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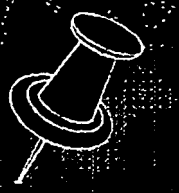
Space Guidelines Volume 1

2001: A Space Odyssey



Space Guidelines

Volume 1

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
ADMINISTRATION
AND RESOURCES
MANAGEMENT

Welcome,

I am pleased to present the first edition of the EPA Space Guidelines. For many years there has been a need for a single source of information to help EPA facilities managers, space managers and line personnel better design and utilize their office, storage and special space.

We all spend a great deal of time in our offices. It is important then, that care and thought be given when planning and laying out that space. Office design is a dynamic industry with new technologies constantly emerging. We have tried to cover and encapsulate those methods which will best serve the needs of the average EPA office environment. At the same time we need to be sensitive to issues of indoor air quality, the environment, ergonomics and a host of complex and often competing priorities.

My hope is that we have provided a framework which organizes these concepts and puts them into a manageable, and more importantly, a useful package. I'm sure there are items in these books we could have covered better, more in-depth or perhaps not as extensively. We tried to put in what would be helpful and keep out that which is cumbersome. You, however, are the best judge. The binder design allows us to update the Guidelines as needed. Your comments are appreciated and anticipated. We want to hear from you.

I am proud of the work my staff has done on this project - the real credit goes to them. Please let them know that you appreciate their efforts as well. We have taken a great leap forward with this publication. Thanks for your support.

Rich Lemley

Rich Lemley, Director
Facilities Management and Services Division

Introduction

Since its inception in the early 1970's, The United States Environmental Protection Agency has experienced remarkable growth in its Programs and workforce -- resulting in a parallel growth in its facility inventory. In 1992, Headquarters, Regions and Laboratories occupied approximately 7.75 million square feet of assignable and parking space. Personnel growth has averaged 3.5% annually over the last 20 years, with virtually every Region, as well as Headquarters, adding new space or moving to a new building.

Rapid growth and organizational change have tested the EPA's ingenuity and ability to develop facilities in a consistent manner. These guidelines are meant to capture the Agency's most successful office expansion experience and share it nationwide, by creating a handbook of practical standards, design hints and technical considerations.

Organization of the Handbook

These guidelines are meant to be used by EPA facility and space managers as a reference document that addresses space issues from many perspectives. It is aimed at helping with both significant moves or expansion and the everyday minor renovation or carpet replacement. Information is organized into specific topic areas, such as Circulation, Special Space, Indoor Air Quality, Walls. Although interrelated, each is described separately to highlight specific recommendations, with illustrations, tips and references. The range of topics includes space distribution, environmental considerations, suggestions for planning and design, space acquisition procedures and selection of materials and furniture. A full Table of Contents will help you find the appropriate information.

There are two volumes. Volume One describes the basic issues, planning principles and key findings of each topic. It should be the first reference source. Volume Two has more detailed or technical information on some of the space topics. For example, Volume One has a two-page discussion of Indoor Air Quality Issues; Volume Two describes the causes, criteria for mechanical systems and recommendations concerning carpets, particle board, adhesives, paints etc. Volume Two also incorporates relevant documents by EPA or others, such as GSA's FPMR.

EPA REGIONS

Space and Design Principles

The recommendations here reflect needs specific to the EPA's organization and mission. Underlying principles of this document are:

Quality Office Space. The EPA's goal of consistent, quality office space for everyone is practical and achievable, even with the constraints imposed by governing GSA space regulations. Expansion has resulted in an uneven mix of space, some compromised by crowding, makeshift facilities or split operations. Also, there may be a perception that, because it is a large government agency, the EPA will have second-rate office space. However, the EPA is committed to providing a good office environment, recognizing it as a basic requirement for satisfied, productive employees.

Space Consistent with the EPA's Mission. As the Nation's protector of the environment, the EPA has a responsibility to encourage conservation measures through example. These guidelines have incorporated environmental considerations for EPA office buildings and specific rooms, including the topics of indoor air quality, energy efficiency, resource conservation and pollution prevention. The discussion

is aimed at awareness and practical application for today's installations. Technology, practice and product availability are always improving and tomorrow's EPA can be even more responsive. Resources and knowledge are available within the EPA, and specific references are included in this document where useful.

A Balance with GSA Regulations. Most of the EPA's office space is controlled by the GSA and subject to the limits of the Federal Property Management Regulations (FPMR). Meeting these regulations requires a balanced approach to the room mix and the sizes of workstations and shared support. Recent successful EPA office development experience has formed the basis for design and space recommendations in these guidelines.

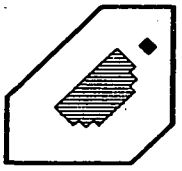
Change as a Positive Force. The strength of a good plan lies in its ability to accommodate changing circumstances. These guidelines accept, and anticipate, that the Agency will change with the evolution of EPA Programs and specific regional needs. Flexible facilities can be accomplished if they are planned for in advance.

Change is also anticipated in these guidelines. These documents capture a snapshot of today's EPA experience and recommendations. New experience, changing regulations and additional technical information can be incorporated easily into the handbook format.

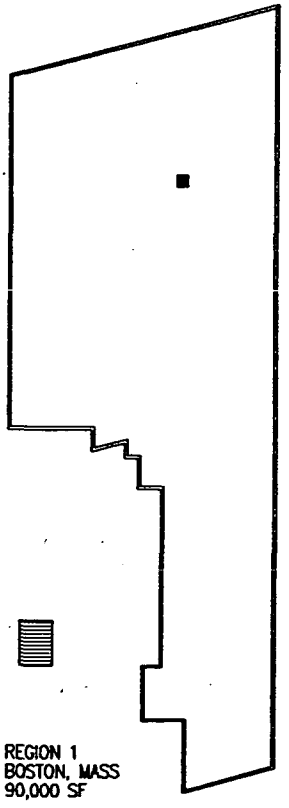
Creating a Good Plan

Good design not only suits the users; it also suits the building. To create the best office environment requires balancing the program guidelines with the specific physical features of the building you will occupy. These guidelines describe soft building blocks that can be arranged in various ways.

Building characteristics differ. Different sizes, shapes and design details affect the location and configuration of all office elements. Good office space does not happen by luck but can be achieved if the buildings' features and potential are understood and used. When EPA acquires and designs new space, the following features are considered.



REGION 8
DENVER, CO
12,000 SF



REGION 1
BOSTON, MASS
90,000 SF

■ OFFICE/WORK STATION @ 100 SF

CORE AREA

Building Characteristics

Floor Size. Although EPA strives for a minimum floor of 20,000 occupiable square feet, a wide range of floor sizes is currently used. Thus your request for 50,000 sf could be on four floors or on one. This would affect the location of Branches and Support Spaces, the duplication of services, and the total square footage devoted to circulation.

Floor Shape. The shape of a building affects the efficiency of its layout -- generally a simple floor shape has more flexibility. Careful planning of room locations and circulation will maximize the potential of an awkward floor. For example, an oddly shaped corner wastes less space in a library than it would in an office space.

Core-to-Window Depth. The distance from the windows to the core (elevators, stairs, toilets etc.) determines the overall layout of the circulation system, clustering of workstations and the location of enclosed rooms. A deep floor needs a more open layout to distribute natural light and more circulation space for fire safety than a shallow floor. EPA recommends a maximum core-to-window depth of 40-50 feet.

Windows. Few buildings will have "perfect" windows. What you want, however, are enough windows to distribute natural light, spacing that coordinates with workstation sizes and layouts, windows without awkward HVAC units, window design that responds efficiently to sun orientation and heat gain, built-in solar shading.

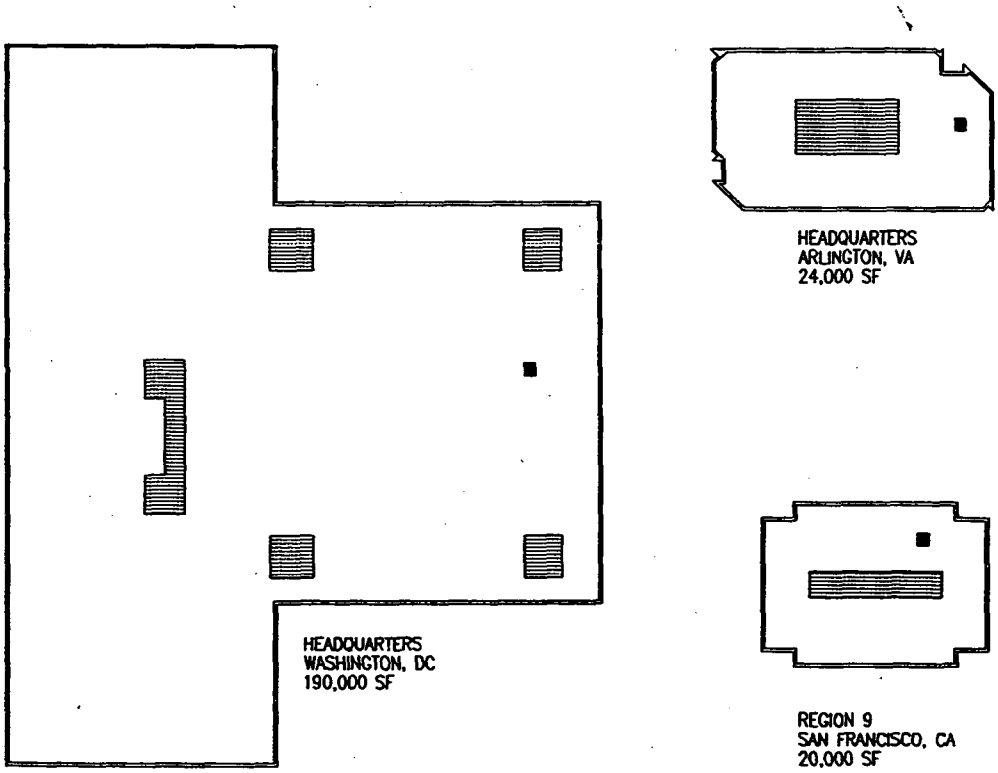
Bay Size. The spacing between columns is known as the "bay size", and its dimensions influence the efficiency of the floor layout and the selection of a furniture system. Speculative office buildings often use a 20' x 20' bay size, which is economical to build and suitable for tenants with small working groups. The EPA, however, recommends a larger bay size for layout efficiency. On floors over 20,000 sf in size, an increased efficiency of 5% - 8% has been demonstrated with a 30' x 30' bay.

Floor Loading. The structural system of any building is designed to accommodate a certain "live load", which is the expected weight of furnishings, interior partitions, and people. A low live load capacity (e.g. 50 pounds per square foot) would require a spread out design for libraries, filing, storage etc., while a high capacity (e.g. 150 - 200 lb/sf) would allow high - density filing. Common in recent office building is a live load capacity of 80 - 100 lb/sf. Some buildings are reinforced in certain areas of each floor for high live loads and this is where filing or computer rooms would be located. For a flexible layout, 5 - 10% of each floor's occupiable space should have a live load capacity of 150 - 175 lb/sf.

The EPA has a full range of building types, some used well and some not. Illustrated on these two pages are some specific examples of the diversity of EPA office buildings; plans are at the same scale for comparison.

Creating a good plan in any building is a joint responsibility between you and your architect. For review and discussions, EPA needs to consider not only specific spaces but also the cohesion and quality of the entire design. To assist with that, the following design issues will be considered on the following pages:

- Overall Organization
- Circulation
- Design Features
- Integration of Power and Signal Services
- Americans with Disabilities Act
- Environmental Issues of the Plan



Overall Organization

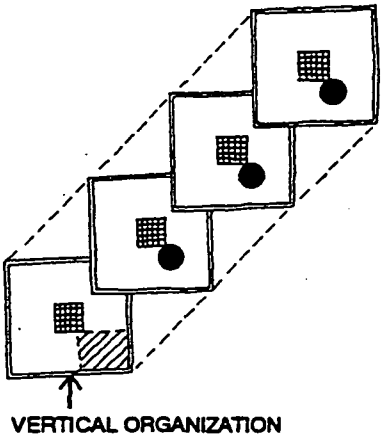
The careful physical organization of your facility -- strategic locations for important components and an organized approach to assigning space -- is the first step in developing good office space. Ineffective design often results from not considering the whole, but responding to each situation as it arises. One compelling reason for a forward looking "master plan" of your building(s) is created by the dynamic nature of the EPA organization, -- its constant program growth, shrinkage and reorganization.

Keeping in mind that the office groupings will change, treat all office space equally in the initial concept. Concentrate instead on the non-office elements of your space. These areas become fixed with the initial design/construction and are difficult and costly to change later. These include (a) Circulation plan, especially the primary circulation on each floor; and (b) Special Spaces, such as computer rooms, libraries, conference/training rooms, copy centers etc.

Moving your Regional offices into new space is obviously the best time for an overall organization plan. But, any change to existing facilities is also an opportunity for improvement. You can evaluate your current offices for the following and make gradual improvements:

- Evenly distributed services;
- A consistent approach to the assignment, size and use of workstations and offices; and
- The ease of circulation and finding desired rooms.

KEY CONSIDERATIONS



Flexibility. Organization is an attitude. Future flexibility means planning for five years from now, as well as planning for today.

- Develop a regular pattern - a rhythm of services, offices and work areas that are adaptable to changing programs.

- Group Special Spaces and other fixed elements on the floor in a way that leaves large blocks of space for workstations.

- Anticipate changes and upgrading, i.e. plan a conference room today that can become a teleconferencing room later, when the budget allows.

Circulation. Both vertical and horizontal circulation are central to the efficiency and coherence of your plan. Circulation is discussed in the following section.

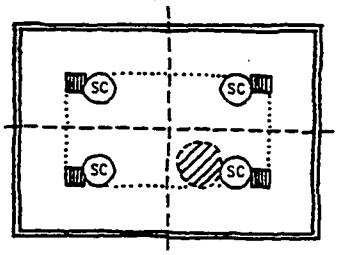
Vertical Organization. All EPA offices, Regional and Headquarters, are on more than one floor, with some in more than one building. There is no universal rule about the vertical stacking of uses -- buildings and organizations vary. Some considerations for assigning floors are the amount of traffic (staff and visitors) to the space, technical limits (e.g. distances for hardwired equipment) and service/delivery requirements. Also, save some time for arguing about who gets the prime view.

Special Access Functions. Certain areas share similar requirements for controlled access. Grouping them together makes supervision easier and more effective.

Examples are:

- Public use areas, including public dockets, libraries, training centers and public information center, should be easy to find and easy to monitor. Ideally they all would be located on the ground floor with direct lobby access. But, if they are not on one floor because of internal EPA use or available space, their entrances should have direct access from the main elevator bank.

- High delivery/service uses, such as the mail and stock room, main copy center, recycling centers, are best located adjacent to the building's service elevators.



LARGE FLOOR PLATES

SC = SERVICE CENTER

CORE

SHARED FLOOR SUPPORT

Office Support. Certain shared support areas are suggested for every office floor - Copier Room, Meeting Room(s), Satellite Recycling and Computer Printer Rooms. To make it easier for all employees, a standardized location on each floor is recommended.

Large Floor Size. Large floor sizes (e.g. over 40-50,000 square feet) should be organized into smaller units, each with its own shared service area (meeting room(s), computer printer room, satellite copy center). Certain support areas could serve the entire floor, such as an employee lounge and the recycling collection area.

Multiple Locations. Several EPA Regions, as well as Headquarters, are located in more than one building, making efficient space use difficult. Satellite duplication of certain functions is inevitable -- mail/stock room and the main reception at a minimum. Public access functions should be located in one building/location. To best use a separate location, assign the space to one Program rather than several unrelated groups.

Floor Loading. When planning the location of office components, its important to know the live load capacity of the floors -- there may be only one location for the library, regardless of where you might want it to go. The structure of a building is designed to take the weight of a certain "live load" of furnishings, equipment, partitions and people. In new buildings it is common to have a live load capacity of 80 - 100 pounds/square foot, while in some older buildings it may be as low as 50 lb/sq. ft. Storage areas, such as libraries, high-density filing, security files, and stock rooms, require a higher floor loading capacity, (eg. minimum 175 lb/sq. ft. for high density file units). Consult a structural engineer if you need to use any of the above elements or other heavy equipment and your building has an average live load capacity. Floor areas can be structurally reinforced for the new use, or the storage can be spread out over a larger floor area. Some new buildings have specific areas on each floor that have been structurally reinforced for heavier loads.

MINIMUM UNIFORM LIVE LOADS

OFFICES	50 LB/SQ. FT.
LOBBIES	100
ASSEMBLY	
FIXED	60
MOVABLE	100
LIBRARY	
STACKS	150+
HI-DENSITY	
FILES	175+

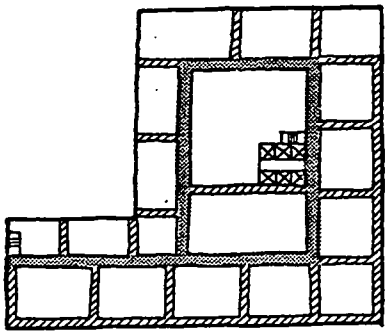
SOURCE: AMERICAN SOCIETY OF CIVIL ENGINEERS, "MINIMUM DESIGN LOADS FOR BUILDINGS AND OTHER STRUCTURES", 12/88

Special Features. All suggestions aside, don't fail to take advantage of any special qualities the building has, which may make a more pleasant or exciting space for your employees. A top floor with a great view might be the best place for the Regional library; a distinctive corner might make a good shared meeting room on every floor. Enjoy your building.

Circulation

While the vertical circulation in your building is set at construction, the horizontal circulation on each floor is usually subject to your control. There is a hierarchy of primary and secondary circulation, in which the primary is the main corridor on each floor, linking the elevators, exits and major components. In older buildings the primary circulation usually was established by the owner who constructed a walled corridor around the core areas. In modern buildings sprinklers improve fire safety and most local building codes don't require enclosed corridors. Following are some suggestions for both primary and secondary circulation.

PRIMARY CIRCULATION



EXAMPLE OF CIRCULATION

PRIMARY CIRCULATION

SECONDARY CIRCULATION

The goals for a good primary circulation system are two-fold:

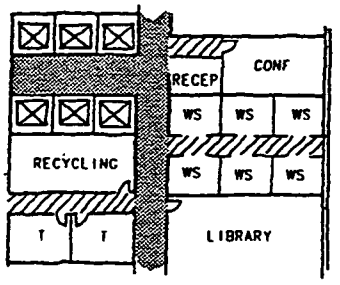
- To maintain an efficient traffic flow while disturbing the fewest number of people; and
- To create a simple pattern that helps people orient themselves.

Key considerations for establishing a primary circulation corridor on your office floors are as follows:

Building Codes. For safety, local codes regulate building construction and occupancy, including the amount, width and configuration of circulation and fire egress. Each locale has different applicable codes, which are the first consideration when developing a circulation system.

Width. Generally the minimum width for the primary corridor is five feet, established by GSA and/or local building codes. A wider corridor of six feet is more pleasant and tends to stay in better repair (fewer cart scrapes), but requires more of the available square footage.

Simple Pattern. Main circulation connects the key shared spaces and the safety components on the floor -- firestairs, toilets, elevators, reception areas, major conference rooms etc. A straightforward pattern is the safest for egress and the simplest to understand. If the building shape allows it use straight corridors in a loop pattern; avoid jogs if possible. You also should consider enlarging the corridor at major corners or intersections. This aids in traffic flow and orientation, as well as protecting the walls.



EXAMPLE OF CIRCULATION
PARTIAL FLOOR

PRIMARY CIRCULATION

SECONDARY CIRCULATION

WS = WORK STATION

T = TOILET

Public Street. Primary circulation is most attractive when it is treated like a public street. It serves as the main path, but is neither quiet nor private. Certain functions should have direct access from a main street -- conference rooms, reception, libraries – but not the private workstations or offices of the employees. Service functions such as recycling centers, toilets, copy centers, should be easy to find, but they would detract from the primary circulation if their entrances were directly on the corridor.

Stacking. Each floor should have the same primary circulation pattern to the extent possible. This is for safety as well as way-finding; the path to the fire exits would always be the same.

Orientation. Primary circulation is the way used by visitors as well as EPA employees. To minimize confusion and maximize security, it should be visually evident and dominate the other pathways. A consistent and different appearance will assist in distinguishing your otherwise straight, simple and wider path. Windows

that open onto the primary circulation are excellent aids in orientation, as well as making the space more pleasant.

Signage. Signs only assist and punctuate, and should not replace a well thought out circulation system, especially for safe egress. They should however, be an integral part of the design.

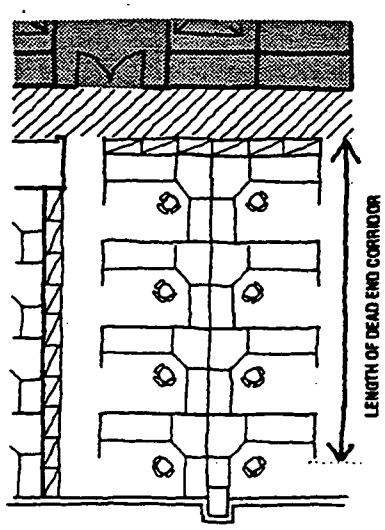
SECONDARY CIRCULATION

Secondary circulation provides access to workstations, offices and support spaces from the primary circulation system. The term is meant to include all secondary corridors as well as the passageways between workstations. Key considerations include:

Width. The appearance of your space will be improved if you keep a regular corridor width between workstations instead of jogging in and out. For workstations of differing sizes, either adopt a standard panel depth or introduce files/support space to keep a consistent aisle width. Consult GSA, local codes and the Americans with Disabilities Act (ADA) for the minimum permitted widths (36" - 44" typical for most secondary circulation).

Simple Pattern. Like primary circulation, a simple pattern here is best, leading directly back to the main corridor.

Dead-end Corridor. A dead-end corridor is one that does not lead to a safe fire egress in two directions. This usually refers to the last portion of a passageway, and its maximum length is regulated by the local building code. In Washington DC, for example, the permitted dead-end corridor is only 20 feet, which allows approximately 2-3 workstations. These rules mean that if there is a significant distance between your main corridor and the windows, you will need a secondary corridor, connecting these potentially dead-end situations. One good way to do this is to create a corridor along the window wall.



DEAD END CORRIDOR EXAMPLE

CORRIDOR TREATMENTS

It is possible to meet the recommendations of regular patterns and standard locations without creating a boring sameness. With an open plan layout, corridors are seldom created by using floor-to-ceiling walls with doors. Instead they are usually defined by a combination of walls, systems furniture panels and support elements (files, cabinets etc.), Use variety to give the floors interest and use the regular pattern to keep it from becoming chaotic. Natural light coming into both the primary and secondary circulation will give it life.

Design Elements of the Plan

The design of the floor layout is unique to each situation and depends on the building, the user needs and the design concept envisioned by the architect. However, one underlying assumption is the use of an open plan layout, which is necessary to meet EPA's mission and GSA's regulations. With open plan and systems furniture, workstations are created for the majority of personnel with enclosed offices being limited to supervising personnel -- Section Chiefs to Administrator. The amount of shared support is more generous than traditional layouts. (See the section "How Much Space?" for more information).

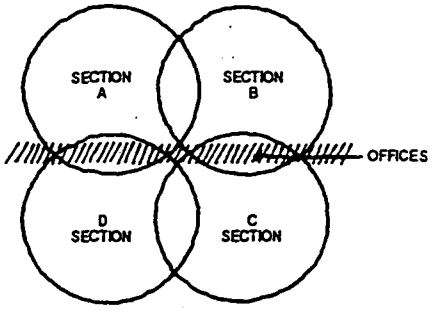
Below are suggestions about floor layouts. They are meant to outline the issues and help you review plans.

KEY CONSIDERATIONS

Bay Size. The pattern and spacing of columns defines the bay size and creates a module that helps set the pattern for a floor layout. Speculative office buildings often have 20' x 20' bays, although for a flexible layout, a larger bay size is better.

Planning Module. Workstation dimensions need to be coordinated with the bay and column sizes. Typically a planning module (e.g. 5' x 5') is adopted to coordinate the size and positioning of workstations, partitions, the ceiling grid, and underfloor systems (if any). A modular approach makes later changes easier -- it causes less physical disruption.

Columns. As a suggestion to prevent surprises, have your architect field check the actual sizes of the columns. Individual columns are often enlarged in the field to cover pipes or other services without modifying the drawings.



GROUPING WORKSTATIONS

Grouping Workstations. When planning for the layout of workstations, look ahead and build in flexibility to meet EPA's changing needs. A classic mistake is to assign blocks of space to various Sections or Branches, and then design each one to meet their needs. It's better to develop, for an entire floor, the circulation system and basic layout for workstations, offices and support based on typical section needs. Later it can be modified slightly for each group, while retaining the underlying flexible plan.

Grouping Offices. Walled offices should be grouped in several clusters on an office floor, rather than sprinkled among the workstations. Clustering walled offices together not only leaves more open space, but also allows Section or Branch sizes to fluctuate with little or no impact on the layout. Groups of offices, and other enclosed spaces, can be strategically located to give visual variety to the plan and also be convenient to the appropriate workstations. Clustering creates efficient and economical construction as well as good HVAC distribution.

Use of the Windows. Windows and their spacing are a great organizing force in the office. For example:

The spacing of the windows will determine if and how workstations and/or offices can be practically located along the window wall.

Offices located along the windows will restrict the penetration of natural light into the interior of the floor, affecting energy conservation as well as the atmosphere of the interior work areas. The majority of walled offices should

be located on the interior; the use of glazed panels will bring natural light into the offices.

The configuration of the interior window wall system will determine if workstations can abut the window. The wall may have irregular projections; clearances may be needed for maintenance; panels may restrict heat distribution.

To distribute natural light throughout the office area, higher or larger panels should be placed away from the perimeter wall. High panels, if required for overhead storage, should be placed perpendicular to the windows.

Orientation and solar heat gain are an issue. Window treatments should aid in reducing glare, especially in buildings without tinted or reflective glazing.

Support and Special Spaces. Support and Special Spaces have characteristics that affect their location on the floors (and/or require special treatment of the space). Examples include:

Spaces that generate noise and need to be removed from workstation areas or be treated for sound transmission -- copy center, mail/stock room, conference/training, employee lounge.

Spaces that require separate and modified HVAC (heating, ventilating , and air conditioning), which suggests their location near the building's core -- copy center, computer room, computer printer room, telecommunications and L.A.N. rooms, conference and training rooms.

Spaces that generate a high live load and need to be clustered in an area of reinforced floor support -- library, high density files or security files, stock room, heavy equipment.

Use of Irregular Floor Space. If your floor plate or building core creates irregular corners, their use should be planned early in the design process. Generally, support space is more adaptable to unusual shapes than workstations, e.g. copy rooms, meeting rooms, lounges.

Demountable Walls. While planning your layout and choosing the systems furniture, it's also the time to consider the use of demountable, or movable, wall systems for the offices (instead of more permanent construction). They typically mount above the finished floor and below the finished ceiling. They are very flexible, easy to move and don't disturb the floor or ceiling (power can feed from below the floor). Their disadvantages include a higher initial cost.

Renovation. Changes to existing office space need a systematic approach -- looking at more than the layout, to consider also the impact on engineering and lighting systems. In renovated space, employee complaints of stuffiness or discomfort are often the result of adding or changing partitions without changing the distribution pattern (balancing) of the HVAC systems. In general, creating more or different, rooms is more disruptive than opening up the floors.

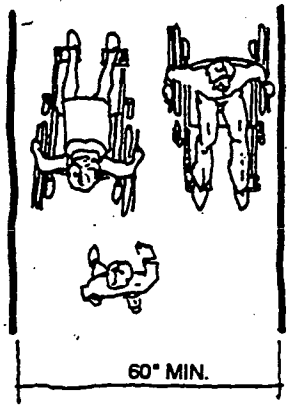
The Americans with Disabilities Act

Implementation of the Americans with Disabilities Act effectively started January 26, 1992.

The Americans with Disabilities Act , commonly known as the ADA, intends to provide disabled persons with accommodations and access equal to, or similar to, that available to the general public. The ADA is a national Civil Rights Law, and it will be enforced as a Civil Rights Law, and not as a building code. Therefore an "aggrieved party" can bring forth a legal action. A party does not have to allege discrimination "after the fact," rather an action based on "reasonable grounds" can be brought forth if a person believes discrimination is about to occur with regard to new construction or alterations. State or local building inspectors will not be enforcing the ADA since it is a Federal Civil Rights Law and supersedes state and local laws, unless a State or local jurisdiction adopts the ADA requirements or unless the U.S. Justice Department certifies the state or local code.

The Americans with Disabilities Act is divided into four titles: I Employment; II Public Services and Transportation; III Public Accommodations; and IV Telecommunications. Title III Public Accommodations is the portion of the Act that addresses accessibility in buildings. New installations and physical alterations (after January 26, 1992) will need to comply with ADA regulations. In existing office spaces, architectural barriers need to be removed, where such removal is "readily achievable". This is determined on a case-by-case basis, and there has been little history on its interpretation.

Many ADA regulations apply to the base building, e.g. building access, parking, stairs, elevators, public toilets and telephones, fire safety issues etc.; they therefore are the responsibility of the landlord. Within an office space, however, certain ADA regulations apply. There are different, more stringent, regulations for areas of "public accommodation" then for office space, which may apply to certain areas in your space (e.g. Public Information, fitness center, library).



MINIMUM PASSING

KEY CONSIDERATIONS

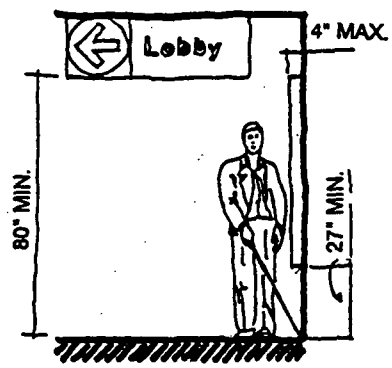
To help you understand when detailed review is necessary, and key topics of concern for office interior design are listed below. This list just identifies common issues and is by no means complete; you should refer directly to the Americans with Disabilities Act.

Base Building. Accessibility of the overall office building -- its parking areas, entrances, public circulation and core areas -- are subject to ADA regulations. This is typically the responsibility of the landlord.

Accessible Routes -- Interior. At least one circulation route will connect the entrance to all accessible rooms or areas within your space. Provisions of ADA cover the width, changes in level, headroom, floor surface, protruding objects, means of emergency egress and areas of rescue. Common issues:

- Minimum clear width of a corridor is 36" except as allowed at doors. (Minimum only -- local codes or GSA regulations may require wider path.)
- Passing space is required at least every 200' if the route is less than 5' wide. This could be a 5' x 5' space, or a T-intersection of two corridors.

- Protruding objects cannot reduce the clear width of 36". This would include drinking fountains, telephone booths, display cases etc. Even when they don't intrude upon the minimum width there are regulations about allowed projection at various heights.
- Review ADA for regulations concerning emergency egress and areas of rescue assistance.



MAXIMUM PROJECTIONS

Doors. Doorways along an accessible route need to comply with regulations concerning width (typically 32" clear), maneuvering clearance, thresholds, hardware and opening force. One of the common areas of non-compliance in existing buildings is the clearance for maneuvering. A disabled person needs clear space (18") on the latch side of the doorway and a level area to pull the door open.

Toilet Rooms. Common use toilet rooms and fixtures need to comply with ADA. In addition, other toilet rooms provided for the specific use of occupants of specific spaces (e.g. the R.A.'s toilet room) must be adaptable. The room will need to be capable of complying with these regulations if a future occupant is disabled.

Assembly Areas. For places of assembly with fixed seating, the ADA has specific requirements for the amount and placement of wheelchair seating and the requirements for Assistive Listening devices.

Storage. Fixed or built-in storage facilities such as cabinets, shelves, closets and drawers, in accessible spaces (private offices, workstations not included) are covered by ADA. At least one of each type provided must comply with provisions on height, approach clearance and hardware.

Libraries. Public areas of a library have specific requirements.

Alarms. Emergency warning systems will include both visual and audible alarms, and must be located in all areas of common usage (e.g. meeting rooms, hallways, lobbies, places of assembly). Specific visual alarm features are described.

Signage. Permanent signs, whether indicating direction or information, or designating rooms, are covered by ADA requirements of size, location and characteristics.

In addition to the considerations above, other ADA issues common to office interior design are:

- Ground and floor surfaces (e.g. carpets, floor tiles etc.).
- Ramps (e.g. when floor elevation differences occur, such as between a raised and unraised floor).
- Doors (e.g. position of hardware, clearances with door swings etc.).
- Drinking fountains and water coolers
- Sinks (e.g. a sink in a staff lounge pantry).
- Reach regulations for controls and operating mechanisms (e.g. a microwave oven, coffee maker or refrigerator in a staff lounge pantry, or other office equipment).
- Telephones (e.g. public telephones in the office space).
- Fixed or built-in seating and tables (e.g. in a library).
- Dressing and fitting room (e.g. a locker room in a fitness area).

Power and Signal Services

Electric power and signal distribution is one of the most complicated aspects of moving or expanding, especially considering the power requirements of equipment, linking computer components, establishing telephone communications for voice and data. The methods of distributing these services are discussed here, while the technical aspects are left to engineering/communication professionals. With an open plan, there are fewer walls to conceal wiring, nor is in-wall wiring conducive to the constant changes of the modern office.

