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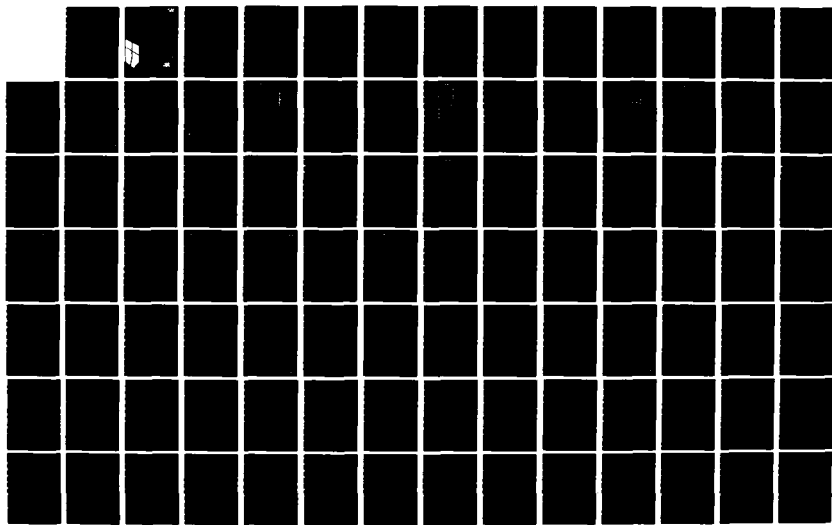
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MANUAL FOR ARMY SERVICE SCHOOLS(U) CONSTRUCTION  
ENGINEERING RESEARCH LAB (ARMY) CHAMPAIGN IL  
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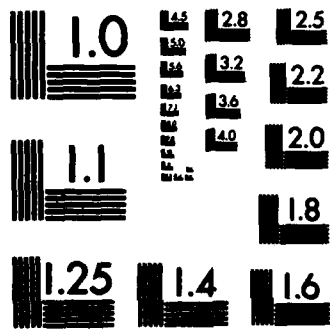
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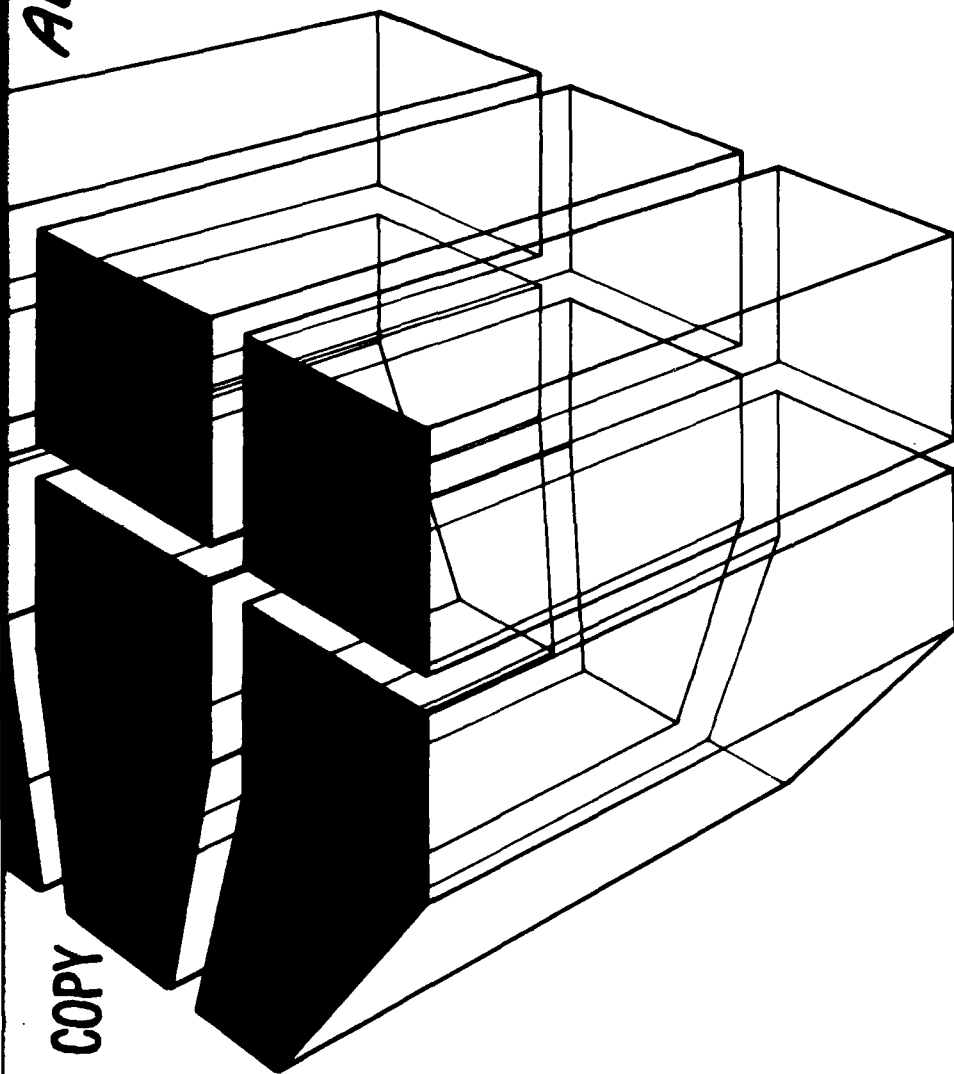
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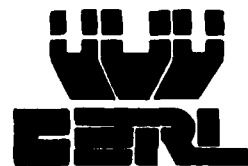
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DEVELOPMENT OF A FACILITY MANAGEMENT  
AND IMPROVEMENT MANUAL FOR ARMY SERVICE SCHOOLS

by  
Roger L. Brauer  
Cynthia McNeilly  
Kim Groesbeck



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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)  This report describes the development of supplementary design information to help Army Service School managers support changes in school training programs. It describes a detailed process for collecting facility management and reference data for 21 types of school spaces.  → The facility management process is divided into three phases: → a u e		

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1. Identifying quantitative and qualitative problems by comparing what is needed to what exists.
2. Organizing problems into improvement projects, and,
3. Initiating improvement projects and monitoring their progress as they are executed by others.

→ This process can help the school administration detect deficiencies early and tell installation and Army organizations responsible for school improvement projects precisely what improvements are needed.

↪ Reference data are for school facilities (in general), training spaces, training support spaces, offices, and shared spaces. These data include typical requirements as well as design criteria and guidance. They can be used to help identify deficiencies within existing spaces and facilities and to define what improvements should be made.

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FOREWORD

This investigation was performed for the Directorate of Engineering and Construction, Office of the Chief of Engineers (OCE), under Project 4A762731AT41, "Design, Construction, and Operation and Maintenance Technology for Military Facilities"; Task A, "Architectural Research and Development in Support of Military Facilities"; Work Unit 001, "Developing Habitability Design Criteria." The applicable QCR is 3.10.001. The OCE Technical Monitors were Robert Shibley and Richard Cramer (DAEN-ECE-A).

This investigation was performed by the Facility Systems Division (FS), of the U.S. Army Construction Engineering Research Laboratory (CERL). Mr. Edward Lots is Chief of CERL-FS. Appreciation is expressed to Dr. Charles Losar for his help with this work.

COL Louis J. Circeo is Commander and Director of CERL and Dr. L. R. Shaffer is Technical Director.

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# INTRODUCTION

## Background

One of the responsibilities of the Chief of Engineers, as defined in Army Regulation (AR) 10-5, is to develop requirements for improved construction design criteria for the Army, Air Force, and other Government agencies.<sup>1</sup> AR 415-20 further defines this responsibility as developing, maintaining, and promulgating architectural and engineering design criteria for use in providing the Department of the Army with constructed facilities.<sup>2</sup> Because many of the Army's missions are unique or constrained by regulations, Army-specific design criteria must be developed.

One goal of design criteria is to ensure that a facility effectively supports the mission and functions of the organizations and people who use it, i.e., to provide habitability. More specifically, design criteria must address the health, safety, morale, and satisfaction of users, the performance of operations and activities, and the security of users, information, and equipment.

A major problem is developing design criteria that address user missions and presenting them in a way that is easy to use. Factors contributing to this problem include (1) design criteria documents have a variety of users with different information needs; (2) the need to differentiate among design criteria, requirements, and guidance; (3) the need for an orderly method of developing criteria; (4) the difficulty of systematically identifying or locating criteria already in practice; and (5) the difficulty of determining and retaining information about why a particular criterion was adopted.

Changes in Army Service School programs of instruction teaching methods and staff levels require that an orderly process be used to identify facility problems and implement appropriate solutions to ensure that school facilities support the school missions as changes occur. Although a Design Guide for U.S. Army Service Schools (DG 1110-3-106) exists, the need to manage school facilities placed a new demand on the Design Guide.

## Objective

The main objective of this study was to develop a method for formulating habitability design criteria for Army Service Schools preparing design information for specific facility or space types.

<sup>1</sup> Organization and Functions -- Department of the Army, Army Regulation (AR) 10-5 (Department of the Army [DA], 1978).

<sup>2</sup> Project Development and Design Approval, AR 415-20 (DA, 1974).

# **INTRODUCTION**

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## **Approach**

The first phase of this study was devoted to developing a data collection and analysis method. The prototype method was discussed in CERL Interim Report P-111.<sup>3</sup>

This prototype method was tested by developing a draft document for managing service school facilities.

In the second phase, the method was further refined and prepared as a user manual for criteria writers. The final method is presented in CERL Technical Report P-121.<sup>4</sup>

This report documents Part 2 of Phase I of this study, the prototype test document.

## **Mode of Technology Transfer**

The product of this work will be a supplement to DG 1110-3-106, Design Guide for U.S. Army Service Schools.

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<sup>3</sup> R. L. Brauer, Methods for Developing Habitability Design Criteria, Interim Report P-111/ADA088011 (U.S. Army Construction Engineering Research Laboratory [CERL], July 1980).

<sup>4</sup> R. L. Brauer, Kim Groesbeck and Cynthia McNeilly, Preparing and Communicating Habitability Design Information, Technical Report P-121/ADA113379 [CERL], July 1980).

# PART 1

# CHANGES AND SCHOOL FACILITIES 1

Because U.S. Army service school training courses, methods, types of students, and equipment are changing continually in response to changes in Army weapons and doctrine, it is important that school facilities be upgraded so their training mission can be accomplished as efficiently as possible (Figure 1).

This report describes ways to (1) upgrade, improve, and renovate service school facilities in response to changes in school operations and (2) manage school spaces. It explains how to identify the impact of changes on school facilities and how to implement necessary modifications. This report also can help service school administrative and academic staffs recognize problems and plan improvements.

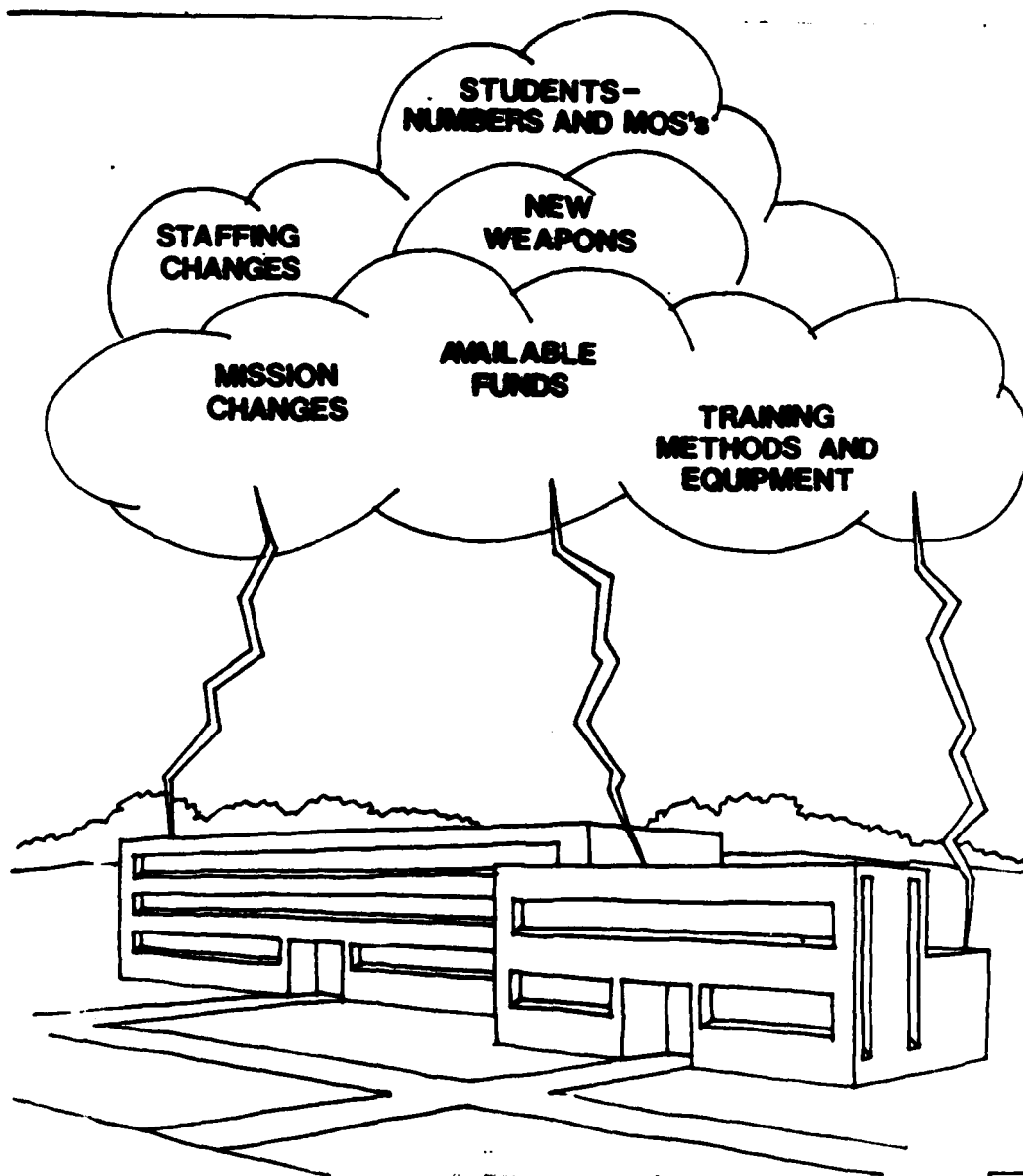


Figure 1. Changes which impact U.S. Army service schools.

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# 1 CHANGES AND SCHOOL FACILITIES

Although this report focuses mainly on school facilities, the approach it describes may be used to plan improvements to field facilities.<sup>5</sup> It also may help National Guard, Army Reserve, or other organizations improve their educational spaces. In addition, personnel in installation offices of the Directorate of Engineering and Housing (DEH) and designers will find information helpful in dealing with improvement projects.

## **Facilities and Mission Accomplishment**

Facilities are one of six elements necessary to accomplish a mission (Figure 2).

1. Activities must be performed.
2. Personnel must be available in adequate numbers and skills to perform these activities.
3. Equipment and Supplies must be available if personnel are to perform Activities effectively.
4. Enough Time must be available to accomplish Activities.
5. A place or Facility is needed in which to perform Activities.
6. Funds must be available to support the other five elements.

With these six elements, a mission can be accomplished.

Facility changes, improvements, modifications, or renovations take time. Therefore, it is important to identify deficiencies or potential deficiencies early. This will insure that the facilities are available when needed. Since new construction funds are not always available, existing school facilities must be kept at peak effectiveness. As suggested in Figure 3, methods of correcting school facility deficiencies range from changing a paint color or providing a lighting fixture to major renovations and additions.

Many organizations can play a significant role in keeping facilities supportive (Figure 4). One of the most important roles is played by the service school organization itself. At the installation, help is available from DEH and the Directorate of Industrial Operations (DIO). Additional help may be available from the Training and Doctrine Command (TRADOC) Headquarters and the Training Support Center at Fort Eustis, VA. On larger projects, a Corps of Engineers district will be involved. Professional architecture, engineering, and other design services may be required and obtained through DEH at the installation or through a Corps of Engineers district. In certain cases, other organizations at the installation, in the Department of the Army (DA), or in the Federal government may be helpful.

<sup>5</sup> Training Land - Unit Land Requirements, Training Circular (TC) 25-1 (DA, 4 August 1978); and Training Ranges (Army Range Requirements), TC 25-2 (DA, 10 March 1980).

# CHANGES AND SCHOOL FACILITIES 1

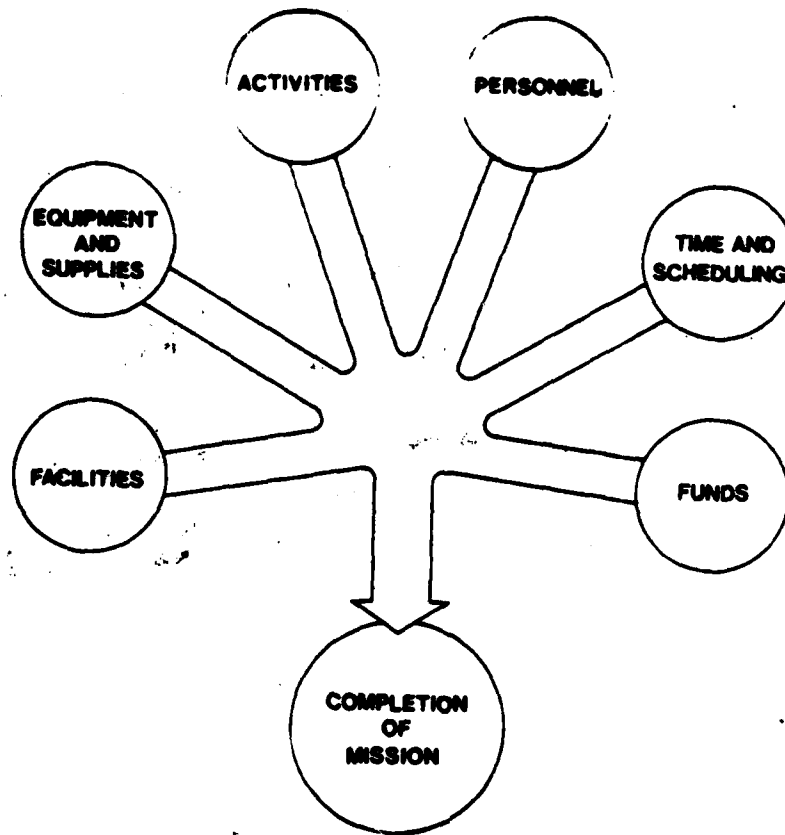


Figure 2. The six elements of mission accomplishment.

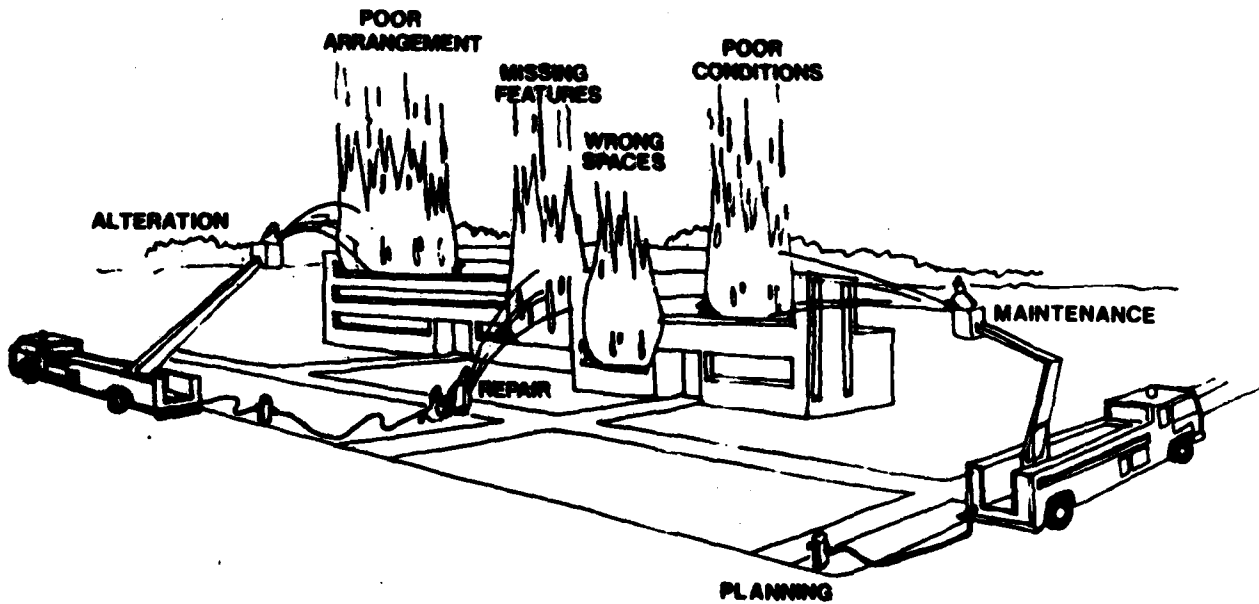


Figure 3. There are many ways to keep school facilities supportive.

# 1 CHANGES AND SCHOOL FACILITIES

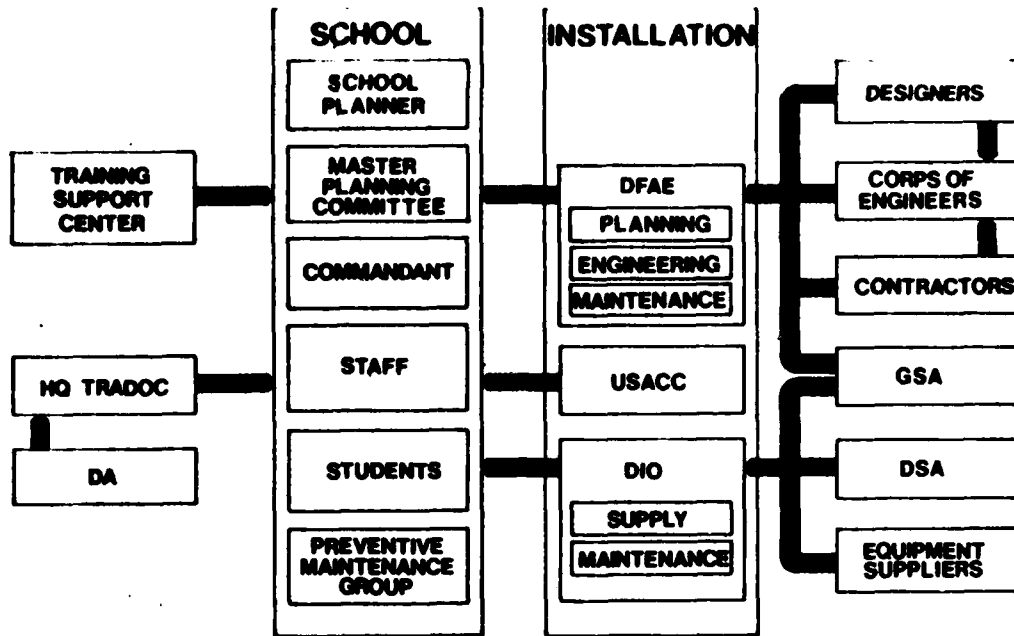


Figure 4. Many people are involved in keeping facilities supportive.

## Overview of Report

Chapters 2 through 4 describe a three-step process for upgrading U.S. Army service schools. The relationships among the three phases are shown in Figure 5. During Phase I, problems with existing school facilities are identified; i.e., methods are detailed for identifying problems with the quantity of space available for various activities, the general quality of school buildings, and the quality of individual spaces.

During Phase II, problems are grouped into improvement projects. Information gathered or developed for each project includes data on the availability of funds, the need for design services, cost estimates, steps from initiation to completion, and required procedures and approvals. Priorities for projects are established and project activities are scheduled.

During Phase III, appropriate projects are initiated and progress is monitored. Feedback to school staff and students is provided.

In view of the many changes that occur in the Army and in Army training schools, facilities can be kept effective only through a continuous effort to improve them. Changes in missions, weapons, teaching methods, educational equipment, training aids, student loans, and qualifications of students need to be monitored to determine their impact on school facilities. Many of these changes can be detected early through existing school directorates and activities.

# CHANGES AND SCHOOL FACILITIES 1

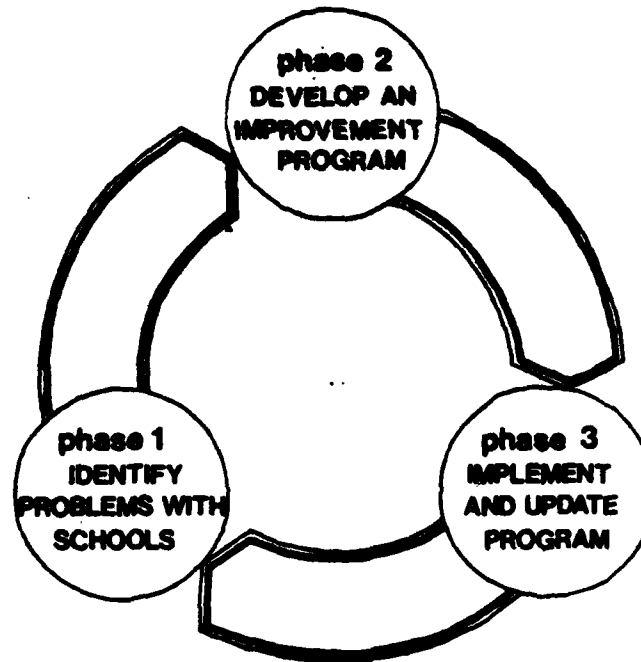


Figure 5. The three-phased process for improving service school facilities.

## How To Use This Report

As shown in Figure 6, this report is divided into two parts: procedures for identifying needs and accomplishing improvements, and improvement guidelines about types of school spaces. The procedures laid out in the three phases described above explain what to do, where to get help, and who to contact. Work sheets for collecting, tabulating, organizing, and managing information and activities for these steps are described in Chapters 2 through 4.

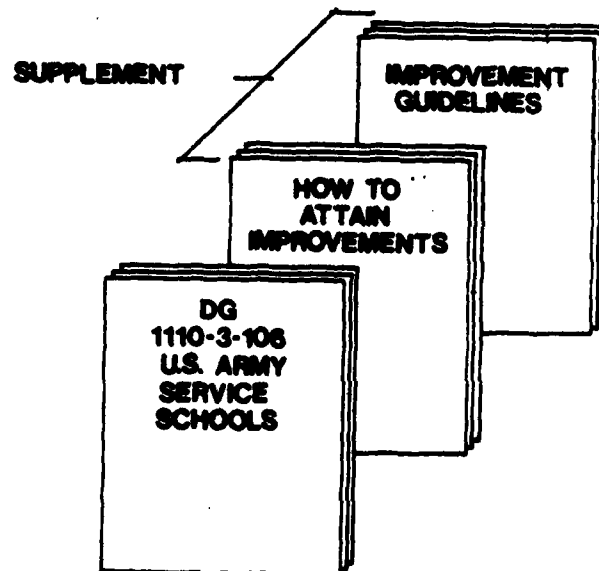


Figure 6. This report is composed of procedures and guidelines.



# 1 CHANGES AND SCHOOL FACILITIES

In Part II, improvement guidelines include requirements (statements about what is needed), criteria (standards which satisfy requirements), guidance (recommendations for applying standards or to illustrate effective solutions), and other data about school facilities.

## Staffing for Improvements

Managing change in school facilities is not a simple task. It requires systematic collection and analysis of data, the ability to draw knowledge and help from others, and a sense of order, and the capability to plan activities and get things done. A professional knowledge of building design and construction is not necessary, although some knowledge and experience with facilities would certainly help. Similarly, a complete knowledge of school operations is not imperative, although a general knowledge of how things operate within a school is important. As shown in Figure 7, the key participants in managing change at school facilities are the school commandant, a school planner, a school master planning committee, and, in some cases, the school's staff, faculty, and students.

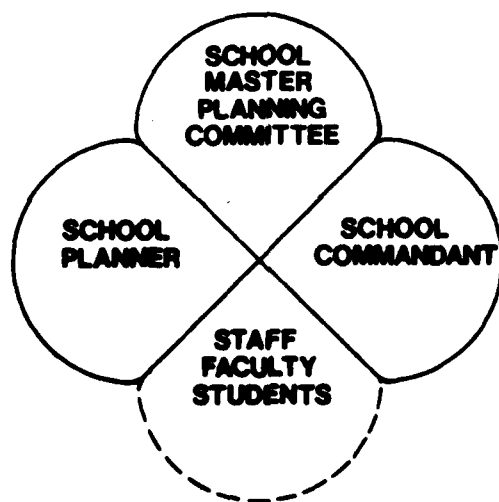


Figure 7. Participants in improving school facilities.

### School Planner

An individual from the school staff should be designated school planner. The school planner is responsible for managing and executing the procedures described in this report. In many cases, the school planner position would be best located in the Directorate of Support, as shown in Figure 8. It is recommended that the school planner be a civilian, to provide continuity from project planning to project completion.

# CHANGES AND SCHOOL FACILITIES 1

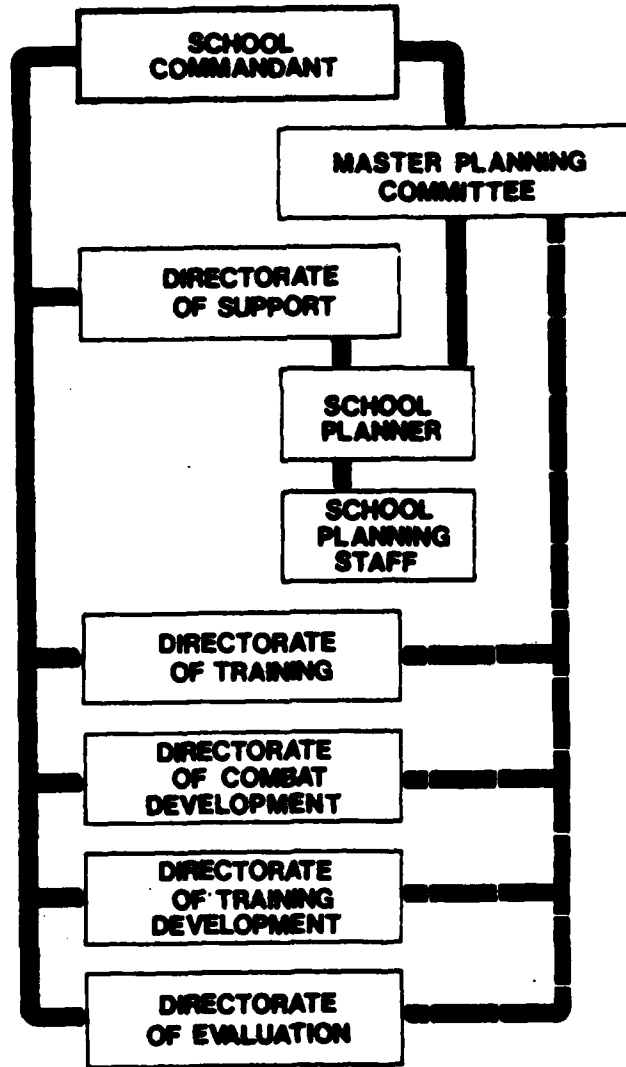


Figure 8. Recommended organizational structure for improving school facilities.

The size of the planning task and the amount of time required for it will vary with the condition and size of the school facility. Initially, the task of identifying problems and getting improvement projects underway could require a sizeable effort. However, after the initial effort, the task should diminish in scope. The school planner may need help in completing planning activities, maintaining planning data, etc. An assistant may be needed to perform more routine tasks; secretarial/clerical help should also be provided.

## Master Planning Committee

To help the school planner, to assure project continuity, and to broaden the representation in planning activities, recommendations, and decisions, a

# **1 CHANGES AND SCHOOL FACILITIES**

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master planning committee should be established. This committee should have five to nine military and civilian members. Members should represent the various directorates in the school. Consideration should be given to including representatives from DEH and DIO as full or advisory members.

The school planner should be a member and possibly chairperson of the master planning committee. The committee would be responsible for helping to prepare recommendations for projects and project priorities, establishing and implementing facility standards, and providing input and continuity to school improvement projects.

Appendix A lists suggestions for establishing a school master planning committee.

## **School Commandant**

The school commandant provides the initiative for school improvements by establishing the importance of school improvement activities and insuring adequate support. The commandant acts as decision-maker and participates in the planning/improvement process.

## **School Staff, Faculty, and Students**

The school staff, faculty, and students are valuable resources which can be used to help identify problems and evaluate particular spaces.

# IDENTIFYING PROBLEMS WITH SCHOOL FACILITIES <sup>2</sup> (Phase 1)

## General Approach to Identifying Problems

Some school facility problems are easy to identify. For example, it is easy to tell whether a light switch is working: if the switch is thrown and the lights do not come on, it is obvious that something is wrong. However, it is more difficult to determine whether students have enough light to read printed material comfortably. The goal of the methods described in this report is to identify all kinds of problems, not just whether available building features are working. In general, the approach is to establish what is needed to support the activities, personnel, and equipment within the school, and to compare those needs to what is provided (Figure 9).

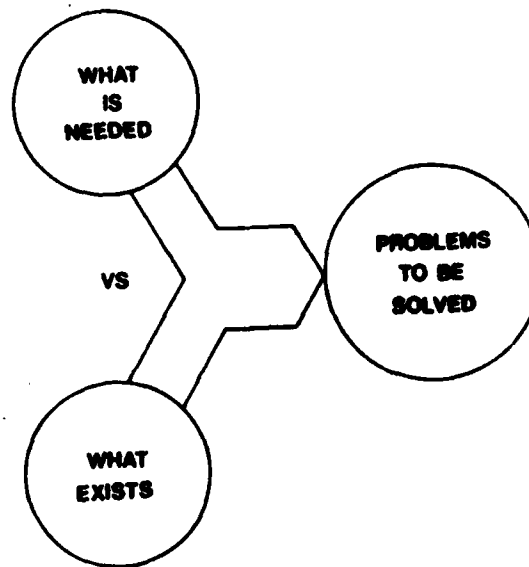


Figure 9. Approach for identifying problems with school facilities.

The approach described in this report can be applied to three main types of problems:

1. Quantity and type of space.
2. General quality of school buildings.
3. Quality of individual spaces.

Figure 10 is an overview of the problem identification process.

# 2 IDENTIFYING PROBLEMS WITH SCHOOL FACILITIES

(Phase 1)

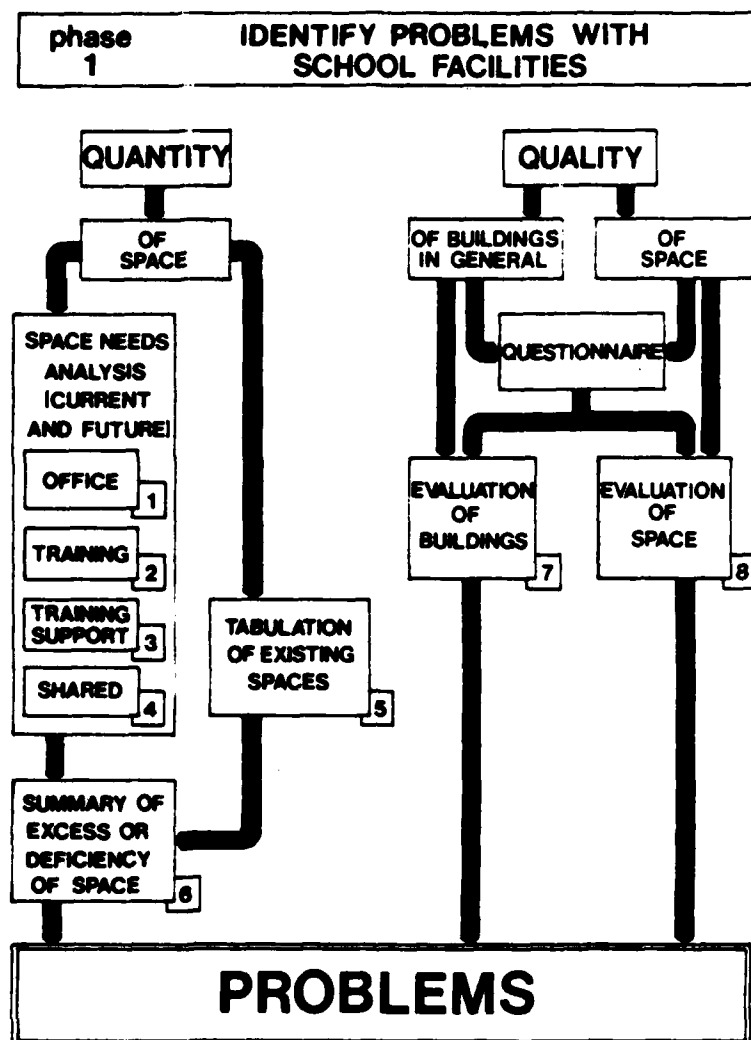


Figure 10. Overview of Phase 1. (Numbers refer to worksheets for organizing information.)

### Quantity and Type of Space

As the number of students, the size of the school staff, teaching methods, types of curriculum, and other factors change in the school, the total amount of space required may change, or the amount of space needed for different purposes may change. Figure 11 shows the difference between current and future space needs for an example school. For example, assume a school currently requires 100,000 sq ft (9 290 m<sup>2</sup>) of space. Twenty percent of that space may be needed for staff offices, 40 percent for classrooms, 30 percent for laboratories, and 10 percent for self-paced instruction. A year later, when additional space or new types of space may be needed, the demand for each type of space may change considerably. For example, 120,000 sq ft (11 148 m<sup>2</sup>) may be required: 17 percent for offices, 13 percent for classrooms, 20 percent for laboratories, 30 percent for self-paced instruction, 10 percent for job simulation areas, and 10 percent for student counseling.

# IDENTIFYING PROBLEMS WITH SCHOOL FACILITIES <sup>2</sup> (Phase 1)

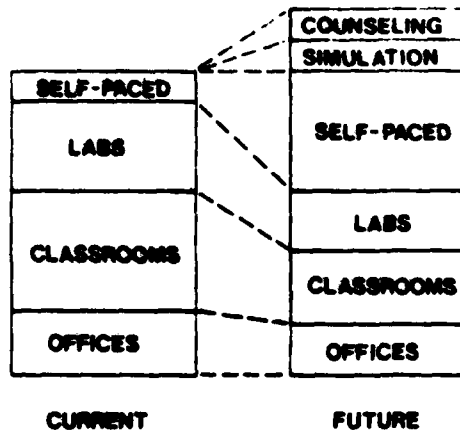


Figure 11. Quantities of spaces needed change with time.

## General Quality of School Buildings

The general quality of school buildings includes exterior features such as parking areas, sidewalks, or landscaping; the condition of exterior materials such as brick work, roofing, and windows; the general appearance and condition of the interior; the quality of utility, waste, and janitorial services; or the arrangement of spaces.

## Quality of Space

Not only is it important to have building features and subsystems in working condition (e.g., light switches, air conditioning, or heating devices that work), but it is also important to know whether the school has the functional characteristics necessary to conduct school activities efficiently and effectively.

## Current and Future Needs

Army schools are not static. It is not sufficient to snap a picture at some point in time, identify existing problems, and make some improvements. Because small changes can add up to significant changes in school requirements over time, it is necessary to look at future needs, and to look ahead for changes in school personnel, student loads, teaching methods, teaching equipment, and other factors which impact facility requirements. Problems must be anticipated and solutions provided before deficiencies become acute. For example, because school operations such as training development and instruction are being performed by contractors more and more frequently, new demands may result from contract agreements. Therefore, the facility needs of contractors must be included in school planning.

## **2 IDENTIFYING PROBLEMS WITH SCHOOL FACILITIES**

### **(Phase 1)**

Four primary categories of space must be considered before the amount of space a school needs can be identified. Each category must be dealt with separately, because different data are used to estimate each category's required amount of space. Part II contains a brief discussion about space usage and contents, and lists the people, activities, and equipment which influence space needs. The four categories of space are:

1. Offices
2. Training spaces
3. Training support spaces
4. Shared spaces.

Worksheets can be used to estimate the amount of space each category needs. Sample worksheets and methods for estimating space requirements are described in this chapter. They are also shown in Appendix H. These worksheets can be modified (if necessary) and reproduced. General methods for estimating amounts of space are explained in Appendix C. These methods can be used for special spaces when worksheets do not apply. After space requirements for both current and future operations have been estimated for the four categories of space, total space demands can be determined by pooling the information recorded on the worksheets.

Each organizational unit must be asked for help when space needs are estimated, particularly if space needs are being predicted. People within each Directorate who are not on the master planning committee, but who thoroughly understand the group's mission, can be very helpful in identifying what is needed or what is wrong with existing spaces.

### **Estimating Required Office Space**

Space standards for general offices in the Army are based on the number of people requiring office space and their rank or grade. In addition to general offices, there are special office areas, such as rooms for reproduction equipment, files, or material storage. The sizes of special office spaces are a function of the equipment and furnishings they contain. Space standards for Army offices are listed in Army Regulation (AR) 1-21 (Appendix A), in AR 405-70, and in Technical Manual (TM) 5-800-1.<sup>6</sup> These standards, together with Federal Property Management Regulations, are summarized in Appendix B.<sup>7</sup>

Figure 12 is an example of how office space requirements are tabulated and estimated for several organizational units using Worksheet 1. Space requirements normally are based on currently authorized personnel and functions. A similar analysis can be done to estimate potential requirements.

<sup>6</sup> Administrative Space Management, AR 1-21 (DA, 20 July 1970); Utilization of Real Estate, AR 405-70 (DA, 23 February 1977); and Construction Criteria for Army Facilities, Technical Manual (TM) 5-800-1 (DA, 10 September 1974).

<sup>7</sup> 41 CFR, Subpart 101-17.3.

# IDENTIFYING PROBLEMS WITH SCHOOL FACILITIES 2

(Phase 1)

SPACE NEEDS ANALYSIS		CURRENT DATE: 2/80		DIRECTORATE			OFFICES	
		FUTURE DATE: _____		<input type="radio"/> DCD <input checked="" type="radio"/> DTE <input type="radio"/> DTD <input type="radio"/> EXEC <input type="radio"/> DOT <input type="radio"/> OTHER				
ORGANIZATION NAME	SPACE NAME	PEOPLE		SPACE TYPE			SPACE STANDARD	SQ. FT. REQ'D
		RANK/ GRADE	NUMBER	GENERAL	SPECIAL	STORAGE		
DTE - Z	CHIEF'S OFFICE	COL.	1	✓			P3: 200 sq. ft.	200
	SECY OFFICE	G5-6	1	✓			P5: 100 sq. ft.	100
							SUBTOTAL	300
DTE - R	RECORD'S CHIEF	Lt. COL.	1	✓			P4: 150 sq. ft.	150
	SECY OFFICE	G5-4	1	✓			P5: 100 sq. ft.	100
		G5-3	2	✓			O3: 60 sq. ft.	120
	RECORD'S OFFICE	G5-9	3	✓			O2: 90 sq. ft.	270
	FILE ROOM					UNIT EQMT.		
							20 files @ 7 sq. ft.	140
							SUBTOTAL	780
DTE - S	SUPPLY CHIEF	G5-9	1	✓			P6: @ 100 sq. ft.	100
	SUPPLY CLERK	G5-4	2	✓			O5: @ 60 sq. ft.	120
	STORE ROOM					✓	UNIT EQMT.	500
	REPAIR ROOM	G5-5	1		✓		UNIT EQMT. &	
		G5-9	1		✓		ANALYTICAL METHOD	185
							SUBTOTAL	905
COMMENTS								WORK SHEET 1

Figure 12. Example of tabulation of office space required by three organizations.

### Estimating Required Training Space

Training spaces are those rooms or areas in which training actually occurs, e.g., classrooms, laboratories, or self-paced instruction areas. The amount of training space needed is a function of the course being taught, the equipment used, the number of students in a class, the number of concurrent classes, and the duration and frequency of the course.

Training space requirements can be listed by program of instruction and course. Figure 13 is an example of how training space requirements are tabulated. Demands for each type of training space required by a particular program of instruction or course are estimated in square foot-hours per week, and then adjusted for the typical number of hours in a training week. A utilization factor (the portion of the training week that a room is actually in use) is then used to provide an estimate of total square feet. The number of hours in a training week may vary by school or curriculum; the utilization factor accounts for these fluctuations in student class loads.

Information about courses (e.g., numbers of students and how often they meet) can be obtained from the Army Program of Input to Training (ARPRINT) and is available from the Directorate of Training (DOT). The ARPRINT projects student loads for each course several years in advance. The ARPRINT can help estimate training space requirements, but should be used only with the help of



# 2 IDENTIFYING PROBLEMS WITH SCHOOL FACILITIES

## (Phase 1)

the class scheduler, because it may contain data which reflect existing space conditions. For example, class sizes shown on the ARPRINT may be based on the seating capacity of available rooms and not on ideal instructor-student ratios. (Additional information about the ARPRINT is given in Appendix D.)

SPACE NEEDS ANALYSIS		CURRICULUM <u>AVIATION - NOE, BASICS</u>			TRAINING SPACES			
COURSE NUMBER/TITLE	OPTIMUM CLASS SIZE (a)	HOURS PER WEEK (b)	NUMBER OF CLASSES (c)	TYPE OF SPACE	SPACE STAND. (sq ft./stud.) (d)	DEMAND (req ft. - hrs./week) (a) x (b) x (c) x (d)	ADJUSTED DEMAND* (sq ft.)	
-75810 BASIC SKILLS	40	5	5	CLASSROOM	25	25,000	893	
	40	15	5	SELF-PAID ROOM	35	105,000	4286	
-75811 ADVANCED SKILLS	40	5	5	SELF-PAID ROOM	35	35,000	1429	
	40	5	5	LABORATORY - CLASSROOM	45	45,000	2143	
-75812 SIMULATION	5	5	10	LABORATORY	50	12,500	446	
-75813 PRE-FLIGHT	40	20	5	LABORATORY	40	160,000	5714	
					TOTAL: LABORATORIES		6160	
COMMENTS: 1. EXAMPLE ASSUMES 35% INSTRUCTION LEVEL. 2. UTILIZATION FACTORS ASSUMED FOR EXAMPLE: CLASSROOMS - 80%; SELF-PAID ROOMS - 70%; LABORATORY - CLASSROOMS - 60%; LABORATORIES - 80%					*ADJUSTED DEMAND = DEMAND + (TYPICAL SHFT (hrs/week) x UTILIZATION FACTOR 1.25)		DATE 3/80	WORK SHEET 2

Figure 13. Example of a tabulation of training space required for several courses.

### Estimating Required Training Support Space

A variety of support spaces are required for training activities. These might include study areas, instructor preparation areas, counseling spaces, school libraries, projection rooms, instructor rehearsal areas, or remedial instruction spaces. The estimate of the space needed for each of these areas is based on a variety of factors, depending on the type of space. Because of this variety, different techniques may be required to complete estimates, or methods already used to estimate office or training space may be appropriate. General methods are described in Appendix C; information given in Part II may also be helpful.

Estimates of training support space needs can be tabulated by organizational unit using Worksheet 3. An example is given in Figure 14.

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(Phase 1)

SPACE NEEDS ANALYSIS			TRAINING SUPPORT SPACES	
ORGANIZATION NAME	SPACE NAME	SPACE TYPE	ESTIMATING FACTORS	SQ. FT. REQD
AVIATION NOE SECTION	WORK STATIONS	INSTRUCTOR PREP ROOMS	15 INSTRUCTORS X 75 SQ FT EACH	1200
	TYPING STATIONS	INSTRUCTOR PREP ROOMS	4 @ 60 SQ FT	240
		REHEARSAL ROOMS	2 @ 400 SQ FT	800
	MAP LIBRARY	TECHNICAL LIBRARY	100 LIN FT SHELVING + 2 TABLES (LARGE)	300
		PROJECTION ROOM	2 @ 250 SQ FT	500
COUNSELING STATIONS	COUNSELING SPACES	3 @ 50 SQ FT	150	
COMMENTS			DATE 2/80	WORK SHEET 3

Figure 14. Example of a tabulation of training support spaces required for one organizational unit.

### Estimating Required Shared Spaces

Shared spaces are those which do not belong to a specific organization. These include student lounges, snack bars and vending areas, book stores, store rooms, janitor closets, and latrines. The basis for estimating their required amount of space will vary by type of space. Size may be a function of the number of people or the amount and kind of equipment located in a space. Space quantity criteria are given in Chapter 4 for some types of spaces. For others, the estimating methods given in Appendix C may be needed. Requirements for shared spaces can be tabulated by organization or for the entire school.

An example of how to tabulate shared space using Worksheet 4 is shown in Figure 15. Data about users and contents were provided on the worksheet where they were necessary to complete the estimates.

### Determining Space Availability

Not only is it necessary to determine how much space is needed for each category and type of space, but it is necessary to establish how much space

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SPACE NEEDS ANALYSIS		ORGANIZATION DTD		SHARED SPACES	
SPACE NAME	USERS	CONTENTS	ESTIMATING FACTORS	SQ. FT. REQ'D	
LAUNDRY					
MEN	42 MALES	STANDARD FIXTURES PLUS 2 SHOWERS WITH CHANGE AREA AND 10 LOCKERS	1 WC @ 30 SQ FT 2 SHOWER @ 40 SQ FT 2 URINAL @ 10 SQ FT 1 LAVATORY @ 18 SQ FT 1 TOWEL @ 10 SQ FT 100 SQ FT	270	
WOMEN	23 FEMALES	STANDARD FIXTURES	1 WC @ 30 1 LAVATORY @ 18 1 TOWEL @ 10	58	
JANITOR CLOSET				48	
RECEPTION		TV, WALL DROPS & FROPS	ANALYTICAL METHOD	400	
		LIGHTING, SOUND, & VIDEO EQUIPMENT	ANALYTICAL METHOD	500	
COMMENTS			DATE	WORK SHEET	
			2/80	4	

Figure 15. Example of a tabulation of shared space requirements for one organization.

exists. The amount of space available can be determined in two ways. The first is to survey all school facilities, classify each space by category and type, measure each space, and compute its size. In the second method, room dimensions can be scaled from floor plans of the buildings and room sizes computed. Up-to-date floor plan drawings can be obtained from DEH.

Information on availability of spaces can be tabulated using Worksheet 5. Data can be logged for each room or area and totals established for each space category and type. An example is given in Figure 16.

### Compilation of Needed and Available Space

To identify whether enough space is available for each category and type of space, the required amount of space must be compared to what exists. This comparison can be made for either current or projected space needs. It can be made for particular organizations or the entire school. Excess or

# IDENTIFYING PROBLEMS WITH SCHOOL FACILITIES

(Phase 1) **2**

TABULATION OF AVAILABLE SPACE			DATE
			2/80
SPACE CATEGORY/TYPE	ROOM OR LOCATION	SIZE SQ. FT.	TOTALS
TRAINING SPACE CLASSROOMS	BLDG 809		
	RM 119	1000	
	RM 120	1220	
	RM 123	1790	
	RM 136	1400	
	RM 140	1200	5570
LABORATORY	BLDG 809		
	RM 122	4000	
	RM 130	1600	
	RM 133	3500	
		9100	
	BLDG 812 MAIN ROOM	0000	19100
SELF-PACED	BLDG 809		
	RM 127	1625	
	RM 131	1830	3455
COMMENTS			WORK SHEET <b>5</b>

Figure 16. Example of a tabulation of existing space for classrooms, laboratories, and self-paced areas.

deficiencies in each category and type may result in space problems to be resolved. Care should be taken when analyzing space to keep categories and types separate. Many space types cannot be directly interchanged with others without modification -- a "quality of space" problem.

Using Worksheet 6, current and future needs for space from Worksheets 1 through 4 are summarized and compared to existing space listed on Worksheet 5. An example comparison is shown in Figure 17.

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COMPARISON OF SPACE NEEDS AND AVAILABILITY					
SPACE CATEGORY/TYPE	AVAILABLE		REQUIRED		EXCESS OR DEFICIENCY
	DATE	SQ. FT.	DATE	SQ. FT.	
<u>TRAINING</u>	<u>FY 81</u>		<u>FY 81</u>		
CLASSROOM		15,720		10,200	+5520
LABORATORY		6,200		18,000	-11,800
SELF-PACED		2530		6,200	
SEMINAR		0		300	-300
<u>OFFICES</u>	<u>FY 81</u>		<u>FY 81</u>		
ADMINISTRATIVE					
ARMY		8,000		7500	+500
CONTRACTOR*		500		1000	-500
NET		8500		8500	0
CONFERENCE					
ARMY		200		300	-100
CONTRACTOR*		0		100	-100
NET		200		400	-200

COMMENTS  
\* SPACE NEGOTIATED IN FY 81 CONTRACT.

WORK SHEET  
6

Figure 17. Example of a comparison of available and required space for certain categories.

## General Quality of Buildings

The purpose of this method is to evaluate the general characteristics of school buildings and identify qualitative problems that may exist. General characteristics are subdivided into two categories. The first is support services which are provided to the building or areas around it. The second is the general condition of the building, the areas around it, the subsystems within the building, and the arrangement of spaces.

Because the evaluation of the general conditions of school buildings involves many technical judgments, help in making those judgments may be

# IDENTIFYING PROBLEMS WITH SCHOOL FACILITIES **2**

(Phase 1)

obtained from school staff members and members of the master planning committee. In addition, DEH may have already completed an evaluation of the building structure, the subsystems, and the grounds under the Real Property Management System (RPMS). (More information on RPMS condition reports is given below and in Appendix E.)

How well a school performs its mission is affected by the general conditions of the school buildings. Such impacts can be direct. For example, water leaking into a room may make it unusable. Other impacts may be indirect. For example, because the general conditions in a school building are very poor, they may affect the attitude and performance of school staff and students.

