NISTIR 4307

POST OCCUPANCY EVALUATION OF FEDERAL BUILDINGS- THE PORTLAND FEDERAL BUILDING AND OTHERS

Arthur Rubin

U.S. DEPARTMENT OF COMMERCE
National Institute of Standards and Technology
National Engineering Laboratory
Center for Building Technology
Gaithersburg, MD 20899

Prepared for:
Public Building Service
General Services Administration
Washington, DC 20405

U.S. DEPARTMENT OF COMMERCE
Robert A. Mosbacher, Secretary

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY
John W. Lyons, Director

NIST

NISTIR 4307

POST OCCUPANCY EVALUATION OF FEDERAL BUILDINGS- THE PORTLAND FEDERAL BUILDING AND OTHERS

Arthur Rubin

U.S. DEPARTMENT OF COMMERCE
National Institute of Standards and Technology
National Engineering Laboratory
Center for Building Technology
Gaithersburg, MD 20899

Prepared for:
Public Building Service
General Services Administration
Washington, DC 20405

April 1990

U.S. DEPARTMENT OF COMMERCE
Robert A. Mosbacher, Secretary

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY
John W. Lyons, Director

Table of Contents

1. Introduction

It has been more than a decade since new technologies such as automation has been introduced into offices. During this time, valuable design experience has been gained by the private and public sectors concerning effective ways of coping with them.

The present report summarizes the findings of several investigations performed for GSA to clarify the relationships of office design practices with the ability to perform office tasks. The studies were performed at several federal agencies. This work is intended to serve several purposes:

1. It summarizes the experiences of various organizations concerning the effect of office automation on job performance.
2. It describes the experiences and expectations of these organizations with regard to systems furniture.
3. It identifies design-sensitive issues likely to impact office productivity.
4. It identifies design "do's and don'ts" based on "real world" experiences.

1.1 Study of the new Portland, Oregon, Federal Building

This investigation consisted of questionnaire surveys of some of the occupants of the BPA headquarters before and after their move into the new Portland, Oregon, Federal Building, the headquarters of the Bonneville Power Administration (BPA). The questionnaire findings were supplemented by physical measurements of environmental conditions in the "old" building, and interviews with design and operational personnel. The intent of the study was to determine the effects of new design features, e.g. technology and systems furniture combined with open-office design, on job performance and satisfaction with the new office settings.

The first investigation was conducted during early May 1987 and served as a basis for comparing the later study phase. The questionnaire survey was administered to 200 people in four buildings occupied by BPA.

A variety of potentially useful sources of productivity information were identified during the interviews, for both operational and design activities. Among the design issues were the effects of furnishings, telecommunications systems, ease of modifying and/or moving workstations and the effectiveness of lighting systems. As for operational issues, the accessibility of data bases, the employment of advanced telephone features such as call forwarding, conferencing, and electronic mail were investigated.

In July 1988 a followup questionnaire study was conducted at the new Portland Federal Building to determine how the building occupants accepted their new environment as compared with their

earlier one. Additional interviews were also conducted with operational and facility management personnel.

The original research plan was to conduct identical pre and post occupancy questionnaires to building occupants and determine what changes (if any) occurred in responses to questions about work and environmental features. The goal was to identify design features that enhance or impede office work productivity. However, after the pre-occupancy phase of the work was completed the research was redirected into a closer examination of office space requirements and furnishings. This necessitated a major modification of the questionnaire and precluded a detailed examination of environmental features as originally intended. (The data collection requirements would have imposed an undue burden upon the respondents and the host organization, BPA.) The findings of each study are summarized in this report and when possible, pre and post occupancy comparisons are made.

With the change in emphasis of the original study, it was necessary to expand the sample beyond the Portland Federal Building. Consequently, interviews were conducted with personnel from several other government organizations (Department of Labor, Treasury Department, General Accounting Office, and GSA Regional Offices) to gain insights about the design implications of technology, open-offices, space, and systems furniture. One additional survey was conducted, at the Office of Personnel Management (OPM). These findings are discussed in sections 3 and 4.

1.2 Technical approach

The study was conducted over a period of approximately one year, before and after the move-in to the new federal building in Portland, Oregon. A questionnaire was administered in May 1987 to the headquarters staff of BPA who were housed in several buildings at the time. Most of the personnel were located in the "old" BPA building (adjacent to the new structure) and in rented space in a high rise building, several blocks from the "old" building. A limited number of workers were dispersed in other buildings within half a mile of these primary locations. For the purpose of this study, the data from these several locations have been grouped into one "before" data set, since the major purpose of the investigation is to determine the effects of the new building environment on attitudes and work performance. Prior to grouping all of the "before" data, a preliminary analysis was made to determine whether the grouped data were significantly different from the findings based on data from two of the "before" locations. This analysis indicated no important differences and therefore all of the findings were grouped for the study.

The data were collected by means of a comprehensive questionnaire covering attitudes toward air quality, lighting, acoustics, thermal comfort, video display terminals (VDT's), health issues,

facility appearance, furnishings and job satisfaction. As noted earlier, the study emphasis changed during the course of the research and the second questionnaire included new items about space usage and furnishings. (All questionnaires used are included in Appendix A)

A limited set of physical measures, primarily concerned with space usage, were collected during the early study phase. These findings are included in Appendix B.

1.2.1 Questionnaire Surveys

Questionnaire surveys have been used for many years to assess the acceptance of buildings by occupants. Steelcase (1) has employed this approach several times during the 1970's and 1980's to determine the effects of new new technologies on office work. The present questionnaire is a modified version of one used by Rubin and Collins (2) in a study of military facilities.

The questionnaires were distributed to a sample of 200 people initially. The sample was developed in conjunction with BPA personnel staff, with the intent of obtaining responses from all major working units, all types of jobs performed and people having varying degrees of responsibility. The sample included approximately 50% male and 50% female respondents. The questionnaire was distributed and collected by BPA, and then given to NIST personnel for analysis. All of the workers sampled were engaged in activities that are usually encompassed by the term 'office work', i.e. forms of information processing. Respondents were assurred of anonymity and encouraged to participate. The response rate on the first questionnaire exceeded 75% and was 70% for the second survey, which was only given to those who completed the first one.

1.3. Questionnaire findings

1.3.1. General Approach

The data are presented in the forms of tables and graphs, which summarize the results of the questionnaire. Since people did not respond to all questions, the number of responses are indicated in all summaries. Most of the graphs summarize findings as percentages. The tables provide additional summary information; mean values and standard deviations. A variety of rating scales were used to make assessments, some verbal, others numerical. In some instances 5 point scales were used, while in others, 4 points were utilized. Respondents were also asked to select 4 changes that they would make to improve their environments, and cite the reasons for their selections. The findings will be discussed in detail under general topic headings, e.g. air quality, lighting, furnishings, etc. Each question was given a unique identifier such as "AIRCIRC". (The identifiers are meant to describe the content area examined.) The code for each identifier appears with the questionnaire in Appendix A.

The findings were treated in several ways. First, the data obtained during the pre-study of Portland were summarized and evaluated to identify major issues. Then, the data for the post-study received similar treatment. The next step was to compare major findings at Portland, before and after the move to the new facility. The OPM questionnaire study was then summarized. Interview data was then be examined to gain additional insights about the effects of technology, furnishings and office design on office work performance. These data covered the experience at Portland, OPM, and other federal buildings. They were obtained from conversations with operational, design and facility management personnel.

A cautionary note. While 'average' data and standard deviations (SD) are being presented to summarize information, these findings can be misleading if not considered with the distribution of responses. For example, often the average findings suggest no major problem, but further analysis indicates that a substantial percentage of people are adversely affected by a condition such as lighting. If 20 to 30 percent of the office population has a problem, it merits attention. Our findings indicate this type of response distribution in several instances.

1.3.2. Demographic Information

The breakdown of the Portland sample with regard to sex is as follows: (Note: Tables will include No (Number of respondents) and % (percentage of total)

Table 1.1 Portland Study Sample - Sexual Distribution

	Portland Pre-study		Portland Post-study	
	No	%	No	%
Male	90	58	55	50
Female	64	42	54	50
Total	154		109	

The age distributions of the sample is contained in Table 1.2.

Table 1.2 Portland Study - Age distribution

	Portland Pre-study		Portland Post-study	
Age	No	%	No	%
Under 25	1	01	2	02
25-34	31	20	19	17
35-44	77	50	44	40
45-54	35	23	36	33
55-64	10	06	6	06
65 or over			2	02
Total	154		109	

The average length of time workers were employed at their present job (LONGSPAC), was 2.69 years, SD .56, N=154.

Table 1.3 Time on job

Time on job	No	%
Less than 6 mos	8	05
6 mos to 2 years	31	20
More than 2 years	115	75
Total	154	

The job breakdown of respondents was as follows for the sample.

Table 1.4 Job type

Job type	No	%
Administrative	36	24
Professional	71	47
Technical	34	22
Clerical	9	6
Other	2	1
Total	152	

Of importance in the evaluation of current work environments is the nature of the previous one. Respondents were asked to identify their previous office characteristics (PREVWS). Most people had been in open offices previously. The summary findings are:

Table 1.5 Office type

Office type	No	%
Private office	18	12
Office shared with 1 person	17	11
Open office or partitioned cubicle	115	76
Other	2	01
Total	152	

1.3.3 Health Issues

The first general question concerned the frequency that particular symptoms were experienced at the workstation. Responses were on a 4-point scale: (never-1, rarely-2, sometimes-3, always-4). Most responses fall within the 2 and 3 categories suggesting occasional problems. (Highest scores are indicated by "*".)

Table 1.6 Symptoms experienced

Code	No	Mean	SD	Fig 1 & 2 Codes
HEADACHE	154	2.55*	.59	A
DIZZY	149	1.70	.67	B
SLEEPY	153	2.45*	.61	C
SORETHOT(throat)	153	2.20	.58	D
RUNNOSE (runny nose)	150	2.35	.68	E
IRRITEYE	151	2.34	.73	F
DIFFCON(concentrating)	152	2.40*	.65	A
CRAMP (leg)	152	1.88	.74	B
FATIGUE	150	2.49*	.70	C
SINUS	153	2.19	.90	D
ALLERGY	151	2.07	.97	E

Figures 1.1 and 1.2 summarize these findings. Half of the items appear on each one of the figures. Headaches and being sleepy, and fatigue were common complaints. (These conditions are consistent with air quality problems indicated in later findings.)

Figure 1.1 Symptoms Experienced (1)

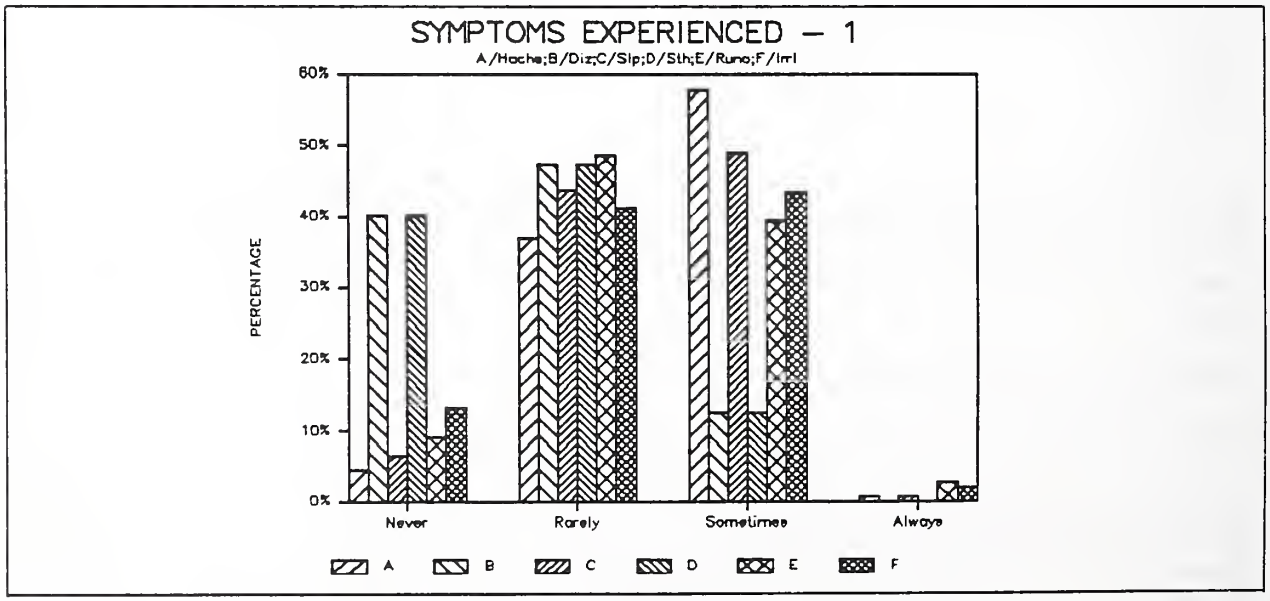
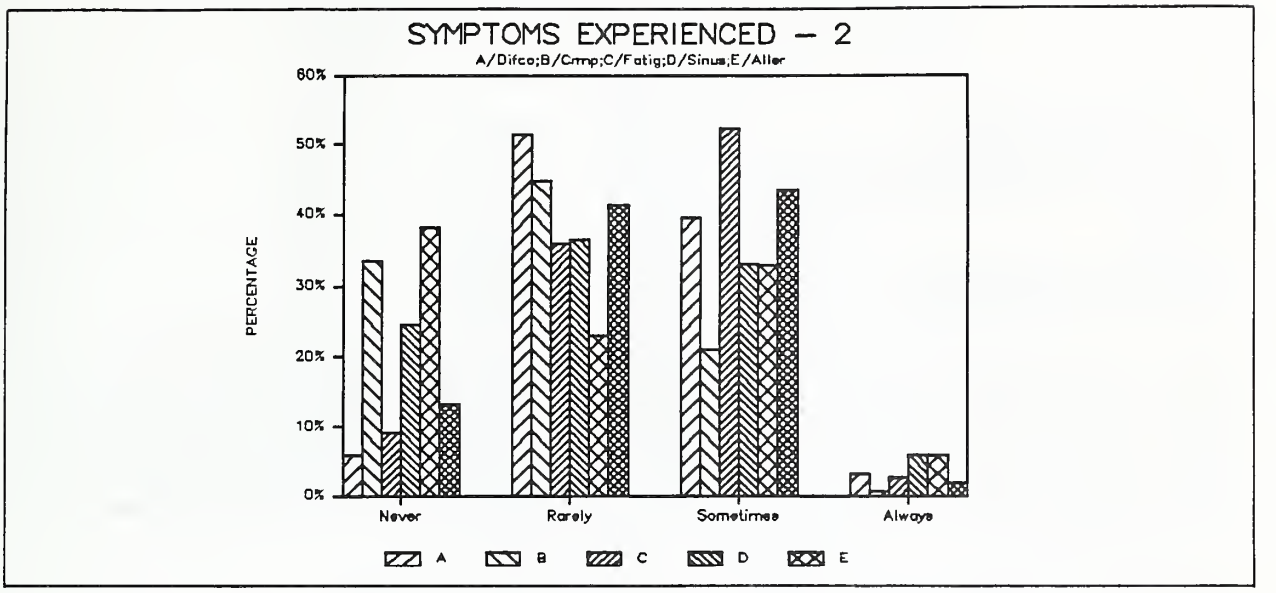


Figure 1.2 Symptoms Experienced (2)



Additional information concerning possible health consequences related to the office is provided below in an analysis of absenteeism due to sickness. Table 1.7 summarizes these findings. The mean score for days absent was 2.54, SD was 1.05.

Table 1.7 Absences

Days absent	No	%
None	24	16
1-2 days	50	34
3-5 days	50	34
6-12 days	15	10
12 days plus	8	05
Total	147	

1.3.4 Appearance of workspace

Respondents were then asked to rate their feelings about the appearance of the workspace, using a 5-point scale. The descriptions were in the form of opposite adjective pairs, e.g. pleasant .. unpleasant. (Pleasant=1, Neutral=3, Unpleasant=5) Table 1.8 shows these findings according to adjective pair averages.

Table 1.8 Adjective pair description averages

Code	No	Mean	SD
WSPLST(pleasant)	150	2.86*	1.13
WSMAINT(maintenance)	153	2.97	1.10
WSSTIMUL(stimulating)	153	3.82*	1.14
CLEAN	151	2.80	1.05
COLOR	152	3.65*	1.05
WSINTRST(interest)	151	3.60*	1.13
WSATMOS(atmosphere)	154	3.25	1.03

The following figures (1.3-1.9) provide detailed information on these responses. Of the feelings expressed about the workplace, the predominant ones were that it was unstimulating, drab, and rather boring. (The intermediate responses on the adjective pair items did not appear on the questionnaire and represent the interpretation of the author; see Appendix.)

Figure 1.3 Adjective pairs (Pleasant-Unpleasant)

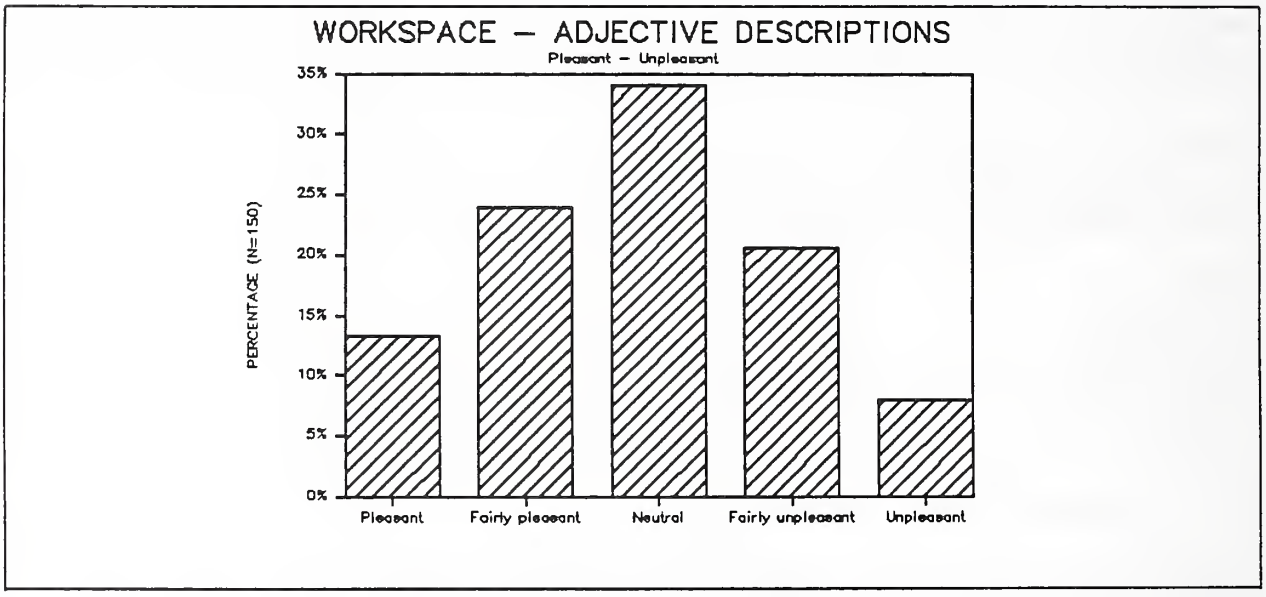


Figure 1.4 Adjective pairs (Maintenance - Well/Poorly)

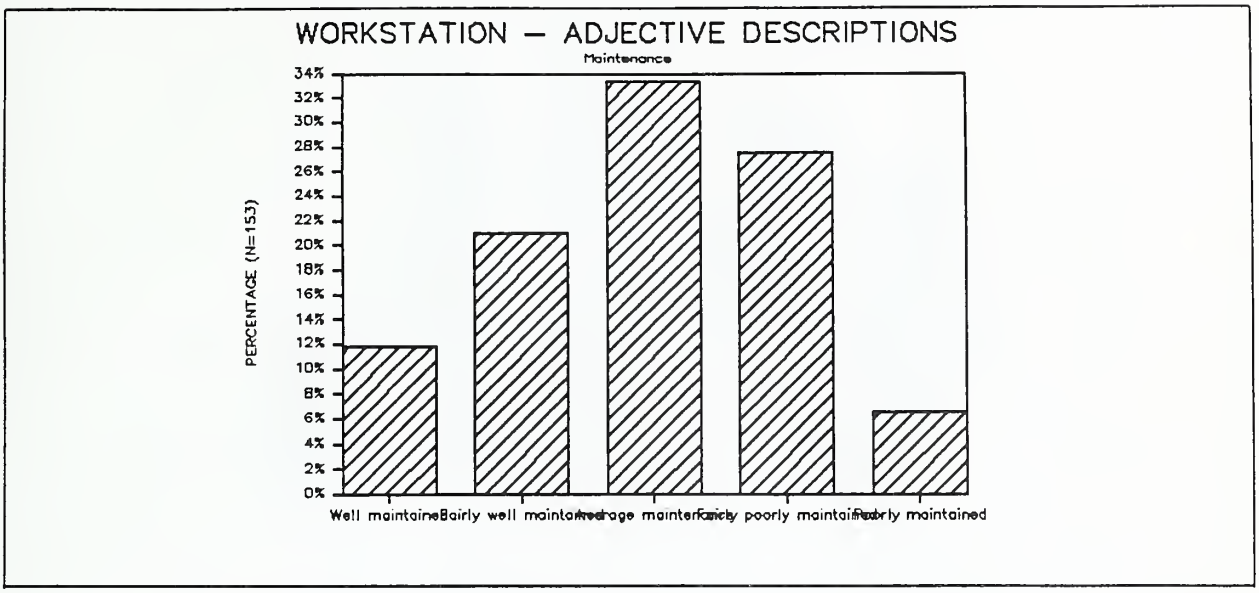


Figure 1.5 Adjective pairs (Clean-Dirty)

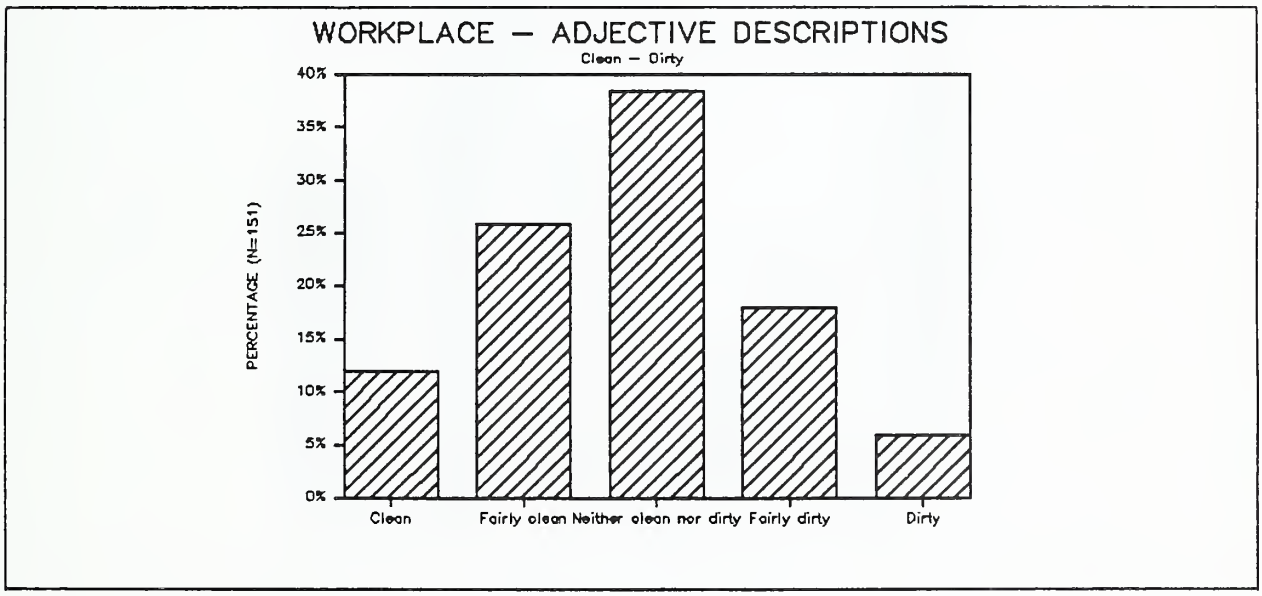


Figure 1.6 Adjective pairs (Atmosphere - Relaxed/Tense)

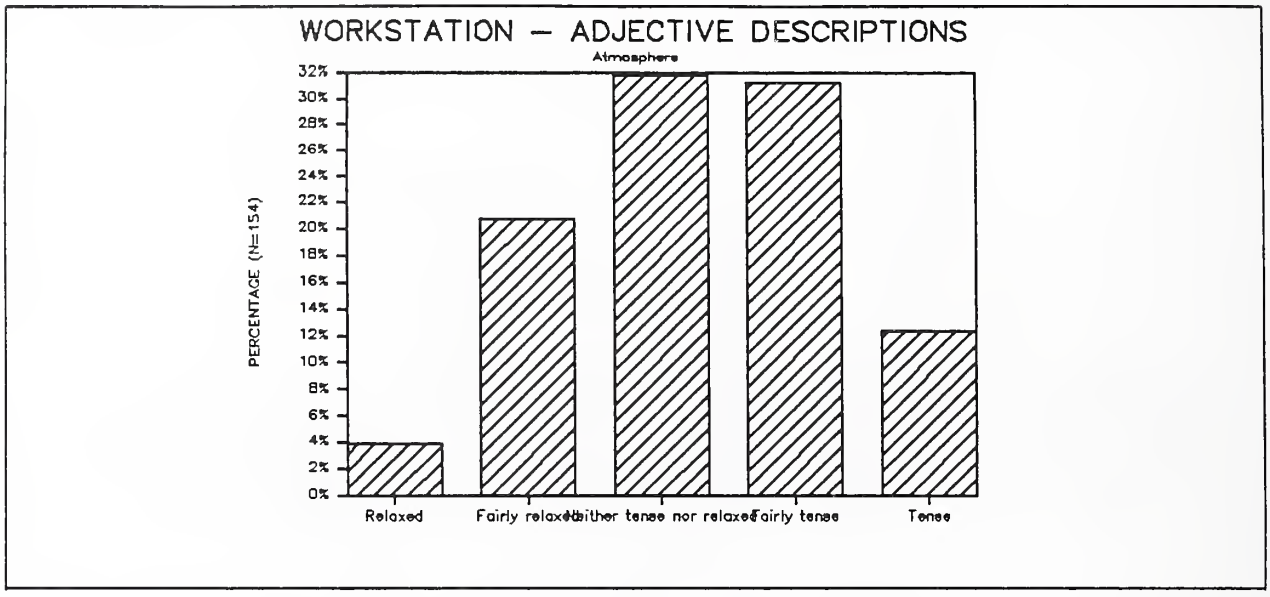


Figure 1.7 Adjective pairs (Interesting-Boring)

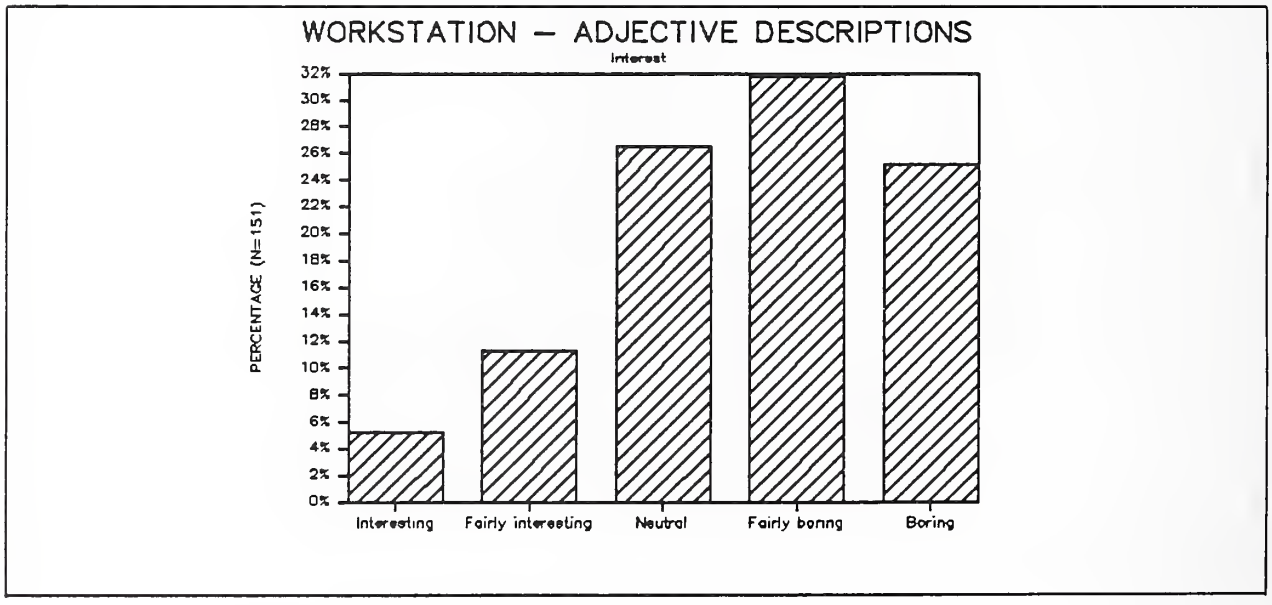


Figure 1.8 Adjective pairs (Colorful-Drab)

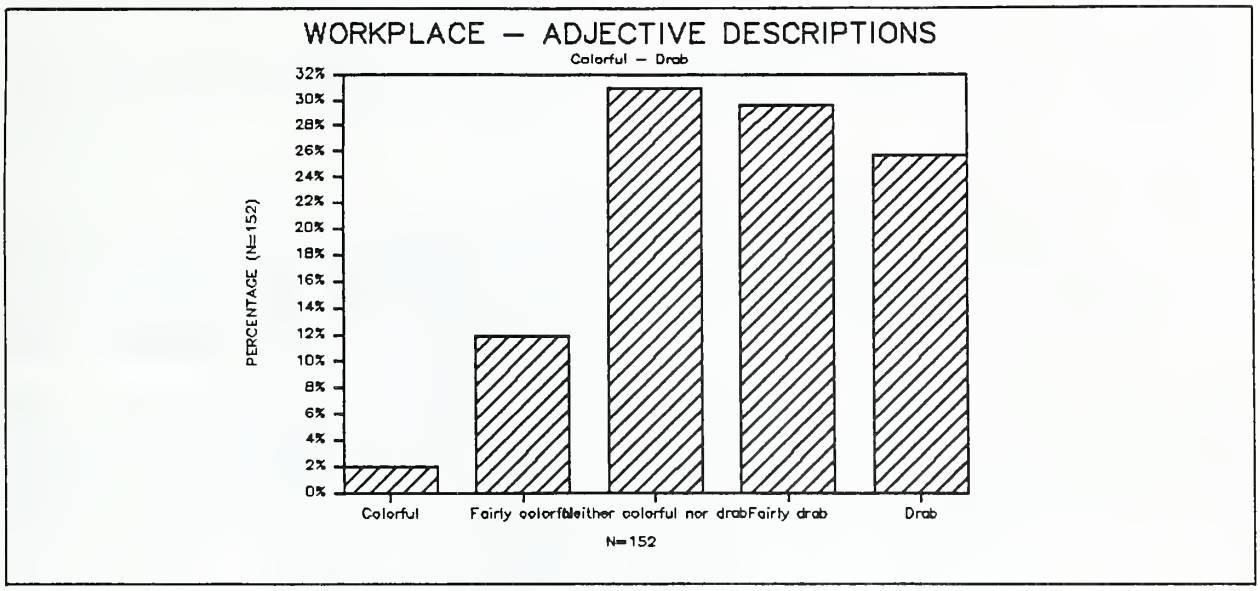
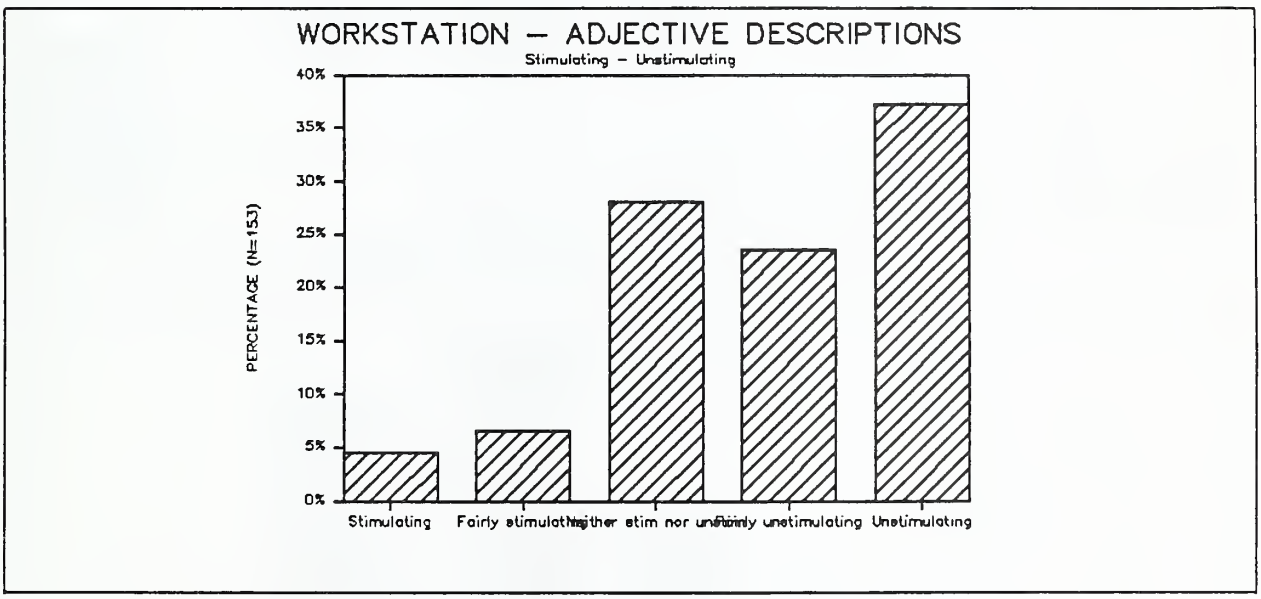


Figure 1.9 Adjective pairs (Stimulating-Unstimulating)



The next items dealt with the arrangement of the workstation for performing work (ARGMTWS) and the way that the work space and office looked. Ratings were made on a 4-point scale (1-excellent, 2-pretty good, 3-fair, 4-poor). Figures 1.10 and 1.11 summarize the responses for each category.

Table 1.9 Workstation arrangement

Code	No	Mean	SD
ARGMTWS	150	3.00	.82
LOOKWS	154	3.12	.80

Figure 1.10 Workstation arrangement

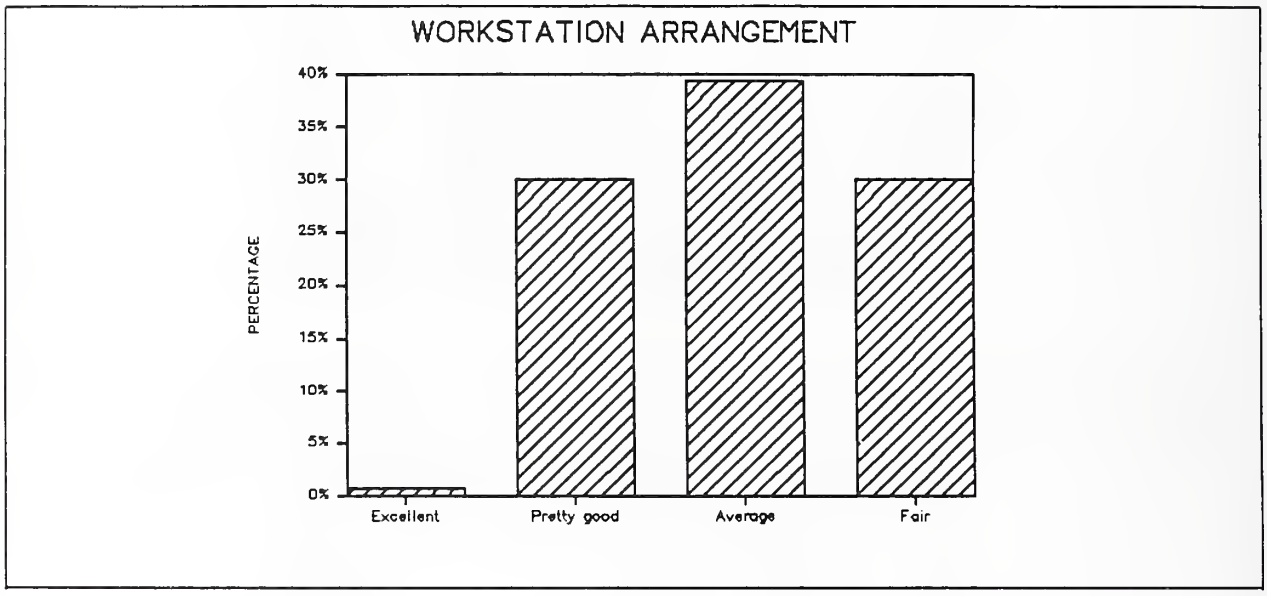
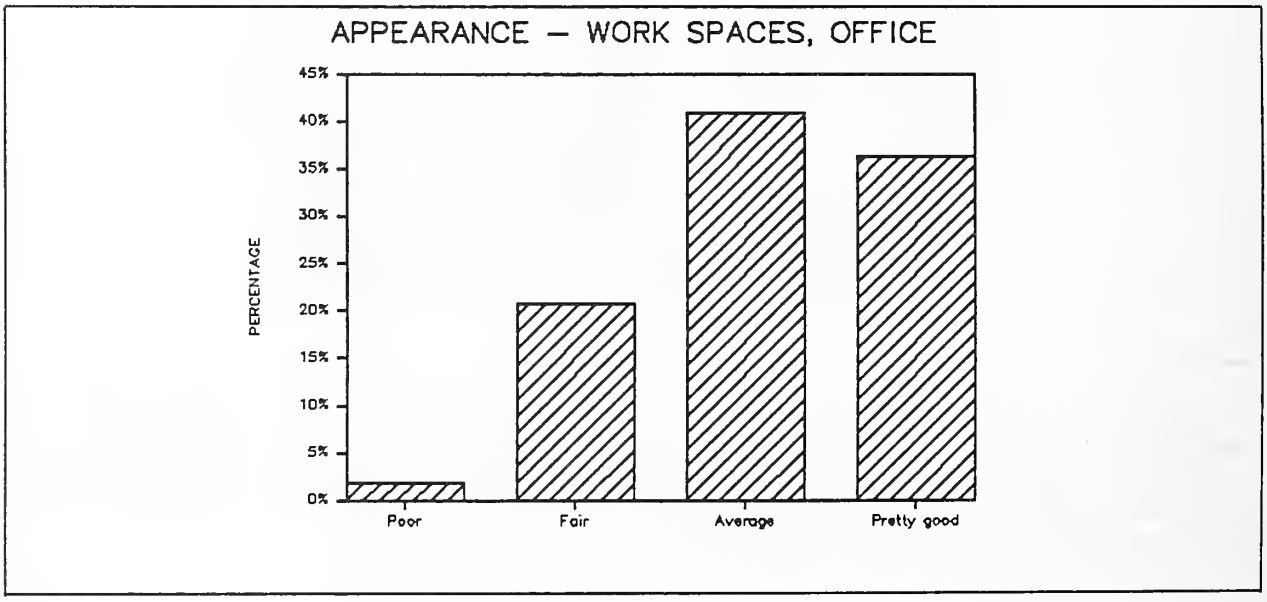


Figure 1.11 Appearance - workspace, office



1.3.5 Environmental features

The following group of questions are concerned with environmental issues: lighting, air quality and thermal comfort features, and acoustics.

1.3.5.1 Lighting

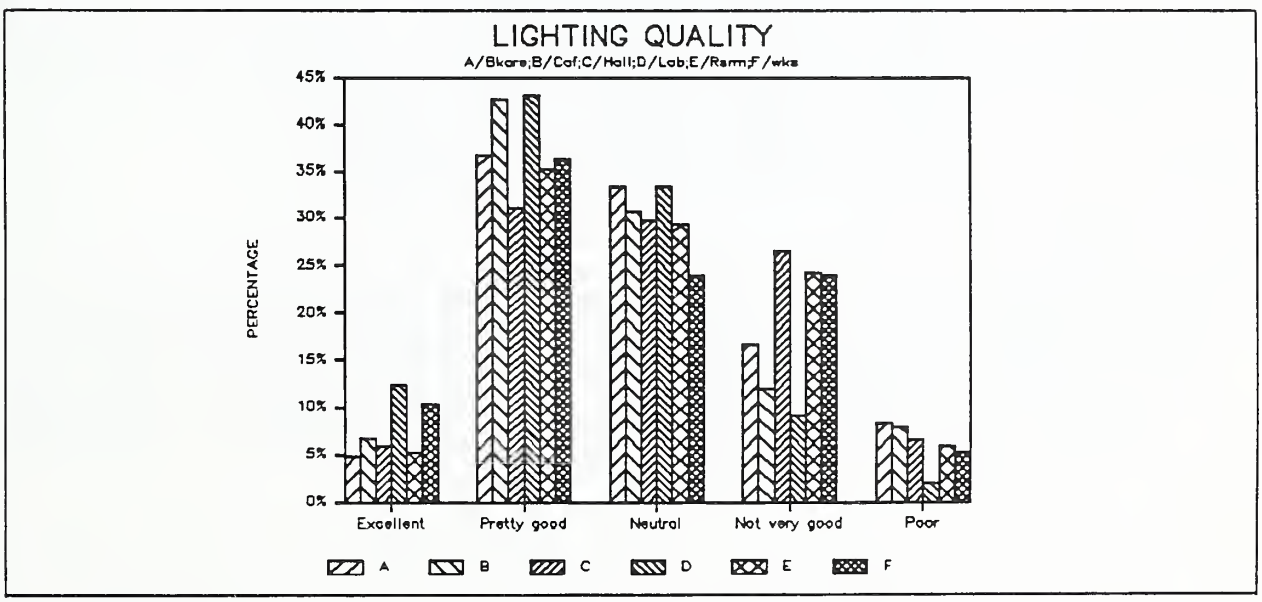
A major concern in the automated office is the quality of lighting, since most tasks rely heavily on vision. Furthermore, past studies of office work, especially those relying heavily on VDT's have identified lighting as a major problem area (1,2).

The first series of questions deal with an evaluation of various dedicated office spaces on a 5-point scale.(1-excellent, 2-pretty good, 3-neutral, 4-not very good, 5-poor.) All of the mean scores were in the mid-range, indicating that the average responses were satisfactory. Figure 1.12 presents detailed findings.

Table 1.10 Light ratings for office spaces

Code	No	Mean	SD	Fig Symbol
RTLTBRK	144	2.87	1.02	A
RTLTCAFE	150	2.72	1.03	B
RTLTHALL	151	2.97	1.04	C
RTLTLOBY	153	2.45	.89	D
RTLTRSTM	153	2.90	1.01	E
RTLTSPAC	154	2.77	1.08	F

Fig 1.12 Lighting quality



In order to learn more about the overall responses to lighting, adjective pair ratings were also obtained. The average responses are in table 1.11. Figures 1.13-1.15 provide detailed findings. These ratings do not identify problem areas for the topics examined.

Table 1.11 Adjective pair responses to lighting conditions

Code	No	Mean	SD
WSLTSOFT	153	3.07	.92
WSBRT	153	2.46	1.04
WELLIT	152	3.34	1.03

Figure 1.13 Adjective pairs (Lighting quality - Soft/Harsh)

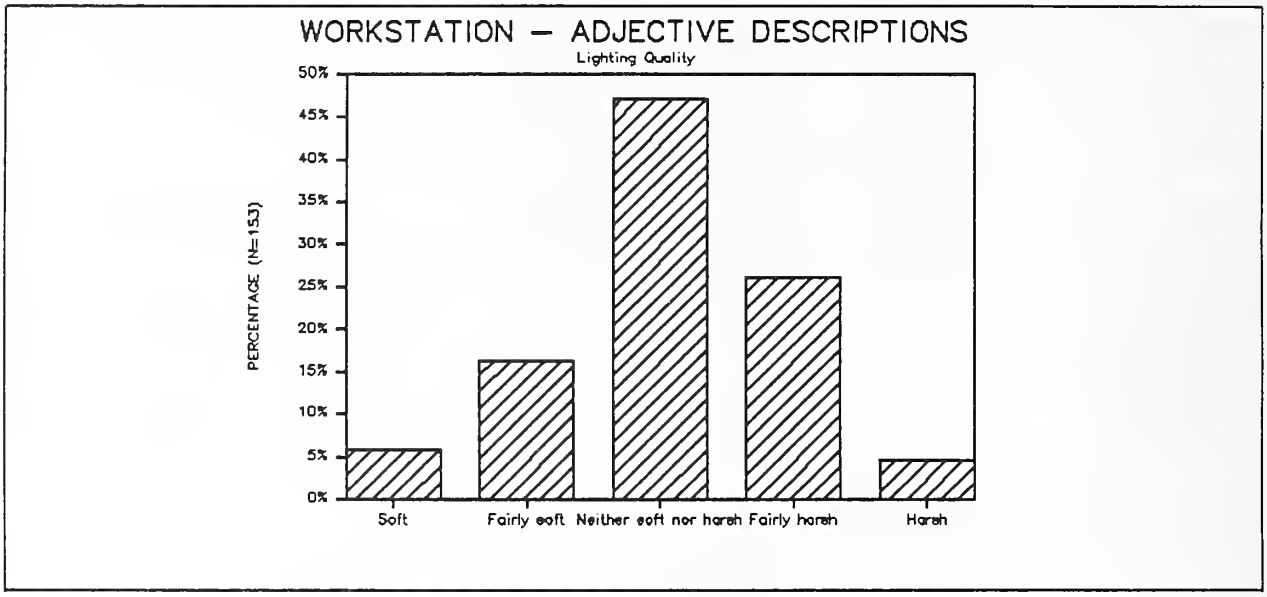


Figure 1.14 Adjective pairs (Light appearance - Bright/Dim)

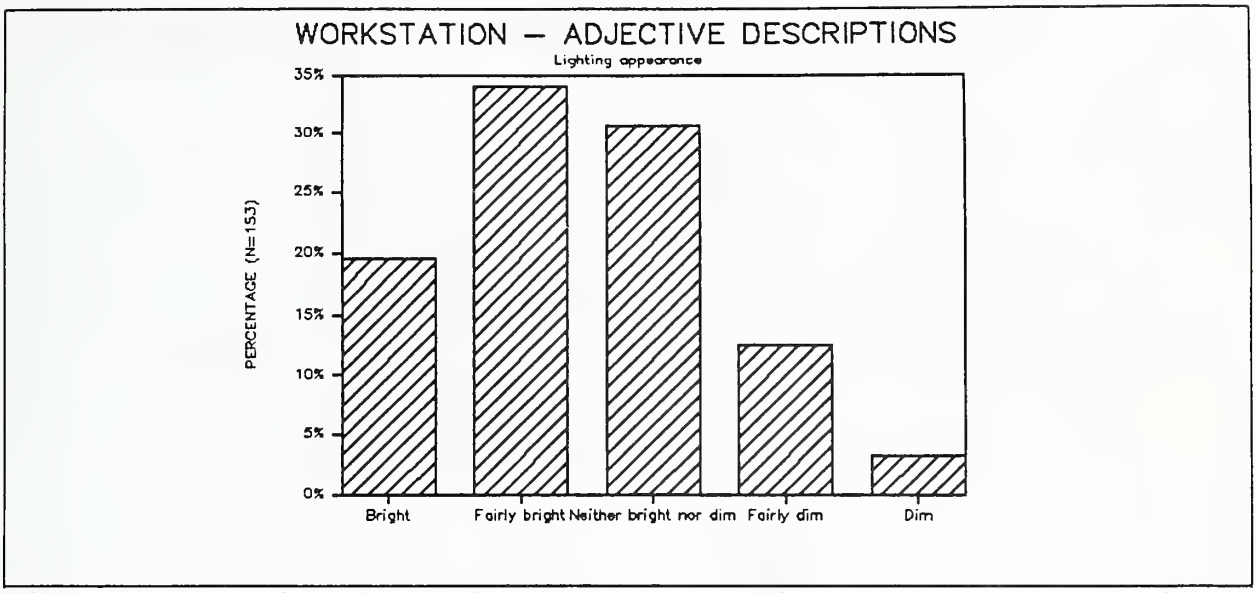
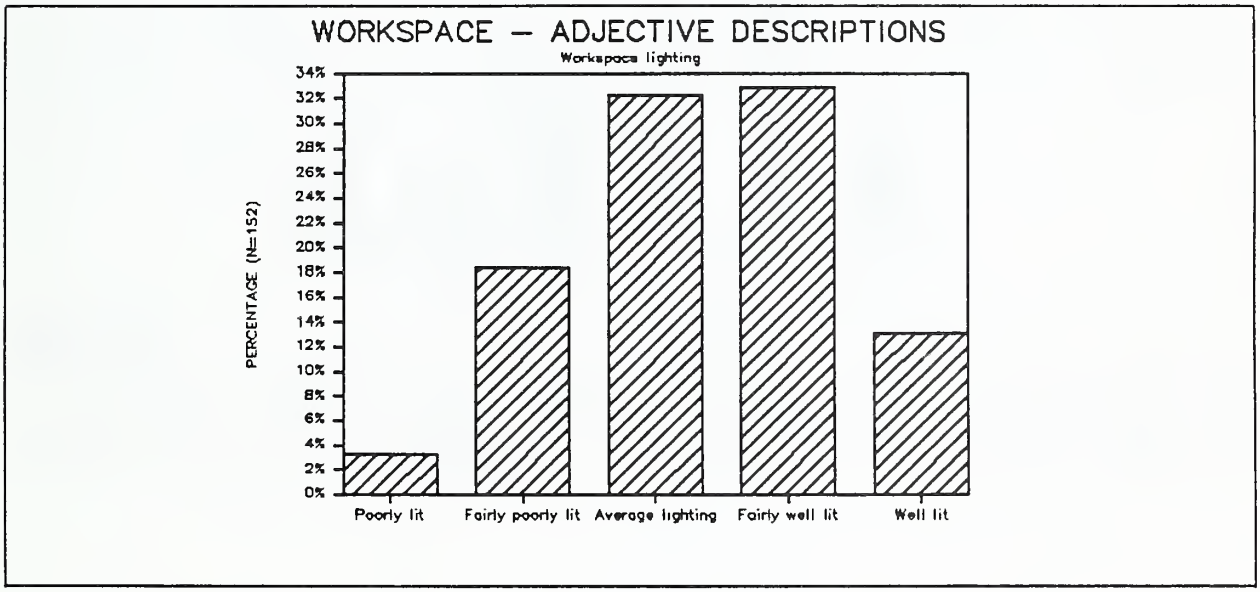


Figure 1.15 Adjective pairs (Workspace light - Poorly/Well lit)



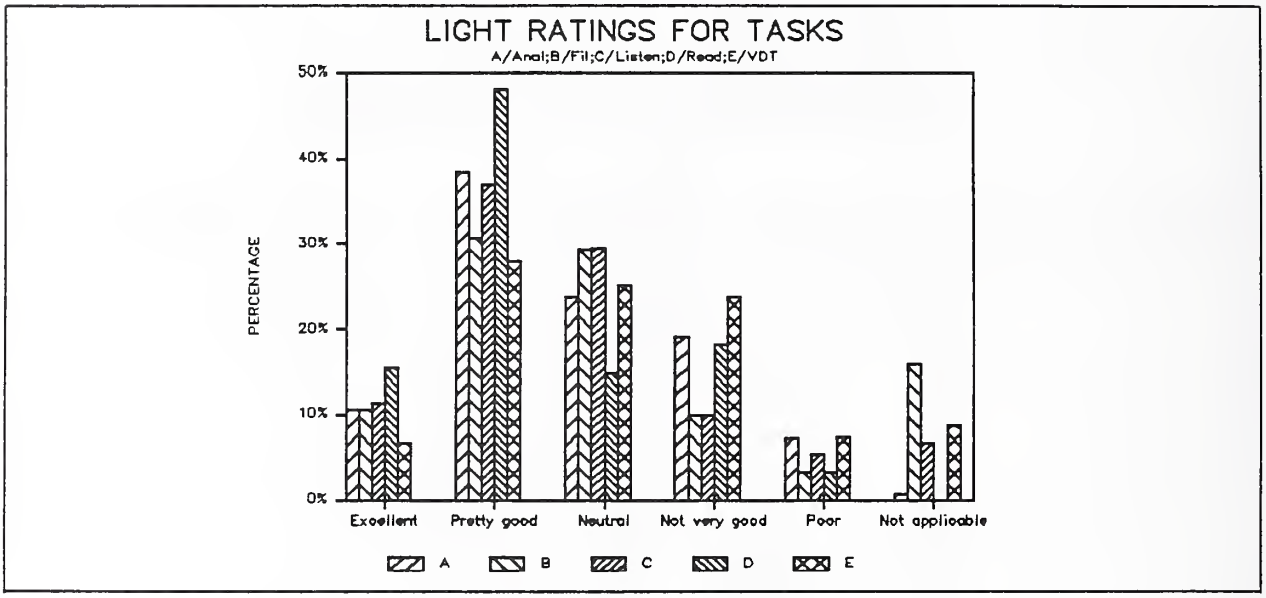
Since our objective is to determine the effect of design features on the ability to perform activities, we then asked workers to rate their lighting in terms of performing various office tasks. The scale was the same as that used in the previous item. (1-excellent, 2-pretty good, 3-neutral, 4-not very good, 5-poor.)

Table 1.12 Lighting for tasks

Code	No	Mean	SD	Symbol Code
LTANALYS	151	2.74	1.16	A
LTFILE	150	2.58	1.04	B
LTLISTEN	149	2.79	1.32	C
LTREAD	154	2.45	1.06	D
LTVDT	147	2.95	1.12	E

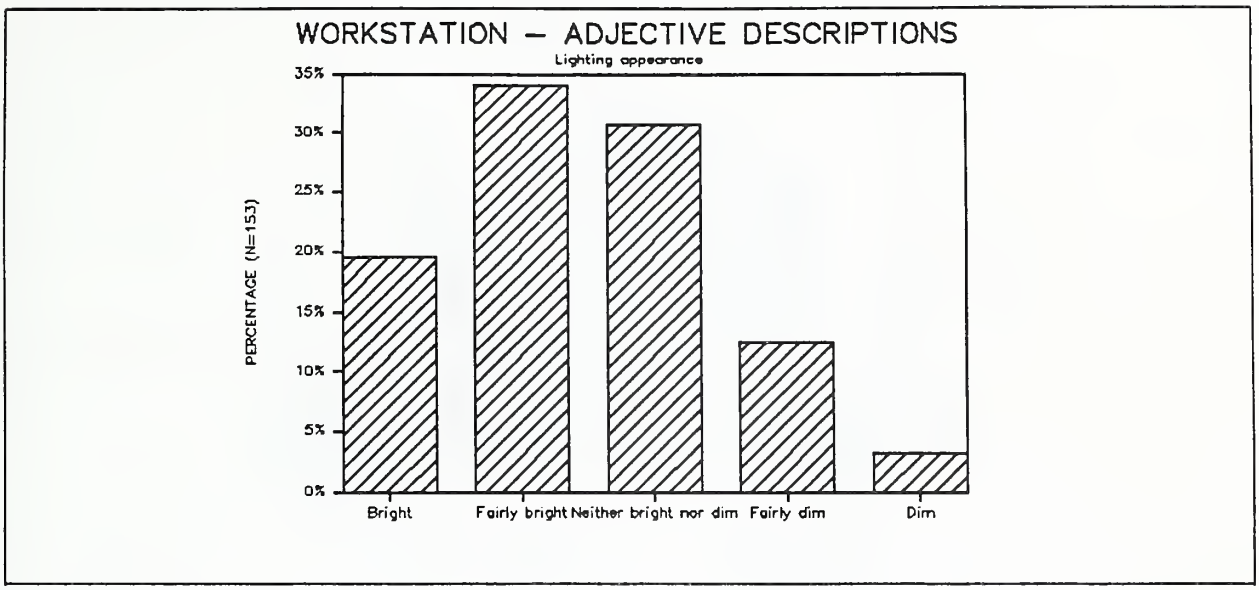
Figure 1.16 provides additional information on these responses.

Figure 1.16 Light rating for tasks



Another item addressed the amount of light available; brightness and dimness on a 5 point scale (WSBRT). The average finding for 154 responses was 3.15, SD of .62, indicating close to an average response of 'just about right'for brightness. See figure 1.17.

Figure 1.17 Adjective pair (Appearance - Bright/Dim)

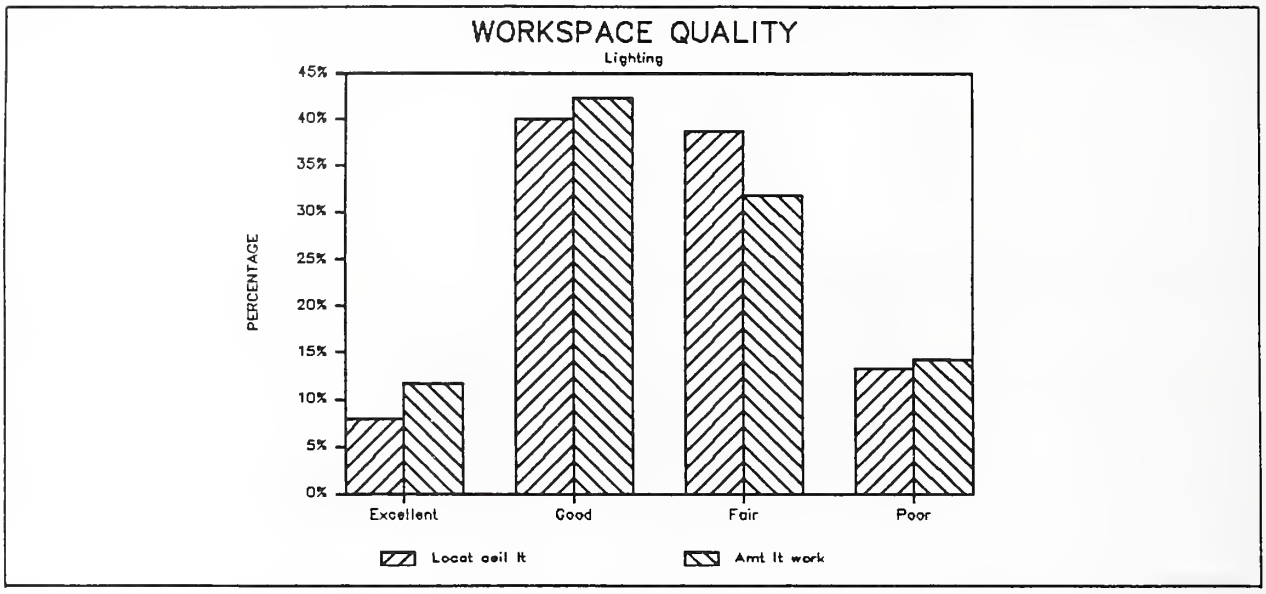


Two additional items dealt with general lighting questions. The first was the location of the ceiling light (LOCCLNLT) and the other was the amount of light for work (AMTLTWRK). Both questions employed a 4-point scale, (1-excellent, 2-good, 3-fair, 4-poor). Figure 1.18 provides additional data.

Table 1.13 Lighting factors

Code	No	Mean	SD
LOCCLNLT	150	2.57	.82
AMTLTWRK	154	2.48	.88

Figure 1.18 Workspace quality - lighting



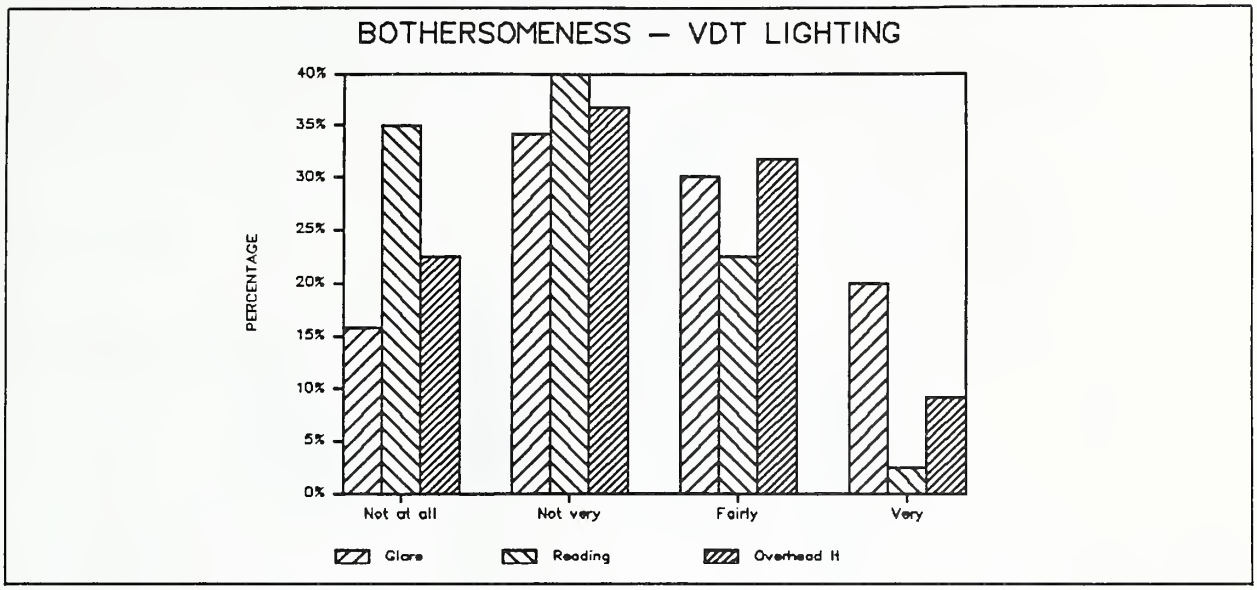
Since VDT's are proliferating in office environments, emphasis was focused on problems often associated with them. With respect to lighting, respondents were asked to rate the 'bothersomeness' of several features. A 4-point scale was used for evaluation. (1-not at all, 2-not very, 3-fairly, 4-very).

Table 1.14 Bothersomeness of VDT lighting

Code	No	Mean	SD
VDTGLARE	120	2.54	.98
VDTREAD	120	1.93	.82
VDTBRTOV	120	2.28	.91

With an average of 2.5 as the estimated neutral point, the averages for lighting conditions indicated acceptable conditions. However, as seen in figure 1.19, glare from the ceiling lights was a possible source of concern.

Figure 1.19 Bothersomeness - VDT lighting

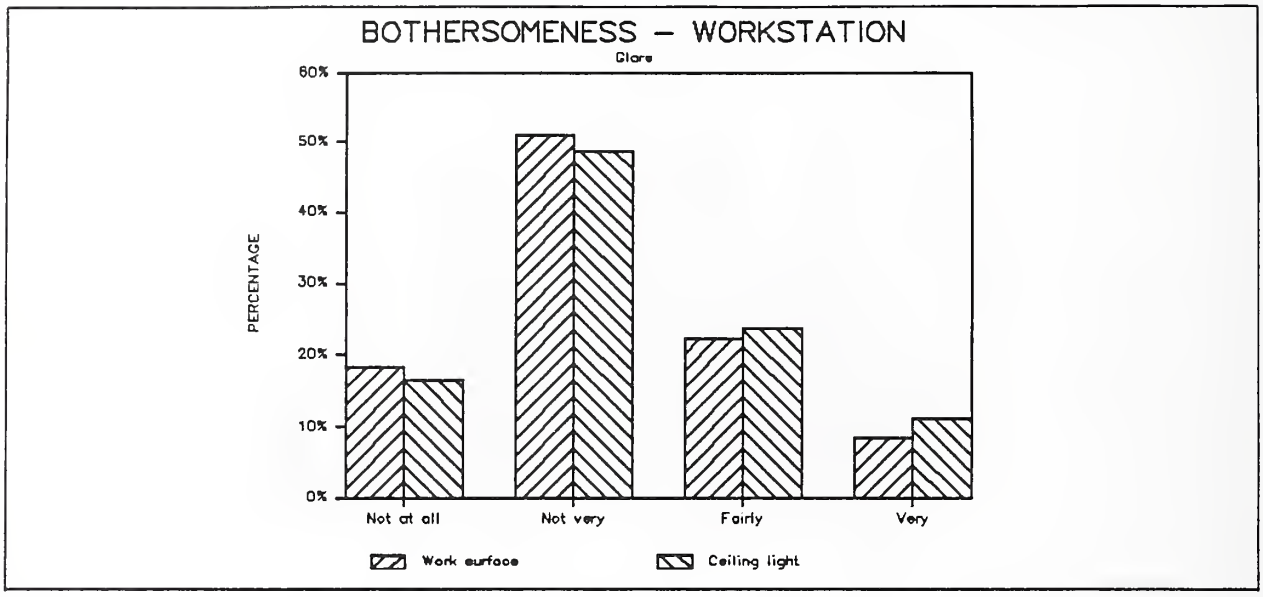


Since glare is a widespread problem in offices with VDT's, additional questions were asked about it. Glare from work surfaces (GLRWKSF) and from the ceiling light (GLRCLNLT) were rated as to their 'bothersomeness', on a 4-point scale (1-not at all, 2-not very, 3-fairly, 4-very). From figure 1.20, it is apparent that more than 30% of the responses were 'fairly' or 'very' bothersome. The comment data further supports this concern.