No right or wrong method of distributing services exists -- solutions vary. The complexity of the office, the construction of the building, the technologies available, the design intent, the budget and the time available for the job all affect the range of possible choices.

Deciding on a method or combination of methods to power and signal an office should be done in conjunction with professionals, and should consider the specific issues unique to each building as well as the applicable standards and codes. Very important to future flexibility is good record-keeping of the installation. Following is a description of common methods of power and signal delivery and their implications:

Ways Power And Signals Can Reach The Workarea

Poke-Through Method, the most widely used approach in existing high-rise buildings, requires drilling through the floor assembly to bring the horizontally distributed lines from the underside of the floor to the desired access point in the workarea. Initial installation provides widereaching design freedom. Access to the ceiling plenum below the floor, however, may not be available (e.g. another tenant may rent that space and deny access to the ceiling) and a less-than-clearly defined organization of the wire layout in the ceiling may cause wire-management and redesign difficulty with future workarea changes.

Attributes: Locations very flexible at initial installation. Low initial costs.

Limitations: Capacity limited. Structural damage may result from repeated changes. Relocation is disruptive to occupants, and high in cost. Limited security.

Flat Cable Conductors, also known as "flat wiring", are 3" wide, thin strips of power and signal transmission wires encased in protective metal. They are laid under carpet tile, which provides necessary access for office layout flexibility. Flat cable is best used for remodelling in buildings which have poured concert flooring systems, and have no other wiring system in place.

Attributes: Easy for remodeling. Flexible. Accommodates both power and signal. Aesthetically acceptable. Acceptable for most future electronics. Floor integrity preserved. Installation on move-in.

Limitations: Advance planning and wire management imperative. Installation is a specialized service. Overlapping cables may cause signal transmissions interference. Cable durability a concern in high traffic areas. Limited security and electronic capacity. Labor/code acceptance. Because of its vulnerability, EPA discourages its use.

Underfloor Duct Systems are placed in the structural floor system and incorporate deep channels; this allows horizontal wire distribution to reach essentially any point in the workarea. Several types of receptacles have been developed to access the distribution channels and are usually located in a grid pattern about 6 feet on center. This approach provides a good appearance in the workarea, but much flexibility is lost after the system is set. Underfloor Duct System wire capacity may be limited, especially in older buildings, thus requiring an additional method of wire distribution.

Attributes: A construction industry standard. Low fire hazard. Available in concrete or metal deck systems. Satisfies all code requirements. Low cost for new construction. Accommodates power, signal and special cable needs.

Limitations: Grid set at the time of construction may not match desired layout. Wire management and capacity limited by system as installed, making expansion or future electronics difficult to accommodate. Cannot be installed during remodeling.

Raised Floors, originally known as "computer floor systems," are composed of pedestal legs resting on a structural floor system with removable floor surface panels 18 to 30 inches square. The height above the structural floor varies from 6 to 18 inches to allow the horizontal distribution of a wide array of services. They are known for their ease of access, though it is important to select a raised floor with a module that works with the planning module.

Attributes: Optimum flexibility. Relocation costs and labor minimal. Low life cycle costs. Accommodates all future electronics, other equipment and distribution lines. Communication interference is minimum. No clean-up or damage on removal.

Limitations: Extra floor-to-floor height required. High initial cost. Limited security, acoustical performance, floor loads, durability and floor finish options. Level installation required.

Surface-mounted Raceways are generally applied to walls, columns or ceilings, and carry the wiring to a point at or near its use. The traditional surface-mounted raceway is an applied channel on the wall, common in light industrial applications and old building conversions. However, they can be attractively designed at the time of construction, e.g. hidden behind a molding strip.

Attributes: Low initial cost. Flexible at installation and for future wiring changes. Minimum cable lengths. Future electronics easily accommodated.

Limitations: Visually intrusive unless custom designed. May be difficult to access. Wiring from the wall to point of need can create safety, security, aesthetic problems.

Power Poles stand floor-to-ceiling with wire connections for horizontal distribution at either end. Power poles usually provide a quick connection, but are controversial with regard to both safety and aesthetics; and their layout organization may also conflict with the planning bay module.

Attributes: Easy to move and connect to distribution lines in the ceiling plenums. Low cost. Accommodates both power and signal. Additional outlets.

Limitations: Visually intrusive. Not durable -- subject to bumping. Code restrictions in some locales. Requires special ceiling penetrations. Not suited for future electronics. Possible electromagnetic interference.

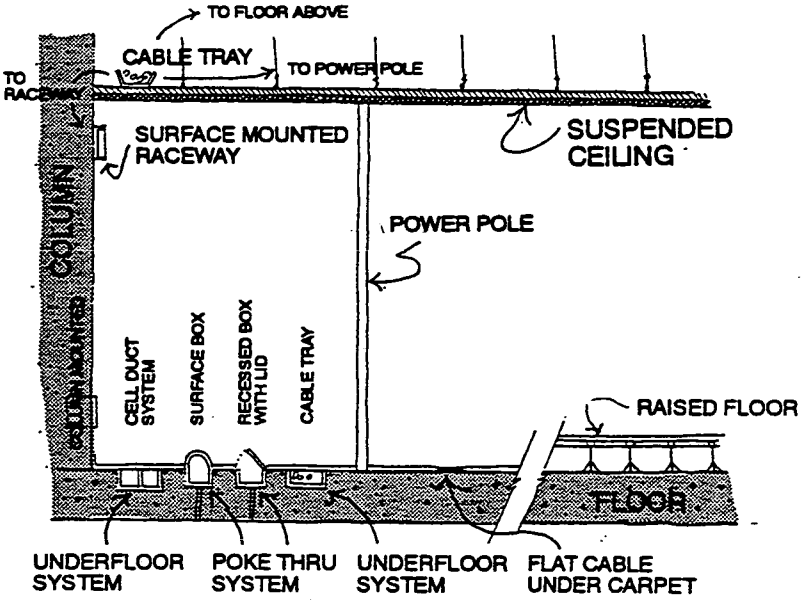
Cable Trays don't provide complete distribution, but they are devices to carry wiring through the ceiling plenum or floor to be distributed by one of the other methods, e.g. Poke-Through, Power Pole or Surface Raceways.

All these methods, together with in-wall wiring, bring power and telecommunication signals to all areas of the office, especially to the open plan workstations. With older panel systems, each station had to be served, but newer systems furniture can have its own internal wiring. This not only conveniently serves the user but also allows distribution to continue through an entire run of workstations.

Systems Furniture Wiring offers both vertical and horizontal wire distribution in workstation panels. The distribution channel is usually located within the base of the panel. Some manufacturers offer systems that now provide distribution at unlimited locations. Access to the power and signal source typically occurs via one of the other methods described here -- from a column, cellular floor, poke-through or power pole. Flexibility, excellent wire management and good aesthetics are achieved by using systems furniture in the workarea; its wire capacity, however, must satisfy program power and signal needs.

Attributes: Power and signal accommodation good. Flexible for changes and accommodating future electronics. Connects to one of the other methods.

Limitations: Panels must interconnect, which may hinder movement. Wire capacity determined by the furniture system. Installation by trade may be required.



ALTERNATIVE METHODS FOR BRINGING POWER AND SIGNALS TO THE WORKSTATIONS

Creating a Better Plan

The following are two floor plans utilizing the same building and space requirements.

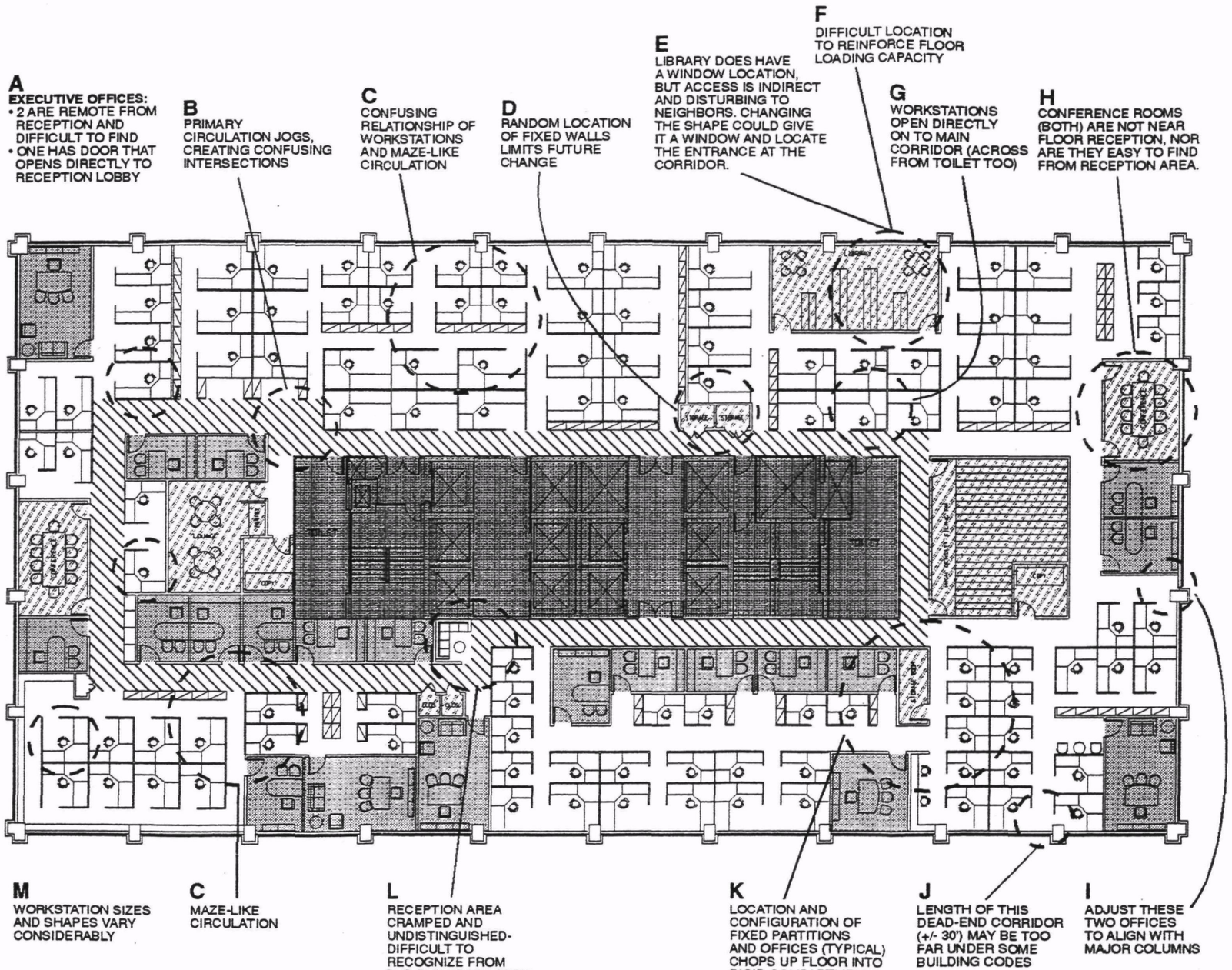
The *Original Plan* is an actual design for a government agency, altered only slightly to illustrate the EPA's requirements.

The *Modified Plan* is a reworking of the first design to illustrate some of the guidelines discussed.

Original Plan

Program Shown:

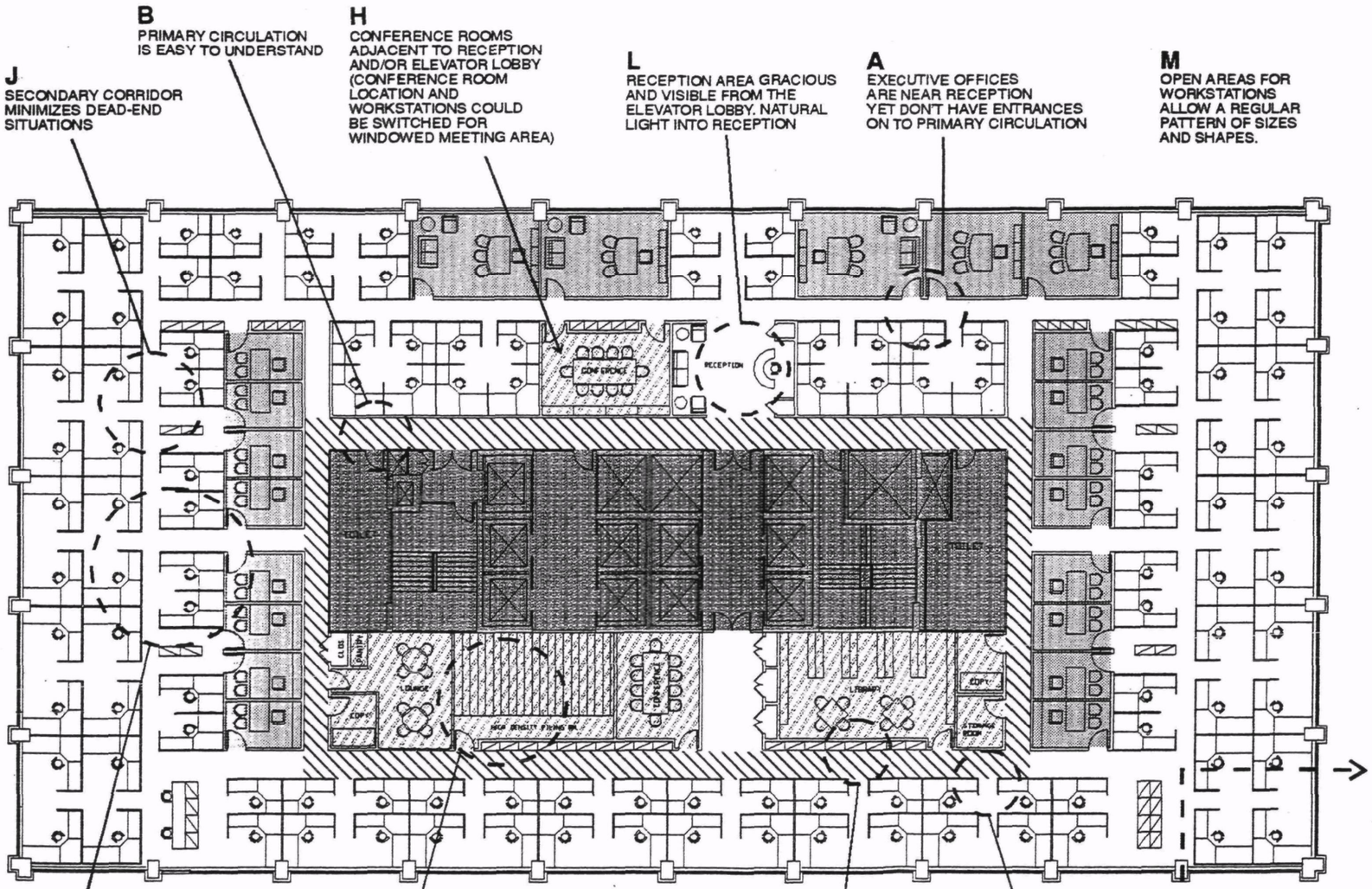
Private offices	21
Workstations	107
Shared Stations	2
Meeting Rooms	2
Copy Rooms	2
Library	
High Density Files	
Lounge	
Reception	



Legend

- Building Core
- Primary Circulation
- Enclosed Offices
- Enclosed Support

Modified Plan



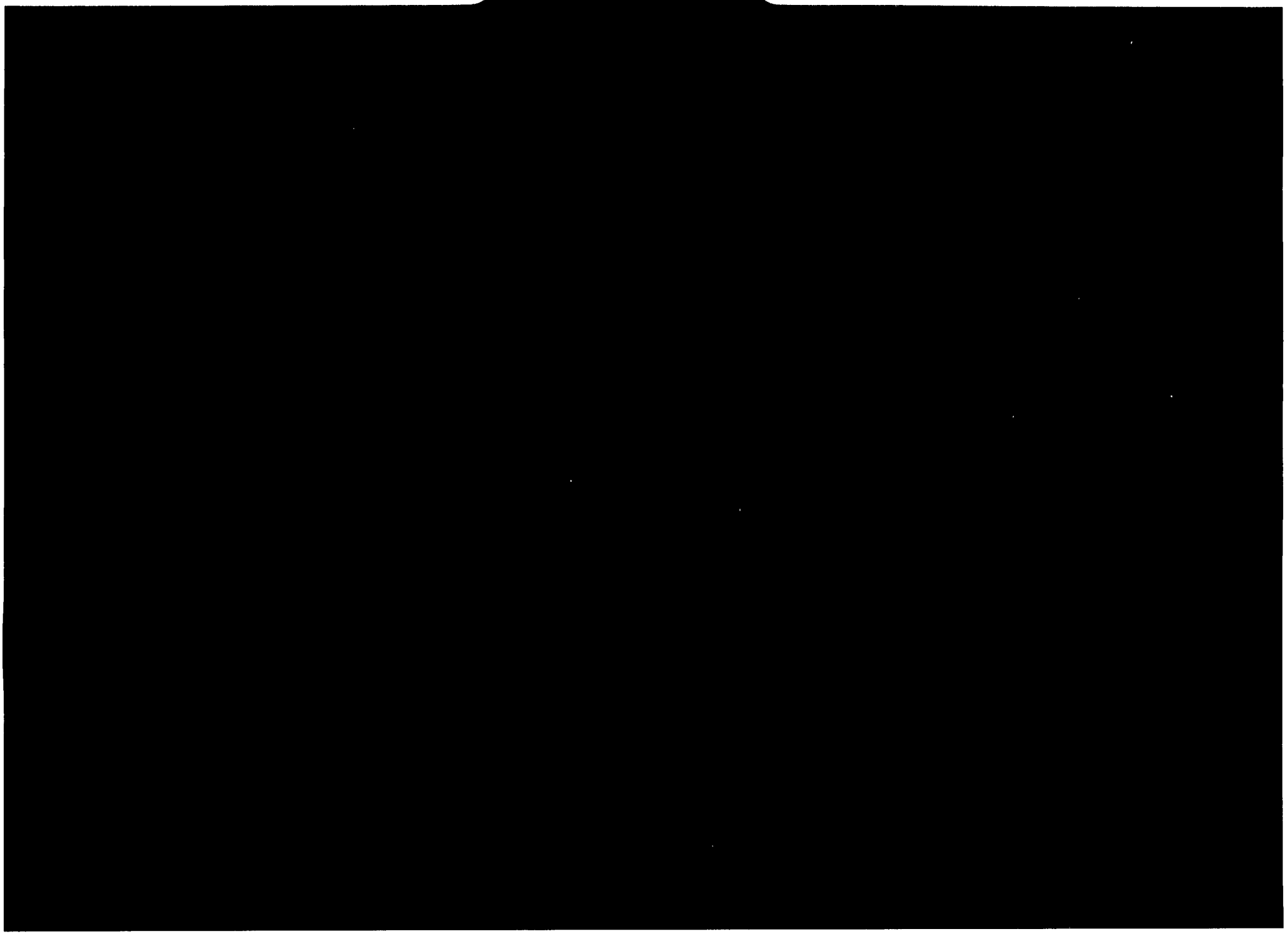
Program Shown:

Private offices	21
Workstations	115
Shared Stations	2
Meeting Rooms	2
Copy Rooms	2
Library	
High Density Files	
Lounge	
Reception	

With the modified plan, there was an increase of 8 professional size workstations, and a lower percentage of small stations. (However, there are somewhat fewer file cabinets shown).

Legend

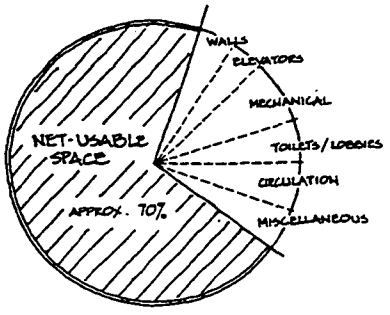
- Building Core
- Primary Circulation
- Enclosed Offices
- Enclosed Support



How Much Space?

You need enough space to create a pleasant office environment that meets EPA's mission, enough space that all employees work well and enough so the Region can serve its public functions. However, the exact answer to "How much?" is complicated, and in the federal government is tied to regulations and budgets.

Specific guidelines for the types of space common to the Regions, their sizes and frequency are presented in this chapter. These are based on research and experience with recent Regional and Headquarters space installations and are meant to reflect several goals:



GROSS SQUARE FOOTAGE

1. To create a quality workplace. People often think of guidelines as "standards" that limit. But at EPA, these space planning guidelines could improve the office quality for many employees by providing a more pleasant, efficient work place and improved indoor air quality.

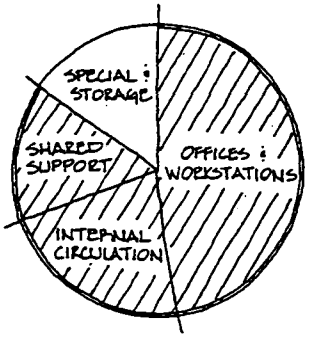
2. To suggest a pattern of use that ages well. EPA changes often, thus a systematic approach to workstation variations and common support elements increases the longevity of any office plan. Fewer physical modifications are required as activities and people change.

3. To improve consistency, not only Region-to-Region, but also within Regions. The gradual application of space guidelines promotes and simplifies the resolution of uneven space distribution.

4. To meet the space limits set by GSA. GSA sets limits on the amount and distribution of space for Agency offices and enforces them through allocation of space and rent for facilities.

5. To provide technical data and assist EPA managers in defining performance guidelines for commonly used spaces at EPA.

GSA Regulations



NET USABLE SQUARE FOOTAGE

GSA regulations play an integral part in determining space allocated to any given federal agency. The General Services Administration publishes a document called the Federal Property Management Regulations (FPMR), which describes its policies on the acquisition, assignment and alterations of space within GSA controlled buildings. Of first importance when planning for space are the FPMR's categories of Occupiable Office Space and the maximum square footage assigned to each. Occupiable space is divided into three main categories:

Office Space Storage Space Special Space

Office Space includes the workstations and offices for personnel, the common support areas (filing, meeting rooms etc.) and the internal circulation that connects them. Most ordinary office areas fit into this category. Historically, GSA has regulated the amount of office space permitted, to control capital/operating costs and to consistently distribute government space. Currently (summer 1993) the maximum permittable square footage for Office Space is 125 square feet per person for offices, workstations and circulation, plus an estimated 22% additional space for shared support. This FPMR allocation effectively works out to 152.5 occupiable square feet per person. This is an average utilization rate; not every person gets 152.5 sf of personnel work area. The total allocation must accommodate reception, meeting rooms, corridors, reference areas, coffee stations etc.

Storage Space is designated for bulk storage, with unfinished interiors, minimal lighting and heating. Most storage areas in office buildings are not included, but are classified instead as Office Space.

Special Space accommodates specific equipment or uses by modifications to the building's architectural or engineering systems, such as augmented ventilation/air conditioning, reinforced floor loading or increased electrical power. Typical examples in EPA buildings are copy centers, high-density filing, conference rooms with A.V. capability, computer rooms, and pantries. These spaces are individually planned, based on specific need. An observation based on the most recent EPA Regional installation, the average amount of Special Space ranges from 25-30 square feet per person. No maximum square footage is prescribed, but all special spaces must be reviewed and approved by GSA and EPA. Higher rent and alteration costs are charged for them.

RULES OF THUMB FOR EPA SPACE NEEDS

OFFICE, SUPPORT, SPECIAL SPACE TOTAL ESTIMATED FOR SEVERAL EXAMPLES:

1. ADDING 15 - 20 PEOPLE
   ±140 OSF/PERSON FOR OFFICE & SUPPORT;
2. ADDING UP TO 100 PEOPLE/SAME LOCATION
   ±165 OSF/PERSON FOR OFFICE, SUPPORT, AND SPECIAL
3. MOVING ENTIRE REGIONAL OFFICES
   ±180 OSF/PERSON

SUITABLE FOR FIRST DISCUSSION ONLY; SPACE PROGRAMMING MUST FOLLOW BECAUSE EACH GROUP HAS DIFFERENT REQUIREMENTS.

How To Meet Guidelines

We have reviewed recent EPA office installations and offer these suggestions. Architects or interior designers should be retained for all but the most minor changes and should be encouraged to:

1. Keep circulation simple and efficient. Circuitous or ill-defined corridors decrease the space available for other uses.

2. Develop a regular pattern of shared support and equipment that discourages the proliferation of reception areas, meeting rooms, printers, etc.

3. Choose modest sizes for offices and workstations and balance this with generous shared support.

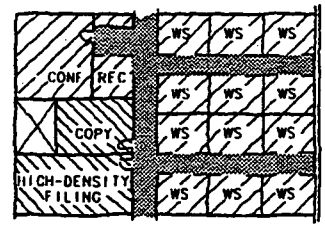
4. Select a furniture system that is flexible in its components and range of sizes.

Space Measurement

Office space is commonly defined and measured in several ways:
- Net Useable square footage
- Occupiable square footage
- Gross square footage
- Rentable square footage

The space in this document is expressed in Net Usable square footage, unless otherwise indicated. GSA definitions of space terms are included in this volume (Definitions). So many variations occur that, when discussion your space requirements, it is very important to establish a mutual understanding of what is included.

Metric equivalents are shown on the following charts, and a conversion table is included in the Definitions section of this document.



NET USABLE SPACE

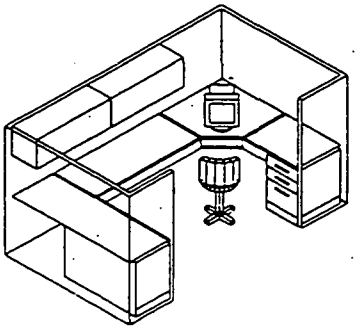
- TYPICAL OFFICE SPACE
- SPECIAL SPACE
- INTERNAL CIRCULATION
- BUILDING SUPPORT SPACE

WS = WORK STATION

Offices and Workstations

At EPA today, the amount of space devoted to offices and work stations varies widely as a percentage of total occupiable square footage. Our experience in both the Regional Offices and Headquarters indicate that offices and workstations should represent approximately half of the total occupiable space. (This means 82-85 sq. ft. per person, averaged from RA to SIS). With this distribution, high quality office space can be achieved within GSA regulations, while providing adequate office support and Special Space.

Space Guidelines



The purpose of space guidelines is to give order and long term flexibility to the interior design. They help establish a regular pattern that organizes your office floors both visually and operationally. The categories and space allocations here are based on research into EPA's typical mix of personnel and its most recent office installations. An underlying assumption is the use of systems furniture for all workstations, laid out in a modular, open plan. Enclosed offices are assigned to supervising personnel -- Section Chiefs to Regional Administrator.

Each office and workstation size is given as a range, recognizing that situations are different -- created by different floor shapes, structural bay sizes, furniture systems. In addition, a limited number of workstation types are presented. Fewer varieties simplify the assignment, layout and future flexibility of the workstations. EPA Regions have implemented two approaches in recent buildouts:

A. The majority of workstations are the same size, using the middle station, Type G at 60-65 square feet. Assigned to all professionals and senior clerical staff, the single workstation size readily accommodates change and reassignment.

B. Workstations are distributed in three configurations based on a profile of the Branch to be accommodated. The range of sizes more closely matches the functions for the various positions, but reassignment is more complex because it requires matching or changing workstation sizes for the new users.

Either way, some standardization will ensure the long-term usefulness of your floor layout. A plan based on the **typical** size and profile of your Sections can be more useful than one tailored to specific individuals. These "custom" plans are often out-of-date before the carpet is down. A good open-plan design can build in enough flexibility for normal variations.

Sometime you might reuse an already configured office floor without renovating for the new users. The existing offices and partitions probably will not match these space guidelines. One suggestion is to concentrate on satisfying your support space needs first, before trying to assign offices. Then share offices to approximate the guidelines. Otherwise, you may find that everyone has a little more office space than they need, but there is no meeting room and the "library" is scattered into several offices.

Note that these recommendations don't reflect the current practice at EPA. With gradual implementation, some people will get larger work areas, some smaller. But the overall plans will meet EPA goals for quality and efficient office space.

TYPE	ASSIGNMENT	KEY SPACE ATTRIBUTES	APPROX. SIZE
			net square feet (square meters)
*A	Regional Administrator	· Enclosed office, with several visitor chairs and conference table (6-8) · Window location · Furniture: Standard or Systems	350-375 sf (32-35 sm)
*B	Deputy Regional Administrator	· Enclosed office, with visitor chairs and conference table (4-6) · Window location · Furniture: Standard or Systems	275-300 sf (25-28 sm)
*C	Assoc. Regional Administrator Division Director General Counsel	· Enclosed office, with either: a. Conference table (4) or b. Informal seating plus pull-up chairs · Window location · Furniture: Standard or Systems	225-250 sf (20-23 sm)
*D	Deputy Division Director Branch Chief	· Enclosed office with small table or pull-up chairs for conference (3-4) · D.D.D. - Window location · B.C. - Interior location · Furniture: Standard or Systems	150-180 sf (14-17 sm)
*E	Section Chief Senior Legal	· Enclosed office or semi enclosed workstation · Interior office location · 2 visitor chairs · Furniture: Systems	100-120 sf (9-11 sm)
*F	Senior Professional	· Semi-enclosed workstation, with 0-2 visitor chairs · Variations in equipment and storage needs · Furniture: Systems	75-80 sf (7-7.5 sm)
*G	Senior Professional Professional Senior Clerical Contractor	· Semi-enclosed workstation · Variations in equipment and storage needs · Furniture: Systems	60-65 sf (5.5-6 sm)
*H	Clerical Contractor AARP, SIS	· Semi-enclosed workstation · Variations in equipment and storage needs · Furniture: Systems, low panels	40-50 sf (4-4.5 sm)

*Indicates that a diagram of this space follows.

Office Support Spaces

Office support spaces are those usual shared rooms, equipment areas and filing/storage that augment the workstations and offices. This group includes functions that can occupy regular office space with no engineering modification -- either as a separate room or as a shared area interspersed with the workstations. By GSA definition, these are part of Office Space and subject to the utilization limit of 152.5 occupiable square feet per person.

Some support can be classified as Office Space in one case and as Special Space in another, for example a library. A small reference library with three rows of bookshelves and a reading area could be accommodated in regular office space. A large Regional Library would be Special Space because of the structural live load requirement of the book stacks (non-stack areas may be considered office). Another example is the conference/meeting room. When a meeting room requires changes to the engineering systems for augmented ventilation or the installation of audio-visual equipment, it is classified as Special Space. Therefore some of the following support areas are listed again under Special Space.

SUPPORT SPACES	DESCRIPTION	APPROXIMATE SIZE	FREQUENCY GUIDE
		net square feet (square meters)	
Reception Area *Main	· Central reception & security point for visitors · Desk/counter area; display; seating for 6 · Adjacent to entry lobby; near Public Information and Dockets	300 sf minimum (28 sm)	1 per facility
*Departmental	· Reception/waiting for senior administrators, eg. R.A., D.D. · Seating for 2-4 · Adjacent to secretary (not in sf)	100 sf for D.D. (9 sm)	1 per Division
*Public Information	· Public education center · Information/display area · Library · Small video theater · Workstations & support	Varies	1 per facility
Public Dockets	· Reference & research area · Work areas · Storage of dockets	Varies	Varies Co-locate if possible
*Meeting Room	· Standard room for meetings of 6-20 people (also see Special Spaces: Conference Room)	150 sf to 400 sf (14-38 sm)	Varies
Library/ Reference	· Reference area for employees, typically for a specific Division · Shelving and seats	300 sf maximum; see Special Space: Library	Varies

*Indicates that a diagram of this space follows.

Central Evidence	· Secure evidence storage room · May contain security files, safe · If increased floor loading is required, this is Special Space	100-200 sf (9-18 sm)	1 per facility (O.I.G only)
Copy Center Main/Satellite	See Special Space	---	---
*Convenience	· Small copier located in office area · Use is discouraged because copier exhaust affects indoor air quality	40 sf (3.5 sm)	Discouraged
Filing - General	· Filing cabinets distributed in open plan office area	9 sf per cabinet (14 sf in file rm.)	Varies
Equipment Station	· Shared station for computer, microfiche reader, typewriter, or other equipment · Space for worksurface and chair	20 sf (2 sm)	As needed
Closets	· Closets or hanging space for employees' and visitors' coats	0.5 sf per employee	Distributed
Coffee Station	· Amenity within office area · Counter with sink and storage (proximate to wet stack)	30-35 sf (3 sm)	1 per ± 50 employees
*Recycling	· Coordinated system of collection for recyclable materials. Plan for 7 materials (white paper, newsprint, other paper, glass, aluminum, plastic, trash) · Usual method has convenience bins distributed locally, satellite collection rooms each floor, and central building collection/storage	Coordinate with building's method	Minimum of 1 satellite center per floor
Employee Counseling	· Career, retirement, personal counseling · Discreet access	120 sf per room (11 sm)	Varies
Recreation A. Credit Union Union Office	· Office space devoted to these employee amenities	200-500 sf each	Varies

Other desirable areas that fall under GSA "Office" space limits

Child Care Center Fitness Center Health Unit	These areas are desirable, but currently considered office-type space by GSA and subject to the utilization limit. Policy changes; check with GSA and FPMR for specific situation.

