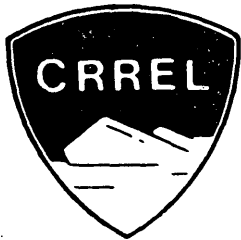


SR 77-5



Special Report 77-5

GUIDELINES FOR ARCHITECTURAL PROGRAMMING OF OFFICE SETTINGS

C. Burgess Ledbetter

March 1977

PREPARED FOR
DIRECTORATE OF MILITARY CONSTRUCTION
OFFICE, CHIEF OF ENGINEERS
BY
CORPS OF ENGINEERS, U.S. ARMY
COLD REGIONS RESEARCH AND ENGINEERING LABORATORY
HANOVER, NEW HAMPSHIRE

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER Special Report 77-5	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) GUIDELINES FOR ARCHITECTURAL PROGRAMMING OF OFFICE SETTINGS		5. TYPE OF REPORT & PERIOD COVERED
		6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) C. Burgess Ledbetter		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS U.S. Army Cold Regions Research and Engineering Laboratory Hanover, New Hampshire 03755		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS DA 4A762730AT42 Task A3, Work Unit 005
11. CONTROLLING OFFICE NAME AND ADDRESS Directorate of Military Construction Office, Chief of Engineers Washington, D.C. 20314		12. REPORT DATE March 1977
		13. NUMBER OF PAGES 18
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		15. SECURITY CLASS. (of this report) Unclassified
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE
16. DISTRIBUTION STATEMENT (of this Report) Approved for public release; distribution unlimited.		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
18. SUPPLEMENTARY NOTES		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Behavior patterns Military forces (United States) Facilities Office design Field office		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) A demonstration of Barker's K-21 test for identifying and differentiating behavior settings is presented as a means of diagnosing problems in an office environment. Guidelines for rearranging the layout of an organization's offices are developed that could also be used for architectural programming for a new building if the organization were to be relocated. As an instructional program, the demonstration presented here shows how to conduct the K-21 test in order to analyze problems concerning behavior setting boundaries or conflicts between behavior settings.		

PREFACE

This report was prepared by C. Burgess Ledbetter, Architect, Applied Research Branch, Experimental Engineering Division, U.S. Army Cold Regions Research and Engineering Laboratory (USA CRREL).

This study was performed under DA 4A762730AT42, *Design, Construction and Operations Technology for Cold Regions*; Task A3, *Facilities Technology/ Cold Regions*; Work Unit 005, *Habitability of Cold Regions Military Facilities*.

Technical review of this report was performed by Dr. Robert B. Bechtel, President of the Environmental Research Development Foundation, Kansas City, Missouri, and by Kevin L. Carey of USA CRREL.

The contents of this report are not to be used for advertising or promotional purposes. Citation of brand names does not constitute an official endorsement or approval of the use of such commercial products.

CONTENTS

	Page
Abstract	i
Preface	ii
Introduction	1
Behavior settings and boundaries	1
The organization	1
Changes for the organization – first floor	5
Changes for the organization – second floor	6
Programming for design	9
Conclusion	9
Appendix A. K-21 test	11

ILLUSTRATIONS

Figure

1. First floor plan of research laboratory – existing layout	2
2. Second floor plan of research laboratory – existing layout	3
3. Recommended changes to the first floor	7
4. Recommended changes to the second floor	8
5. “Bubble diagram” for division secretary and coffee settings	9
6. “Bubble diagram” for division secretary and NCOIC settings	9
7. “Bubble diagram” for division secretary and division chief settings..	9

TABLES

Table

I. K-21 score for coffee break setting compared with division secretary setting	5
II. K-21 score for coffee break setting compared with NCOIC setting...	5
III. K-21 score for administrative assistant setting compared with division chief setting	6
IV. K-21 score for technician setting compared with architect setting....	7
V. K-21 score for technician setting compared with civil engineer “B” setting	8

GUIDELINES FOR ARCHITECTURAL PROGRAMMING OF OFFICE SETTINGS

C. Burgess Ledbetter

INTRODUCTION

When an architectural programmer or a management analyst begins to investigate an organization, how does he go about organizing information on workers, job descriptions, workflow, visitors, management procedures, formal hierarchy, informal flow of communications, room numbers, etc.? This report describes one way to go about such a task. It may surprise those who are familiar with Barker's* (1968) Behavior Setting Theory that only the first part of his Behavior Setting Survey, *the K-21 test for identifying behavior settings*, is used. The K-21 test is traditionally used only as a procedural step in the survey, and not as an end in itself. But when the design or reorganization of an office environment is being programmed, the K-21 test results, by themselves, can provide valuable information. This information results in improved design of Army facilities, more cost effective solutions and greater efficiency of operation. The recommendations for changes developed in this study are primarily based upon the K-21 test scores.

BEHAVIOR SETTINGS AND BOUNDARIES

The K-21 test is used to compare two potential behavior settings. If the resulting score is less than 21, the two potential settings belong to only one behavior setting. If the score is 21 or greater, the two potential settings are separate; that is, they do not belong to the same setting.