Table 1.15 Glare

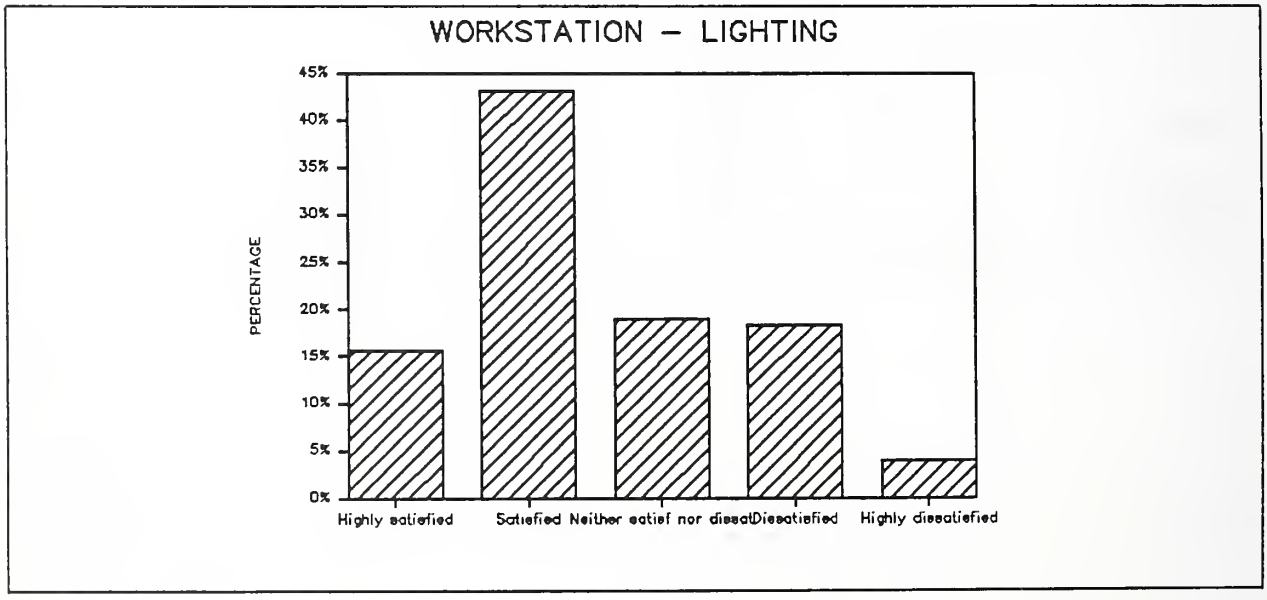
Code	No	Mean	SD
GLRWKSF	152	2.30	.87
GLRCLNLT	153	2.21	.84

Figure 1.20 Bothersomeness - Workstation glare



A summary question was also asked concerning how satisfied the occupant was with workspace lighting (WSLITSAT), using a 5-point scale. (1-very, 2-fairly, 3-neutral, 4-not very, 5-not at all) The average rating was 2.55, SD was 1.13, indicating reasonable satisfaction overall. Additional findings appear in figure 1.21.

Figure 1.21 Workstation lighting satisfaction



Respondents were finally asked to indicate any lighting changes that they would like to make at their workstations. The following list of suggestions summarizes their responses, in order of frequency ( ). The desire for task lights predominated, while improved quality of ambient lighting received considerable attention. (Few task lights were present while the survey was conducted.)

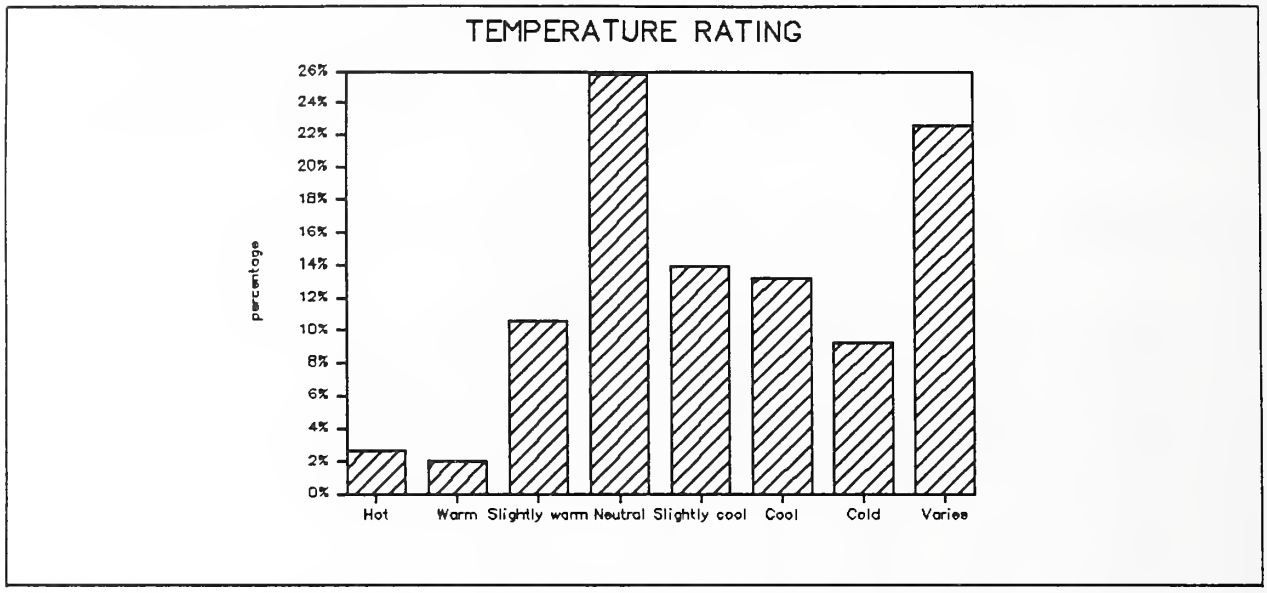
a. Lighting suggestions (Numbers in ( ) indicate response frequency)

- Task light - adjustable (26)
- Better placement of overhead lights (10)
- Remove fluorescents (4)
- Too much glare on VDT (4)
- More uniform lighting (3)
- Better light maintenance (3)
- Eliminate glare (3)
- More natural light (3)
- Brighter (3)
- Better task light (3)
- Lights needed under all cabinets (2)
- More light fixtures (2)
- Softer lighting (2)
- More indirect lighting (1)
- Full spectrum lights (1)
- Better for VDT work (1)
- Better lighting in stacks (1)
- Blinds (1)

1.3.5.2 Thermal comfort and air quality

Temperature regulation was a major problem for many respondents, who indicated it was too hot or too cold, depending on the season. The comment data suggests that this was a major shortcoming in the 'old' Portland facility. The mean rating for this item (THERMRAT) of 3.56 on a 7-point scale ranging from 'hot' to 'cold' is not indicative of the findings, the SD of 2.30 describes the wide variability among responses. The most telling response for this item was the volunteered comments made by 34 of the respondents that temperature variability was a major problem. Also, 25% of the respondents indicated that they were 'cool' or 'cold'. Recall that these ratings were taken in May, but the question was a general one - concerned with all seasons. Detailed findings appear in Figure 1.22.

Figure 1.22 Temperature rating



Adjective pairs (hot-cool) were also used to evaluate thermal comfort conditons. The following table and figures 1.23 and 1.24 present these findings.

Table 1.16 Thermal comfort conditions

Code	No	Mean	SD
WSTEMP	133	2.84	1.07
HUMID	152	3.13	.89

Figure 1.23 Adjective pairs (Temperature sensation - Hot/Cool)

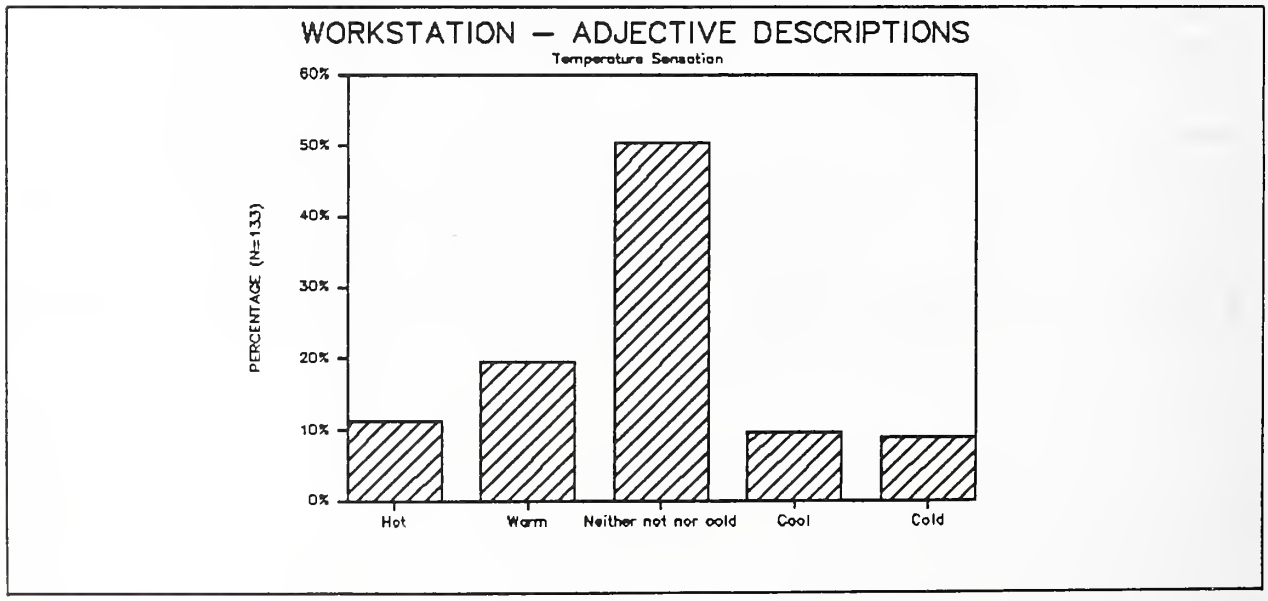
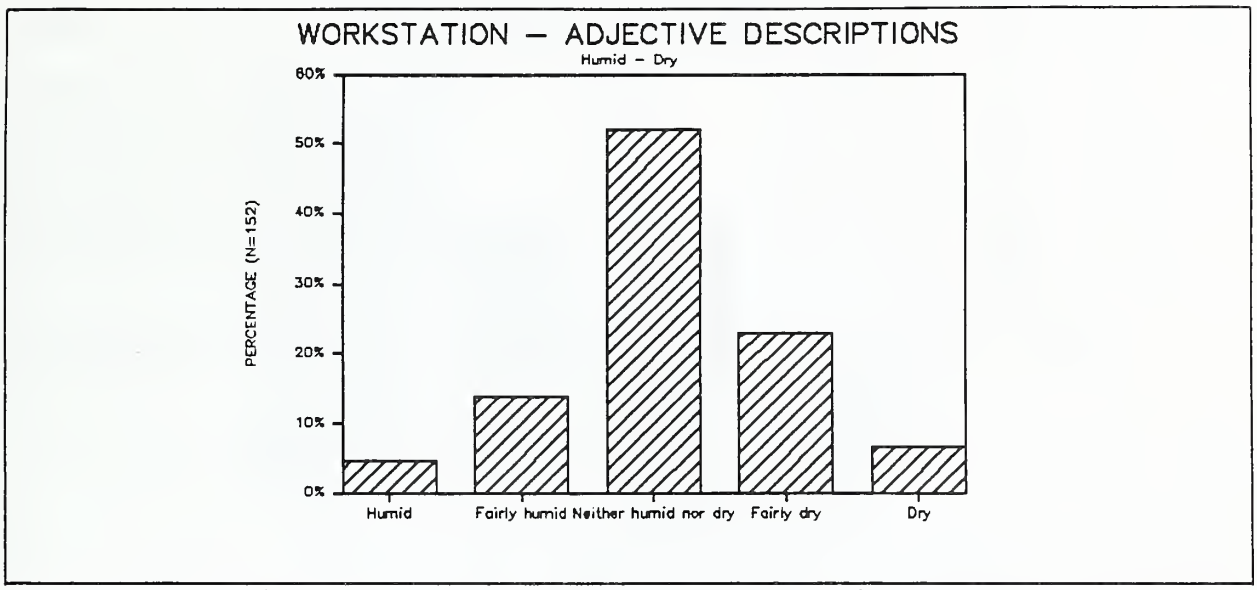
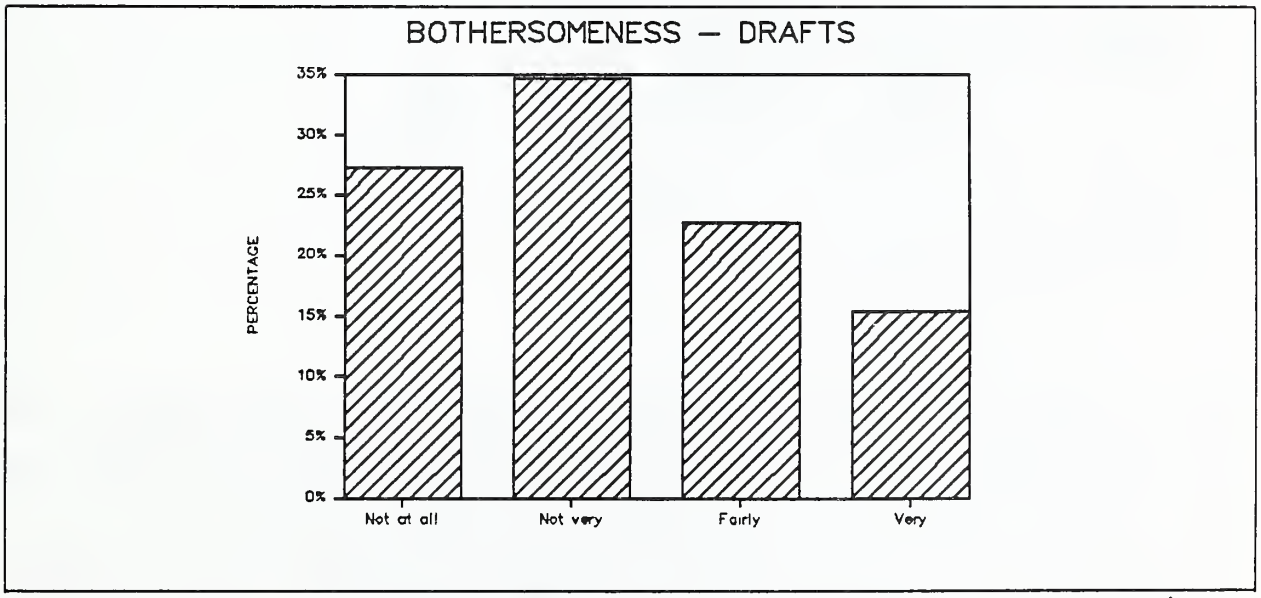


Figure 1.24 Adjective pairs (Humid-Dry



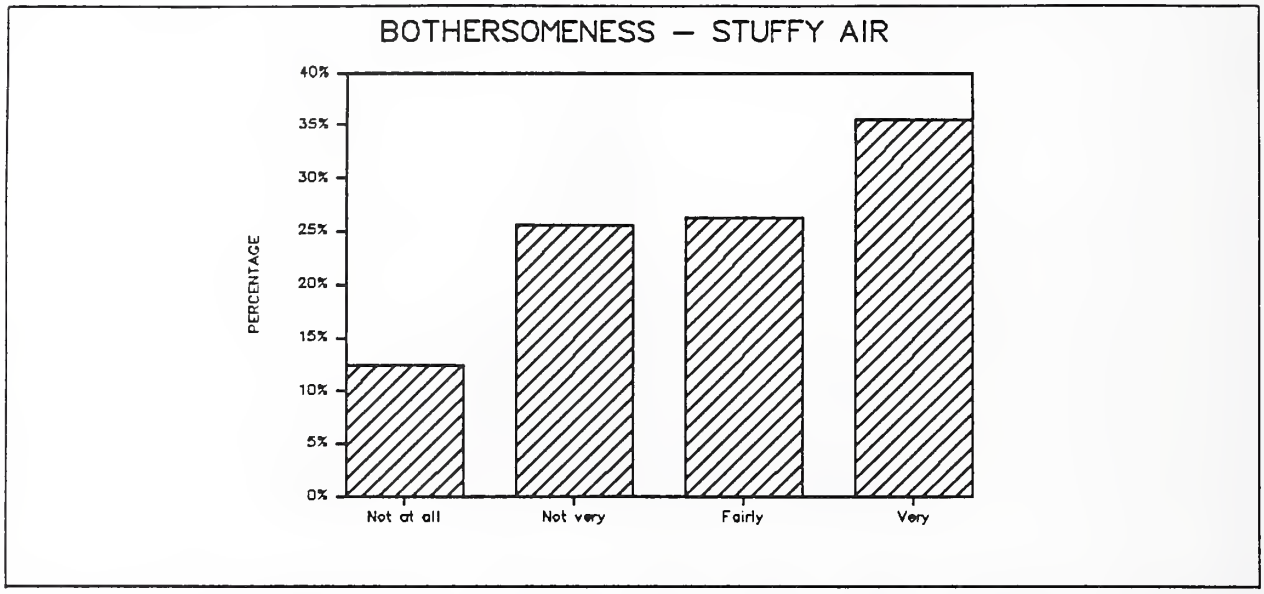
Another question that dealt with thermal environmental conditions was concerned with DRAFTS, rated as to their 'bothersomeness', on a 4-point scale (1-not at all, 2-not very, 3-fairly, 4-very). The average score was 2.26, SD 1.02, N= 150, indicating not much of a problem. See figure 1.25.

Figure 1.25 Bothersomeness - Drafts



On the other hand when the same scale was used to evaluate air stuffyness, (STUFYAIR), the average response was 2.85, SD 1.04, N=152. This finding together with the following comments about desired changes and interview data, indicated a considerable air quality problem. Figure 1.26 provides more detailed findings.

Figure 1.26 Bothersomeness - Stuffy air



When asked about the 4 changes to made to improve the environment, it was evident that improved temperature control and air quality were very prominent. (The prior temperature data did not indicate this to be a major problem.) A summary of the major problems and environmental needs of the building identified are indicated below, with the number of responses cited ( ):

a. Temperature control
 - Better climate control (39)
 - Too hot/too cold (17)

b. Indoor Air Quality

 - Stuffy air (28)
 - Bad air circulation (3)
 - Air quality bad (3)

1.3.5.3 Acoustics/privacy

The acoustic environment has been a major cause for complaint for office workers, especially those in open offices. The major problems have been noise intrusions from equipment and people and the lack of auditory privacy for those engaged in confidential discussions, especially supervisory personnel. Noise was addressed from several perspectives in the present study. First, respondents were asked to rate the 'bothersomeness' of a variety of noises on a 4-point scale, ranging from 'not at all' to 'very'. Scores of more than 2.5 are considered indicative of a problem. Table 1.17 summarizes these findings.

Table 1.17 Bothersomeness of office noises

Code	Total	Average	SD	Fig Code
TELERING(telephone ring)	154	3.08	.78	Tel
PEPLTALK(people talking)	154	2.97	.75	Talk
NOISEHAL(hallway noise)	152	2.29	.83	Hall
PEPLWALK(people walking)	154	2.35	.76	Walk
NOISEPRT(printer noise)	154	2.51	.92	Print
NOISEEQP(equipment noise)	154	2.44	.84	Equip
NOISEVNT(ventilation noise)	152	1.95	.81	Vent

Figures 1.27 and 1.28 summarize the distribution of these responses.

Figure 1.27 Bothersomeness - Noise

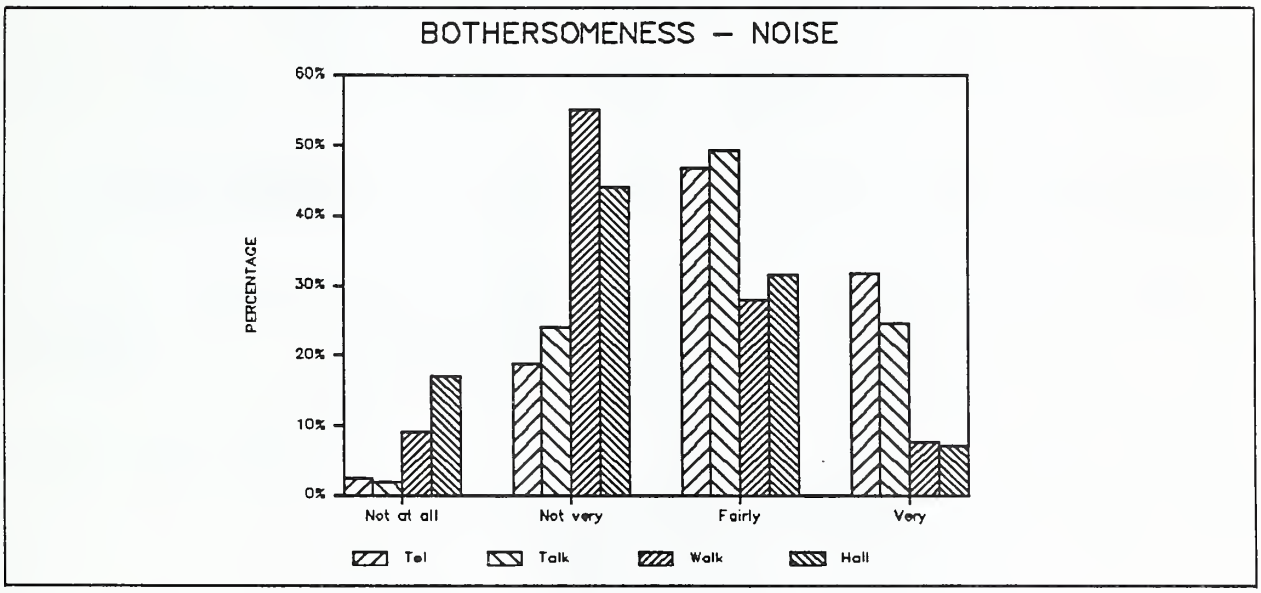
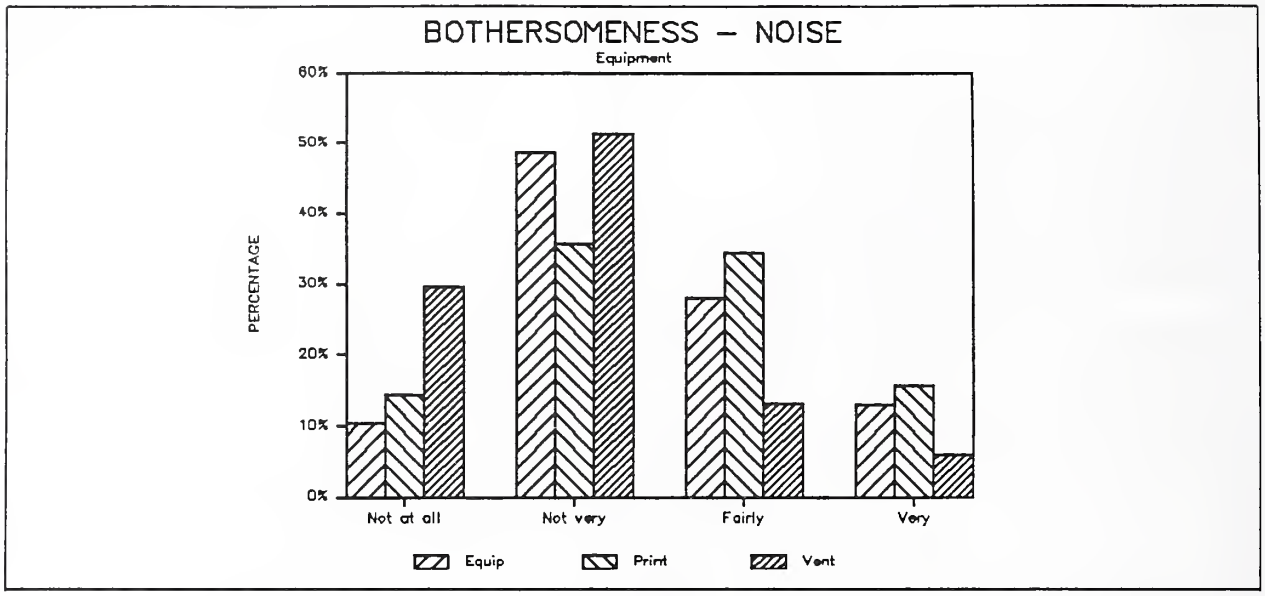
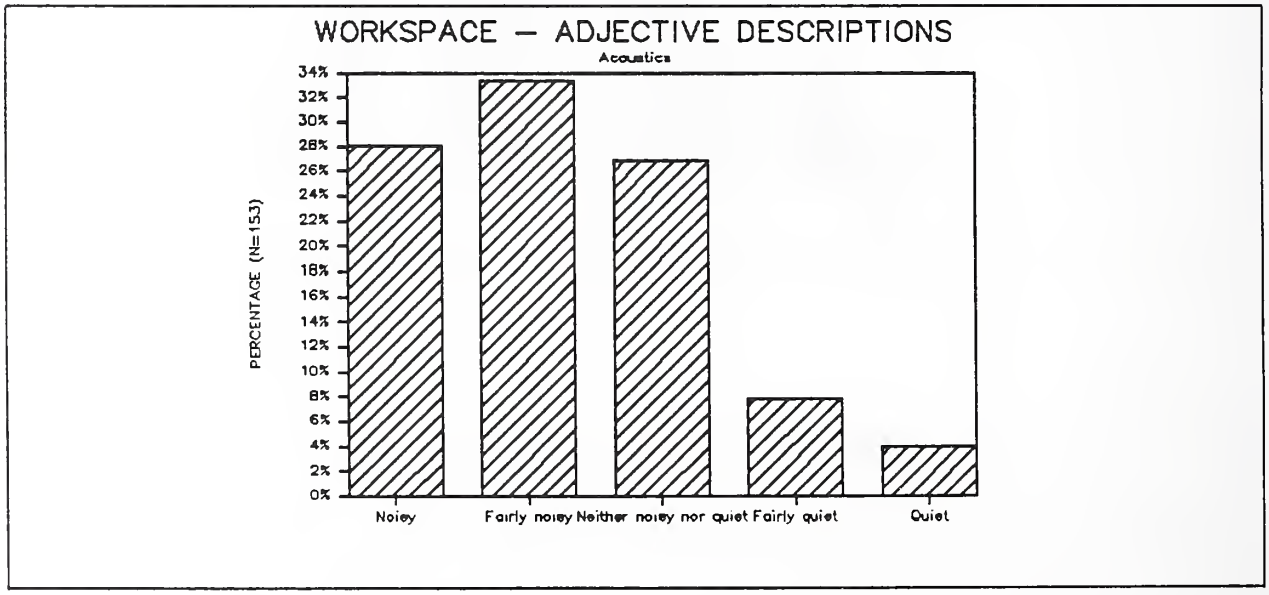


Figure 1.28 Bothersomeness - Equipment noise



An adjective pair evaluation of noise was also conducted, the average was 2.26, SD 1.07, N=153. Figure 1.29 details these responses.

Figure 1.29 - Workspace adjective pairs (Noisy/Quiet)



The most disturbing sounds were those made by ringing telephones and people talking nearby. All of the sounds except that produced by the ventilating system exceeded 2 on the 5 point rating scale. Furthermore, when asked what changes would improve the work environment, 61 respondents mentioned noise as the major problem to be dealt with.

Among specific problems cited were:

- Phones ring often
- Traffic patterns are disruptive
- Equipment noise
- Conversations are bothersome
- Cafeteria is noisy

1.3.5.4 Privacy

Two items directly addressed the issue of privacy. The first (CONVERS) asked to respond to the truth of the statement "When I talk to co-workers), others can hear us" on a 4-point scale ranging from 'very true' (1) to 'not at all true' (4). The average of 1.27 suggests widespread agreement with the statement. The next ratings were for conversational privacy (CONVPRIV) and visual privacy (VISPRIV) on a 4-point scale ranging from 'excellent' (1) to 'poor' (4). The average of 3.68 was quite consistent with the previous finding. The interview data supports these results, showing noise to be a major distraction for many of the workers questioned. Also see figures 1.30, 1.31.

Table 1.18 Privacy

Code	Total	Average	SD
CONVERS	154	1.27	.51
CONVPRIV	154	3.68	.65
VISPRIV	153	3.05	.92

Figure 1.30 Privacy - Conversational and Visual

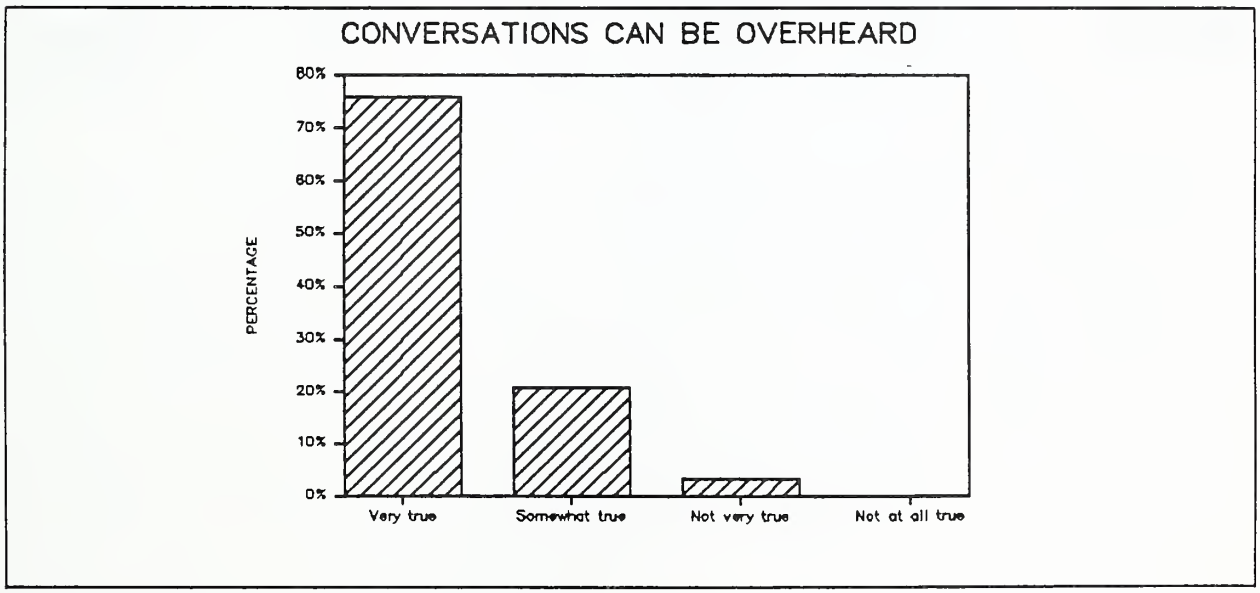
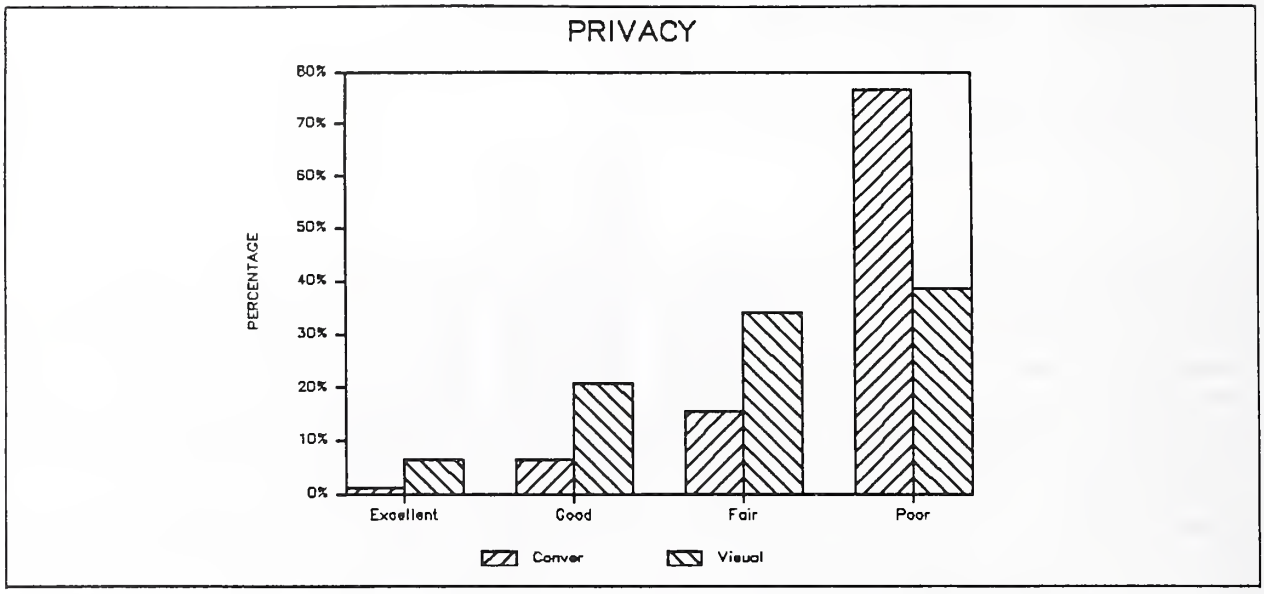


Figure 1.31 Privacy rating

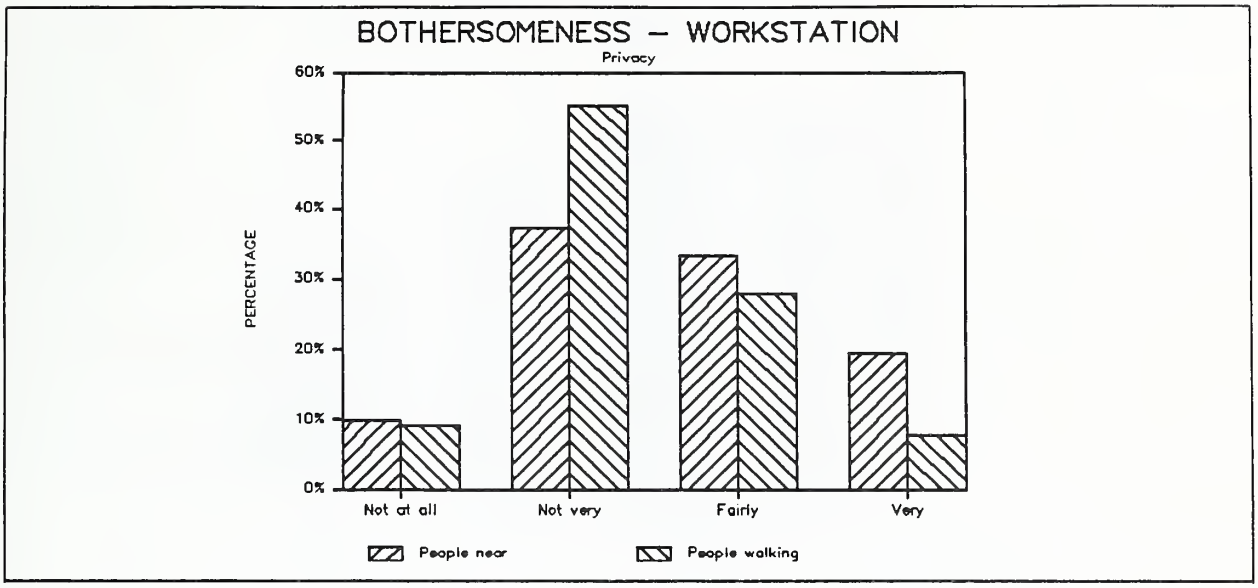


Another question which relates to privacy was an evaluation of people 'being too close' (PEPLCLOS) using a 4-point scale of 'bothersomeness' (1-not at all, 2-not very, 3-fairly, 4-very). A related problem for privacy as well as noise is that of people walking nearby (PEPLWALK). See figure 1.32 also.

Table 1.19 People nearby

Code	Total	Average	SD
PEPLCLOS	153	2.63	.91
PEPLWALK	154	2.35	.76

Figure 1.32 - Bothersomeness - Workstation privacy



1.3.6 Other design issues

The same 'bothersomeness' scale was used to evaluate other design features: the lack of a window (NOWINDOW), people being too far away (PEPLFAR). The findings for these responses appear below. See figures 1.33 and 1.34 also.

Table 1.19 Miscellaneous issues

Code	Total	Average	SD
NOWINDOW	144	2.28	1.09
PEPLFAR	154	1.63	.63

Figure 1.33 Bothersomeness - No window

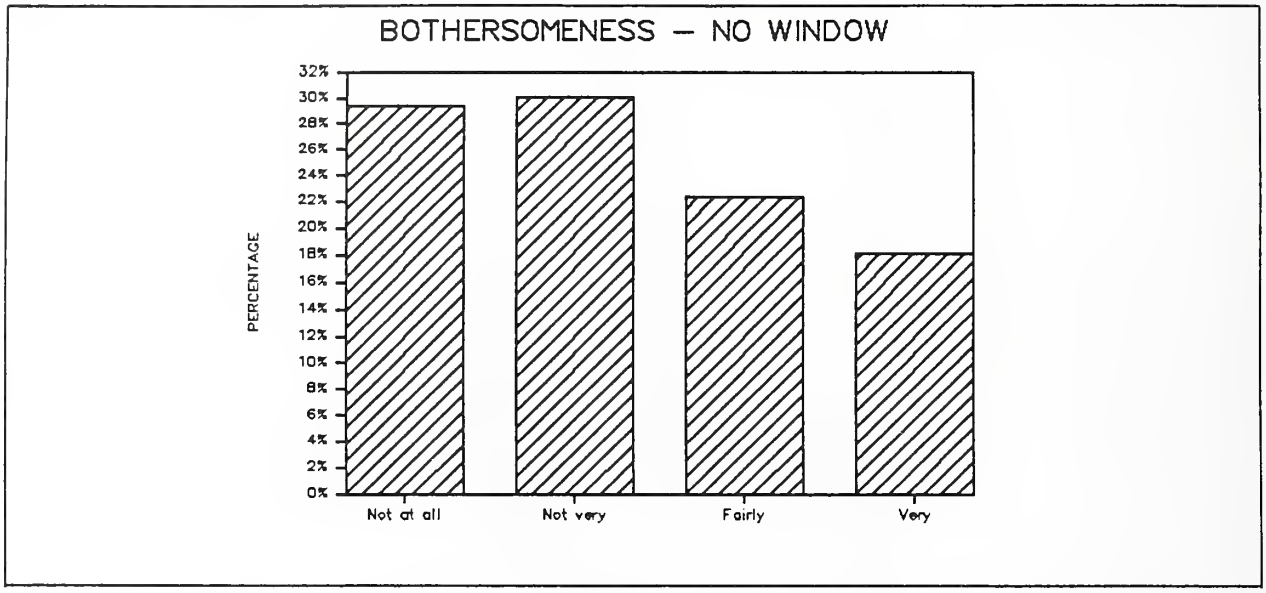
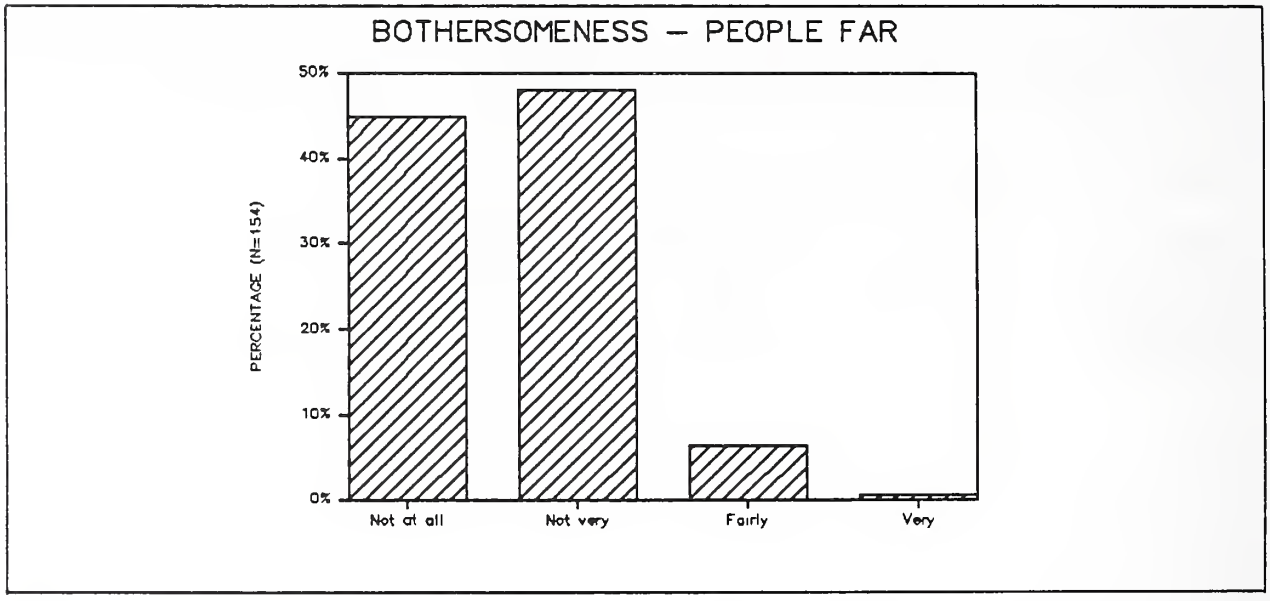


Figure 1.34 Bothersomeness - People far away



1.3.7 Equipment Usage

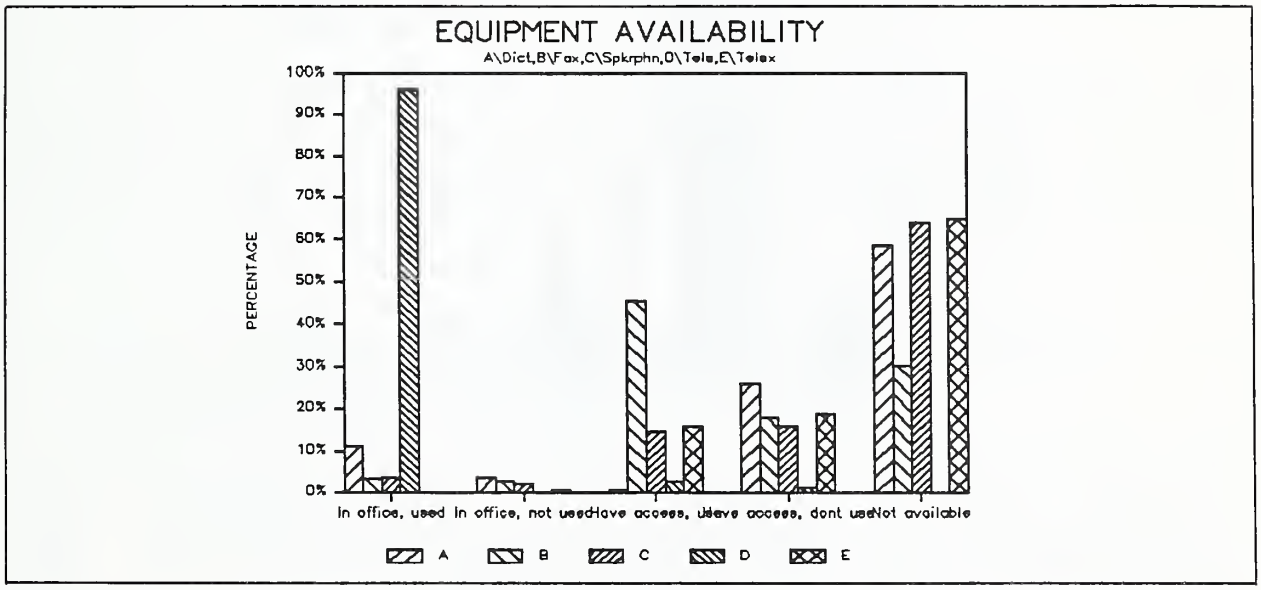
To determine the type of equipment employed by the respondents, they were asked about specific items. A 5-point scale was used. (1-located in office, used, 2-located in office, not used, 3-have access, use, 4-have access, dont use, 5-not available.)

Table 1.20. Equipment used

Device	Total	1	2	3	4	5	Figure Code
INTERCOM	140	15	1	3	7	114	A
FAX	145	5	4	66	26	44	B
SPKRPHON	144	5	3	21	23	92	C
TELEACC	152	144		6	2		D
TELEX	139	1	22	26	90		E
ANSWDEV	153	8	2	2	3	138	
VDTACC	151	72	10	38	17	14	
DICTAT	143	16	5	1	37	84	

Figure 1.35 summarizes equipment usage.

Fig 1.35 Equipment used at desk

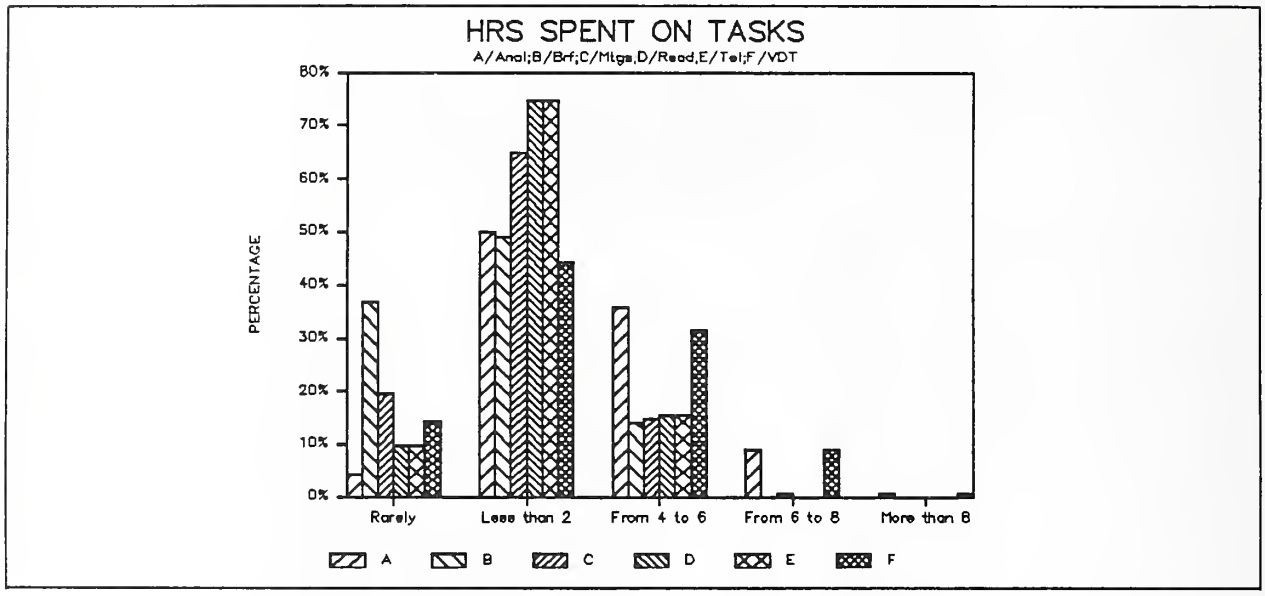


In order to gain an understanding of the tasks performed by staff members, they were asked to estimate the hours spent on various office tasks each day. (1-rarely, 2-less than 2, 3-2 to 4, 4-4 to 6, 5-6 to 8) The summary findings appear in table 1.21, while the distribution of times for each activity appears in figure 1.36. Considerable variability exists among these categores since a broad range of jobs were examined.

Table 1.21 Time spent on office tasks

Code	Total	Average	SD	Figure Code
HRSDYANL	142	2.50	.77	A
HRSDYBRF	106	1.74	.71	B
HRSDYMTG	128	1.94	.65	C
HRSDYRED	152	2.46	.56	D
HRSDYTEL	142	2.04	.53	E
HRSDYVDT	133	2.36	.88	F

Figure 1.36 Hours per day spent on office tasks



A further analysis concerned the percentage of time spent looking for information in files, by telephone, in reports/manuals, and in computer records. Table 1.22 indicates that the various media employed were used for similar time periods.

Table 1.22 Percentage of time spent searching for information

Code	Total	Average	SD
FILES%	140	22.59	22.48
TELE%	134	22.49	20.70
RPRT%	138	24.08	17.37
COMPUTE%	127	18.75	20.69

The next analysis dealt with the types of material read in the office; the percentage of time spent on: (internal mail - same location (INMAIL1%), internal mail - same company (INMAIL2%), external mail - (EXMAIL%), company documents - (CODCMNT%), files/reports - (FILESRD%), and computerized information (COMPINF%)

Table 1.23 Material read in office (Percentage)

Code	Total	Average	SD
INMAIL1%	145	19.08	18.35
INMAIL2%	136	15.18	15.32
EXMAIL%	141	15.56	15.92
CODCMNT%	138	14.55	15.19
FILESRD%	143	18.73	14.88
COMPINF%	140	16.56	19.60

Although the averages for the previous two tables indicate a rather balanced usage of information and material, the high standard deviations point to the considerable variability evident among the respondents. Evidently, usage is largely dependent upon the types of tasks being performed, and the position within the organization. This is not a surprising finding.

The following questions were about the jobs being performed. The purpose was to identify job features that might impact productivity directly or indirectly. For each one the respondent was to indicate how true it is for their job. (1-very, 2-somewhat, 3-not very, 4-not at all) For the items indicated by "#", a low score (below 2), would indicate a problem.

a. I have the equipment needed for my job. (NEEDEQP)
b. My job requires remaining in place all day. (NOCANMOV)
c. My job requires great concentration. (JOBCON)
d. I need more time on a terminal. (NEDVDTTM)
e. My job requires speed and accuracy. (JOBSPEED)

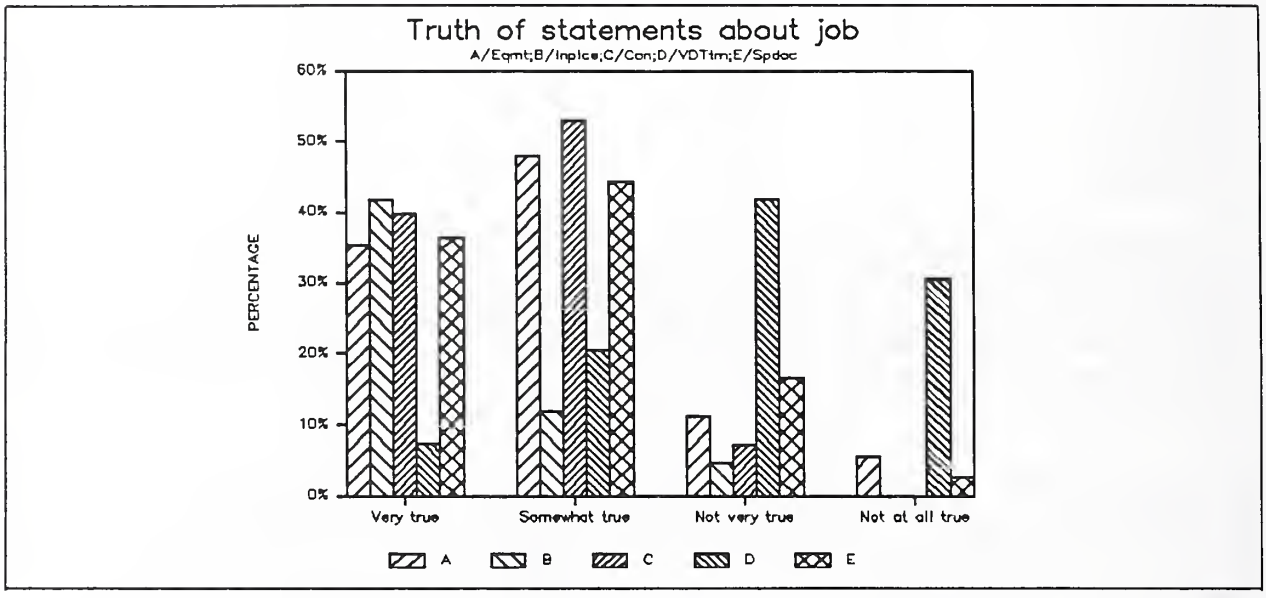
Table 1.24 Job features

Code	Total	Average	SD	Figure Code
NEEDEQP	151	1.84	.86	A
NOCANMOV#	153	2.59	.82	B
JOBCON	153	1.67	.60	C
NEDVDTTM#	151	2.95	.89	D
JOBSPEED	151	1.85	.78	E

The finding meriting attention is the 1.67 average for the need to concentrate in performing tasks. This is indicative of susceptibility to noise distractions found in the results. The

other responses do not identify problem areas. A further breakdown of these responses is presented in figure 1.37.

Figure 1.37 Job requirements



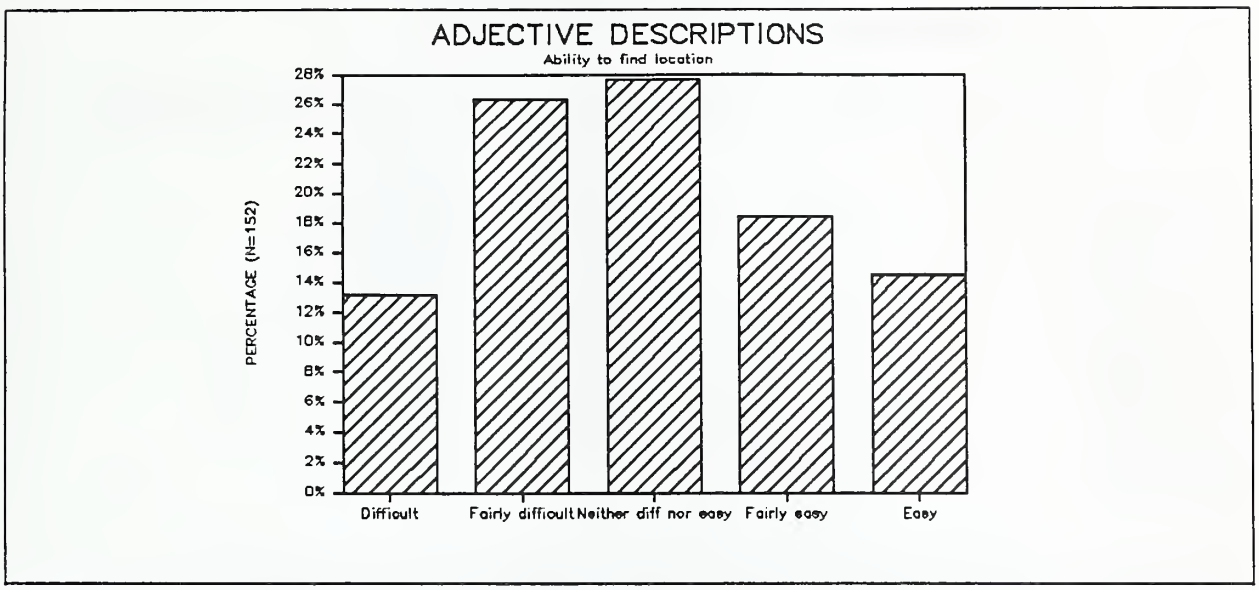
1.3.8 Interaction with co-workers

The following questions were directed toward the ease of interacting with co-workers. The ratings were based upon a 4-point scale (1-excellent, 2-good, 3- fair, 4-poor). The ability to find office locations was further explored in a paired adjective scale (FINDWAY2). Responses to this item are summarized in figure 1.38. Both items dealing with this issue demonstrated that many people thought that direction finding was a major problem. Comment data supported these results also.

Table 1.26 Worker interaction

Code	Total	Average	SD
COWORKER	154	2.18*	.74
FINDWAY	152	2.95*	1.24

Figure 1.38 Adjective pairs (Ability to find locations - Difficult/Easy)



Three other questions were directed toward worker interaction. They were:

1. What percentage of time do you spend with visitors at your workstation (VISTOR%)? The average was 17.9, SD 16.31, N=149.

2. How many meetings do you attend monthly (MEETINGS)? The average here was 9.2, SD 16.44, N=106.

3. What percentage of time do you spend in personal contact with others; staff, visitors (PSNLCON%)? The average response was 35.27, SD 25.32, N=145.

These data indicate that a considerable amount of time is spent communicating directly with others and points to the need for adequate facilities to accommodate these activities.

1.3.9 The VDT work environment

Since the VDT is gaining such prominence in the automated office and is likely to have a substantial effect on productivity, its features were examined in some detail. The issues examined were the characteristics of the VDT screen (a), the positioning and adjustability of the keyboard and screen (b) and the furniture used to accommodate the system (c). The only feature averaging more than 2.5, the rating midpoint, was the chair. These findings suggest that the VDT features and its supporting furnishings did not constitute a serious problem for the respondents.

The next table summarizes "bothersomeness" of VDT conditions on a 4-point scale (1-not at all, 2-not very, 3-fairly, 4-very)

Table 1.25 Bothersomeness of VDT conditions

Code	Total	Average	SD	Figure Codes 1	2	3
VDTDSTSC	120	1.72	.78	A		
VDTADJSC	118	1.93	.98	B		
VDTANGSC	119	1.94	.90	C		
VDTDSTKB	119	1.64	.79	D		
VDTANGKB	117	1.74	.81	E		
VDTFLICK	120	1.97	1.07		A	
VDTLTRSZ	119	1.79	.77		B	
VDTBRTSC	117	1.80	.84		C	
VDTCHAR	119	1.98	.86		D	
VDTDSKHT	120	1.93	.95			A
VDTSEAT	117	2.22	1.06			B

Figures 1.39-1.41 summarize the 'bothersomeness' of VDT conditions according to features identified. None of the average scores indicated problems.

Figure 1.39 Bothersomeness of VDT - Locations of VDT hardware (1)

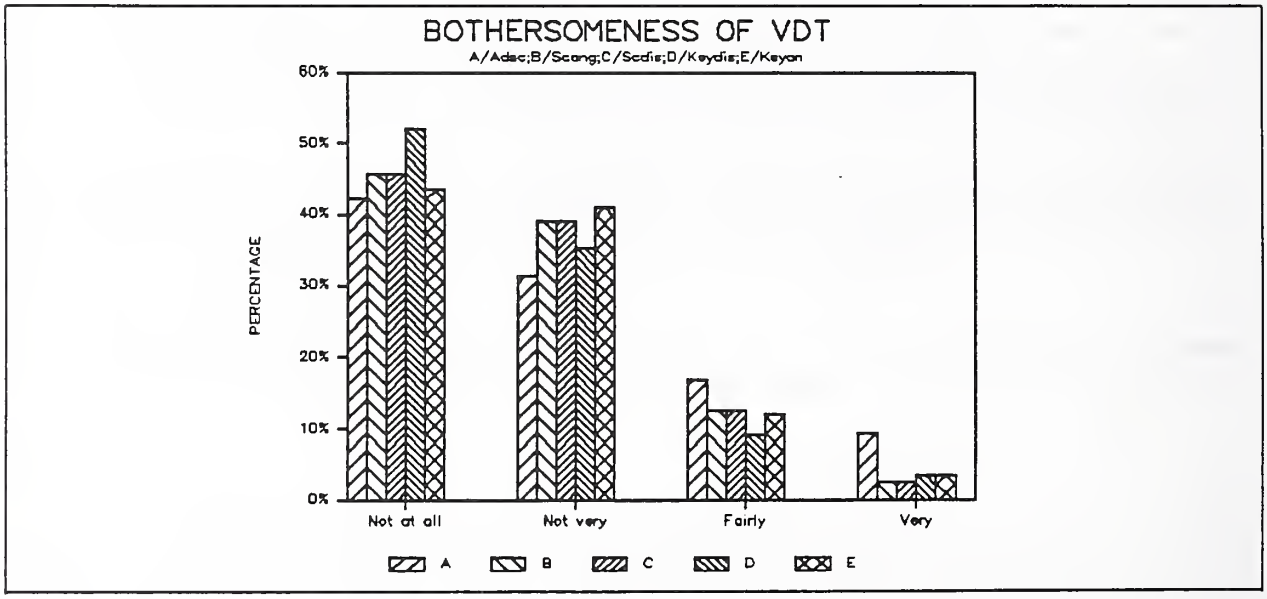


Figure 1.40 Bothersomeness of VDT - VDT characters and screen (2)

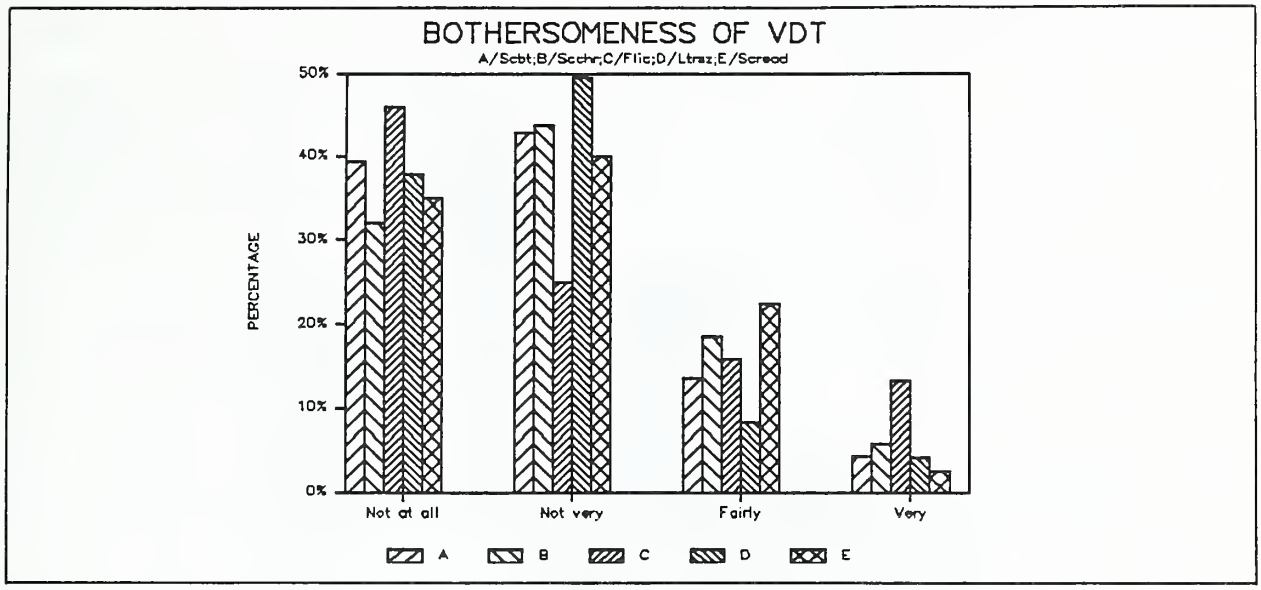
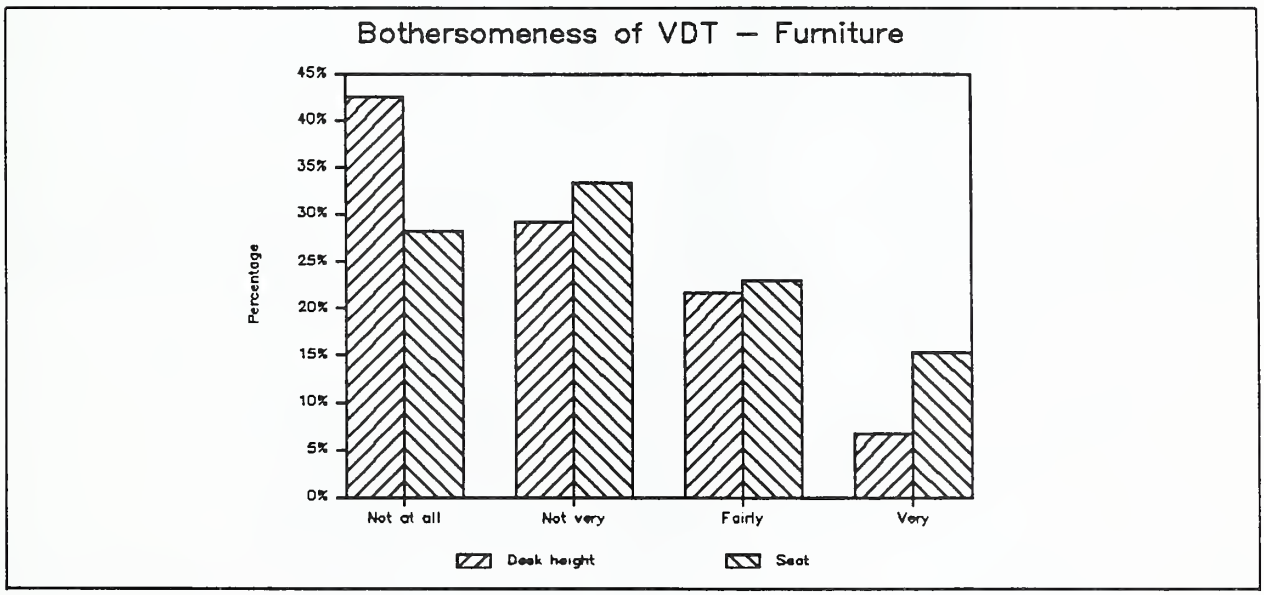


Figure 1.41 Bothersomeness of VDT - Desk and chair



The next items were assessments of wall color (WALLCOLR) and general workstation satisfaction (WSSAT). The findings, especially those in figure 1.42 and 1.43, indicate these to be problem areas.

