Technical Memo

Post-occupancy evaluation of The New York Times Headquarters Building: An examination of causes for occupant satisfaction and dissatisfaction with the energy-efficiency measures

Robert D. Clear, Staff Scientist
Building Technologies Program, Environmental Energy Technologies Division,
Lawrence Berkeley National Laboratory, Mailstop 90-3111,
1 Cyclotron Road, Berkeley, CA 94720

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A post-occupancy evaluation (POE) survey was issued by The New York Times (NYT) to their employees with the assistance of Sustainable Energy Partnerships (SEP). SEP conducted a detailed analysis of the survey data (September 29, 2010 draft) and found that a significant fraction of the building occupants were satisfied to very satisfied with the overall building. Compared to other buildings, the overall level of satisfaction was greater than the norm of surveyed buildings.

This additional analysis was conducted to identify potential causes of the occupants' satisfaction or dissatisfaction with the innovative lighting, shading, and space-conditioning systems themselves and/or the resultant indoor environment produced by these systems. The analysis used various methods to identify statistically significant factors, where the factors were those given in the survey questionnaire. Additional factors or causes of satisfaction and dissatisfaction were identified through analysis of the detailed comments: this was done for the questions related to the lighting section of the survey.

Summary

A post-occupancy evaluation (POE) survey was issued by The New York Times (NYT) to their employees with the assistance of Sustainable Energy Partnerships (SEP). SEP conducted a detailed analysis of the survey data. This additional analysis was conducted to identify potential causes of the occupants' satisfaction or dissatisfaction with the innovative lighting, shading, and space-conditioning systems themselves and/or the resultant indoor environment produced by these systems. Independent measures or variables (IV) included occupant responses to questions such as physical location in the building, window orientation, proximity to exterior windows, and other factors such as how well informed the occupant was with the features of the building. Dependent variables (DV) included occupant responses to questions such as their satisfaction with lighting quality, thermal and visual comfort, temperature or humidity control, the shading and lighting control systems, and their ability to get their job done. Correlations between independent and dependent variables revealed statistically significant factors that explained in part the cause of occupants' satisfaction or dissatisfaction. These factors can then be used to determine what actions can be taken to increase occupant satisfaction with the innovative systems and overall building.

This analysis does not include an evaluation of the degree of occupant satisfaction or dissatisfaction: this information is provided in the SEP analysis. The SEP analysis (September 29, 2010 draft) indicated that a significant fraction of the building occupants were satisfied to very satisfied with the overall building and that compared to other buildings, the overall level of satisfaction was greater than the norm of surveyed buildings. Detailed review of the SEP analysis has not yet been conducted by LBNL.

Several levels of statistical analysis were performed in this study. A preliminary contingency analysis using grouped response data was used to identify statistically significant, plausible relationships between independent and dependent variables. All IVs were included in this preliminary analysis. A logistic probability fit analysis was then conducted to identify statistically significant factors. These fits were then re-run as ANOVAs, enabling analysis of how strongly dependent variables or factors affected occupant satisfaction and dissatisfaction with the environmental quality, comfort, and innovative features of the building. Separately, written comments pertaining to the lighting portion of the survey were grouped, tallied, and analyzed.

To summarize the results from this analysis, we found that there was a significant positive correlation between lighting quality and visual comfort variables and how well informed the respondents were about the building features. Lighting and thermal comfort variables were positively correlated against each other. There were weaker, but still significant positive correlations between lighting quality satisfaction and being adjacent to a window or having a private office. Finally, there was a weak positive correlation between thermal comfort as a whole and being located on the upper floors.

Overall, satisfaction was most strongly related to the satisfaction with the humidity and lighting quality issues. The independent variable that was most strongly correlated with satisfaction was that of being informed. These results indicate that explaining the building features is useful in getting people to buy in to the environment.

The NYT had five partially to fully open-ended requests for comments. We examined only the two related to lighting. The main concern found in these questions was too much glare. This is primarily a problem in the open-plan areas, and is also more prevalent for employees next to the exterior windows than for subjects further away. Other more minor problems were identified. Suggestions for addressing the various causes of dissatisfaction were proposed.