What is a behavior setting? Probably the best way to describe a behavior setting is to refer to the seven K-21 test variables regarding the potential settings. These seven variables measure the degree to which:

1. The same people enter both settings

2. The same power figure or leaders are active in both settings

3. Both settings use the same physical space or spaces that are close together

4. Both settings use the same or similar behavior objects

5. The same molar action units span the two settings

6. Both settings occur at the same time or at times that are close together

7. The same kinds of behavior mechanisms occur in the settings.

Therefore, a behavior setting is an activity that has a distinct population and leader(s); a distinct physical space in which it occurs; and distinct behavior objects such as furniture, office equipment, furnishings, and utensils.

Furthermore, the behavior setting, such as is described by job role, is self-contained and occurs in a specified time distinct from that of other settings; and specific kinds of behavior are unique to that setting. The division chief, administrative assistant, and coffee break activities are examples of behavior settings.

In this exercise, the settings will be identified and a number of K-21 scores will be calculated in order to study the boundary conditions between settings. Further, a few settings will be rearranged hypothetically and what their new K-21 scores might be will be projected. This information will help to develop guidelines for changing the organization and for convincing the employees that the changes would be helpful.

THE ORGANIZATION

The research laboratory field office studied is the center of operations for research projects conducted mostly in the field. It hosts visiting researchers from its distant parent organization. Although called a research laboratory, little laboratory work takes place in the building. Most of such research is performed in the field, while writing, reducing data, reading, and other desk-related tasks are performed in the building.

* Barker, R.G. (1968) *Ecological psychology*. Stanford, Calif.: Stanford University Press.

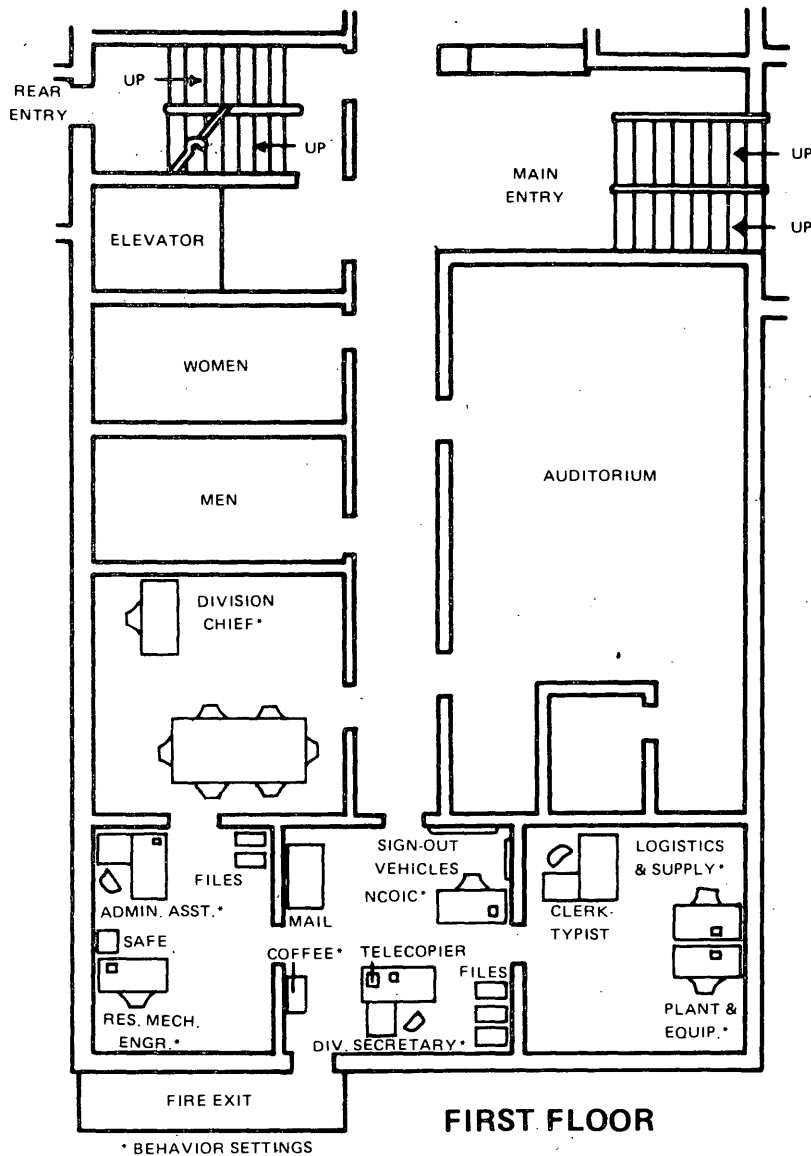


Figure 1. First floor plan of research laboratory – existing layout.

Likewise, the administrative staff perform only desk-related tasks in the building.

For the nine resident research and technical personnel in the field office buildings, there are 15 administrative and support employees. However, only 7 of these employees are located in this building; the remaining 8 employees are in satellite locations and may enter the building only once a day for 30 minutes.

The building contains three stories, one of which is a basement. At the center of the building are two entrances, one to the front and one to the rear. Portions of the first and second floors (shown in Fig. 1 and 2) are occupied by the research organization being discussed. In this demonstration, it is assumed

that the organization must remain divided between the two floors rather than merge into one; this restraint is imposed by the owners of the building.

To identify settings, information is obtained from the occupants. This may be derived from written material such as job descriptions, from observation of the work, and from visual clues in the physical environment. The division chief can quickly identify the people and describe their jobs.