Table 1.27

Code	Total	Average	SD
WALLCOLR	151	2.83*	.87
WSSAT	154	3.0*	1.16

Figure 1.42 Wall color ratings

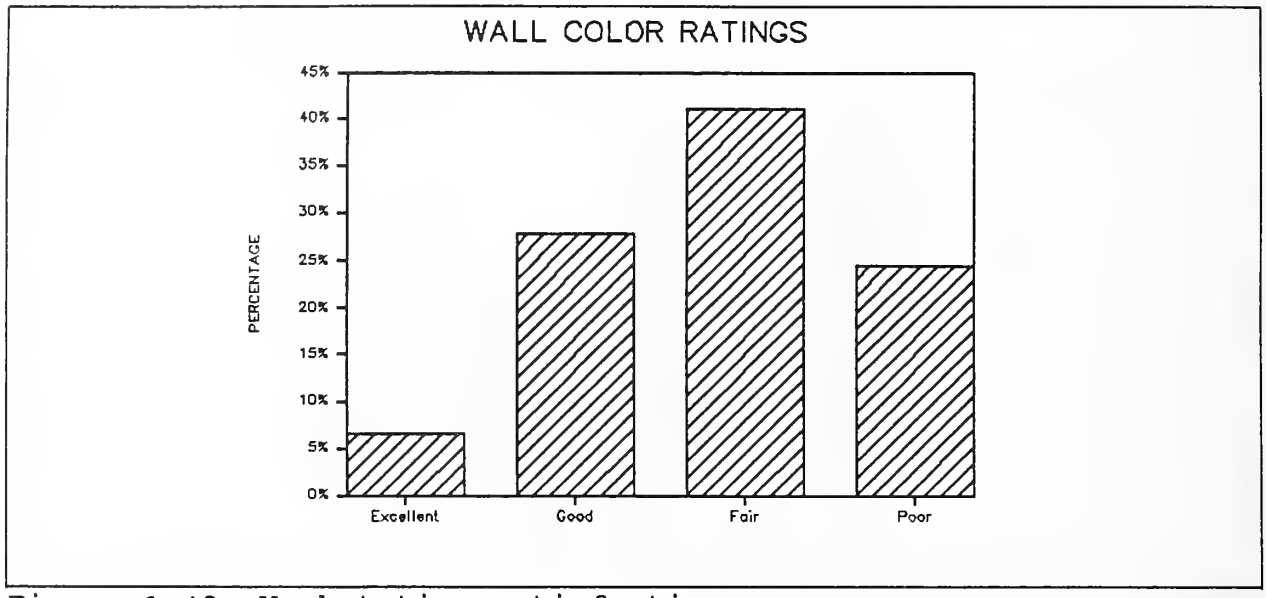
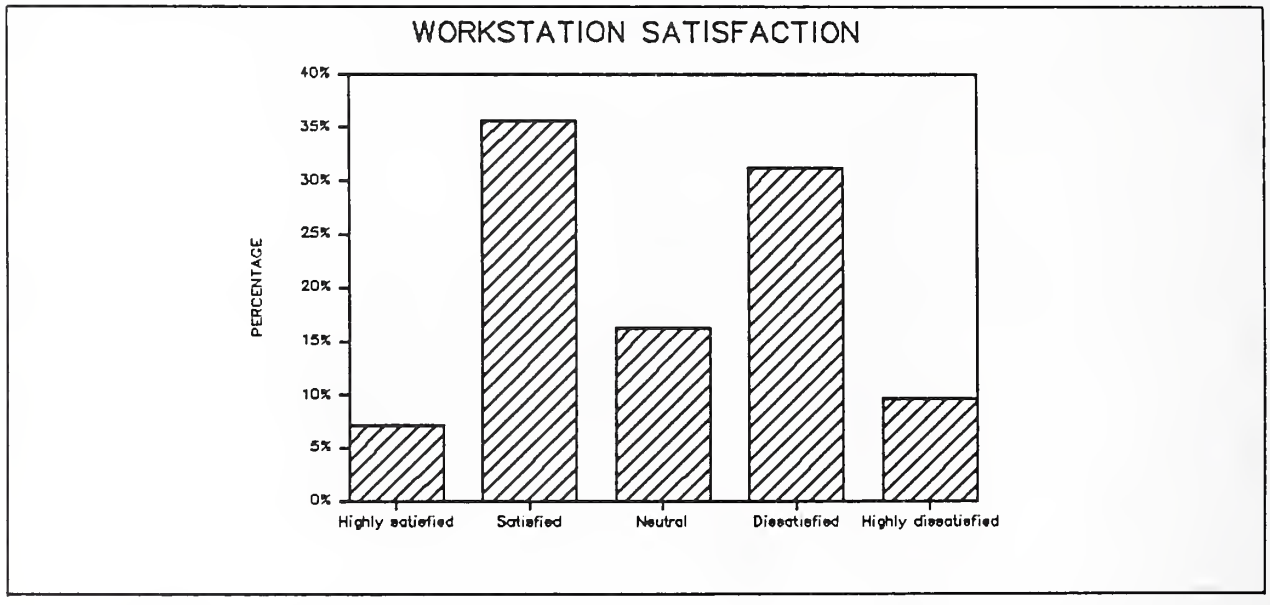


Figure 1.43 Workstation satisfaction



1.3.10 Amount of space

Overall space ratings were evaluated using a 4-point scale (1-excellent, 2-good, 3-fair, 4-poor). With an estimated score of 2.5 being neutral, all space ratings were quite negative. However, storage space received the least favorable rating. The perceived spaciousness of the work space was also assessed using an adjective pair scale (WSSPAC). These findings also support the idea that people felt confined at their workstations. See figures 1.44 and 1.45.

Table 1.28 Space availability

Code	Total	Average	SD
PSNLSPAC(personal space)	151	2.75*	.87
STORAGE	153	3.01*	.88
WSSPCAMT(workstation space)	152	2.60*	1.03
WSSPAC(confined/spacious)	152	2.40	1.13

Figure 1.44 Space ratings

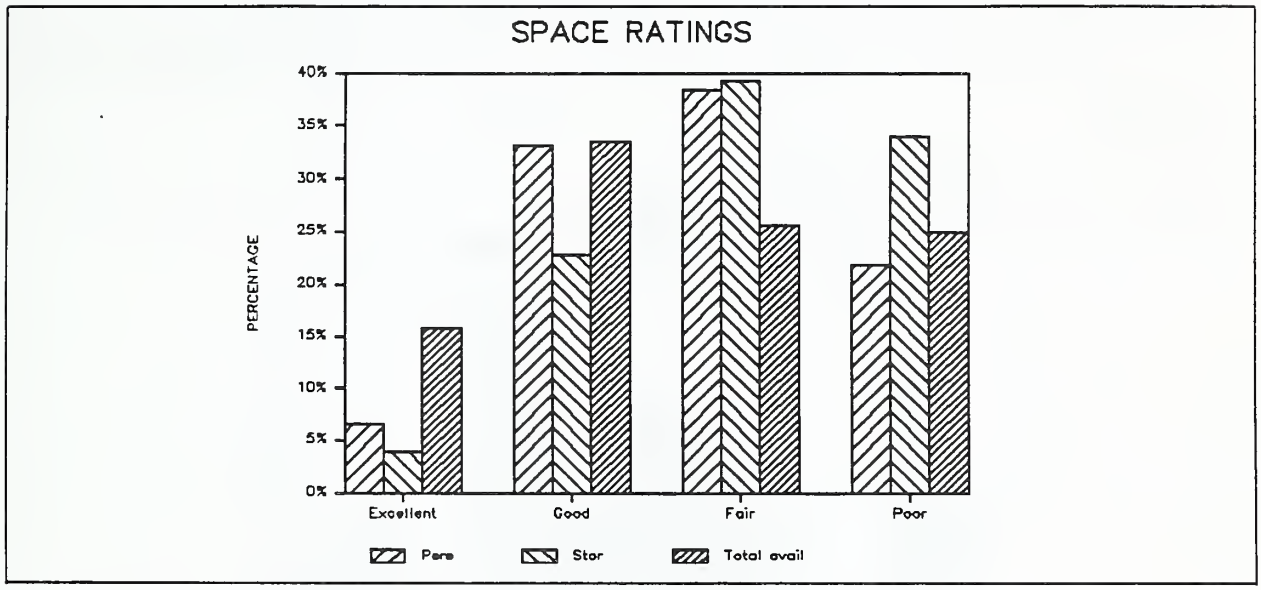
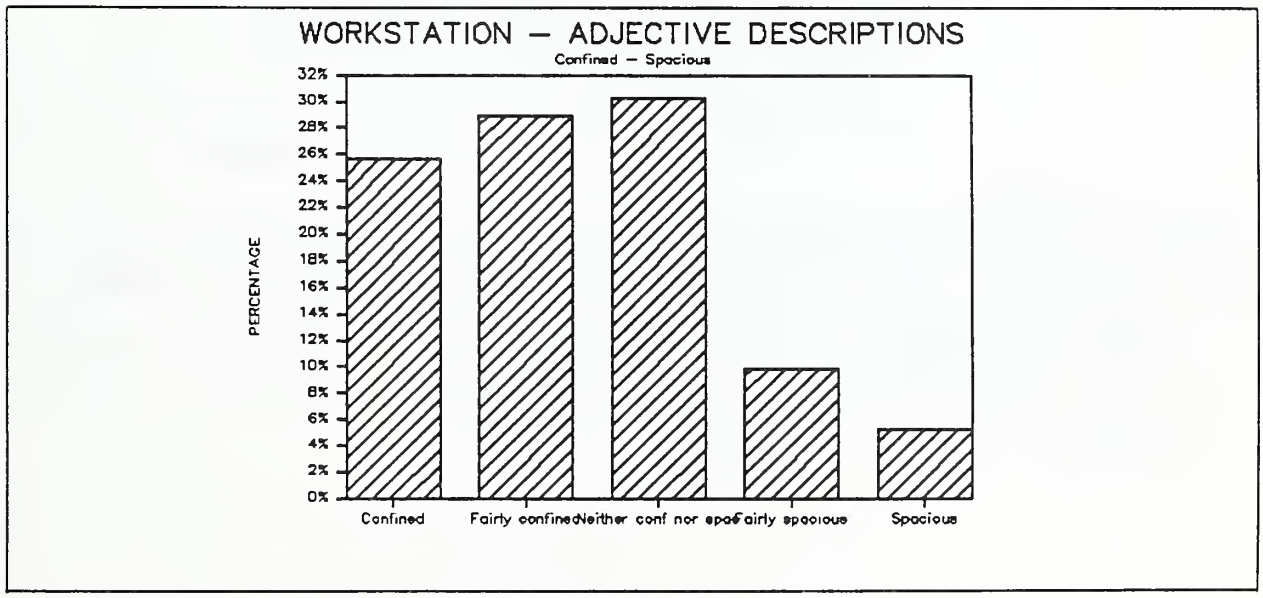


Figure 1.45 Adjective pairs - Space rating - (Confined/Spacious)



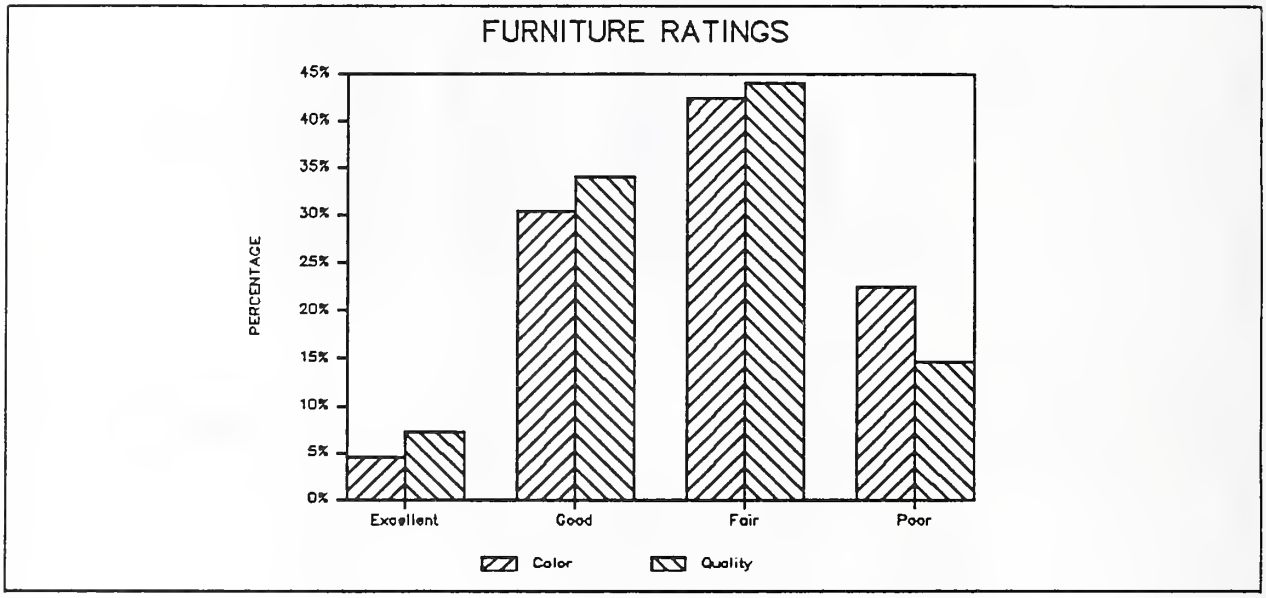
1.3.11 Furniture quality

The next topic examined was furniture quality. First, all furnishings were assessed using a 4-point scale (1-excellent, 2-good, 3-fair, 4-poor). Color (FURNCOLR) and quality (FURNQUAL) averages indicated considerable dissatisfaction with the furnishings, if 2.5 is considered a neutral value. See figure 1.46 also.

Table 1.29 Furniture ratings

Code	Total	Average	SD
FURNCOLR	151	2.83*	.83
FURNQUAL	150	2.66*	.82

Figure 1.46 - Rating of furniture



1.3.11.1 Chairs

Chairs were then assessed using a 4-point scale (1-excellent, 2-good, 3-fair, 4-poor). The features examined were as follows:

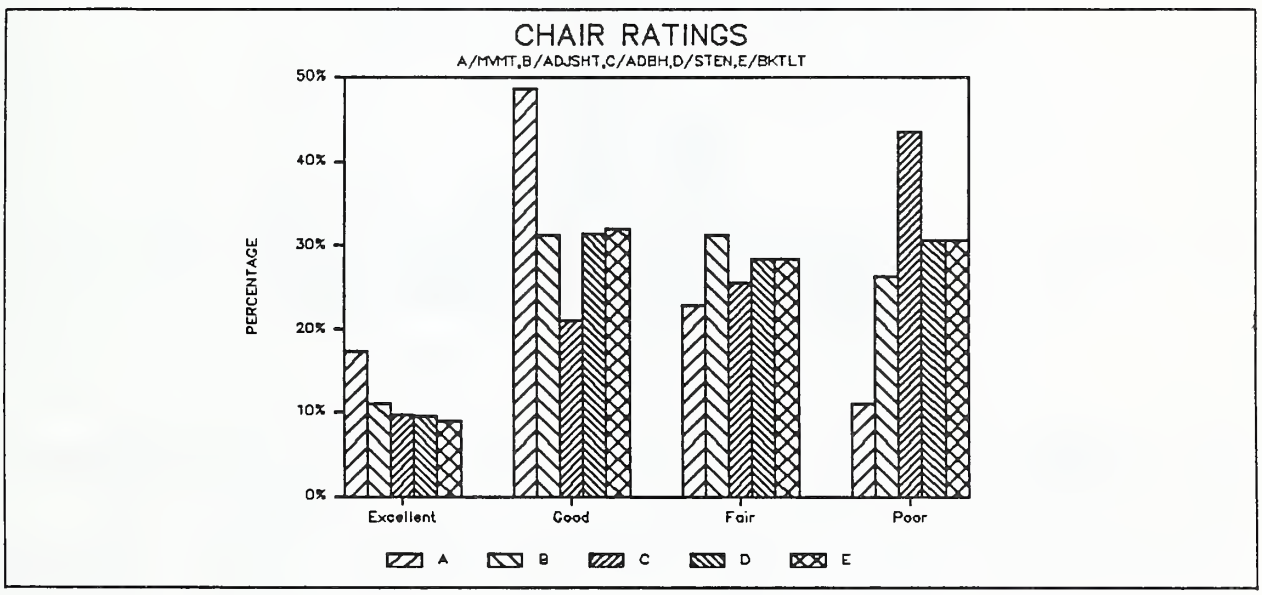
1. Ease of movement on carpet (CHRMVTC)
2. Ease of adjusting seat height (CHRADHT)
3. Ease of adjusting back height (CHRADJBK)
4. Seat/tilt tension (CHRTLTT)
5. Back tilt tension (CHRBKT)

Table 1.30 Chair evaluation

Code	Total	Average	SD	Figure Codes
CHRMVTC	144	2.28	.88	A
CHRADHT	148	2.73*	.97	B
CHRADJBK	133	3.03*	1.02	C
CHRTLTT	137	2.80*	.98	D
CHRBKT	134	2.81*	.97	E

As with the furnishings evaluations, all of the chair assessment scores were above the estimated neutral value of 2, with most scores in the vicinity of 3, indicating barely acceptable performance. See figure 1.47.

Figure 1.47 - Chair ratings



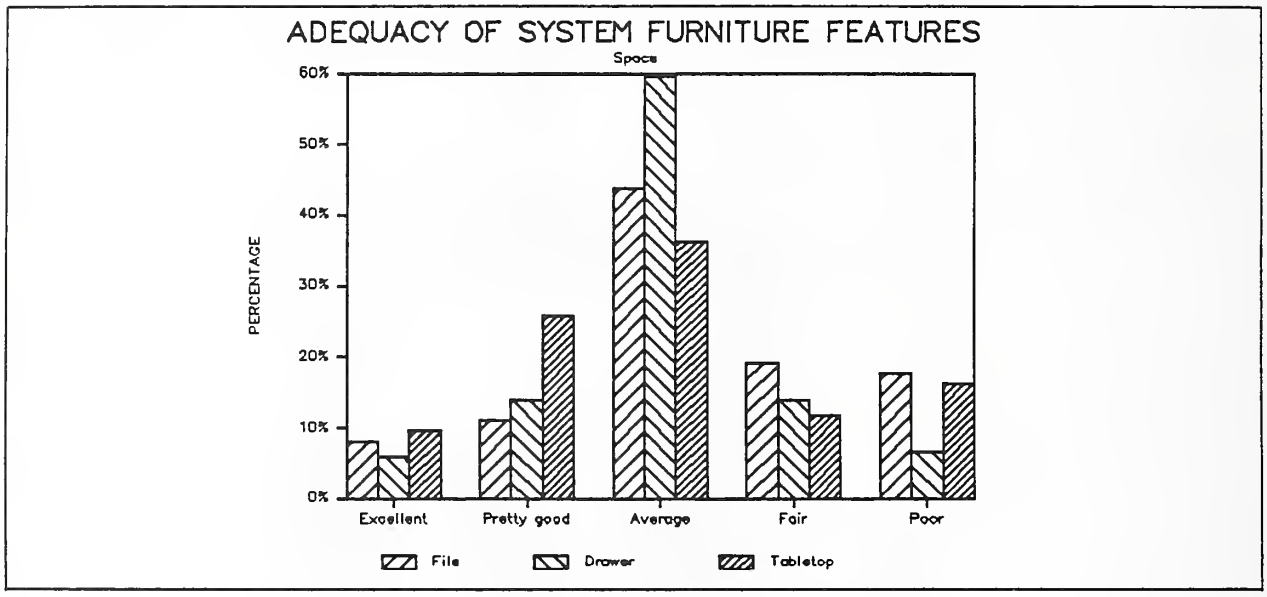
1.3.11.2 Systems furniture

The last specific design topic covered was systems furniture. These ratings are for those employees who had systems furniture. Ratings of features were made on a 5-point scale (1-excellent, 2-good, 3-average, 4-fair, 5-poor). The first group of scores concerned space availability. The average findings did not identify a problem, except possible for file space. Also see figure 1.48.

Table 1.31 Systems furniture - space

Code	Total	Average	SD
FILESPAC	135	3.25*	1.16
DRWRSPAC	136	3.00	.92
TABLSPAC	136	2.97	1.21

Figure 1.48 - Systems furniture (Space)

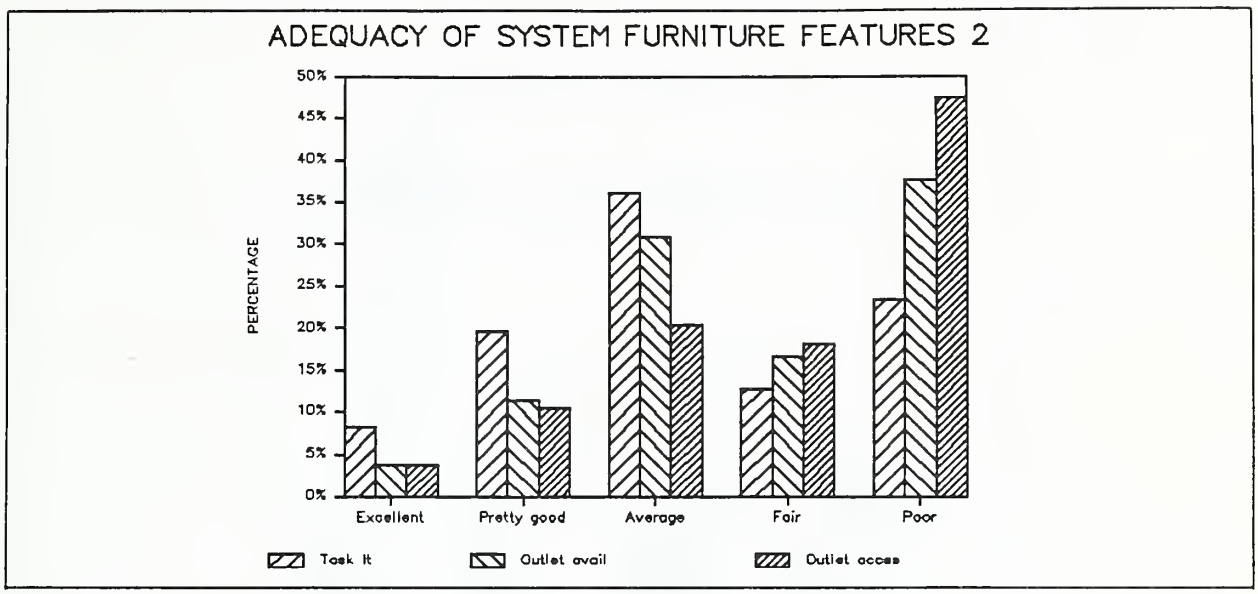


Respondents were asked to rate their task lighting (RTLTTASK) and the adequacy of their electrical outlets on the same 5-point scale used above. The availability of outlets (OUTAVAIL) and their accessibility (OUTACCES) were both found wanting, according to their average scores, and their distribution (figure 1.49).

Table 1.32 Systems furniture - electrical system, task light

Code	Total	Average	SD
RTLTTASK	133	3.23	1.24
OUTAVAIL	133	3.73*	1.18
OUTACCES	133	3.95*	1.20

Figure 1.49 - Systems furniture (Lighting, electrical)



1.3.12 Desired changes in work setting

Respondents were then asked for the 4 most preferred changes that would improve their working conditions. Table 1.33 presents a summary of the total number of mentions of each feature.

Table 1.33 Four changes to improve work environment - frequency count

Code		Total	Figure Codes 1	2	3	4
WSIMTEMP	" temperature)	91*	A			
WSIMLTG	" lighting)	36*	B			
WSIMNOIS	(improved acoustics)	101*	C			
WSIMAIRC	" air circ)	55*	D			
WSIMFURN	" furniture)	29*		A		
WSIMTKLT	" task light)	38*		B		
WSIMCHA	" chairs)	28*		C		
WSIMADCR	" adjustable chair)	13*		D		
WSIMCLR	" color)	21		E		
WSIMPRIV	" privacy)	96*			A	
WSIMACC	" outside access)	11				A
WSIMBKSP	" break area)	22				B
WSIMCLEN	" maintenance)	16				C
WSIMLOC	" location)	21				D

Improvements of environmental conditions and increased privacy predominated these findings. See figures 1.50-1.53 for more detailed data.

Figure 1.50 Desired improvements - environment (1)

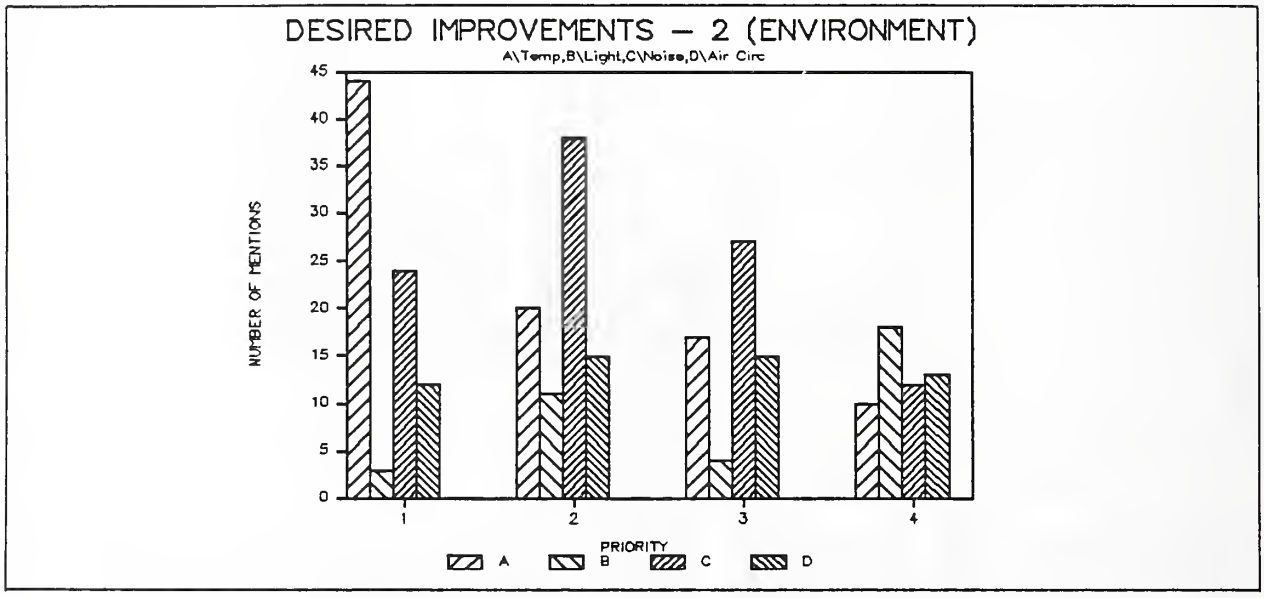


Figure 1.51 Desired improvements - furnishings (2)

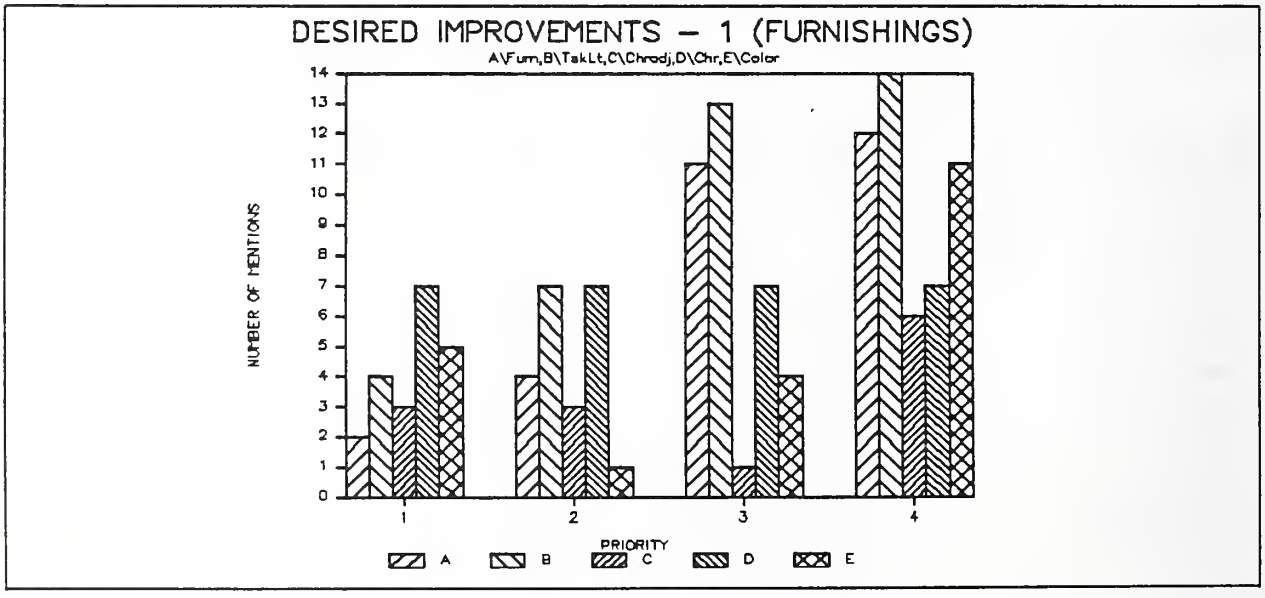


Figure 1.52 Desired improvements - Privacy (3)

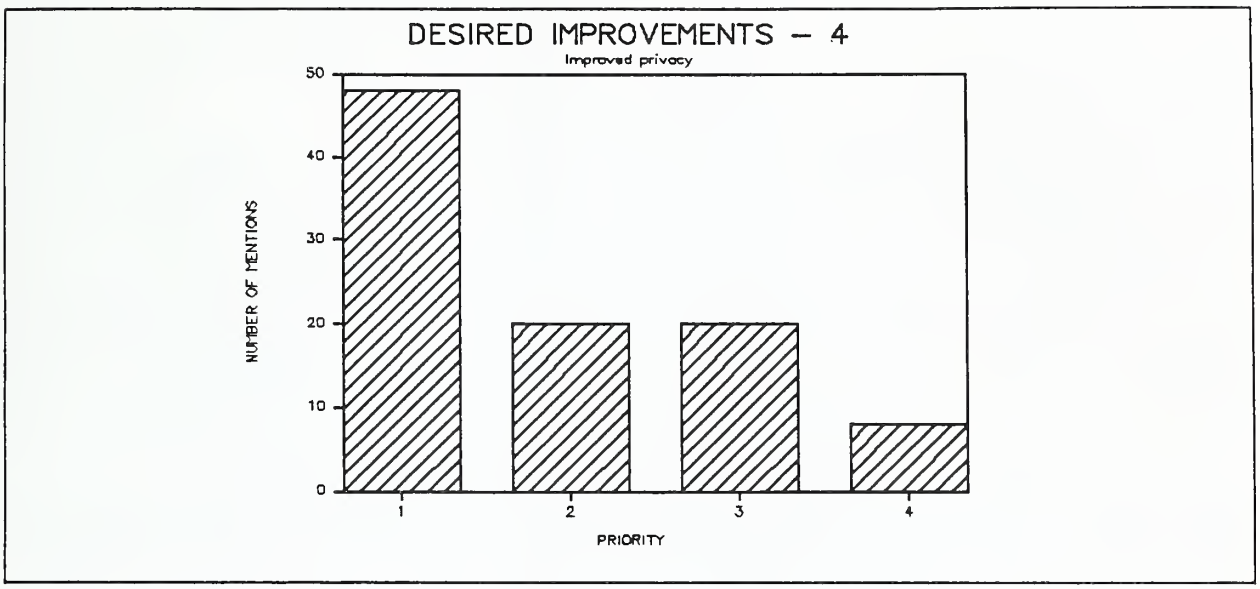
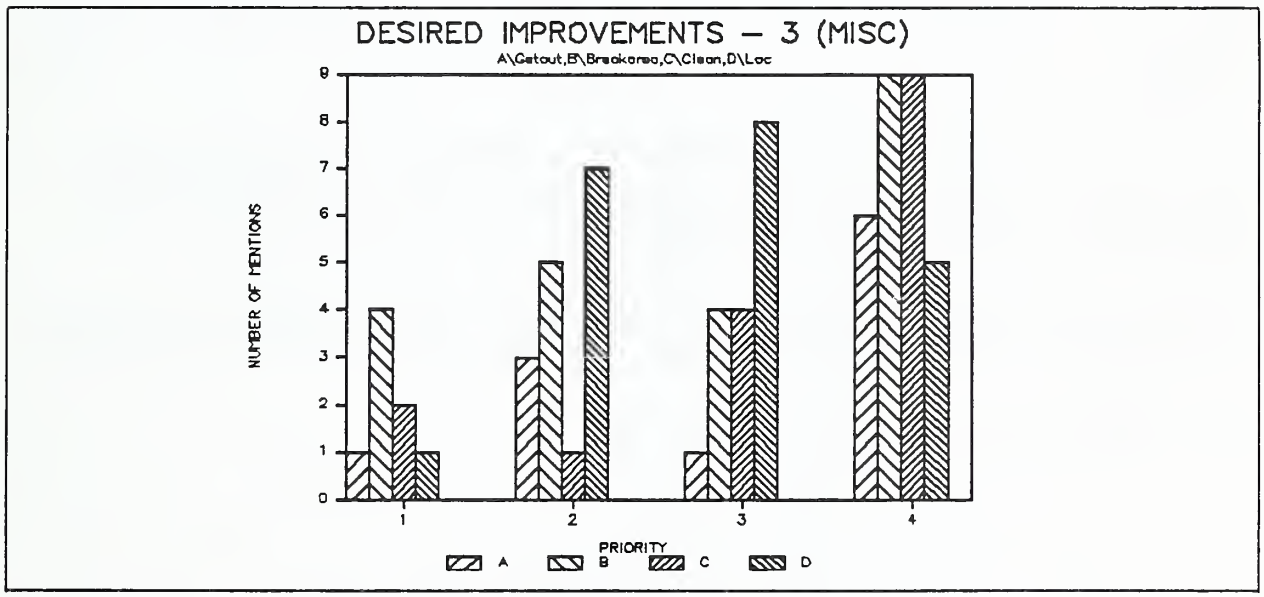


Figure 1.53 Desired improvements - Miscellaneous (4)



1.3.13 Desired equipment changes

Since one goal of the study was to identify technological and furnishings issues that could assist office work, workers were

then asked what equipment changes would be beneficial. A frequency count of the items mentioned appears below.

More storage space	(46)
PCs	(21)
Ergonomic chair	(11)
Better desk drawers	(10)
Improved phone system	(7)
Desk that locks	(6)
More worksurface	(6)
Partitions	(6)
Desk for VDT	(5)
More desktop space	(4)
Table	(4)
Visitors chair	(3)
Total	129

1.3.14 Workplace influence on job performance

When asked whether their current workplace helps their work, the responses were rather evenly divided.

Yes	(39)
Somewhat	(15)
No	(58)
Neutral	(7)
Total	119

1.3.15 Anticipations of the move to the new federal building.

The last two questions were directed to the planned move. The questions were general in nature:

"With respect to the planned move, what are you looking forward to with anticipation; e.g. what are the major benefits that you anticipate?

The responses appear in 1.3.15.1.

1.3.15.1 Major benefits anticipated:

Better climate control	(27)
Better furniture	(26)
Near others at BPA	(25)
Quieter	(22)
More space	(21)
Better phones	(17)
More privacy	(17)
Nicer environment	(16)
Better office layout	(13)
Better workstation	(11)
Cleaner	(10)
Better lighting	(9)
Better cafeteria	(8)
Better elevators	(5)
New building	(5)
More file storage	(5)
Better computer access	(5)
Personal VDT	(4)
Improved security	(4)
More worksurface	(4)
Terrace	(4)
Exercise facilities	(4)
Improved ventilation	(3)
More electrical outlets	(2)
Total	267

The next question was: "What are your major concerns about the forthcoming move? Responses are in 1.3.15.2.

1.3.15.2 Major concerns about the planned move.

Move disrupts ongoing work	(29)
Parking	(19)
Lack of space	(18)
Crowding	(17)
Lack of privacy	(10)
Noise	(10)
Sufficient file space	(9)
Lack of window	(9)
Lighting bad	(7)
Wayfinding	(6)
Difficulty adjusting/moving itself	(4)
Climate control	(4)
Furniture quality	(4)
Conference rooms	(3)
Air quality	(3)
Shopping difficult	(3)
No security	(2)
Work during construction	(2)
Structural safety of new building	(2)
Total	161

2. Introduction - Portland2

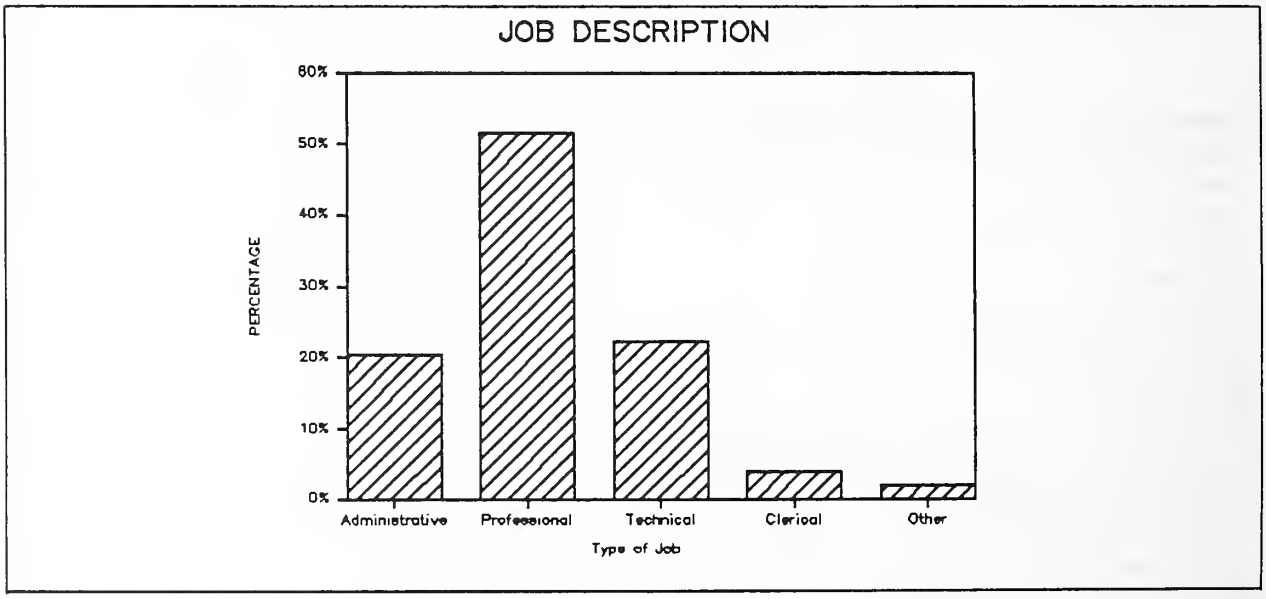
As noted earlier, under ideal conditions the same questionnaire administered during the first study phase would have been given to the occupants for the second part of the study. This was not possible because of a change in emphasis to issues related to space and furnishings, where more detailed findings were sought. As a result, questions were restructured to cover most of the topics included in the first study in a summarized fashion. This procedure was employed to ensure that the expanded set of data could be collected within one hour. Researchers have found this to be the 'tolerance limit' for most respondents if they are to maintain their motivation and interest in the survey (3).

A breakdown of the job categories describing the respondents in the Portland2 study is given in table 2.1 and figure 2.1:

Table 2.1 Job categories

Category	#	%
Administrative	21	20.4%
Professional	53	51.4%
Technical	23	22.3%
Clerical	4	4.9%
Other	2	1.9%
Total	103	

Figure 2.1 Job descriptions



2.1 Comparison between present and previous workstation

The first set of questions was a comparison of features of the present workstation with those of the previous one. The present one fared very well in most instances. All characteristics but one were assessed to be better. The exception was 'the ease of changing furnishings and layout', rated slightly below the earlier one. This finding is somewhat surprising because flexibility is advertised as a major 'selling point' in systems furniture. Table 2.2 summarizes these average findings. (5-point scale; 1-much better, 2-better, 3-about the same, 4-worse, 5-much worse). Figures 2.1 and 2.2 provide additional information on the distribution of responses.

Table 2.2 Comparison of present workstation features with previous one.

Code	Number	Average	SD	Figure Code 1	Figure Code 2
WSRTJOB	108	2.39*	1.06	A	
WSRTAPPR	108	1.94*	1.13	B	
WSRTEASE	108	3.10	1.22	C	
WSRTSTOR	108	2.34*	1.12	D	
WSRTTOP	108	2.23*	1.14		A
WSRTPERS	103	2.83	1.05		B
WSRTPRIV	91	2.77	1.16		C

Figure 2.2 Workstation comparisons - 1

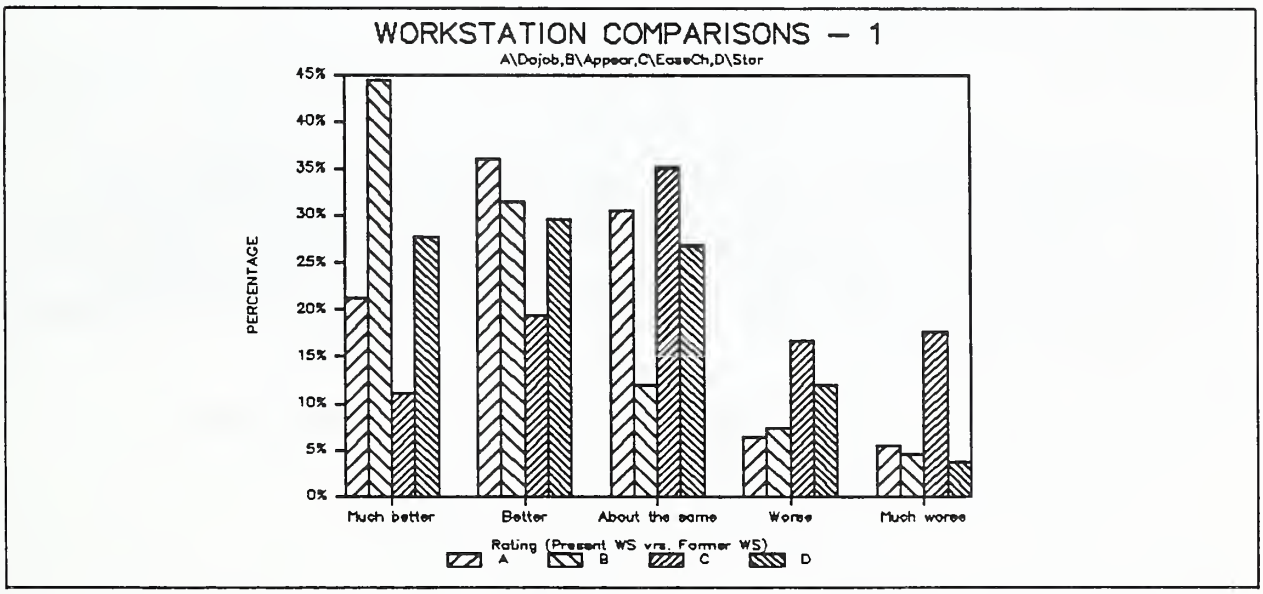
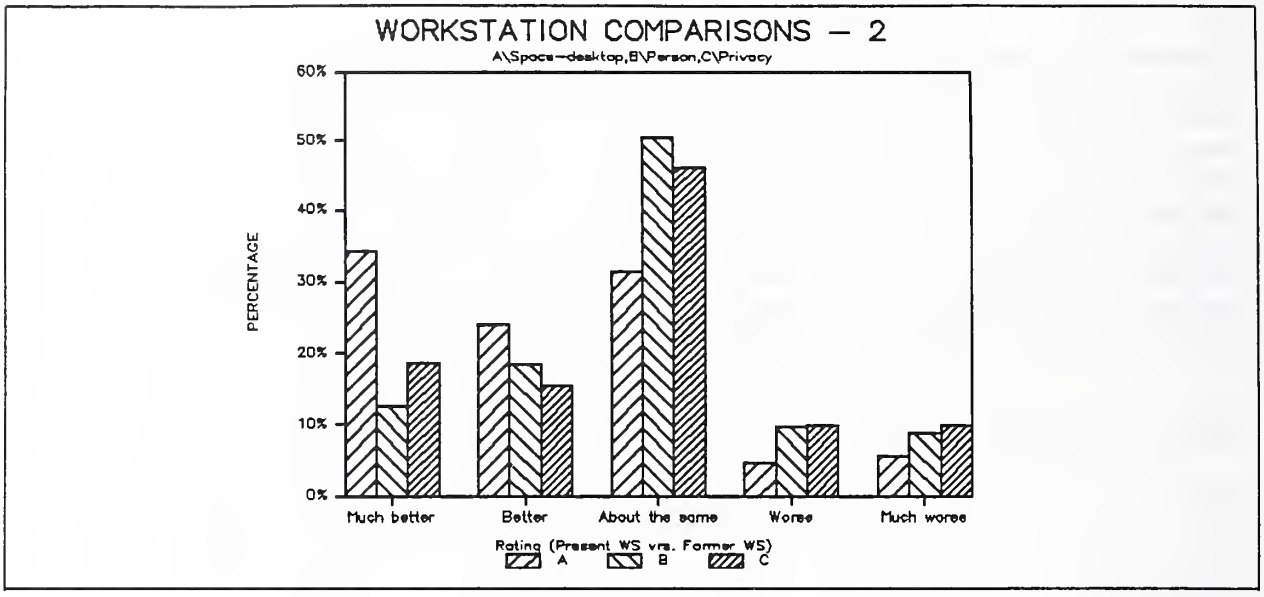


Figure 2.3 Workstation comparisons - 2



Respondents were then asked whether their feelings about their workplace had changed since moving. Table 2.3 summarizes these findings. As workers became more familiar with their surrounds, their satisfaction evidently increased for the most part.

Table 2.3 Workplace satisfaction comparison

Increased satisfaction	43	42.16%
Decreased satisfaction	18	17.65%
About same	41	40.20%
	102	

The reasons given for changes in satisfaction for aspects of their workspace appear in Table 2.4. Lack of privacy was the major cause of decreased satisfaction. Others were a reduction in space, unpleasant surroundings and and problems with furnishings. Increased satisfaction was mainly attributed to an improved office environment, better furniture, the newness of the building and modern equipment.

Table 2.4 Reasons for changes in workspace satisfaction.

a. Reasons for decreased satisfaction

Code	#
DECPRIV (less privacy)	20
DECSPACE (less space)	8
DECSURR (worse surroundings)	7
DECFURN (worse furnishings)	6
Total	41

b. Reasons for increased satisfaction

Code	#
INCENVIR (better environment)	32
INCFURN (better furnishings)	31
INCNEW (new surrounds	24
INCEQUIP (better equipment)	22
INCATMOS (better atmosphere)	8
INCENJOY (more enjoyable)	6
Total	123

As a means of exploring why changes in satisfaction occurred, a 5-point adjective pair scale was used to describe several work space features. Portland1 averages are indicated as ( ), for comparison purposes.

Table 2.5 Workstation features - adjective pairs

Code	Number	Average	AverPort1	SD
WSPLST	106	2.19	(2.86)	.94
WSMAINT	106	2.08	(2.97)	.92
WSSPAC	104	2.86	(2.40)*	1.05
WSSTIMUL	104	3.27	(3.82)	1.05
CLEAN	107	2.08	(2.80)	.90
COLOR	106	3.48	(3.48)	.91
WSINTRST	98	3.09	(3.09)	.94
WSATMOS	106	2.77	(2.77)	.98

None of the findings indicated extreme feelings about building features. The most positive responses identified cleanliness/maintenance and pleasantness, while the most negative feature noted was the lack of color. When the averages for Portland2 were compared with Portland1, all scores indicate an increased level of satisfaction; (In the case of WSSPAC, the lower number signifies being 'more confined'.) Figures 2.3-2.10 provide detailed information on the distribution of each response.

Figure 2.4 Adjective pairs - Pleasant/Unpleasant

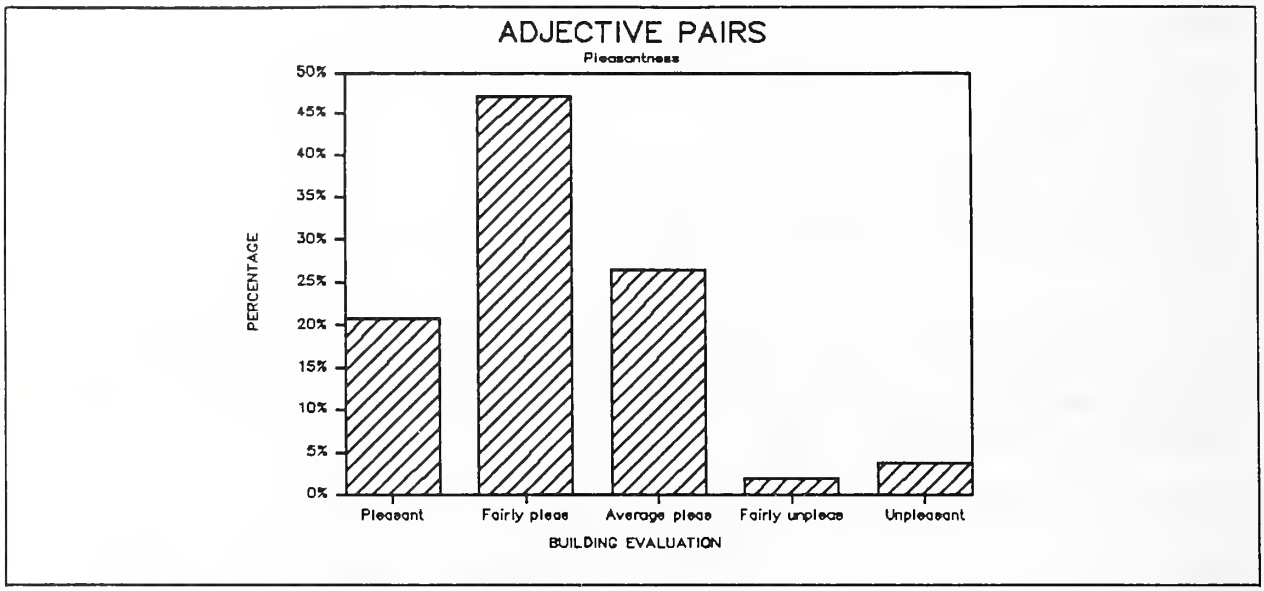


Figure 2.5 Adjective pairs - Maintenance - Well/Poorly

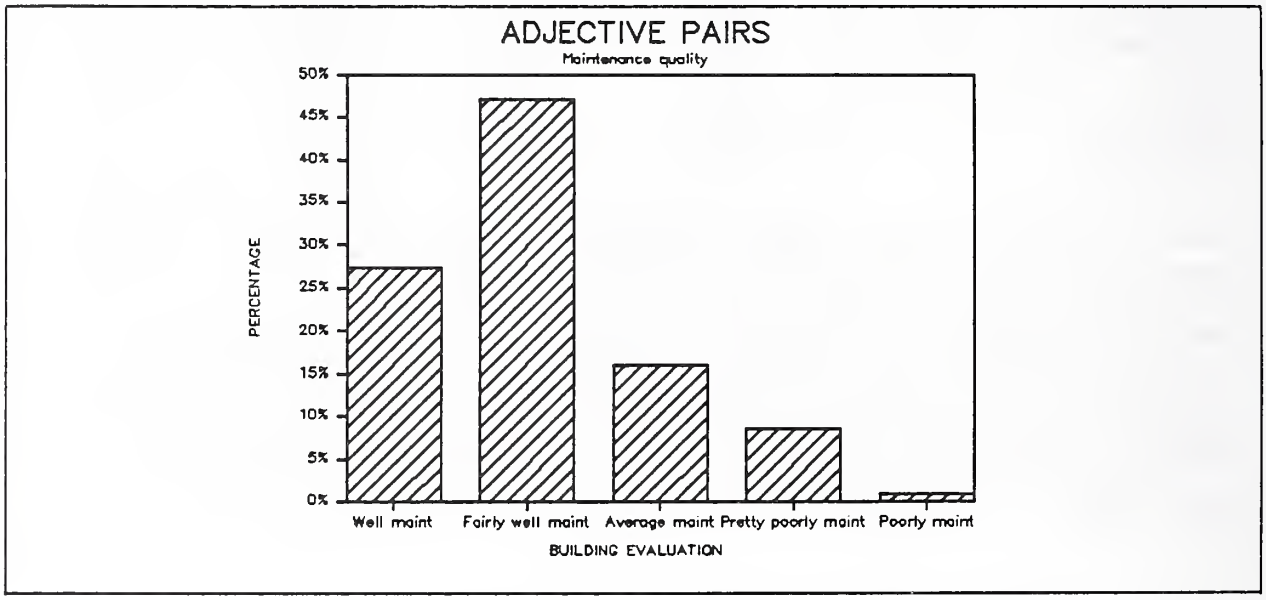


Figure 2.6 Adjective pairs - Spaciousness - Spacious/Confined

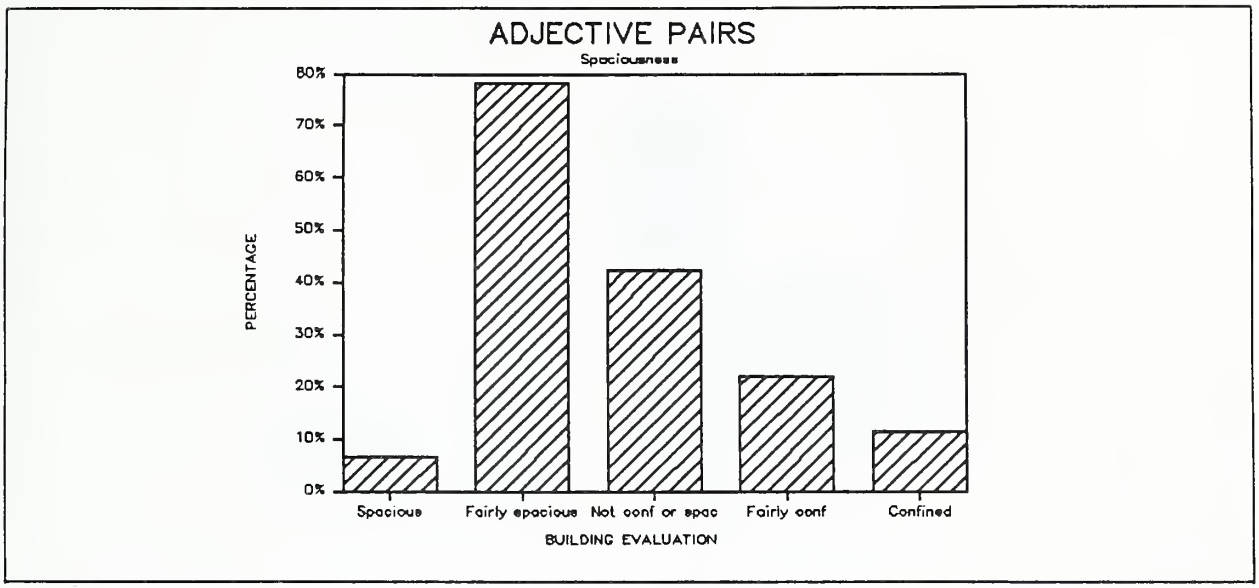


Figure 2.7 Adjective pairs - Stimulating/Unstimulating

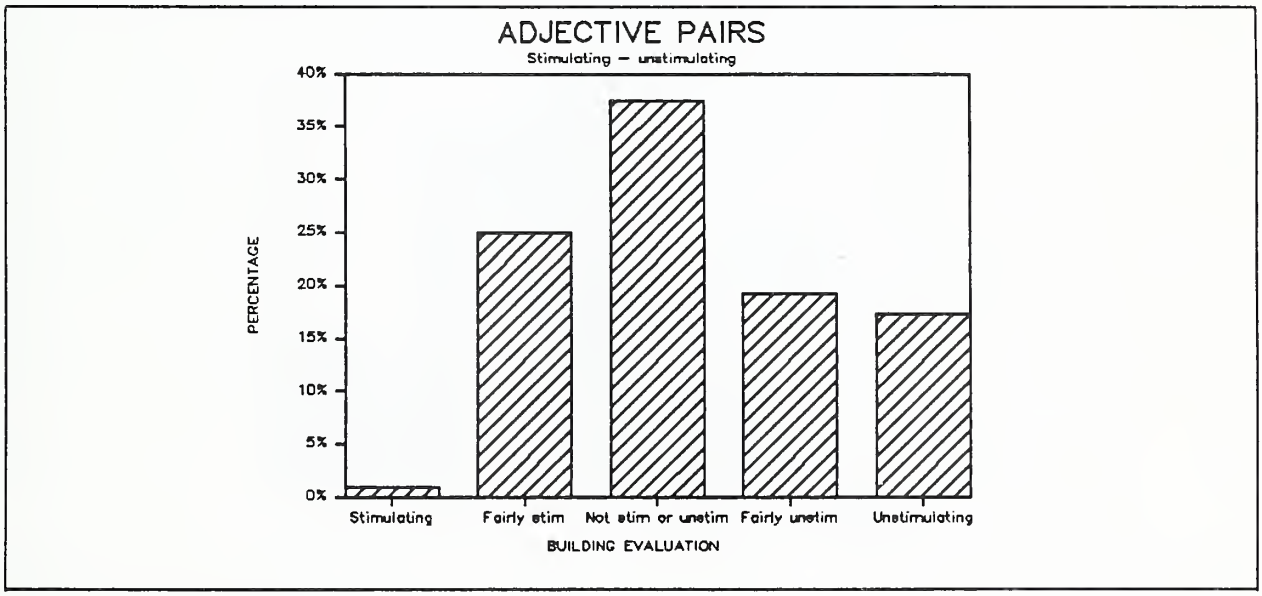


Figure 2.8 Adjective pairs - Clean/Dirty

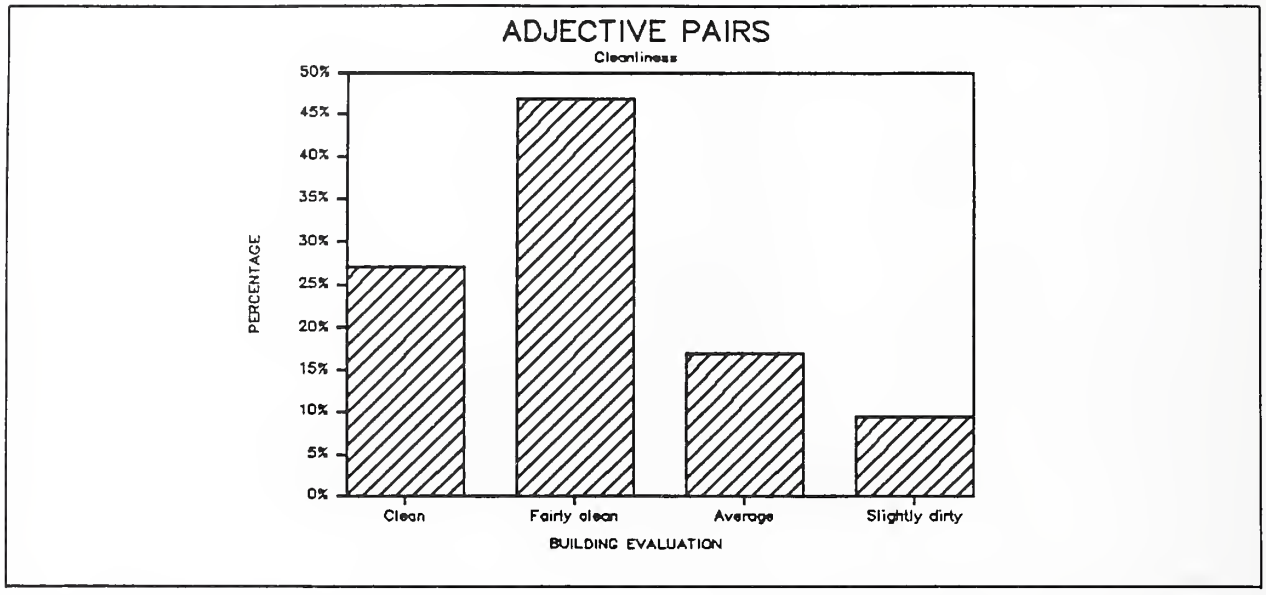


Figure 2.9 Adjective pairs - Colorful/Drab

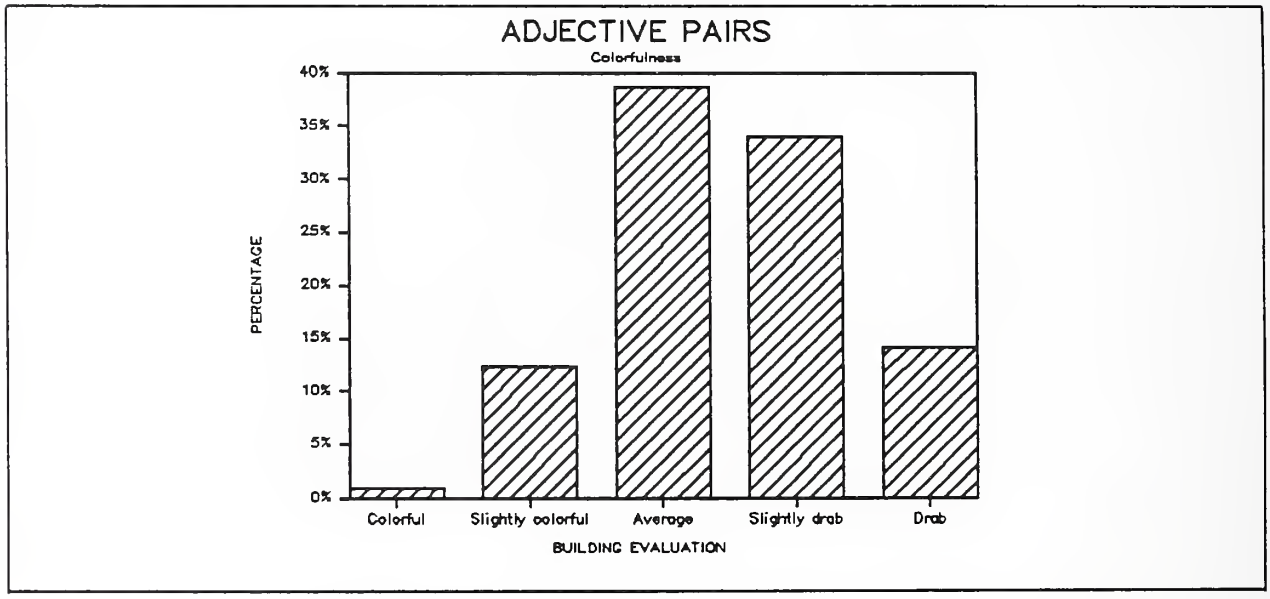


Figure 2.10 Adjective pairs - Interesting/Boring

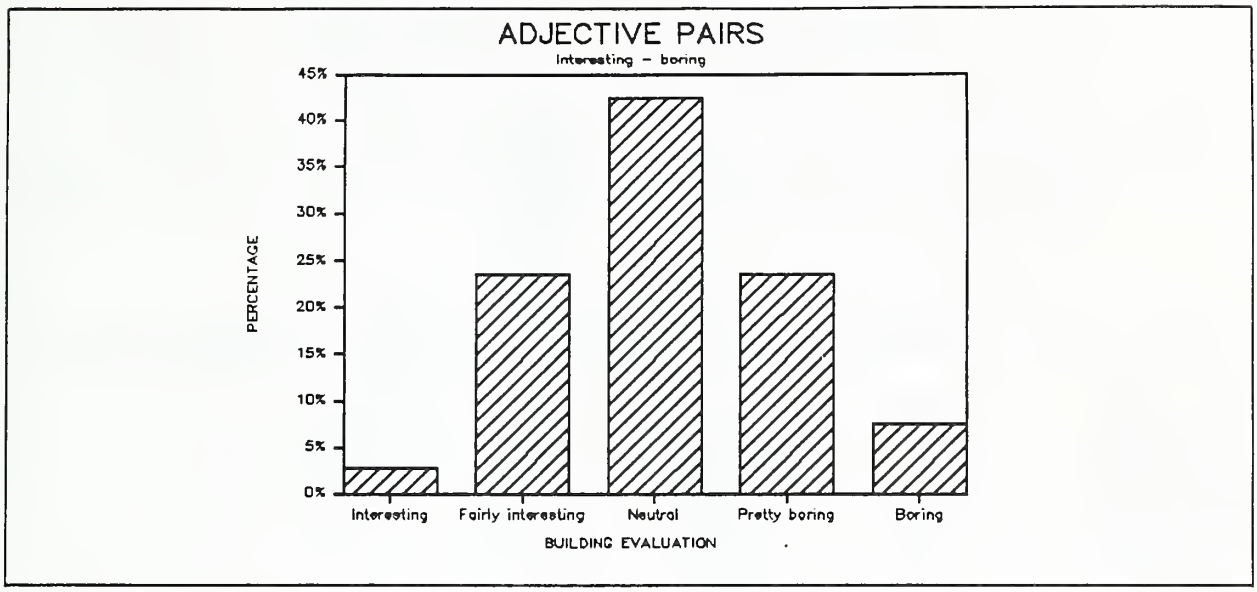
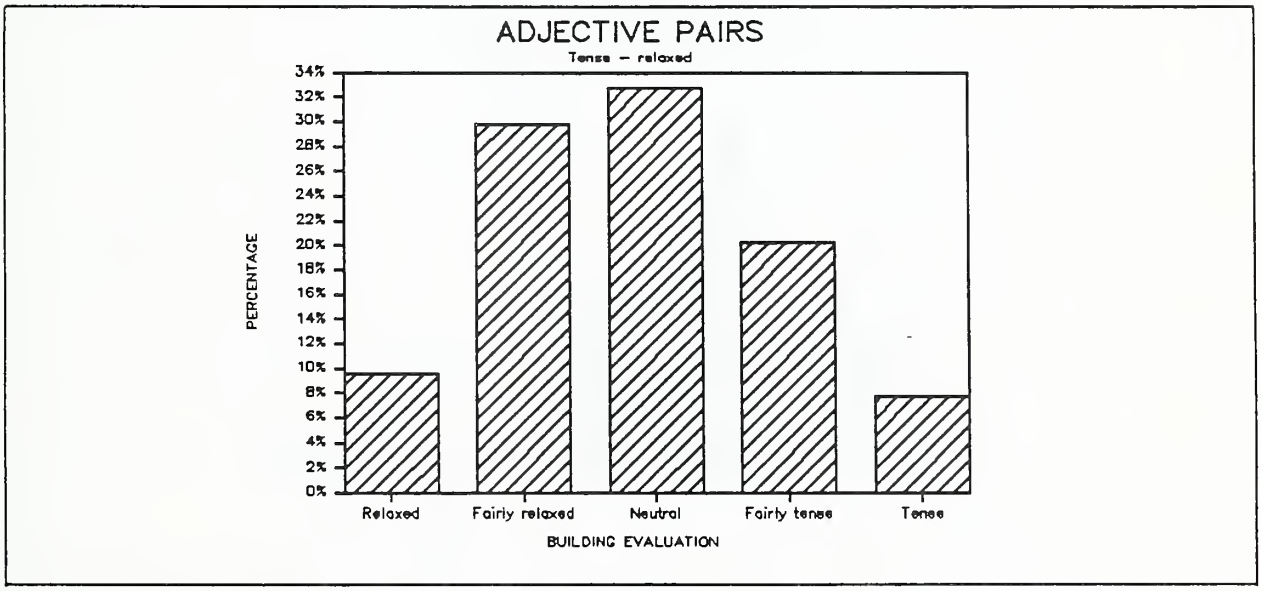


Figure 2.11 Adjective pairs - Atmosphere - Relaxed/Tense



2.2 Environmental conditions

Since environmental conditions were the source of many complaints in the Portland1 study, an important part of the followup study was focused on this issue. The first factor to be examined is lighting.

