10% of (b) and (c) - 15.3 lb. Per square foot.
 - (e) Slab Loading of floor is as follows:-
 - (1) Distributed load - 120.0 lb.
 - (2) Live Load - 33.5 lb.
 - (3) Out-of-balance - 15.3 lb.
- 168.8 lb. Per square foot.

TABLE 4
WEIGHTS AND CAPACITIES OF TYPICAL 10'-6 1/2" RACKS USING 2000 TYPE EQUIPMENT

Type of Rack (Centralised Distribution Scheme)	Rack Width	Circuit Capacity	Actual Weight per rack			Total Weight Lb.	Weight per Linear Ft. Lb.
			Rack Less Selectors etc. Lb.	Equipment Lb.	Cable and Runway Lb.		
Primary Finders	4' 6"	70	756	683	117	1556	346
Secondary Finders	4' 6"	100	1061	-	72	1133	252
Uniselectors and I. And C.O. Relays	4' 6"	300	1600	-	80	1680	370
10/20 Group Selectors	4' 6"	80	833	880	157	1870	416
10/10 Group Selectors	4' 6"	90	851	810	112	1773	394
Final Selector, 200 Line, Ord.	4' 6"	60	714	780	118	1612	358
Final Selector, 200 Line, 2/10 P.B.X.	4' 6"	60	798	840	118	1756	390
Final Selector, 100 Line, Ord.	4' 6"	70	827	875	99	1801	400
Final Selector, 100 Line, 2/10 P.B.X.	4' 6"	70	882	980	99	1961	436
Relay Set, 10 Point	4' 6"	100	588	1080	100	1768	393
Subscriber Meter Racks	2' 9"	1200	206	540	70	816	297
T.D.F. with P.O.107 etc. Connection Strip	3' 0 1/4"	1280/640	452	184	227	863	288
Miscellaneous Apparatus Rack	2' 9"	840 Relays	524	-	100	624	227
Alarm Equipment Rack	2' 9"	-	460	-	90	550	200
Fuse Panel Rack	2' 9"	1120	511	-	90	601	219
Traffic Recorder Control	1' 6"	-	308	-	34	342	228
Traffic Recorder Access	1' 6"	12	234	12	54	300	200
Routiner Control, Various	1' 6"	-	333	-	34	367	245
Routiner Access, 100 Outlet	1' 6"	600	294	40	54	396	262

Note 1: The weights given in the above Table are also applicable to most of the racks of the decentralised distribution scheme, the only exceptions being the group selector racks and the final selector racks, which are slightly heavier. Round figures allowances of 2% and 5% should be added respectively to the weights of the group and final selector racks given in the Table to give the weights of the corresponding racks on the decentralised scheme.

TABLE 5
WEIGHTS AND CAPACITIES OF TYPICAL 8'-6½" RACKS USING 2000 TYPE EQUIPMENT

Type of Rack (Centralised Distribution Scheme)	Rack Width	Circuit Capacity	Actual Weight per rack			Total Weight Lb.	Weight per Linear Ft. Lb.
			Rack Less Selectors etc. Lb.	Equipment Lb.	Cable and Runway Lb.		
Primary Finders	4' 6"	50	672	505	97	1274	283
Secondary Finders	4' 6"	80	567	-	58	625	139
Uniselectors and L. And C.O. Relays	4' 6"	200	880	-	65	946	210
10/20 Group Selectors	4' 6"	60	630	660	131	1421	316
10/10 Group Selectors	4' 6"	70	665	630	92	1387	308
Final Selector, 200 Line, Ord.	4' 6"	40	534	520	98	1152	256
Final Selector, 200 Line, 2/10 P.B.X.	4' 6"	40	618	560	98	1276	284
Final Selector, 100 Line, Ord.	4' 6"	50	585	625	61	1271	282
Final Selector, 100 Line, 2/10 P.B.X.	4' 6"	50	636	750	61	1447	320
"A" Digit Selector	4' 6"	50	910	354	112	1376	306
Subscriber Meter	2' 9"	1000	186	450	58	694	256
T.D.F. with P.O.106 Connection Strip	2' 3"	960/480	297	108	114	549	244
Miscellaneous Apparatus Rack	2' 9"	660 Relays	350	-	83	433	157
Alarm Equipment Rack	2' 9"	-	375	-	75	450	164
Lamp Rack, Mult. Ans.	2' 9"	480	655	-	63	718	261
Traffic Recorder Control	1' 6"	-	288	-	28	316	211
Traffic Recorder Access	1' 6"	9	214	9	47	270	180
Routiner Access, 100 Outlet	1' 6"	400	284	32	47	363	242
Relay Set, 10 points	4' 6"	100	560	900	83	1543	343

Note 1: The weights given in the above Table are also applicable to most of the racks of the decentralised distribution scheme, the only exceptions being the group selector racks and the final selector racks, which are slightly heavier. Round figures allowances of 2% and 5% should be added respectively to the weights of the group and final selector racks given in the table to give the weights of the corresponding racks on the decentralised scheme.