In this research organization, no jobs overlap on the first floor (see Fig. 1) except that of the temporary clerk-typist who helps the other two people in that office. Since the people work independently, each job is likely to be a separate setting. Each person has a

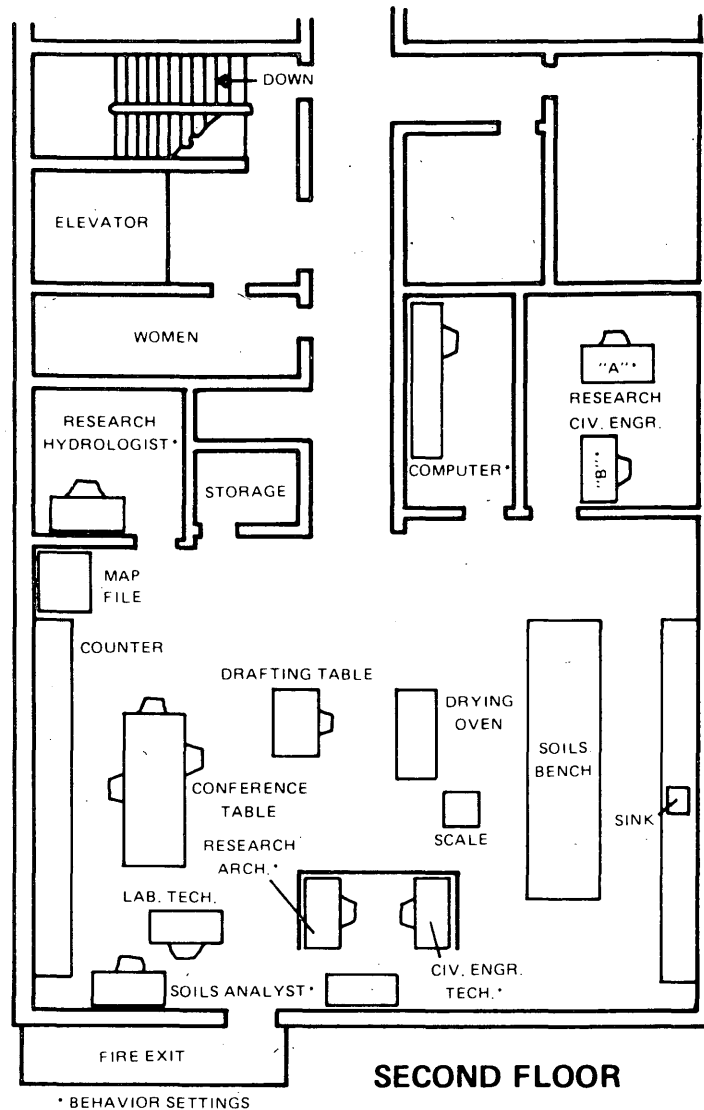


Figure 2. Second floor plan of research laboratory – existing layout.

desk and defined area or territory. For example, the division secretary has her files next to her desk and the telecopier on her desk, the noncommissioned officer in charge (NCOIC) has a personnel sign-out chart and vehicle-utilization chart on the wall next to his desk, and the administrative assistant has the safe and files near her desk. Furthermore, job titles are displayed on doors and on desk-top holders. Other signs or clues to the identities of settings include indicators such as separate phones on adjacent desks, where one phone might suffice if both people worked on the same job. Examples of this are the desks for the supply and logistics chief and the plant and equipment chief.

Observation of behavior includes what is overheard. For example, the division secretary may be overheard to say to a caller, "The NCOIC is not in and I can't

speak for him." This further reinforces the evidence that she does not take over for him in his absence. The K-21 test score is therefore higher than it would be if she shared the leadership of the NCOIC's job.

Now, a K-21 test is used to compare the NCOIC and division secretary potential behavior settings. All activities identified should be considered no more than *potential* behavior settings until they have been resolved by the K-21 test. (Refer to Fig. 1, which shows the layout of the first floor, and to the appendix, which shows how to score each of the seven K-21 tests.)

Bechtel (1977)* provides comments on each of the seven K-21 tests and on boundary problems of the

* Bechtel, Robert B. (1977) Enclosing behavior. Stroudsburg, Pennsylvania: Dowden, Hutchinson and Ross (in press). Copyright authorization, Dowden, Hutchinson and Ross, Inc.; reprinted by permission.

potential settings of the NCOIC and the division secretary as follows:

"The scoring of the K-21 scale is explained as follows:

"Test 1. Population interdependence was given a rating of 1, indicating a 95-100% overlap. It was observed that both the NCOIC and the secretary had populations overlapping both settings nearly 100%.

"Test 2. Leadership interdependence was found not to be overlapping as much as it might seem at first. The NCOIC leaves his setting more often than the secretary does, and she answers more of his phone calls than he answers hers. However, both cannot act in a leadership capacity in the other's setting. The NCOIC does not have knowledge of the secretary's business, nor does she know about his. Only the NCOIC can handle military matters, and only the secretary knows the location of the files and how to run the telecopier. They are both reduced to being an answering service for the other which is not a leadership role. Therefore, the leadership interdependence rating is 6, which is only a trace of 1% of occupancy time.