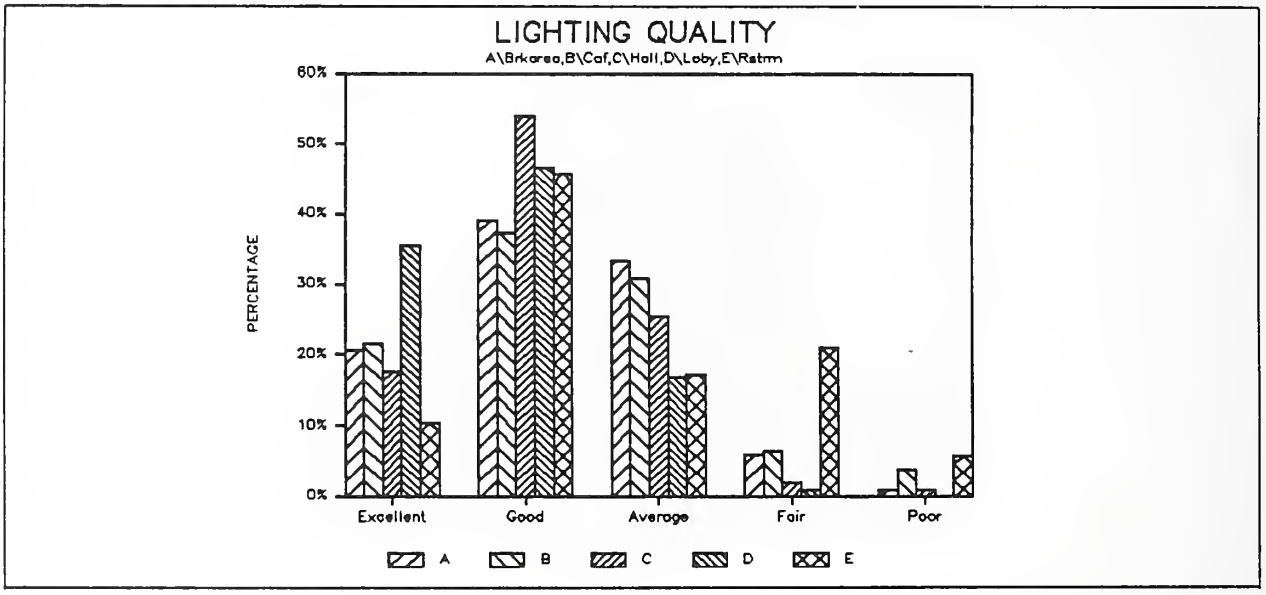
2.2.1 Lighting

The lighting of several spaces was evaluated using a 5-point rating scale (1-excellent, 2-pretty good, 3-neutral, 4-not very good, 5-poor). Of the areas rated, the workspace, although receiving an acceptable rating, had the lowest rating. The average scores for space lighting were considerably better than those obtained in the Portland1 survey (see table below). Figure 2.11 presents detailed findings.

Table 2.6 Lighting evaluations of spaces

Code	Number	Average	AverPort1	SD	Figure Code
RTLTBRK	102	2.27	(2.87)	.89	A
RTLTCAFE	105	2.34	(2.72)	1.00	B
RTLTHALL	102	2.15	(2.97)	.76	C
RTLTLOBY	107	1.81	(2.45)	.73	D
RTLTRSRM	107	2.04	(2.45)	.74	E
RTLTSPAC	105	2.63	(2.77)	1.12	F

Figure 2.12 Lighting quality



Employees were then asked to rate how satisfied they were with their workstation lighting (5-point scale; 1-very, 2-moderately, 3-average, 4-not very, 5-not at all). The average rating for (WSLITSAT) was 2.55, SD 1.21, N= 107 respondents; see figure 2.12. Task lighting (TSKLTG) was also rated on the same scale; the average rating was 2.70, SD 1.18, N= 104. See figure 2.13 also.

Figure 2.13 Satisfaction - Workstation lighting

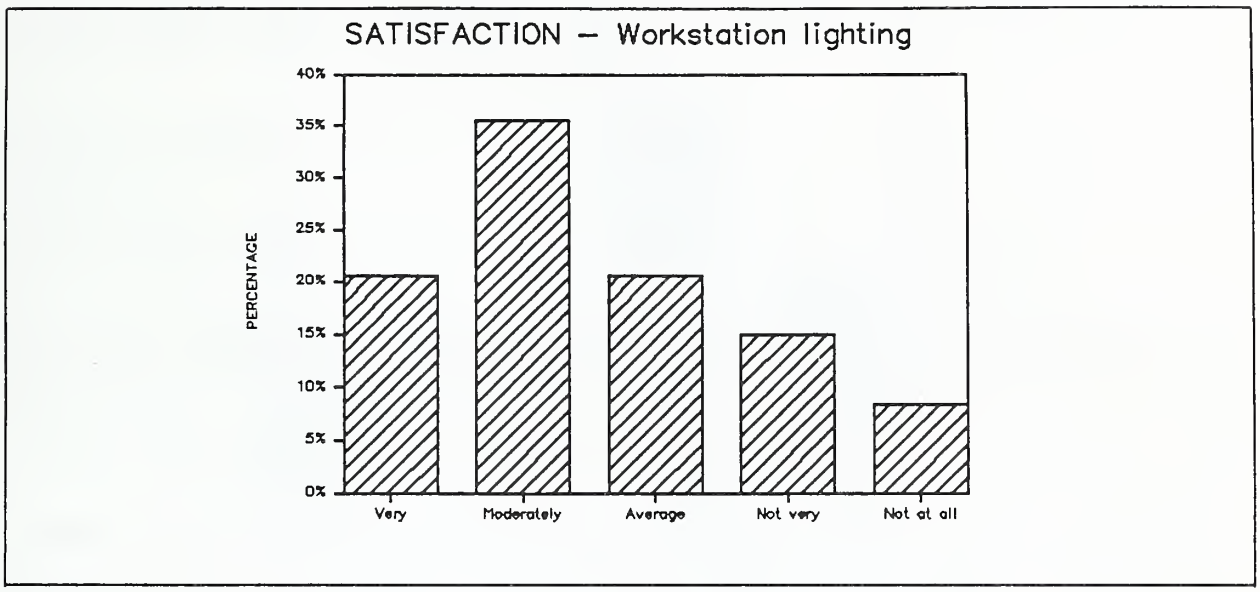
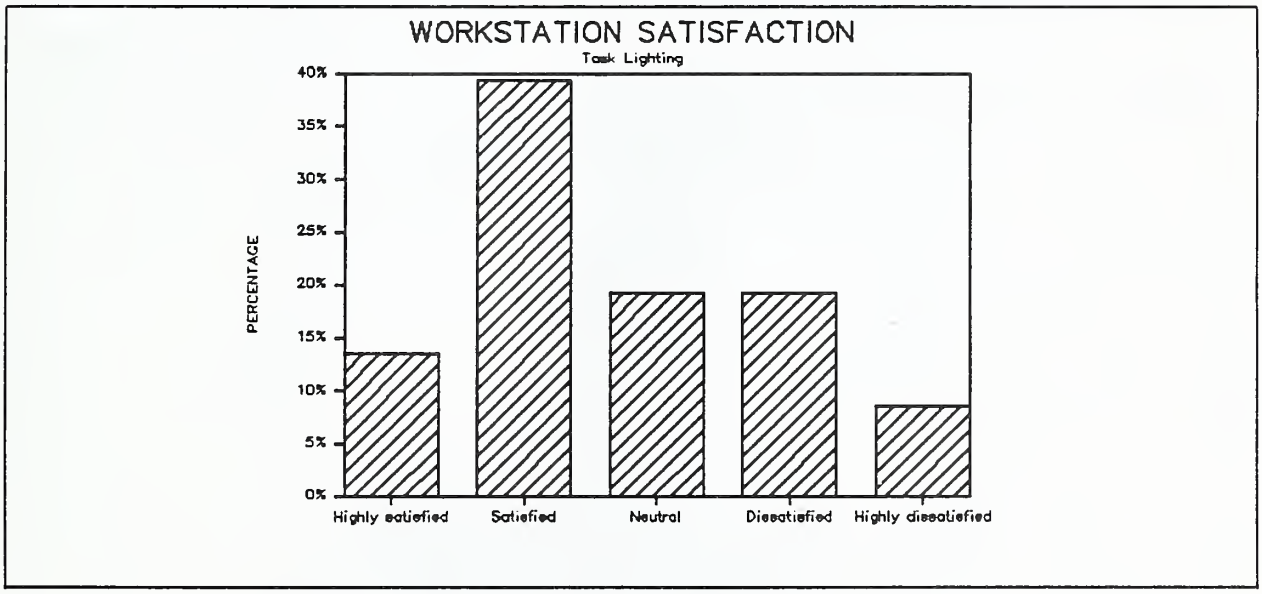
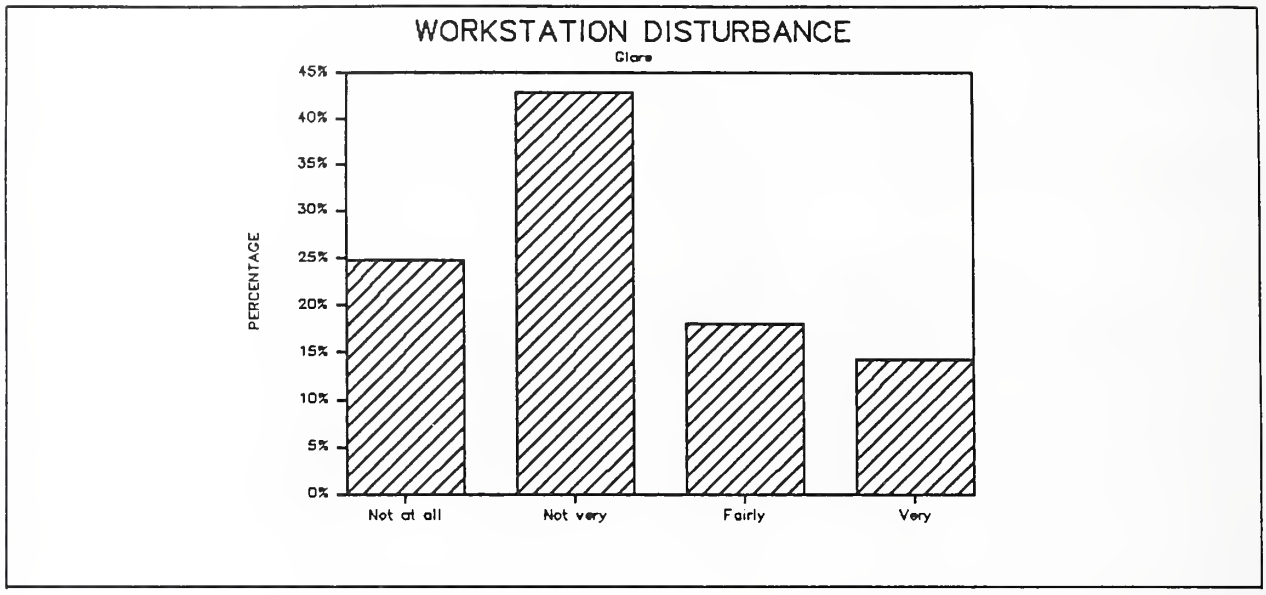


Figure 2.14 Workstation satisfaction - Task lighting



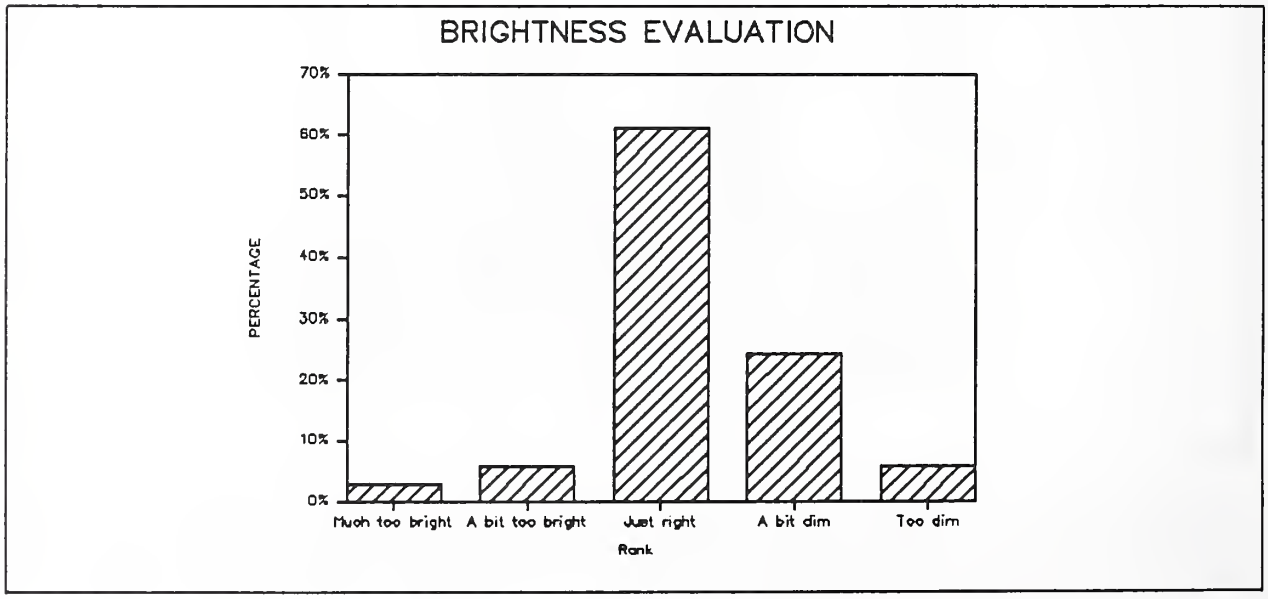
The degree of glare disturbance was also assessed (4-point scale; 1-not at all, 2-not very, 3-fairly, 4-very). The average rating of 2.2, SD .98, N= 105 for (GLARE) indicates some disturbance due to glare, but it was not a major difficulty.

Figure 2.15 Workstation disturbance - Glare



The brightness of lighting conditions was then assessed, (AMTLTBRT) on a 5-point scale; see figure 2.15. The average was 3.12., SD .98, N=107.

Figure 2.16 Brightness evaluation



The comment data clarified some of these summary findings. Complaints mentioned shadowing, bad positioning of ceiling and task lights. The categories of lighting issues and responses were:

Lighting bad	(15)
Lighting placement bad	(5)
Light dim	(2)
Glare	(3)
Task light needed	(3)
Light causes shadows	(3)

Selected lighting characteristics were then evaluated using the 5-point adjective pair scale. Detailed findings appear in figures 2.16-2.18.

Table 2.7 Lighting evaluations - adjective pairs

Code	Number	Average	AverPort1	SD
WSLTSOFT	107	2.77	(3.07)	.96
WELLIT	104	3.13	(2.46)	1.08
WSBRT	104	2.51	(2.51)	1.07

Figure 2.17 Adjective pairs - Lighting quality

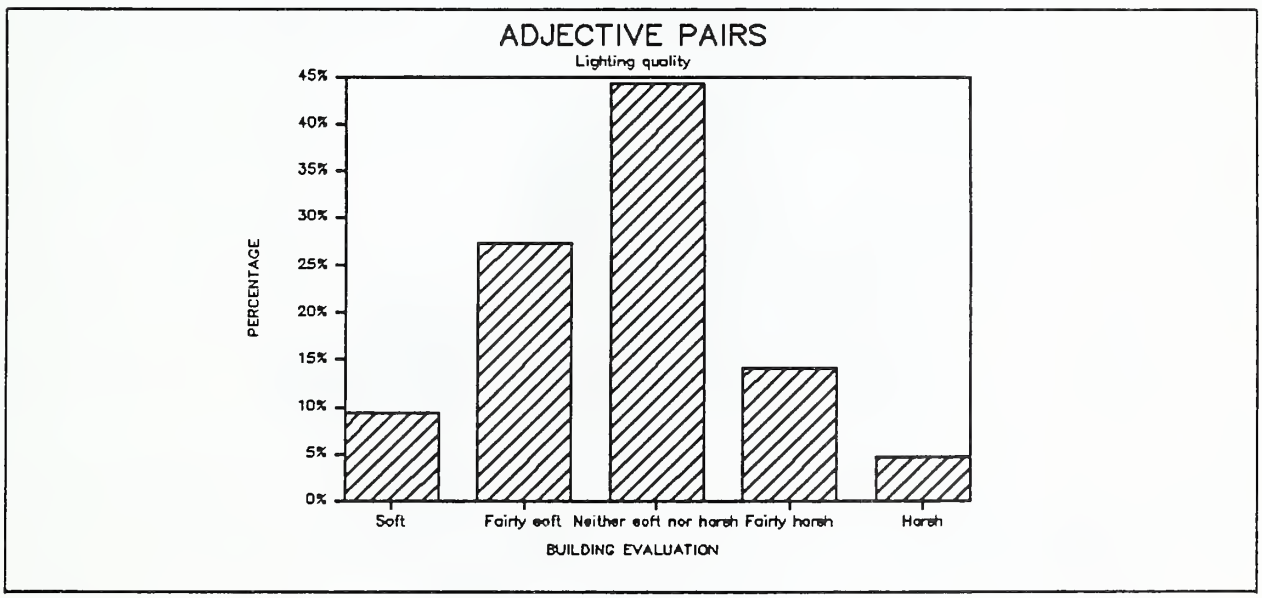


Figure 2.18 Adjective pairs - Space lighting

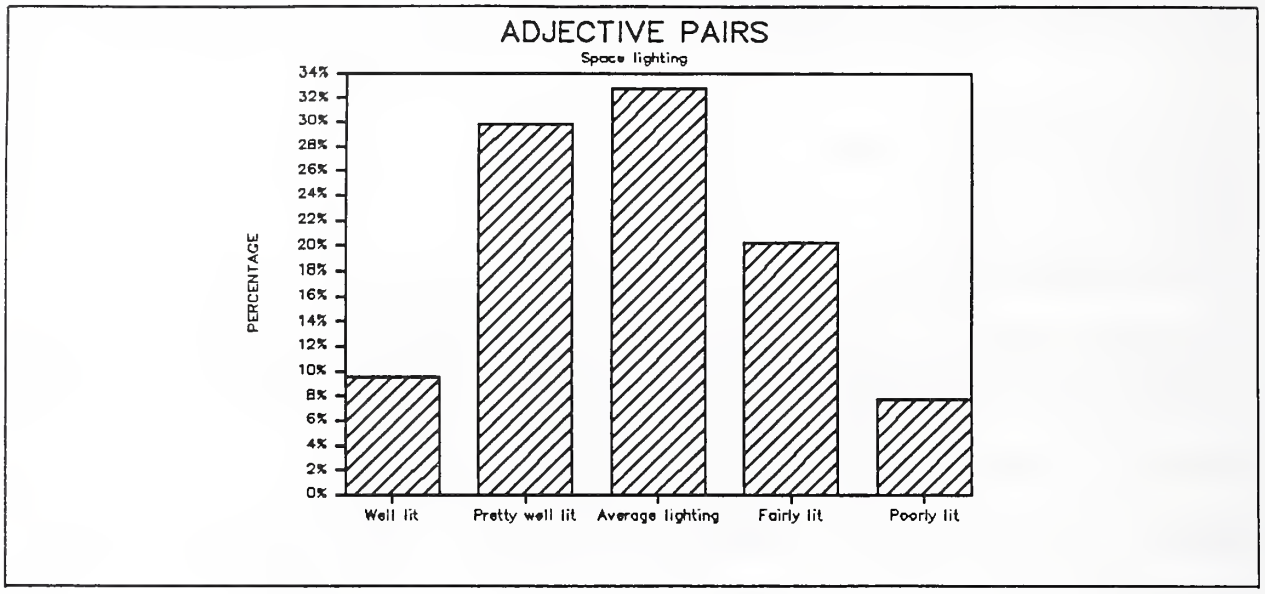
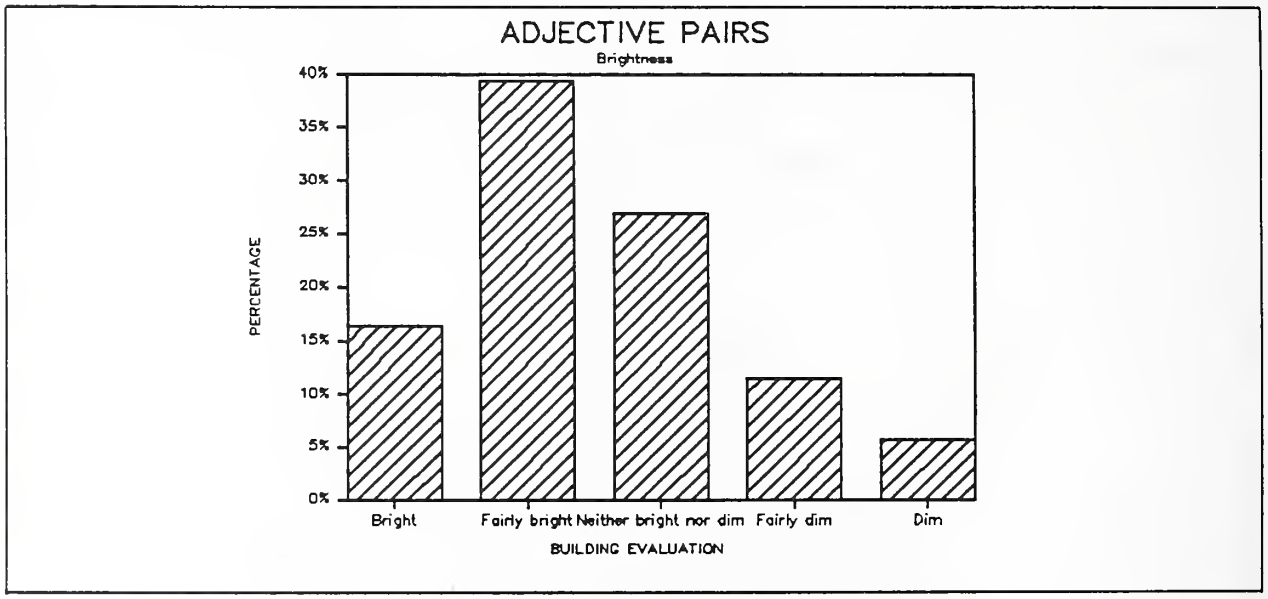


Figure 2.19 Adjective pairs - Brightness



2.2.2 Temperature

Workers were asked to rate how satisfied they were with their workstation temperature (5-point scale; 1-very, 2-moderately, 3-average, 4-not very, 5-not at all). The move to the new facilities modified this rating, which had been quite unsatisfactory for many people in their previous offices. The average rating for (TEMPSAT) was 2.57, SD 1.14, N= 107. However the comment data indicate that temperature control continued to be disturbing for many respondents. When asked what 4 changes would improve their environment, 23 people indicated that better

temperature control is needed. The primary complaint was of temperature variability; sometimes being too hot, and other times being too cold. The comment summary and frequencies follows:

Temp varies	(15)
Warm	(8)
Drafts	(2)
Total	(25)

An evaluation was also made to determine how disturbing temperature conditions are (TEMPERTR), on a 4-point scale (1-not at all, 2-not very, 3-fairly, 4-very). The average was 2.28, SD .89, N= 107. The responses to (DRAFTS), using the same scale yielded average scores of 1.92, SD .92, N=106. Other thermal comfort items were ratings for heating and cooling based on a 5-point scale, with 3 being a neutral mid-point. Table 2.8 and the following figures provide additional data.

Table 2.8 Temperature ratings

Code	Number	Average	SD
RTHEAT	106	2.83	1.16
RTCOOL	106	2.98	1.13

Figure 2.20 Workstation disturbance - Thermal comfort

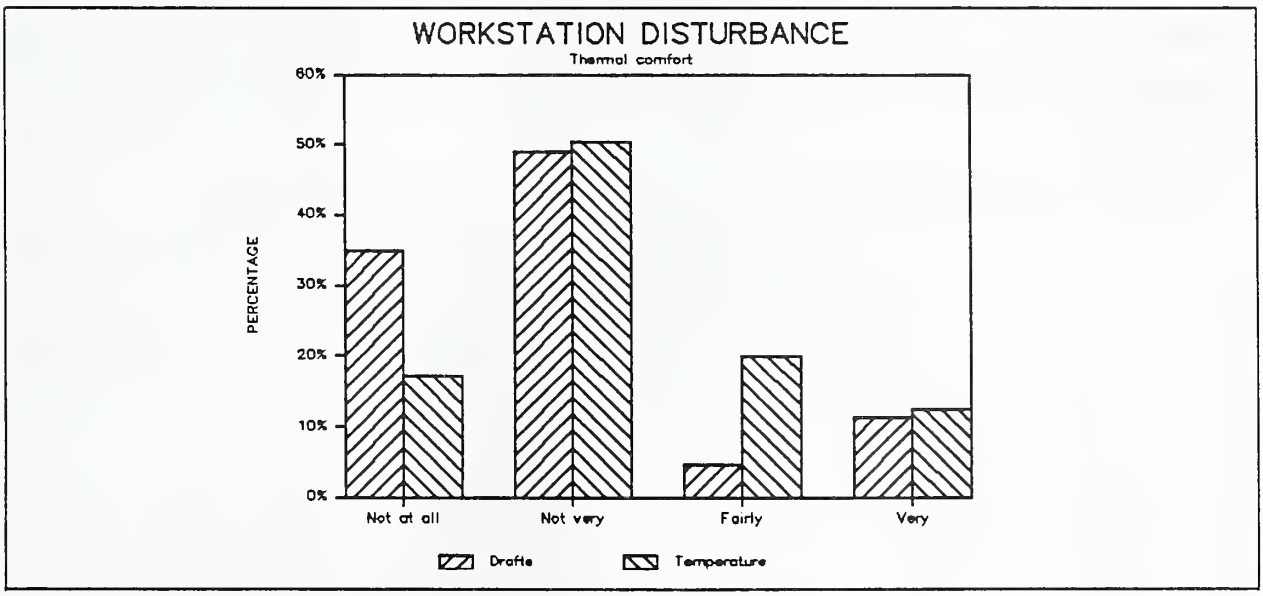
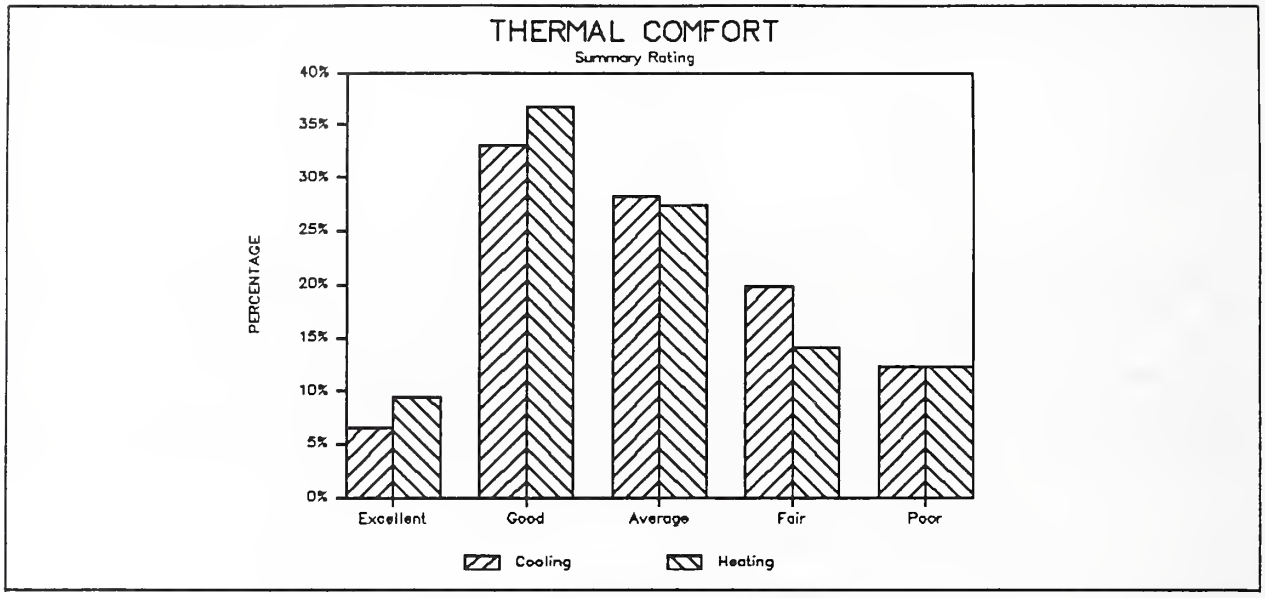


Figure 2.21 Thermal comfort - summary ratings



Finally, temperature conditions were evaluated using the adjective pair technique. Figures 2.21 and 2.22 presents these findings.

Table 2.9 Thermal comfort - adjective pairs

Code	Number	Average	SD
HUMID	106	3.09	.75
WSTEMP	107	2.59	.88

Figure 2.22 Adjective pairs - Temperature - Hot/Cold

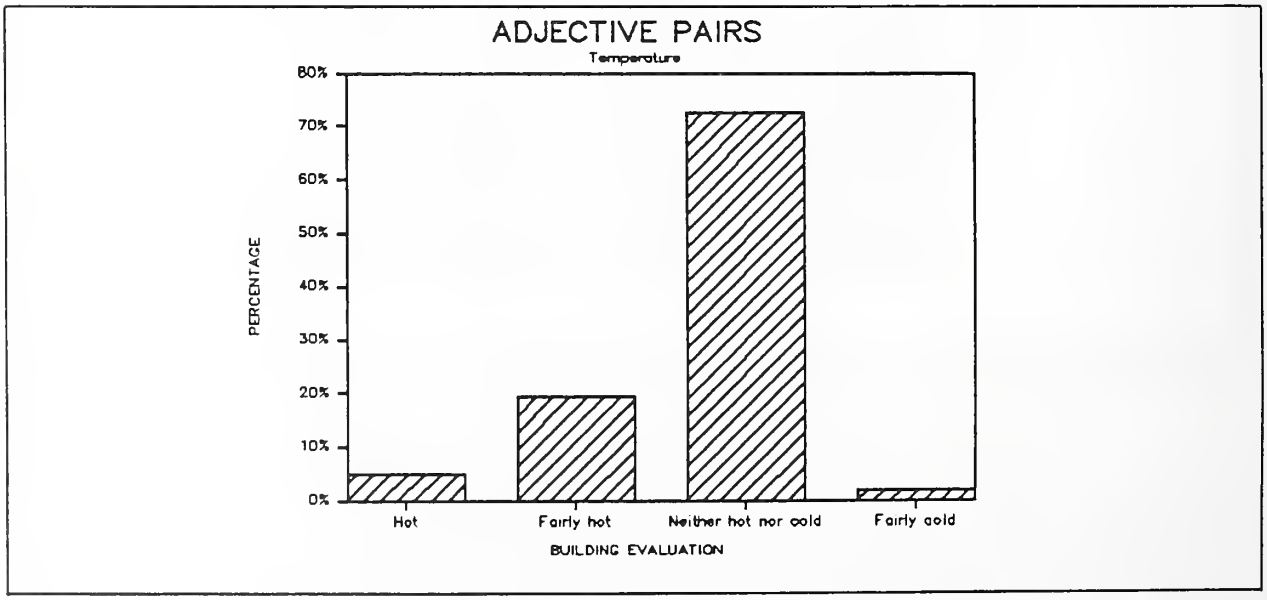
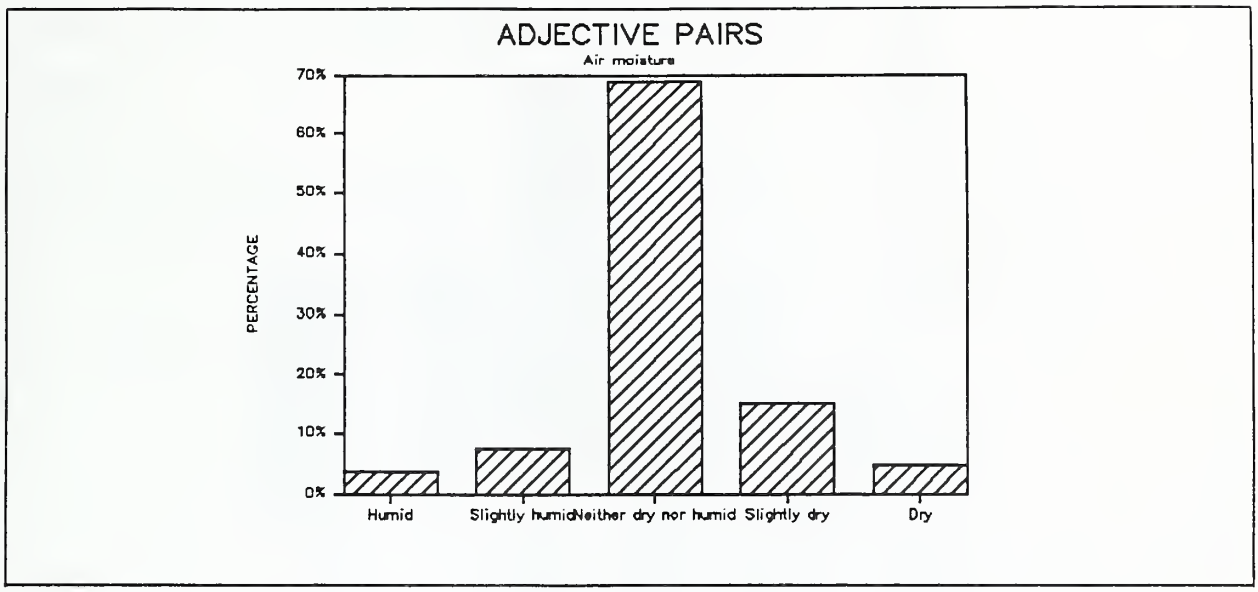


Figure 2.23 Adjective pairs - Air moisture - Humid/Dry



2.2.3 Air quality

Air quality satisfaction (AIRQSAT) was evaluated on a 5-point scale; see figure 2.23. The average finding of 3.20, suggests a problem, which is reinforced by responses to the question. The average response of 2.70 for (STUFYAIR) indicates that air stuffyness is still a problem for many respondents. (The average for Portland1 was 2.85.) The final air quality issue examined was (ODORS), also assessed on a 4-point scale. See figures 2.24 and 2.25.

Table 2.10 Air quality

Code	Number	Average	SD
AIRQSAT	106	3.20	1.22
STUFYAIR	106	2.70	1.02
ODORS	105	2.08	.88

Figure 2.24 Satisfaction - Air quality

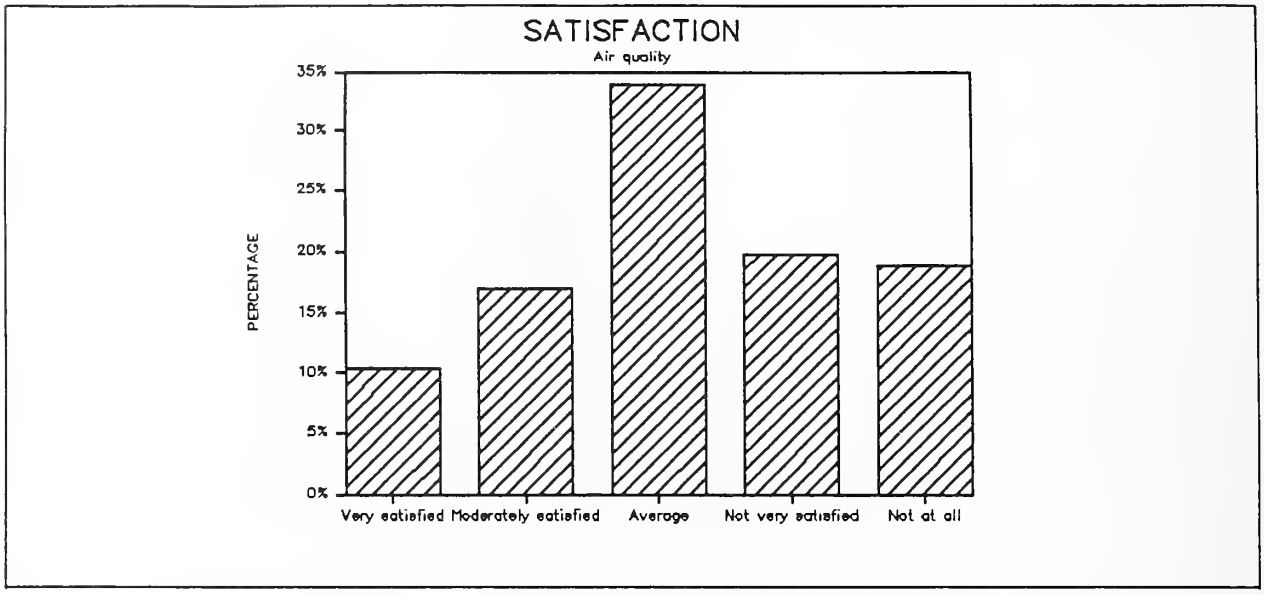
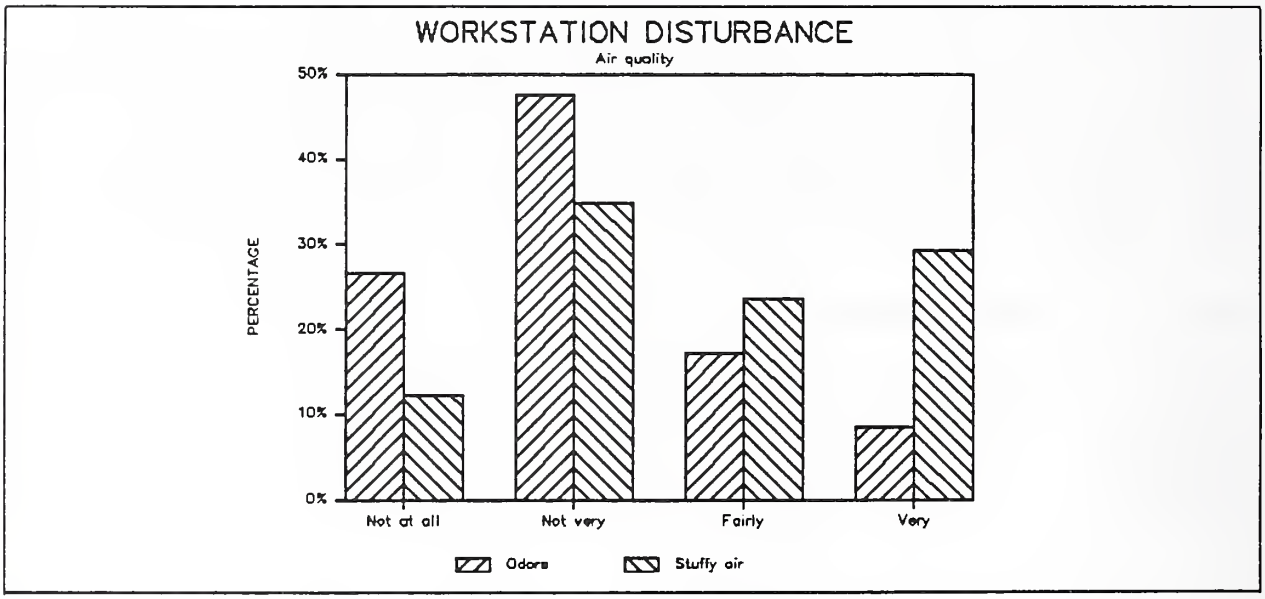


Figure 2.25 Workstation disturbance - Air quality

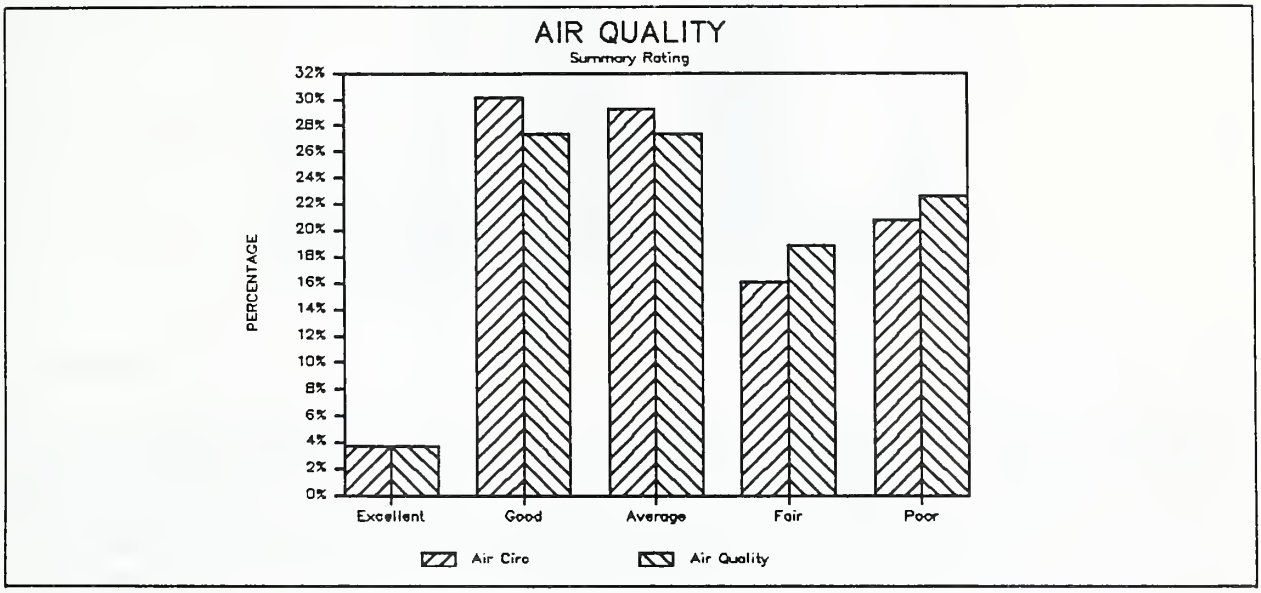


A 5-point rating scale was used to evaluate the workspace for air circulation (RTAIRC) and air quality (RTAIRQ). These findings support the view that the respondents believe that an air quality problem exists in the new buildings, as it did in the original one. See figure 2.25.

Table 2.11 Air quality ratings

Code	Number	Average	SD
RTAIRC	106	3.20	1.18
RTAIRQ	106	3.29	1.20

Figure 2.26 Air quality - Summary rating



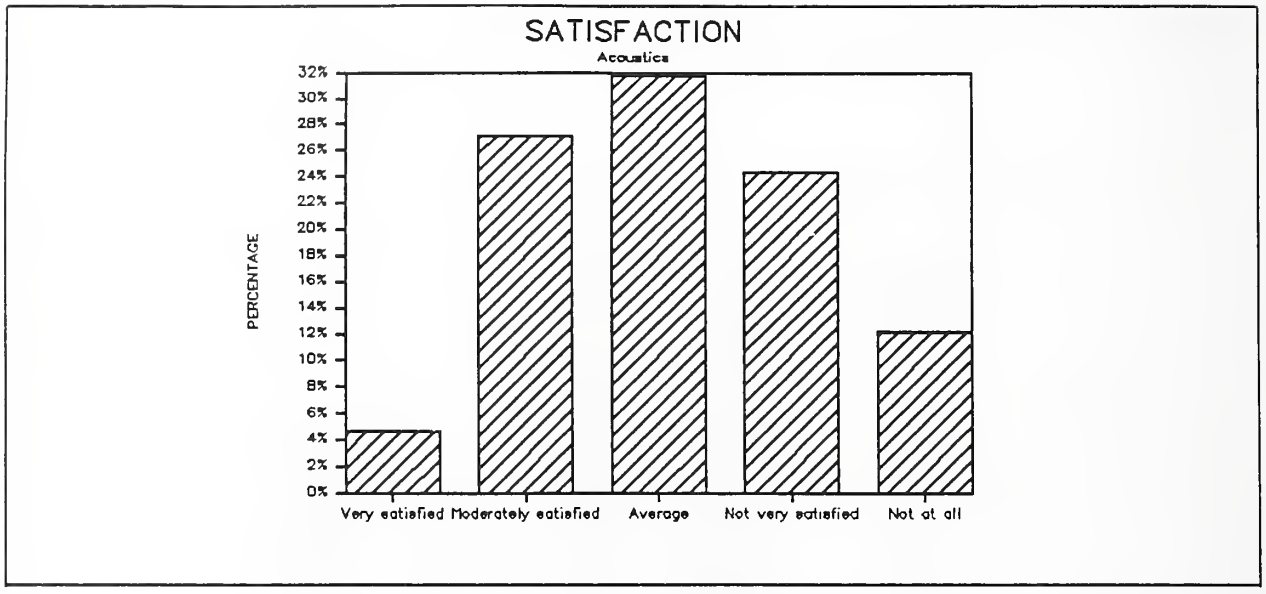
The comment data further clarified the types of complaints associated with air quality. The types of responses and their frequencies were:

Stuffy	(15)
Poor air circulation	(7)
Bad air quality	(5)
Odors present	(2)
Total	(29)

2.2.4 Noise

The next issue addressed is the acoustic environment. This appears to constitute perhaps the greatest problem in the Portland2 building. While the average of 3.12 for (SOUNDSAT) is only slightly above the midpoint of the 5-point satisfaction scale (SD 1.08, N=107), from figure 2.26, it is evident that many respondents indicate considerable dissatisfaction with the acoustic environment.

Figure 2.27 Satisfaction - Acoustics

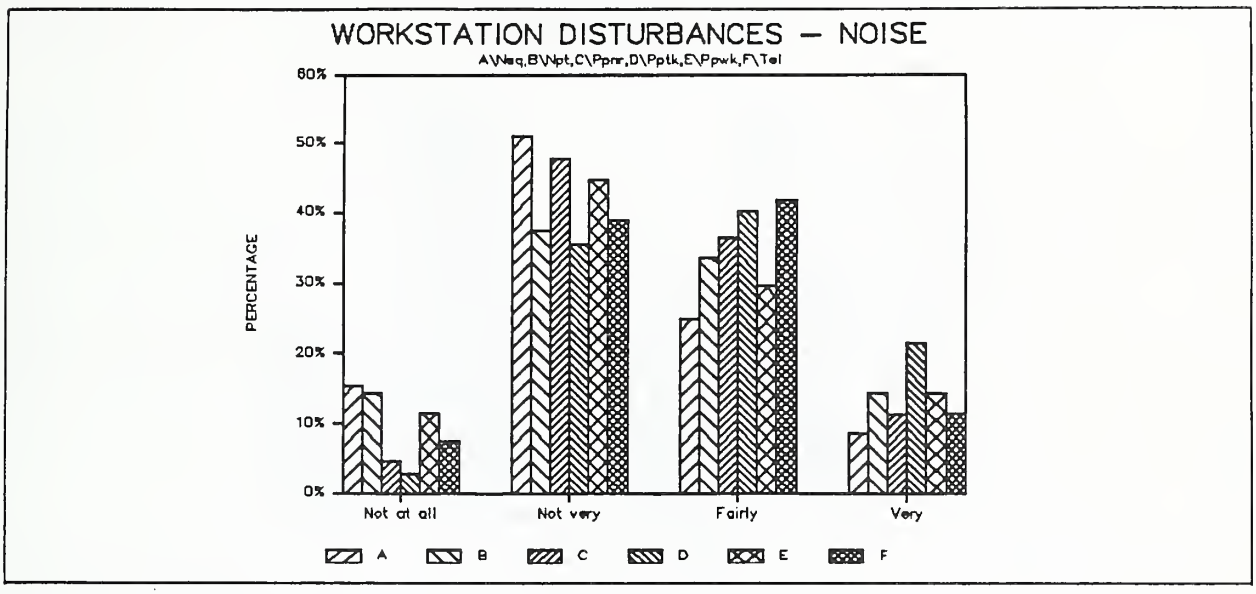


The degree of disturbance caused by a variety of factors was examined using a 4-point scale (1-not at all, 2-not very, 3-fairly, 4-very). Note that all of the responses average more than 2, the assumed neutral value. As seen in Table 2.12, the average scores for Portland2 show a slight improvement over Portland1. Figure 2.27 provides distributional data for these responses.

Table 2.12 Noise disturbances

Code	Number	Average	AverPort1	SD	Figure Code
NOISEEQP	104	2.27	(2.44)	.82	A
NOISPRT	104	2.48	(2.29)	.91	B
PEPLNEAR	107	2.54	(2.63)	.75	C
PEPLTALK	107	2.80	(2.97)	.80	D
PEPLWALK	105	2.47	(2.35)	.87	E
TELERING	105	2.57	(3.08)	.79	F
Average		2.52	(2.63)		

Figure 2.28 Workstation disturbance - Noise

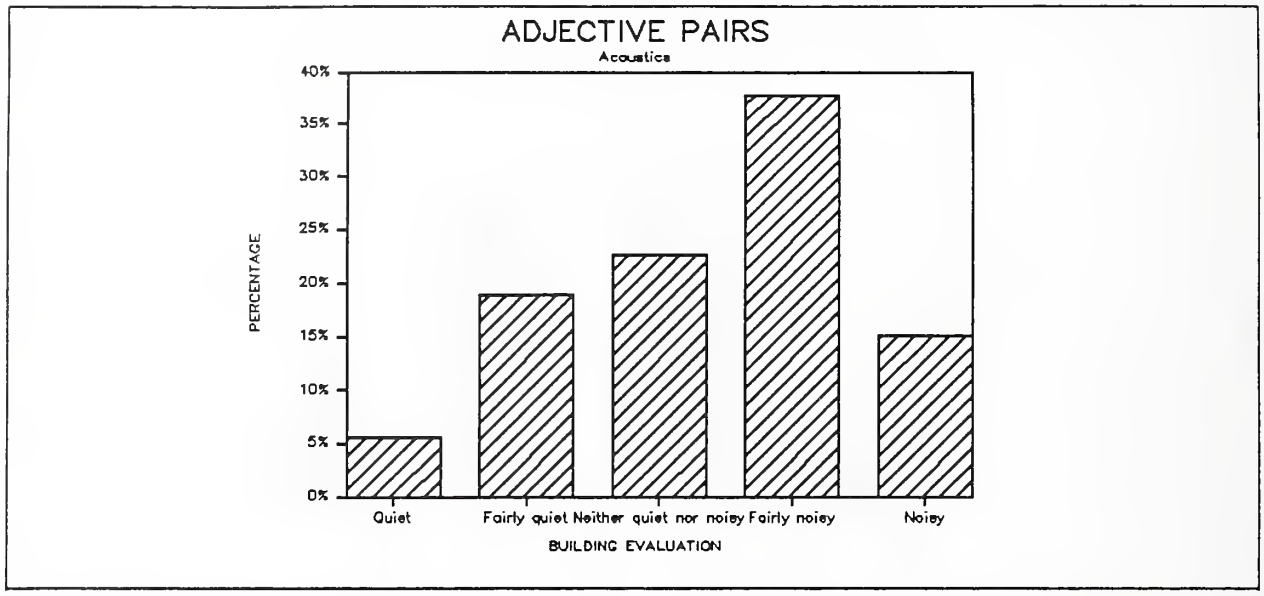


The comment data provided further information on the types of complaints made and their numbers. The total of 42 surpassed all of the other categories. People moving nearby, conversations by co-workers and equipment noise were particularly cited disturbances. When asked about the ability to control noise distractions (CTRLNOIS) at the workstation, again the average finding of 3.47, SD 1.14, N=106, on a 5-point satisfaction scale, indicated that noise was a major annoyance. Below are some of the responses and their frequencies.

Noisy	(17)
Traffic disturbances	(7)
Conversations	(7)
Equipment noise	(7)
Can't concentrate	(4)
Total	(42)

The final noise assessment employed adjective pairs; the average was 2.62, SD 1.12, N=106. See figure 2.28.

Figure 2.29 Adjective pairs - Quiet/Noisy



2.2.5 Privacy

The ability to function without being interrupted is an important feature of most work. This factor was examined under the general category of 'privacy'. Privacy was then assessed on a 5-point scale (1-strongly agree, 2-agree, 3-neutral, 4-disagree, 5-strongly disagree). Respondents were asked to respond to the statement that 'Visual (auditory) privacy is adequate'. Auditory privacy was an evident problem, although slightly improved from the Portland1 findings. Further data appear in figure 2.29.

Table 2.13 Privacy

Code	Number	Average	AverPort1	SD
VISPRIV	105	2.83	(3.05)	1.25
AUDPRIV	104	3.60	(3.68)	1.15

Figure 2.30 Workstation layout - Adequacy of privacy

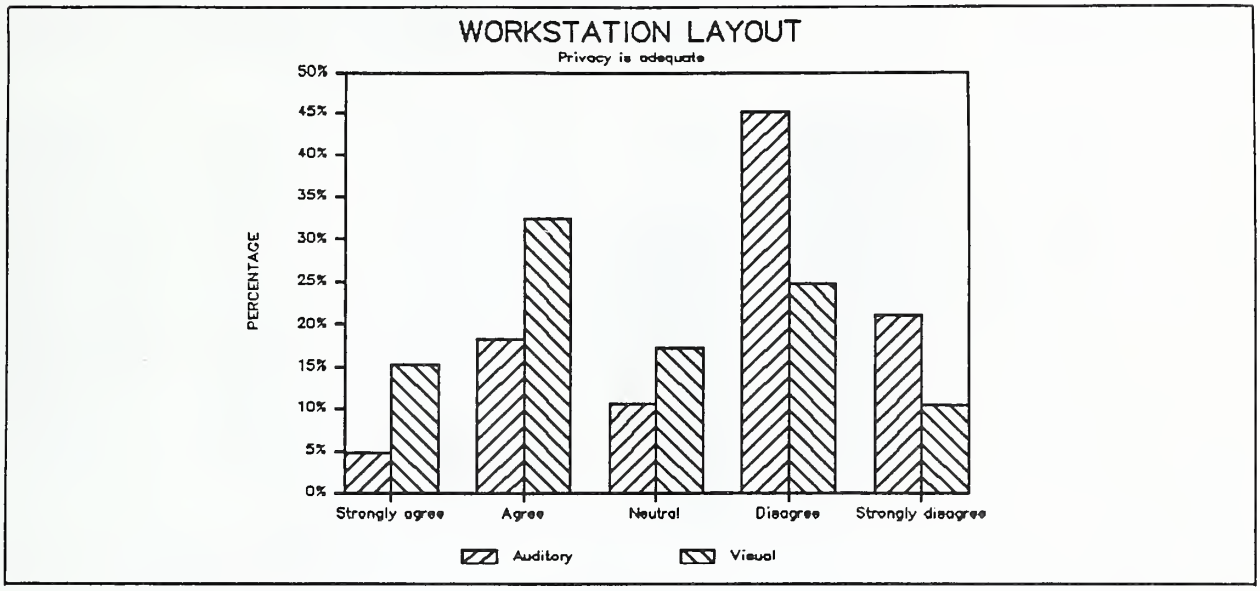
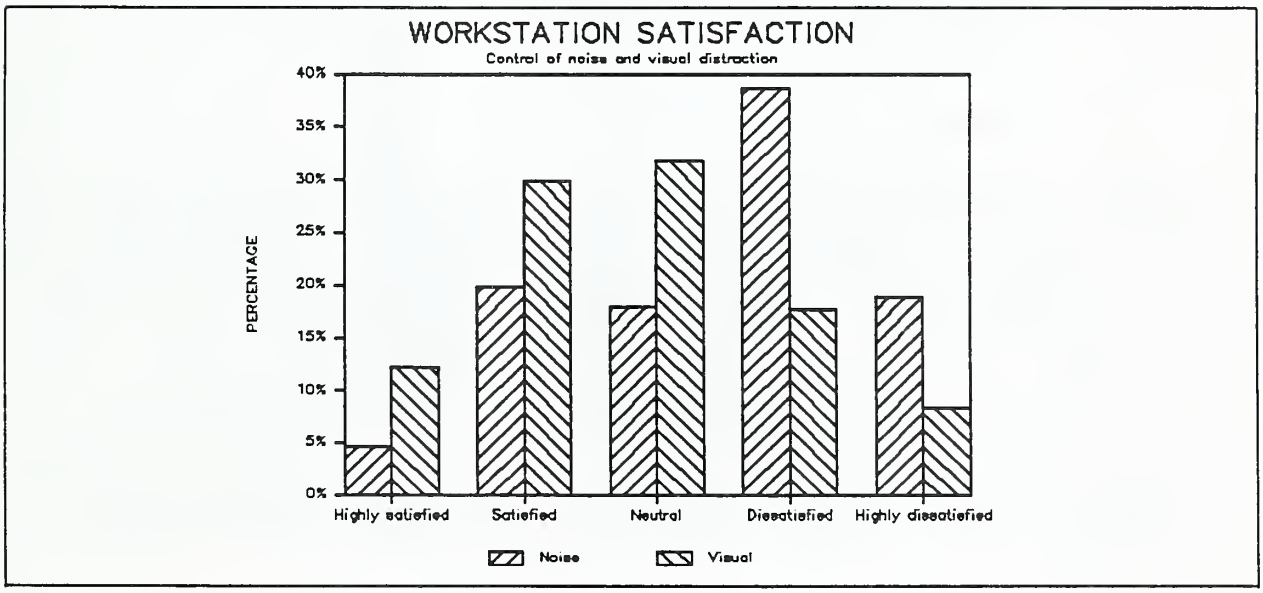


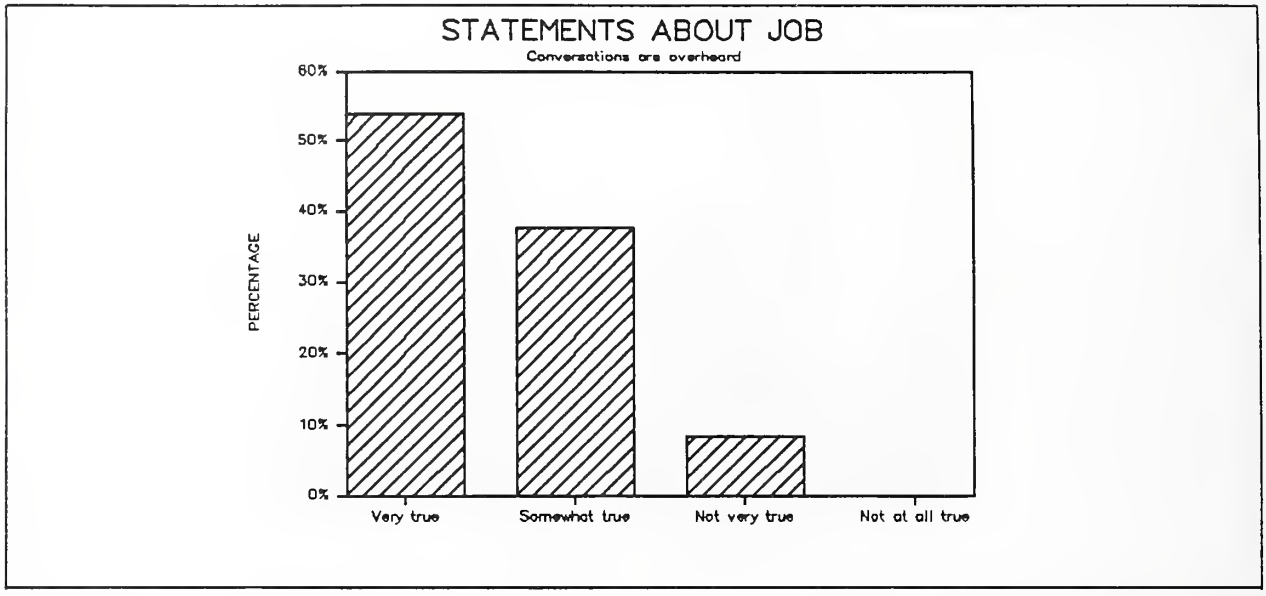
Figure 2.31 Workstation satisfaction - Control of distractions



The comment data strongly supported the need for more privacy.

The truth of the statement that conversations are overheard was rated on a 4-point scale (very true-1, somewhat true-2, not very true-3, and not at all true-4). (CONVERS) had a rating of 1.55, SD of .65, N= 105 respondents. Several respondents indicated that conversations could be readily heard. There was no chance to have confidential discussions at workstations. This was especially noted by those with supervisory responsibilities, who suggested that it made their jobs very difficult. Below are some comments.

Figure 2.32 Statements about job - Conversations overheard



No privacy	(15)
No confidentiality	(13)
Private office, supervisor	(4)
Total	(32)

2.3 Health issues

The respondents were asked how often they think that various symptoms occurred by working in the building. A 4-point scale was used (1-never, 2-rarely, 3-sometimes, 4-always). Difficulty in concentration (DIFFCON) was the most frequent complaint. This is possibly attributed to noise intrusions. The other scores well above 2 (the estimated 'neutral' response) were 2.28 for (HEADACHE) and 2.34 for (SLEEPY), are often associated with air quality and air circulation difficulties. These findings are consistent with the responses to the noise and air quality questions. The ratings were a considerable improvement of those obtained in the Portland1 findings, with a single exception (*). (See Table 2.14) Figures 2.32 and 2.33 provide more detailed information.

Table 2.14 Symptom frequency

Code	Mumber	Average	AverPort1	SD	Figure Codes 1	2
ALLERGY	99	1.83	(2.07)	.92	A	
CRAMP	93	1.53	(1.88)	1.16	B	
DIZZY	92	1.39	(1.70)	.62	C	
DIFFCON	95	2.47*	(2.40)	.90	D	
FATIGUE	97	2.12	(2.49)	.92	E	
FOCUSEYE	97	2.03		.94	F	
IRRITEYE	93	2.23	(2.34)	.95		A
HEADACHE	97	2.28	(2.55)	.96		B
RUNNOSE	95	1.86	(2.35)	.94		C
SLEEPY	98	2.34	(2.45)	.91		D
SORETHOT	97	1.80	(2.20)	.80		E
SINUS	98	2.05	(2.19)	1.30		
Average		1.99	(2.24)			

Figure 2.33 Symptoms - 1

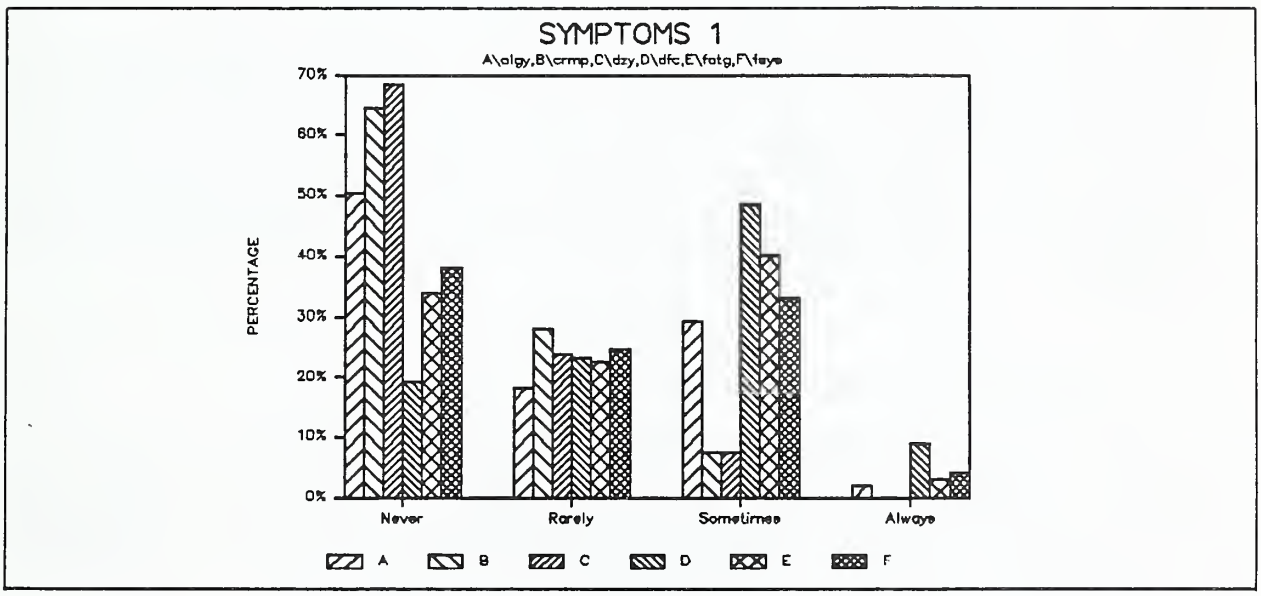


Figure 2.34 Symptoms - 2

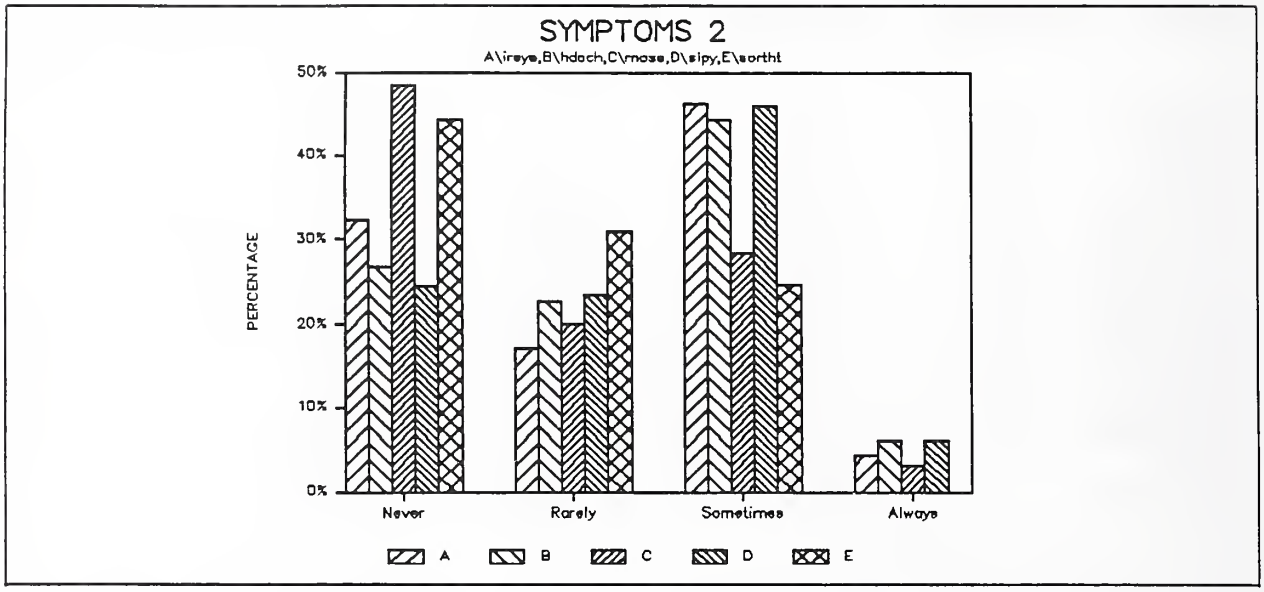


Table 2.15 SICKNESS - Time lost during last year

Time lost	No	%
None	24	23.8%
1-2 days	35	34.7%
3-5 days	29	28.7%
6-12 days	11	10.9%
12+ days	2	2.0%
Total	101	

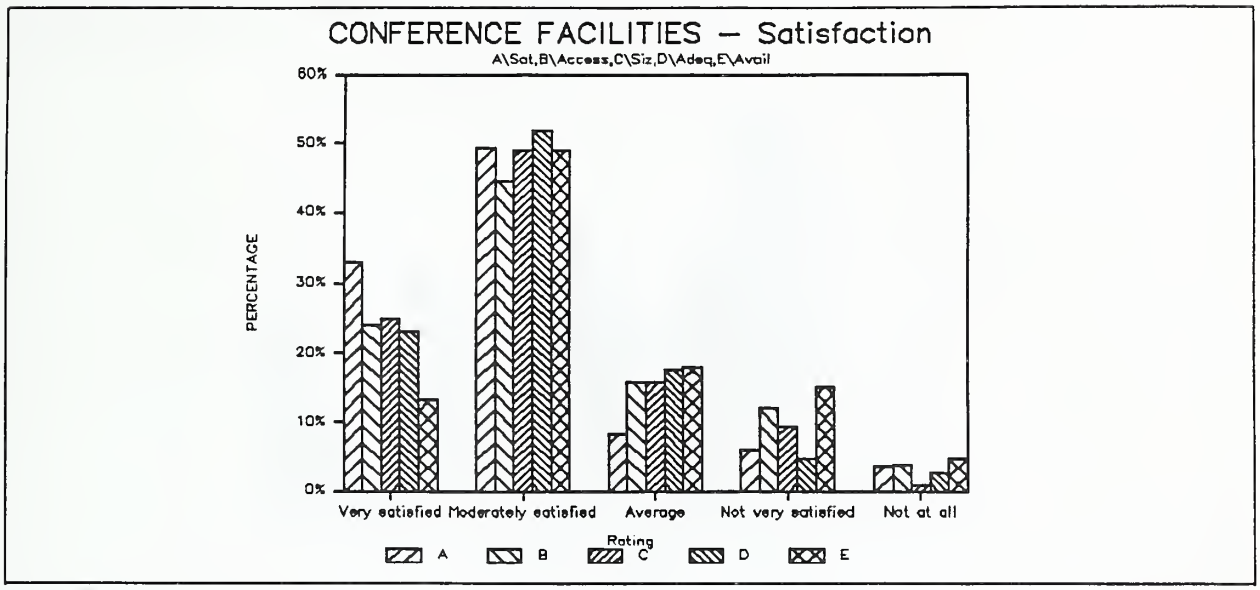
2.4 Building features

The next topic addressed was the degree of satisfaction with several aspects of the office. A 5-point scale was used for these ratings (1-highly satisfied, 2-satisfied, 3-neutral, 4-dissatisfied, 5-highly dissatisified). The first rating concerned conference facilities. All features were rated satisfactory on the average; also see figure 2.34.