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1. Method

A preliminary post-occupancy evaluation (POE) was performed by Sustainable Energy Partnerships (SEP). The preliminary analysis evaluated the overall levels of the responses to the POE questions. This analysis looks at relationships between the multiple choice questions (Table 1). In particular, the questions were partitioned into responses to the thermal and lighting conditions in the building, and questions relating to location (orientation, private versus open office, floor level, and adjacent or not adjacent to a window), and information (knowledge of contact for thermal problems, and information about the special features of the building). When the lighting responses are considered to be dependent variables, the remaining questions were treated as independent variables. Similarly, when the thermal questions were considered to be dependent variables, the remaining questions (including lighting) were treated as independent variables. The point of including thermal questions as independent variables for lighting, and vice versa, was to test whether the responses to one set of variables affected the response to the other variable.

Answers to the questions were either rank values (ordinal values from 1 = very dissatisfied to 7 = very satisfied), or category values (nominal values of yes/no, floor level, etc.). Initially, we did contingency analysis tests to determine whether there were any plausible relationships. Contingency analysis is not accurate if more than 20% of the individual response cells have less than 5 entries. In order to meet this criterion, it was necessary to group some of the responses to increase the number of entries per cell. For the question of how informed the employee was about the lighting and temperature features of the building, responses 1 - 3 became low, 4 -5 became middle, and 6 - 7 became high. For the question of how thermal comfort affected job performance the grouping was 1 -3 to low, 4 to middle, and 5 - 7 to high. These groupings gave roughly equal numbers of responses per group. In addition to these two groupings, the floor location was grouped with 2 -4 being low, 5 -13 being middle, and 14 to 21 being high. This grouping was based both on a review of the skyline obstructions from adjacent buildings, and the number of subjects per resultant group.

This preliminary step identified a number of plausible relationships. The strongest and most frequent single-variable correlate was to how well the employees were informed about the lighting and temperature features of the building. For the lighting questions, the second strongest independent variable was to the thermal response. Window orientation and knowledge of who to contact for thermal comfort problems had no significant correlations with the lighting questions. Type of office, adjacency to a window and location (height) showed correlations for some of the lighting questions, but tended to also be correlated to each other, and to how informed the employee was. Because the cross correlations were in general fairly robust, the statistical significance for an individual correlate is not guaranteed for that variable when it is part of a multi-variable fit. In short, this initial analysis merely establishes plausible relationships.

In the second step in the analysis, the dependent variables were fit against the likely independent variables using the logistic platform in the JMP statistical package. No interaction terms were examined, so this only evaluates direct effects. This analysis identifies the factors which are statistically significant, but returns parameter values that are not easily interpreted.

As a third step we re-ran the statistically significant logistic fits as ANOVAs by relabeling the dependent variable as a continuous variable, and relabeling the independent variables as nominal variables. This procedure returns an intercept, and adjusting factors for each of the levels of the independent variables, so that the trends and relative magnitudes of the response versus the independent variables can be seen. This procedure is not exact, as there is no guarantee that the levels of the ordinal response variables are linear. We used it after identifying the statistically significant fits as an approximate procedure that aids in the understanding of the practical implications of the results.

Table 1.
Survey headings and questions

	Headings and questions	Response
	Visual Comfort	
	The design of the NY Times facility at 620 Eighth Avenue included state of the art environmentally-sustainable features intended to enhance occupant satisfaction and productivity as well as save energy. Some of these features are first of their kind ventures. Learn More about NY Times Facility Features at http://www.nytco.com/social_responsibility/environmental_stewardship.html	
Q1	In terms of the overall quality of light in your workspace, are you:	Scale A: 1-7
Q2	How satisfied are you with the visual comfort of the lighting (e.g., glare, reflections, contrast)?	Scale A: 1-7
Q3	If you're not satisfied with the overall quality of light, please choose one of the following:	Too bright, too dim, too much glare, other
Q3	If other, please specify:	
Q4	How satisfied are you with the automatic lighting controls (occupancy sensors, dimming in response to daylight conditions)?	Scale A: 1-7
Q5	How satisfied are you with the automatic window shades?	Scale A: 1-7
Q6	Overall, does the lighting quality enhance or interfere with your ability to get your job done?	Scale B: 1-7
Q7	Please describe any other issues related to the visual comfort that are important to you. If you expressed dissatisfaction in any of the above questions, please elaborate.	
	Thermal Comfort	
Q8	How satisfied are you with the temperature in your workspace?	Scale A: 1-7
Q9	How satisfied are you with the humidity level in your workspace?	Scale A: 1-7
Q10	Overall, does your thermal comfort in your workspace enhance or interfere with your ability to get your job done?	Scale B: 1-7
Q11	Do you know who to contact if you have a regarding thermal comfort?	Yes, No
Q12	Please describe any other issues related to the indoor environmental quality that are important to you, including any issues that may arise during specific seasons. If you expressed dissatisfaction in any of the above questions, please elaborate.	