Judgments about the quality of buildings may be influenced by personal biases. These biases may have to do with promotion potential, economics, political issues, or other factors. However, one way to minimize the impact of these biases is to obtain judgments from more than one individual.

Worksheet 7 is the checklist used during the general evaluation of school buildings. A variety of items are listed for judging the general character of items. Definitions of the three rating categories are given on the worksheet. In addition, space is provided for making comments to explain or justify judgments. An example of a completed general evaluation is shown in Figure 18.

An evaluation should be completed for each building. RPMS reports (Appendix E) already contain evaluations of certain items. The two significant reports are Deficiencies by Facility (RDF) and Deficiencies by Component (RDC). Schools should contact DEH to be placed on the distribution list for these two RPMS reports.

The arrangement of space within a school also can have a major impact on the efficiency and cost of school operations. For example, physical distance may create the need for extra equipment or staff, or, over the years, rooms within a school may be assigned to house functions for which they were not designed. Because spaces do not become available when needs arise, functional relationships among spaces are destroyed over the years. From time to time, it may be necessary to reassign space to create the functional relationships which best support school operations.

Although functional relationships are of primary concern for school operations, many other factors must be considered when reassigning space within a school. Key relationships are presented for each type of space in Part II. General relationships for school spaces are discussed in detail in Army Design Guide (DG) 1110-3-106.<sup>8</sup> Procedures for analyzing existing space relationships or projecting desired relationships are given in Appendix F.

## **Quality of Individual Spaces**

The purpose of this method is to identify what requirements exist for individual spaces and to determine how well those requirements are satisfied.

<sup>8</sup> Army Service Schools, Design Guide (DG) 1110-3-106 (DA, September 1976).

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GENERAL EVALUATION OF SCHOOL BUILDINGS				
ITEM	RATING*			DESCRIBE AND EXPLAIN PROBLEMS
	1	2	3	
<b>A. SUPPORT SERVICES</b>				
1. Janitorial		✓		
2. Rubbish Collection and Removal		✓		
3. Fire Protection		✓		
4. Snow, Ice and Sand Removal			✓	SAND ACCUMULATIONS AT WEST ENTRANCE KEYS IDEE FROM CLOTHING
5. Security				
<b>B. BUILDINGS</b>				
1. Roofing				
2. Structure			✓	FLOORING IN 2 <sup>ND</sup> FLOOR HALLWAYS CRUMBLING RAPIDLY
3. Floor Covering				
4. Exterior Painting		✓		SOUTH WALL PEELING
5. Interior Painting				
6. Heating				
7. Air Conditioning				
8. Plumbing				
9. Electrical			✓	WIRING WILL BE INADEQUATE FOR SELF-FACED EQUIPMENT
10. Equipment				
11. Utility Plant Equipment				
a. Water				
b. Air conditioning and refrigeration				
c. Heating				
d. Sewage				
e. Electrical				
* 1. Satisfactory condition 2. Needs some improvement or shows some sign of deterioration 3. Needs extensive improvement or shows extensive sign of deterioration				
COMMENTS			DATE	WORK SHEET 7a

Figure 18. Example of a completed evaluation of one school building.

Deficiencies between what is required and what exists are defined as problems which must be incorporated into an improvement program. Ideally, a functional evaluation should be completed for every space used in every school building.

Evaluating the quality of individual school spaces is the most labor-intensive task in this process. An individual may be assigned this duty on a regular, part-time basis. When evaluating space quality, the evaluator should ask the school staff for help since they are the ones who use the spaces regularly and are most likely to recognize functional problems which may not be apparent to a casual observer.

# IDENTIFYING PROBLEMS WITH SCHOOL FACILITIES 2

(Phase 1)

GENERAL EVALUATION OF SCHOOL BUILDINGS				
BLDG.	RATING <sup>a</sup>			DESCRIBE AND EXPLAIN PROBLEMS
	1	2	3	
12. Utility Systems a. Water b. Air conditioning and refrigeration c. Heating d. Sewage e. Electrical		✓		LOW PRESSURE AT TIMES.
13. Pavements a. Concrete b. Bituminous c. Other		✓	✓	SIDEWALK NEAR SOUTH ENTRANCE HAS RAISED. PAVING LOT HAS DEEP POT HOLES.
14. Trackage				
15. Ties				
16. Drainage			✓	WATER POOLS NEAR ENTRANCE WHEN IT RAINS, BLOCKING ENTRANCE.
17. Appurtenances a. For all except bridges b. For bridges				
18. Ground Cover a. Improved grounds b. Unimproved grounds			✓	AREA NORTH OF BUILDING TO BE GRASSED OUT.
C. SPATIAL ARRANGEMENT 1. Relationships Among Buildings 2. Relationships Within Buildings		✓		VEHICLE DROVE TO LAB BAYS CLOSED PERMANENTLY, HAZARDOUS.
* 1. Satisfactory condition 2. Needs some improvement or shows some sign of deterioration 3. Needs extensive improvement or shows extensive sign of deterioration				
COMMENTS			DATE	WORK SHEET 7b

Figure 18. (Cont'd).

An evaluation of individual spaces should determine both the functional and the technical quality of the space. Functional quality is concerned with how well a room or space and its features support the activities, people, and equipment it contains. Human performance, equipment performance, health and safety, security, satisfaction, and morale are other factors included in functional quality. Technical quality is concerned with whether materials and features in a space work properly.

A checklist can be used to help complete the evaluation of each school space. Worksheet 8 is an example of such a checklist (Figure 19). This worksheet is designed to fit on a double-page folded sheet (four sides). Ini-



# 2 IDENTIFYING PROBLEMS WITH SCHOOL FACILITIES

## (Phase 1)

SPACE EVALUATION CHECKLIST				
SPACE NAME NUMBER _____		DATE _____		
BUILDING _____		COMPLETED BY _____		
ROOM DIMENSIONS _____ L x _____ W x _____ H				
TYPE OF SPACE (circle)				
OFFICE	TRAINING	TRAINING SUPPORT	SHARED USE	
Administrative Office Spaces Conference Rooms Other _____	Classroom spaces/ Conference classrooms Laboratory spaces/ Instructional shops Laboratory - Classrooms Self-Paced Instruction Rooms Seminar Classrooms Auditorium/Theater Other _____	Instructor Preparation Areas Instructor Rerearsal Room Counseling Spaces Remedial Instruction Spaces Technical Library Study Areas Projection Rooms Other _____	Student Lounges Snack Bar/ Jending Areas Bookstore Latrines Janitor Closets Other _____  Mechanical Other _____	
REQUIREMENT	REQMT. EXISTS	REQMT. SATISFIED		COMMENT / PROBLEMS
		YES	NO	
A. <u>SPACE</u>				
(1. Size (amount of space))	✓	✓		SIZE OKAY
2. Dimenstions (L,W,H)	✓		✓	CAN'T ORGANIZE ACTIVITIES WELL
3. Shape				
4. Distance between columns				
B. <u>ACCESS/CIRCULATION</u>				
1. Seeing in or out				
2. Not seeing in or out				
(3. <u>Doors &amp; openings</u> )	✓	✓		
a. Dimensions				
b. Opening & closing				
c. Locks				
4. Distance to other spaces (cable runs, walking)				
a. Horizontal				
b. Vertical				
(5. <u>Access to other spaces</u> )	✓		✓	BRIEFING ROOM SHOULD HAVE DOOR OPENING TO HALL. NOW ONLY ENTRY IS THROUGH INSTRUCTOR OFFICE.
				WORK SHEET 8a

Figure 19. Example of a completed evaluation of one space.

ually, what is required in a space must be determined. Then, it must be established whether the requirement is satisfied by the conditions or features in the space. If a requirement is not satisfied, the problem or deficiency must be described.

Some requirements may be applicable to all repetitive spaces, such as classrooms or offices. The master planning committee may also want to establish its own basic or standard requirements for repetitive spaces. Standard requirements can be noted on worksheets before they are reproduced and used to evaluate particular spaces. Modifications can still be made for particular spaces of that type. The typical steps used to conduct evaluations of the quality of school spaces are:

# IDENTIFYING PROBLEMS WITH SCHOOL FACILITIES 2

(Phase 1)

REQUIREMENT	REQUIR. EXISTS	REQUIR. SATISFIED		COMMENT PROBLEMS
		YES	NO	
<b>C. UTILITIES AND WASTE</b>				
1. <u>Electrical Service</u>	✓	✓		
a. Voltage (110 assumed)				
b. Current				
c. Power				
d. Fluctuation limits				
e. Receptacle location				
f. Special controls				
g. Control locations				
-----				
2. <u>Water</u>	✓	✓		
a. <u>Cold</u>				
b. Hot				
c. Quantity				
d. Location				
-----				
3. <u>Solid Waste</u>	✓	✓		
a. Type of waste				
b. Amount or capacity				
-----				
4. <u>Sanitary Sewer</u>	✓	✓		
a. Capacity				
b. Location				
-----				
5. <u>Special Sewer or Waste</u>	✓		✓	MUST PROVIDE WASTE OIL COLLECTION SYSTEM TO STOP SPILLS FROM ENTERING SANITARY SEWER.
a. <u>Type of waste</u>				
b. Location				
c. Capacity				
-----				
6. <u>Special Gases or Fluids</u>	✓		✓	NEED OUTLET IN DAY #3 FOR THE CARBONAL MACHINE.
a. <u>Compressed air</u>				
b. Other gases				
c. Special fluids				
d. Pressure				
e. Capacity				
f. Location				
<b>D. ENVIRONMENTAL CONDITIONS</b>				
1. <u>Lighting</u>	✓	✓	✓	NEED TASK LIGHTING OVER PREP WORKS IN DAY #3
a. <u>General light level</u>				
b. <u>Task lighting</u>				
c. Controls				
d. Lighting quality				
-----				
2. <u>Sound and Noise</u>	✓		✓	SOME SOUND CONTROL BETWEEN DAYS WOULD HELP. IT'S DIFFICULT TO HEAR MANY TIMES.
a. Not being overheard				
b. Isolation from outside sounds				
c. <u>Control of speech interference</u>				

work  
sheet  
8b

Figure 19. (Cont'd).

1. Establish standard or minimum requirements for types of school spaces which are repetitive. Premark or preprint worksheets for those types of spaces.
2. Establish a user point of contact (POC) for each space to help conduct evaluations. (Note: One POC may be familiar with the use of a number of spaces.)
3. Complete a separate worksheet for each space.
4. File completed worksheets by building and room numbers for future analysis.

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REQUIREMENT	REQMT. EXISTS	REQMT. SATISFIED		COMMENT PROBLEMS
		YES	NO	
3. <u>Thermal Conditions</u> a. Comfort heating b. Comfort cooling c. Comfort ventilation d. Humidification e. Air movement f. Heating or cooling for equipment	✓	✓		
4. Air Quality a. Odor control b. Control of dusts c. <u>Control of gases or vapors</u>	✓	✓		VEHICLE EXHAUST SYSTEM DOESN'T ALWAYS WORK PROPERLY.
5. Radiation a. Shielding for ionizing b. Shielding for non-ionizing radiation				
<b>E. APPEARANCE/FINISHES/IMAGE</b>				
1. Floors a. Non-slip b. Static free c. Acid resistant d. <u>Maintenance &amp; cleaning characteristics</u> e. Appearance/image characteristics f. Heavy loads and traffic	✓	✓		NEW COATING MAKES CLEANING MUCH EASIER THAN BEFORE.
2. Walls a. Appearance/image characteristics b. Maintenance & cleaning characteristics c. <u>Special uses (charts, maps, etc.)</u>	✓	✓		A PLACE FOR TRAINING CHARTS IS NEEDED IN EACH RT. EASELS NOT INCLUDED OVER.
3. Ceiling a. Appearance/image characteristics b. Special provisions				
<b>F. COMMUNICATION</b>				
1. <u>Telephone instruments</u> 2. Dedicated lines (hot lines, data lines) 3. TV receptacles & lines 4. <u>Speaker system</u>	✓	✓		A TELEPHONE INTERCOM TO EACH BAY WOULD BE LESS DISTURBING TO CLASS THAN THE ONE SPEAKER SERVING ALL BAYS.

work sheet  
8c

Figure 19. (Cont'd).

To shorten the time needed to initially evaluate the quality of individual spaces in a school, a questionnaire may be substituted for a comprehensive evaluation. This questionnaire should be distributed to people who occupy and use school spaces. Those spaces identified by questionnaire responses or spaces where serious problems exist should be evaluated first. Eventually, all spaces should be checked carefully.

When a questionnaire is used, it should be brief, since its main goal is to quickly locate particular problems. An example questionnaire is shown in Figure 20. Because questionnaires often collect a lot of information which

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(Phase 1)

REQUIREMENT	REQUIREMENT EXISTS	REQUIREMENT SATISFIED		COMMENT / PROBLEMS
		YES	NO	
<b>G. STORAGE WITHIN THIS SPACE</b>				
1. Built-in a. Shelving b. Parts bins c. Closets				
2. Bulk Storage a. Floor area b. Dimensions				
<b>H. SPECIAL BUILDING FEATURES</b>				
1. Security a. Devices (safes, vaults) b. Hardware (locks, window bars, etc.) c. Wall construction				
2. Fire Protection a. Sensors (smoke, heat) b. Alarms c. Suppressions systems				
3. Health & Safety a. Eye wash fountains b. Emergency showers c. <u>Non-slip surfaces</u>	✓		✓	NEW FLOOR COATINGS HAVE REDUCED SLIPS AND FALLS.
4. Material Handling a. <u>Lifts</u> b. Cranes c. Elevators d. Ramps or docks	✓		✓	A SMALL LIFT SHOULD BE PROVIDED IN BAYS 102 WHEN NEW BUILDING CORNER IS STARTED.
5. Vibration a. Isolation				
6. Signage a. Identification Signs				
<b>I. FURNITURE</b>				
1. <u>Quantity and type</u> 2. <u>Appearance/Quality</u> 3. Operating Conditions or Features	✓		✓	2 METAL TABLES SHOULD BE PROVIDED PER BAY FOR DEMONSTRATIONS.

work sheet 8d

Figure 19. (Cont'd).

cannot be used, the evaluator should use questionnaires only to obtain a description of each problem, its location, and whether it exists now or will be coming up in the future. Data about respondents and their organizations are not needed. The typical steps used to prepare and analyze questionnaires are:

1. Draft questionnaire content. Prepare cover letter and/or distribution statement. Prepare camera copy.
2. Print questionnaire materials in sufficient quantities.

# **2 IDENTIFYING PROBLEMS WITH SCHOOL FACILITIES**

**(Phase 1)**

SCHOOL FACILITY QUESTIONNAIRE

Background

We want to improve our school facilities. We think you can help us identify problems that need attention. We are interested in those which exist now or may come up in the future.

School facilities include the buildings themselves, areas around them, building services as well as particular interior rooms and exterior spaces. The following questions may help you think of some problems with our school facilities.

1. Do problems adversely affect activities, performance, or productivity for you? For your group?
2. Do building features or furnishings and equipment work? Properly?
3. Are there any safety hazards? Security problems?
4. What could be done to make the school a more pleasant place?
5. Do the right kinds of spaces exist? Are they arranged well?

Instructions

1. In the space below, please identify problems with school facilities that you know about. Obviously, you will know more about the areas in which you work, but do not restrict yourself to problems in those areas of the building. For each problem, please:
  - a) Describe the problem briefly,
  - b) identify the location where the problem exists,
  - c) state whether the problem is a future one.
2. If you need more space, use the backside of this sheet, or call \_\_\_\_\_ for additional copies.
3. Thanks for your help. We want to make our school facilities the best and keep them that way.

THE MASTER PLANNING COMMITTEE

<u>PROBLEM DESCRIPTION</u>	<u>LOCATION/FUTURE</u>
----------------------------	------------------------

Figure 20. Sample questionnaire for identifying problems with school facilities.

3. Distribute questionnaires to all faculty and staff members and a sample of students. Try to make student samples representative by selecting some from each school building or area of a building.

# IDENTIFYING PROBLEMS WITH SCHOOL FACILITIES **2**

(Phase 1)

4. When questionnaires are returned to a central point, tabulate results. Organize tabulations by type of problem and list each location where a problem exists. Keep future problems separate from current ones.
5. Use data to help develop an improvement program.
6. Provide feedback to school personnel about questionnaire results.

When conducting space evaluations, consideration must be given to how much time and support are available. If time is short and help is minimal, start with the questionnaire approach.

To assure that functional problems are identified, it is essential that one or more users be involved in evaluating each space (using Worksheet 8).

When evaluating shared spaces, it may be necessary to involve a representative sample of users. For example, a student lounge should be evaluated with the help of several students. A snack bar should be evaluated by a sample of people who use the snack bar, as well as by the food service organization which operates or services the snack bar.

Spaces used to house mechanical equipment for the building or spaces used by custodial services need only be evaluated if problems are known to exist or if an impact on school operations is apparent. However, if these spaces are evaluated, it is important to involve the users in the evaluation.

# DEVELOPING AN IMPROVEMENT PROGRAM <sup>3</sup>

(Phase 2)

Figure 21 shows how improvement planning is completed during Phase 2. First, problems identified in Phase 1 are grouped into improvement projects. Preparations are then made for implementing these projects: that is, cost estimates are obtained, the steps and approvals necessary for each project are identified, available funds are identified, priorities are set, and project schedules are plotted so that progress can be monitored to completion. By the end of Phase 2, all project planning should be completed. Solutions are not developed in Phase 2. Solutions are prepared or project designs are completed during Phase 3.

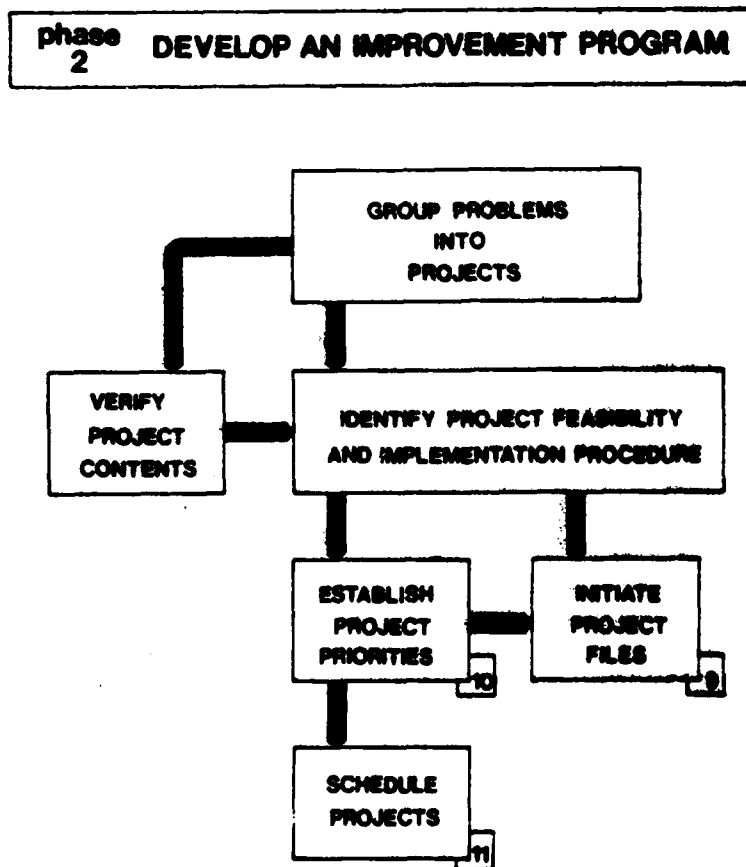


Figure 21. Overview of Phase 2 activities (numbers refer to worksheets associated with activities).

## Converting Problems into Projects

The purpose of Phase 2 is to organize and group similar problems so that they can be handled as a project. A project is defined as a group of similar or related problems which are to be resolved.

# **3 DEVELOPING AN IMPROVEMENT PROGRAM**

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## **(Phase 2)**

School staff people with knowledge of or experience with funding sources, facility maintenance, improvements or new projects, or space management can help in school planning. People with such experience are most likely to be found in the executive staff, in the Directorate of Support, or in the Directorate of Training at the installation. DEH should be able to help solve most facility problems, since its personnel represent a variety of technical backgrounds. The Military Construction Division or Branch also has people who are familiar with building problems. DIO should be able to help define furniture and school equipment problems, e.g., maintenance, refurbishing, or procurement.

Help and guidance in dealing with special kinds of school problems also may be available at higher command levels. For example, at TRADOC Headquarters, help may be available from or through Deputy Chief of Staff for Training (DCST) (see Table 1). Initial contacts may be made through the Resident Training Directorate, which has a coordinator assigned to each school.

### **Instructions**

#### **General**

Facility problems identified in Phase 1 should be grouped into projects. Problems are grouped into a project because they require similar actions to complete improvements, because accounting regulations govern what funding categories may be used, or because the problems are all in one room or area of a building. For example, the need to improve flooring in several buildings may result in a flooring improvement project. In another case, a furniture painting and modernization project may be formed to deal with many furniture problems because furniture maintenance falls under a single funding category.

The facility problems identified in Phase 1 should generally be grouped according to the categories under which they will probably be funded (see Table 1 for category descriptions).

If a preventive maintenance group exists within the school, its chief should help the school planner identify the kinds of problems the group can respond to (see Table 1). If a preventive maintenance organization exists within the school staff, those items which can be completed under that program should be removed from the problem list tabulated during Phase 1.

#### **Quantity of Space**

Initially, alternatives for resolving the excess or deficiency of spaces identified on Worksheet 6 must be developed and evaluated. These alternatives do not have to be complete solutions.

A special study may be required on how to reallocate space, since the functional arrangement of space, the feasibility of using available types of



# DEVELOPING AN IMPROVEMENT PROGRAM **3**

(Phase 2)

Table 1

Funding Categories\* and Sources of Help for School Improvement Projects

<u>Funding Category</u>	<u>Description</u>	<u>Organization</u>
1. OPERATIONS AND MAINTENANCE, ARMY (O&MA)		
A. <u>Training Activities</u>		
(1) School operations	Conducting military training, including consumer procurement, supplies and equipment, school libraries. Preventive maintenance support may exist within the school staff.**	School Commandant
(2) Installation training support	Production of training devices, publications, and educational TV; installation of a training and audiovisual support center; training development and evaluation.	School Commandant
(3) Army training support	Management and operational guidance to Army training and audiovisual support centers.	U.S. Army Training Support Center
(4) HQ TRADOC	Management and operational guidance to schools and centers	HQ TRADOC
B. <u>Base Operations</u>		
(1) Supply operations	Purchasing and contracting services; purchase operating supplies and equipment; receiving, storing, issuing, and controlling supplies and equipment.	DIO
(2) Maintenance of material	Provides for DS and GS maintenance of troop and operating equipment, including Commodity Group Equipment (furniture and office machines/equipment) and audiovisual equipment.	DIO

\*See note on last page of this table.

\*\*See note on last page of this table.

# 3 DEVELOPING AN IMPROVEMENT PROGRAM

## (Phase 2)

Table 1 (Cont'd)

<u>Funding Category</u>	<u>Description</u>	<u>Organization</u>
(3) Operation of utilities	Production and distribution of utilities (water, sewer, steam, hot water, electricity, air conditioning and refrigeration).	DEH
(4) M&R	M&R real property, including design costs and excluding minor construction.	
a. Utilities	M&R of distribution systems (generally up to the building line) for water, sewer, electric (including street and exterior lighting); steam and hot water, air conditioning and refrigeration (including fan coil units and small window units); ventilation; fire alarm; and instruction systems.	
b. Buildings	M&R of structural roofing, interior plumbing, electrical and heating systems (including elevators, covered walks, and exterior and interior painting).	
c. Grounds	Maintenance; repair of grass, ground cover, landscape and windbreak plantings, crushed rock and gravel blankets, accessory drainage, and dust control.	
d. Surface area	M&R of roads, airfield pavements, parking areas, open storage areas, and walks.	
e. Miscellaneous	M&R of fences, flagpoles, and training facilities (other than buildings), and fabrication of signs.	
C. <u>Minor Construction</u>	Small-sized projects involving erection***, installation, or assembly of real property facilities;	DEH (DEH may obtain design services from organizations in the area,

\*\*\*See note on last page of this table.

# DEVELOPING AN IMPROVEMENT PROGRAM **3**

(Phase 2)

Table 1 (Cont'd)

<u>Funding Category</u>	<u>Description</u>	<u>Organization</u>
	the addition, expansion, extension, alteration, conversion, or replacement of existing real property facilities (includes design costs and excludes minor construction projects under MCA).	from the Corps of Engineers or General Services Administration
D. <u>Other Engineering Support</u>	Expenses for miscellaneous real property service such as fire protection (including procurement, replacement, and installation of fire extinguishers, testing and inspection of equipment and systems); refuse collection and disposal, pest control services (fungi, rodents, birds, and insects) within and around buildings; custodial and janitor services; snow and sand removal; and ice alleviation.	DEH
2. MILITARY CONSTRUCTION - ARMY (MCA)		
A. <u>Major Construction</u>	Construction of military facilities and acquisition of real estate (generally large projects***).	Corps of Engineers (request made through DEH and HQ TRADOC).
B. <u>Minor Construction</u>	Construction and modification of military facilities (generally medium-sized projects not involving totally new facilities***).	Corps of Engineers (requests made through DEH and HQ TRADOC).
C. <u>Supporting Activities</u>	Construction of access roads.	Corps of Engineers (requests made through DEH).

\*\*\*See note on last page of this table.

# 3 DEVELOPING AN IMPROVEMENT PROGRAM

## (Phase 2)

Table 1 (Cont'd)

<u>Funding Category</u>	<u>Description</u>	<u>Organization</u>
D. <u>Design</u>	Design of MCA projects.	Corps of Engineers (provided for approved projects).

\* Funding categories are derived from AR 37-100-79.

\*\* Preventive maintenance is part of the Real Property Maintenance Activity (RPMA) in the Army (AR 420-22). Within a school staff, skilled individuals may be assigned to preventive maintenance activities, and, thus, be a resource for accomplishing improvements within preventive maintenance guidance provided by DEH.

\*\*\* Renovations, additions, and new facilities funded by O&MA or MCA are covered by Army regulations which define the size or cost for a project and the approvals required. Because these regulations change occasionally, assistance from DEH is recommended in determining what funding sources are available and what projects would meet the limitations placed on specific categories. For general information purposes, the projects have been called small, medium, and large in this table.

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space for other purposes, the need to relocate partitions, and other factors must be considered. Some guidance is provided below and in Part II. For larger projects, economic analysis of alternatives may be required (Appendix G).

Three approaches can be used to develop space quantity alternatives. The first is to have someone in the school staff prepare them. The second is to have someone from outside the school staff prepare them. The third is a combination -- school personnel working with outside help. For either the second or third approach, outside help can come from DEH or from a designer contracted by DEH for the school. Additional help may be available from the MACOM or from a Corps of Engineers district office. Once alternatives are developed, they are evaluated. The best alternative becomes an improvement project.

Major funding for changes in space (relocating partitioning, alterations, renovation, or new construction) would most likely come from the funding categories listed under 1.C, 2.A, 2.B, or 2.D in Table 1.

### **Special Arrangement and Reuse of Space**

An important consideration in the allocation of space is how spaces and rooms are arranged or grouped relative to each other. For school operations, a spatial arrangement should be based on how activities and organizational

# **DEVELOPING AN IMPROVEMENT PROGRAM**

## **(Phase 2) 3**

units tie together and on how people, material, equipment, and information flow among these units. Accomplishment of the mission should be the driving force behind spatial arrangement. If spatial arrangement was not considered when school problems were identified, it must be considered when assigning excess space or when reallocating space. Instructions for defining relationships are given in Appendix G. Information about space relationships is given in Part II.

Before space problems can be resolved into alteration, renovation, or new construction projects, the feasibility of reallocating space or of using excess space for some purpose other than that for which it was designed also must be considered. There is no simple rule stating that space of one type can be used directly for another purpose. A change in function often requires that the characteristics and features of a space be modified. Even reassignment of the same type of space to a new organization or course may require changes to a room. Necessary modifications are identified by comparing the space's predicted requirements to its existing characteristics and features. Necessary modifications should be included in the project description. Once all problems to be resolved and all changes are listed for a product, alternative solutions for the project must be developed and cost comparisons made.

### **General Quality of School Buildings**

Problems regarding the general quality of school buildings which are common to two or more buildings can be grouped into a single improvement project. Different kinds of problems for a single building can also be grouped into a project. DEH can help solve general quality problems, particularly those already listed in RPMS reports (Appendix E).

The funding categories listed in Table 1 which are most likely to support projects dealing with the general quality of school buildings are 1.B(4)a through e, 1.D, and 2.C.

### **Quality of Individual Spaces**

Problems with individual spaces can be grouped in a variety of ways to form projects. Depending on the frequency with which certain kinds of problems occur and where they occur, problems can be grouped according to type of space or according to requirement categories (Worksheet 8). For example, all classroom problems or all lighting problems might be grouped into a project.

The funding categories in Table 1 which are most likely to support projects dealing with the quality of individual spaces are 1.D or 1.B(4)a, b, and e.

Modifications or changes to school furniture and equipment should be grouped into a separate project or projects. Funding categories which are most likely to support procurement and maintenance of furniture and equipment are listed under 1.A(1), 1.A(2), 1.B(1), and 1.B(2) in Table 1.

# **3 DEVELOPING AN IMPROVEMENT PROGRAM**

## **(Phase 2)**

### **Economic Analysis**

When solving school facility problems, primarily space problems, a variety of alternatives are available including alteration, renovation, locating available space on the installation, leasing space, or building new facilities. Both cost and functional requirements are used to establish the feasibility of an alternative. AR 11-28, which requires that economic analysis be applied to the allocation of Army resources, provides some methodology and guidance.<sup>9</sup> Economic analysis used during school planning is part of the process for selecting final alternatives. The level of detail and time spent in economic analysis is to be commensurate with the size of a project. Economic analysis is used during school planning as part of the process for selecting final alternatives.

Appendix G gives some guidelines for completing economic analysis for school facility improvement projects.

### **Summary**

After problems have been organized into projects, consideration can be given to numbering projects (for school use only) and beginning to organize all project information into general housekeeping files (AR 340-18-1).<sup>10</sup> General housekeeping files usually have a two-line label. For example:

101-02 Office General Management Files

(Project Identifying Number and Project Name)

### **Identifying Project Feasibility and Implementation Procedures**

The purpose of this activity is to prepare for project initiation by determining whether projects are well organized, whether funds are available, what steps and procedures are necessary to move projects from start to completion, and what projects might cost.

Some persons within the school staff may have had previous experience with school improvement projects, with space management in schools, or with the procurement of furniture and equipment. If such individuals can be located, they can help identify procedures which must be followed or explain how to obtain cost estimates. Personnel within DEH also should be able to help plan the steps necessary to complete a project, identify the availability of funds, and help obtain cost estimates or design services.

Personnel in DIO operations may help define procedures for purchase or M&R of equipment and furnishings. They can also help obtain cost estimates.

<sup>9</sup> Economic Analysis and Program Evaluation for Resource Management, AR 11-28 (DA, 2 December 1978).

<sup>10</sup> The Army Functional File System: General Revisions, AR 340-18-1 (DA, 14 August 1969).

# DEVELOPING AN IMPROVEMENT PROGRAM **3**

(Phase 2)

If furniture style and color are to be included in an overall improvement plan, interior design services (obtained by the school or through DEH) could help the school planner select furnishings and prepare a detailed cost estimate. Furniture color and finish recommendations are included in Chapter 6.

After funding is authorized for certain projects, it may be appropriate to convert the labels on project files to satisfy DEH regulations (AR 340-18-15).<sup>11</sup>

Table 2 should be used to determine project procedural and funding information. POCs in control of funding sources should be established within the school or other organizations. Their help will be needed to answer checklist questions.

Problems within projects should be reorganized (or revised), as needed. POCs can help the school planner determine which projects should be reorganized to better correspond to funding categories and to the rules governing the use of funds. After the school planner gains some experience in organizing projects and learning what procedures are required, the need to revise draft projects should be reduced.

Cost estimates should be completed for each project. POCs may explain how to prepare estimates or identify who can help. Cost comparisons may also be required (Appendix G).

## **Planning and Scheduling Projects**

The purpose of this activity is to establish priorities for feasible projects and to plan and schedule projects so their implementation can be monitored.

A project data sheet (Worksheet 9) must be completed for each project. The project data sheet lists key information about a project. Most information is collected using the Project Feasibility Checklist (Table 2). An example of a completed Worksheet 9 is shown in Figure 22.

Priorities should be established for all projects. The master planning committee should evaluate the importance of each project and its impact on school operations. Priorities should be submitted to the school commandant for concurrence. For the convenience of the school master planning committee, key project information can be tabulated on Worksheet 10. An example of a completed Worksheet 10 is shown in Figure 23. A draft project schedule may also be completed (see below) to help evaluate the importance of projects and the significance of project completion times.

After priorities have been established, a final project schedule should be prepared for all projects which are to be implemented. The project schedule keeps track of the progress of each project from start to finish. The project schedule can be either page or wall-chart size. A page-size

<sup>11</sup>Maintenance and Disposition of Facilities Functional Files, AR 340-18-15 (DA, 15 August 1981).

# **3 DEVELOPING AN IMPROVEMENT PROGRAM**

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## **(Phase 2)**

Table 2

### Project Feasibility Checklist

After initially organizing problems into projects, their feasibility must be checked and the steps to complete them must be determined. The questions below will help gather key information about the potential success of projects from organizations in charge of project funds or project procedures.

#### A. Organization of Projects

1. Are problems logically grouped into projects?
2. Should projects be combined or subdivided for some reason?
3. Do projects and problems within them correspond correctly to funding sources?
4. Do projects need to be completed in stages to avoid disruption of school activities?

#### B. Funding

1. Are funds available for projects? When?
2. What factors influence whether these projects will be funded? What criteria are used to allocate funds in these categories? What local, MACOM, or DA constraints affect distribution of funds in these categories?
3. What additional information or justification from the school is necessary or would help obtain funds?
4. If projects cannot be funded from accounts thought feasible, where might funds be available?
5. Is it possible that year-end funds will be available for projects? How is the availability of year-end money monitored?

#### C. Procedures

1. What steps are necessary to initiate, justify, design, procure, obtain bids, and/or complete each project?
2. How long will each step take?
3. Who will complete each step? Are there costs involved? Who will pay for it?



# DEVELOPING AN IMPROVEMENT PROGRAM **3**

(Phase 2)

Table 2 (Cont'd)

C. Procedures (cont'd)

4. What forms, documents, or letters must be submitted or completed? By whom? What format?
5. What coordinations or approvals are needed?
6. If year-end funds might be available, what must be done so they can be used on short notice?

D. Cost Estimates

1. How can a cost estimate be developed with reasonable accuracy?
2. Is any help available in preparing cost estimates? From whom? Is there a charge? Who pays for it?
3. Is an economic analysis required?

E. Design (see Question C1 above)

1. Are designs, drawings, specifications, or lists of materials needed for certain projects? Which ones?
2. Who is responsible for initiating, procuring, or preparing them? Who pays for design services?
3. What design resources are available? On the installation? In the area? In the Army? In the Government?

F. Points of Contact

Who is the POC in the supporting organization for the project? For each step in the project?

# 3 DEVELOPING AN IMPROVEMENT PROGRAM

(Phase 2)

<b>PROJECT DATA SHEET</b>		SCHOOL FT. GREEN, MP SCHOOL			
COST ESTIMATED <u>20,000</u> ACTUAL _____		PROJECT TITLE/NUMBER RENOVATION OF SECOND FLOOR, BUILDING 3255			
PRIORITY <input type="checkbox"/> 1 URGENT <input checked="" type="checkbox"/> 2 NEEDED <input type="checkbox"/> 3 DESIRABLE					
FUNDING	AVAILABLE? <input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> MAYBE (explain) _____	WHEN? <u>FY 81</u>	SOURCE? <u>FE</u>		
RESOURCES	ORGANIZATION	POC/PHONE	STEP/IS		
	DFAE - XX DESIGNER	X 1234 RALPH CARPENTER ART BROWN ASSOC. 789-5555	1, 3-5  2		
STEPS AND TIME (FROM INITIATION TO COMPLETION)					
STEP	EST. TIME TO COMPLETE	ACTUAL TIME		COST	ACCOUNT
		START	FINISH		
1. PREPARE & SUBMIT FORMS; GET APPROVAL ON PROJECT	2 WKS	FEB 1	MAR 31		O&MA DFAE
2. COMPLETE DESIGN	6 WKS	APR 1	MAY 15	\$1,000	
3. REMOVE & BUILD NEW PARTITIONS, MODIFY UTILITIES, ETC.	4 WKS	JUNE 1	JUNE 30	9,000	
4. INSTALL CEILING	1 WK	JULY 1	JULY 8	2,500	
5. INSTALL FLOOR	1 WK	JULY 9	JULY 16	4,000	
6. PAINTING AND FINISH CARPENTRY	2 WKS	JULY 17	JULY 31	3,500	
7. OCCUPANCY		AUG 1			
TOTALS	22 WKS			\$20,000	
COMMENTS				WORK SHEET 9	

Figure 22. Example of a completed Worksheet 9.

# DEVELOPING AN IMPROVEMENT PROGRAM.

(Phase 2)

PROJECT PRIORITY WORKSHEET		SCHOOL FT GREEN, M P SCHOOL						
PROJECT		FUNDS AVAILABLE			MONTHS TO COMPLETE	PRIORITY*		
NUMBER/TITLE	BRIEF DESCRIPTION	YES	NO	MAYBE		1	2	3
5	REBUILDING OF AUDITORIUM		✓		6			✓
6	PAINT CLASSROOMS, 3 <sup>RD</sup> FLOOR, BLDG 3219	✓			3		✓	
7	UPGRADE ELECTRICAL SERVICE, BLDG 3015	✓			4	✓		
8	REMODELING OF 2 <sup>ND</sup> FLOOR BUILDING 3219			✓	8	✓		
9	REFURBISH METAL FURNITURE BLDG 3219			✓	3		✓	
10	UPDATE OUTDOOR ACCIDENT INVESTIGATION AREA	✓			5	✓		

\*1.URGENT: School mission is severely affected. 2.NEEDED: School mission is affected but can be accomplished. 3.DESIRABLE: Of some value to school mission and quality of the school.

COMMENTS	WORK SHEET 10
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Figure 23. An example of completed Worksheet 10.

chedule is given in Worksheet 11. Figure 24 illustrates its use. If the project schedule is to be a wall chart, art groups in the Directorate of Training Development may be willing to help prepare it.

Because of its broad representation of school organizations and activities, the master planning committee should be able to recognize project impacts and use them as a basis for ordering project implementation. Identifying, discussing, and resolving such impacts is a critical step in the improvement process.

Contingency plans for dealing with important projects for which funding is not available and with projects which cannot be completed in time to satisfy a current or future need should be considered when assigning project priorities. The issue is: "What can be done to alleviate problems for which immediate solutions are not available?" Of primary concern are high-priority improvements which appear difficult to achieve.

# 3 DEVELOPING AN IMPROVEMENT PROGRAM

(Phase 2)

SCHEDULE & STATUS OF IMPROVEMENT PROJECTS		SCHOOL MP SCHOOL, FT GREEN	DATE 6/79
PROJECT / STEP	% COMPLETE	TIME	
		FY 79	FY 80
		O N D J F M A M J J A S	O N D J F M A M J J A S
15. SECOND FLOOR RENOVATION			
1. FORMS & APPROVALS			
2. DESIGN			
3. PARTITIONS, UTILITIES			
4. CEILING			
5. FLOORING			
6. PAINTING, FINISH WORK			
7. OCCUPANCY			
17. FURNITURE REFURDISHING, DIR OF TRAINING DEVEL			
1. SUBMIT REQUEST			
2. PREPARE SCHED W/CHTR/DC			
3. REFURDISHING			
→ COMPLETION			
COMMENTS			WORK SHEET 11

Figure 24. An example of projects scheduled on Worksheet 11.

# IMPLEMENTING AND UPDATING A PROGRAM <sup>4</sup>

(Phase 3)

Figure 25 shows the basic steps required to complete a project. First, projects must begin to move through the steps defined for them in Phase 2. Then, these actions must be monitored to insure they are proceeding as planned (even though responsibility for completion may not belong to the school).

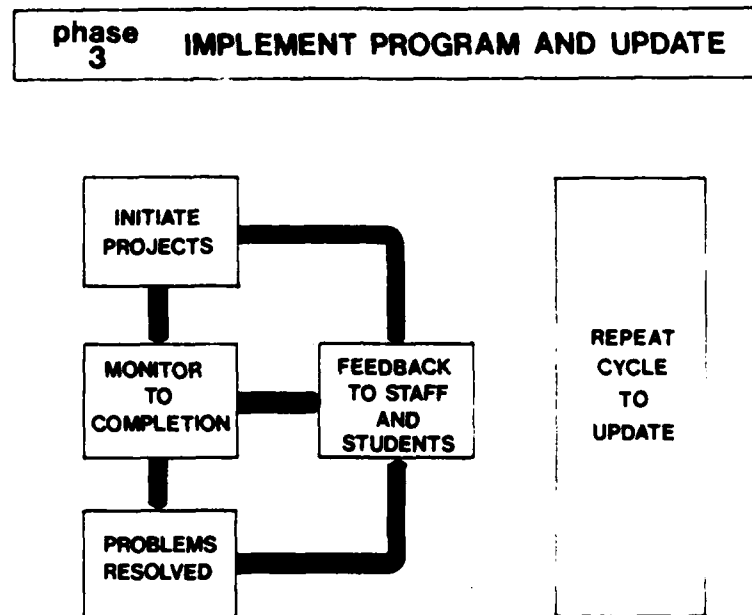


Figure 25. Overview of Phase 3.

## Implementing and Monitoring Improvement Projects

The purpose of this activity is to begin projects (or steps within projects) and to monitor project progress.

The project priorities established during Phase 2 should be used to determine which projects (or steps within a project) to begin first. Action should follow the steps listed on the project data sheet (Worksheet 9) and the project schedule (Worksheet 11).

After action has begun on a project or project steps, the POCs should be asked to help monitor project progress and/or to help resolve unexpected problems.

Since project actions may be completed earlier or later than planned, projected completion dates for subsequent steps should be revised as needed.

## **4 IMPLEMENTING AND UPDATING A PROGRAM**

### **(Phase 3)**

A project file which lists all significant project items such as correspondence, phone calls, memos, data sheets, etc., should be maintained until the project is completed.

Students and staff should be kept advised of project progress. Since they helped identify the original school facility problems, their feedback on how a project is affecting those problems is important. Besides helping them to feel that their contributions during the project planning stage were valuable, this will encourage them to participate in future "problem identification" campaigns.

Project updates should be given to students and staff even if they were not involved in problem identification. Keeping staff and students informed about what is going on around them will help prevent negative reactions to improvement projects. For example, if a project is being completed in phases as funds are available, its intermediate stage may look like a bad final solution to those unaware of the project's long-term goals.

Disposition Forms (DFs), information bulletins, bulletin boards, and special displays can be used to update students and staff about project progress and goals.

Chapter 1 explained how the master planning committee can help maintain long-term continuity in school improvements. During Phase 3, the master planning committee can help integrate the appearance of various modification projects by standardizing the colors of furnishings, partitions, walls, and floors throughout buildings. They can also help identify areas where house-keeping would improve appearance. This will eliminate "hodge-podge" solutions resulting from piecemeal improvements or unlimited choices.

### **Updating the Improvement Plan**

The purpose of this activity is to identify *new* problems and to develop, plan, schedule, and implement *new* improvement projects.

The space needs analysis conducted during Phase 2 should be updated annually. All directorates that have responsibility for the school and its operations should participate in this update. At midyear, review projections of future needs for training and training support should be made by the school's Director of Training Development.

An evaluation of the general quality of each school building and the quality of its individual spaces should be completed at least once every 2 years. These evaluations can be phased so that about 50 percent of a school's buildings and spaces are evaluated annually.

Staff and students should be asked to reevaluate school problems at least once a year. This reevaluation may be done using the formal questionnaire described in Chapter 2 (Figure 19), or by having a member of the school planning committee monitor maintenance request forms.

# **IMPLEMENTING AND UPDATING A PROGRAM 4**

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**(Phase 3)**

Project schedules should be updated annually on the basis of newly identified problems.

An annual improvement plan should be prepared by the master planning committee, based on the evaluation steps described above.

# APPENDICES

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# APPENDIX A

## Master Planning Committee

This appendix describes the typical membership, goals, and responsibilities of a service school master planning committee. This description may be modified to meet local school needs.

### Members

The master planning committee is usually composed of an odd number of members (not to exceed nine). The membership should broadly represent all school directorates and elements. Members should have a good understanding of the operations and opinions of the group they represent. They should have some experience with Army building improvement or procurement, and have some training in architecture, engineering, or planning (not mandatory). They must be able to serve on the committee for no less than 1 year. Longer tenure for at least some members will help insure project continuity. A student may also be included on the committee. If students are generally not at the school long enough to meet the 1-year requirement, someone who can represent the perspective of students could be given committee membership. A representative from the installation DEH (preferably from the master planning branch) can serve as a full or an advisory member. A DIO representative who is familiar with furniture and equipment procurement should be included in at least an advisory capacity. The chairman of the master planning committee should be the school planner. The school planner must be familiar with planning data and day-to-day planning activities.

### Objective

The service school master planning committee helps the school commandant insure that school facilities are attractive and functional, effectively support current and future missions, and meet the needs of faculty, staff, and students.

### Responsibilities

The school master planning committee will:

1. Establish and maintain standards of excellence for the school environment.
2. Prepare and periodically update a master plan for improving school facilities.
3. Conduct a regular program for determining deficiencies and problems with existing school facilities.
4. Provide continuity, insure commonality, and help achieve conformance with school standards and the school master plan by reviewing requests regarding allocation and use of school spaces and grounds, modifications to school facilities and grounds, or furniture procurement or refurbishing. Review criteria will include aesthetics, function, need, durability, and maintenance.

## **APPENDIX B**

### **Office Space Standards**

Some Army and Federal space standards for administrative offices are reproduced in this appendix. For more details, cited references should be consulted.

#### **Standards Based on Pay Grade**

Tables B-1, B-2, and B-3 list Army and Federal space standards based on individual pay grades. These standards are useful in estimating space needs by the Rule-of-Thumb Method (Appendix C).

#### **Standards Based on Furniture and Equipment**

Office space requirements can be estimated based on the equipment and furnishings used in a space (see the explanation of the Analytical Method in Appendix C). The space allowances in Table B-4 include space required by items themselves as well as that needed to use, operate, and move among them (circulation). If equipment items that will be in an office do not appear in Table B-4, use the space allowance for a similar item or refer to Appendix C.

#### **Overall Office Space Allowances**

DOD Construction Criteria Manual 4270.1-M establishes space criteria for the total office space in a building. The total office space requirements of an Army service school should be checked against these standards (Table B-5).

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# APPENDIX B

## Office Space Standards

Table B-1

Private Office Space Allowance (From AR 1-21)

P-1	Secretary of the Army Chief of Staff Undersecretary of the Army Assistant Secretaries of the Army Director of Civil Defense Vice Chief of Staff	600 net square feet
P-2	Administrative Assistant to the Secretary of the Army General Counsel of the Army Deputy Undersecretaries of the Army Deputy Assistant Secretaries of the Army Deputy and Assistant Chiefs of Staff Heads of Directorates, Commands, Offices, Bureaus, and Agencies reporting directly to positions in P-1. Executive Assistants in Grade GS-18 or equivalent.	400 net square feet
P-3	Executive Assistants in Grades GS-17 and GS-16 Division Heads in Grade GS-16 or Brigadier General and above; comparable positions. Deputies to positions in P-2 category.	300 net square feet
P-4	Division Heads in Grades GS-15/14 (or Colonel) who require private offices; comparable positions. Branch Heads in Grades GS-15/14 (or Colonel) who report to Division Heads in P-3 category and require private offices; comparable positions. Deputies to positions in P-3 category who require private offices. Professional or administrative personnel in Grade GS-16 (or Brigadier General and above) who require private offices.	200 to 225 net square feet
P-5	Division Heads in Grade GS-13 or Lieutenant Colonel who require private offices; comparable positions. Branch Heads in Grades GS-15/14/13 (or Colonel and Lieutenant Colonel) who report to Division Heads in P-4 category and require private offices; comparable positions. Professional or administrative personnel in Grades GS-15/14 (or Colonel) who require private offices.	150 net square feet
P-6	Branch Heads in Grade GS-12, Major, and below who require private offices; comparable positions. Professional or administrative personnel in Grade GS-13, Lieutenant Colonel, and below who require private offices.	100 net square feet

## APPENDIX B

### Office Space Standards

Table B-2

Open Office Space Allowances (From AR 1-21)

<u>Space Category</u>	<u>Assignment</u>	<u>Allowance (Net Square Feet)*</u>
0-1	Unit Supervisors in Grade GS-9, E-8, WO, 01, or above who supervise six or more employees.	110
0-2	Professional and administrative personnel in Grade GS-7, E-8, WO, 01, or above.  Unit Supervisors in Grade GS-8, E-7, or below who supervise six or more employees.	90
0-3	Clerical, stenographic, and all other personnel	60

\*Space allowances include space for furniture and equipment normally associated with the position. Open office space allowances include a circulation or layout factor.

Table B-3

Work Station Space Allowances for General Schedule Personnel  
(From Federal Property Management Regulation, 41 CFR 101-17.3)

<u>Grade</u>	<u>Type of Assignment</u>	<u>Office Space (Square Feet Per Person)</u>
GS 1 to 6	--	60
GS 7 to 11	Nonsupervisory	75
GS 7 to 11	Supervisory*	100
GS 12 to 13	Nonsupervisory	100
GS 12 to 13	Supervisory	150
GS 14 to 15	Nonsupervisory	150
GS 14 to 15	Supervisory	225
GS 16, 17, and 18	Nonsupervisory	225
GS 16	Supervisory	300
GS 17	Supervisory	350
GS 18	Supervisory	400

\*Supervisory means supervision of or frequent meetings with three or more employees within the confines of the office.

# APPENDIX B

## Office Space Standards

Table B-4

Unit Equipment\* Space Allowances  
 (From AR 1-21 and Federal Property Management Regulations [41 CFR 101-17.304-2])

Item	Square Feet**
Bookcase, 13 x 33.....	6
Bookcase, unitized, 22 x 18.....	4
Cabinet, storage and wardrobe, 18 x 24.....	6
Cabinet, storage and wardrobe, 18 x 36.....	9
Cabinet, storage and wardrobe, 24 x 36.....	11
Cabinet, stationery, 18 x 36.....	9
Cabinet, filing, letter size, 15 x 25.....	6
Cabinet, filing, legal size, 18 x 25.....	7
Cabinet, filing, safe, 19 x 28.....	9
Cabinet, filing, map and plan, 36 x 48.....	24
Cabinet, filing, map and plan, 36 x 60.....	30
Chair, side.....	4-6
Chair, lounge.....	10
Costumer.....	4
Credenza, 18 x 66.....	15
Locker, clothing, 18 x 21.....	6
Locker, clothing, 36 x 21.....	19
Safe, two door, 42 x 36 = 18; one door, 42 x 36 = 10; one door, 21 x 23 = 8.....	
Sofa.....	30
Stand, dictionary.....	4
Stand, office machine, 18 x 18.....	5
Stand, office machine, 18 x 34.....	9
Stand, office machine, 24 x 36.....	12
Table, 14 x 26.....	4
Table, 24 x 36.....	12
Table, 34 x 45.....	24
Table, 34 x 60.....	30
Table, 36 x 72.....	35
Valet Rack, 30 x 20.....	8
Valet Rack, 51 x 20.....	14
Shelving, 12 x 36.....	9
Shelving, 18 x 36.....	10
Shelving, 24 x 36.....	11

\*The term "unit equipment" refers to those items of furniture and equipment housed in open office space which are not assigned to any one open work station, but are used by a number of individuals.

\*\*Working area is included where appropriate. The space requirements for items not listed may be calculated from actual measurements or by using the items below as a guide.

# APPENDIX B

## Office Space Standards

Table B-5

### DOD Space Criteria for Administrative Facilities (From DOD 4270.1-M)

Net floor area*	115 square feet (minimum)
per building occupant	130 square feet (maximum)
Net office area**	80 square feet (minimum)
per building occupant	90 square feet (maximum)

---

\*Net floor areas include the total gross area excluding (1) exterior walls, (2) interior partitions, (3) stairs and stair towers, (4) elevator shafts and machinery space, (5) toilet and cleaning gear space, (6) permanent hallways and corridors, (7) mechanical equipment and water supply equipment space, and (8) basements not suited for use as office space.

\*\*Net office area includes the net floor area less central files, storage, special purpose, conference and miscellaneous rooms not specifically used as office space.

This appendix describes three ways to estimate building space requirements: the Rule-of-Thumb Method, the Analytical Method, and the Scaled Layout Method. Each method has certain advantages, depending on what type of space is being estimated, what is known about its contents, or what space standards exist for it.

### **Rule-of-Thumb Method**

This method is used for well-defined spaces or spaces made up of repetitive smaller spaces, such as the theaters, auditoriums, lecture-type classrooms, and offices. In this method, the total space is based on a standard (or rule-of-thumb) for the space as a whole or for each occupant. For example, a private office with a desk, credenza, file, and two visitor chairs requires about 100 square feet. For a theater, the size (including aisles) is based on 12 square feet per person. If the required seating capacity is known, it is easy to compute the total space by multiplying the capacity times the space per person.