Table 2.16 Rating of conference facilities

Code	Mumber	Average	SD	Figure Code
CFSAT	82	1.98	.98	A
CFSATACC	108	2.27	1.07	B
CFSATSIZ	108	2.12	.92	C
CFSATADQ	108	2.12	.92	D
CFSATAVL	106	2.49	1.05	E

Figure 2.35 Satisfaction - Conference facilities

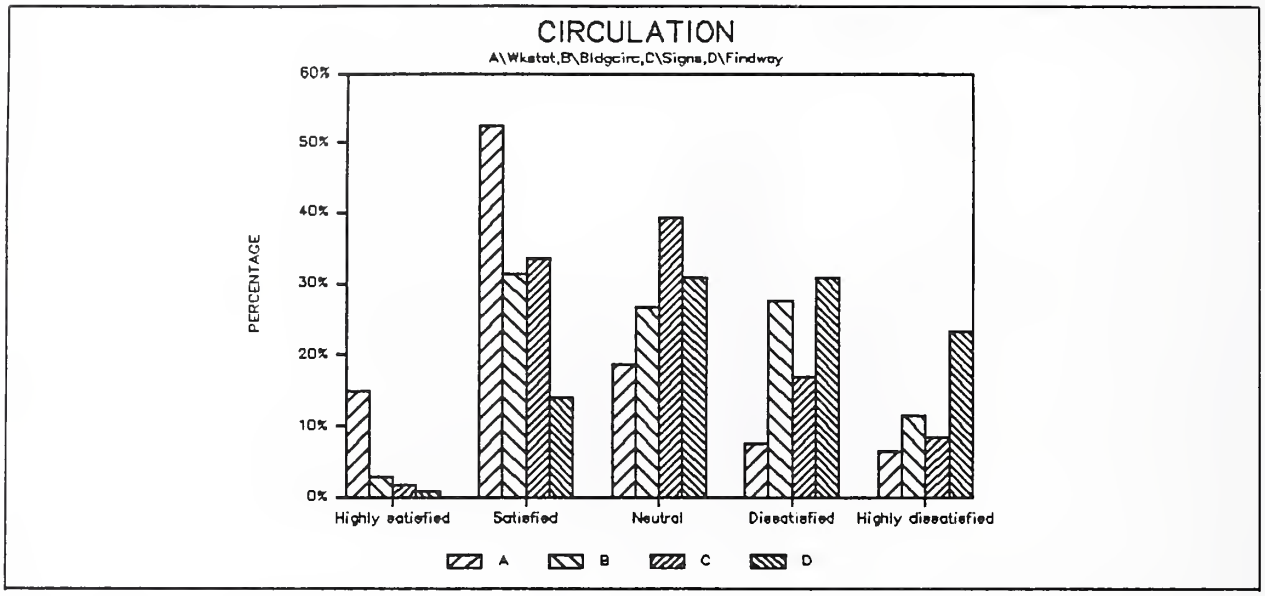


Using the same 5-point satisfaction scale noted above, the ease of circulation was assessed. If we consider all scores greater than 3 as indicative of a possible problem, then this building feature requires some attention. The ease of finding ones way through the building was given the 'worst' rating, 3.62. This finding was supported by interview data with employees and facility management personnel who indicated that visitors often have a difficult time finding their destinations.

Table 2.17 Building circulation features

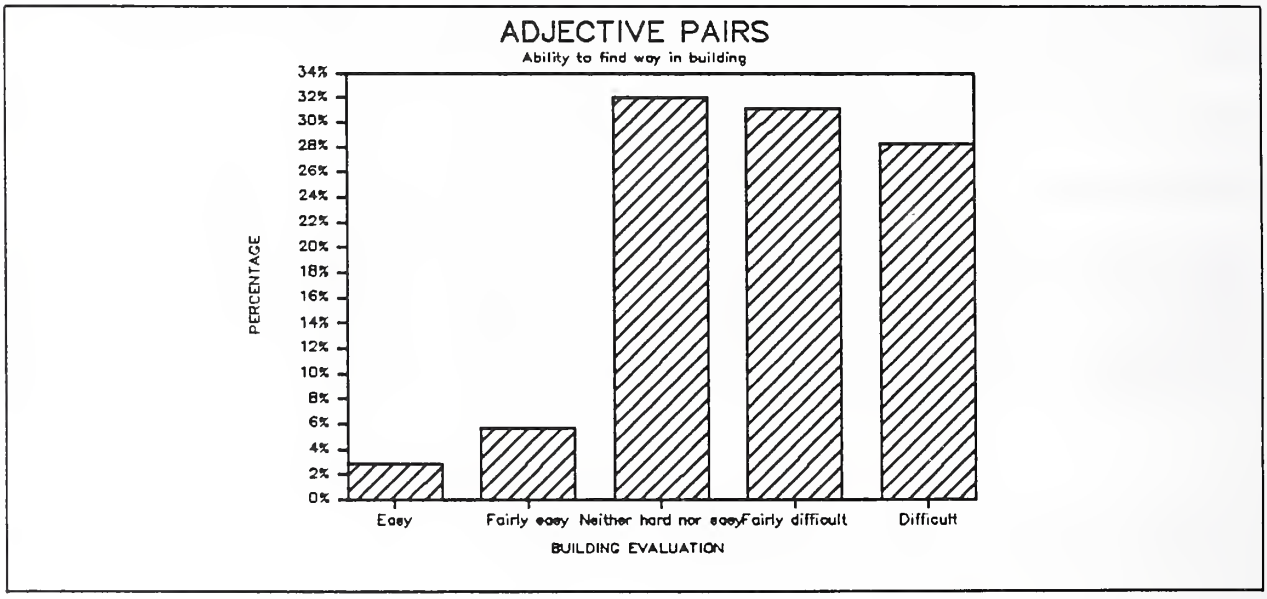
Code	Mumber	Average	SD	Figure Code
WSCIRC	107	2.38	1.04	
SECTCICR	107	2.63	1.04	
BLDGCIRC	105	3.13*	1.07	
SIGNAGE	107	2.96	.96	
FINDWAY2	107	3.62	1.02	

Figure 2.36 Office circulation



A further analysis of direction finding was performed using an adjective pair approach. The average for (FINDWAY) was 2.24, SD 1.01, N=106. Figure 2.36 summarizes these findings.

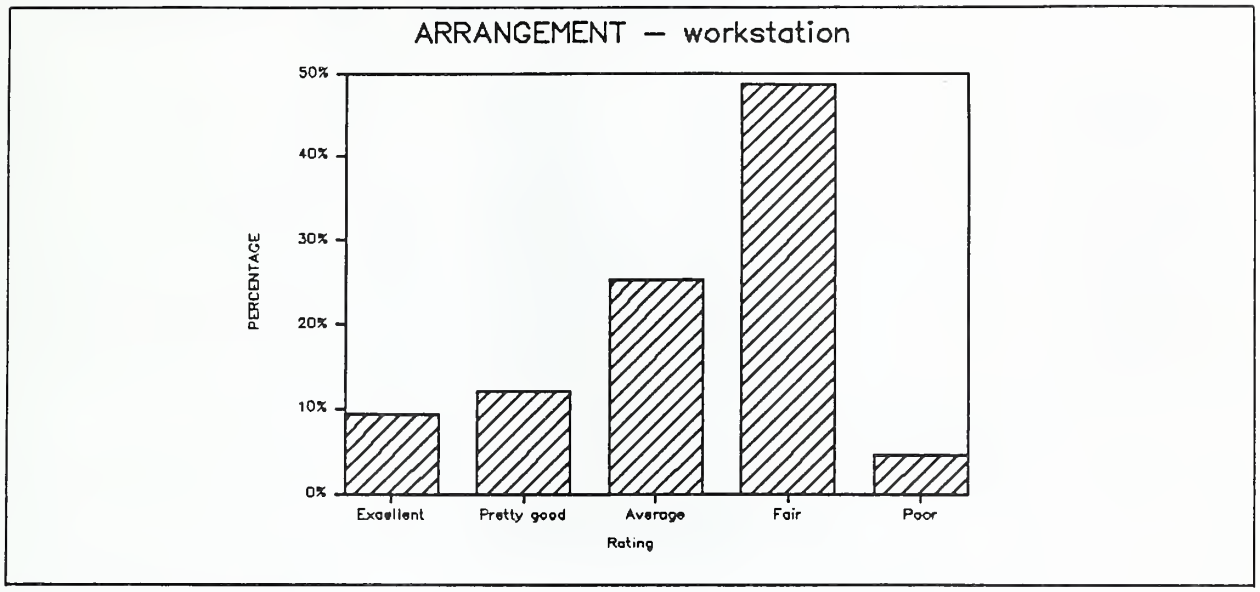
Figure 2.37 Adjective pairs - Wayfinding - Easy/Difficult



2.5 Job related activities

The arrangement of the workstation to get the job done was then rated on a 5-point scale (1-poor, 2-fair, 3- average, 4-pretty good, 5-excellent). The ratings indicated a generally unfavorable response. The average rating for (ARGMTWS) was 3.27, SD 1.05, N= 105. Figure 2.37 summarizes these data.

Figure 2.38 Arrangement - Workstation



The ease of communicating with coworkers (EASECOM) was assessed on a 5-point satisfaction scale. The average was 2.46, SD 1.03, N=107.

Figure 2.39 Workstation satisfaction - Coworker access

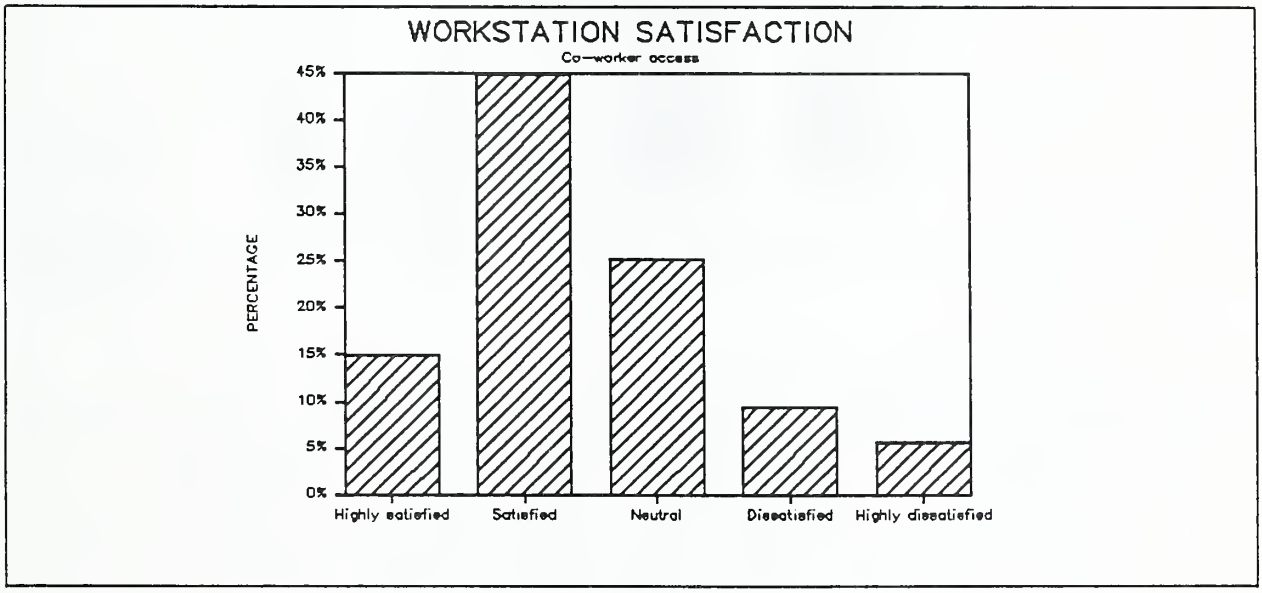


Table 2.18 summarizes the average amount of time spent per day on a variety of office tasks. The data indicate that most tasks were performed between 1 and 3 hours on the average. Figures 2.39 and 2.40 provide a more detailed breakdown of these findings.

Table 2.18 Hours spent on office tasks

Code	Mumber	Average	SD	Figure Code 1	Figure Code 2
HRSDYANL	97	2.59	.77	A	
HRSDYBRF	80	1.61	.60	B	
HRSDYFIL	75	1.37	.56	C	
HRSDYMTG	95	2.19	.77	D	
HRSDYOTH	29	2.21	.89	E	
HRSDYTEL	103	2.03	.43		A
HRSDYTYP	65	1.55	.74		B
HRSDYWRT	98	2.39	.72		C
HRSDYVDT	91	2.44	.80		D
HRSDYRED	104	2.45	.60		E

Figure 2.40 Hours spent on task - 1

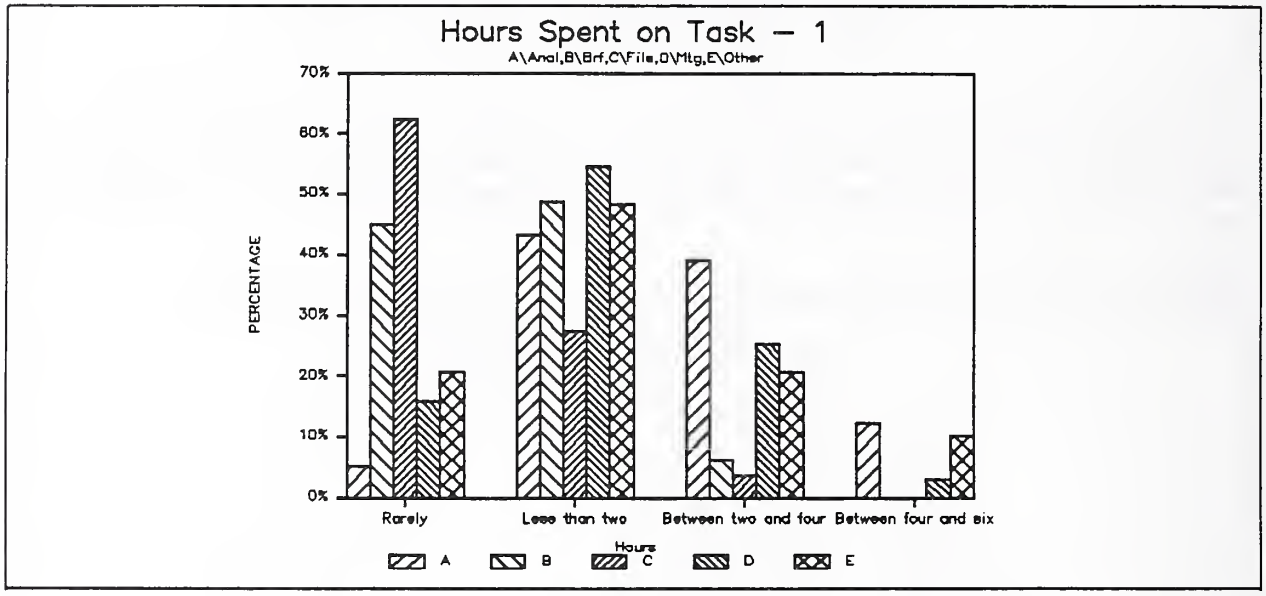
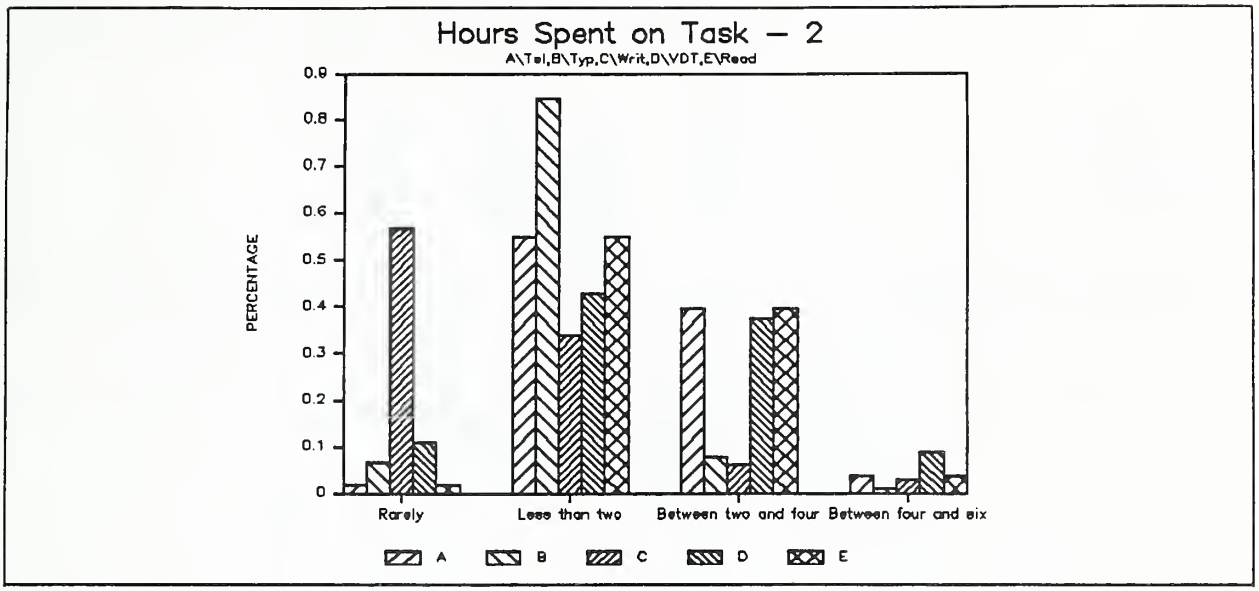


Figure 2.41 Hours spent on task - 2



The next table indicates the number of people engaging in various tasks at their workstations. The findings indicate that most people perform a variety of tasks during the course of their work. These data are consistent with the hours spent on tasks; the question analyzed.

Table 2.19 Activities performed at workstations

Code	Number
VDTATWS	76
READING	97
ANALYSIS	91
BRIEFING	48
MEETING	76
TELEPHON	85
FILING	17

The next item explores job features likely to influence productivity. These characteristics were examined by determining the truthfulness of a series of statements on a 4-point scale (1-very, 2-somewhat, 3-not very, 4-not at all). The most important finding appears to be the need for concentration on the job. This would contribute to complaints about the lack of privacy and noise intrusions; distractions that hinder job performance.

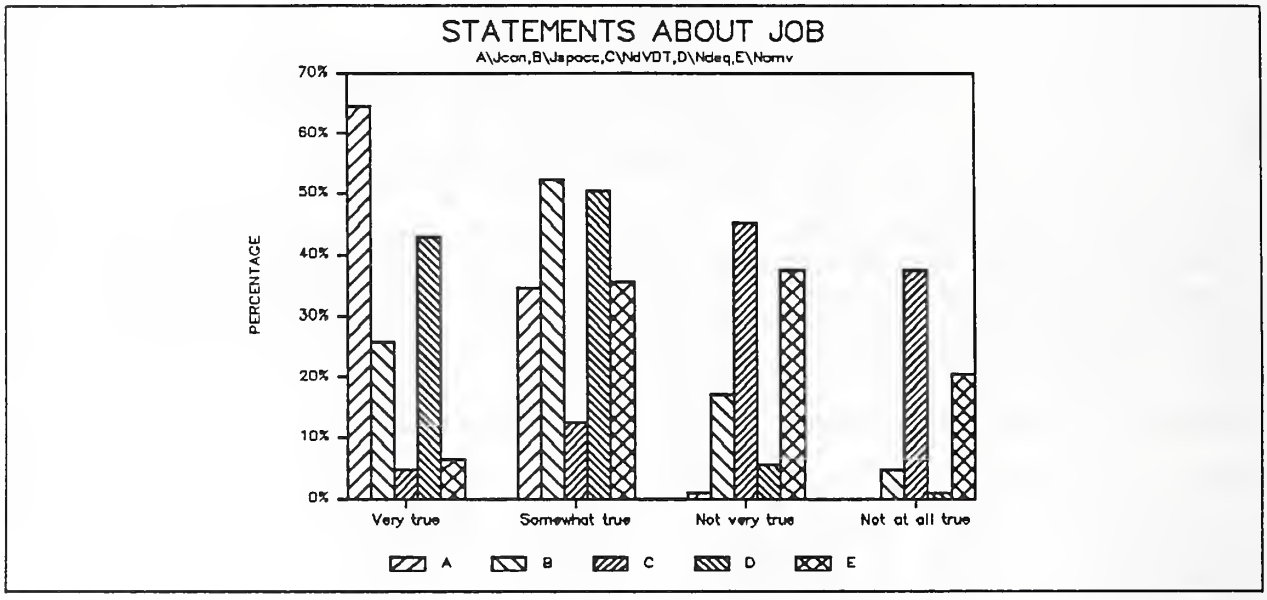
I have the job tools needed. (NEEDEQP)
I remain in place all day. (NOMOVFWS)
My job requires concentration. (JOBCON)
I need more time on a terminal. (NEDVDTTM)
My job requires speed/accuracy. (JOBSPEED)

Table 2.20 Job features

Code	Mumber	Average	SD	Figure Code
JOBCON	107	1.36	.50	A
JOBSPEED	106	2.03	.80	B
NEDVDTTM	107	3.15	.82	C
NEEDEQP	107	1.64	.63	D
NOMOVFWS	107	2.72	.86	E

Figure 2.41 indicates the distribution of responses on these job related activities.

Figure 2.42 Statements about job

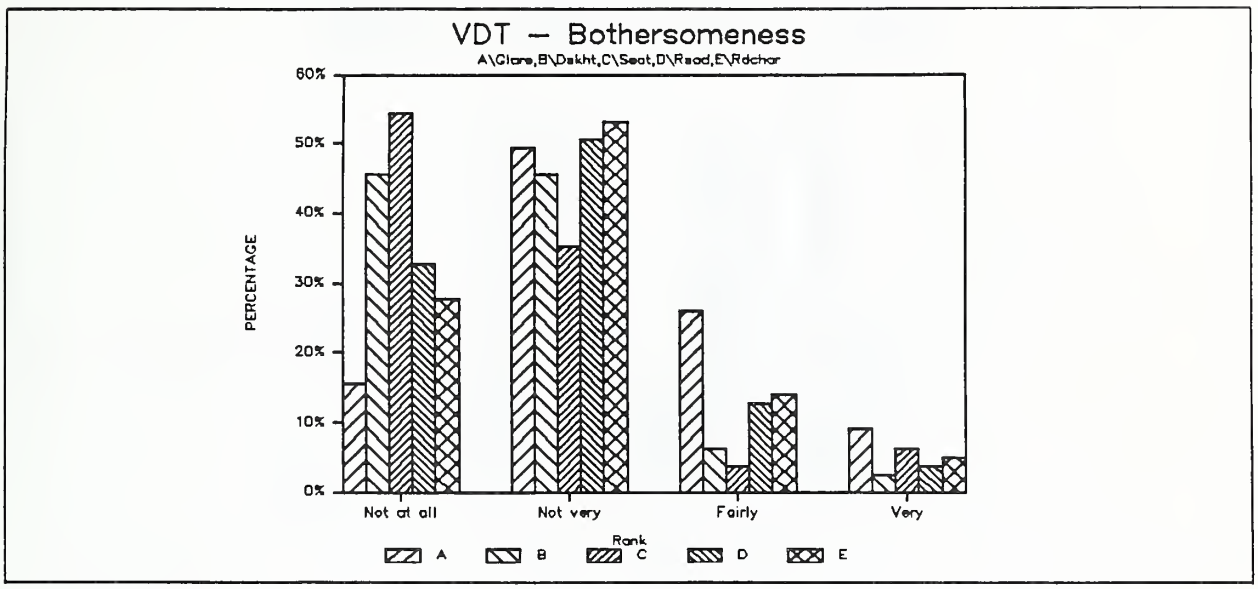


The next question concerns those workers who used VDT's in their jobs. The intent was to assess the 'bothersomeness' of a series of VDT features on a 4-point scale (1-not at all, 2-not very, 3-fairly, 4-very). These findings did not identify any major problem, although glare was a problem for quite a few respondents. As evident in Table 2.21, all scores for Portland2 improved upon the earlier ones. Figure 2.42 presents additional data on VDT use.

Table 2.21 VDT environmental features

Code	Mumber	Average	AverPort1	SD	Figure Code
VDTGLARE	77	2.23	(2.54)	.90	A
VDTDSKHT	79	1.76	(1.93)	1.33	B
VDTSEAT	79	1.62	(2.22)	.83	C
VDTREAD	79	1.87	(1.93)	.77	D
VDTCHAR	79	1.96	(1.98)	.79	E

Figure 2.43 VDT - Bothersomeness of features



2.6 Workstation features

A variety of workstation features were then evaluated using a 5-point scale of satisfaction (1-highly satisfied, 2-satisfied, 3-neutral, 4-dissatisfied, 5-highly dissatisfied).

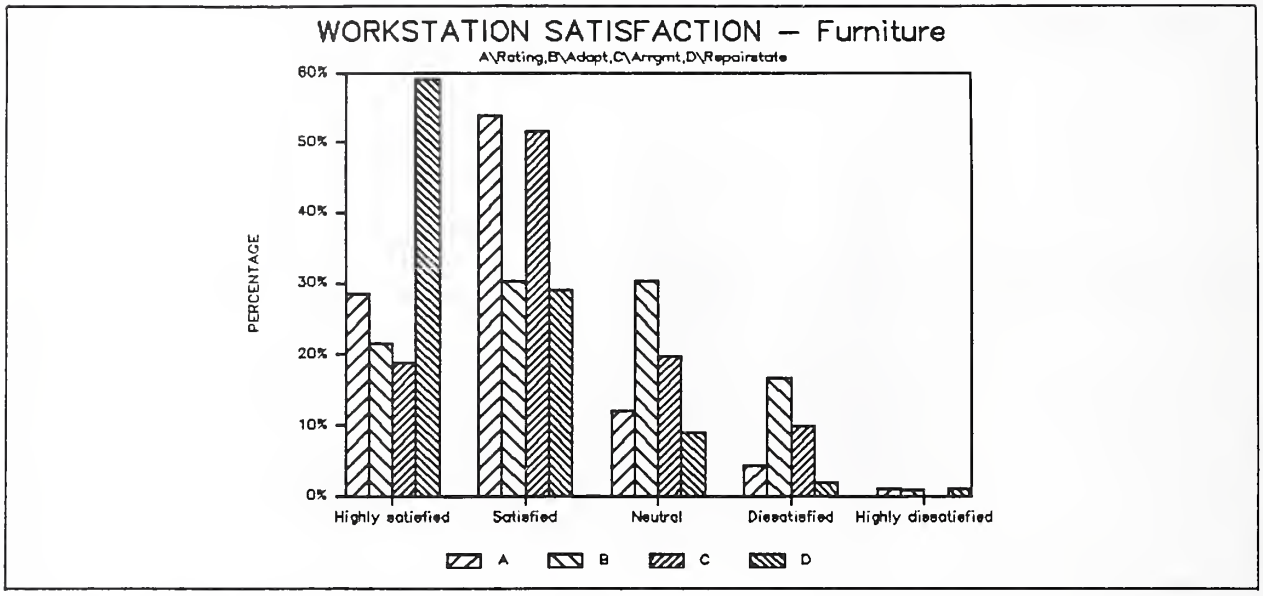
2.6.1 Furniture

The first feature examined was the furniture, using the same 5-point satisfaction scale. All average ratings were acceptable. See figure 2.43 for detailed findings.

Table 2.22 Furniture features

Code	Mumber	Average	SD	Figure Code
FURNRATE	91	1.96	.82	A
FURNABIL	102	2.45	1.03	B
FURNAGMT	101	2.21	.86	C
FURNREPR	100	1.57	.82	D

Figure 2.44 Workstation satisfaction - Furniture

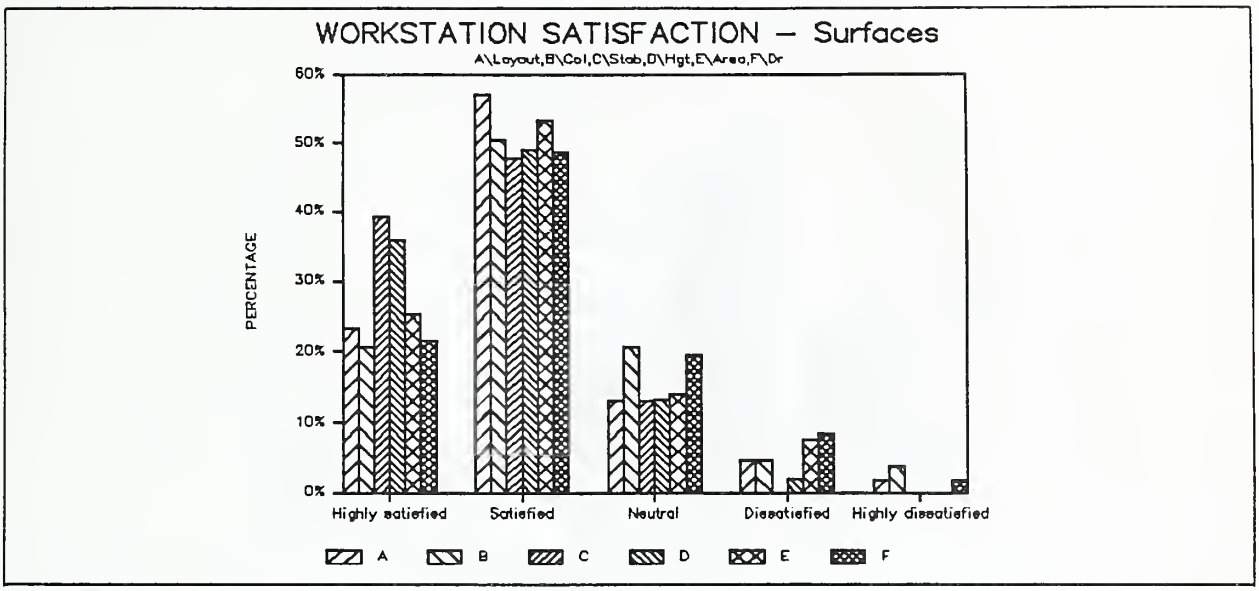


Next, characteristics of the work surfaces were examined. These features were also well regarded on the average. Further information is provided in figure 2.44.

Table 2.23 Worksurface features

Code	Mumber	Average	SD	Figure Code
WORKSURF	82	1.95	.71	
WKSFLAY	107	2.05	.85	A
WKSFCLR	107	2.21	.94	B
WKSFSTAB	107	1.74	.67	C
WKSFHGT	106	1.81	.73	D
WKSFAREA	107	2.04	.83	E
WKSFDWR	107	2.21	.93	F

Figure 2.45 Workstation satisfaction - Surfaces



Chair characteristics were then evaluated. As with the other workstation features, these average ratings indicated high user satisfaction. Additional findings appear in figures 2.45 and 2.46. The chairs were given quite good ratings on the whole.

Table 2.24 Chair features

Code	Mumber	Average	SD	Figure Code 1	Figure Code 2
CHAIRRAT	79	2.11	.97	A	
CHRADJT	106	2.04	.91	B	
CHRBACK	106	2.24	1.05	C	
CHRCLOR	106	2.13	.91	D	
CHRCMFT	106	2.19	1.06	E	
CHRHGT	75	1.99	.86		A
CHRMOBIL	106	1.83	.76		B
CHRSTAB	106	1.89	.80		C
CHRTENSE	55	2.11	.85		D

Figure 2.46 Workstation satisfaction - Chairs - 1

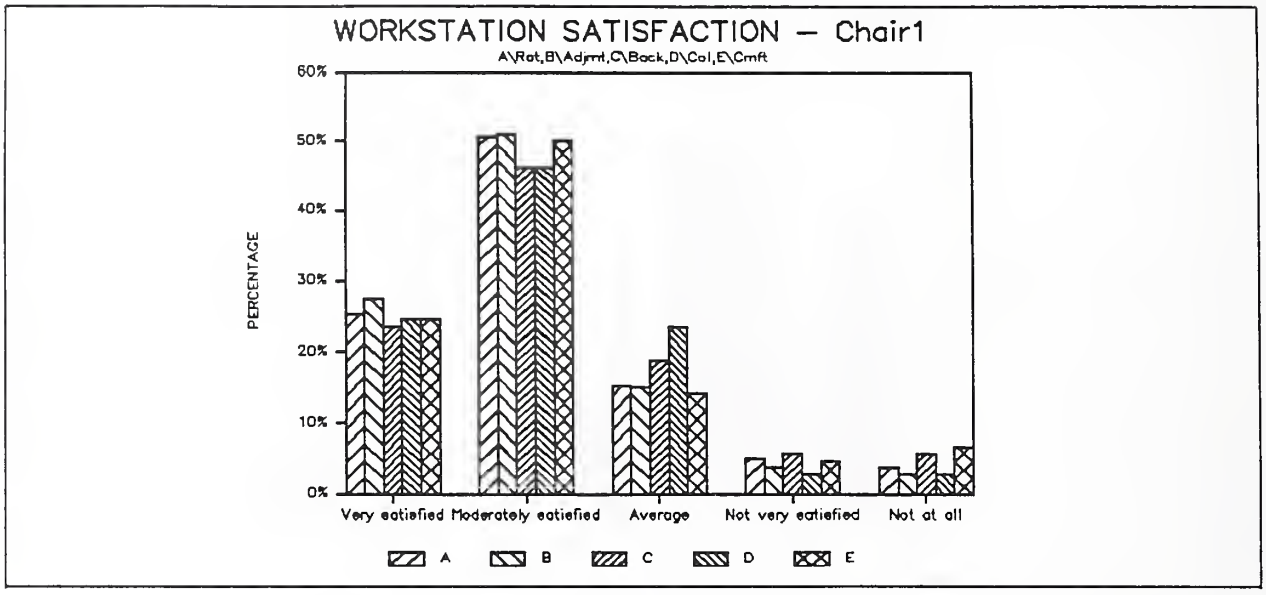
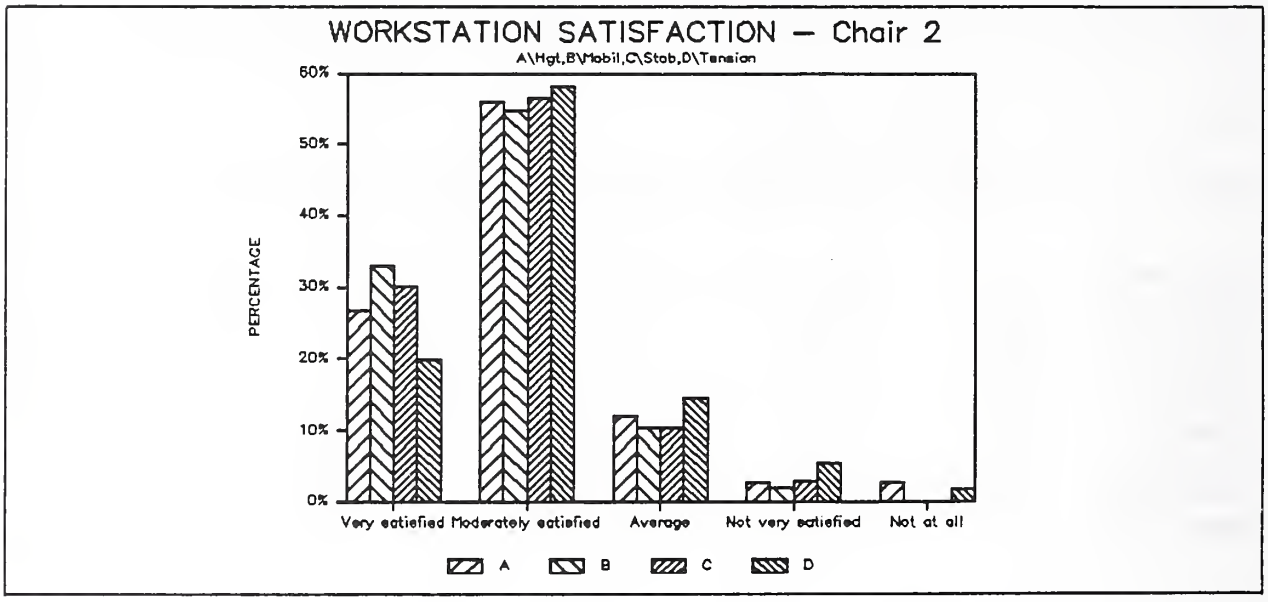
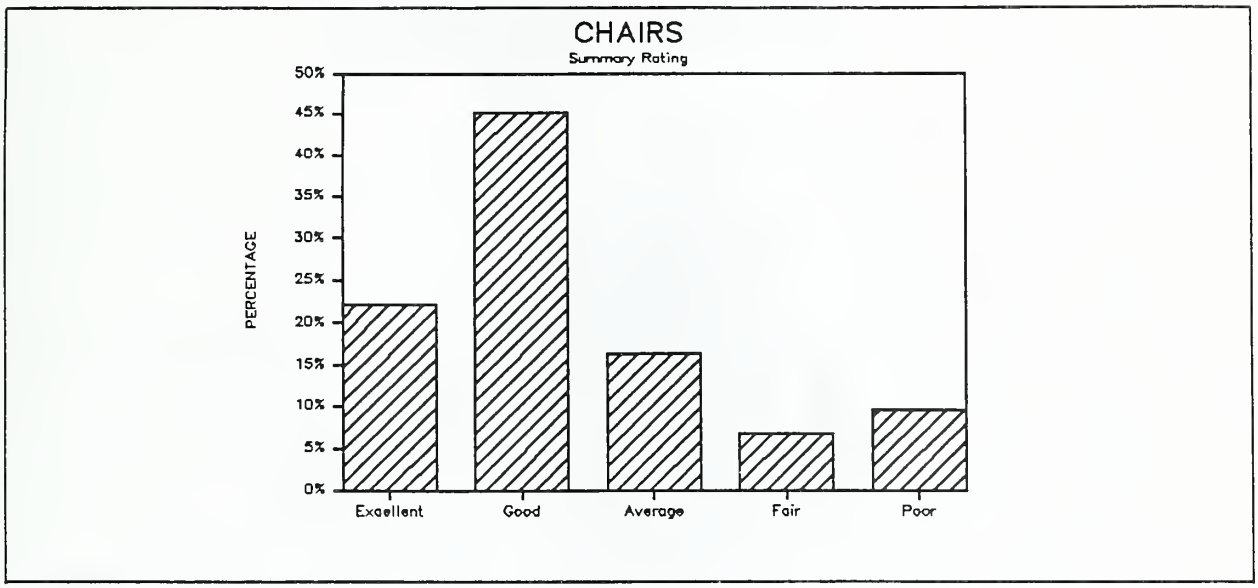


Figure 2.47 Workstation satisfaction - Chairs - 2



Chair comfort (RTCHAIR) was also assessed on a 5-point scale, ranging from 'excellent'-1 to 'poor'-5'. The average score was 2.37, which indicated considerable satisfaction, the SD was 1.18, N=104.

Figure 2.48 Chairs - Summary ratings



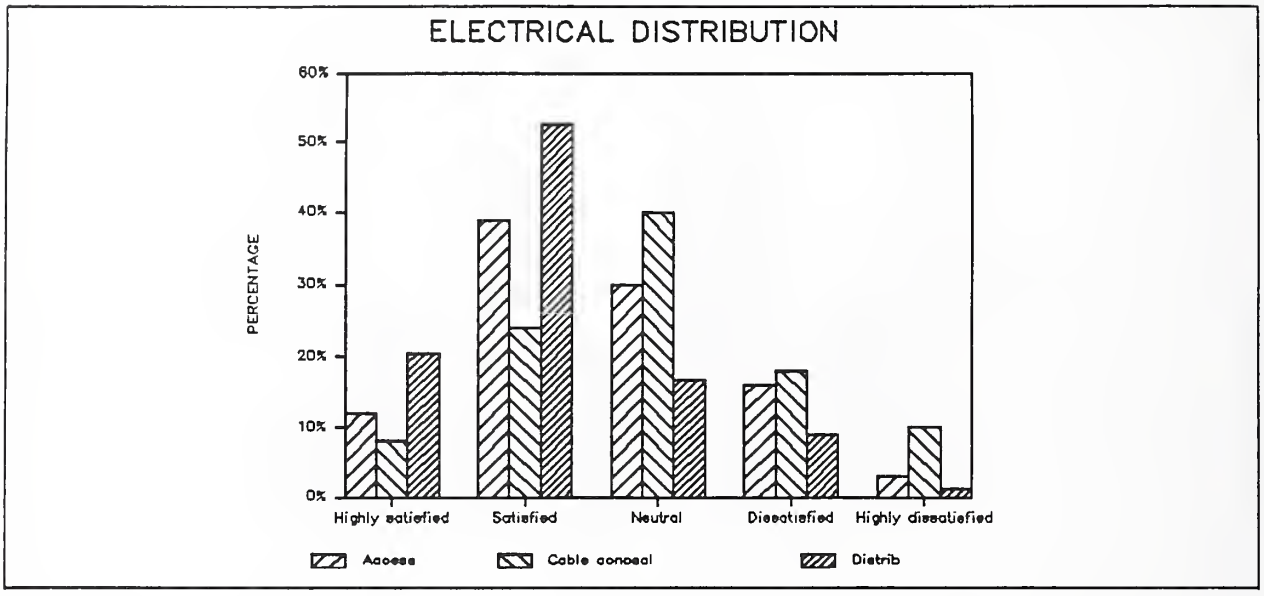
2.6.2 Electrical distribution

The introduction of new electronic equipment at workstations has greatly increased the importance of electical distribution in the modern office. The next items evaluated the satisfaction of occupants with this feature, using the 5-point scale ranging from 'excellent'-1 to 'poor'-5'. No apparent problem was identified. Ratings were considerably higher than in Portland1. Figure 2.48 presents detailed findings.

Table 2.25 Electrical distribution

Code	Number	Average	AverPort1	SD
ELECDIST	78	2.27		1.39
ELECACC	100	2.59	(3.95)	.99
ELECCABL	100	2.98		1.07
OUTLETUS	82	3.23	(3.73)	1.87

Figure 2.49 Electrical distribution



2.6.3 Storage

The amount of storage room available for working materials and personal items has been a sore point with many workers in open plan offices (1,2). The next items examined the rate of satisfaction (using the same 5-point scale as above). The average scores were in the acceptable range. Also see figures 2.49 and 2.50.

Table 2.26 Storage

Code	Mumber	Average	SD	Figure Code 1	Code 2
STORFILE	100	2.33	.95	A	
STORDISK	98	2.53	2.11	B	
STORQMT	103	2.30	.83	C	
STORACC	106	2.17	.82	D	
STORPERS	106	2.34	.93		A
STORAMT	104	2.42	.95		B
STORFUTR	101	2.53	.96		C

Figure 2.50 Workstation satisfaction - Storage - 1

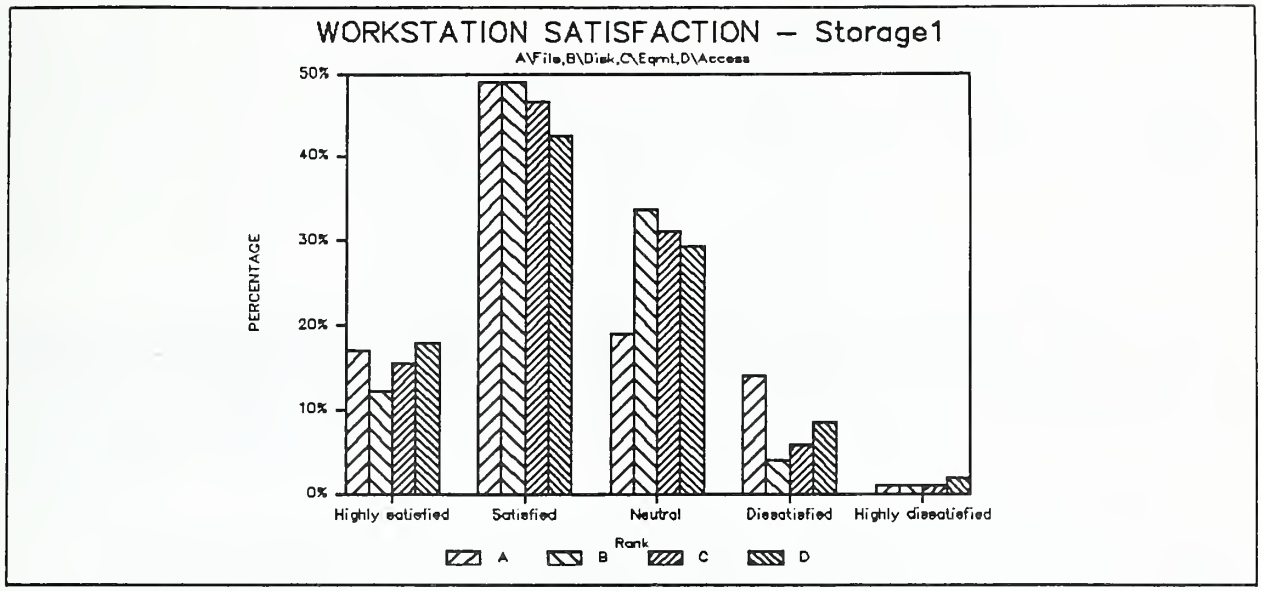
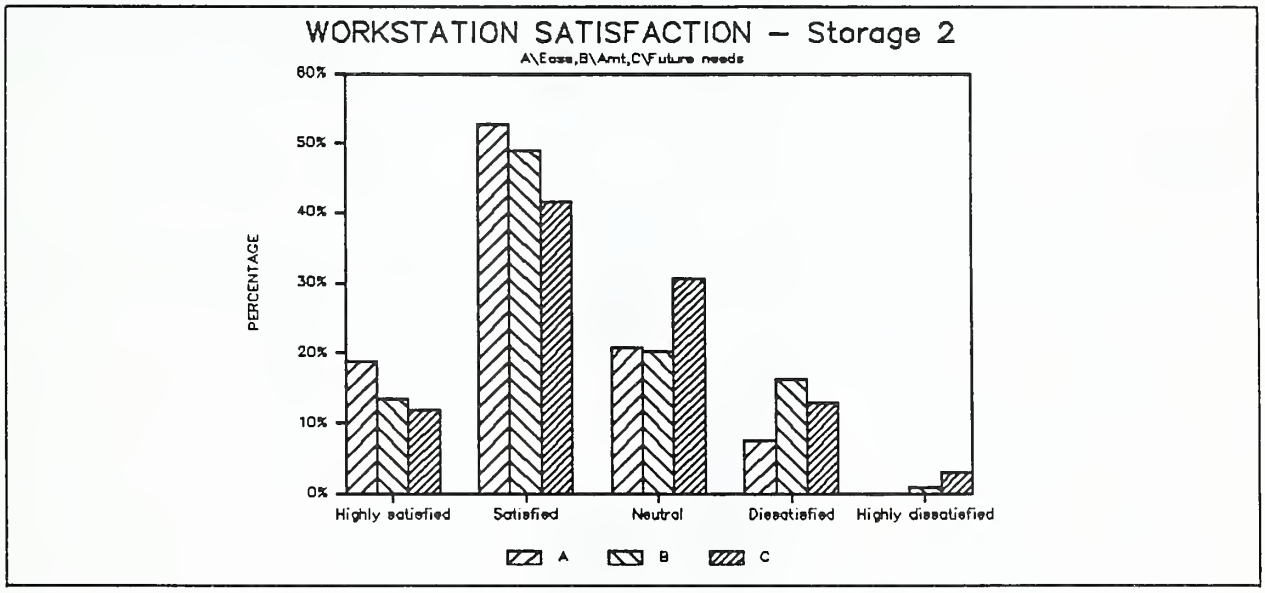


Figure 2.51 Workstation satisfaction - Storage - 2



2.6.4 File usage

As a means of determining the types of files kept at workstations, several categories of information were examined. The numbers indicate the total number of people having these files at their workstations. The categories are reference or office use (FILEUSE), printouts sent out (FILEHCPY), files to be discarded (FILEDSCD), shared reference files (FILEREF), updated information (FILEUPDT) and information to be reviewed (FILERVEW).

Table 2.27 File use

Code	Number
FILEUSE	79
FILEHCPY	19
FILEDSCD	12
FILEREF	44
FILEUPDT	48
FILERVEW	36

The following item (CHGTIMES) was concerned with the number of times that changes were made at the workstation since moving. The average was .48, SD .90, N= 106, indicating approximately half of the respondents had changes made since occupancy. These changes were due to individual requests and organizational actions.

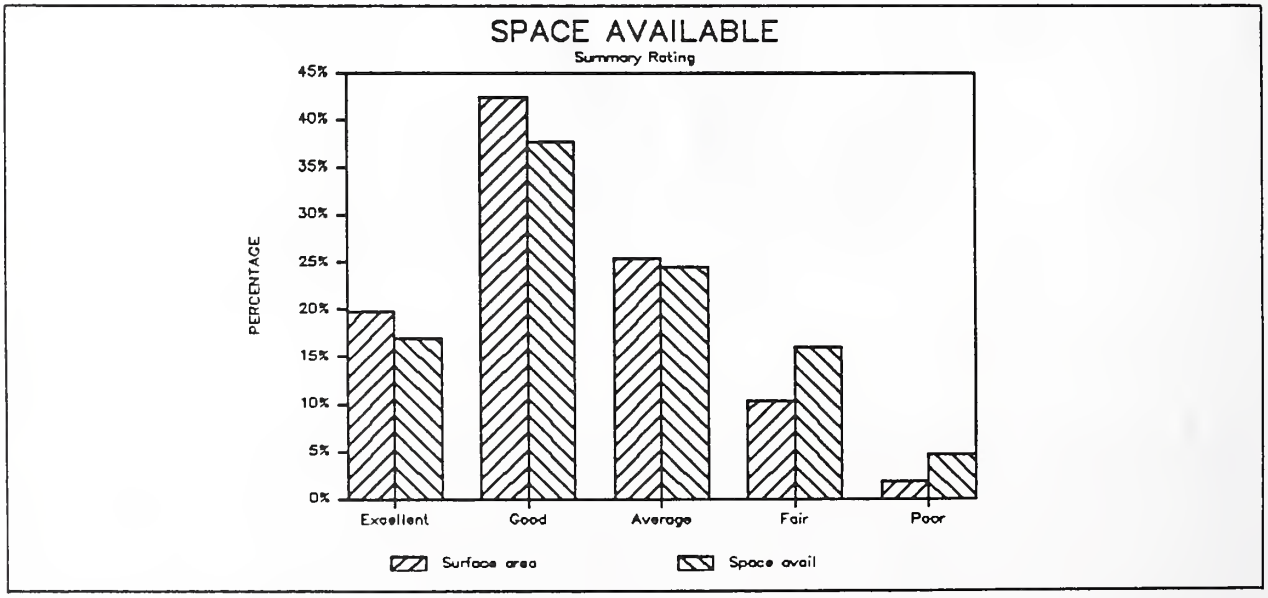
2.7 Space

Another series of questions was asked about surface area and space. A 5-point rating scale was used in this case. (1-excellent, 2-good, 3-average, 4-fair, 5-poor). A further analysis of the detailed findings appear in figure 2.51.

Table 2.28 Summary workspace ratings on selected features.

Code	Number	Average	SD
WSSPCAMT	106	2.54	1.09
RTWKSF	106	2.32	.97

Figure 2.52 Space available - Summary rating



2.7.1 Space statistics

The space used by files is summarized next. The categories employed were (LFFILES), for letter and legal sized papers, (LFDISKS) for computer printouts and disks, (LFFORMS) for forms, (LFREFS) for reference materials and books. The numbers in the table indicate the number of workstations containing the storage amnounts of the cited materials.

Table 2.29 File storage used (Linear feet)

	Linear feet			
Code	1-2	3-5	6-10	10+
LFFILES	22	23	26	17
LFDISKS	26	7	7	3
LFFORMS	19	3	2	
LFREFS	16	18	33	21

2.7.2 Workstation types

In order to determine the workstations that individuals used and their satisfaction with them, included in each questionnaire were drawings of standardized workstations (Figures 2.53-2.60). Respondents were asked to indicate which configuration most resembled their own, and then evaluate them.

Figure 2.53
Workstation type A

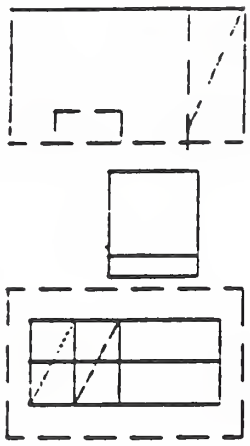


Figure 2.54
Workstation type B

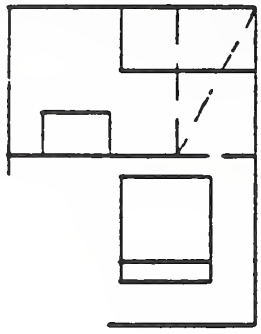


Figure 2.55
Workstation type C

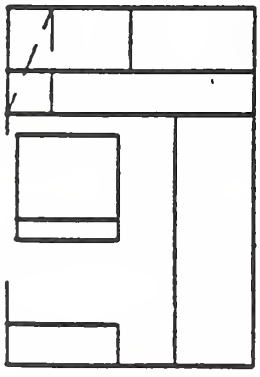


Figure 2.58
Workstation type E

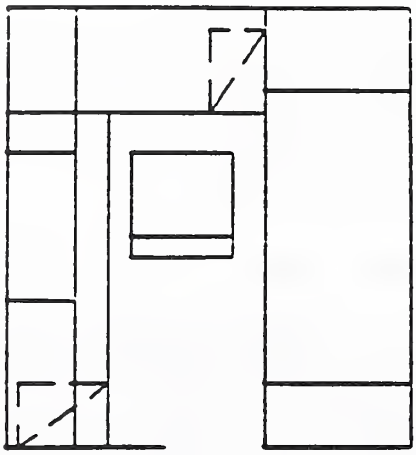


Figure 2.57
Workstation type F

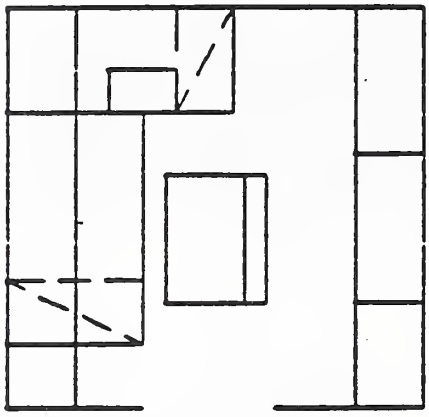


Figure 2.56
Workstatdon type D

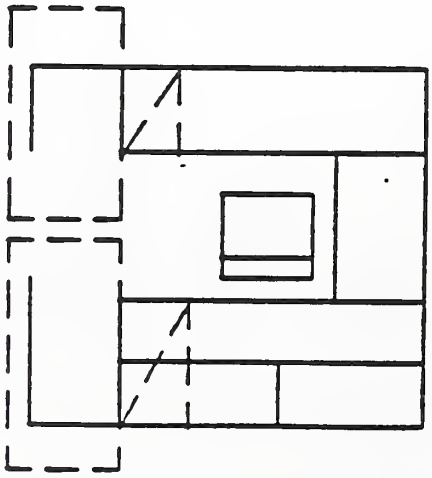


Figure 2.59

Workstation type G

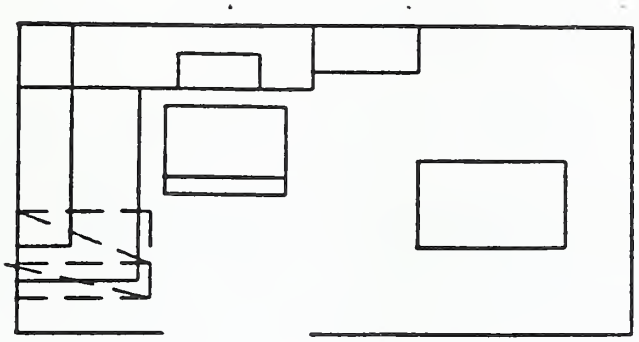
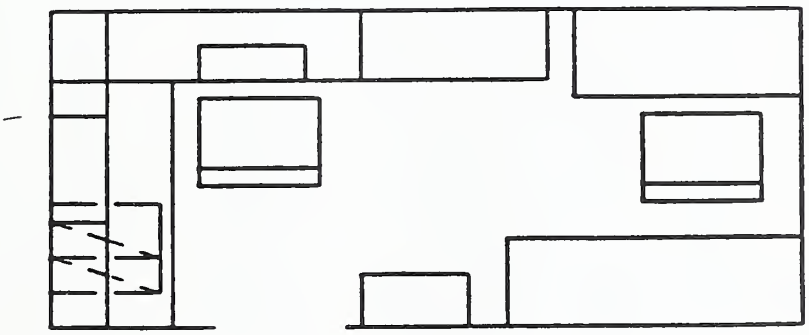


Figure 2.60

Workstation type H



These are some of the workstation configurations that are found at BPA. Please mark with an "X", the layout that BEST describes the workstation you occupy.

(1) Workstation type A WITHOUT rear unit.
(2) Workstation type A WITH rear unit (shown as dotted line).
(3) Workstation type B.
(4) Workstation type C.
(5) Workstation type D with NO panel extensions.
(6) Workstation type D with ONE panel extension (shown as dotted line).
(7) Workstation type D with TWO panel extensions (shown as dotted line).
(8) Workstation type E WITHOUT drafting board.
(9) Workstation type E WITH drafting board.
(10) Workstation type F.
(11) Workstation type G.
(12) Workstation type H.

Table 2.30 Workstation Space Statistics

WSshape	Floor area (SQ FT)	No
2	48	2
4	48	5
5	48	21
6	63	8
7	72	32
8	90	7
9	80	4
10	90	2
11	108	20
12	68	1

A= Shapes 2,4,5
B= Shapes 6,7
C= Shapes 8-11

Table 2.31 Average of workstation groups

WSshape Group	Floor area (Sq ft)	No	Storage (Lin ft)
A	48	28	18
B	70	40	15
C	100	33	15

Table 2.32 Floor area for workstation groups

Sizes	A #	A %	B #	B %	C #	C %	Total #	Total %
Highly satisfied	8	(29)	1	(3)	9	(27)	18	(19)
Satisfied	7	(25)	21	(53)	10	(30)	38	(37)
Neutral	6	(21)	8	(20)	8	(24)	22	(22)
Dissatisfied	7	(25)	7	(18)	5	(15)	19	(19)
Highly dissatis	0		3	(8)	1	(3)	4	(4)

Table 2.33 Ratings of space available - workstation groups

Sizes	A #	A %	B #	B %	C #	C %	Total #	Total %
Excellent	6	(22)	3	(8)	7	(21)	16	(17)
Good	10	(37)	18	(45)	11	(33)	39	(39)
Average	5	(20)	11	(28)	9	(27)	25	(25)
Fair	5	(20)	4	(10)	6	(18)	15	(15)
Poor	1	(1)	4	(10)	0		5	(5)

Table 2.34 Spaciousness judgements

Sizes	A #	A %	B #	B %	C #	C %	Total #	Total %
5Spacious	4	(15)	1	(3)	1	(3)	6	(6)
4	6	(22)	3	(8)	6	(19)	15	(16)
3	9	(33)	21	(59)	13	(41)	43	(42)
2	4	(15)	9	(23)	10	(31)	23	(23)
1Confined	4	(15)	5	(13)	2	(6)	11	(11)

2.8 Workstation improvements; 4 most preferred changes.

Respondents were asked to list the 4 changes they would make in their overall environment to improve it. They were to be listed in preference order. Table 2.34 presents a summary of the total responses given for each category (combined ratings of 1-4). Environmental factors of noise, air quality, lighting, and temperature are all important issues, as is privacy. Figures provide detailed findings for each choice.