*Indicates that a diagram of this space follows.

Special Spaces

Special spaces are those that require modification to the building's architectural or engineering systems for their use. These changes might be to augment the HVAC system, reinforce the structure for high live loads, increase the electrical power to a specific room or introduce plumbing. Following are common EPA Special Space (see also Office Support).

SPECIAL SPACES	DESCRIPTION	APPROXIMATE SIZE	FREQUENCY GUIDE
Common Special Spaces		net square feet (square meters)	
*Conference Room	· Meeting room with audio-visual capabilities · Specialized lighting, power, HVAC	Varies See Volume 2	minimum 1 per facility
Copy Center * Main	· Shared facility for large volume copying, collating & binding · Service counter, reproduction equipment, tables, storage, recycling bins · Specialized HVAC, power, acoustics	750 sf (70 sm)	1 per facility
*Satellite	· Centralized room for routine office copying · 1-2 copiers, table, storage, recycling bins · Specialized HVAC, power, acoustics	225 sf (20 sm)	1 per floor or 1 per 150 employees
*Computer Printer Room	· Enclosed space for laser printers serving PC's, LAN's · Counter, paper storage · For IAQ, recommended over providing printers in open work areas; special exhaust	70 sf for 1-3 printers (6.5 sm)	Walking distance maximum 75'
Computer Room	· Specialized room for mainframe or LAN equipment and related workstations · Specialized HVAC, power, telecommunications	Varies with equipment	---
*L.A.N. Room	· Equipment support for networked computer services · Cable racks, table/counter for monitor and file servers · Locate centrally; stack floors · Specialized HVAC, power, telecommunications	Varies w/equip. (e.g. 80-100 sf per 100 employees served	1 per floor
Telecom-munications Room	· Storage of equipment for voice & data communications · Locate centrally; stack floors · Specialized HVAC, power, telecommunications	Varies (e.g. 150 sf for 250 people) Sometimes built into bldg. core	1 per floor

*Indicates that a diagram of this space follows.

YOUR RENT TO GSA FOR SPECIAL SPACE VARIES BY TYPE. AS A RATIO OF BASE OFFICE RENT (X):

CONFERENCE / TRAINING	1.19X
ADP	1.58X
STRUCTURALLY CHANGED	1.80X

*Library	· Reference area for EPA employees and public · Reading area, stacks, cataloguing, storage · Specialized floor loading, humidity control, lighting	Varies with size of region + specialization	1 per facility; May be separate law library
Filing: Secure	· Enclosed area or special file cabinets for confidential material · Specialized floor loading, fireproofing	Varies	As needed
*High Density	· Compact storage for files or other media, using mechanized equipment · Specialized floor loading	80 sf per Lecktriever ® 18 sf per Times-2 ® H.D. systems vary	1 H.D. unit per floor if needed & structure allows
Mail & Stock Room	· Receiving, storage and dispensing of office supplies; distribution of mail · Work area and storage · Locate with easy access to service elevator · Specialized floor loading	Varies	1 per facility Satellite if split location
*Employee Lounge	· Strategically located break room · Tables & chairs, peak occ. 15 · Pantry with sink, refrigerator, storage, microwave · Specialized HVAC, plumbing	250 sf May be smaller if fewer employees (23 sm)	1 per ± 200 employees or 1 per floor
Record Management	· On-site storage for records · Shelving, min. interior finishes · Specialized floor loading, climate control	500-600 sf (46-56 sm)	1 per facility
Desirable areas if budget permits			
*Training/ Conference Center	· Sophisticated, flexible multi-purpose facility, A.V. capability · Moveable partitions, storage for materials and equipment, tables, chairs · Specialized HVAC, acoustics, lighting, audio-visual installation	minimum 750 sf for 1 room (24 persons at tables or 40 in rows)	1 per facility May share with another Agency
*Video Conferencing	· Facility to allow multi-party meetings at 2 or more locations, using visual, voice and data communications · Specific design of equipment & furniture available · Specialized HVAC, power, telecommunications, lighting, acoustics	600 sf 20' x 30' (56 sm)	1 per facility

*Indicates that a diagram of this space follows.

Guidelines for Specific Spaces

Diagrams and technical guidelines for common EPA spaces have been prepared, including individual descriptions of offices, workstations, shared support and Special Spaces. They are intended to be a reference when planning new spaces, by illustrating the basic requirements, important considerations and possible variations.

These diagrams are only guides and examples -- circumstances such as planning module, furniture system, equipment and occupant needs will determine final size and features.

The following are included:

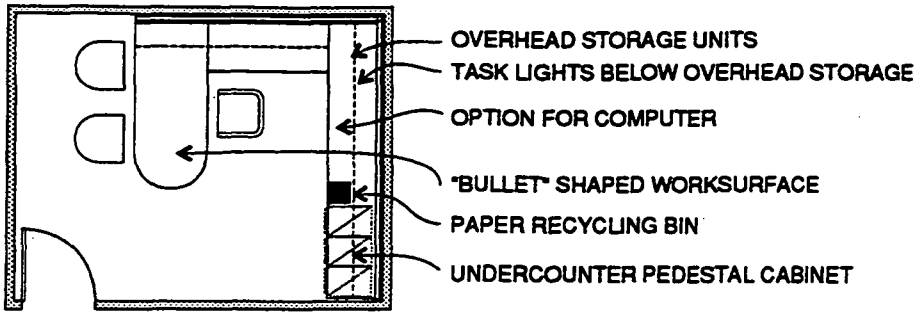
Personnel Spaces
- Office Types - Examples of A,B,C,D
- Office or Workstation E
- Workstation F
- Workstation G
- Workstation H

Support and Special Space
- Meeting/Conference Rooms
- Teleconferencing
- Projection Screens
- Training Center
- Copy Centers
- Computer Printer Room
- Location Area Network Room
- High Density File Storage
- Employee Lounge
- Reception
- Recycling Areas
- Library
- Public Information Center

Office Types - Examples

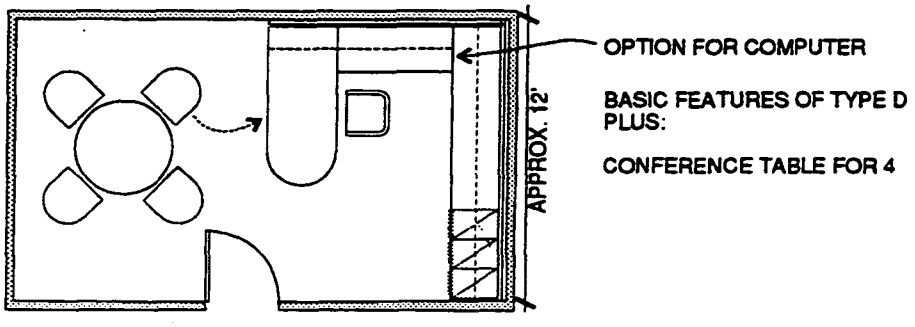
Type D:
150-180 Square Feet
(14-17 Square Meters)

Assignment:
Deputy Division Director
Branch Chief



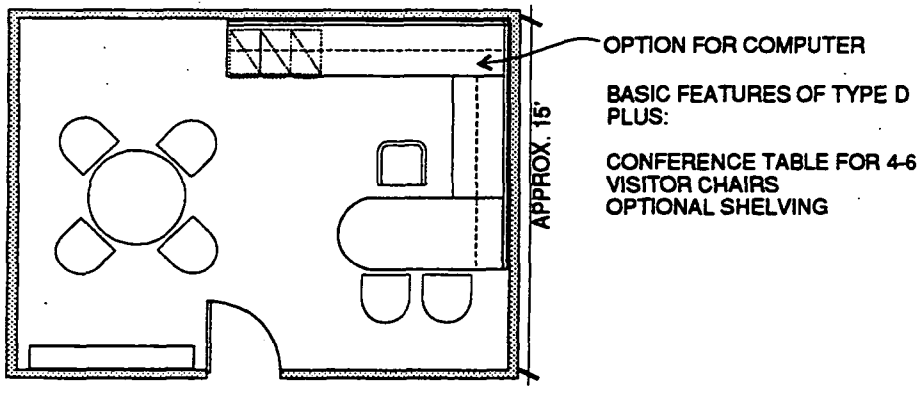
Type C:
225-250 Square Feet
(20-23 Square Meters)

Assignment:
Associate Regional Administrator
Division Director
General Counsel



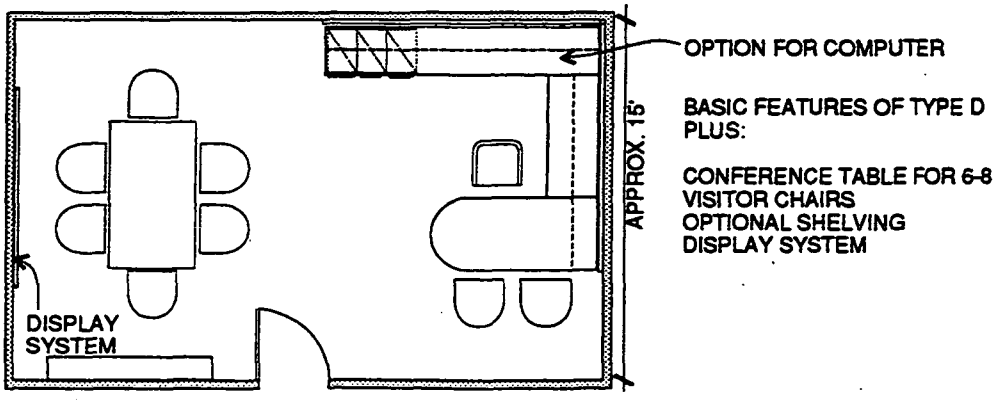
Type B:
275-300 Square Feet
(25-28 Square Meters)

Assignment:
Deputy Regional Administrator



Type A:
350-375 Square Feet
(32-35 Square Meters)

Assignment:
Regional Adminstrator



BASIC OFFICE GUIDELINES

Worksurface:
Approximately 15 linear feet (24"-30" deep is typical)

Storage:
Shelving at 12-20 linear feet
Undercounter pedestal cabinets and/or lateral files - minimum of 2 with options for drawer configuration and mobility.

Lighting:
Task lights and/or general lighting consistent with Green Lights Program.
Combination of task and ambient lighting.

Equipment:
Up to 3 elements.

OPTIONAL OFFICE FEATURES

-Additional storage - Shelves or undercounter pedestal.
-Additional worksurface and/or equipment; may reduce conference capacity.
-Drafting surface
-Glazed wall and/or door sections.
-Straight slide or articulated undercounter keyboard.
-Panel hung work organizers.
-Coat hooks
-Display system, electronic keyboard, or projection screen.

Note: Printers require slotted worksurface to accommodate paper feed.
Note: If loose furniture replaces systems furniture, the layout efficiency of the office may be reduced.

TECHNICAL GUIDELINES

Power:
Minimum of 3 duplex convenience electrical outlets (2 in Office Type D).
One isolated, grounded outlet for computer.
Power for task lighting as required.
Additional power requirements may be determined by program.

Lighting:
Task lighting to provide 50 footcandles at desk.
Overhead lighting at conference table.
Lights dimmable in Office Types A, B for audio-visual use.
Ambient lighting to provide 30 footcandles.

Data/Telecommunication:
Line quantity and need determined by program.

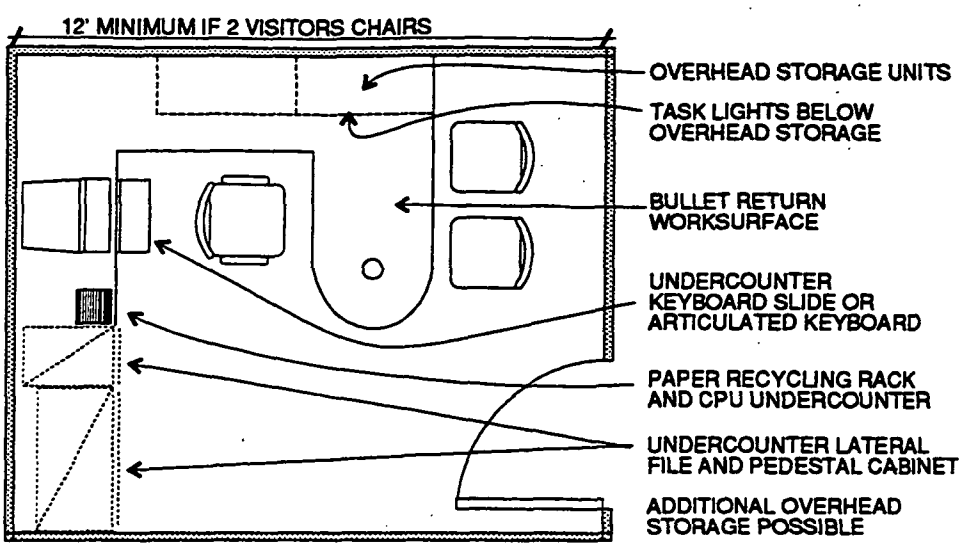
Acoustics:
The desired result is a sound transmission class rating of 24 and noise reduction coefficient of .80.

Worksurface for computers should be located 26 1/2" above finished floor. Offices with windows need daylight control method.

Office or Workstation E

Size:
100-120 Square Feet
(9-11 Square Meters)

Assignment:
Section Chief
Senior Legal



BASIC GUIDELINE

Worksurface:
Approximately 15 linear feet (24"-30" deep is typical) with a bullet return worksurface.

Storage:
Shelving at a minimum of 6 linear feet.
Undercounter pedestal cabinets and/or lateral files - minimum of 2 with multiple options for drawer configuration and for mobility.

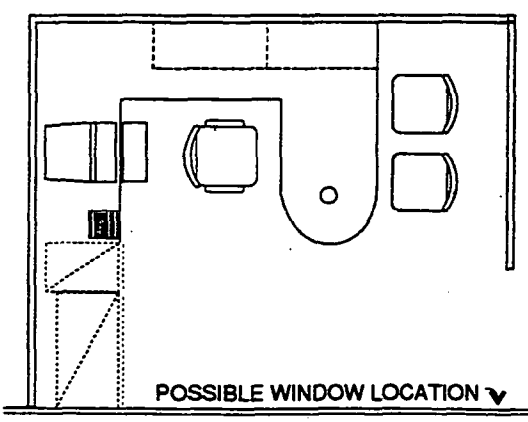
Lighting:
Task lights consistent with Green Lights Program

Seating:
1 adjustable ergonomic chair and 2 visitor chairs

Equipment:
Up to 3 elements.

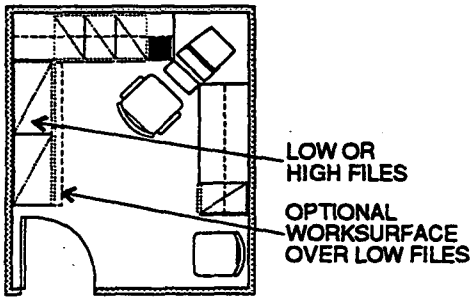
OPTIONAL FEATURES

Additional Storage: Shelves and/or pedestal cabinet
Additional filing and/or equipment (eliminate worksurface)
Drafting surface
Glazed panels
Straight slide or articulated undercounter keyboard
Panel hung organizers, coat hook, marker board
Adjustable task lamp or ambient light fixture

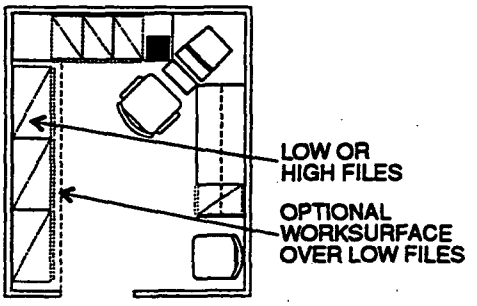


WORKSTATION:
Some Regions have provided Workstations for Section Chiefs intead of enclosed offices. Usually another amenity is included, such as a window, or prime location. Features remain the same.

VARIATIONS:



OFFICE WITH EXTRA
FILING AND/OR WORKSURFACE



WORKSTATION WITH EXTRA
FILING AND/OR WORKSURFACE

TECHNICAL GUIDELINES

Power:
Minimum of 2 duplex convenience electrical outlets. One isolated, grounded outlet for computer. Power for tasklighting as required. Additional power requirements may be determined by program.

Lighting:
Task lighting to provide 50 footcandles at desk, 30 footcandles ambient.

Data/Telecommunication:
Line quantity and need determined by program.

Worksurface for Computers:
Should accommodate the keyboard at a height of approximately 27" above finished floor.

HINTS FOR GOOD DESIGN

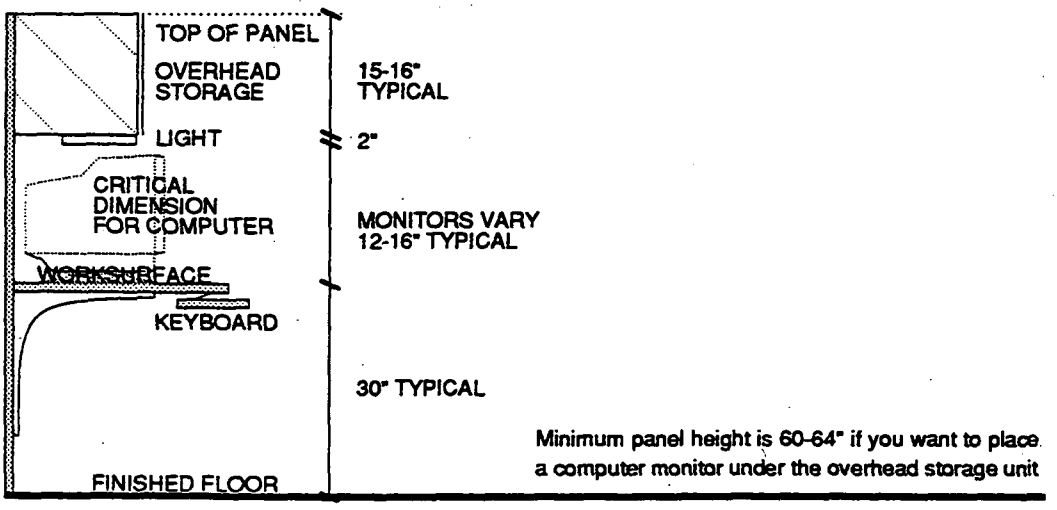
-Some furniture systems have floor-to-ceiling moveable walls with doors.

-Use the advantages of open plan layout, and reduce visual chaos, by grouping walled office together. Locate them on the interior, not along the windows.

-Dimensions will vary with the furniture system and the building module - Bay size, building depth, window modules.

-If panels are used, coordinate their height with height and size of shelving/cabinets, when a computer is to be placed beneath.

PANEL HEIGHT & COMPUTERS:

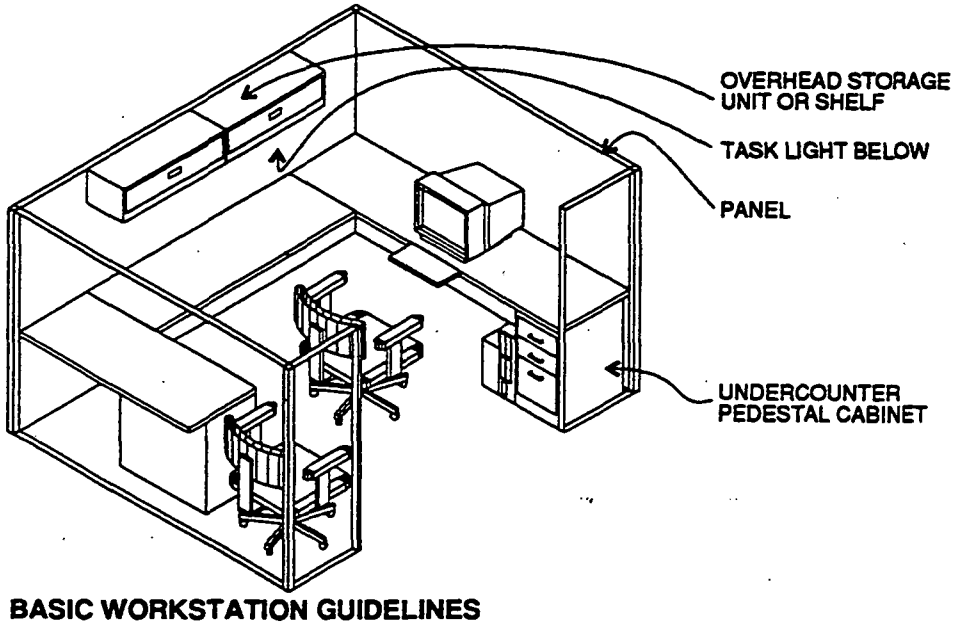


Minimum panel height is 60-64" if you want to place a computer monitor under the overhead storage unit

Workstation F

Size:
75-80 Square Feet
(7-7.5 Square Meters)

Assignment:
Senior Professional



BASIC WORKSTATION GUIDELINES

Worksurface:
Approximately 14 linear feet (24"-30" deep is typical)

Storage:
Shelving at a minimum of 6 linear feet
Undercounter pedestal cabinets and/or lateral files - minimum of 2, with multiple options for drawer configuration and for mobility.

Lighting:
Task lights consistent with Green Lights Program

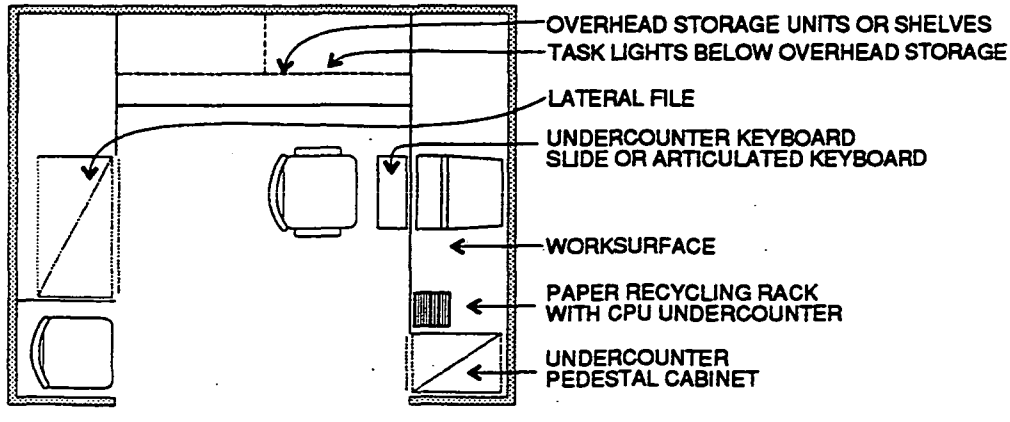
Seating:
1 adjustable ergonomic chair and 1 visitor chair

Equipment:
Up to 3 elements

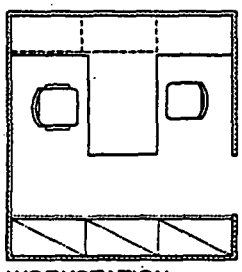
OPTIONAL WORKSTATION FEATURES

Additional storage - Shelves and/or pedestal cabinet.
Additional filing and/or equipment (eliminate worksurface)
Drafting surface
Glazed panels
Straight slide or articulated undercounter keyboard
Panel-hung work organizers, coat hook
Marker board
Adjustable task lamp

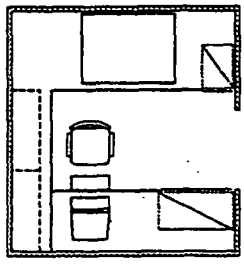
Note: Printers require slotted worksurface to accommodate paper feed. placed beneath.



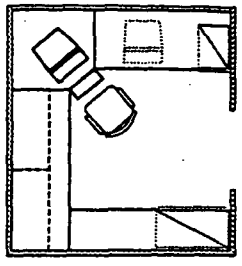
VARIATIONS:



WORKSTATION
FOR INTERVIEWING



WORKSTATION
FOR DRAFTING



WORKSTATION FOR
HIGH TECHNOLOGY USE

TECHNICAL GUIDELINES

Power:
Minimum of 2 duplex convenience electrical outlets. One isolated, grounded outlet for computer. Power for task lighting as required. Additional power requirements may be determined by program.

Lighting:
Task lighting to provide 50 footcandles at desk, 30 footcandles ambient.

Data/Telecommunication:
Line quantity and need determined by program.

Acoustics:
Panels' acoustical features determined as part of an office-wide acoustical strategy. The desired result is a sound transmission class rating of 24 and noise reduction coefficient of .80.

Worksurface for Computers:
Should accommodate the keyboard at a height of approximately 27 inches above the finished floor.

HINTS FOR GOOD DESIGN

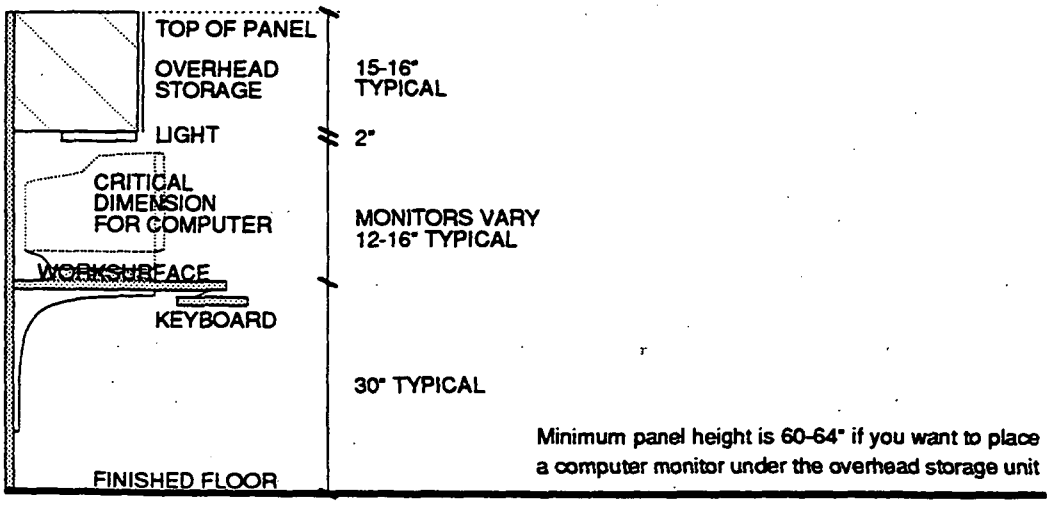
-Panel heights will vary with design, for visual variety, function, natural light.

-Reduce visual chaos by considering grouped workstations as a whole; especially coordinate components/shelving that occur above the worksurface.

-Dimensions will vary with the furniture system and the building module - Bay size, building depth, window modules.

-Coordinate panel height with height and size of shelving/cabinet, if computer is to be placed beneath.

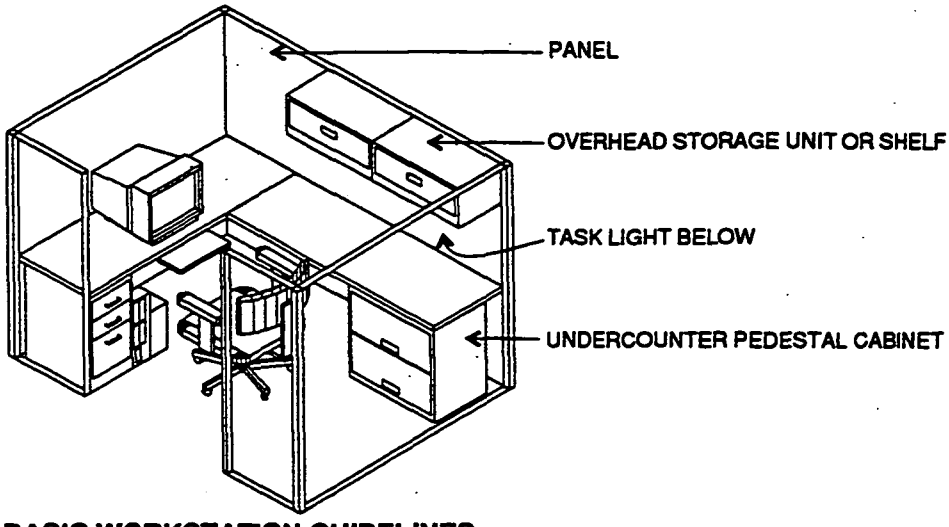
PANEL HEIGHT & COMPUTERS:



Workstation G

Size:
60-65 Square Feet
(5.5-6 Square Meters)

Assignment:
Senior Professional
Professional
Senior Clerical
Contractor



BASIC WORKSTATION GUIDELINES

Worksurface:
Approximately 11 linear feet (24"-30" deep is typical)

Storage:
Shelving at a minimum of 5 linear feet.
Undercounter pedestal cabinets and/or lateral files - minimum of 2, with multiple options for drawer configuration and for mobility.

Lighting:
Task lights consistent with Green Lights Program.

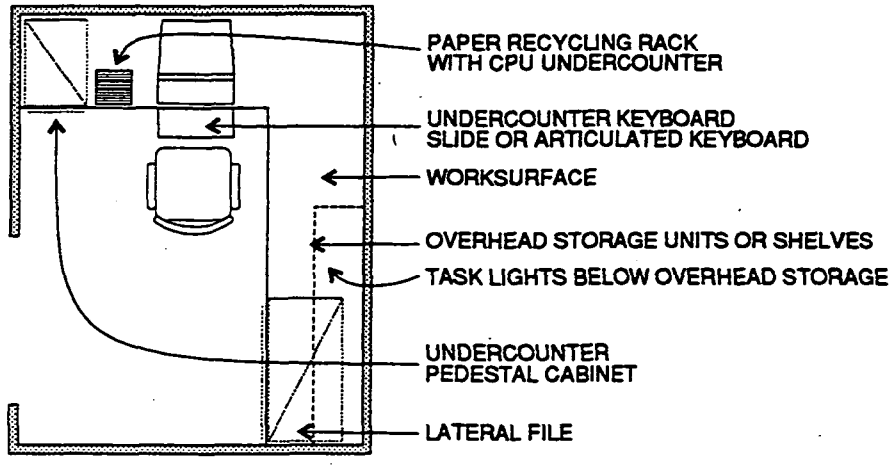
Seating:
1 adjustable ergonomic chair

Equipment:
Up to 2 elements

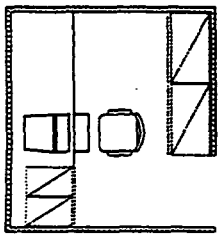
OPTIONAL WORKSTATION FEATURES

Additional storage - Shelves and/or pedestal cabinet.
Additional filing and/or visitor chair (eliminate worksurface)
Drafting surface
Glazed panels
Straight slide or articulated undercounter keyboard
Panel-hung work organizers, coat hook
Marker board
Adjustable task lamp

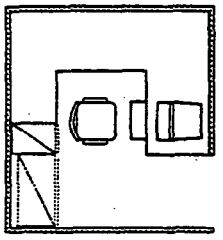
Note: Printers require slotted worksurface to accommodate paper feed placed beneath.



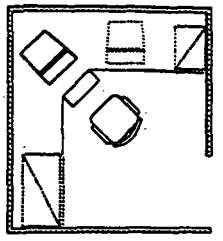
VARIATIONS:



WORKSTATION WITH ENCLOSURE/FILES



WORKSTATION WITH WRAP-AROUND WORKSURFACE



WORKSTATION FOR HIGH TECHNOLOGY USES

TECHNICAL GUIDELINES

Power:
Minimum of 2 duplex convenience electrical outlets. One isolated, grounded outlet for computer. Power for tasklighting as required. Additional power requirements may be determined by program.

Lighting:
Task lighting to provide 50 footcandles at desk, 30 footcandles ambient.

Data/Telecommunication:
Line quantity and need determined by program.

Acoustics:
Panels' acoustical features determined as part of an office-wide acoustical strategy. The desired result is a sound transmission class rating of 24 and noise reduction coefficient of .80.

Worksurface for Computers:
Should accommdate the keyboard at a height of approximately 27" above finsihed floor.

HINTS FOR GOOD DESIGN

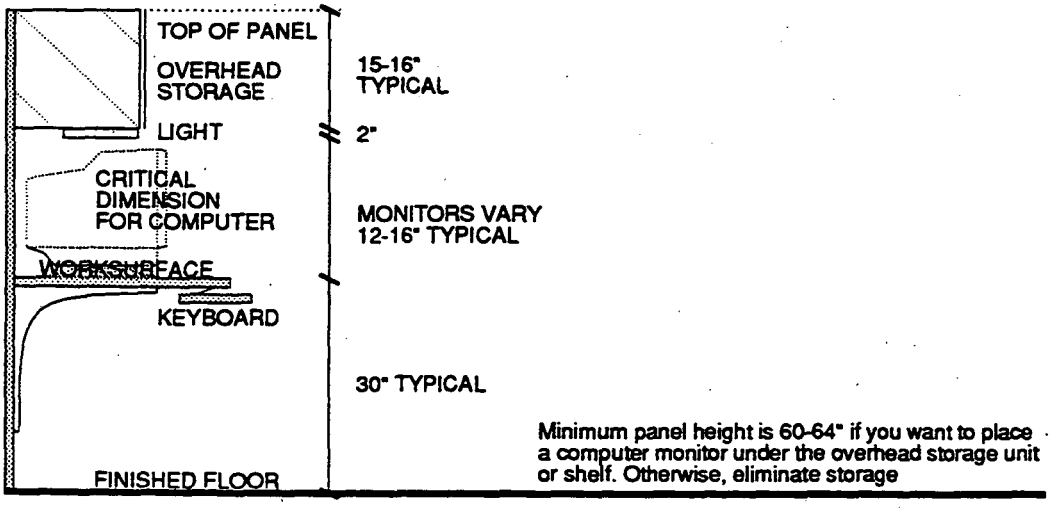
-Panel heights will vary with design, for visual variety, function, natural light.

