

PROJECT INFORMATION

JOB NUMBER	PROJECT NAME	DATE
047-769	Plug Load Metering Study	11/08/17

ADDRESSED TO

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INFORMATION

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COMMENTS

Plug loads are one of the most unknown energy end-uses in hospitals. Recent research studies of plug loads in medical facilities have demonstrated that current assumptions on plug load energy use are far greater than actual consumption. Evidence suggests that current sizing of electrical distribution in hospitals are overly conservative and should be revisited based on an evidence based design approach. This study was commissioned to supplement the available loading evidence on this topic. The collected information will be used to support several proposals submitted to NFPA to reduce mandated plug load density allowances in the next edition of the National Electrical Code (NEC).

In this study, we collected and analyzed the plug load metering data at a number of inpatient care facilities, the first batch of load result data is included in **Table 1**. The data was collected at an active acute care hospital using the building's existing Electrical Power Monitoring System (EPMS) which featured individual meters installed on segregated 208Y/120V plug load panels serving patient care areas. The EPMS meters used could record the following information; phase currents, phase voltage, power consumption and power factor.

Plug load data was collected over a one-month period. The actual sampling periods varied between hospitals surveyed. Plug loading was measured and calculated in 15-minute intervals over 32 days starting on July 1st 8:00AM and concluding on August 1st 7:45 AM. The sampled data was used to calculate the following loading results;

- Minimum plug load kVA
- Maximum plug load kVA
- Average plug load kVA
- Minimum plug load VA / square foot
- Maximum plug load VA / square foot
- Average plug load VA / square foot

The example data provided below is from several different suites in a cardiac care building at a large (1000+ bed) academic medical center in Boston, Massachusetts. See **Table 1** and graphs below for a summary of the data gathered. Additional patient care areas and hospitals will be added in a similar format as soon as the data is made available.

Clinical Care Area	Square Feet (SF)	Plug Load (kVA)			Total VA/SF	
		Min	Max	Average	Max	Average
Cardiac Intensive Care Unit (29 Beds)	26654	2.58	20.23	16.75	0.76	0.63
Cardiac Inpatient Unit (29 Beds)	26674	8.74	13.57	10.42	0.51	0.39
Cardio Vascular Surgery Suite (29 Beds)	26798	1.18	12.76	9.93	0.48	0.37
Cardiac Critical Care Unit (29 Beds)	26632	1.77	20.01	15.77	0.75	0.59

Table 1: Watts per Square Foot Summary

Cardiac Critical Care Unit

Date & Time	NL3	NL1	TOTAL
	D61 NP Plug kWATTS	D55 CB Plug - kWATTS	PLUG Total Plug - kWATTS
Jul, 1 - 8:06 AM	4.09	11.74	15.83
Jul, 1 - 8:21 AM	4.26	11.74	15.99
Jul, 1 - 8:36 AM	4.33	11.46	15.79
Jul, 1 - 8:51 AM	4.46	11.44	15.90
Jul, 1 - 9:06 AM	4.50	11.75	16.25
Jul, 1 - 9:21 AM	4.61	11.60	16.21
Jul, 1 - 9:36 AM	4.95	11.71	16.67
Jul, 1 - 9:51 AM	4.65	11.60	16.25
Jul, 1 - 10:06 AM	4.53	11.97	16.50
Jul, 1 - 10:21 AM	4.63	11.96	16.59
Jul, 1 - 10:36 AM	4.82	12.15	16.97
Jul, 1 - 10:51 AM	4.65	11.60	16.26
Jul, 1 - 11:06 AM	4.70	11.58	16.29
Jul, 1 - 11:21 AM	4.56	11.02	15.57
Jul, 1 - 11:36 AM	5.04	10.61	15.65
Jul, 1 - 11:51 AM	4.76	10.77	15.53
Jul, 1 - 12:06 PM	4.67	10.49	15.15
Jul, 1 - 12:21 PM	4.77	10.28	15.05
Jul, 1 - 12:36 PM	4.75	10.33	15.08
Jul, 1 - 12:51 PM	4.70	10.18	14.89
Jul, 1 - 1:06 PM	4.67	10.39	15.06
Jul, 1 - 1:21 PM	4.79	10.91	15.70
Jul, 1 - 1:36 PM	5.08	10.81	15.89
Jul, 1 - 1:51 PM	5.19	10.54	15.74
Jul, 1 - 2:06 PM	5.25	10.57	15.83
Jul, 1 - 2:21 PM	5.83	10.60	16.43
Jul, 1 - 2:36 PM	5.25	10.48	15.73
Jul, 1 - 2:51 PM	4.93	10.37	15.30
Jul, 1 - 3:06 PM	5.30	10.20	15.50
Jul, 1 - 3:21 PM	5.72	10.59	16.31
Jul, 1 - 3:36 PM	5.70	10.43	16.13
Jul, 1 - 3:51 PM	6.01	10.57	16.58
Jul, 1 - 4:06 PM	5.92	10.43	16.34
Jul, 1 - 4:21 PM	5.87	10.54	16.40
Jul, 1 - 4:36 PM	5.72	10.63	16.35
Jul, 1 - 4:51 PM	5.71	10.60	16.31
Jul, 1 - 5:06 PM	5.97	10.42	16.39
Jul, 1 - 5:21 PM	5.99	10.79	16.78
Jul, 1 - 5:36 PM	5.89	10.95	16.84
Jul, 1 - 5:51 PM	6.08	10.98	17.06