The space standards or rules-of-thumb for a particular space must be known before the Rule-of-Thumb Method can be applied. Chapter 5 lists the standards for many types of service school spaces. The standards for general office spaces (based on pay grade) are listed in Appendix B, Tables B-1 through B-3. Figure C-1 illustrates the Rule-of-Thumb Method.

### **RULE OF THUMB - EXAMPLE**

$$\begin{array}{r} 200 \text{ seat theater} \\ \times 12 \text{ sq. ft. per person} = 2400 \\ + 10 \times 40 \text{ stage} = \quad \underline{400} \\ \text{Total} \quad \underline{2800 \text{ sq. ft.}} \end{array}$$

Figure C-1. Example of the use of the Rule-of-Thumb Method.

### **Analytical Method**

The analytical method is used for spaces whose equipment and operations are well-defined, but whose contents can be arranged in a variety of ways, e.g., office or administrative spaces. This approach assumes that each equipment item occupies a specific amount of floor area, *e*, but requires an additional amount of activity space, *a*, when it is being used or operated. For example, a file cabinet may occupy 4 square feet, but require an additional 3 square feet of activity space so its drawers can be opened easily and so clerks have room to stand in front of the open drawers. Therefore, its total functional space requirement is 7 square feet.

## APPENDIX C

### Estimating Space Sizes

$$\begin{array}{r} 200 \text{ seat theater} \\ \times 12 \text{ sq ft per person} = 2400 \\ + 10 \times 40 \text{ stage} = \quad 400 \\ \hline \text{Total} \quad 2800 \text{ sq ft} \end{array}$$

The steps listed below should be followed when using the Analytical Method:

1. Make a table of equipment which could be used in the space under consideration.
2. For each item of equipment, establish the amount of floor space it occupies (e).
3. For each item, estimate an amount of activity space required to operate or use the equipment (a).
4. Add a column in the table for the total functional space (e + a).
5. Calculate the total amount of space needed by using the following steps:
  - a. Compute the amount of space required for each type of equipment (number of items x [e + a]).
  - b. Sum for all types of equipment in the space.
  - c. Add a circulation factor, c, to establish the total quantity of space needed. For example, for offices, 40 square feet per person is a good estimate of circulation space. For shops, the required circulation space may be as great as 50 percent of the functional space (sum of all a + e). (Two examples of the Analytical Method are shown in Figure C-2.)

For offices, the Analytical Method is similar to the use of space standards based on furniture and equipment (Appendix B). Unit equipment space allowances, listed in Table B-4, already include activity space and a circulation factor.

### Scaled Layout Method

This method is used for spaces in which equipment arrangements are critical and circulation paths for moving material and supplies are important.

The following steps are suggested when using the Scaled Layout Method:

1. Use grid paper (e.g., 1/4 inch = 1 foot or 1/8 inch = 1 foot). Place scaled shapes of each equipment item on the grid paper and move them around until an acceptable layout is achieved.



# APPENDIX C

## Estimating Space Sizes

### ANALYTICAL METHOD-EXAMPLES

office ITEM	(a) FLOOR AREA REQ'D, sq. ft.	(a) ACTIVITY SPACE REQ'D, sq. ft.	(a+a) TOTAL PER ITEM	NUMBER REQ'D	TOTAL SPACE, sq. ft.
desk	□ 3x5=15	■ 3x5=15	30	2	60
file	□ 2.5x1.5=3.75	■ 3x1.5=4.5	8.25	3	24.75
visitor chair	□ 2x2=4	■ 2x2=4	8	2	10
<b>SUBTOTAL</b>					<b>100.75</b>
<b>CIRCULATION</b>			<b>FACTOR 40 (sq. ft./pers.)</b>	<b>PEOPLE 2</b>	<b>80</b>
<b>GRAND TOTAL</b>					<b>180.75</b>

shop ITEM	(a) FLOOR AREA REQ'D, sq. ft.	(a) ACTIVITY SPACE REQ'D, sq. ft.	(a+a) TOTAL PER ITEM	NUMBER REQ'D	TOTAL SPACE, sq. ft.
drill press	□ 3x4=12	■ 3x6=18	30	1	30
lathe	□ 2.5x6=15	■ 6.5x9=15=42.5	57.5	1	57.5
work bench	□ 3.5x8=28	■ 3x8=24	52	2	104
<b>SUBTOTAL</b>					<b>191.5</b>
<b>CIRCULATION</b>			<b>FACTOR 50%</b>	<b>SPACE 191.5</b>	<b>95.75</b>
<b>GRAND TOTAL</b>					<b>287.25</b>

Figure C-2. Examples of the use of the Analytical Method.

## APPENDIX C

### Estimating Space Sizes

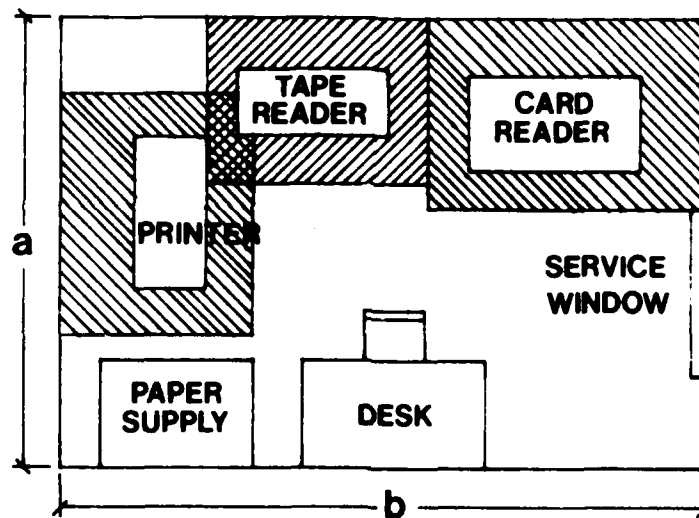
2. Measure the area around each equipment item to determine whether there is enough additional space for required activities, e.g., moving items among equipment, etc.

3. Adjust the layout until a satisfactory arrangement is achieved.

4. Define the boundaries of the space by drawing a line around the layout (a rectangle is best). The location of doors and other design features are not important for determining the size of the space.

5. Compute the amount of space required by measuring the two sides of the rectangle, then determine the length each side represents in feet and multiply to find square feet (an example of the Layout Method is given in Figure C-3).

### SCALED LAYOUT EXAMPLE



$a \times b = \text{sq. ft. required}$

$a = 12 \text{ ft.}$

$b = 18 \text{ ft.}$

$12 \times 18 = 216 \text{ sq. ft.}$

Figure C-3. An example of Scaled Layout Method.

# APPENDIX D

## ARPRINTS and Training Space Needs

The ARPRINT is a computer-generated report which is used to determine training requirements. Information listed in this computer report includes school names, course numbers and titles, course capacities, class sizes, course length, and attrition rates for the current year and projections for the next 3 years. Figure D-1 gives an example of an ARPRINT report.

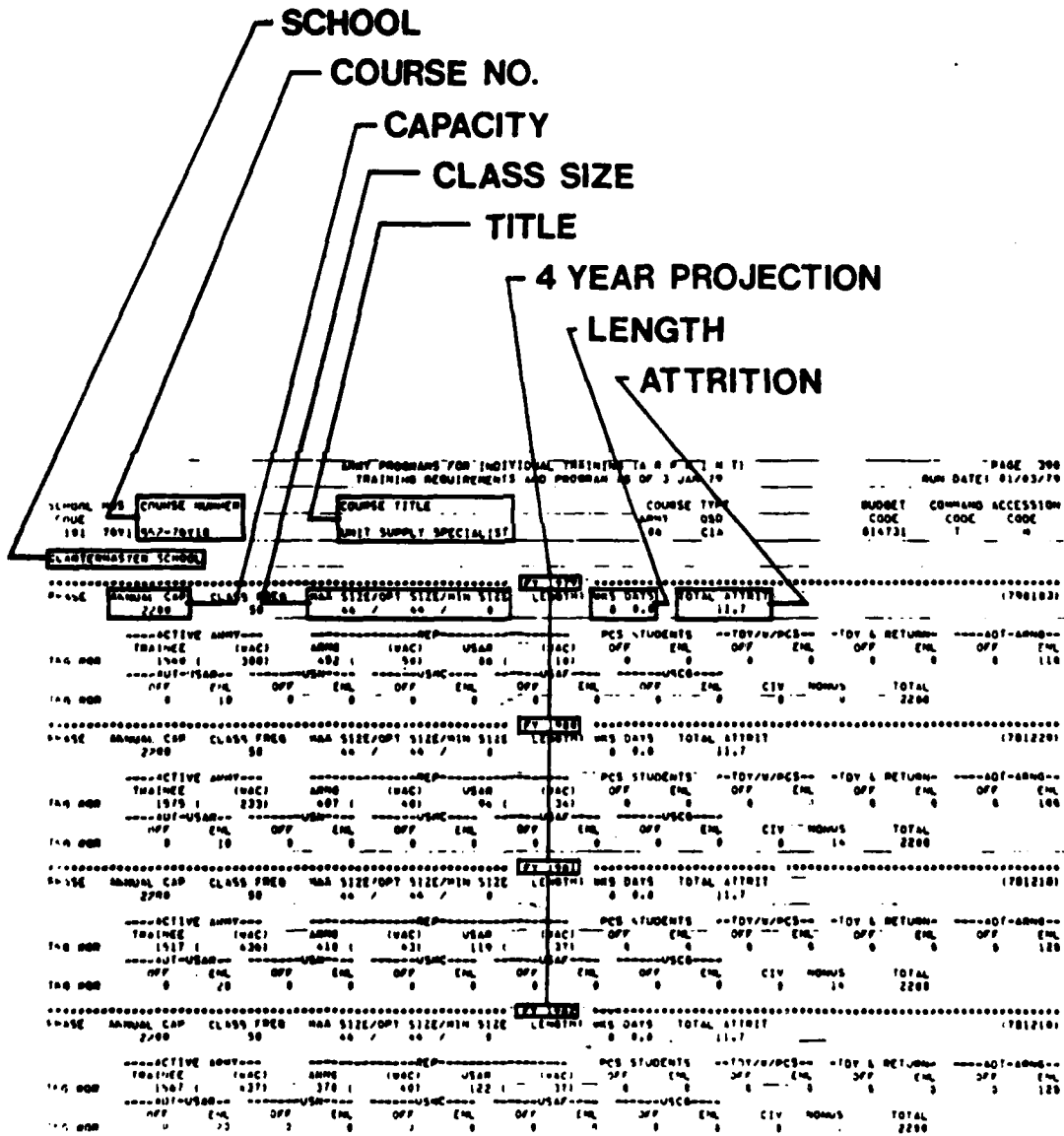


Figure D-1. Example of an ARPRINT report.

# APPENDIX D

## ARPRINTS and Training Space Needs

The ARPRINT data can be used to help determine space needs for classrooms, laboratories, self-paced instruction areas and other training spaces, and to determine the number of concurrent classes required to meet the annual capacity requirements established by TRADOC headquarters for each course.

For example, as shown in Figure D-2, annual capacity divided by optimum class size determines the number of training sessions or classes required annually for a course. The number of consecutive training sessions per year is computed by dividing an assumed 260 days of possible classtime by the length of a class in days. The number of concurrent classes for a course is determined by dividing the number of annually required training sessions by the number of consecutive training sessions per year.

UNIT PROGRAMS FOR INDIVIDUAL TRAINING TO R (P) (I) (I)											PAGE 300		
TRAINING REQUIREMENTS AND PROGRAM AS OF 3 JUN 70											RUN DATE: 01/03/70		
SYMBOL NOS	COURSE NUMBER	COURSE TITLE	COURSE TYPE				BUDGET CODE	COMMAND CODE	ACCESSION CODE				
101	701	547-7010	00	ARMY	OSD		010731	T	H				
		UNIT SUPPLY SPECIALIST											
CLASSIFICATION SCHOOL													
PRG NO	ANNUAL CAP	CLASS PRG	MAX SIZE	OPT SIZE	MIN SIZE	LENTH	WKS	DAYS	TOTAL ATTRIT				
101	2200	50	44	44	0	0	0	0.0	11.7				
TRAINING AMT (WAC) ABNG (WAC) USAR (WAC) OFF													
TAG	1700	300	400	100	100	0	0	0	0	0	0	0	0
AUT-TRNG													
101	0	0	0	0	0	0	0	0	0	0	0	0	0
CIV													
101	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL													
2200													

<b>A. Annual Capacity</b>	<b>2200</b>	<b>students/year</b>
<b>+ B. Optimum Size</b>	<b>+ 44</b>	<b>students/class</b>
<b>ANNUAL TRAINING SESSIONS</b>	<b>50</b>	<b>classes/year</b>

<b>Possible Class Days</b>	<b>260</b>	<b>days/year</b>
<b>+ C. Class Length</b>	<b>+ 40</b>	<b>days/class</b>
<b>CONSECUTIVE TRAINING SESSIONS</b>	<b>6.5</b>	<b>classes/year</b>

<b>ANNUAL TRAINING SESSIONS</b>	<b>50</b>	<b>classes/year</b>
<b>+ CONSECUTIVE TRAINING SESSIONS</b>	<b>+ 6.5</b>	<b>classes/year</b>
<b>CONCURRENT CLASSES</b>	<b>7.7</b>	<b>≅ 8</b>

Figure D-2. Using the ARPRINT to determine the number of concurrent classes.

## APPENDIX D

### ARPRINTS and Training Space Needs

The ARPRINT also provides other information for estimating training space needs. On Worksheet 2, optimum class size is taken from the ARPRINT. Hours per week are obtained from the course scheduler in the Directorate of Training. The number of concurrent classes is computed as described above. The space standard in square feet per student is obtained from the information listed in Chapter 4. An example of the space demand for a particular training space is given in Figure 13. Information derived from the ARPRINT for use in Worksheet 2 should be selected to correspond to the analysis of current or future space needs.

The ARPRINT should only be used with the help of the class scheduler in order to avoid certain biases. For example, class size indicated in the ARPRINT may be based on the desired teacher-to-student ratio or on the capacity of existing classrooms. In estimating space needs on Worksheet 2, optimum class size should not be constrained by existing classroom sizes, but should be governed by the number of instructors available and optimal conditions for the best training environment possible.

# APPENDIX E

## RPMS Evaluations and Reports

The Directorate of Engineering and Housing (DEH) makes routine evaluations of the general quality of school buildings to determine the need for preventive or restorative maintenance. The information from these evaluations is logged on a computer and periodically updated. Deficiencies are removed from the data files after maintenance has been completed. Two reports generated from this stored data can help the service school evaluate existing facilities. These are the Deficiency by Component (RDC) and Deficiency by Facility (RDF) reports.

### Coding

The alphanumeric coding system given in Table E-1 describes the particular features evaluated by DEH. These features are termed "components" in the Army's Real Property Management System (RPMS). There are 20 such components and each has a three-level evaluation system (coded C-1, C-2, C-3) which describes the nature and degree of deterioration of that component. The components and evaluation system coding are described below. Not all components will necessarily be found in a school facility.

### Deficiency Listing By Component Facility —RDC/RDF

#### General Description

The RDC and RDF reports are directly generated from results of the routine inspections of existing facilities by DEH personnel in which the facility components are found to be in marginal (C-2) or in unsatisfactory (C-3) condition. C-2 and C-3 components are in need of repair and require the expenditure of Deficiency Dollars (\$D) as opposed to maintenance (normal day-to-day operations) and the expenditure of Recurring Maintenance (\$R) Dollars.

The RDC and RDF reports listings are identical, but structured differently. The RDC report is formatted by component, by functional ground code, and by facility. The RDF report is formatted by facility, by component, and by functional group. These reports list all facilities within a functional group code that require repairs to a specific component in the RDC and RDF. The display is of all component repairs required in a single facility. This allows those planning repair and maintenance work to establish meaningful projects with little difficulty. The listings are corrected and updated monthly. Periodic reinspections of components and job completion inspections serve to add new requirements and to delete corrected work from the deficiency listings. The deficiency data are used by DEH to justify maintenance and repair funds with TRADOC headquarters and DA. The RDC and RDF reports also provide DEH managers with an accurate description of all the work requirements in their area of responsibility.

# APPENDIX E

## RPMS Evaluations and Reports

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Table E-1  
Component Coding

### Roofing (01)

- C-1. No leaks, little sign of deterioration.
- C-2. Some leaks, signs of partial deterioration.
- C-3. Several leaks, complete deterioration over certain areas.

### Structure (02)

- C-1. Structure and subcomponents in sound structural and/or operating condition.
- C-2. Sound structure but some components are damaged, show signs of deterioration, or perform improperly.
- C-3. Signs of unsound structure, some of which have hampered activities within the structure.

### Floor Covering (03)

- C-1. Serviceable condition with some signs of wear and defects.
- C-2. Flooring worn thin, damaged, or loose in many areas (not exceeding 25 percent of total floor area).
- C-3. Damaged and unserviceable flooring exceeding 25 percent of total floor area.

### Exterior Painting (04)

- C-1. Good covering but soiling, flaking, and/or caulking may be evident.
- C-2. Cracked paint and exposed substrate not exceeding 25 percent of the total painted area.
- C-3. Extensive cracking, erosion, flaking, peeling, and abnormal deterioration exceeding 25 percent of the total painted area.

# APPENDIX E

## RPMS Evaluations and Reports

Table E-1 (Cont'd)

### Interior Painting (05)

- C-1. Good covering but some dulling.
- C-2. Soiling, spotting, cracking, and some deterioration (not exceeding 25 percent of the total painted area).
- C-3. Extensive soiling, cracking, and deterioration, presenting serious sanitary problems and exposing much of the substrate.

### Heating (06)

- C-1. System components in excellent to good condition.
- C-2. Major restoration or replacement of some system components imminent.
- C-3. Breakdown of system components requiring complete replacement.

### Air Conditioning (07)

- C-1. System components in excellent to good condition.
- C-2. Major restoration or replacement of some system components.
- C-3. Imminent breakdown of system components requiring complete replacement.

### Plumbing (08)

- C-1. System components in excellent to good condition.
- C-2. Major restoration or replacement of some system components.
- C-3. Imminent breakdown of system components requiring complete replacement.

### Electrical (09)

- C-1. System components in excellent to good condition.
- C-2. Major restoration or replacement of some system components.



# APPENDIX E

## RPMS Evaluations and Reports

---

Table E-1 (Cont'd)

C-3. Imminent breakdown of system components requiring complete replacement.

### Equipment (10)

C-1. Functionally sound but exhibiting signs of some functional weakness.

C-2. Some restoration or replacement of inoperative components.

C-3. Functionally ineffective -- requires major overhaul or replacement.

### Utility Plant Equipment (11) (includes water, air conditioning and refrigeration, heating, sewage, electrical)

C-1. Functionally sound -- in excellent to good condition.

C-2. Some restoration or replacement of inoperative components.

C-3. Imminent breakdown or functional ineffectiveness -- requires major overhaul or replacement.

### Utility Systems (12) (includes water, air conditioning and refrigeration, heating, sewage, electrical)

C-1. Functionally sound -- in excellent to good condition.

C-2. Some restoration or replacement of inoperative components.

C-3. Imminent breakdown or functional ineffectiveness -- requires major overhaul or replacement.

### Pavements (13)

#### Concrete

C-1. Minor surface imperfections such as spalling, scaling, cracks (no hindrance to the movement of traffic).

C-2. Considerable deterioration consisting of major spalling and scaling, and cracks, abrasion, rutting, and differential settling (impedes comfortable traffic).

# APPENDIX E

## RPMS Evaluations and Reports

Table E-1 (Cont'd)

- C-3. Major deterioration (sections impassable without causing major equipment damage).

### Bituminous

- C-1. Minor surface defects and shoulder damage in isolated areas.
- C-2. Serious cracking and raveling, depressions caused by settlement, bleeding of bituminous surface, corrugations, rutting, and potholes.
- C-3. Impassable surface with defects penetrating into the subgrade, numerous potholes, rutted shoulders, and some side-hill slippage.

### Other

- C-1. Some surface corrugation, long ruts, and irregularities holding puddles of water.
- C-2. Surface corrugation more extensive, hazardous potholes, and water-holding depressions.
- C-3. Impassable unless dry; no recognizable crown or edges; gullies and washes in high-fill slopes require extensive restoration.

### Trackage (14)

- C-1. Rails are in good condition; ballasts are firm and provide good drainage but allow some vegetation growth in crib; track is level and/or not out of alignment.
- C-2. Rails, ballast, and other items are wearing at joints, switch points, and flanges; poor drainage in ballast cribs; splits, fissures, and breaks in rails; loose joints and inoperable mechanisms are common.
- C-3. Deteriorated rails are poorly constrained, causing frequent derailments; packed ballast is overgrown with vegetation, prohibiting drainage; inoperable and hazardous mechanisms.

# APPENDIX E

## RPMS Evaluations and Reports

Table E-1 (Cont'd)

### Ties (15)

- C-1. Ties are in good condition -- need to replace only 1 in every 39-foot rail length.
- C-2. Weathered and decayed wood, loose spikes, and rail cut ties.
- C-3. Deteriorated ties, large splits and decayed wood; spikes have poor holding power.

### Drainage (16)

- C-1. Uneroded and stabilized slopes and functioning culverts clear of silt, debris, and vegetation.
- C-2. Culverts, ditches, inlets, and channels are silted and clogged with debris and vegetation; poor drainage and sedimentation.
- C-3. Clogged drainage systems prohibiting proper functioning; subsurface failure caused by deterioration.

### Appurtenances (17) (for all except bridges)

- C-1. Satisfactory condition.
- C-2. Some deterioration.
- C-3. Extensive deterioration.

### Appurtenances (17) (for bridges)

- C-1. Substructure and superstructure in good condition; some rust on superstructure; rough road service.
- C-2. Substructure in good condition but superstructure and decks beginning to deteriorate; trusses and handrails out of line.
- C-3. Deteriorating substructure; distorted compression members and rotten timber piling.

### Ground Cover (18) (improved grounds)

- C-1. Satisfactory condition, quality, and appearance -- requires only preventive maintenance.

# APPENDIX E

## RPMS Evaluations and Reports

Table E-1 (Cont'd)

- C-2. Thin, weedy grass cover, incipient erosion, soil compaction, and overgrown, woody vegetation.
- C-3. Bare areas, poor plant vigor, overcrowding, and similar substandard conditions.

### Ground Cover (18) (unimproved grounds)

- C-1. Satisfactory condition; controlled grassy and woody growth; productive forests efficiently maintained.
- C-2. Poor coverage; eroded areas contributing to dust problems; sedimentation; vegetative fire hazards; and noxious weeds.
- C-3. Major deterioration caused by land clearing, fire, or storm, insect and/or disease, and drought damage.

Forest Land (19) and Fish and Wildlife (20) do not normally apply to service schools.

### **RDC -- Deficiency by Component (see Figure E-1)**

Heading Line. This line shows three data elements: preparation date -- Year-Month-Day (i.e., 77Mar22); report name -- deficiency by component; PCN -- a program control number (i.e., AKC-001-RDC).

Heading Line 2. This line displays two data elements: installation name and installation number.

Heading Line 3. This heading data element will change each time the printout of the previous component's deficiencies have been completed. It includes a component code (01 - 20) and a component description.

Data elements. Paragraphs keyed to the RDC report include:

1. Functional group code (this code is a five-digit number that identifies facility type -- see AR 415-28).<sup>12</sup>
2. Facility type construction code (T/C). P -- permanent, S -- semi-permanent, or T -- temporary.
3. Facility number. Each facility on an installation is identified by a unique number.

<sup>12</sup>Department of the Army Facility Classes and Construction Categories (Category Codes), AR 415-28 (DA, 1 November 1981).

# APPENDIX E

## RPMS Evaluations and Reports

4. Facility description.
5. Facility unit of measure (U/M). In Figure E-1, the UM is square feet (SF).
6. Facility total quantity (TOT-QTY). This is the total amount, in UM, that the facility should have.
7. Component unit of measure (UM). This should be the same as Data Element 5 above.
8. Component total quantity (TOT-QTY). This is the total amount, in UM, that the facility has.
9. Component deficiency quantity (DEF-QTY). This is the amount, in UM, that is deficient (C-2 or C-3).
10. Estimated deficiency dollars C-2 and C-3 (EST-DEFICIENCY-DOLLARS-COND2/COND3). This is the estimated cost to remove the deficiencies.
11. Estimated deficiency dollars total. This is the total estimated cost for removing C-2 and C-3 deficiencies.
12. Component deficiency description. This is a brief description of the repair requirement.
13. User code (USER-CD). The user code is used to specify the organization occupying or using the facility.
14. Shop code/dollars. These fields display which DEH shops are responsible for correcting the deficiencies and the deficiency dollars allocated to that shop.

General. At the end of each functional ground code display for every component code, totals will be posted for each of the following data elements: facility total quantity; component total quantity; component deficient quantity; estimated deficiency dollars (C-2); estimated deficiency dollars (C-3); and total deficiency dollars.

### RDF -- Deficiency by Facility

The RDF report contains the same information items as the RDC report. The major difference between the two listings is the format.

Two exceptions to the RDC report are present in the RDF report. These are:

1. Q -- facility condition code. This data element displays a condition code for the facility based on the condition codes of the components in the facility.

# APPENDIX E

## RPMS Evaluations and Reports

DEFICIENCY BY COMPONENT

INSTALLATION NO. 01252      RELATION CODE 01252

COMPONENT 02 STRUCTURE

UNIT	C	NUMBER	SUF	FACILITY	DESCRIPTION	U/M	TOT-QTY	U/M	TOT-QTY	DEF-QTY	---ESTIMATED DEFICIENCY-DOLLARS---			DEFICIENCY	DESCRIPTION	---USER---	
											COND 2	COND 3	TOTAL			CD	CD
T 10310	1	T03101		APPL	INST BLDG	SF	7,706	SF	7,706	1	1,400	0	1,400	REPAIR	BLDG	TA	001A
T 10320	1	T03204		INDR	FIRE RC	SF	4,960	SF	4,960	1	1,000	0	1,000	RPR	EXT	FE	001A
T 10360	1	T03601		APPL	INST BLDG	SF	3,378	SF	3,378	1	750	0	750	RPR	EXT	FE	001A
P 10490	1	P04901		AC	TRAINING BLDG	SF	39,094	SF	39,094	1	320	0	320	RPR	INT	TA	001A
T 10501	1	T05015		GEN	INST BLDG	SF	1,800	SF	1,800	1	510	0	510	RPR	EXT	PC	001A
T 10501	1	T05015		GEN	INST BLDG	SF	1,800	SF	1,800	1	390	0	390	RPR	EXT	PC	001A
T 10501	1	T05016		GEN	INST BLDG	SF	1,800	SF	1,800	1	500	0	500	RPR	EXT	PC	001A
T 10501	1	T05021		GEN	INST BLDG	SF	2,500	SF	2,500	1	420	0	420	RPR	EXT	PC	001A
T 10510	1	T05103		GEN	INST BLDG	SF	5,310	SF	5,310	1	3,100	0	3,100	RPR	EXT	PC	001A
T 10511	1	T05113		GEN	INST BLDG	SF	1,800	SF	1,800	1	600	0	600	RPR	EXT	FE	001A
T 10511	1	T05113		GEN	INST BLDG	SF	1,800	SF	1,800	1	675	0	675	RPR	EXT	FE	001A
T 10511	1	T05116		GEN	INST BLDG	SF	5,310	SF	5,310	1	650	0	650	RPR	EXT	FE	001A
T 10511	1	T05117		GEN	INST BLDG	SF	5,310	SF	5,310	1	675	0	675	RPR	EXT	FE	001A
T 10511	1	T05118		GEN	INST BLDG	SF	5,310	SF	5,310	1	518	0	518	RPR	EXT	FE	001A
T 10511	1	T05119		GEN	INST BLDG	SF	2,500	SF	2,500	1	618	0	618	RPR	EXT	FE	001A
T 10512	1	T05120		GEN	INST BLDG	SF	2,500	SF	2,500	1	718	0	718	RPR	EXT	FE	001A
T 10521	1	T05211		GEN	INST BLDG	SF	2,200	SF	2,200	1	425	0	425	RPR	LAT	FE	001A
P 10601	1	P06010		GEN	INST BLDG	SF	18,240	SF	18,240	1	475	0	475	RPR	STRUCTURE	TA	001A
P 10603	1	P06031		APPL	INST BLDG	SF	5,385	SF	5,385	1	415	0	415	RPR	DOORS	TA	001A
T 10942	1	T09427		APPL	INST BLDG	SF	4,250	SF	4,250	389	3,200	0	3,200	RPL	SCRN	TA	001A
							123,253		123,253	408	17,159	0	17,159				

Figure E-1. RDC -- deficiency by component.

# APPENDIX E

## RPMS Evaluations and Reports

DEFICIENCY LISTING BY FACILITY

AKC-003 RDF

NAME OF INSTALLATION	FORT RUCKER ALA	INSTALLATION NO.	01252	RELATION CODE	01252	ESTD-DEFICIENCY-DOLLARS		DEFICIENCY	USER	
FACILITY DESCRIPTION	U/M	TOT-QTY	COND	CD	U/M	TOT-QTY	COND	DESCRIPTION	CD	U/M
T GEN INST BLDG	SF	1800	17100	02	SF	1800	1	410 RPR EXT STRUCT	PL	001X
								410		410
T GEN INST BLDG	SF	1800	17100	02	SF	1800	1	390 RPR EXT STRUCT	PL	001X
								390		390
T GEN INST BLDG	SF	1800	17100	02	SF	1800	1	400 RPR EXT STRUCT	PC	001X
								400		400
T GEN INST BLDG	SF	2500	17100	01		0	1	1200 RPL ROOF	PC	0014
								1200		1200
T GEN INST BLDG	SF	2500	17100	02	SF	2500	1	420 RPR EXT	PC	001X
								2500		2500
T GEN INST BLDG	SF	5310	17100	02	SF	5310	1	500 PNT EXT BLDG	PC	001X
								500		500
T GEN INST BLDG	SF	1800	17100	02	SF	1800	1	600 RPR EXT BLDG	FE	001X
								3600		3600

Figure E-2. RDF -- deficiency by facility.

## APPENDIX E

### RPMS Evaluations and Reports

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2. The summary totals shown beneath the dashed line display facility totals for C-2, C-3, and a total estimated deficiency dollars. This summary gives the total estimated repair requirements of each individual facility resident on the installation. This report listing is designed to report all deficiency requirements without constraints.



# APPENDIX F

## Guidelines for Organizing Spaces

Careful space organization can improve the flow of people and interactions among or within school organizations and reduce school improvement costs. Space organization must consider many things, including (1) sound control and zoning of noisy and quiet activities, (2) circulation patterns, (3) life-safety and safe exiting, (4) accessibility for handicapped people, (5) functional relationships among organizations, (6) zoning of similar activities, (7) growth or change in organizational activities, and (8) the length of utility runs, depth of rooms or room clusters between corridors and outside walls, etc.

Some general recommendations for organizing school space are given in DG 1110-3-106 (Chapter 4). Key relationships among each type of space are given in Part II of this report.

In cases where general guidance is not adequate, a further analysis of school space relationships may be necessary. The methods described in this appendix chart three types of space relationships and can be used in such cases. These methods may also be used to analyze factors other than those shown, and to chart both desired or existing space relationships.

### Matrix Method

The matrix method is commonly used to define relationships among particular spaces or organizations.

A numerical code is used to identify the type or strength of a space relationship. Worksheet 12 (Appendix H) is used to list these coded relationships or space adjacencies.

All spaces which are to be analyzed are listed on Worksheet 12. The space at the top of the list is considered first. This space is compared with all other spaces listed below it on Worksheet 12 by determining how they should be related to one another and by inserting the numerical code in the box at the intersection of the two space names. Each appropriate numerical relationship code should be inserted in the intersecting box, moving diagonally along the first row toward the lower right. After comparing each space in the list to the first space, compare the second space to each space below it, inserting the relationship code in the intersecting box in the second diagonal row. Then, compare the third space to each listed below it, the fourth, etc., until the matrix has been filled in. An example of a completed analysis is shown in Figure F-1. The analysis may also be applied to existing space. Then, existing space relationships should be compared to desired ones to define space relationship problems.

### Bubble Diagrams

Another method frequently used to chart space relationships uses bubbles to represent organizations or spaces. Figure F-2 shows an example identifying relationships by bubble placement. Bubbles which are touching show a stronger

# APPENDIX F

## Guidelines for Organizing Spaces

SPACE NEEDS ANALYSIS		ORGANIZATION	DATE	SPACE RELATIONSHIPS
RM.NQ.	SPACE NAME	adjacency		
	OFFICE OF DIRECTOR	1: must be adjacent		
	SECRETARY OFFICE	2: close okay, but adjacent preferred		
	CHIEF, ART DIVISION	3: nearby		
	SECRETARY, ART DIVISION	4: different building or no significant relationships		
	ARTIST OFFICES			
	CHIEF, STUDIO DIVISION			
	SECRETARY, STUDIO DIVISION			
	SOUND BRANCH OFFICE			
	VIDEO BRANCH OFFICE			
	TV STUDIO			
	CONTROL ROOM			
COMMENTS				WORK SHEET 12

Figure F-1. Example of using Worksheet 12 to establish space relationships.

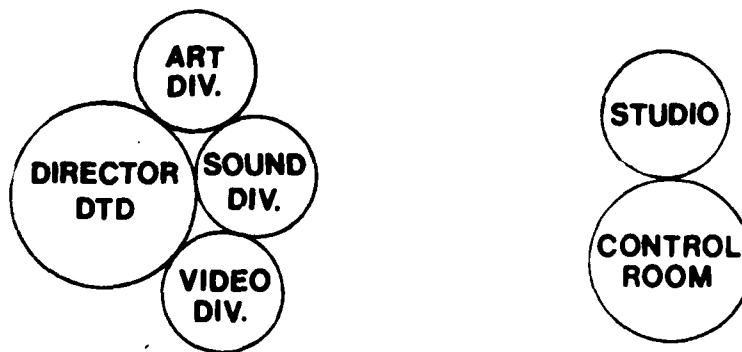


Figure F-2. Bubble diagram showing relationships (touching bubbles show strong relationships, more distant bubbles show weaker relationships).

## APPENDIX F

### Guidelines for Organizing Spaces

relationship, while those which are more distant show weak relationships. This approach is not as precise as the matrix method.

Figure F-3 illustrates how connecting lines with relationship codes may be used with bubble diagrams. One difficulty with this approach is the confusion which results when all connections are shown in diagrams with many organizations or spaces. Such confusion can be reduced by showing only the stronger relationships.

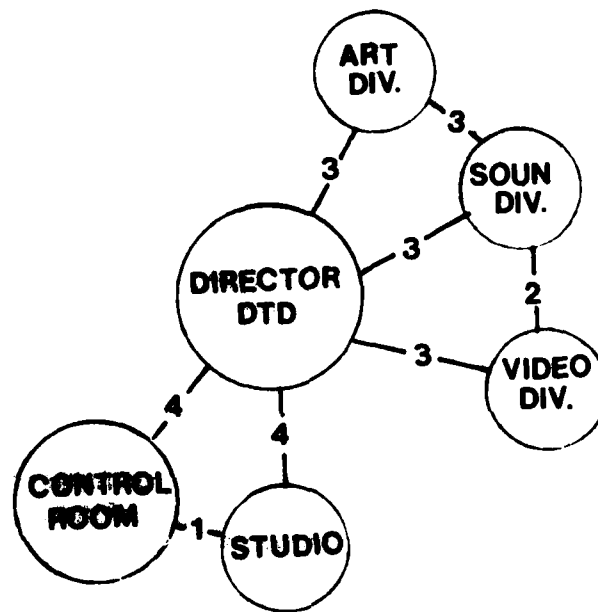


Figure F-3. Bubble diagram using coded connecting lines to show relationships.

### Flow Charts

Relationships which indicate movement of people, material, or information can be illustrated by flowcharts. Spaces, operations, organizations, locations, or other information can be represented by circles, rectangles, or other shapes. Movement is shown by lines and arrows. An example of a flowchart is given in Figure F-4.

# APPENDIX F

## Guidelines for Organizing Spaces

### TRAINING MANUAL DEVELOPMENT

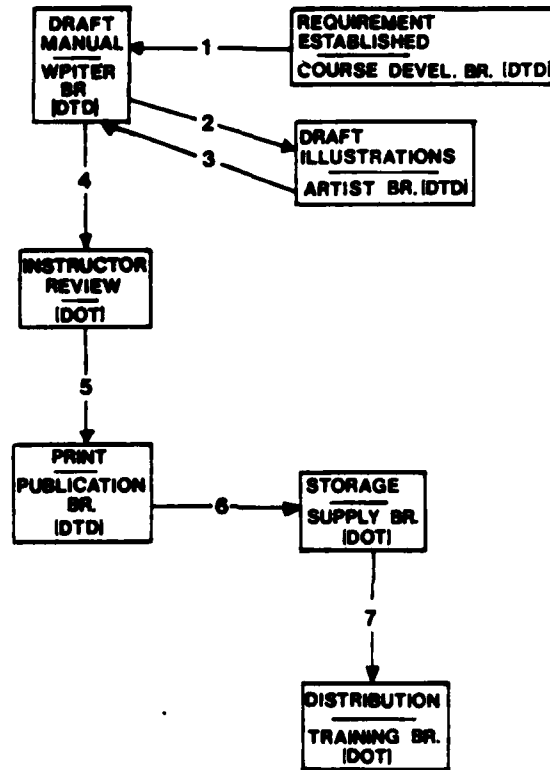


Figure F-4. Example of a flowchart.

## **APPENDIX G**

### **Economic Analysis**

After problems with existing facilities are identified and organized into projects, project feasibility must be determined (Chapter 4). One of the cost considerations included in Table 2 is the possible need to do an economic analysis; i.e., a systematic investigation into how to use scarce resources. An economic analysis is required for some projects by AR 11-28.

The DEH can help the school planner determine whether an economic analysis is required or help the school planner complete an economic analysis.

The procedures for an economic analysis are outlined in Figure G-1 and explained in AR 11-28. The analysis begins by identifying a mission-related objective for the project and the project's assumptions and constraints. The systematic identification of facility problems (Chapter 1) should provide background information for defining mission objectives and functions.

After analysis procedures are established, alternatives for resolving the objectives must be identified. The proposed project is one alternative. For projects primarily concerned with an amount of space, alternatives could include using excess space within the school, using available space on the installation, leasing space, or building new space. For projects concerned with quality of space or buildings, alternatives could include alterations, renovations, or new facilities.

Benefits must be identified for each feasible alternative. Benefits can be those quantifiable in dollars, as well as qualitative benefits like health and safety, security, staff morale, etc. Items which may be quantified into dollars could include higher training or production rates, less instructor or development time, lower contract costs, etc.

Direct and indirect costs must be estimated for each feasible alternative. Cost estimates must include research and development costs, investment costs for equipment and real property, special services, startup, or other one-time investment costs. Operational costs (personnel, materials, supplies, utilities, maintenance, overhead, travel, and per diem) must be included and adjusted for inflation and interest.

The final step in the economic analysis process is comparing or evaluating the costs and benefits for each alternative.

# APPENDIX G

## Economic Analysis

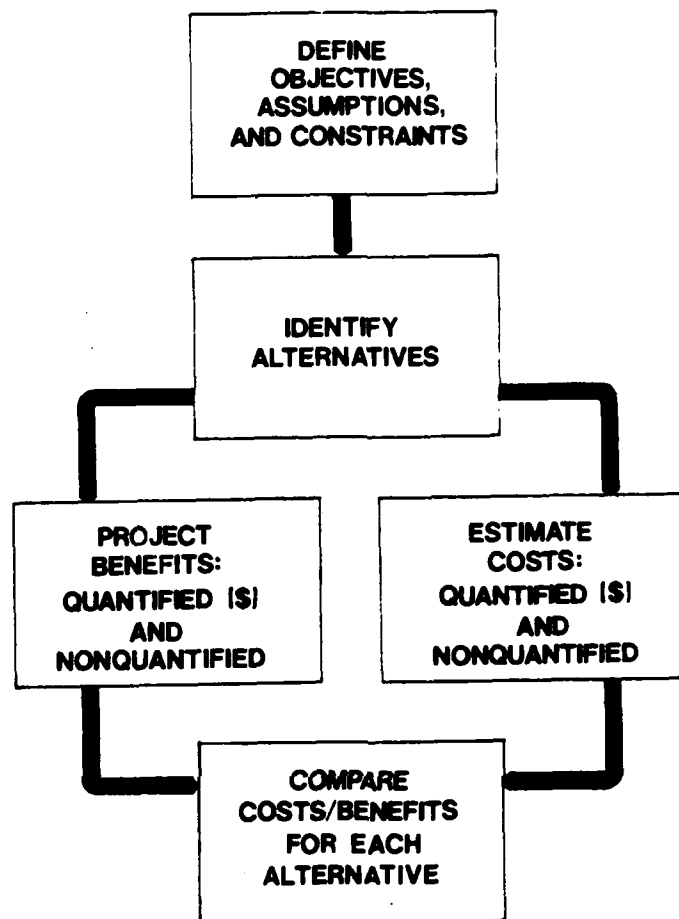


Figure G-1. Overview of the economic analysis process.

# **APPENDIX H**

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## **Worksheets**

(Local reproduction and/or modification of the worksheets in this appendix is authorized)

# APPENDIX H

## Worksheets

SPACE NEEDS ANALYSIS	OFFICES																																					
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%; text-align: center;"> <input type="radio"/> CURRENT (DATE) _____  <input type="radio"/> FUTURE (DATE) _____                 </td> <td style="width: 45%; text-align: center;"> <input type="radio"/> DCD   <input type="radio"/> DTE  <input type="radio"/> DTD   <input type="radio"/> EXEC  <input type="radio"/> DOT   <input type="radio"/> OTHER _____                 </td> <td style="width: 40%;"></td> </tr> <tr> <td style="text-align: center;"> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="2" style="text-align: left;">SPACE NAME</th> <th colspan="2" style="text-align: left;">SPACE TYPE</th> <th rowspan="2" style="text-align: center;">SQ. FT. REQ'D</th> </tr> <tr> <th style="text-align: center;">RANK/ GRADE</th> <th style="text-align: center;">NUMBER</th> <th style="text-align: center;">GENERAL</th> <th style="text-align: center;">SPECIAL STORAGE</th> </tr> <tr> <td style="height: 50px;"></td> <td></td> <td></td> <td></td> <td></td> </tr> </table> </td> <td style="text-align: center;"> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="2" style="text-align: left;">PEOPLE</th> <th rowspan="2" style="text-align: center;">SPACE STANDARD</th> </tr> <tr> <th style="text-align: center;">RANK/ GRADE</th> <th style="text-align: center;">NUMBER</th> </tr> <tr> <td style="height: 50px;"></td> <td></td> <td></td> </tr> </table> </td> </tr> <tr> <td style="text-align: center;"> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="text-align: left;">ORGANIZATION NAME</th> </tr> <tr> <td style="height: 50px;"></td> </tr> </table> </td> <td style="text-align: center;"> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="text-align: left;">COMMENTS</th> </tr> <tr> <td style="height: 50px;"></td> </tr> </table> </td> </tr> <tr> <td colspan="2" style="text-align: right;"> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 80%; text-align: center;">WORK SHEET</td> <td style="width: 20%; text-align: center;">1</td> </tr> </table> </td> </tr> </table>		<input type="radio"/> CURRENT (DATE) _____ <input type="radio"/> FUTURE (DATE) _____	<input type="radio"/> DCD <input type="radio"/> DTE <input type="radio"/> DTD <input type="radio"/> EXEC <input type="radio"/> DOT <input type="radio"/> OTHER _____		<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="2" style="text-align: left;">SPACE NAME</th> <th colspan="2" style="text-align: left;">SPACE TYPE</th> <th rowspan="2" style="text-align: center;">SQ. FT. REQ'D</th> </tr> <tr> <th style="text-align: center;">RANK/ GRADE</th> <th style="text-align: center;">NUMBER</th> <th style="text-align: center;">GENERAL</th> <th style="text-align: center;">SPECIAL STORAGE</th> </tr> <tr> <td style="height: 50px;"></td> <td></td> <td></td> <td></td> <td></td> </tr> </table>	SPACE NAME		SPACE TYPE		SQ. FT. REQ'D	RANK/ GRADE	NUMBER	GENERAL	SPECIAL STORAGE						<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="2" style="text-align: left;">PEOPLE</th> <th rowspan="2" style="text-align: center;">SPACE STANDARD</th> </tr> <tr> <th style="text-align: center;">RANK/ GRADE</th> <th style="text-align: center;">NUMBER</th> </tr> <tr> <td style="height: 50px;"></td> <td></td> <td></td> </tr> </table>	PEOPLE		SPACE STANDARD	RANK/ GRADE	NUMBER				<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="text-align: left;">ORGANIZATION NAME</th> </tr> <tr> <td style="height: 50px;"></td> </tr> </table>	ORGANIZATION NAME		<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="text-align: left;">COMMENTS</th> </tr> <tr> <td style="height: 50px;"></td> </tr> </table>	COMMENTS		<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 80%; text-align: center;">WORK SHEET</td> <td style="width: 20%; text-align: center;">1</td> </tr> </table>		WORK SHEET	1
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Figure H-1. Worksheet 1, Space Needs Analysis -- Offices.



# APPENDIX H

## Worksheets

<b>SPACE NEEDS ANALYSIS</b>		<b>CURRICULUM _____</b>						<b>TRAINING SPACES</b>	
COURSE NUMBER/TITLE	OPTIMUM CLASS SIZE <small>(c)</small>	HOURS PER WEEK <small>(h)</small>	NUMBER OF CLASSES <small>(c)</small>	TYPE OF SPACE	SPACE STAND. <small>(sq ft/stand.)</small> <small>(c)</small>	DEMAND <small>(sq ft-hrs/week)</small> <small>(c) x (b) x (c) x (d)</small>	ADJUSTED DEMAND* <small>(sq ft)</small>	COMMENTS	DATE

**\*ADJUSTED DEMAND = DEMAND +  
(TYPICAL SHIFT (hrs/week) x UTILIZATION  
FACTOR (1.xx))**

**WORK SHEET  
2**

Figure H-2. Worksheet 2, Space Needs Analysis -- Training Spaces.

# APPENDIX H

## Worksheets

SPACE NEEDS ANALYSIS		TRAINING SUPPORT SPACES		
ORGANIZATION NAME	SPACE NAME	SPACE TYPE	ESTIMATING FACTORS	SQ. FT. REQ'D

COMMENTS

DATE
WORK SHEET 3

Figure H-3. Worksheet 3, Space Needs Analysis -- Training Support Spaces.

**APPENDIX H**  
**Worksheets**

<b>SPACE NEEDS ANALYSIS</b>		<b>SHARED SPACES</b>		
<b>SPACE NAME</b>	<b>USERS</b>	<b>CONTENTS</b>	<b>ESTIMATING FACTORS</b>	<b>SO. FT. REQ'D</b>
<b>COMMENTS</b>				
				<b>DATE</b>
				<b>WORK SHEET</b> <b>4</b>

Figure H-4. Worksheet 4, Space Needs Analysis -- Shared Spaces.

**APPENDIX H**  
**Worksheets**

TABULATION OF AVAILABLE SPACE			DATE
SPACE CATEGORY/TYPE	ROOM OR LOCATION	SIZE SQ. FT.	TOTALS

COMMENTS	WORK SHEET <b>5</b>
----------	------------------------

Figure H-5. Worksheet 5, Tabulation of Available Space.

**COMPARISON OF SPACE NEEDS AND AVAILABILITY**

SPACE CATEGORY/TYPE	AVAILABLE		REQUIRED		EXCESS OR DEFICIENCY
	DATE	SQ. FT.	DATE	SQ. FT.	

COMMENTS

WORK SHEET  
**6**

Figure H-6. Worksheet 6, Comparison of Space Needs and Availability.

# APPENDIX H

## Worksheets

<b>GENERAL EVALUATION OF SCHOOL BUILDINGS</b>				
BLDG.	RATING*			DESCRIBE AND EXPLAIN PROBLEMS
ITEM	1	2	3	
<p>A. SUPPORT SERVICES</p> <ol style="list-style-type: none"> <li>1. Janitorial</li> <li>2. Rubbish Collection and Removal</li> <li>3. Fire Protection</li> <li>4. Snow, Ice and Sand Removal</li> <li>5. Security</li> </ol> <p>B. BUILDINGS</p> <ol style="list-style-type: none"> <li>1. Roofing</li> <li>2. Structure</li> <li>3. Floor Covering</li> <li>4. Exterior Painting</li> <li>5. Interior Painting</li> <li>6. Heating</li> <li>7. Air Conditioning</li> <li>8. Plumbing</li> <li>9. Electrical</li> <li>10. Equipment</li> <li>11. Utility Plant Equipment               <ol style="list-style-type: none"> <li>a. Water</li> <li>b. Air conditioning and refrigeration</li> <li>c. Heating</li> <li>d. Sewage</li> <li>e. Electrical</li> </ol> </li> <li>12. Utility Systems               <ol style="list-style-type: none"> <li>a. Water</li> <li>b. Air conditioning and refrigeration</li> <li>c. Heating</li> <li>d. Sewage</li> <li>e. Electrical</li> </ol> </li> <li>13. Pavements               <ol style="list-style-type: none"> <li>a. Concrete</li> <li>b. Bitumious</li> <li>c. Other</li> </ol> </li> <li>14. Trackage</li> <li>15. Ties</li> <li>16. Drainage</li> <li>17. Appurtenances               <ol style="list-style-type: none"> <li>a. For all except bridges</li> <li>b. For bridges</li> </ol> </li> <li>18. Ground Cover               <ol style="list-style-type: none"> <li>a. Improved grounds</li> <li>b. Unimproved grounds</li> </ol> </li> </ol>				
<p>1. Satisfactory condition</p> <p>2. Needs some improvement or shows some sign of deterioration</p> <p>3. Needs extensive improvement or shows extensive sign of deterioration</p>				
<b>COMMENTS</b>			<b>DATE</b>	<b>WORK SHEET</b> <b>7</b>

Figure II-7. Worksheet 7, General Evaluation of School Buildings.

AD-A135 145

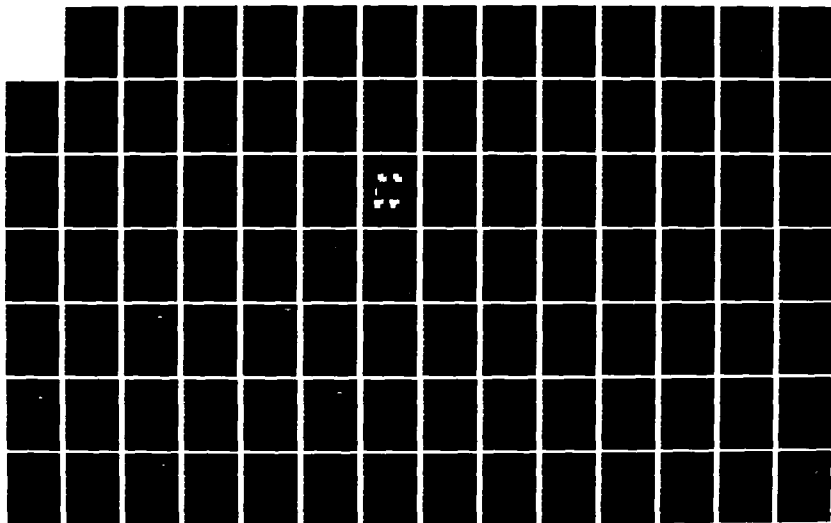
DEVELOPMENT OF A FACILITY MANAGEMENT AND IMPROVEMENT  
MANUAL FOR ARMY SERVICE SCHOOLS(U) CONSTRUCTION  
ENGINEERING RESEARCH LAB (ARMY) CHAMPAIGN IL  
R L BRAUER ET AL. MAR 83 CERL-TR-P-144

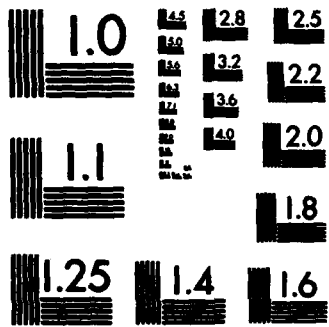
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MICROCOPY RESOLUTION TEST CHART  
NATIONAL BUREAU OF STANDARDS-1963-A



**GENERAL EVALUATION OF SCHOOL BUILDINGS**

BLDG.	RATING*			DESCRIBE AND EXPLAIN PROBLEMS
	1	2	3	
<b>ITEM</b>				
C. SPATIAL ARRANGEMENT 1. Relationships Among Buildings 2. Relationships Within Buildings				
1. Satisfactory condition 2. Needs some improvement or shows some sign of deterioration 3. Needs extensive improvement or shows extensive sign of deterioration				

<b>COMMENTS</b>	<b>DATE</b>	<b>WORK SHEET</b> 7
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Figure H-7 (Cont'd).