Table 2.35 Workstation improvements desired

Code	Number	Average	SD	Figure Codes 1	2	3
WSIMTEMP	41	2.29	1.09	A		
WSIMPRIV	64	2.16	1.15	B		
WSIMFLSP	23	2.48	1.10	C		
WSIMSPAC	35	2.66	1.09	D		
WSIMLTG	30	2.93	1.00	E		
WSIMNOIS	69	2.39	1.18		A	
WSIMAIRC	46	2.30	1.04		B	
WSIMDKSP	14	2.50	1.24		C	
WSIMBKSP	14	3.42	.82		D	
WSIMFURN	3	4.00	0.00			A
WSIMFRLK	2	2.50	.50			B
WSIMPERS	14	2.29	1.10			C
WSIMTKLT	19	2.68	.92			D
WSIMWIRE	4	3.75	.43			E
WSIMLOC	9	2.67	1.05			

Figure 2.61 Desired improvements - 1

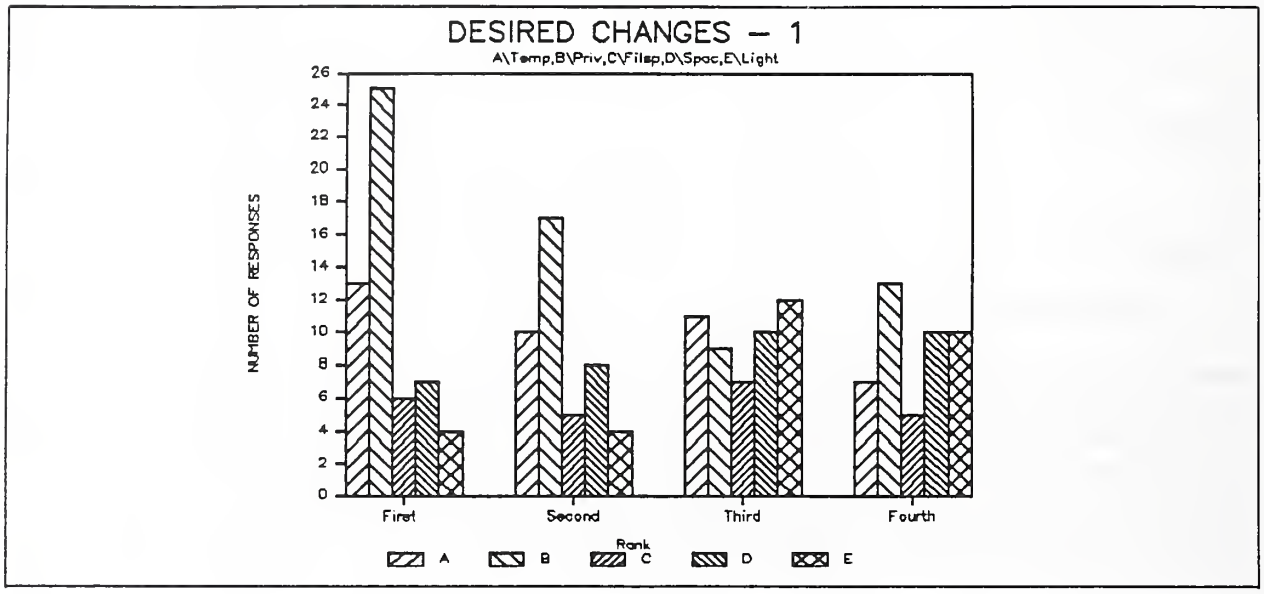


Figure 2.62 Desired improvements - 2

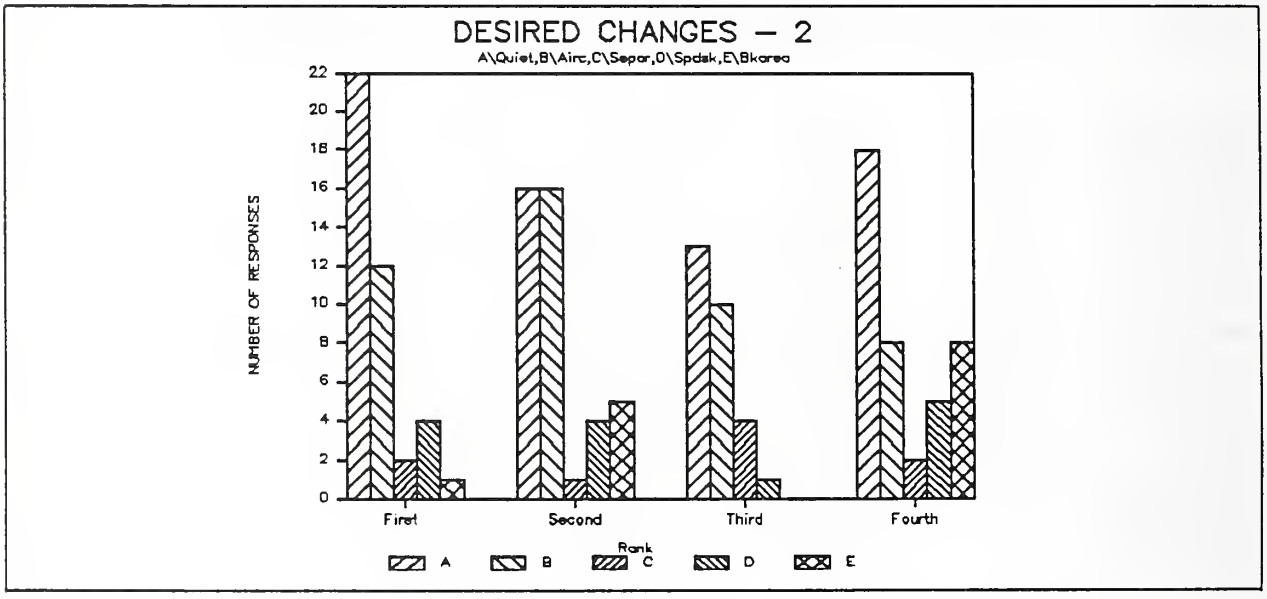
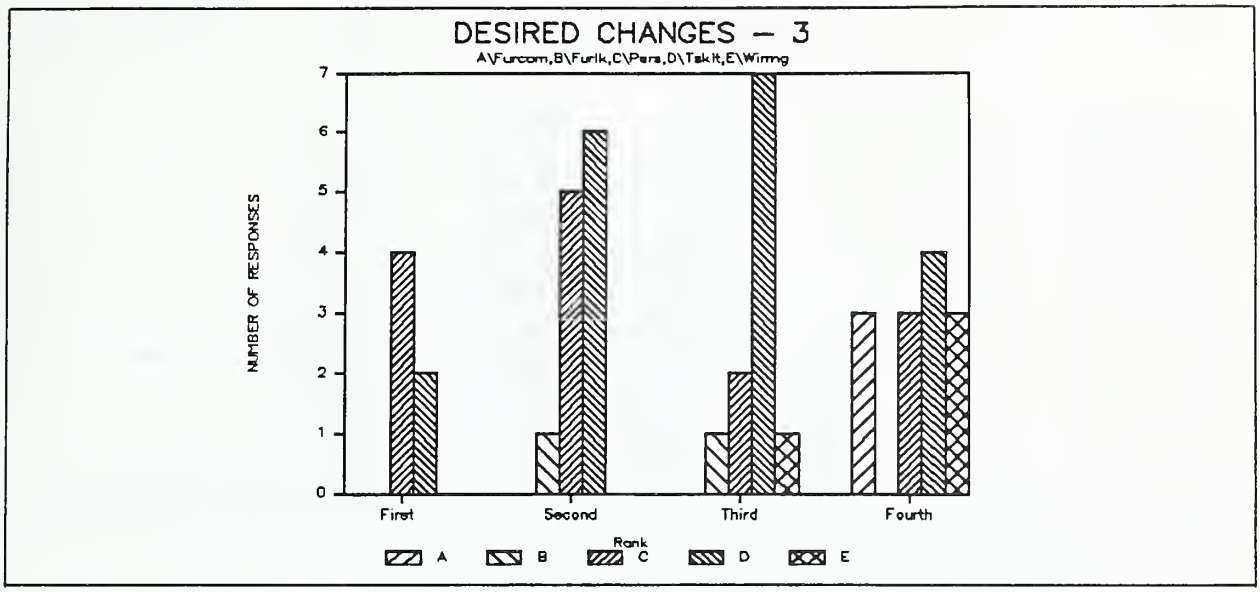


Figure 2.63 Desired improvements - 3



2.9 Miscellaneous features

The next group of items probed the 'strength of feeling' about aspects of the workstation layout. A series of statements were made and then rated by a 5-point scale (1-strongly agree, 2-agree, 3-neutral, 4-disagree, 5-strongly disagree).

The statements were as follows:

1. The size of my desk is adequate (DESKSIZE).
2. The area my space occupies is adequate (SPACAREA).
3. I have sufficient file space at and near my desk (SPACFILE).
4. I have enough flexibility to meet changing needs (SPACFLEX).
5. My workstation presents a professional image (PROFIMAG).
6. My workstation is attractively arranged (ATTRAGMT).
7. My workstation is easy to keep clean (SPACCLEN).
8. I can personalize my space (SPACPERS).
9. There are no safety hazards (SAFETY).
10. My workstation discourages unwelcome visitors (VISITORS).

Table 2.36 Feelings about workstation layout

Code	Number	Average	SD	Figure Code 1	Figure Code 2
DESKSIZE	104	2.16	.86	A	
SPACAREA	104	2.31	.96	B	
SPACFILE	105	2.45	1.07	C	
SPACFLEX	105	2.70	1.08	D	
ATTRAGMT	105	2.55	.95		A
PROFIMAG	105	2.52	1.10		B
SPACCLEN	105	2.29	.81		C
SPACPERS	105	2.70	1.01		D
SAFETY	105	2.30	1.00		
VISITORS	103	3.44	2.15		

With 3 as a neutral average score, the only item exceeding this value is statement 10. This average response suggests unwelcome interruptions are disturbing. Figures 2.63 and 2.64 provide detailed information about these data.

Figure 2.64 Workstation layout - Space adequacy - 1

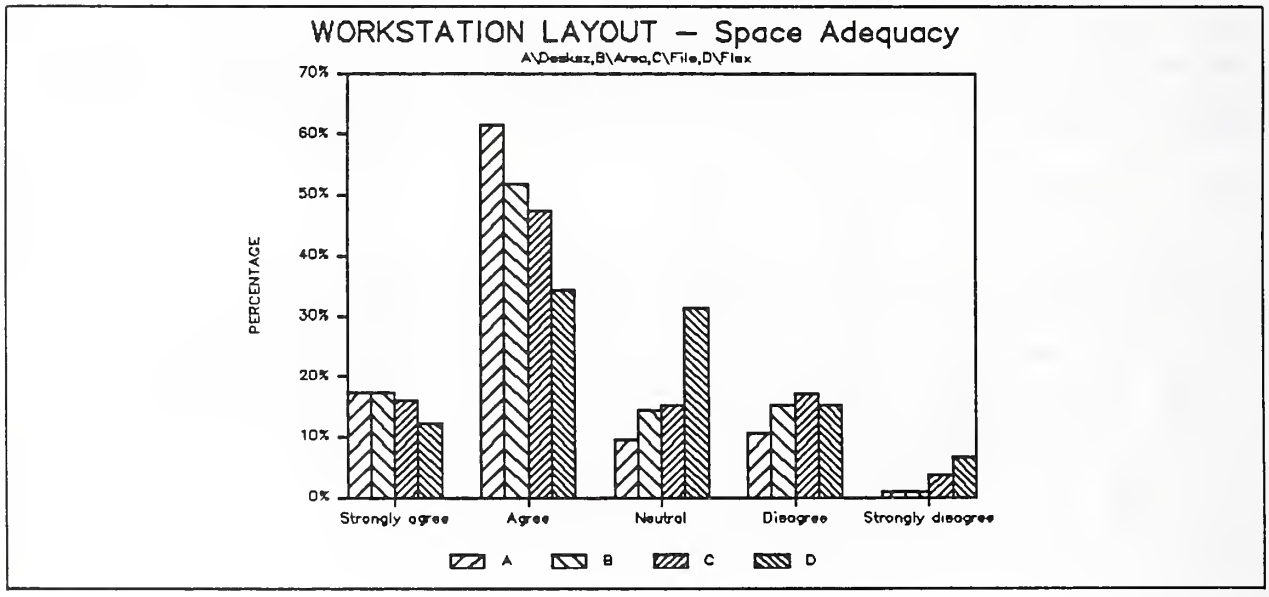
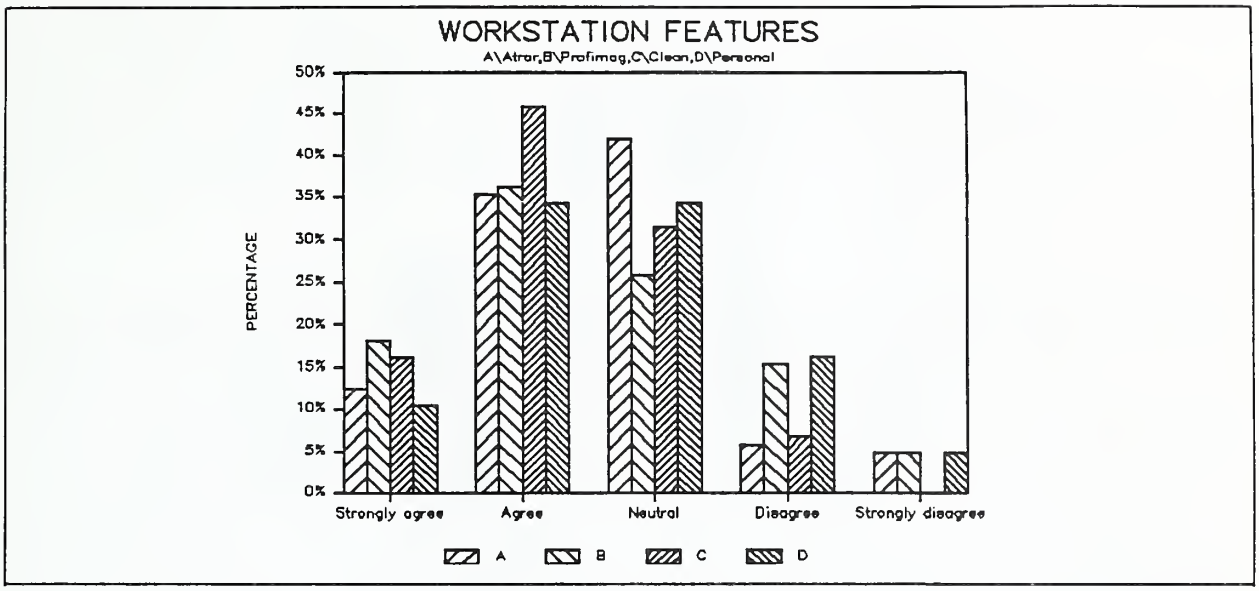
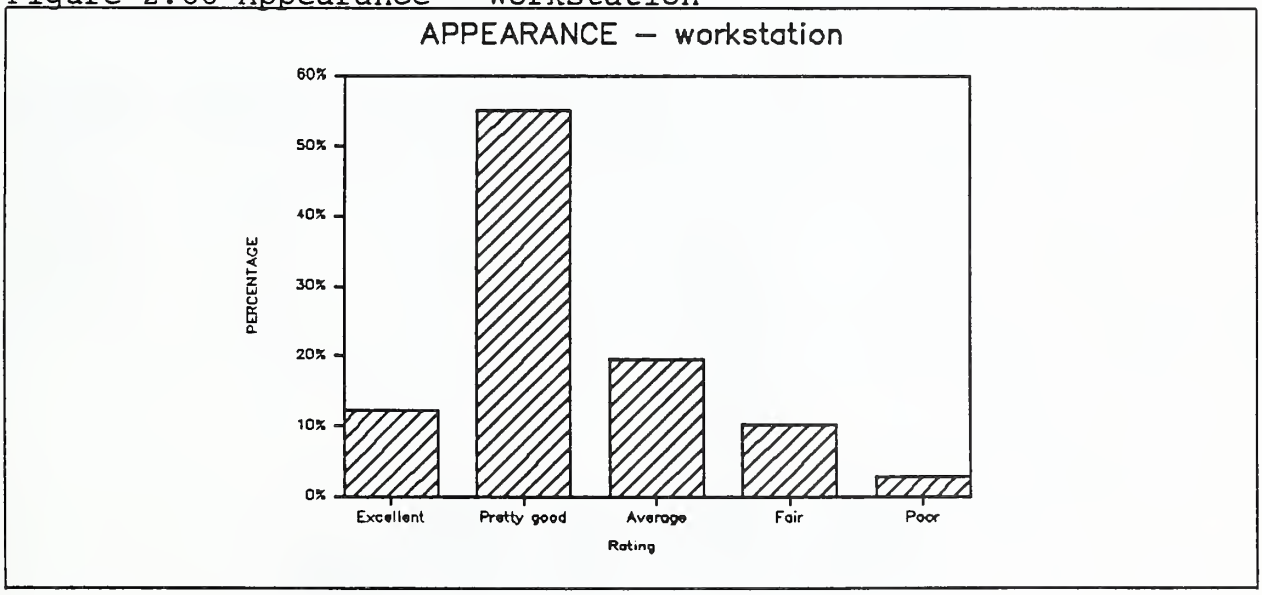


Figure 2.65 Workstation features - Miscellaneous



Workstation appearance was then rated on a 5-point scale (1-poor, 2-fair, 3- average, 4-pretty good, 5-excellent). The average rating indicated a favorable response. (LOOKWS) figures were 3.64, SD of 92, N= 107. Figure 2.65 summarizes these data.

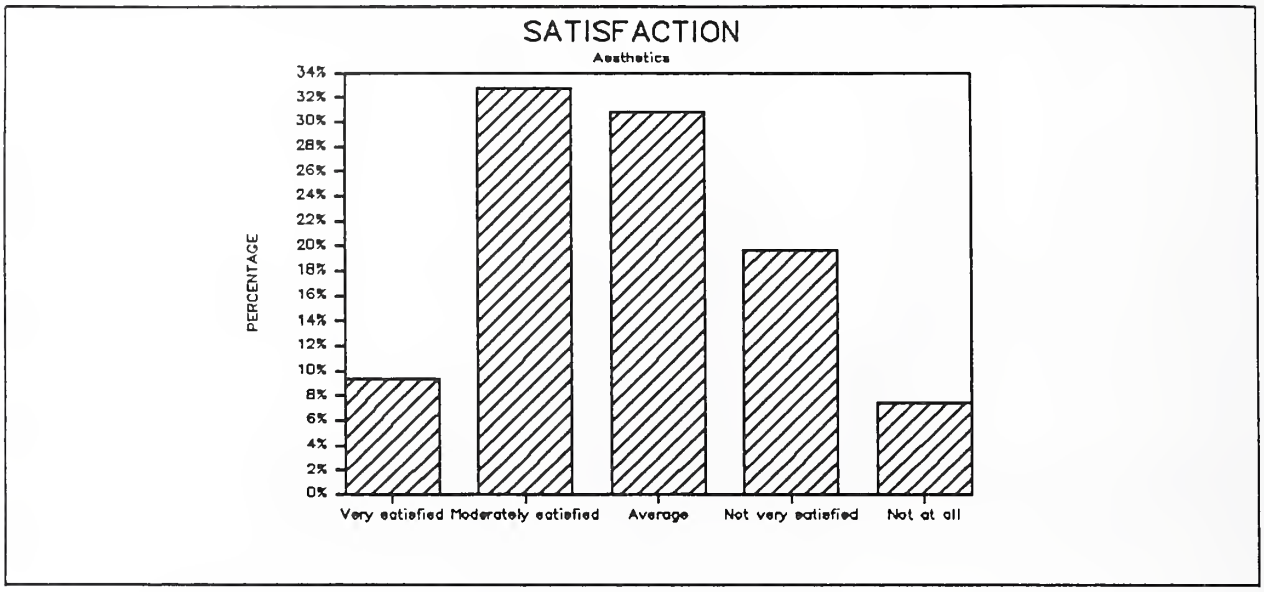
Figure 2.66 Appearance - Workstation



2.9.1 Aesthetic satisfaction

Aesthetic satisfaction was then rated on a 5-point scale (1-very satisfied, 2-fairly satisfied, 3- neither satisfied not dissatisfied, 4-not very satisfied, 5-not at all satisfied.); the average was 2.83, SD 1.08, N=107.

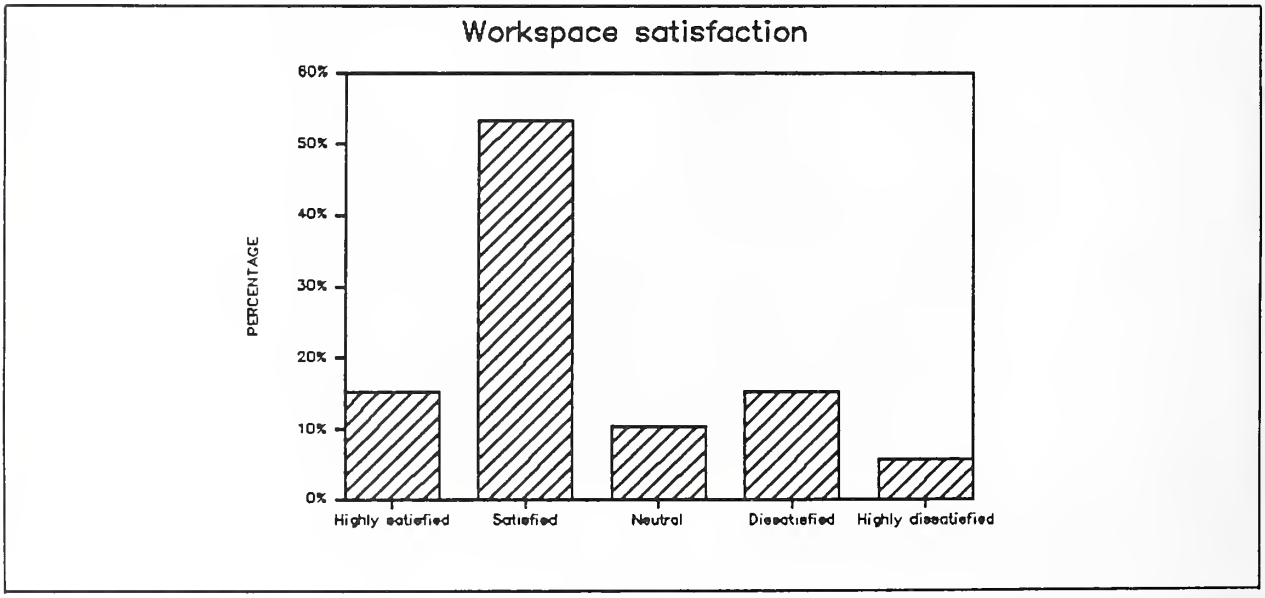
Figure 2.67 Satisfaction - Aesthetics



2.9.2 Workspace satisfaction

The next rating was workspace satisfaction (WSSAT) using the same 5-point scale as in the previous item. Respondents were asked to compare their present workstation with their previous one. The average score was 2.43, SD 1.09, N=105. See figure 2.67 also.

Figure 2.68 Workspace satisfaction



2.9.3 Windows

Two questions were asked about windows.
The first was: Can you see outside from workstation?
Forty-seven responded that they could, 56 indicated that they couldn't. A followup item was: Is it important to see outside from workstation? The responses were 'Yes'-67, 'Would be nice, but not critical'-11, No-27.

2.10 Service center

Administrative Service Centers are an innovative feature in the Portland2 building. They are designed to bring basic services and supplies close to the work stations. They are staffed by technicians who provide assistance on job-related problems and with building administration issues such as temperature controls, replacement of lighting fixtures and custodial needs. Ratings of the Service Center were made on a 5-point scale (1-excellent, 2-pretty good, 3-average, 4-fair, 5-poor). This feature of the building was very well received by most employees. Comments reinforced the evaluations; many people mentioned the helpfulness of the staff in solving problems and providing materials when required. Figures 2.68 and 2.69 provide detailed findings.

Table 2. Service Center evaluation

Code	Number	Average	SD	Figure Code 1	Figure Code 2
SCMAIL	100	1.99	.81	A	
SCSUPP	104	1.51	.57	B	
SCCOPY	98	1.82	.81	C	
SCFAX	82	1.63	.65	D	
SCAVEQ	75	1.87	.68		A
SCLIB	71	1.98	.86		B
SCPROB	72	1.99	.74		C
SCQUES	80	1.95	.80		D

Figure 2.69 Service Center - 1

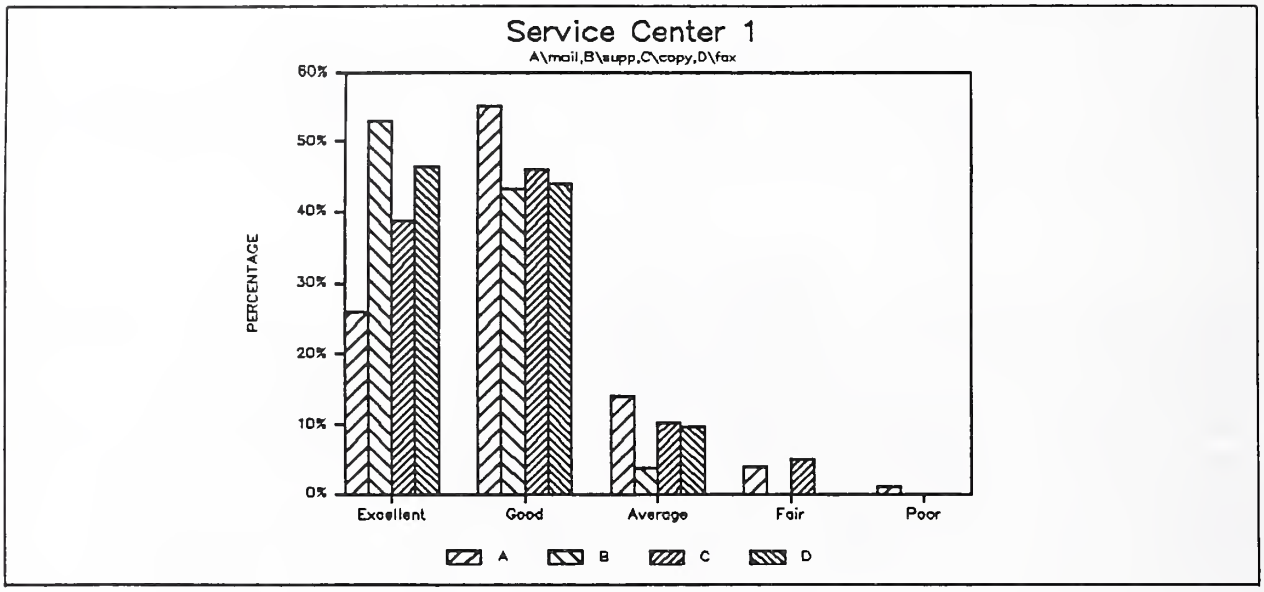
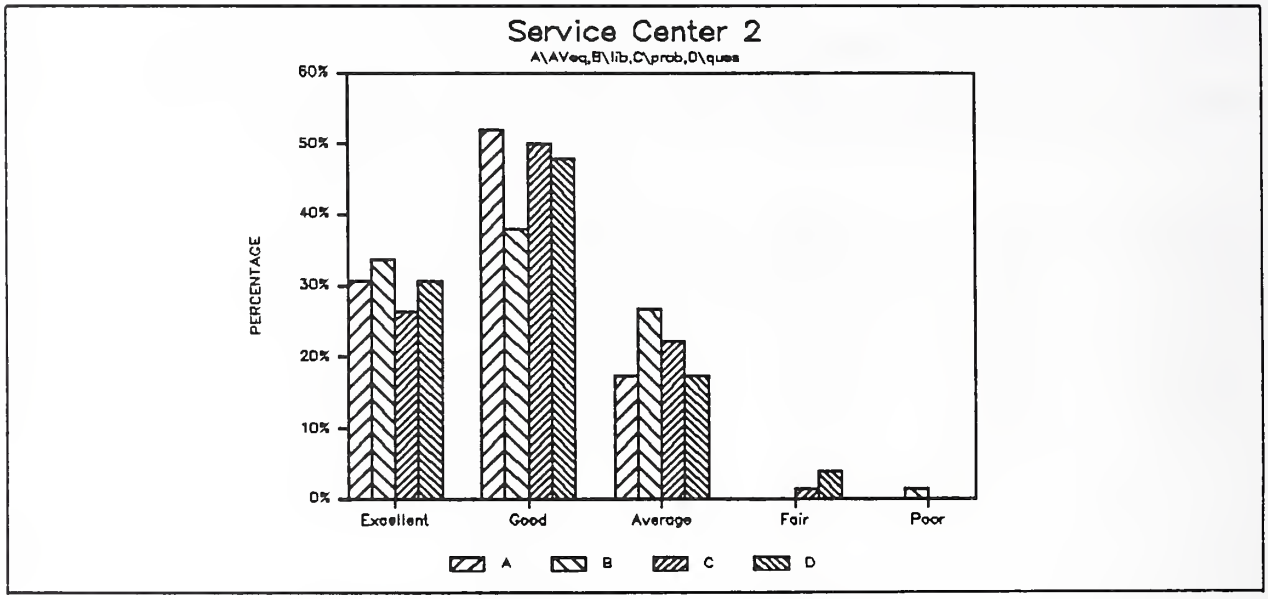


Figure 2.70 Service Center - 2



2.11 How change have affected job.

Respondents were asked the following:

Have changes in furnishings and surrounds since the move affected your ability to do your job? How?

The responses were categorized into major positive and negative features. The numbers ( ) indicate the response frequency.

1. Positive features

More space (9)
More worksurface area (7)
Better equipment (7)
More efficient (7)
Better phone system (5)
Near coworkers (5)
Better lighting (5)
Better appearance (4)
Better environment (4)
More storage (3)
Less noise (3)
Better meeting spaces (3)
More accessible supplies (3)
More privacy (2)
Cleaner (2)
Better furniture (2)

2. Negative

Noisy (14)
 Disturbance by traffic (6)
Air quality bad (11)
No privacy (8)
Walking distances great (7)
Temperature fluctuations (5)
Layout problems (5)
More space needed (4)
Finding way around (4)
Natural light wanted (3)
Less access to coworkers (3)
Bad chair (3)
File storage space (3)
People socializing (2)
Better lighting (2)
Lack of VDT at WS (2)

2.12 Suggestions for improvement

The last item solicited ideas for improving the work environment. These responses were then categorized under several major headings.

1. Environmental conditions

Improve air quality (5)
Move or enclose printers, xerox (4)
Better climate control (3)
Ceiling high partitions for quiet (3)
Less noise (2)
Better task lighting (2)
Sound proof panels around workstation
Better air removal from parking, loading, & cafeteria areas;
Natural light

2. Furnishings

Better chairs
Provide lower binder bins; would fight "tennis elbow" from removing binder from overhead bins; also desktop might be too high.
Replace curved glass panel with translucent panel.

3. Space

Larger workstation (4)
Space for visitors, chair (3)
More file space (3)
Larger space
Less dense packing, more open aisles & circulation area.
Don't cram people in too little space; space could serve fuction instead of interfere with it.

4. Design

Rearrange workstation (2)
Private office for managers/for confidential meetings (2)
Remove half the partitions & reconfigure
Better furniture access
Provide record handling area, also for temporary storage
More small conference rooms or private ofices.
More color.

5. Work issues

More privacy (3)
Make information more retrievable.

2.13 Summary - Comparison of Portland1 and Portland2 offices

Overall, respondents seemed to favor their present work environment over their previous one. When asked to compare workstations, in 6 of 7 categories the current one was favored, with the other one being "about the same". (The topics ranged from ability to do job well, space, appearance, privacy.)

The newness of the building, the advanced telephone system, improved equipment, the furniture, and the Service Center were highly regarded by most employees.

On the other hand, environmental, space, privacy, and other features received "mixed reviews". While there was some evidence that conditions were better than in Portland1, they were still not considered satisfactory.

Most of the negative comments were directed at environmental conditions. Noise and the lack of privacy were major complaints. These were said to disrupt ongoing work and make it difficult to perform needed activities. Air quality was a concern for a substantial number of people. Also, many individuals were dissatisfied with the lighting of their work spaces.

Some employees noted that they were cramped for working and file space. Others indicated that finding ones way about in the building, especially for visitors, is very difficult. The signage system and office layout both contributed to this problem.

(Some of these conditions were being addressed while the study was under way, and may no longer be present.)

Chapter 3 OPM data summary

3.1 Background

In order to broaden the sample of federal workplaces examined, beyond those in the new Portland Federal Building, other agencies were contacted to participate in the general survey of office conditions and systems furnishings. The Office of Personnel Management (OPM) agreed to permit the distribution of a limited questionnaire to 53 employees. OPM is responsible for conducting the personnel related functions of the federal government. Their offices have been undergoing major upgrading and changes in recent years, using open-office designs and systems furniture.

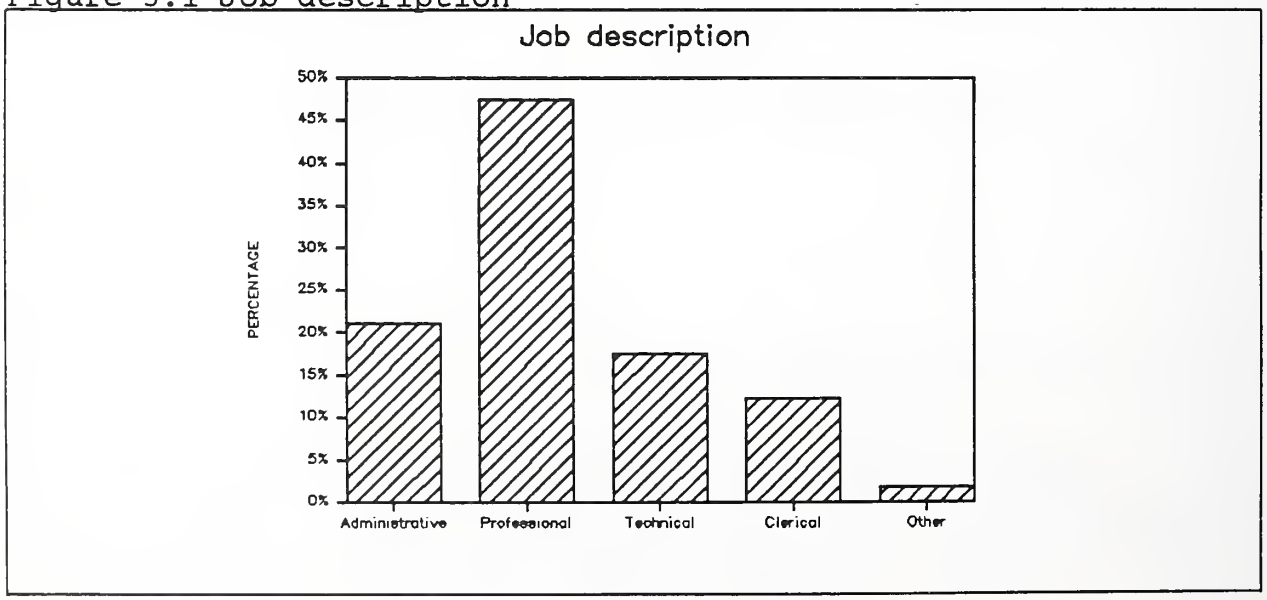
A limited number of interviews were conducted with facility management, operational management and working level people to supplement the questionnaire findings.

The sample is a restricted one and the findings should be interpreted as indicative of possible trends in office design and problem areas. Because of these inherent constraints, there was no attempt at finer analyses in terms of sex, age, and other demographic variables. In addition, many of the judgements involved comparisons with their previous workplace, which was not studied. These item responses are intended to be suggestive of feelings about present surroundings.

3.2 Job categories

The jobs performed by the sample of respondents were similar to those in most offices. Professionals were the predominant group surveyed, as shown in figure 3.1.

Figure 3.1 Job description



Most of the survey participants had been in their new workspaces less than one year (50 of 53).

Table 3.1 Previous office

	Number	Percentage
Private office	11	0.22
Shared office	3	0.06
Open office	36	0.72
	total 50	

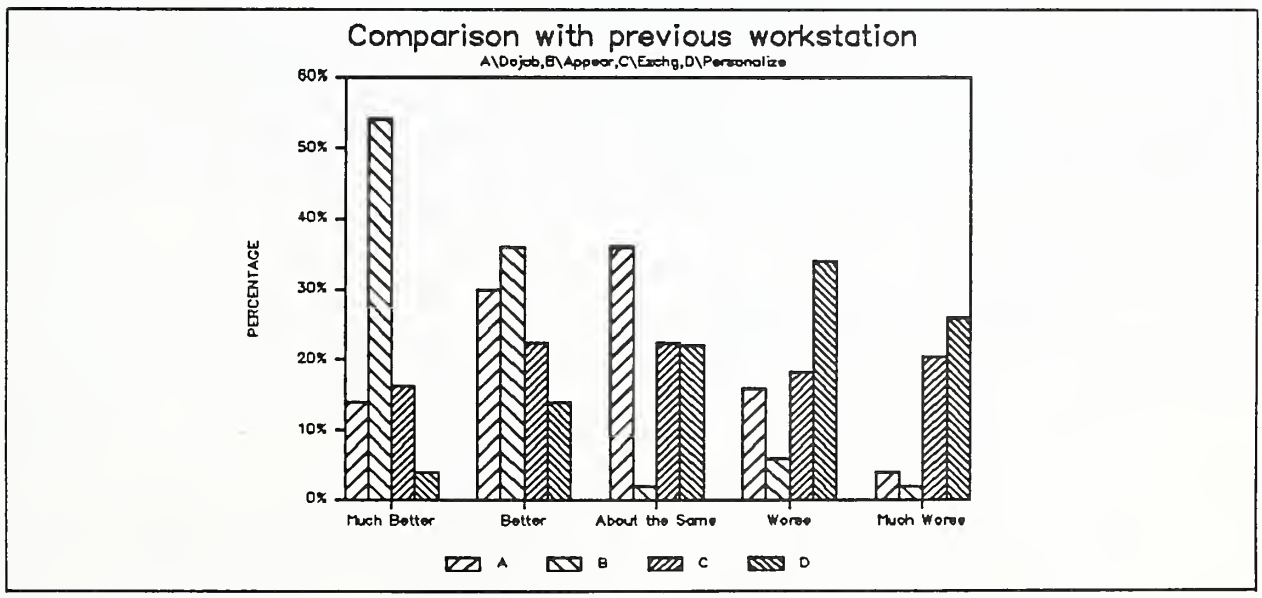
3.3 Performing work

The next items concerned the ability to perform the job well, appearance, ease of changing furnishings, and the amount of personalization permitted. The ratings were comparisons with previous offices. (These were in the same building, before a major retrofit of electrical, HVAC, and new furniture systems.) The data for appearance and ability to do the job were quite positive, ease of changing furnishings were neutral, while the personalization item indicated considerable dissatisfaction. Table 3.1 and figure 3.2 provide more detailed findings.

Table 3.2 Workstation features

Code	Number	Average	SD	Figure Code
WSRTJOB	50	2.67	1.03	A
WSRTAPPR	50	1.66	.93	B
WSRTEASE	49	3.04	1.37	C
WSRTPERS	50	3.64	1.13	D

Figure 3.2 Previous workstation comparison

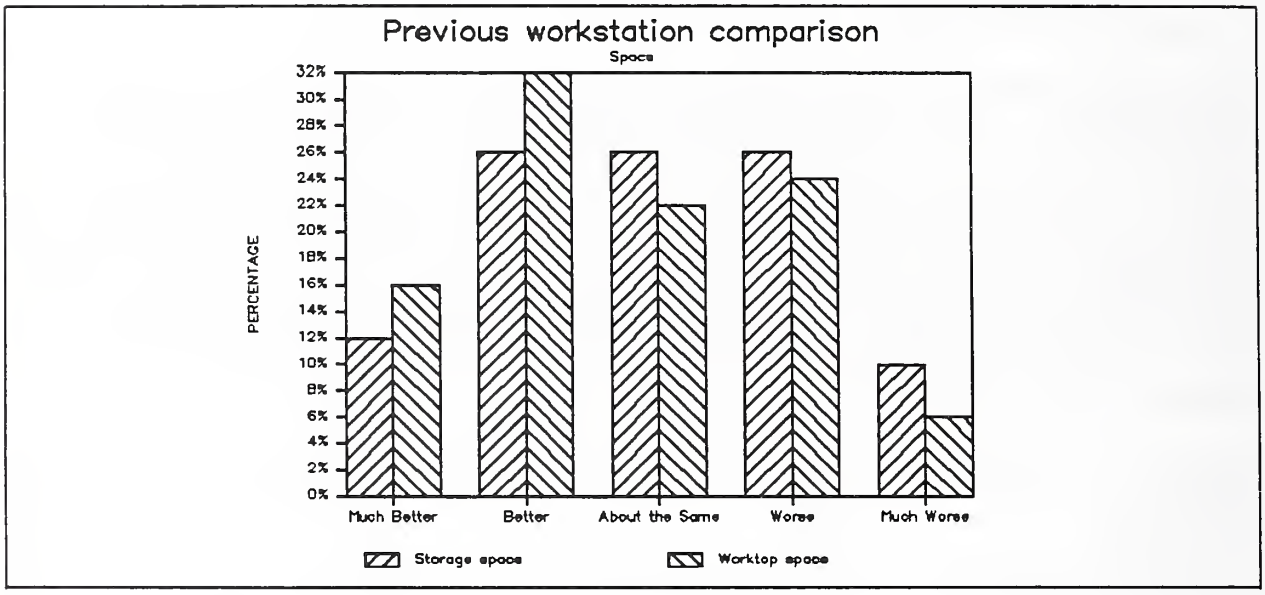


The next topic addressed was space, storage and desktop. These findings suggested some improvement over previous conditions.

Table 3.3 Space availability

Code	Number	Average	SD
WSRTSTOR	50	2.96	1.18
WSRTTOP	50	2.72	1.17

Figure 3.3 Previous workstation comparison - Space



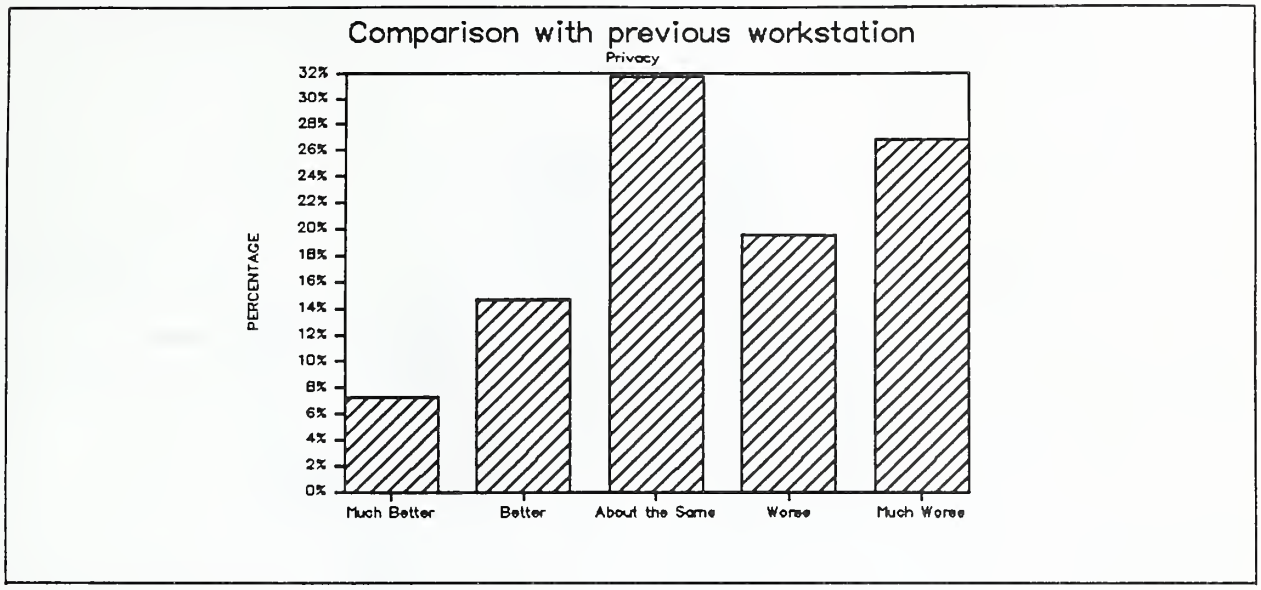
3.3.1 Privacy

The final comparison with the previous workstation concerned privacy. The lack of privacy was also a major concern to study participants. The questionnaire findings were supported by personal interviews which indicated that supervisors were especially sensitive to the need to conduct confidential discussions with staff personnel and visitors, and that present workstations were unsuitable for that purpose.

Table 3.4 Privacy

Code	Number	Average	SD
WSRTPRIV	41	3.44	1.23

Figure 3.4 Previous workstation comparison - Privacy



Several other questions dealt with privacy. These were both 5-point ratings, structured somewhat differently. One asked the level of satisfaction with the control of noise and visual distractions, while another dealt with the adequacy of the workstation layout for auditory and visual privacy. While the responses to visual privacy were somewhat mixed, auditory privacy was a major complaint for many employees.

Table 3.5 Distractions, auditory and visual

Code	Number	Average	SD
CTRLNOIS	53	3.68	.95
CTRLVIS	52	2.60	1.00

Figure 3.5 Control of distractions

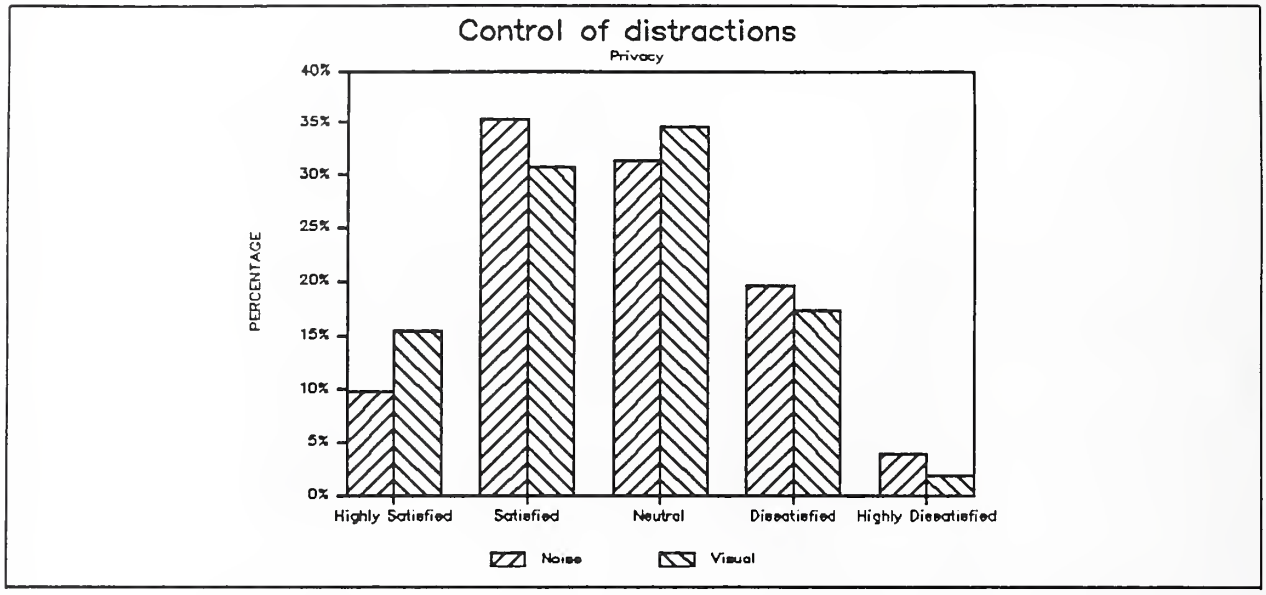
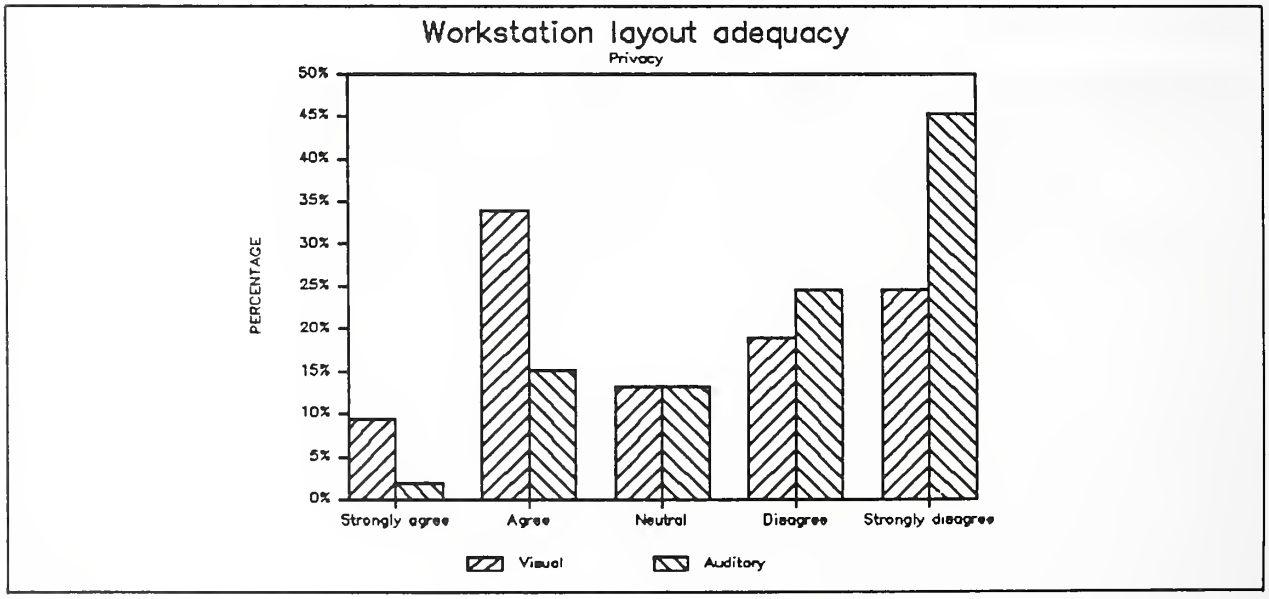


Table 3.6 Privacy, visual and auditory

Code	Number	Average	SD
VISPRIV	53	3.17	1.40
AUDPRIV	53	3.98	1.19

Figure 3.6 Workstation layout adequacy - privacy

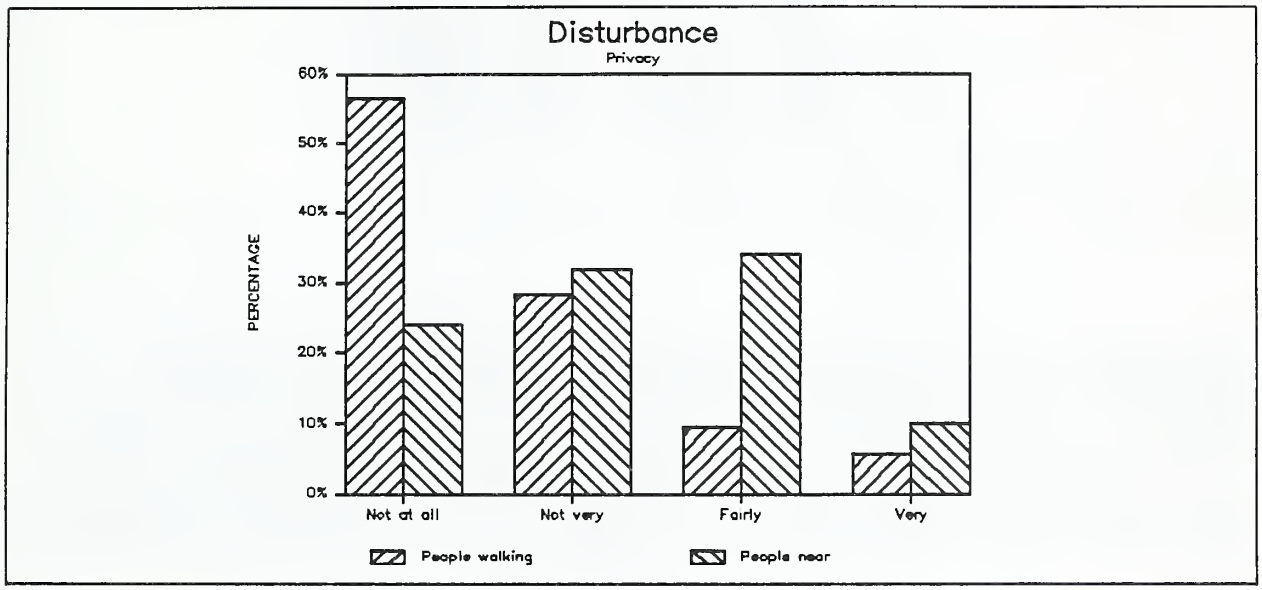


Another question related to privacy was the degree of disturbance from people walking or from people nearby. This rating was on a 4-point scale (1-not at all, 2-not very, 3-fairly, 4-Very). People nearby constituted somewhat of a problem; see figure 3.7.

Table 3.7 Disturbance, people related

Code	Number	Average	SD
PEPLWALK	53	1.59	.82
PEPLNEAR	50	2.29	.98

Figure 3.7 Disturbance - Privacy



Respondents were then asked to summarize their general feelings about current space compared with the previous location. The general concensus was an improvement.

3.3.2 Feelings about space

Table 3.8 Feelings about space

Rating	Number	Percentage
Better	20	0.39
Worse	6	0.11
Same	26	0.50
	total 52	

Respondents were then asked to provide specific reasons why the current space was rated better or worse than the preceding one. First, perceived improvements were explored. The data represent the numbers of respondents selecting the following reasons:

Table 3.8 Reasons for increased workspace satisfaction

Better furnishings	(16)
Newer equipment	(14)
Better environment	(14)
More relaxed	(11)
Enjoy work more	(5)
Newer building	(2)

Then the respondents were asked to identifiy the work environmental factors resulting in decreased satisfaction. Lack of privacy and space limitations were the primary ones mentioned.

Table 3.9 Reasons for Decreased Satisfaction

Not enough privacy	(13)
Not enough space	(6)
Unpleasant surroundings	(2)
Furnishings problems	(1)

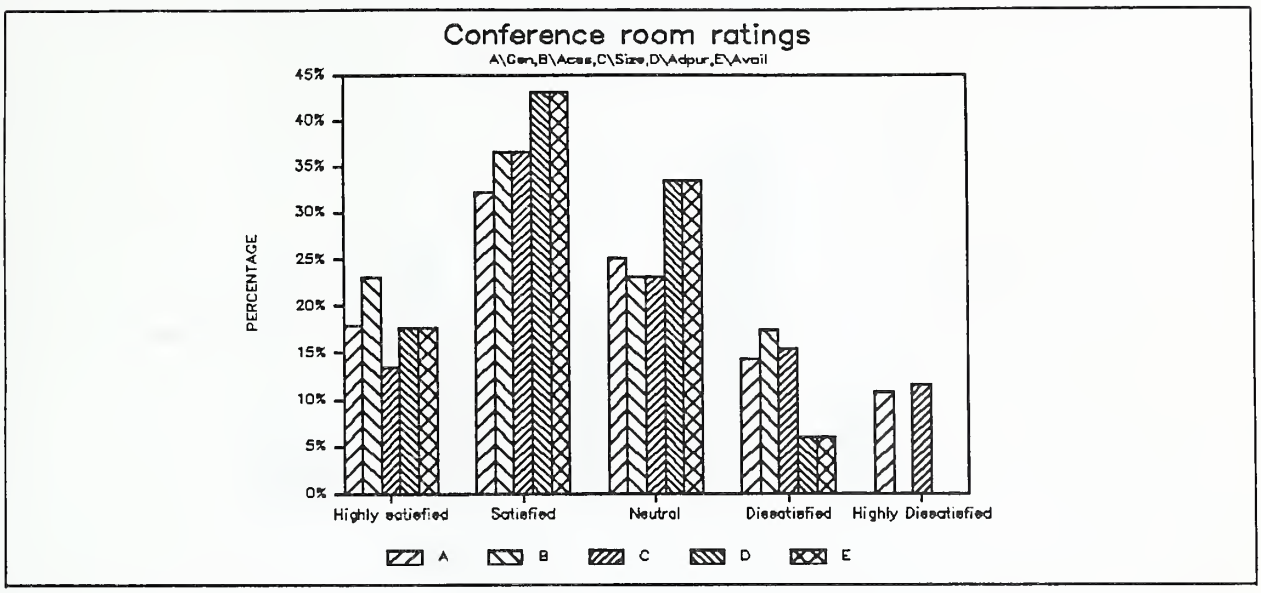
3.4 Conference rooms

In open offices it is often difficult to conduct private conversations. Therefore conference rooms take on greater importance for serving these functions. The following group of questions deal with the satisfaction of available conference rooms, using a 5-point scale with 3 being a neutral rating. The average ratings were quite acceptable, but 25% of the respondents expressed some dissatisfaction in the overall scores. See Table 3.10 and figure 3.8 for detailed findings.

Table 3.10 Conference room ratings of satisfaction.

Code	Number	Average	SD	Figure Code
CFSAT	28	2.68	1.23	A
CFSATACC	52	2.34	1.03	B
CFSATSIZ	52	2.76	1.23	C
CFSATADQ	52	2.64	1.09	D
CFSATAVL	51	2.27	.83	E

Figure 3.8 Conference room ratings



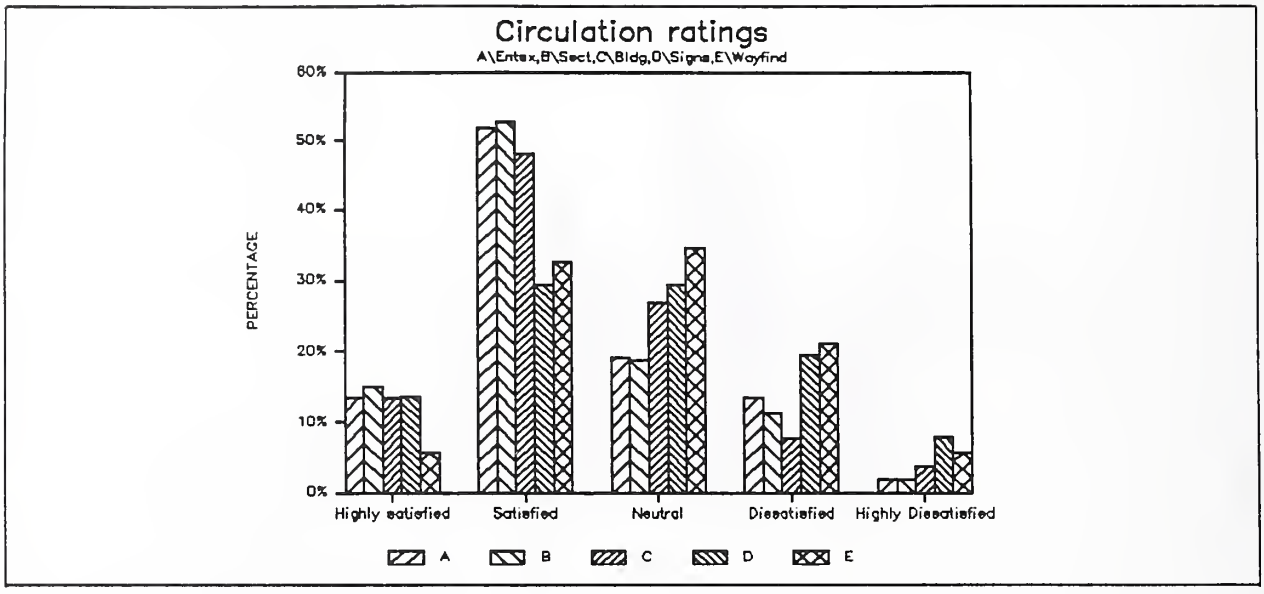
3.5 Ease of Circulation

Questionnaire surveys have indicated that open office workstation designs provide ambiguous cues regarding major circulation paths, and workstation access. Table 3.11 and figure 3.9 summarize the findings for circulation. While the average scores are indicative of overall satisfaction, again, about 25% of the responses indicate some problem with signage, and finding one's way within the building.

Table 3.11 Circulation

Code	Number	Average	SD	Figure Code
WSCIRC	52	2.37	.93	A
SECTCIRC	53	2.29	.91	B
BLDGCIRC	52	2.34	.89	C
SIGNAGE	51	2.78	1.17	D
FINDWAY2	52	2.88	1.01	E

Figure 3.9 Circulation ratings



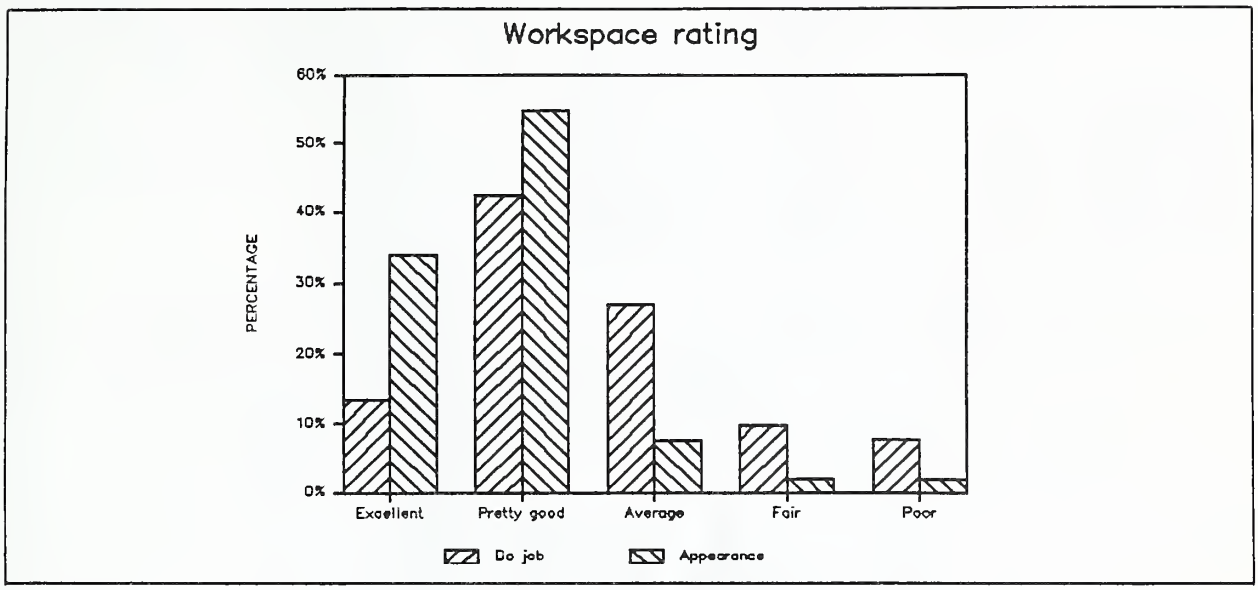
3.6 Workstation layout

The next question addressed the effectiveness of the office and workstation layout for performing work as well as its appearance. The findings are quite favorable to the changes made.

Table 3.12 Workstation layout for performing job; appearance

Code	Number	Average	SD	Figure Code
ARGMTWS	52	2.58	1.10	Do job
LOOKWS	53	1.82	.81	Appearance

Figure 3.10 Workspace rating



The appearance of the space and office was also very favorably judged by the sample of workers questioned. Only two of the 52 respondents answered negatively to this question.

3.7 Work activities

The activities performed was the next topic examined. The numbers indicate how many of the 53 respondents performed the activities described.

Table 3.13 Activities performed

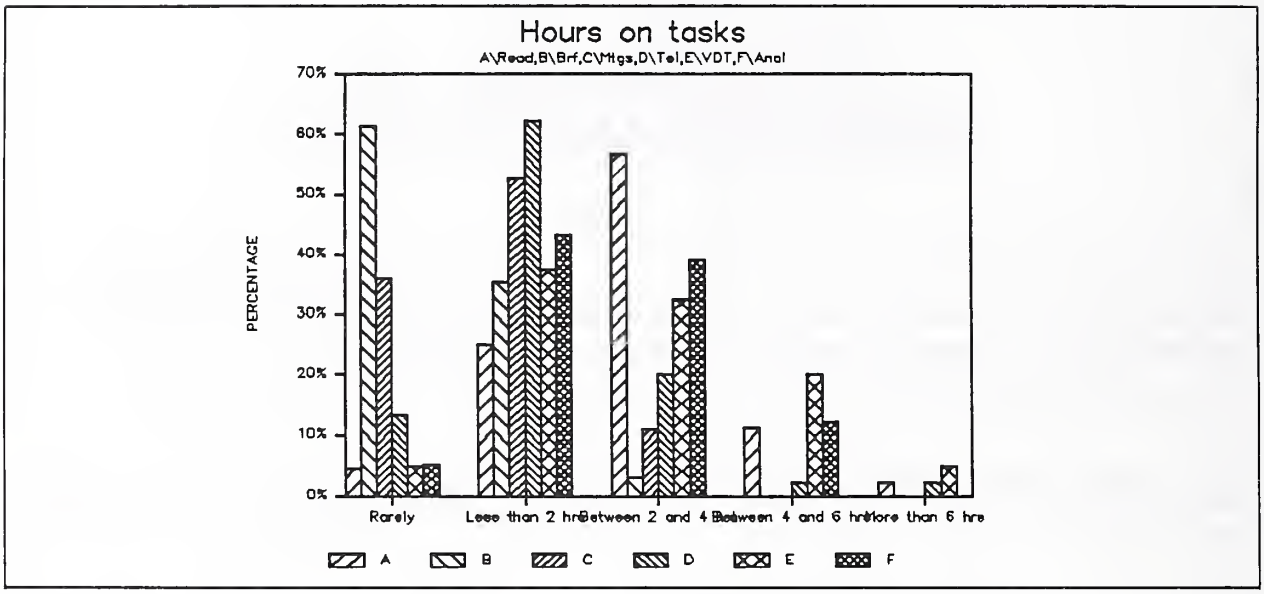
Using a VDT	(40)
Reading and Writing	(44)
Analysis of Material	(39)
Preparing Briefing Material	(19)
Attending Meetings	(26)
Talking on Telephone	(41)
Filing	(9)

The tasks were then analyzed with respect to the number of hours spent on them daily. Figure 3.11 summarizes these findings.

Table 3.14 Hours spent on tasks

Code	Number	Average	SD	Figure Code
HRSDYRED	44	2.81	.79	A
HRSDYBRF	31	1.42	.55	B
HRSDYMTG	36	1.71	.61	C
HRSDYTEL	45	2.18	.78	D
HRSDYVDT	40	2.82	.98	E
HRSDYANL	45	2.80	1.04	F

Figure 3.11 Hours on task



3.8 Environmental conditions

The next series of questions dealt with environmental working conditions.

3.8.1 Lighting

Lighting satisfaction was rated on a 5-point scale (1=very, 2=moderately, 3=average, 4=not very, 5=not at all). The average was 1.59, SD .82, N=53. Figure 3.12 presents further data.

The issue of glare was then addressed. Since most office tasks are visual, any glare problem can adversely effect work performance. It is especially important to determine whether the problem is associated with the use of VDT's, since more workstations will be equipped with them in the future. Glare disturbance was assessed on a 4-point scale (1-not at all, 2-not very, 3-fairly, 4-very). The average score was 1.52, SD .88, N=52; also see figure 3.13.

These findings suggest that lighting was generally satisfactory although glare constituted a problem for approximately 25% of the respondents. Of the 40 people who used VDT's 10 had scores above 2 for glare problems - also 25% of the total.