Cardiac Critical Care Unit

Date & Time	NL3	NL1	TOTAL
	D61 NP Plug kWATTS	D55 CB Plug - kWATTS	PLUG Total Plug - kWATTS
Jul, 1 - 6:06 PM	6.15	11.06	17.21
Jul, 1 - 6:21 PM	6.11	11.48	17.59
Jul, 1 - 6:36 PM	6.04	11.20	17.23
Jul, 1 - 6:51 PM	5.81	11.24	17.05
Jul, 1 - 7:06 PM	5.72	10.93	16.65
Jul, 1 - 7:21 PM	5.74	10.77	16.52
Jul, 1 - 7:36 PM	6.02	11.23	17.25
Jul, 1 - 7:51 PM	5.93	11.55	17.48
Jul, 1 - 8:06 PM	5.74	11.67	17.42
Jul, 1 - 8:21 PM	6.09	11.52	17.61
Jul, 1 - 8:36 PM	6.60	11.13	17.73
Jul, 1 - 8:51 PM	6.42	11.32	17.74
Jul, 1 - 9:06 PM	6.26	11.28	17.54
Jul, 1 - 9:21 PM	6.22	11.44	17.67
Jul, 1 - 9:36 PM	5.97	11.45	17.42
Jul, 1 - 9:51 PM	5.70	11.33	17.04
Jul, 1 - 10:06 PM	5.62	11.10	16.72
Jul, 1 - 10:21 PM	5.58	10.97	16.56
Jul, 1 - 10:36 PM	5.44	11.17	16.61
Jul, 1 - 10:51 PM	5.28	11.16	16.44
Jul, 1 - 11:06 PM	5.38	10.94	16.33
Jul, 1 - 11:21 PM	5.28	11.23	16.50
Jul, 1 - 11:36 PM	5.23	11.30	16.53
Jul, 1 - 11:51 PM	4.90	11.38	16.28
Jul, 2 - 12:06 AM	4.75	11.20	15.94
Jul, 2 - 12:21 AM	4.49	11.15	15.64
Jul, 2 - 12:36 AM	4.44	10.89	15.33
Jul, 2 - 12:51 AM	4.31	10.87	15.18
Jul, 2 - 1:06 AM	4.26	10.92	15.18
Jul, 2 - 1:21 AM	4.23	11.08	15.32
Jul, 2 - 1:36 AM	4.36	11.13	15.49
Jul, 2 - 1:51 AM	4.16	11.15	15.31
Jul, 2 - 2:06 AM	4.14	10.81	14.95
Jul, 2 - 2:21 AM	4.25	10.63	14.88
Jul, 2 - 2:36 AM	4.07	10.98	15.05
Jul, 2 - 2:51 AM	4.07	11.24	15.31
Jul, 2 - 3:06 AM	4.25	11.31	15.56
Jul, 2 - 3:21 AM	4.16	11.51	15.67
Jul, 2 - 3:36 AM	4.08	11.34	15.43
Jul, 2 - 3:51 AM	4.08	11.13	15.21