# APPENDIX H

## Worksheets

<b>SPACE EVALUATION CHECKLIST</b>				
SPACE NAME/NUMBER _____		DATE _____		
BUILDING _____		COMPLETED BY _____		
ROOM DIMENSIONS _____' L x _____' W x _____' H				
<b>TYPE OF SPACE (circle)</b>				
TYPE OF SPACE (circle)				
<u>OFFICE</u> Administrative Office Spaces Conference Rooms Other _____	<u>TRAINING</u> Classroom spaces/ Conference classrooms Laboratory spaces/ Instructional shops Laboratory - Classrooms Self-Paced Instruction Rooms Seminar Classrooms Auditorium/Theater Other _____	<u>TRAINING SUPPORT</u> Instructor Preparation Areas Instructor Rehearsal Room Counseling Spaces Remedial Instruction Spaces Technical Library Study Areas Projection Rooms Other _____	<u>SHARED USE</u> Student Lounges Snack Bar/ Vending Area Bookstore Latrines Janitor Closets Other _____  <u>Mechanical</u> Other _____	
REQUIREMENT	REQMT. EXISTS	REQMT. SATISFIED		COMMENT / PROBLEMS
A. <u>SPACE</u> 1. Size (amount of space) 2. Dimensions (L,W,H) 3. Shape 4. Distance between columns  B. <u>ACCESS/CIRCULATION</u> 1. Seeing in or out  2. Not seeing in or out  3. Doors & openings a. Dimensions b. Opening & closing c. Locks  4. Distance to other spaces (cable runs, walking) a. Horizontal b. Vertical  5. Access to other spaces		YES	NO	
				WORK SHEET <b>8</b>

Figure H-8. Worksheet 8, Space Evaluation Checklist.

# APPENDIX H

## Worksheets

REQUIREMENT	REQMT. EXISTS	REQMT. SATISFIED		COMMENT / PROBLEMS
		YES	NO	
<b>C. UTILITIES AND WASTE</b>				
1. Electrical Service <ul style="list-style-type: none"> <li>a. Voltage (110 assumed)</li> <li>b. Current</li> <li>c. Power</li> <li>d. Fluctuation limits</li> <li>e. Receptacle location</li> <li>f. Special controls</li> <li>g. Control locations</li> </ul>				
2. Water <ul style="list-style-type: none"> <li>a. Cold</li> <li>b. Hot</li> <li>c. Quantity</li> <li>d. Location</li> </ul>				
3. Solid Waste <ul style="list-style-type: none"> <li>a. Type of waste</li> <li>b. Amount or capacity</li> </ul>				
4. Sanitary Sewer <ul style="list-style-type: none"> <li>a. Capacity</li> <li>b. Location</li> </ul>				
5. Special Sewer or Waste <ul style="list-style-type: none"> <li>a. Type of waste</li> <li>b. Location</li> <li>c. Capacity</li> </ul>				
6. Special Gases or Fluids <ul style="list-style-type: none"> <li>a. Compressed air</li> <li>b. Other gases</li> <li>c. Special fluids</li> <li>d. Pressure</li> <li>e. Capacity</li> <li>f. Location</li> </ul>				
<b>D. ENVIRONMENTAL CONDITIONS</b>				
1. Lighting <ul style="list-style-type: none"> <li>a. General light level</li> <li>b. Task lighting</li> <li>c. Controls</li> <li>d. Lighting quality</li> </ul>				
2. Sound and Noise <ul style="list-style-type: none"> <li>a. Not being overheard</li> <li>b. Isolation from outside sounds</li> <li>c. Control of speech interference</li> </ul>				

Figure H-8 (Cont'd).

# APPENDIX H

## Worksheets

REQUIREMENT	REQMT. EXISTS	REQMT. SATISFIED		COMMENT / PROBLEMS
		YES	NO	
3. Thermal Conditions a. Comfort heating b. Comfort cooling c. Comfort ventilation d. Humidification e. Air movement f. Heating or cooling for equipment				
4. Air Quality a. Odor control b. Control of dusts c. Control of gases or vapors				
5. Radiation a. Shielding for ionizing b. Shielding for non-ionizing radiation				
<b>E. <u>APPEARANCE/FINISHES/IMAGE</u></b>				
1. Floors a. Non-slip b. Static free c. Acid resistant d. Maintenance & cleaning characteristics e. Appearance/image characteristics f. Heavy loads and traffic				
2. Walls a. Appearance/image characteristics b. Maintenance & cleaning characteristics c. Special uses (charts, maps, etc.)				
3. Ceiling a. Appearance/image characteristics b. Special provisions				
<b>F. <u>COMMUNICATION</u></b>				
1. Telephone instruments 2. Dedicated lines (hot lines, data lines) 3. TV receptacles & lines 4. Speaker system				

Figure H-8 (Cont'd).

# APPENDIX H

## Worksheets

REQUIREMENT	REQMT. EXISTS	REQMT. SATISFIED		COMMENT / PROBLEMS
		YES	NO	
<b>G. <u>STORAGE WITHIN THIS SPACE</u></b>				
1. Built-in				
a. Shelving				
b. Parts bins				
c. Closets				
2. Bulk Storage				
a. Floor area				
b. Dimensions				
<b>H. <u>SPECIAL BUILDING FEATURES</u></b>				
1. Security				
a. Devices (safes, vaults)				
b. Hardware (locks, window bars, etc.)				
c. Wall construction				
2. Fire Protection				
a. Sensors (smoke, heat)				
b. Alarms				
c. Suppressions systems				
3. Health & Safety				
a. Eye wash fountains				
b. Emergency showers				
c. Non-slip surfaces				
4. Material Handling				
a. Lifts				
b. Cranes				
c. Elevators				
d. Ramps or docks				
5. Vibration				
a. Isolation				
6. Signage				
a. Identification Signs				
<b>I. <u>FURNITURE</u></b>				
1. Quantity and type				
2. Appearance/Quality				
3. Operating Conditions or Features				

Figure H-8 (Cont'd).

# APPENDIX H

## Worksheets

<b>PROJECT DATA SHEET</b>				SCHOOL _____	
COST    ESTIMATED _____ ACTUAL     _____			PROJECT TITLE/NUMBER		
PRIORITY <input type="checkbox"/> 1 URGENT <input type="checkbox"/> 2 NEEDED <input type="checkbox"/> 3 DESIRABLE					
<b>FUNDING</b>	AVAILABLE? <input type="checkbox"/> YES                          WHEN? _____ <input type="checkbox"/> NO                                          SOURCE? _____ <input type="checkbox"/> MAYBE (explain) _____				
<b>RESOURCES</b>	ORGANIZATION	POC/PHONE		STEP(S)	
<b>STEPS AND TIME (FROM INITIATION TO COMPLETION)</b>					
<b>STEP</b>	<b>EST. TIME TO COMPLETE</b>	<b>ACTUAL TIME</b>		<b>COST</b>	<b>ACCOUNT</b>
		<b>START</b>	<b>FINISH</b>		
<b>TOTALS</b>					
<b>COMMENTS</b>					<b>WORK SHEET</b> <b>9</b>

Figure H-9. Worksheet 9, Project Data Sheet.

<b>PROJECT PRIORITY WORKSHEET</b>		<b>SCHOOL</b>					
<b>PROJECT</b>		<b>FUNDS AVAILABLE</b>		<b>MONTHS TO COMPLETE</b>		<b>PRIORITY*</b>	
NUMBER/TITLE	BRIEF DESCRIPTION	YES	NO	MAYBE	1	2	3

\*1.URGENT: School mission is severely affected. 2.NEEDED: School mission is affected but can be accomplished.  
3.DESIRABLE: Of some value to school mission and quality of the school.

**COMMENTS**

**WORK SHEET**  
**10**

Figure H-10. Worksheet 10, Project Priority Worksheet.

**APPENDIX H  
Worksheets**

<b>SCHEDULE &amp; STATUS OF IMPROVEMENT PROJECTS</b>		SCHOOL	DATE																																																																																																																																																																																										
		<b>PROJECT / STEP</b>		<b>% COMPLETE</b>	<b>TIME</b>																																																																																																																																																																																								
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**WORK  
SHEET  
11**

Figure H-11. Worksheet 11, Schedule and Status of Improvement Projects.  
110





# **PART 2**

# DESIGN GUIDELINES

The information in this section can help the planner/designer identify and resolve Army service school facility problems. Its purpose is not to give patent solutions, but to encourage the planner/designer to think creatively, and to respond to local needs.

General guidelines (i.e., those which apply to an entire facility or to many different kinds of spaces) are presented first, followed by information about training spaces, training support spaces, office spaces, and shared spaces (Figure 26). Each major space type is then subdivided into a number of specific kinds of space.

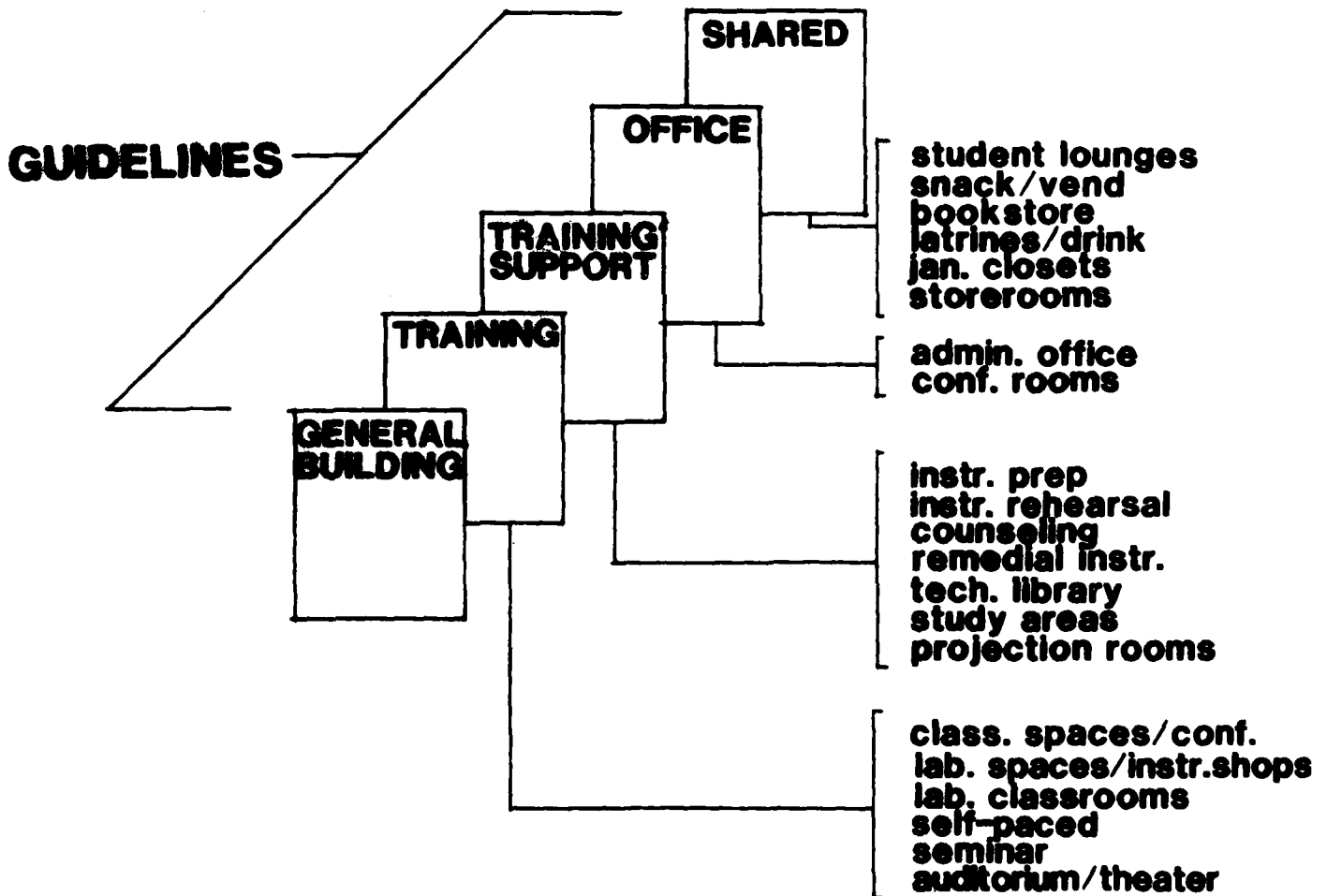


Figure 26. Guidelines are structured by the type of space.

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# DESIGN GUIDELINES

Information about each type of space is classified in two ways. One classification divides material into requirements, criteria, and guidance (Figure 27). Requirements are statements about what is needed and are used to either help define problems (Phase 1) or explain what is needed before a project can be begun (Phase 3). Criteria are standards that meet requirements. Guidance explains how to apply criteria. Criteria and guidance are used to develop problem solutions. The second classification divides space type by topic. These topics are listed in Table 3.

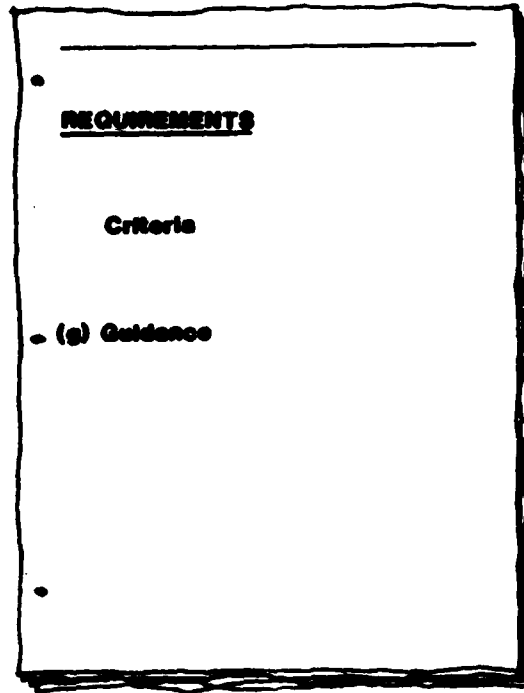


Figure 27. Guidelines are organized into requirements, criteria, and guidance for each type of space.

## How to Use Guidelines

During Phase 1, guidelines can be used to tabulate school facility problems; i.e., to compare what exists with requirements. The differences are problems which must be resolved.

When evaluating an entire facility, the requirements listed in the General Design Guidelines section below may help identify problems that should be recorded on Worksheet 7. Similarly, when Worksheet 8 is used to evaluate a particular space or room within a school facility, the requirements for that kind of space plus general facility requirements should be used to help identify problems which should be recorded.

The designer/planner should read through the guidelines before evaluating a facility or a space. This will increase his/her sensitivity and awareness to the topics which must be considered during evaluations. Typical evaluation steps are:

# DESIGN GUIDELINES

1. Decide whether the requirements listed in the guidelines are applicable to the school facilities being evaluated.
2. Determine whether requirements other than those in the guidelines are applicable to the school facilities being evaluated.
3. If requirements are applicable, does the facility satisfy them adequately?
4. Determine which requirements are not satisfied adequately; these are problems which should be recorded.

During Phase 3, problems are resolved through the design and implementation of solutions. These solutions are developed using criteria and guidance.

Criteria and guidance are used in at least three ways during Phase 3. One way is to use them to adopt standards which will provide continuity and coordination to improvement projects. For example, assume that the master planning committee has established color and finish schemes for certain spaces or areas within a building. In this case, even though money for a flooring project may be available before funds are allocated to paint walls (perhaps at the same time furniture is repainted), the final solution will be color coordinated and appealing.

Criteria and guidance also can be used to help the school staff accomplish projects within the limits of their available resources. Criteria and guidance information will help those designing solutions, deciding about options, or selecting furniture understand what can be done to obtain an effective solution.

Solutions can also be developed by outside sources, i.e., at the installation, and within the Army, the Federal Government, or the private sector. The guidelines outlined above should be given to such sources so they can suggest actions based on an understanding of the factors which contribute to effective solutions for service school operations.

Requirements also play a role in Phase 3. Before an effective solution can be developed, applicable requirements must be identified. Whenever a design solution is developed by someone outside the school, it is very important to organize and communicate requirements to designers. This is especially important for MCA projects. Requirements can be developed/identified with the help of DEH and information in TM 5-800-3.<sup>13</sup>

## General Design Guidelines

### Accommodations for the Handicapped

Provisions for handicapped visitors, staff members, and civilian students

<sup>13</sup> Project Development Brochures; Pt 1 Functional Requirement, TM 5-800-3 (DA, 15 May 1974).

# DESIGN GUIDELINES

should be in accordance with ER 1110-1-102 and EM 1110-1-103.<sup>14</sup> Renovation planning should include bringing the existing building up to the requirements of applicable codes and regulations (Table 3).

## Security Considerations

Security requirements and restrictions may differ for each Army Service School according to individual course content, materials, and equipment. The designation and establishment of "restricted" areas is the responsibility of the military commander of the installation or facility. Advice is furnished to him/her by the Provost Marshal or Physical Security Officer, in coordination with the Intelligence Officer and the Staff Judge Advocate. "Exclusion," "limited," and "controlled" areas should be designated according to AR 380-20, AR 310-25, AR 50-5, and AR 190-21.<sup>15</sup>

## Furniture

It is important to consider furniture in overall planning for improvements. However, because Government contracts with furniture companies are continually changing, it is very difficult to provide up-to-date information about specific furniture styles and features.

The guidelines give the school planner information which can be used to select furniture. Color and finishes are included with overall color and texture schemes. Other characteristics are covered within space types for furniture appropriate to it.

DIO can help the school planner find out what furniture is available to the school. DIO maintains a current list of Government contractors for furniture items, and may have many of the contractor's catalogs. Catalogs provide the best information about what furniture is available; they can be obtained directly from the contractors shown in the current listing.

Table 3

### Topics Used in Guidelines

USE/ACTIVITIES	ENVIRONMENTAL CONDITIONS
OCCUPANTS	Lighting
EQUIPMENT/SUPPLIES	Windows
SPACE	Sound
Size	Thermal/Heating, Cooling and Ventilating
Shape	APPEARANCE/FINISHES/IMAGE
ACCESS/CIRCULATION	COMMUNICATION
Location	
Openings and Access	STORAGE
Circulation Within Room	SPECIAL FEATURES
UTILITIES AND WASTE	FURNITURE

<sup>14</sup>Design for the Physically Handicapped, Engineer Manual (EM) 1110-1-102 and 103 (Office of the Chief of Engineers [OCE], 15 October 1976).

<sup>15</sup>Restricted Areas, AR 380-20 (DA, 15 December 1979); Dictionary of United States Army Terms, AR 310-25 (DA, 15 September 1975); Nuclear Surety, AR 50-5 (DA, 1 September 1978); and Security Identification Credentials and Application, AR 190-21 (DA, 26 June 1978).

# GENERAL BUILDING

# GUIDELINES FOR GENERAL BUILDING

## Space

### 1. ALLOW ENOUGH FLOOR AREA FOR CIRCULATION.

Multiply the net floor area by 0.15 to estimate the amount of circulation space required.

(g) For example, a facility with a net floor area of 13,300 square feet would require 1,995 square feet for circulation:  $13,300 \times 0.15 = 1,995$  square feet.

### 2. MECHANICAL EQUIPMENT MUST HAVE ENOUGH FLOOR AREA.

Multiply the net floor area by 0.05 to determine the amount of mechanical space required.

(g) For example, a facility with a net floor area of 13,300 square feet would require 665 square feet for mechanical equipment:  $13,300 \times 0.05 = 665$  square feet.

### 3. CIRCULATION BETWEEN FLOORS SHOULD BE DESIGNED BASED ON THE MAXIMUM POSSIBLE NUMBER OF PERSONS THAT CAN MOVE BETWEEN FLOORS IN A SPECIFIED TIME PERIOD.

Stairs will be designed based on a flow rate of 12 persons per foot of stair width per minute. This will insure that stairways can maintain a comfortable flow rate (see DG 1110-3-106, para 2-4c). Minimum stair widths must permit emergency exiting as specified in the National Fire Protection Association (NFPA) 101 Life Safety Code.

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# GUIDELINES FOR GENERAL BUILDING

## **Access/Circulation**

1. THE VARIOUS ACTIVITIES OF THE SERVICE SCHOOL AND THE FLOW OF MATERIALS, INFORMATION, STUDENTS, AND STAFF MUST NOT INTERFERE WITH ONE ANOTHER AND MUST INTERFERE AT CERTAIN POINTS (SEE DG 1110-3-106, PARA 2-4C).

Corridors should widen at points of queuing and decision such as corridor intersections, entrances to stairways, building entrances to stairways, and building entrances. This will allow pedestrians to pause without impeding the circulation flow (see DG 1110-130-106, para 2-4c).

(g)

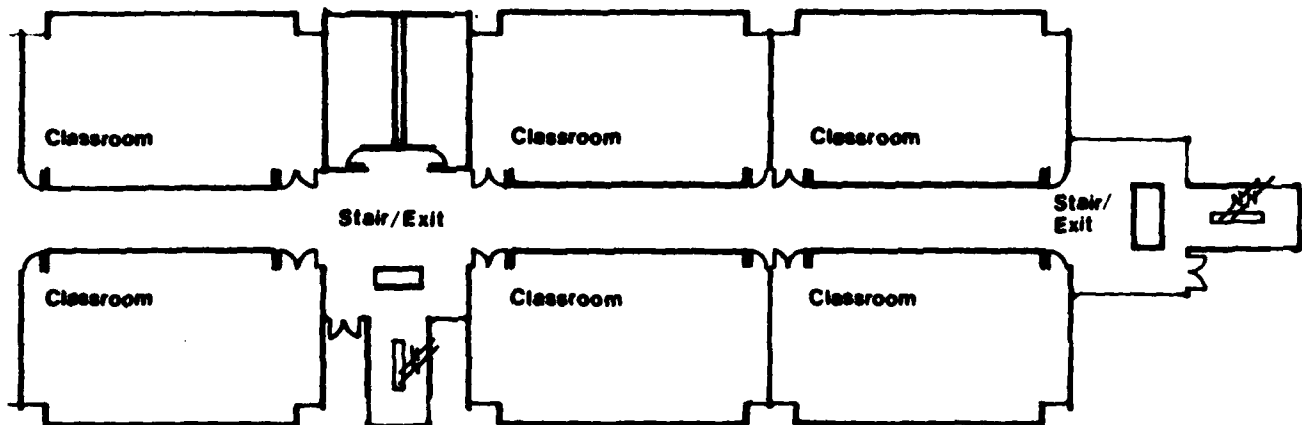


Figure 28. Widening of corridors at points of queuing and decision.

## GUIDELINES FOR GENERAL BUILDING

### 2. INSURE THAT LOCKERS ARE EASY TO GET TO AND ARE IN AREAS LARGE ENOUGH TO PREVENT CROWDING.

Lockers should be near classroom and training spaces. Crowding can be avoided by using corridors wide enough to accommodate both the normal traffic load and the activity of students at lockers which line the corridor walls, and by placing locker sections and groupings off main corridors.

(g)

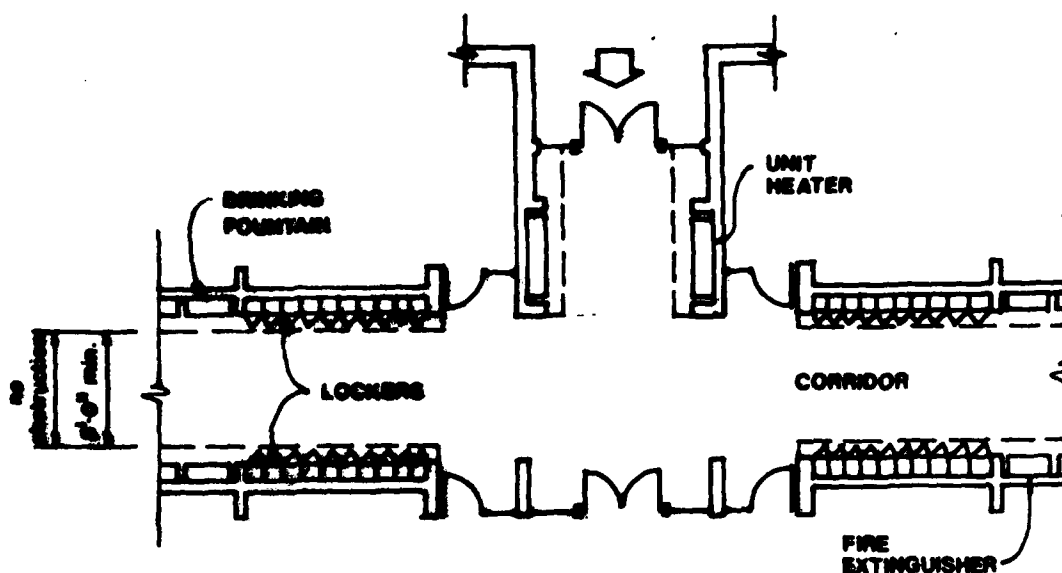


Figure 29. Locker activity does not obstruct minimum hallway clearance.

### 3. CORRIDORS SHOULD BE SAFE.

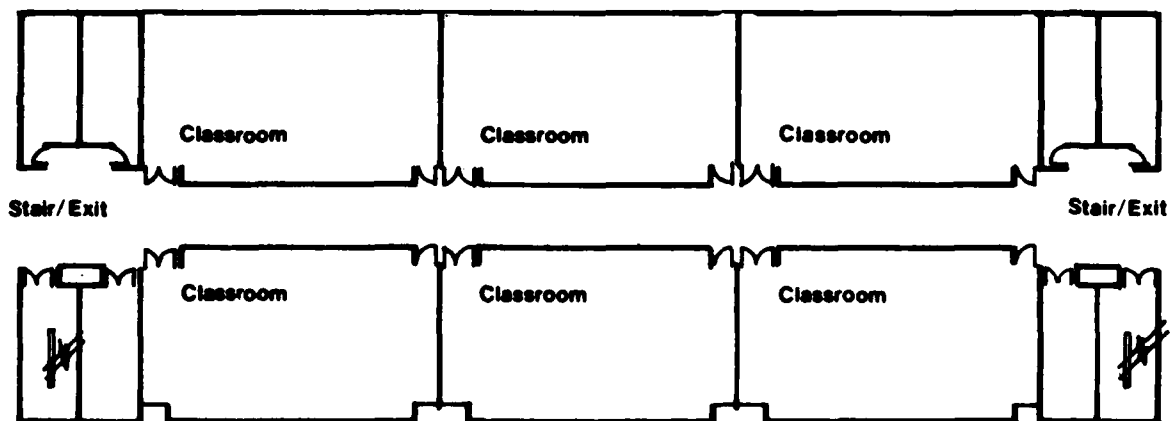
Corridor walls should be free of all projections. Heat units, drinking fountains, fire extinguishers, lockers, doors, and display cases should be recessed in the interest of safety. Corridors should be well lighted; emergency lights should also be installed so corridors will remain lighted in the event of a main power failure. Floor coverings should be durable, skid resistant, and easy to maintain. The maximum length of unbroken corridors should not exceed 150 to 200 feet. Longer sections give an undesirable perspective.

## GUIDELINES FOR GENERAL BUILDING

### 4. CIRCULATION SYSTEMS MUST BE CAPABLE OF SAFELY AND COMFORTABLY HANDLING PEAK LOADS.

Circulation loads are computed based on the occupancy of the activity spaces served by the circulation system.

(g) For example, in Figure 30, the circulation system services 9,000 square feet of classroom space. These classrooms are designed to provide 30 square feet of space per occupant. Thus, the maximum design capacity for this space is  $9,000/30 = 300$  people. This loading can be circumstances, classroom occupancy will be somewhat less than capacity. A reasonable assumption, and one which will provide an efficient circulation system both for normal use and mobilization loads, is an occupancy of five-sixths of capacity. The corridor width in Figure 30 can be determined by multiplying the estimated loading ( $5/6 \times 300 = 250$  persons) by the allowable crowding factor (6 square feet per person) to determine the required space (1500 square feet) and dividing by the corridor length (150 feet) to obtain the required width (10 feet). This dimension must be compared with the minimum fire exit width required by NFPA-101 (see DG 1110-3-106, para 2-4c).



1500 Sq. Ft. Classroom  
 $6 \times (1500 \text{ Sq. Ft.}) = 9000 \text{ Sq. Ft.}$

Figure 30. Circulation system calculations.

### 5. MULTILEVEL SCHOOL BUILDINGS MAY BE EQUIPPED WITH COMBINATION FREIGHT AND PASSENGER ELEVATORS (WHEN NECESSARY) TO MOVE HEAVY OR BULKY MATERIALS BETWEEN FLOORS. USE OF PASSENGER ELEVATORS WILL BE KEPT TO THE MINIMUM NECESSARY TO MEET OPERATIONAL REQUIREMENTS (SEE DG 1110-3-106, PARA 2-4C).

## GUIDELINES FOR GENERAL BUILDING

6. THE LOCATION OF RESTROOMS, DRINKING FOUNTAINS, AND CLOSETS SHOULD NOT DISRUPT CORRIDOR CIRCULATION.

Restrooms, drinking fountains, mechanical/electrical closets, and janitors' closets should be at corridor intersections because of the additional corridor space available at these points (see DG 1110-3-106, para 2-4c).

7. WHEN OPENED, CLASSROOM DOORS SHOULD NOT IMPEDE TRAFFIC FLOW IN CORRIDORS OR FROM CLASSROOMS.

All doors should be at least 3 feet wide, open in the direction of exit, and recessed so that they do not protrude into the corridor when they are opened.

(g) The path of travel on the pull side of a doorway should be clear and level for 6 feet. On the opposite side, the floor should be clear and level for at least 4 feet. On the pull side of the door, the floor should extend at least 18 inches beyond the doorway strike jamb (Figure 31).

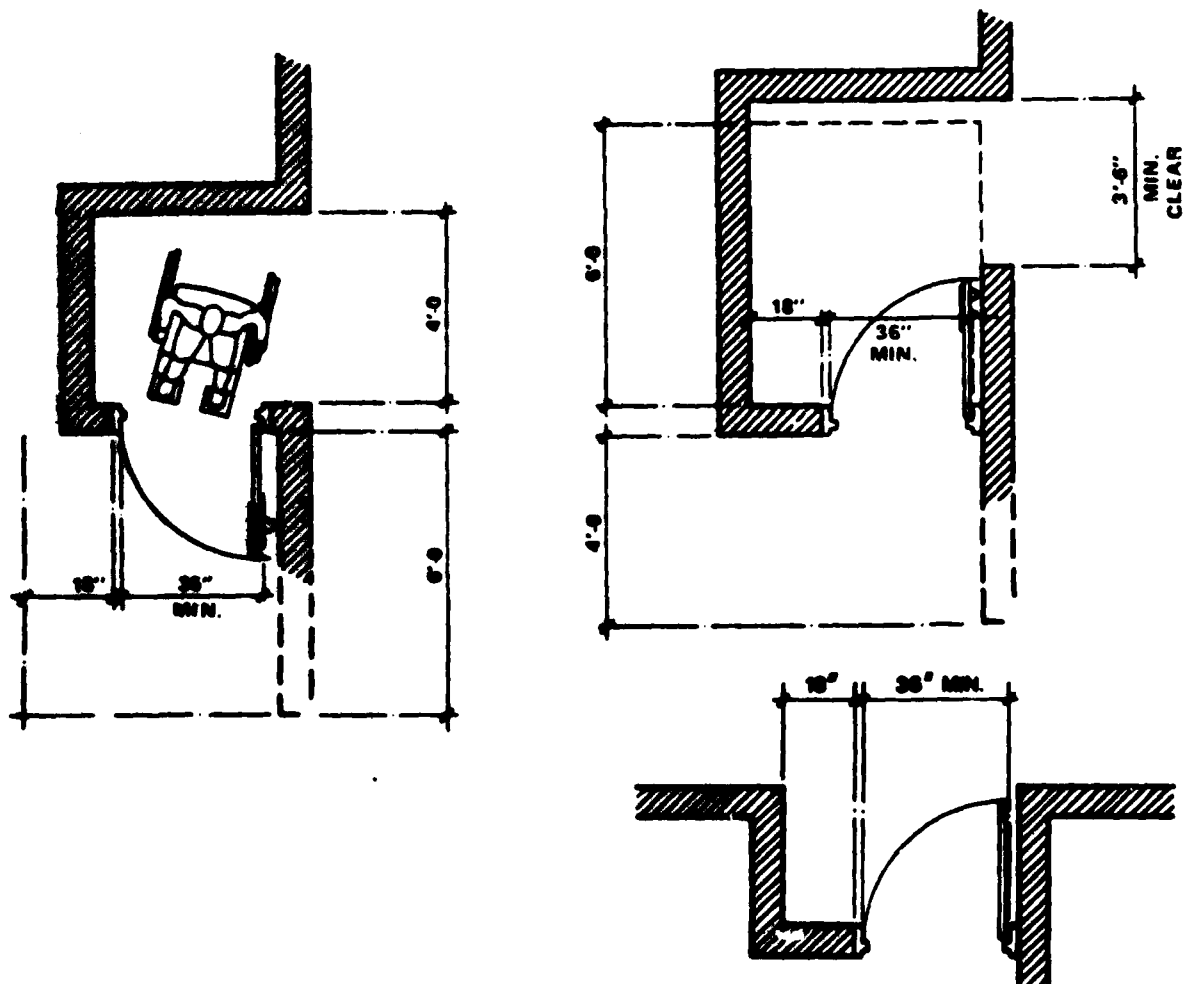


Figure 31. Clearance at doorways.

## **GUIDELINES FOR GENERAL BUILDING**

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8. **THE PHYSICALLY HANDICAPPED SHOULD HAVE ACCESS TO ALL AREAS OF THE BUILDING.**

The building must be accessible to and usable by the physically handicapped (ER 1110-1-102, EM 1110-1-103, and DC 1110-3-106, 2-4c). To insure handicapped accessibility, designs must include kick plates on doors, 3-foot interior doors, ramps, key-operated elevators, push bars on entrance doors (placed at a convenient height), and no doorway thresholds.

# GUIDELINES FOR GENERAL BUILDING

## **Utilities and Waste**

1. THE WIRING DISTRIBUTION SYSTEM MUST PROVIDE, AT A MINIMUM, SIGNAL AND LINE VOLTAGE POWER. DEPENDING ON THE INSTRUCTIONAL PROGRAM, ADDITIONAL POWER DISTRIBUTION MAY BE REQUIRED FOR UNUSUAL VOLTAGE, PHASING, OR FREQUENCY DEMANDS.

Electrical design must conform to DOD Directive 4270.1-M and TM 5-811-1. Three-phase 208Y/120 volts should generally be used to serve incandescent and small fluorescent or mercury vapor lighting loads, small power loads, and receptacles. Consideration should be given to the feasibility of using three-phase 480Y/277-volt systems (see DG 1110-3-106, para 2-4c).

To reduce line losses which can occur at lower voltages, power should be distributed at the highest practical voltage. Substation transformers should be located throughout the school to reduce the voltage to 277/480 volts for fluorescent lighting, heavy equipment operation, and power distribution. A second set of transformers should be provided to step the voltage from 480 to 120/208 for convenience outlets. Primary electric service should be placed underground. Cables should feed from the nearest pole or manhole to a pad-mounted transformer(s) that is located outdoors below grade, and is as close to the load centers as possible. Secondary electric service from transformer(s) should also be underground. Service and distribution equipment should be of the circuit breaker or fusible switch type. Shallow closets should be provided for electrical, telephone, and auxiliary system equipment (where required). Power distribution within the building should be in trenches or overhead raceways located to afford maximum flexibility in room power requirements and ready accessibility for circuit revisions (see DG 1110-3-106, para 2-4c).

2. ALL ACTIVITY SPACES SHOULD HAVE MECHANICAL CHASES AT DOOR RECESSES.

Chases should be easily accessible, large enough to allow additions to services, and should feature an electrical distribution panel (on the corridor side) and a chase panel (on the room side) with connections to ceiling and intrawall conduit runs.

3. THERE SHOULD BE ENOUGH ELECTRICAL OUTLETS SO EXTENSION CORDS DO NOT HAVE TO BE USED.
4. THERE SHOULD BE ACCESSIBLE, THREE-PLUG OUTLETS. THESE RECEPTACLES SHOULD BE LOCATED IN AREAS WHERE EQUIPMENT IS LIKELY TO BE USED.

## **GUIDELINES FOR GENERAL BUILDING**

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### **5. SWITCHES SHOULD BE EASILY ACCESSIBLE.**

Switches should be low enough for handicapped instructors to operate, i.e., 48 inches above the floor (EM 1110-1-103).

### **6. PLUMBING SYSTEMS MUST BE SAFE AND SANITARY.**

Plumbing must be in accordance with TM 5-810-5 (and TM 5-810-6, if gas fittings are required). Water supply facilities must be as prescribed in TM 5-813-5 and TM 5-813-6. Sanitary sewers must be as prescribed in TM 5-814-1. Plumbing and fixtures shall comply with the American National Plumbing Code A 40.8 or the National Standard Plumbing Code, within the limits established by DOD Directive 4270.1-M, Chapter 10 (also see DG 1110-3-106, para 2-4c).

# GUIDELINES FOR GENERAL BUILDING

## Environmental Conditions

### Lighting

1. LIGHTING SHOULD BE USED EFFICIENTLY TO PROVIDE USER COMFORT AND LIGHTING LEVELS ADEQUATE FOR SAFETY AND VISUAL TASKS.

A lighting engineer or expert should be consulted to insure that the lighting system will be well-planned and efficient.

2. TO INSURE THE FLEXIBLE USE OF MODULAR SPACES, MECHANICAL AND ELECTRICAL SYSTEMS MUST BE DESIGNED TO ADAPT TO CHANGES IN ROOM FUNCTION.

Specific considerations include the following:

Separate lighting controls will be provided for each 750 square feet of space. These controls should be located near the entrances. Separate controls should be provided for each 750-square foot space component.

Room lighting should be designed so lighting levels and arrangements can be changed. It should be possible to adjust lighting to classroom activities (uniform 70 foot-candles), self-paced learning (uniform background illumination of 30 foot-candles, local task illumination of 70 foot-candles), and audiovisual presentations (screen area darkened, other areas 30 foot-candles).

Each 750-square-foot space should have separate temperature controls. Subdivisions other than 750 square feet will require room heating and cooling system revisions. These revisions must be both economical and simple (see DG 1110-3-106, para 3-2g).

3. LIGHTING DESIGNS SHOULD HAVE ENOUGH LOCAL SWITCHING CAPABILITY TO ACHIEVE MAXIMUM AND MINIMUM LIGHTING LEVELS FOR FACILITY OPERATION, WHERE PRACTICAL, LIGHTING SHOULD BE DESIGNED FOR SPECIFIC LOCAL TASKS INSTEAD OF FOR UNIFORM, GENERAL LEVELS.

Intensities should conform to the minimum levels recommended by the latest edition of the *Illuminating Engineering Society Lighting Handbook*. OCE Standard Drawing No. 40-06-04 should also be used, where possible (see DG 1110-3-106, para 2-4c).

Research has established that a lighting level between 30 and 40 foot-candles is high enough for the comfortable and efficient completion of most tasks. However, it is recommended that illumination be designed to supply 70 foot-candles on all educational tasks, since accurate reading of pencil handwriting demands higher illumination levels than most other visual tasks. Lighting levels higher than 70 foot-candles are not usually required (DG 1110-3-106, para 3-3b).



## GUIDELINES FOR GENERAL BUILDING

4. AN IMPORTANT CONSIDERATION IN LIGHTING CIRCULATION SPACES IS THE ABILITY OF THE EYE TO ADAPT TO LIGHT AND DARKNESS. SINCE PERSONNEL ENTERING THE SERVICE SCHOOL FACILITY WILL BE COMING FROM THE OUTDOORS (WHERE THE LEVEL OF ILLUMINATION MAY BE AS HIGH AS 12,000 FOOT-CANDLES), IT IS IMPORTANT TO PROVIDE ENOUGH LIGHTING IN CIRCULATION SPACES.

Foyers will be bright enough to permit the eye to gradually adapt to the interior lighting level.

5. STAIRCASES SHOULD HAVE HIGH-INTENSITY LIGHTING TO OUTLINE STEPS, HAND-RAILS, STAIRWAY CONFIGURATION, AND OTHER IMPORTANT ELEMENTS (SEE DG 1110-3-106, PARA 3-3B).

6. LIGHTING SHOULD BE ADJUSTED SO SHADOWS ON DESK TOPS, CHALKBOARDS, MAPS, AND DISPLAY PANELS ARE ELIMINATED.

Seating should be designed so windows are behind students or on their left. If such an arrangement is not possible, entering light should be modulated with shading or other light-attenuating devices (see DG 1110-3-106, para 3-3b).

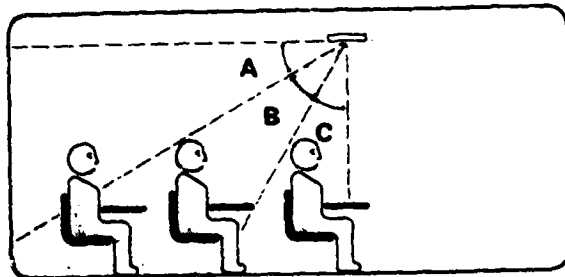
In general, the task (paper, book, item of equipment) confronting the student should be brighter than the surrounding environment; i.e., for optimum contour and depth perception, the task should be no more than three times as bright as its surroundings. Contrasts greater than this produce distortions. In no case should the task illumination level exceed 10 times the general lighting level (see DG 1110-3-106, para 3-3b).

7. LIGHTING WILL BE DESIGNED TO MINIMIZE VEILING REFLECTIONS; I.E., LIGHT WHICH IS REFLECTED OFF THE TASK OR NEARBY SURFACES DIRECTLY INTO THE STUDENT'S EYES.

In general, light fixtures should be selected and placed so the angle of incidence measured from the vertical is greater than 30 degrees, with as much light as possible falling within the 30- to 60-degree core (see DG 1110-3-106, para 3-3b and Figure 32).

## GUIDELINES FOR GENERAL BUILDING

(g)



- A 0 Degrees - 30 Degrees  
Fixture Glare
- B 30 Degrees - 60 Degrees  
Optimum Light
- C 60 Degrees - 90 Degrees  
Veiling Reflections

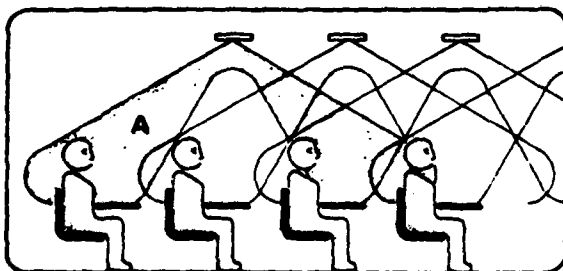
Lighting Glare and Reflections

Figure 32. Lighting glare and reflections.

8. LIGHTING DESIGN WILL MINIMIZE GLARE; I.E., LIGHT WHICH SHINES DIRECTLY FROM THE LIGHT SOURCE INTO THE STUDENT'S EYES.

Glare is minimized by selecting and placing light fixtures so light is directed below a 60-degree angle of incidence, with as much light as possible falling in the 30- to 60-degree core. For example, a lighting fixture with low brightness characteristics that produces a "bat-wing" light distribution pattern will substantially reduce glare (see DG 1110-3-106, para 3-3b).

(g)



- A "Batwing" Distribution

Lighting Without Glare

Figure 33. Lighting without glare.

## GUIDELINES FOR GENERAL BUILDING

### 9. CAREFUL CONSIDERATION SHOULD BE GIVEN TO CHOOSING LIGHTING SYSTEMS AND FITTINGS.

(g) In terms of light output for a given cost, bare fluorescent tubes are probably the most efficient method of lighting, *if* they can be arranged so as to avoid glare. Recent research shows that if bare tube light fittings are housed in V-shaped slots in such a way that the tube has high background brightness, it is quite possible to look at the assembly without suffering from glare. This is because the V-shaped slot gradually filters the tube's intense brightness as the eye moves away from it.

Low brightness louvered fittings are also good light sources (though less efficient than the bare tube), especially if they are ventilated.

The least efficient but most common form of light fitting has opal or prismatic diffusers over the face of the tube. Although these diffusers reduce tube glare, they cause a considerable loss of light, which in turn can add to both the capital and operating costs of the building.

### 10. EXIT ROUTES MUST BE ILLUMINATED DURING POWER OUTAGES AND CLEARLY MARKED AT ALL TIMES.

Illuminated exit signs and emergency lights must be provided for all emergency exits and passageways as required by NFPA Life Safety Code No. 101 (see DG 1110-3-106, para 2-4c).

## **Windows**

### 1. CAREFUL CONSIDERATION SHOULD BE GIVEN TO USING WINDOWS AS AN EFFICIENT LIGHTING OR VENTILATING SYSTEM.

Windows should be functional in case of loss of power, air, or light.

Operable windows are required in non-air-conditioned buildings. They should be arranged so the maximum possible advantage may be gained from any wind, particularly the prevailing wind.

### 2. USING WINDOWS FOR DAYLIGHT IS UNDESIRABLE UNLESS THE SOLAR EFFECTS ARE CONSIDERED AND ALLOWANCES ARE MADE FOR THEM.

(g) Windows should not be used to provide daylight in *addition* to or as an *alternative* to electric lights. Recent research shows that windows do not provide correct lighting for most of the tasks people perform. Attempts to use windows to provide such light result in large areas of glazing with possible unsatisfactory heat gains or losses and glare-caused discomfort.

## GUIDELINES FOR GENERAL BUILDING

Surveys of existing buildings show that, almost irrespective of the amount of glazing provided, lights are switched on first thing in the morning and remain on all day, winter and summer alike. There is, therefore, little point in attempting to use windows to provide daylight. It is essential, however, that some windows be provided, both to enable the building's occupants to see out and to insure the satisfactory appearance of interior and exterior elevations.

### 3. GLARE FROM WINDOWS AND GLASS SHOULD BE KEPT AT A MINIMUM.

Clear areas of glass with thin mullions help reduce apparent glare. If the mullions are wide compared to the glass width, the eye uncomfortably attempts to accommodate both the bright view and dark mullions. Tinted windows will help to reduce glare.

## **Sound**

### SOUND CONTROL SHOULD HELP CREATE A POSITIVE LEARNING ENVIRONMENT.

A background noise level of about 35 decibels of full-spectrum or "white" sound produces optimum alertness and muscle tones for learning (see DG 1110-3-106, para 3-3a).

(g) The following are generalizations about acoustical environments:

The level at which a constant background noise is acceptable is usually defined as that level which is consistent with the ability to hear normal speech easily.

Extreme quiet does not provide an appropriate environment for many learning activities.

Intermittent or irregular sounds cause attention to shift and are therefore more annoying and distracting than steady sounds, which do not cause many attention shifts.

Noise which is familiar is less annoying than strange or unnecessary sound.

High-pitched noise is more fatiguing and irritating than low-pitched noise.

# GUIDELINES FOR GENERAL BUILDING

## **Thermal/Heating, Cooling and Ventilating**

1. CONSTRUCTION METHODS AND MATERIALS SHOULD BE SUCH THAT THE EFFICIENCY OF HEATING AND COOLING SYSTEMS IS INSURED. SUCH SYSTEMS SHOULD NOT BE USED TO COMPENSATE FOR THE BUILDING DEFICIENCIES.

(g) Fixed baffles (e.g., overhanging roofs and verandas) can prevent direct solar infiltrations. However, the least expensive way to avoid unwanted solar infiltration is to orient buildings so windows face only north. However, such orientation is not always practical or desirable.

Venetian blinds do not protect a building from solar heat gain well. They are also often improperly used and are difficult to clean.

Inefficient luminaire fittings may also result in higher heat gains in the building. This higher heat gain in turn requires larger air-conditioning plants which add to both capital and operating costs.

Double-glazed windows should be installed whenever possible.

# GUIDELINES FOR GENERAL BUILDING

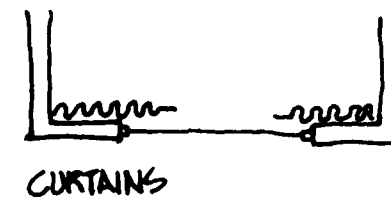
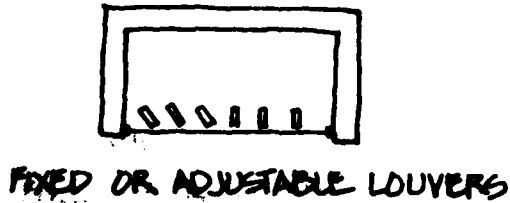
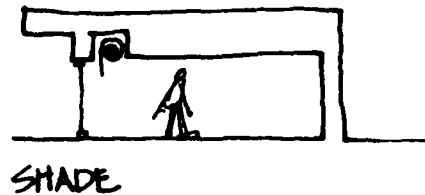
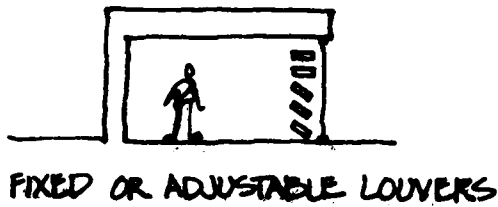
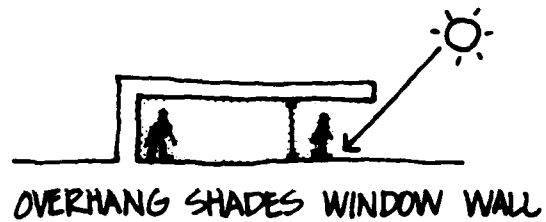
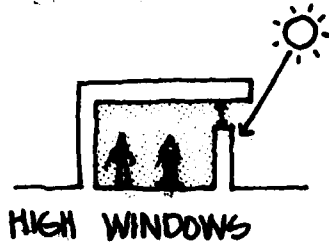
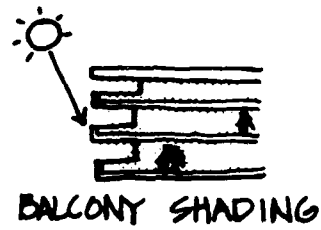
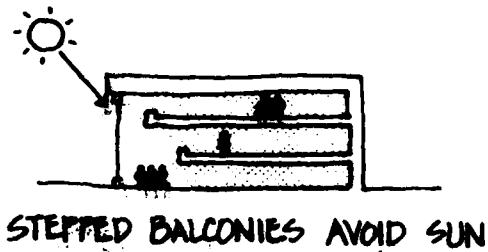
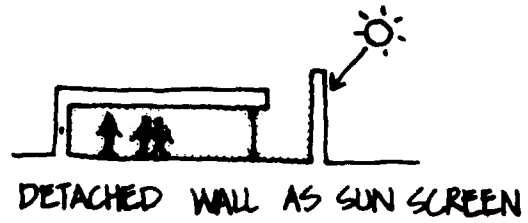
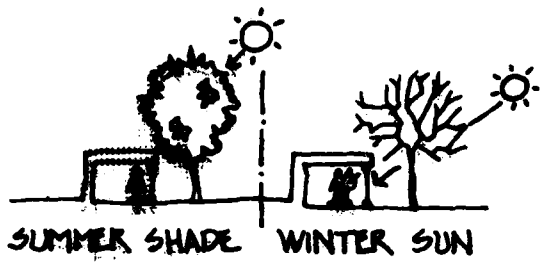


Figure 34. Protection from sunlight and solar penetration.

## GUIDELINES FOR GENERAL BUILDING

2. THERMAL CONDITIONS SHOULD BE WITHIN THE HUMAN COMFORT RANGE (WHERE POSSIBLE), BUT SHOULD MINIMIZE HEAT OR COLD STRESS.

(g) Investigations in the area of human performance show that high temperature and humidity decreases working efficiency, increases errors, and under extreme conditions, adversely effects health (see DG 1110-3-106, para 3-3d).

3. ENVIRONMENTAL CONDITIONS NECESSARY FOR THERMAL COMFORT SHOULD BE DETERMINED FOR EACH SPACE WITH CONSIDERATION FOR THE SPECIFIC ACTIVITIES PERFORMED WITHIN IT.

Optimal thermal conditions vary with individuals, but are primarily a function of activity level and clothing worn. No two researchers agree on which exact combinations of radiant temperature, air temperature, relative humidity, and air movement constitute the optimum. However, there is general agreement on the following:

Radiant Temperature. The average temperature of surrounding surfaces should be about the same as the room air temperature. Glass or poorly insulated walls may result in surface temperatures which are above or below room air temperature, and can be compensated for by changing air temperature and air velocity to achieve thermal comfort. Floor temperature should be warm to the touch (79 degrees Farenheit optimum).

Air Temperature. Sixty to 70 degrees Farenheit is used for vigorous activities; 68 to 78 degrees Farenheit is used for sedentary activities.

Air Movement. For heating, air velocities should be kept below 100 feet per minute. To prevent occupants' ankles and legs from being chilled, 20 to 40 lineal feet per minute measured at about 30 inches above the floor level is optimal.

Relative Humidity. Thirty to 70 percent is optimal.

Heating, air conditioning, and ventilation must be in accordance with the current DOD Construction Criteria Manual 4270.1-M and TM 5-810-1. The heat loss and heat gain calculations must be made in accordance with the current ASHRAE *Handbook of Fundamentals*. In the design of air-conditioning systems, various systems should be considered. These include variable air volume, multizone, dual-duct, single-zone, a combination of systems, and any other suitable systems covered by the current ASHRAE Handbook. Within the design scope and environmental conditions required for various spaces, each air-conditioning system should be studied and the least energy-intensive system selected based on life-cycle cost and energy analyses. Energy-recovery systems should be investigated and incorporated into the design, if economical (see DG 1110-3-106, para 2-4c).

# GUIDELINES FOR GENERAL BUILDING

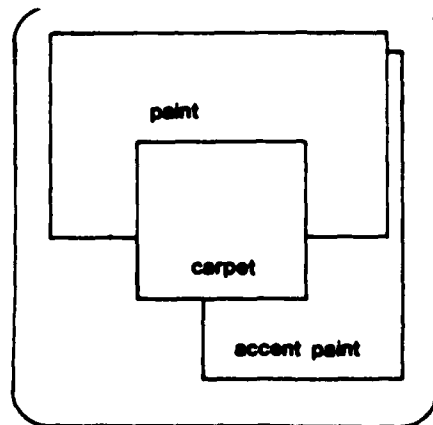
4. AN ADEQUATE SUPPLY OF CLEAN OUTDOOR AIR MUST BE PROVIDED TO EACH OCCUPIED SPACE TO MAINTAIN OXYGEN LEVELS NEAR 21 PERCENT, AND TO MINIMIZE ODORS.