-Reduce visual chaos by considering grouped workstations as a whole; especially coordinate components/shelving that occur above the worksurface.

-Dimensions will vary with the furniture system and the building module - Bay size, building depth, window modules.

-Coordinate panel height with height and size of shelving/cabinet, if computer is to be placed beneath.(See below).

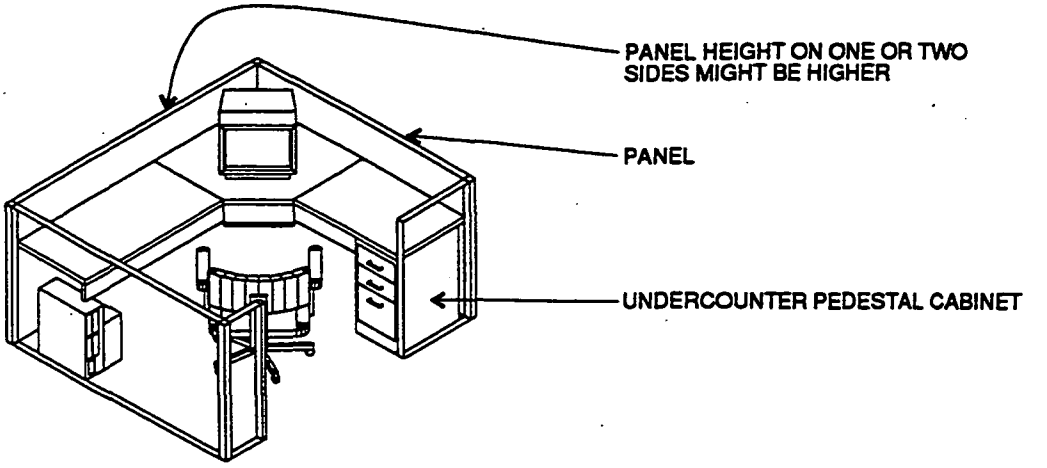
PANEL HEIGHT & COMPUTERS:



Workstation H

Size:
40-50 Square Feet
(4-4.5 Square Meters)

Assignment:
Clerical
Contractor
AARP, SIS



BASIC GUIDELINE

Worksurface:
Approximately 9 linear feet (24"-30" deep is typical).

Storage:
Shelving is optional (panel height may be low). Undercounter pedestal cabinets - minimum of 1 with multiple options for drawer configuration and for mobility.

Lighting:
Task lights consistent with Green Lights Program.

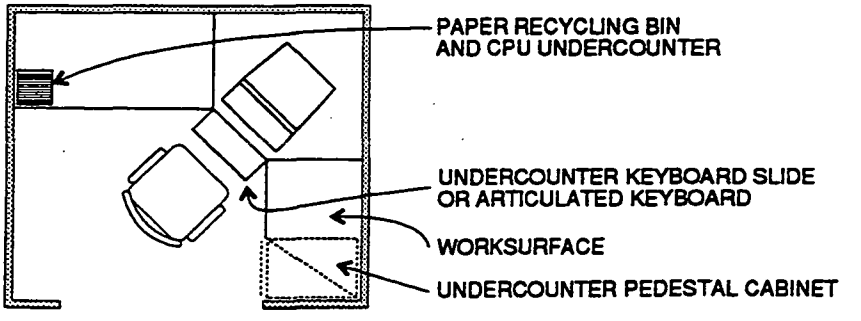
Seating:
1 adjustable ergonomic chair.

Equipment:
Up to 2 elements.

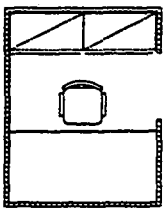
OPTIONAL WORKSTATION FEATURES

Additional Storage: Shelves and/or pedestal cabinet;
Additional filing and/or worksurface
Glazed panels
Straight slide or articulated undercounter keyboard
Panel hung organizers, coat hook
Marker board
Adjustable task lamp or ambient light fixture

Note: Printers require slotted worksurface to accommodate paper feed placed beneath.



VARIATION:



WORKSTATION
FOR FILING/SORTING

TECHNICAL GUIDELINES

Power:
Minimum of 2 duplex convenience electrical outlets. One isolated, grounded outlet for computer. Power for task lighting as required. Additional power requirements may be determined by program.

Lighting:
Task Lighting to provide 50 footcandles at desk, 30 footcandles ambient.

Data/Telecommunication:
Line quantity and need determined by program.

Acoustics:
Panels' acoustical features determined as part of an office-wide acoustical strategy. The desired result is a sound transmission class rating of 24 and noise reduction coefficient of .80.

Worksurface for Computers:
Should accommodate the keyboard at a height of approximately 27 inches above the finished floor.

HINTS FOR GOOD DESIGN

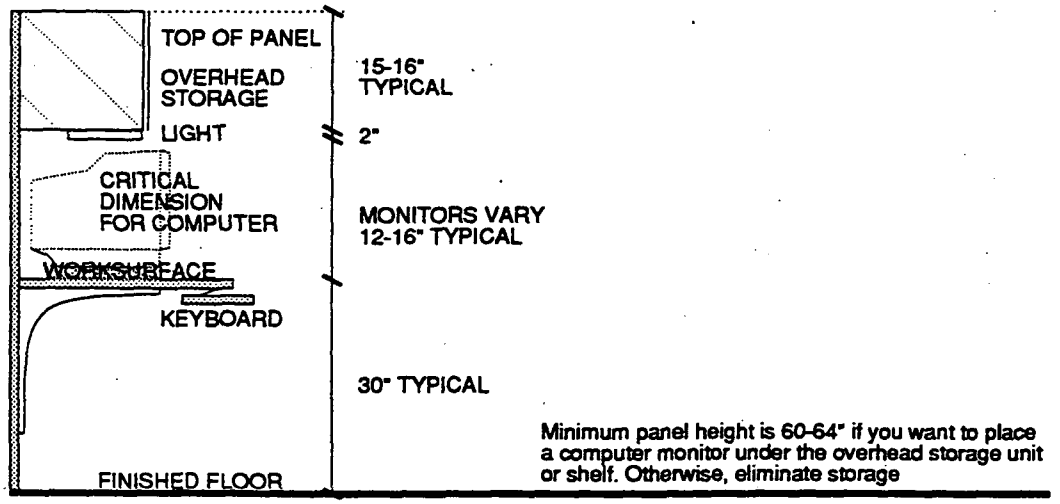
-Panel heights will vary with design, for visual variety, function, natural light.

-Reduce visual chaos by considering grouped workstation as a whole;especially coordinate components/shelving that occur above the work surface.

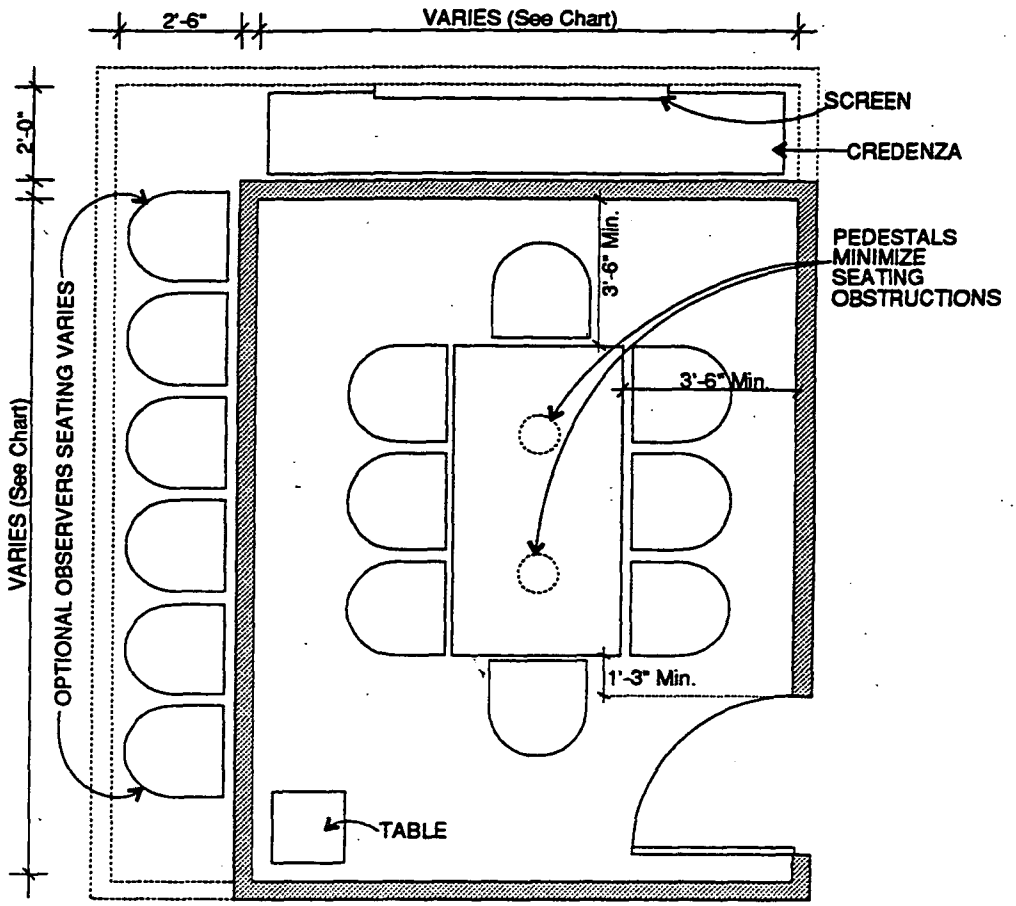
-Dimensions will vary with the furniture system and the building module - Bay size, building depth, window modules.

-Coordinate panel height with height & size of shelving/cabinet, if computer is to be placed beneath.

PANEL HEIGHT & COMPUTERS:



Meeting/Conference Rooms



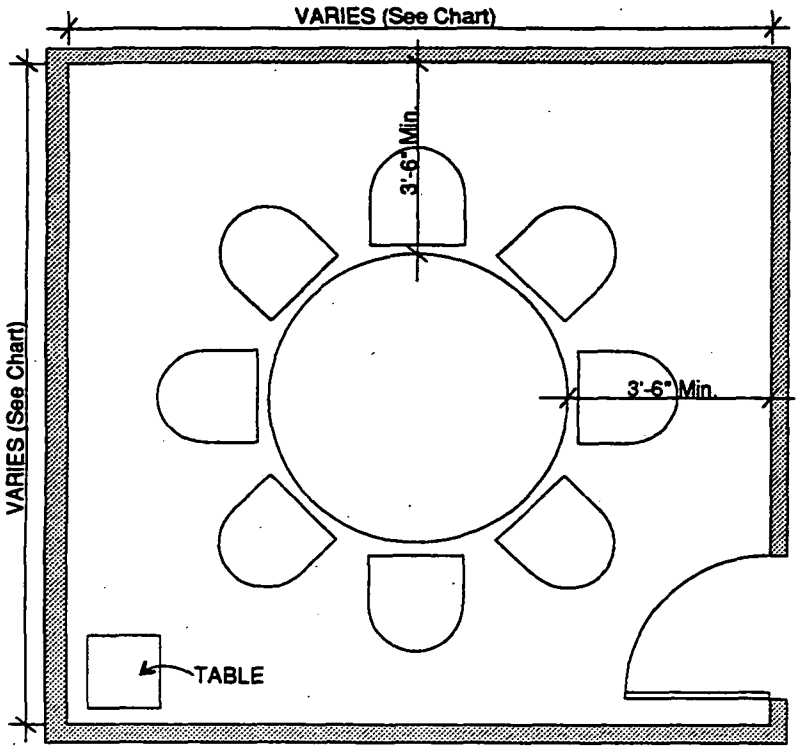
CONSIDER WHEN PLANNING

Meeting Rooms, in this context, are standard rooms for meetings of 6-20 people. Consider the number of users and plan for pinup surface on one wall minimum. A pull-down slide screen is an option.

Conference rooms are Special Spaces, requiring specialized HVAC, power, and/or lighting. Plan for audio-visual capability and pinup surface, and consider the need for spectator seats, storage, coat closets nearby, or night time access. These rooms are generally for 16+ people.

MINIMUM MEETING ROOM SIZES

Number of Users	*Rectangular Table*		*Round Table*		*For Credenza*
	Room Size	Table Size	Room Size	Table Size	
6	120 - 140 nsf	2'-6" x 5'-6"	130 - 150 nsf	54"	Add 20 nsf
8	150 - 170 nsf	3'-0" x 7'-0"	170 - 200 nsf	72"	Add 20 nsf
10	160 - 180 nsf	3'-6" x 8'-0"	200 - 225 nsf	84"	Add 25 nsf
12	200 - 225 nsf	4'-0" x 11'-0"	225 - 260 nsf	96"	Add 25 nsf
16	240 - 275 nsf	4'-6" x 14'-0"	Not Recommended		Add 30 nsf
30	Special				



TECHNICAL GUIDELINES

Power:
One general purpose duplex receptacle for every 25 linear feet of perimeter wall. Additional power requirements may be determined by program.

Lighting:
General illumination by fluorescent fixtures that utilize High Color Rendition (parabolic lens fixtures recommended). Supplemental illumination: fluorescent directional fixtures (e.g. track lighting or wall washers) along one wall used for display (minimum). Conference rooms with audio-visual capabilities to have recessed incandescent light fixtures, controlled by dimmer switches (100 watt PAR type lamps recommended).

Telecommunication:
Need determined by program.

Acoustic:
Sound transmission properties of the enclosure should have an acceptable (STC) rating. The room enclosure elements should have an acceptable sound absorption (NRC) rating.

HVAC:
Minimum of 8 air changes per hour for odor-free air and good ventilation. Sound attenuation for diffusers.

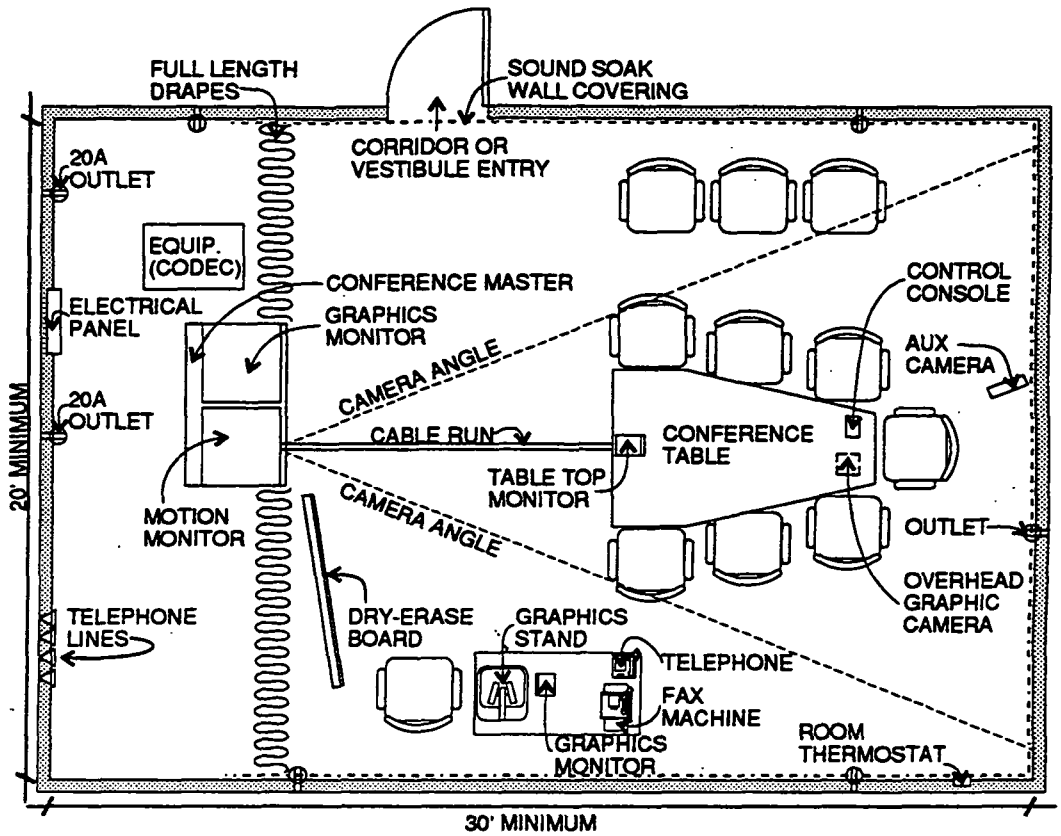
Audio-Visual: Meeting Rooms
On one wall provide tackable wall surface or tack board, and chart rail. Projection screens, when present, to be recessed in ceiling or otherwise concealed when not in use (See separate page on projection screens).

Audio-Visual: Conference Rooms
Specifically designed to program needs. May have special electrical requirements, video outlet, sound system or other capabilities.

Recommended Finishes:
Carpeted floors, vinyl wall covering or acoustical wall panels, chair rail, acoustical ceiling.

Video-Conferencing

Size:
600 Square Feet
(56 Square Meters)



TECHNICAL NOTES

Given the sophisticated level of this room's communications technology and equipment, it is advisable for the designer to collaborate with qualified engineering, code and communication consultants who are experienced in video teleconferencing design and construction.

Acoustical and lighting designs are the most critical elements for a successful video teleconferencing facility.

Ceiling recommended 8'-0" above finished floor.

Using this room for non-video meetings may not be practical because of room security and schedule considerations. Sharing a teleconferencing facility with other government agencies may be possible.

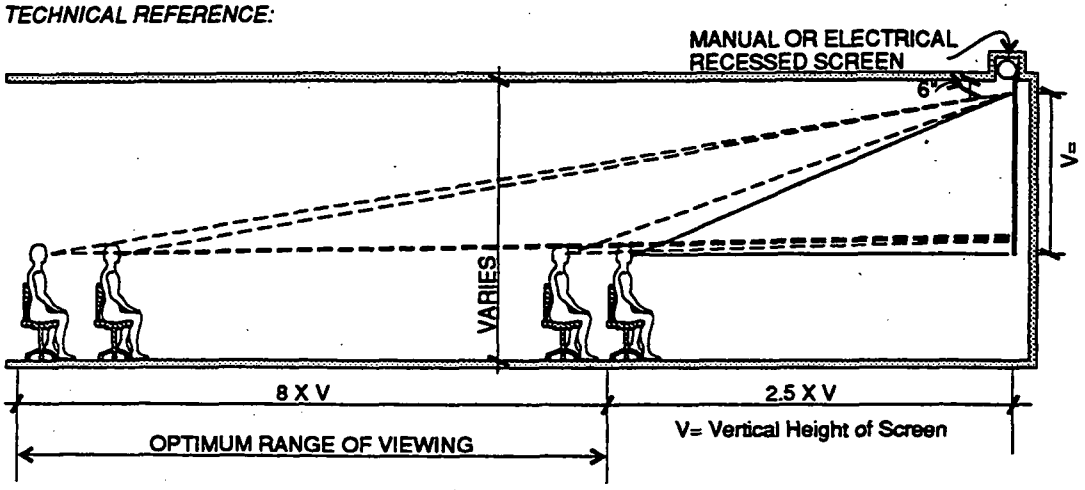
SOURCE

More information and established guidelines are available in the EPA document:
FTS-2000 Switched Digital Video
General Guidelines for EPA Video Teleconferencing Facilities

This document, as well as assistance and technical support, is available from the Architectural Planning and Management Branch, National Data Processing Division, EPA Research Triangle Park.

Projection Screens

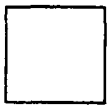
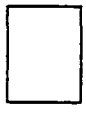
TECHNICAL REFERENCE:



The size of the Projection Screen depends on the height of the wall to which it is attached. The chart below provides a rough guideline to the relationship between screen size, room size & configuration, and the seating capacity of the room.

SCREEN SIZE REQUIRED BY ROOM SIZE:

Room Ratio:


Length:Width — *1:1* — *4:3* — *3:2*

Minimum Vertical Screen Size (Inches)	ROOM SIZE (Feet)	SEATING CAPACITY	ROOM SIZE (Feet)	SEATING CAPACITY	ROOM SIZE (Feet)	SEATING CAPACITY
40"	20 X 20	21	20 X 15	16	20 X 13	10
50"	24 X 24	33	24 X 18	26	24 X 16	23
60"	30 X 30	57	30 X 22	47	30 X 20	41
70"	36 X 36	82	35 X 26	69	35 X 23	48

SCREEN SIZE REQUIRED BY PROJECTION EQUIPMENT:

To determine screen size required by different types of projection equipment, use the following formula (All dimensions are in inches).

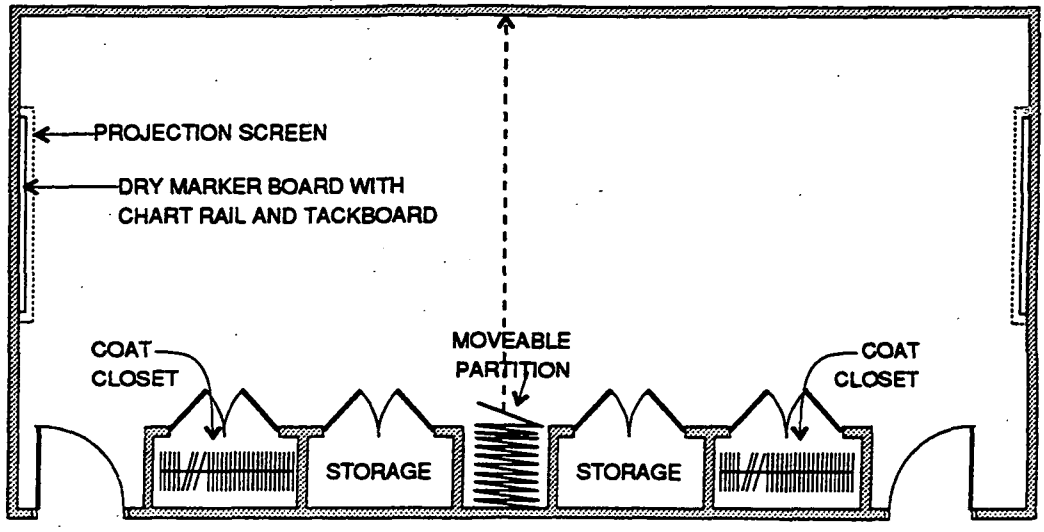
$$\text{Screen Width} = \frac{\text{Aperture width X Projection distance}}{\text{Lens focal length}}$$

	Aperture Width (Inches)	Lens Focal Length (Inches)
8MM Movie	0.172	1
Super 8MM Movie	0.210	1
16MM Movie	0.380	2
35MM Slide	1.35	4-5
Filmstrip	0.885	3

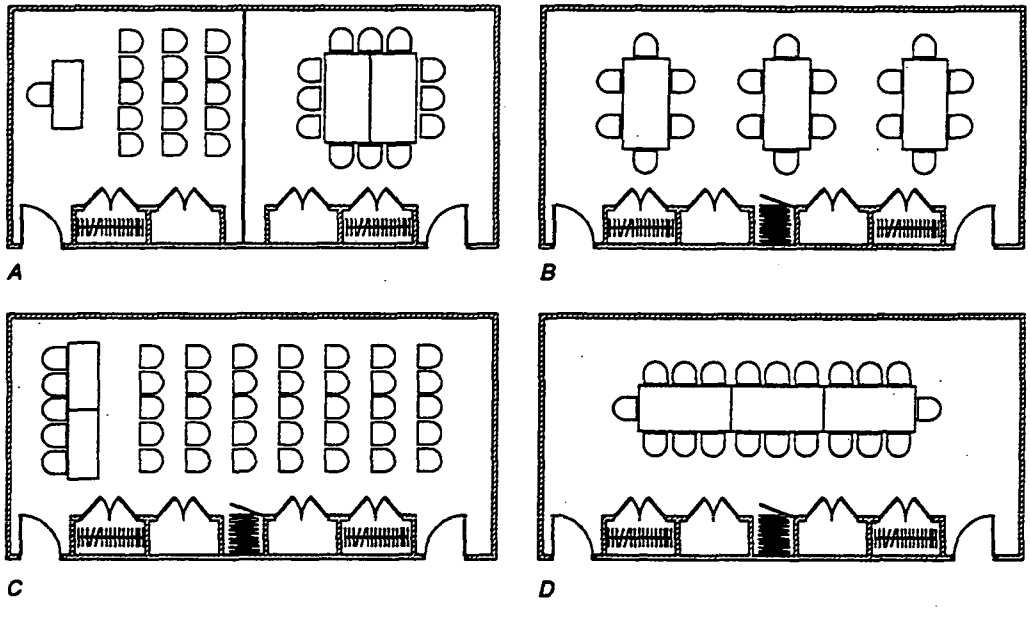
Training Center

Size:
Example shown is
750 Square Feet
(70 Square Meters)

TYPICAL SMALL TRAINING ROOM



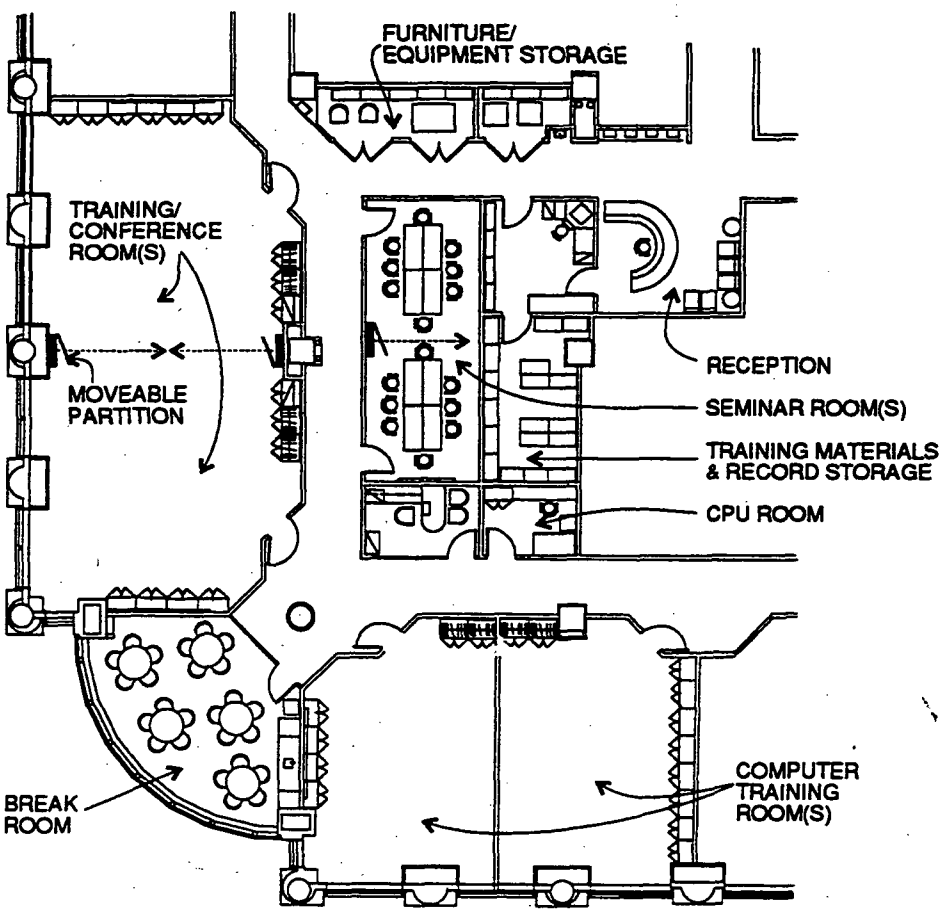
CONFIGURATION OPTIONS



CONSIDER WHEN PLANNING

Training rooms should be designed to be flexible. The configuration of the spaces will depend on the specific program requirements. The use of a sound insulated moveable wall partition will allow for added flexibility of the space. Storage spaces for coats, equipment and furniture (i.e. chairs and tables) should be provided.

EXAMPLE OF TRAINING/CONFERENCE FACILITY:



TECHNICAL GUIDELINES

Power:
Provide general purpose duplex receptacles, one every 25 linear feet on the perimeter wall. Provide 2 semi-dedicated outlets for every 100 square feet of gross area. Connect the semi-dedicated outlets to emergency power supply needs for computer or technical training rooms determined by program.

Lighting:
Standard fluorescent fixtures utilizing high color rendition lamps. Compact florescent task lighting should be used to increase foot candle levels where necessary. Dimmable down lights and/or wall fixtures. Install occupancy sensors.

Telecommunication:
To be determined by program requirement.

Acoustic:
Sound transmission properties of the enclosure-walls, ceilings and floors should have acceptable (STC) rating. The room enclosure elements shall have acceptable sound absorption (NRC) rating, in order to control sound reflection/reverberation. Operable walls to be sound insulated and sound sealed.

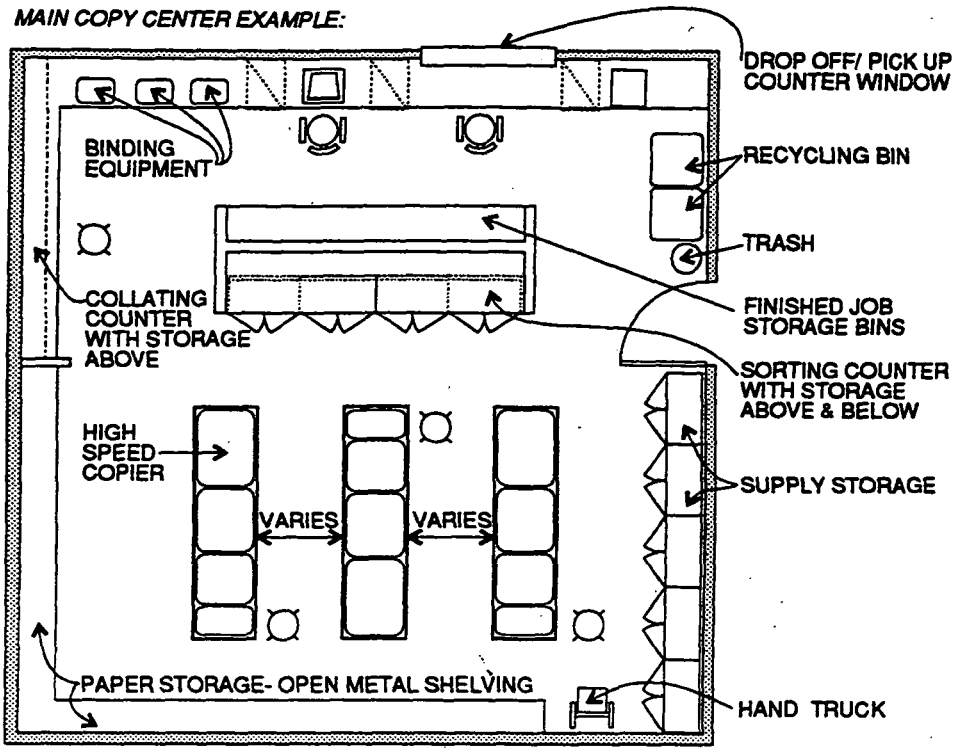
HVAC:
Minimum of 8 air changes per hour for odor free air and good ventilation. Separate control for each training room recommended. Sound attenuation for diffusers.

Audio-Visual:
To be determined by program requirement

Copy Centers

MAIN COPY CENTER EXAMPLE:

Size:
Varies. Example shown is 750 Square Feet. (70 Square Meters)



CONSIDER WHEN PLANNING

The specific size of either Center would depend on the equipment chosen and the number of copiers. The Main Center example is based on three high speed copiers. Typical maintenance and ventilation clearances are shown.

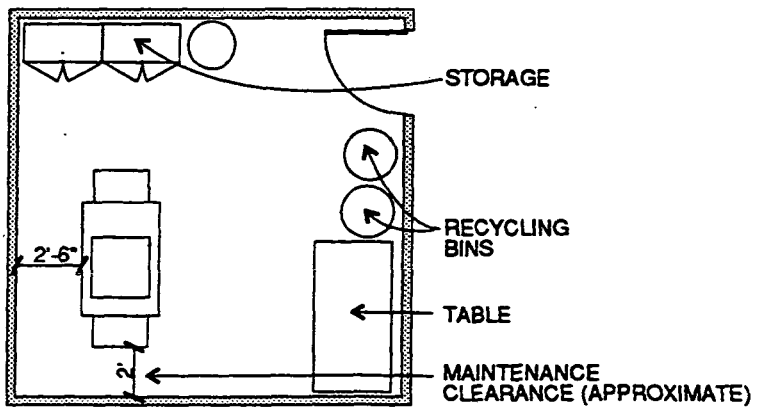
The locations of either should consider the noise generated.

The Main Copy Center would receive shipments of paper and would send out boxed printed material-locate with easy access to building's service elevators.