"Test 3. Rating of spatial interdependence is easy in this case because it closely fits Barker's (1968)* designation of 'different parts of same room or small area.' The rating is 3. This was also calculated in terms of actual square feet of floor space and found to be less than 49% overlap.

"Test 4. Interdependence of behavior objects is slight. No objects, or virtually none, are actually shared since both have their own phones, pencils, paper, desks, etc. And, many of the objects used by one are not used by the other, such as files, telecopier, typewriter, etc. The rating is 5.

"Test 5. Interdependence of environment-related behavior is obvious from the observations of phone calls answered across boundaries. Yet, considering the occupancy time of both settings, this only occurs up to but not exceeding 33% of the total, and is rated 4.

"Test 6. Interdependence on temporal contiguity is nearly total and is rated 1. The hours of work are the same in both settings. Only if one of the leaders were out a great deal would time overlap be less.

"Test 7. Interdependence based on similarity of behavior mechanisms is also nearly total. There is little activity (telephoning, talking, etc.) the NCOIC does that is not also

done by the secretary and vice versa. The interdependence is rated 1.

"The K-21 scale reveals in what kinds of behavior and physical aspects there is overlap. In population, time, and behavior mechanisms the overlap is almost total. They both meet at the same time, are visited by the same people, and do the same things. But, in leadership, the objects they use, and molar behavior, they differ enough to be considered separate settings. Consider that if each knew more about the other's job, that would be enough to lower the leadership rating and make the score less than 21. Also, if the NCOIC were to learn the use of the typewriter and telecopier better, this would also cause the settings to merge into one. Thus, only knowledge seems to keep the settings separate. But why doesn't the NCOIC learn more about secretarial work and the secretary more about military matters? In the course of time, one would expect some of the details to rub off on the other. The reason, of course, is that each has a separate *role*. The NCOIC cares for military matters and the secretary cares for the files and similar tasks. Each guards the province of his duties as important to keep separate. The sheer force of the roles in this case is what finally keeps the two settings separate.

"But consider, then, what this means in terms of work and performance. A psychological effort must be put forth to sustain boundaries that exist only psychologically. In some ways, this makes all of the work of each setting more difficult and it makes some of the work nearly impossible. To counsel military men the NCOIC must physically leave his setting, and the secretary must trust to the honor of others while typing confidential memos or making confidential calls.

"Barker (1968) advises that when K-21 scores ranging between 18-23 are obtained, the scales should be carefully done over with more detailed observational data to ensure that the ratings are reliable. Once this is done, however, it is well to bear in mind that settings with a range of scores from 18-23 are still likely to contain behavior with boundary problems. Just because two potential settings score below 21 does not mean each can be seen as a smoothly functioning single setting. Likewise, settings in the 21-23 category are also likely to have boundary problems."

The conflict between the NCOIC and division secretary is exacerbated by the presence of the coffee urn. Tables I and II show the K-21 scores of the coffee break setting compared with the division secretary setting and the NCOIC setting.

* See footnote, p. 1.

Table I. K-21 score for coffee break setting compared with division secretary setting.

Population	1
Leaders	3
Physical space	2
Physical objects	6
Molar action	4
Time	3
Behavior mechanism	2
	<u>21</u>

Table II. K-21 score for coffee break setting compared with NCOIC setting.

Population	1
Leaders	4
Physical space	2
Physical objects	6
Molar action	4
Time	3
Behavior mechanism	2
	<u>22</u>

In this example, only one score is different, that of leadership interdependence. The division secretary and coffee break settings have a more permeable boundary as reflected in the total score and more specifically in the test for leadership interdependence. This difference exists because the division secretary prepares the coffee.

CHANGES FOR THE ORGANIZATION – FIRST FLOOR

The following is the author's commentary, appearing in Bechtel (1977),* which explains changes that might be applied to improve the organization studied. How an employee of the laboratory might respond to the following analysis and suggestions for changes should be kept in mind:

"It is not difficult to recognize the conflict created among these settings (or in this room). Observation of the occupants' behavior reveals interruptions and annoyance. The occupants readily emphasize the problems interviews. What should areas be like to more closely match the behavior normal to the job? Taking into account moderate space and remodeling limitations, the following descriptions of the physical environment for each setting are suggested.

"The NCOIC functions as a personnel coordinator. He assigns jobs and maintains the

keys to vehicles and other equipment. These activities require him to be easily accessible since he is often needed by many people. Actually, the more exposure he has to the people the better he can perform his job. However, this occasionally conflicts with his need to counsel the military employees in privacy.

"The preferred office for the NCOIC would have the following characteristics. Upon closing a door, the office would allow acoustical privacy for counseling. With the door open, a direct view is available to the coffee break setting and mail distribution area. Mail distribution is an activity belonging to the division secretary setting. The latter setting and activity serve as a focal point attracting people who benefit from contact with each other and with the NCOIC.

"The division secretary is often interrupted. Currently she is some distance from her supervisor, the division chief. However, her position in the office is excellent for receiving visitors. Yet the visitors have no place to sit and wait. The division secretary must often prepare documents considered private, such as personnel records. She can achieve only limited privacy with the coffee break setting and NCOIC setting in the same area.