Table 1. (continued)
Survey headings and questions

	Headings and questions	Response
	General Comments	
Q13	How satisfied are you with the building overall?	Scale A: 1-7
Q14	How well informed do you feel about using the innovative lighting and comfort features in this building?	Scale C: 1-7
Q15	Overall, does the new office building enhance or interfere with your ability to get your job done?	Scale B: 1-7
Q16	Any additional comments or recommendations about your personal workspace or building overall?	
Q17	If you struggle with lighting or thermal conditions at certain times of day or seasons, please describe the problems, and what you do about them (i.e, add layer of clothing, constantly adjust shades, etc.)	
Q18	Are you in an open plan area or a private office?	Open office area, private office
	Background/ Context	
	To better understand answers to this survey and group responses, please answer the following:	
Q19	On which floor is your office space located?	2-21
Q20	To which direction do the windows closest to your workstation face?	NESW
Q21	Is your workspace next to an exterior window?	Yes, No
	Thank you for your time and participation.	

Notes:

Scale A: Very dissatisfied (1), Neutral (4), Very satisfied (7)
Scale B: Interferes (1), Neutral (4), Enhances (7)
Scale C: Not well informed (1), Neutral, Very well informed (7)
NESW: North 41st St; South 40th St; East 7th Ave; West 8th Ave

2. Lighting analysis

For the lighting analysis, we considered the following questions to be potential independent variables (all other IVs were found to be statistically insignificant in the preliminary analysis):

Q10: Overall, does your thermal comfort in your workspace enhance or interfere with your ability to get your job done?
Q11: Do you know who to contact if you have a question regarding thermal comfort?
Q14: How well informed do you feel about using the innovative lighting and comfort features in this building?
Q18: Are you in an open plan area or a private office?
Q19: On which floor is your office space located?
Q20: To which direction do the windows closest to your workstation face?
Q21: Is your workspace next to an exterior window?

Table 2 presents the results for the lighting questions. The five lighting questions are listed in the top row. The intercept of the ANOVA, and the coefficients for the maximum and minimum for the two 7-level factors, plus the coefficients for the category responses for the remaining factors, are listed in the rows below. Only the maximum and minimum coefficients are shown, as this gives the range of the response. The expected value for the dependent variable is simply the sum of the appropriate terms. Thus, for example, the expected lighting quality for a subject who is very well informed, whose thermal comfort enhances their job performance, and who has a private office adjacent to a window is $5.62 + 0.59 + 0.48 + 0.18 + 0.15 = 7.02$. This illustrates one of the problems of using an ANOVA, as the actual values are bounded to be no more than 7, nor less than 1. A similar problem exists for the maximum score for lighting comfort, but the remaining estimates are properly bounded.

In general, the strongest effects seem to be due to the two psychological variables. Office type, and adjacency to a window may also be psychological variables, but it is at least plausible that they also have a direct physical effect on the lighting.

Table 2.
ANOVA coefficients for lighting variable fits (1-7 scale).

