BUILDING ELECTRICAL SYSTEMS

ELECTRICAL LOAD ANALYSIS

FOR

TELECOMMUNICATIONS BUILDINGS

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1. GENERAL

1.01 This section covers the information necessary to perform an electrical load analysis for a telecommunications building.

1.02 Whenever this section is reissued, the reason(s) for reissue will be given in this paragraph.

1.03 This section is issued to improve the methods for electrical load estimating, and to renumber this section to conform with updated information in the Building Electrical System Sections.

2. LOAD ANALYSIS

2.01 Specific terminology (ie, essential, nonessential, etc) as used here is covered in Section 790-100-659, Standby Power Plants.

2.02 Analysis or estimation of the various anticipated electrical loads in a telecommunications building is necessary in the planning stage in order to determine the size and type of electrical service. Refer to Section 760-400-110, Voltage, for power distribution systems in Telco buildings. Refer to Section 760-400-215, Switching Arrangements for Standby Power, to assure that present and future requirements are adequately met.

2.03 Good engineering judgment is required in preparing a load analysis since it affects many decisions to be made during the electrical design. The analysis must consider ***Existing, or Initial and Future loads.***

2.04 The electrical service, like other facilities, should be compatible with the economic life of the building. Consideration should be given to possible expansion of telephone equipment within the initial building, future extensions of the structure, and when they might occur. Refer to Section 760-400-220, Service Entrance and Electric Service Switchboard, for details.

2.05 A careful load analysis with prepared load estimate worksheets will assist the building engineer in sizing the service entrance capacity, main feeders, associated protective devices and, with the cooperation of Network Design, will aid in determining the size and type of standby power plant required.

2.06 Although loads have to be estimated roughly at the preliminary design stage, they can be

determined with more precision as design details are formulated.

2.07 Underestimating loads will result in uneconomical life and early addition or replacement of the electric service switchboard, while overestimating will result in excessive amounts of capital being tied up in equipment long before required. Avoid providing large amounts of spare capacity long in advance of requirements due to the uncertainty in making long range predictions.

2.08 Data for preparing a load analysis can be obtained from:

(a) Experience acquired from similar buildings.

(b) Telephone load information from Network Design.

(c) TOPES/PLAN Module.

(d) Information from the mechanical designer.

(e) Manufacturer's publications on specific types of building equipment to be installed.

2.09 A valuable aid in verifying Central Office Equipment loads is the PLAN module of the Telephone Office Planning and Engineering System (TOPES). With a few simple inputs, this will produce accurate estimates of power requirements for most Electronic Switching Systems (ESS).

2.10 The circuit requirements are input via a Tektronix 4014 terminal or alphanumeric terminal such as the DATASPEED* 40/2. The TOPES/PLAN module provides an estimate of equipment requirements, floor space, current drain, and heat load. An excerpt of a typical output is illustrated in Fig. 1.

2.11 Any significant difference between the TOPES/PLAN module requirements and those provided by Network Design should be reconciled before proceeding with the design.

2.12 Terminal equipment, such as D-Channel Banks, T-Repeaters, Metallic Facility Terminals, etc, is more difficult to verify but as a "rule of thumb" its power consumption will not exceed 1/4 that of the switching equipment. If the stated requirements are greater than that, insist upon written justification from the network group responsible for forecasts for this equipment.

* Registered trademark of AT&T.

3. ELECTRICAL LOAD ESTIMATE (FORM A)

3.01 Electrical Load Estimate (Form A) (Fig. 2) should be used for preliminary estimates of power requirements. It is based primarily on the telephone equipment load, which together with its refrigeration load account for the bulk of the requirements in a telecommunications building. Volt-Amperes per square foot are used for lighting and building space including operating rooms which lend themselves to this approach.

3.02 The unit load factors shown in Table A are average values based on experience and are subject to revision as more precise information becomes available. They will, however, give preliminary information sufficiently accurate to make a voltage selection, plan a distribution arrangement, and prepare a budget estimate.

4. ELECTRICAL LOAD SUMMARY (FORM B)

4.01 Electrical Load Summary (Form B) (Fig. 3) is intended to be maintained as a permanent building record. This form has been structured to include:

(a) Existing load information for "In-Service" buildings.

(b) Estimated initial loads for new buildings or building additions.

(c) Estimated loads when the building fills (exhaust).

(d) Estimated loads when the site reaches its ultimate development.

5. SUMMARY

5.01 After the building is constructed and occupied, all load figures should be verified. Load estimating forms should be updated to show the ***ACTUAL*** loads in the building. These forms shall be maintained as a permanent part of the building record documents.

5.02 The general load estimating procedure shall be:

(a) Obtain telephone power load from the Network Design organization.

(b) Block out floor space assignment.

Section 760-400-110 - Voltage

(c) Estimate the loads -

Connected

Demand

Essential

Section 760-400-215 - Switching Arrangements for Stand-by Power

(d) Total up the connected, demand, and essential loads on Form A.

(e) Transfer to Form B, and maintain a record of the building.