"Characteristics of an office preferred for the secretary would make her highly visible to visitors and the first person they encounter. In this way there would be no confusion on the part of the visitor and the secretary could function easily as a receptionist. However, the visitor would require seats which can be observed by the secretary. It might also be best if the visitor not directly view the coffee break area lest she make premature judgements of the organization's productivity.

"The secretary's position relative to her supervisor, the division chief, is of greatest importance. She should be able to act as a buffer for him by screening visitors, making appointments, etc. To do this effectively, she should be located adjacent to his office and adjacent to the traffic flow in and out of his office.

"These preceding characteristics for placement of the NCOIC, coffee break, and division secretary settings are based upon requirements for the job, no matter who fills them. However, there is a setting in this organization that experiences conflict because of the particular person filling the role and setting of administrative assistant. This person was formerly the division secretary for many years. Several years ago she was promoted to administrative assistant. As the reader will see in Figure 1 [used as Fig. 1 in present report], she sits

* See footnote, p. 3.

at the entrance to the division chief's office.

"After several years, she is still approached as though she were the secretary to the division chief. She is asked, 'Is the chief in?', 'When can I see him?', 'May I go in?'

"The K-21 score comparing the administrative assistant and division chief is shown in Table III [used as Table III in present report].

Table III. K-21 score for administrative assistant setting compared with division chief setting.

Population	3
Leaders	4
Physical space	4
Behavior objects	5
Molar action	2
Time	2
Behavior mechanisms	1
	<hr/>
	21

"The boundary conflict is reflected in the low score for these two settings. There is no requirement for the jobs that dictates such a close relationship between these two settings. Actually the administrative assistant shares work with the plant and equipment chief and supply and logistics chief located several offices away.

"The administrative assistant setting is at a disadvantage for several reasons. Her physical placement at the entrance to the chief communicates that she is his secretary. The memory of her former role as the division secretary lingers in the minds of her office mates. People ask her questions regarding the division chief as though she were his private secretary, questions for which she has no answer. These factors, and the stereotype of a woman as a secretary, combine to cause the conflict for this setting.

"Also in the same office with the administrative assistant is a research mechanical engineer. He is located there because of a lack of space on the second floor. He and the administrative assistant manage a workable boundary, their K-21 score being 24. He does, however, express concern at being away from his professional peers on the second floor and dislikes the interruptions to his work.

"Now that all settings on the first floor have been covered, Figure 3 [used as Fig. 3 in present report] shows how this space might be rearranged. The research mechanical engineer can

be relocated to the second floor since space is found in this proposed change.

"The division chief seldom uses the large conference table in his office. Chairs around a desk or coffee table would suffice. By moving him to the office adjacent to the division secretary, she can keep her prominent position for visitors. In addition the visitors can have a place to wait.

"The administrative assistant can now join the plant and equipment chief and logistics and supply chief. Room is also available for the clerk-typist who is occasionally hired to assist them.

"The NCOIC is provided a partitioned office with direct access to the coffee break setting and mail distribution activity. He has only to close his door for privacy during counsel sessions."

CHANGES FOR THE ORGANIZATION – SECOND FLOOR*

"Although called a laboratory, only one part of the second floor is used for laboratory work. The majority of people use desks (see Fig. 2) [used as Fig. 2 in present report].

"The one part of the second floor operation that is used as a laboratory consists of one person using the drying oven, scales, bench, and sink for soil analysis. This equipment is permanently affixed so no change is considered other than locating the soils analyst's desk in this area.

"The remainder of the open lab space and offices are to be changed. Figure 4 [used as Fig. 4 in present report] shows the proposed alterations.

"The following changes might be made. The research mechanical engineer takes over the computer room. The research civil engineer 'A' moves to an enlarged room formerly used for storage. His move makes room for the civil engineer technician to move into the office with the research civil engineer 'B.' These two people work most often with each other.

"The technician shared a partitioned area with a visiting research architect. The K-21 score comparing their setting is shown in Table IV [used as Table IV in present report].

"The technician and architect do not work together. These settings share the same conflict the NCOIC and division secretary experience with their highly permeable boundaries. The

* This section is a continuation of the author's comments appearing in Bechtel (1977) (see footnote, p. 3).