The Satellite Centers would be located on office floors - locate convenient to users and near the core where it would be easy to accommodate HVAC requirements.

SATELLITE CENTER EXAMPLE:

Size:
200-225 Square Feet (19-20 Square Meters)



TECHNICAL GUIDELINES

Power:
One general purpose duplex receptacle for every 25 linear feet of perimeter wall. One dedicated electrical outlet for every high speed copier. Additional power or telecommunication requirements may be determined by program.

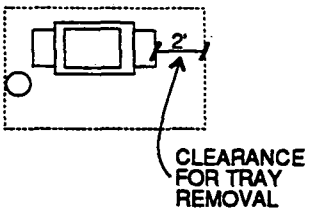
Lighting:
General illumination by fluorescent fixtures that utilize high color rendition lamps (approximately 50 footcandles). Where necessary, task lighting should be used to increase foot candle levels, at Main Center work areas. Install occupancy sensors.

Acoustic:
Sound transmission properties of the enclosure (walls, ceiling, and floor) should have acceptable STC rating. Enclosure elements should have acceptable sound absorption (NRC) rating in order to control sound reflection/reverberation.

HVAC:
Special HVAC design for ventilation and temperature control. Copiers using ammonia or wet toners exhausted directly to the outside.

CONVENIENCE COPIERS

The use of small convenience copiers located in the open work areas is discouraged. Although handy, the copier's exhaust affects indoor air quality, and the machine is better located in a ventilated room. A small copier might be located in a room that also contains computer printers.

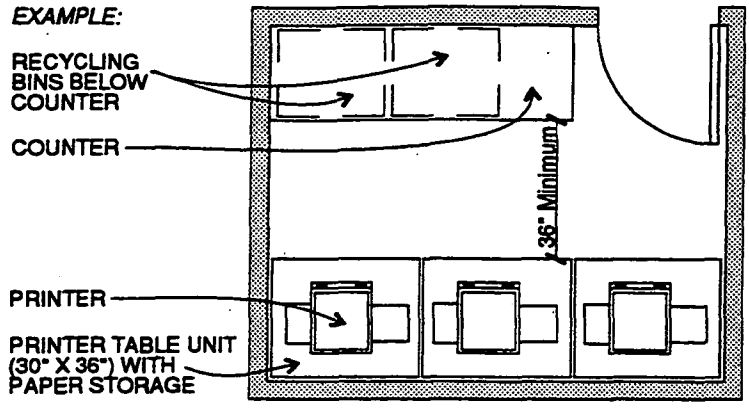


Convenience Copier

Size:
Approximately 40 Square Feet
(3.5 Square Meters)

Computer Printer Room

Size:
70 Square Feet
(6.5 Square Meters)
For up to 3 printers.



CONSIDER WHEN PLANNING

Actual size of the printer room is dependent upon the quantity and sizes of the printers. For planning purposes the minimum size of a room should be 70 square feet for 3 printer units, with 24-30 square feet for each additional 2 units.

Proximity:
The number of computer printer rooms per floor should be determined by the convenience to all the users, rather than by square footage. Therefore, a maximum walking distance for the user is recommended to be 75 feet.

Noise Generation:
Locate away from areas requiring low noise level.

If a small convenience copier is required by a nearby Section, it could be located in a room with computer printers (size adjusted).

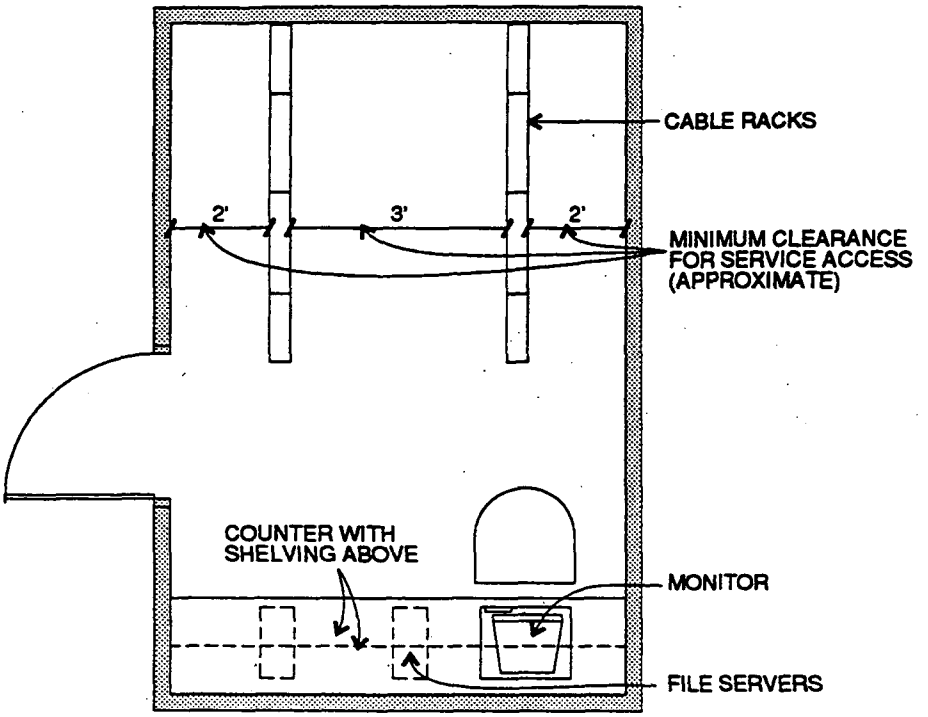
TECHNICAL GUIDELINES

Power and Telecommunications:
Requirements to be determined by program.

Acoustic:
Sound transmission properties of the enclosure (walls, ceiling and floor) shall have an acceptable STC rating.

HVAC:
Special ventilation and exhaust for Indoor Air Quality (IAQ).

Local Area Network (LAN) Room



Size:
Varies with equipment.

CONSIDER WHEN PLANNING

Actual size of LAN room is dependent on the number of computers that the network serves and the actual equipment required. For planning purposes 80-100 square feet serves 100 computers.

Secured Access is important.

Rooms should be stacked floor-to-floor and centrally located. It should be in close proximity to the telecommunications room to minimize cable distribution runs.

TECHNICAL GUIDELINES

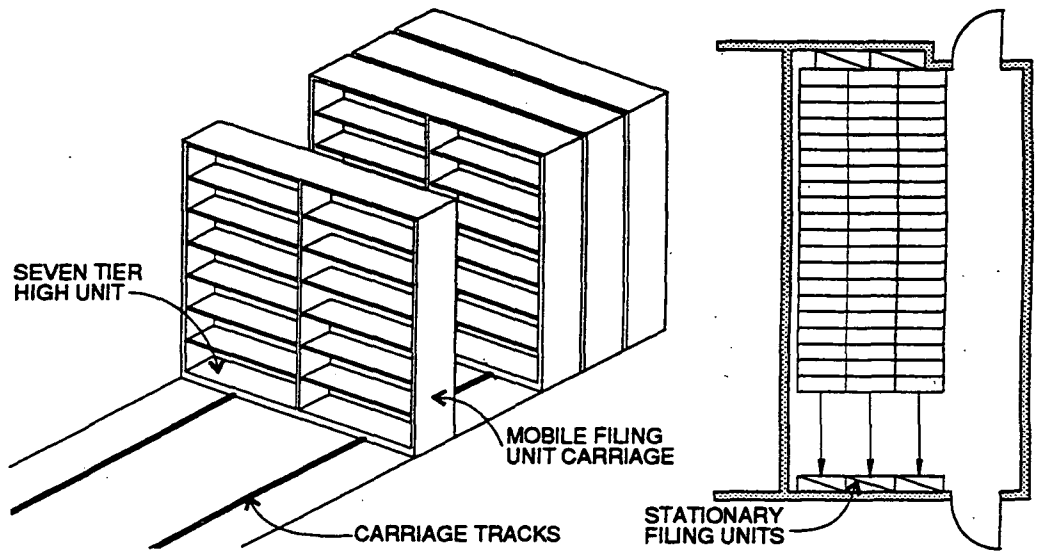
Power:
2 duplex outlets per circuit distributed at one (1) per 20 square feet of closet space, mounted 18" above finished floor, typical. Actual requirements depend upon the equipment served.

Lighting:
Fluorescent fixtures, for an illumination level of 80 footcandles.

HVAC:
For rooms with heat sensitive equipment only: temperature range 65-85 F, relative humidity 20-60%. Air Conditioning unit which functions 24 hours per day, 7 days per week to handle BTU's generated by equipment. Air circulation via air transfer grills and/or vented door.

High Density File Storage

The need to secure and consolidate files in order to use them more efficiently and save expensive floor space drives the decision to select "high density" filing systems for office areas. High density mobile file systems, usually comprised of 7 or 8 tier units, are standard selections for maximizing space efficiencies. High density (HD) systems have racks of files that move along rails, taking advantage of vertical space and eliminating aisles. As an example, a 4-drawer 36" lateral file has 144" of filing space; a 7 tier 36" high density file of equal depth has 252" of filing space. Depending on the configuration, height and specific features, an HD system can store 2 to 3



CONSIDER WHEN PLANNING

Floor loading. The most important design consideration regarding high density files is the greatly increased live loads these systems place on floor slabs. The accepted engineering floor slab live load standard for a library is 150 pounds per square foot, whereas a 7 high density file tier system creates a live load range between 175 and 200 lbs. per square foot. To reinforce for a high density storage system in new construction adds little to the cost of the system or the project. The need however, to reinforce an existing building's floor slab to meet high density file loading requirements adds to the file system's cost. There are two options for reinforcement:

1. Below the floor slab (more expensive).
2. Above the floor (raises the floor; necessary to consider access for disabled and overall height).

Program storage needs versus the space available - and the system and installation cost balanced against the rent change (less space, but higher rent per square foot).

Configuration and capacity. Files come 6, 7, or 8 tiers high in a variety of arrangements, with storage options for files, books, computer tapes or other records.

Use of a system with manual or mechanically assisted handwheel or electric drive (larger/deeper installations require electric).

Possibility for future expansion.

Selection of a specific system should consider: the structural rails (profile, number, lengths); the file carriage (load rating, profile and dimensions); systems controls and guidance; safety features; delivery time, ease of installation and service.

Security - systems can have their own security or be located in a locked room.

TECHNICAL GUIDELINES

Power:
If using an electrical system, plan for one dedicated 120 volt, 10 amp power junction to be located above stationary unit for each electrified run of storage units. If using an electric or mechanical system within its own room, provide one general purpose duplex receptacle for every 25 linear feet of accessible perimeter wall.

Lighting:
General illumination by fluorescent fixtures that use high color rendition lamps (parabolic lens recommended). Install occupancy sensors.

Safety:
Safety floor, to prevent the carriage from moving while someone is in the aisle; Anti-tip protection; determine seismic requirements; other requirements as determined for system chosen.

HINTS FOR GOOD DESIGN

-Side tabs save space over files with top tabs and are easier to retrieve. An HD filing system with top-tabbed files requires a 12" O.C. shelving space, whereas side-tabbed file shelves require only 10 1/2" O.C. Thus an extra 10 1/2" side-tabbed file shelf can be obtained in a standard 7-tier, 12" O.C. file. (7 x 12"=84"; 8 x 10 1/2"=84"). A file with side-tabbed folders on a top shelf at 6'-5" above the finished floor is easily accessible to a 5'-5" tall person (six 12" O.C. shelves with a 5" carriage base equals 6'-5").

-Floor level - when a mobile HD file system is installed, a 5/8" fire resistant plywood subfloor is generally laid by the file manufacturer so the client's finish flooring material can level out at the top of the carriage track, which leaves +/- 3/8" between the bottom of the file carriage and the top of the finished floor.

-Standard units of measure for comparing storage capacity is "filing inches".

-For safety reasons, do not top load the filing racks; make sure employees do not leave loose material on top of the system.

MECHANIZED VERTICAL FILES (e.g. *LEKTRIEVER®*).

Another high density file option is the automated vertical file - a self contained cabinet with vertical rotating shelves of files and a work counter.

Example is the *LEKTRIEVER* ® brand. Standard unit requires approximately 80 square feet for unit and seating.

Capacity of units varies with the model and the media stored.

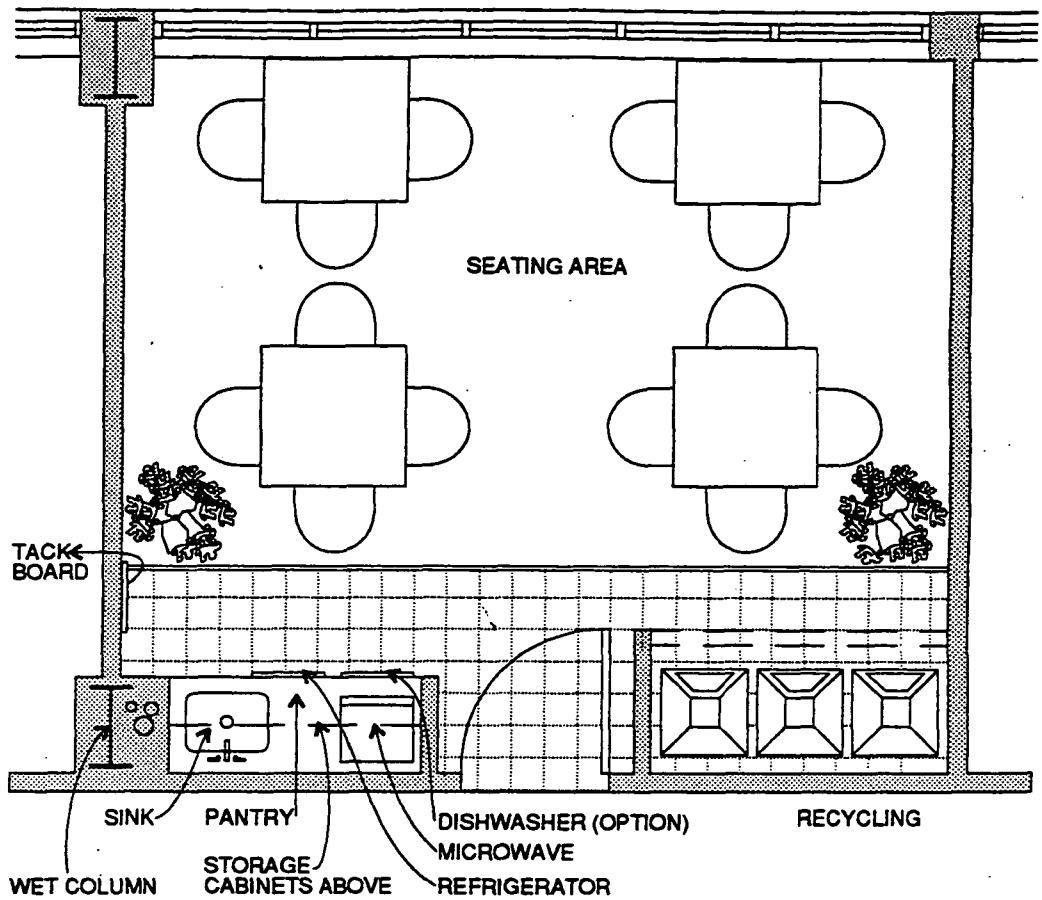
Floor loading capacity must be determined.

Dedicated power circuit required.

Employee Lounge

LOUNGE WITH PANTRY & RECYCLING

Size:
250 Square Feet
(23 Square Meters)



CONSIDER WHEN PLANNING

Should be strategically located for access by employees.
Requires specialized HVAC and plumbing.
Recycling Area
Vending Area (Optional) Add 60-80 square feet.
Review and meet ADA requirements

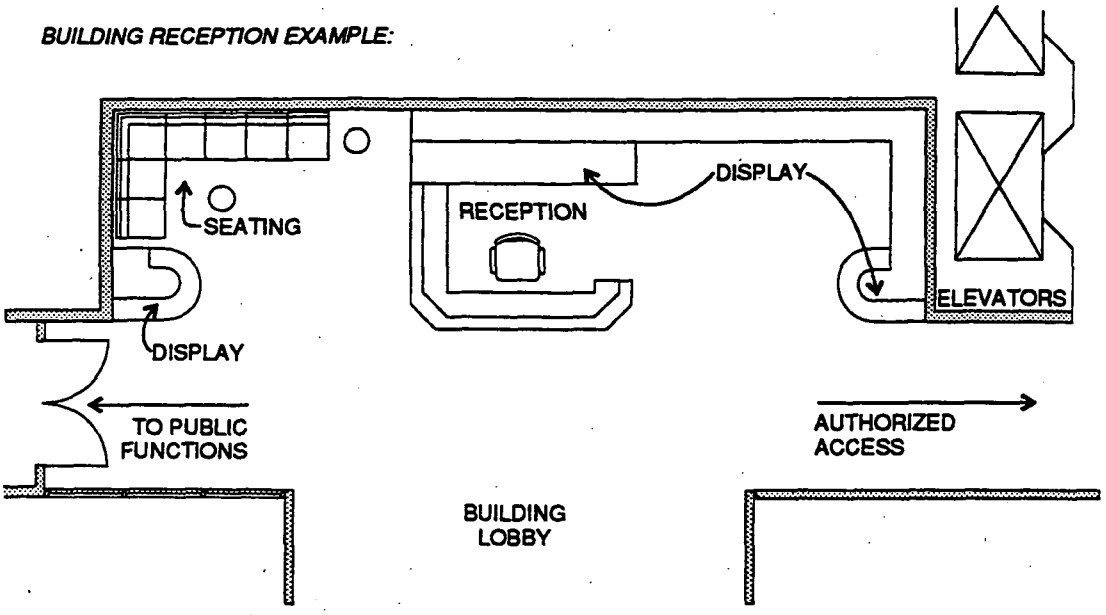
TECHNICAL GUIDELINES

Power:
Pantry area should be equipped with one dedicated outlet for each appliance. i.e. Refrigerator, Microwave, Coffee Maker, etc.

Lighting:
Standard fluorescent fixtures utilizing high color rendition.

Reception

BUILDING RECEPTION EXAMPLE:



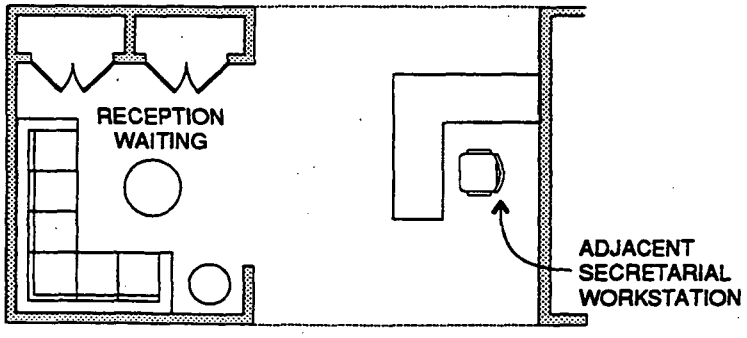
Size:
Example shown is 300 Square Feet. (28 Square Meters)

CONSIDER WHEN PLANNING

Main Reception:
Security measures for Agency visitors.
Location adjacent to building lobby, with easy access for visitors to Public Dockets and Public Information Center (if present).
Actual size and design will depend on the configuration of the building lobby. Include desk, seating and display.

Division Reception:
Location with easy access and a visual connection to the elevator lobby.
Include seating for 2 - 4 persons and coat closet.
Adjacent to secretarial workstation.

DIVISION RECEPTION EXAMPLE:



Size:
Example shown is 100 Square Feet Plus workstation (9 Square Meters)

Recycling Areas

The recycling system that you adopt depends on the system that your building has in place or is capable of accommodating, as well as policies adopted by the Agency regarding the types of materials to be recycled.

However, in order to provide for multi-material recycling (all office paper, newspaper, glass, metal and plastic) areas must be identified for the collection, separation, transportation, storage and shipment of recyclable materials. Space should be designed for the following functions:

Local Areas:
Collection bins located on the office floor convenient to users, e.g. paper bins in workstations and copy rooms, glass and metal bins in lounges, etc.

Satellite Areas:
Separated waste, such as recyclable paper, glass, aluminum and other trash from individual workstations and recycling containers, would be deposited (by employees or custodial staff) into collection bins stored on each floor in areas contiguous to freight elevators for consolidation into larger containers; and then transported to Central Recycling Area.

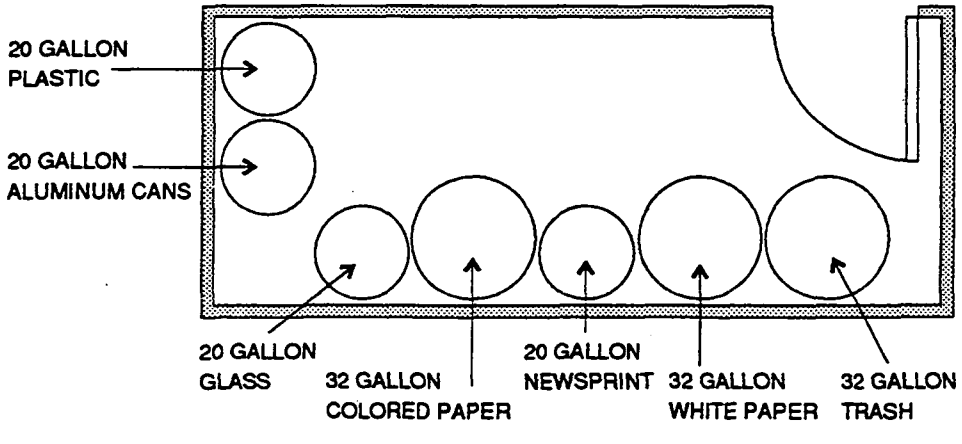
Central Recycling Area:
Further consolidation of materials into large storage/shipping containers and/or crushing, compaction in a central storage and shipping area. In a large building containers would be kept on skids or pallets for easy moveability by fork lifts or pallets jacks. Additional sorting (e.g. glass by colors) prior to loading into shipping containers may be necessary. The large containers are stored in a holding area close to the dock area awaiting scheduled pick-ups for crushing, compacting or bailing depending on the building's system.

CONSIDER WHEN PLANNING

Key to any recycling program is having sufficient space both on the floors and in the shipping/storage area in which to separate, sort and store recyclables prior to shipment. As new recyclables such as plastic and cardboard are added to the system, additional equipment may be needed. The storage area must be flexible enough to meet changing requirements.

EXAMPLE OF MULTI-MATERIAL SATELLITE STATION:

Size:
70-90 Square Feet
(6.5-8.5 Square Meters)



To assist in understanding or planning space needs for recycling, following is a list of the components and their sizes:

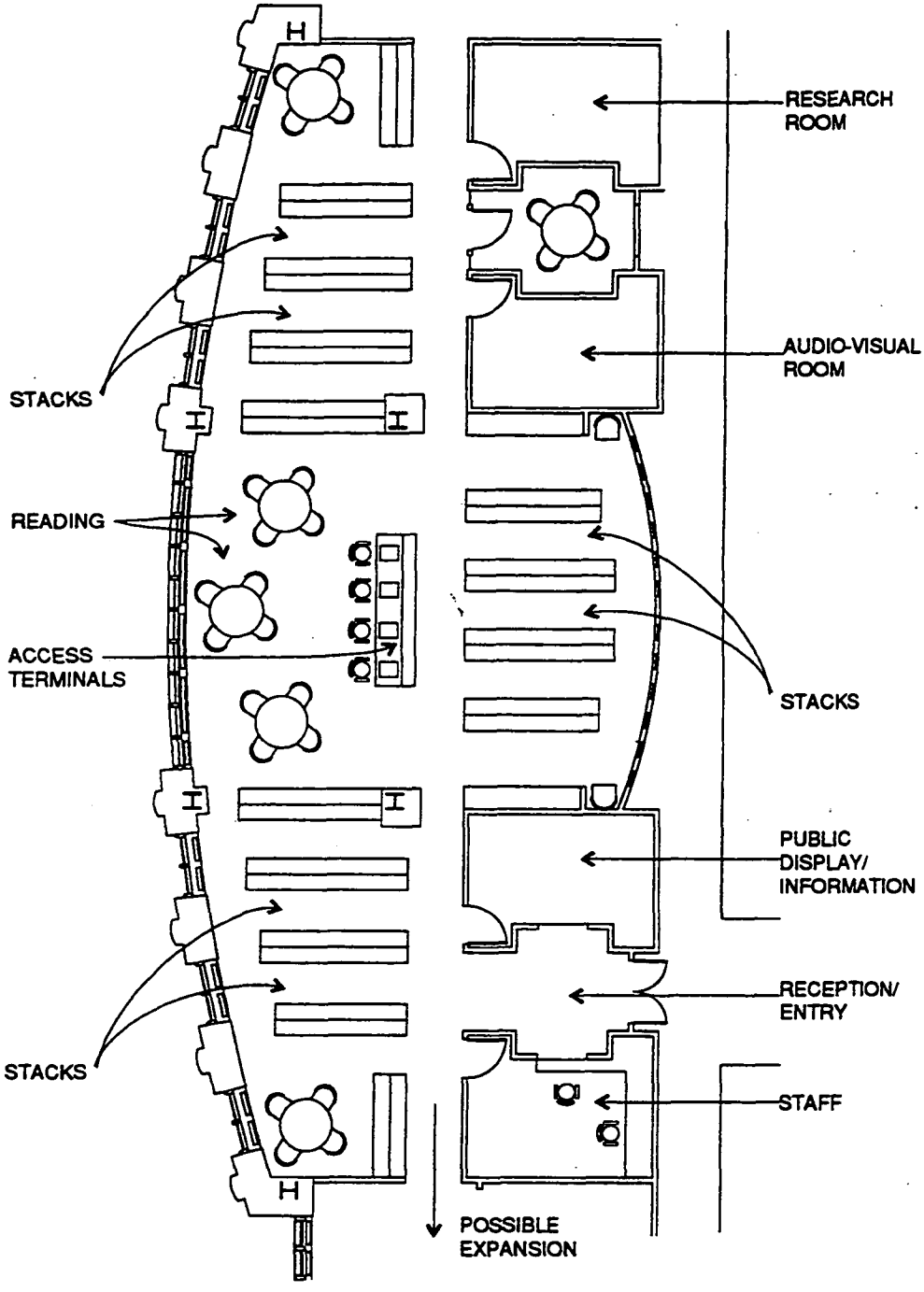
EQUIPMENT AREA REQUIREMENTS

Equipment/Area	Use	Location
Bins 3 - 20 gallon: Up to 2 square feet.	Sorting at source, workstations.	Primary office space, some collection centers.
Containers 32 - 100 gallon: 2 to 3 square feet 1.5 - 4 cubic yards: 12 to 30 square feet.	Collection from bins and other containers.	Lobbies, satellite and main collection rooms.
Storage/Shipping Containers 4 - 5 cubic yards: 25 to 30 square feet.	Collection from containers, sorting, storage till pick-up or crushing or compaction.	Shipping, sorting, storage areas.
Fork Lifts Variable. 35 to 50 square feet.	Hauling and lifting large containers to compactors, crushers and in and out of shipping/storage area.	Loading docks, shipping/storage areas.
Pallet Jacks 15 square feet.	Moving or transporting of heavy containers.	Main trash rooms per floor, freight elevators, shipping, storage area, loading docks.
Compactor Area varies.	Volume reduction of materials, especially refuse.	Loading dock
Crusher 64 square feet.	Volume reduction for glass, metal and plastic.	Loading dock, shipping/ storage area
Baler 60 square feet.	Compresses compacted materials into bundles or packages for shipping (e.g. cardboard, cans).	Loading dock, shipping/storage areas.
Dumpster 30 - 45 cubic yards. 23' x 8' x 6' : 250 square feet.	Large container permanently stationed at the docks, or rolled off into pickup truck. Sometimes compactor attached.	Loading dock.
Cart Dumper	Mechanically lifts and empties 100 gallon carts and 1/2-1 cubic yard containers into bulk shipping containers or dumpsters.	Shipping/storage and loading dock.
Shredder Up to 500 square feet.	Shreds classified material (paper, microfilm) into strips or flakes.	Large capacity at storage or loading dock, or smaller units at specific programs.

Library

EXAMPLE:

Size:
Varies by Region.
Example shown is approximately 3,000 Square Feet (280 Square Meters)



This example illustrates a Reference/Research Library accommodating approximately 2,000 linear feet of shelving, or 24,000 volumes of reference materials, using 7' high stacks.

CONSIDER WHEN PLANNING

Library space allocation is dependent on the size and the type of collection, number of reader stations, facilities for library staff and the public, and provisions for possible future growth.

The following guidelines identify several basic required function areas of a typical library facility.

Stack Space:
Shelf space for books and any other reference material.
Space allocation for stacks at 7'-6" high including aisles:
General - 0.2 sq.ft/volume
Legal - 0.4 sq.ft/volume

Reading Study Area:
This may be in the form of table seating, carrels for periodicals, etc.
Space allocation: 25 sq.ft/person

Equipment Area:
This may contain equipment such as microfiche readers/printers, as well as computers with on-line technical services.
Space allocation: 20 sq.ft/equipment station

Office Space:
The administrative and technical assistance required to operate library and space for cataloging circulation, research, mailing, copying, etc.
Space allocation: Should follow the guidelines for other EPA office space.

Catalog and Central Support Area:
Area to issue/receive circulation material, card catalog and for general control and supervision.
Space allocation: Usually 5 to 10% of total library area.

Other Specialized Functions may be:

TECHNICAL GUIDELINES

Power:
Provide one general purpose duplex outlet for every 25 linear feet of wall space. Additional power required for equipment. Reading tables may require power for lamps.

Lighting:
25-35 footcandles for general illumination. Task lighting to provide 50-60 footcandles in work or reading areas.

Note: Lighting and stack configuration to be coordinated to provide proper lighting for spine of shelved books.

Telecommunication:
Requirements dependent on program.

Structural:
Floor loading for stacks to be 150 minimum: otherwise, stacks will need to be distributed further apart.

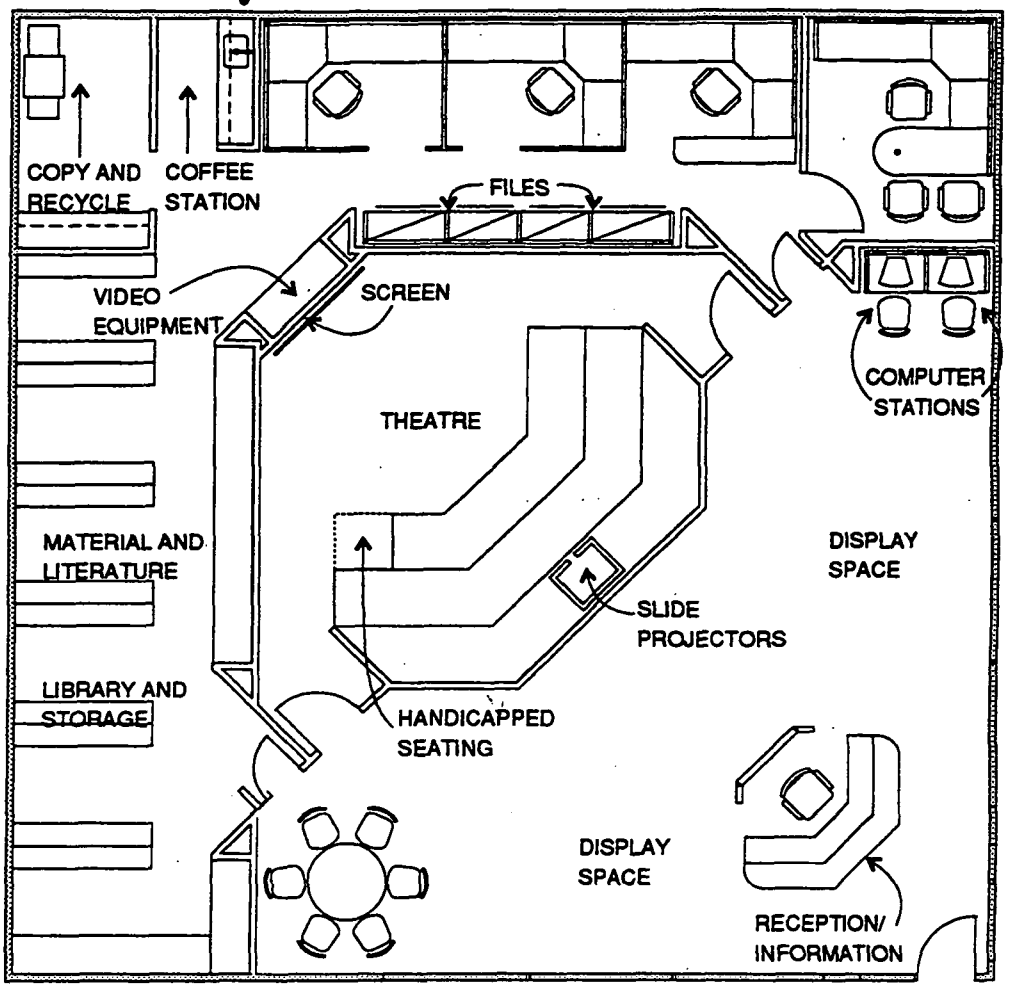
Acoustic:
Acoustical partitions to achieve an STC rating not less than 50.

HVAC:
Humidity control.