Five cubic feet per minute per person of outside air is the minimum needed to maintain an adequate oxygen supply. Ten to 30 cubic feet per minute per person is typically used for odor control, depending on the space's odor generation rates. The presence of smoking necessitates higher ventilation rates. Exhaust ventilation is used in lockers and washrooms.

## Appearance/Finishes/Image

1. COLORS, MATERIALS, AND FINISHES SHOULD BE CHOSEN WITH AN OVERALL SCHEME IN MIND.

(g)



COLOR SCHEME KEY

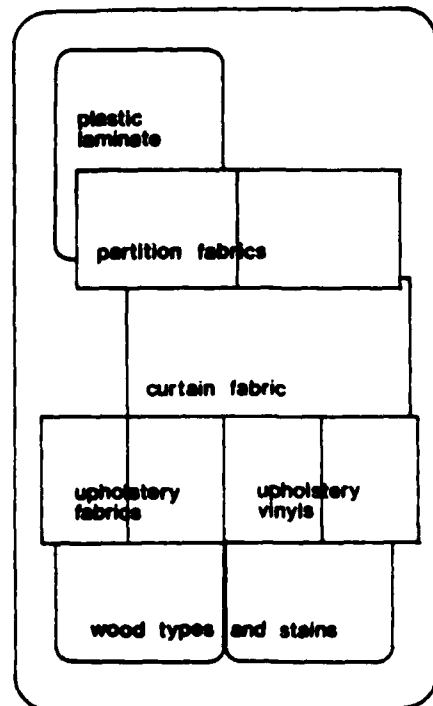


Figure 35. Color schemes.

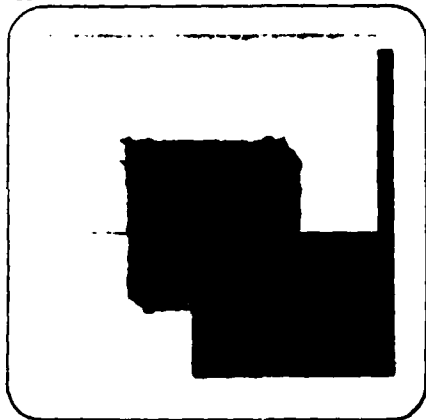


# GUIDELINES FOR GENERAL BUILDING

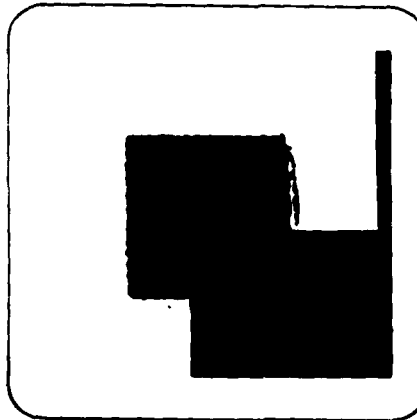
## COLOR SCHEME

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a	b

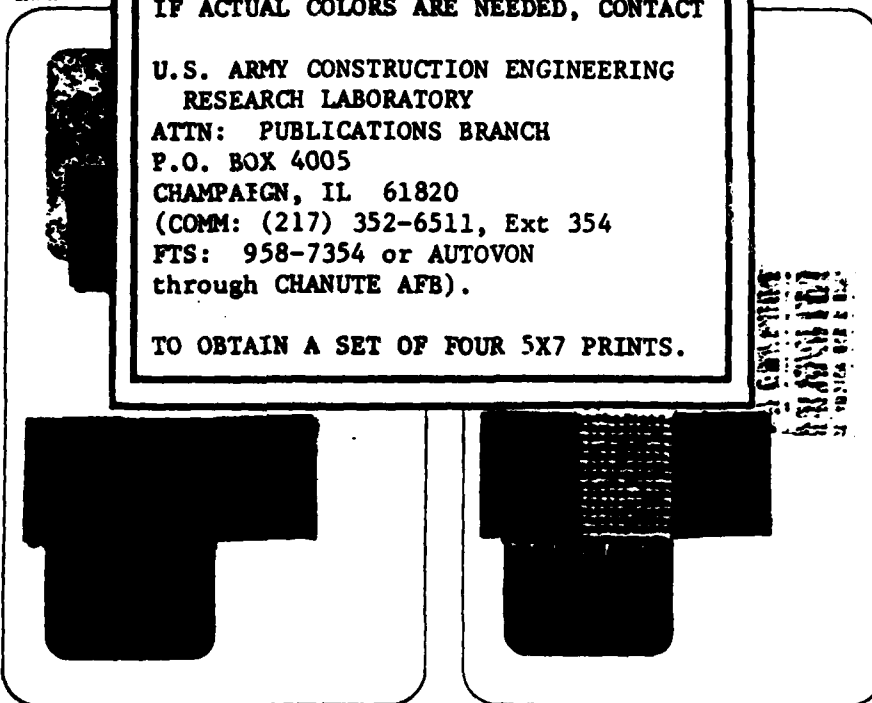
room finish



room finish



furniture



IF ACTUAL COLORS ARE NEEDED, CONTACT

U.S. ARMY CONSTRUCTION ENGINEERING  
RESEARCH LABORATORY

ATTN: PUBLICATIONS BRANCH

P.O. BOX 4005

CHAMPAIGN, IL 61820

(COMM: (217) 352-6511, Ext 354

FTS: 958-7354 or AUTOVON  
through CHANUTE AFB).

TO OBTAIN A SET OF FOUR 5X7 PRINTS.

OPTION a

OPTION b

Figure 35. (Cont'd).

# GUIDELINES FOR GENERAL BUILDING

## 2. BUILDING SURFACES SHOULD BE EASY TO MAINTAIN.

Some of the items that should be included or considered to help insure that buildings remain clean are cove bases, entrance mats, removable carpeted elevator floors, sealed concrete floors, large kick plates and push plates on doors, hard finish or ceramic tile walls, plastic-coated concrete block walls, elimination of crevices and recesses, and hermetically sealed buildings.

## 3. INTERIOR FINISHES MUST BE APPROPRIATE FOR THE DESIGNED FUNCTION OF THE BUILDING AND SPACES. MATERIAL SELECTION SHOULD BE BASED ON LOW MAINTENANCE QUALITIES (CONSIDERING THE ANTICIPATED USE), LIFE-CYCLE COST, FIRE, AND OTHER SAFETY REQUIREMENTS.

Decisions concerning the extent of carpet installation must be coordinated with the using service and should be based on distinct functional advantages, such as acoustics, safety, and maintenance. Native (local) materials should be used where possible. Long-life materials such as stones, tiles, woods, plastics, and vinyls should be selected to provide attractive colors, textures, and patterns that will not quickly become outdated. Interior finishes must conform to the flame spread and smoke development standards contained in DOD Manual 4270.1-M and NFPA 101 (see DG 1110-3-106, para 2-4c).

## 4. FLOOR COVERINGS SHOULD BE APPROPRIATE TO A LEARNING ENVIRONMENT.

Floor surfaces should be linoleum, carpet, terrazo, or vinyl asbestos tile. Selection will be based on space type, acoustic qualities and requirements, and appearance.

## 5. PROTECTIVE MATERIALS SHOULD BE USED TO COVER LOWER WALLS AND DOORS.

There should be baseboards at all floor-wall connections. Doors should have metal kick plates.

## 6. WALL SURFACE FINISHES SHOULD MINIMIZE GLARE.

Windows can be a source of glare. To reduce glare as much as possible, window walls should be very light in color. Windows should also have deep, light-colored, splayed reveals. This gives the smoothest possible brightness gradation from inside the room to the bright view outside and thus reduces the effective glare.

## **GUIDELINES FOR GENERAL BUILDING**

The use of color in Army facilities is limited to a practical number selected from Federal Standard 595A. General guidance for color selection is provided in Figure 35 and TM 5-807-7. Color should be used to stimulate human physical and emotional reactions and to enhance the overall functionality of the building. Use soft colors in study areas and consider brighter base colors and accents in casual seeing spaces. In critical seeing areas, glare, brilliant colors, and great brightness differences, both in the lighting system and in the color of walls, floors, furnishings, and equipment, should be avoided (see DG 1110-3-106, para 2-4c).

# GUIDELINES FOR GENERAL BUILDING

## **Communication**

### **1. AN ADEQUATE PUBLIC-ADDRESS OR INTERCOM SYSTEM MUST BE AVAILABLE.**

An intercommunication system consisting of a master station capable of selectively paging through individual loudspeakers in selected areas and offices must be provided. The loudspeaker stations should be the talk-back type, and include a conveniently located master station call button. The master station should have volume controls on input and output, an all-call feature, and indicators for announcing incoming calls. Speakers should be flush-mounted. Medium- and large-size classrooms must be furnished with receptacle and wiring for microphones and speakers for amplified audio distribution (see DG 1110-3-106, para 2-4c).

### **2. THERE SHOULD BE A CLASS BELL SYSTEM.**

A class bell system can be incorporated into a public address intercom system. Telephones and lines will be provided by the local Communications-Electronics Officer (see DG 1110-3-106, para 2-4c).

# GUIDELINES FOR GENERAL BUILDING

## **Storage**

1. THERE SHOULD BE ENOUGH SPACE FOR STUDENT AND INSTRUCTOR COAT RACKS.

Space should be available to store outer clothing and other personal equipment within or near each training, work, or study area.

2. THERE SHOULD BE ADEQUATE AND SECURE STORAGE FOR INSTRUCTION MATERIALS, TRAINING AIDS, AND AUDIOVISUAL EQUIPMENT.

To determine the required amount of visual and training aid storage space, allow 1-1/2 square feet per student (this assumes that storage will be four shelves high).

3. SAFEGUARDING OF INSTRUCTIONAL MATERIALS SHOULD BE A HIGH PRIORITY ITEM (CONTROL OF CLASSIFIED MATERIALS AND DAY-TO-DAY ENTRY TO THE STORAGE AREA AND LOCKER AREA SHOULD HELP THIS SAFEGUARDING EFFORT).

4. THERE SHOULD BE EASY-TO-REACH, ADEQUATE FILING SPACE FOR LEARNING MATERIALS.

If filing is an important task within a space, an adequate number of filing cabinets should be selected and arranged within the space. The selection of other furniture and accessories should be based on the remaining floor area.

5. LOCKERS AND OTHER STORAGE CABINETS AND SHELVES SHOULD BE EASY TO MAINTAIN.

The ceramic tile bases will be used to simplify floor maintenance. Sof-fits will prevent dust and trash from accumulating on top of lockers. These units can be ventilated by pulling air through lower front vents into the plenum above.

## **GUIDELINES FOR GENERAL BUILDING**

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Medium-sized equipment that is not in daily use (e.g., engines and mechanical assemblies) should be placed on dollies and stored in lockable spaces within 75 feet of the classroom.

Light, hand-carried equipment should be stored in lockable spaces within 75 feet of the classroom. If such equipment is in daily use, storage should be provided in classroom lockers or in a room directly adjacent to the classroom.

Multipurpose classroom spaces, divided to allow for storage, will be used before single-use storage spaces are considered (see DG 1110-3-106, para 2-4c).

# GUIDELINES FOR GENERAL BUILDING

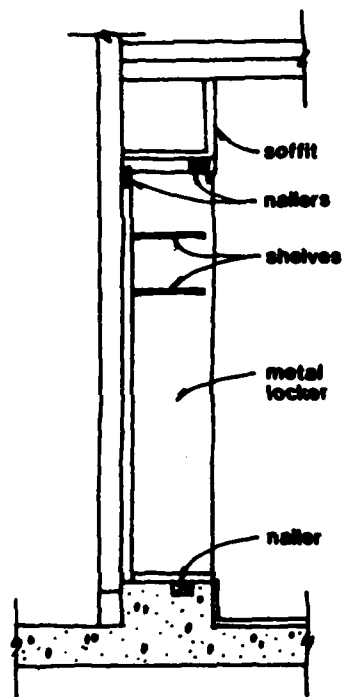


Figure 36. Typical locker detail.

## 6. STORAGE SHOULD BE CONVENIENT, ATTRACTIVE, AND SERVE FUNCTIONAL NEEDS.

(g) Both the physical characteristics and frequency of use of stored materials affect storage design.

To increase utilization, training equipment should be portable or movable.

When indicated by the mission, provision will be made to allow for the movement of large, mobile equipment such as tanks, helicopters, and military vehicles between classrooms and outdoor storage areas.

Large equipment that is infrequently used and is not readily moved should be blocked from view by movable partitioning when it is not in use.

Large- and medium-sized equipment that is in daily use should be stored in its dedicated shops and classrooms.

# GUIDELINES FOR GENERAL BUILDING

## Special Features

### 1. FIRE ALARMS SHOULD BE ACCESSIBLE TO ALL BUILDING OCCUPANTS.

Fire alarms should be 48 inches high. This will allow any handicapped person to activate them.

### 2. ADEQUATE FIRE PROTECTION MUST BE PROVIDED.

Criteria for fire protection, including fire and/or smoke detection systems, fire alarm and evacuation signal systems, and extinguishment systems, are prescribed in DOD Construction Criteria Manual 4270.1-M, TM 5-812-1, and TM 5-813-6. Area limitations, length of corridors, size of rooms, and exits must conform to the requirements for "flexible plan" buildings given in NFPA 101. Changes in fire-rated construction, location of detection and alarm systems, exits and evacuation routes, sprinkler and extinguishing systems, and other fire protection features must be included in renovation planning and coordinated with the installation fire marshal. Spaces where special electrical or mechanical devices such as computers and simulators are to be housed must be identified and extinguishment systems designed accordingly.

Automatic sprinkler systems must be provided in all portions of educational buildings located below the floor of exit; in all windowless classrooms, shops, and educational spaces not having exits leading directly to the outside; and in all shops and classrooms in which hazardous materials are handled (see DG 1110-3-106, para 2-4c).

### 3. COMPUTER-CONTROLLED AND ELECTRONIC TRAINING EQUIPMENT MAY REQUIRE SPECIAL ENVIRONMENTS.

Refer to equipment manuals to establish criteria and specifications for radio frequency shielding, thermal conditions, signal grounding, and power fluctuation.

### 4. SIGNAGE SHOULD BE FUNCTIONAL AND ATTRACTIVE.

Criteria for signage systems are given in DG 1110-3-106 (para 2-4c). Identification and sign criteria for the physically handicapped are prescribed in EM 1110-1-103. Safety markings must comply with AR 385-30.



# GUIDELINES FOR GENERAL BUILDING

## **Furniture**

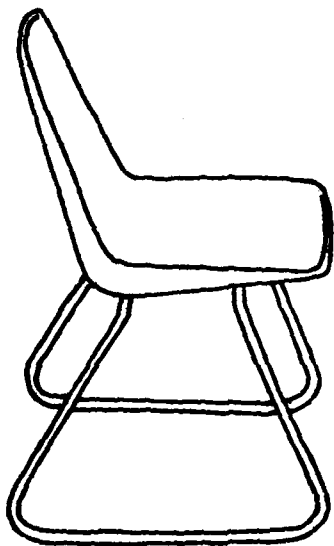
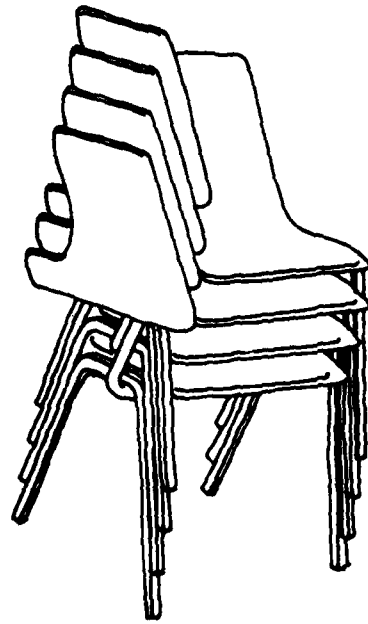
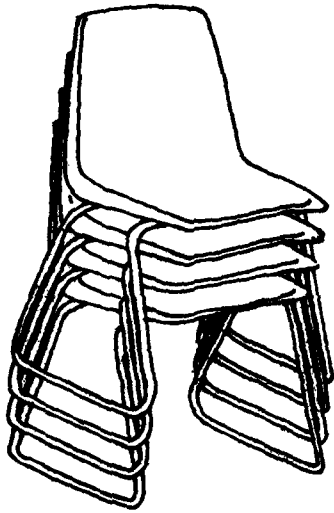
1. FURNITURE SHOULD BE CAREFULLY SELECTED TO BLEND WITH OVERALL BUILDING DECOR.

Furniture is an integral part of the overall building renovation and should be closely coordinated with the color selection and material finish to insure consistent appearance and quality.

2. DURING FURNITURE SELECTION, CONSIDERATION SHOULD BE GIVEN TO THE MANY DIFFERENT QUALITIES AND CHARACTERISTICS OF THE FURNITURE ITSELF AND THE MATERIALS USED.

Parts that receive the most wear should be replaceable, and finishes should sustain regular cleaning. Colors, textures, sizes, proportions, shapes, and reflections are important comfort factors that should be considered. Edges and surfaces should be smooth and rounded. Materials must be flame-retardant (see DG 1110-3-106, para 2-4d). Most interior furnishings should not be of scale which would require more than two persons to relocate them, or be so complicated as to require an undue amount of time to assemble or disassemble. Whenever possible, care should be taken to choose multipurpose furnishings aesthetically suitable for a variety of needs and activities. Stackable and foldable furniture should be considered for reducing storage bulk and transport where such requirements exist (see DG 1110-3-106, para 2-3d and Figure 47 and Table 4).

(g)



**Figure 37. Examples of foldable and stackable furniture.**

**GUIDELINES FOR GENERAL BUILDING**

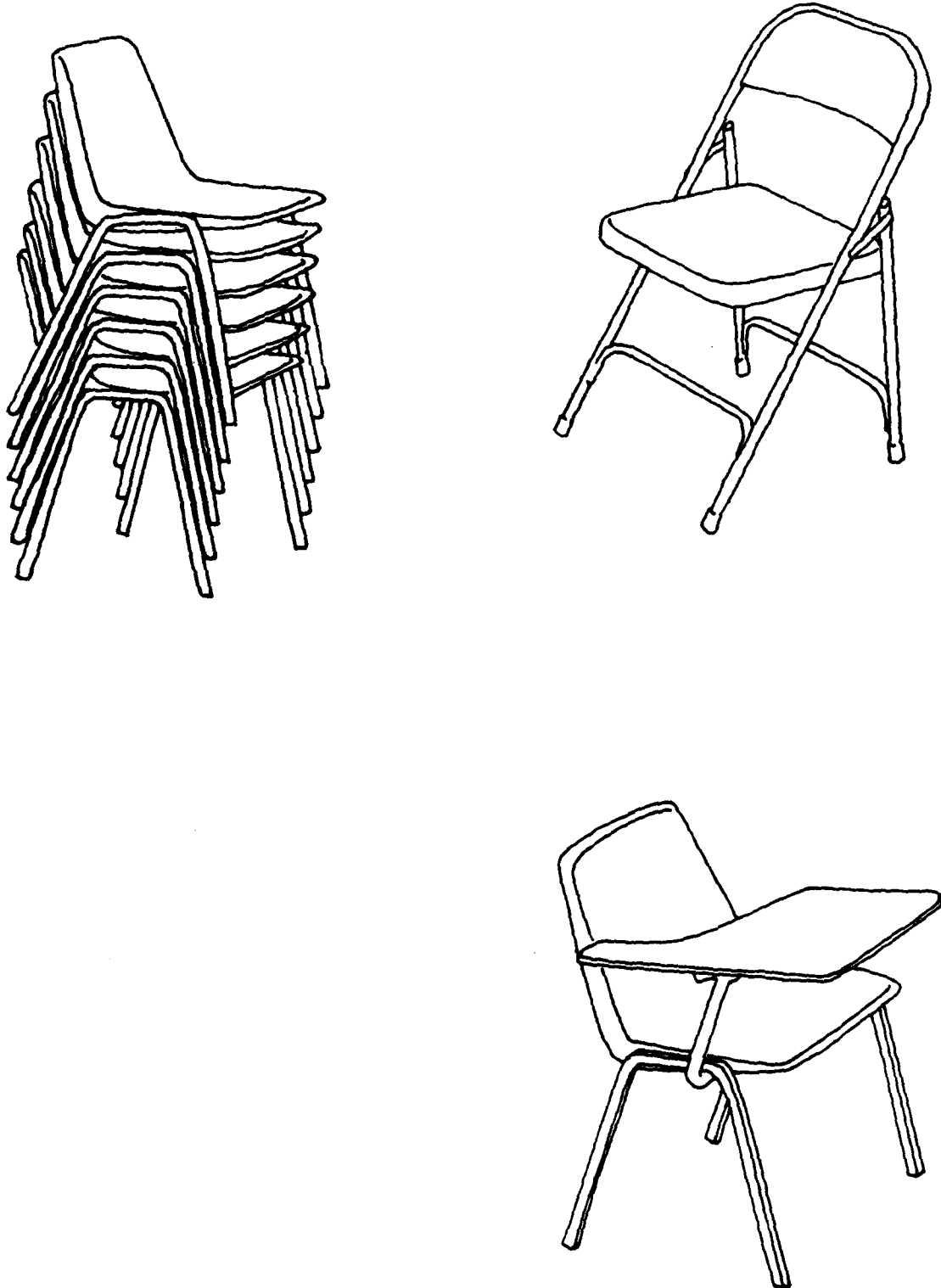


Figure 37. (Cont'd).

**GUIDELINES FOR GENERAL BUILDING**

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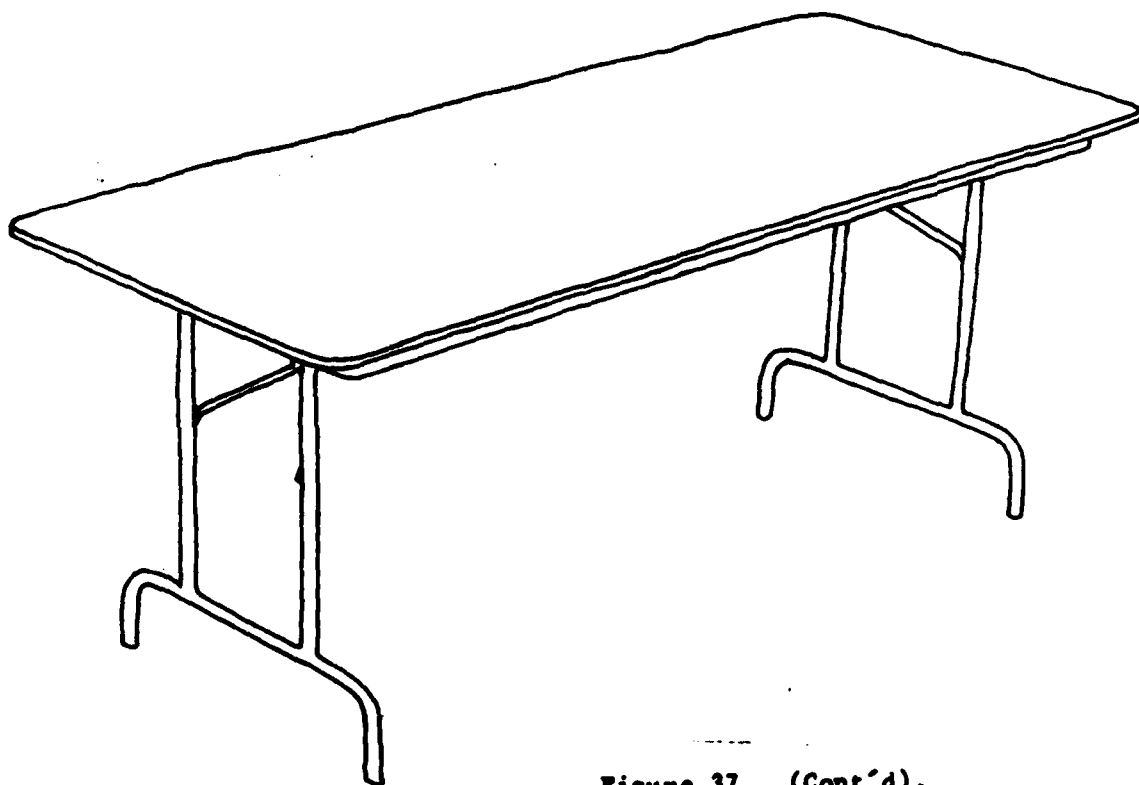
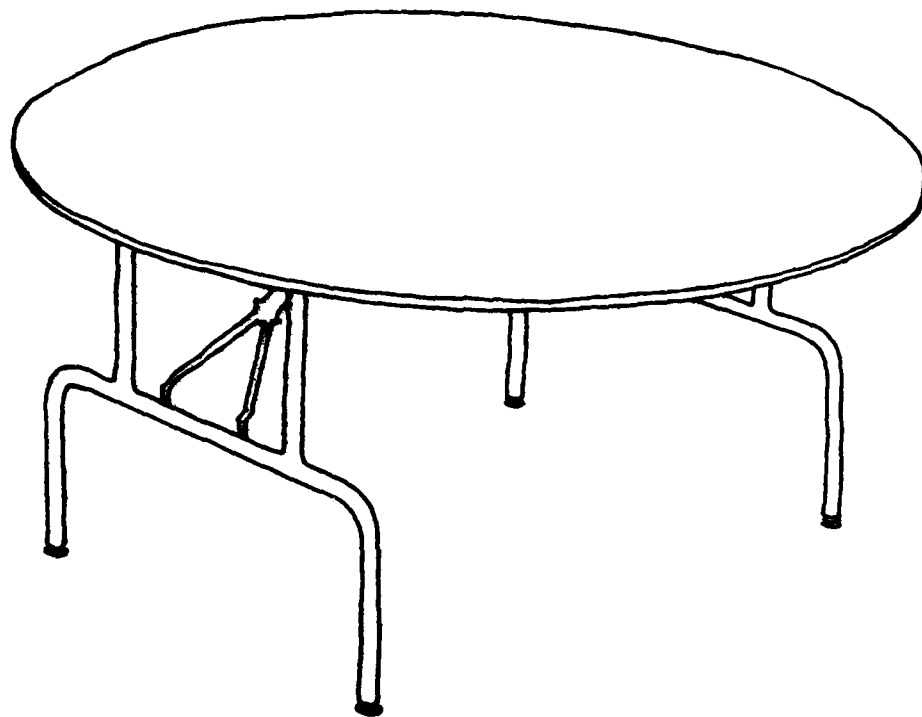


Figure 37. (Cont'd).

## GUIDELINES FOR GENERAL BUILDING

3. FURNITURE SHOULD BE SELECTED AT THE SAME TIME OTHER RENOVATION DESIGN WORK IS BEING DONE.

(g) Better furniture arrangements and room layouts are possible if exact dimensions and characteristics of furniture are known.

# TRAINING SPACES

# **CLASSROOM SPACES/CONFERENCE CLASSROOMS**

## **Guidelines for Training Spaces**

### **Use/Activities**

Classrooms are typically used by one or more instructors to conduct lectures, presentations, or demonstrations, using a variety of training aides. The primary activities of students in the classroom are seeing, hearing, and writing. Requirements and criteria for effective communication and the ability of the instructor to establish a relationship with students vary with the size of the group, teaching methods, and the media used.

### **Occupants**

The number of instructors, including teaching aides or technicians, may vary from one to as many as eight or 10. The size of the audience could be as large as 200 people.

### **Equipment/Supplies**

The instructor may need a platform, chalkboards, tackboards, map hangers, projection screens, and equipment for demonstrations at the front of the room. A lectern, table, or desk may also be needed. Desks may have to be arranged in temporary or permanent tiers to enable students to see the instructor and/or training aids. These desks should have a writing surface. Tables and chairs may also be used. Projection or sound equipment that is kept permanently in the classroom should be placed on movable stands or mounted securely. Other demonstration/training aid equipment can be kept in a storage area adjacent to the classroom.

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# **CLASSROOM SPACES/CONFERENCE CLASSROOMS**

## **Guidelines for Training Spaces**

### **Space**

#### **Size**

1. CLASSROOM SPACE SHOULD BE SIZED TO SUPPORT A VARIETY OF CLASSES, INSTRUCTION METHODS, AND CLASSROOM ACTIVITIES.

Twenty-five to 35 square feet are required per student. The lower limit of 25 square feet is applicable to classrooms which only require chairs without note-taking arms. The upper limit of 35 square feet is applicable when there is a continuous need for audiovisual presentations, writing surfaces, and the use of reference materials.

(g) A space 30 x 50 feet (1500 square feet) will be large enough for 42 to 60 students (including aisles, a teaching station, coat and book storage), regardless of the classroom's configuration.

2. THERE MUST BE ENOUGH SPACE NEAR THE FRONT OF THE CLASSROOM FOR AUDIOVISUAL AND OTHER TEACHING EQUIPMENT.

Overhead projectors must be located 8 to 15 feet from the screen, depending on the size of the room and the desired size of the projected image. The relationships between seating and the ability to see images on projection screens is discussed in detail in DG 1110-3-106, para 3-4.

### **Shape**

1. CLASSROOMS SHOULD BE DESIGNED SO THAT THEY CAN ACCOMMODATE A VARIETY OF CLASSROOM ACTIVITIES AND LAYOUTS. THIS ALLOWS CLASSROOMS TO BE USED FOR DIFFERENT FUNCTIONS WITH LITTLE MODIFICATION.

When a number of rooms are renovated, attempts should be made to standardize room sizes so they can be subdivided or coupled together to form smaller or larger spaces. This concept (called modular design) is discussed in detail in DG 1110-3-106, para 3-2.

2. SEATING ARRANGEMENTS WITHIN A CLASSROOM SHOULD PROVIDE GOOD VIEWING ANGLES, PROPER EYE CONTACT, AND LINE OF SIGHT BETWEEN INSTRUCTOR AND STUDENTS, BETWEEN STUDENTS AND PROJECTION SCREENS, OR AMONG STUDENTS.



## CLASSROOM SPACES/CONFERENCE CLASSROOMS

### Guidelines for Training Spaces

Large classrooms (50 students or more) should have tiered seating. Room width-to-length ratios greater than 0.6 should be avoided because seating along the outer edges near the front have poor viewing angles. When interaction and discussion among students is an essential part of course objectives, room shapes and seating arrangements (e.g., semicircular, horseshoe, circular, or octagonal) are needed to achieve the eye contact among students that encourages participation.

3. CEILING SHOULD BE HIGH ENOUGH TO INSURE NECESSARY IMAGE SIZES ON A PROJECTION SCREEN, TO PROVIDE ALL STUDENTS A GOOD VIEW OF THE SCREEN, AND TO PREVENT STUDENTS' HEADS FROM CASTING SHADOWS ON THE SCREEN.

Ceilings should not be less than 9 feet high. Ceilings higher than 12 feet are seldom required.

(g) If a projection screen is used, the required ceiling height, C (feet), can be found using the equations below and assuming (1) the bottom of the screen will be placed 4 feet above the floor, and (2) the distance between the top of the screen and the ceiling will be 6 inches. For horizontal image formats (where the image height is less than or equal to the screen width, W (feet), divided by 1.33):

$$C = 4.5 + \frac{W}{1.33}$$

where the room length, L (feet), is 6W. This can be simplified to establish a direct relationship between L and C:

$$L = 8C - 36$$

For vertical image formats (where the image height is greater than or equal to the image width):

$$C = 4.5 + W$$

and

$$L = 6C - 27$$

If vertical formats (slides) will also be used, the screen height value H is equal to W, requiring additional height.

# CLASSROOM SPACES/CONFERENCE CLASSROOMS

## Guidelines for Training Spaces

### Access/Circulation

#### Location

A CLASSROOM SHOULD BE CONVENIENTLY LOCATED AND AWAY FROM NOISY AREAS.

The classroom should be separated from spaces that require privacy, but near other training spaces. It is best to centrally locate a frequently used classroom.

(g)

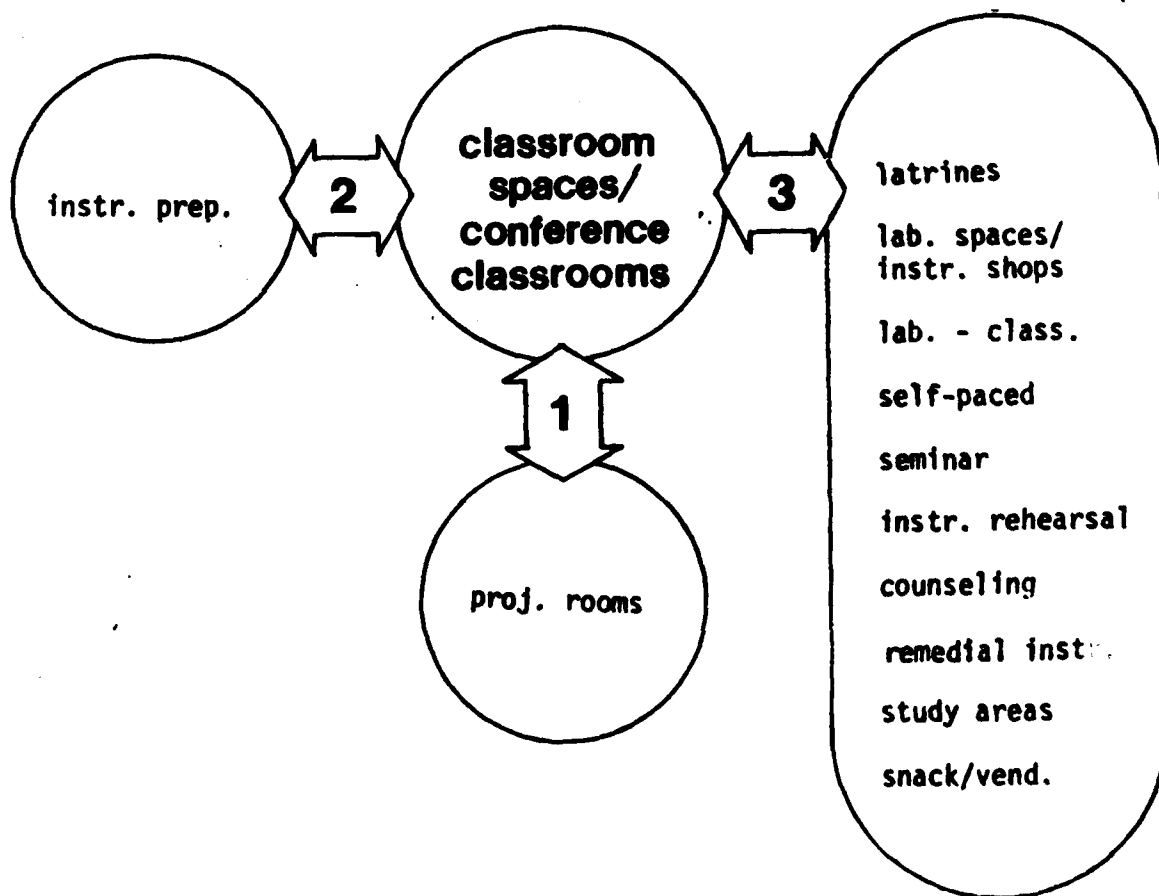


Figure 38. Spaces near classroom spaces/conference classrooms.

# **CLASSROOM SPACES/CONFERENCE CLASSROOMS**

## **Guidelines for Training Spaces**

### **Openings and Access**

1. LATE STUDENTS SHOULD BE ABLE TO ENTER CLASSROOMS WITHOUT DISRUPTING CLASS ACTIVITY.

At least one door should be at the rear of the classroom.

2. ACCESS TO CLASSROOMS CONDUCTING CLASSIFIED INSTRUCTION SHOULD BE CONTROLLED.

(g) See guidance on physical security.

3. CIRCULATION AROUND AND INTO CLASSROOMS SHOULD OCCUR WITH EASE AND PROVIDE FOR SAFE EXITING IN EMERGENCIES.

All doors should be at least 3 feet wide and recessed so that they do not protrude into the corridor when opened. Doors must swing out from the room. Provide two routes of exit from each classroom; more may be required for very large classrooms to meet life safety standards.

4. MOVEMENT OF EQUIPMENT IN AND OUT OF CLASSROOMS SHOULD OCCUR WITH EASE.

Classroom doorways should not have thresholds. In classrooms where large furniture or large equipment is used, double doors should be provided or doors should be sized to allow easy movement of equipment.

### **Subdivided Classrooms**

1. PARTITION SYSTEMS FOR SUBDIVIDING LARGE CLASSROOMS SHOULD BE DURABLE, EASY TO OPERATE, AND MINIMIZE SOUND TRANSMISSION BETWEEN SUBSPACES.

Partitions should have a sound transmission classification (STC) of 45 or greater. Seals around all edges (particularly along the floor and ceiling) are essential.

# **CLASSROOM SPACES/CONFERENCE CLASSROOMS**

## **Guidelines for Training Spaces**

2. PARTITIONS SHOULD BE PLACED SO THAT FURNISHINGS AND TRAINING EQUIPMENT ARE AVAILABLE IN EACH SUBSPACE AND ROOM FEATURES AND CONTROLS ARE ACCESSIBLE FROM WITHIN EACH SUBSPACE.

Each subspace should have electrical, television, and sound receptacles and controls, chalkboards and other items necessary to meet training needs. Partitions should be positioned between windows and lighting fixtures.

3. EXITS FROM A SUBSPACE MUST PROVIDE SAFE EMERGENCY EGRESS AND NOT DISTURB OTHER SUBSPACES.

Each subspace must have an independent exit which opens directly into a corridor and does not pass through other subspaces. Most life safety standards consider operable walls, accordion-fold partitions, or a door in a partition between subspaces a second route of exit.

### **Circulation Within Room**

1. FURNITURE AND TRAINING AIDS SHOULD BE ARRANGED TO PROVIDE GOOD VISUAL CONTACT BETWEEN THE INSTRUCTOR AND STUDENTS, TO ALLOW STUDENTS TO SEE IMAGES ON PROJECTION SCREENS EASILY, AND TO PERMIT SAFE EXITING IN EMERGENCIES.

Windows should be located along the sides of rooms so that neither students nor instructors are required to look into the glare of window-light. Seats for students should not be closer than 2W nor farther than 6W from a projection or television screen of width W. Aisle widths and locations and the number of seats which can be placed together between aisles must comply with life safety standards.

# CLASSROOM SPACES/CONFERENCE CLASSROOMS

## Guidelines for Training Spaces

### Utilities and Wastes

1. THERE SHOULD BE ENOUGH WIRING TO SUPPORT ALL EQUIPMENT USED IN CLASSROOM PRESENTATIONS OR DEMONSTRATIONS, OR FOR ANTICIPATED FUTURE USE.

Electrical service will provide 115 volt, ac, single-phase power and special power supplies (as needed). Power and communication and electronic cables should be inclosed to minimize the need to string cables across the floor. Receptacles and jacks should be provided in sufficient quantities at convenient locations in each classroom.

2. CONTROLS FOR LIGHTING, AUDIOVISUAL EQUIPMENT, AND SOUND SYSTEMS SHOULD BE LOCATED WHERE THE INSTRUCTOR CAN EASILY REACH THEM.

(g) The preferred location for controls is at the front of the room where the instructor stands. In classrooms where a lectern is almost always used, a control panel built into the lectern may be desirable. Lighting controls provided for the convenience of the instructor may be redundant to controls normally located near exits. However, dimming controls need only be included for the instructor.

# **CLASSROOM SPACES/CONFERENCE CLASSROOMS**

## **Guidelines for Training Spaces**

### **Environmental Conditions**

#### **Lighting**

1. VARIOUS LIGHTING LEVELS ARE NEEDED TO MEET LIGHTING REQUIREMENTS OR ANY TYPE OF INSTRUCTION.

For classroom reading tasks, 70 foot-candles is usually adequate. For viewing projection screens, room ambient light level should be between 10 and 33 percent of the screen (or tube) brightness. For particular media the following are recommended:

16-mm movies	5 to 10 foot-candles
35-mm slides	15 to 25 foot-candles
Television monitors	35 foot-candles
Television projection screen	4 to 10 foot-candles

Luminaires should be selected to prevent direct or reflected glare problems (see DG 1110-3-106, para 3-4b).

2. DAYLIGHT ENTERING THE ROOM THROUGH WINDOWS MUST BE CONTROLLED TO MINIMIZE SHADOWS AND GLARE.

Seating should be arranged so windowlight is on the students' left. This will keep hand shadows from falling on writing areas used by right-handed people (usually the majority). Venetian blinds or shades can control shadow and glare problems at times when it is bright outdoors.

3. CLASSROOM LIGHTING SHOULD BE DIMMABLE AND CONTROLS SHOULD BE CONVENIENT TO THE INSTRUCTOR.

Fluorescent lighting should be circuited for one-half and full intensity. Incandescent lights should be circuited through dimmers for infinite light intensities of zero to full lamp wattage. However, to simplify the use of the system, dimmers can be preset and locked at two or three intensities, then controlled by simple toggle switches. Lighting controls should be located with audiovisual equipment controls at the front of the room. Window shades or blinds should seal out daylight well enough to achieve the appropriate light level.

4. ONLY OCCUPIED AREAS OF A CLASSROOM NEED TO BE LIGHTED.

Light switches should control zones of a classroom. It is better to establish zones that extend across the room than zones which run the length of the room.

# CLASSROOM SPACES/CONFERENCE CLASSROOMS

## Guidelines for Training Spaces

### 5. THERE SHOULD BE SUFFICIENT TASK LIGHTING.

Adjustable track or eyeball (spot/flood) lighting should be used to illuminate the instructor, classroom demonstrations, chalkboards, and other training aids.

## Sound

### 1. THE INSTRUCTOR SHOULD BE EASILY HEARD. UNDESIRABLE SOUNDS GENERATED INSIDE THE ROOM SHOULD NOT BE DISTRACTING.

A portion of the classroom ceiling should be dropped and contoured at the angle to which sound will be projected most efficiently.

(g) Proper placement and a correct amount of sound-absorbing surfaces (acoustical tile, carpeting) can produce desirable conditions in a classroom. Too little absorption (a lot of hard surfaces) will result in echoes, make hearing at certain locations difficult, and allow distracting sounds to carry throughout the room. Too much or improperly placed absorption materials will reduce the instructor's voice range. On tiers for seating and on steps, particularly when voids exist below them, sound generation caused by the impact of feet on a hard surface can be eliminated or reduced by carpeting. Transmission of such sounds can be reduced by placing carpet or absorption materials on lower walls and risers or on the undersides of tiers and steps.

Noise with a wide frequency spectrum and no distinguishable tones (white noise) is produced by the flow of air through diffusers and is effective in masking many noises which would otherwise be distracting.

### 2. SOUNDS GENERATED OUTSIDE A CLASSROOM SHOULD NOT BE ALLOWED TO DISTURB ACTIVITIES IN THE CLASSROOM. SOUNDS GENERATED IN ONE CLASSROOM SHOULD NOT DISTURB OTHER CLASSROOMS.

Walls between instructional spaces should have an STC of 45. Spaces between instruction spaces and corridors should have an STC of 40. Placing seals on classroom doors and windows can effectively reduce sound leakage. Thick glass in windows will also reduce sound transmission.

### 3. THE THERMAL CONDITIONS IN EACH CLASSROOM SHOULD BE COMFORTABLE.

Each classroom should have an independent thermostat.

# **CLASSROOM SPACES/CONFERENCE CLASSROOMS**

## **Guidelines for Training Spaces**

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### **Appearance/Finishes/Image**

1. FLOORS SHOULD BE ATTRACTIVE, EASY TO MAINTAIN, AND FUNCTIONAL.

(g) Although flooring materials can be used for sound control, final selection should include durability, wear, and ease of maintenance. Hard-surface flooring materials wear better, are less easily soiled, and are easier to clean, while carpets and cushioned flooring have better sound control characteristics.

2. INTERIOR FINISHES AND COLORS SHOULD BE SELECTED TO MAINTAIN ACCEPTABLE LEVELS OF VISUAL COMFORT (CONTROLLED REFLECTANCE PROPERTIES AND BRIGHTNESS RATIOS).

Accepted methods of achieving visual comfort include painting ceilings, walls, woodwork, etc., to insure high light reflection; using matte rather than glossy paint; using satin rather than glossy wood finishes; using light-colored furniture and equipment; using light-colored tack and chalkboards; using light-colored floors; having a multisource for daylight; making windows continuous; placing window heads flush with the ceiling; and using minimum-width window mullions.



# CLASSROOM SPACES/CONFERENCE CLASSROOMS

## Guidelines for Training Spaces

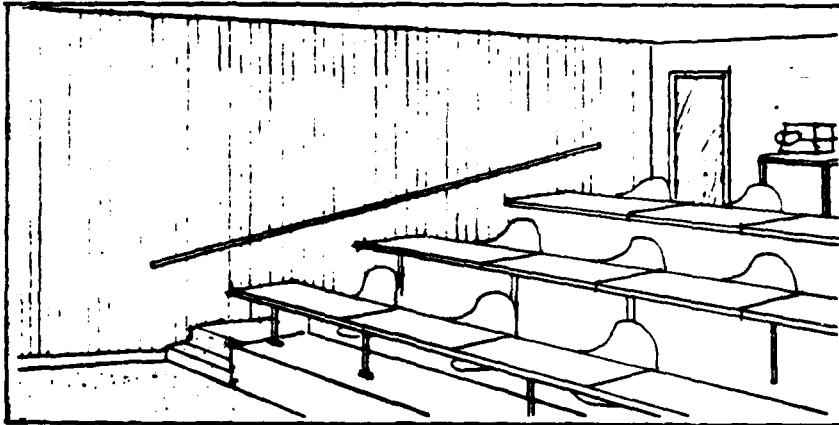
(g)

### SPACE TYPE

A	C	D
a	b	b

Classrooms/Conference Classrooms

color scheme



#### general decor recommendations

Colors should be muted.

Acoustical materials should be selected to coordinate with overall decor scheme.

Furniture and finishes should be durable for heavy use.

	item	recommended characteristics
room finishes	Walls	Use light colors. Flat paint is recommended to minimize glare.
	Floor	Hard surfaces are recommended for easy maintenance.
	Doors	Use recommended accent colors or wood finishes.
	Trim	Use recommended accent colors or wood finishes.
furniture/accessories	Seating	Chairs should be movable.
	Tables	Tables used by students should have laminated work surfaces with rounded or beveled edges.
	Lighting	Spotlights should be used to accent the speaker and demonstration areas.
	Curtains	Blackout shades are recommended. Colors should coordinate with the overall color scheme.

Figure 39. Decor guidelines for classroom spaces/conference classrooms.

# **CLASSROOM SPACES/CONFERENCE CLASSROOMS**

## **Guidelines for Training Spaces**

### **Communication**

1. STUDENTS SHOULD BE ABLE TO HEAR THE INSTRUCTOR AND TO SEE WHAT IS BEING WRITTEN OR SHOWN. THERE SHOULD BE A SOUND AMPLIFICATION SYSTEM IN LARGE TRAINING SPACES. TELEVISION SHOULD ALSO BE USED TO ILLUSTRATE FINE POINTS OF COMPLEX EXPERIMENTS (E.G., MATERIALS SEEN THROUGH A MICROSCOPE). (SEE THE RECOMMENDATIONS FOR THE INSTALLATION OF RECEPTACLES AND CABLES).

2. THERE SHOULD BE ENOUGH TELEVISION MONITORS TO INSURE THAT EACH STUDENT CAN SEE THE TELEVISION MONITOR WELL.

Television monitors should be placed along classroom walls. There should be one television per 25 to 35 students. Mounting of monitors on permanent fixtures is preferred for security.

3. THE INSTRUCTOR SHOULD HAVE A CONTROL CONSOLE FOR ALL ELECTRICAL EQUIPMENT IN THE ROOM.

Controls may be mounted in a special cabinet in the front of the room, mounted on the wall, or located in a lectern.

# CLASSROOM SPACES/CONFERENCE CLASSROOMS

## Guidelines for Training Spaces

### **Storage**

1. INADEQUATE STORAGE MAY CAUSE GENERAL-PURPOSE CLASSROOMS TO BE "DEDICATED" BECAUSE THEY MUST BE LOCKED TO PROTECT EQUIPMENT (SEE DG 1110-3-106, PARA 2-4C). WHEN EQUIPMENT IS USED FREQUENTLY IN ONE CLASSROOM, SECURE STORAGE SPACE SHOULD BE PROVIDED WITHIN THE ROOM.

The size of the audiovisual storage space can be determined from the following media/storage volume (units per cubic foot) estimates (also see DG 1110-3-106, 3-4b):

16-mm film (400-foot reels)/9 reels

Film strip/160 strips

8-mm film loops/45 loops

35-mm slides/535 slides

Audio cassettes/143 cassettes

7-inch reel audio tape/42 reels

Long playing records/40 records

Overhead projection transparencies/64

Microfilm (35-mm)/34 films

Microfilm (16-mm)/68 films

Microfiche/1,785 cards

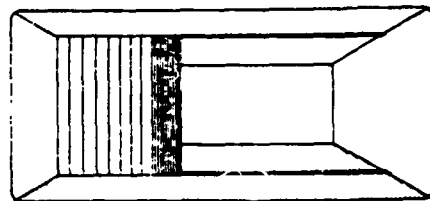
# CLASSROOM SPACES/CONFERENCE CLASSROOMS

## Guidelines for Training Spaces

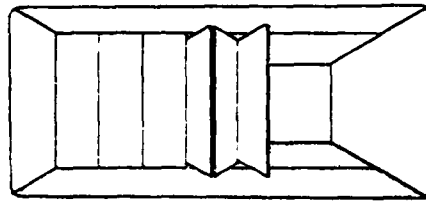
### Special Features

MOVABLE WALLS AND COLLAPSIBLE CURTAINS SHOULD BE AVAILABLE SO ADMINISTRATORS CAN VARY CLASSROOM SIZE.

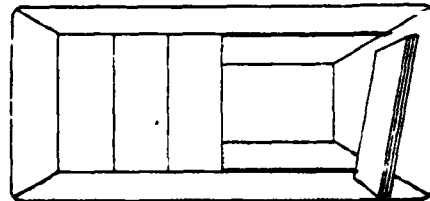
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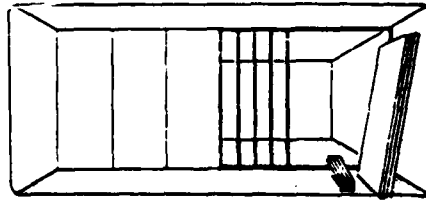
Operable Accordion Wall



Operable Stacking Panel Wall



Portable Panel



Movable Stud and Facing Panel Wall

PARTITION TYPE	Relative Cost	CHANGE FREQUENCY			
		Hourly	Daily	Monthly	Yearly
Fixed (non-load bearing) 6" CMU 5" GWB	1	No	No	No	Yes
Movable	1.8	No	No	Possible	Yes
Accordion	2.6	Yes	Yes	Yes	Yes
Portable	3.2	No	Possible	Yes	Yes
Folding Panel	5.4	Yes	Yes	Yes	Yes

Figure 40. Changeable wall system.

# CLASSROOM SPACES/CONFERENCE CLASSROOMS

## Guidelines for Training Spaces

### Furniture

1. SEATING SHOULD BE REASONABLY COMFORTABLE, BUT NOT SO RELAXING THAT IT ENCOURAGES INATTENTIVENESS (SEE DG 1110-3-106, PARA 3-3E).

Chairs with contoured seats and backs are more comfortable than those with straight seats and backs. The contours also keep the user facing forward because the contours cause discomfort when the user is oriented in other directions.

(g)

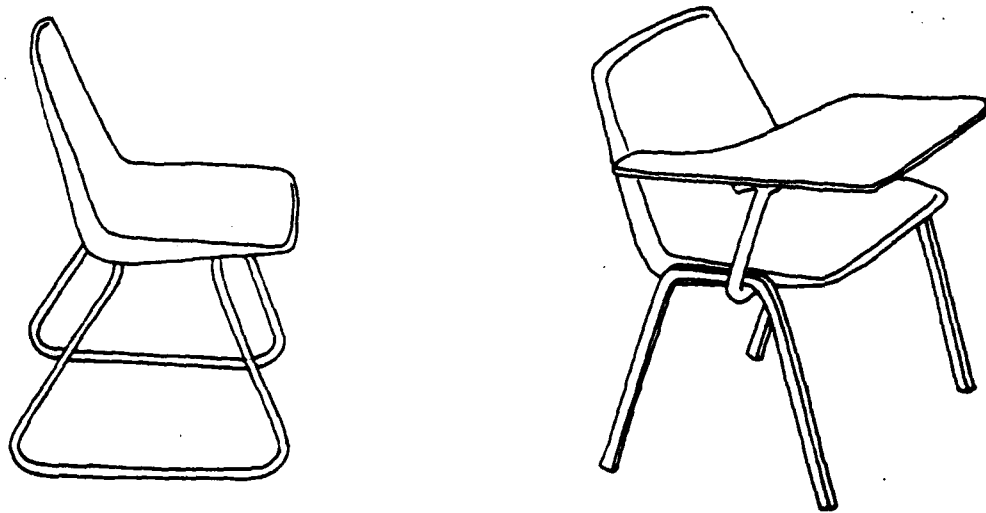


Figure 41. Examples of plastic shell chairs.