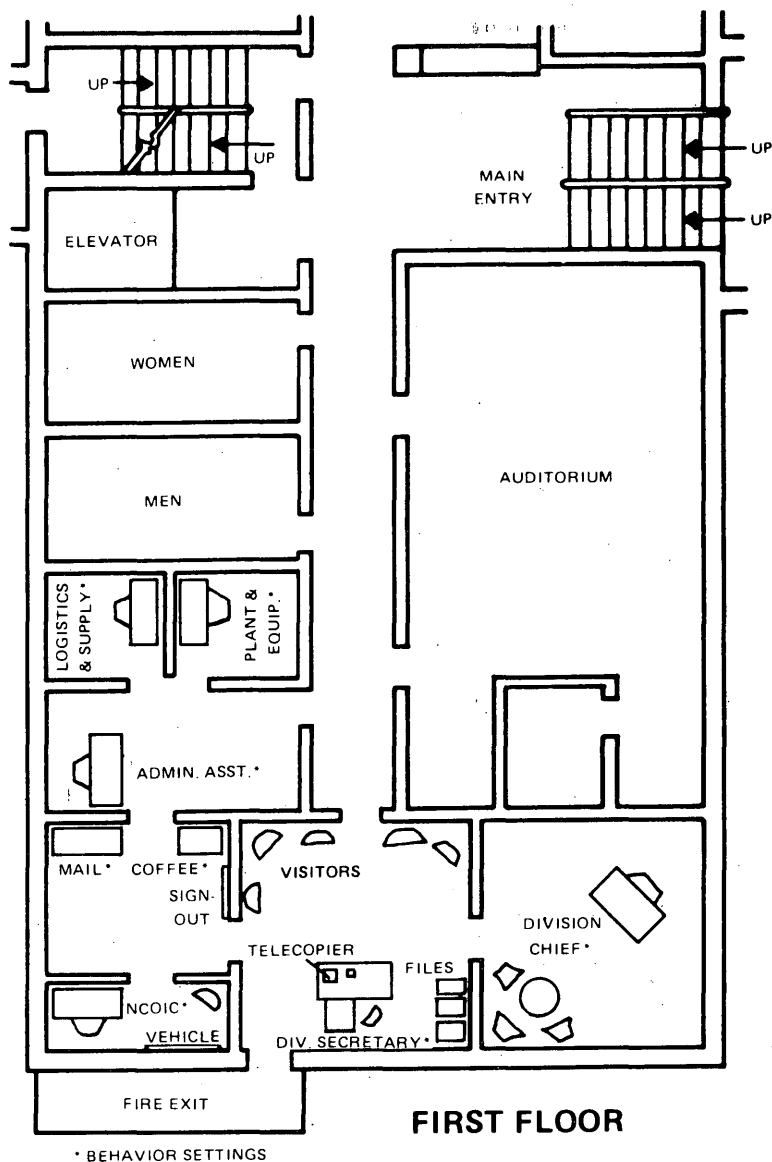


Figure 3. Recommended changes to the first floor.

Table IV. K-21 score for technician setting compared with architect setting.

	<u>Before move</u>	<u>After move</u>
Population	1	4
Leaders	6	6
Physical space	3	4
Behavior objects	6	6
Molar action	4	4
Time	1	1
Behavior mechanisms	1	1
	<u>22</u>	<u>26</u>

phone must be answered for the other person. Visitors to one interrupt the other. Idle conversation easily begins. What might the K-21 score be if they are separated? This is shown in the 'After move' heading in Table IV.

"By changing the physical location of people the settings have been altered. Boundary problems caused by physical closeness of settings unrelated in an organization are ameliorated. Unrelated work and low K-21 score suggest problems. Changes that increase the K-21 score improve those problems.

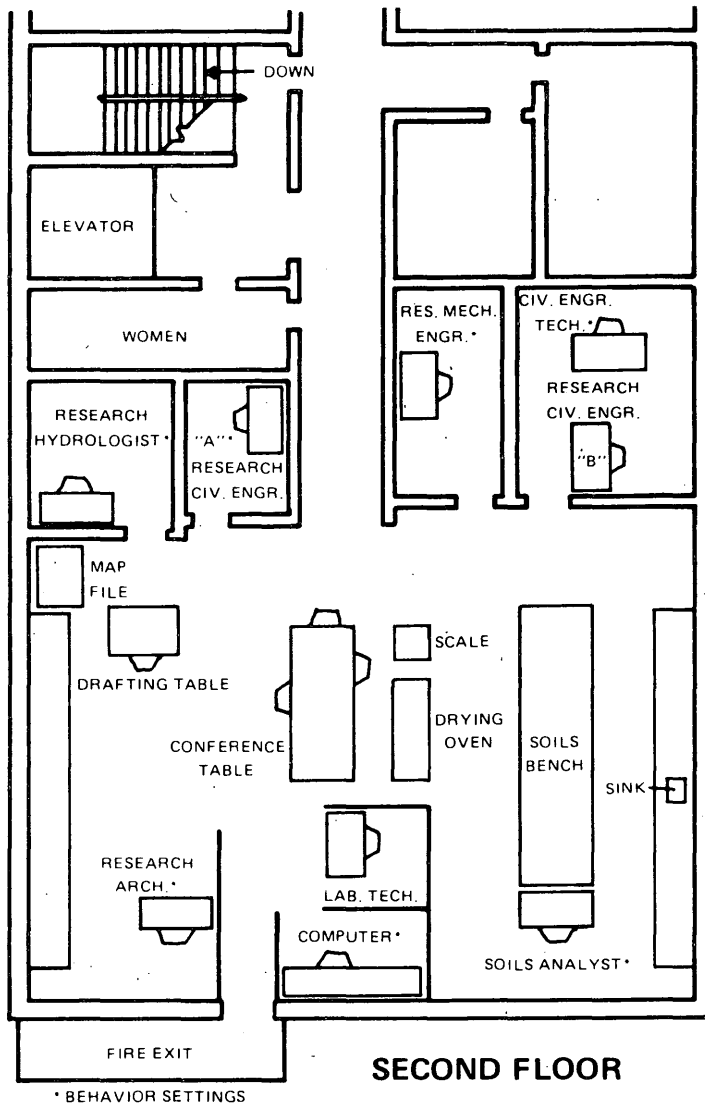


Figure 4. Recommended changes to the second floor.

"The technician and civil engineer 'B' who work together but sit apart have the following K-21 score shown in Table V [used as Table V in present report].