	Independent variable	Dependent variable				
		Lighting quality	Visual comfort	Lighting controls	Window shades	Lighting quality enhances job
		Q1	Q2	Q4	Q5	Q6
	Intercept	5.62	5.24	4.70	4.07	4.65
Q14	Very well informed	0.59	0.88	0.84	0.99	0.89
Q14	Not well informed	-0.52	-0.71	-0.65	-0.47	-0.40
Q10	Thermal comfort enhances job	0.48	0.58	0.82	1.03	1.00
Q10	Thermal comfort inteferes with job	-0.39	-0.61	-0.82	-0.78	-0.75
Q18	Private Office	0.18	0.40	N.S.	N.S.	N.S.
Q18	Open Office	-0.18	-0.40	N.S.	N.S.	N.S.
Q21	Adjacent to window	0.15	N.S.	N.S.	N.S.	N.S.
Q21	Not adjacent to window	-0.15	N.S.	N.S.	N.S.	N.S.

N.S. = not significant.

3. Thermal analysis

Table 3 presents the results for the three thermal questions. The format for this table is the same as before, but the thermal comfort variable was changed to a dependent variable, and the lighting questions were allowed as independent variables.

There is a plausible physical link between satisfaction with the window shades and the temperature and thermal comfort questions. The relationship of window shades to satisfaction with the humidity is less obvious, although it seems reasonable that if an employee is overheated from sunlight, they may be bothered more by humidity. The two lighting questions (Q1 and Q5) and the well informed question (Q14) are presumably acting as psychological inputs, with employees who are either bothered by the lighting or unaware of the purpose of building features being more sensitive to thermal discomfort. This sensitivity is probably also true with the relationship between thermal comfort and floor level (higher floor levels being viewed as more desirable), although there may be a slight thermal effect due to lesser shading on the higher floors. This cannot be determined from the data available.

Table 3.
ANOVA coefficients for thermal variable fits.

	Independent variables	Dependent variables		
		Temperature	Humidity	Thermal comfort enhances job performance
		Q8	Q9	Q10
	Intercept	3.77	4.95	4.05
Q14	Very well informed	0.64	N.S.	N.S.
Q14	Not well informed	-0.2	N.S.	N.S.
Q1	Very satisfied with lighting quality	0.29	0.67	N.S.
Q1	Very unsatisfied with lighting quality	-0.75	-0.64	N.S.
Q4	Very satisfied with window shades	0.66	0.59	0.29
Q4	Very unsatisfied with window shades	-0.9	-0.69	-0.63
Q5	Lighting enhances job performance	N.S.	N.S.	0.66
Q5	Lighting interferes with job performance	N.S.	N.S.	-0.73
Q19	Floors 14 up	N.S.	N.S.	0.21
Q19	Floors 5 -13	N.S.	N.S.	0.09
Q19	Floors 2 -4	N.S.	N.S.	-0.3

N.S. = not significant.

4. Overall performance

Although individual measures of satisfaction are important, the most important measures are those of overall satisfaction. Overall satisfaction was addressed by two questions:

Q13: How satisfied are you with the building overall?
Q15: Overall, does the new office building enhance or interfere with your ability to get your job done?

These questions can be analyzed both in terms of how they are related to individual measures of lighting and thermal comfort and satisfaction, and to how they relate to the physical and psychological independent variables that were correlated to the lighting and thermal measures. The correlation to the individual comfort measures provides an indication of their relative overall importance. Logistic probability fits found that three of the five lighting measures, and two of the three thermal measures, were significantly correlated to the overall measures. Table 4 shows the corresponding ANOVA levels as a guide to the relative strength of the different factors.

The top three measures were approximately equal in importance. Of the three, satisfaction with the humidity is particularly interesting because it is the least closely correlated of any of the measures to the independent variables measuring location, how well informed the occupant was, and psychological factors. This suggests that humidity may be the most responsive to physical intervention, and thus possibly the easiest to improve.

The top three measures are moderately strong constraints of job satisfaction and the ability to the get one's job done. There was a 38 to 45 percent probability that occupants who reported from 1 to 3 (below neutral) on any of these three measures, would also report a value from 1 to 3 on overall satisfaction. The percent probability ranges from 32 to 48 percent for the ability to get one's job done.

Although humidity had a significant effect for both overall measures, its strongest effect was on overall satisfaction. It should be noted that the two factors that had the largest effect on employee's perceptions of their ability to get their jobs done were two of the lighting quality responses.