2. FURNISHINGS FOR A CLASSROOM SHOULD BE SELECTED TO MEET THE NEEDS OF THE COURSES WHICH USE THE CLASSROOM.

(g) The number of chairs, tables, or desks depends on the desired class size. The instructor's need to write material for students to see may be satisfied by a variety of products, including chalkboards, flip charts, boards that use marker pens instead of chalk, electronic chalkboards, and overhead projectors with films that can be written on with wax pencil or special markers. The instructor's need to display papers and other visual aids may be satisfied by tack boards, tack strips along the top border of chalkboards, magnetic chalkboards, and a variety of special devices for hanging papers, maps, and charts. Some of these furnishings may be free standing and movable, while others may be fixed to walls or hung from ceilings.

# CLASSROOM SPACES/CONFERENCE CLASSROOMS

## Guidelines for Training Spaces

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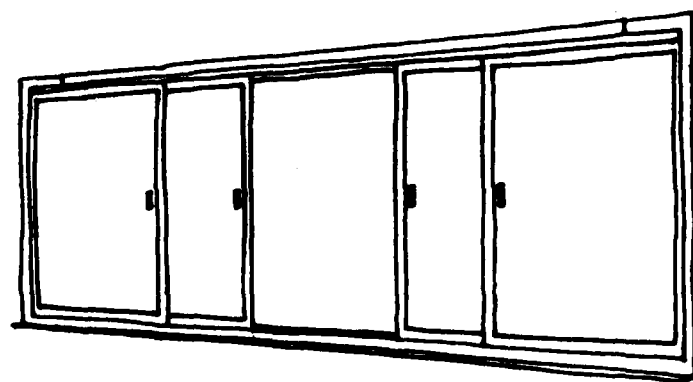
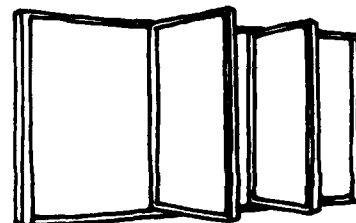
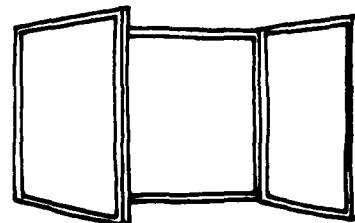
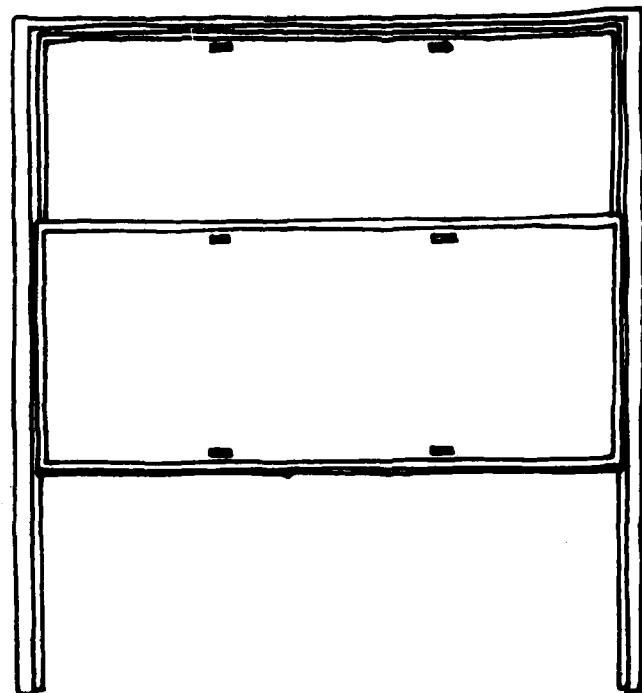


Figure 42. Examples of chalkboards/tackboards.

# **LABORATORY SPACES/INSTRUCTIONAL SHOPS**

## **Guidelines for Training Spaces**

### **Use/Activities**

Laboratory spaces and instructional shops are used for "hands-on" training. Laboratories generally refer to spaces where equipment is small and a number of similar work stations or work benches can be grouped into a single room. Instructional shops generally refer to spaces for larger equipment and vehicles; students work in small groups or rotate among specialized locations. Laboratories and shops often require exterior practice and demonstration areas.

### **Occupants**

The instructor-student ratio will vary between 1:40 and 1:20 or less.

### **Equipment/Supplies**

Many kinds of equipment are used in laboratories and shops, e.g., electronic and chemical instruments and components, simulators, mock-ups or actual vehicles, or aircraft. Furniture, supplies, and support equipment will vary according to the special needs of the laboratory or shop.

# **LABORATORY SPACES/INSTRUCTIONAL SHOPS**

## **Guidelines for Training Spaces**

### **Space**

#### **Size**

CAREFUL ANALYSIS OF TEACHING METHODS AND STUDENT EQUIPMENT SHOULD BE MADE TO DETERMINE HOW MUCH LABORATORY SPACE IS REQUIRED.

Standard space criteria are not established for this type of space because requirements vary with the subject matter being taught, which in turn determines the training devices, equipment, and aids to be used. How many of these items will be used in the laboratory is determined by the student/equipment/instructor ratios established for a particular course. Space requirements for each laboratory will be stated in terms of the size of training devices and equipment and will include required floor area, ceiling and door height, power source, etc. Additional space requirements include the amount of circulation space required around each piece of equipment for its use and maintenance (a general square foot estimate is 30 to 60 square feet per student and a ceiling height of 10 feet). Movable partitions can be used to subdivide laboratory/shop space.

#### **Shape**

WHENEVER POSSIBLE, THE LABORATORY/SHOP SHOULD DUPLICATE ACTUAL WORK SETTINGS.

(g) It may be difficult to duplicate real work station and shop layouts in a school. Layouts should be checked to determine if course goals and training methods are accommodated.



# **LABORATORY SPACES/INSTRUCTIONAL SHOPS**

## **Guidelines for Training Spaces**

### **Definitions**

- A = Average number of students in each session.
- B = Number of students assigned to each item of practice equipment or to each training aid.
- C = Number of items of practice equipment or training aids required =  $\frac{A}{B}$
- D = Square feet of floor area occupied by each item of practice equipment or each training aid (includes critical dimensions and clearances in all directions, safety requirements, aisles, and fire exits).
- E = Square feet of floor area required for one student working on or around each item of practice equipment or each training aid.
- F = Net square feet area of instructional laboratory.

### **Formula**

1.  $[(B \times E) + D] \times C = F$
2. Add 20 percent allowance to F for instructional changes due to technological advances.
  - a. A graphic layout should be made. The arithmetical square footage derived by the formula process can be deceiving, particularly where circular or odd-shaped items of practice equipment and training aids are required.
  - b. Human engineering factors to include safety, and lighting should be considered at the outset of the planning process.
  - c. Additional guidance for estimating the size for school spaces will be found in appendix C; for instructional laboratories, refer also to TM 5-843-1.

# LABORATORY SPACES/INSTRUCTIONAL SHOPS

## Guidelines for Training Spaces

### Access/Circulation

#### Location

(g)

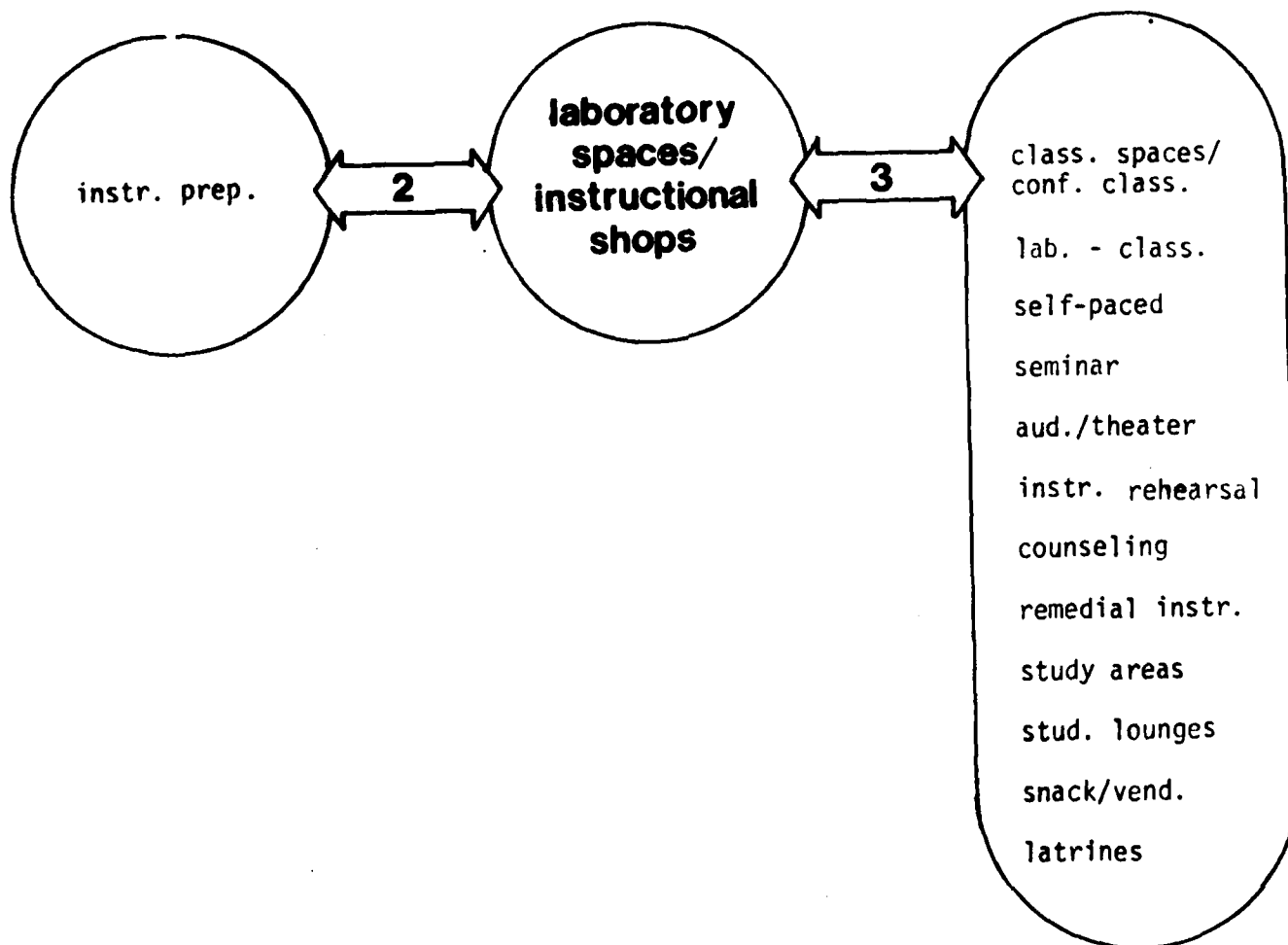


Figure 43. Spaces near laboratory spaces/instructional shops.

# **LABORATORY SPACES/INSTRUCTIONAL SHOPS**

## **Guidelines for Training Spaces**

### **Openings and Access**

IT SHOULD BE EASY TO MOVE EQUIPMENT IN AND OUT OF THE LABORATORY/SHOP.

Laboratories/shops which use vehicles or large equipment (i.e., that will not fit through a 3- or 6-foot wide doorway) should have an overhead or track-mounted door which allows direct entry to a shop from the outside.

(g) When existing buildings are modified for laboratories and shops, a general circulation plan should be developed. The advantages and disadvantages of outdoor and indoor routes should be compared. Outdoor routes require a drive and a door for each laboratory/shop area. Indoor routes may create vehicle-pedestrian traffic hazards and will use up space within the building, but will reduce the number of doors to the outside. Doors may increase energy use and ventilation for the building, depending on climate, laboratory/shop activities, and other factors.

### **Circulation Within Laboratories or Shops**

GENERAL CIRCULATION AMONG DIFFERENT SPACES IN THE LABORATORY/SHOP SHOULD NOT DISTURB STUDENTS WHO ARE WORKING.

A corridor or circulation route with training spaces on each side will reduce disturbances. Routes through training spaces should be avoided.

# **LABORATORY SPACES/INSTRUCTIONAL SHOPS**

## **Guidelines for Training Spaces**

### **Environmental Conditions**

#### **(Air Quality, Ventilation)**

AIR QUALITY IN LABORATORIES/SHOPS MUST MEET THE HEALTH, SAFETY, AND OPERATIONAL REQUIREMENTS FOR THE ACTIVITIES AND EQUIPMENT THEY CONTAIN.

Each laboratory/shop requires an outside air flow of 10 cubic feet per person per minute (minimum). If fumes, smoke, other air contaminants, or excessive heat are present, there may be a need for general or local ventilation or exhaust systems (see DG 1110-3-106, table 4-3). Laboratories/shops containing optical or electronic equipment may require special filtration and cleaning of air.

# LABORATORY SPACES/INSTRUCTIONAL SHOPS

## Guidelines for Training Spaces

### Appearance/Finishes/Image

WALLS AND FLOORS SHOULD BE DURABLE AND EASY TO CLEAN.

Depending on laboratory/shop activities, surfaces may need to be resistant to acids, alkaline material, greases, and solvents.

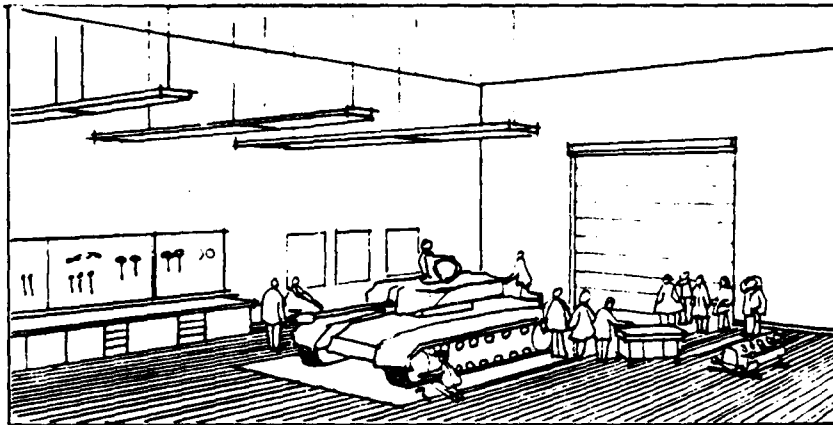
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#### SPACE TYPE

Laboratory Spaces/Instructional Shops

A	C	D
a	b	b

color scheme



#### general decor recommendations

Background colors should be muted.

Brighter colors should be used for worktables or benches, seating and trim.

Caution or hazard areas should be clearly marked.

Furniture should be movable for maximum flexibility.

	Item	recommended characteristics
room finishes	Walls	Painted concrete block or materials of similar durability should be used.
	Floor	Hard, durable surfaces are recommended for easy maintenance and wearability.
	Doors	Use durable hard wood, or metal in recommended colors.
	Trim	Use durable vinyl, hard wood or metal in recommended colors.
furniture/accessories	Seating	Unupholstered, durable stools are appropriate.
	Tables	Worktables with sturdy bases and replaceable wooden tops are recommended.
	Lighting	Task lighting should be adjustable to provide flexibility.
	Lockers	Metal locker units should be used if storage of student equipment or tools is required.

Figure 44. Decor guidelines for laboratory spaces/instructional shops.

# **LABORATORY SPACES/INSTRUCTIONAL SHOPS**

## **Guidelines for Training Spaces**

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### **Special Features**

FLOOR SYSTEMS SHOULD BE DESIGNED TO SUPPORT EXPECTED HEAVY-EQUIPMENT LOADS.

When existing facilities are modified for laboratory/shop use, floor strength and other structural components should be evaluated by a structural engineer to determine their capacity.

### **Furniture**

FURNITURE SHOULD BE DURABLE AND EASY TO CLEAN.

# **LABORATORY/CLASSROOMS**

## **Guidelines for Training Spaces**

### **Use/Activities**

Part of the instruction period in laboratory/classrooms is devoted to a lecture. After the lecture, students leave their desks and move to another part of the room to apply "first-hand" the material presented during the lecture session to a model, mock-up, training aid, or real piece of equipment.

### **Occupants**

The instructor-student ratio will vary with each course, but typically is about the same as for laboratories and shops, i.e., between 1:20 and 1:40.

### **Equipment/Supplies**

Typical classroom equipment is found in a laboratory/classroom. However, specific equipment and supplies for laboratory activities will vary widely.

# LABORATORY/CLASSROOMS

## Guidelines for Training Spaces

### Space (Size)

A LABORATORY/CLASSROOM SHOULD HAVE ENOUGH AREA FOR BOTH LABORATORY AND LECTURE INSTRUCTION.

About 45 square feet should be provided per student, but individual room requirements will vary because of the equipment and space required around each room. The lecture area will require 25 to 35 square feet per student.

### Access/Circulation

#### Location

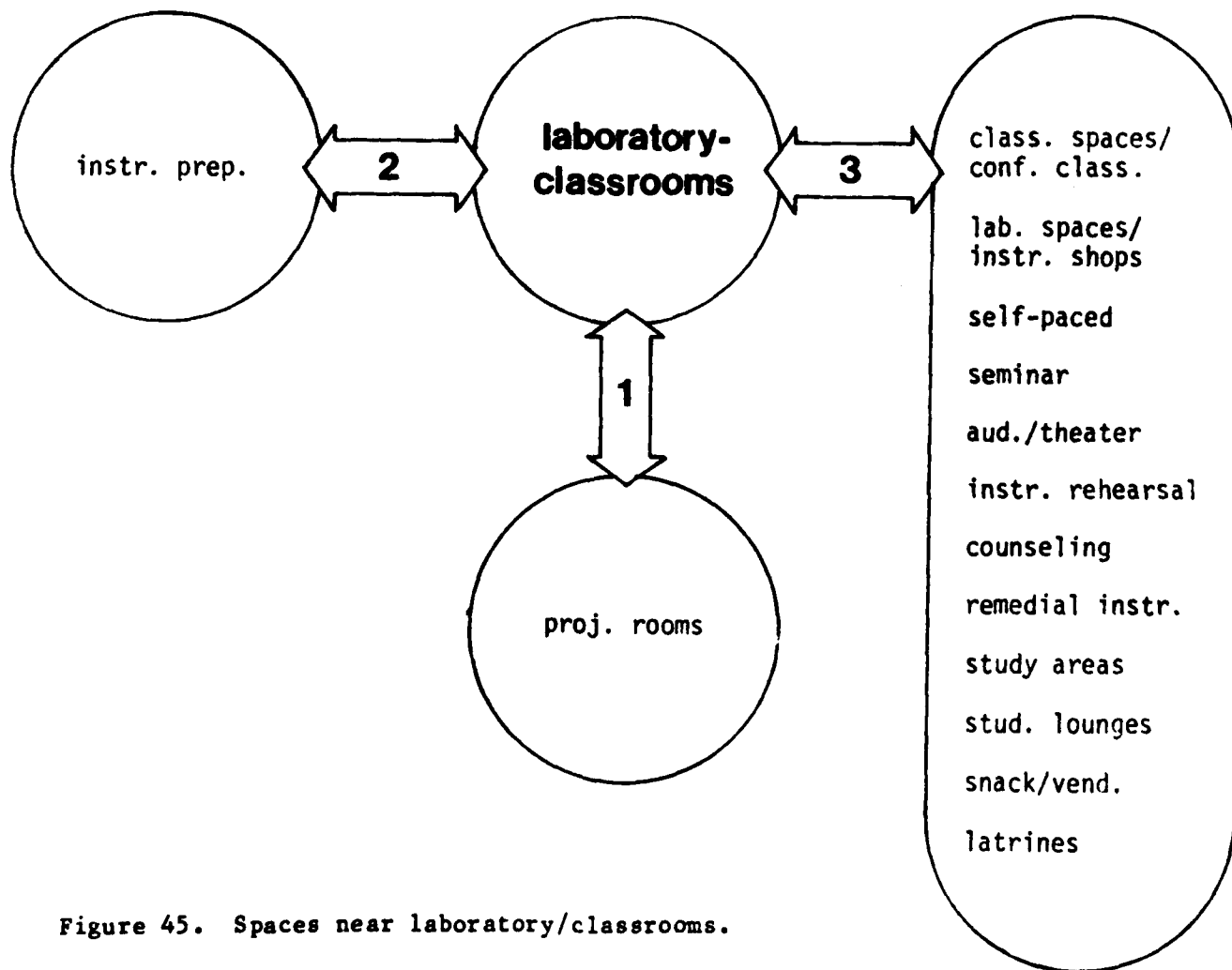


Figure 45. Spaces near laboratory/classrooms.



# **LABORATORY/CLASSROOMS**

## **Guidelines for Training Spaces**

### **Circulation**

AISLES SHOULD PROVIDE EASY MOVEMENT BETWEEN THE CLASSROOM AREA AND THE LABORATORY AREA AND AROUND THE LABORATORY EQUIPMENT. IT SHOULD BE POSSIBLE TO MOVE EQUIPMENT IN AND OUT EASILY.

Circulation in a laboratory/classroom must meet the same life-safety criteria as classrooms. Special doors may be needed to move laboratory equipment in or out of the room. Enough space should be provided around laboratory equipment so students can see well and to insure that material movement does not create hazards.

# LABORATORY/CLASSROOMS

## Guidelines for Training Spaces

### Appearance/Finishes/Image

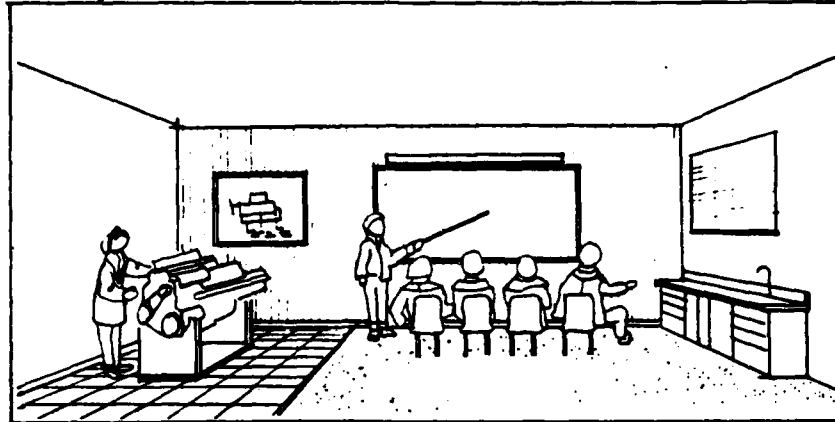
(g)

#### SPACE TYPE

Laboratory - Classrooms

A	C	D
a	b	b

color scheme



#### general decor recommendations

Background colors should be muted.  
Brighter colors should be used for seating, tables, and trim.  
Caution or hazard areas should be clearly marked.

	item	recommended characteristics
room finishes	Walls	Painted concrete block or materials of similar durability should be used in lab area. All wall surfaces should be washable.
	Floor	Hard, durable surfaces are recommended for easy maintenance and wearability. Seating area may be vinyl flooring.
furniture/accessories	Seating	Chairs should be vinyl covered or plastic for easy cleaning. Stackable or foldable seating will also allow flexibility.
	Lighting	Task lighting should be adjustable to provide flexibility.
	Lockers	Metal locker units or built in cabinets should be used for storage of equipment and tools.
	Curtains	Blackout shades are recommended. Colors should coordinate with overall color scheme.

Figure 46. Decor guidelines for laboratory/classrooms.

# **SELF-PACED INSTRUCTIONAL ROOMS**

## **Guidelines for Training Spaces**

### **Use/Activities**

Self-paced instruction rooms allow students to master instructional material at their own rate. Students collect lesson materials from a control station, seat themselves at an available carrel, and study using audiovisual and written materials. Most self-paced instruction uses Training Extension Course (TEC) lessons which consist of a pretest, viewing of and listening to lesson topics, and a post-test. (TEC lessons may require the students to write.) After completing a lesson with an adequate performance level on the post-test, students return the TEC lesson to the control point and collect their next lesson. Each student is logged in and out by the classroom staff, who also maintain a progress chart on each student, verify test performance, and monitor carrel activities. In some cases, the staff may give specific instructions to a group or an individual at a special carrel.

### **Occupants**

The number of students in this type of space can vary considerably. The upper limit is the number of carrels which can be monitored and managed from a control point. Some self-paced instructional spaces may be designed for only one or two students. Classroom staff typically will include instructors and clerks, depending on program requirements. Usually only one or two staff members will operate a control point.

### **Equipment/Supplies**

Self-paced instruction rooms contain special carrels equipped with audiovisual aids and a writing surface. The number of carrels in a room will vary with the student load. Power requirements and heat generated can be significant when many carrels are located together. Special carrels containing demonstration, simulation, mock-ups, or other training aids may also be necessary. The staff area (control station) may include a desk, checkout counter, storage shelves for lesson materials, and files and racks for maintaining student progress charts.

# **SELF-PACED INSTRUCTIONAL ROOMS**

## **Guidelines for Training Spaces**

### **Space (Size)**

1. SELF-PACED INSTRUCTIONAL SPACES SHOULD BE SIZED TO MEET TRAINING OBJECTIVES AND PROVIDE FOR ADMINISTRATION, SERVICE, STORAGE, SECURITY, AND CUSTODIAL REQUIREMENTS.

Each student should have 35 to 40 square feet of space (see DG 1110-3-106, para 4-5b).

2. THERE SHOULD BE ENOUGH SPACE FOR AN INSTRUCTOR'S DESK, STORAGE UNITS FOR PRINTED AND AUDIOVISUAL TRAINING MATERIAL, AND CIRCULATION.

About 200 square feet will be required for instructors and clerks, storage, and circulation around the control station.

### **Access/Circulation**

#### **Location**

PROGRAMS OF INSTRUCTION WHICH USE A COMBINATION OF SELF-PACED AND OTHER FORMS OF INSTRUCTION IN A COORDINATED MANNER SHOULD BE LOCATED TO BEST MEET TRAINING GOALS.

Self-paced instructional spaces should be near laboratories, shops, classrooms, or work areas as required by course plans.

# SELF-PACED INSTRUCTIONAL ROOMS

## Guidelines for Training Spaces

(g)

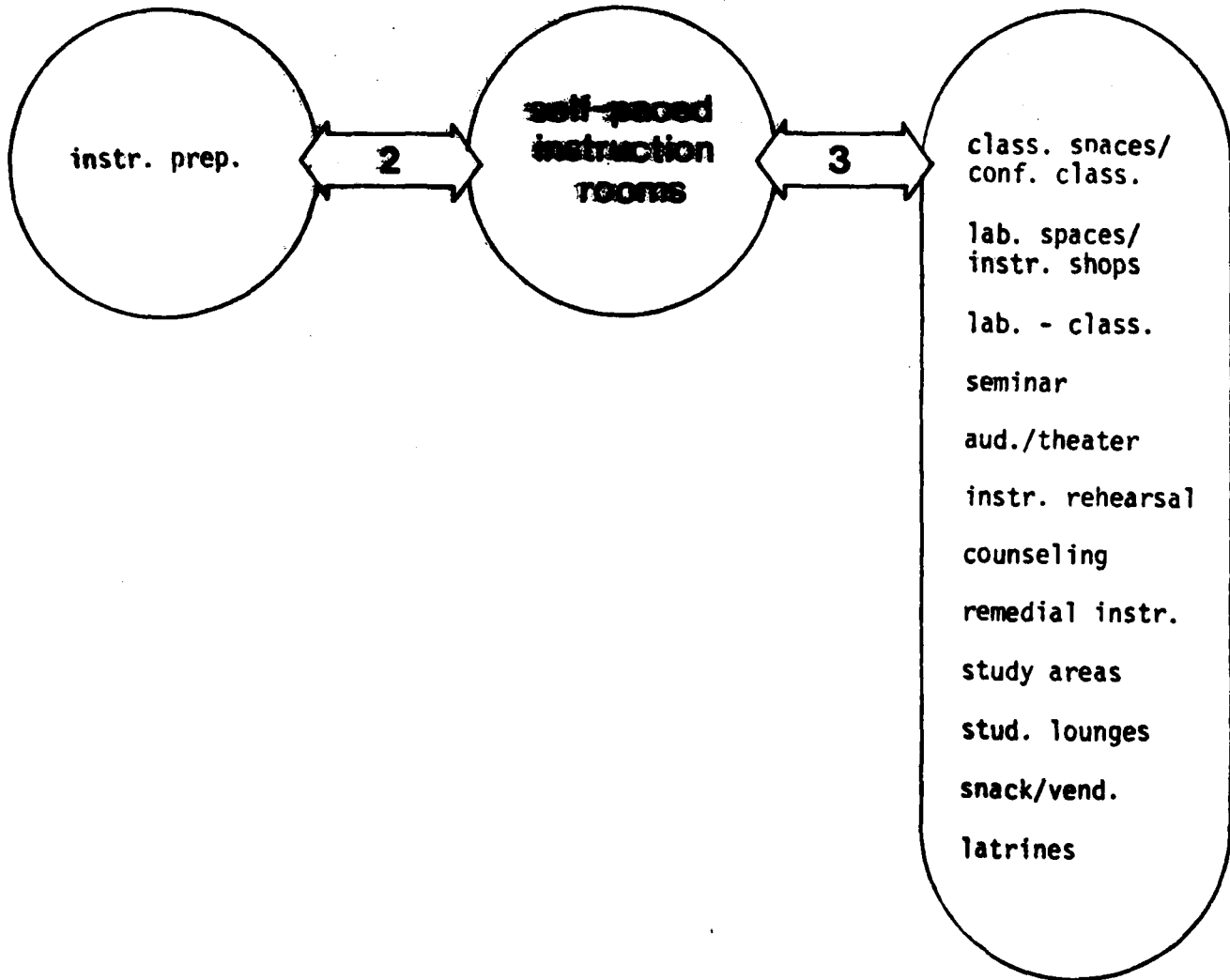


Figure 47. Spaces near self-paced instruction rooms.

# **SELF-PACED INSTRUCTIONAL ROOMS**

## **Guidelines for Training Spaces**

### **Circulation Within Room**

1. STUDENT DISTRACTIONS SHOULD BE MINIMIZED.

Carrels should not be in or near a room's primary circulation routes. Reading carrels can be double-loaded onto an aisle (see DG 1110-3-106, para 4-5b).

2. INSTRUCTOR'S DESKS AND TRAINING MATERIAL STORAGE SHOULD BE PLACED WHERE THEY WILL INSURE CONVENIENT LOG-IN PROCEDURES OR STUDENT ACQUISITION OF MATERIALS.

Circulation routes from study carrels to exits should pass the control station; however, sufficient space should be provided around the control station so that traffic does not back up into the carrel area.

### **Utilities and Waste**

1. ELECTRICAL SERVICES ARE NEEDED AT CARRELS FOR TASK LIGHTING AND THE OPERATION OF AUDIOVISUAL AND OTHER EQUIPMENT. LOCATION AND ROUTING OF ELECTRICAL LINES SHOULD BE UNOBTRUSIVE AND SAFE.

Current will usually be 115 volts, AC, single phase (see DG 1110-3-106, table 4-4). Careful analysis of carrel equipment power demands should be made. A 15-ampere circuit is typically used for every three to four carrels.

2. HEAT BUILDUP SHOULD BE AVOIDED IN SELF-PACED INSTRUCTIONAL ROOMS.

Because of the amount of heat generated by electrical equipment, a separate thermostat should be installed in each self-paced classroom. This will enable instructors to control the classroom's temperature level.

# **SELF-PACED INSTRUCTIONAL ROOMS**

## **Guidelines for Training Spaces**

### **Environmental Conditions**

#### **Lighting**

The general lighting level should be 30 foot-candles; task lighting levels in carrels should be 70 foot-candles.

#### **Sound**

ACOUSTICAL CONTROL IS ESSENTIAL TO PERMIT LISTENING AT NORMAL CONVERSATIONAL LEVELS. NOISE DISTRACTIONS FROM WITHIN AND OUTSIDE THE ROOM SHOULD BE MINIMIZED. THE CONTROL OF NOISE FROM AUDIOVISUAL EQUIPMENT IS VERY IMPORTANT.

Audiovisual carrels require acoustical separation on all four sides. Acoustical panels between rows of carrels may also be required (see DG 1110-3-106, para 4-5b). Ambient levels should not exceed 40 decibels; a continuous background noise level of 30 decibels is preferred. It is recommended that carpets and acoustical ceiling material be used to control noise. Walls between rooms should have an STC rating of 45. Walls between self-paced instructional rooms and corridors should have an STC rating of 40.

#### **Thermal**

WASTE HEAT FROM AUDIOVISUAL AND OTHER EQUIPMENT MAY NEED TO BE REMOVED. CARRELS SHOULD BE DESIGNED TO ALLOW AIR CIRCULATION ALONG THE FLOOR.

Thermal criteria are listed on page 134. Carrel panels should not be closer to the floor than 8 inches.

# SELF-PACED INSTRUCTIONAL ROOMS

## Guidelines for Training Spaces

### Appearance/Finishes/Image

THE REFLECTANCE LEVEL OF CARREL SURFACES SHOULD BE MINIMAL.

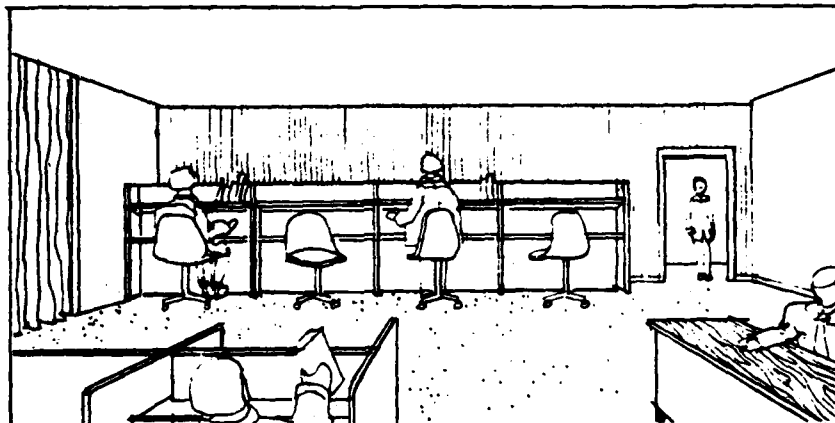
Surface reflectance should not exceed 35 to 50 percent.

(g) **SPACE TYPE**

Self Paced Instruction Rooms

A	B	C	D
a	b	a	b

color scheme



**general decor recommendations**

Physical, visual, thermal, and auditory comfort are very important in self-paced instruction rooms. The total environment should be conducive to study rather than inhibitive.

	Item	recommended characteristics
room finishes	Walls	Use flat paint in recommended colors or wallpaper coordinated with the overall decor scheme.
	Floor	Use recommended carpeting.
	Doors	Use recommended colors or wood finishes.
	Trim	Use recommended colors or wood finishes.
furniture/accessories	Seating	Chairs should be comfortable, upholstered with recommended fabrics, and equipped with casters.
	Carrels	Use laminated plastic or wood veneer.
	Lighting	Lighting should be carefully designed to fully meet the task requirements of this room. A professional should be consulted.
	Curtain	Open weave curtains are recommended to limit direct sunlight.

Figure 48. Decor guidelines for self-paced instructional rooms.



# SELF-PACED INSTRUCTIONAL ROOMS

## Guidelines for Training Spaces

### Communication

CERTAIN TYPES OF TRAINING PROGRAMS MAY REQUIRE INTERCONNECTIONS BETWEEN CARREL EQUIPMENT AND AN INSTRUCTOR STATION, COMPUTER, OR OTHER LOCATIONS.

### Storage

SELF-PACED INSTRUCTION ROOMS AND CARRELS SHOULD BE EQUIPPED TO ACCOMMODATE STUDENTS' PERSONAL BELONGINGS.

Coat racks should be provided. Each carrel should have a bookshelf or book rack where study materials can be placed.

### Furniture

- CARRELS CONTAINING FREQUENTLY USED OR HIGHLY SPECIALIZED EQUIPMENT OR MATERIALS MAY BE DEDICATED. OTHERWISE, CARRELS SHOULD BE SUITABLE FOR USING A VARIETY OF EQUIPMENT AND DEVICES.
- CARRELS MUST BE DESIGNED TO MEET LEARNING OBJECTIVES, TRAINING TASKS, AND EQUIPMENT REQUIREMENT. (Also see *Handbook for the Design and Implementation of Air Force Learning Center Programs* [Air Force Systems Command, December 1975], pp 62-77.) Reading carrels should be 3 x 4 feet (minimum). Reading carrels should be grouped back-to-back or in clusters. Audiovisual carrels should be 4 x 4 feet (minimum); this may vary with the type of audiovisual equipment being used and the need for a writing surface. Carrels with audiovisual aids require acoustical separation on all four sides (fig. 6-24).

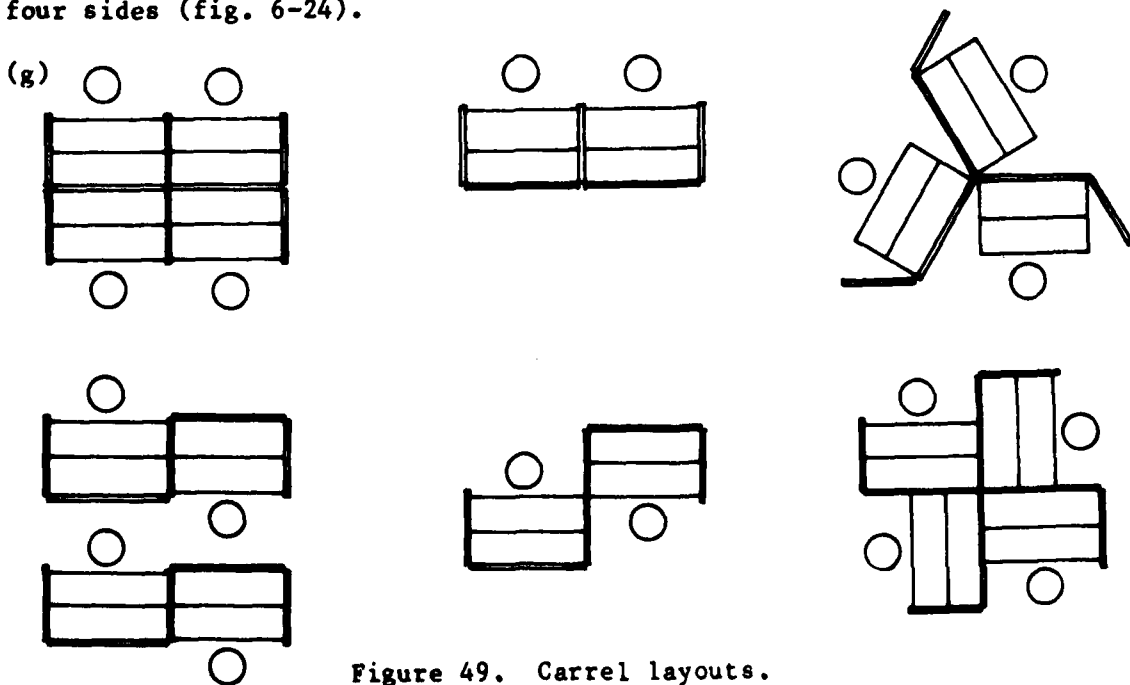


Figure 49. Carrel layouts.

# **SEMINAR CLASSROOMS**

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## **Guidelines for Training Spaces**

### **Use/Activities**

Seminar classrooms are used for small group discussions, briefings, or debriefings. Seminar classrooms can also be used for counseling and remedial instruction.

### **Occupants**

Typically, fewer than 20 people will use this type of space, because larger groups cannot effectively engage in seminar-type discussions.

### **Equipment/Supplies**

This space will usually require one or more tables with chairs. Audiovisual equipment and wall-mounted graphics and media may be used occasionally.

# SEMINAR CLASSROOMS

## Guidelines for Training Spaces

### Space (Size)

The required area per person is 20 square feet. The ceiling should be 8 feet high (see DG 1110-3-106, table 4-5).

### Access/Circulation

#### Location

(g)

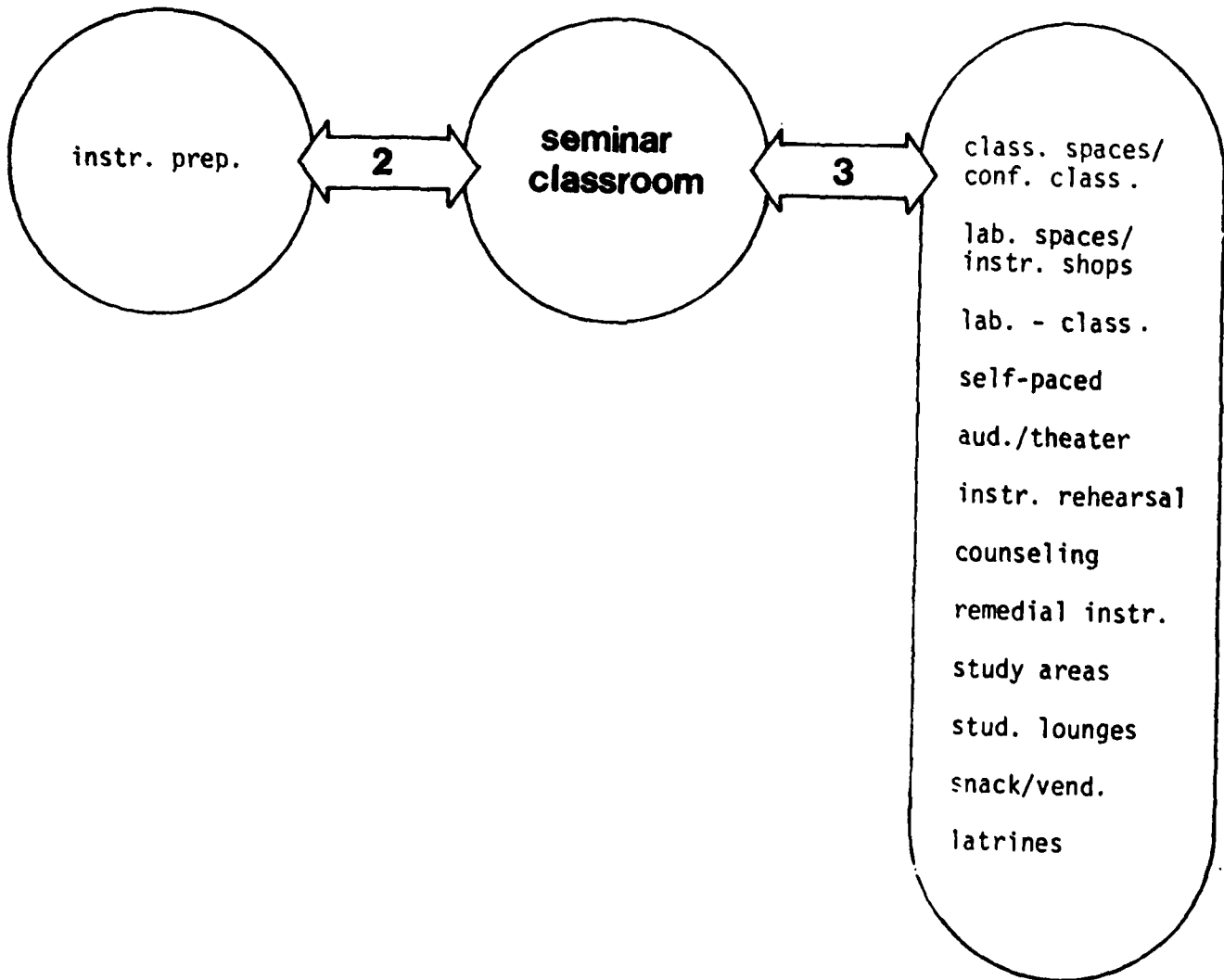


Figure 50. Spaces near seminar classrooms.

# **SEMINAR CLASSROOMS**

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## **Guidelines for Training Spaces**

### **Environmental Conditions**

#### **Windows**

ALTHOUGH VIEWS TO THE OUTSIDE AND NATURAL LIGHTING ARE NOT REQUIRED, THEY ARE DESIRABLE.

A better feeling of spaciousness is achieved in a small room when a view to the outside is provided. If windows are operable and have screens, they will provide a natural source of ventilation. Natural lighting also will contribute to a more relaxed and informal setting, which is appropriate for a seminar classroom. When natural lighting is direct (i.e., other than a north exposure), venetian blinds, curtains, or shades should be used.

#### **Lighting**

LIGHTING LEVELS SHOULD BE ADEQUATE FOR READING AND HELP CREATE A RELAXED AND INFORMAL SETTING.

The required lighting level is 70 foot-candles (see DG 1110-3-106, table 4-5). Studies have shown that incandescent lighting, which has a color spectrum that is psychologically warm, creates relaxed and informal settings when used alone or in combination with fluorescent lighting and accent lighting on walls.

# SEMINAR CLASSROOMS

## Guidelines for Training Spaces

### Appearance/Finishes/Image

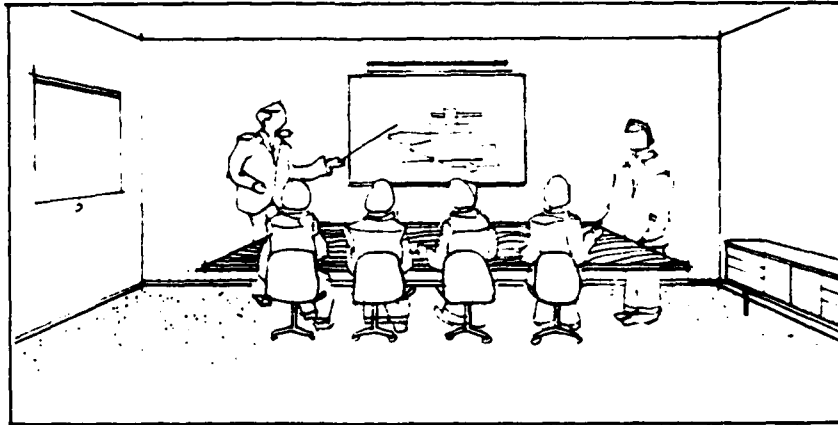
(g)

#### SPACE TYPE

Seminar Classrooms

A		C	D
a	b	a	b

color scheme



general decor recommendations

	item	recommended characteristics
<b>room finishes</b>	Walls	Use flat paint in recommended colors or wallpaper coordinated with the overall decor scheme.
	Floor	Use recommended carpeting.
	Doors	Use recommended colors or wood finishes.
	Trim	Use recommended colors or wood finishes.
<b>furniture/accessories</b>	Seating	Chairs should be comfortable, upholstered with recommended fabrics, and equipped with casters.
	Tables	Use recommended laminated plastics or wood.
	Curtains	Blackout shades are recommended. Colors should coordinate with overall color scheme.

Figure 51. Decor guidelines for seminar classrooms.

# SEMINAR CLASSROOMS

## Guidelines for Training Spaces

### Furniture

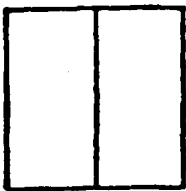
1. IN A SEMINAR SETTING WHERE PARTICIPANTS ARE TO HAVE AN EQUAL STATUS OR TO BE DRAWN INTO THE DISCUSSION, TYPE AND ARRANGEMENT OF FURNITURE CAN AFFECT GROUP DYNAMICS.

(g) Good eye contact among members of a group will encourage interaction. Rectangular tables create dominant table positions on ends. Square tables and table arrangements reduce dominant positions, encourage sub-group formation, and improve eye contact in the group. Round tables result in best eye contact and make all seating positions equal.

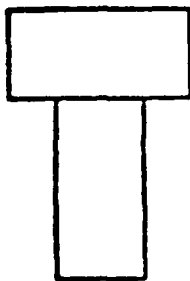
2. IT SHOULD BE POSSIBLE TO ARRANGE FURNITURE IN DIFFERENT WAYS SO DIFFERENT NUMBERS OF STUDENTS CAN BE ACCOMMODATED.

Rectangular tables provide much flexibility in seating arrangements, while round and square tables do not.

(g)



**SIDE BY SIDE**



**SIDE TO END**



**END TO END**

Figure 52. Table arrangements.

# **AUDITORIUM/THEATER**

## **Guidelines for Training Spaces**

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### **Use/Activities**

An auditorium or theater is used to make a presentation to large audiences. Presentations may include the use of audiovisual media.

### **Occupants**

This type of space usually must accommodate one or more speakers plus an audience (100 people or more), and possibly some technicians or aides (up to 3 people).

### **Equipment/Supplies**

Equipment usually includes a lectern or table, a screen for audiovisual materials, microphones, speakers at the front of the room, and special lighting for the speaker platform or stage. The audience may require seats with attached writing surfaces. A special room for projection equipment and audio and lighting controls is usually provided.

# AUDITORIUM/THEATER

## Guidelines for Training Spaces

### Space (Size)

THERE SHOULD BE ENOUGH FLOOR AREA TO ACCOMMODATE SEATS FOR EACH STUDENT AND TO PROVIDE ADEQUATE CIRCULATION.

During preliminary planning, 7-1/2 square feet per seat should be allowed, including aisles and cross-overs.

### Access/Circulation

#### Location

(8)

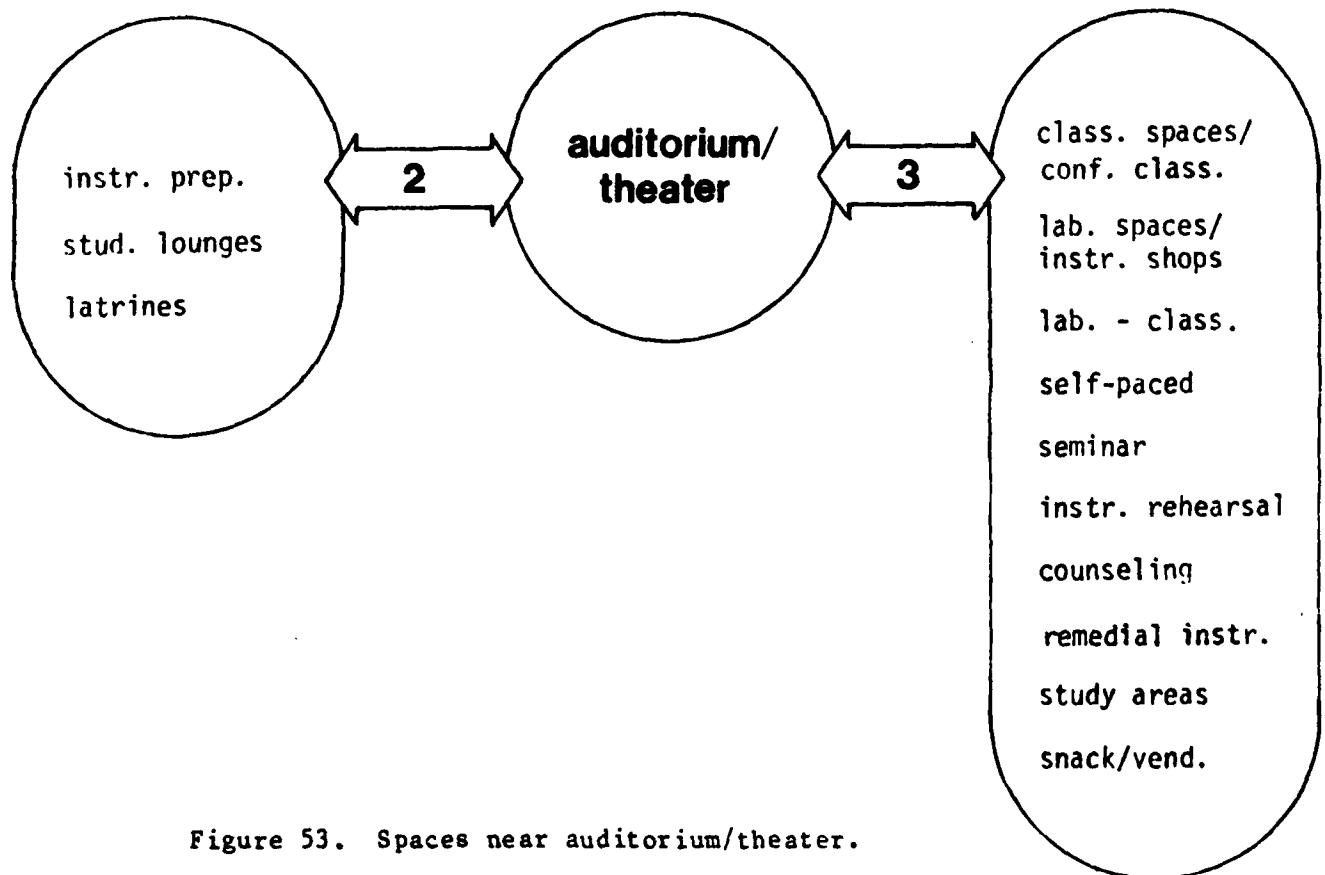


Figure 53. Spaces near auditorium/theater.



# AUDITORIUM/THEATER

## Guidelines for Training Spaces

### Circulation Within Room

1. INSTRUCTOR PLATFORMS THAT ARE EASY TO REACH AND LARGE ENOUGH FOR THE INSTRUCTOR'S NEEDS MUST BE AVAILABLE.

Rows should not be less than 32 inches (seat back to seat back). Seats within each row should not be less than 20 inches on center. Continental seating (in which spaces between all rows widen and become aisles) will considerably reduce the seating capacity of an auditorium. Aisle widths, number of aisles, seat density, number of exits and exit locations are specified in NFPA 101 and local codes.