Table V. K-21 score for technician setting compared with civil engineer 'B' setting.

	<i>Before move</i>	<i>After move</i>
Population	4	1
Leaders	3	2
Physical space	4	3
Behavior objects	4	2
Molar action	4	3
Time	1	1
Behavior mechanisms	1	1
	<u>21</u>	<u>13</u>

"This shows a close relation, yet still separate setting. However, they work on the same projects and have a need to be close. By putting them into the same office we might expect the K-21 score comparing the two settings to be that shown in the 'After move' heading in Table V.

"What would result then is the two people join to make one setting. The setting might then be called civil engineering research 'X,' comprising two performers sharing leadership roles.

"Boundary problems can be the conflict between unlike settings being too close or like settings being too far apart. In some cases settings exist only because they are distant from each other. If close, they would naturally merge into one.

"Other changes on the second floor simply reflect best use of available space for the settings.

The visiting research architect is located near the counter where forms used in his research can be assorted. The conference table, drafting table, and counter are clustered near the map file, since these tables are used mostly as layout spaces (see Fig. 4)."

PROGRAMMING FOR DESIGN

Some architects may be disappointed that no significant architectural changes have been suggested. However, if such changes were made, the laboratory would be no more attractive or unattractive, aesthetically, than it is now.

But what if this organization were to move into another building, either a building designed specifically for it or one renovated for its use? Sufficient architectural programming information to develop a conceptual plan would be provided. In terms of behavior settings and boundaries, target K-21 scores could even be programmed between settings based upon a prediction of the user's behavior.

The "bubble diagram" used universally by architects in developing concept design lends itself well to behavior settings and boundaries. For example, the relationship between the division secretary's setting in one office, and the coffee setting that she is responsible for but which is located in another area, might be shown as in Figure 5. The NCOIC and division secretary settings might be shown as in Figure 6. The division secretary and division chief settings might be shown as in Figure 7.

Some people respond to this demonstration with the comment: "These are all common sense solutions." This is exactly right. But this organization has remained unchanged for several years. Like most office environments, no one systematically analyzes conditions, formulates changes and markets the solutions. Furthermore, without systematic investigation and analysis, priorities for change and after-change evaluation cannot be reliably conducted. The K-21 test provides such a systematic approach to architectural programming.

CONCLUSION

Only one part of Barker's* (1968) Behavior Setting Survey has been discussed. However, most of the information collected to establish the K-21 scores is also used for scoring the variety of variables required

* See footnote, p. 1.

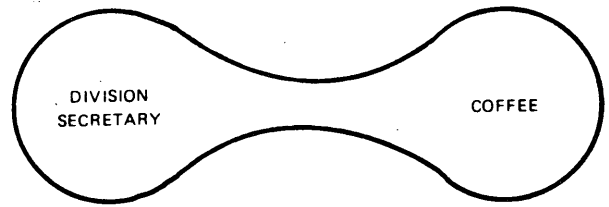


Figure 5. "Bubble diagram" for division secretary and coffee settings.

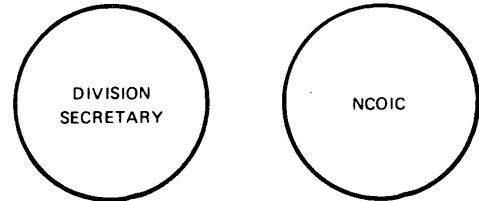


Figure 6. "Bubble diagram" for division secretary and NCOIC settings.

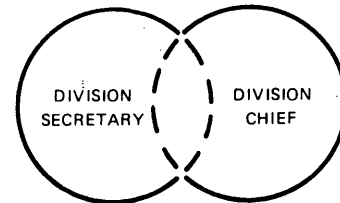


Figure 7. "Bubble diagram" for division secretary and division chief settings.

in the behavior setting survey. By no means is it suggested that one be satisfied with the K-21 boundary study alone. This exercise has simply tried to show how one part of the behavior setting survey can be used to categorize, in an orderly manner, a military or civilian organization, diagnose boundary problems, and develop programming guidelines for organizational and design changes to ameliorate these boundary problems.

APPENDIX A. K-21 TEST (from Barker 1968)*

The K-21 test of interdependency of two behavior settings is based upon ratings of the degree to which:

1. The same people enter both settings
2. The same power figure or leaders are active in both settings
3. Both settings use the same physical space or spaces that are close together
4. Both settings use the same or similar behavior objects
5. The same environment-related behavior units span the two settings
6. Both settings occur at the same time or at times that are close together
7. The same kinds of behavior mechanisms occur in the settings.

Rating of population interdependence (see 1 above), i.e., the degree to which people who enter setting *A* (P_A) are the same as those who enter setting *B* (P_B).

The percentage of overlap is judged by the following formula:

$$\% \text{ Overlap} = \frac{2P_{AB}}{P_A + P_B}$$

where P_A = number of people who enter setting *A*

P_B = number of people who enter setting *B*

P_{AB} = number of people who enter both setting *A* and setting *B*.

This percentage of overlap is converted to an interdependency rating by the following scale:

<u>Rating</u>	<u>Overlap (%)</u>
1	95-100
2	67-94
3	33-66
4	6-32
5	2-5
6	trace-1
7	0

Rating of leadership interdependence (see 2 above), i.e., the degree to which the leaders of setting *A* are also the leaders of setting *B*.