Audio-visual:

Public Information Center (PIC)

Size:
Example shown is approximately 2,500 Square Feet (233 Square Meters)



CONSIDER WHEN PLANNING

As this facility serves an inherently important public relations function, it should ideally:

-Be located in a high traffic and visibility zone to maximize public access.
-Have glazed walls between the display spaces and the outside to attract public attention and interest.

A ceiling height of minimum 10'0 is desirable in the display and theatre areas as it lends flexibility to display, lighting, equipment and theatre seating design.

Specific requirements include number of personnel and their workstation sizes; quantity of library/storage space; number of computer stations and reading tables (will vary, and would depend on the needs of the actual client).

It is advisable to have specialist consultants for the following tasks:

Audio-visual equipment selection and installation design.
As the electronic media grows in importance in comparison to other more conventional modes of display and information dissemination, it may be assumed that any PIC would utilize a substantial amount of state-of-the-art computer and audio-visual equipment.

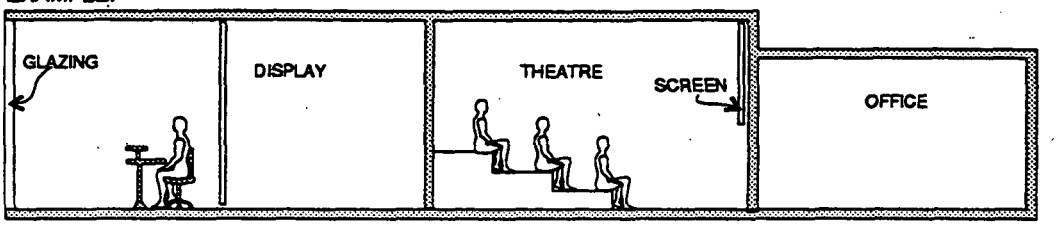
Graphics display and audio-visual presentation.
A media agency that combines exhibit design abilities with graphics and slide/video production capabilities would be best equipped to provide a cohesive and

Lighting:
A critical part of any exhibit design, the importance of good lighting cannot be overemphasized.

The mini-theatre could be conceived as a multipurpose space, capable of being used either for the screening of videotapes (large format) or as a lecture room (with slide presentation capability).

As school children are one of the most important segments of anticipated visitors, the theatre should be designed to accommodate one classroom (approximately 30 people).

EXAMPLE:



TECHNICAL GUIDELINES

Power:
Provide to accommodate additional/special audio-visual and computer requirements.

Lighting:
Low level of general lighting in display space with accent/spot lighting over displays. Theatre lights to have dimming control. Office/library space to have 25-35 footcandles of general lighting. Task lighting where necessary.

Acoustic:
Display and theatre space to have high absorbency materials on all finished surfaces. Low level white noise in display space is desirable.

Audio-visual:
Provide in accordance with program and audio-visual consultant recommendations.

Recommended finishes:
Acoustic tile with NRC minimum rating of 1.0.
Walls in theatre to be covered in wall carpeting or other sound absorbing material.
Carpet to be heavy duty, capable of withstanding constant heavy traffic.
Neutral tones recommended for finishes so as not to clash with or overpower graphics and colors of display.

EPA Mission and EPA Space

EPA Mission. In 1970, the U.S. Environmental Protection Agency (EPA) was established to control and abate environmental pollution and conserve the Nation's vast resources for future generations. Since then, the EPA has undertaken research and set environmental standards, which it has regulated and enforced. The Agency interacts with and supports numerous state and local government environmental projects and enters into agreements with universities, industrial laboratories and private institutions to conduct research. Authorized by legislation, the Agency controls programs such as Clean Water Act, Clean Air Act, Superfund, Resource Conservation, and Recovery Act, etc. to implement its policies on Resource Conservation, Energy Conservation, and Pollution Prevention. The Agency has also been on the forefront in the areas of Indoor Air Pollution. Clearly, the exercise of the Agency's mission includes the application of sound environmental policies, where feasible, over its own facilities.

EPA Space. To effectively carry out the national mandate, the Agency occupies millions of square feet of office and laboratory space across the United States, housing approximately 25,000 federal and other employees in hundreds of facilities. A large proportion of EPA space is leased and managed by the General Services Administration (GSA) under the Federal Property Management Regulations (FPMR). The FPMR establishes a well defined real estate acquisition process to ensure a fair competition and best value for the Government. However, as part of the acquisition process, client agencies such as EPA are encouraged to define special Agency and mission related requirements.

Therefore, the application of environmental practices in GSA-controlled space is contingent upon a multitude of factors related to procurement, lease agreement, maintenance and operations. For example, a new acquisition for Regional Offices may allow the EPA substantial latitude in requesting GSA to include mission-related elements in both the base building and its interiors, while in a short-term lease situation, building modifications may be limited. Recent acquisitions in Chicago and New York indicate that the GSA has been extremely sensitive to EPA mission needs, and space solicitations have succeeded in including EPA requirements. To ensure that special base building requirements are met, they need to be identified early and included in GSA's Solicitation for Offers.

A small percentage of EPA inventory is controlled by the EPA itself. This includes specialized buildings such as EPA laboratories. The opportunity to build exemplary facilities can be fully exercised in such situations.

Design, Construction and Environment

The field of design and construction, as it relates to environmental concerns, is rapidly evolving. New materials and products are coming to the market which avoid or limit the extent of Volatile organic chemicals (VOCs) that contaminate the air. New ways are being found to use materials that were formerly destined for the incinerator or landfill. Methods to make more efficient use of energy are being discovered or developed. Because of this evolution, the suggestions and ideas contained herein should be considered as a guide only; every effort should be made to take advantage of the many advances that continue to be made.

This section of the Guidelines point out environmental considerations to address in the selection, planning, and fitout of EPA facilities. The considerations listed here may be fully or partially applicable depending on the acquisition and lease status of individual facilities. These mission-related concerns are Indoor Air Quality (IAQ), Energy Conservation, Recycling and Resource Conservation, and Pollution Prevention. Each describes actions in two steps: a). Understanding the base building planning issues, over which the EPA may or may not have control; and b). Interior design issues that the EPA can control through the design process. See Volume Two for a more detailed discussion.

This document is not meant to be a comprehensive discussion of building-related environmental practice, but an introduction to the breadth of the issues. The topics are complex in themselves, and they also are interdependent and constantly changing. Thus a lighting fixture might be energy efficient in use, but exact a high environmental cost in its manufacture. More information and policies are available within EPA; references are indicated throughout this document. In addition, the American Institute of Architects publishes a document, with quarterly updates, that reports on environmental aspects of architecture and building materials. (*Environmental Resource Guide Subscription;* American Institute of Architects, Washington, D.C., 1992).

Indoor Air Quality (IAQ)

We address IAQ first because this aspect of pollution prevention is the one of most immediate personal concern to EPA employees. Poor air quality — sometimes called "sick building syndrome" — is a characteristic of the workplace that can directly affect the productivity, well-being, and even the health of each person. It can be caused by pollutants introduced into the building from the outside, from the building's mechanical systems, or from materials used within the building interiors including finish materials. When occupied, the space can be affected by human activity; the odors and contaminants from printing inks, artists' materials, copy machines, cooking, smoking, cleaning supplies etc. will affect IAQ. It is therefore important that each of these elements be examined carefully, both prior to space acquisition, and during the selection and specification of interior materials.

INTERIOR DESIGN

Assuming your new building meets the conditions described below, good IAQ will depend upon exercise of careful choice and control of interior materials. The materials that require attention include carpet and carpet backing, wood finishes and preservatives, adhesives, plywood and particleboard, and sealants. Because it is not possible to eliminate entirely the gases that emanate from these materials, there are several strategies to minimize their effect on IAQ. Remember, the selection of materials is a GSA function and needs to be done with their approval.

- Carpet should be carefully selected, to assure that the least amount of VOCs are discharged. The EPA has studied this question, and developed specifications to guide in this selection. GSA has supported and agreed with EPA specifications.

- Prior to installation, carpet should be rolled out and aired for several days, ideally in a separate location. Once installed, the carpet should be allowed to "cure" before occupancy, which includes venting at 100% capacity of outside air.

- Low VOC emitting adhesives, caulks, and sealants should be specified. For some purposes, more benign water-based adhesives are available.

- Plywood and particleboard, which emit formaldehyde, should be sealed to prevent the continuous escape of gas.

- During the tenant fitout period, operable windows (if any) should remain open to permit gases to escape. Upon completion, the space can be "flushed out," using a high rate of ventilation to drive out most of the gases that remain.

Maintenance. Maintaining a high level of Indoor Air Quality requires that building managers observe certain common sense precautions during occupancy. Cleaning compounds, waxes, and polishes should be chosen with a view towards their possible effect on IAQ. Ducts should be cleaned and filters replaced periodically to prevent the buildup of dust, bacteria, pollen, and fungi.

Finally, plants can be used to "landscape" the workplace; they can absorb some carbondioxide, formaldehyde; and other gases that may be present. However, they must be selected and maintained properly.

UNDERSTANDING BASE BUILDING

Every step of the acquisition and build-out process requires careful planning to prevent poor air quality in EPA space. The base building design and its environs play an important part. As we have stated several times, EPA does not directly participate in acquisition of GSA controlled space but exercises leverage in defining its space needs and therefore is able to influence the acquisition of an environmentally acceptable building. The opportunity for EPA to define the general facility location, the performance and technical requirements and important criteria for space selection will generally ensure acquisition of buildings with sound IAQ.

The following building characteristics must be pre-defined in the solicitation, thus putting offerors on notice as to the importance of these items in selection.

1. The general location is in a commercial zone and away from large industrial plants, to avoid any possibility of noxious fumes entering the building.

2. The building is required to be away from local sources that contribute to pollution, e.g. a heavy traffic truck route.

3. If EPA is required to occupy a building that might entrain pollutants from the atmosphere, an analysis of micro-climatic conditions using available Government data and EPA's own in-house expertise may suggest a method to control or mitigate the problem.

To achieve a facility with good IAQ, a careful evaluation of the existing (or proposed) mechanical system is made. Points include the following:

- Intakes for outside air are located away from sources of pollutants, and well above grade (above vehicle exhausts) and protected from intrusion by insects, birds, and rodents.

- Air intakes for fresh air are adequately separated from the exhausts from kitchens, garages, truck docks, and toilet rooms, to avoid "short-circuiting" of contaminated air.

- The mechanical system utilizes an efficient method to filter the air, and, in some cases, to absorb gases and odors. Filters should be easily cleaned or replaced.

- The air distribution system is designed to prevent the introduction of particles and fibers from insulation and sound lining into the indoor atmosphere. The ductwork is readily cleaned with non-toxic cleaners, to prevent buildup of dust, fungi, bacteria.

- Ventilation is adequate. This is probably the single most important requirement to achieve satisfactory air quality. For typical office occupancies, the mechanical system should provide outside air based on a standard of 20 cfm/person (based on 150 sq.ft./person of occupiable space for office use)>

- Exhausts from kitchens, parking areas, large copy machines, and toilet rooms should be directly exhausted to the outside.

Energy Conservation

EPA's mission to promulgate efficient use of our energy resources is of prime importance in the selection and design of EPA's own facilities. Energy efficiency must be a foremost consideration in the space acquisition process, and some of the things that should be looked at are noted below. In the office workplace, the largest consumers of energy are the mechanical and the lighting systems. Office machines and incidental appliances also use energy and should be chosen judiciously, but these are a less significant factor in total energy use.

INTERIOR DESIGN

Once space has been acquired by the Agency, the planning and specifying of the interior space should include the following energy-saving considerations:

- Maximum use of open-space planning to maximize daylight. If possible, avoid enclosed offices at the window perimeter; where unavoidable, provide borrowed light glazing to extend daylight to the interior of the space.

- EPA's "Green Lights" program used as guidance in the design of the lighting system. This means using high-efficiency fluorescent fixtures with electronic ballasts. The current recommendation by EPA for overhead fixtures is to use 2'x2' (or 2'x4') large cell parabolic reflectors with T-8 lamps. Also used is indirect fluorescent lighting combined with task lighting. It is advisable to consult with the Green Lights program on this aspect of the lighting design.

- In conjunction with the recommended fluorescent fixtures, daylight sensing controls used to dim fixtures near windows, thereby taking advantage of natural light. Use occupancy sensors to control lighting in rooms and offices so that unoccupied spaces do not needlessly waste lighting energy. Advice on such controls is also available from the Green Lights program.

- Where feasible, compact fluorescent lamps replace incandescent lamps.

- The proliferation of individual fans, space heaters, coffee pots, and microwave ovens should be avoided. A properly designed mechanical system should obviate any need for individual fans or heating units. A space layout that provides for convenient lounge/pantry areas that can accommodate a microwave cooking station will help avoid them at the workstations and thereby reduce the energy drain, and, at the same time, help to keep cooking odors out of the work areas.

- Appliances (if any) should be selected on the basis of their energy efficiency.

- The use of task lighting to reduce levels of ambient lighting.

These strategies, combined with the technical design measures that can be implemented by qualified mechanical and electrical design engineers, will result in a high degree of energy efficiency.

UNDERSTANDING BASE BUILDING

Prior to acquisition of space for EPA use, the following energy efficiency aspects for new space are considered and weighed by GSA and EPA:

- The building is considered in terms of passive design techniques to minimize heating and cooling loads - that is, whether the building has been sited and designed to take advantage of local climatic conditions, local vegetation, and solar path.

- Because building mechanical systems, as well as building codes, have evolved in recent years in response to shortages of fossil fuels, newer buildings with newer HVAC systems will almost inevitably be more energy efficient. Wasteful systems should be avoided, such as those that require extensive use of electric resistance reheat.

- The Offeror provides information on the proposed building to demonstrate whether the insulation in the walls and roof meet (or exceed) current code standards. A qualified engineer or the local utility determines whether a retrofit (e.g. modifications to the existing mechanical system or the addition of more insulation and weatherstripping) could result in significant energy savings.

- Existing windows should be dual glazed (or triple glazed) and windows thermally broken; that is, the metal frame should contain a synthetic rubber spacer to reduce the conduction of heat through the frame from interior to exterior.

- The HVAC control system should be up-to-date to minimize energy use; replacing an older control system may be considered.

- Existing glazing should take maximum advantage of potential for daylighting, thereby reducing need for artificial lighting. At the same time, glazing should not allow excessive solar heat gain, thus burdening the air conditioning system; shading or sun control of some type may be required.

- If space under consideration includes tenant lighting, fixtures and lighting controls should have been planned with energy efficiency in mind, or replacement of the existing system should be studied for feasibility and cost-effectiveness.

- The local utility serving the facility may have incentive programs that will conserve energy and also generate cost savings.

- The use of buildings with convenient inter-floor stairs may be favored, to reduce the use of elevators.

Recycling & Resource Conservation

Conservation of the planet's limited resources is another aspect of the Agency's mission that can, and should, be exercised in the selection and design of Agency facilities.

INTERIOR DESIGN

After space for EPA has been acquired, a program to implement the recycling policy must be developed. Depending on the policy, the program could include:

- Design of recycling centers in the space plans, located in convenient relationship to employee workstations.
- Recycling centers to contain bins of appropriate size for the various categories of recyclables.
- Provision for central storage near the truck dock for collected recyclables, plus compactors, balers, and/or glass crushers as may be required by the program.

Conservation of resources refers to any material that is the product of a limited, non-renewable resource. As applied to space design for an Agency facility, examples would include:

- Utilization of hardwoods for cabinetwork and furniture that are the product of a managed, sustainable forest, rather than hardwoods from unmanaged tropical forests. See Volume 2 for examples.
- Use of linoleum tile, which is based on linseed oil, instead of Vinyl composition tile (VCT), which is petroleum based.

UNDERSTANDING THE BASE BUILDING

When investigating space to be acquired, EPA and GSA look into these questions:

- What recycling policies will be followed in the new facility? What materials will be recycled: paper (what categories?), plastics (what kinds?), glass (clear and colored?), aluminum, other metals? Will separation be at the source, or post-collection? Are these the policies of the local governmental jurisdiction, the solid waste management contractor, or the landlord/building manager? Or, is EPA free to develop a program of its own?
- What facilities for solid waste management exist at the building, e.g. truck docks, trash chutes, storage areas for recyclables, compactors?

Water is also a resource to be conserved. The building proposed for EPA use should be checked to see if low-flow water-conserving plumbing fixtures are used, or, if not, whether it would be feasible and cost-effective to substitute such fixtures. The use of flow-metering faucets are also considered.

Pollution Prevention

In the design of its space, and the selection of materials, the EPA should take every effort to minimize the potential to pollute the atmosphere, the ground, and water runoff to streams and rivers. Similarly, design choices need to be made that will minimize the impact on landfills. Basic strategies include the selection of materials and products that utilize a high content of recycled or recovered materials, avoidance of products that generate excessive pollutants in their acquisition and manufacture, selection of materials that may be recycled or easily disposed of, and selection of quality products and materials that are durable and long-lasting, thus diminishing the disposal problem.

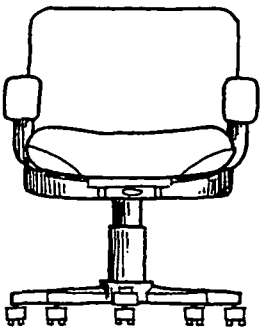
The following are several examples of ways to minimize pollution:

- Avoid the use of refrigerants and fire extinguishing equipment (e.g. Halon) that utilize CFC's, an ozone-depleting gas. Avoid products, such as some insulation materials, that are manufactured using CFC's.

- Specify products that contain a high proportion of recycled material. As technology advances, many more such products are being added to the construction industry's inventory. Current examples are: drywall, ceramic tile, acoustical ceiling tile, toilet partitions, and many other products (See Volume 2). Recycled materials should be evaluated to ensure that they do not impact adversely the Indoor Air Quality by off-gassing VOCs.

Selecting Materials and Furniture

The selection of the materials comprising your office space is never a simple, or individual, effort. Instead it is an accumulation of decisions over time, primarily by professionals such as architects, engineers, contractors and building owners. The material that go into the base building -- windows, insulation, masonry etc. -- are usually in place before the EPA chooses a building. However, you can influence the choice of interior materials, by working with the professionals and GSA as new space or renovation is planned. The range of components selected as part of an interior fit-out include partitions, acoustic treatment, floor and wall coverings, ceilings, window coverings, lighting, architectural details and furniture.



While there are "standard" selections, your understanding of the range and variety within each category can help create a quality office environment. Consideration needs to go beyond availability, cost and color to reflect longer range objectives. Products are available that meet a wide list of goals. Linoleum is an example. Eclipsed in popularity by vinyl composition tile (VCT), linoleum is similar in performance to VCT yet is made of natural materials, emits no VOC's and is biodegradable.

Furniture also must be viewed in a broader light. Today's open plan layouts demand that furniture both define space and deliver services. Furniture and panel systems enhance office acoustics, deliver power and electronic signals, augment or provide lighting, as well create visually separated work areas. Selecting the appropriate furniture system and using it well establishes a functional office and helps create a pleasant place to work.

Specific discussion of materials and furniture follow in this chapter, with more detailed environmental information provided in Volume 2. Selection of materials or products is not a straightforward process but rather a balancing of many factors, including:

Impact on IAQ. The primary indoor air quality consideration when choosing materials is possible contamination from Volatile Organic Compounds (VOC's). These are chemical substances emitted into the air from carpet, adhesives, paints and other finishes, sealants, plywood etc. The level of VOC's emitted by interior materials varies by product and manufacturer and decreases with time.

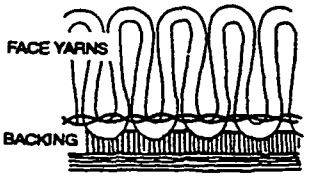
Resource Conservation. Many building materials are now incorporating recycled materials -- wall panels, ceilings, carpet, ceramic tile, insulation etc. Consider the useful life and disposal/recycling of a product when you choose it. In addition, substitutes should be sought for products made of limited or non-renewable resources.

Hidden Materials. More of today's products are composites of several materials and each part needs to be evaluated. For example, acoustical panels have a structural material, insulation and fabric covering; an acceptable carpet fiber might have a potentially hazardous backing. Also realize that chemicals may have been applied to fabrics to create specific qualities, such as soil or fire resistance.

Safety. Safety considerations include flammability, slipping and tripping hazards, potential for furniture tipping, structural capacity of shelving and unexpected projections.

Durability. Sturdiness and wearability are important factors -- wearability for fabrics and finishes, and sturdiness when choosing products made of separate components,

such as systems furniture. Evaluate the connectors as well as the specific parts. Life expectancy is tied to value, but also related to anticipated usage, e.g a temporary installation doesn't need the most long-lasting carpet.



TUFTED CARPET

Soiling Qualities. Ease of cleaning, coordinated with the intended use and maintenance expectations, should be considered. Carpets, fabric panels and wall coverings can be treated to improve resistance to soiling.

Special Features. An analysis of special material needs should be made early in the design process, e.g. acoustical requirements, anti-static carpet, special lighting, tackable surfaces.

Visual Qualities. Visual considerations go beyond aesthetics to include features that make work easier and save energy -- glare reduction and appropriate lighting, especially for computer use, windows in partitions to share daylight etc.

Budget and Value. Always an important consideration.

Availability and Manufacturers Support. Availability (delivery of all components when you need them) and manufacturer's support (replacement parts and additional components years later) contribute greatly to a product's value. Lack of these characteristics in your furniture system will limit your ability to reconfigure and easily expand.

Installation Characteristics. Products that need to be moved or replaced often should be reviewed for their ease of installation. The ability to use in-house maintenance staff can be an important advantage for long-term flexibility.

ADA Regulations. Proposed floor coverings, thresholds and changes in level must be reviewed in light of the Americans with Disabilities Act (e.g. maximum carpet pile thickness of 1/2 inch).

EPA Assistance. Assistance and information on materials is available within EPA. Contact the Environmental Health and Safety Division for the latest policies and guidelines on testing and safety.

REAL ESTATE SPACE MANAGEMENT BRANCH CAN PROVIDE FURTHER INFORMATION OR DIRECT YOU TO ANOTHER EPA SOURCE.
PHONE 202 / 260-2022

Signage and Artwork

Signage, both for directions and identification, are an integral part of the visual design -- yet often forgotten until the last minute. The base building design includes elevator and lobby signage, as well as signs to identify fire exits and the building's mechanical/support rooms. The signs within EPA's space are a GSA/EPA responsibility, including directional signs to the exits, room numbers, directories, signs identifying Branches and special spaces. A signage package should be developed during the design intent phase of the interior design process, in order to coordinate it with the furniture and base building signage, budget for its production and installation, and ensure that it arrives in time.

Artwork in the public areas will give the office a coordinated and professional look, yet need not be expensive. Framed posters and prints are suggested, for reception areas, conference rooms and lounges. (Inexpensive security hardware is available to make sure they stay on the walls.) A budget for artwork should be set aside when planning the project -- one-half of one percent of the interior design budget is commonly used. Provision for display and bulletin boards also should be included.

Floor Finishes - Carpet

Carpet is the most widely used and popular flooring material for office areas, because it is comfortable underfoot, absorbs sound, installs quickly and easily, and requires low maintenance. It is available in a great range of colors, textures, and patterns, in natural or synthetic fibers, and in various weights. In most commercial applications, it is usually glued directly to the concrete floor slab, although it can also be placed over a pad for additional comfort. Carpet can also be obtained as carpet tiles, a form that permits ready access to underfloor wiring, and also allows replacement of individual tiles in areas of excessive wear.

The various carpet options available to the designer or specifier include:

Type of fiber. Natural (wool or cotton), or synthetic (nylon, polyester or acrylic, polypropylene—called olefin, and terepthalate). Although wool is the most luxurious, it is also expensive, and not as durable as nylon. Terepthalate made from recycled plastic bottles, is a relatively new carpet material, similar to polyester. It is not as durable as wool or nylon, and at present is available only with SB latex backing (see below). Of the synthetic fibers, nylon is the most durable, and the most stain resistant. It is the fiber of choice for most commercial uses.

Type of Backing. Backing can be natural (jute) or synthetic (polypropylene, fiberglass or SB latex). SB (styrene butadiene) latex backing has a high VOC content, and should be avoided.

Type of Construction. There are three types of carpet construction: woven, knitted, and tufted. All are acceptable, but tufted construction has become prevalent in commercial applications because it is most economical.

Texture. Two basic surface textures may be used: Loop construction (including level loop, cut and loop, and ribbed loop); and Cut pile construction (plush, shag, multilevel). Because it is more durable under heavy traffic conditions, level loop carpeting is used most often in commercial applications.

Cushion. To provide a more comfortable feel underfoot or to improve acoustic or insulating qualities of the floor, cushioning is sometimes provided. This can be bonded to the carpet, or can be separate. Materials used include polyurethane foam, urethane foam, sponge rubber, felt, rubberized jute, and synthetic fiber. Most are made from waste materials, and are typically low in VOCs. Padding should be selected based on the performance needs of the particular installation.

Installation. The majority of commercial installations are of the "direct glue-down" type, which means that an adhesive is spread over the concrete floor and the carpet is then applied. Sometimes an impervious barrier (e.g. linoleum) is introduced between the concrete and carpet, to prevent any excess moisture from the concrete from being absorbed into the carpet and promoting mold growth. Where a separate cushion is involved, the installation uses adhesive at two levels, and is called "double glue-down." The direct glue-down method is not applicable to all types of carpet. A second method of installation is called " tackless strip " and consists of stretching the carpet over a broad area and then securing it at the perimeter with narrow plywood tackless strips. This method is less successful than glue-down in areas that are quite large and receive heavy traffic, because the carpet can shift and the seams can pull apart.

Other Considerations. In addition to the concerns described above, the specifier will need to look into factors such as flammability, generation of static electricity (particularly with respect to electronic equipment), and acoustical characteristics. Carpet and backing weights, pile height, and yarn density also need to be selected.

Environmental Concerns. The primary environmental consideration with any carpet installation is the possible effect on indoor air quality. This is discussed in detail elsewhere in these standards, but is mentioned here as a reminder that care should be taken in the selection of carpet, backing, cushion (if any), and adhesive, to avoid those with high VOC emissions. Where wool carpeting is used, particularly in areas that are subject to moisture, the use of an anti-microbial additive in the carpet is recommended.

	CARPET
Where Used	• Offices and office areas • Corridors (moderate traffic) • Conference Rooms • Libraries
Options	• Type of Construction: woven; tufted;knitted • Type of Fiber: Natural (wool, cotton); Synthetic (nylon, polyester, olefin, terephtalate) • Type of Backing: Jute; polypropylene; fiberglass; SB Latex • Texture: Loop construction; Cut pile construction • Cushion (if required or desired): Polyurethane foam; rubberized jute; felt sponge rubber; urethane foam
Sizes	• Carpet rolls typically 12' wide (Broadloom carpet) • Carpet Tiles typically 18"x18"
Installation Methods	• Tackless Strip installation • Glue-down or Double glue-down • Factory application (optional) of carpet tiles over access flooring • "Free-Lay" (adhesiveless) carpet and carpet tiles
Environmental Concerns	• VOC emissions from carpet, from backing ,and from adhesives. (Use low-VOC adhesive) • Avoid double glue-down installation, because it doubles quantity of adhesive • Avoid SB latex backing because of VOCs • Disposal of used carpet burdens landfills; select a durable product and maintain it properly. • Avoid carpet cushions made with CFC blowing agent. • Carpet acts as sink for contaminants generated elsewhere in the space; keep carpet clean.
Recommendations and Remarks	• Use 28 oz. or 32 oz. (face weight) nylon carpet; tufted continuous loop or cut pile construction; tackless strip or glue-down installation. Use polypropylene backing. • Use a 4" high straight vinyl base at carpeted areas. • Allow carpet to air out before and after installation. • A carpet of good quality, if well maintained, should last for approximately ten years. • An anti-microbial additive is recommended for wool carpeting.

RESILIENT FLOORING

Resilient flooring is the material of choice in areas that receive heavy traffic, and where the sound-absorbing qualities of carpet are not required. It is also more easily washed than carpet, and can be used where spillage of food and drink could occur. It is an appropriate flooring for lounges/pantries, copy rooms, recycling centers, and storage and utility rooms.

Several different materials are classified as resilient flooring, and, as with carpet, are made in a wide range of colors, grades, patterns, and weights. The most commonly used products are:

Vinyl Composition Tile (VCT). This is the resilient flooring most often used, because it is economical and durable, and suited to most interior applications where carpeting is not called for. For commercial and institutional use, 12"x12" tiles, in 1/8" gauge, is usually selected. The material is also available in sheet form, where the cleanliness and appearance of a seamless installation is desired. VCT is a petroleum based product, and is not biodegradable.

Vinyl Tile. This is similar to VCT, but is a solid, or homogeneous, vinyl material. It has a more luxurious look and feel than VCT, and is more costly, so its use is limited to spaces that require its special qualities. It is also available in sheet form.

Linoleum. This product is similar in appearance to VCT, but is made of natural materials (primarily linseed oil), emits no toxic or irritating gases, and is biodegradable. It is made in 12"x12" and 24"x24" tiles, 1/8" gauge for commercial use. It, too, is made in sheet form. Linoleum is regaining popularity and is now available in a wide variety of colors and patterns.

Other Resilient Flooring. In addition to the above products, cork tile, rubber tile, and sheet rubber flooring can be utilized in specialized conditions, but are not likely to find application in typical EPA offices. Asphalt tile and vinyl asbestos tile are no longer made, but many floors covered with these materials still exist.

Environmental Concerns. Resilient flooring is installed using adhesives. Care should be taken to specify adhesives that emit low levels of VOCs, and to ventilate the space thoroughly prior to occupancy. If renovating an older space, any tile to be removed should be checked for asbestos content.

CERAMIC TILE

Where durability, resistance to wear, and ease of maintenance are paramount, ceramic tile is usually chosen. It is a material that is usually a part of the base building, and not often used as part of the tenant fitout. Ceramic tile is often selected for toilet rooms, shower and locker rooms, and food service facilities, where its hard impervious surface can be washed down. It resists staining, abrasion, and water penetration.

Ceramic tile comes in many shapes, colors, and sizes, and offers unlimited design possibilities. It is made from natural materials, and emits no VOCs. Installation is with portland cement mortar, or with thin-set adhesive.

Environmental Concerns. Ceramic tile with content of recycled material has recently come onto the market, and should be considered for use. Some adhesives and sealers contain VOCs.

	RESILIENT TILE	CERAMIC TILE
Where Used	• Stairs • Corridors (heavy traffic) • Copy rooms • Mail rooms • Storage rooms • Vending areas • Pantries	• Toilet rooms • Shower & Locker rooms • Kitchens & Food Service areas
Options	• Vinyl Composition Tile • Linoleum tile • Solid vinyl tile • Sheet vinyl • Sheet linoleum • Rubber tile & cork tile (for special situations)	• Unglazed floor tile • Ceramic Mosaic tile • Quarry tile (often used for floors in commercial kitchens)
Sizes Available	• Tile: 12"x12" x 1/8" gauge, also 9"x9" • Sheets: 6'x90' (typical)	• Various sizes; 1"x1" and 2"x2" usually used; hexagons & larger sizes also available • Quarry tile: 4"x4"; 6"x6" & 8"x8"(1/2" thick)
Environmental Concerns	• VOC emissions from adhesives and from VCT; little or none from linoleum • VCT: non-biodegradable • Linoleum: biodegradable	• Possible VOC emissions from adhesives, sealants and grouts. (Low emitting adhesives are available). • Recycling: Ceramic tile made from recycled material is available.
Recommendations	• VCT or Linoleum Tile in 12"x12"(1/8"ga.) recommended; linoleum/s preferred. • Use low VOC emitting adhesive • Use 4" high coved vinyl base at resilient tile areas.	• Use unglazed ceramic mosaics; 1"x1" or 2"x2" in portland cement mortar. Use 4" high glazed cove base. • If budget allows, use tile made from recycled materials.

Gypsum Wallboard. This material, usually called "drywall" is the wall material most often encountered in office space. Drywall is a sheet of gypsum, typically 1/2" thick, with a paper surface prepared to received paint or adhesive for wallcovering. Drywall comes in 4'x8' sheets, which are attached to wood or metal studs to form partitions. Construction is fast and inexpensive. Various metal stud and drywall assemblies can be constructed, providing different characteristics of fire and/or acoustical separation as required to meet code or privacy needs. Selection and specification of such assemblies should be made by someone familiar with code requirements and the various drywall assemblies.

Paint. The simplest and most economical way to finish a drywall partition or masonry wall is to paint it. Paint provides a uniform appearance, and can be easily cleaned or repainted if necessary. The paint used almost universally for interior walls is flat latex (water-based) wall paint. Latex paint dries quickly, cleans up easily, and is relatively free of VOCs. For new drywall, a latex primer followed by two finish coats, is recommended. Where cleanability and a more soil resistant surface is required, such as in toilet rooms or food surface areas, alkyd-based enamels (available in flat, semi-gloss, or gloss finish) may be used. Most present-day interior paints (including water-based paints) emit VOCs, primarily during application, which can be irritating to some people. Alternative ("natural") paints are available which may be used where there could be particular sensitivity to such irritants; "natural" paints are rare in commercial installations.