(g)

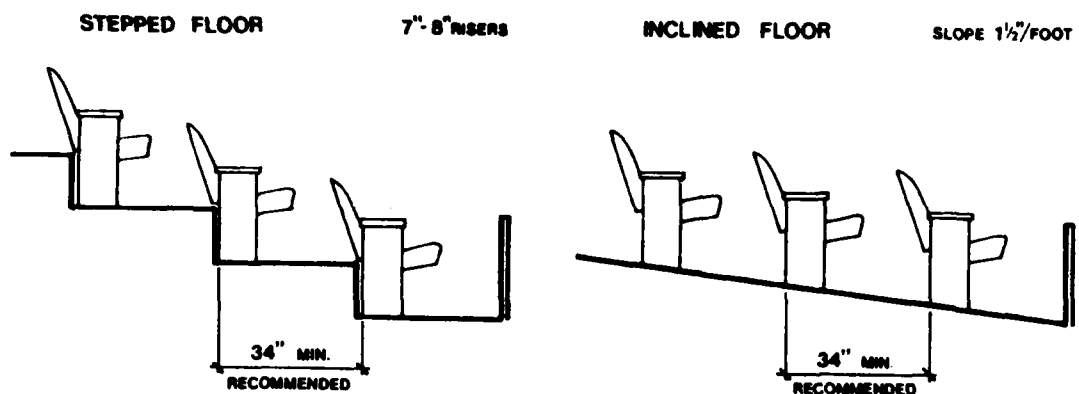


Figure 54. Tiered seating.

2. ALL SEATS SHOULD HAVE A GOOD VIEW OF THE SPEAKER AND/OR SCREEN.

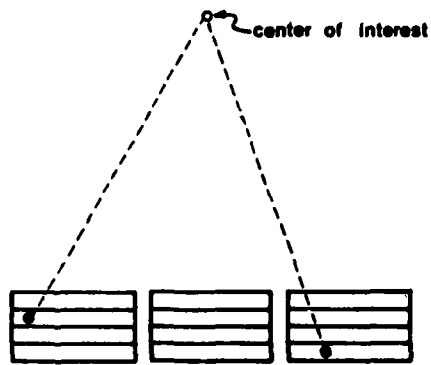
Rows may run straight across the entire theater. Side banks may be canted, or entire rows may be curved. Because of seat construction, the minimum radius for curved rows is 20 feet. The center for radii of rows and center of screen or stage need not coincide, although this is the ideal. When rows are curved, a sloping auditorium floor should be a compound curve or amphitheater-type to prevent tilted side seats. Aisles may be straight, curved, parallel, or radial. Aisles should run at right angles to rows to provide the best traffic flow.

NFPA 101 and local codes govern the maximum number of seats in a bank, aisle width, and cross aisles (not uniform). Typical rules are no seat more than seven seats from an aisle and a minimum aisle width of 3 feet, increasing by varying factors in relation to length of aisles. Requirements for cross aisles vary with the number of seats served and aisle width.

# AUDITORIUM/THEATER

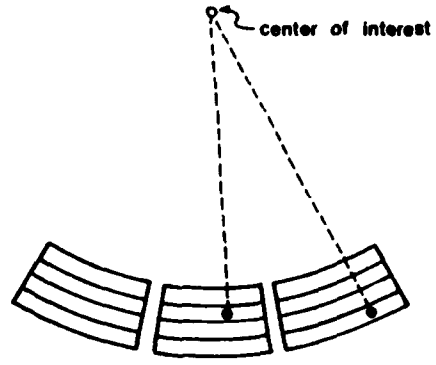
## Guidelines for Training Spaces

(g)



**Straight Rows.**

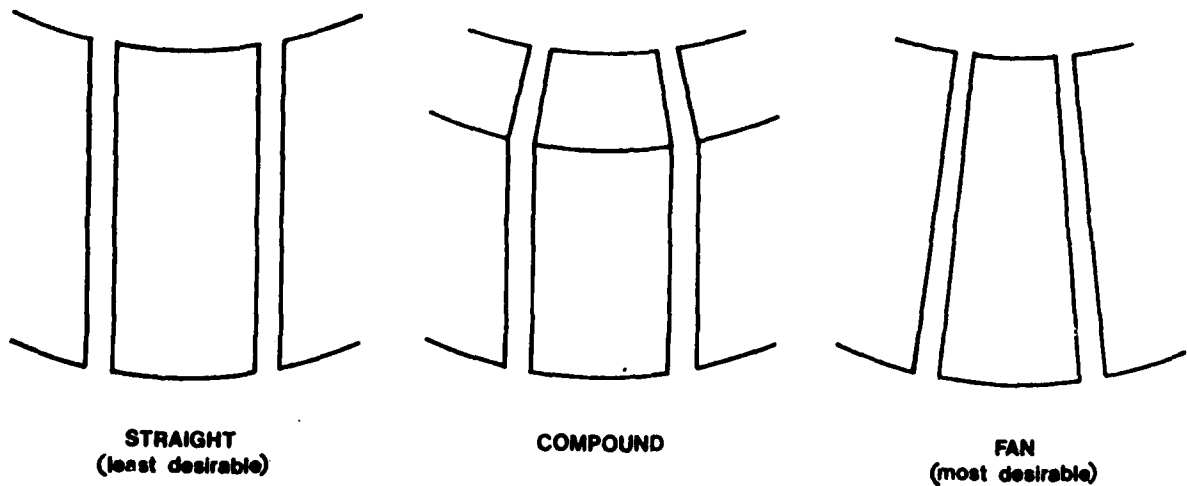
Uncomfortable for individuals seated at sides because the center of interest does not coincide with the natural lines of sight.



**Curved Rows.**

Most desirable because of comfort and ease of vision.

**Figure 55. Types of rows.**



**Figure 56. Typical three-bank layouts.**

# AUDITORIUM/THEATER

## Guidelines for Training Spaces

### Environmental Conditions (Sound)

CONSIDERATION SHOULD BE GIVEN TO THE ACOUSTICAL TREATMENT OF AUDITORIUMS.

In large spaces like auditoriums, a technical expert in sound and acoustics should be consulted to make sure that desired effects are achieved.

### Appearance/Finishes/Image

COLOR AND MATERIAL SHOULD BE SELECTED TO INSURE A NEUTRAL BACKGROUND. See Figure 57

### Communication

VISUAL AIDS SHOULD BE SELECTED BASED ON THE NEED FOR GOOD VISIBILITY BY EACH STUDENT.

Large classrooms (i.e., those seating several hundred students) should use overhead transparency projectors instead of chalkboards. The installation and use of overhead projectors demand little room preparation. However, the room's ceiling must be high enough so a screen large enough for all students to see can be mounted. Screens are usually mounted about 3 feet from the front wall of the room, with the screen bottom drawn back to the wall to eliminate image keystoneing; i.e., to keep the picture square and in focus.

### Furniture

SEATS SHOULD BE SELECTED ON THE BASIS OF COMFORT, COST, SIZE, USE, AND DURABILITY. EACH SEAT SHOULD BE EQUIPPED WITH A FOLD-AWAY ARM FOR NOTE TAKING.

Upholstery variations include spring-edge seats (most luxurious, more expensive); box spring seats (nearly as comfortable as spring-edge seats); spring-back seats; and padded-back seats. Veneer-back seatings are more durable than other types. Upholstered seats provide the best acoustical control. Seats are sized based on width; front-to-back depths vary only slightly.

In determining the distance between rows, the following points should be considered:

1. Coves at the intersection of floor and walls (or risers) should be kept as small as possible so that seat standards will fit close to risers and seats are level.
2. Risers cramp knee room unless spacing between rows is increased.
3. Seat backs which slope backward will require increased spacing between rows.

# AUDITORIUM/THEATER

## Guidelines for Training Spaces

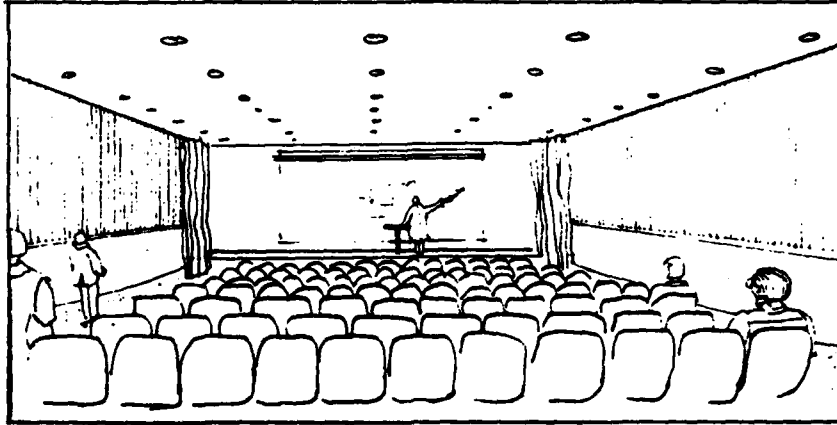
(g)

### SPACE TYPE

Auditorium/Theater

A	B	C	D
b	a	b	a

color scheme



#### general decor recommendations

Colors should be muted.

Furniture and finishes should be durable for heavy use.

	Item	recommended characteristics
room finishes	Wall	Vinyl wallpaper is recommended because of its durability and easy maintenance properties.
	Floor	Carpet is recommended for aisles only. This application is accoutically sensitive but does not create major maintenance problems.
	Trim	Use durable vinyl, hardwood or metal.
furniture/accessories	Seating	Reference Criteria for Auditorium/Theater Furniture.
	Platform	Specific characteristics should be based on local requirements.
	Lectern	Referenced Criteria for Classroom Spaces/Conference Classrooms Communication.

Figure 57. Direction of aisles.

# **TRAINING SUPPORT SPACES**

# **INSTRUCTOR PREPARATION AREAS**

---

## **Guidelines for Training Support Spaces**

### **Use/Activities**

These spaces are used by instructors to prepare personal instruction materials and to store current reference materials; they also have sound-controlled typing stations. If the area has good audio or visual privacy, it can also be used for student counseling. Each instructor in this space has an individual work station.

### **Occupants**

Each instructor area will contain one or two instructors (depending on the type of partitioning system).

### **Equipment/Supplies**

Each instructor's work station has a desk and chair, a visitor's chair, and a carrel-type shelf over the desk or a separate storage shelf unit. Typing stations have a typewriter stand or a typing desk, and storage space for reference or supply materials.

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# INSTRUCTOR PREPARATION AREAS

## Guidelines for Training Support Spaces

### Space (Size)

THERE SHOULD BE ENOUGH SPACE FOR INSTRUCTORS TO PREPARE THEIR LECTURES.

Each instructor will be provided 90 square feet (see DG 1110-3-106, table 4-6).

A net area of 70 square feet should be provided for each preparation area, 30 square feet for each typing booth, and 11 square feet for each section of shelving or each storage cabinet (see DG 1110-3-106, 4-7b).

### Access/Circulation (Location)

(g)

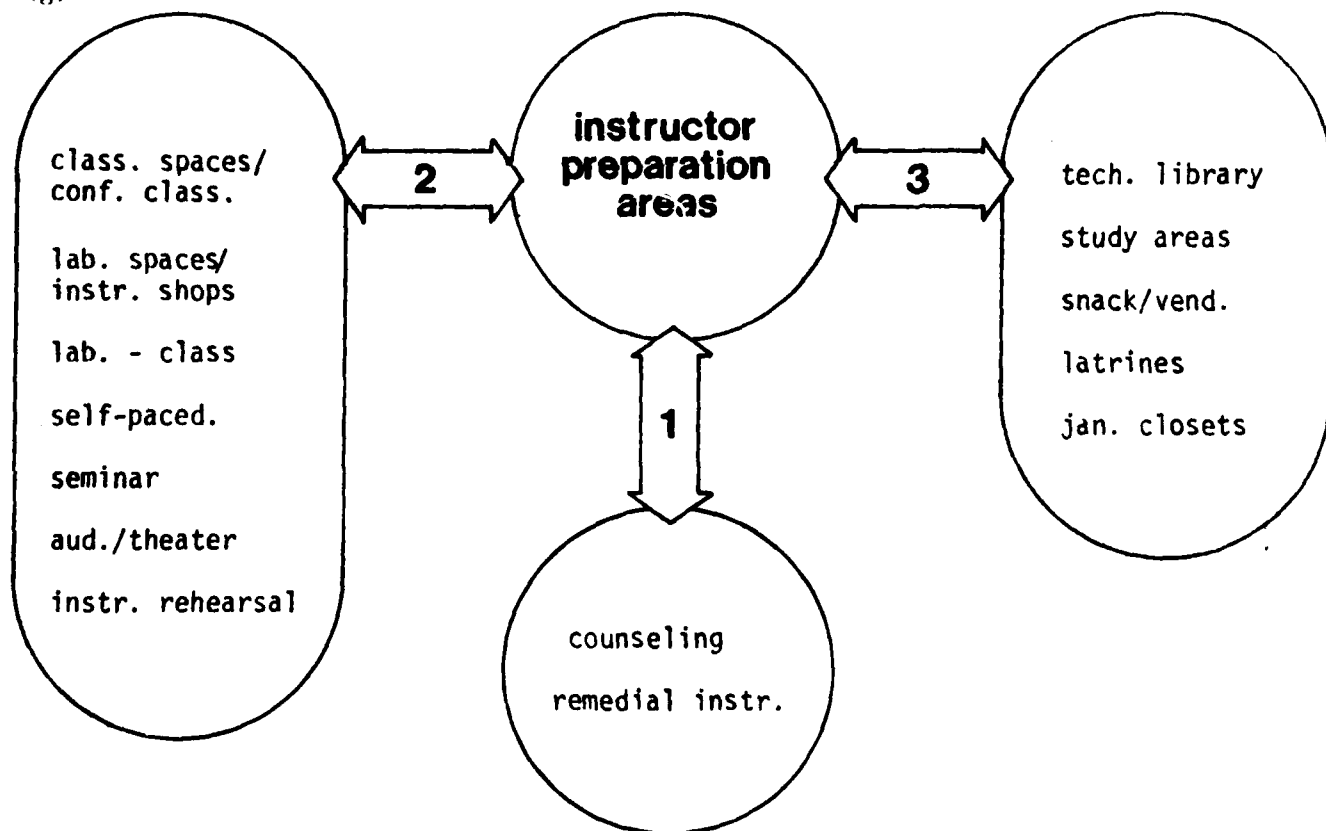


Figure 58. Spaces near instructor preparation areas.

# INSTRUCTOR PREPARATION AREAS

## Guidelines for Training Support Spaces

### Environmental Conditions (Lighting)

LIGHTING SHOULD BE ADEQUATE.

The general lighting level will be 30 foot-candles. Task lighting will be 70 foot-candles (see DG 1110-3-106, table 4-6).

### Appearance/Finishes/Image

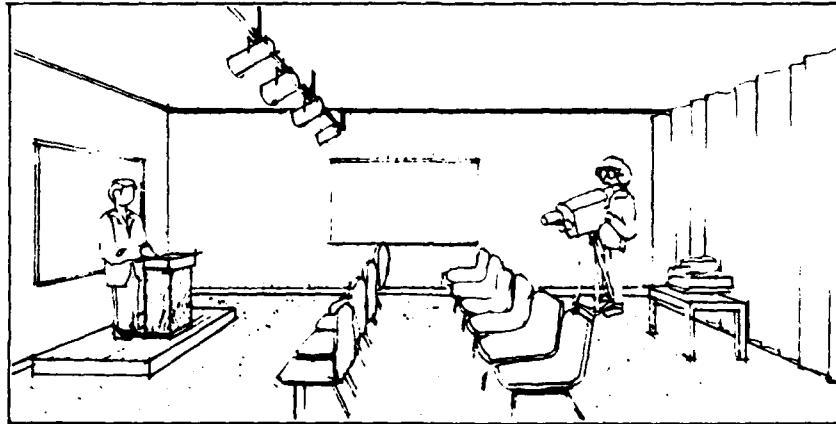
(g)

#### SPACE TYPE

A	B	C
b	a	b

color scheme

Instructor Rehearsal Rooms



general decor recommendations

	item	recommended characteristics
room finishes	Walls	Use recommended colors. Flat paint is recommended to reduce glare.
	Floor	Use recommended carpeting.
	Doors	Use recommended wood finishes.
	Trim	Use recommended wood finishes.
furniture/accessories	Seating	Chairs with tablet arms are recommended.
	Platform	A small, moveable wood platform is suggested for flexibility.
	Lectern	Reference Criteria for Classrooms Spaces Conference Classrooms Communication.
	Curtains	Open weave curtains are recommended to limit direct sunlight. Blackout shades may also be necessary. Colors should coordinate with overall color scheme.

Figure 59. Decor guidelines for instructor preparation rooms.



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MANUAL FOR ARMY SERVICE SCHOOLS(U) CONSTRUCTION  
ENGINEERING RESEARCH LAB (ARMY) CHAMPAIGN IL

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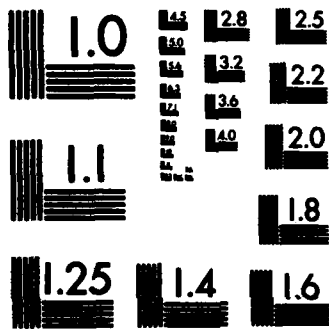
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# **INSTRUCTOR PREPARATION AREAS**

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## **Guidelines for Training Support Spaces**

### **Furniture**

INSTRUCTORS NEED VISUAL AND SOME SOUND PRIVACY. TYPING STATIONS NEED GOOD SOUND ISOLATION.

The general instructor preparation area should be open, with shoulder-height partitions between each instructor's area. Typing booths should be inclosed with full-height partitions (see DG 1110-3-106, para 4-7b).

# **INSTRUCTOR REHEARSAL ROOMS**

---

## **Guidelines for Training Support Spaces**

### **Use/Activities**

This space is used by instructors to practice a lecture or demonstration. A small audience may be present to help with or criticize the presentation; lectures are sometimes videotaped. Instructor rehearsal rooms are also occasionally used for student counseling or remedial instruction.

### **Occupants**

This space must accommodate an instructor, a small audience, and equipment operators.

### **Equipment/Supplies**

Typical equipment used in this space may include a lectern or instructor table, instructor platform, desks or chairs and tables for the audience, audiovisual equipment (screen and microphones, slide, movie, or viewgraph projector, audio and television recording equipment), special lighting and lighting controls, and chalkboards and tackboards.

# **INSTRUCTOR REHEARSAL ROOMS**

## **Guidelines for Training Support Spaces**

### **Space (Size)**

THERE SHOULD BE ENOUGH SPACE FOR AN INSTRUCTOR TO PRACTICE OR VIDEOTAPE LECTURES AND DEMONSTRATIONS (see DG 1110-3-106, para 4-8a).

The instructor rehearsal room will be 250 to 375 square feet (see DG 1110-3-106, para 4-7).

### **Access/Circulation (Location)**

THE REHEARSAL ROOM SHOULD BE CONVENIENT TO THE INSTRUCTOR PREPARATION AREA (see DG 1110-3-106, para 4-8b).

(g)

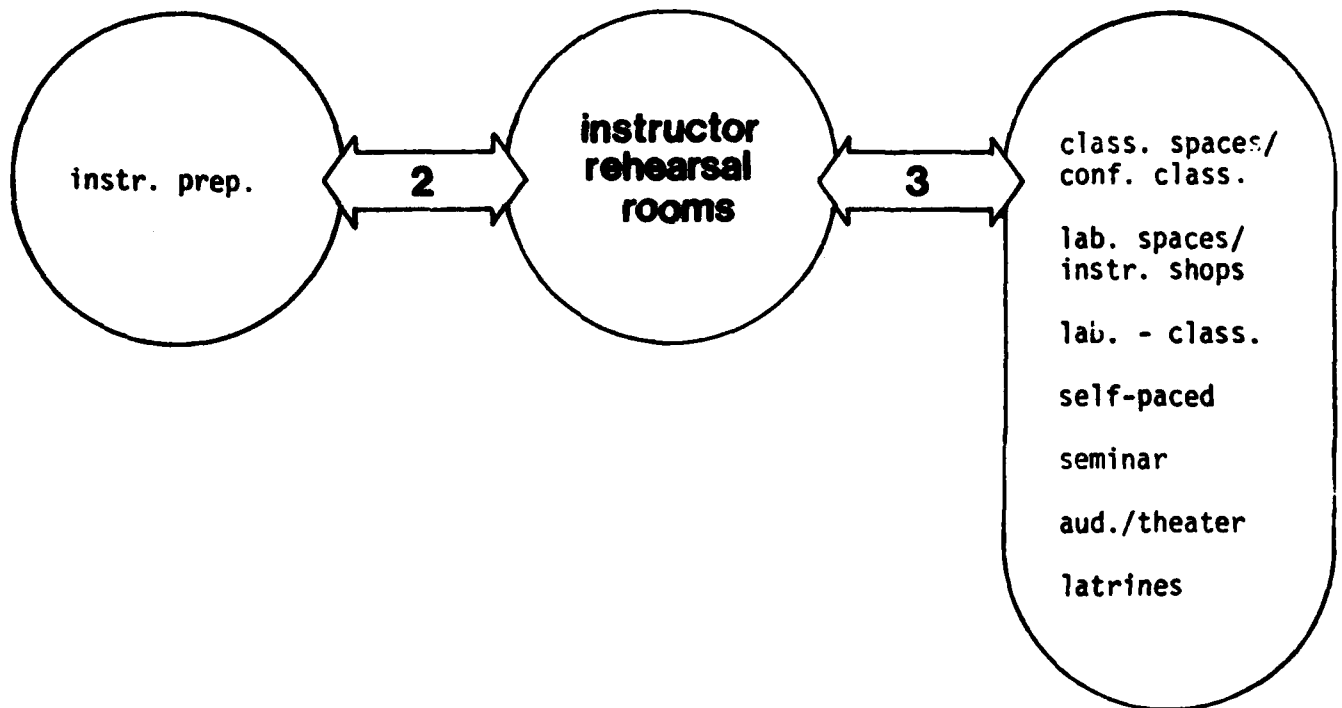


Figure 60. Spaces near instructor rehearsal rooms.

# **INSTRUCTOR REHEARSAL ROOMS**

## **Guidelines for Training Support Spaces**

### **Environmental Conditions (Lighting)**

ADEQUATE LIGHTING SHOULD BE PROVIDED FOR AUDIOVISUAL MATERIALS AND PRACTICE LECTURES/DEMONSTRATIONS (see DG 1110-3-106, para 4-8a).

A separate control should be provided for the platform lighting (see DG 1110-3-106, para 4-8a). The general lighting level will be 70 foot-candles. The audiovisual lighting level for viewing is 35 foot-candles; 70 foot-candles for black and white videotaping; and 250 foot-candles for color videotaping (see DG 1110-3-106, table 4-7).

### **Appearance/Finishes/Image**

See Figure 61

### **Furniture**

THE REHEARSAL ROOM SHOULD BE ADEQUATELY FURNISHED. ALL FURNITURE SURFACES MUST BE DURABLE AND EASY TO MAINTAIN.

The rehearsal room should have audiovisual controls, a projection screen, a blackboard, and 10 to 12 desks. There should be a television cassette unit so taped presentations can be reviewed and to allow lectures to be monitored during taping (see DG 1110-3-106, para 4-8a).

# INSTRUCTOR REHEARSAL ROOMS

## Guidelines for Training Support Spaces

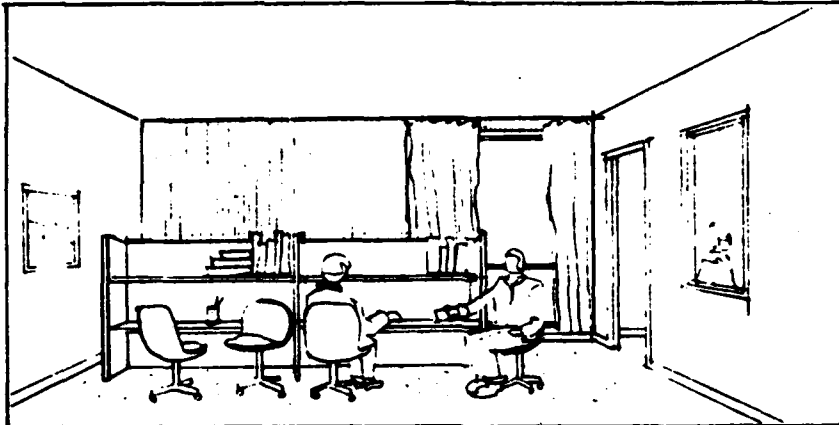
(g)

### SPACE TYPE

A	B	C	D
a	a	b	b

color scheme

Instructor Preparation Areas



#### general decor recommendations

The decor of Instructor Preparation Rooms should allow for instructors to individualize their own areas with personal objects. A neutral color scheme allows each instructor flexibility for personalization.

	Item	recommended characteristics
room finishes	Walls	Use light colors. First paint is recommended to minimize glare.
	Floors	Use recommended carpeting.
	Doors	Use recommended accent colors or wood finishes.
	Trim	Use recommended accent colors or wood finishes.
furniture/accessories	Seating	At least one upholstered, swivel chair with casters is recommended per instructor area. One compatible chair is also required for instructor-student counseling.
	Desks	Desks, partitions, and shelves should all be part of an integrated open office system.
	Curtains	Open weave curtains are recommended to limit direct sunlight.

Figure 61. Decor guidelines for instructor rehearsal rooms.

# **COUNSELING SPACES**

## **Guidelines for Training Support Spaces**

---

### **Use/Activities**

Counseling spaces are areas where instructors meet with individual students to discuss academic problems. Instructor preparation areas, instructor rehearsal rooms, empty classrooms, seminar rooms, or other areas which have audio and visual privacy are used for counseling.

### **Occupants**

Counseling spaces usually must accommodate one instructor and one student.

### **Equipment/Supplies**

This type of space usually requires two chairs of the same height (so an instructor does not intimidate the student by looking down at him or her) and a low, small table.



# COUNSELING SPACES

## Guidelines for Training Support Spaces

### Space (Size)

THERE SHOULD BE ENOUGH SPACE FOR TWO OR THREE PEOPLE TO SIT AND TALK WITH A COMFORTABLE DISTANCE BETWEEN THEM.

Each counseling room should be about 80 square feet. Ideal dimensions would be 8 x 10 or 9 x 9 feet. Ceiling height should not exceed 9 feet.

### Access/Circulation (Location)

COUNSELING ROOMS SHOULD BE PRIVATE.

Counseling rooms should be near other instructor spaces so that instructors and supervisors can control their use. Whenever possible, counseling rooms should be separate rooms with walls and a closable door (not partitioned spaces).

(g)

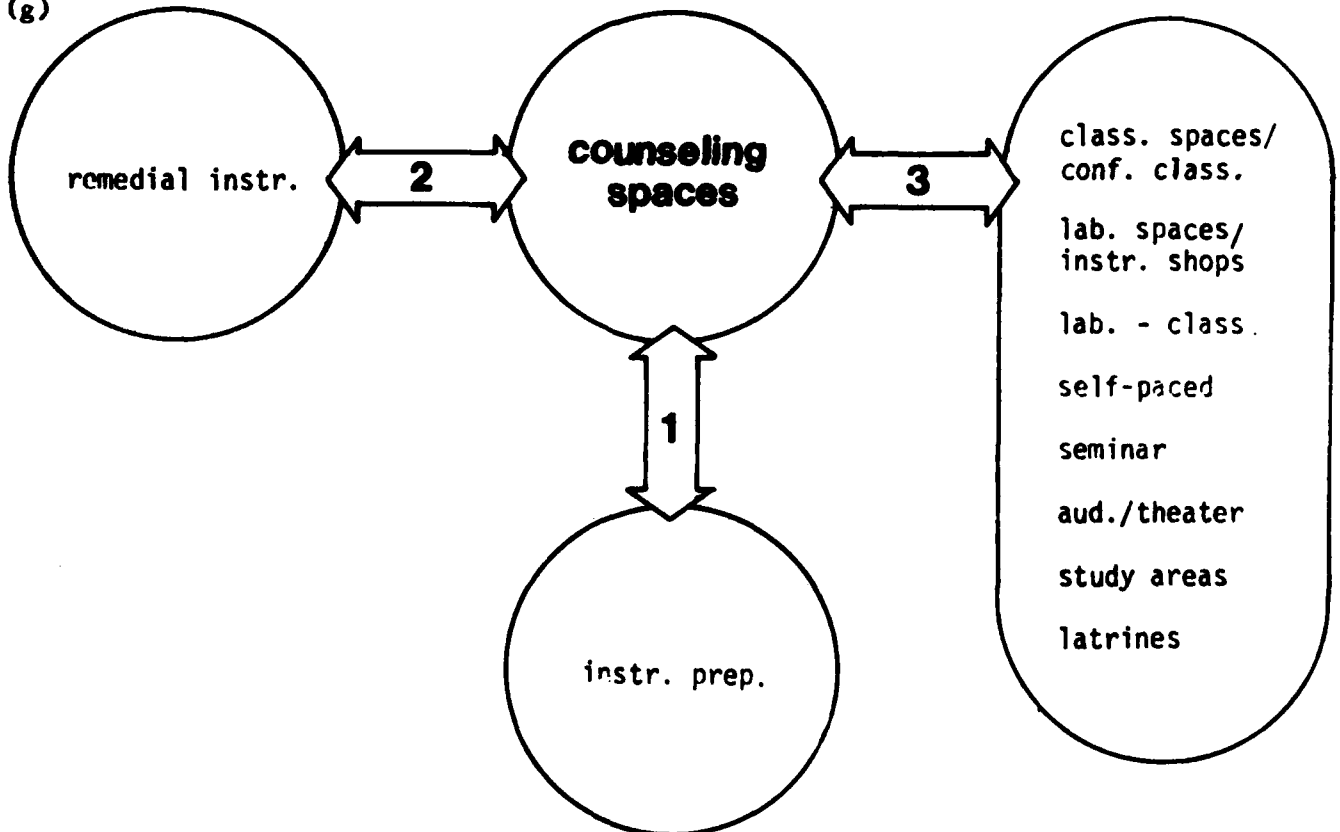


Figure 62. Spaces near counseling spaces.

# **COUNSELING SPACES**

## **Guidelines for Training Support Spaces**

### **Environmental Conditions**

#### **COUNSELING ROOMS SHOULD NOT CREATE A FEELING OF CLAUSTROPHOBIA.**

Although the counseling space should be private, it may have windows in one wall to create a more spacious feeling. If the windows are on an interior wall, they should open onto a little-used circulation path, not onto an area where people are sitting. Furniture should be arranged so that neither the instructor's nor the student's back faces the windows.

### **Sound**

#### **COUNSELING ROOMS SHOULD BE PRIVATE.**

Walls and doors of the counseling space should be sound-proofed well enough so confidential discussions are not overheard. If the counseling room is along a circulation path, the room should be acoustically treated so outside noises do not disturb or distract the instructor and student.

### **Appearance/Finishes/Image**

#### **THE GENERAL CHARACTER OF COUNSELING ROOMS SHOULD BE INFORMAL.**

# COUNSELING SPACES

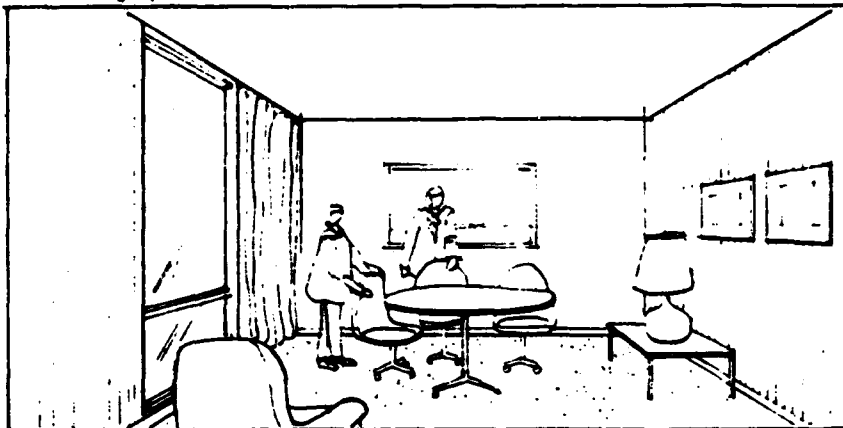
## Guidelines for Training Support Spaces

(g) **SPACE TYPE**

A		C	D
a	b	a	b

Counseling Spaces

color scheme



general decor recommendations

	item	recommended characteristics
room finishes	Floor	Use recommended carpeting to help create a comfortable quiet space.
furniture/accessories	Seating	Chairs should be comfortable but without swivel mechanism.
	Table	A small round conference table in recommended wood finish is appropriate.
	Curtains	Open weave curtains are recommended to limit direct sunlight.

Figure 63. Decor guidelines for counseling spaces.

### Furniture

FURNITURE SHOULD BE COMPATIBLE WITH THE APPEARANCE AND FINISHES OF THE ROOM.

# **REMEDIAL INSTRUCTION SPACES**

## **Guidelines for Training Support Spaces**

---

### **Use/Activities**

Based on a student's performance in class or on information obtained during academic counseling, an instructor may determine that a student requires remedial help. This usually involves supervised study or a review of troublesome material in a one-on-one setting. Remedial instruction may take place in the instructor preparation area (if there is a place for a student to sit undisturbed in the instructor's view) or in empty classrooms, instructor rehearsal rooms, or seminar classrooms.

### **Occupants**

Spaces used for remedial work usually must accommodate one instructor and one student. Supervised study areas must accommodate one instructor and as many as three or four students.

### **Equipment/Supplies**

Remedial instruction spaces usually have a desk or table and chair for each student, and an instructor's work station. Work stations should be placed so the instructor can do his or her own work while keeping an eye on the student.

# REMEDIAL INSTRUCTION SPACES

## Guidelines for Training Support Spaces

### Space (Size)

REMEDIAL INSTRUCTION SPACES SHOULD BE LARGE ENOUGH TO ACCOMMODATE ONE INSTRUCTOR AND A MAXIMUM OF THREE OR FOUR STUDENTS.

Each remedial instruction area should be 100 square feet.

### Access/Circulation (Location)

(g)

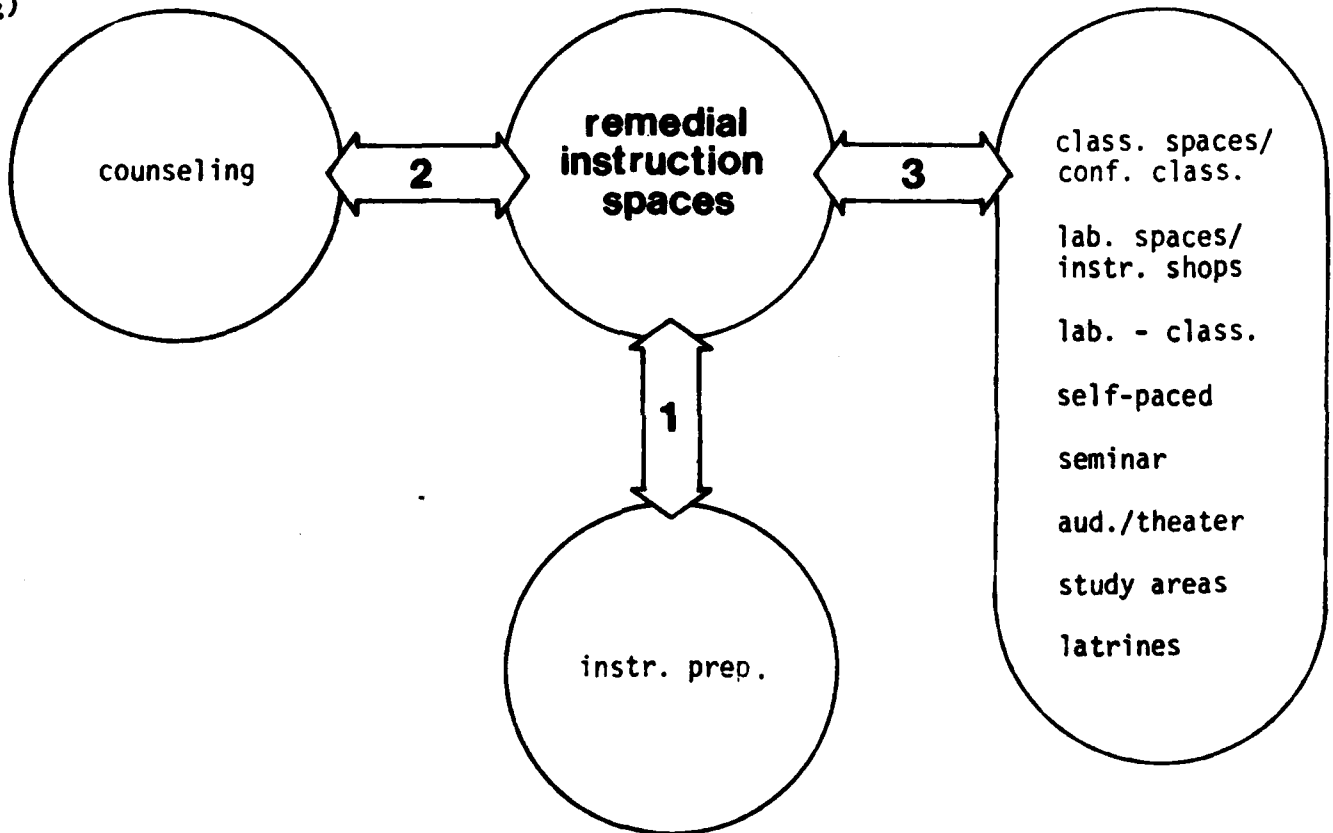


Figure 64. Spaces near remedial instruction spaces.

# **REMEDIAL INSTRUCTION SPACES**

## **Guidelines for Training Support Spaces**

---

### **Environmental Conditions (Windows)**

#### **OCCUPANTS SHOULD NOT FEEL CLOSED IN.**

(g) Windows help to create a more spacious feeling, especially within small rooms.

### **Furniture**

Each work station should have a desk, table or carrel, and a chair.

# TECHNICAL LIBRARY

---

## Guidelines for Training Support Spaces

### Use/Activities

Service school libraries provide the technical references staff and faculty use to develop training materials or to conduct training evaluations. Library users borrow and return reference materials, browse through the stacks or film holdings, check catalog files, etc. The library staff acquires, catalogs, files, checks out and receives materials, and helps users locate references.

### Occupants

This space usually must accommodate one librarian, several library aides, and a number of users. How many users will be in the library during a given period depends on the size of the school and the time of day.

### Equipment/Supplies

The library usually has stack and storage areas with shelving or microfiche files; drawer files for reference materials; work stations with equipment to allow users to view film materials, to read reference materials, or to write while working from references; catalog files and index displays; checkout and return areas; and staff areas with equipment for ordering, cataloging, and processing new materials.

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# TECHNICAL LIBRARY

## Guidelines for Training Support Spaces

### Space (Size)

#### THERE SHOULD BE SUFFICIENT LIBRARY SPACE.

Reading areas and the circulation desks (including traffic) require 25 square feet per person reading. The space required for classified storage vaults and for reading rooms is determined on a case-by-case basis. The number of work stations or carrels used for microfiche, microfilm, or other audiovisual media is based on the individual library's needs. Typically, stack areas are sized so that 1 square foot of floor area is provided for every 15 books in the stacks. This rule includes aisles between bookshelves and assumes stacks are 6 to 7 shelves high.

#### Approximate Book-Shelving Capacities

<u>Number of 3-ft sections*</u>	<u>7 shelves high</u>	<u>5 shelves high</u>	<u>3 shelves high</u>
1	1 x 150 = 150	1 x 105 = 105	1 x 65 = 65
2	2 x 150 = 300	2 x 105 = 210	2 x 65 = 130
3	3 x 150 = 450	3 x 105 = 315	3 x 65 = 195
4	4 x 150 = 600	4 x 105 = 420	4 x 65 = 260
n	n x 150 =	n x 105 =	n x 65 =

\* Capacities given in the table are for single-face sections only. Double-face shelving capacities can be calculated if the above products are multiplied by 2.

Library ceilings should be 9 to 10 feet high.



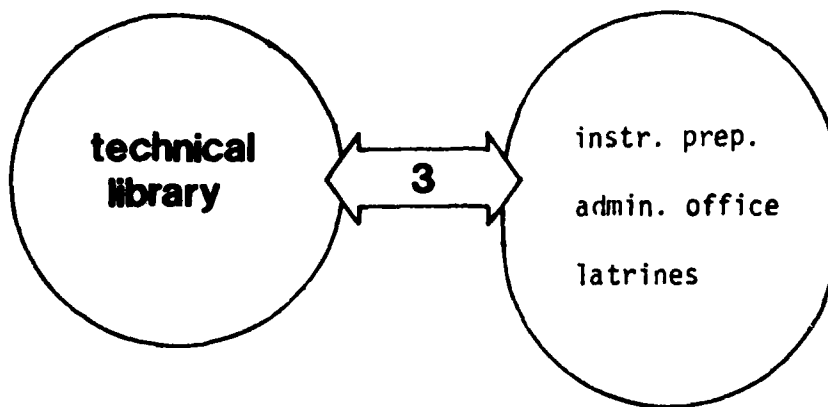
# TECHNICAL LIBRARY

## Guidelines for Training Support Spaces

### Access/Circulation

#### Location

(g)



Figures 65. Spaces near the technical library.

### Circulation Within Room

STACK AISLES SHOULD BE LARGE ENOUGH TO ALLOW MATERIALS TO BE VIEWED EASILY.

The recommended face-to-face spacing between book stacks is 3 feet.

### Environmental Conditions (Lighting)

DIFFERENT KINDS OF LIGHTING SHOULD BE USED THROUGHOUT THE LIBRARY TO SATISFY DIFFERENT VISUAL TASK REQUIREMENTS.

Specially designed lighting systems should be used in the stack area, the carrel area, the reading area, and at the circulation desk. A lighting designer or engineer should be asked to recommend appropriate lighting systems during the design phase.

The general required lighting level is 70 foot-candles.

# TECHNICAL LIBRARY

## Guidelines for Training Support Spaces

### Appearance/Finishes/Image

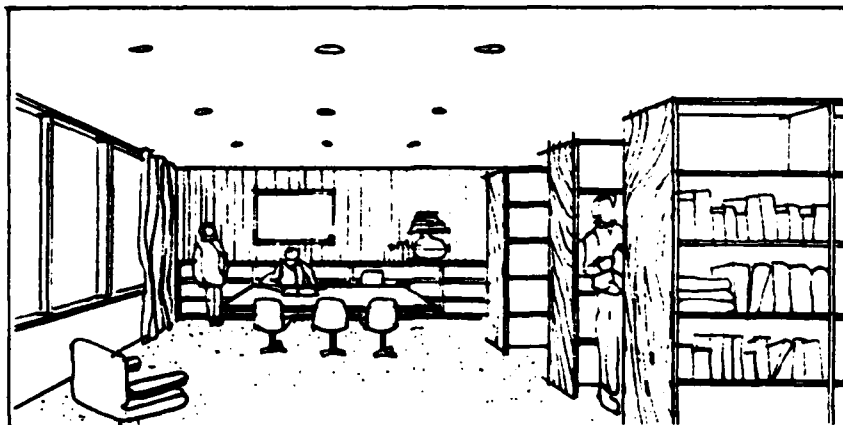
(g)

#### SPACE TYPE

Technical Library

A	B	C	D
a	b	a	b

color scheme



#### general decor recommendations

Muted colors help minimize distractions  
There should be a variety of furniture types to allow different modes of study.

	Item	recommended characteristics
room finishes	Walls	Use flat paint in recommended colors.
	Floor	Use recommended carpeting.
furniture/accessories	Seating	A mixture of comfortable table seating and lounge chairs is recommended.
	Tables	Plastic laminate is recommended.
	Carrels	Plastic laminate is recommended.
	Bookcase	Finish should match doors and trim as appropriate.
	Desk	The service desk should be compatible with overall decor and finish welcome.
	Curtains	Open weave curtains are recommended to limit direct sunlight.

Figure 66. Decor guidelines for technical library.

# TECHNICAL LIBRARY

## Guidelines for Training Support Spaces

### Storage

THERE SHOULD BE ENOUGH STORAGE TO ACCOMMODATE BOTH EXISTING LEARNING RESOURCES AND RESOURCES THAT WILL BE ACQUIRED IN THE FUTURE.

(g)

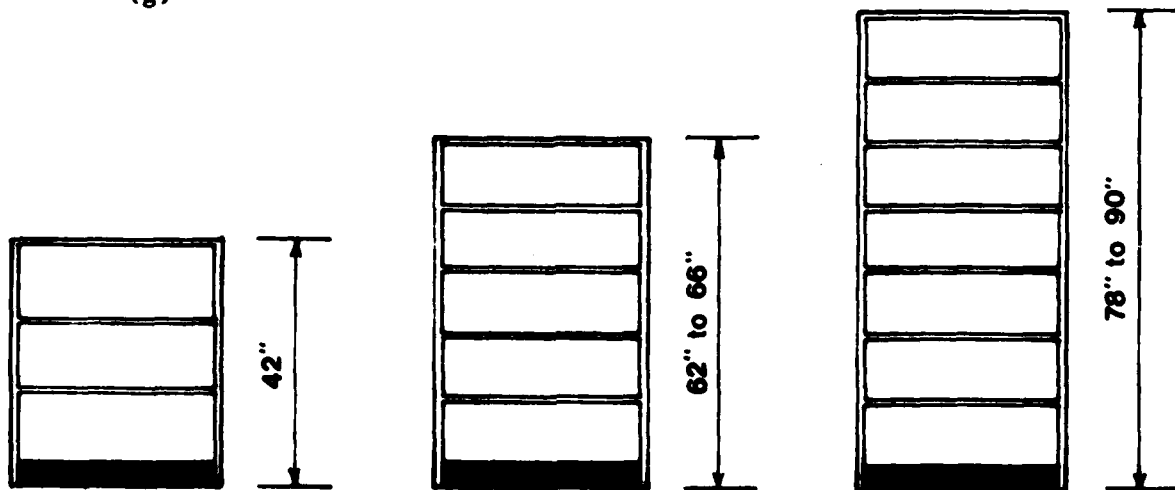


Figure 67. Typical heights for 3-foot sections with three, five, or seven shelves.

### Furniture

LIBRARY FURNITURE SHOULD BE ATTRACTIVE AND COMFORTABLE.

(g) If the library is supervised, there is less chance that students will abuse the furniture. Therefore, couches and cushioned chairs can be used in specified reading areas.

## **STUDY AREAS**

### **Guidelines for Training Support Spaces**

#### **Use/Activities**

This type of space is used by students to do independent reading and writing, and to view self-paced lessons or practice on special equipment.

#### **Occupants**

The number of students a study area must accommodate depends on the individual school's curriculum and training methods.

#### **Equipment/Supplies**

Study areas typically have a comfortable chair (for reading), desks or tables and chairs, and properly equipped carrels (for self-paced lessons). Specially designed study areas may be needed if students must practice using special equipment.

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# STUDY AREAS

## Guidelines for Training Support Spaces

### Space (Size)

STUDY AREAS SHOULD BE LARGE ENOUGH TO MEET MOST NEEDS.

Each study area should provide 30 square feet per student (including circulation). The number of students to be accommodated at any one time will vary with the school.

### Access/Circulation (Location)

(g)

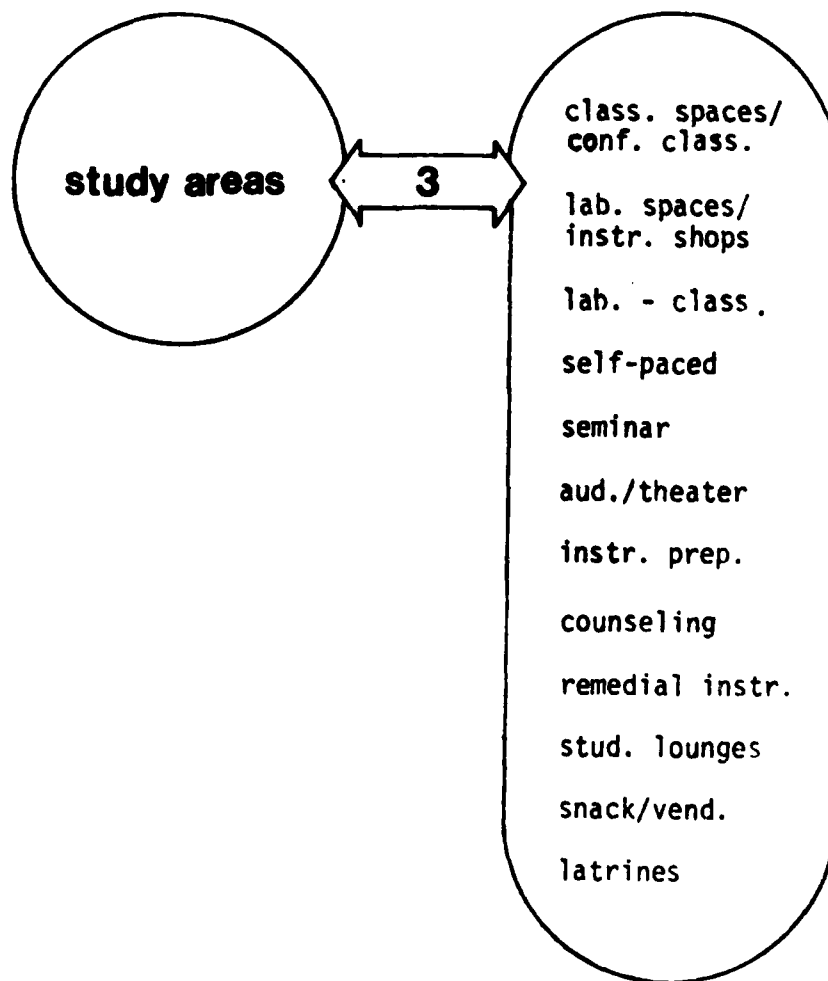


Figure 68. Spaces near study areas.

# STUDY AREAS

## Guidelines for Training Support Spaces

### Appearance/Finishes/Image

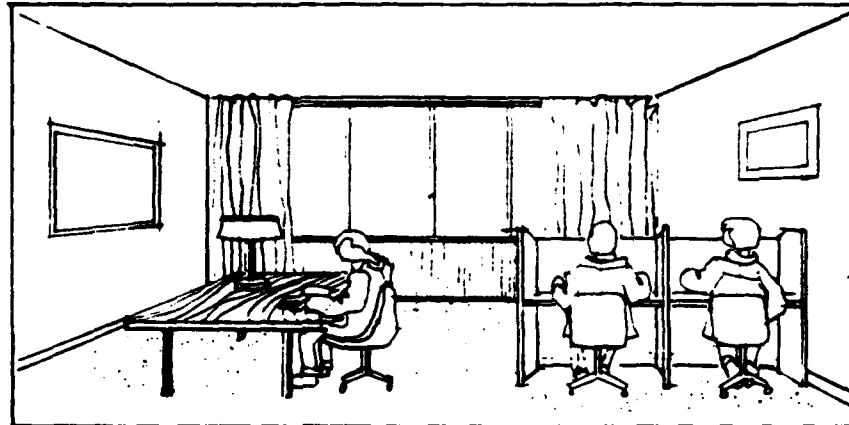
(g)

### SPACE TYPE

Study Areas

A	C	D
b	a b	b

color scheme



#### general decor recommendations

Muted colors help to minimize distractions. There should be a variety of furniture types to allow for different modes of study.

	item	recommended characteristics
room finishes	Floor	Use recommended carpeting.
	Walls	Use flat paint in recommended colors.
furniture/accessories	Tables	Plastic laminate is recommended.
	Seating	A mixture of comfortable table seating and lounge chairs is recommended.
	Carrels	Plastic laminate is recommended.
	Lighting	Lighting should be carefully designed to fully meet the task requirements of this room. A professional should be consulted.
	Curtains	Open weave curtains are recommended to limit direct sunlight.

Figure 69. Decor guidelines for study areas.

## **STUDY AREAS**

### **Guidelines for Training Support Spaces**

---

#### **Furniture**

EACH SPACE SHOULD BE ANALYZED TO DETERMINE IF SPECIAL TYPES OF FURNITURE ARE REQUIRED.

Carrels are needed for viewing self-paced lessons and should be used when students must be free from visual distractions. Carrels, tables, and chairs are required when students must do written work.

# **PROJECTION ROOMS**

## **Guidelines for Training Support Spaces**

---

### **Use/Activities**

This space is used to operate rear-screen projection equipment and to store projection materials. Rear-screen projection rooms which extend into a corner of a classroom can be operated from the instructor's area. Mirrors are used to project the image on a screen, or projectors can be placed in a separate room located behind the screen. Larger projection rooms may also have areas where visual programs can be prepared and/or equipment can be maintained.

### **Occupants**

Large projection rooms (or projection rooms supporting more than one instructional space) that have a rear-projection screen require space for a projectionist or technician. Depending on the design, instructors may be able to operate projectors themselves or by remote control.

### **Equipment/Supplies**

Projection rooms typically have a slide or movie projector, some storage shelves which are out of the image path, amplifiers and controls for audio equipment, and lighting controls.



# **PROJECTION ROOMS**

---

## **Guidelines for Training Support Spaces**

### **Space (Size)**

A PROJECTION ROOM OR BOOTH SHOULD PERMIT DISPLAYED IMAGES TO BE LARGE ENOUGH SO THAT THEY CAN BE SEEN WITHOUT DISTORTION.

Because a rear-screen projector must be located a distance of 1.5 times the screen width, the minimum size for a projector room with an 8-foot-wide screen is about 15 feet deep and 10 feet wide.

### **Access/Circulation**

#### **Access to Space**

THE REAR-SCREEN PROJECTION ROOM SHOULD BE EASILY ACCESSIBLE TO THE INSTRUCTOR.

There should be a 3-foot-deep, solid, opaque door between the projection room and the classroom. It is also advisable to have a door which opens into the projection room from an adjoining hallway.

#### **Location**

Whenever possible, the rear-screen projection room should serve more than one classroom.