Table 4.
Covariants with overall satisfaction measures.

	Covariant	Overall satisfaction Q13	Ability to get job done Q15
	Intercept	4.42	4.25
Q9	Very satisfied with humidity	0.52	0.4
Q9	Very unsatisfied with humidity	-1.14	-1.02
Q1	Very satisfied with lighting quality	0.71	0.69
Q1	Very unsatisfied with lighting quality	-0.64	-0.93
Q6	Lighting enhances job performance	0.39	0.89
Q6	Lighting interferes with job performance	-0.55	-1.14
Q10	Thermal comfort enhances ability to do job	0.39	0.43
Q10	Thermal comfort interferes with ability to do job	-0.4	-0.7
Q4	Very satisfied with lighting controls	0.43	N.S
Q4	Very unsatisfied with lighting controls	-0.97	N.S.

N.S. = not significant.

Table 5 shows the trends in overall response to the independent variables. The most significant variable is once again "how well informed". The remaining three variables are much less significant, and possibly somewhat ambiguous, as they are weakly, but significantly, correlated to each other. It is possible that all of them enter as psychological variables. Having a private office has potential thermal, lighting (see table 1), and privacy advantages, but it is also an indication of status, which is a psychological variable. Being adjacent to a window affects lighting quality (table 1) and could

conceivably affect thermal comfort, but it also affects the view, which is again a psychological variable. Finally, being higher up will again affect the view.

Table 5.
Overall responses versus independent variables.

	Independent variable	Overall satisfaction Q13	Ability to get job done Q15
	Intercept	5.26	5.09
Q14	Very well informed	0.74	1.05
Q14	Not well informed	-0.83	-0.88
Q18	Private Office	N.S.	0.25
Q18	Open Office	N.S.	-0.25
Q21	Adjacent to window	N.S.	0.16
Q21	Not adjacent	N.S.	-0.16
Q19	Floors 2 -4	-0.38	N.S.
Q19	Floors 5 -13	0.1	N.S.
Q19	Floors 14 up	0.28	N.S.

N.S. = not significant.

5. Analysis of comments on lighting

In addition to the main subjective scale and information questions, there were also several questions asking employees to identify problems or provide comments. Questions 3 and 7 asked for further information on lighting issues:

Q3: If you're not satisfied with the overall quality of light, please choose one of the following: too bright, too dim, too much glare, or other.

Q7: Please describe any other issues related to the visual comfort that are important to you. If you expressed dissatisfaction in any of the above questions, please elaborate.

The main questions had responses from about 660 employees. There were 285 responses to question 3, distributed as in Table 6.

Table 6.
Number of responses to question 3.
If not satisfied with overall quality of lighting,
choose one of the following or specify.

	No. of responses
Too bright	41
Too dim	29
Too much glare	118
Other, please specify	97
Total responses	285

Table 7.
Allocated responses to question 3 on satisfaction with lighting quality.

Response	Number of responses	% of responses to Q3	% of total subjects (n=653)
Too much glare	142	45.4%	21%
Too bright	54	17.3%	8%
Shade control problems	42	13.4%	6%
Too dim	39	12.5%	6%
Not specified	12	3.8%	2%
Other	11	3.5%	2%
Lighting control problems	7	2.2%	1%
Satisfied	6	1.9%	1%
Total responses	313	100%	47%

"Other" responses covered many issues, but was sometimes used to elaborate on a "too bright" or other main response, or to allow the respondent to indicate more than one response. Counting responses and allocating them to these main categories when appropriate, results in the breakdown of responses given in Table 7.

"Other" in Table 7 consisted of the following complaints: No task lighting, Don't like the color, Flicker, Don't like fluorescents, Not enough daylight, Shades down wastes energy.

The most common complaint of too much glare came from almost one fifth of the survey population. This is identical to the number of subjects who reported being less than neutral (values from 1 - 3) on the question of visual comfort, which is the major issue here. Although employees were instructed to fill out question 3 if they were not satisfied

with the quality of the lighting, the actual responses were much more closely correlated to dissatisfaction with the comfort of the lighting. This is due to the preponderance of complaints about glare.