Figure 3.12 Environmental satisfaction - Lighting

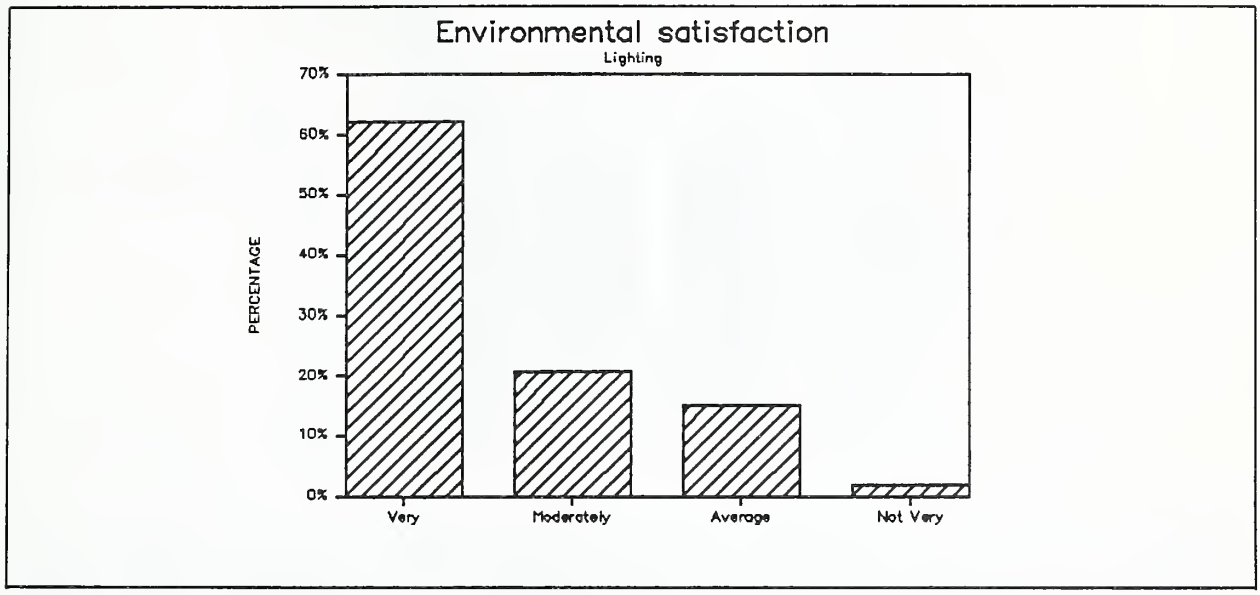
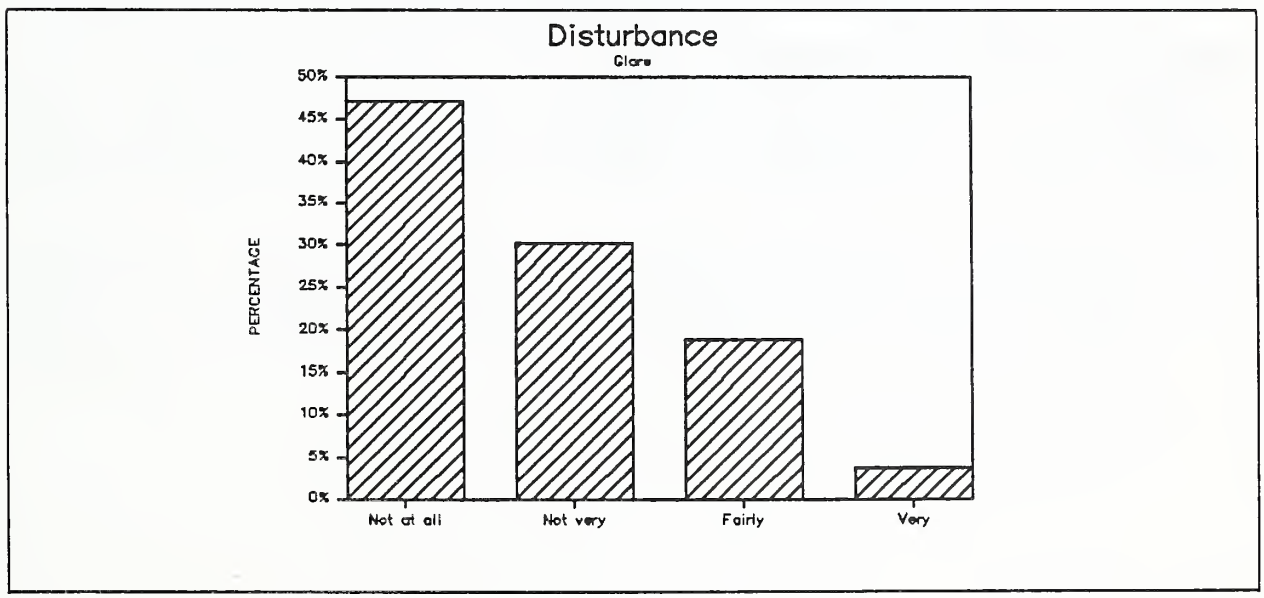


Figure 3.13 Disturbance - Glare

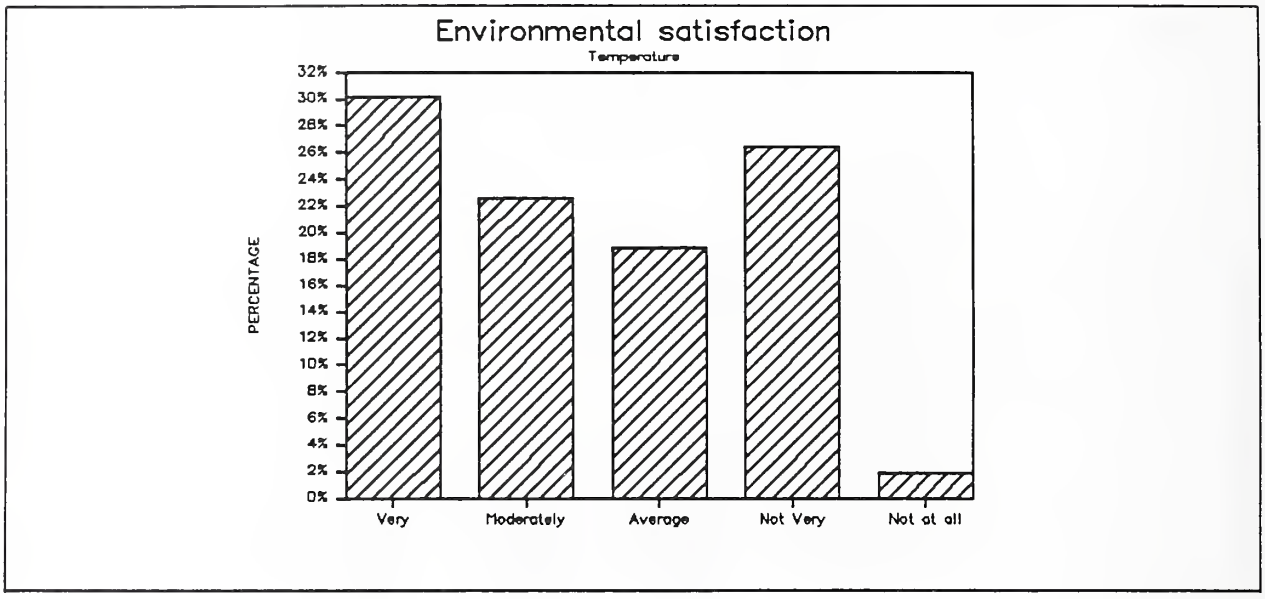


3.8.2 Thermal comfort

The next topic touched upon was work disruption caused by temperature factors. These data further indicate the need for better temperature control, and are consistent with the data

obtained in a related question. The average rating for a 5-point satisfaction scale (TEMPSAT) was 2.47, SD 1.24, N=53.

Figure 3.14 Environmental satisfaction - Temperature

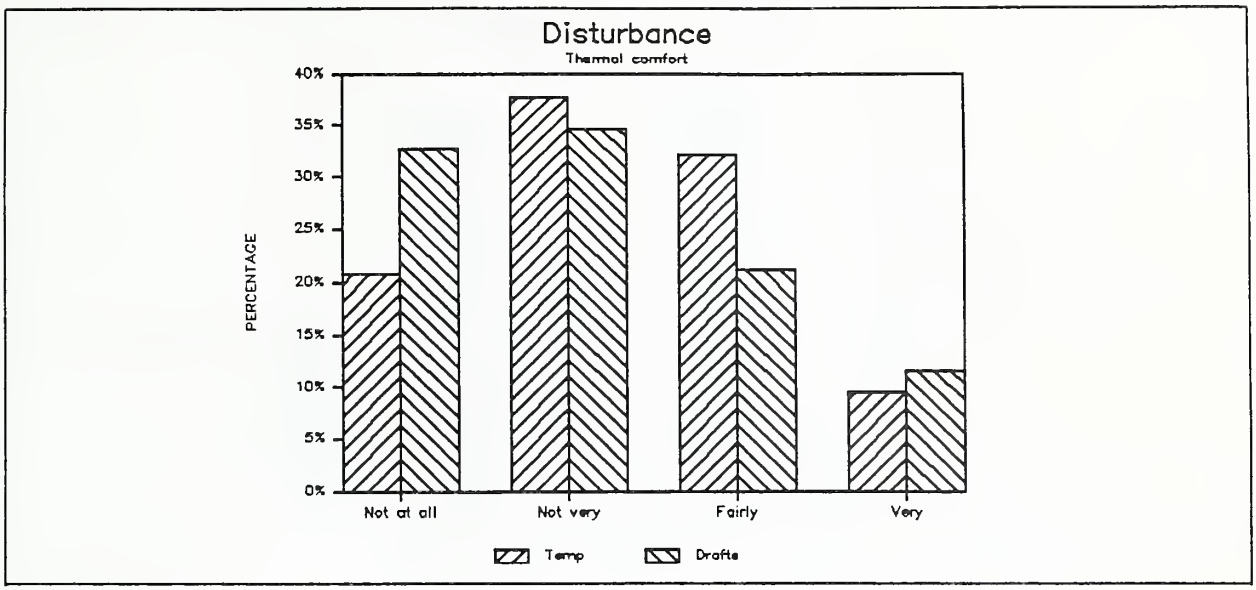


Related measures were taken on a 4-point 'disturbance' scale. The average scores were above the estimated neutral point of 2; see figure 3.15.

Table 3.15 Disturbance by temperature, drafts

Code	Number	Average	SD
TEMPERTR	53	2.29	.91
DRAFTS	52	2.12	1.01

Figure 3.15 Disturbance - Thermal comfort



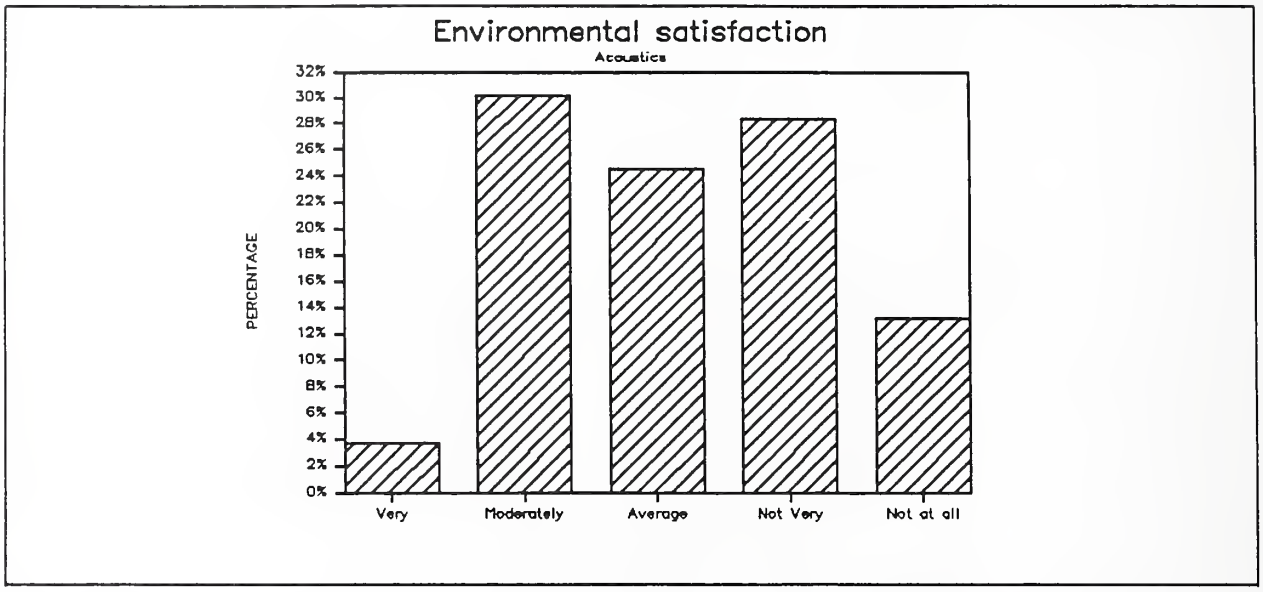
3.8.3 Acoustics

The first group of questions deal with noise and privacy issues. While each of these factors by themselves indicate a considerable degree of disturbance, more importantly, the cumulative effect of all of them suggest a major acoustical problem that merits attention. Virtually every questionnaire item dealing with sound disruption directly or indirectly reveals a problem.

Sound satisfaction was first rated on the same 5-point scale used for lighting and temperature. The average was 3.16, SD 1.09, N=53; also see figure 3.16. This score was the highest among the environmental attributes examined, and indicates a major concern to be addressed.

Twenty-two of the 53 respondents gave unfavorable responses to acoustics, indicating that noise and privacy are the major sources of annoyance among environmental features. Acoustic problems have been prevalent in most recent studies of open offices.

Figure 3.16 Environmental satisfaction - Acoustics



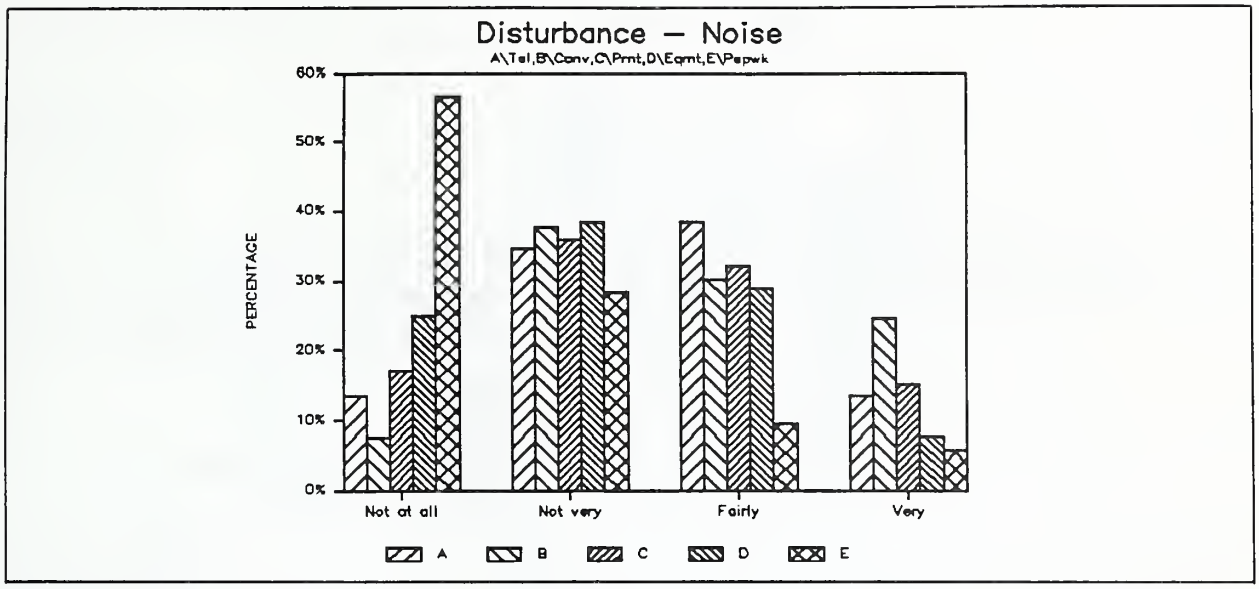
As further evidence of the noise problem, more than 40% of the respondents expressed dissatisfaction with the acoustic environment.

Following is a 4-point scale concerned with disturbance caused by noises, with scores above 2 indicating a problem. The only item that indicated an acceptable condition, was the low rating for disturbance caused by people walking nearby.

Table 3.16 Disturbances by noise

Code	Number	Average	SD	Figure Code
TELERING	52	2.5	.88	A
PEPLTALK	53	2.75	.93	B
NOISEPRT	53	2.43	.93	C
NOISEEQP	52	2.18	.86	D
PEPLWALK	53	1.59	.82	E

Figure 3.17 Disturbance - Noise



3.8.4 Air Quality

Nine of the 53 respondents had unfavorable comments about air quality; consistent with typical complaint ratios for office buildings with no significant problems (4).

Ratings of distraction due to stuffy air (STUFYAIR) 4-point scale, and satisfaction (AIRQSAT) 5-point scale, were within the neutral range; see figures 3.18, 3.19.

Table 3.17 Air quality

Code	Number	Average	SD
STUFYAIR	53	1.78	.89
AIRQSAT	53	2.39	1.07

Figure 3.18 Environmental satisfaction - Air quality

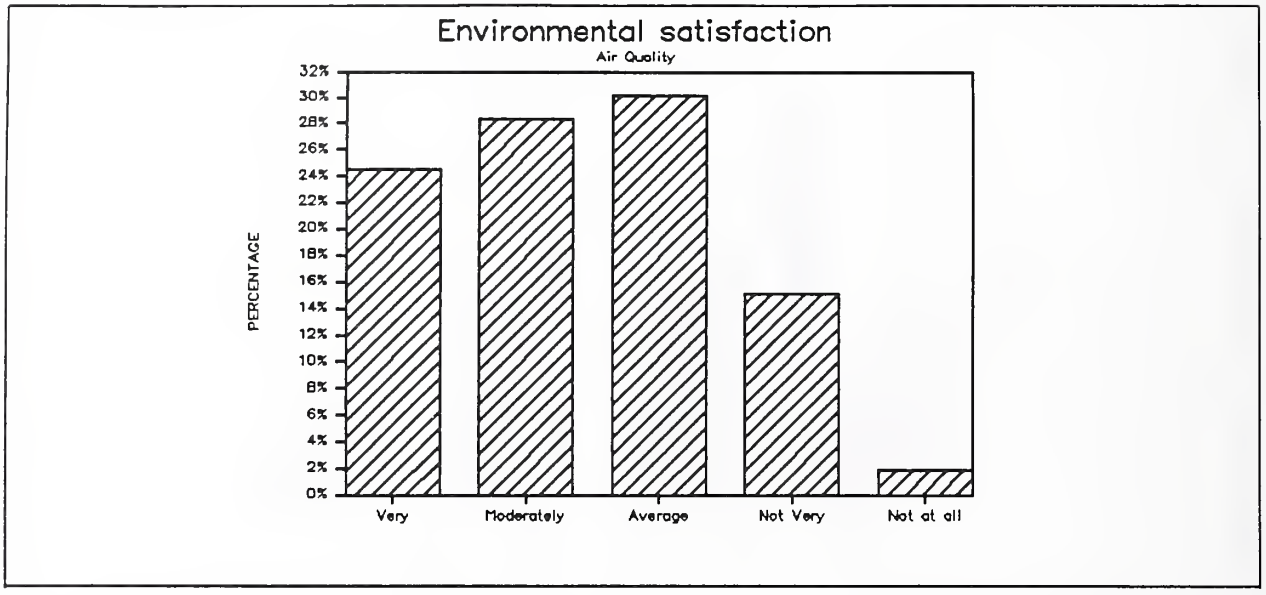
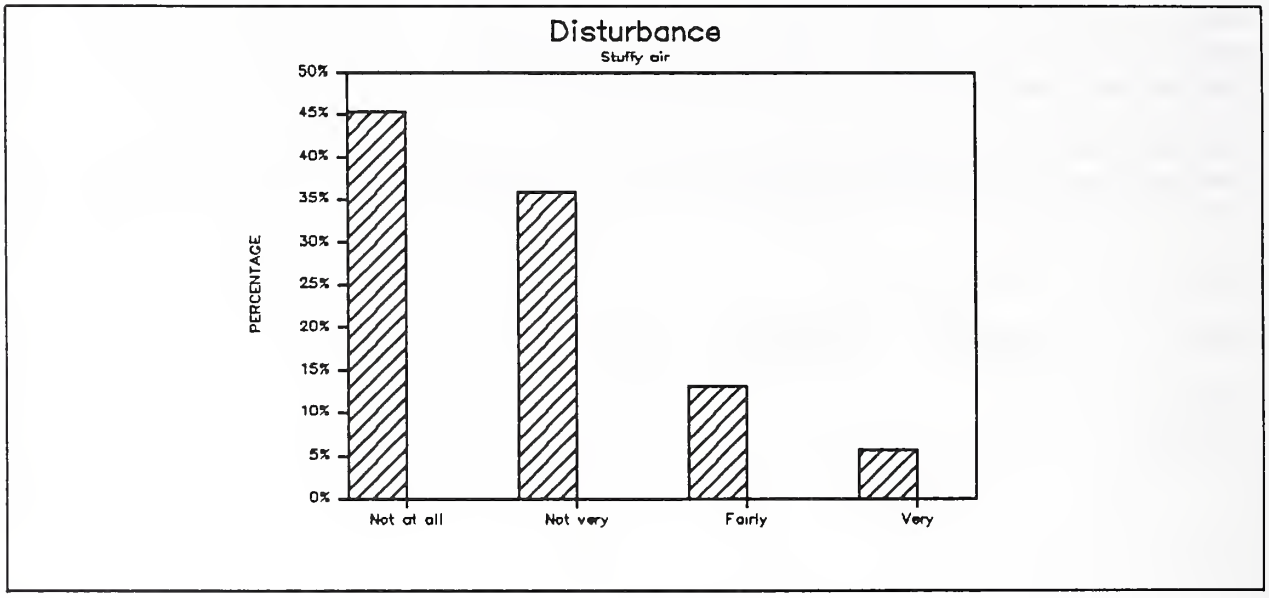


Figure 3.19 Disturbance - Stuffy air



3.9 Environmental control

The degree of environmental control available at the workstation was then explored. Workers were asked whether controls were available to them.

Table 3.18 Environmental Control

Design Feature	No	Yes
Lighting	19	34
Temperature	48	5
Air Flow	46	7
VDT Glare	28	21

A followup question then probed which controls were desired. Of the 19 responses given, 18 dealt with lighting. This, despite the fact that more control was available for lighting than any other environmental feature.

Table 3.19 Desired Controls

Control Desired	Number
Task light	(11)
Light switch	(6)
Thermostat	(1)
VDT light	(1)

In order to gain an insight into the technologies used at the workstations sampled, workers were asked to identify the devices used at their jobs. The findings indicate that VDT's and telephones were present at most of them.

Table 3.20 Devices used at work

Device	Number
VDT	(42)
Telephone	(46)
Typewriter	(5)
Calculator	(4)
Printer	(2)
Modem	(1)
Scanner	(1)

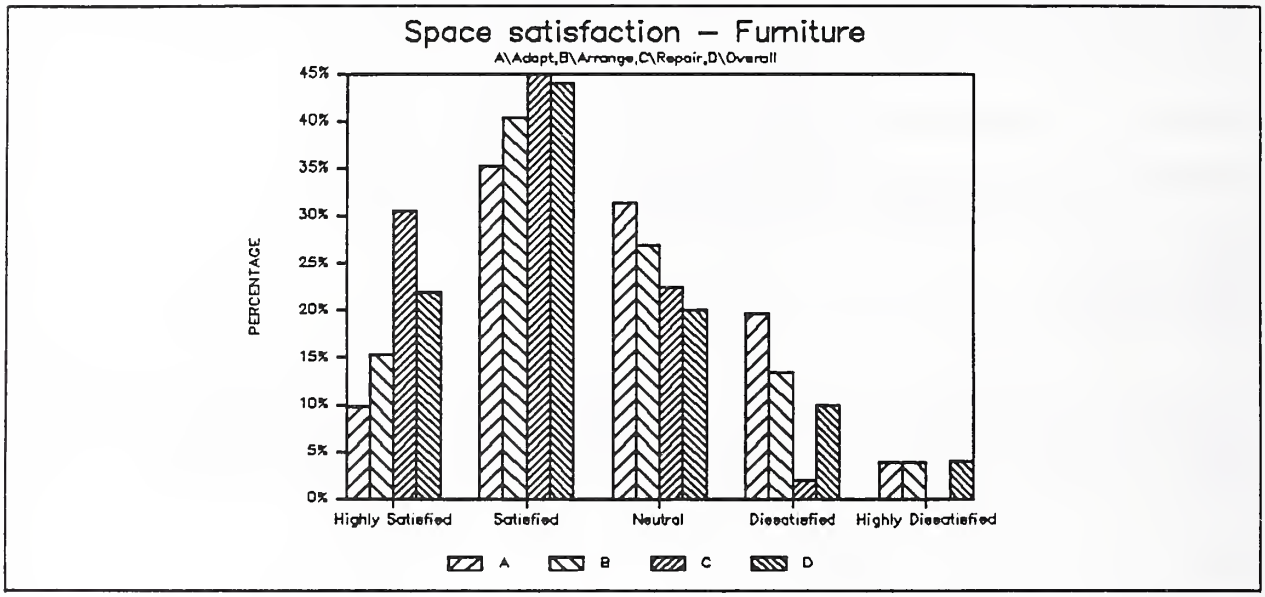
3.10 Furniture characteristics

Table 3.21 and figure 3.21 summarize furniture ratings. Most features were rated quite favorably, with the exception of adaptability. Twenty-four percent of the ratings expressed some level of dissatisfaction with this feature.

Table 3.21 Furniture ratings

Code	Number	Average	SD	Figure Code
FURNABIL	51	2.73	1.01	A
FURNAGMT	52	2.5	1.03	B
FURNREPR	49	1.96	.78	C
FURNRATE	50	2.3	1.04	D

Figure 3.21 Space satisfaction - Furniture



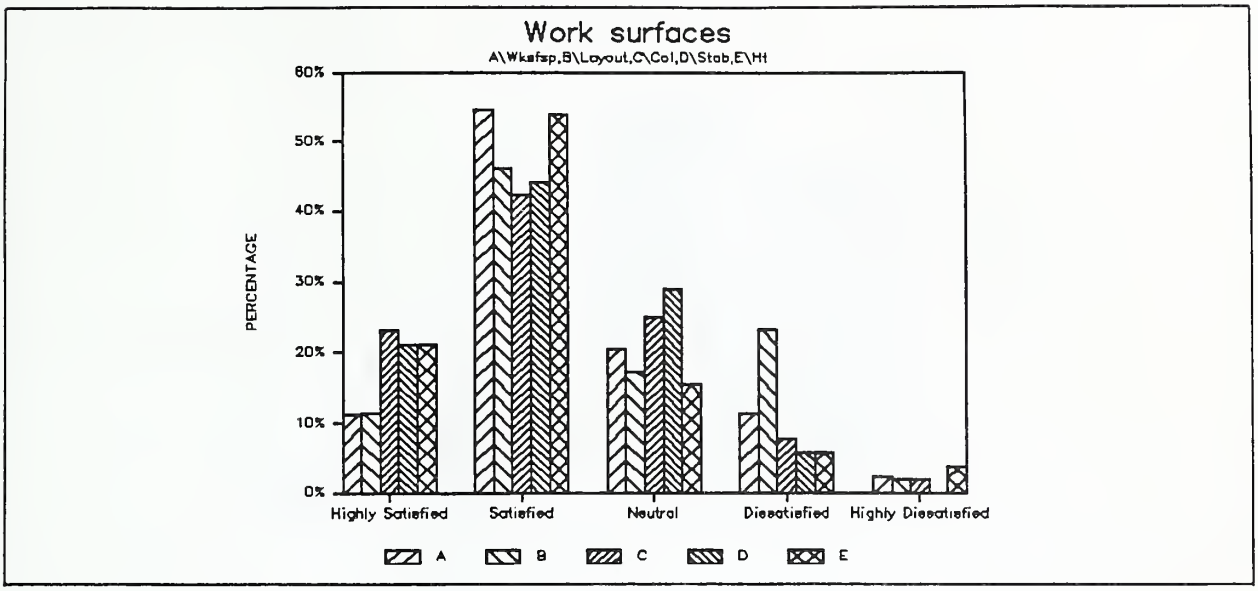
Respondents were then asked to evaluate their ability to control noise and visual distractions. These findings support earlier responses about noise problems in the office; 64% of the answers indicated dissatisfaction with noise control. While visual distractions were also indicated, they elicited much fewer dissatisfied responses.

The next topic examined was worksurface features. Most responses indicated a high degree of satisfaction; negative ratings were all below 15%. The ratings were made on a 5-point satisfaction scale (highly satisfied-1, highly dissatisfied-5).

Table 3.22 Worksurface satisfaction

Code	Number	Average	SD
WKSF	44	2.39	.91
WKSFLAY	52	2.29	.95
WKSFCLR	52	2.23	.95
WKSFSTAB	52	2.19	.83
WKSFHGT	52	2.17	.96

Figure 3.22 Work surface ratings

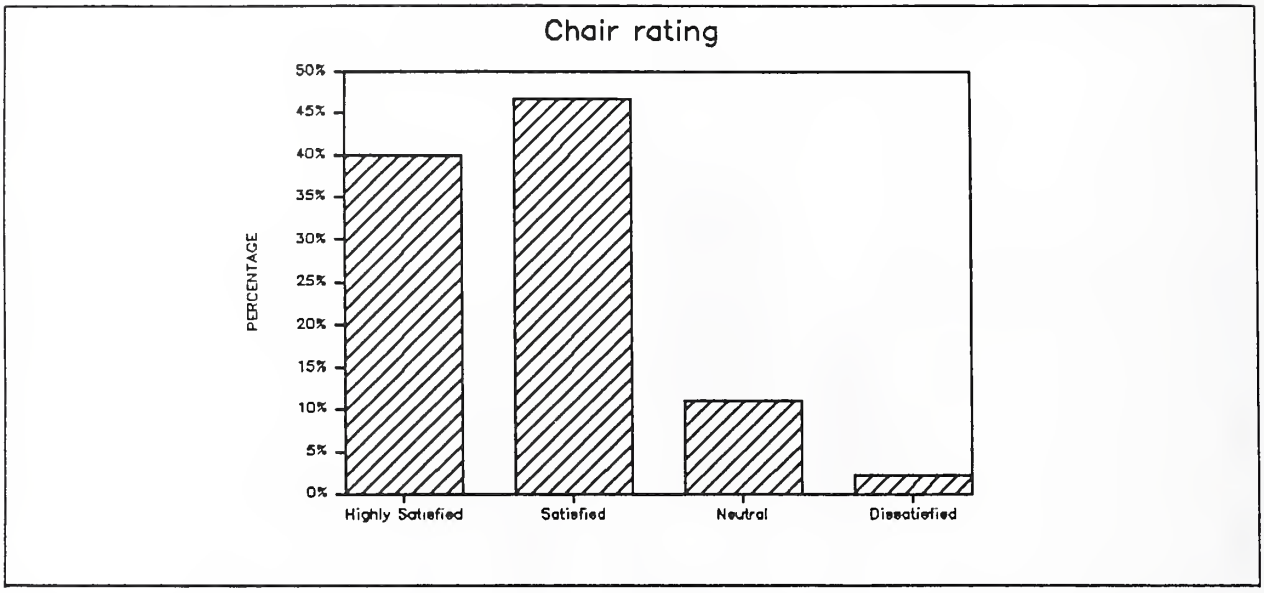


As was the case with other questions about furnishings, the responses to the chairs were very favorable. The vast majority of the workers sampled were 'highly satisfied' or 'satisfied' with all of the features asked about.

Table 3.23 Chair ratings

Code	Number	Average	SD
CHAIRRAT	45	1.78	.81
CHRCMFT	51	1.88	.86
CHRADJT	53	1.90	.85
CHRBACK	51	1.92	.90
CHRCLOR	49	1.94	.89
CHRMOBIL	51	1.78	.67

Figure 3.23 OCHR29



The next topic explored was storage satisfaction, using the same 5-point scale employed in evaluating furnishings. The average scores were all in the satisfactory range, but the storage of personal items and the total storage room elicited a substantial amount of dissatisfaction - approximately 30%. Figures 3.24 and 3.25 provide detailed findings.

Table 3.24 Satisfation with storage.

Code	Number	Average	SD	Figure Code 1	Figure Code 2
STORFILE	52	2.4	.97	Paper	
STORDISK	49	2.33	1.0	Elec	
STOREQMT	51	2.51	1.04	Eqmt	
STORPERS	52	2.69	1.19		A
STORACC	51	2.41	1.03		B
STORAMT	50	2.74	1.18		C
STORFUTR	46	2.61	1.01		D

Figure 3.24 Storage - 1

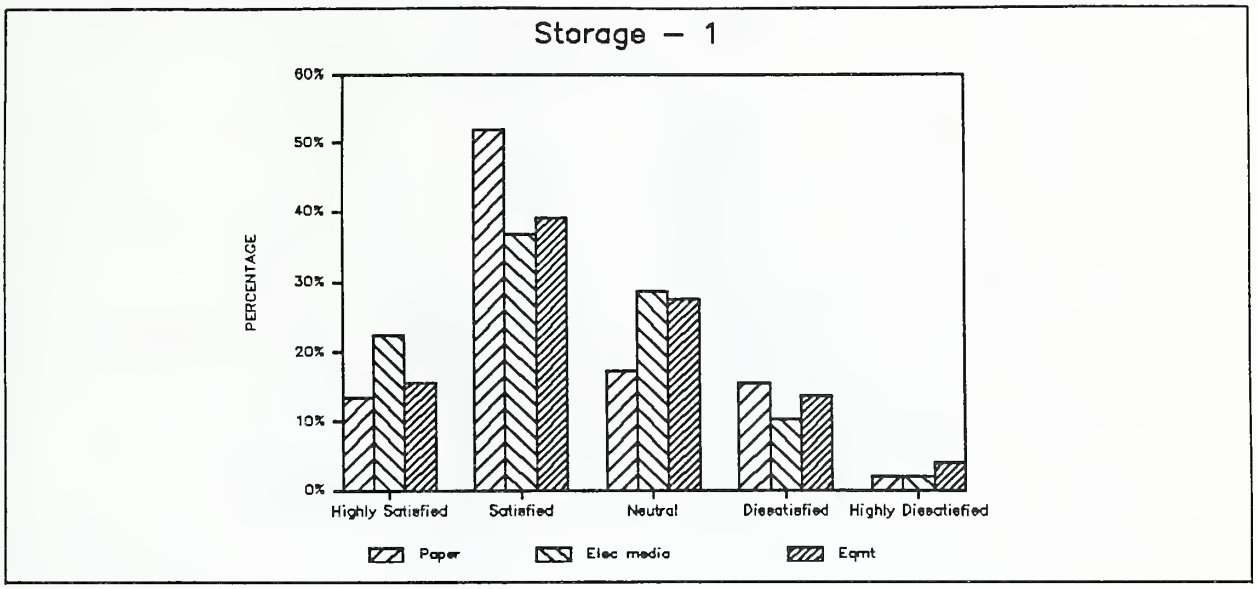
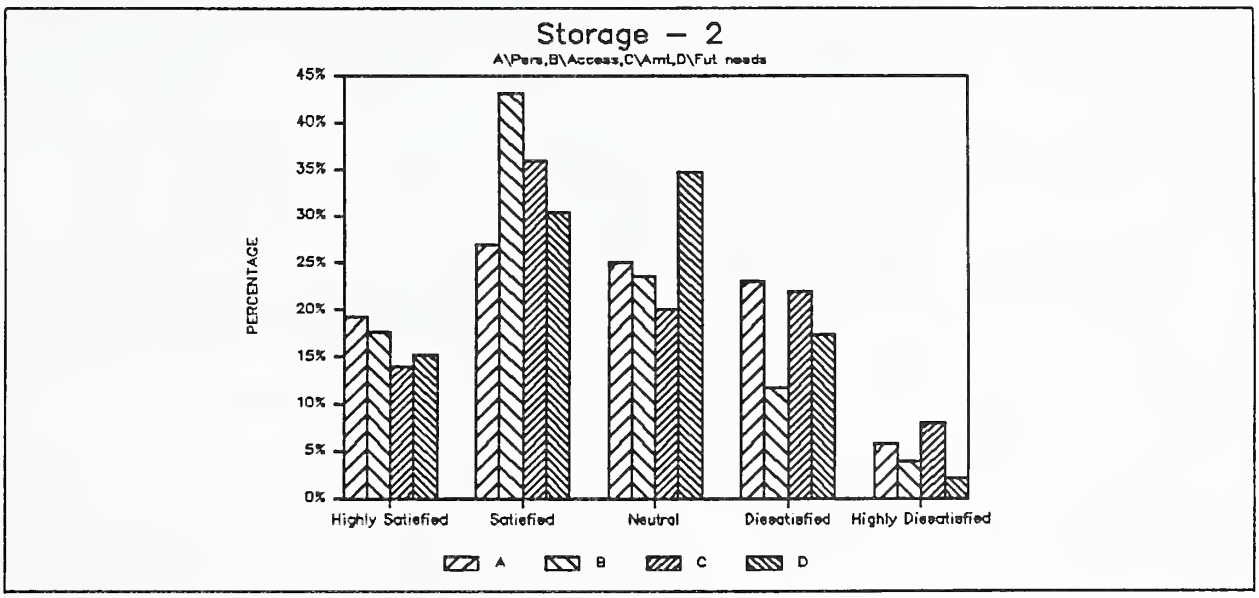


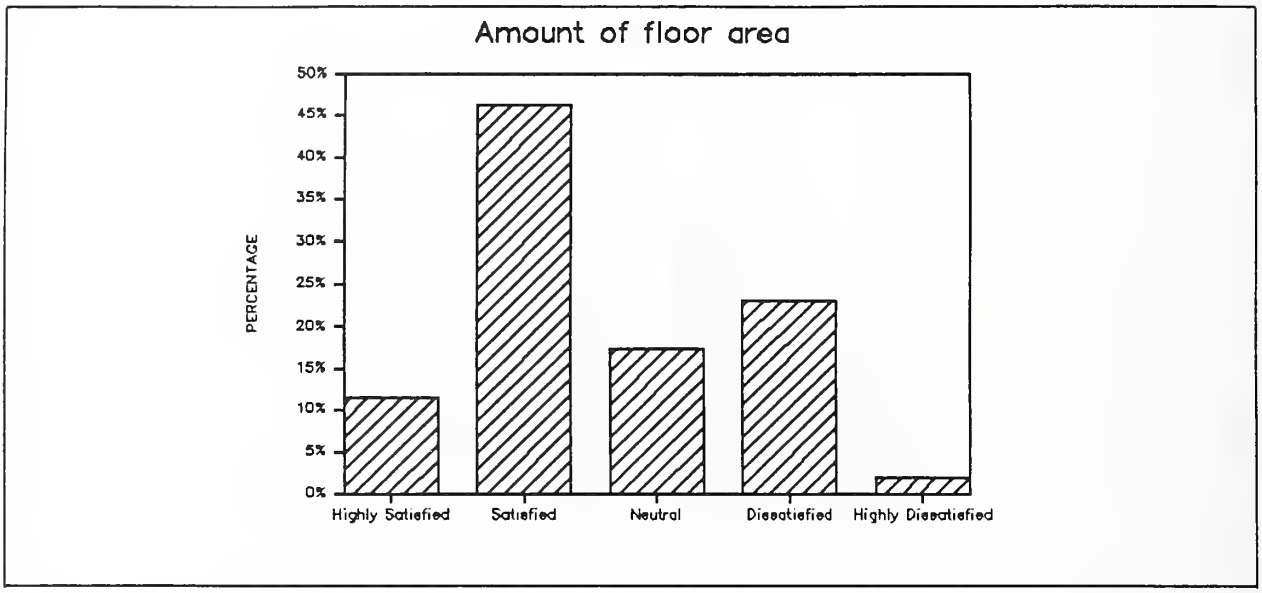
Figure 3.25 Storage - 2



3.11 Space requirements

Workstations in open offices frequently result in less floor area being occupied for each individual. Feelings of being confined and crowded often result. When evaluating the satisfaction of the amount of floor area available on a 5-point scale, 25% of the occupants expressed some level of dissatisfaction. The average response for FLRAREA was 2.58, SD 1.03, N=52; also see figure 3.26.

Figure 3.26 Amount of floor area rating



The next series of items were in the form of statements which dealt with the strength of feelings about workstation layout. The assumption is that the stronger the feeling, the more likely it is to affect job performance. A 5-point scale was used in these evaluations (1-strongly agree, 2-agree, 3-neutral, 4-disagree, 5-strongly disagree).

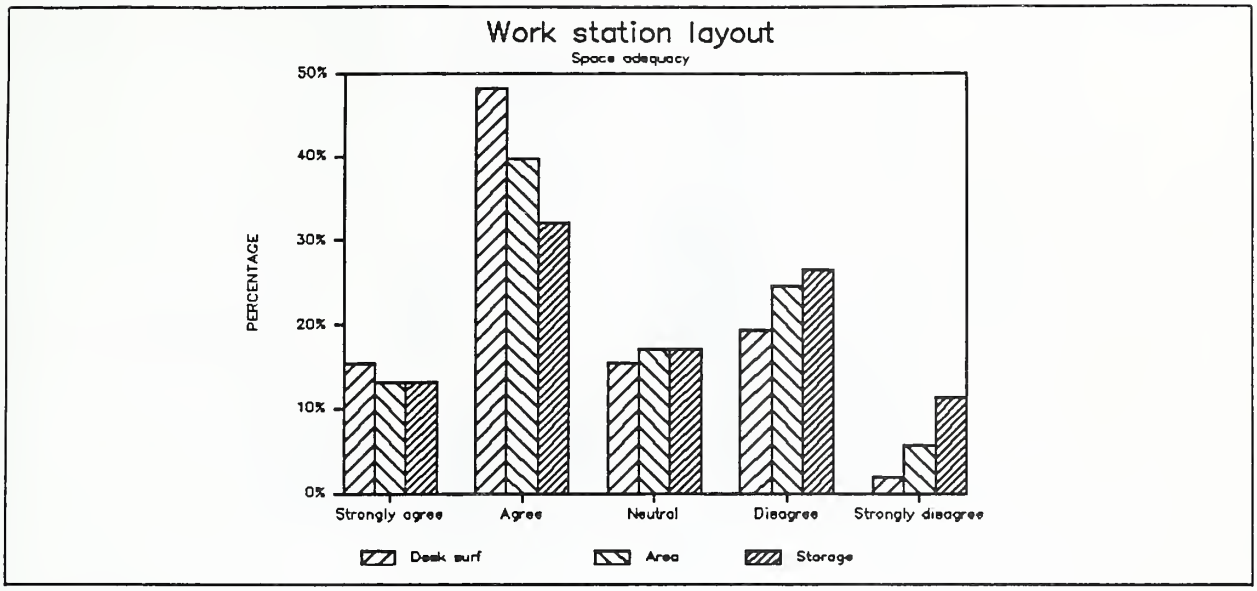
The first statements dealt with space issues, the size of the desk surface and the area occupied.

- The size of desk surface is adequate.
- The area my space occupies is adequate.
- There is enough storage space in and around my desk.

Table 3.25 Workstation space

Code	Number	Average	SD
DESKSIZE	52	2.44	1.03
SPACAREA	46	2.70	1.14
SPACFILE	53	2.91	1.25

Figure 3.27 Workstation layout



While the average values appear to be satisfactory, an examination of figure 3.27 suggests that a sizable percentage of respondents (approximately 30%) indicated that they would like more space, especially for the storage of materials.

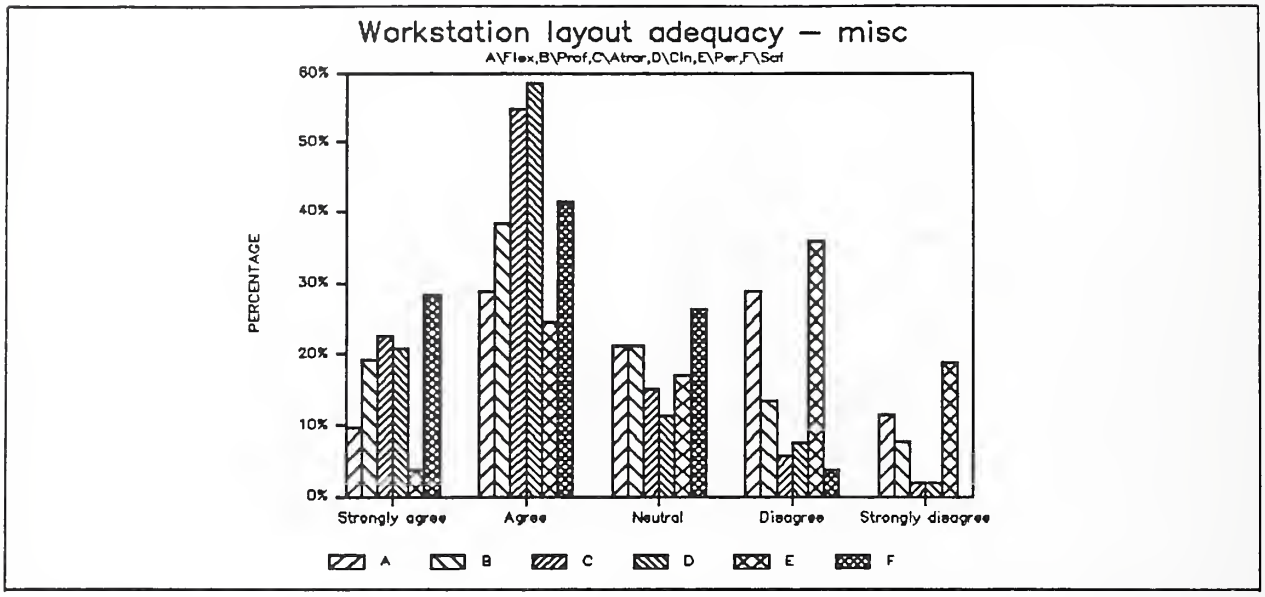
Other workstation layout features were then examined using the same approach as above. The items were:

- The layout is flexible enough to meet changing needs.
- The workstation presents a professional image.
- The layout is attractively arranged.
- My space is easy to keep clean.
- I can personalize my space.
- There are no safety hazards.

Table 3.26 Workstation features

Code	Number	Average	SD	Figure Code
SPACFLEX	52	3.04	1.19	A
PROFIMAG	52	2.52	1.17	B
ATTRAGMT	53	2.09	.87	C
SPACCLEN	53	2.11	.88	D
SPACPERS	53	3.42	1.16	E
SAFETY	53	2.06	.83	F

Figure 3.28 Workstation layout adequacy - Miscellaneous

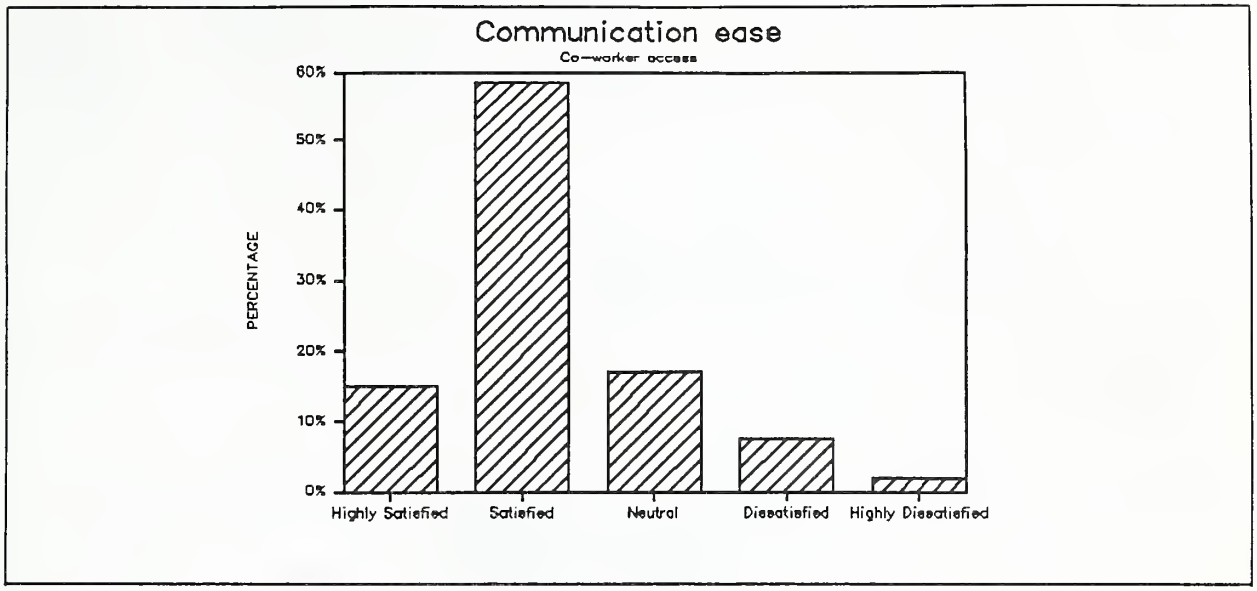


The feature that drew the greatest negative response was the lack of opportunity to personalize work spaces. More than half of the respondents indicated a desire to do this. Lack of flexibility was also a major concern, with approximately 40% of the responses indicating that this was a problem. The arrangement of the workstations and their cleanliness were given especially "good grades".

3.12 Miscellaneous features

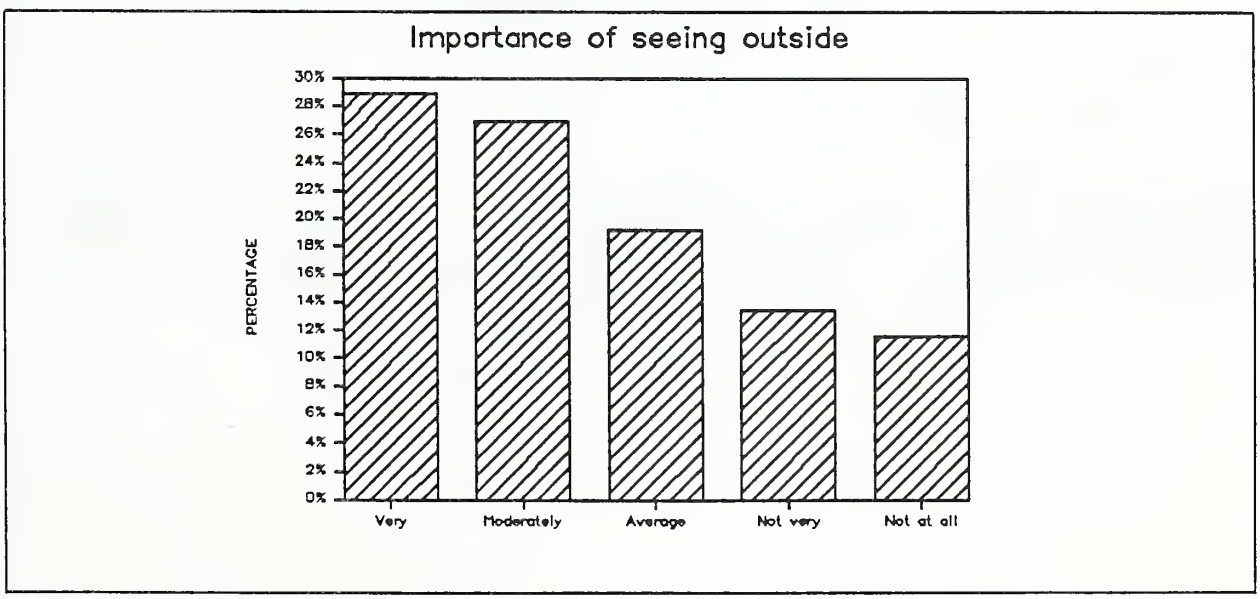
One of the initial reasons for the popularity of the open-office design concept was to facilitate communication among co-workers. When asked about this, employees responded quite favorably on the present design. Satisfaction with communication (EASECOM) was rated, using a 5-point scale (1-very, 2-moderately, 3-average, 4-not very, 5-not at all). The average score was 2.23, SD .86, N=53; also see figure 3.29.

Figure 3.29 Communication ease



In open-office designs, windows are often an important amenity, and considered a shared attribute for the entire staff. The importance of seeing outside was the topic the next item. The findings support those of other studies, with 56% of the respondents evidencing a desire to see outside. A related question concerned whether a window was visible; 25 of the 51 respondents were able to see a window from their workstations. The importance of seeing outside was evaluated on the same 5-point scale used for communication. The average for NEDSEOUT was 2.52, SD 1.34, N=52; see figure 3.30.

Figure 3.30 Importance of seeing outside

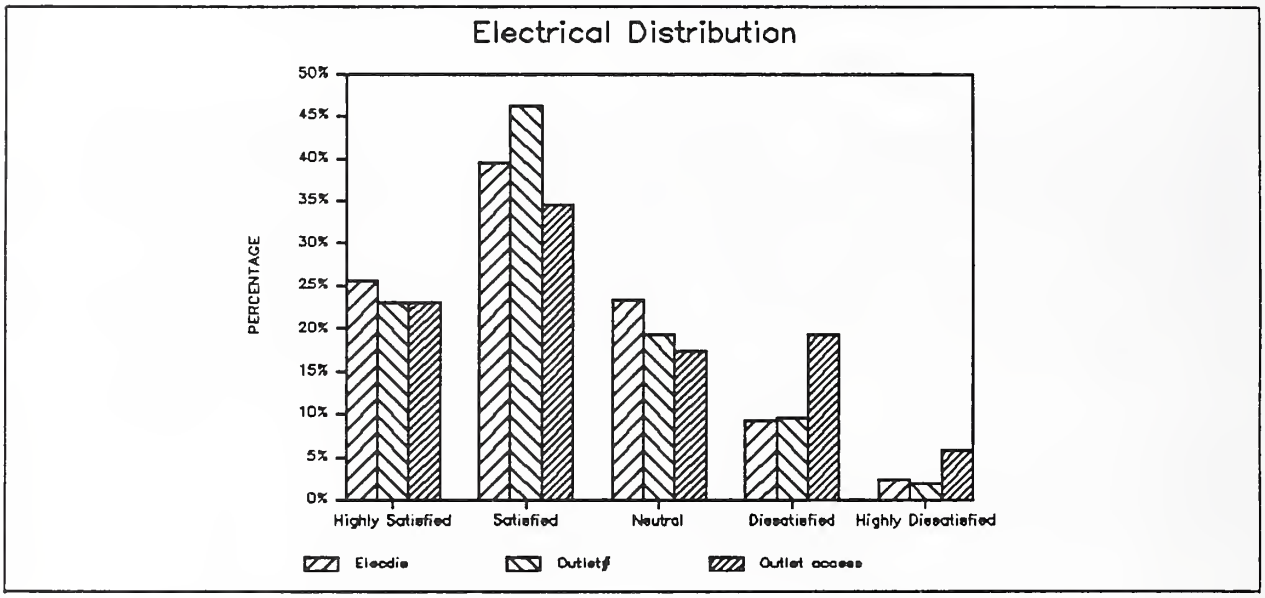


In the automated office, cable distribution is an extremely important feature, to readily access power and to facilitate changes due to technological and organizational changes. Ratings of distribution and outlet availability were generally favorable, with the exception of 'ease of access', which resulted in 25% of the responses expressing dissatisfaction. See table 3.29 and figure 3.31.

Table 3.27 Electrical distribution

Code	Number	Average	SD
ELECDIST	43	2.32	1.01
OUTLETNO	52	2.21	.97
OUTLETUS	52	2.5	1.20

Figure 3.31 Electrical distribution



3.13 Summary questions

Several general summary question were included in the survey. The first dealt with the workstation adequacy (WSGENRL); the next concerned space satisfaction (WSSAT). Both were rated on 5-point scales. The results were similar, expressing considerable agreement that the workstations performed well.

Table 3.28 Overall workstation satisfaction

Code	Number	Average	SD
WSGENRL	43	2.51	.85
WSSAT	53	2.49	1.07

Figure 3.32 Workstation layout

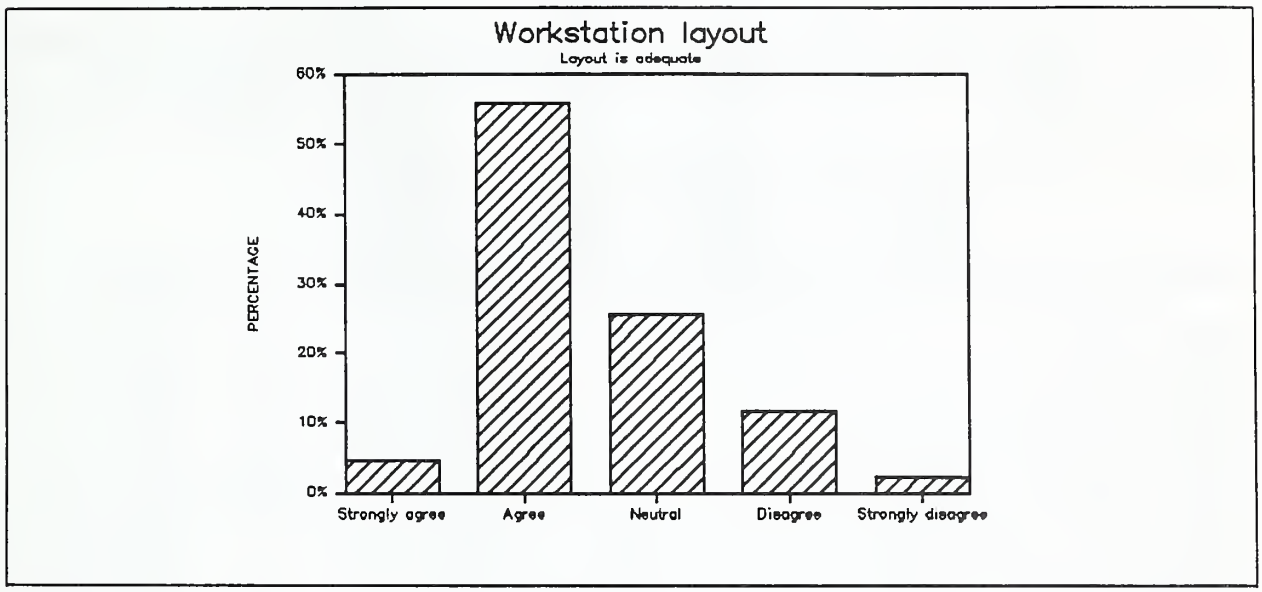
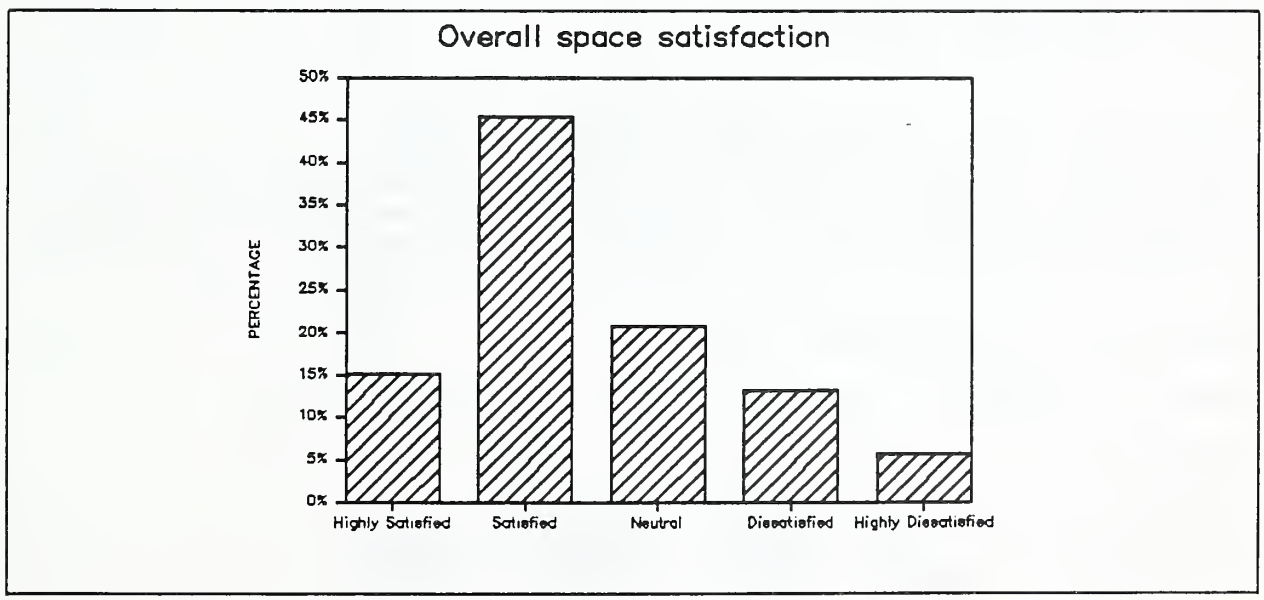


Figure 3.33 Overall space satisfaction



3.14 Four desired environmental changes

As a final step in the evaluation, respondents were asked the following:

Suppose you could make 4 changes to your overall work environment. Indicate the changes you would make, in order of preference, where 1 is the most preferred one.

Privacy and space issues predominated, as evidenced by the table below. Noise and temperature regulation were also prominently noted. Lighting, air circulation and furnishings changes received few mentions.

Table 3.29 Desired office changes (4 Changes)

	Choices				
Desired Changes	1	2	3	4	Total
More privacy	20	11	4	2	37
Less noise	5	10	8	3	26
Better temperature	12	1	4	7	24
More workstation space	3	3	9	4	19
More storage space	3	5	3	7	18
More desktop workspace	3	5	5	2	15
Away from coworkers	3	4	5	1	13
Ability to personalize space		3	2	7	12
Better break areas	1	2	1	5	9
Improved air circulation		2	1	3	6
Improved lighting		2	2	1	5
Adjustable task lighting	1		1	2	4
More comfortable furnishings			2		2

The first group of items dealt with environmental factors. While the averages and standard deviations are noted below, the most important findings are the number of mentions which are charted in the following figures. (For some items, the number of mentions are so small that standard deviations are inappropriate.)

Table 3.30 Environmental changes

Code	Number	Average	SD	Figure Code
WSIMTEMP	24	2.32	1.35	A
WSIMLTG	5	2.8		B
WSIMNOIS	26	2.41	.95	C
WSIMAIRC	6	3.17		D
WSIMTKLT	4	1		E

Figure 3.34 Desired changes - Environment (1-4)

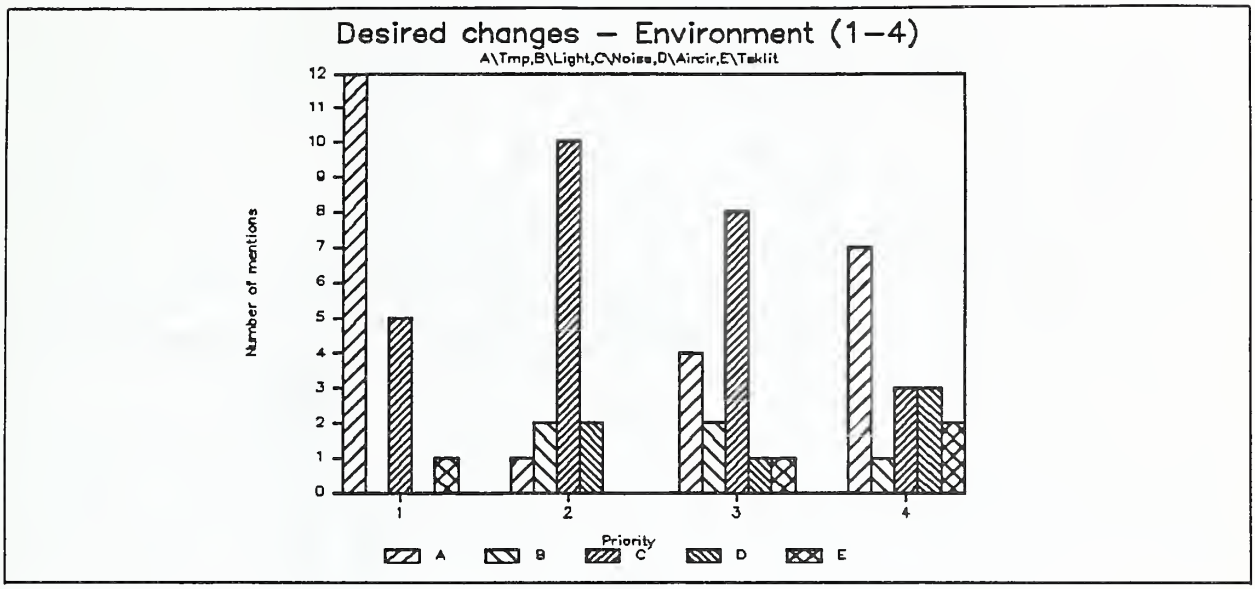


Table 3.31 Workstation features

Code	Number	Average	SD	Figure Code
WSIMPRIV	37	1.68	.87	A
WSIMFLSP	18	2.88	1.08	B
WSIMSPAC	19	2.72	.99	C
WSIMLOC	13	2.31	.91	D
WSIMDKSP	15	2.43	.98	E

Figure 3.35 Desired changes - Space (1-4)

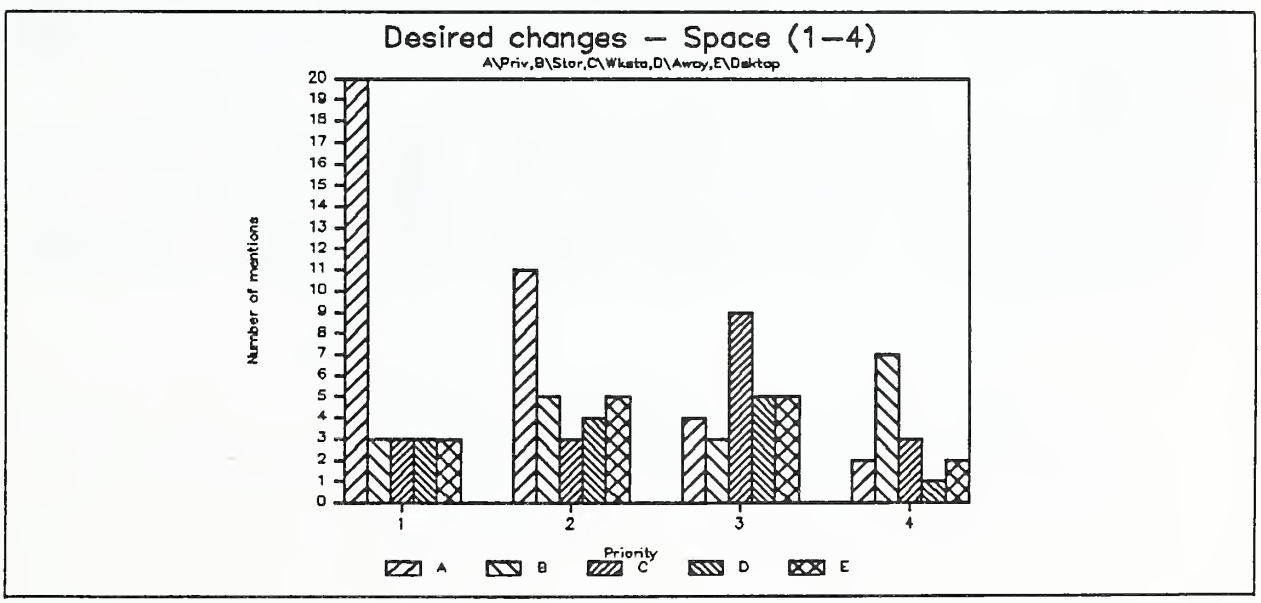
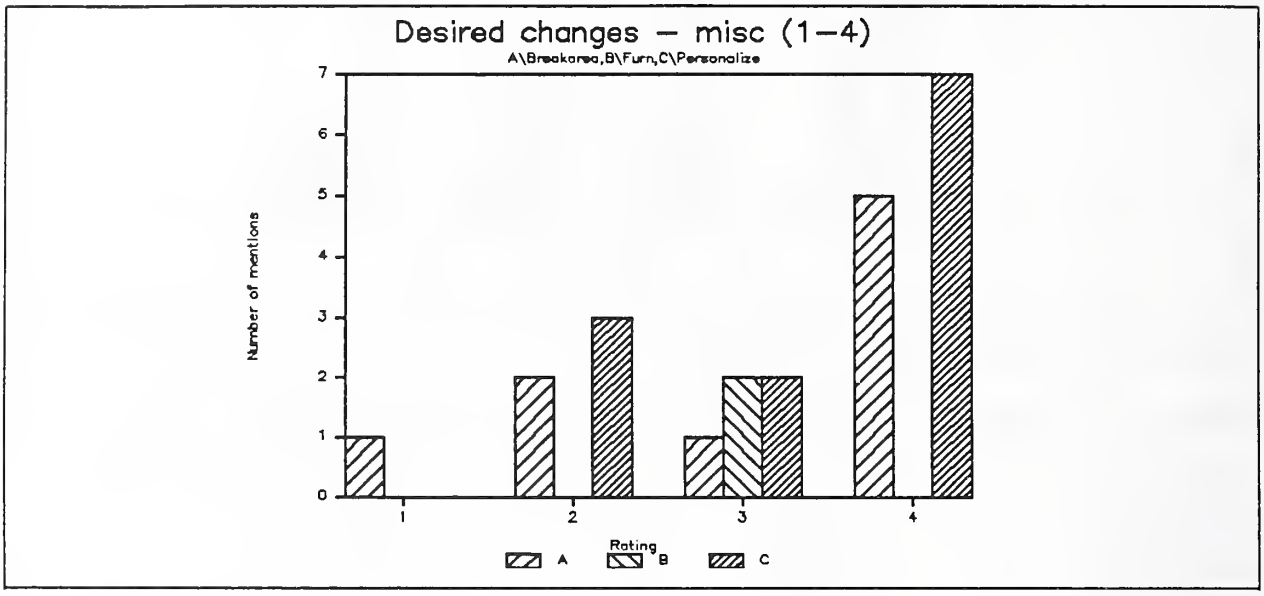


Table 3.32 Breakspace, furniture, personalization

Code	Number	Average	SD	Figure Code
WSIMBKSP	9	3.11	1.10	A
WSIMFURN	2	3.		B
WSIMPERS	12	3.38	.84	C

Figure 3.36 Desired changes - Miscellaneous (1-4)



3.15 Conclusions

When the findings of the Portland2 and OPM findings are compared with one another the results are quite similar. This is the case despite the fact that OPM was a retrofitted building and Portland2, a new one. The lack of privacy, noise, temperature fluctuations and limited space, were all mentioned as design features which needed improvement. Similarly, the newness of the surrounds and improved furnishings both received favorable mention. However, lighting and air quality deficiencies in the Portland2 building were not apparent at OPM, where the inability to personalize workstations was a major source of complaint.