See Figure 70

#### **Utilities and Waste**

THERE SHOULD BE ENOUGH OUTLETS AND WIRING TO SUPPORT ALL THE ELECTRICAL EQUIPMENT THAT MAY BE REQUIRED.

# PROJECTION ROOMS

## Guidelines for Training Support Spaces

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(g)

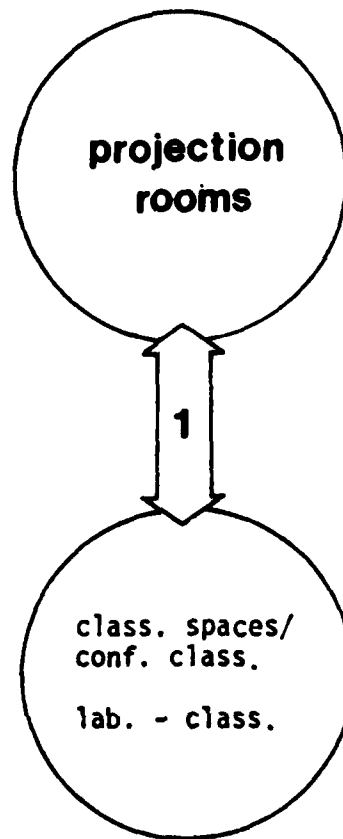


Figure 70. Spaces near the rear-screen projection room.

# ADMINISTRATIVE OFFICE SPACES

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# **ADMINISTRATIVE OFFICE SPACES**

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## **Guidelines for Administrative Office Spaces**

### **Use/Activities**

The office activities of Army service schools can vary widely. For example, some people may need privacy, others may need to work in small groups, some may work alone part of the time and at other times interact frequently. There may also be a need for counters, windows, or work areas.

### **Occupants**

The number of persons an office space may have to accommodate will vary with the function of the space.

### **Equipment/Supplies**

Furniture and equipment needs vary widely across organizations. Typical office furniture may meet the needs of many, but some organizations may need drafting tables, work benches, or other, highly specialized equipment.

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# **ADMINISTRATIVE OFFICE SPACES**

## **Guidelines for Administrative Office Spaces**

### **Space (Size)**

1. OFFICE SPACE SHOULD BE BASED ON THE FUNCTIONAL NEEDS OF EACH OCCUPANT.

Each office space should provide between 80 and 400 square feet per person. Each clerical space should provide between 45 and 90 square feet per person. See Appendix B for office standards.

2. CEILING HEIGHTS SHOULD BE APPROPRIATE.

The ceiling heights for closed offices should be 8 feet. Open-plan offices should have ceilings at least 9 feet high.

### **Access/Circulation (Location)**

(g)

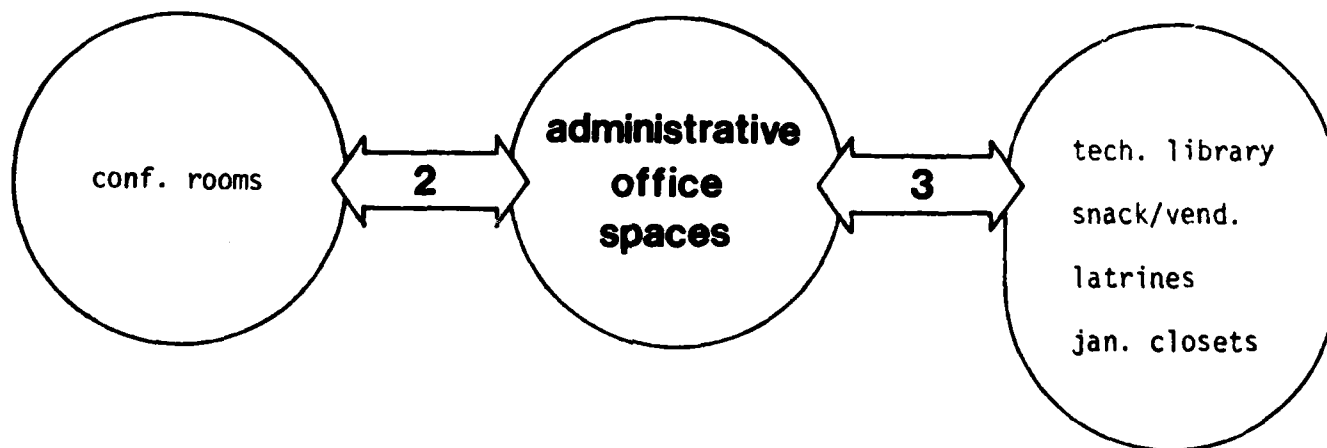


Figure 71. Spaces near administrative work spaces.

# **ADMINISTRATIVE OFFICE SPACES**

## **Guidelines for Administrative Office Spaces**

---

### **Environmental Conditions (Windows)**

#### **AN OUTSIDE VIEW IS ESSENTIAL.**

(g) Research has shown that most people desire to have an outside view. However, windows should be located to minimize glare and maximize energy conservation. Windows should provide a northern or southern exposure. If there is a southern exposure, some control of direct sunlight should also be provided (such as louvered blinds, curtains, etc.).

### **Appearance/Finishes/Image**

See Figure 72

### **Storage**

#### **SPACE-SAVING SHELVING SHOULD BE USED TO CONSERVE FLOOR SPACE.**

When a free-standing shelf unit is used, it should contain three to six shelves before other units are added. Shelving which can be wall-hung, set on desks, or hung on partitions will result in more effective use of floor space.

# ADMINISTRATIVE OFFICE SPACES

## Guidelines for Administrative Office Spaces

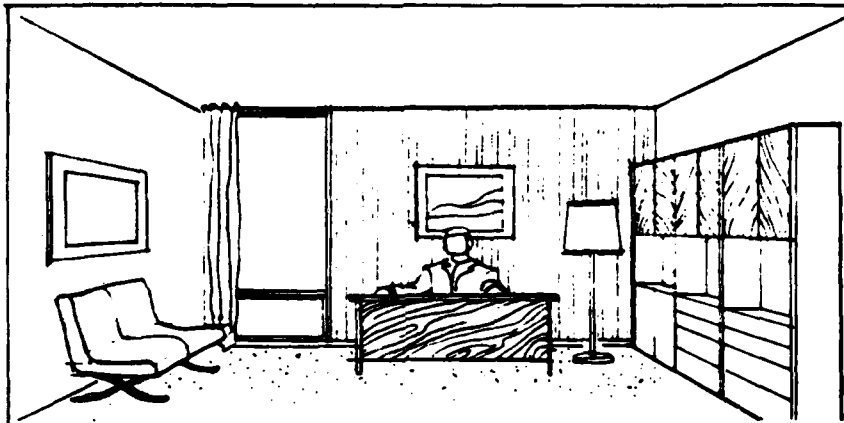
(8)

### SPACE TYPE

A	B	C	D
a	b	a	b

Administrative Office Spaces

color scheme



### general decor recommendations

Muted colors help to minimize distractions. There should be a variety of furniture types to allow different modes of study.

	item	recommended characteristics
room finishes	Floor	Use recommended carpeting.
furniture/accessories	Seating	Comfortable, swivel chairs with casters are recommended.
	Curtains	Open weave curtains are recommended to limit direct sunlight.

Figure 72. Decor guidelines for administrative office spaces.

## **CONFERENCE ROOMS**

### **Guidelines for Administrative Office Spaces**

---

#### **Use/Activities**

This space is used for meetings, discussions, and presentations. Conference rooms are not used for academic courses. Their main purpose is to provide meeting spaces for school organizations not involved in the instruction of students.

#### **Occupants**

Conference rooms may have to accommodate from six to 25 people at one table. A conference classroom is more appropriate for presentations to larger groups.

#### **Equipment/Supplies**

Conference rooms used for meetings and discussions may require one or more tables with chairs. Audiovisual and wall-mounted graphics or chalkboards may also be needed, particularly for presentations. A lectern may be desirable.



# CONFERENCE ROOMS

## Guidelines for Administrative Office Spaces

### Space (Size)

THERE SHOULD BE ENOUGH SPACE FOR SEVERAL PERSONS TO SIT COMFORTABLY.

Twenty square feet per person should be provided (see DG 1110-3-106, table 4-5).

### Access/Circulation (Location)

(g)

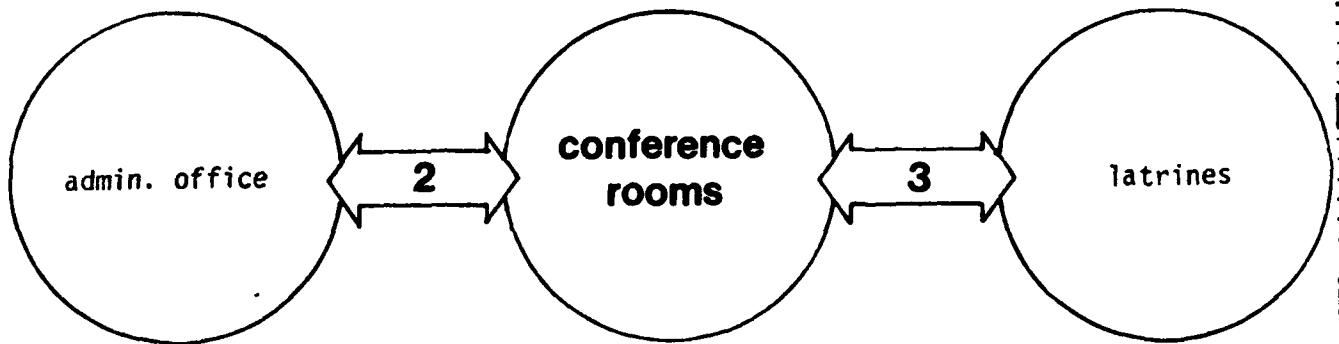


Figure 73. Spaces near conference room.

### Environmental Conditions (Lighting)

ADEQUATE LIGHTING SHOULD BE PROVIDED FOR EACH TASK.

The required general lighting level is 70 foot-candles. The audiovisual lighting level is 30 foot-candles.

# CONFERENCE ROOMS

## Guidelines for Administrative Office Spaces

### Appearance/Finishes/Image

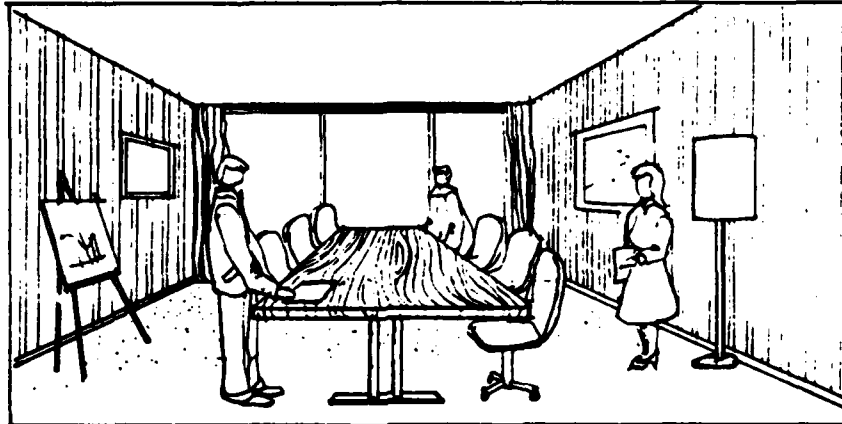
(g)

#### SPACE TYPE

Conference Rooms

	B	C	D
a	b	a	b

color scheme



#### general decor recommendations

The Conference Room decor should present a distinguished military image.

	Item	recommended characteristics
room finishes	Walls	Use flat paint, wallpaper or paneling in recommended colors.
	Floor	Use recommended carpeting.
	Doors	Use recommended wood finish.
	Trim	Use recommended wood finish.
furniture/accessories	Seating	Comfortable chairs with casters.
	Tables	Plastic laminate is recommended.
	Curtains	Open weave curtains are recommended to limit direct sunlight. Blackout shades may also be necessary. Colors should coordinate with overall scheme.

Figure 74. Decor guidelines for conference rooms.

# SHARED SPACES

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## **STUDENT LOUNGES**

### **Guidelines for Shared Spaces**

---

#### **Use/Activities**

These spaces are used for visiting, smoking, or relaxing. Some are adjacent or integral to vending machines or short-order snack bars.

#### **Occupants**

The number of occupants will vary. Peak occupancy will be between class periods, at lunch time, or during an unscheduled class period.

#### **Equipment/Supplies**

Typical lounges have comfortable, informal seating, tables with chairs, and ashtrays.

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# **STUDENT LOUNGES**

## **Guidelines for Shared Spaces**

---

### **Space (Size)**

#### **LOUNGES SHOULD BE LARGE ENOUGH TO INSURE COMFORT AND RELAXATION.**

There will be 0.1 square foot of lounge space for each 1 square foot of instructional space (see DG 1110-3-106, para 4-111b). Lounge seating space will provide 30 square feet per person; lounge standing space will be 6 square feet per person. Lounge ceilings must be at least 9 feet high (see DG 1110-3-106, table 4-10).

### **Access/Circulation (Location)**

#### **1. LOUNGES SHOULD BE SEPARATED FROM CLASSROOMS AND LABORATORIES.**

Student lounges must be located where they do not interfere with instructional activities (see DG 1110-3-106, table 4-10). Student lounges should be near latrine and vending areas, but separated from functional areas (to allow acoustical isolation) (see DG 1110-3-106, para 4-111b). See Figure 75

#### **2. VENDING AREAS SHOULD BE CONVENIENTLY LOCATED.**

There should be vending areas in each major building. These areas should be easy to service, but situated so as to discourage use by non-school personnel. A vending area should be furnished in buildings where there is no snack bar or dining facility, or where the nearest exchange facility is 3 to 5 minutes walking distance away (see DG 1110-3-106, para 12b[2] and fig. 6-50).

### **Environmental Conditions**

#### **Windows**

#### **WINDOWS ARE NECESSARY TO HELP CREATE A RELAXED AND INFORMAL ATMOSPHERE BY PROVIDING DAYLIGHT AND A SCENIC VIEW.**

Windows should be provided. A northern or southern exposure is recommended. If a southern exposure, direct sunlight must be controlled by louvered blinds, curtains, etc.

# STUDENT LOUNGES

## Guidelines for Shared Spaces

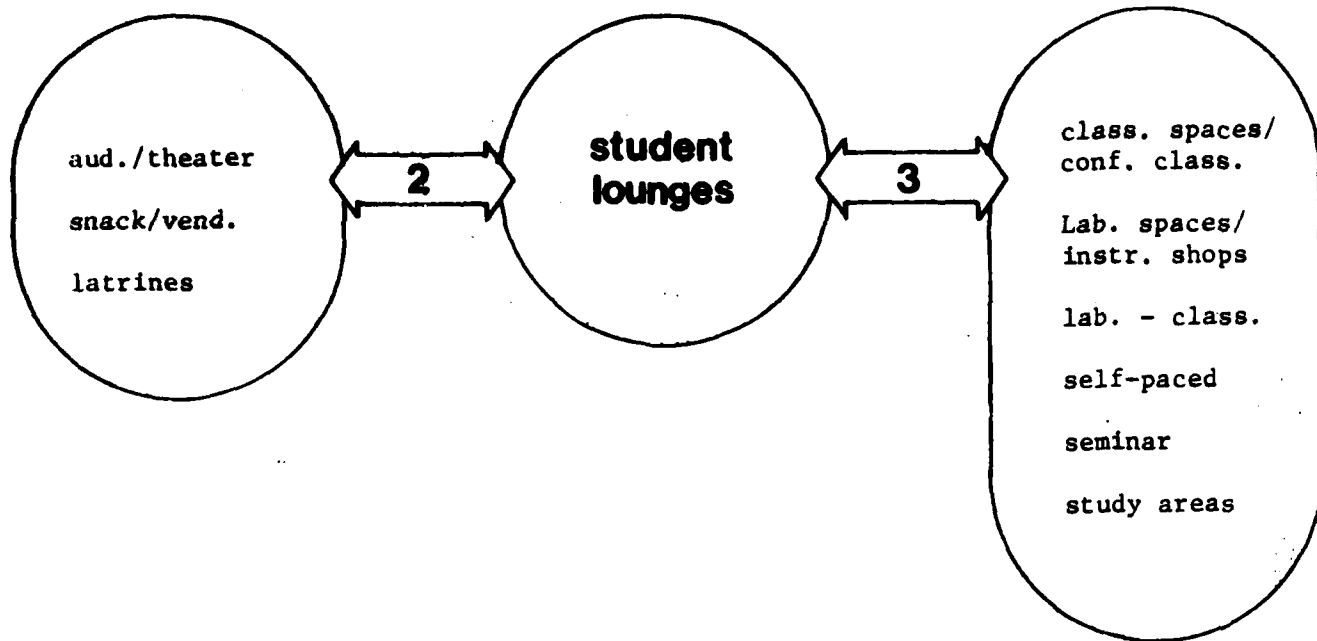


Figure 75. Spaces near student lounges.

### Lighting

#### THERE SHOULD BE ADEQUATE LIGHTING.

The general lighting level required is 30 foot-candles (if not otherwise specified).

### Thermal

#### A MECHANICAL VENTILATION SYSTEM SHOULD PROVIDE ADEQUATE AIR QUALITY.

Because of smoking, about 30 cubic feet per minute per person of clean air should be provided.

### Appearances/Finishes/Image

See Figure 76

### Furniture

#### DURABLE TABLES AND CHAIRS SHOULD BE PROVIDED.

Furniture should withstand spills of food and drinks, resist cigarette burns, and be easy to wash.

# STUDENT LOUNGES

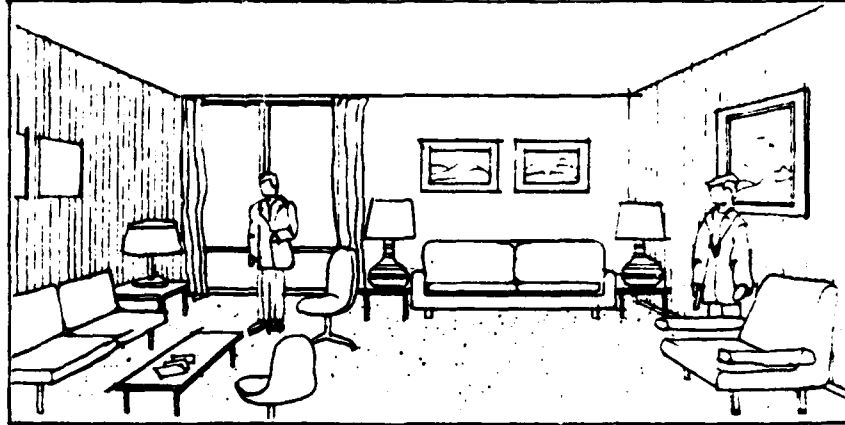
## Guidelines for Shared Spaces

### SPACE TYPE

A	C	D
a	b	a

Student Lounges

color scheme



#### general decor recommendations

All fabrics, furniture and finishes should be durable.

	item	recommended characteristics
room finishes	Walls	Use flat paint in recommended colors.
	Floor	Durable surfaces such as vinyl asbestos tile are highly recommended.
	Trim	Use durable vinyl, hardwood or metal.
furniture/accessories	Seating	Durable vinyl upholstered sofas and chairs and molded plastic chairs are recommended.
	Tables	Laminated plastic tables and end tables are durable and attractive.

Figure 76. Decor guidelines for student lounges.

# **SNACK BARS/VENDING AREAS**

## **Guidelines for Shared Spaces**

---

### **Use/Activities**

These spaces are used to sell food, beverages, candy, and cigarettes to students and school personnel. Vending areas usually have tables adjacent to them. Sometimes vending areas are within student lounges. Snack bars provide full food service and include a dining room.

### **Occupants**

The number of students, school staff, and faculty and food service personnel these spaces must accommodate depends on the size and type of the school's food facility. Vending areas and snack bars are operated by the Army and Air Force Exchange Service. Full dining services may be contracted.

### **Equipment/Supplies**

The type of food preparation, display, vending, or serving equipment used in these spaces are determined by the Army and Air Force Exchange Service. Typically, these areas have vending machines, waste containers, condiment displays, microwave ovens, and either stand-up type tables or tables with chairs.



# **SNACK BARS/VENDING AREAS**

## **Guidelines for Shared Spaces**

---

### **Space (Size)**

THESE SPACES MUST BE LARGE ENOUGH TO ALLOW USERS TO BUY AND EAT FOOD COMFORTABLY.

Snack bars/vending areas will provide 12 square feet per seating space; 20 square feet are provided per vending machine.

### **Access/Circulation (Location)**

Figure 77.

### **Appearance/Finishes/Image**

Figure 78.

### **Furniture**

DURABLE TABLES AND CHAIRS MUST BE PROVIDED.

Furniture should withstand food and drink spills, be easy to wash, and resist cigarette burns.

# SNACK BARS/VENDING AREAS

## Guidelines for Shared Spaces

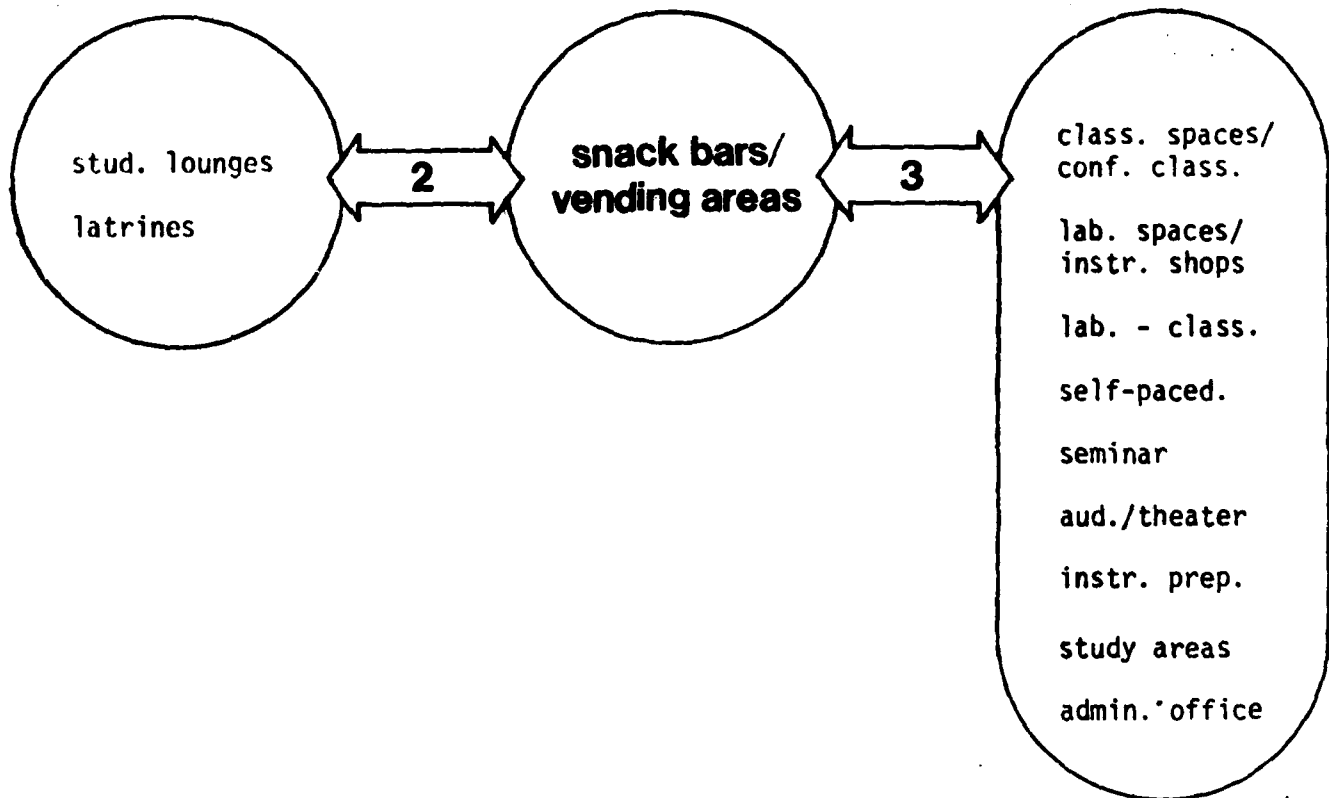


Figure 77. Spaces near snack bars/vending areas.

# SNACK BARS/VENDING AREAS

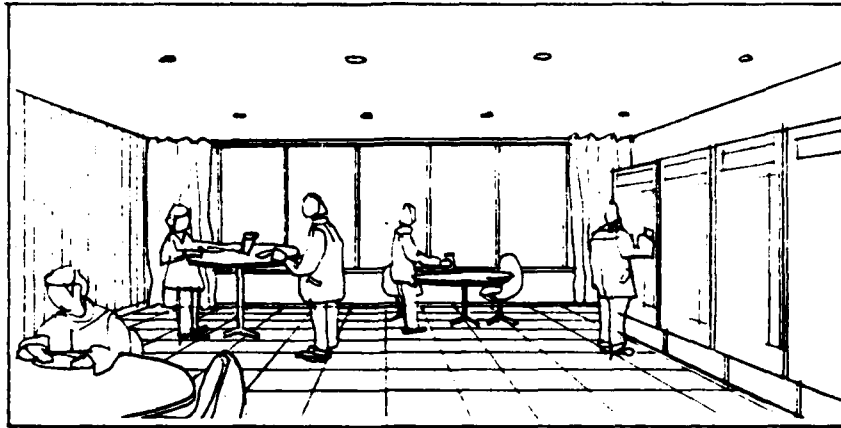
## Guidelines for Shared Spaces

### SPACE TYPE

Snack Bar/Vending Area

A		C	D
a	b	a	b a

color scheme



### general decor recommendations

All table surfaces should be laminated plastic.  
 All fabrics, furniture and finishes should be durable and easy to clean.

	item	recommended characteristics
room finishes	Wall	Use Semi-gloss paint in light shades of recommended colors.
	Floor	Durable asbestos tile is recommended.
	Trim	Use durable vinyl, hardwood or metal.
furniture/accessories	Seating	Durable vinyl upholstered or molded plastic chairs are recommended.
	Tables	Use laminated plastic for table top surfaces.

Figure 78. Decor guidelines for snack bars/vending areas.

# **BOOKSTORE**

## **Guidelines for Shared Spaces**

---

### **Use/Activities**

The service school book store sells supplemental training documents, stationary supplies, technical books, and related material.

### **Occupants**

Book stores are operated by the Army and Air Force Exchange Service. The number of book store employees and the number of customers varies with each school.

### **Equipment/Supplies**

This space usually has display stands, racks and counters, and cash registers.

# **LATRINES/DRINKING FOUNTAINS**

---

## **Guidelines for Shared Spaces**

### **Use/Activities**

In some cases, latrine areas will also have shower and locker rooms.

### **Occupants**

The population served by a latrine will vary by school and by building layout.

### **Equipment/Supplies**

The type and number of fixtures will vary with the population and area served by a latrine. When latrines are renovated, provisions for the physically handicapped must be included.

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# **LATRINES/DRINKING FOUNTAINS**

## **Guidelines for Shared Spaces**

### **Space (Size)**

1. **THERE SHOULD BE ENOUGH LATRINES FOR BOTH MEN AND WOMEN.**

Latrines used by women must have one water closet per 45 persons, one lavatory per 90 persons, and one couch per building. Latrines used by men must have one water closet per 50 persons. Urinals may be substituted for water closets without increasing the total number of latrine fixtures. No less than one water closet per 100 persons is allowed. There must be one urinal per 30 persons and one lavatory per 100 persons.

2. **AN ADEQUATE NUMBER OF DRINKING FOUNTAINS SHOULD BE PROVIDED.**

Each drinking fountain should serve 75 people.

3. **EACH WASHROOM SHOULD HAVE ENOUGH CIRCULATION AND FIXTURE SPACE.**

#### **Required Washroom Space**

<b>Fixture</b>	<b>Space Required per fixture (sq ft)</b>
Water closets	30
Urinals	16
Lavatories	18
Towel Dispensers	10
Showers	40
Bathtubs	26

# LATRINES/DRINKING FOUNTAINS

## Guidelines for Shared Spaces

### Access Circulation

#### Location

#### 1. WASHROOMS SHOULD BE CONVENIENT TO THE USERS.

Both men's and women's latrines should be near the administrative area. There should be one latrine on each floor of the classroom area. Groups of latrines should be spaced at intervals, not to exceed 500 feet (see DG 1110-3-106, paras 2-4c and 4-12b).

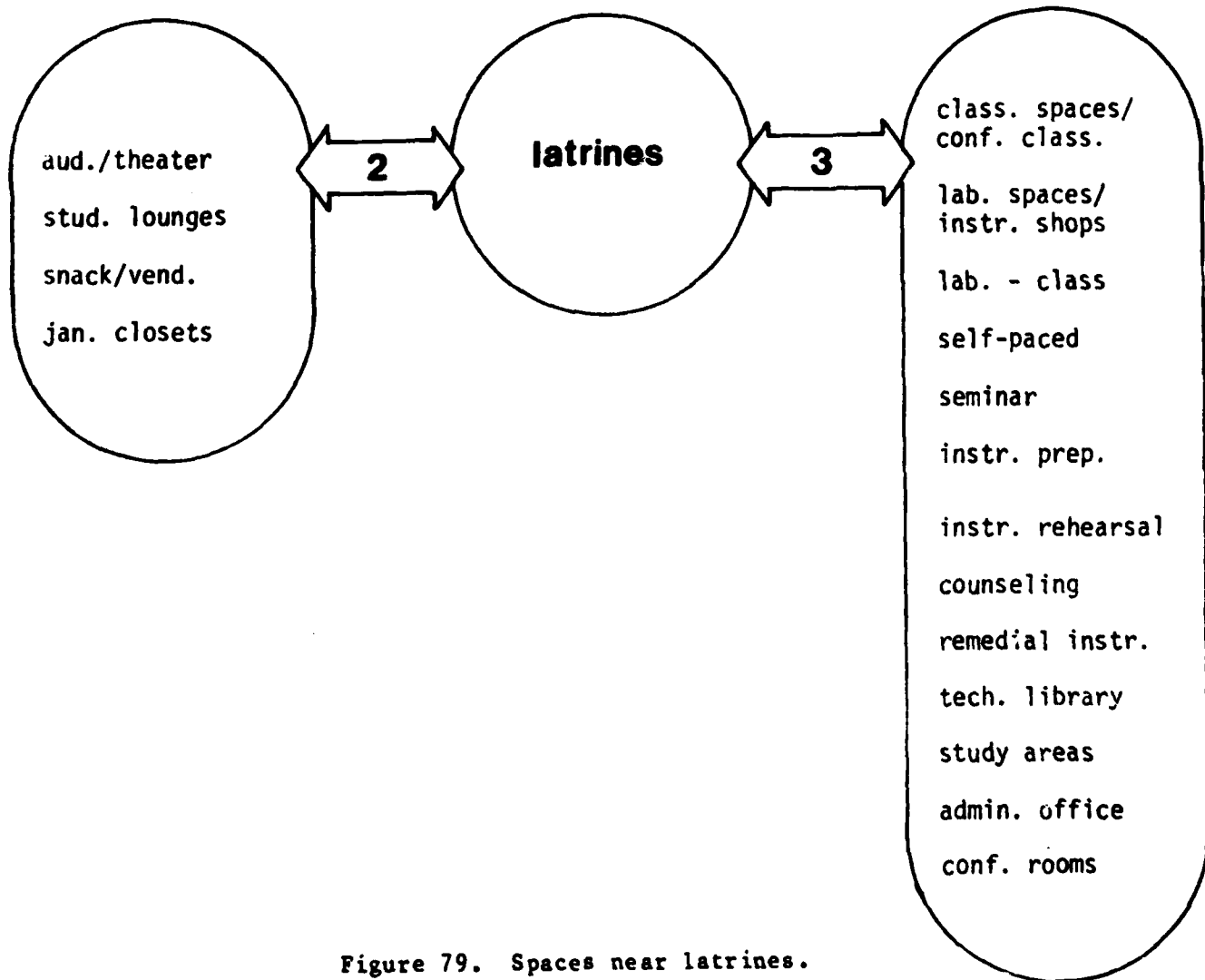


Figure 79. Spaces near latrines.

# LATRINES/DRINKING FOUNTAINS

## Guidelines for Shared Spaces

### 2. FIXTURES SHOULD BE ARRANGED TO MINIMIZE TRAFFIC CONGESTION.

The usual arrangement of latrine fixtures is lavatories nearest the door, followed by urinals, water closets, and dressing rooms. Where space is at a premium, these fixtures are typically placed along a narrow corridor, with urinals nearest the door to allow a wider aisle.

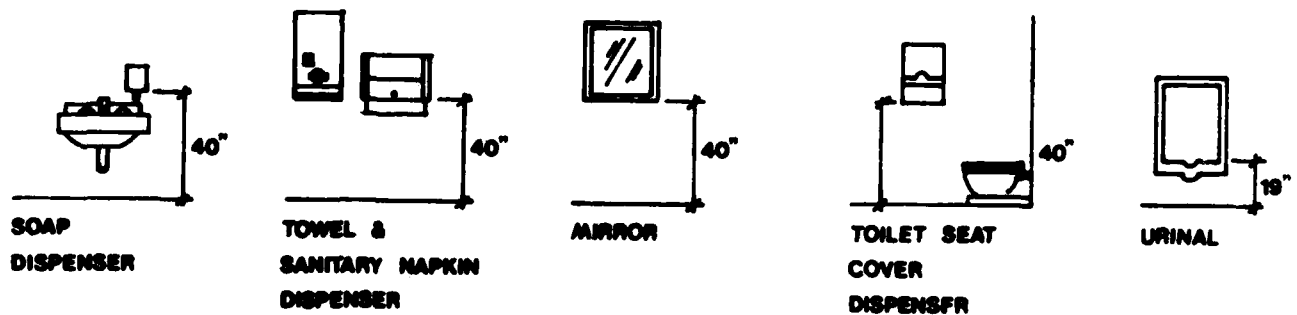


Figure 80. Convenient placement of basins, towel dispensers, mirrors, and fixtures.

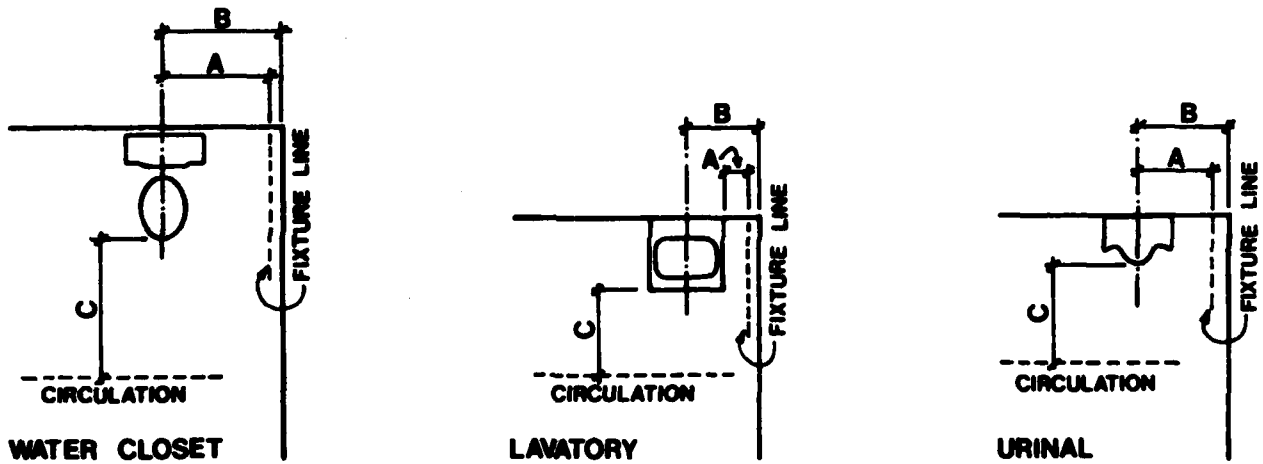


# LATRINES/DRINKING FOUNTAINS

## Guidelines for Shared Spaces

### Openings and Access

THERE SHOULD BE SUFFICIENT CLEARANCE BETWEEN THE WALL AND THE FIXTURES, AND BETWEEN LAVATORIES AND TOILETS.



FIXTURE	A		B <sup>1</sup>		C <sup>2</sup>	
	MINIMUM	LIBERAL	MINIMUM	LIBERAL	MINIMUM	LIBERAL
WATER CLOSET	12"	18"	15"	22"	18"	36"
LAVATORY	2"	6"	14"	22"	18"	30"
URINAL	15"		12"		24"	

<sup>1</sup>DISTANCE FROM FIXTURE CENTERLINE TO WALL OR PARTITION

<sup>2</sup>UNOBSTRUCTED AREA REQUIRED FOR FIXTURE USE

Figure 81. Clearances for common latrine features.

# **LATRINES/DRINKING FOUNTAINS**

## **Guidelines for Shared Spaces**

### **Utilities and Wastes**

LATRINES MUST HAVE ENOUGH SEWER CAPACITY TO SUPPORT INCREASED USE DURING HOURLY BREAKS. CAREFUL CONSIDERATION SHOULD BE GIVEN TO LATRINE FIXTURE ARRANGEMENT AND ITS EFFECT ON THE PLUMBING AND PIPE RUNS.

Fixtures should be arranged in batteries. Stall urinals need a trap beneath the floor level. If the floor-slab thickness will not accommodate the indicated average dimension of the trap, urinals may be placed on a platform 4 inches high by about 2 feet wide, and their surface pitched to the fixtures.

### **Environmental Conditions**

#### **Lighting**

LIGHTING SHOULD BE APPROPRIATE FOR WASHROOMS.

In general, 20 to 30 foot-candles will adequately light a latrine. Lights should directly illuminate lockers, lavatories, and showers.

#### **Windows**

LATRINES MUST BE WELL VENTILATED (TO CONTROL ODOR).

2.0 to 2.5 cubic feet per minute of exhaust ventilation without recirculation is recommended per square foot of floor area. A minimum of 1.5 cubic feet per minute per square foot should be provided.

### **Appearance/Finishes/Image**

ALL SURFACES SHOULD BE DURABLE.

Latrine walls, floors, and ceilings must resist water and water-borne dirt penetration. Floors should be strong enough to support heavy traffic, and soap, water, acid, and alkali contamination. Fixtures should be durable enough to withstand heavy use and cleaning. Latrine ceilings can be acoustically treated. Items that should be included or considered for latrine use are suitable floor drains in toilet and locker rooms, and hose bibs in toilet and locker rooms.

# LATRINES/DRINKING FOUNTAINS

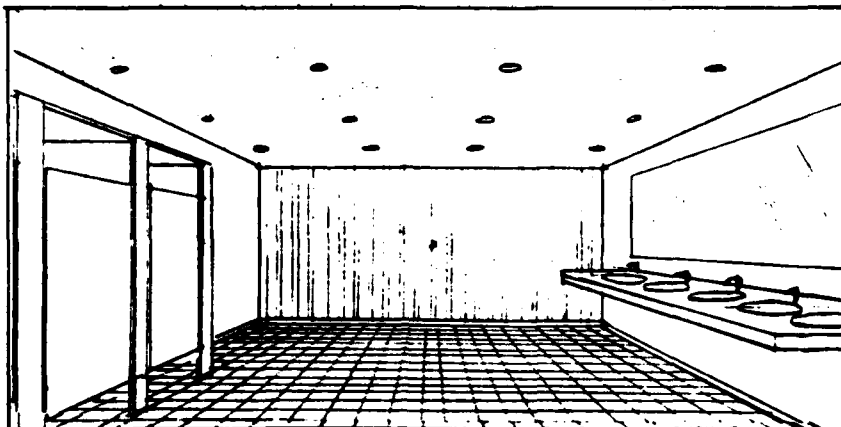
## Guidelines for Shared Spaces

### SPACE TYPE

A	C	D
a	b	ba

Latrines

color scheme



#### general decor recommendations

The primary decor concern in latrines is surface cleanability, durability, and imperviousness to water.

	Item	recommended characteristics
room finishes	Wall	Ceramic tile in recommended colors must be applied to at least the lower five feet of all latrine walls. Gloss paint in recommended colors may be used from top of tile to ceiling.
	Floor	Use ceramic tile in recommended colors.
furniture/accessories	Walls	Partition walls should be of a non-rust metal.

Figure 82. Decor guidelines for latrines.

# **LATRINES/DRINKING FOUNTAINS**

## **Guidelines for Shared Spaces**

### **Furniture**

1. LAVATORY FIXTURES SHOULD BE SELECTED FOR APPEARANCE, DURABILITY, AND EASE OF CLEANING.

Lavatories may be leg, counterset, or wall-hung. Wall-hung types are easiest to clean, but must be supported on suitable chair carriers to avoid unsightly cracks between wall and fixture. Lavatories should be white or a light color.

2. WATER CLOSETS SHOULD BE SELECTED FOR APPEARANCE, DURABILITY, AND EASE OF CLEANING.

Water closets are either wall-hung or floor (pedestal) types. Floor-type water closets are difficult to clean and are recommended only for latrines whose use will be restricted. Wall-hung water closets are generally recommended for normal-use latrines. Water closet seats should be unbreakable and have open fronts and an impervious surface. Color recommendations are the same as for lavatories. Self-metering flush valves are recommended for all types.

3. URINALS SHOULD BE SELECTED FOR APPEARANCE, DURABILITY, AND EASE OF CLEANING.

Three kinds of urinals can be used: stall, wall-hung, or pedestal types. Wall-hung urinals are recommended. Partitions or fins are usually installed between pedestal or wall-hung urinals, rarely between stall urinals. Many wall-hung urinals, however, have integral shields which serve as partitions. Center-to-center spacing ordinarily varies from 2 feet to 2 feet, 4 inches. If the space between stall urinals is too small for easy cleaning, pockets should be filled flush with impervious surface materials. Urinals are usually white or light colored.

4. PARTITION SYSTEMS SHOULD BE SELECTED FOR APPEARANCE, DURABILITY, AND EASE OF CLEANING.

To permit air circulation, partitions should stop about 1 foot above the floor. Various kinds of metal partitions are available, including post-and-panel assemblies (with or without overhead bracing) and flush panels with integral posts (floor-supported or ceiling-hung). Floor-mounted partition systems are usually more durable than other types, while ceiling-hung types make floor cleaning easy. Partition colors should fit with overall room decor. Subdued and neutral colors are recommended. Partitions should resist corrosion. Compartment dimensions depend on whether doors swing inward or outward. Hardware should be simple to operate.

## LATRINES/DRINKING FOUNTAINS

### Guidelines for Shared Spaces

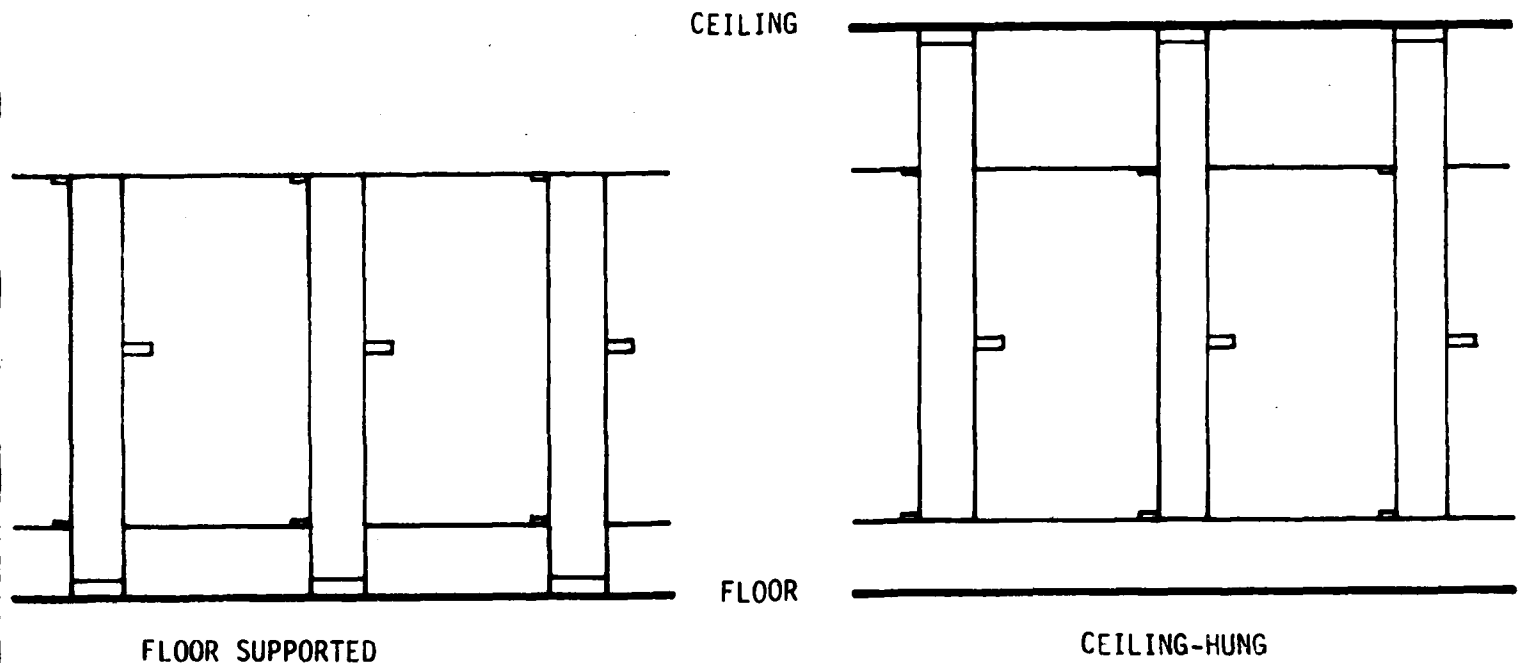


Figure 83. Partition types.

5. ACCESSORIES FOR LATRINES SHOULD BE CONVENIENT TO USE, DURABLE, ATTRACTIVE, AND EASY TO CLEAN AND SERVICE.

Finishes on accessories should be made of noncorrosive materials. Double-roll, 15,000-sheet toilet tissue dispensers are recommended. One towel dispenser should serve no more than three lavatories. Automatic hand driers should serve no more than two lavatories. One soap dispenser should be provided for every two lavatories. Dispensers for waterless or other special hand cleaners should be provided in latrines near laboratories and shops. Each lavatory should have a mirror above it. Each lavatory serving locker and shower room should have a shelf. Waste containers for paper towels should have an 8- to 10-gallon capacity per towel dispenser. Waste containers should meet OSHA regulations and be easy to remove and empty. Each women's water closet should have a feminine napkin dispenser; these dispensers should include disposal bags. When a women's latrine includes a lounge, an ashtray should be provided with each couch.

# **JANITOR CLOSETS**

## **Guidelines for Shared Spaces**

### **Use/Activities**

These spaces are used to store janitorial supplies and equipment, to obtain water (for mopping), and to dump waste water. They may also be holding areas for solid waste. In office areas, janitor closets are often used to fill coffee urns or to dump coffee grounds. Management of janitorial services will vary locally; in some cases, such services will be contracted. School personnel will also use these areas for routine or emergency cleanup activities.

### **Occupants**

The number of janitorial and/or school personnel that will use the janitor closets depends on the size of the school and how janitorial services are managed.

### **Equipment/Supplies**

The amount and type of equipment and supplies to be stored in janitor closets will vary. In some cases, not only mops and brooms must be stored, but buffers and floor cleaning machines. Security for expensive equipment or for contractor-furnished equipment may be necessary. Furniture for a supervisor work station (desk and file) may be necessary.

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# **JANITOR CLOSETS**

## **Guidelines for Shared Spaces**

### **Space (Size, Shape)**

THERE SHOULD BE ENOUGH JANITOR CLOSETS TO INSURE GOOD BUILDING SANITATION.

Each janitor closet should be 48 square feet. The ceiling should be at least 8 feet high and the room dimensions should be at least 6 by 8 feet. There must be a closet on every floor. For a floor between 9,000 and 15,000 square feet, one closet is adequate. In larger buildings, it may be necessary to have two closets per floor. Each janitor closet should be centrally located within the area it serves.

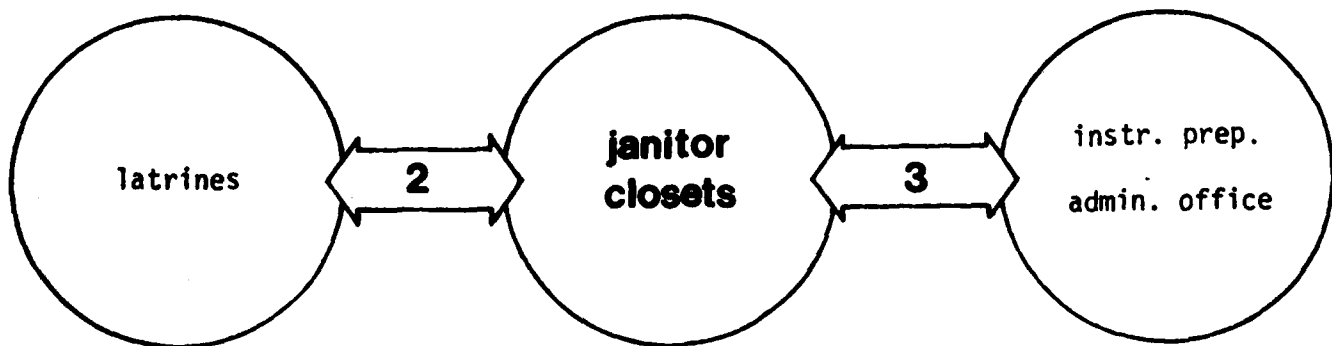


Figure 84. Spaces near janitor closets.

# **JANITOR CLOSETS**

## **Guidelines for Shared Spaces**

### **Access/Circulation**

JANITOR CLOSETS SHOULD BE EASY TO ENTER BUT SCREENED FROM GENERAL VIEW.

The door to the janitor closet should be self-closing and have a foot-operated door stop. The door should not have a window and should be labeled "JANITOR" on the outside.

### **Utilities and Waste**

Each janitor closet should have a floor service sink (with hot and cold water) and a 3-foot length of hose (for filling buckets).

### **Environmental Conditions**

#### **Lighting**

Each janitor closet should have at least a 50 foot-candle lighting level.

#### **Thermal**

VENTILATION SHOULD BE PROVIDED TO PREVENT MILDEW AND ODORS.

There must be at least 0.015 cubic foot per minute of ventilation air per square foot of floor area.



# **JANITOR CLOSETS**

---

## **Guidelines for Shared Spaces**

### **Appearance/Finishes/Image**

FLOORS AND WALLS SHOULD HAVE AN UNMARRABLE FINISH.

Floors and walls should be salt-glazed brick, ceramic tile, or similar, easily cleaned materials.

### **Storage**

THERE SHOULD BE ENOUGH CLEANING CHEMICAL AND EQUIPMENT STORAGE.

Each closet should have at least 12 square feet of shelving and a rack for mops and brooms.

### **Furniture**

THE JANITOR CLOSET SHOULD HAVE A CORK BULLETIN BOARD FOR USER OR EMPLOYEE NOTICES.

Cork boards should be 18 x 24 inches, hung at a convenient height, and on a wall that is away from stacked equipment or boxes.

# **STOREROOMS**

## **Guidelines for Shared Spaces**

### **Use/Activities**

This type of space is used exclusively for storage.

### **Occupants**

Typically, storerooms do not have occupants. In a few cases, large storerooms may have someone located near the entrance to control and distribute contents. Storerooms may belong to one organization or may be shared by several.

### **Equipment/Supplies**

The contents of storerooms may include office and general supplies, audiovisual equipment, mockups, or other training aids. Storerooms may be partitioned for use by several organizations.

### **Space (Size)**

Actual storeroom area will vary with the various needs and uses of the school.

### **Access/Circulation**

#### **Location**

Storerooms which house large equipment should be located on an outside wall of the building so they can be accessed from the outside. Infrequently used storerooms should be located in an out-of-the-way area.

#### **Openings and Access**

#### **MOVEMENT OF MATERIALS AND EQUIPMENT SHOULD OCCUR WITH EASE.**

Storerooms should have an overhead (garage-type) door if movement of large equipment and materials is expected. Double doors (i.e., two 3-foot doors) should be provided to allow access from a corridor.

# **STOREROOMS**

---

## **Guidelines for Shared Spaces**

### **Appearance/Finishes/Image**

SURFACES SHOULD BE DURABLE AND EASY TO MAINTAIN.

Concrete block walls and concrete floors should be used.

### **Storage**

STORAGE ROOMS SHOULD BE PLANNED AND EQUIPPED TO KEEP CONTENTS ORDERLY.

(g) Enough shelving, cabinets, and racks should be provided and sized to accommodate the items to be stored.

### **Special Features**

SOME STOREROOMS SHOULD BE SECURE AT ALL TIMES.

A guard and/or an alarm system can be used to provide storeroom security. Keyed locks must be installed.

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Fort McClellan, AL 36306

Commander  
US Army Missile and Munitions Center & School  
Redstone Arsenal, AL 35897

Commander  
US Army Ordnance Center & School  
Aberdeen Proving Ground, MD 21005

Commander  
US Army Organizational Effectiveness  
Center & School  
Fort Ord, CA 93941

Commander  
US Army Quartermaster Center & Fort Lee  
Fort Lee, VA 23801

Commandant  
US Army Sergeants Major Academy  
Fort Bliss, TX 79918

Commander  
US Army Signal Center & Fort Gordon  
Fort Gordon, GA 30905

Commander  
US Army Transportation Center & Fort Eustis  
Fort Eustis, VA 23604

Commandant  
US Army Element School of Music  
Naval Amphibious Base (Little Creek)  
Norfolk, VA 23521

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