Section 760-400-220 - Service Entrance and Electric Service Switchboard

6. REFERENCES

National Fire Protection Association (NFPA) 70, National Electrical Code (NEC), Article 220

Section 760-400-100 - Planning

Section 790-100-659 - Stand-by Power Plants

TABLE A

LOAD ESTIMATE FACTORS

ROW	TYPE OF LOAD	NOTES	CONNECTED LOAD — TOTAL KVA OR VA PER SQ FT	DEMAND FACTOR	ESSENTIAL FACTOR
1	CO Power	1	From Network Design	0.8	1.0
5-8	Lighting				
	Equipment	2	1.5	0.5	0.5
	Office	3	1.5	1.0	*
14-18	Refrigeration:				*
	For CO power		70% of CO power	0.9	
	For Lighting		70% of Lighting power	0.9	*
	For Space		1.5	0.9	
					1.0
19-21	Air Handling		10% of refrigeration demand	0.9	1.0
22	Heating (negligible except for electrically heated buildings)		*	*	*
23	Elevators		35 KVA/Passenger 55 KVA/Freight	0.8	1 elevator service during power outage
25	Kitchen Equipment		*	*	*
26	Miscellaneous	4	1.0	1.0	*

* must be determined at each site

Notes: 1. Verify per paragraphs 2.09 through 2.12.
2. Switching frames, relay racks, X-connecting frames, power, etc. All space occupied or to be occupied by telecommunications equipment.
3. Offices, lunch rooms, maintenance, and test centers, etc. All space occupied by personnel
4. All building space (in multistoried buildings use 0.2 VA/sq ft).

NO. 1/1A ESS PLANNING DATA SUMMARY							
MODEL OFFICE		1	2	3	4	5	6
INPUT DATA	Ultimate working lines	110000.	110000.	110000.	110000.	110000.	110000.
	Working lines	45000.	56000.	65000.	73000.	80000.	100000.
	Line fill factor	98.	98.	98.	98.	98.	98.
	Line conc. ratio	4:1	4:1	4:1	4:1	4:1	4:1
AVG. HEAT DISSIPATION	Watts (ESS1PROC)	19926.	19926.	0.	0.	0.	0.
	BTU/HR	68027.	68027.	0.	0.	0.	0.
	Refrig-eration (Tons)	5.67	5.67	0.00	0.00	0.00	0.00
	Watts (PROC1A3)	12973.	12973.	12973.	12973.	12973.	12973.
	BTU/HR	44290.	44290.	44290.	44290.	44290.	44290.
	Refrig-eration (Tons)	3.69	3.69	3.69	3.69	3.69	3.69
	Watts (NETWORK AREA)	36990.	39967.	48143.	50849.	55774.	64315.
	BTU/HR	126284.	136447.	164360.	173598.	190412.	219571.
	Refrig-eration (Tons)	10.52	11.37	13.70	14.47	15.87	18.38

Fig. 1—No. 1/1A ESS Planning Data Summary

Estimated Electrical Loads, KVA Worksheet

	A Type Of Load	B Area □	C Va/□ Conn	D Conn KVA $\frac{B \times C}{1000}$	E Demand Factor	F Demand KVA D x E	G Essential Factor	H Essential KVA F x G
1	Telephone Power							
2								
3								
4	(Subtotal) Tel. Pwr.							
5	Equipment Ltg. & Recp. Pwr.							
6								
7								
8								
9								
10	Office Ltg. & Rec.							
11								
12								
13	(Subtotal) Lighting							
14	Equipment Refrigeration							
15								
16	Lighting Refrigeration							
17	Space Refrigeration							
18								
19	Air Handling							
20								
21								
22	Heating							
23	Elevators							
24								
25	Kitchen Eqpt. Pwr.							
26	Misc. Pwr.							
27								
28								
29	(Subtotal) Bldg. Pwr.							
30	Total (Sum Of 4, 13, 29)							

Building Name: Address:

Prepared By: Date:

Check One ☐ Existing ☐ Initial ☐ Bldg. Fill 19___(11) ☐ Ultimate Load 19___(11)

Fig. 2—Estimated Electrical Loads, KVA Work Sheet (Form A)

Electrical Load Analysis, KVA Summary
(Form B)

Building										Date			
Address (Street)				City			State						
Power Co. Voltage		Service Voltage		Distribution Voltage			Phase						
Perpared By		Architect		Cons. Elect. Eng.			Pwr Co. Rep.						
	A	B	C	D	E	F	G	H	I	J	K	L	M
1		Existing Load			Initial Load (19__)			Building Fill Load (19__)			Ultimate Load (19__)		
2	Type Of Load	Conn	Demand	Essential	Conn	Demand	Essential	Conn	Demand	Essential	Conn	Demand	Essential
3	Telephone Pwr.												
4													
5													
6													
7	(Subtotal) Tel. Pwr.												
8	Eqpt. Rm. Ltg. & Rec.												
9													
10	Office Ltg. & Rec.												
11													
12													
13	(Subtotal) Lighting												
14	Refrigeration Pwr.												
15	Air Handling Pwr.												
16	Heating Pwr.												
17	Elevator Pwr.												
18													
19	Kitchen Pwr.												
20	Misc. Pwr.												
21													
22	(Subtotal) Bldg. Pwr.												
23	Total (Sum Of 7, 13, 22)												

Fig. 3—Electrical Load Analysis, KVA Summary (Form B)