In general, subjects who reported any type of lighting problem were more likely to be in an open office than a private office (Table 8). The probabilities of reporting a problem was 45% for employees in open offices versus 23% of those in private offices. The logistic fit platform rejected any further contributions past office type. The complaints of too much glare also correlated to office type, but in addition were slightly more prevalent for employees adjacent to a window.

Table 8.
Proportion of employees with a category who reported too much glare in Q3 as a function of office type and adjacency to window.

Category			Open plan office	Private office
Adjacent to window	Too much glare	n=	89	2
	Total unsatisfied	n=	310	25
	% of total unsatisfied who reported too much glare		29%	8%
Not adjacent to window	Too much glare	n=	44	5
	Total unsatisfied	n=	242	76
	% of total unsatisfied who reported too much glare		18%	7%

The logistic fit platform rejected any other combinations of independent variables as being statistically significant. The remaining issues listed had a relatively low frequency, and none of them showed statistically meaningful correlations.

There were 249 responses to question 7, of which 144 were from subjects who had already commented on question 3. Although the comments are in the employee's own words, we found that we could roughly identify 318 specific comments in six broad categories (Table 9).

Table 9.
Employee responses to question 7 on visual discomfort

Type of response	No. of responses
Window shade problems	206
Electric lighting problems	59
Other visual environment comments or problems	35
Non-visual issues or no problem	10
Suggestions	5
Glare on PC from unspecified source	3

Table 10.
Window shade problem responses.

Type of response	No. of responses
Not down when needed	79
Not up or down when needed or unspecified	54
Down when not needed	33
Manual control problems	13
Speed or frequency a problem	7
Shade inadequate	7
Other	7
Shade operation annoying	6

Window shade problems break down into six categories, as shown in Table 10. The most common concern with the window shades was that they failed to control glare. In addition, many employees felt that the shades operated in a meaningless (22) or inappropriate (28) manner, and were bothered by both too much glare, when the shade was up, and too little light when the shade was down. Of the subjects who only called out problems with too much glare, 14 specifically mentioned problems in blocking reflected glare from nearby buildings (mostly the new building on the north), and 13 specifically mentioned problems with the shade rising one-half hour before sunset. It is likely that many of the non-specific responses are due to these same conditions. Fixing these two issues (if possible) could have a significant impact.

With regards to reflected glare, the issue may well be one that is not easily handled with automatic blinds. Reflected glare may be fairly local, and therefore not likely to be seen by a sensor that controls several, or many, blinds. Solving this problem may require a more responsive manual system in the areas with the problem, or more direct intervention with blinds or tinting the glass (as was suggested by a few employees).

With regards to the shade up at sunset issue, an obvious intervention is to shorten the period during which the shade permits a view of the sunset, either overall, or in response to specific complaints. Reducing the sunset period has two beneficial effects. Figure 1, below, shows the relative luminance of the sun on a clear day as a function of the time before sunset. The luminance drops very abruptly in the last ten minutes before sunset. For most people, it is likely to still be uncomfortably bright 10 minutes before sunset, but it becomes much less likely to be too bright as the time approaches closer to sunset. At thirty minutes before sunset the sun is a full factor of 10 brighter (on a clear day) than at 10 minutes before sunset, and is likely to be un-viewable, unless the sky is cloudy or dirty. Shortening the sun viewing period may not alleviate problems with glare on computer screens, but will reduce problems with views facing the sun.

The second advantage of shortening the sun viewing period is simply that any problems that do remain will persist for a much shorter time, and are thus more likely to be tolerated, while still preserving a chance to see the sunset.