This is judged in the same way as population interdependence for persons who penetrate to zone 4, 5, or 6 in settings *A* and *B*.

Rating of spatial interdependence (see 3 above), i.e., the degree to which settings *A* and *B* use the same or proximate spatial areas.

* Barker, R.G. (1968) Ecological psychology. Stanford, Calif.: Stanford University Press.

The rating is given in the following scale (in the case of scale points with two definitions, the more appropriate one applies, and if more than one applies, the lower scale rating is given):

<u>Rating</u>	<u>Space common to settings A and B (%)</u>	
1	95-100	Or A and B share the same desk or small area.
2	50-94	Or A and B use different parts of same small area.
3	10-49	Or A and B use different parts of same room.
4	5-9	Or A and B use different parts of same building.
5	2-4	Or A and B use areas in same part of town.
6	trace-1	Or A and B use areas in same town but different parts of town.
7	0	Or A in town, B out of town.

Rating of interdependence based on behavior objects (see 4, p. 11), i.e., the degree to which behavior setting A and behavior setting B use identical or similar behavior objects.

The rating is given in the following scale. In the case of scale points with two definitions, the more appropriate one applies; if more than one applies, the lower rating is given.

Rating

1	Identical objects used in setting A and setting B, i.e., all behavior objects shared.	
2	More than half of the objects shared by A and B.	Or virtually all objects in A and B of the same kind.*
3	Half of the objects shared by A and B.	Or more than half of the objects in A and B of same kind.*
4	Less than half the objects shared by A and B.	Or half the objects in A and B of same kind.*
5	Few behavior objects in A and B identical.	Or less than half the objects of A and B of some kind.*
6	Almost no objects shared by A and B.	Or few behavior objects of same kind in A and B.*
7	No objects shared.	Or almost no similarity between objects in A and B.

Rating of interdependence based on environment-related behavior units (see 5, p. 11), i.e., degree to which molar behavior units are continuous between setting A and setting B.

The behavior in behavior settings A and B may be integrated in two ways. The inhabitants of setting A may interact across the boundary with the inhabitants of setting B; e.g., the NCOIC interacts directly with the visitors to the division secretary setting. On the other hand, behavior begun in one behavior setting may be completed in the other; e.g., the division secretary answers the phone for the NCOIC.

Scales are provided for both kinds of behavior integration. For each kind of behavior integration, the highest percentage that applies should be used. The average of the two ratings is then the final rating.

* Objects of the same kind are different instances of objects that have the same dictionary definition; e.g., spoons are used in the behavior setting School Lunch Room and the setting Clifford's Drug Store Fountain, but they are different spoons.

<i>Rating</i>	<i>Behavior in setting A having direct effects on setting B, or vice versa (%) (highest percent counts)</i>	<i>Behavior actions beginning in setting A that are completed in setting B, or vice versa (%) (highest percent counts)</i>
1	95-100	95-100
2	67-94	67-94
3	34-66	34-66
4	5-33	5-33
5	2-4	2-4
6	trace-1	trace-1
7	0	0

Rating of interdependence based on temporal contiguity (see 6, p. 11), i.e., the degree to which settings A and B occur at the same time, or at proximate times.

Most behavior settings occur at intervals. Any pair of settings, therefore, may occur close together on some occasions and be temporally separated at other times. For example, the American Legion meets monthly, while the Boy Scout Troop meets weekly; once a month their meetings occur during the same week. The closest temporal proximity of setting A and setting B determines the column to enter in the table below. The percentage of contact at the point of closest proximity determines the interdependence rating in the column at the left. The percentage of contact is computed as the ratio of the number of occurrences of both settings at this closest point of contact divided by the total number of occurrences of both behavior settings.

*Scales for rating temporal interdependence
(Closest temporal proximity percent of contact)*

<i>Inter-dependence rating</i>	<i>Simultaneous</i>	<i>Same part of day</i>	<i>Same day</i>	<i>Same week</i>	<i>Same month</i>	<i>Same year</i>
1	0.75-1.00					
2	0.50-0.74	0.75-1.00				
3	0.25-0.49	0.50-0.74	0.75-1.00			
4	0.05-0.24	0.25-0.49	0.50-0.74	0.75-1.00		
5	0-0.04	0.05-0.24	0.25-0.49	0.50-0.74	0.75-1.00	
6		0-0.04	0.05-0.24	0.25-0.49	0.50-0.74	0.50-1.00
7			0-0.04	0.05-0.24	0.25-0.49	0-0.49

Interdependence based on similarity of behavior mechanisms (see 7, p. 11), i.e., the degree to which behavior mechanisms are similar in setting A and setting B.

Ratings are based on the following behavior mechanisms:

Gross motor	Writing	Eating
Manipulation	Observing	Reading
Verbalization	Listening	Emoting
Singing	Thinking	Tactual feeling

The interdependence score is determined by the number of behavior mechanisms present in one setting and absent in the other as indicated in the following table:

*Interdependence
rating* *Number of mechanisms
present in one setting
and absent in the other*

1	0-1
2	2-3
3	4-5-6
4	7-9
5	9-10
6	11
7	12