4. Lessons learned

The following represents a composite account of the design experiences of several federal agencies with office automation. The agencies where the interviews were conducted include the General Services Administration, the Treasury Department, the Office of Personnel Management, the Department of Labor and the Bonneville Power Administration. The information was gathered by interviewing facility managers and operational personnel at headquarters as well as some field offices - supervisors and workers were both questioned. While the findings should not be considered representative of all such buildings, they are indicative of the issues encountered by organizations coping with new office technologies. The buildings examined were new structures and older ones retrofitted to accommodate new office technologies and upgrade environmental and other systems. An overriding concern for all interviewees was the requirement to meet the GSA 135 sq ft average space allocation for workstations.

4.1 Planning

At one agency, the approach was decentralized. A master plan was prepared by a contract architect but most of the detailed layout decisions were made by operational units. For example, an organizational element was allocated a fixed amount of space. The unit manager then decided on the mix of private and open space; the details were worked out with staff designers. Initially, several managers planned large offices for themselves, but when this resulted in cramped spaces for the staff, the original decisions were modified and managerial offices made smaller. The facility manager believes the involvement of end-users in making layout decisions enhanced the acceptance of the final designs.

Other agencies employed a very different process. Planning was highly centralized, with detailed layouts of workstations and space allocations by a small group of people. A limited number of workstation components and configurations were selected by the staff, with little individual choice.

4.1.1 Design process issues

In the cases of both new buildings and renovated ones, building users encountered problems when their scheduled move-in was premature. That is, the buildings were occupied before work was completed. After occupancy, many problems

were encountered, and contractors were not very responsive in solving them in a timely fashion. Examples of the difficulties encountered were:

- Holes in the facades
- Lack of acoustic insulation in the ceilings of some offices
- Loose wires at and near workstations
- Unbalanced HVAC systems; hot in some areas, cold in others.
- Furniture which didn't work properly; drawers that could not lock; file cabinets that were too large for workstations

4.1.2 Planning suggestions

There was a consensus among the organizations examined that user input is very important in deciding space and furniture needs. However, higher management was not always sufficiently sensitive to this issue and many decisions were made without including information from users. Complaints about inadequate filing space, lack of privacy, and workstations ill-suited to the jobs being performed, were common among users whose views were not solicited during design.

4.1.3 Moving workstations

Despite the presence of systems furniture in all of the buildings examined, movement of workstations was often difficult. Among the comments made were:

-"There is no swing space. Stations are knocked down and rebuilt rather than trying to move them."
-"If the hole in the access floor is in the wrong place; a good deal of panel movement is needed."
-"It took 3 months to move 20 stations. Drawings had to be done. The electrical systems were a determining factor because the wiring goes thru the furniture; electrical and phones. Electrical and phone companies had to be involved. The wires had to be pulled down from the ceiling and through the stations. Often, panels had to be reordered; this took 3 months for delivery."
-"Where workstations differ movement is a greater problem. They are tailored for individuals. They are difficult to move."

The cost of moving a workstation ranged from $450 to $1500 for the buildings examined. Running cable and adding conduits added greatly to the price. To build a workstation, including furniture purchases, cost about $5000.

4.1.4 Workstation standardization

There is a conflict between space management and individuals in terms of standardized workstations. Individuals want tailored workstations as the job becomes more specialized. In the typical instance, plans were made for 4 or 5 standard workstations, but changes were made later to accommodate the needs of workers. The range of different workstations present in the buildings examined ranged from 14 to 27 at the time of the investigation. However, this number changed often.

4.2 Environmental systems

4.2.1 Balancing HVAC systems

Balancing seems to still be a problem in new buildings and retrofitted ones. It is attributed to a combination of the people, equipment and the circulation spaces.

In one building there were more people on each floor than originally intended. In another instance, private offices were on the perimeter, blocking the circulation. Changes in configuration of workstations also were made without proper consideration of the air distribution system. For example, private partitions were added without sufficient thought given to air circulation.

4.2.2 Lighting

Lighting is inadequate in several of the buildings examined. Typically, the placement of the overhead lighting bears little relationship to the location of the workstation. Among the comments made were:

-"A lot of task lighting has been installed."
-"There are dark spots in many parts of the office."
-"The built-in light over the desk is inappropriate; it lights the back half of the workstation but not the front."

4.3 Wiring

Bringing sufficient power to the workstation presented a major challenge in all of the buildings examined, whether new or retrofitted. Some comments were:

-"Adding power when a binder bin has been added is difficult; there is no path. Sometimes another strip has to be added."
-"Some conduits are filled up already."
-"A major power upgrade is needed; panels are full, no cables can be pulled."
-"There is sufficient power for vertical distribution, but bringing power to workstations is sometimes difficult; adding conduits thru raised floor or overhead if needed."
-"Access holes have to be moved around."
-"In some instances wire is moved though the workstation and through the floor panel. The wiring is often in the wrong place for easy moves."
-"There are only 3 outlets per station; this creates a problem."

4.4 Telephone systems

All of the agencies examined had new telephone systems or were in the process of installing them. Generally they were well received because of increased capabilities. The need for appropriate training in their use was stressed. However, telephone ringing in open-offices created several problems, e.g.:

-"Phones ring all of the time. 75% of the work is done over the phone and sound creates a major problem."
-"In open space, the phone system was a nightmare; people didn't pick up phone. Calls were constant and noise was a dissatisfier."
-"All phones sound alike; you can't tell where phone is coming from; whether the ring is in ones group or another one."

4.5 Files

Adequate and efficient file space was a concern for all of the people interviewed. Of special importance was the "fit" of the workstation dimensions with filing requirements. The

design and adequacy of file systems elicited many comments, primarily unfavorable:

-"Drawers with hanging files waste a good deal of space. These are inefficient. Those near the floor are difficult to access."
-"The filing cabinets are not convenient or efficient. They waste room and are inaccessible; especially the bottom one. It is often necessary to turn sideways when accessing files."
-"Many functions require considerable paper storage, and paper is placed in boxes and on floor. The cubicle size precludes adding storage.
-"Not enough desktype drawer space. They only have suspended files."

4.6 Furniture

Although a common justification for the purchase of systems furniture is its flexibility, reassembly is expensive and needs considerable expertise. Another difficulty encountered with system components is that they are often used to hold old equipment, which is often quite heavy. These new modules are sometimes not designed to accommodate this load.

4.6.1 Furniture purchases

One problem identified concerns the competitive procurement system. After an initial furniture purchase, followon contracts often result in systems incompatible with the original one.

One respondent noted: "Competitive bidding makes likely the use of different systems, components, more inventory, less flexibility, visual clutter, etc. Long term, responding to the low bidder is often more costly to the organization. The competitive bid should be done once; replacements then should be on sole-source negotiated contracts."

4.7 Training

The capabilities of building management system are greater than the staff's ability to use it. Training is needed to operate the system effectively. It is a mistake to just turn over the system to users who cannot take advantage of capabilities.

5 Conclusions

5.1 GSA Workstation Space Requirements

No general conclusion is possible from the information analyzed about the effectiveness of the 135 sq ft space allocation for workstations. The interpretation of this requirement differed from agency to agency. In some cases, it was rigidly enforced within each organizational unit, while in other instances it was used as a starting point for negotiations between the agency and GSA. For example, waivers were sought because of "special purpose" spaces, not anticipated when the space allocation was promulgated. Depending on the activity being performed, sometimes the 135 sq ft was adequate for the purpose; in other instances there were complaints that job performance was seriously impaired because of space limitations.

5.2 Environmental systems

Adequate temperature control was a recurrent problem for several reasons:

- Underestimates of the number of people and equipment occupying spaces
- Constant movement of workstations and changes in configurations
- Undersizing of HVAC equipment

Lighting was a problem in many offices; even where overall levels were appropriate, it was not available where needed - on the work surface. Also, inappropriate light placement and/or fixture characteristics created glare problems. The proper integration of daylight, ambient and task light was rare.

5.3 Electrical systems

Just as the HVAC systems often didn't accommodate the needs of equipment and people, wiring needs were often underestimated. Wire conduits were often filled to capacity shortly after move-in (or retrofit). Bringing wiring to the workstations effectively and at a reasonable cost was sometimes difficult.

5.4 Furnishings

While new systems furniture was welcomed by occupants and facility managers, moving workstations was frequently more difficult and costly than anticipated. Considerable expertise was often necessary to modify or move furniture and the use of outside contractors was prevalent.

5.5 Privacy and Confidentiality

Privacy and confidentiality at the workstation was a general problem in all organizations, especially for managers. This difficulty was often intensified by the shortage of small conference rooms to accommodate private meetings. Such rooms were typically overbooked and not available for unplanned meeting.

5.6 The Design Process

Interviews with managers and staff members of the organizations examined felt that they did not have sufficient influence in the design process. For the most part they believed that their opinions were not sought and that decisions were imposed on them from above.

6. Bibliography

1. The Office Environment Index - 1988 Detailed Findings, Steelcase, Grand Rapids, MI, 1988.

2. Rubin, A. and Collins, B. "Interview Survey of Selected Military Building Environments: A Research Approach", NBSIR 87-3606, August 1987.

3. Oppenheim, A., Questionnaire Design and Attitude Measurement, Basic Books, N.Y. 1966.

4. Rand, G. "Indoor Pollution Isn't Going Away", Architecture, June 1988.

APPENDICES

Appendix A

QUESTIONNAIRE ADMINISTERED AT BPA (BEFORE MOVE - PORTLAND1)
(INCLUDING CODES)

NBS/GSA/BPA QUESTIONNAIRE SURVEY

NOTE: THE FOLLOWING QUESTIONS ARE GROUPED INTO DISCRETE CATEGORIES FOR CONVENIENCE: YOU WILL NOT AN OVERLAP IN CONTENT WHICH IS UNAVOIDABLE BECAUSE OF THE SUBJECTS BEING EXAMINED.

A. BASIC IDENTIFYING INFORMATION

1. ID

2. Job Title

3. Are you Female? Yes_____ (SEX)
Male? Yes_____

4. How old are you? (AGE)
_____ Under 25 _____25-34 _____35-44
_____ 45-54 _____55-64 _____65 or over

5. How often have you experienced any of the following symptoms which you think are caused by working in this facility?

	(1) Never	(2) Rarely	(3) Sometimes	(4) Always	
Headache	_____	_____	_____	_____	(HEADACHE)
Dizziness	_____	_____	_____	_____	(DIZZY)
Sleepiness	_____	_____	_____	_____	(SLEEPY)
Sore Throat	_____	_____	_____	_____	(SORETHOT)
Runny Nose	_____	_____	_____	_____	(RUNNOSE)
Difficulty in Concentrating	_____	_____	_____	_____	(DIFFCON)
Leg Sleeping or Cramping	_____	_____	_____	_____	(CRAMP)
atigue	_____	_____	_____	_____	(FATIGUE)
Frequent Colds	_____	_____	_____	_____	(COLDS)
Sinus Problems	_____	_____	_____	_____	(SINUS)
Allergies	_____	_____	_____	_____	(ALLERGY)

6. How many days have you been absent from work due to illness during the last six months? (SICK)
____ None
____ 1-2 days
____ 3-5 days
____ 6-12 days
____ More than 12 days

7. Here are some words used to describe work spaces. Please rate each of the following by placing an X in the space that best describes your feelings about the building you work in. For example, if you think it is pleasant, place an X next to the word "pleasant", if unpleasant, put an X next to "unpleasant", and if it is in between, please put an X where you think it belongs.

Pleasant	___	___	___	___	___	Unpleasant	(WSPLST)
Bright	___	___	___	___	___	Dim	(WSBRT)
Well Maint Interiors	___	___	___	___	___	Poorly Maint Interiors	(WSMAINT)
Confined	___	___	___	___	___	Spacious	(WSSPAC)
Stimul Spacs	___	___	___	___	___	Unstim Spaces	(WSSTIM)
Diff Find Wayy Around	___	___	___	___	___	Easy to Find Way Around	(FINDWAY)
Poor Lit	___	___	___	___	___	Well Lit Spac	(WELLIT)
Humid	___	___	___	___	___	Dry	(HUMID)
Clean	___	___	___	___	___	Dirty	(CLEAN)
Noisy	___	___	___	___	___	Quiet	(WSQUIET)
Colorful	___	___	___	___	___	Drab	(COLOR)
Interesting	___	___	___	___	___	Boring	(WSINTRST)
Hot	___	___	___	___	___	Cold	(WSTEMP)
Relax Atmos	___	___	___	___	___	Tense Atmos	(WSATMOS)
Soft Light	___	___	___	___	___	Harsh Light	(WSSOFT)

8. For each of the following spaces in your facility, please rate the quality of the lighting.

	(1) Excellent	(2) Pretty Good	(3) Neutral	(4) Not Very Good	(5) Poor	
Main Lobby	_____	_____	_____	_____	_____	(RTLTLOBY)
Brk Areas	_____	_____	_____	_____	_____	(RTLTBRK)
Corridors & Hallways	_____	_____	_____	_____	_____	(RTLTHALL)
Restrooms	_____	_____	_____	_____	_____	(RTLTRSTM)
Work Spac	_____	_____	_____	_____	_____	(RTLTSPAC)
Cafet	_____	_____	_____	_____	_____	(RTLTCAFE)

9. The way offices and other work spaces are arranged in terms of making it easier for employees to get their jobs done is: (ARGMTWS)

____ Excellent
____ Pretty Good
____ Fair
____ Poor

10. The way the work spaces and offices look is: (LOOKWS)

____ Excellent
____ Pretty Good
____ Fair

____ Poor

11. Before you moved into your present work space, did you work in: (PREVWS)
(Check one)
_____ A private office
_____ An office shared with one other person
_____ An open office or cubicle with partitions
_____ Other (Please specify) _____

12. For each task performed, please rate the lighting available to you.

	(1) Excellent	(2) Pretty Good	(3) Neutral	(4) Not Very Good	(5) Poor	(6) Not Applicable	
Reading	_____	_____	_____	_____	_____	___	(LTREAD)
Listening	_____	_____	_____	_____	_____	___	(LTLISTEN)
Using VDT	_____	_____	_____	_____	_____	___	(LTVDT)
Filing	_____	_____	_____	_____	_____	___	(LTFILE)
Other	_____	_____	_____	_____	_____	___	(LTOTHER)

13. How would you describe the amount of light available to you now? (AMTLTBRT)
_____ Much too bright
_____ A bit too bright
_____ Just about right
_____ A bit too dim
_____ Much too dim

14. Overall, how would you rate the thermal conditions at your workspace? (TEMPRAT)
(Circle the appropriate number.)

Hot	7
Warm	6
Slightly warm	5
Neutral	4
Slightly cool	3
Cool	2
Cold	1

15. Overall, how satisfied are you with the lighting at your work space. (WSLITSAT)
_____ Very Satisfied
_____ Fairly Satisfied
_____ Neither Satisfied nor Dissatisfied
_____ Not Very Satisfied
_____ Not At All Satisfied

16. Are there any changes that you would make to the lighting at your workstation? (LTCHG)
_____
_____

17. On the average, how many hours a day do you spend at your work space in this facility? (HRSDYBLG)

1-2 Hours	3-4 Hours	5-6 Hours	7-8 Hours
_____	_____	_____	_____

18. Before you moved into your present work space, did you work in: (PREVWS)
(Check one)

------ A private office
------ An office shared with one other person
------ An open office or cubicle with partitions
------ Other (Please specify) _____

19. Please estimate the number of hours that you spend at each task on a typical day.

	Rarely	Less/ 2 hours	2-4 hours	4-6 hours	6-8 hours	More than 8 hours	
Reading	___	_____	_____	_____	_____	_____	(HRSDYRED)
Preparing, Conducting Briefings	___	_____	_____	_____	_____	_____	(HRSDYBRF)
Meetings	___	_____	_____	_____	_____	_____	(HRSDYMTG)
Telephone	___	_____	_____	_____	_____	_____	(HRSDYTEL)
Using VDT	___	_____	_____	_____	_____	_____	(HRSDYVDT)
Filing	___	_____	_____	_____	_____	_____	(HRSDYFIL)
analysis	___	_____	_____	_____	_____	_____	(HRSDYANL)
Other	___	_____	_____	_____	_____	_____	(HRSDYOTH)

20. If you use a Video Display Terminal (VDT), indicate how bothersome each of the following conditions is for you. If you do not use a VDT, please go to question 16.

	(1) Not at all Bothersome	(2) Not very Bothersome	(3) Fairly Bothersome	(4) Very Bothersome	
Screen Flicker	_____	_____	_____	_____	(VDTFLICK)
Distance to Screen	_____	_____	_____	_____	(VDTDSTSC)
Screen Angle	_____	_____	_____	_____	(VDTSCANG)
Glare from Overhead Light	_____	_____	_____	_____	(VDTGLARE)
Letter Sz	_____	_____	_____	_____	(VDTLTRSZ)
Distance to Keyboard	_____	_____	_____	_____	(VDTDSTKB)
Keyboard Angle	_____	_____	_____	_____	(VDTANGKB)
Height of Desk	_____	_____	_____	_____	(VDTDSKHT)
Chair	_____	_____	_____	_____	(VDTSEAT)
Ease of Reading Printed/Typed Material	_____	_____	_____	_____	(VDTREAD)
Brightness of Overhead Light	_____	_____	_____	_____	(VDTBRTOV)
Ease of Reading Screen Char	_____	_____	_____	_____	(VDTREDSC)
Inability to Adjust Screen	_____	_____	_____	_____	(VDTADJSC)

21. These statements are about people's jobs. For each one, please indicate how true it is for your job.

	(1) Very True	(2) Somewhat True	(3) Not Very True	(4) Not At All True	
When I talk to co-workers, others can hear us	_____	_____	_____	_____	(CONVERS)
I have the equipment needed for my job	_____	_____	_____	_____	(NEEDEQP)
My job requires remaining in place all day	_____	_____	_____	_____	(NOCANMOV)
My job requires great concentration	_____	_____	_____	_____	(JOBCON)
I need more time on a terminal	_____	_____	_____	_____	(NEDVDTTM)
My job requires speed and accuracy	_____	_____	_____	_____	(JOBSPEED)

22. Which of the following best describes your job? (JOBTYPE)

_____ Administrative
_____ Professional
_____ Technical
_____ Clerical
_____ Other

23. Equipment usage (Fill blank with letter)

a. Located in office and used.
b. Located in office and not used.
c. Have access to it and use it.
d. Have access to it but don't use it.
e. Not available for use.

___ Intercom
___ Telephone
___ Mechanical answering device
___ Speaker phone
___ Computer terminal
___ Telex or TWX
___ Individual dictation unit
___ Fax or telecopier

24. Time Distribution (hrs per week) spent on:

___ Telephone
___ Calculating
___ Meetings in own office
___ Meetings elsewhere
___ Operating VDT
___ Writing
___ Dictating
___ Proofreading
___ Reading
___ Searching for information
___ Reviewing reports, computerized information
___ Personnel tasks
___ Administrative functions
___ Other (specify) _____

25. Sometimes the arrangements of work stations can be distracting to the people in offices. Please indicate how bothersome each of the following is to you.

	(1) Not at all	(2) Not very	(3) Fairly	(4) Very	
Ringing Telephones	_____	_____	_____	_____	(TELERING)
Conversations of People	_____	_____	_____	_____	(PEPLTALK)
Noise From Printers	_____	_____	_____	_____	(NOISEPRT)
Noise From Equipment	_____	_____	_____	_____	(NOISEEQP)
Noise From Ventilating System	_____	_____	_____	_____	(NOISEVNT)
Noise From Corridors	_____	_____	_____	_____	(NOISEHAL)
Reflected Glare Off Work Surfaces	_____	_____	_____	_____	(GLRWKSF)
Glare From Ceiling Lights	_____	_____	_____	_____	(GLRCLLT)
Absence of Windows	_____	_____	_____	_____	(NOWINDOW)
Too Many Drafts	_____	_____	_____	_____	(DRAFTS)
Air is Too Stuffy	_____	_____	_____	_____	(STUFYAIR)
People Walking Around	_____	_____	_____	_____	(PEPLWALK)
People Too Close	_____	_____	_____	_____	(PEPLCLOS)
People Too Far Apart	_____	_____	_____	_____	(PEPLFAR)
Opportunity to Move About During Work	_____	_____	_____	_____	(NOCANMOV)

26. Suppose you could make 4 changes to your overall work environment. Using the list below, indicate the 4 changes you would make in order of preference (where 1 = most preferred).

____	A.	A better year-round temperature	(WSIMTEMP)
____	B.	More privacy	(WSIMPRIV)
____	C.	Outside access during lunch and breaks	(WSIMACC)
____	D.	Change color of walls, furn, carpets	(WSIMCOL)
____	E.	Improved lighting	(WSIMLTG)
____	F.	Less noise	(WSIMNOIS)
____	G.	Improved air circulation	(WSIMAIRC)
____	H.	Move further away from co-workers	(WSIMLOC)
____	I.	More comfortable chair	(WSIMCHR)
____	J.	Better break areas	(WSIMBKSP)
____	K.	More comfortable furnishings	(WSIMFURN)
____	L.	More frequent cleaning	(WSIMCLEN)
____	M.	Adjustable task lighting	(WSIMTKLT)
____	N.	More adjustable chair	(WSIMADCR)

27. Please explain the reasons for your four choices._____

_____

_____

28. Please rate your work space on each of the following:

	(1) Excellent	(2) Good	(3) Fair	(4) Poor	
Amount of Space Available to You	_____	_____	_____	_____	(WSSCPAMT)
Quality of Desks and Chairs	_____	_____	_____	_____	(FURNQUAL)
Amount of Lighting	_____	_____	_____	_____	(AMTLTWRK)
Location of Ceiling Lights	_____	_____	_____	_____	(LOCCLNLT)
Color of Walls and Partitions	_____	_____	_____	_____	(WALLCOLR)
Color of Furniture	_____	_____	_____	_____	(FURNCOLR)
Storage Space	_____	_____	_____	_____	(STORAGE)
Conversational Privacy	_____	_____	_____	_____	(CONVPRIV)
Access to Co-workers	_____	_____	_____	_____	(COWORKER)
Wall/Desk Space for Personal Item	_____	_____	_____	_____	(PSNLSPAC)
Visual Privacy	_____	_____	_____	_____	(VISPRIV)

29. Overall, how satisfied are you with your work space? (WSSAT)

_____ Very Satisfied
_____ Fairly Satisfied
_____ Neither Satisfied nor Dissatisfied
_____ Not Very Satisfied
_____ Not At All Satisfied

30. If you could make any change to the work space, what would you do?_____
_____
_____
_____

31. If you could make any change to your equipment, what would you do?_____
_____

32. Please rate your chair on each of the following:

	(1) Excellent	(2) Good	(3) Fair	(4) Poor	
Ease of Movement on Carpet	_____	_____	_____	_____	(CHRMVTC)
Ease of Adjusting Seat Height	_____	_____	_____	_____	(CHRADHT)
Ease of Adjusting Back Height	_____	_____	_____	_____	(CHRADBK)
Seat/tilt Tension	_____	_____	_____	_____	(CHRSLTT)
Back tilt Tension	_____	_____	_____	_____	(CHRBKT)

33. With respect to your furnishings:

a. Do you have systems furniture? Yes ____ No ____
b. If so, rate the following:

	Adequate	Inadequate	
Storage space	_____	_____	(FURNSTOR)
Ease of use	_____	_____	(FURNEASE)
Convenience	_____	_____	(FURNCONV)
Modifiability	_____	_____	(FURNCHNG)
Durability	_____	_____	(FURNDURB)
Maintenance	_____	_____	(FURNMAIN)

c. Adequacy of system furniture features (On a scale of 1-5; 1=best, 3=average, 5=poor)

___ File space (FILESPAC)
___ Drawer space (DRWRSPAC)
___ Table top area (TABLSPAC)
___ Task lighting (RTLTTSK)
___ Availability of electrical outlets (OUTAVAIL)
___ Accessibility of electrical outlets (OUTACC)
___ Color selection (FURNCOL)
___ Stability, strength of tabletop (FURNSTAB)

34. Does your workplace help your work process? __ (WORKHELP)
a. If so, how?_____
b. If not, how? _____

35. Does your space encourage access by appropriate people? _____
_____ (SPACENC)

36. Does your spece express relationships of people, levels of authority? _____ (SPACAUTH)

37. Do you have to move from your workspace to perform demanding tasks? ___ If so, please explain _____ (MOVEWORK)
_____

38. Does your workspace enable (facilitate) the display of important work materials; personal items? _____(SHOWWORK)

39. Could your workspace be readily be changed without major design efforts? _____ (CHGDES)

40. Does your workspace enable you to have auditory privacy?
_____ (AUDPRIV)

41. Does your workspace enable you to have visual privacy?
_____ (VISPRIV)

42. With respect to the planned move:

a. What are you looking forward to with anticipation; e.g. what are the major benefits that you anticipate?
_____
_____(MOVEANT)

b. What are your major concerns about the forthcoming move?_____
_____(MOVECON)

Appendix B

PORTLAND2 QUESTIONNAIRE SURVEY

Introduction.

This survey is being conducted to determine how office designs and furnishings for federal workers can be made more responsive to their needs. The questions that follow are directed toward understanding how well your present office and workstation works, and to identify perceived problem areas. The study is being conducted by the National Bureau of Standards for the General Services Administration, with the cooperation of your Department or Agency.

A. BASIC IDENTIFYING INFORMATION

1. ID

2. Job Title

3. Job Description

_____

_____

4. Are you Female? Yes_____ (SEX)
Male? Yes_____

5. Do you wear glasses? Yes_____ No_____
contact lenses? Yes_____ No_____
bifocals? Yes_____ No_____

6. If you answered yes to question #4, how long have you worn corrective lenses?
_____ less than 6 months
_____ 6-12 months
_____ 1-2 years
_____ 2-5 years
_____ more than 5 years

7. How old are you? (AGE)
_____ Under 25 _____25-34 _____35-44
_____ 45-54 _____55-64 _____65 or over

NOTE: THE FOLLOWING QUESTIONS ARE GROUPED INTO DISCRETE CATEGORIES FOR CONVENIENCE: YOU WILL NOT AN OVERLAP IN CONTENT WHICH IS UNAVOIDABLE BECAUSE OF THE SUBJECTS BEING EXAMINED.
BACKGROUND INFORMATION

8. How long have you been in your present work space?_____
(LONGSPAC)

9. Before you moved into your present work space, did you work in: (Check one) (WSTYPE)

_____ A private office
_____ An office shared with one other person
_____ An open office or cubicle with partitions
_____ Other (Please specify) _____

10. How would you rate your present workstation against your former workplace with respect to the following:(1=much better, 2=better, 3=about the same; 4=worse, 5= much worse)

a. Ability to do your job well	( )	(WSRTJOB)
b. Appearance	( )	(WSRTAPPR)
c. Ease of changing furnishings, layout	( )	(WSRTEASE)
d. Space for storage	( )	(WSRTSTOR)
e. Worktop space	( )	(WSRTTOP)
f. Ability to personalize	( )	(WSRTPERS)
g. Privacy	( )	(WSRTPRIV)

11. Since moving into your workspace, has your feeling about it changed?

a. Increased satisfaction ____ (FEELINGS)
b. Decreased satisfaction ____
c. About the same ____

12. If increased satisfaction: why?

a. Improved office environment	( )	(INCENVIR)
b. Better/more relaxed atmosphere	( )	(INCATMOS)
c. Better furnishings	( )	(INCFURN)
d. New, modern office equipment	( )	(INCEQUIP)
e. Enjoy work more	( )	(INCENJOY)
f. New office, building	( )	(INCNEW)
g. Other, specify _____	( )	

13. If decreased satisfaction, why?

a. Problems with furnishings	( )	(DECFURN)
b. Unpleasant surroundings	( )	(DECSURR)
c. Not enough space	( )	(DECSPACE)
d. Not enough privacy	( )	(DECPRIV)
e. Other, specify _____	( )	

14. How many times have you made changes in your workstation since moving? ( ) (CHGTIMES)

a. What changes did you make?_____
_____

b. Why were the changes made?_____
_____

15. Approximately how large was your workspace before changing to the present one?_____

16. Approximately how large is your current workspace?_____

OVERALL SPACE

B. Please rate your satisfaction (1-5) with each of the following items concerning the facility in which you work. (1= highly satisfied, 2= satisfied, 3= neutral, 4= dissatisfied, 5= highly dissatisfied)

17. Conference facilities	( )	(CFSAT)
a. Ease of access (location)	( )	(CFSATACC)
b. Size	( )	(CFSATSIZ)
c. Adequacy for purpose	( )	(CFSATADQ)
d. Availability	( )	(CFSATAVL)
18. Ease of circulation of people	( )	(WSCIRC)
a. Workstation entrance, exit	( )	(WSENTR)
c. Ease of building circulation	( )	(BLDGCIRC)
d. Signage	( )	(SIGNAGE)
e. Ease of finding ones way	( )	(FINDWAY)

19. The way offices and other work spaces are arranged in terms of making it easier for employees to get their jobs done is: (ARMTGWS)

____ Excellent
____ Pretty Good
____ Average
____ Fair
____ Poor

20. The way the work spaces and offices look is: (LOOKWS)

____ Excellent
____ Pretty Good
____ Average
____ Fair
____ Poor

21. Here are some words used to describe work spaces. Please rate each of the following by placing an X in the space that best describes your feelings about the building you work in. For example, if you think it is pleasant, place an X next to the word "pleasant", if unpleasant, put an X next to "unpleasant", and if it is in between, please put an X where you think it belongs.

Pleasant	___	___	___	___	___	Unpleasant	(WSPLST)
Bright	___	___	___	___	___	Dim	(WSBRT)
Well Maintained Interiors	___	___	___	___	___	Poorly Maint Interiors	(WSMAIN)
Confined	___	___	___	___	___	Spacious	(WSSPAC)
Stimulating Spaces	___	___	___	___	___	Unstim Spaces	(WSSTIM))
Difficult to Find Way Around	___	___	___	___	___	Easy to Find Way Around	(FINDWAY
Poorly Lit Spaces	___	___	___	___	___	Well Lit	(WELLIT)
Humid	___	___	___	___	___	Dry	(HUMID)
Clean	___	___	___	___	___	Dirty	(CLEAN)
Noisy	___	___	___	___	___	Quiet	(WSQUIET)
Colorful	___	___	___	___	___	Drab	(COLOR)
Interesting	___	___	___	___	___	Boring	(WSINTRST)
Hot	___	___	___	___	___	Cold	(WSTEMP)
Relaxed Atmosphere	___	___	___	___	___	Tense Atmo	(WSATMOS)
Soft Lighting	___	___	___	___	___	Harsh Light	(WSLTSOFT)

JOB

22. Which of the following best describes your job? (JOBTYPE)

_____ Administrative
_____ Professional
_____ Technical
_____ Clerical
_____ Other

23. Which of the following tasks best describes the work that you normally do. (Check those that apply)

_____ Using a video display terminal (VDT) (VDTATWS)
_____ Reading and writing (READING)
_____ Analysis of material (ANALYSIS)
_____ Preparing briefing materials (BRIEFING)
_____ Attending meetings (MEETING)
_____ Talking on telephone (TELEPHON)
_____ Filing (FILING)
_____ Other. Please specify _____

24. Please estimate the hours that you spend at each task on a typical day.

	Rarely	Less than 2 hours	2-4 hours	4-6 hours	6-8 hours	
Reading	_____	_____	_____	_____	_____	(HRSDYRED)
Briefings	_____	_____	_____	_____	_____	(HRSDYBRF)
Meetings	_____	_____	_____	_____	_____	(HRSDYMTG)
Telephone	_____	_____	_____	_____	_____	(HRSDYTEL)
Using VDT	_____	_____	_____	_____	_____	(HRSDYVDT)
Filing	_____	_____	_____	_____	_____	(HRSDYFIL)
Analysis	_____	_____	_____	_____	_____	(HRSDYANL)
Writing	_____	_____	_____	_____	_____	(HRSDYWRT)
Typing	_____	_____	_____	_____	_____	(HRSDYTYP)
Other	_____	_____	_____	_____	_____	(HRSDYOTH)

25. These statements are about people's jobs. For each one, please indicate how true it is for your job.

	(1) Very True	(2) Somewhat True	(3) Not Very True	(4) Not At All True	
Conversations are overheard	_____	_____	_____	____	(CONVERS)
I have the job tools needed	_____	_____	_____	____	(NEEDEQP)
I remain in place all day	_____	_____	_____	____	(NOMOVFWS)
My job requires concentration	_____	_____	_____	____	(JOBCON)
I need more time on a terminal	_____	_____	_____	____	(NEDVDTTM)
My job requires speed/accuracy	_____	_____	_____	____	(JOBSPEED)

ENVIRONMENT

26. Overall, how <u>satisfied</u> are you with the following environmental conditions?

	Very	Moderately	Average	Not Very	Not at all	
a. Lighting	( )	( )	( )	( )	( )	(WSLITSAT)
b. Temperature	( )	( )	( )	( )	( )	(TEMPSAT)
c. Acoustics	( )	( )	( )	( )	( )	(SOUNDSAT)
d. Air quality	( )	( )	( )	( )	( )	(AIRQSAT)
e. Aesthetics	( )	( )	( )	( )	( )	(AESTHSAT)

27. The following items refer to the thermal conditions at your workspace; please indicate by circling the appropriate number:
(TEMPRAT)

Much too warm	7
Too warm	6
Comfortably warm	5
Comfortable (neither cool nor warm)	4
Comfortably cool	3
Too cool	2
Much too cool	1

28. Sometimes the surroundings of workstations can be distracting. Please indicate how <u>disturbing</u> each of the following is to you.

	(1) Not at all	(2) Not very	(3) Fairly	(4) Very	
Telephones	_____	_____	_____	_____	(TELERING)
Conversations	_____	_____	_____	_____	(PEPTALK)
Printer Noise	_____	_____	_____	_____	(NOISEPRT)
Equipt Noise	_____	_____	_____	_____	(NOIDEEQP)
Glare	_____	_____	_____	_____	(GLARE)
Temperature	_____	_____	_____	_____	(TEMPERTR)
Drafts	_____	_____	_____	_____	(DRAFTS)
Stuffy Air	_____	_____	_____	_____	(STUFYAIR)
Odors	_____	_____	_____	_____	(ODORS)
People Walking	_____	_____	_____	_____	(PEPWALK)
People Nearby	_____	_____	_____	_____	(PEPNEAR)
Other _____ (specify)	_____	_____	_____	_____	

29. Suppose you could make 4 changes to your overall work environment. Using the list below, indicate the 4 changes you would make in order of preference (where 1 = most preferred).

_____	A.	A better year-round temperature	(WSIMTEMP)
_____	B.	More privacy	(WSIMPRIV)
_____	C.	More file space	(WSIMFLSP)
_____	D.	More workstation space	(WSIMSPAC)
_____	E.	Improved lighting	(WSIMLTG)
_____	F.	Less noise	(WSIMNOIS)
_____	G.	Improved air circulation	(WSIMAIRC)
_____	H.	Move further away from co-workers	(WSIMLOC)
_____	I.	More desktop workspace	(WSIMCHR)
_____	J.	Better break areas	(WSIMBKSP)
_____	K.	More comfortable furnishings	(WSIMFURN)
_____	L.	Better looking furnishings	(WSIMFRLK)
_____	M.	Ability to personalize space	(WSIMPERS)
_____	N.	Adjustable task lighting	(WSIMTKLT)
_____	O.	Better wire management	(WSIMWIRE)
_____	P.	Other, specify _____	

30. Please explain the reasons for your four choices._____

_____

_____

_____

_____

_____

31. For each of the following spaces in your facility, please rate the quality of the lighting.

	(1) Excellent	(2) Pretty Good	(3) Neutral	(4) Not Very Good	(5) Poor	
Main Lobby	_____	_____	_____	_____	_____	(RTLTLOBY)
Break Areas	_____	_____	_____	_____	_____	(RTLTBRK)
Corridors & Hallways	_____	_____	_____	_____	_____	(RTLTHALL)
Restrooms	_____	_____	_____	_____	_____	(RTLTRSRM)
Work Spaces	_____	_____	_____	_____	_____	(RTLTSPAC)
Cafeteria	_____	_____	_____	_____	_____	(RTLTCAFE)

32. How would you describe the amount of light available to you now? (AMTLTBRT)

_____ Much too bright
_____ A bit too bright
_____ Just about right
_____ A bit too dim
_____ Much too dim

33. At your workspace, can you control the following conditions?

	Yes	No	How controlled	
Lighting	_____	_____	_____	(CTRLLIT)
Temperature	_____	_____	_____	(CTRLTEMP)
Air flow	_____	_____	_____	(CTRLAIRF)
Glare on VDT	_____	_____	_____	(CTRLVDTG)

34. How often have you experienced any of the following symptoms which you think are caused by working in this facility?

	(1) Never	(2) Rarely	(3) Sometimes	(4) Always	
Headache	_____	_____	_____	_____	(HEADACHE)
Dizziness	_____	_____	_____	_____	(DIZZY)
Sleepiness	_____	_____	_____	_____	(SLEEPY)
Sore Throat	_____	_____	_____	_____	(SORETHOT)
Runny Nose	_____	_____	_____	_____	(RUNNOSE)
Irritated Eyes	_____	_____	_____	_____	(IRRITEYE)
Trouble Focusing Eyes	_____	_____	_____	_____	(FOCUSEYE)
Difficulty in Concentrating	_____	_____	_____	_____	(DIFFCON)
Leg Sleeping or Cramping	_____	_____	_____	_____	(CRAMP)
Fatigue	_____	_____	_____	_____	(FATIGUE)
Sinus Problems	_____	_____	_____	_____	(SINUS)
Allergies	_____	_____	_____	_____	(ALLERGY)

35. How many days have you been absent from work due to illness during the last six months? (SICKNESS)

_____ None
_____ 1-2 days
_____ 3-5 days
_____ 6-12 days
_____ More than 12 days

36. Can you see outside from where you work?_____(SEEOUT)

37. Is it important to be able to see outside from your workstation? _____ (NEDSEOUT)

WORKSTATION

38. What devices are used during work?
a. Video display terminal (computer)_____ (VDTACC)
b. Telephone_____ (TELACC)
c. Other, specify _____

39. Please rate your satisfaction with each of the following items concerning your workstation. (1= highly satisfied, 2= satisfied, 3= neutral, 4= dissatisfied, 5= highly dissatisfied)

a. Furniture (desks, tables, files)	( )	(FURNRATE)
Ability to adapt for several functions.	( )	(FURNABIL)
Arrangement	( )	(FURNREPR)
State of repair.		
b. Control over noise distractions.	( )	(CTRLNOIS)
c. Control over visual distractions.	( )	(CTRLVIS)
d. Ease of communication/access to co-workers.	( )	(EASECOM)
e. Amount of floor area.	( )	(FLRAREA)
40. Worksurfaces (desk,tabletops)	( )	(WKSURF)
a. Layout	( )	(WKSFFLAY)
b. Color	( )	(WKSCLR)
c. Stability	( )	(WKSFSTAB)
d. Height	( )	(WKSFHGT)
e. Tabletop area	( )	(WKSAREA)
f. Drawer space	( )	(WKSFDWR)
g. Other (Specify)_____	( )	
41. Chair	( )	(CHAIRRAT)
a. Comfort	( )	(CHRCMFT)
b. Ease of adjustment	( )	(CHRADJT)
c. Back support	( )	(CHRBACK)
d. Color	( )	(CHRCLOR)
e. Mobility	( )	(CHRMOBIL)
f. Stability	( )	(CHRSTAB)
g. Height	( )	(CHRHGT)
h. Tension - back, seat	( )	(CHRTENSE)
42. Electrical distribution	( )	(ELECDIS)
a. Number of outlets_____	( )	(OUTLETNO)
b. Number of outlets used _____	( )	(OUTLETUS)
c. Ease of access	( )	(ELECACC)
d. Cable concealment	( )	(ELECABL)
43. Storage		
a. Paper files	( )	(STORFIL)
b. Electronic media	( )	(STORDISK)
c. Equipment	( )	(STOREQMT)
d. Personal items	( )	(STORPERS)
e. Ease of access	( )	(STORACC)
f. Amount	( )	(STORAMT)
g. Future needs	( )	(STORFUTR)
44. Task lighting	( )	(TSKLTG)

45. If you use a Video Display Terminal (VDT), indicate how bothersome each of the following conditions is for you. If you do not use a VDT, please go to next question.

	(1) Not at all	(2) Not very	(3) Fairly	(4) Very	
Overhead Light Glare	_____	_____	_____	_____	(VDTGLARE)
Desk Height	_____	_____	_____	_____	(VDTDSKHT)
Chair	_____	_____	_____	_____	(VDTSEAT)
Reading Print/Type	_____	_____	_____	_____	(VDTREAD)
Reading Screen Characters	_____	_____	_____	_____	(VDTCHAR)

46. As for your telephone, does it have "extra" features? _____
a. If so, which ones do you employ; how do they help you in your job? _____ (TELEXTRA)

47. Workstation layout (1=strongly agree, 2=agree, 3=neutral, 4=disagreee, 5=strongly disagree)

a. The size of desk surface is adequate. ( ) (DESKSIZE)
b. The area my space occupies is adequate. ( ) (SPACAREA)
c. Enough file space in and around desk. ( ) (SPACFILE)
d. Flexible enough to meet changing needs. ( ) (SPACFLEX)
e. It presents a professional image. ( ) (PROFIMAG)
f. Visual privacy is adequate. ( ) (VISPRIV)
g. Auditory privacy is adequate. ( ) (AUDPRIV)
h. It is attractively arranged. ( ) (ATTRAGMT)
i. It is easy to keep clean. ( ) (SPACCLEN)
j. I can personalize my space. ( ) (SPACPERS)
k. There are no safety hazards. ( ) (SAFETY)
l. Workstation discourages unwelcome visitors. ( ) (VISITORS)

FURNITURE

48. I have the following furniture in my work area.
a. Desk type - (material, color) _____ (DESKTYPE)
b. Book shelves - free standing, panel hung (BKSHELF)
(no.)_____
c. File cabinet - no. of drawers_____ (CABINET)
d. Other equipment - specify_____ (OTHREQMT)
e. Partitions - movable, freestanding; height_____ (PART)

49. Chair type (check) (CHRTYPE)

a. Armless posture chair ( )
b. Armless chair ( )
c. Arm chair ( )
d. High back executive chair ( )
e. Wheels ( ) No wheels ( ) (CHRWHL)
Swivels ( ) Doesnt swivel ( ) (CHRSWVL)
Tilts ( ) Doesnt tilt ( ) (CHRTLT)
f. Other (describe) _____

50. Type of files in workspace.

___ Reference and office use (FILEUSE)
___ Make hard copy, send on (FILECOPY)
___ Discard (FILEDSCD)
___ Reference; used elsewhere also (FILEREF)
___ Updated information (FILEUPDT)
___ Review (FILERVEW)
___ Other, (specify) _____

51. What and how much materials are stored at your workstation?

	Linear feet	
___ Files, letter size, legal size	_____	(LFFILES)
___ Computer based files; printouts, disks	_____	(LFDISKS)
___ Forms	_____	(LFFORMS)
___ Reference materials, books	_____	(LFREFS)
___ How much space (lin ft) storage used.	_____	(LFSTORE)

GENERAL SUMMARY

52. Please rate your work space on each of the following:

	(1) Excellent	(2) Good	(3) Average	(4) Fair	(5) Poor	
Space Available	_____	_____	_____	_____	_____	(WSSPCAMT)
Surface Area	_____	_____	_____	_____	_____	(RTWKSF)
Chair Comfort	_____	_____	_____	_____	_____	(RTCHAIR)
Vent/Air circ	_____	_____	_____	_____	_____	(RTAIRC)
Heating	_____	_____	_____	_____	_____	(RTHEAT)
Cooling	_____	_____	_____	_____	_____	(RTCOOL)
Air Quality	_____	_____	_____	_____	_____	(RTAIRQ)

53. Overall, how satisfied are you with your work space? (WSSAT)

_____ Very Satisfied
_____ Fairly Satisfied
_____ Neither Satisfied nor Dissatisfied
_____ Not Very Satisfied
_____ Not At All Satisfied

54. Have the changes in furnishings and surroundings since the move affected your ability to do your job? Yes___ No ___ (AFFJOB)

a. If so, what has improved your work situation?_____

_____

b. What has made things more difficult for you? _____

_____

55. Are there environmental, furnishings, or design features in your office and/or workspace that make it difficult to do your job? Yes _____ No _____ (DIFFJOB)

a. If so, what are they?_____

_____

b. Any suggestions for improvement?_____

_____

_____

c. How would these improvements help?_____

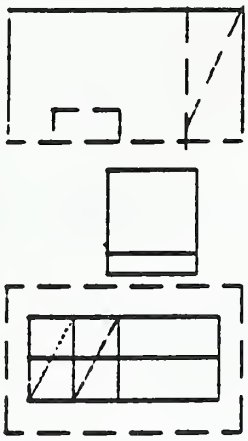
_____

56. The following questions concrn the service centers:

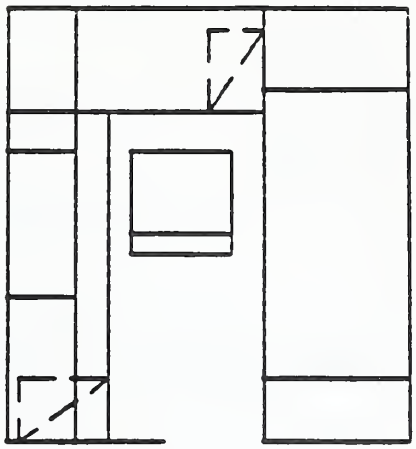
a. Please rate the following activities:

	Excellent	Good	Average	Fair	Poor	
Mail	_____	_____	_____	_____	_____	(SCMAIL)
Supplies	_____	_____	_____	_____	_____	(SCSUPP)
Copying	_____	_____	_____	_____	_____	(SCCOPY)
FAX	_____	_____	_____	_____	_____	(SCFAX)
AV eqp	_____	_____	_____	_____	_____	(SCAVEQP)
Library	_____	_____	_____	_____	_____	(SCLIB)
Problem	_____	_____	_____	_____	_____	(SCPROB)
Question Ans	_____	_____	_____	_____	_____	(SCQUES)

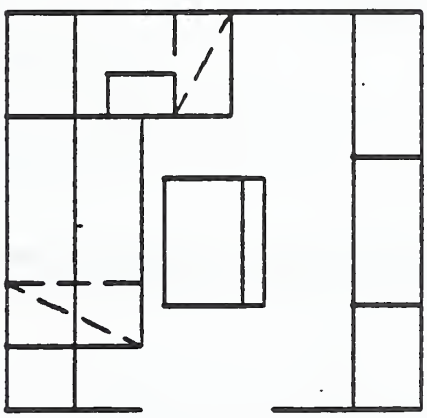
Workstation type A



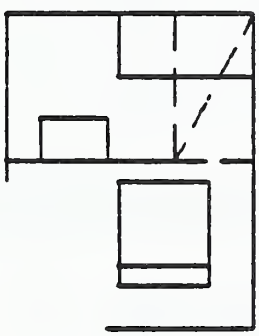
Workstation type E



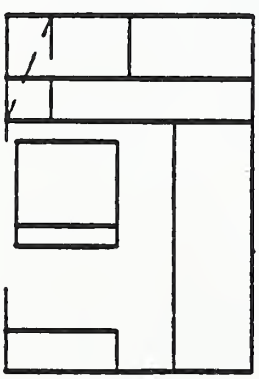
Workstation type F



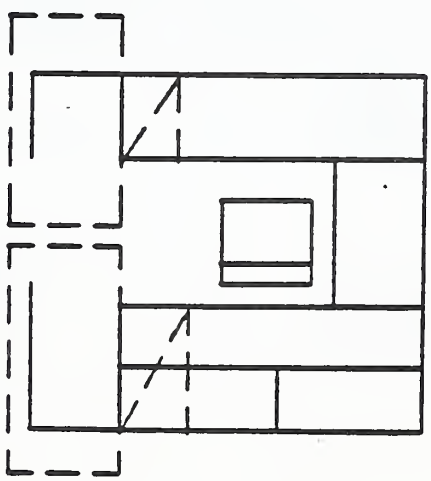
Workstation type B



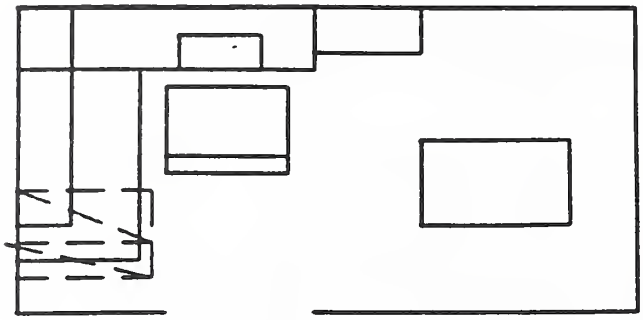
Workstation type C



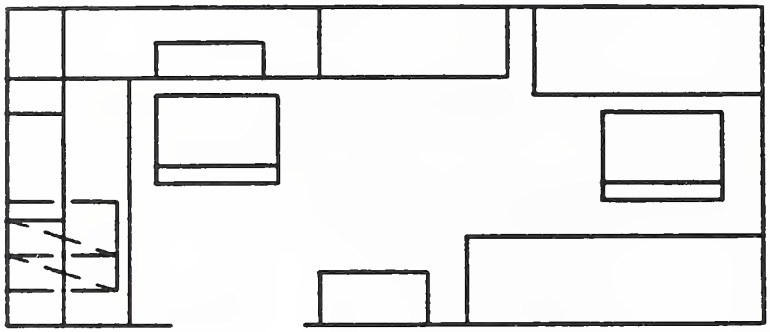
Workstation type D



Workstation type G



Workstation type H



These are some of the workstation configurations that are found at BPA. Blease mark with an "X", the layout that BEST describes the workstation you occupy.

(1) Workstation type A WITHOUT rear unit.
(2) Workstation type A WITH rear unit (shown as dotted line).
(3) Workstation type B.
(4) Workstation type C.
(5) Workstation type D with NO panel extensions.
(6) Workstation type D with ONE panel extension (shown as dotted line).
(7) Workstation type D with TWO panel exteensions (shown as dotted line).
(8) Workstation type E WITHOUT drafting board.
(9) Workstation type E WITH drafting board.
(10) Workstation type F.
(11) Workstation type G.
(12) Workstation type H.

Appendix C

OPM QUESTIONNAIRE

1. How long have you worked in the facility where you are now employed? (LONGSPAC)

2. Before you moved into your present work space, did you work in: (Check one) (WSTYPE)

____ A private office
____ An office shared with one other person
____ An open office or cubicle with partitions
____ Other (please specify)

3. How would you rate your present workstation against your former workplace with respect to the following: (1=much better, 2=better, 3=about the same, 4=worse, 5=much worse)

a. Ability to do your job well ( ) (WSRTJOB)
b. Appearance ( ) (WSRTAPPR)
c. Ease of changing furnishings ( ) (WSRTEASE)
d. Space for storage ( ) (WSRTSTOR)
e. Worktop space ( ) (WSRTTOP)
f. Ability to personalize ( ) (WSRTPERS)
g. Privacy ( ) (WSRTPRIV)

4. Since moving into your workspace, has your feeling about it changed? (FEELINGS)

a. Increased ___
b. Decreased ___
c. About the same ___

5. If increased, why?

a. Improved office environment ( ) (INCENVIR)
b. Better/more relaxed atmosphere ( ) (INCATMOS)
c. Better furnishings ( ) (INCFURN)
d. New, modern office equipment ( ) (INCEQUIP)
e. Enjoy work more ( ) (INCENJOY)
f. New office, building ( ) (INCNEW)
g. Other, specify _____ ( ) (INCOTHR)

6. If decreased, why?

a. Problems with furnishings ( ) (DECFURN)
b. Unpleasant surroundings ( ) (DECSURR)
c. Not enough space ( ) (DECSPACE)
d. Not enough privacy ( ) (DECPRIV)
e. Other, specify _____ ( )

OVERALL SPACE

B. Please rate your satisfaction (1-5) with each of the following items concerning the facility in which you work. (1=highly satisfied, 2=satisfied, 3=neutral, 4=dissatisfied, 5=highly dissatisfied)

7. Conference facilities ( ) (CFSAT)

   a. Ease of access (location) ( ) (CFSATACC)
   b. Size ( ) (CFSATSIZ)
   c. Adequacy for purpose ( ) (CFSATADQ)
   d. Availability ( ) (CFSATAVL)

8. Ease of circulation of people ( ) (WSCIRC)

   a. Workstation entrance, exit ( ) (WSENT)
   b. Section entrance, exit ( ) (SECTCIRC)
   c. Ease of building circulation ( ) (BLDGCIRC)
   d. Signage ( ) (SIGNAGE)
   e. Ease of finding ones way ( ) (FINDWAY2)

9. The way offices and other work spaces are arranged in terms of making it easier for employees to get their jobs done is: (ARGMTWS)

   _____ Excellent
   _____ Pretty Good
   _____ Average
   _____ Fair
   _____ Poor

10. The way the work spaces and offices look is: (LOOKWS)

   _____ Excellent
   _____ Pretty Good
   _____ Average
   _____ Fair
   _____ Poor

11. Which of the following best describes your job? (JOBTYPE)

   _____ Administrative
   _____ Professional
   _____ Technical
   _____ Clerical
   _____ Other

12. Which of the following tasks best describes the work that you normally do. (Check those that apply)

_____	Using a video display terminal (VDT)	(VDT)
_____	Reading and writing	(READING)
_____	Analysis of material	(ANALYSIS)
_____	Preparing briefing materials	(BRIEFING)
_____	Attending meetings	(MEETING)
_____	Talking on telephone	(TELEPHON)
_____	Filing	(FILING)
_____	Other. Please specify _____	(OTHER)

13. Please estimate the number of hours that you spend at each task on a typical day.

	Rarely	Less than 2 hours	2-4 hours	4-6 hours	6-8 hours	More than 8 hours	
Reading	_____	_____	_____	_____	_____	_____	(HRSDYRED)
Preparing, Conducting Briefings	_____	_____	_____	_____	_____	_____	(HRSDYBRF)
Meetings	_____	_____	_____	_____	_____	_____	(HRSDYMTG)
Telephone	_____	_____	_____	_____	_____	_____	(HRSDYTEL)
Using VDT	_____	_____	_____	_____	_____	_____	(HRSDYVDT)
Filing	_____	_____	_____	_____	_____	_____	(HRSDYFIL)
Analysis	_____	_____	_____	_____	_____	_____	(HRSDYANL)
Other	_____	_____	_____	_____	_____	_____	(HRSDYOTH)

14. Overall, how satisfied are you with the following environmental conditions?

	Very	Moderately	Average	Not Very	Not at all	
a. Lighting	_____	_____	_____	_____	_____	(WSLITSAT)
b. Temperature	_____	_____	_____	_____	_____	(TEMPSAT)
c. Acoustics	_____	_____	_____	_____	_____	(SOUNDSAT)
d. Air Quality	_____	_____	_____	_____	_____	(AIRQSAT)

15. Sometimes the arrangements of work stations can be distracting to the people in offices. Please indicate how disturbing each of the following is to you.

	(1) Not at all	(2) Not very	(3) Fairly	(4) Very	
Telephones	_____	_____	_____	_____	(TELERING)
Conversations	_____	_____	_____	_____	(PEPLTALK)
Printer Noise	_____	_____	_____	_____	(NOISEPRT)
Equip Noise	_____	_____	_____	_____	(NOISEEQP)
Glare	_____	_____	_____	_____	(GLARE)
Temperat	_____	_____	_____	_____	(TEMPERTR)
Drafts	_____	_____	_____	_____	(DRAFTS)
Stuffy Air	_____	_____	_____	_____	(STUFYAIR)
People Walk	_____	_____	_____	_____	(PEPLWALK)
People Near	_____	_____	_____	_____	(PEPLNEAR)

16. Suppose you could make 4 changes to your overall work environment. Using the list below, indicate the 4 changes you would make in order of preference (where 1 = most preferred).

____	A.	A better year-round temperature	(WSIMTEMP)
____	B.	More privacy	(WSIMPRIV)
____	C.	Access to the outside - lunch and breaks	(WSIMACC)
____	D.	Change in color of walls, furnishings	(WSIMCOL)
____	E.	Improved lighting	(WSIMLTG)
____	F.	Less noise	(WSIMNOIS)
____	G.	Improved air circulation	(WSIMAIRC)
____	H.	Move further away from co-workers	(WSIMLOC)
____	I.	More desktop workspace	(WSIMDKSP)
____	J.	Better break areas	(WSIMBKSP)
____	K.	More comfortable furnishings	(WSIMFURN)
____	L.	Ability to personalize	(WSIMPERS)
____	M.	Adjustable task lighting	(WSIMTKLT)

17. Please explain the reasons for your four choices._____

_____

_____

18. At your workspace, can you control the following conditions?

	Yes	No	How Controlled	
Lighting	_____	_____	_____	(CTRLLIT)
Temperature	_____	_____	_____	(CTRLTEMP)
Air flow	_____	_____	_____	(CTRLAIRF)
Glare on VDT	_____	_____	_____	(CTRLVDTG)

19. Is a window visible from where you work? ____ (SEEOUT)

20. How important is it to see outside a window from your workstation? (1=very, 2=moderately, 3=average, 4=not very, 5=not at all) ( ) (NEDSEOUT)

21 Overall, how satisfied are you with your work space? (1=very, 2=moderately, 3=average, 4=not very, 5=not at all) ( ) (WSSAT)

WORKSTATION

22. What devices are used during work?

a. VDT	( )	(VDTACC)
b. Telephone	( )	(TELACC)
c. Other, specify _____	( )	

Please rate your satisfaction with each of the following items concerning your workstation. (1=highly satisfied, 2=satisfied, 3=neutral, 4=dissatisfied, 5=highly dissatisfied)

23. Furniture (desks, tables, files) ( ) (FURNRAT)

    a. Ability to adapt for several functions ( ) (FURNABIL)
    b. Arrangement ( ) (FURNAGMT)
    c. State of repair ( ) (FURNREPR)

24. Control over noise distractions. ( ) (CTRLNOIS)

25. Control over visual distractions. ( ) (CTRLVIS)

26. Ease of communication/access to others. ( ) (EASECOM)

27. Amount of floor area. ( ) (FLRAREA)

28. Worksurfaces (desks, tabletops) ( ) (WKSF)

    a. Layout ( ) (WKSFLAY)
    b. Color ( ) (WKSFCLR)
    c. Stability ( ) (WKSFSTAB)
    d. Height ( ) (WKSFHGT)

29. Chair ( ) (CHAIRRAT)

    a. Comfort ( ) (CHRCMFT)
    b. Ease of adjustment ( ) (CHRADJT)
    c. Back support ( ) (CHRBACK)
    d. Color ( ) (CHRCLOR)
    e. Mobility ( ) (CHRMOBIL)
    f. Stability ( ) (CHRSTAB)

30. Electrical distribution ( ) (ELECDIST)

    a. Number of outlets ( ) (OUTLETNO)
    b. Ease of access ( ) (OUTLETUS)

31. Storage ( ) (STORAGE)

    a. Paper files ( ) (STORFILE)
    b. Electronic media ( ) (STORDISK)
    c. Equipment ( ) (STOREQMT)
    d. Personal items ( ) (STORPERS)
    e. Ease of access ( ) (STORACC)
    f. Amount ( ) (STORAMT)
    g. Future needs ( ) (STORFUTR)

32. Workstation layout (1=strongly agree, 2=agree, 3=neutral, 4=disagree, 5=strongly disagree)

a. The size of desk surface is adequate. ( ) (DESKSIZE)
b. The area my space occupies is adequate. ( ) (SPACAREA)
c. Enough storage space in and around desk. ( ) (APACFILE)
d. Flexible enough to meet changing needs. ( ) (SPACFLEX)
e. It presents a professional image. ( ) (PROFIMAG)
f. Visual privacy is adequate. ( ) (VISPRIV)
g. Auditory privacy is adequate. ( ) (AUDPRIV)
h. It is attractively arranged. ( ) (ATTRAGMT)
i. It is easy to keep clean. ( ) (SPACCLEN)
j. I can personalize my space. ( ) (SPACPERS)
k. There are no safety hazards. ( ) (SAFETY)
l. In general, your workstation. ( ) (WSGENRL)

NIST-114A
(REV. 3-89)

U.S. DEPARTMENT OF COMMERCE
NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY

BIBLIOGRAPHIC DATA SHEET

1. PUBLICATION OR REPORT NUMBER
NISTIR 4307

2. PERFORMING ORGANIZATION REPORT NUMBER

3. PUBLICATION DATE
APRIL 1990

4. TITLE AND SUBTITLE

Post Occupancy Evaluation of Federal Buildings - The Portland Federal Building and Others

5. AUTHOR(S)

Arthur I. Rubin

6. PERFORMING ORGANIZATION (IF JOINT OR OTHER THAN NIST, SEE INSTRUCTIONS)

U.S. DEPARTMENT OF COMMERCE
NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY
GAITHERSBURG, MD 20899

7. CONTRACT/GRANT NUMBER

8. TYPE OF REPORT AND PERIOD COVERED

9. SPONSORING ORGANIZATION NAME AND COMPLETE ADDRESS (STREET, CITY, STATE, ZIP)

Public Building Service
General Services Administration
18th & F Streets, NW
Washington, DC 20405

10. SUPPLEMENTARY NOTES

[ ] DOCUMENT DESCRIBES A COMPUTER PROGRAM; SF-185, FIPS SOFTWARE SUMMARY, IS ATTACHED.

11. ABSTRACT (A 200-WORD OR LESS FACTUAL SUMMARY OF MOST SIGNIFICANT INFORMATION. IF DOCUMENT INCLUDES A SIGNIFICANT BIBLIOGRAPHY OR LITERATURE SURVEY, MENTION IT HERE.)

The introduction of new technologies in office buildings has changed the working environment for government employees. The effects of these new conditions are not yet well understood.

This report presents an evaluation of the working conditions at the "old" and new Portland Federal Building, occupied by the Bonneville Power Administration (BPA). Assessments were made by questionnaires filled out by employees, and interviews with operational and facility management personnel. Other federal buildings were examined to obtain supplementary information. Interviews were conducted with facility management personnel at the Department of Labor, the Treasury Department, the General Services Administration (GSA) and the Office of Personnel Management (OPM). A limited questionnaire survey was conducted at OPM. Some of the buildings examined were new ones, while others were being retrofitted. A summary of "lessons learned" is included, in addition to evaluations of the buildings examined.

12. KEY WORDS (6 TO 12 ENTRIES; ALPHABETICAL ORDER; CAPITALIZE ONLY PROPER NAMES; AND SEPARATE KEY WORDS BY SEMICOLONS)

acoustics; air quality; design process; ergonomics; furniture systems; lighting; post-occupancy evaluation; thermal comfort; wiring

13. AVAILABILITY

[X] UNLIMITED

[ ] FOR OFFICIAL DISTRIBUTION. DO NOT RELEASE TO NATIONAL TECHNICAL INFORMATION SERVICE (NTIS).

[ ] ORDER FROM SUPERINTENDENT OF DOCUMENTS, U.S. GOVERNMENT PRINTING OFFICE, WASHINGTON, DC 20402.

[X] ORDER FROM NATIONAL TECHNICAL INFORMATION SERVICE (NTIS), SPRINGFIELD, VA 22161.

14. NUMBER OF PRINTED PAGES
178

15. PRICE
A09

ELECTRONIC FORM