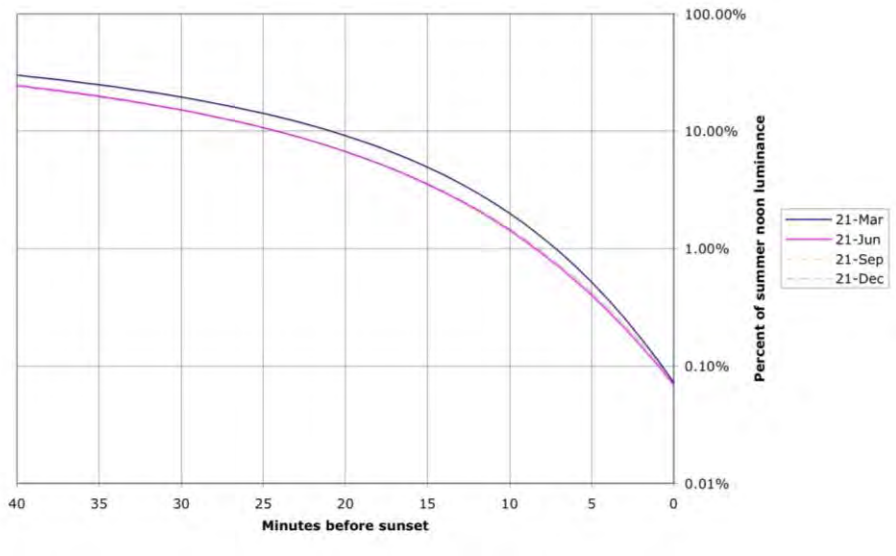

Figure 1. *Solar luminance as a percent of summer noon luminance.*

Comments on the manual control of shades were much less common, and were very varied. The most common complaint was that it wasn't clear how to use the manual controls, or it was too inconvenient or slow (8 complaints total). In addition, two subjects complained that the manual override didn't work. One subject complained that the override did not last long enough, and one subject complained about having to provide a reason for the override, as the system doesn't learn. Finally, one subject wanted to remove the override, because they liked the automatic operation of the blinds.

The remaining comments about window shades were relatively minor, but it is possible that a few of them could lead to useful changes:

- The shade as too slow to react (4).
- The shade moved too frequently (2).
- The shade was too noisy or otherwise distracting (6).
- There were disagreements with other employees over the shade control settings (5).
- The shades failed to block the light or heat even when down (6).
- No shades by the stairs (1).
- Shades block the view (1),
- and finally the shades were inoperable for awhile (1).

The second largest overall category of complaints was with the electric lighting, with the most common complaint being against the occupancy controls (18). The main complaint here is that the occupancy controls do not see people, and there is no way to lock the lights on for a reasonable period of time. Conversely, whole banks of lights will go on, and will stay on for a considerable time, when an employee is simply passing through to go to the bathroom. Solving the latter problem seems as if it would require controlling circulation corridors separately from work areas. The former problem either requires higher sensitivity, more sensors, or an override that a subject can trigger with their computer or even a separate "I am here" transponder that a subject can keep with them.

There were two other main complaints. The first, is that the electric lights did not respond well to changes in the shade position (10), with eight people specifically stating that it was too dim when the shades were down. The second main area of complaints was with the quality of the electric lighting: too bright and/or glaring (6), too dim (5), or poor (but otherwise unspecified - 5). There were a number of other comments, but the only remaining common complaint was that five people wanted task lights. One employee noted that people who moved from the old building were given task lights, but they had not moved in at that time. They did not have a task light, and did not know how to get one.

The third category of responses included comments which could not be specifically tied to the window shades or lights, or were about other aspects of the visual environment. Ten employees submitting positive comments praising the light and open building. Another ten subjects complained that the environment was too bright. Three subjects wanted the windows washed, which is a complaint that could be dealt with, but might be costly to do so on a regular basis. Finally there were a number of subjects who found the building ugly or bland, plus three subjects who expressed a dislike of "Renzo red".

The final category of interest was that of the suggestions. Two subjects suggested tinting the windows, and one other suggested room darkening blinds. One subject complained

that their computer screen was too glossy, and the final subject suggested that the whole system was too Rube Goldberg to ever work properly. The first suggestions raise the question as to whether there are specific locations, or situations, that cause glare that could be alleviated by tinting or blocking. One such possibility might be that of reflected glare, as this is likely to be localized, and of lower intensity than direct sun.

In addition to questions 3 and 7, which have been analyzed above, there were three other questions, 12, 16, and 17, that were completely open-ended. Analysis of these types of questions can be rewarding, but is extremely time consuming and difficult. As of this time (9/28/10), we have not reviewed the responses for these other questions.

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