6. WEIGHTS OF PRE-2000 TYPE EQUIPMENT UNITS.

6.1 9' 1-9/16" High Equipment.

Keith Plunger Type Line Switchboard, Capacity - 200 L. Sw.	1,030 lb.
Keith Plunger Type Line Switchboard, Capacity - 100 L. Sw. and 24 F.S. ...	1,200 lb.
Rotary Line Switchboard, Capacity - 200 Rot. L. Sw.	1,600 lb.
Rotary Line Switchboard, Capacity - 120 Rot. L. Sw. and 32 F.S.	1,800 lb.
Rotary Line Switchboard, Shelf Type, Capacity - 120 Rot. L. Sw.	700 lb.
Rotary Line Switchboard, Shelf Type, Capacity - 150 Rot. L. Sw.	875 lb.
Selector Trunk Board, Capacity - 240 Selectors, without Casing	5,700 lb.
Selector Trunk Board, Capacity - 240 Selectors, with Casing	6,000 lb.
Repeater Trunk Board, Capacity - 320 Repeaters, without casing	5,500 lb.
Repeater Trunk Board, Capacity - 320 Repeaters, with casing	5,700 lb.

Manual Desks.

Type 1 Local Test Desk, Single Position Section	740 lb.
Type 2 Centralised Information Desk, 2 Position Section	595 lb.
Type 2 Centralised Information Desk, 4 Position Section	1,010 lb.
Cable Turning Section and End Panel for Test Desk	80 lb.
Card Compartment fitted between each 2 Position Desk	100 lb.

Weights of Manual Switchboards.

100 Line Magneto position	-	224 lbs.
200 Line Magneto position	-	308 lbs.
Magneto trunk position	-	162 lbs.
C.B. non-multiple	-	392 lbs.
C.B. multiple-unequipped	-	196 lbs.
C.B. multiple - equipped @ 200 line	-	280 lbs.
multiple - each panel	-	280 lbs.

7. POWER PLANT.

7.1 The details included in the following Tables supply typical weights and base dimensions for various types of power plant. They have been included for reference purposes only. The weights and base dimensions should be checked from manufacturers' details when available. Reference should also be made to Power Plant Engineering Instructions - Batteries, L 2010 Battery Room Layouts, and Batteries, A 2010 Secondary Cells, for details as to dimensions of battery stands, etc.

Motor Generators.

Make	Output	Weight	Size of Base	
			Length	Width
* E.C.C.	65 V./100 A.	2100	5' 3"	2' 2"
* E.C.C.	65 V./200 A.	2700	6' 1"	2' 10"
* E.C.C.	65 V./500 A.	5750	8' 7"	3' 5"
ØX K.L.	65 V./500 A.	8650	10' 0"	3' 4"
* E.C.C.	65 V./1000 A.	10000	11' 7"	4' 10"

* E.C.C. - Electrical Construction Company, England.

Ø K.L. - Kelly & Lewis (Aust.).

X The increased weight over Item 3 is related to type of motor fitted.

Batteries - Glass Containers.

Cap. A.H.	Weight per Cell	Weight per Battery	
		48/24 Cells	24/12 Cells
72	45 lb.	1080 lb.	540 lb.
108	60 lb.	1400 lb.	720 lb.
144	75 lb.	1800 lb.	900 lb.
180	88 lb.	2092 lb.	1046 lb.
216	109 lb.	2616 lb.	1308 lb.
288	137 lb.	3288 lb.	1644 lb.
360	160 lb.	3840 lb.	1920 lb.
432	194 lb.	4656 lb.	2328 lb.

Batteries - Wood Containers.

Cap. A.H.	Weight per Cell	Weight per Battery	
		48 V.	24 V.
600	360 lb.	8640 lb.	4320 lb.
1200	612 lb.		7444 lb.
1800	868 lb.	20832 lb.	10416 lb.
2400	1140 lb.	27360 lb.	13680 lb.
3000	1400 lb.	33600 lb.	16800 lb.
4500	1950 lb.	46400 lb.	23400 lb.

Batteries - Pasted Plate, PPS.33.

Cap. A.H.	Weight per Cell	Weight per Battery	
		48 V.	24 V.
500	150 lb.	3600 lb.	1800 lb.

RECTIFIERS.

Cap.	Weight	Base Dimensions
48/30 *	930 lb.	2' x 1' 7"
48/50 *	1200 lb.	3' x 2'
48/100 *	2000 lb.	4' x 2'
48/200 *	3200 lb.	4' x 3' in two cubicles
48/500 *	5200 lb.	8' x 3' in three cubicles

* S.T.C. Manufacture.