Vinyl Wallcovering. A surface that is tougher and more durable than paint is vinyl wallcovering. It is recommended for use in areas of high traffic, such as corridors, or where the walls are subject to more than usual abuse. A great variety of color, texture, pattern, and weight can be obtained. Three classifications of this material are made: Type I, Light Duty; Type II, Medium Duty; and Type III, Heavy Duty. Type II is appropriate for most office space. Vinyl wallcovering is further classified based on its backing material: Type II backing provides the strength suited to most commercial applications. Vinyl wallcovering, which is furnished in 54: wide rolls, is installed on the substrate with an adhesive. A non-toxic adhesive should be specified. The wallcovering material itself is made from plasticized Polyvinyl Chloride (PVC), which is a toxic substance, however, offgassing from wallcovering has not been identified as a problem in most installations.

Fabric Wallcovering. Besides vinyl, various other materials may be applied to a backing and hung on the substrate with an adhesive to achieve decorative or other effects, such as acoustic softening. Such materials include paper, fabric, and wood veneer. Of these, fabric is most often used in office applications, where its acoustic properties and decorative qualities may be preferred to those of vinyl wallcovering. Fabric should be selected that is economical, durable, and easily maintained (it can be treated to resist soil), as well as aesthetically appealing. Besides an overall wall treatment with fabric wallcovering, discrete fabric wall panels can be installed, often as an acoustical treatment in meeting rooms or other spaces where noise is a problem. They can be used for decorative effect, or, when covered with fabric both sides, used as room dividers. Panel cores typically are molded fiberglass, and attachment is with clips, adhesive, or velcro fasteners.

	GYPSUM WALLBOARD	PAINT	VINYL OR FABRIC WALLCOVERING
Where Used	• Typical for great majority of interior walls: applied to metal studs, wood studs or furring on masonry.	• Lowest cost finish for drywall, masonry, wood, and metal. Can be cleaned. • Painting is economical way to change colors and to refurbish soiled walls.	• Vinyl wallcovering can be used in corridors, offices, reception/ waiting areas where durability and ease of maintenance are req'd. • Use fabric in conference rooms or auditoria for special decorative effect.
Options	• Various sizes and gauges of metal studs to meet specific needs. • Sound insulation for conf. rooms, offices as required • Special drywall assemblies to meet fireresistance requirements. • Water resistant drywall for toilet/shower rooms.	• Latex based flat wall paint is standard for most walls. • Semi-gloss alkyd paints can be used for doors, trim, and walls subject to frequent cleaning. • Alternative (natural) paints available for especially sensitive areas.	• Various colors, weights, patterns and textures. • Backing: Type II (moderate duty) suitable for most locations. • If fabric, select for durability and treat for soil resistance.
Sizes Available	• Typical sheet size: 4'x8' • 1/2" thickness usually used, • 3/8" and 5/8" also available. Two thicknesses of drywall sometimes used for increased sound reduction, fire rating, or structural rigidity.	• Not Applicable	• Vinyl wallcovering comes in rolls 54" wide by 30 yards long. • Fabric usually 36" to 54" wide (sold by the yard).
Environmental Concerns	• No known environmental problems associated wih gypsum wallboard. • Wallboard made from recycled material is made, and is recommended.	• All paints, including water-based paints, emit VOCs, mostly during application. • Provide good ventilation. • Use alternative paints if circumstances warrant.	• Installation of wallcoverings uses adhesives, some of which emit VOCs. Select low VOC-emitting adhesive; provide good ventilation.
Recommendations and Remarks	• Select drywall assemblies to meet Code req'ments for fire ratings, and provide desired STC (acoustic) rating. • Use WR type drywall in toilet rooms and similar moist locations.	• Prime new drywall or masonry with primer sealer, then paint with two coats flat latex paint, or two coats semi-gloss alkyd in copy rooms, mail & store rooms. • Allow ample drying time (72 hrs) before occupancy	• Use 13 oz/sq yd vinyl wallcovering for most locations; use 22 oz. (min.) material for elevator lobbies, lounge/ kitchen/ vending areas, and areas subject to heavy use. • Building Code may require fabric with low flame-spread rating. Class 1 flame spread is recommended but may be an above standard charge.

CEILINGS

Ceilings in office areas are typically suspended from the floor slab above to create a space in which ductwork, piping, and wiring can be concealed and fluorescent troffers may be recessed. The suspended ceilings are usually made of a sound absorbing material with a textured pattern of perforations or other deformations.

Several choices are available to the designer. The metal suspension grid, hung with wires from the structure above, can be concealed or exposed. With either method, it is possible to access the utilities above the ceiling. If exposed, the grid can have a factory applied enamel finish (most often, white) or, it can be white metal (aluminum) in color. The grid is most often a 2'x4' or a 2'x2' module, matching the size of recessed fluorescent fixtures.

Ceiling tiles are made of fiberglass or mineral fiber, in many patterns and configurations. Usually, they are white or off-white (factory applied latex paint), and may be repainted if the ceiling becomes discolored, although this would affect the acoustical rating. From the functional standpoint, a key design consideration is the Noise Reduction Coefficient (NRC), a measure of the tile's acoustical performance, that is, its ability to absorb rather than reflect sound. For most office applications, an NRC of .60 or better is desirable; higher ratings are available for special areas.

In some spaces, acoustical considerations may be less important than the need for washability and moisture resistance, for example, in locker rooms and shower rooms, or in food preparation areas. In such locations, a suspended drywall ceiling, painted with a alkyd semi-gloss enamel provides an acceptable ceiling surface. The drywall is the same as that used for partitions (sheets 4'x8'x1/2"), but it should be specified as water resistant drywall for moist locations.

MILLWORK

Millwork (cabinetwork) and furniture are also an important part of the working environment. Furniture is discussed elsewhere in these guidelines. Millwork -- sometimes called "custom casework" -- consists of those items of fixed-in-place furnishings, traditionally made of wood, such as paneling, shelving, and cabinets. In years past, such things were made of solid wood, or of wood veneers bonded to a lumber core. Now, it is probable that the lumber core is replaced by particleboard (or, possibly, plywood), and the rich-looking hardwood veneers replaced by high-pressure plastic laminates. The advantages of the newer methods of millwork and furniture construction are several: lesser cost, a wider selection of colors and finishes, improved dimensional stability, and greater resistance to fire and abrasion.

Besides the fundamental concerns of function, cost and appearance, the design and specification of millwork should address the environmental issues of VOC and formaldehyde emissions. Particleboard and/or plywood with low formaldehyde content should be used, and adhesives low in VOC emissions should be called for. All sides of particleboard should be sealed, to encapsulate the potential escape of gases. To evaluate VOC emissions, it is best to have potential suppliers submit "chamber test" data on their products. Finally, if real wood veneers are to be used, wood that is the product of a managed, sustainable forest should be used.

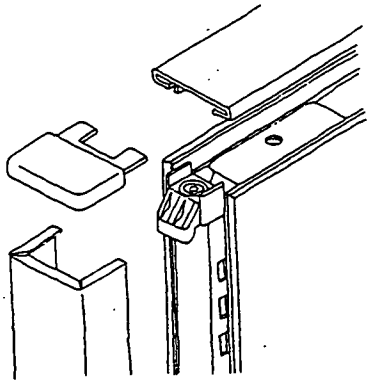
	CEILINGS	MILLWORK
Where Used	• Acoustical tile ceilings used wherever sound absorption is needed: offices, corridors, conference rooms • Suspended drywall often used in toilet/ locker rooms, where moisture resistance is desired.	• Paneling, shelving, cabinetwork • Custom furniture.
Options	• Acoustic tile material typically mineral fiber, but fiber board, metal, fabric, or film faced also available. • Various colors, patterns, and textures. • Various NRC ratings available. • Ceiling suspension grid can be concealed or exposed.	• Choices of materials and details limited only by budget and designer's imagination.
Sizes	• Ceiling tiles typically 2'x2' or 2'x4'; 3/4" or 5/8" thick. Sometimes tiles are scored to look like 1'x1'. • Suspended gypsum wall-board: 4'x8'x1/2" sheets	• Not Applicable (custom)
Environmental Concerns	• Few environmental concerns with use of acoustical tile, although material can shed glass fibers into the air • Some tile is made using recycled material.	• Offgassing from Urea Formaldehyde in plywood and particleboard. • VOCs in glues, adhesives, and wood finishes. • Depletion of tropical hardwoods.
Recommendations and Remarks	• Recommended acoustic tile: 2'x2'x3/4" mineral fiber with tegular edge; exposed grid system. • Use NRC of '.90-1.0 for open plan offices, copy rooms, libraries; use tile w/ NRC of .50-.60 (or better) elsewhere. • Paint suspended drywall with semi-gloss alkyd enamel.	• Seal all faces of plywood and particleboard. Use low VOC adhesives and wood finishes. • Specify wood veneers from managed forests. • Millwork details are specific to each individual application.

Selecting a Furniture System

Why is "Systems Furniture" used in offices? It is designed primarily for use in an open office plan that calls for few fixed floor-to-ceiling partitions. Open office planning derives its purpose from its ability to respond easily to requirements for increased flexibility and for lower long term expenses. The major requirements that systems furniture responds to are:

Flexibility of Planning:	Systems furniture in an open plan configuration efficiently maximizes the net usable space.
Flexibility of Function:	Systems furniture allows individual workstation modification, so that workstation design can reflect the functional requirements of the task performed. Changes in function, therefore, can be accommodated without total furniture replacement.
Flexibility of Plan Modification:	Systems Furniture in an open office allows easier response to organizational changes in size, structure and function. Open planning helps your Divisions respond to change by lowering costs related to partition relocation, HVAC modification, lighting relocation, construction and moving time.

Finally the new, rapid developments in telecommunication and electronic technology in the office environment require adaptable and responsive systems furniture products. The following list of issues focuses on the key considerations in the selection of a furniture system.



SYSTEM COMPONENTS

KEY CONSIDERATIONS

GSA Regulations. In selecting furniture, EPA must follow the process and products of the GSA Federal Supply Schedule in effect at the time of acquisition.

Integrity and Simplicity of Components. Engineering design is at the heart of a Furniture System's integrity and sturdiness. Simple engineering design responds successfully to structural, assembly and operational requirements. Therefore, installation is easier and faster, as are future furniture rearrangements. If installation goes quickly, delivery schedules are more realistically achievable. Simplicity also means fewer parts which translates into better inventory control. All this creates substantial initial and life-cycle cost savings.

Sturdiness. Another aspect of the engineering design is the ruggedness built into the system. Are the panels and hanging shelves designed to support a full load of computer manuals? Can the panel connectors withstand a moderate amount of bumping?

Wire Management. One of the chief concerns in open offices is wire management. The systems furniture's capacity to accommodate an increasing number of power and signal wires and to distribute them appropriately within the system configuration may determine the selection of one system over another. Does the system have the ability to bring wiring directly to the work surface? How easy is it to access the wire management channels?

Electrical Capacity. In addition to wire management, when selecting systems furniture one must also consider its electrical capacity: How much electrical power

can each workstation carry? Can it carry enough clean power for ADP usage? What is the arrangement for convenience outlets?

Size and Modularity. A broad range of sizes for systems furniture provides more flexibility to accommodate varying workstation configurations as well as planning modules. Are the sizes of components set at standard dimensional increments for both width and height; does enough variety of sizes in both dimensions exist? Does the system offer floor-to-ceiling panels? Do those panels accommodate doors; does the system have freestanding panels that can take doors? Does the system set its dimensioning point on the centerline of its workstation module (to do so keeps the "layout creep" factor to a minimum)?

Budget and Value. Since a very wide array of systems furniture exists, a cost that matches a specific budget can usually be found. An important part of that cost, however, pertains to the systems furniture's finish. Some manufacturers offer only a limited range of finishes, whereas others offer a broad selection menu. The quality of the finish strongly affects the aesthetics and functional longevity of the furniture--the better the quality of finish, the better it will look and wear. Thus the capacity of a finish to resist the effects of wearing significantly determines the furniture's useful life-cycle.

Lighting Applications. Does the system offer overhead lighting units in increments longer than the system's standard panel widths? This feature saves on the cost of convenience outlets or on the number of outlets dedicated to lighting; this also provides greater system furniture rearrangement flexibility. Local electrical codes need to be checked to determine whether lighting units can be connected in series; if they can, this too will save on the use of convenience outlets.

Acoustic Rating. Check and compare different systems sound transmission ratings.

Aesthetics. What does the system look like and what are the options for variety and change over time? Visual consideration is especially important when choosing new furniture and integrating it with existing furniture. What is the "shelf life" of the system and the manufacturer's commitment to keeping finishes and fabrics?

Matching Furniture. Does the system offer loose furniture, either as independent pieces or as pieces constructed with systems parts?

Some new trends in systems furniture design, such as the following, should also be considered.

- Does the system provide any integrated air handling mechanism to circulate and filter air within or between the workstations?

- Does the furniture manufacturer offer, as part of an inventory control process, computer software designed to coordinate and track loose furniture and system components?

- What environmentally safe materials does the manufacturer use in the furniture? Does the manufacturer offer a selection of environmentally benign finishes; does a cost premium exist for using them?

Plants for a Healthier Environment

Beyond beautifying our interior and exterior environments, plants make our world a healthier place to live. In the closed environments of today's modern offices air quality can be a health concern. Chemicals emitted from building materials, cleaning products, furniture, finishes, office equipment and the like are all potential pollutants. Gasses released from inks, plasters, rubber, tobacco smoke, as well as from simple human breathing all add to the problem. Properly selected and maintained indoor plants, however, can provide an inexpensive and refreshingly natural aid to the removal of pollutants from office air.

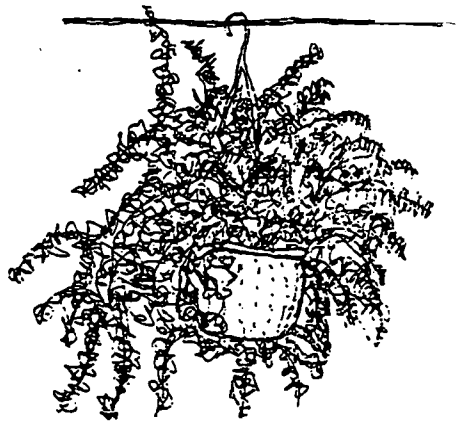
Research into the ability of interior plants to improve indoor air quality is relatively recent, although the role of plants and the earth's atmosphere has been studied for decades. Following is a summary of research on interior plants provided by the non-profit organization Plants for Clean Air Council, in Reston, Virginia. The information below was taken from a study by Wolverton Environmental Services, Inc. (see following page) and PCAC's synopsis of results from a study by NASA and the Associated Landscape Contractors of America. They found, through testing specific pollutants, that tropical plants normally used indoors as well as many well-known flowering plants are effective cleaners of indoor air. Specific pollutants, some of their sources and plants that clean the air of them are listed here, in descending order of tested removal rate.

POLLUTANT	SOURCES	BENEFICIAL PLANTS
Formaldehyde	foam insulation	Boston fern*
	plywood	Chrysanthemum
	particle board	Gerber daisy
	clothes	Dwarf date palm
	carpeting	Bamboo palm*
	furniture	Janet Craig
	paper goods	Kimberley queen fern
	household cleaners	English ivy*
	water repellents	Weeping fig
		Peace lily
		Areca palm*
		Corn plant
Benzene	tobacco smoke	Gerber daisy
	synthetic fibers	Chrysanthemum
	plastics	Peace lily
	inks	Warneckei
	oils	Bamboo palm*
	detergents	Marginata*
	rubber	Sansevieria
	gasoline	Janet Craig
Trichloroethylene	paints	Gerber daisy
	varnishes	Marginata*
	lacquers	Peace lily
	adhesives	Janet Craig
	dry cleaning	Bamboo palm*
	inks	Warneckei

WEEPING FIG

* Indicates indoor plants commonly available.

POLLUTANT	SOURCES	BENEFICIAL PLANTS
Xylene	adhesives	Areca palm*
	jointing compound	Dwarf date palm
	wallpaper	Dumb cane*
	caulking compounds	Dragon tree
	floor covering	King of hearts
	floor lacquer	Kimberly queen fern
	grease cleaners	Warneckei
	tobacco smoke	Lady Jane
	varnish	Corn plant
		Weeping fig
Ammonia	office cleaners	Lady palm
	copy inks	King of hearts
		Lily turf
		Lady Jane
		Chrysanthemum
		Peacock plant



BOSTON FERN

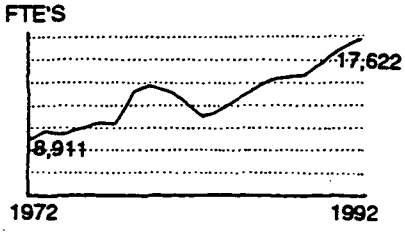
* Indicates indoor plants commonly available

Sources: Wolverton, B.C. and Wolverton, John.
Interior Plants and Their Role in Indoor Air Quality: an Overview.
Wolverton Environmental Services, Inc., Picayune, Miss, 1992

Plants for Clean Air Council
Plant Tips for Commercial and Residential Environments
P.C.A.C., Reston Virginia.

Getting it Done

The Environmental Protection Agency is a dynamic organization, in a continual state of flux. Programs are regularly initiated, reorganized and contracted in response to changing environmental priorities. This condition requires facility managers in the Agency to regularly assess changing space needs and respond with appropriate action. Each EPA component therefore needs to develop logical solutions that respond to individual space problems, defining needs and generating workable solutions. The process is called Office Planning.



WORK YEAR GROWTH

Good Office Planning is not an accident. It requires informed decision making through careful examination of the existing situation, an understanding of the characteristics of the occupied space, working knowledge of the procurement process, and a fair idea of detailed user requirements e.g. space, functional relationships, technical requirements, etc.

In 1983, the General Services Administration (GSA), through its Public Buildings Service (PBS), began focusing on development of an Advanced Technology Buildings Program for its federal clients. This action was born out of the recognition that, over a 30 year life-cycle, the comparative costs of building construction and maintenance were only about 10% of the total expenses, while salaries amounted to approximately 90% of the costs. Which means that good office planning and design, while not costing much proportionately, can significantly improve performance and efficiency of employees and contribute towards productivity, and today GSA encourages an interactive design process.

GSA controls and manages the space acquisition process, and any addition of space, whether for 20 people or 2,000, follows a similar process:

1. EPA initiates the process by developing preliminary space needs and requesting space from GSA.

2. GSA seeks the appropriate space in a Federal Office Building, or if not available, solicits offers.

3. EPA procures professional services to assist them.

4. GSA, with input from EPA, reviews the offers and adequacy of the buildings, and selects/procures the additional space.

5. The interior design process begins, as a cooperative effort between GSA and EPA.

6. Parallel with the interior space design is the furniture selection and procurement (by EPA under GSA Federal Supply Schedule).

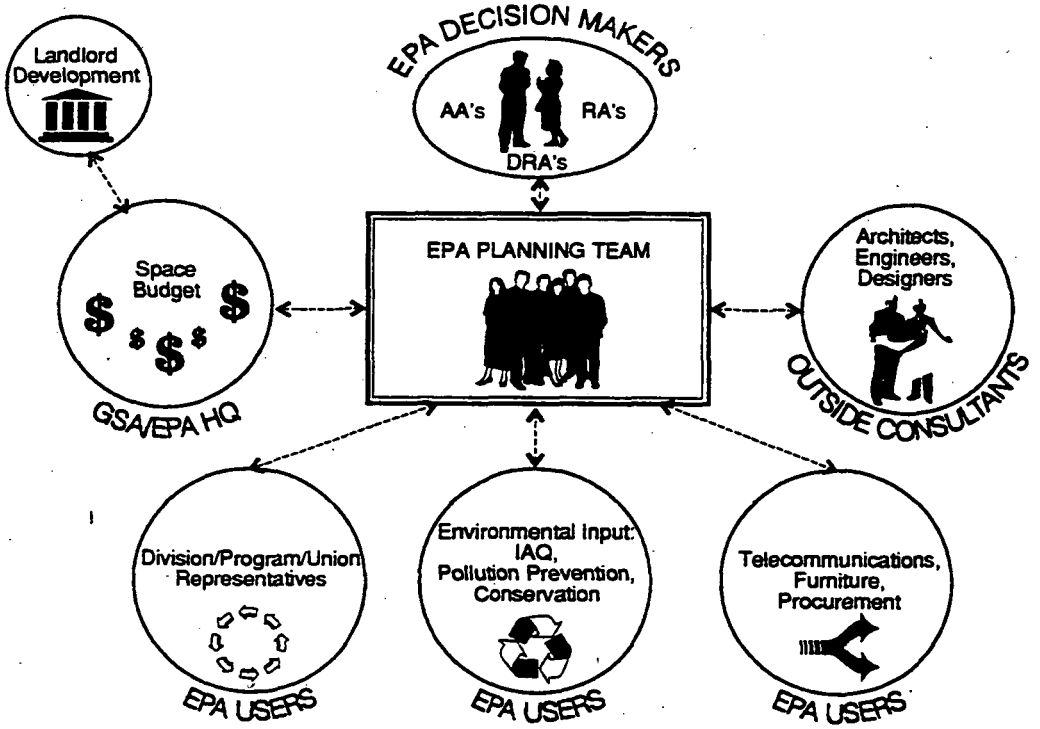
7. Construction, Installation and Move.

EPA Initiates the Process

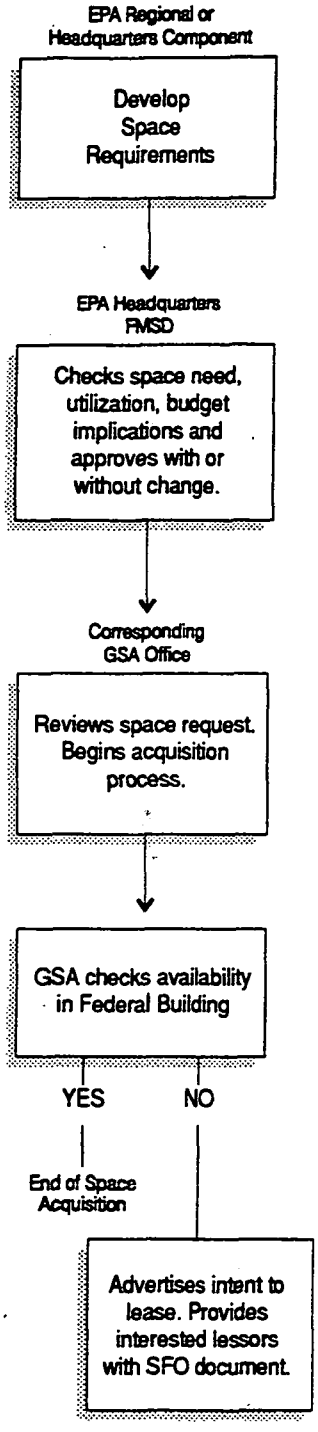
The expiration of an existing lease, move from a building because of environmental upgrades, proposed consolidation of fragmented offices and program growth or contraction are reasons that require project initiation.

The first step for EPA is to form an interdisciplinary planning team. The purpose of the team is to make certain that the requirements and activities of the EPA users, GSA, EPA Headquarters and consultants are coordinated. The make-up of the planning team is contingent upon the size of the EPA organization involved and the project scope. For example, the team size and composition will be very different when you are adding 20,000 sq.ft. to an existing facility from when you are acquiring a new building for an entire regional office. Therefore, the formation of this team should be flexible and responsive to specific EPA project needs. The team should be responsible for all planning tasks, holding meetings with EPA users, hiring outside consultants, selection of furniture, coordinating with GSA and EPA headquarters. This method of planning has been successfully deployed in several regions, headquarters, and NEIC to the satisfaction of EPA employees. The team is usually drawn from in-house personnel and is augmented with specialists as needed.

The second step is to develop a preliminary program of space requirements and request the space from GSA. In order for GSA to begin the Solicitation Process, EPA's project needs must be defined in sufficient detail to enable GSA to approach Offerors and obtain lease proposals that can be easily compared. This is accomplished by the EPA Initiating Office through completion of Form 81, which defines overall space requirements for office, special and storage needs. Additionally, GSA above-standard requirements are also articulated so that Offerors are aware of cost implications as they relate to 24-hour HVAC, structural reinforcement, electrical power needs, Uninterruptable Power Supply, etc. Depending upon the size of the project, this effort can be done in-house, by using 'Space Standard Guidelines,' or by hiring consultants.



GSA Solicits Appropriate Space



The Federal Property Management Regulations (FPMR) are very specific as to the process to be followed when requesting space. The majority of new leases, or additional space requests are GSA controlled. Based upon Form 81, GSA first attempts to provide the Agency with space in a Federal Office Building (FOB). If unavailable, GSA solicits proposals from interested parties to lease space within a neighborhood (Area of Consideration) mutually agreed upon by GSA and EPA.

The responses from Offerors are based upon information contained in the Solicitation for Offers (SFO), which among other items, specifies the technical and performance specifications for the base building, the quantitative and qualitative requirements for EPA space, life safety requirements, the services, utilities and maintenance procedures, and the procurement, award and lease process.

The SFO contains specifications that ascertain acquisition of first class office space. However, the information contained is generic for all federal acquisitions and GSA encourages client Agencies such as EPA to provide specific requirements and criteria to meet its mission needs. This includes all special space requirements; technical requirements like Indoor Air, Energy Efficiency and Recycling, and maintenance/operational requirements, that can be easily accommodated in the acquisition process without hampering competition. It is important that you work closely with FMSD to identify these special needs before the SFO is issued.

You must note that GSA negotiates rent for space obtained for a client agency based upon a standard list of interior construction items (called "Workletter" in private industry jargon) for useful occupancy. The quantities of these items are provided based on occupiable square footage. These include the following: a basic HVAC system; drywall, electrical and telephone outlets; doors, frames and standard hardware; ceiling and floor covering; lighting fixtures and fire protection sprinklers; and window coverings.

The GSA allows upgrades in quality and quantity, where necessary, on payment of extra costs to the landlord. Before embarking upon requesting any additional items, please ascertain that estimated costs are budgeted and available. (Refer to GSA Facilities Standards - PBS/PQ100).

In cases where the Agency has been granted "Delegation of Authority" for special areas such as its laboratories, EPA controls the entire process and prepares a detailed "Program of Requirements" that includes space requirements as well as technical requirements for the Base Building itself.

EPA Procures Professional Services

Early selection of professional services will enable EPA to participate in GSA's selection of appropriate space, as well as easily coordinate the later design work.

The procurement of Planning and Design Services is dependent upon the size and complexity of the project. Several Regions and Headquarters have in-house staff of architects/planners for routine facility management tasks. Expansion, contraction and moves of fifty to hundred persons have been successfully handled by in-house technical staff in several regions. However, when a large project such as an entire regional office move is planned, it usually becomes necessary to augment existing staff with outside consultants. The role of the in-house technical staff then reverts to coordinating, directing and monitoring consultants, to enable EPA to meet schedule and budget goals.

Besides the services of Architects, Planners and Interior Designers, a project needs specialized consultants like mechanical and electrical engineers. Other consultants such as structural engineer, lighting consultant, tele-communication consultant, audio-visual consultant, environmental consultant etc. may also be required

The services of the technical experts can be obtained in a number of ways, provided both money and time are adequately budgeted. The following mechanisms have been employed by various EPA organizations; some projects have used a combination of contract opportunities.

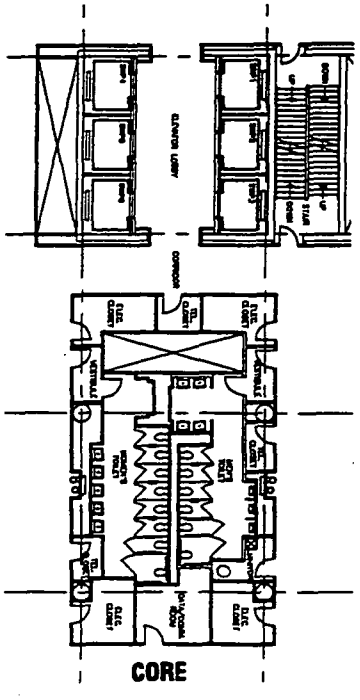
In-house Support. The availability of workyears can allow part-time or full-time hires on EPA staff. As stated earlier such assistance is extremely valuable in maintaining basic facility management activities. Usually, such in-house technical staff keeps the space situation in control, updates drawings, produces designs for expansion, keeps up-to-date furniture inventory etc.

Design Services through GSA. In several regions, the General Services Administration (GSA) pre-selects local architectural and planning firms and signs term contracts of one to five years with them to provide design services to federal agencies. Such mechanisms are useful when a design needs to be completed to meet a lease-imposed deadline and EPA is unable to procure services within the required timeframe.

Lessor provides Design Services. In the absence of design assistance from GSA the lessor may agree to provide design services. The cost of such services is built into lease payments. However, design teams hired by the lessor may not be in a position to develop an objective design and fully represent EPA interests. In our experience, schematic and design development should be developed by EPA consultants with the lessor design team producing construction documents and obtaining necessary local municipal permits.

EPA procures design services. GSA must issue a waiver before EPA is allowed to hire its own consultants. Once such a waiver is obtained, EPA Contracts Division procures design services under the Federal Acquisition Regulations, which can take anywhere from 6 to 12 months. The process requires advertising in Commerce Business Daily (CBD), development of a 'Request for Proposals' outlining scope of services, receiving proposals and selection of a design firm.

GSA Reviews and Selects Space



GSA reviews offers and selects a building based on the Federal Property Management Regulations process and the Solicitation for Offers (SFO) they have prepared. In order to get suitable space for EPA, GSA examines the base building design for technical excellence. We have listed items which, if applied during space selection, will ensure acquisition of an adequate building. Relevant parts of the listing may be included in the SFO as requirements or as evaluation criteria. Regardless, the application of the following adequacy listing will be useful when GSA and EPA review buildings.

BASE BUILDING ADEQUACY

The quality of interior space is related to the quality of the Base Building itself. You must ensure that the capacity of structural, mechanical, and electrical systems provided in the building is adequate to support the present and future EPA office automation requirements. When obtaining expansion or new space, the following aspects of the base building should be carefully examined by relevant professionals:

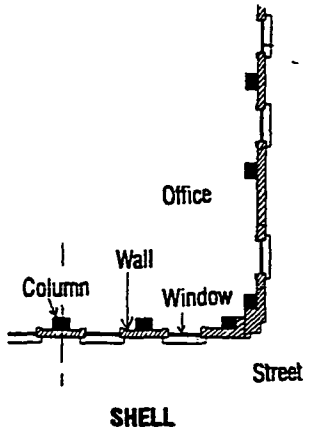
Core

Core is a term utilized to define the assemblage of vertical circulation and services in multi-storeyed buildings. It consists of passenger elevators, freight elevators, toilet rooms, janitor closets, maintenance rooms, primary mechanical and electrical distribution, ducts/shafts, electrical/data closets, fire protection equipment areas, and structural elements for building structural functions. The arrangement of these elements and the overall design of the core impacts the efficiency of space under consideration.

Core Support. Adequate equipment closet space to meet current and future demands of EPA's occupancy must be built within the existing core. In buildings where electrical and telephone closets fall short of need and no area is provided for data closets, the Agency ends up converting occupiable area for these functions. The inclusion of space for mail management and recycling in core design is an added plus.

See Volume 2 - Technical Considerations for more details

Elevator Lobbies. The passenger elevator lobby must be a minimum of 10'-0" wide in double loaded elevator situations. The waiting time during peak period should be no more than 18 seconds. A service vestibule isolating freight activities should be provided.



SHELL

Building Shell

This term defines the external skin of a building and includes the glass, aluminum, steel, concrete and masonry skin of the building and the window sill condition including heating, ventilation and air distribution system. The shell may include structural columns located within or outside of the glass line at the window wall.

Perimeter Conditions. When assessing space suitability for EPA occupancy, the perimeter conditions (the configuration and protrusions along the inside surface of the building's outside walls) become important to investigate, since they have a major impact on space planning and workstation layout and in turn planning efficiency. For example, large number of protrusions from the wall, e.g. columns, convectors etc., may

require a perimeter corridor instead of engaging stations with external wall, thus losing occupiable space.

Height of Window Sill. The height of the window sill varies with the perimeter air conditioning systems. In modern buildings, especially in Washington, D.C. and south of Washington D.C., perimeter conditioning is provided through forced air distributed through ceilings instead of under the sill convectors. This allows the window sill to be lower than the furniture height of 30", which is a difficult planning condition. In some buildings the sill is totally eliminated, causing problems with the accommodation of data, telecommunication and electrical wiring.

Building Structure. Programs within EPA require substantial secure space for filing, functionally adjacent to the office space. Typical offices spaces do not provide unusual floor loadings to accept central filing, libraries, dockets, etc. Similarly, in large acquisitions for entire regional offices, the Agency may need column-free areas and extra height for spaces such as auditorium, cafeteria, training center, etc. Therefore when assessing a base building, attention must be given to the capacity of floor loading, available floor-to-ceiling heights, bay sizes, regularity of structural elements and availability of area (mostly on ground floor) to accommodate columnless and extra height spaces.

FUNCTIONAL ADEQUACY

It is clear from observing several existing EPA facilities that the availability of requisite occupiable area does not always translate to space suitable for intended occupancy. This is particularly true for older structures with irregular layouts that were constructed when life-safety codes were not as stringent. The following aspects of space must be kept in mind.

Building Shape. The occupiable area needed may be apparently available in the building under consideration, but may be so poorly configured that intended EPA office functions cannot be accommodated. Several EPA buildings around the country, especially those located in older buildings or non-office structures, lose efficiency because of narrow or angled floors, poorly proportioned areas, irregular column spacing, inadequate core design, etc. It is a good idea to prepare a conceptual layout of a typical floor in order to assess the efficiency of space for EPA's use.

Below Grade and Interior Space. A portion of EPA spaces do not usually require daylight. Uses such as storage rooms, stock rooms, mail area, computer rooms, copying, and even conference rooms can be satisfactorily located in below grade space or interior space. (Below grade workstations are not acceptable). However, this represents only 10 to 15% of programmed net area. Therefore buildings offering a larger percentage of below grade space may be unsuitable.

As discussed previously, the core-to-wall depth (called lease depth) and the window-to-wall area determine the extent of daylight available on a typical floor. Both these variables alter somewhat based upon the climatic conditions of the area where the building is located. Our experience indicates that a lease depth of 40' to 50' and a

minimum window-to-wall area ratio of 40% usually satisfies most performance requirements.

MECHANICAL SYSTEMS ADEQUACY

The mechanical system in each building can be engineered in a variety of ways to achieve requisite performance requirements for heating, cooling and ventilation. Although the mechanical system design has to meet minimum local code criteria, it is a good idea to further assess the systems in areas critical to EPA occupancy. Our experience indicates that, if engineering drawings and specifications are available, the analysis can be easily conducted within a few days by EPA consultants at minimal initial costs. We recommend that the following items related to the mechanical systems should be investigated:

Outside Air Capacity. The system must meet the minimum ASHRAE standard 62-1989 for 'Ventilation for Acceptable Indoor Air Quality.' This means that at least 20 cubic feet per minute (cfm) of fresh air per person at a density of 150 sq.ft./person must be available. In other words, a 15,000 sq.ft. floor accommodating 100 EPA employees should be capable of providing a minimum of 2,000 cfm of outside air.

Zoning. Office buildings have two discrete zones of temperature control. The first is called the perimeter, the second the interior. The perimeter is commonly described as a band approximately fifteen feet deep adjoining the windows. The interior is the balance of the floor plate, the entire remainder beyond the perimeter band.

The perimeter is affected by seasonal variations in the outdoor air temperature and the diurnal effects of solar radiation. The perimeter has contrasting demands for both heating and cooling, even within the frame of a single day. The interior requires cooling all year long because the heat released by lighting, office machines and human metabolism are nearly constant all year.

Both the interior and exterior zones are further subdivided into sub-zones and controlled by thermostats. Each thermostat regulates the amount and temperature of air delivered to maintain desired temperatures.

The proposed mechanical systems must be investigated to determine the method of heating/cooling adopted to control perimeter temperature on each side of the building; the size of sub-zones controlled by thermostats (Range between 1,000-1,500 sq.ft.); and the capacity of air supply boxes on the perimeter and interior zones.

Ducts. A well balanced Heating, Ventilation and Air Conditioning system, among other things, is dependent upon unimpeded flow of air from central mechanical rooms. A proper duct layout will ensure that it follows straight horizontal and vertical rows and minimizes sharp bends or jogs caused by structural and other plenum elements. A large presence of such obstructions may cause constriction of air flow and cause air turbulence that leads to noisy air diffusion and loss of efficiency in air distribution. Space with such problems should be avoided. Further, the air distribution systems must permit space planning flexibility and allow EPA space to be re-designed without impacting performance or efficiency.

Auxiliary Ventilation. Several EPA programs maintain graphic, printing, copying, blueprinting and kitchen uses that require special ventilation requirements, such as direct exhaust to outside. At times the base building's existing exhaust ductwork serving toilet rooms and other core requirement is insufficient to accommodate additional direct exhaust needs. The availability of tenant ventilation duct shafts becomes important to EPA occupancy when noxious fumes from aforementioned uses need to be filtered and exhausted to the outside.

Off-hour operation for computers and personnel. EPA's office operations are supported by computer rooms and other equipment rooms that require 24-hour air-conditioning. Additionally, after normal-office-hours access is usually required by EPA staff in the late evenings and on the weekends. When assessing mechanical systems in a base building, it becomes important to establish if the systems have been designed to support small loads during off-hours. A building incapable of supporting 24-hour operation from the base building mechanical systems may require EPA to install its own auxiliary air conditioning system for computer rooms, necessitating independent ducted air supply from window wall or ducts from roof-top. These sources of air are very expensive to add.

Noise. The base building is equipped with elevator machinery, mechanical equipment, fans, and ducts that carry high velocity air that can subject the occupants to disturbing noise levels in the absence of proper acoustic isolation.

Sound ratings of air terminals and equipment should be based on Noise Criteria (NC) curves as defined in ASHRAE Guide System and Applications 1987. They should be as follows:

- General Office Space NC 35 - NC 40
- Private Offices NC 30 - NC 35
- Conference Room and Executive Offices NC 25 - NC 30
- Computer Equipment Rooms NC 40 - NC 45

Interior Design Process

The exact organization of the interior design process and the working relationship between GSA and EPA will vary with the specific project. However, all will need the following steps:

DEVELOP SPACE REQUIREMENTS

Review Existing Situation: To develop a program of requirements, it is important to review the existing situation. A lot is learned through observing how a specific EPA organization operates, the station sizes used, relationships of central functions to various divisions, etc. Further, analysis of documents such as layout plans, furniture inventory, staffing list, environmental and adjacency problems are all important in the development of a Program of Requirements.

Detailed Programming. The detailed requirements for additional or new space are developed through a process called Programming. The end result of Programming is usually a document called the 'Space Program' that contains information about the Organization, its departments, the number of employees, sizes of workstations for various employees, special spaces, workflow requirements, operational needs, security needs, growth projections, organizational goals, etc. This is accomplished through observation, study of existing documentation and interviews. The basic purpose of the document is to provide a design team adequate information to enable them design EPA space. See the chapter "How much space?" for general guidelines and standards.

PREPARE PROJECT SCHEDULE

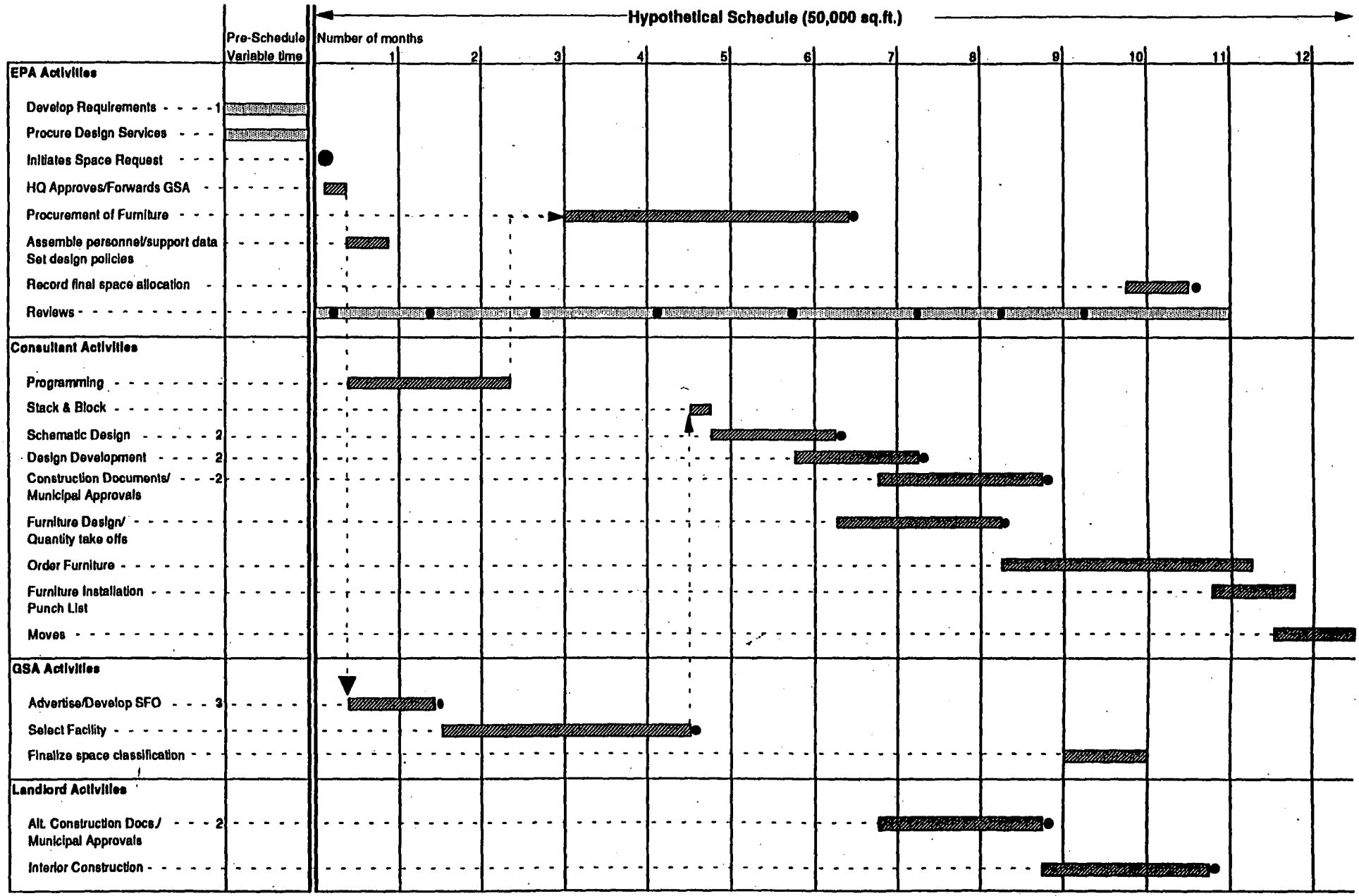
The interaction between project participants and the complex procurement process requires development of a project schedule. A schedule establishes events, activities and responsibilities. It creates a framework that enables project managers to monitor the EPA, GSA, landlord and consultant activities, project start and end, when consultants are needed, client review periods, budget planning, move and occupancy.

The schedule depends upon several project variables that need to be established up front. For example: a) Is the space requested available in a Federal building or requires to be leased?; b) Are the design services being provided by the landlord, GSA or obtained by EPA?; c) Does EPA already have a contract for furniture supply or does it need to go out on street, and whether EPA will lease furniture or buy it?

The development of a project schedule is critical in project implementation. In itself, the schedule does not guarantee timely or successful completion but, if properly monitored, it acts like a barometer for tracking planned progress with actual progress and makes an effective decision-making tool.

For the EPA project manager, this tool provides a useful basis for encouraging EPA users to make timely decisions and also helps establish and justify design fees for various kinds of consultants.

We have provided an example of a schedule for a 50,000 sq.ft. development on the next page.



1 May be developed by consultants in cases of large and complex projects
2 Alternatively, may be obtained from GSA or landlord if feasible
3 This time is not required if EPA elects to go to an available Federal Facility.

ESTABLISH PROJECT BUDGET

Every EPA project initiated and completed costs money. At the outset, the Agency should ensure that estimates for renting space, design and consulting services, above standard-cost, furniture and installation, equipment, telecommunications and move/occupancy are established and budgeted for appropriate fiscal years. The following macro-budget items are of importance when planning a new project:

1. Rent. This cost is established by GSA based upon the extent of Office, Special, Storage, and Parking space leased. It is usually in dollars per occupiable square foot and is for standard construction. The EPA Headquarters commits itself for such payments on EPA occupancy.

2. Above-standard costs. To meet several mission-related design requirements, such as special construction for secure areas, card key entrances, direct exhausts for print rooms, clean power, 24-hour operation for computer rooms, uninterrupted power supply, energy-efficient lighting and use of interior materials that are environmentally suitable. These costs can be accurately estimated after completion of Design Intent drawings when quantities and specifications for interior materials, such as walls, wall coverings, lighting, electrical outlets, etc. are established, when it is possible to identify above-standard items. However, at the planning stage, a set-aside budget of $5.00 to $10.00 per square foot, is usually sufficient.

3. Design Fee. The budget for programming, schematic design, design development, and construction documents usually depends upon the size of the project. A budget of $3.50 to $4.50 per square foot that includes all the above mentioned phases, as well as construction monitoring is a good rule-of-thumb for interior design projects. Note that a project may require EPA to budget for all or part of design services only. EPA responsibilities must be established at the start of the project.

4. Furniture Costs. The costs for furniture, furnishing, installation and furniture design are usually established by inviting bids from various vendors. A budget of $3,500 to $4,000 per station for systems furniture, inclusive of support furniture such as filing, reception and design fees is adequate. If EPA desires to re-utilize existing furniture, the design fees need to be increased due to the time and effort of conducting a furniture inventory and designing on that basis.

5. Voice and Data Communications. The EPA National Data Processing Division (NDPD) has established technical standards for voice and data communications to be used in EPA office facilities. These standards recommend specifications related to cables, jacks, distribution system, hardware equipment, etc. In NDPD's assessment, approximately $1,000.00 per workstation is a reasonable budget to cover costs related to general wiring, wiring closets, phone sets etc. Beware, that in some cases GSA pays for all or portion of telecommunication costs. Check the FPMR.

6. Equipment Costs. These are based upon actual equipment that EPA proposes to install in its new space. This can only be developed after assessing the extent of additional equipment the EPA needs to obtain.

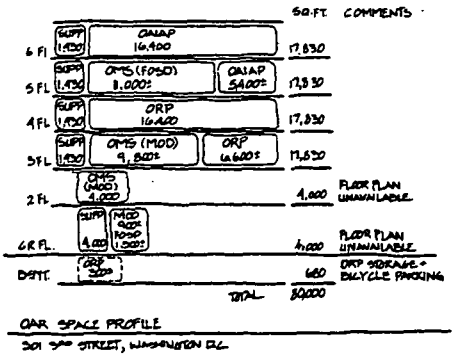
7. Move and Occupancy Costs. The move and occupancy costs are related to the transfer of equipment, filing and personal effects from the current to the proposed location. These vary considerably depending upon the extent of equipment, furniture and the distance between the existing and new location. Within Washington, D.C., the Agency budgets an estimated cost of approximately $150/person for personal effects and equipment, assuming no furniture is to be moved. The FPMR identifies conditions under which GSA or EPA pick the move costs.

8. Expert Consultants. Depending upon the needs and complexity of a project, the services of expert consultants are usually required. Since such services are associated with specific areas, it is not possible to define these needs unless the scope of the project is established. Given the environmental focus, projects may require review and consulting from lighting experts, IAQ experts, specialized engineers, graphic artists, etc. Costs for these services must be estimated at the beginning of the project.

DESIGN DEVELOPMENT

Blocking and Stacking. On completion of the detailed program and selection of space, the design can be initiated. As a first step, the EPA components need to be placed on each floor, representing the extent of square footage needed for major functions. Logical placements of division and central support should determine the Block Plan. This means that due regard should be given to functions that could be on the interior, equal access to windows, desired adjacencies between planning units and possible sharing of support.

In situations where EPA occupies more than a single floor of the building, a vertical section indicating distribution and relationship among various divisions is prepared. This is called the Stack Plan. On approval of the Block and Stack Plan by EPA, the design process can continue.



STACK PLAN

Schematic Design. With the Block and Stack Plan as a guide, the layouts for each floor are prepared as concepts. These concepts are based upon the space program. EPA operational requirements, environmental requirements, base building constraints, the building module, window wall conditions, etc. Make sure that the architects/interior designers have field measured the space, that the plans actually reflect the dimensions, are drawn to a scale appropriate for the size of the project and show circulation, location of partitions, doors, cabinets, furniture, etc.

Design Intent Documents. On approval of the schematic design, the plans are further articulated to begin defining station layouts, ceiling conditions, lighting, materials etc. The architects and interior designers define performance specifications of drywalls, ceilings, wall coverings, carpets, to meet the technical and performance requirements associated with each space. Elevations, isometrics and three dimension studies are completed.

Power requirements, exhaust requirements, mechanical ventilation for each type of space is noted. Use of sensors and type of lighting is also defined, recognizing the energy efficient requirements.

The end result of this phase should be the definition of design to a level so that construction documents and specifications can be prepared. In an ideal situation, the furniture system and equipment should have been identified by now so that the design intent documents are based on actual dimensions of panels, furniture, and equipment under consideration.

Normally, this is the stage at which GSA hands over the design to the lessor for preparation of construction documents.

Construction Documents. Since the interior build-out often is carried out by the lessor, the Solicitation for Offers (SFO) usually specifies construction documents as a lessor responsibility. This enables the architectural team already familiar with the base building systems to develop, integrate and obtain municipal approvals for the interiors. However, the GSA/EPA responsibility does not end at design intent levels. Rather, EPA should stay involved to ensure that the intent of the design is completely carried out in construction documents, and professionals need to carefully monitor the layout and construction details and the shop drawings prepared by lessor team.

EPA should obtain the final set of documents, preferably on CADD systems, for their records.

Furniture Selection & Procurement

The selection of furniture and its procurement needs to follow the process and products delineated in the GSA Federal Supply Schedule. There are numerous furniture systems that are on GSA schedule. However, before going out to procure them, Federal Agencies are expected to utilize furniture produced by UNICOR. In situations where UNICOR is unable to supply the extent of furniture or supply it within the period in which it is required, the GSA issues a waiver to go out in the market for procurement.

Regardless of the furniture chosen, it is critical for EPA to select a system by the time design intent documents commence. This is important because various systems work on different modules, and a layout that is based on one system will require substantial revision if another is chosen. Minor dimensional variations, when factored over an entire floor, may end up significantly altering clearances and passage widths and reducing the number of stations.

EPA has successfully selected systems furniture by soliciting bids on the basis of four to five generic workstation configurations and estimated quantities. Additionally, the bids include other services such as furniture design, the preparation of documents and furniture installation. Based on the size of the procurement, this process has allowed the Agency to purchase furniture at extremely attractive prices, benefiting the Government.

The quality and style of furniture systems made by various manufacturers varies significantly. It is in EPA's interest that selection criteria be established when soliciting proposals. Systems manufacturers will go to great lengths to provide technical data to win contracts. Some of the usual criteria include, but are not limited to, quality, flexibility, safety, wire management, availability etc. (See Selecting Furniture Systems, in this Volume). Besides these factors it is important for EPA to analyze the environmental implications of furniture systems offered. The Indoor Air Pollution potential due to the use of glues, fabrics and woods must be examined by testing various system products.

Construction, Installation & Move

The construction of the interiors is a lessor's responsibility and is supervised by construction managers. In GSA controlled leases EPA typically has a limited role during this phase. However, you should discuss with GSA a greater EPA participation at this stage - in which you or your consultant architect monitors the work to protect EPA's interest.

The installation of furniture is carried out by manufacturers vendors. Several on-site problems do surface that need consultation with designers. EPA should make sure that these services are included in their contracts on an as needed basis.

The Agency is responsible for moving its employees to the new location. Usually this is done through contracting with moving companies. Such events should be used to purge unnecessary papers, equipment and furniture.

It is important that the employees are oriented to their new offices, furniture, security systems and the neighborhood. Recently the EPA Region 5 and Headquarters prepared a hand-out addressing these issues.

As-built documents should be obtained and filed by EPA facilities to enable future alterations and revisions. As EPA has started using CADD extensively, this may be the right media for recording.

Concerning Maintenance

The development of a successful maintenance program for your space is the way of keeping a good "quality" office environment. Beyond recognizing, selecting and installing environmentally appropriate materials, office space must also be properly maintained if it is to remain environmentally sound. Two primary areas of concern are adequate maintenance of the Air Handling System(s) and the choice of cleaning materials and their use. Both issues seriously affect the long term standards of an office's Indoor Air Quality (IAQ).

One should keep in mind that the relationships among building owners, management, staff and occupants are important factors in decisions that affect indoor air quality. As occupants, your primary concern is that your space be a safe, efficient and pleasant environment in which to work. On the other hand, the building owner's and manager's concerns are more dollar driven. It is therefore a balancing act to satisfy the occupants' needs for a good quality space within the parameters set by operating and maintenance budgets.

However different the objectives of the players may be, the issue of providing a healthy indoor environment is a common concern and should be addressed. The time to plan for good maintenance is when a Solicitation for Offers (SFO) is prepared to acquire new space.

With regard to maintaining a continued high level of IAQ, the entire HVAC system should be designed with access panels so a person inspecting the system can get into it at key points for regular inspections and cleaning. Moisture in the HVAC system is the major catalyst in indoor air pollution. Water is the medium in which dangerous bacteria, mold and fungi breed. Since A/C cycles cool air and extract moisture, the system must be kept trouble-free by eliminating all the residual moisture it creates. A preventive maintenance program for the HVAC system should also include:

- Routine inspection and cleaning of cooling coil drain pans.
- Removal of loose dust and debris that may accumulate in air-handling, induction, and fan coil units.
- Inspection and calibration of automatic temperature and other control systems (for example, for variable air-volume systems).
- Routine inspection and servicing of humidification systems that may be present.
- Treatment of cooling tower water with biocide, and scale and corrosion inhibitors.

It is important that renovation projects be given as much attention as a new building. Adjacencies, zoning, finishes, furnishings and new equipment should be evaluated to identify any possible cause of air quality problem, and to make the necessary changes to the mechanical equipment to handle the problem.

Ultimately the long term quality of your office depends on its maintenance. Sufficient budget should be allocated for proper maintenance and repair of HVAC equipment, cleaning programs and chemical storage. The consequences of not doing so can lead to poor system operations or even obsolescence. Facilities staff should be involved in all building modifications in order to ensure that the impact of the resulting changes to the building mechanical systems are addressed.

The following short list provides a broad guideline for maintaining an office's IAQ.

Air Quality Maintenance and Operation

- Establishment of cleaning schedules and mechanical schedules
- Selection of cleaning chemicals
- Storage of cleaning chemicals
- Maintenance of equipment; filters, humidifiers
- Occupancy awareness about
  - smoking (CO)
  - aerosols (fluorocarbon, vinyl chloride)
  - cleaning products (organic pollutants)
  - automobile exhaust (CO and lead)
- Sampling: particulates, gases, micro-organism airflow, and percent fresh air
- Replacement program that considers IAQ when selecting paint, carpet, adhesives etc.

Definitions

Ambient Lighting. Refers to the background level of general illumination. Generally used within the context of task\ambient lighting where task lit areas are illuminated to a high intensity and ambient levels maintained at a low intensity. Ambient lighting levels are often achieved through use of indirect or reflected light sources.

ASHRAE - Abbreviation for American Society of Heating Refrigeration and Air Conditioning Engineers.

Base Building. In a leased facility, it generally refers to the portions of a building for which the landlord has responsibility including: public lobbies; elevator; stairs; toilets and maintenance spaces; central building heating, air conditioning, and electrical systems; the exterior walls, windows, doors, roof and building structure. The Base Building includes all elements of a building not the responsibility of and/or supplied by tenant.

Building Shell. The exterior walls and roof of a structure exclusive of any interior finishes applied by the occupant. Unfinished, interior floor slabs are sometimes referred to as being part of the as building shell.

Construction Documents. Drawings and written specifications prepared by a licensed architect or engineer which are sufficiently detailed to provide the basis for obtaining bids from contractors and undertaking construction.

Core. The assembled vertical circulation elevator lobbies, mechanical equipment (air conditioning, telephone and electrical), toilet and janitorial spaces that are centralized elements in a typical multi-story building. Core elements are generally part of the "*base building*".

Design Intent Drawings. Drawings and written specifications prepared by an architect, planner, or interior designer which are sufficiently detailed to establish office layouts, finishes, and engineering criteria. These documents are completed prior to the preparation of construction documents.

Electro-magnetic Field. Electrical radiation often attributable to certain types of office equipment, wiring, or related electronic components.

FOB - Abbreviation for Federal Office Building.

FPMR - Abbreviation for Federal Property Management Regulations. Regulations established by the United States Government controlling the acquisition, occupancy, management of federally owned, leased, or controlled space.

GSA - Abbreviation for the United States General Services Administration.

Glazed Areas. Generally refer to the portions of a wall or roof which is constructed of glass including windows, glass block, skylights, vision panels or any glass materials.

Green Lights Program. An existing EPA program for achieving energy efficient lighting in the work place. Conservation strategies include: maximum use of daylight; use of energy efficient lamps and fixtures; control of lighting based upon occupancy.

Gross Square Footage (FPMR Definition). "Gross square footage means all floor area (including all openings in floor slabs) measured to the outer surfaces of exterior or enclosing walls, and includes all floors, mezzanines, halls, vestibules, stairwells, service and equipment rooms, penthouses, enclosed passages and walks, inside parking, finished usable space with sloping ceilings (such as attic space) having 5 feet or more headroom, and appended covered shipping or receiving platforms at truck or railroad car height. Also included in gross floor area, but calculated on one-half of actual floor area, are covered open process, passages and walks, with appended uncovered receiving and shipping platforms at truck or railroad car height."

High Density File Storage. The use of any of a variety of techniques to achieve increased file storage capacity per unit of area. Techniques include use of movable compact storage units which eliminate aisles, mechanical systems such as Lektreivers©, and open shelf or file storage employing increased storage height. It is cautioned that these techniques may require structural reinforcement to support floor loads generated by increased storage capacity. (See page 51).

IAQ - Abbreviation for Indoor Air Quality. Refers to a range of issues affecting the healthfulness of the office environment as affected by mechanical systems, finishes and materials, and processes employed within the work place.

MSDS - Abbreviation for Material Safety Data Sheet. This document which is prepared by manufacturers listing the ingredients/chemical composition of products.

Net Usable Space (FPMR Definition). "Means the area to be leased for occupancy by personnel and/or equipment. It is determined as follows:

1. If space is on a single tenancy floor, compute the inside gross area by measuring between the inside finish of the permanent exterior building walls or from the face of the convectors (pipes or other wall-hung fixtures) if the convector occupies at least 50 percent of the length of exterior walls.
2. If the space is on a multiple tenancy floor, measure from the exterior building walls, as in (1) above, to the room side finish of fixed corridor and shaft walls and/or the center of tenant separating partitions.
3. In all measurements, make no deductions for columns and projections enclosing the structural elements of the building and deduct the following from the gross area including their enclosing walls.
   - Toilets and lounges
   - Stairwells
   - Elevators and escalator shafts
   - Building equipment and service areas
   - Entrance and elevator lobbies
   - Stacks and shafts
   - Corridors in place or required by local codes and ordinances."

NRC - Noise Reduction Coefficient. An ASTM measure of the sound absorptive quality of an acoustic material

STC - Sound Transmission Class. An ASTM measure of the sound transmission qualities of a material.

Space Categories. The General Services Administration defines 3 space categories which commonly occur within EPA facilities.

1. *Office Space.* Refers to all non-specialized (see Special Space definition below) space which is suitable for occupancy and use as an office setting. These spaces are generally comprised of two components:

   - Personal Space - refers to areas that are designed to be occupied on a continuous basis, predominantly by staff, in the performance of their work.

   - Support Space - refers to areas that provide for ancillary functions including reception, conference, incidental storage, filing, lounge or common facilities in a non-specialized setting.

2. *Storage Space.* General purpose area, typically finished to below office space levels of quality, which provide space for bulk storage of files, building materials, furniture, equipment and supplies.

3. *Special Space.* Space that necessitates the expenditure of additional or varying sums to construct, maintain, and/or operate as compared with the amount spent for office and storage space. Typically the provisions of items such as increased floor loading, enhanced mechanical systems, power supply, unusual materials, etc. which are over and above typical office space capacity or quality are designated with the special space.

Power and Signal. Refers to electrical service and telecommunications. Power and signal plans denote the location and characteristics of electrical outlets, telephone connections and data connections. (See page 13).

Raised Floor System. A means of readily providing electrical, computer, and telephone cable access to equipment by creation of an elevated platform supported by pedestals above and existing or proposed floor. The platform is most frequently constructed of removable concrete panels and provides a space of between 6 and 18 inches in depth for cable distribution.

Schematic Design. The initial phase of a design project where office layouts, approaches to ceiling design, and use of materials and finishes is studied.

Systems Furniture Workstation. An individual office constructed of modular furniture components and often enclosed by free-standing furniture panels between 36"-72" in height.

Task Lighting. A method of energy efficient lighting design whereby the greatest illumination is directed at the work surface. Fixtures are generally associated with the workstation and furniture-mounted, thereby reducing the amount of ceiling light required.

UNICOR. Furniture produced through an industries program of the United States Federal Bureau of Prisons.

Metric Equivalent

LINEAR CONVERSION - FEET TO METERS

FEET		METERS	FEET		METERS
1	=	0.3048	51	=	15.5448
2	=	0.6096	52	=	15.8496
3	=	0.9144	53	=	16.1544
4	=	1.2192	54	=	16.4592
5	=	1.5240	55	=	16.7640
6	=	1.8288	56	=	17.0688
7	=	2.1336	57	=	17.3736
8	=	2.4384	58	=	17.6784
9	=	2.7432	59	=	17.9832
10	=	3.0480	60	=	18.2880
11	=	3.3528	61	=	18.5928
12	=	3.6576	62	=	18.8976
13	=	3.9624	63	=	19.2024
14	=	4.2672	64	=	19.5072
15	=	4.5720	65	=	19.8120
16	=	4.8768	66	=	20.1168
17	=	5.1816	67	=	20.4216
18	=	5.4864	68	=	20.7264
19	=	5.7912	69	=	21.0312
20	=	6.0960	70	=	21.3360
21	=	6.4008	71	=	21.6408
22	=	6.7056	72	=	21.9456
23	=	7.0104	73	=	22.2504
24	=	7.3152	74	=	22.5552
25	=	7.6200	75	=	22.8600
26	=	7.9248	76	=	23.1648
27	=	8.2296	77	=	23.4696
28	=	8.5344	78	=	23.7744
29	=	8.8392	79	=	24.0792
30	=	9.1440	80	=	24.3840
31	=	9.4488	81	=	24.6888
32	=	9.7536	82	=	24.9936
33	=	10.0584	83	=	25.2984
34	=	10.3632	84	=	25.6032
35	=	10.6680	85	=	25.9080
36	=	10.9728	86	=	26.2128
37	=	11.2776	87	=	26.5176
38	=	11.5824	88	=	26.8224
39	=	11.8872	89	=	27.1272
40	=	12.1920	90	=	27.4320
41	=	12.4968	91	=	27.7368
42	=	12.8016	92	=	28.0416
43	=	13.1064	93	=	28.3464
44	=	13.4112	94	=	28.6512
45	=	13.7160	95	=	28.9560
46	=	14.0208	96	=	29.2608
47	=	14.3256	97	=	29.5656
48	=	14.6304	98	=	29.8704
49	=	14.9352	99	=	30.1752
50	=	15.2400	100	=	30.4800

AREA CONVERSION - SQUARE FEET TO SQUARE METERS

SQ. FEET		SQ. METERS	SQ. FEET		SQ. METERS
1	=	0.0929	500	=	46.4515
10	=	0.929	510	=	47.3805
20	=	1.8581	520	=	48.3096
30	=	2.7871	530	=	49.2386
40	=	3.7161	540	=	50.1676
50	=	4.6452	550	=	51.0967
60	=	5.5742	560	=	52.0257
70	=	6.5032	570	=	52.9547
80	=	7.4322	580	=	53.8837
90	=	8.3613	590	=	54.8128
100	=	9.2903	600	=	55.7418
110	=	10.2193	610	=	56.6708
120	=	11.1484	620	=	57.5999
130	=	12.0774	630	=	58.5289
140	=	13.0064	640	=	59.4579
150	=	13.9355	650	=	60.3870
160	=	14.8645	660	=	61.3160
170	=	15.7935	670	=	62.2450
180	=	16.7225	680	=	63.1740
190	=	17.6516	690	=	64.1031
200	=	18.5806	700	=	65.0321
210	=	19.5096	710	=	65.9611
220	=	20.4387	720	=	66.8902
230	=	21.3677	730	=	67.8192
240	=	22.2967	740	=	68.7482
250	=	23.2258	750	=	69.6773
260	=	24.1548	760	=	70.6063
270	=	25.0838	770	=	71.5353
280	=	26.0128	780	=	72.4643
290	=	26.9419	790	=	73.3934
300	=	27.8709	800	=	74.3224
310	=	28.7999	810	=	75.2514
320	=	29.7290	820	=	76.1805
330	=	30.6580	830	=	77.1095
340	=	31.5870	840	=	78.0385
350	=	32.5161	850	=	78.9676
360	=	33.4451	860	=	79.8966
370	=	34.3741	870	=	80.8256
380	=	35.3031	880	=	81.7546
390	=	36.2322	890	=	82.6837
400	=	37.1612	900	=	83.6127
410	=	38.0902	910	=	84.5417
420	=	39.0193	920	=	85.4708
430	=	39.9483	930	=	86.3998
440	=	40.8773	940	=	87.3288
450	=	41.8064	950	=	88.2579
460	=	42.7354	960	=	89.1869
470	=	43.6644	970	=	90.1159
480	=	44.5934	980	=	91.0449
490	=	45.5225	990	=	91.9740
			1000	=	92.9030